EASTGATE FRAIL LANDS MULTIPLE USE WATERSHED DEVELOPMENT PROJECT

ARTICLE I - Project Description

A. Name: Eastgate Frail Lands Multiple Use Watershed Development Project

B. Watershed Location: The Eastgate Watershed lies on both sides of U.S. Highway 50 in central Nevada. The watershed drains in a westerly direction, and the drainage outlet is located approximately 110 miles East of Reno, Nevada. The watershed has a size of 214 square miles and is bounded by the Clan Alpine Mountain Range to the North and the Desatoya Mountain Range to the East. The boundaries are further defined on the attached "Location Map".

ARTICLE II - Authorization

Taylor Grazing Act approved June 28, 1934, (48 Stat. 1269) as amended, and Grazing Regulations for the Public Lands dated May 1965, as amended and supplemented.

Soil Conservation Act, Public Law 46, 74th Congress, 1935, as amended, and Reorganization Plan IV, 1940, and Comptroller General's Decision B-115665 (33 C.G. 133) October 1, 1953.

Classification and Multiple Use Act - Public Law 88-607, September 19, 1964, as amended and supplemented.

ARTICLE III - Project Definition

Article II cites the authorities and responsibilities of the BLM that are the basis for the initiation of this project.

The Multiple-Use Act requires that areas selected for management shall be included in a comprehensive long-range land use plan and that such plan will be on an inventory and evaluation of available resources and requirements for such resources and other features of the area. The Eastgate Basin falls in a much larger land area that has been placed in the category requiring multiple-use development.

In this project, the directives outlined above are being implemented for the purpose of development, to the highest use, arid lands, portions of which have extremely marginal precipitation for any type or types of land treatment that is routinely carried on by the BLM, and that are highly susceptible to erosion because of steepness of slope, nature of the soil and depleted plant cover.

The Eastgate project is a research and development pilot project for development of such lands. Rehabilitation of such watersheds requires that these lands be used within their capabilities and treated according to their needs. Objectives are to halt deterioration, to rebuild depleted soils, to promote soil fertility, to stabilize critical runoff and sediment producing areas, to improve vegetal cover, woodlands and wildlife lands, develop recreation areas, to conserve and develop water for beneficial multiple-use and establish and implement the use or uses with the greatest benefits, and to control flooding and reduce flood and sediment damage. These objectives will be obtained insofar as determined feasible with improved multiple resource use management and application of land treatment and water development and control practices.

Prior to substantial capital investment in large development work on frail arid lands, a resource inventory must be performed and analyzed and known management techniques tested by feasibility studies that carefully check the resource capability to respond to known management and development techniques. Further, to insure that the lands and waters are used to their greatest potential under the multiple-use concept, new management and development techniques must be proposed and analyzed. Again, the resource capability must be tested for successful response to the proposed treatment.

The scope of the work involved in such feasibility studies on large areas of the public domain requires the use of a sizeable manpower pool of many technical specialists. The contractor will furnish this manpower pool of technical specialists.

ARTICLE IV - Items to be furnished by the Government

A. Rainfall Data

In February 1963, the Bureau of Land Management established a network of instruments in the Eastgate Basin to collect precipitation in a systematic pattern at various elevations and locations. Both recording and non-recording rainfall instruments are being used. At the outlet of the drainage at approximate elevation of 5,000 ft. a continuous precipitation recorder was installed, and at three intermediate locations within the drainage, three additional continuous precipitation recorders were installed. In addition, a total of 22 rain cans were distributed as uniformly as possible throughout the drainage. One-quarter (1/4) mile west of the village of Eastgate, the Weather Bureau has maintained a reporting station for approximately 11 years.

The BLM instrumentation has been serviced approximately every 30 days since installation in 1963. If a storm of significance occurred they, generally, were serviced immediately after the storm. In September 1965, the precipitation information collected since 1963 was turned over to the Desert Research Institute through the University of Nevada for interpretive studies. As a minimum, the Desert Research Institute (D.R.I.) has agreed to furnish the following items early in 1966.

1. A series of depth-area-precipitation frequency curves for each 1000 foot differential in elevations in the Eastgate Basin. Frequency curves of one year, two years, five years, twenty-five years, fifty years, one hundred years and a determination relative to the maximum probable flood will be furnished. The curves developed for each elevation of 1000 foot will be prepared as applicable for areas of 0 to 10 square miles and 12 hour precipitation duration, and greater than 10 square miles and 24 hour precipitation duration.

Since the precipitation collected to-date is only a three year record and the Weather Bureau station at Eastgate is on the valley floor, it is not possible to develop frequency curves for the areas of higher elevations by direct statistical analysis of this information. Therefore, D.R.I. is correlating the precipitation information from the rain cans of different elevations with the long term Weather Bureau records at Eastgate and other stations to obtain the necessary frequency data for the higher elevations.

2. Rainfall intensity distribution curves will be furnished for each series of depth-area-frequency curves developed for the Eastgate Basin.

3. For stockpond development work and seedings, a separate rainfall frequency study will be furnished for the Eastgate Basin.

(a) Isohyetal maps for normal rainfall in each calendar month and for the year.

(b) Maps showing the expected frequency and the lower 80 percent confidence limit on the expected frequency for 24-hour rains of .01 inch or more, and for 24-hour rains greater than .10", .25", .50" and 1.00" for all locations within the basin.

4. D.R.I. will prepare an estimate of the reliability (confidence level) by percent rating or other method for all data developed. An estimate of increased accuracy of adjusted data as compared to unadjusted valley records will be included with each reliability statement.

B. Runoff Data

At the outlet of the Eastgate drainage, a continuous stage recorder was installed in February 1963. On tributaries within the drainage a series of four (4) peak flow devices were installed at strategic locations. These runoff recorders were placed to obtain runoff hydrographs of storms reaching the drainage

outlet and peak flows occurring on the tributaries. With this information, and hydraulic characteristics developed by computations and by direct current meter readings of low flows of runoff at the stage recorder, storm hydrographs and unit hydrographs for applicable portions of the drainage area for unit storms are being developed by the University of Nevada and will be furnished to the Contractor.

Loss curves for the various portions of the Eastgate drainage will be developed and furnished to the Contractor.

Also, depth-area-runoff frequency curves will be furnished for the same frequencies and elevations as outlined for the precipitation frequency curves.

C. Sedimentation Data

From certain of the storms recorded by the instruments outlined in A and B above, a sample of water was collected to assist in estimating the approximate sedimentation quantities in the flow. This information, to-date, has only been obtained on low flows and on one point only on the flood hydrograph.

Also, as supplemental information, sedimentation quantity data from a small number of flows from similar areas in Nevada will be furnished.

D. Plant Data

The Bureau of Land Management will furnish, under agreement with the University of Nevada, an analysis of the vegetative characteristics of the Eastgate Basin. Vegetative data will be developed on a basis that will reflect determinations on species, composition and dominance. Objectives of this study are to furnish interpretive information for analysis as follows:

1. To describe and delineate the major plant communities on the Eastgate Watershed.

2. To allow determination of the production, condition, and trend of the vegetation.

3. To provide vegetative data that can be used by hydrologists in watershed analyses.

4. To interpret land conditions for various management and improvement practices.

Data on each plant community will be furnished on a planimetric map of the area. Data will also include related topographic features, slope, aspect; physiographic features including land form, macrorelief, microrelief; and vegetative features characterized by cryptogams, including data on type, cover and distribution. Dominance ratings of the various species will be provided and cover estimates will be tabulated. Specific data on shrubs and trees including age and class distribution will be provided.

E. Soils Data

The Bureau of Land Management will furnish, under agreement with the University of Nevada, an analysis of the soil characteristics of the Eastgate Basin. This information will be furnished with the following objectives in mind:

1. The ecology of range lands can best be understood if the soils are investigated at the same time that the vegetation is appraised. In a synecological appraisal certain decisions regarding the state of a vegetative grouping can be satisfactorily resolved only when the soils are carefully examined. By properly interpreting soil characteristics and correlating them with natural vegetation, the following can be accomplished:

a. Range sites can be more fully described

b. The relative productivity of a site established

c. The results of classifying use evaluated

d. A sound management plan developed

It is intended that the soils information will provide adequate data for deciding the suitability of a site for various range improvements such as brush control, seeding, fertilization, growth of desirable plant species, and data to predict success or failure of previously untried land development practices.

Specific information that will be furnished on soils will include:

1. Soil survey characteristics including percentage cover of stones and gravels, and soils characteristics based on profile descriptions. Samples will be collected and analyzed in the laboratory for each horizon. These analyses will include at least the following:

PH, conductivity, texture of soil and percentage of organic matter, and cation exchange capacity of the A horizon. Water infiltration rates will be determined on important and widespread soil units with varying slopes by artifical sprinkling. The data will be furnished on maps and in tabular form.

F. Photography and Mapping

1. A complete set of 1:15,840 scale photographs of the drainage area will be furnished to the Contractor. The photography furnished has an accuracy of + or - 5% tolerance allowed on this specified scale. A minimum amount of control was placed prior to the flight to obtain this photography. It would be necessary to perform a considerable amount of additional photo identification and field control location work to obtain reliable 10 foot interval contour maps from this photography.

2. A planimetric map delineating the dendritic pattern of the watershed channels will be furnished. The map will be at a scale of 2" = 1 mile. United States Geological Survey mapping is also in the preparation state and may become available for portions of the Eastgate Basin within the period allowed for the feasibility studies outlined below.

G. Project Development Guidance

In order to insure timely completion of the feasibility study by the Contractor, the BLM will furnish technical specialists in several related fields for advice and instructions as necessary for the Contractor to perform the feasibility study as required under the terms of this contract. In order to insure that this coordinated effort will be done with the least interruption of other work being performed by the BLM technicians, it will be required that the Contractor establish a project office in Government provided quarters during the period of time required for the field investigation and formative portion of the feasibility study. This will provide the required contacts, as necessary, and limit the need for formal meetings.

In addition, on a monthly scheduled basis, formal meetings will be held with the Contractor and BLM personnel to review progress of the work. BLM technicians will be made available for these meetings to insure that timely guidance is provided to the Contractor as necessary.

H. Land Treatment Plan

The BLM will furnish guidelines relating to conventional land treatment practices for the Contractor to consider in his feasibility studies. A general outline including maps reflecting certain suggested types of proposed land treatment work, will be given as preliminary advice.

I. Cadastral surveys are scheduled for the Eastgate Basin and a new survey network will be available on the ground by the fall of 1967.

J. Previously published evaporation rates for surface waters for various locations, seasons and elevations have been assembled by BLM technicians and will be furnished to the Contractor.

K. Road development criteria: Standard geometric designs, design methods and sample plans and specifications.

L. Standard specifications and design criteria for wells, stock dams, dikes and detention reservoirs.

M. BLM standard drawing sizes and title block data.

N. Card punched precipitation data.

O. Standard specifications for seedings, certain other plantings, and fences.

P. Map reflecting location of land developed for agriculture and allowed entrees under the Desert Land Act.

Q. Eastgate Basin "Location Map".

ARTICLE V - Contractor's Responsibility

A. General

It shall be the responsibility of the Contractor, using the resource inventory and other data being furnished by the BLM as outlined in Article IV above, together with data from other sources to prepare within one calendar year from the date of Notice to Proceed on this contract, a complete and comprehensive feasibility study and report for development on the Eastgate Basin. It will be the Contractor's responsibility to take all information furnished and to obtain from private sources, universities, state institutions, and other sources, any additional information necessary to perform this task in a timely manner.

The Contractor will make and evaluate all reasonable proposals for development of the land, including but not limited to those items specified below and including the preliminary Land Treatment Plan provided by BLM and to arrive at conclusions using, as guidelines, benefit cost studies that can be defended.

The studies must be comprehensive enough to insure that the selected project development work will put the land to its highest potential use.

In addition to proposing and analyzing development work using conventional procedures, it will be the responsibility of the Contractor to initiate new thinking and develop new proposals untried on marginal lands. The chances of success of these new proposals will be evaluated by analysis of the soils data, rainfall data and other interpretive information.

The selected projects from this analysis will then be analyzed on a benefit cost basis. Each separate and integral part of a basic concept will be examined in determining which items are complementary in nature and which items are supplementary in nature. Cost analysis will eliminate the less desirable competitive items.

This contract places no restrictions on the creativity of the contract consultant. The primary consideration is that proposed projects must produce savings to the Government over previous conventional methods or show favorable benefit-cost ratios that can be defended.

Project justifications will also consider intangible benefits and items of important aesthetic values.

BLM technicians, as outlined in Article IV above, will provide basic information on conventional land treatment procedures. The feasibility studies will determine the specific application of conventional projects and the need and potential for success of new practices and activity on BLM administered resources.

1. Analysis of basic data

It shall be the responsibility of the Contractor to take the basic data collected by the BLM, the University of Nevada and the Desert Research Institute and interpretive studies performed by the University and D.R.I. and make his own

determinations as to whether all possible usable information has been developed from the available basic data and to satisfy himself that the interpretive work performed is adequate for the project development work being undertaken. He shall furnish the BLM a written statement relative to his findings, including specific comments on the statement of adequacy made by D.R.I. in its report.

If the Contractor determines that additional interpretive work is necessary prior to initiation of project feasibility studies, it shall be his responsibility to perform this additional interpretive work and again to provide a statement of adequacy of all information and interpretive work available upon completion of his own portion of the studies. In determining which projects are feasible and which are not, he will make a statement, if such statement is deemed necessary, as to any calculated risk that he has determined may be involved in any specific portion of the work because of missing or insufficient basic data records collected to date. It is recognized that a three year span of time for collection of basic data is extremely limited for project development work of this scope. All possible protective measures must be built into the feasibility studies when proposing development work.

2. Required Coordination with BLM Technicians and Management Personnel

At periodic intervals of approximately one month, as outlined in Article IV above, and at the completion of the feasibility studies, the Contractor shall, with his expertise, as necessary, from each field, appear before a BLM board of technicians and management personnel for evaluation, acceptance and/or rejection of various proposals within his overall feasibility study. The monthly meetings will be primarily for the purpose of providing guidance to the Contractor by BLM technicians and management personnel, to allow the BLM the opportunity to closely monitor the work of the Contractor and to insure continuity of thought

between the BLM and the Contractor. A written summary of each meeting shall be prepared by the Contractor and reviewed and signed by both parties. The final board meeting, which will be set up 30 days in advance, will be held for formal action on the feasibility study. It is understood and agreed by the Contractor that the Contracting Officer shall make all final decisions relative to acceptance or rejection of any and all portions of the feasibility study.

The feasibility study will be broken down into (1) feasibility investigations, and (2) a report.

B. Feasibility Investigations

Purpose and Scope: The purpose of the feasibility investigation will be to provide the basis for formulating overall plans for the Eastgate watershed development and to determine the worthiness of individual projects, and to define their physical limits. The feasibility investigation will be based on available data as outlined in Article IV above and will be supplemented where needed by the Contractor by a minimum of additional field surveys. The investigation should be made in enough detail and the data presented should be of sufficient accuracy to provide adequate support to the conclusions reached.

The Contractor will ascertain the needs and the possibilities and form balanced plans for the orderly development of the resources to meet these needs. The investigation should evaluate all resources and factors which are related to the development of the water resources. Some of these resources or factors may be situated outside the basin under investigation. Particular attention should be given to water requirements for all present uses and new requirements attendant upon development of the basin. Sites for control, storage and utilization of water shall be located and suitability for engineering structures determined and the cost of construction estimated. The feasibility investigation

will establish an order of preference among the competitive uses for water. The established preference order shall be recognized in forming definite plans for basin development. Careful basin planning will obviate the danger of partial or incomplete uses, which may prevent or make more costly, later full development.

The objective of the feasibility basin investigations should be to meet the needs of the basin through the optimum utilization of the water resources consistent with sound engineering and economic principles and the policies of the BLM.

This basin plan should present an orderly sequence of development. Key facilities and projects to meet immediate or critical needs should be indicated for early construction. Examples might be major storage works which would conserve water for several projects and uses, and reservoirs to reduce erosion, flood damage and relieve adverse effects of drought. Caution must be exercised in establishing a development program to make sure that, as far as possible, projects are not chosen for early construction which would preclude or make more expensive the later development of more worthy and economically justified enterprises.

The feasibility investigation will include the examination of specific projects to formulate a plan for development of the projects, establish needs and justifications, define their limits, and determine their technical and economic practicability.

If the projects appear desirable and technically possible, the recommendations should include the data to support the findings. If any projects appear clearly undesirable or unjustified, the projects should be dropped from the plan with a written statement of why they were dropped.

Required Methods and Procedures

It shall be the responsibility of the Contractor to make a clear written statement of the nature, source, reliability and adequacy of all of the information used in the investigation including the data furnished by the BLM and any supplemental data collected by the Contractor. The methods and assumptions employed in making estimates should be adequately explained.

1. Water Studies: The water resource investigations will include studies involving the extent, character, magnitude and dependability of water resources and analysis of present and past utilization of water supplies and an evaluation of future operations for control and development.

Water resource studies shall be carried out in sufficient detail to insure the adequacy of the water supply for all anticipated project uses and to establish design and operating criteria. Planning and developing water resources in the Eastgate Basin cannot be delayed for a long period of observation and record accumulation. Therefore, it is recognized that certain synthesized projections may have to be adopted. On the other hand, the hazards of over development and faulty design must be eliminated as far as is practical under the specific situation being studied. Analysis of basic data available must reasonably insure against failure to reach anticipated goals because of inadequate water supplies, of costly over design of facilities and of tragic structure failure attributal to failure to recognize flood potential. The problem is to determine the extent to which the expansion and interpolation of recorded data are justifiable as a basis for planning and development. The BLM, under the terms of this contract, places responsibility for this type of analysis on the integrity, ability and judgment of the Contractor.

(a) Water Supply - The water supply studies in this feasibility investigation will be concerned with the source, amount, occurrence, variability, quality and availability of water for use. The Contractor will make these studies with the use of the hydrologic data furnished by the BLM and supplemented as necessary by his own actions.

Because of the time limitations imposed for completion of the overall feasibility study, it may be necessary in certain instances to obtain critical answers by synthesizing non-existent records. If this becomes necessary, a judgment of adequacy shall be made of the synthesized record and a written statement furnished.

A complete investigation of surface water and ground water is required. Information furnished by the United States Geological Survey indicates that in one known area in the lower part of the Eastgate Basin, the ground water level has dropped considerably since the time of the last severe earthquake in the area in 1954. This occurrence should be investigated further to determine its significance, if any, and the results used in the appraisal of ground water potential. Ground water studies will involve studies which will provide data concerning the extent, thickness, capacity, hydrologic characteristics, and economic and dependable yield of the aquifer. Data from the operation of existing pump wells shall be obtained to provide such information.

The feasibility investigation should determine the suitability of the water for its intended use and should provide specific information on the quantity of transported sedimentation. The feasibility investigations must make proper allowances for existing water uses. Established rights to the use of water must be recognized and protected. It will be necessary for the Contractor to make a separate study of current basin and downstream uses within the past five years in

order to insure that waters that have been put to beneficial use are reserved for this continuing purpose and that all waters that have not been put to beneficial use will be quantitatively determined, which will then allow planned use of this surplus water in the development program.

(b) Water Requirements - Since the Eastgate Basin and other lands identified in Article IV, paragraph P, are in a semi-arid location, the available water supply is inadequate to meet the needs for water for all contemplates uses. Limiting factors such as total available water supply, geologic location of source, and seasonal and annual distribution of water occurrence all affect the utilization of this water. The task of the Contractor shall be to relate the available water supply to the requirements for various possible uses and arrive at a plan for the optimum utilization of the water resource. In the planning process the theoretical ideal water requirement should be estimated for each possible water use. Then, through operation studies, engineering, economical and other considerations, a practical plan can be tailored to provide for the most practical utilization of all resources.

Estimates of water required for vegetative growth shall be determined with the assistance of the soils and vegetative data provided as outlined in Article IV above. The BLM will furnish preliminary information regarding land areas with the highest potential for vegetative growth and guidance relative to conventional practices and procedures required for successful development of specific types of vegetation. The feasibility investigations must determine the supplemental waters, if any, required for the production of vegetative growth by comparison with the rainfall available on a monthly basis for the specific location in question. Consideration of return flows from projects at a higher elevation must be considered when appropriate and these estimates should reflect quality, location and time of occurrence.

Estimates of water requirements for anticipated recreation and domestic use should be made. The estimates should show the current or anticipated location and type of use, the gross requirements, peak consumptive rate, net consumption in amount, quality, location and time of return flow. Available and supplemental water requirements must be established to determine the feasibility of each proposed project. Known livestock and wildlife watering locations will be indicated on the data map furnished by BLM.

The Contractor, when performing feasibility investigations, should be continually alert to the water qualities necessary for any proposed projects and quality control requirements should be implemented in the study as necessary to meet these needs. Investigation of potential sites for development of fisheries in the Desatoya Range should include the quality of water necessary to insure against adverse affects on fish propagation. These studies should be made with the services of a qualified fishery biologist. The construction of project works and the development of areas for various uses must not upset the existing wildlife balance and result in the loss of recreation and other values. Planning should include measures to improve the wildlife environment and the quality and availability of wildlife.

(c) Flood Studies - These feasibility investigations involve the fields of engineering, resource management, and economics and are concerned with (1) the volumes, stage and frequency of anticipated floods for use in determining the desirability of including flood control as a project purpose, and (2) the floods to be considered in the design of hydrologic structures and practical land treatment practices.

For all structures not affecting loss of life or causing significant material damage to downstream installations, the design storm should be of the size that will accomplish its intended purpose and will meet the test of economic feasibility.

In instances where it is reasonable to assume that severe downstream property damage is a consideration or that loss of life would be a factor the design storm for any hydrologic structure shall be the maximum probable flood. Estimates of flood flows for these studies will be based upon data furnished as outlined in Article IV above and as supplemented by investigations made by the Contractor.

Several approaches shall be made to the problem of reducing or preventing flood damage and downstream erosion. One approach to be considered shall be the construction of encircling dikes to protect certain areas from flooding. Another approach to be considered should be the construction of levees or dikes which would confine high flows to selected floodways and prevent inundation of adjacent areas. Careful consideration should be made to the possible concentration of flood flows and the resultant problems to downstream areas when analysis of use of channel improvement levees or dikes in the upstream areas is contemplated.

Peak flood flows can be reduced by the construction of appropriate retention or detention reservoirs. Multiple purpose storage reservoirs should be considered to reduce both peak flood flows and total flood volume by retention and storing part or all of the flood for later beneficial use.

Combinations of several methods of control should be considered. The ultimate selection of a flood control plan should follow careful consideration of all engineering, land treatment, and economic factors with proper attention to an integrated basin plan. It may be found that some protective works must be built to meet immediate needs while awaiting the implementation of a long range multiple purpose plan. It also may be found that better watershed management, including the beneficial use of waters for the growth of additional vegetation, may be used to reduce flood problems. As a rule, some risks must be accepted in the selection of design flood discharges for local protection works of various

structures. A decision as to how much risk should be accepted in each case is of utmost importance and should be based on careful consideration of economic and other appropriate factors such as the State and Federal highway systems in the area and the limited private lands.

2. Sedimentation Studies - Estimates of the sediment load transported in the main channel flow and the various tributaries in the Eastgate Basin for each design storm will be based upon the information furnished by the BLM, again as outlined in Article IV above, and on drainage area data from similar areas. Changes in natural flows resulting from construction of dams or other works may create silting or erosion problems which will require special attention and should be considered in the feasibility investigations.

3. Erosion Control - Field reconnaissance as necessary must be performed by the Contractor, occasionally in the company of BLM personnel, to evaluate the active erosion problems that are present within the Eastgate Basin and to initiate engineering studies as necessary including engineering soil studies and studies relating to earthquake design in structures. The objectives of the feasibility study in this phase will be to locate structures that will (1) stop the active erosion that is taking place throughout the basin, primarily in the lower one-third of the area, and (2) to locate and propose structure types that would heal or tend to heal the erosion scars that now exist.

It shall be the responsibility of the Contractor to perform reconnaissance as necessary to insure that all cases of active erosion are found and considered in the feasibility investigations. Erosion control structures and land treatment methods to control erosion may include, but will not be limited to, drop structures, detention dams, retention dams, gully plugs, reservoirs, dikes, contour furrowing and ripping, land treatment and other management practices. Benefit costs, aesthetic values, and intangible benefits will all be considered, again, in this portion of the study.

4. Operation Studies - These water operation studies will be carried out in order to make it possible to visualize the manner in which the project or basin plan will work. In operation studies, various assumptions as to water supply and water requirements will be compared under anticipated operating conditions. Basically, the study will develop a system of accounting for the water income and expenditures and will then present a picture of the project in action based on runoff conditions experienced in the past.

Consideration must be given to anticipated periods of critically low flows and extend through a period prior and subsequent to the low flow period sufficiently long to represent a realistic cycle of operations. The criteria established for the operations study should set forth the amount and timing of water diversion or releases for the various contemplates uses. The criteria should define the order and extent of preference to be given to specific uses during periods of competition for available waters. The storage or regulating capacity assumed for the study will be dictated by engineering and/or economic limitations.

5. Road Network - In conjunction with the operation studies which will determine the manner in which the basin plan will work, a complete road network will be developed by the Contractor consistent with the needs of the overall development plan. A time schedule for road development as required to adequately service the basin development plan will be made.

6. Geology and Mapping - Up to date planimetric maps at a scale of 2" = 1 mile and new photography at a scale of 1:15,840 will be available on the entire Eastgate Basin. From the photography and the planimetric mapping and from limited topographic mapping developed by the Contractor from the photography, reservoir areas and capacities can be estimated and satisfactory paper locations of water diversions and waterways can be made.

a. General Geology - It shall be the Contractor's responsibility to obtain, or make, general geologic mapping of the Eastgate Basin for interpreting land classification for project development work, developing ground water data and other factors which influence the physical plans.

b. Foundation Geology - The suitability of foundation conditions for dams and other major structures shall be determined by field examination by the Contractor. Test pits or holes may be needed if questionable conditions are encountered.

c. Construction Materials - The location of suitable deposits of construction material of earth, concrete aggregate and similar materials shall be made as required from field examinations.

7. Construction Cost Estimates - Cost estimates developed in the feasibility investigation will provide a basis for authorization of the project for construction. This use should be kept in mind in preparing the estimates. Individual estimates should be prepared for each identifiable feature. The estimates should be in enough detail to show the quantity, unit costs and total costs of the various works and supply items. The estimate will be modified to reflect unusual construction problems such as climatic conditions affecting construction time or method, existing road networks and construction of new roads, availability of labor supplies, equipment repair facilities, and location and quality of construction materials. The location, size, type and cost of major facilities should be established within reasonable limits. The designs and estimates of cost should be in sufficient detail that no major deviation from the plan will be necessary when actual construction and development of the project is undertaken.

8. Easements and Agreements - It shall be the responsibility of the BLM to acquire any easements or agreements necessary to accomplish the development plan.

9. Economic Investigations and Plan Formulation Guidance - Economic investigations to determine how proposed projects would achieve such objectives as improving the efficiency of resource use, promoting economic growth and stimulate diversified development are a requirement of this contract. The investigation should provide a comparison of alternate means of achieving stated objectives and provide a guide in selecting needs to meet; (1) which projects or facilities to develop, and (2) the extent to which development should be carried.

The economic investigations shall be conducted to determine how the proposed projects will contribute toward achieving the primary objective of promoting and sustaining economic growth and optimum use of the resources. This overall objective cannot be reached by a single project but must be approached by a number of complimentary projects designed to meet specific problems and needs through new or improved use of available resources. The economic investigation will provide a basis for comparison of projects and for selection of the most desirable plan of development. The investigation will also provide information for determining the economic justification and financial feasibility of the selected plan. The extent and detail of the Eastgate investigation should be sufficient to provide a firm basis for authorizing the proposed project for development.

a. Benefits - The term "benefits" is used to designate the estimated improvements in conditions attributal to project construction and development. The affects of the project may be manifest in improvement of economic conditions. For convenience of discussion the project manifests are defined as follows:

Direct benefits - an increase in value of the immediate goals and services resulting from the proposed project.

Indirect benefits - The value of increases in useful goals and services which accrue from activities stemming from processing of the project output.

Intangible benefits - The benefits which cannot be measured in monetary terms. An item to be considered under intangible benefits is aesthetic values.

b. Methods of Economic Investigation - The economic investigation is concerned with the identification and comparison of the costs and benefits associated with a particular course of action, purpose or project. These costs and benefits shall be measured by the difference in conditions which would prevail with and without the project. The investigation will cover three time categories: historic and present conditions, probable future conditions without the proposed project, and probable future conditions with the project in operation. Time is a vital element in the comparison because equal cost and equal benefits which occur at different times are not of equal value. The comparison of future conditions which would prevail with and without the project is the foundation of the economic analysis. It is not proper to base the analysis solely on a comparison of conditions immediately before and after project construction and development. Change is inevitable and conditions may decline or improve in the absence of the project. These changes must be recognized in determining the affects of the proposed project. The predication of future conditions without the project should be based on historic and present conditions and the economic trends which will most likely occur in the absence of the proposed project and of the alternative projects. The predication of future conditions to the area should reflect on improvements in available resources and opportunities and production resulting from project construction.

(1) Basic Data - The existing situation in an area represents the beginning from which the projections of the future conditions will be made. Historic data on use of resource and actual needs will be useful in estimated future trends.

The factors which characterize the economy of the area should be identified. Needs, weaknesses and problems of resource use that could be solved by project development should be listed. In addition to the project purposes previously discussed, the project may serve other varied purposes, either specifically designed or incidental to its operation for the primary purposes. Among such opportunities for project use are: control or reduction of stream sediment loads, erosion control, recreation improvement or development of fisheries and improvement of the wildlife habitat. Under conditions where significant benefits may be derived, these potential uses should be studied by the consideration of future conditions with and without the project and anticipated demands resulting from project development. The use of water and land resources are closely related and all practicable uses of both shall be considered in selecting the purposes to be served by the basin development. Engineering and economic principles and the advantages of multiple purpose development should guide the selection of the alternative competing or complementary uses which will most efficiently contribute to the overall objective of development. Proper planning requires selecting the most desirable and economic methods of accomplishing the purposes of the project. The selection must be based on an evaluation and comparison of the relative merits of alternatives such as structure sites, type of structures, service areas and combined use of facilities as contemplated by the Multiple Use Act. The construction of a project may make partial or complete commitments extending far into the future regarding the use of resources. In selecting the size or capacity of major facilities, careful attention should be given to possible future uses not included in the present project purposes. If the structure is too small, further extension of service may be rendered unfeasible because of the cost of enlarging or extending the facilities. On the other hand, if the facilities are too large the added cost may destroy feasibility of the present project. Stage development should be a consideration in this feasibility study.

The formulations of plans for development of water in related land and other resources encompasses the processing of inventorying, analyzing, correlating, and balancing the physical economic and sociological factors involved in establishing the optimum plan of development. The general objective is the selection of those plans for water and land use which will secure efficient and effective resource utilization to the maximum extent practicable at the minimum cost consistent with sound business principles. The objective should be achieved within the framework of practical engineering, land management, and economic principles and criteria for a comprehensive long and short range public point of view. Detailed comparison of closely competitive alternatives should be made. Projects accepted for inclusion in the plan for basin development should show benefits at least equal to cost. Estimates of the annual operation, maintenance, and replacement costs must be considered in the plan selection. It should be kept in mind, however, that there are other factors such as secondary and intangible benefits and aesthetic considerations which cannot be reduced to monetary terms which could dictate the adoption of a plan somewhat less than the ideal.

Even though the development of the Eastgate Basin is of a multi-use nature, the individual projects that will make up the development plan are relatively simple in scope. It is not considered necessary to follow the feasibility study as outlined above with a highly detailed Definite Plan Study since it is probable that little additional meaningful data could be developed regardless of the depth of the follow-on study. This is in contrast to a large scale highly intensified development plan requirement for very large basins with a high degree of agricultural and industrial potential. The feasibility study must, however, be in adequate depth to insure that major changes in the overall basin development plan will not be necessary during the design phase.

Additional data required for implementation of the development plan, in this instance, is normally what would be required by the survey portion of

Title I services and is made a requirement of this contract under Article VI, Survey and Design Requirements.

Report Requirements

A complete report presenting the findings of the feasibility study will be prepared and presented to the BLM technical and management review committee 30 days prior to the final meeting of the committee referred to in paragraph 2, page 11, of Article V. The report shall present sufficient basic data, photographs, illustrative drawings and other descriptive information and analyses to permit a clear appraisal and understanding of the comprehensive plan.

The outline of the basin report:

Basin map

Part I - Transmittal

Part II - General description

Part III - Problems and needs

Part IV - Resources

Part V - Plan of development

1. Purposes to be served

2. Potential projects

Part VI - Economic analysis

Part VII - Conclusions and recommendations

Appendices

The following general explanations and instructions apply to the above outline.

Basin map - A clear, well executed, general map of the basin shall be included in the report. It should be conveniently placed so as to be readily available to the reader. It shall be of adequate scale to show the principle features of the basin and the location of all potential projects and the comprehensive

plan for the conservation and use of the water. Care should be taken to insure that all places and features mentioned in the narrative report are shown on the map. The map may be in several parts as necessary for convenient use.

Part I - Transmittal - This part of the report shall be prepared in letter style addressed to the BLM. The authority for the report should be briefly stated with specific documentation, at least by reference. Appropriate acknowledgements should be expressed for special assistance rendered by agencies or individuals other than those of the Contractor.

The main part of the transmittal should be a brief resume of the principle items of the basin plan: a description of the plan, what it will accomplish, the features involved, engineering feasibility and economic justification.

Part II - General description - This part of the report shall present a brief overall picture of the basin. It shall cover such factors as: physical features, climate, history and settlement, present stage of development, general economy and resources.

Part III - Problems and needs - This part of the report should be given special attention because it establishes the need for proposed basin development. It should discuss local and regional problems and needs such as need for improved transportation and communication services, development and need for conserving and developing water resources to achieve the desired goals of economic growth and optimum use of the resources.

Part IV - Resources - A discussion of the water, land and other resources pertinent to development of the basin shall be given in this part of the report.

The discussion of water supply and its existing and potential use should be comprehensive. Statistical information on precipitation, stream flows, underground water, and quality of water shall be given. The report shall show

quantitatively the water available for additional uses and the storage and regulation needed for maximum development. Since the water supply is limited and there are competing alternative uses for the available supply, these factors shall be presented.

Part V - Plan of development - This presents a master plan for developing and utilizing the resources of the basin.

A clear, concise description of the plan proposed for the development of the basin should be presented. The overall objectives and purposes of the plan should be discussed in detail. Its adaptability to existing and foreseeable conditions should be demonstrated.

The projects recommended for inclusion in the basin plan should be described individually. The location, physical features and purposes served should be described. The manner in which each project fits into the basin plan should be shown. The estimated construction costs should be given as well as annual operating, maintenance and replacement costs.

The report should present a schedule showing the order in which construction and development of the various projects should be undertaken.

Part VI - Economic analysis - Approval of the proposed basin plan will be largely based on consideration of this part of the report. It should provide a full explanation of the economic studies and analyses of present conditions and of conditions which may be anticipated with and without the proposed development. A clear, factual and impartial evaluation of estimated benefit and costs should be given for each unit of the basin plan and for the plan as a whole. The report should include a full discussion of intangible and social benefits and other factors such as aesthetic values which may influence consideration of the basin plan.

Part VII - Conclusions and recommendations - It shall contain, for emphasis, a brief summary of the problems and needs of the basin and the importance, from an economic and social point of view, of the proposed development. The conclusions should be positive statements of facts related to the need for basin development, the envisioned accomplishments, engineering feasibility and economic justification. The report should conclude with plainly worded recommendations of the action to be taken.

Appendices - Appendices shall be prepared to cover each major phase of the investigation. Their purpose is to supply full information to substantiate the findings shown in the report proper, and to permit close scrutiny and review, by qualified specialists, of the work and findings of the investigation. The principle aim should be clarity and completeness. The appendix should contain a full description of the investigations and studies undertaken and of the work methods and techniques employed. Basic data used in the study should be presented in full.

Fee and Payment - The Government shall pay the Contractor a fixed fee of _____ which shall constitute full compensation for all services provided under Article V of this contract.

Fifty (50) percent of this fee shall be paid at the time of essential completion of the field work required if such payment is concurred to by the Contracting Officer.

Payment of the remaining 50 percent of the fee shall be made upon acceptance of the feasibility report by the Contracting Officer.

NOTE: The report and all supporting data developed by this study shall become the property of the Government and use of, or reproduction of this data is prohibited without the express permission of the Government.

ARTICLE VI - Field Survey and Design Requirements

The portions of the feasibility study that are accepted by the Government as the final overall Basin Development Plan shall be authorized in writing by the Contracting Officer for design by the Contractor. A total of 18 months shall be allowed for the complete design and preparation of contract documents.

A. Scope of Services:

1. Field Surveys - To insure adequacy of the design, certain additional detailed individual project feasibility analysis may be required within the scope of the approved Basin Development Plan. Minor revisions of the Basin Development Plan may be made as required by these additional feasibility studies upon receipt of written approval by the Contracting Officer. This additional feasibility analysis shall be a part of the surveys necessary for individual project design.

a. Individual Project Supplemental Feasibility Analysis: This work involves the additional field studies that are normally required to solve the engineering problems related to the proper design of individual projects. Also, in this instance, it may involve surveys required to solve engineering problems related to proper design of a series of related projects. An example of this would be sub-surface soils analysis of a structure location as proposed on the Basin Development Plan. Soils analysis may determine that the structure site should be shifted and this relocation would effect a second structure's size and location. These changes to the overall plan, however, will be well within the scope and detail of the plan and would not involve changes that would significantly effect the overall plan operation or cost.

b. Remaining Field Surveys: The remaining field surveys required for complete design of all of the individual projects in the approved Basin Development Plan shall be done in conjunction with the work involved in the supplemental feasibility analysis outlined in "a" above.

The remaining field surveys to be performed by the Contractor shall include all professional engineering services necessary to insure adequate data for the required design work.

Surveys shall include but not be limited to the following items:

(1) Surveying - All surveying required for preparation of topographic mapping for design, additional surveying for design computations and staking, surveying for control and miscellaneous surveying as necessary. Topographic surveys of reservoirs, dam sites, major structure sites, and project land areas will be required at appropriate scales for development of design and costs of the various component parts of the basin plan. Maps for reservoirs should be mapped at a contour interval of two feet. Major structure sites shall be mapped at not less than the scale of 1:1,200 with a contour interval of two foot. Areas proposed for irrigation should be mapped at a scale of 1:1,800 with a two foot contour interval to facilitate the land classification survey and design of the distribution system.

(2) Soils Investigations - Complete soils investigations as required to support design requirements of the approved Basin Development Plan.

(3) Seismic field studies as necessary to insure safe design for all projects in the Eastgate Basin which is located in a zone of "severe" damage potential.

2. Design - The Contractor shall perform all professional engineering services required for a complete design, including preparation of the plans and specifications for each project in the approved Basin Development Plan. Each project shall be provided a legal tie to the nearest land grid section corner.

a. Construction Packages: Based upon the approved chronological sequence of development of the basin plan, the plans and specifications shall be separated into four complete construction packages, with complete plans and specifications for the work involved in each package.

b. Water Loss Considerations: Designs for water developments shall be carefully made to minimize as much as possible, as allowed by economic limitations, the loss of developed waters by evaporation and seepage.

Estimates of probable evaporation losses should be made by reference to actual records of evaporation pans with adjustment to evaporation from a free water surface. Evaporation losses from a reservoir water surface will be of significant magnitude in the Eastgate Basin. These losses must be considered in reservoir operation studies. Seepage losses from reservoirs also require serious consideration. If the losses are small and where structural stability is not affected, the losses may be ignored or considered as part of the reservoir release. Where the losses are high and especially where they may increase due to piping or solution of foundation material they may govern practicability of using the reservoir site. All geologic studies of dam and reservoir sites should carefully evaluate probable seepage losses.

c. Reservoir Design Considerations: The design flood selected may be less than the maximum probable flood where loss of life and severe property damage are not involved, and should be tied very closely to the economic considerations. These economic considerations should include balancing the construction and maintenance costs of the spillway and other protective works against the cost of replacement or repair of damage to the structure arising from the passage of excessive floods.

The economic and physical life of a reservoir is shortened by the reduction in storage capacity resulting from accumulation of sedimentation. To insure that the anticipated benefits are realized, provisions shall be made for a reasonable amount of sediment without encroaching on the required storage capacity. The space reserved should not be less than the anticipated deposition during the project life assumed in the economic analysis of the project.

d. Geology and Exploration: Geologic exploration of dams and major structure sites should be carried out to supplement survey exploration and earlier reconnaissance exploration and to establish the adequacy of the site and provide sufficient information for reliable designs and estimates. Sub-surface examinations of canal and waterway locations should be conducted to determine the nature of materials to be encountered with particular attention to unusual construction difficulties and the need for impervious linings. A major factor influencing the type of structure and structure costs is the availability of the construction materials such as earth, concrete aggregate, timber and rock. Deposits of material of satisfactory quality in adequate quantity shall be located and tested during the design phase.

e. Water Balance Checks: As the design of the individual projects proceeds a continuous check of the water being utilized shall be made and compared with available water that has been developed. Re-use of waters in downstream areas shall be a part of this continuous check on water balance. Adjustments, as necessary, within the scope of the approved Basin Development Plan shall be made to insure a proper water balance of use against availability.

f. Available BLM Standard Specification and Drawing Sheets: Standard specifications and design criteria for stock dams, wells, dikes and detention reservoirs will be furnished to the Contractor for use, as appropriate, in preparing each design package.

The BLM standard drawing sizes and title block data will be furnished to the Contractor.

B. Fee and Payment:

The Government estimate of cost which was prepared in detail as part of the feasibility study and represents project costs that have met the test of

economic feasibility shall be used as a basis of payment for services rendered by the Contractor for all survey and design work.

The Government shall pay the Contractor a fee of _____% for surveys and _____% for design of the approved Government Estimate of cost for each land treatment project which forms a part of the Basin Development Plan.

The Government shall pay the Contractor a fee of _____% for surveys and _____% for design of the approved Government Estimate of cost for each project (other than land treatment) which forms a part of the Basin Development Plan.

On a contract quarterly basis, 80% of the survey fee shall be paid for each project of the Basin Development Plan that field surveys were completed on in the quarter being covered by the partial payment estimate.

On a contract quarterly basis, 80% of the design fee shall be paid for each project of the Basin Development Plan that design was completed on in the quarter being covered by the partial payment estimate.

The remaining 20% of the survey and design fees shall be paid upon acceptance of the completed Basin Development Plan design.

ARTICLE VII - Project Field Staking and Inspection

A. Establishment of Control:

As the construction packages outlined in Article VI are awarded to the various construction contractors, it shall be the responsibility of this Contractor to establish or re-establish all necessary horizontal and vertical control that will allow the construction contractor to accomplish the necessary construction staking required for him to construct the work in strict conformance with his contract requirements.

This horizontal and vertical control shall be shown in detail on the construction drawings and shall be shown to be accomplished by "others".

The Contractor shall establish all of this control within 20 days after official notification by the Bureau of Land Management that award has been made on a construction contract.

B. Construction Inspection:

The Contractor shall furnish competent inspection personnel to supervise the construction of all facilities awarded under each construction contract.

In general, this inspection work shall be full time on each project when work is being performed and shall be sufficient to insure strict compliance with the contract requirements by the construction contractor.

The Contractor shall make the necessary measurements for, and preparation of, tabulations of work satisfactorily completed for use in making partial and final payments to the construction contractor.

C. Fee and Payment:

The Government shall pay the Contractor a fee of _____% of the awarded construction contract for establishment of survey controls and inspection of construction. 80% of this fee shall be paid on the construction contract quarterly basis and the remaining 20% of this fee shall be paid upon completion and acceptance of the contract work by the Government.

No additional inspection fees will be allowed for time extensions on the construction contracts as long as the time extensions are part of contract modifications that are within the scope of the original contract except that in instances where such time extensions exceed 15% of the original contract time additional inspection fees will be allowed based upon a pro-rated cost as established by the original contract and shall be applicable to all time exceeding 115% of the original contract time.

List of Governm[illegible] Furnished Contract Data

Item No.	Item	Spec. Page Reference
* 1	Hydrometeorologic Data	3, 4, 5
* 2	Daily Rainfall Studies	4
** 3	D.R.I. Confidence Level Statements	4
* 4	Sedimentation Data	5
* 5	Plant and Soils Data	5,6
** 6	Photographs, 1:15,840	7
** 7	Planimetric Watershed Map	7
* 8	Preliminary Land Treatment Plan	8
** 9	Advanced Cadastral Survey Plat	8
* 10	Evaporation Rate Data	8
** 11	Road Data	9
** 12	Standard Specifications, Drawing Sizes and Title Block Data	9
** 13	Card Punched Precipitation Data	9
** 14	Desert Land Entry Map	9
** 15	Eastgate Basin Boundary Data	9

* Data Attached

** Items to be furnished to contractor after contract award.

AERIAL PHOTOS - 1 TO 15840

SOME CONTROL - NOT TOO MUCH.