

REVISED JULY 1976

JENSEN UNIT

CENTRAL UTAH PROJECT DEFINITE PLAN REPORT

DECEMBER 1975

APPENDIX D

AGRICULTURAL ECONOMY
FINANCIAL & ECONOMIC ANALYSES



DEPARTMENT OF THE INTERIOR
THOMAS S. KLEPPE, SECRETARY

Bureau of Reclamation
Gilbert G. Stamm, Commissioner



JENSEN UNIT

CENTRAL UTAH PROJECT DEFINITE PLAN REPORT

DECEMBER 1975

APPENDIX D

AGRICULTURAL ECONOMY
FINANCIAL & ECONOMIC ANALYSES

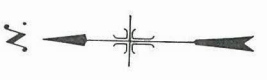
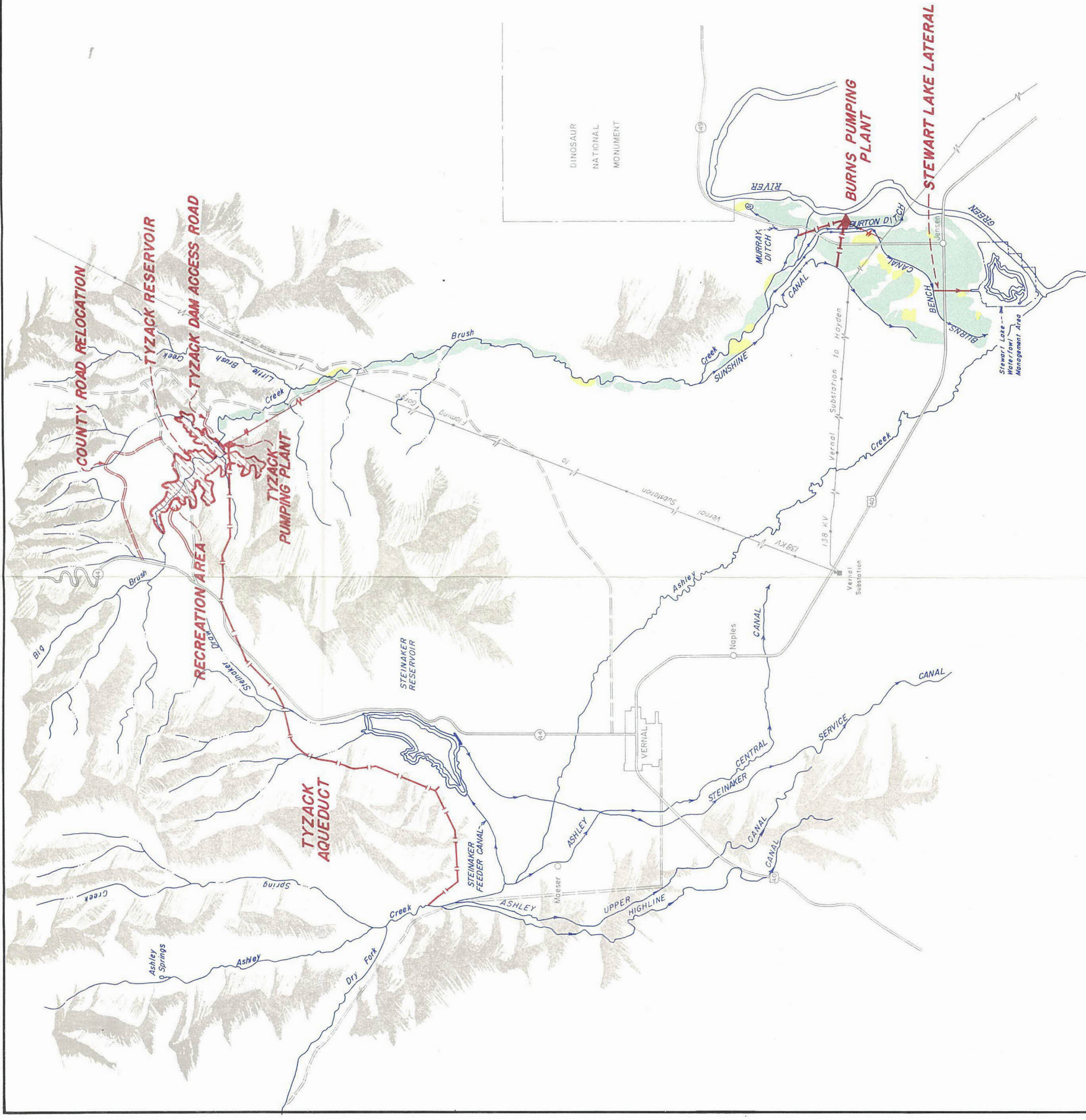
BUREAU OF RECLAMATION

GILBERT G. STAMM, COMMISSIONER

Upper Colorado Region

David L. Crandall, Regional Director





- EXPLANATION**
- PROPOSED PROJECT FEATURES**
- RESERVOIR
 - PUMPING PLANT
 - PIPELINE
 - TRANSMISSION LINE
 - LATERAL
 - SUPPLEMENTAL SERVICE LAND
 - FULL SERVICE LAND



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
JENSEN UNIT PROJECT
JENSEN UNIT-UTAH
GENERAL MAP
SEPTEMBER-1975

SUMMARY SHEETS

Jensen Unit

LOCATION

Uintah County, northeastern Utah, in Uinta Basin of Upper Colorado River Basin.

AUTHORIZATION

Initial Phase of the Central Utah Project, including Jensen Unit, authorized as a participating project of the Colorado River Storage Project by act of April 11, 1956 (70 Stat. 105).

PLAN OF DEVELOPMENT

The Jensen Unit will provide municipal and industrial water to augment existing supplies throughout the project area and water for irrigation in the vicinity of Jensen. It also will benefit fish and wildlife, recreation, and flood control.

The main project feature will be Tyzack Reservoir to be constructed on Big Brush Creek. Project water will be pumped from the reservoir to Ashley Creek by the Tyzack Pumping Plant and Aqueduct and exchanged with Ashley Spring for municipal and industrial use. Tyzack Reservoir operation will be coordinated with operation of Steinaker Reservoir of the Vernal Unit to avoid winter operation of the Tyzack Aqueduct. Treatment and distribution of the municipal and industrial water will be the responsibility of the water users.

Storage water to be used for irrigation below Tyzack Reservoir will be released from the reservoir to Big Brush Creek and conveyed in the Brush Creek channel to points of diversion. The project Burns Pumping Plant will pump water from Green River for the irrigation of lands near Jensen and for municipal and industrial purposes by exchange with water from Big Brush Creek. The irrigation water, whether supplied from the reservoir or the pumping plant, will be distributed by existing canals. Only minor extensions of existing irrigation distribution facilities will be required and these will be provided by the water users. Project drainage will be provided as necessary. Power for operation of the project pumping plants will be obtained from the Colorado River Storage Project system.

Specific recreational facilities will be provided at Tyzack Reservoir. Measures for fish and wildlife will include a fishery pool in Tyzack Reservoir and rehabilitation of public lands as big game range to compensate for range lands that will be inundated by the reservoir. Also improvements will be made in the methods of water deliveries to the Stewart Lake Waterfowl Management Area, permitting improved operation of the area.

SUMMARY SHEETS (Continued)

IRRIGATION SERVICE AREA (acres)

Full service land	440
Supplemental service land	<u>3,640</u>
Total	4,080

WATER SUPPLY (average annual acre-feet)

Project increases in supply	
Municipal and industrial use	18,000
Irrigation	<u>4,600</u>
Total	22,600
Depletion of Colorado River	15,000
Increases in salinity concentration	
at Imperial Dam (mg/l)	
From stream depletion.	1.5
From increase in salt load1

COSTS

Construction costs (January 1975 prices, except as noted)

Tyzack Dam and Reservoir	\$18,455,000
Tyzack Pumping Plant and discharge line (aqueduct)	<u>1/9,420,000</u>
Burns Pumping Plant and discharge lines.	3,290,000
Drains	774,000
Tyzack Pumping Plant switchyard.	<u>2/121,000</u>
Burns Pumping Plant switchyard	65,000
Facilities to connect with Colorado River Storage	
Project power system	121,000
Transmission line to Tyzack Pumping Plant.	97,000
Transmission line to Burns Pumping Plant	93,000
Recreational facilities.	757,000
Fish and wildlife development.	43,000
Permanent operating facilities	<u>27,000</u>
Total	33,263,000

Annual operation, maintenance, and replacement

costs (1972-74 prices).	177,000
<u>1/</u> Entire cost at July 1975 prices except \$6,000 for acquisition of	
land and land rights which was estimated at January 1975 prices.	
<u>2/</u> At July 1975 prices.	

SUMMARY SHEETS (Continued)

COST ALLOCATIONS (\$1,000)

	Construction costs	Reimbursable interest during construction (5.116 percent)	Annual operation, maintenance, and replace- ment costs
Reimbursable costs			
Municipal and industrial water	\$25,668	\$2,338	\$120
Irrigation	4,933		6
Recreation			48
Subtotal	<u>30,601</u>	<u>2,338</u>	<u>174</u>
Nonreimbursable costs			
Fish and wildlife			
Enhancement	596		1
Mitigation	20		
Recreation	757		
Flood control	609		2
Highway improvement	680		
Subtotal	<u>2,662</u>		<u>3</u>
Total	<u>33,263</u>	<u>2,338</u>	<u>177</u>

REPAYMENT OF REIMBURSABLE COSTS (50-year repayment period)

Municipal and industrial water			
Prepayment ^{1/}	58		
Water users	16,903	1,543	120
Ad valorem tax revenue	8,707	795	
Subtotal	<u>25,668</u>	<u>2,338</u>	<u>120</u>
Irrigation			
Prepayment ^{1/}	11		
Water users	750		6
Apportioned revenues from Colo- rado River Storage Project	4,172		
Subtotal	<u>4,933</u>		<u>6</u>
Recreation (State of Utah)			<u>48</u>
Total	30,601	2,338	174

^{1/} Includes payments made for investigation from Colorado River Development Fund and funds contributed by State of Utah.

SUMMARY SHEETS (Continued)

MUNICIPAL AND INDUSTRIAL WATER CONSTRUCTION COSTS AND REPAYMENT^{1/}

<u>Item</u>	<u>Initial use</u>	<u>Deferred costs or sub-</u>		<u>Total</u>
	<u>Block 1</u>	<u>sequent construction^{2/}</u>	<u>Block 3</u>	
	(6,000	Block 2	(6,000	(18,000
	acre-feet)	(6,000	acre-feet)	acre-feet)
Tyzack Reservoir	\$4,565,000	\$4,566,000	\$4,566,000	\$13,697,000
Tyzack Pumping Plant and related facilities	10,546,000			10,546,000
Burns Pumping Plant and related facilities		2,363,000	1,323,000	3,686,000
Permanent operating facilities		19,000		19,000
Total	15,111,000	6,948,000	5,889,000	27,948,000

Annual payment
(50 years) 842,600 387,400 328,400 1,558,400

^{1/} Costs shown include \$2,338,000 in reimbursable interest during construction but exclude \$58,000 in prepayments.

^{2/} "Subsequent construction" refers only to Burns Pumping Plant and related facilities.

SUMMARY SHEETS (Continued)

BENEFIT-COST ANALYSIS

(100-year period of analysis at 3.25 percent interest)

	<u>Direct</u>	<u>Indirect and public</u>	<u>Total</u>
Average annual benefits			
Municipal and industrial water	\$2,055,000		\$2,055,000
Irrigation	166,000	\$17,000	183,000
Fish and wildlife	24,000		24,000
Recreation	88,000		88,000
Flood control	24,000		24,000
Total	2,357,000	17,000	2,374,000
	<u>Direct effects</u>	<u>Indirect effects</u>	<u>Total</u>
Negative externalities			
Concentrating effects of stream depletion	\$282,000	\$63,000	\$345,000
Increase in salt load	18,800	4,200	23,000
Average annual equivalent costs.			1,371,000
Benefit-cost ratios			
Without externalities			
Ratio of total benefits to costs			1.73:1
Ratio of direct benefits to costs.			1.72:1
With negative externalities from increased salt load			
Ratio of total benefits to costs			1.71:1
Ratio of direct benefits to costs.			1.70:1

PROJECT FEATURES

Tyzack Reservoir	
Capacity (acre-feet)	
Active	24,000
Inactive and dead.	2,000
Total	26,000
Surcharge.	7,600
Normal water surface area (acres)	520
Tyzack Dam	
Height above streambed (feet)	145
Crest length (feet)	1,640
Volume of dam (cubic yards)	2,030,000
Tyzack Pumping Plant	
Maximum operating head (feet)	587
Design diversion capacity (second-feet)	46
Tyzack Discharge Line (aqueduct)	
Capacity (second-feet).	46
Length (miles).	11.8
Burns Pumping Plant	
Maximum static head at average flow of river (feet)	52 to 195
Design diversion capacity (second-feet)	97.4

Appendixes to the Jensen Unit, Central Utah Project, have been prepared in four volumes with the data grouped as follows.

APPENDIX A
DESIGNS AND ESTIMATES
PLAN FORMULATION

APPENDIX B
WATER SUPPLY

APPENDIX C
PROJECT LANDS
DRAINAGE
GROUND WATER

APPENDIX D
AGRICULTURAL ECONOMY
FINANCIAL AND ECONOMIC ANALYSES

CONTENTS

Agricultural Economy

	<u>Page</u>
Chapter I General Discussion	1
Introduction.	1
Settlement and early history.	1
Need for supplemental water	2
Project plan.	3
Project lands	3
Water supply.	4
General description of project area	4
Climate.	4
Population	5
Present agricultural economy	5
Size and types of farms	6
Land use and crop distribution.	6
Crop yields	6
Transportation and markets	10
Off-farm employment.	10
Farm credit and farm mortgage indebt- edness	11
Tenancy.	12
Excess lands	12
Chapter II Basic data used in farm budgets.	13
Basis of analysis	13
Price level.	13
Prices received	13
Prices paid	13
Farm size and type.	13
Repayment budgets.	13
Benefit budgets.	16
Land use and crop distribution.	16
Crop yields	16
Land values and land development costs.	19
Labor requirements.	20
Crop labor requirements.	20
Livestock labor requirements	20
Miscellaneous labor requirements	25
Operator labor	25
Farm machinery and equipment.	25
Custom work and rates.	25
Automobile and truck use and operating costs.	28
Farm building and improvements.	28
Cost and annual depreciation, repairs, and insurance rates.	28

CONTENTS (Continued)

Agricultural Economy (Continued)

	<u>Page</u>
Chapter II Basic data used in farm budgets (continued)	
Farm building and improvements (continued)	
Fencing.	30
Crop production expenses.	30
Fertilizer requirements.	30
Spraying costs	32
Seeding rates and costs.	32
Baling twine.	33
Livestock production expenses	33
Livestock turnoff rates.	33
Livestock feed requirements.	38
Substitution rates, prices paid, and	
inventory values of feed.	38
Public grazing permits.	41
Inventory value of livestock	41
Miscellaneous livestock expense.	41
Other farm expenses	42
Telephone.	45
Domestic water	45
Miscellaneous farm expenses.	45
Existing operation, maintenance, and replace-	
ment costs	45
Chapter III Irrigation repayment	46
Farm budgets.	46
Weighting of farm budgets	46
Farm family living allowance.	47
Value of farm perquisites	47
Farm budget summaries	48
Chapter IV Irrigation benefits.	65
Direct irrigation benefits.	65
Indirect irrigation benefits.	65
Public irrigation benefits.	71
Development period.	71
Loss in benefits.	71
References.	73

CONTENTS (Continued)

Financial and Economic Analyses

	<u>Page</u>
Chapter I Present economic conditions.	1
Population.	1
Employment and personal income.	2
Medical facilities.	2
Education facilities.	2
Problems and needs.	5
Expected growth.	5
Municipal and industrial water needs	7
Irrigation needs and supplies.	15
Need to control flood flows.	15
Support by local officials.	15
Chapter II Economic justification	16
Introduction.	16
Benefits.	18
Municipal and industrial water.	18
Irrigation.	20
Recreation.	20
Fish and wildlife	22
Flood control	23
Costs	23
Construction costs.	23
Interest during construction.	25
Annual operation, maintenance, and replacement costs	25
Cost of regulatory features of the Colorado River Storage Project	30
Externalities	30
Section 8 costs	30
Annual equivalent costs	31
Benefit-cost comparison	31
Benefit-cost summary tables	31
Economic rate of return	31
Chapter III Cost allocation.	36
Introduction.	36
Method of allocation.	36
Benefits.	36
Alternative single purpose costs	37
Justifiable expenditures.	38
Separable costs.	38
Multipurpose project without municipal and industrial water	38
Multipurpose project without irrigation.	38
Multipurpose project without fish and wildlife	41
Multipurpose project without flood control	41
Multipurpose project without highway improvement.	41

CONTENTS (Continued)

Financial and Economic Analyses (Continued)

	<u>Page</u>
Chapter III Cost allocation (continued)	
Justifiable expenditures (continued)	
Remaining justifiable expenditure.	41
Remaining joint costs.	41
Total allocated costs.	43
Chapter IV Project repayment.	45
Repayment organization.	45
Reimbursable and nonreimbursable costs.	45
Repayment of operation, maintenance, and re- placement costs	46
Project revenues.	46
Municipal and industrial water repayment.	46
Irrigation revenues	52

TABLES

Agricultural Economy

<u>Number</u>		<u>Page</u>
1	Land classification summary	4
2	Numbers of farms by size and type, percent of farms by size, and acreage per farm and percent acres by size.	7
3	Number of farms and percent of farms by type as reported in the 1969 Census of Agriculture and the farm management survey.	8
4	Farm size and crop distribution by type of farm	9
5	Crop yields	10
6	Summary of off-farm employment.	11
7	Farm indebtedness by percent of investment.	11
8	Prices received by farmers for principal crops and livestock products--Utah.	14
9	Farm sizes based on irrigable acres as determined in the farm management survey and as used in the farm budgets	15
10	Projection of farm sizes and percent distribution of crops grown on irrigable lands.	17
11	Present and projected crop yields	18
12	Investment values of land used in farm budgets.	19
13	Labor requirements and percent distribution of man-hours by crops with project development	22
14	Labor requirements and percent distribution of man-hours by crops without project development.	23
15	Livestock labor requirements and distribution of labor projected for Jensen Unit	24
16	Livestock and crop management calendar.	26
17	Machinery and equipment costs, annual repairs, and depreciation.	27
18	Fuel, oil, lubrication, and tire costs per mile for automobiles, pickups, and 1 1/2-ton trucks.	29
19	Farm buildings and improvement.	31
20	Fertility depletion of soils by harvest of crops. . . .	32
21	Seeding rates and costs per acre.	33
22	Projection of feeds used to meet TDN requirements of beef cattle.	39
23	Projection of feeds used to meet TDN requirement of sheep.	40
24	Estimated annual miscellaneous livestock expenses short and long projection	42
25	Assessed values of land, machinery, buildings and improvements, and livestock--short- and long-term projections	43

TABLES (Continued)

Agricultural Economy (Continued)

<u>Number</u>		<u>Page</u>
26	Mill levy rates used in farm budgets.	43
27	Farm share of electricity	44
28	Electricity rates	44
29	Farm budget summary, repayment number 1	49
30	Farm budget summary, repayment number 2	50
31	Farm budget summary, repayment number 3	51
32	Farm budget summary, repayment number 4	52
33	Summary of farm data and recommended water charge	64
34	Farm budget summary, benefit budget number 1.	66
35	Farm budget summary, benefit budget number 2.	67
36	Farm budget summary, benefit budget number 3.	68
37	Farm budget summary, benefit budget number 4.	69
38	Summary of farm budget data and irrigation benefits	70
39	Agricultural losses in excess of right-of-way costs	
	Loss of production, 433 acres--Tyzack Reservoir	72

Financial and Economic Analyses

1	Employees on nonagricultural payrolls in Uintah County.	3
2	Miscellaneous business statistics for Uintah County	4
3	Estimated employment and population from three levels of oil shale development in the Uinta Basin, Utah.	8
4	Projected population and population distribution (prototype development)	9
5	Projected population and population distribution (moderate commercial development)	10
6	Projected population and population distribution (accelerated commercial development).	11
7	Estimated new municipal and industrial water re- quirements.	13
8	Summary of project benefits	17
9	Municipal and industrial water--single purpose alterna- tive.	18
10	Computation of municipal and industrial water benefits.	20
11	Recreation benefits	21
12	Jensen Unit recreation annual costs	22
13	Project costs	24
14	Interest during construction.	29
15	Benefit-cost analysis	32
16	Occurrence of project costs (interest during construction excluded)	33
17	Occurrence of project benefits.	34
18	Occurrence of water supply services	34
19	Economic rate of return	35
20	Alternative single purpose projects	37

TABLES (Continued)

<u>Financial and Economic Analyses (Continued)</u>		
<u>Number</u>		<u>Page</u>
21	Separable and remaining joint costs	39
22	Allocation of project costs	44
23	Summary of cost allocation and repayment.	47
24	Determination of municipal and industrial water repayment under provisions of the 1958 Water Supply Act. . .	49
25	Municipal and industrial water repayment schedules. . . .	50
26	Repayment schedule of reimbursable costs allocated to irrigation.	53
27	Recapitulation of project repayment	54

MAPS AND FIGURES

General map (450-418-71).	Frontispiece
-----------------------------------	--------------

<u>Agricultural Economy</u>		
<u>Figure number</u>		
1	Capacity chart for field machines	21
2	Turn-off rates per 100 beef cows with growing short yearlings (at end of development period).	34
3	Turn-off rates per 100 ewes (at end of development period)	35
4	Turn-off rates per 100 beef cows with growing short yearlings (long-term projections)	36
5	Turn-off rates per 100 ewes (long-term projection). . . .	37

<u>Financial and Economic Analyses</u>		
1	Population projection for Ashley Valley	12
2	Estimated new municipal and industrial water requirements (Ashley Valley)	14
3	Municipal and industrial water only alternative	19
4	Tyzack Reservoir cost curve	40
5	Tyzack Dam and Reservoir road costs	42

AGRICULTURAL ECONOMY

CHAPTER I

GENERAL DISCUSSION

Introduction

The Jensen Unit is one of four units of the Central Utah Project Initial Phase which was authorized by the act of April 11, 1956 (70 Stat. 105). Definite plan reports have already been completed on the other three units, i.e., Vernal, Bonneville, and Upalco. Jensen Unit is located along the Green River east of the town of Vernal and in Ashley Valley in Uintah County in northeastern Utah. It will develop about 22,600 acre-feet of water for irrigation and municipal and industrial purposes as well as provide facilities for fish and wildlife, recreation, and flood control.

The economic analysis of the Jensen Unit has been accomplished in accordance with procedures set forth in Reclamation instructions, directives, and the authorizing legislation. Irrigation payment capacity and irrigation benefits were determined using farm budget analysis. Payment capacity studies are based on a level of management anticipated at the beginning of the repayment period, while irrigation benefits are based on a level of management anticipated 15 to 20 years after the end of the development period.

All of the information used in this study was collected or assembled by the Bureau of Reclamation from primary or secondary sources. Primary data adapted for use in the farm budgets were taken from farm management surveys of 29 project area farms. Approximately 70 percent of the irrigated acres in the Jensen area were included in the farm management survey. The survey was conducted in 1962, and the crop yield data were updated in 1965 and 1973. An effort was made to obtain information from the more representative farms, but because of the area's small and compact size, nearly every farmer was contacted. Information collected in the farm management survey includes farm sizes, crop yields, livestock numbers, machinery owned and rented, and other basic input-output data. Secondary data found applicable in the study came from personal interviews with agricultural leaders, feed mill operators, farm implement dealers, bulletins published by the U.S. Department of Agriculture, Agricultural Experiment Stations, and data developed in the Upper Colorado Region over a number of years.

Settlement and Early History

Father Silvester Valez de Escalante, a Catholic priest and explorer, with a group of 10 Spaniards, crossed the Green River 4 miles above the

town of Jensen on September 17, 1776. This was the first recorded visit by a white man to the project area. In 1825 General William N. Ashley along with Jim Bridger and Andrew Henry made a trapping expedition into the area. General Ashley left his name on Ashley Creek and Ashley Valley. The Vernal area of Ashley Valley was settled in 1873 and 1877.

The first settlers in the Jensen area were Mormon colonists who came in the fall of 1877 and spring of 1878. These pioneers diverted water from Brush Creek to irrigate the readily accessible agricultural lands adjacent to the stream. The town of Jensen was named in honor of Lars Jensen, who operated the first ferry for passengers and baggage across the Green River from 1881 to 1909.

By 1878 there were three canals as well as several small individual ditches in use, but water shortages during August and September resulted in numerous court actions regarding the use of natural streamflow from Brush Creek. The rights to the natural flows have since been adjudicated by court decree. The project area still suffers a shortage of irrigation water during the late growing season.

Isolation due to inadequate roads, high mountains, and absence of railroad facilities forced the early settlers to become self-supporting. Through the years this same economic philosophy has continued although the area enjoys fast, efficient motor freight transportation to markets outside the area.

Livestock and livestock feeds are the only agricultural products produced. This type of agricultural economy has been dominant since the area was settled and is not expected to change with project construction. Types of livestock raised include beef cattle and sheep. Dairy farms are nonexistent and may never be of major importance. The kinds of crops grown supplement the livestock industries.

Need for Supplemental Water

Lack of irrigation water, particularly in the late summer and fall, greatly handicaps farmers of this area. Crops are almost entirely dependent upon irrigation since annual rainfall averages only 7.7 inches. Irrigation water serving the area originates in the high Uinta Mountains located north of the project area. The high runoff period occurs rather late in the spring, usually in late May or early June. Some shortages occur prior to the runoff, but shortages during August and September cause nearly all of the crop damage. The average annual shortage is estimated at approximately 25 percent. The shortage varies from 2 percent (1947) to 56 percent (1934); and because it is unpredictable, adjustments in irrigated acreage to obtain maximum results from the available water are difficult to make. These shortages originate at Brush Creek, which until recently was the only water source utilized by the irrigators

in Jensen. In 1961 the Burns Bench Canal Company constructed a pumping plant which began operation in 1962. The Burns Bench Company is the largest company in the Jensen area and supplies water to approximately 1,860 irrigated acres. The pumping plant pumps water from the Green River to the Burns Bench Canal to supplement water diverted from Brush Creek. Operation of the pumping plant is expensive, and even in years of nonuse it is a financial burden on its owners. Because of its expense, the pumping plant is used infrequently. In 1965 the pump was not operated even though shortages from Brush Creek did occur. Construction of the project would result in an orderly program of irrigation and planting of crops by the local farmers and would insure a dependable water supply.

Project Plan

The Jensen Unit will develop about 22,600 acre-feet of water for irrigation and municipal and industrial purposes. Preliminary plan formulation studies have indicated that a combination of pumping from Green River and storage on Brush Creek will be the most economical development. A supplemental water supply will be provided for about 3,640 acres of presently irrigated land and a full supply for about 440 acres of new land. About 18,000 acre-feet of water will also be provided for municipal and industrial use.

Storage will be obtained in the Tyzack Reservoir to be constructed on Big Brush Creek about 3 miles below the stream's crossing by Utah Highway 44. The reservoir will have a total capacity of 26,000 acre-feet, of which 24,000 acre-feet will be active. It will store early spring runoff and surplus flows of Big Brush Creek for subsequent irrigation and municipal and industrial use. Storage water will be used, when available, for the irrigation of the Jensen Unit lands. The storage supplies, when insufficient, will be supplemented by irrigation water pumped from Green River by the Burns Pumping Plant.

Existing canals and laterals will be used for the distribution of the project irrigation water. Some project drainage may be required on drainage-deficient land.

Project Lands

Project lands of the Jensen Unit comprise 4,080 irrigable acres and are located in Uintah County in northeastern Utah. Situated approximately 12 miles south and east of Vernal, Utah, the area is part of the Uinta Basin, a generally broad, shallow physiographic depression. Most of the project lands are adjacent to the west bank of the Green River in an area averaging 3 miles in width and extending 6 miles in length. Small tracts of project lands also lie in narrow strips along the banks of Brush and Little Brush Creeks.

Project lands are predominantly deep, well drained, heavy clay loams. The soils, like those of most arid regions, are rich in mineral plant nutrients and low in organic matter and nitrogen. They are fertile and generally free from excessive amounts of soluble salts. For the most part, the topography of the lands is gently sloping and well suited to irrigation farming. Table 1 is a land classification summary of project lands in the Jensen Unit.

Table 1
Land classification summary
(Unit--acres)

	Supple- mental service lands	Full service lands	Total
Class 1	40		40
Class 2	3,180	250	3,430
Class 3	420	190	610
Total irrigable	3,640	440	4,080
Class 6W	333		333
Total irrigated	3,973	440	4,413

Water Supply

Project water developed by the Jensen Unit for irrigation will total 4,600 acre-feet annually measured at head of canal. A supplemental water supply of 3,000 acre-feet will be provided for lands presently irrigated and 1,600 acre-feet for full service lands. Tyzack Reservoir would store early spring runoff and surplus flows of Big Brush Creek for subsequent irrigation and municipal and industrial use. Initially, irrigation water will be supplied from storage water; but as municipal and industrial demands are met, irrigation water will be supplemented by pumping from the Green River by Burns Pumping Plant.

General Description of Project Area

Climate

The Jensen Unit area has a semiarid climate. It is characterized by wide daily and annual variations in temperature and by well defined seasons. The winters are generally cold, but snowfall is light. The summers are warm with an occasional hot spell. The prevailing winds are from a westerly direction. The small annual precipitation of less than 8 inches and only 60 percent or about 4 1/2 inches recorded during the growing season precludes any dry farming in the area. The short growing season, distance to markets, plus the present inadequate water supply, restrict the selection of crops on the irrigated lands to crops that can be utilized

as livestock feed. Thus pasture, hay, some small grains, and corn for silage comprise the typical crop rotation on most project farms. Climatological data gathered from weather stations of the surrounding area are presented in the following table.

Climatological data		
	Station	
	Jensen	Vernal
Elevation (feet)	4,720	5,280
Temperature (° F.)	45.7	44.6
Mean annual		
Extremes		
High	105	103
Low	-36	-38
Precipitation (inches)		
Mean annual	7.67	7.97
Extremes		
High	12.55	14.78
Low	3.52	2.81
Frost-free period (days above 32° F.)	119	119
Average irrigation season		
Number of days	180	180
From	April 14	April 14
To	October 10	October 10

Population

Population growth in the Jensen Unit area for the 30-year period 1940 through 1970 was approximately 2 percent per year or near the Utah State average. Since 1970 the growth rate has increased more sharply due to oil exploration activities. An exceptional growth spurt occurred in the 1970-72 period. In view of the present and possible accelerating National energy shortages, it is expected that oil resource development will continue with resultant population increases from expanding employment in the oil industry.

Present agricultural economy

The economy of the Jensen Unit is based on the production of livestock and livestock products. Beef and sheep form the nucleus of the livestock industry, and one or a combination of these types of livestock can be found on most of the area's farms. Essentially there are no cash crops, and all the hay and grain harvested are utilized locally and marketed through livestock. Availability of grazing on public lands is the major reason for the importance of livestock in this area. These public grazing lands fit well into an irrigation agriculture. The irrigated land is the base of operations where the winter feed is produced and fed to the livestock. The mountain ranges provide the grass and forage for summer grazing.

No agriculturally related industries are found in the Jensen area, and farming forms the basis for nearly all of the present economy in this small local area. A great deal of fluctuation is caused by an unstable and usually short irrigation water supply. Construction of the Jensen Unit will stabilize and strengthen the agricultural economy of this area.

Size and Types of Farms

Farm sizes vary considerably not only by type of farm but also within the same type. Table 2, based on farm management survey results, shows the number, percent, and acreage per farm in various-sized groups presented by the U.S. Bureau of the Census. This table also indicates the number of farms by farm types and size.

Beef, sheep, or a combination of these types comprise 65 percent of the farms in the project area. Agricultural census figures of Uintah County show a similar trend but differ slightly due to classification procedures. Table 3 compares results of the 1962 farm management survey and the 1969 agricultural census of Uintah County for type of farm by number and percent.

Land Use and Crop Distribution

The agricultural production on the presently irrigated land in the project area is limited by climate, water supply, and distance to market. Alfalfa hay and pasture are grown on approximately 75 percent of the irrigated land, corn silage and small grains on about 23 percent, while farmstead and waste make up the remaining 2 percent. The present crop distribution is in its most efficient use as a base operation for livestock in the utilization of public and private range.

Although the growing season is short, it is possible to get three cuttings of alfalfa if late-season water is available. Legumes and palatable high-yielding grasses are the principal pasture forages, so both hay and pasture are of high quality. Small grains are grown for two reasons, one being as a nurse crop for new stands of pasture or alfalfa hay and the second as a concentrate supplement for winter feeding. Table 4 shows the average acreage per farm and crop distribution of the irrigated lands by type of farm as determined by the farm survey.

Crop Yields

Crop yield data were obtained from the farm management survey and updated by spot checks in the field in 1973. Information for alfalfa, small grain, and corn silage was representative of the entire area. Sufficient information from the farm management survey was not available to determine the yield from rotation pasture. The yield for rotation pasture was determined by comparison to nearby areas. Table 5 shows the

Table 2
Numbers of farms by size and type, percent of farms by size,
and acreage per farm and percent acres by size

Farm-size (acres)	Number of farms			Total farms	Percent of farms	Acreage per farm		Percent of acres
	Beef	Beef- sheep	Sheep			Total	Irrigated	
Under 100	1		1	8	28	49	45	2
101-179	2	1	2	8	28	143	91	7
180-259	1			1	3	218	120	2
260-499	3	1		5	17	331	168	11
500-999	2			2	7	700	130	9
1,000-over	4	1		5	17	2,112	98	69
Total or average	13	3	3	29	100	530	97	100

Table 3
Number of farms and percent of farms by type as
reported in the 1969 Census of Agriculture
and the farm management survey

Type of farm	1969 Census of Agriculture Uintah County		1962 Jensen area farm management survey	
	Number	Percent	Number	Percent
Livestock	247	47	19	66
Beef			(13)	
Sheep			(3)	
Beef-sheep			(3)	
General	25	5	10	34
Dairy	30	6		
Miscellaneous and unclassified	224	42		
Total	526	100	29	100

Table 4
Farm size and crop distribution by type of farm

Farm type	Number of farms	Acres owned	Acres rented	Total farm size	Acres irri- gated	Acres nonirri- gated	Average acreage per farm					
							Land use irrigated acres					
							Alfalfa	Small grains	Rotation pasture	Corn silage	Perma- nent pasture	Farm- stead and waste
Beef	13	792		792	117	675	60	13	10	7	22	5
Beef-sheep	3	1,213		1,213	114	1,099	43	16	21		31	3
Sheep	3	128		128	102	26	57	15	8	7	15	
General	10	64	41	105	63	42	31	18	4	1	7	2
Total or average	29	516	14	530	97	433	48	15	9	4	18	3

Source: Farm Management Survey.

crop yields within the Jensen Unit based on results obtained from the farm management survey.

Table 5
Crop yields

	Unit of yield	Yield per acre
Alfalfa	Ton	3.7
Barley	Bu.	70.0
Corn silage	Ton	12.0

Crop production practices are standard throughout the area. Alfalfa is rotated about every 6 years, and small grains are rarely planted in the same field more than 3 years in succession. Spraying for weeds and insects is practiced by approximately 75 percent of the farmers interviewed, and nearly 65 percent have their own spraying equipment. Corrugation and flooding are the most common types of irrigation practiced. Corrugation is used on alfalfa, small grains, and corn; flooding is used for pastures.

Transportation and markets

The project area is readily accessible by automobile or truck over hard-surfaced highways maintained by the State of Utah and by Uintah County. No railroads serve the area. The nearest railroad is approximately 140 miles away at Heber, Utah. U.S. Highway 40 offers regular bus service, and there are bus terminals at Vernal, approximately 10 miles from the Jensen area.

Markets for livestock are located primarily outside of the area. Larger shipments of feeder cattle or lambs are usually sent east to Denver or west to Salt Lake City or Ogden. The weekly auction at Roosevelt, located approximately 40 miles from the project area, however, is well attended by out-of-area buyers and is rapidly becoming the favorite market of the area farmers.

Off-farm employment

There were 29 farmers interviewed concerning off-farm employment and 15 reported income from off-farm sources. These sources included construction work, mining, selling, and custom work for other farmers. Much of this work was performed during the winter months or when work on the farm was not too demanding. Therefore, if a farmer spent more than 90 days or earned more than \$2,000 in off-farm labor, he was listed as a part-time farmer. There were 14 out of 29 farmers interviewed who were classified as part-time farmers. Table 6 summarizes information regarding off-farm employment by type of farm in the project area.

Table 6
Summary of off-farm employment

Type of farm	Number of farmers	Number of farmers working off-farm by estimated earnings					Total	Percent of farmers
		0 to 1/500	\$500 to 1/1,000	\$1,000 to 1/2,000	\$2,000 to 3,000	\$3,000 and over		
Beef	13		0	0	1	2	3	23
Beef-sheep	3		0	0		1	1	33
Sheep	3	1	0	0		1	2	66
General	10		0	0	3	6	9	90
Total	29	1	0	0	4	10	15	52
Part-time farmers					4	10	14	48

1/ Considered full-time farmers. Worked less than 90 days and earned less than \$2,000 in off-farm employment.

Source: Farm management survey.

Farm credit and farm mortgage indebtedness

Farmer credit is available from several sources. Some of the more important sources are the Federal Land Bank, Farmers Home Administration, insurance companies, private individuals, and a number of commercial banks with offices in Vernal.

Farm mortgage debt is continually changing as a result of old mortgages being retired and new mortgages being incurred. Also, many land-owners mortgage land outside of the project area under the same mortgage as project lands. Thus the attempt to determine farm mortgage indebtedness becomes complicated.

In the farm management survey several questions related to farm indebtedness were asked. These questions concerned the actual extent of debt, the source of credit, and the percent debt was of the total value of land, livestock, and machinery. Survey results show 47 percent of the farms have a real estate mortgage and that land indebtedness amounts to about 14 percent of the total investment. Livestock indebtedness amounts to 4 percent and machinery 5 percent of total investment. The amount of indebtedness varied with type of farm as shown in Table 7.

Table 7
Farm indebtedness by percent of investment

	Percent of farms	Farm mortgage real estate	Live-stock	Feed and seed	Machinery	Other
Beef	70	15	5	0	7.1	0.8
Sheep	6	25		0		
Miscellaneous	24	10		0		
Weighted average	100	14	4	0	5.0	.6

Tenancy

Tenants are defined as those who rent from others or work all the land they operate on a share basis. Full owners operate only the land they own, while part owners own some land and rent from others. Managers operate land for others and are paid a wage or salary for their services.

According to the 1969 Census of Agriculture, there are 28 tenant farmers, or 4.2 percent in Uintah County. It should be noted this was a decrease within the total area from 1959 as illustrated in the following table taken from the 1969 census of agriculture.

	Tenure of operator		
	Uintah County		
	1959	1964	1969
Number of farmers	759	659	526
Full owners	468	420	306
Part owners	244	207	199
Managers	8	4	
All tenants	39	28	21
Proportion of tenancy	5.1	4.2	3.9

The farm management survey indicated only one full-time tenant in the Jensen area, representing 3.4 percent.

Excess lands

In accordance with Reclamation law, delivery of project water is limited to 160 irrigable acres in a single ownership, which has been construed to mean 320 acres when owned by husband and wife. The results of a study of excess acreage indicate there is only one owner who at the present time would be affected by this limitation. This ownership contains approximately 920 irrigable acres, which represent 23 percent of the total project acreage. Indications are that this ownership will be divided into smaller parcels in the near future. Before construction is begun, however, a commitment will be obtained assuring compliance with the provisions of Reclamation law in regard to excess ownership. Two courses of action are open to him: (1) The excess lands may be deeded to someone else, ordinarily heirs, or (2) he can sign a recordable contract with the United States Government agreeing to dispose of excess land and granting power of attorney to the Secretary of the Interior to dispose of the excess lands in the event he does not. The land must be disposed of within a 10-year period after water is delivered at an appraised price made prior to project construction.

CHAPTER II

BASIC DATA USED IN FARM BUDGETS

Basis of Analysis

The information presented in this appendix reflects conditions anticipated for two different time periods. Projections of present crop yields, farm sizes, etc., anticipated at the end of the development period are used in payment capacity studies. Payment capacity studies are shown in Chapter III. Agricultural data for irrigation benefits studies are projected to 15 to 20 years after the end of the development period. These projections reflect technological changes expected during this time period.

Price level

Price levels used in repayment and benefit studies represent current agricultural prices normalized for short-term fluctuations. These prices are derived from linear regression procedures similar to those described in Guideline 2, Agricultural Price Standards for Water and Related Land Resource Planning, dated October 1974, prepared by the Water Resource Council. These prices represent 1974 trend values derived from an 11-year (1963-73) linear regression procedure adjusted to reflect 1974 data.

Prices Received

Prices received are based on State price data which are considered to be representative of the project area. A list of prices received is shown on Table 8.

Prices Paid

Prices paid by farmers were obtained primarily from local sources and projected to 1973 current normalized levels and adjusted to include 1974. Each item of expense is discussed separately in this appendix.

Farm Size and Type

Repayment budgets

Farm sizes used in the repayment analysis are based on the 1962 farm management survey and discussions with agricultural leaders in 1973. In the Jensen Unit, with exception of long narrow strips of land located on Brush and Big Brush Creeks, the bulk of the project lands lies above the west bank of the Green River in the vicinity of Jensen. These lands

Table 8
Prices received by farmers
for principal crops and livestock products--Utah

Commodity	Unit	Normalized price ¹ / (adjusted to reflect 1974 data)
Food grains		
Wheat (all)	Bu.	\$2.85
Feed grains and hay		
Corn	Bu.	2.01
Oats	Bu.	1.03
Barley	Bu.	1.58
Hay, all baled	Ton	36.10
Wool		
Including incentive payment		.70
Beef cattle		
Cows	Cwt.	26.42
Yearlings		
Heifers	Cwt.	36.13
Steers	Cwt.	40.43
Sheep		
Ewes	Cwt.	8.14
Lambs	Cwt.	33.10

comprise a relatively small area and are made up of approximately 85 percent class 2 lands. The remaining 15 percent is class 3. Since the class 3 lands are interspersed with the class 2, it was impossible to obtain data for farm size, farm type, and crop yields for class 3 lands; therefore, budgets were made for only class 2 lands. Table 9 presents a summary of farm sizes in irrigable acres by farm type as determined in the farm management survey and as used in the farm budgets. Although farm sizes used in the farm budgets vary from those found in the farm survey, it should be remembered that the trend is toward larger farms and the time represented by the farm budgets is about 10 to 15 years after the farm management survey was taken. Size of irrigated farms increased approximately 20 percent from 1950 to 1960 as reported by agricultural census data for Uintah County.

Table 9
Farm sizes based on irrigable acres
as determined in the farm management survey
and as used in the farm budgets

Farm type	Average farm size (irrigable acres)		
	Farm man- agement survey results (class 2)	Farm sizes used in repayment budgets (class 2)	Farm sizes used in benefit budgets
Beef	107	160	200
Beef-sheep	104	160	200

In addition to irrigable acres, farms in the Jensen area have large acreages of private range and some permanent pasture. Irrigated pasture with a water right but some adverse physical property has been classified as 6W. These pasture lands have an integral and important part in the farm operation as a source of animal feed. Because of their importance to the overall economy, it was necessary to include both types of pasture in the farm budget.

Results of the farm management survey indicate the average farm has approximately 600 acres of private range and permanent pasture. Land classification results list 333 acres of 6W land and 4,080 acres of irrigable lands.

Two farm types were budgeted, beef and beef-sheep. These farm types account for 45 and 21 percent, respectively, of the area's farms as shown in the farm management survey. The remaining 34 percent of the farms were classified as general farming, but most of these farms were small, and off-farm employment was necessary to supplement farm income. On the beef-sheep combination farm, beef is dominant and the trend is toward more beef and fewer sheep. Therefore, in the repayment budgets, beef farms were used to represent 75 percent of irrigable lands and beef-sheep 25 percent.

Benefit budgets

Farm sizes used in determination of irrigation benefits are projections of farms and conditions as they are anticipated some 15 to 20 years after project water is delivered. Some of the anticipated conditions affecting farm size include increased automation, advanced agricultural technology in the development of higher yielding crop varieties, and increased use of commercial fertilizers. National and State trends indicate that farm units will increase in size and decrease in number. Table 9 also shows farm sizes in irrigable acres as used in the benefit budgets which are approximately 25 percent larger than existing farms. Farm types are not expected to change in the future.

Land Use and Crop Distribution

Land use under project conditions is not expected to differ significantly from that found on adjacent areas with a full water supply. Climatic factors and distance to market restrict the area to the production of livestock feed, hay, pasture, and small grains which are expected to continue as the dominant crops. A regulated and improved water supply will allow a greater portion of the land to be used for raising corn silage.

Farm management survey results of land use and crop distribution were discussed in a previous section of this report and are shown in Table 4. These data have been modified slightly based on judgment and information from some farmers known to have adequate water supply for use in the farm budgets. Land use and crop distribution by percent for each farm type is shown in Table 10 for both the repayment and benefit budgets.

Crop Yields

Crop yields used in the farm budgets are shown in Table 11. Yields used in the repayment analysis are now being obtained by farmers with good water rights and under project conditions should be obtained by the average farmer. In projecting yields for payment capacity studies, two basic assumptions were made: (1) farm management will remain about as it is now except for increase in application of technological advancement and (2) irrigation water will be available for late-season use on hay, corn, and pasture crops. Because of the difficulty in obtaining accurate pasture yields, it was assumed that pastures grown on irrigable land will yield as much total digestible nutrients as alfalfa hay reduced for waste.

Crop yields for the benefit analysis are projected from the same basic data as those for repayment. It was assumed, however, that new varieties will improve levels of production. Farm management survey data indicate that yields used in the long-term budgets have been obtained by

Table 10
Projection of farm sizes and percent distribution
of crops grown on irrigable lands

Farm type	Percent of farms	Land use (acres per farm)			Percent distribution of irrigable acres					
		Irrigable	Perma- nent (6w)	Pri- vate range	Total farm size	Al- falga	Small grain silage	Rotat- ion stead pas- ture and waste	Total	
Payment capacity studies										
Beef	75	160	25	600	785	57	4	25	5	100
Beef-sheep	25	160	25	600	785	57	4	25	5	100
Weighted average	100	160	25	600	785	57	4	25	5	100
Benefits studies										
Beef	75	225	25	600	850	56	5	24	4	100
Beef-sheep	25	225	25	600	850	56	5	24	4	100
Weighted average	100	225	25	600	850	56	5	24	4	100

Table 11
Present and projected crop yields

Crop	Unit of yield per acre	1973 yields ^{2/}	Projected yields class 2 land			
			End of develop- ment period		15 to 20 years after end of develop- ment period	
			Without project	With project	Without project	With project
Alfalfa	Ton	3.7	3.7	4.0	3.9	5.0
Rotation pasture ^{1/}	AUM		5.0	6.5	6.0	9.0
Barley	BU	70.0	50.0	60.0	70.0	100.0
Corn silage	Ton	12.0	12.0	17.0	14.0	22.0
Aftermath ^{1/}	AUM		.6	.6	.6	.6
Permanent pasture ^{1/}	AUM		2.0	2.0	2.0	2.0
Private range ^{1/}	AUM		.3	.3	.3	.3
Straw	Ton	1.0				

^{1/} Insufficient information to determine present yields.

^{2/} Based on farm budget survey data collected in 1962 and 1965 updated to 1973 by interviews with agricultural leaders.

approximately 20 percent of the farmers in these areas. Agricultural census data, 1940-69, indicate an upward trend in crop yields as farmers adopt new management practices and crop varieties in an effort to stay competitive. As an example, alfalfa hay yields, according to the U.S. Department of Agriculture census, have increased 0.9 ton in the last 24 years in Uintah County. Other crops show a similar trend.

Land Values and Land Development Costs

Land values for use in the farm budgets are based on farm management survey data. From the farmers interviewed, the value of irrigated crop land was estimated to be \$100 to \$500 per acre. The model ranged from \$200 to \$249 while the arithmetic mean was \$240 (rounded). These values include land, development costs, and the existing water supply. The value of irrigated permanent pasture (6W land) is estimated at less than the mean value for irrigated crop land or approximately \$100 per acre. Native or private range in the Jensen area is valued at approximately \$45 per acre. A summary of information obtained in the farm management survey concerning land values is shown in the following table.

Value of irrigated crop land	
Number of farmers responding	Range of land values
1	\$100-\$149
0	150- 199
6	200- 249
5	250- 299
5	300- 399
2	400- 500
Total 19	(average) (rounded) 240

Current normalized land values were used in payment capacity and irrigation benefits studies. These values are based on data taken from the farm management survey and indexed to 1974 values. Table 12 shows land values used in the farm budgets.

Table 12
Investment values of land
used in farm budgets

Type of land	Value without project development (per acre)	Value with project development (per acre)
Irrigable land class 2	200	240
Irrigated class 6 (permanent pasture)	100	100
Private range	45	45

Labor Requirements

Labor requirements were obtained from several different sources. Crop production requirements are based on data from the farm management survey in the project area and field efficiency tests conducted in Sevier River Basin, Utah. Labor requirement data for caring of livestock are from secondary sources and adjusted to practices and conditions existing in the project area.

Crop labor requirements

In the farm management surveys farmers were asked to enumerate, in sequence, cultural practices for each crop they raised. Several factors affect the man- and tractor-hours required to perform various field operations. Size, shape, and the general topography of the field along with the size of the implement are the most important factors which influence effective field capacity. All machinery has a theoretical field capacity or the number of acres it can theoretically cover in 1 hour's time. Actually, it is necessary to stop for unloading, turning, etc., so that the theoretical field capacity is never reached. The ratio of actual acres covered in an hour (effective field capacity) to the theoretical number of acres covered is known as field efficiency. By using a field efficiency factor along with the speed of the machine and width of machine in feet, the capacity chart shown in Figure 1 can be used to compute effective capacity in acres per hour.

From this chart and information obtained in the farm management survey, standards representing average conditions and management were established for each land class. Tables 13 and 14 show the man- and tractor-hours needed per acre for each crop in the various farm budgets.

Livestock labor requirements

Labor requirements for the caring for livestock were developed from data in various publications by colleges and universities and private, State, and Federal agencies. These data were adjusted to the project area assuming average management, work efficiency, and use of typical facilities and equipment. Table 15 shows the annual requirements per animal unit of man- and tractor-hours and the distribution of this labor.

Labor estimates for the beef and sheep enterprises are based on a combination of range and irrigated farm conditions. Beef calves are kept on the farm until they reach a weight of 650 to 750 pounds. This practice provides efficient use of feed and labor resources as well as increasing the gross farm income. Lambs are sold as fat or feeder lambs in October or early November. Lambing and feeding the base herd provide efficient labor utilization during the winter months.

Figure 1

Capacity Chart for Field Machines

Effective Capacity in Acres per Hour

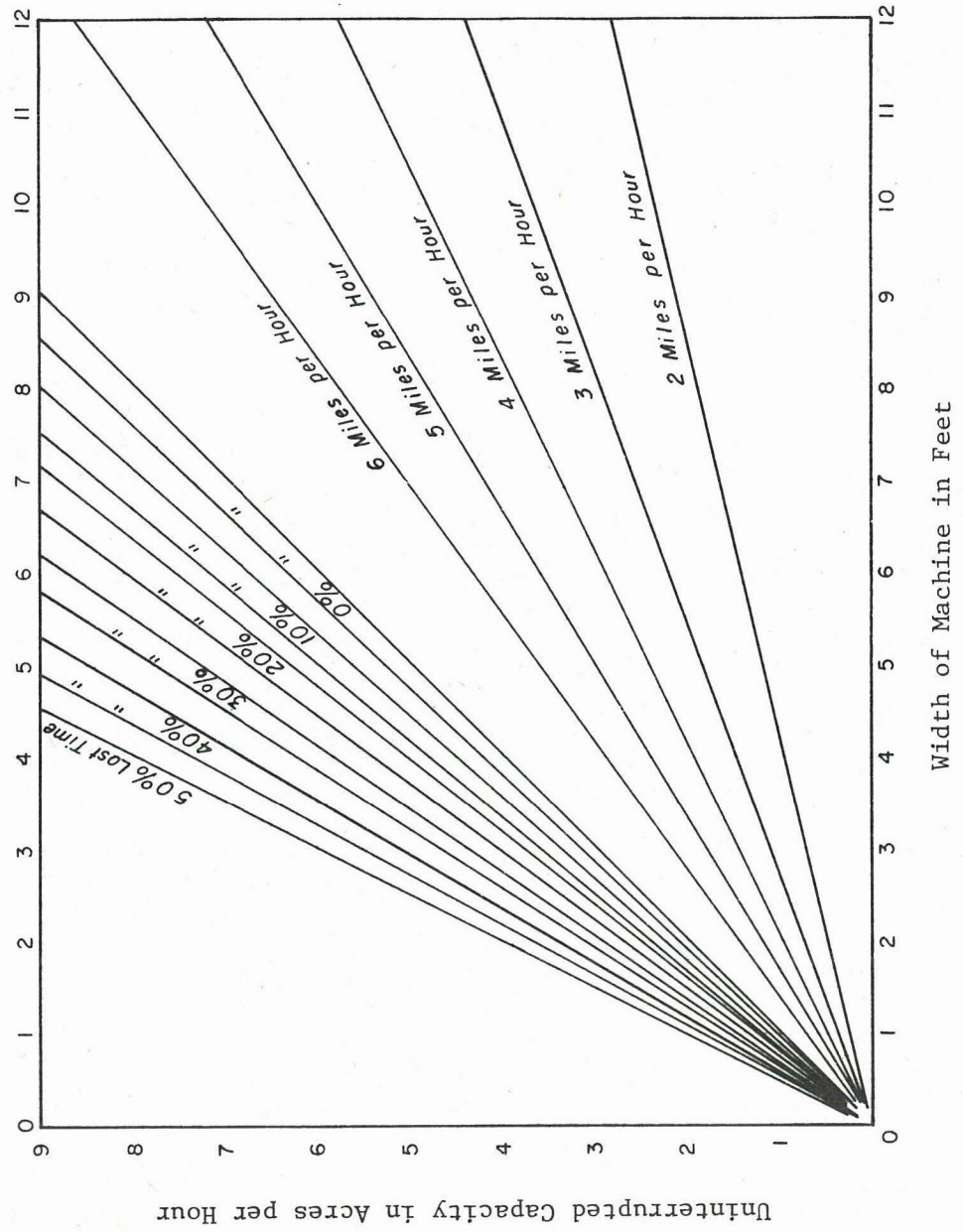


Table 13
Labor requirements and percent distribution of
man-hours by crops with project development

Crop	Crop yield per acre	Hours per acre		Percent distribution of man hours											
		Man	Tractor	January	February	March	April	May	June	July	August	Septem- ber	October	Novem- ber	December
Payment capacity															
Alfalfa	4.0 Tons	9.5	4.0				3	6	20	20	22	24			
Barley	69 BU	6.9	3.0				26	14	12	8	11	12	5	5	
Corn silage	17 Tons	14.3	6.0				8	14	17	8	6	43	2	2	
Rotation pasture	6.57 AUM	4.5	.7				24	13	10	15	14	11	5		
Benefits															
Alfalfa	5.0 Tons	10.0	4.5				3	6	20	21	21	24			
Barley	90.0 Bu.	7.5	3.5				26	14	12	8	11	12	5	5	
Corn silage	22.0 Tons	15.5	6.5				8	14	17	8	6	43	2	2	
Rotation pasture	9.0 AUM	4.5	.7				24	13	10	15	14	11	5		
Permanent pasture	2.0 AUM	4.0	.5				11	17	17	24	22	6			

Table 14
Labor requirements and percent distribution
of man-hours by crops without project development

Crop	Crop yield per acre	Hours per acre		Percent distribution of man-hours											
		Man	Tractor	January	February	March	April	May	June	July	August	Septem- ber	October	Novem- ber	December
Payment capacity															
Alfalfa	3.7 Tons	9.0	3.5			5	3	6	20	20	22	24			
Barley	70 Bu.	6.7	2.9			7	26	14	12	8	11	12	5	5	
Corn silage	12 Tons	14.0	5.9			8	8	14	17	8	6	43	2	2	
Rotation pasture	5 AUM	4.3	.7			8	24	13	10	15	14	11	5		
Benefits															
Alfalfa	3.9 Tons	9.7	4.2			5	3	6	20	20	22	24			
Barley	70 Bu.	7.3	3.3			7	26	14	12	8	11	12	5	5	
Corn silage	14 Tons	14.0	6.0			8	8	14	17	8	6	43	2	2	
Rotation pasture	6 AUM	4.5	.7			8	24	13	10	15	14	11	5		
Permanent pasture	2 AUM	4.0	.5			3	11	17	17	24	22	6			

Table 15
Livestock labor requirements and distribution of labor
projected for Jensen Unit

Type livestock operation	Number of breeding units	Hours		Distribution of man hours											
		Man	Tractor	January	February	March	April	May	June	July	August	September	October	November	December
Cow-yearling	100	11.7	1.2	0.12	0.12	0.15	0.13	0.11	0.03	0.03	0.03	0.03	0.07	0.07	0.11
	200	10.1	1.0	.12	.12	.15	.13	.11	.03	.03	.03	.03	.07	.07	.11
	300	9.2	.9	.12	.12	.15	.13	.11	.03	.03	.03	.03	.07	.07	.11
	400	8.3	.8	.12	.12	.15	.13	.11	.03	.03	.03	.03	.07	.07	.11
	500	7.4	.7	.12	.12	.15	.13	.11	.03	.03	.03	.03	.07	.07	.11
Farm-flock sheep	100	3.0	.4	.16	.20	.16	.10	.08	.03	.03	.04	.05	.03	.04	.08

A calendar of farm events is shown in Table 16. This calendar provides only the approximate dates, since considerable variation exists between farms and between years due to climatic conditions.

Miscellaneous labor requirements

Miscellaneous labor requirements include items not directly associated with each crop and livestock enterprise, such as fence repair, hauling manure, and farmstead maintenance. Labor requirements for these items were included in the farm budgets as a percentage of crop and livestock labor. Miscellaneous labor on livestock farms is estimated at 15 percent of crop and livestock labor.

Operator labor

The maximum amount of labor the farm operator is expected to contribute is 2,700 hours annually with a maximum of 260 hours in any month. Any labor above these limits would be hired at \$2.25 per hour. This rate is consistent with farm wage rates reported by the Statistical Reporting Service of the Department of Agriculture for the State of Utah.

Farm Machinery and Equipment

Farm ownership of machinery and equipment generally includes those items necessary to efficiently perform each farm operation. Grain combines, grain drills, corn planters, and corn choppers are exceptions. These items are either owned in partnership by two or more farmers or the operation is custom hired.

Purchase prices of the various items of machinery were obtained from local equipment dealers and converted to 1974 normalized prices. Prices used in the budgets represent the completely assembled equipment delivered to the farm. A list of the machinery used in the farm budgets, its purchase price, inventory value, cost of annual repairs, and annual depreciation is shown in Table 17. Tractor operating costs vary with the type of operation performed and are primarily determined by the amount of fuel used per hour of tractor use. Operating costs in addition to fuel requirements are grease, oil, oil filters, and servicing which amount to \$0.0205 per hour of tractor operation.

Custom work and rates

Custom work commonly hired by farmers in the Jensen area includes combining grain and spraying alfalfa. Custom rates for these operations were obtained by interviews with custom operators and Agriculture Extension agents in Duchesne and Uintah Counties. These rates are shown in the table on page 28.

Table 16
Livestock and crop management calendar

Date	Beef cattle		Sheep		Crops
	Supplemental feeding, simple mineral mixture, corn silage, alfalfa hay	Supplemental feeding, spraying and dusting for lice control, start calving	Supplemental feeding, start lambing	Supplemental feeding, start lambing	
January					
February					Machinery repair
March					Hauling manure, fence repair
April					
May					
June					
July					
August					
September					
October					
November					
December					

Table 17
Machinery and equipment costs, annual
repairs, and depreciation

Item	Capacity	Original		Inventory value	Annual repairs		Annual years (life)	Depreciation (amount)
		cost	cost less salvage value		Rate	Amount		
Plow	2 to 14 inches	\$1,200		\$546	0.03	\$27.30	15	\$35.18
Disk	9 feet	1,000	\$621.00	414	.03	20.70	15	26.68
Level	9 feet	400	562.50	375	.01	6.25	20	15.29
Spiketooth harrow	12 inches	500	189.00	126	.05	10.50	20	5.14
Springtooth harrow		410	369.00	246	.05	20.50	15	15.85
Grain drill (1/2)	8 feet	950	522.00	348	.01	5.80	20	14.19
Corn planter (1/3)	2-row	500	108.00	72	.01	1.20	20	2.94
Cultivator	8 feet, 2-row	300	621.00	414	.03	20.70	20	16.88
Commercial fertilizer spreader	12 feet	500	450.00	300	.02	10.00	20	12.23
Corn chopper (1/3)	1-row	1,600	882.00	588	.05	49.00	10	66.92
PTO hay baler		3,000	2,538.00	1,692	.05	141.00	10	192.56
Manure loader		670	603.00	402	.02	16.75	15	25.90
Manure spreader		1,270	1,143.00	762	.01	12.70	20	31.07
Ditcher		325	468.00	312	.03	15.60	15	20.11
Hay elevator		170	153.00	102	.03	5.10	10	11.61
Bale wagon (1/2 interest)		4,540	4,086.00	2,724	.05	227.00	10	310.00
Small tools								
Auto (50 percent)		2,050	1,845.00	1,230	.05	105.50	10	139.98
Truck	1 1/2 ton	5,850	5,265.00	3,510	.05	292.50	10	399.46
Tractor	DBHP 29-36	6,500	4,554.00	3,036	.04	177.10	15	195.64
Swather	10 feet	5,605	5,044.50	3,363	.02	112.10	15	216.71

1/ Calculated at 5 percent of nonpower equipment.

Custom work and rates		
Operation	Unit	1974 normalized price
Combining grain	Acre	\$7.30
Spraying alfalfa	Acre	5.05

Automobile and truck use and operating costs

Farmers in the project area reported various combinations in types of motor vehicles owned. Nearly all farmers owned an automobile in addition to a pickup or truck. Few farmers, however, owned both a pickup and a truck. Therefore, in the farm budgets, it was assumed that each farmer would own an automobile and a 1 1/2-ton truck. It was also assumed that 50 percent of the auto expense will be paid by the farm.

Annual expenses incidental to ownership and operation of these types of vehicles include depreciation, repairs, taxes, interest, fuel and lubrication, license fees, and liability insurance. Depreciation and annual repairs for each type of vehicle are included in Table 17. Taxes were based on 15 percent of the inventory value, and interest was calculated at 5 percent of the original cost. Expenses for fuel, oil, lubrication, and tires were determined on a per mile basis as shown in Table 18.

Automobile license fees in the State of Utah were projected at \$6.25 per year. License fees for trucks were determined on a weight basis amounting to \$26.25 annually. Insurance rates are based on a male driver over 25 years of age. The estimated annual insurance expense for bodily injury and property damage at this rate was \$32 for automobiles and \$31 for a 1 1/2-ton truck.

Farm Building and Improvements

Field observations and the farm management survey revealed a wide variety in the number, size, age, and use of buildings and improvements. Variations were almost as great within a certain farm type as they are between different types. Because of variations that exist, farm management survey results are used only as a guide to farm types and number of livestock per farm. In the farm budget analysis it is assumed that each farm will have enough buildings and improvements to efficiently meet crop and livestock demands.

Cost and annual depreciation, repairs, and insurance rates

Building and improvement requirements were developed from data published by universities, U.S. Department of Agriculture, Doane's Agriculture Service, and other sources. Estimated costs of building materials

Table 18
Fuel, oil, lubrication, and tire costs per mile
for automobiles, pickups, and $1\frac{1}{2}$ -ton trucks

Item	Rate		Unit cost	Cost per mile	
	Auto and pickup	Truck		Auto and pickup	Truck
Fuel	14 miles per gallon	12 miles per gallon	\$0.39	\$0.0278	\$0.0326
Oil	1,230 miles per gallon	1,230 miles per gallon	1.20	.001	.001
Oil filter	2,000 miles	2,000 miles	3.90	.0019	.002
Grease	1,000 miles	1,000 miles	1.60	.0016	.0016
Tire depreciation					
Auto and pickup	25,000 miles		182.00	.0072	
Truck		60,000 miles	858.00	.039	.0143
Total cost per mile					.052

and labor were obtained from local sources and reflect 1974 normalized prices. In addition to the farm dwelling and buildings used for the caring of livestock, each farm also has a combination shop, garage, and implement shed. This building was included to furnish shelter for farm machinery and provide a place where the farm operator could perform maintenance and repair work during the winter months. Table 19 presents construction costs and annual repairs and depreciation for types and sizes of buildings and improvements used in the farm budgets.

Average annual repairs of buildings and improvements were estimated at 2 percent of the original cost. Annual depreciation was based on a 6 percent sinking fund factor for the useful life of equipment and applied to the original cost. Depreciation of most buildings was based on a useful life of 50 years. Fire insurance was estimated at 0.5 percent of the original cost annually and is chargeable to the farm.

Fencing

The amount and cost of fencing required per farm varied greatly from farm to farm. Farm size, shape, type, and patterns of land use are some of the variables. Therefore, in the farm budgets, where farm sizes were standardized by type, the amount of fencing required per farm was also standardized. It is assumed that beef farms are equipped with 4-strand barbed wire fences, while sheep farms must be fenced with woven wire. The costs of these types of fences, as obtained from local dealers, reflect 1974 normalized prices. Fencing costs are estimated at \$2.68 per rod for the barbed wire and \$3.36 per rod for the woven wire fence.

Each farm was charged with two-thirds of the boundary fence around the irrigable acres, 160 rods of cross fence, and 50 rods to enclose the farmstead. In addition, all permanent pasture and one-third of the private range were assumed fenced and chargeable to the farm. Annual fence repairs were estimated at 2 percent of the original cost, and depreciation was computed using a 6 percent sinking fund factor for 20 years of useful life.

Crop Production Expenses

Fertilizer requirements

Fertilizer requirements necessary to maintain proper fertility levels were determined by the crop removal method and used as guides in the farm budgets. Of the 13 soil-obtained elements necessary for proper plant growth, only nitrogen and phosphorus are deficient in most Utah soils, and supplemental applications of these elements in the form of fertilizer are necessary to satisfy crop needs. (The potassium content of Utah soils is generally adequate for the requirements of most crops. Irrigation water in the area also contains potassium in fairly large amounts.)

Table 19
Farm buildings and improvement

Item	Capacity	1974 norma- lized cost	Original cost less salvage value	Inventory value	Annual repairs		Annual years life	Depre- ciation (amount)	Insurance	
					Rate	Amount			Factor	Amount
Farm dwelling	5 Room	\$15,150	\$13,635.00	\$9,090.00	0.02	\$303.00	50	\$46.90	0.002	\$28.78
Shop plus implement shed		2,170	1,953.00	1,302.00	.02	43.40	50	6.72	.002	4.99
Steel granary	1,000 BU	830	747.00	498.00	.02	16.60	30	9.30		
Pit silo	150 Ton	425	382.50	255.00	.02	8.50	50	1.32		
Beef lounging shed	120 Cows	1,960	1,764.00	1,176.00	.02	39.20	25	32.16		
Corral and manger	120 Cows	770	693.00	462.00	.02	15.40	25	12.63		
Shed	150 Ewes	675	607.50	405.00	.02	13.50	25	11.07		
Corrals and mangers	150 Ewes	102	91.80	61.20	.02	2.04	25	1.67		
Total		28,152	25,336.80	16,891.20		821.29		204.60		33.78

Application rates of commercial fertilizers and barnyard manure were determined for the various crops from the farm management survey, recommendations of Utah State University, and feed composition standards in F.B. Morrison's 22nd edition of Feeds and Feeding. From these sources of data the amounts of nitrogen and phosphorous removed from the soil by various types of crops were determined. It was assumed in the farm budgets that nitrogen and phosphorous lost by removal of crops would be replaced by fertilization. To meet part of these requirements all barnyard manure that can be recovered was returned to the land. The remaining crop needs were corrected by applying commercial fertilizers. Commercial nitrogen was purchased at a project cost of \$0.154 per available pound and phosphate at \$0.10 per available pound. Tabulations showing value of nutrients and value of manure recovered are shown in Table 20.

Table 20
Fertility depletion of soils by harvest of crops

Crop	Unit of yield	Fertilizer nutrient per unit (pounds)		Cost of nutrients per unit of yield ^{2/}		Total cost per unit
		Nitro- gen	Phos- phorus	Nitrogen	Phos- phorus	
Alfalfa	Ton		4.80		\$0.48	\$0.48
Barley	Bu.	0.97	.19	\$0.18	.02	.17
Corn silage	Ton	6.80	1.20	1.05	.11	1.16
Rotation pasture ^{1/}	AUM	7.20	1.90	1.11	.19	1.30

Source: "Feeds and Feeding," F.B. Morrison, 22nd Edition, 1957.

^{1/} AUM = 840 pounds alfalfa.

^{2/} Price nitrogen \$0.154/pound; price phosphorus \$0.10/pound.

Spraying costs

Spraying for weed and insect control is a common practice in the project area. It is assumed that spraying will continue as an important crop production practice.

Spraying practices for insect control have been affected recently by government restrictions on certain spray materials. In the farm budget analysis it is assumed that spraying would be custom contracted. Cost of custom spraying is shown on page 28.

Seeding rates and costs

Seeding practices and rates of application were obtained from the farm management survey and recommendations by the Utah State Agricultural Experiment Station. Seed prices were obtained from local retail outlets and reflect 1974 normalized prices. Seeding rates, practices, and costs used in the farm budget were assumed to be the same for both payment capacity and benefits studies and are shown in Table 21.

Table 21
Seeding rates and costs per acre

Crop	Unit	Unit		Cost per acre	Seeding interval	Annual cost per acre
		Seed per acre	price (1974 level)			
Alfalfa	lb.	12	\$0.525	\$6.30	6 years	\$1.05
Rotation pasture	lb.	16	.435	7.00	10 years	.70
Barley	lb.	90	.03	2.70	Annually	2.70
Corn silage	lb.	12	.475	5.70	Annually	5.70

Baling twine

Information obtained from farmers doing custom work indicated that one package of twine would tie approximately 400 bales of hay. An average bale weighs about 65 pounds, so one package of twine would bale about 13 tons of hay. Baling twine at the 1974 normalized price costs \$19.50 per package or \$1.50 per ton of hay. This amount has been included as a cost in the budgets.

Livestock Production Expenses

Livestock turnoff rates

Turnoff rates for livestock have been developed from information gathered in the farm management survey and from data in publications from western universities. Turnoff rates are determined by annual birth rates, death losses, and culling standards, and these are directly related to feeding and management practices. When animals are properly fed and cared for the results are higher birth rates, fewer death losses, and larger offspring at marketing time. Farmers in the project area are becoming increasingly aware of these relationships as they strive for higher production. As a result, new and better methods, such as pregnancy testing, use of proven sires, production testing, and testing feeds to determine their nutritional content, are being adopted. Thus, turnoff rates for the payment capacity studies were somewhat better than those presently being obtained, and those used in benefit studies reflect the progress expected during the next 15 to 20 years.

Turnoff rates used in the payment capacity budgets are illustrated in Figures 2 and 3 for beef cattle and sheep, respectively. Rates used in the benefit budgets are shown in Figures 4 and 5. The turnoff rates shown for each class of livestock were based on 100 head of animals in the breeding herd or flock so that percentage relationships could readily be applied to other livestock numbers.

Figure 2

Turn-off rates per 100 beef cows with growing short yearlings -
at end of Development period

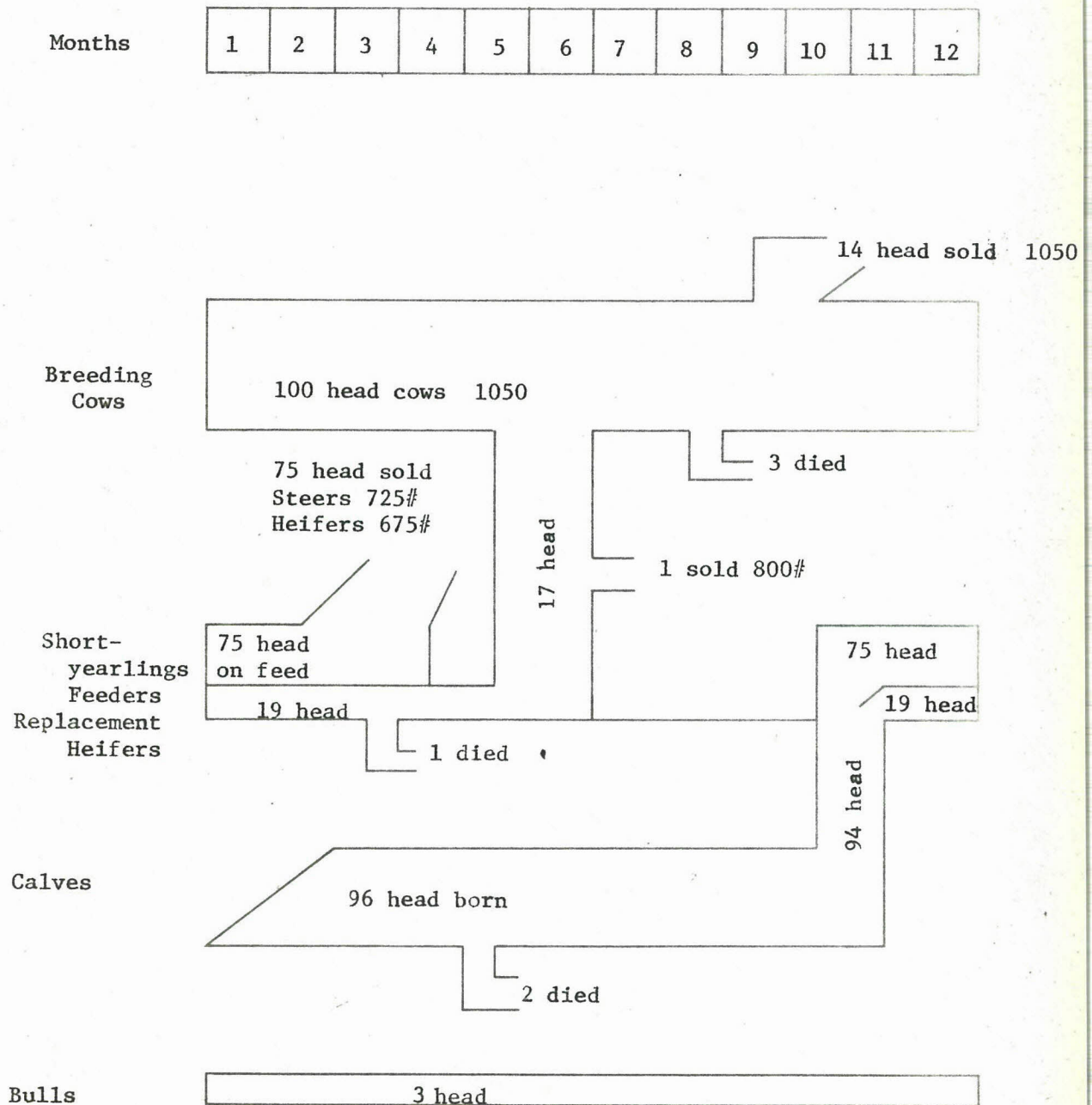


Figure 3

Turn-off rates per 100 ewes - at end of Development Period.

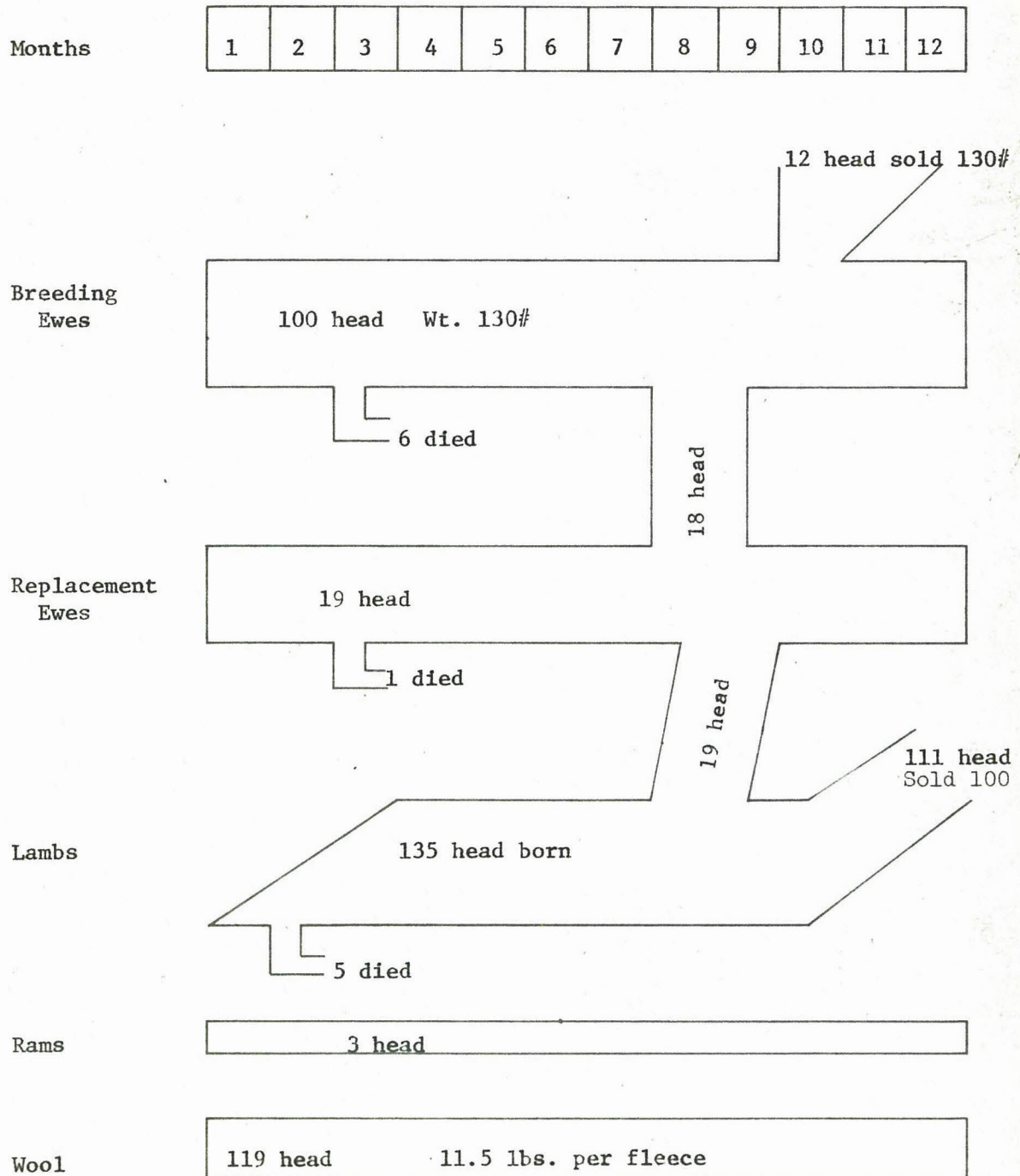


Figure 4

Turn-off rates per 100 beef cows with
growing short yearlings - long term projections

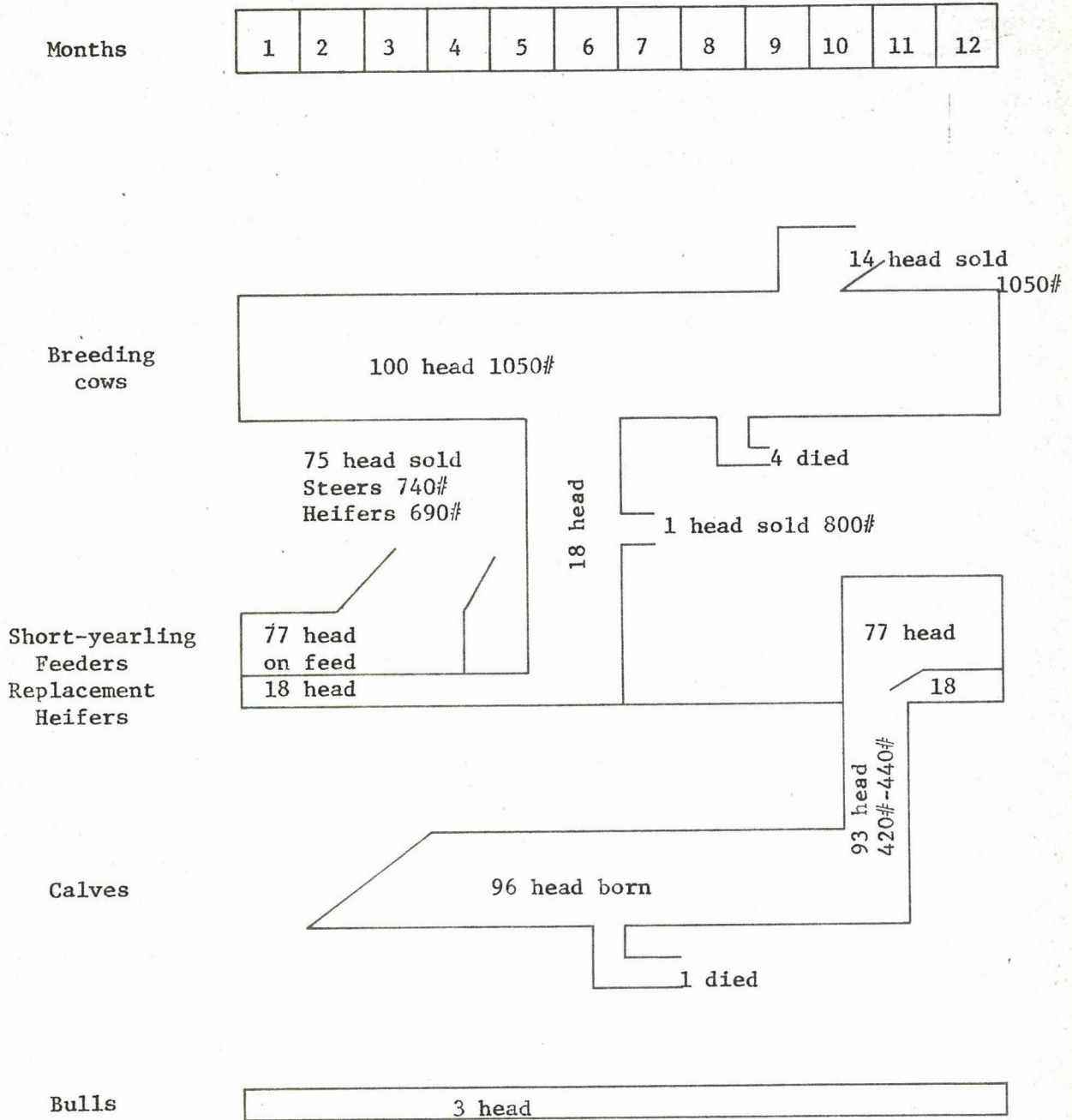
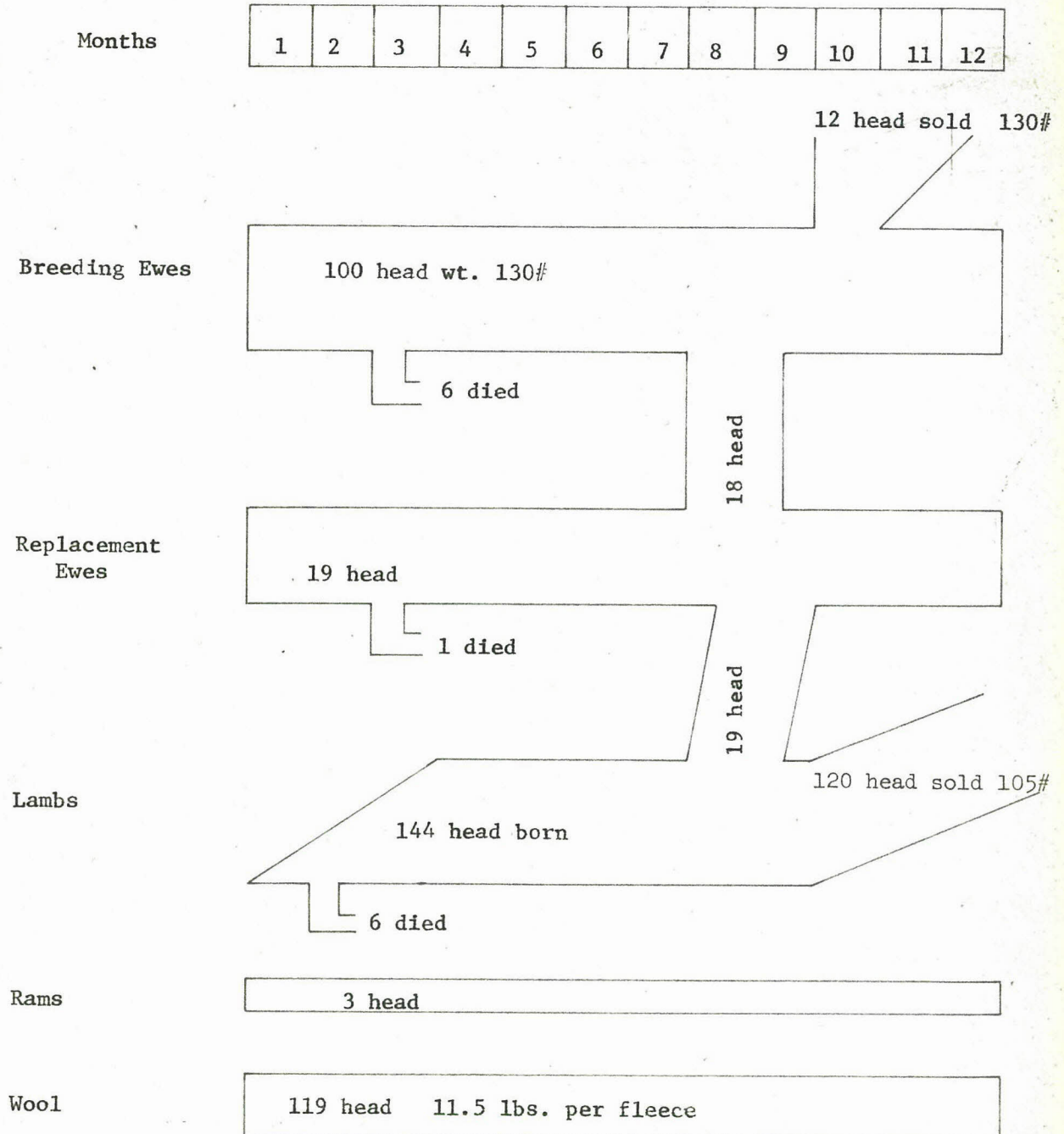


Figure 5

Turn-off rates per 100 ewes - long term projection



Livestock feed requirements

Feed requirements used in the farm budgets were based on feeding standards found in Feeds and Feeding, by F.B. Morrison, and Recommended Nutrient Allowances for Domestic Animals, published by the National Research Council. Some adjustments have been made, however, to meet local conditions.

The amount of feed needed for each type of livestock unit is dependent upon the total digestible nutrient (TDN) requirements of each class of livestock comprising the livestock unit. Therefore, TDN requirements, based on standards in the above publications, were determined for each class of livestock and weighted according to livestock turnoff rates.

It was assumed that feeds grown on project lands were of a quality consistent with feed composition standards listed in the above publications. The percent of TDN and the pounds of TDN per unit for feeds used in the farm budgets are shown in the following table.

Amount of TDN in feeds used in the farm budgets			
Feed	Unit of measure	Percent TDN	Pounds of TDN per unit
Hay	Ton	50.3	1,006.0
Corn silage	Ton	17.1	342.0
Barley	Bu.	77.7	37.3
Pasture	AUM	<u>1</u> / ₁	420.0
<u>1</u> / One AUM equals 840 pounds of alfalfa or 420 pounds of TDN.			

Source: "Recommended Nutrient Allowance for Domestic Animals," National Research Council, 1950.

The amount of feed needed for each class and type of livestock was determined from rations formulated from the kinds of feed available and consistent with local feeding habits. These rations, balanced according to TDN requirements, are shown in Tables 22 and 23. In these tables a 5 percent loss in TDN through spoilage and waste was assumed, and the TDN requirements have been adjusted to reflect this situation.

Substitution Rates, Prices Paid, and
Inventory Values of Feed

Feed substitution rates were based on the TDN content of the various feeds. These rates, using an alfalfa equivalent comparison, are as follows:

- 1 ton alfalfa = 2.9 tons of corn silage
- 1 ton alfalfa = 2.38 AUM's
- 1 ton alfalfa = 26.97 bushels of barley

Table 22
Projection of feeds used to meet TDN
requirements of beef cattle

Class of livestock	Average weight (pounds)	Number per animal unit	Winter feeding period				Pasture season				Total TDN supplied
			Days on feed	Pounds of TDN required	Hay (tons)	Pounds of TDN furnished	Days on pasture	AUM allowed	TDN supplied in AUM/		
Beef cows	1,050	1.00	151	1,629	1.60	1,628	214	7.0	2,940	4,568	
Replacements over 1 year	800	.17	50	371	.37	372	214	5.6	2,352	2,724	
Replacements under 1 year	500	.19	151	936	.94	941				941	
Market animals	500	.75	151	864	.86	865	170	4.1	1,722	2,587	
Bulls		.03	151	1,752	1.75	1,753	214	9.8	4,116	5,869	
Livestock unit ^{2/} (end of development period)				2,570		2,571		11.3	4,754	7,325	
Livestock unit ^{2/} (15 to 20 years after end of development period)										7,400	

1/

One AUM provides sufficient TDN to meet requirement of cow and calf.

2/

Includes waste and spoilage estimated at 5 percent.

^{1/} One AUM provides sufficient TDN to meet requirement of cow and calf.

^{2/} Includes waste and spoilage estimated at 5 percent.

Table 23
Projection of feeds used to meet
TDN requirement of sheep

Class of livestock	Average weight (pounds)	Number per animal unit	Winter feeding period and feeds used				Pasture season				
			Days fed	Pounds of TDN required	Hay (ton)	Grain (pound)	Pounds of TDN supplied	Days on pasture	AUM's allowed	TDN supplied in AUM's ¹	Total TDN supplied
Breeding ewes	130	1.00	120	324	0.27	127	365	245	1.6	675	1,040
Replacement ewes	110	.19	120	218	.22	16	232	245	1.2	504	736
Lambs		1.30			.04		40				40
Rams	160	.03	120	294	.29	32	314	245	1.6	672	986
Livestock unit ^{2/} (end of development period)				416	.37	131	470	245	1.9	790	1,261
Livestock unit (15 to 20 years after end of development period)					.37	144	478		1.9	790	1,268

¹/ One AUM provides sufficient TDN to meet requirement of 5 ewes and lambs.

²/ Includes waste and spoilage estimated at 5 percent.

Feed requirements will be supplied as much as possible by home-grown feeds. It will be necessary, however, to purchase some feeds to supplement farm-produced feeds. Feed inventory values were placed at 25 percent of the total amount used on the farm, valued at farm prices.

Public Grazing Permits

Public grazing permits held by livestock farmers supply a relatively small part of the summer feed consumed by livestock. The Jensen Unit area is characterized by large amounts of native range lands interspersed with and surrounding the irrigable lands. Most of these lands are privately owned.

From the farm management survey it was found that public grazing permits were held on Bureau of Land Management and Forest Service lands. There was an average of 350 to 400 AUM's per farm in the project area on Bureau of Land Management lands and about 200 AUM's on Forest Service lands. Therefore, 350 AUM's were included in the farm budgets from the Bureau of Land Management and 200 from the Forest Service. Charges per AUM of \$1.13 for Forest Service and \$1 for Bureau of Land Management permits were included in the farm budgets.

Inventory value of livestock

The average inventory value of livestock used in the farm budgets reflects current prices (1974) normalized for short-term fluctuations. These values, assumed to be the same for both payment capacity and benefits studies, are as follows.

<u>Type of livestock</u>	<u>Inventory value per head</u>
Beef cattle	
Cows	\$180
Replacement heifers	125
Bulls	400
Sheep	
Ewes	18
Replacement ewes	20
Rams	110
Horses	270

Miscellaneous livestock expense

Numerous miscellaneous items of expense are connected with the production of livestock--such items as veterinary and medical expense, pregnancy test, bull depreciation, salt and bone meal, and marketing costs. Because of the various methods of marketing, the cost of marketing livestock varies depending upon the method used. When a producer markets

directly from his farm or ranch, he usually pays no direct marketing cost. His net selling price, however, reflects a marketing deduction. Costs of these items and other miscellaneous expenses based on 1974 normalized prices are shown in Table 24.

Table 24
Estimated annual miscellaneous livestock
expenses short and long projection

Item	Unit	Cost per unit
Beef cattle expenses		
Veterinary and medicine	Cow	\$1.50
Salt and bone meal	Cow	1.00
Bull depreciation	Cow	2.10
Pregnancy test	Cow	
Subtotal per beef cow unit		4.60
Marketing expenses (including freight)	Cwt	1.00
Sheep expenses		
Shearing and sacks	Ewe	.84
Salt and dipping	Ewe	.47
Ram depreciation	Ewe	.94
Subtotal per sheep unit		2.25
Marketing expenses		1.00
Horse depreciation		20.00

Other Farm Expenses

The assessed valuation and mill levy rates used in the farm budgets for taxation purposes were developed from data provided by the Assessor's and Treasurer's Offices of Uintah County. No significant changes in the assessed valuation of agricultural real estate and personal property have occurred in recent years, and no new changes are expected in the near future; therefore, the current assessed valuation scheduled is considered representative of normalized 1974 prices.

The project mill levy was determined from rates applicable to the county. Rates used in the farm budgets are based on 1960 to 1970 data indexed to 1974 normalized values.

Special levies made on livestock include predatory animal control for sheep, range cattle, and horses; inspection and a bounty fund tax for sheep; and tuberculosis and Bangs disease assessment on cattle.

Table 25 is a schedule of the assessed values of land, machinery, improvements, and livestock. Table 26 shows the mill levy rates used in the farm budgets.

Table 25
Assessed values of land, machinery, buildings and improvements, and livestock--short- and long-term projections

Item	Unit	Assessed value
Class 2 land	Acre	\$45.00
Class 3 land	Acre	32.00
Permanent pasture (6W)	Acre	20.00
Private range	Acre	3.00
Machinery		15 percent inventory value
Buildings and improvements		
Beef cattle		
Cows (2 years and over)	Head	36.00
Yearlings	Head	32.00
Calves over 6 months	Head	24.00
Calves under 6 months	Head	According to value
Bulls	Head	60.00
Sheep		
Ewes	Head	3.50
Replacement ewes	Head	3.50
Rams	Head	8.50

Source: Uintah County Assessor's Office.

Table 26
Mill levy rates used in farm budgets

Item	County mill levy plus \$1 mill levy	Inspection	Bounty	Range animals	Total mill levy ^{1/}
Machinery, improvement, and land	\$57				\$61
Cattle	57			\$2	59
Sheep	57	\$0.60	\$70		128

^{1/} Rounded.

Source: Based on 1960-70 mill levy rates obtained from Uintah County Assessor.

The farm share of electricity costs is dependent on the type of farm and the amount of electrical equipment in operation on the farm. Several items of electrically operated equipment are found on all farms, while other items are found only on certain types. The amount of energy required for various farm uses was furnished by Utah Power & Light Company and is shown in Table 27. Electrical expenses shown in the farm budgets were computed from Table 28. Rates included in the table were furnished by Moon Lake Electric and are representative of the project area.

Table 27
Farm share of electricity

Item	Kilowatt-hours used	
	Per month	Per year
Sheep		
Shearing per livestock unit		0.019
Lambing per livestock unit		3.66
General farm uses		
Lighting	28	366
Farm shop	2	24
Farm chore motor	8	96
Pumping domestic water	25	300

Source: Utah Power & Light Company.

Table 28
Electricity rates

Kilowatt-hours used per month	Rate	Amount of electricity bill (monthly)
60	3.9	\$2.34
140	3.0	4.20
500	1.3	6.50
800	1.65	13.20
Over 1,500	1.35	20.25

Source: Moon Lake Electric.

Telephone

Information gathered in the farm management survey indicates that the average monthly telephone charge for a farm family was \$5 per month or \$60 per year. It was estimated that 45 percent of \$35 should be charged to the farm and included as an annual expense in the farm budget.

Domestic water

Domestic water for the Jensen Unit area is delivered through recently completed pipe systems which is an extension of the Ashly Valley Water System.

An annual cost of \$133 was included in farm expenses to cover domestic water costs.

Miscellaneous farm expenses

An allowance amounting to 2 percent of the total farm expense has been included as a miscellaneous expense. This amount accounts for the numerous incidental and unforeseen expenses which are difficult to determine and itemize. Some of these will include farm organization dues, farm books and periodicals, coverings for silage pit, antifreeze for power equipment, riding equipment for horses, heating workshop, postage, etc.

Existing operation, maintenance, and replacement costs

Existing operation, maintenance, and replacement costs associated with nonproject water supplies were included as a farm expense.

Existing operation, maintenance, and replacement costs are estimated at \$2 per acre. This estimate is based on historical charges from canal companies serving the project area.

CHAPTER III

IRRIGATION REPAYMENT

Farm Budgets

The farm budget method of analysis was used to determine the ability of farmers to repay project costs. This method involves the systematic study of the organization and operation of representative farms, including the projected farm income and expenditures. Farms were analyzed under expected future conditions both with and without the project.

Effort has been made to determine a fair and equitable repayment rate which will not be a burden on any particular type of farm based on the major farm types expected in the future. Two farm types were budgeted in the Jensen Unit--a beef and a beef-sheep. From these budgets the amount available to pay for project water was determined.

Weighting of Farm Budgets

To summarize the farm budgets and extend them to a project total, it was necessary to estimate the expected importance of each farm type and weight them by percent.

It was estimated the beef farms will represent 75 percent of the area and the beef-sheep will make up the remaining 25 percent. The weighting is based principally upon farm types as they now exist, assuming insignificant changes in the future.

Beef and sheep production form the backbone of the area's economy. These enterprises are complementary to the production of field crops which characterize the project area. Climatic factors which limit crop production primarily to forage crops and the availability of grazing land result in farm enterprises devoted to livestock production.

Beef cattle as a single enterprise can be found on approximately 45 percent of the area's farms and in combination with sheep on an additional 10 percent of farms. Sheep as the only enterprise were found on only 10 percent of the area's farms but not significant enough to warrant budgeting. It was felt, however, that along with a beef farm budget, a budget including both beef and sheep would be appropriate.

The beef farms feature a cow-yearling type operation. Calves born in the spring are weaned in the fall and held over until the following fall when they are marketed as long yearlings weighing from 650 to 750 pounds.

Sheep as an enterprise in the project area are usually a farm flock and operated in combination with beef. The ability of sheep to graze sparsely vegetated areas inaccessible to cattle insures their value in the future development of the area. It is anticipated that sheep numbers will remain fairly constant with the development of the project. Sheep utilize the farm-grown feeds during the winter months, and farm-owned pasture and natural range provide spring, summer, and fall grazing. Lambs are born during February and March, and lambs not kept for flock replacements are sold each fall.

Farm Family Living Allowance

A family living allowance is deducted from net farm income to arrive at payment capacity. The family living allowance consists of returns to labor, management, and capital of \$1 per hour of the farmer's labor as a return to management, \$2.25 per hour as a return to the farmer's labor, and 1 percent of farm investment as a return to equity.

Value of Farm Perquisites

The amount that the farm family obtains from the farm and is considered as a contribution toward the family living expenses varies from farm to farm. The most important factors contributing to the variation are size of family, types and kinds of commodities produced, and housing accommodations. Normally the farm contributes to the family living by providing housing and supplying a portion of the family food needs.

The estimated annual savings which the farm family can obtain by occupying the farm dwelling is based on the yearly cost incurred in operating and maintaining the dwelling. Using a \$15,150 construction cost for a farm dwelling, the annual credit to family living will amount to \$1,365 computed as follows.

<u>Farm housing (rental value)</u>	
Interest--6 percent of \$15,150	\$909
Taxes, 40 percent inventory value x 57 mills	77
Depreciation, 6 percent sinking fund, useful life, 50 years	47
Insurance, 0.2 percent x \$15,150	29
Repairs, 2 percent x \$15,150	303
Total	1,365

Farm Budget Summaries

A summary sheet for each farm budget used in the economic analysis of the Jensen Unit is included in this chapter. The summaries show the main features of farm organization, acreage and yields of various crops grown, kinds of livestock, production and disposition of farm products, labor requirements, farm investment, and principal items of income and expense incident to farm operation. Summaries of budgets used in the repayment analysis are shown in Tables 29, 30, 31, and 32.

A complete farm budget, including worksheets, is submitted as an example of the procedure followed in arriving at the entries in the farm budget summaries. This sample farm budget is shown from pages 53 to 63.

A summary of payment capacity and recommended water charge is shown in Table 33 on page 64. The recommended water charge for the Jensen Unit is \$21,000 or \$4.50 per acre-foot. These values will be used in repayment studies presented in Chapter IV of the Financial and Economic Analysis Appendix.

FARM BUDGET SUMMARY									
JENSEN UNIT		FARM TYPE		LAND CLASS		TYPE OF ANALYSIS		REPAYMENT	
CONDITION WITH PROJECT		IRRIGABLE ACRES IN FARM		WATER REQUIRED PER ACRE		BUDGET NO.		R2	
AREA REPRESENTED		ACRES		MAN		FARM PRODUCTION		DISPOSAL OF FARM PRODUCTION	
CROPS AND LIVESTOCK		OR NUMBER		WORK HOURS		YIELD		TOTAL	
-LEALFA		85.00		807.50		TON		PRODUCT	
BARLEY		20.00	138.00	60.0	1200.00	876.50	BU	340.00	0.00
CORN SILAGE		14.00	200.20	17.0	238.00	0.00	TON	36.10	1384.87
ROT PAST		33.00	148.50	6.5	214.50	0.00	AUM	12.00	0.00
PRM PAST 6W		25.00	100.00	2.0	50.00	0.00	AUM	0.00	0.00
PVT RANGE		600.00	0.00	.3	180.00	0.00	AUM	0.00	0.00
AFTERMATH		112.00	0.00	.6	67.20	0.00	AUM	0.00	0.00
FMST + WASTE		8.00	0.00	-0.0	0.00	0.00	AUM	0.00	0.00
BLM GRAZING		350.00	0.00	-0.0	0.00	0.00	AUM	0.00	0.00
F.S. PERMITS		200.00	0.00	-0.0	0.00	0.00	AUM	0.00	0.00
TOTAL		160.00							1384.87
BEEF COWS		106.90	1250.78	10.5	1122.49	157.15	CWT	4151.88	
RPL. HFRS.		19.24	0.00	0.0	0.00	0.00	CWT	-0.00	
HEIFER		2.14	0.00	8.0	17.10	36.13	CWT	617.99	
STR. CALVES		49.18	0.00	7.3	356.53	40.43	CWT	14414.33	
HFR. CALVES		31.00	0.00	6.8	209.27	36.13	CWT	7560.75	
BULLS		3.21	0.00	0.0	0.00	0.00	CWT	-0.00	
EWES		75.00	225.00	1.3	97.50	8.14	CWT	95.24	
REP. ENES		13.50	0.00	0.0	0.00	0.00	CWT	-0.00	
LAMBS		83.25	0.00	1.1	87.41	33.10	CWT	2893.35	
RAMS		2.25	0.00	0.0	0.00	0.00	CWT	-0.00	
WOOL		89.25	0.00	.1	10.26	70.00	CWT	718.46	
HORSE		1.00	0.00	0.0	0.00	0.00	CWT	-0.00	
TOTAL								30452.01	
FARM WORK		ENTERPRISE		HOURS		AMOUNT		FARM INVESTMENT	
TOTAL WORK ON CROPS				1394.20		LAND		ITEM	
TOTAL WORK ON LIVESTOCK				1475.78		IMPROVEMENTS		EQUIPMENT	
TOTAL WORK ON MISC.				430.50		LIVESTOCK		FEED AND SUPPLIES	
TOTAL WORK ON FARM				3300.48		TOTAL INVESTMENT			
WORK BY OPERATOR				2698.10					
TOTAL HIRED LABOR				602.38					
FARM EXPENSES		HIRE LABOR		REPAIRS, BUILDINGS & IMPRVMTS		FARM		FINANCIAL SUMMARY	
				REPAIRS, MACHINERY/EQUIP		USE		CROP SALES	
				DEPRECIATION, BUILDINGS		340.00		LIVESTOCK AND PRODUCTS SOLD	
				CUSTOM WORK		323.50		VALUE FARM PERQUISITES	
				TAXES, LAND, MACH, IMPRVMTS		238.00		GROSS FARM INCOME	
				TAXES, LIVESTOCK		214.50		CURRENT FARM EXPENSE	
				INSURANCE		50.00		RETURN TO FARM FAMILY	
				MARKETING COSTS		180.00		1.0 PERCENT EQUITY ALLJ4	
				MISCELLANEOUS LIVESTOCK COSTS		67.20		RETURN TO MGT.	
				SPRAY MATERIAL		0.00		RETURN TO LABOR	
				GRAZING FEES		0.00		PAYMENT CAPACITY	
				BALING TWINE		0.00		LESS 15.0 PRCT CONTINGENCY	
				SEED COSTS		0.00		RECOMMENDED WATER CHARGE	
				FEED PURCHASED		0.00		PER ACRE	
				FERTILIZER		0.00		PER ACRE-FJOT	
				TELEPHONE		4151.88			
				ELECTRICITY(FARM SHARE)		-0.00			
				DOMESTIC WATER		617.99			
				AUTO TRUCK LICENSE & INS.		14414.33			
				FARM LIABILITY INSURANCE		7560.75			
				IRRIGATION D & M		-0.00			
				OTHER EXPENSES		95.24			
				OPERATING COSTS		-0.00			
				INTEREST ON BORROWED CAP.		2893.35			
				SUBTOTAL		-0.00			
				MISCELLANEOUS(2 PERCENT)		718.46			
				INTEREST ON INDEBTEDNESS		-0.00			
				PURCHASED LIVESTOCK		30452.01			
				CURRENT FARM EXPENSE					

FARM BUDGET SUMMARY									
JENSEN UNIT		FARM TYPE		LAND CLASS		LAND CLASS		REPAYMENT	
CONDITION		IRRIGABLE ACRES		BEEF		WATER REQUIRED PER ACRE		BUDGET NO.	
AREA REPRESENTED		PROJECT		IN FARM		160.		R3	

JENSEN UNIT
CONDITION WITHOUT PROJECT
AREA REPRESENTED

FARM TYPE BEEF-SHEEP
IRRIGABLE ACRES IN FARM

FARM BUDGET SUMMARY

LAND CLASS LANDCLASS 2 TYPE OF ANALYSIS REPAYMENT
WATER REQUIRED PER ACRE .83 BUDGET NO. R4

FARM PRODUCTION				DISPOSAL OF FARM PRODUCTION				FARM EXPENSES			
ACRES	MAN	WORK	YIELD	UNIT	AMOUNT	PRICE	VALUE	HIRED LABOR	REPAIRS, BUILDINGS & IMPRVMTS	USE	
CROPS AND LIVESTOCK	828.00	TON	3.7	340.40	0.00	36.10	0.00	REPAIRS, BUILDINGS & IMPRVMTS	1187.10		
ALFALFA	92.00	BU	50.0	300.00	0.00	1.58	0.00	REPAIRS, MACHINERY/EQUIP	789.64		
BARLEY	6.00	TON	12.0	168.00	0.00	12.00	0.00	DEPRECIATION, BUILDINGS	1402.24		
CORN SILAGE	14.00	TON	5.0	200.00	0.00	0.00	0.00	DEPRECIATION, MACH & EQUIP	197.91		
ROT PAST	40.00	AUM	2.0	50.00	0.00	0.00	0.00	CUSTOM WORK	1983.62		
PRM PAST 6M	25.00	AUM	0.0	180.00	0.00	0.00	0.00	TAXES, LAND, MACH, IMPRVMTS	508.40		
PVT RANGE	600.00	AUM	0.0	67.20	0.00	0.00	0.00	TAXES, LIVESTOCK	874.58		
AFTERMATH	112.00	AUM	0.0	0.00	0.00	0.00	0.00	INSURANCE	311.72		
FMST + WASTE	8.00	AUM	0.0	0.00	0.00	0.00	0.00	MARKETING COSTS	33.78		
BLM GRAZING	350.00	AUM	0.0	0.00	0.00	0.00	0.00	MISCELLANEOUS LIVESTOCK COSTS	861.11		
F.S. PERMITS	200.00	AUM	0.0	0.00	0.00	0.00	0.00	SPRAY MATERIAL	642.28		
TOTAL 160.00			0.0	0.00	0.00	0.00	0.00	GRAZING FEES	0.00		
								BALING TIME	577.50		
								SEED COSTS	510.50		
BEEF COWS	102.94	CWT	10.5	1080.88	151.32	26.42	3997.94	FERTILIZER	220.60		
RPL. HFRS.	18.53	CWT	0.0	0.00	0.00	0.00	0.00	FEED PURCHASED	0.00		
HEIFER	2.06	CWT	8.0	16.57	16.47	36.13	595.08	TELEPHONE	233.98		
STR. CALVES	47.35	CWT	7.3	343.31	343.31	40.43	13879.89	ELECTRICITY(FARM SHARE)	35.00		
HFR. CALVES	29.85	CWT	6.8	201.51	201.51	36.13	7280.42	DOMESTIC WATER	50.00		
BULLS	3.09	CWT	0.0	0.00	0.00	0.00	0.00	AUTO TRUCK LICENSE & INS.	133.00		
								FARM LIABILITY INSURANCE	95.00		
EWES	75.00	CWT	1.3	97.50	11.70	8.14	95.24	IRRIGATION O & M	-0.00		
REP. EWES	13.50	CWT	0.0	0.00	0.00	0.00	0.00	OTHER EXPENSES	370.00		
LAMBS	83.25	CWT	1.1	87.81	87.41	33.10	2893.35	OPERATING COSTS	20.00		
RAMS	2.25	CWT	0.0	0.00	0.00	0.00	0.00	INTEREST ON BORROWED CAP.	1028.93		
WOOL	89.25	CWT	0.1	10.26	10.26	70.00	718.46		166.35		
								SUBTOTAL	12233.73		
HORSE	1.00	CWT	0.0	0.00	0.00	0.00	0.00	MISCELLANEOUS(2 PERCENT)	244.57		
								INTEREST ON INDEBTEDNESS	8663.98		
TOTAL							29460.38	PURCHASED LIVESTOCK	0.00		
								CURRENT FARM EXPENSE	21142.38		

FARM WORK				FARM INVESTMENT				FINANCIAL SUMMARY			
ENTERPRISE	WORK	HOURS	AMOUNT	LAND	IMPROVEMENTS	EQUIPMENT	LIVESTOCK	GROSS FARM INCOME	CURRENT FARM EXPENSE	RETURN TO FARM FAMILY	
TOTAL WORK ON CROPS	1336.20	1429.40	80250.00					RETURN TO FARM INCOME	NET FARM INCOME	1-3PERCENT EQUITY ALLOW	
TOTAL WORK ON LIVESTOCK	1429.40	414.84	26722.00					RETURN TO MGT.	1736.96		
TOTAL WORK ON MISC.	414.84	3180.45	38206.75					RETURN TO LABOR	5968.90		
TOTAL WORK ON FARM	3180.45	2652.85	24475.40					PAYMENT CAPACITY	-575.71		
WORK BY OPERATOR	2652.85	527.60	3694.46					LESS 15.0 PRCNT CONTINGENCY	-574.35		
TOTAL HIRED LABOR	527.60		173348.96					RECOMMENDED WATER CHARGE:	-3.59		
								PER ACRE	-4.38		
								PER ACRE-FJOT			

FARM BUDGET SUMMARY

MACHINERY AND EQUIPMENT

ITEM	CAPACITY	ORIGINAL COST	ORIGINAL COST LESS SALVAGE VALUE	INVENTORY VALUE	ANNUAL REPAIRS RATE	ANNUAL DEPRECIATION YEARS LIFE	ANNUAL DEPRECIATION AMOUNT	INSURANCE FACTOR	AMOUNT
PLOW	2-14 IN.	1200.	1080.00	720.00	.03	15.	46.40		
DISK	9"	1000.	900.00	600.00	.03	15.	38.55		
LEVEL	9"	400.	360.00	240.00	.01	20.	9.78		
SPIKETooth HARROW	12 IN.	500.	450.00	300.00	.05	20.	12.23		
SPRINGTOOTH HARROW		410.	369.00	246.00	.05	15.	15.85		
GRAIN DRILL 1/2	8"	950.	855.00	570.00	.01	20.	23.24		
CORN PLANTER 1/3	2 ROW	500.	450.00	300.00	.01	20.	12.23		
CULTIVATOR	8"-2 ROW	300.	270.00	180.00	.03	20.	7.34		
COMB FERT SPREADER	12"	500.	450.00	300.00	.02	20.	12.23		
CORN CHOPPER 1/3	1 ROW	1600.	1440.00	960.00	.05	10.	109.25		
PTD HAY BALER		3000.	2700.00	1800.00	.05	10.	204.85		
MANURE LOADER		670.	603.00	402.00	.03	15.	25.90		
MANURE SPREADER		1270.	1143.00	762.00	.01	20.	31.07		
DITCHER		325.	292.50	195.00	.03	15.	12.57		
HAY ELEVATOR		170.	153.00	102.00	.03	10.	11.61		
BALE WAGON		4540.	4086.00	2724.00	.05	10.	310.00		
SMALL TOOLS		867.	780.08	520.05	.02	7.	92.94		
SUBTOTAL		18202.							

AUTO 50%		2050.	1845.00	1230.00	.05	10.	139.98		
TRUCK		5850.	5265.00	3510.00	.05	10.	399.45		
TRACTOR	1 1/2 TON	6500.	5850.00	3900.00	.04	15.	251.32		
SWATHER	DBHP 29-36 10"	5605.	5044.50	3363.00	.02	15.	216.71		
TOTAL		38207.	34386.07	22924.05			1402.24		1983.62

FARM BUDGET SUMMARY

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM TYPE BEEF
IRRIGABLE ACRES IN FARM 160.

LAND CLASS LAND CLASS 2 TYPE OF ANALYSIS REPAIRMENT
WATER REQUIRED PER ACRE .83 BUDGET NO. R1

BUILDINGS AND IMPROVEMENTS

ITEM	CAPACITY	ORIGINAL COST	ORIGINAL COST LESS SALVAGE VALUE	INVENTORY VALUE	ANNUAL REPAIRS RATE	ANNUAL REPAIRS AMOUNT	ANNUAL DEPRECIATION YEARS LIFE	ANNUAL DEPRECIATION AMOUNT	INSURANCE FACTOR	AMOUNT
FARM DWELLING	5 ROOM	15150.	13635.00	9090.00	.02	303.00	50.	66.90	.002	28.79
SHOP + IMP SHED		2170.	1953.00	1302.00	.02	43.40	50.	6.72	.002	4.99
STEEL GRANARY	1000 BU	830.	747.00	498.00	.02	16.60	30.	9.30	-0.000	0.00
PIT SILO 150 TON	150	425.	382.50	255.00	.02	8.50	50.	1.32	-0.000	0.00
BEEF LOUNGING SHED	100-120 COW	1960.	1764.00	1176.00	.02	39.20	25.	32.16	-0.000	0.00
CORRAL AND MANGER	100-120 COW	770.	693.00	462.00	.02	15.40	25.	12.63	-0.000	0.00
FENCES	1380 RDS	3696.	3326.40	2217.60	.08	277.20	25.	60.64	-0.000	0.00
TOTAL		25001.	22500.90	15000.60		703.30		169.67		33.78

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM BUDGET SUMMARY

FARM TYPE	BEEF	LAND CLASS	2TYPE OF ANALYSIS	REPAYMENT
IRRIGABLE ACRES	IN FARM	WATER REQUIRED PER ACRE	.83	BUDGET NO. R1
				160.

HORSE	PRODUCTION					PRICE	VALUE	NUMBER	UNIT VALUE	TOTAL VALUE
	NUMBER	AVERAGE WEIGHT	TOTAL CWT	NUMBER SOLD	CWT SOLD					
1.00	-0.	0.00	0.00	0.00	-0.00	-0.00	1.00	270.00	270.00	
TOTAL						0.00			270.00	

LABOR REQUIREMENTS

[illegible]

EXPENSE (LABOR EXCLUDED)

LIVESTOCK	NUMBER SOLD	MARKETING		MISCELLANEOUS		TAXES		PURCHASED LIVESTOCK		
		UNIT COST	COST PER HD	TOTAL	COST PER HD	ASSESSMENT PER HD	TOTAL	PRICE PER CWT	TOTAL	INTEREST
HORSE	0.00	-0.00	-0.00	-0.00	-0.00	0.00	20.00	20.00	0.00	-0.00
				0.00	0.00	0.00	20.00	20.00	0.00	0.00

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM TYPE BEEF
IRRIGABLE ACRES IN FARM 160.

FARM BUDGET SUMMARY

LAND CLASS LAND CLASS 2 TYPE OF ANALYSIS REPAYMENT
WATER REQUIRED PER ACRE .83 BUDGET NO. R1

	NUMBER	AVERAGE WEIGHT	TOTAL CWT	PRODUCTION		PRICE	VALUE	INVENTORY		
				NUMBER SOLD	CWT SOLD			NUMBER	UNIT VALUE	TOTAL VALUE
BEEF COWS	118.72	1050.	1246.55	16.62	174.52	26.42	4610.75	118.72	180.00	21369.68
RPL. HERS.	21.37	-0.	0.00	0.00	0.00	-0.00	-0.00	21.37	125.00	2671.18
HEIFER	2.37	800.	19.00	2.37	19.00	36.13	686.29	2.37	125.00	296.80
STR. CALVES	54.61	725.	395.93	54.61	395.93	40.43	16007.41	54.61	-0.00	0.00
HFR. CALVES	34.43	675.	232.39	34.43	232.39	36.13	8396.36	34.43	-0.00	0.00
BULLS	3.56	-0.	0.00	0.00	0.00	-0.00	-0.00	3.56	400.00	1424.63
TOTAL							29700.81			25762.09

LABOR REQUIREMENTS

LIVESTOCK	HEAD	NO.	WORK UNITS/HD		TOTAL WORK UNITS	SEASONAL DISTRIBUTION OF MAN WORK UNITS											
			MAN	TRACTOR		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BEEF COWS	118.72	11.70	1.20		1389.0	222.2	222.2	138.9	83.3	55.6	27.8	27.8	27.8	41.7	69.5	111.1	156.7
					1389.0	222.2	222.2	138.9	83.3	55.6	27.8	27.8	27.8	41.7	69.5	111.1	156.7

JENSEN UNIT WITH PROJECT AREA REPRESENTED 75/06/18.

FARM TYPE BEEF IRRIGABLE ACRES IN FARM 160.

LAND CLASS LAND CLASS 2TYPE OF ANALYSIS REPAYMENT BUDGET M3. R1

FARM BUDGET SUMMARY

WATER REQUIRED PER ACRE .83

EXPENSE (LABOR EXCLUDED)

	MARKETING		MISCELLANEOUS		TAXES		PURCHASED LIVESTOCK		
	NUMBER SOLD	UNIT COST	TOTAL	COST PER HD	TOTAL	ASSESSMENT PER HD	PRICE PER CWT	TOTAL	INTEREST
LIVESTOCK									
BEEF COWS	16.62	10.50	174.52	4.60	546.11	36.00	-0.00	0.00	-0.00
RPL. HFRS.	0.00	-0.00	-0.00	-0.00	0.00	32.00	-0.00	0.00	-0.00
HEIFER	2.37	8.00	19.00	-0.00	0.00	32.00	-0.00	0.00	-0.00
STR. CALVES	54.61	7.25	395.93	-0.00	0.00	-0.00	-0.00	0.00	-0.00
HFR. CALVES	34.43	6.75	232.39	-0.00	0.00	-0.00	-0.00	0.00	-0.00
BULLS	0.00	-0.00	-0.00	-0.00	0.00	60.00	-0.00	0.00	-0.00
			821.83		546.11			0.00	0.00

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM TYPE BEEF
IRRIGABLE ACRES IN FARM 160.

FARM BUDGET SUMMARY

LAND CLASS LAND CLASS 2 TYPE OF ANALYSIS REPAYMENT
WATER REQUIRED PER ACRE .83 BUDGET N.J. RI

FEED REQUIREMENTS

LIVESTOCK	NUMBER	ROUGHAGE		STRAW		BARLEY		RATON	
		FEED RATE	TOTAL REQUIRED	FEED RATE	TOTAL REQUIRED	BU. PER HEAD	FEED RATE	CHT PER HEAD	MILK REPLACER
BEEF COWS	118.72	7.30	866.65	-0.00	0.00	-0.00	0.00	0.00	0.00
HORSE	1.00	2.92	2.92	-0.00	0.00	16.00	-0.00	0.00	0.00
		869.57		0.00		16.00		0.00	
SUPPLIED	ALFALFA	638.57	231.00	STRAW	0.00	BARLEY	1200.00		
PURCHASED		0.00			0.00		0.00		0.00
SOLD		.00			0.00		1184.00		

CROP PRODUCTION AND DISPOSAL									
CROP	ACRES	YIELD OF	YIELD PER ACRE	PRO- DUCTION	FARM USE	AMOUNT	PRICE	VALUE	AVERAGE INVENTORY AMOUNT
ALFALFA	85.	TON	4.0	340.	340.00	-00	36.10	-00	85.00
BARLEY	20.	BU	60.0	1200.	16.00	1184.00	1.58	1870.72	4.00
CORN SILAGE	14.	TON	17.0	238.	238.00	0.00	12.00	0.00	59.50
STRAW	-0.		-0.0	0.	0.00	-0.00	-0.00	0.00	0.00
ROT PAST.	33.	AUM	6.5	215.	214.50	0.00	-0.00	-0.00	53.63
PRM PAST 6M	25.	AUM	2.0	50.	50.00	0.00	-0.00	-0.00	12.50
PVT RANGE	600.	AUM	-3	180.	180.00	0.00	-0.00	-0.00	45.00
AFTERHATH	112.	AUM	.6	67.	67.20	0.00	-0.00	-0.00	16.80
FMST + WASTE	8.		-0.0	0.	0.00	-0.00	-0.00	0.00	0.00
BLM GRAZING	350.	AUM	-0.0	0.	0.00	-0.00	-0.00	0.00	0.00
F.S. PERMITS	200.	AUM	-0.0	0.	0.00	-0.00	-0.00	0.00	0.00
TOTAL	160.							1870.72	3788.82

FARM BUDGET SUMMARY

JENSEN UNIT
 CONDITION WITH PROJECT
 AREA REPRESENTED
 75/06/18.

FARM TYPE BEEF
 IRRIGABLE ACRES IN FARM 160.

LAND CLASS LAND CLASS 21TYPE OF ANALYSIS REPAYMENT
 WATER REQUIRED PER ACRE .83 BUDGET NO. R1

CROP EXPENSES (LABOR EXCLUDED)

CROP	ACRES	SEED UNIT COST	SEED TOTAL	FERTILIZER UNIT COST	FERTILIZER TOTAL	SPRAY UNIT COST	SPRAY TOTAL	TRACTOR FUEL UNIT COST	TRACTOR FUEL TOTAL	CUSTOM HIRE UNIT COST	CUSTOM HIRE TOTAL	BALE TWINE UNIT COST	BALE TWINE TOTAL	ASSESSMENTS UNIT COST	ASSESSMENTS TOTAL	LAND INV. UNIT COST	LAND INV. TOTAL
ALFALFA	85.	1.05	89.25	.48	163.20	-0.00	0.00	0.00	0.00	5.05	429.25	1.50	510.00	45.	3825.	240.	20400.
BARLEY	20.	2.70	54.00	.17	204.00	-0.00	0.00	0.00	0.00	7.30	146.00	-0.00	0.00	45.	900.	240.	4800.
CORN SILAGE	14.	5.70	79.80	1.16	276.08	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	45.	630.	240.	3360.
STRAW	-0.	-0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	-0.00	-0.	0.	-0.	0.
ROT PAST.	33.	.70	23.10	1.30	278.85	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	45.	1435.	240.	7920.
PRM PAST 6W	25.	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	20.	500.	100.	2500.
PVT RANGE	600.	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	3.	1800.	45.	27000.
AFTERMATH	112.	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	-0.	0.	-0.	0.
FMST + WASTE	8.	-0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	45.	360.	240.	1920.
BLM GRAZING	350.	-0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.	0.	25.	8750.
F.S. PERMITS	200.	-0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.	0.	50.	10000.
TOTAL			246.15		922.13		0.00		0.00		575.25		510.00		9500.		86650.

LESS VALUE MANURE

TOTAL

415.52

506.61

FARM BUDGET SUMMARY

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM TYPE BEEF
IRRIGABLE ACRES IN FARM 160.

LAND CLASS LAND CLASS 2 TYPE OF ANALYSIS REPAYMENT
WATER REQUIRED PER ACRE .83 BUDGET NO. R1

CROP LABOR REQUIREMENTS

ITEM OR OPERATION	ACRES WORK UNITS		TOTAL		SEASONAL DISTRIBUTION OF MAN WORK UNITS												
	OR HEAD	OR MAN	OR TRACT	OR TRACT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
ALFALFA	85.	9.50	4.00	807.50	340.00	0.0	0.0	40.4	24.2	48.5	161.5	169.6	169.5	193.8	0.0	0.0	0.0
BARLEY	20.	6.90	3.00	138.00	60.00	0.0	0.0	9.7	35.9	19.3	16.6	11.0	15.2	16.6	6.9	6.9	0.0
CORN SILAGE	14.	14.30	6.00	200.20	84.00	0.0	0.0	0.0	16.0	28.0	34.0	16.0	12.0	86.1	4.0	4.0	0.0
STRAW	-0.	-0.00	-0.00	0.00	0.00	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
ROT. PAST.	33.	4.50	.70	148.50	23.10	0.0	0.0	11.9	35.6	19.3	14.9	22.3	20.3	16.3	7.4	3.0	0.0
PERM PAST 6W	25.	4.00	.50	100.00	12.50	0.0	0.0	3.0	11.0	17.0	17.0	24.0	22.0	6.0	0.0	0.0	0.0
				1394.20	519.60	0.0	0.0	64.9	122.8	132.1	243.9	242.9	239.5	318.8	13.3	13.9	0.0

FARM BUDGET SUMMARY

JENSEN UNIT
CONDITION WITH PROJECT
AREA REPRESENTED
75/06/18.

FARM TYPE BEEF
IRRIGABLE ACRES IN FARM

	LAND CLASS	LAND CLASS 2T
	WATER REQUIRED PER ACRE	.83

SIS REPAYMENT
BUDGET NJ. RI

EXPENSES

ITEM	TAXES			INTEREST ON INVESTMENT			INTEREST ON INDEBTEDNESS	
	VALUE FOR TAXATION	ADJUST FACTOR	TOTAL VALUE FOR TAXATION	MILL LEVY	TOTAL	INVESTMENT VALUE		INTEREST RATE
LAND	9500.00	1.000	9500.00	.0570	541.50	86650.00	-.0600	5199.00
IMPROVEMENTS	15000.60	.150	2250.09	.0570	128.26	25001.00	-.0600	1500.06
EQUIPMENT	22924.05	.150	3438.61	.0570	196.00	38206.75	-.0600	2292.41
DAIRY	0.00	-.000	-0.00	-0.0000	0.00	0.00	-0.0000	-0.00
BEEF	5247.39	1.000	5247.39	.0590	309.60	25762.09	-.0600	1545.73
SHEEP	0.00	-.000	-0.00	-0.0000	0.00	0.00	-0.0000	-0.00
HORSE	20.00	1.000	20.00	.0590	1.18	270.00	-.0600	16.20
FEED AND SUPPLIES	0.00	-.000	-0.00	-0.0000	0.00	3788.82	-.0600	227.33
						179678.66		10780.72
					1176.53			8980.34

Table 33

Summary of farm data and recommended water charge

	Unit	Without project development (class 2 land)			With project development (class 2 land)			Project increase
		Beef (0.75)	Beef-sheep (0.25)	Average	Beef (0.75)	Beef-sheep (0.25)	Average	
Farm budget number								
Irrigable	Acre	160	160	160	160	160	160	
Irrigated (class 6)	Acre	25	25	25	25	25	25	
Private range (class 6)	Acre	600	600	600	600	600	600	
Total acres per farm		785	785	785	785	785	785	
Water supply (regulated supply)								
Ideal diversion requirement	Acre-feet	592	592	592	592	592	592	
Supplied by project	Acre-feet				136	136	136	
Irrigable project land represented	Acre	2,730	910	2,275	2,730	910	2,275	4,600
Number of animal units	Number	190	191	190	197	198	197	7
Number of beef cows (breeding)	Head	115	103	112	119	107	116	4
Number of ewes	Head		75	19		75	19	
Grazing permits	AUM	550	550	550	550	550	550	
Farm investment								
Land		\$80,250	\$80,250	\$80,250	\$86,650	\$86,650	\$86,650	\$6,400
Improvements		25,001	26,722	25,431	25,001	26,722	25,431	
Equipment		38,207	38,207	38,207	38,207	38,207	38,207	
Livestock		25,172	24,476	24,998	26,032	25,336	25,858	860
Feed		3,582	3,704	3,613	3,789	3,910	3,819	207
Total		172,212	173,359	172,498	179,679	180,825	179,965	7,466
Income								
Crops		449		337	1,870	1,385	1,749	1,412
Livestock and products		28,709	29,460	28,897	29,701	30,452	29,889	992
Farm perquisites		1,365	1,365	1,365	1,365	1,365	1,365	
Total		30,923	30,825	30,598	32,936	33,202	33,002	2,404
Expenses								
Interest 5 percent		8,607	8,664	8,621	8,980	9,038	8,995	373
Taxes		1,166	1,187	1,171	1,177	1,197	1,182	11
Insurance		34	34	34	34	34	34	
Depreciation and repairs (machinery)		3,386	3,386	3,386	3,386	3,386	3,386	
Depreciation and repairs (building and implement)		873	988	902	873	988	902	
Nonproject operation, maintenance, and replacement		370	370	370	370	370	370	
Crop expenses		1,508	1,473	1,499	1,838	1,805	1,830	331
Livestock expenses		1,899	2,081	1,945	1,945	2,126	1,990	46
Hired labor		915	1,187	983	1,126	1,355	1,183	200
Miscellaneous and other		1,733	1,772	1,743	1,826	1,863	1,835	93
Total		20,491	21,142	20,653	21,555	22,162	21,706	1,053
Net farm income		10,032	9,683	9,944	11,381	11,040	11,295	1,351
Return to capital		1,725	1,737	1,728	1,811	1,811	1,802	74
Return to management		2,674	2,653	2,669	2,700	2,698	2,700	31
Return to family labor		5,633	5,293	5,548	6,075	6,071	6,074	526
Payment capacity					806	460	720	720
Recommended water charge ^{2/}					685	391	612	612
Per acre					4.28	2.44	3.82	
Per acre-foot					5.04	2.88	4.50	
Total								
Rounded								
1/ AU = 4,400 TDN.								20,686
2/ Contingency 15 percent.								21,000

CHAPTER IV

IRRIGATION BENEFITS

Irrigation benefits resulting from project construction were determined by the farm budget method of analyses. Farm types used in the repayment analysis were also used in the benefit budgets. Changes in farm sizes, number of livestock per farm, crop yields, labor requirements, and other input-output data were made, however, in an attempt to evaluate economic conditions anticipated approximately 20 years after the development period. These changes reflect the results of technological advances in crop and livestock production, improved farm management, larger but fewer farms, and a higher degree of specialization and intensification of farm enterprises. Full service lands totaling 440 acres occur in relatively small tracts, are privately owned, and are interspersed among existing farm units. These lands have been included in the "without" budgets as idle irrigable land and as irrigated land in the "with" budgets. Summaries of budgets used in the benefit analyses are shown in Tables 34 to 37. Farm budget data used to determine irrigation benefits are summarized in Table 38.

Direct Irrigation Benefits

Irrigation benefits recognized in this analysis are a result of the increased production of goods and services associated with the increased project water supply less associated costs. These benefits may be classed as either tangible or intangible depending upon the possibility of evaluating them in monetary terms. Tangible benefits may be further classed as direct, indirect, and public.

Direct irrigation benefits are represented by the increase in net farm income resulting from the application of project water. Direct benefits include improved family living, payment capacity, and increased accumulation of equity. Direct benefits are valued at \$166,000 annually.

Indirect Irrigation Benefits

Indirect irrigation benefits are those associated with the increased volume of agricultural products flowing through the channels of trade. These benefits have been measured by the profits that would arise from the various economic activities associated with producing and handling commodities produced on the project. Indirect irrigation benefits comprise the increase in:

- (a) Profits of local wholesalers and retailers from handling increased sales of farm products consumed locally off the project without processing.

FARM BUDGET SUMMARY									
JENSEN UNIT		FARM TYPE		LAND CLASS		TYPE OF ANALYSIS		BENEFIT	
CONDITION WITH AREA REPRESENTED		IRRIGABLE ACRES IN FARM		WATER REQUIRED PER ACRE		BUDGET NO.		81	
PROJECT		225.		.83					
ACRES		FARM PRODUCTION		DISPOSAL OF FARM PRODUCTION		FARM EXPENSES			
CROPS AND LIVESTOCK		YIELD		TOTAL		Hired Labor			
DR		UNIT		PRODUCT		REPAIRS, BUILDINGS & IMPRVMTS			
NUMBER		TUN		500.00		REPAIRS, MACHINERY & EQUIP			
100.00		100.0		1200.00		DEPRECIATION, BUILDINGS			
12.00		22.0		529.00		CUSTOM WORK			
24.00		9.0		485.00		TAXES, LAND, MACH, IMPRVMTS			
54.00		243.00		100.00		TAXES, LIVESTOCK			
25.00		250.00		250.00		INSURANCE			
25.00		0.00		0.00		MARKETING COSTS			
600.00		0.00		0.00		MISCELLANEOUS LIVESTOCK COSTS			
136.00		0.00		0.00		SPRAY MATERIAL			
10.00		0.00		0.00		GRAZING FEES			
350.00		0.00		0.00		BALING TWINE			
200.00		0.00		0.00		SEED COSTS			
F.S. PERMITS		0.00		0.00		FEED PURCHASED			
225.00		0.00		0.00		FERTILIZER			
TOTAL		10.5		1680.00		TELEPHONE			
		CWT		235.20		ELECTRICITY (FARM SHARE)			
BEEF COWS		1872.00		0.00		DOMESTIC WATER			
RPL. HFRS.		0.00		0.00		AUTO TRUCK LICENSE & INS.			
28.00		0.00		0.00		FARM LIABILITY INSURANCE			
3.20		0.00		0.00		IRRIGATION O & M			
75.20		0.00		0.00		OTHER EXPENSES			
48.00		0.00		0.00		OPERATING COSTS			
4.00		0.00		0.00		INTEREST ON BORROWED CAP.			
TOTAL		1.00		0.00		SUBTOTAL			
HORSE		0.00		0.00		MISCELLANEOUS (2 PERCENT)			
		CWT		0.00		INTEREST ON INDEBTEDNESS			
				41603.65		PURCHASED LIVESTOCK			
						CURRENT FARM EXPENSE			
						FINANCIAL SUMMARY			
						CROP SALES			
						LIVESTOCK AND PRODUCTS SOLD			
						VALUE FARM PERQUISITES			
						GROSS FARM INCOME			
						CURRENT FARM EXPENSE			
						NET FARM INCOME			

FARM BUDGET SUMMARY										
JENSEN UNIT CONDITION WITH AREA REPRESENTED	PROJECT	FARM TYPE		ACRES	BEEF-SHEEP		LAND CLASS	COMPOSITE	TYPE OF ANALYSIS	BENEFIT BUDGET NO. B2
		IRRIGABLE	ACRES IN FARM		225.	WATER REQUIRED PER ACRE				
DISPOSAL OF FARM PRODUCTION										
CROPS AND LIVESTOCK	MAN WORK HOURS	UNIT	YIELD	TOTAL PRODUCT	AMOUNT	PRICE	VALUE	FARM USE	FARM EXPENSES	
									WEIGHT	TON
ALFALFA	100.00	1000.00	5.0	500.00	137.04	36.10	4947.07	362.96	REPAIRS,BUILDINGS & IMPRVMTS	4516.93
BARLEY	12.00	90.00	100.0	1200.00	846.50	1.58	1337.47	353.50	REPAIRS, MACHINERY&EQUIP	931.01
CORN SILAGE	24.00	372.00	22.0	528.00	0.00	12.00	0.00	528.00	DEPRECIATION, BUILDINGS	1402.24
ROT PAST.	54.00	243.00	9.0	486.00	0.00	0.00	0.00	486.00	DEPRECIATION, MACH & EQUIP	228.83
PRM PAST 6W	25.00	100.00	2.0	50.00	0.00	0.00	0.00	50.00	CUSTOM WORK	1983.62
ALFALFA	25.00	250.00	5.0	125.00	0.00	36.10	0.00	125.00	TAXES, LAND, MACH, IMPRVMTS	718.85
PVT RANGE	600.00	0.00	.3	180.00	0.00	0.00	0.00	180.00	TAXES, LIVESTOCK	1050.98
AFTERMATH	136.00	0.00	.6	81.60	0.00	0.00	0.00	81.60	INSURANCE	447.48
FMST + WASTE	10.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	MARKETING COSTS	33.78
BLM GRAZING	350.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	MISCELLANEOUS LIVESTOCK COSTS	1267.84
F.S. PERMITS	200.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	SPRAY MATERIAL	881.75
TOTAL 225.00			0.0	0.00	0.00	0.00	6284.54	0.00	GRAZING FEES	0.00
									BALING TWINE	577.50
									SEED COSTS	937.50
									FEED PURCHASED	338.25
									FERTILIZER	0.00
BEEF COWS	155.00	1813.50	10.5	1627.50	227.85	26.42	6019.80	0.00	TELEPHONE	1130.78
RPL. HFRS.	27.90	0.00	0.0	0.00	0.00	0.00	0.00	0.00	ELECTRICITY(FARM SHARE)	35.00
HEIFER	3.10	0.00	8.0	24.80	24.80	36.13	896.02	0.00	DOMESTIC WATER	50.00
STR. CALVES	72.85	0.00	7.4	539.09	539.09	40.43	21795.41	0.00	AUTO TRUCK LICENSE & INS.	133.00
HFR. CALVES	46.50	0.00	6.9	320.85	320.85	36.13	11592.31	0.00	FARM LIABILITY INSURANCE	95.00
BULLS	4.65	0.00	0.0	0.00	0.00	0.00	0.00	0.00	IRRIGATION O & M	0.00
EWES	75.00	225.00	1.3	97.50	11.70	8.14	95.24	0.00	OTHER EXPENSES	450.00
REP. EWES	13.50	0.00	0.0	0.00	0.00	0.00	0.00	0.00	OPERATING COSTS	20.00
LAMBS	90.00	0.00	1.1	94.50	94.50	33.10	3127.95	0.00	INTEREST ON BORROWED CAP.	1411.46
RAMS	2.25	0.00	0.0	0.00	0.00	0.00	0.00	0.00		369.36
WOOL	89.25	0.00	.1	10.26	10.26	70.00	718.46	0.00	SUBTOTAL	19011.17
HORSE	1.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	MISCELLANEOUS(2 PERCFNT)	380.22
TOTAL							44245.19	0.00	INTEREST ON INDEBTEDNESS	10369.04
								0.00	PURCHASED LIVESTOCK	0.00
									CURRENT FARM EXPENSE	29760.43
FINANCIAL SUMMARY										
ENTERPRISE										
LAND										
AMOUNT										
CROP SALES										
98750.00										
LIVESTOCK AND PRODUCTS SOLD										
28607.00										
VALUE FARM PERQUISITES										
38206.75										
GROSS FARM INCOME										
35772.50										
CURRENT FARM EXPENSE										
6127.49										
NET FARM INCOME										
207463.74										
WORK BY OPERATOR										
2700.00										
TOTAL HIRED LABOR										
2007.53										
6284.54										
44245.19										
1365.00										
51894.73										
29760.43										
22134.30										

FARM BUDGET SUMMARY									
JENSEN UNIT		FARM TYPE BEEF		LAND CLASS COMPOSITE		TYPE OF ANALYSIS		BENEFIT	
CONDITION WITHOUT PROJECT		IRRIGABLE ACRES IN FARM		225.		-83		BUDGET NO. 83	
AREA REPRESENTED		ACRES		MAN		WORK		HOURS	
CROPS AND LIVESTOCK		NUMBER		UNIT		YIELD		TOTAL	
ALFALFA		100.00	970.00	TON	3.9	390.00			
BARLEY		12.00	87.60	BU	70.0	840.00			
CORN SILAGE		24.00	336.00	TON	14.0	336.00			
ROT PAST.		54.00	243.00	AUM	6.0	324.00			
PERM PAST		25.00	100.00	AUM	2.0	50.00			
PVT RANGE		600.00	0.00	AUM	.3	180.00			
AFTERMATH		136.00	0.00	AUM	.6	81.60			
NONIRRIGATED		25.00	0.00		0.0	0.00			
FMST=WASTE		10.00	0.00		0.0	0.00			
BLM GRAZING		350.00	0.00	AUM	0.0	0.00			
F.S. PERMITS		200.00	0.00	AUM	0.0	0.00			
TOTAL		225.00							
DISPOSAL OF FARM PRODUCTION		AMOUNT		PRICE		VALUE		FARM	
SELL		-00		36.10		-00		390.00	
REPAIRS,BUILDINGS & IMPRVMTS		824.00		1.58		1301.92		16.00	
REPAIRS, MACHINERY&EQUIP		0.00		12.00		0.00		336.00	
DEPRECIATION, BUILDINGS		0.00		0.00		0.00		324.00	
CUSTOM WORK		0.00		0.00		0.00		50.00	
TAXES, LAND, MACH, IMPRVMTS		0.00		0.00		0.00		180.00	
TAXES, LIVESTOCK		0.00		0.00		0.00		81.60	
INSURANCE		0.00		0.00		0.00		0.00	
MARKETING COSTS		0.00		0.00		0.00		0.00	
MISCELLANEOUS LIVESTOCK COSTS		0.00		0.00		0.00		0.00	
SPRAY MATERIAL		0.00		0.00		0.00		0.00	
GRAZING FEES		0.00		0.00		0.00		0.00	
BALING TWINE		1301.92							
SEED COSTS									
FEED PURCHASED		199.10		26.42		5260.20		0.00	
FERTILIZER		0.00		0.00		0.00		0.00	
TELEPHONE		21.67		36.13		782.96		0.00	
ELECTRICITY(FARM SHARE)		471.07		40.43		19045.20		0.00	
DOMESTIC WATER		280.36		36.13		10129.56		0.00	
AUTO TRUCK LICENSE & INS.		0.00		0.00		0.00		0.00	
FARM LIABILITY INSURANCE		0.00		0.00		0.00		0.00	
IRRIGATION O & M		0.00		0.00		0.00		0.00	
OTHER EXPENSES		0.00		0.00		0.00		0.00	
OPERATING COSTS		0.00		0.00		0.00		0.00	
INTEREST ON BORROWED CAP.		35217.92							
SUBTOTAL		14887.67							
MISCELLANEOUS(2 PERCENT)		297.75							
INTEREST ON INDEBTEDNESS		9416.44							
PURCHASED LIVESTOCK		0.00							
CURRENT FARM EXPENSE		24601.86							
FINANCIAL SUMMARY		AMOUNT							
CROP SALES		89500.00							
LIVESTOCK AND PRODUCTS SOLD		26502.50							
VALUE FARM PERQUISITES		38206.75							
GROSS FARM INCOME		29660.83							
CURRENT FARM EXPENSE		4534.07							
NET FARM INCOME		188404.15							
TOTAL		1301.92							
TOTAL		35217.92							
TOTAL		245.80							
TOTAL		14887.67							
TOTAL		297.75							
TOTAL		9416.44							
TOTAL		0.00							
TOTAL		24601.86							
TOTAL		1301.92							
TOTAL		35217.92							
TOTAL		1365.00							
TOTAL		37884.84							
TOTAL		24601.86							
TOTAL		13282.98							

[illegible]

Table 37

SUMMARY OF FARM BUDGET DATA AND IRRIGATION BENEFITS
JENSEN UNIT - CENTRAL UTAH PROJECT

TABLE 38
SUPPLEMENTAL SERVICE LANDS

ITEM	INDIRECT BENEFIT FACTOR	UNIT	*****WITHOUT PROJECT***** WITH PROJECT *****				TOTAL AREA	BEEF SHEEP SINGLE FARM	BEEF .75 SINGLE FARM	BEEF .25 SINGLE FARM	TOTAL AREA	PROJECT INCREASE	FULL SERVICE LANDS 2/	TOTAL PROJECT SUPPLEMENTAL SERVICE	LOSS IN BENEFITS RESERVOIR INUNDATION	TOTAL
			REEF .75 SINGLE FARM	REEF .25 SINGLE FARM	REEF .75 SINGLE FARM	REEF .25 SINGLE FARM										
FARM BUDGET NO.			38	48	18	28										
WEIGHT NO. FARMS			13.6	4.5	13.6	4.5	18.1	28	13.6	4.5	18.1	0	440	4080		0
IRRIGABLE ACRES			225	225	225	225	4079	225	225	225	4079	0	0	0		0
IRRIGATED CLASS 6 LAND			25	25	25	25	453	25	25	25	453	0	0	0		0
DRY PASTURE			600	600	600	600	10878	600	600	600	10878	0	0	0		0
TOTAL FARM ACREAGE			850	850	850	850	15410	850	850	850	15410	0	0	0		0
IRRIGABLE PROJECT ACRES REPRESENTED			3060	1020	3060	1020	4080	1020	3060	1020	4080	0	0	0		0
WATER SUPPLY FOR PROJECT LAND			7578	2526	7578	2526	10104	2526	7578	2526	10104	0	0	0		0
DIVERSION REQUIREMENT			0	0	0	0	0	0	0	0	0	4600	4600	0		0
WATER SUPPLIED PROJECT																
LIVESTOCK		A.U.	228	229	270	281	4138	229	270	281	4138	807	0	0		0
NO. ANIMAL UNITS 1/		HD.	135	124	160	155	2398	124	160	155	2398	480	0	0		0
NO. REEF COWS (BREEDING)		HD.	0	75	0	75	340	75	0	75	340	0	0	0		0
NO. FWEs																
FARM INVESTMENT																
LAND		\$	89500	89500	1622635	89750	1790338	89750	1622635	89750	1790338	167703	0	0		0
BUILDINGS AND IMPROVEMENTS		\$	26502	28607	490017	26502	490017	28607	26502	28607	490017	0	0	0		0
MACHINERY AND EQUIPMENT		\$	38207	38207	692693	38207	692693	38207	38207	38207	692693	0	0	0		0
LIVESTOCK		\$	29661	28999	534755	29661	534755	28999	34990	35772	637911	103156	0	0		0
FEED AND SUPPLIES		\$	4534	4667	82804	4534	82804	4667	5550	6127	103235	20431	0	0		0
TOTAL		\$	188404	189980	3422904	188404	3422904	189980	203999	207463	3714194	291290	0	0		0
LABOR		HRS.														
CROPS		HRS.	1737	1737	31492	1737	31492	1737	2055	2055	37257	5765	0	0		0
LIVESTOCK		HRS.	1585	1673	29135	1585	29135	1673	1872	2039	34696	5541	0	0		0
MISC.		HRS.	498	511	9088	498	9088	511	589	614	10792	1704	0	0		0
TOTAL		HRS.	3820	3921	69715	3820	69715	3921	4516	4708	82745	13030	0	0		0
PERFORMED BY OPERATOR		HRS.	2684	2693	48702	2684	48702	2693	2700	2700	48951	249	0	0		0
HIRED		HRS.	1135	1228	20999	1135	20999	1228	1816	2008	33794	12795	0	0		0
FARM INCOME		\$														
HAY AND FORAGE	.05	\$	0	0	0	0	0	0	6725	4947	113870	113870	0	0		0
FEED GRAINS	.05	\$	1302	769	21191	1302	21191	769	1871	1337	31502	10311	0	0		0
LIVESTOCK (MEAT)	.11	\$	35218	35411	639377	35218	639377	35411	41603	43527	762978	123601	0	0		0
WOOL	.78	\$	0	718	3253	0	3253	718	0	718	3253	0	0	0		0
FARM PERQUISITES		\$	1365	1365	24747	1365	24747	1365	1365	1365	24747	0	0	0		0
TOTAL		\$	37885	38263	688568	37885	688568	38263	51564	51894	936350	247782	0	0		0
FARM EXPENSES		\$														
INTEREST ON INVESTMENT AT 5 PER CENT		\$	9416	9495	171070	9416	171070	9495	10196	10369	185637	14567	0	0		0
TAXES		\$	1330	1353	24217	1330	24217	1353	1459	1498	26628	2411	0	0		0
HIRED LABOR		\$	2554	2764	47255	2554	47255	2764	4086	4517	76032	28777	0	0		0
LIVESTOCK		\$	2173	2359	40239	2173	40239	2359	2462	2728	45841	5602	0	0		0
CROPS		\$	2606	2573	47097	2606	47097	2573	3633	3575	65604	18507	0	0		0
DEPRECIATION AND REPAIRS		\$	1010	1160	18991	1010	18991	1160	1010	1160	18991	0	0	0		0
IMPROVEMENTS		\$	3386	3386	61388	3386	61388	3386	3386	3386	61388	0	0	0		0
EQUIPMENT		\$	2127	2164	38730	2127	38730	2164	2467	2527	44999	6269	0	0		0
OTHER		\$	24602	25254	448987	24602	448987	25254	28699	29760	525120	76133	0	0		0
TOTAL EXPENSES		\$	13283	13009	239581	13283	239581	13009	22865	22134	411230	171649	0	0		0
NET FARM INCOME		\$														
INDIRECT BENEFITS		\$														
PUBLIC BENEFITS .05 X DIRECTS		\$														
(ECONOMIC GROWTH)		\$														
TOTAL BENEFITS		\$														
AVERAGE ANNUAL BENEFITS DISCOUNTED AT 3 1/4 PER CENT INTEREST FOR 3 YEARS (FACTOR .968)		\$														
DIRECT		\$														
INDIRECT		\$														
PUBLIC		\$														
TOTAL		\$														
PER ACRE FOOT																
DIRECT																
INDIRECT																
PUBLIC																
TOTAL																
PER ACRE																
DIRECT																
INDIRECT																
PUBLIC																
TOTAL																

1/ A. U. = 4400 T. O. N.
2/ BENEFITS BASED ON PER ACRE FOOT VALUES DETERMINED FOR SUPPLEMENTAL SERVICE LANDS.

- (b) Profits of all other enterprises between the farm and final consumer, from handling, processing, and marketing increased quantities of farm products locally and elsewhere. Indirect benefits are valued at \$19,000 annually.

Public Irrigation Benefits

Public benefits in this analysis have been evaluated as economic growth estimated at 5 percent of direct benefits and are valued at \$8,000 annually.

Development Period

Following the initial delivery of project water, the farmers will be allowed a 3-year development period. The project acres consist of both supplemental and full service lands; however, the full service lands are represented by only 440 acres scattered among the supplemental lands and will not be developed as new farm units. The full service lands will be added to the existing farm units and will not require a completely new farm distribution system. Only a few adjustments in farming operations will be necessary before full production can be realized. Under these circumstances 3 years are considered adequate for a development period. During this time the farmers will be required to pay project operation, maintenance, and replacement costs but will not be assessed for construction costs.

Loss in Benefits

In order to completely analyze the effects of the project upon the economy, it is necessary to evaluate losses in agricultural production caused by project construction. Inundation of lands by Tyzack Reservoir will result in production loss from about 480 acres. These lands comprise irrigated crop land, brush and river bottom pasture, and hillside grazing. Benefits per acre, estimated for these lands, are shown in Table 39 and are capitalized for 100 years at 3 1/4 percent interest. These benefits are reduced by right-of-way costs to a net production loss figure. Considerable public lands are involved within the reservoir area for which acquisition costs were relatively low, resulting in a right-of-way cost considerably lower than the net production loss. This loss in production, when subtracted from benefits determined by the farm budgets, results in average net irrigation benefits as shown in the benefit summary, Table 38.

Table 39
Agricultural losses in excess of right-of-way
costs--Tyzack Reservoir

Type of land	Acres	Estimated benefits per acre	Benefits capital- ized ^{3/}	Right- of-way cost	Benefits lost in excess right- of-way
Irrigated crop land	105	<u>1/</u> \$149.00	\$462,000		
Brush pasture and river bottoms	141	<u>2/</u> 9.00	37,000		
Hillside grazing	234	1.50	10,000		
Total	480		509,000	\$200,000	\$309,000
Average annual					10,500

1/ Jensen Unit benefits exclusive of public benefits.

2/ Bonneville Unit related to 1974 normalized prices.

3/ 100 years at 3.25 percent interest.

REFERENCES

1. Bateman, H. P., Effect of Full Load on Farm Machinery Operating Economies, Agricultural Engineering, 24: 111-114, April 1943.
2. Doane Agricultural Service, Inc., Doane Agricultural Digest, St. Louis 8, Missouri.
3. Morrison, F. B., Feeds and Feeding, 22nd Edition, The Morrison Publishing Company, Ithaca, New York.
4. National Research Council, Committee of Animal Nutrition, Recommended Nutrient Allowances for Beef Cattle, Revised December 1950, Washington 25, D. C.
5. U. S. Agricultural Research Service and Agricultural Marketing Service, Agricultural Price and Cost Projections, Washington, Government Printing Office, September 1957.
6. U. S. Agricultural Marketing Service, Livestock Division, Weekly Livestock Market Report, Ogden, Utah.
7. U. S. Bureau of Reclamation, Labor, Power, and Performance for Bonneville Basin, Region 4, Salt Lake City, Utah, July 1960.
8. U. S. Bureau of Reclamation, Types of Farming - Columbia Basin Joint Investigations, Problem 2, Washington, U. S. Government Printing Office, 1945.
9. U. S. Bureau of the Census, U. S. Census of Agriculture: 1964 Vol. I, Counties, part 44, Utah, U. S. Government Printing Office, Washington, D. C. 1967.
10. U. S. Department of Agriculture, Farm Fences, Farmers Bulletin No. 1832, Washington, U. S. Government Printing Office, 1954.
11. U. S. Department of Agriculture, Statistical Reporting Service, Agricultural Prices, Washington, U. S. Government Printing Office.
12. U. S. Weather Bureau, Climatological Data: Utah, Ashville, North Carolina.
13. Utah State Agricultural Experimental Station, Farm Flock Sheep Production Northern Utah, Bulletin 428, Logan, Utah, 1959.
14. Utah State University, Fertilizer Guide for Utah, Circular 142, Logan, Utah.

FINANCIAL AND ECONOMIC ANALYSES

CHAPTER I

PRESENT ECONOMIC CONDITIONS

The Jensen Unit area in Uintah County, Utah, is generally synonymous with Ashley Valley. It includes Vernal City, county seat and the largest municipality, Maeser, Naples, Jensen, and several smaller rural communities.

Vernal City serves municipal water to all communities in the valley except part of Maeser. Should the demand arise, Vernal has the facilities to deliver more water to Maeser.

The economy of the area is reliant upon several industries. Included are a mining industry which utilizes phosphate, gilsonite, and petroleum resources; a growing recreation and tourist industry; and agriculture which consists primarily of livestock enterprises. A small manufacturing industry is also located within the area.

As of 1974, there existed within the Jensen Unit area no major water intensive industry. There were no refineries for processing local phosphate, gilsonite, or oil.

Vernal is the headquarters of many of the businesses which directly or indirectly serve the petroleum industry in many of the western states and especially the oil fields of the Uinta Basin. Stauffer Chemical Company's phosphate plant and mine north of Vernal make up another important mineral industry contributing to the area's economy. Recreation and tourism are becoming increasingly important as sources of income. Recreationists and tourists are attracted to the area not only by the nearby Flaming Gorge Reservoir and Dinosaur National Monument but also by the streams, lakes, and scenic beauty of the Uinta Mountains. Agriculture ranks third, behind mining and mineral production and tourism, in its contribution of income to the local economy. Production of beef cattle and sheep is the major agricultural enterprise.

Population

Ashley Valley is the population center of Uintah County. In 1973, according to Utah Economic and Business Review dated December 1973, there were 15,200 people living in Uintah County.

This compares with 1970 census data that show the county having a population of 12,624 with 9,665 in Ashley Valley. Vernal in 1970 had 3,980 inhabitants, Maeser had 1,248, and the community of Jensen had 343. Since 1970, Ashley Valley has had a population increase of over 10 percent

annually, however, the annual rate since 1940 has been only 2 percent. Vernal's 1974 estimated population was 6,200.

The long-term growth rate is about the same as the State of Utah and has resulted primarily from exploration of and production of petroleum and natural gas. Phosphate and gilsonite mining has contributed to the growth as have the tourist and recreation industries. Farm population has been declining slightly and will likely continue. Construction of the Vernal Unit of the Central Utah Project provided part of Ashley Valley with needed supplemental irrigation water and municipal and industrial water which have helped maintain this steady growth rate.

Employment and Personal Income

Data prepared by Utah Department of Employment Security indicate that the number of nonagricultural employees in Uintah County has nearly tripled since 1950. Table 1 shows the number of employees on nonagricultural payrolls by major industry divisions from 1950 to 1973. These data show the growth patterns for each employment sector in the past 24 years. Significantly, while the number of employees in each of these industries was growing, employment in the agricultural field was decreasing. In 1950 there were 1,200 jobs in agriculture, but by 1972 there were only 430. During this same period the unemployment rate has declined to less than 4 percent, and per capita income has risen from \$1,840 in 1960 to \$3,880 in 1973. While the unemployment figures for Uintah County are lower than State and National averages, the per capita income is less.

Increases in employment and personal income are reflected by corresponding increases in nearly all business activity. Table 2 shows some miscellaneous business statistics for Uintah County, 1965-73. Statistics for Ashley Valley are not shown specifically because they are not available, however, those that pertain to Uintah County are similar because of the influence Ashley Valley has in the county totals.

Medical Facilities

In 1970, Uintah County had one hospital with 34 beds. The same year, the hospital admitted 1,435 patients for 4,941 bed-days, an average of about 3.5 days per patient. In 1971, Uintah County had 5 physicians, 3 dentists, 21 registered nurses, and 13 licensed practical nurses.

Education Facilities

The 1970 census revealed that 59.4 percent of the Uintah County inhabitants age 25 and older were high school graduates. Only 2.1 percent had completed less than 5 years of school. The median number of school years completed was 12.2, and 8.6 percent had completed at least 4 years

Table 1
Employees on nonagricultural payrolls in Uintah County
(by major industry divisions)

Year	Manufac- turing	Mining	Contract construc- tion	Transpor- tation, communica- tions, and public util- ities	Trade	Finance, insurance, and real estate	Services	Govern- ment	Total
1950	76	194	47	67	271	30	232	397	1,314
1951	93	415	56	86	316	31	269	400	1,666
1952	80	514	108	91	389	37	290	409	1,918
1953	80	433	182	75	411	36	234	417	1,868
1954	81	381	53	74	382	36	214	432	1,653
1955	97	444	78	82	386	36	199	431	1,753
1956	113	585	150	87	418	41	218	478	2,090
1957	122	729	117	120	431	44	212	583	2,358
1958	125	664	144	127	441	47	209	637	2,393
1959	140	750	355	140	455	57	218	632	2,747
1960	165	838	376	166	523	59	225	649	3,001
1961	151	977	224	170	596	55	265	646	3,084
1962	144	1,095	181	172	657	57	336	740	3,382
1963	151	898	90	156	631	62	298	794	3,080
1964	131	862	118	154	631	68	247	789	3,000
1965	117	884	132	143	615	66	260	806	3,023
1966	114	805	179	141	659	84	340	864	3,186
1967	121	795	152	154	691	81	360	867	3,221
1968	125	712	157	162	660	74	377	896	3,163
1969	189	817	188	172	691	72	449	841	3,419
1970	249	711	180	177	711	74	548	860	3,510
1971	318	779	150	210	824	79	666	826	3,852
1972	316	950	255	300	1,001	95	838	900	4,655
1973	324	*	*	368	1,114	*	915	857	4,909

Notes: Detail may not add to totals because of independent rounding. *Not shown to avoid disclosure of individual firm data.

Table 2
Miscellaneous business statistics for Uintah County (1965-73)^{1/}

Type of statistic	1965	1966	1967	1968	1969	1970	1971	1972	1973
Population	12,700	12,300	12,500	12,300	12,400	12,624	13,300	14,400	15,200
Average work force (persons)	4,400	4,480	4,510	4,540	4,610	4,750	5,140	5,880	6,170
Average nonagricultural employment (persons)	3,023	3,186	3,221	3,280	3,423	3,510	3,852	4,655	4,870
Average number of unemployed workers	240	230	230	220	210	280	310	360	230
Average percentage of workers unemployed	5.5	5.2	5.2	5.0	4.6	6.0	6.1	4.4	3.8
Average monthly nonagricultural wage	\$426	\$414	\$427	\$439	\$472	\$482	\$490	\$551	\$619
Annual nonagricultural payroll (\$1,000)	15,463	15,847	16,502	17,297	19,375	20,311	22,645	30,785	36,198
Number of new cars and trucks sold	478	622	526	602	675	610	766	1,015	1,258
Number of new dwelling units	37	27	17	18	14	95	74	122	127
Construction values (\$1,000)									
Residential	\$416	\$293	\$262	\$249	\$265	\$1,243	\$1,158	\$2,008	\$2,442
Nonresidential and other	2,175	254	95	309	1,154	400	543	2,380	2,286
Total	2,591	547	357	558	1,419	1,643	1,701	4,388	4,728

^{1/} Data for this table were taken from "Selected Business Statistics for Utah Counties," Utah Economic and Business Review (1969, 1971, and 1974).

of college. Data for the State of Utah and the United States for 1970 indicate that 67.3 and 52.4 percent, respectively, of the inhabitants age 25 and over had completed at least 4 years of high school, and 14.0 and 10.7 percent had completed at least 4 years of college.

Uintah County has no colleges or universities. It has one high school and one junior high school in Vernal which serve the Ashley Valley. Students in the western part of Uintah County attend high school and junior high school in Roosevelt, Duchesne County. Ashley Valley has four elementary schools, and elementary students in the western part of the county attend the Todd School near Fort Duchesne.

Problems and Needs

Problems and needs associated with the Jensen Unit of the Central Utah Project are both National and local in character. National needs are directly reflected by the Nation's "energy crisis," and local needs are based upon an immediate need for both municipal and industrial water and supplemental irrigation water.

Rich deposits of fossil fuels are located within the Uinta Basin. Petroleum and natural gas are currently being produced in ever increasing quantities, but oil shale, the most abundant resource, is virtually untouched. Increased prices for crude oil are making oil shale a feasible source of energy, and in the early spring of 1974 the Federal government issued leases on four oil shale tracts, two in Colorado and two in Utah, to commence prototype recovery operations. Development of these Federally leased tracts is scheduled to start before 1980 and on some State of Utah lease tracts about a year later. The possible effects of oil shale development on the population and economic growth of the Jensen Unit area are expected to be significant. Oil shale development will be the principal factor but development of other industries will also contribute. Asphalt Ridge, located a few miles southwest of the city of Vernal, contains an extensive bituminous sand deposit. The SOHIO Petroleum Company has been given permission by the Utah Division of Oil and Gas Conservation to conduct mining operations on Asphalt Ridge. An open pit mine will be developed and crude oil extracted. This operation, though small at first, is expected to be in production by about 1980, and if successful, could be a major factor in the oncoming population "boom." Also added will be increases caused by expansion of the phosphate and gilsonite industries.

Expected growth

Ashley Valley growth is contingent upon development of the oil shale industry, particularly, and also production of other minerals. Without oil shale the area is expected to continue to grow at about 2 percent annually with some increases representing expanded development of the

phosphate, petroleum, and gilsonite industries. Bituminous sands, if expected pilot studies prove successful, could significantly affect population growth. This growth should continue because of the employment opportunity and the National need for new sources of energy. The Jensen Unit would provide the municipal water that will be demanded by the incoming population.

Sufficient municipal water resources, a viable oil shale industry, and more than adequate land areas give the Ashley Valley a growth potential of "boom" proportions for the next several decades. There would be problems associated with this growth. Already schools, water lines, sewer lines, and service-related businesses in Ashley Valley are inadequate for present needs. There is a housing shortage, and this shortage would be extremely critical without the availability of mobile homes. In addition, motels that have depended on a 3- to 6-month tourist season for business in the past are now occupied most of the time by oil-exploration workers. Officials of Uintah County foresee a tapering off in oil exploration but a more-than-compensating increase in oil shale development.

Of the resources in the Uinta Basin, development of oil shale would have the biggest impact. The National crisis for energy and the desire for energy independence as well as increasing crude oil prices could stimulate oil shale development to such proportions that the Uinta Basin and particularly Ashley Valley would experience a boom of population and construction greater than has ever been experienced by any place in the State of Utah. The boom could be minor, moderate, or accelerated depending upon the rate and scope of oil shale development. All three rates are possible and so the problem of projecting growth and impact becomes speculative. To establish the range of impact, three levels of production were estimated as shown in the following table.

Estimated shale oil production in Utah
(Barrels per day)

Year	Prototype development	Moderate commercial development	Accelerated commercial development
1980	100,000	100,000	100,000
1985	200,000	200,000	300,000
1990	200,000	300,000	500,000
1995	200,000	400,000	500,000
2000	200,000	500,000	600,000

These production levels are consistent with those outlined by the Department of the Interior in their task force report for "Project Independence" to the Federal Energy Administration. Using these estimates, the probable population growth for Ashley Valley was determined. First, projected population from the industry was ascertained. Then this population was distributed between the various areas of the Uinta Basin. For example, population as a result of oil shale development would be attracted

to Duchesne County, western Uintah County, Ashley Valley, and to a new city if one were built for oil shale workers and their families. There would also be some workers who would commute from communities in Colorado to the Utah tracts. Much of this impact, however, would be offset by workers from Utah who work in the Colorado tracts. Table 3 shows the expected population that would result from three levels of oil shale development. Tables 4 through 6 show population distribution at the three development levels. Population distribution was made assuming that the buildup in a new city would be slow and would probably never accommodate more than 60 percent of the population associated with oil shale. The remaining 40 percent would settle in the already established communities of Duchesne and Uintah Counties. It is assumed that 10 percent would settle in Duchesne and western Uintah County and 30 percent would live in Ashley Valley. Population projections are presented graphically in Figure 1.

Municipal and industrial water needs

Municipal and industrial water needs in Ashley Valley have already exceeded the available supply. Even with an oil shale new city the Jensen Unit is needed to meet increased demands. In the past, municipal water has been used for gardens and livestock so the per capita consumption rate has been high (0.45 acre-foot per capita per year). Projected water supply is based on an annual per capita municipal and industrial requirement for new population of 0.25 acre-foot. The municipal water needs for the near future, however, are critical as the area undergoes a tremendous population boom and the Jensen Unit would be the key to meeting these needs. Industrial water for the phosphate and bituminous sand industries will further add to the demands for Jensen Unit water. The phosphate industry has informally indicated a desire to double its present production. This action could require as much as 4,500 acre-feet additional industrial water. Water demands from the bituminous sand industry would depend upon the method used for oil extraction. It could vary from several thousand to less than 100 acre-feet.

As outlined above, many factors would affect municipal and industrial water demands from the Jensen Unit. Table 7 presents projected new population and new municipal and industrial water demands that are expected in Ashley Valley. Figure 2 shows graphically municipal and industrial water requirements for Ashley Valley. As shown in Table 7 new municipal and industrial water demands by 2000 would be 5,300 acre-feet for prototype development, 13,500 acre-feet for moderate commercial development, and 16,200 acre-feet for accelerated commercial development.

The per capita water use rate for new population could be higher than the 0.25 acre-foot used in the projections shown in Table 7. The present per capita use in Ashley Valley is about 0.45 acre-foot. If per capita use were 0.35 acre-foot, new municipal and industrial water

Table 3
Estimated employment and population from three levels of
oil shale development in the Uinta Basin, Utah

Year	Plant capacity under construction (barrels/day)	Plant construction (employees)	Plant capacity (barrels/day)	Plant operation ^{1/} (employees)	Oil shale employment (jobs available)	Service and support employment ^{2/}	Total jobs	Number of households ^{3/}	Oil shale population ^{4/}
Total									
Prototype Development									
1980	100,000	1,750	100,000	2,360	3,610	5,415	9,025	6,590	24,400
1985	100,000	850	200,000	4,720	5,570	8,355	13,925	10,160	37,600
1990			200,000	4,720	4,720	7,080	11,800	8,615	31,900
1995			200,000	4,720	4,720	7,080	11,800	8,615	31,900
2000			200,000	4,720	4,720	7,080	11,800	8,615	31,900
Moderate Commercial Development									
1980	100,000	1,250	100,000	2,360	3,610	5,415	9,025	6,590	24,400
1985	100,000	1,250	200,000	4,720	5,970	8,955	14,925	10,950	40,300
1990	100,000	1,250	300,000	6,380	7,630	11,445	19,075	13,920	51,500
1995	100,000	1,250	400,000	8,500	9,750	14,625	24,375	17,790	65,800
2000	100,000	1,250	500,000	10,630	11,880	17,820	29,700	21,680	80,200
Accelerated Commercial Development									
1980	200,000	2,500	100,000	2,360	4,860	7,290	9,650	7,040	26,000
1985	200,000	2,500	300,000	6,380	8,880	13,320	19,700	14,380	53,200
1990	100,000	1,250	500,000	10,630	11,880	17,820	28,450	20,770	76,800
1995	100,000	1,250	500,000	10,630	11,880	17,820	28,450	20,770	76,800
2000	100,000	1,250	600,000	12,740	13,990	20,990	33,730	24,620	91,100

1/ "Project Independence" Task Force Report, U.S. Department of the Interior, November 1974, Table H-5, page 193; and Table F-3, page 111.

2/ Basic employees to service - support employees ratio 1:1.5.

3/ 1970 Census of Population, 1.37 jobs per household.

4/ 1970 Census of Population, 3.7 people per household.

Table 4
Projected population and population distribution--Uinta Basin
1980-2000 with prototype development
(Unit--number of people)

Type of statistic	1973	1980	1985	1990	1995	2000
1973 base	27,900	27,900	27,900	27,900	27,900	27,900
Normal growth at 2 percent annually		4,100	7,400	11,100	15,200	19,600
Added growth from						
Gilsonite		100	200	200	200	200
Phosphate		100	100	100	100	100
Bituminous sands		0	0	0	0	0
Oil shale		24,400	37,600	31,900	31,900	31,900
Total	27,900	55,600	73,200	71,200	75,300	79,700
Distribution						
Uintah County	15,200	39,800	55,100	51,900	54,200	56,600
Ashley Valley	14,300	32,600	34,000	30,000	32,200	34,500
Western Uintah County	900	2,200	3,100	2,900	3,000	3,100
New oil shale city		5,000	18,000	19,000	19,000	19,000
Duchesne County	12,000	15,000	17,200	18,400	20,100	22,100
Horrocks Water District ¹ /	12,900	17,200	20,300	21,300	23,100	25,200
Daggett County	700	800	900	900	1,000	1,500

¹/ Partly in Uintah County.

Table 5
Projected population and population distribution--Uinta Basin
1980-2000 with moderate commercial development

Type of statistic	1973	1980	1985	1990	1995	2000
1973 base	27,900	27,900	27,900	27,900	27,900	27,900
Normal growth at 2 percent annually		4,100	7,400	11,100	25,200	19,600
Added growth from (increase over 1973)						
Gilsonite		100	100	100	100	100
Phosphate		400	700	700	700	700
Bituminous sands		400	800	1,300	2,700	2,700
Oil shale		24,400	40,300	51,500	65,800	80,200
Total	27,900	56,300	77,200	92,600	112,400	131,200
Distribution						
Uintah County	15,200	40,500	59,000	72,200	89,300	105,400
Ashley Valley	14,300	33,300	35,600	39,000	47,100	54,200
Western Uintah County	900	2,200	3,300	3,900	4,700	5,500
New oil shale city		5,000	20,100	29,300	37,500	45,700
Duchesne County	12,000	16,000	17,300	19,500	22,100	24,800
Horrocks Water District ^{1/}	12,900	18,200	20,600	23,400	26,800	30,300
Daggett County	700	800	900	900	1,000	1,000

^{1/} Partly in Uintah County.

Table 6
Projected population estimates and distribution--Uinta Basin
1980-2000 with accelerated commercial development
(Unit--number of people)

Type of statistic	1973	1980	1985	1990	1995	2000
1973 base	27,900	27,900	27,900	27,900	27,900	27,900
Normal growth at 2 percent annually		4,100	7,400	11,100	15,200	19,600
Added growth from (increase over 1973)						
Gilsonite		200	200	200	200	200
Phosphate		400	1,100	1,100	1,100	1,100
Bituminous sands		800	1,300	2,700	2,700	2,700
Oil shale		26,000	53,200	76,800	76,800	91,100
Total	27,900	59,400	91,100	119,200	123,900	142,600
Distribution						
Uintah County	15,200	43,400	72,200	98,000	100,300	116,200
Ashley Valley	14,300	35,100	42,400	46,900	49,100	56,100
Western Uintah County	900	2,300	3,800	5,100	5,200	6,100
New oil shale city		5,000	26,000	46,000	46,000	54,000
Duchesne County	12,000	15,200	18,000	20,900	22,600	25,400
Horrocks Water District ^{1/}	12,900	17,500	21,800	26,000	27,800	31,500
Daggett County	700	800	900	900	1,000	1,000

^{1/} Partly in Uintah County.

Figure 1
POPULATION PROJECTION
FOR
ASHLEY VALLEY
1975-2000

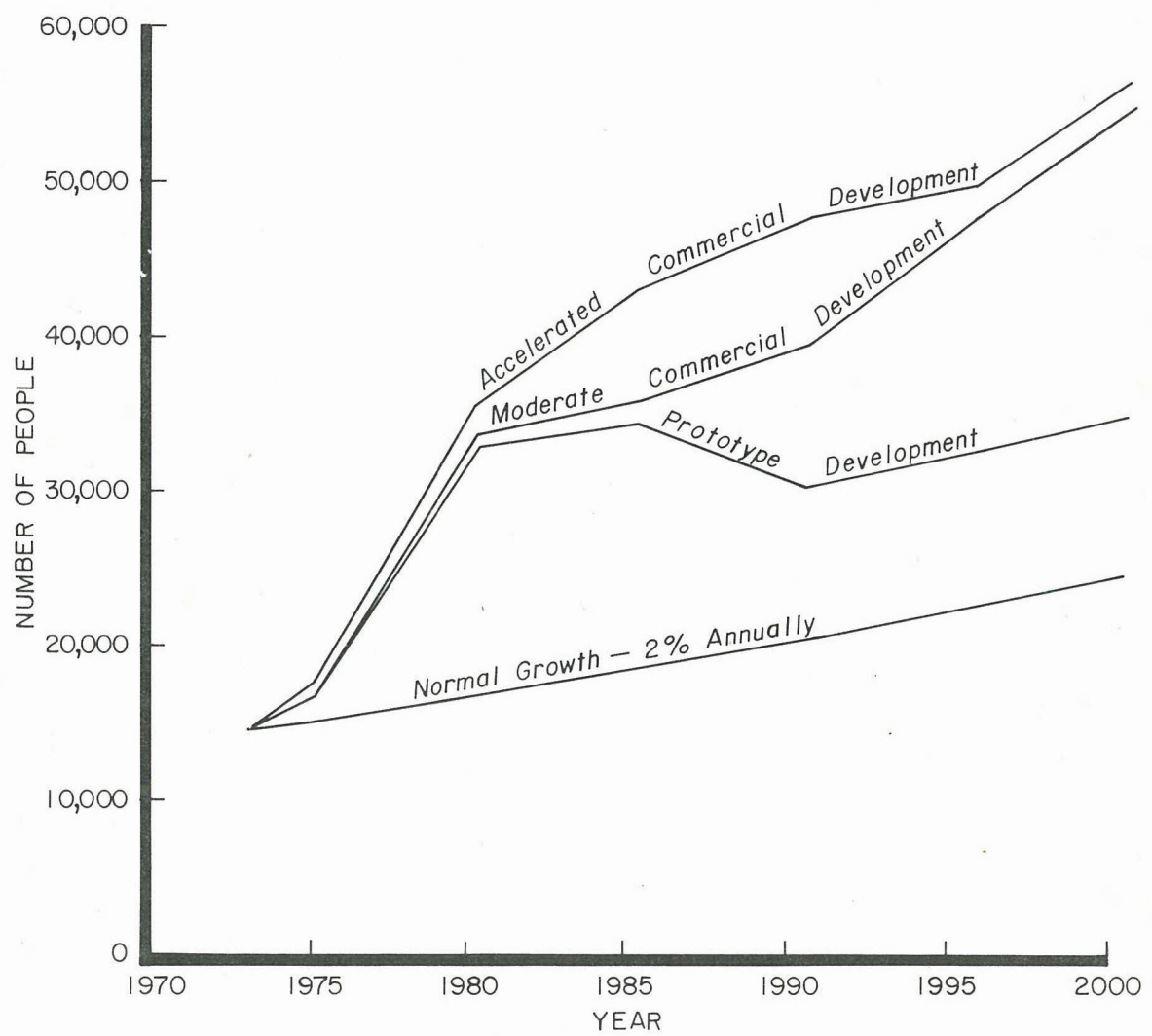
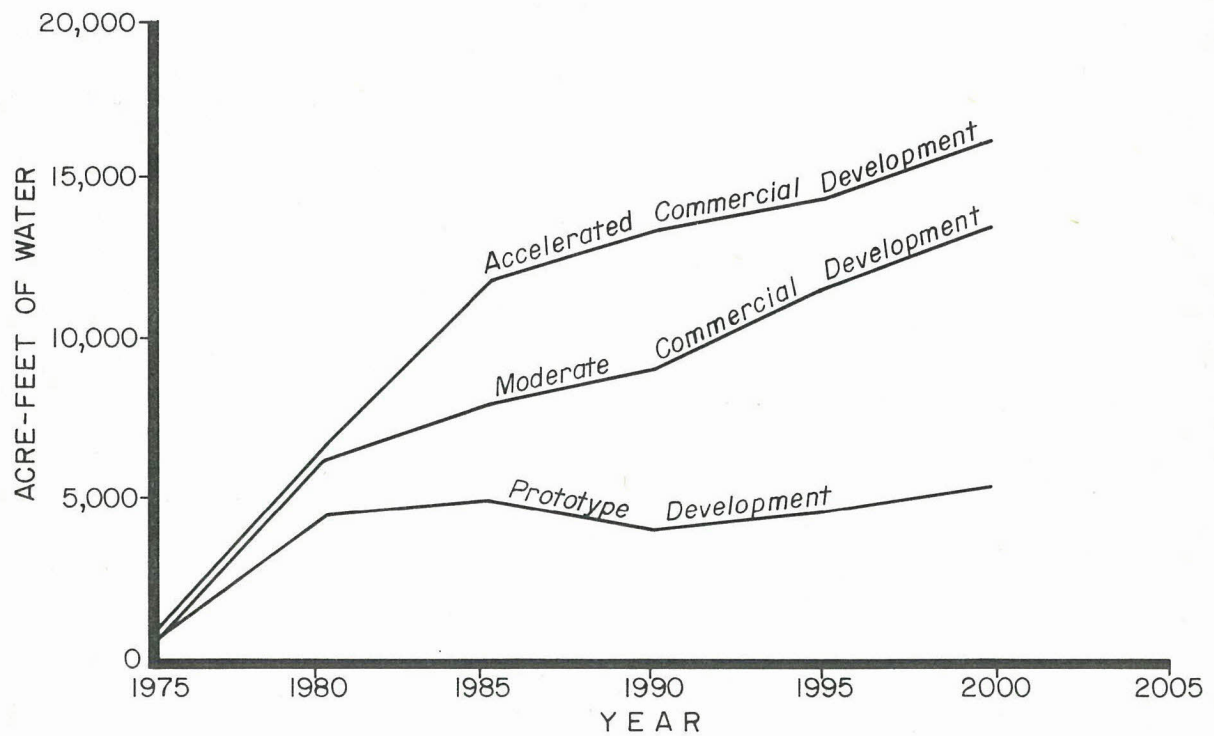


Table 7
Estimated new municipal and industrial
water requirements
(Unit--acre-feet)

Year	Level of oil shale development	Estimated new population	New mu- nicipal water ^{1/}	New indus- trial water	Total new municipal and indus- trial water
1980	Prototype	18,300	4,600		4,600
	Moderate commercial	19,000	4,800	1,300	6,100
	Accelerated commercial	20,800	5,200	1,300	6,500
1985	Prototype	19,700	4,900	100	5,000
	Moderate commercial	21,300	5,300	2,700	8,000
	Accelerated commercial	28,100	7,000	4,900	11,900
1990	Prototype	15,700	3,900	100	4,000
	Moderate commercial	24,700	6,200	2,900	9,100
	Accelerated commercial	32,600	8,200	5,100	13,300
1995	Prototype	17,900	4,500	100	4,600
	Moderate commercial	32,800	8,200	3,500	11,700
	Accelerated commercial	34,800	8,700	5,700	14,400
2000	Prototype	20,200	5,100	200	5,300
	Moderate commercial	39,900	10,000	3,500	13,500
	Accelerated commercial	41,800	10,500	5,700	16,200

^{1/} Estimated at 0.25 acre-foot per capita.

Figure 2
ESTIMATED NEW MUNICIPAL & INDUSTRIAL
WATER REQUIREMENTS-ASHLEY VALLEY



demands by year 2000 would be 8,300 acre-feet for the prototype projection, 17,500 acre-feet for the moderate projection, and 20,300 acre-feet for the accelerated projection.

These projections assume a new city will be built for oil shale workers and their families. The oil companies who were awarded the Federal leases in Utah (Ua and Ub) have indicated this is their intention. TOSCO, who has non-Federal leases in the same area, however, has stated they do not intend to build a new city but expect their employees to settle in existing communities. If plans for a new city fail to materialize or if the new city does not attract 60 percent of the oil shale workers, the population of Ashley Valley and the demand for municipal and industrial water would be substantially greater than now anticipated.

Irrigation needs and supplies

There are about 4,200 acres of presently irrigated land and nearly 500 acres of nonirrigated land in the Jensen Unit irrigation service area. On the basis of the computed requirement of 3.7 acre-feet per acre, about 17,000 acre-feet would be needed for full irrigation service of these lands. The present irrigation supply is derived from the flows of Big and Little Brush Creeks and pumping from the Green River. The natural flows of Brush Creek during the spring snowmelt are generally adequate for the irrigation needs. In practically every year, however, shortages occur in the latter part of the irrigation season. Present shortages average about 23 percent annually but have exceeded 50 percent in some years.

Need to control flood flows

Flood damages occur to some extent nearly every year along Brush Creek. This damage occurs whenever the flow exceeds about 200 second-feet and includes bank erosion, damage to canal headings, farm buildings, fences, irrigation ditches, county roads and bridges, and silt damage to fields and crops. Operation of the proposed Tyzack Reservoir for flood control on the basis of the Federal-State cooperative runoff forecasts would control the reservoir inflow to a nondamaging flow.

Support by Local Officials

Local and State officials are cognizant of the probable impact of the mineral industry upon the area and have encouraged the Bureau to expedite construction of the unit. Vernal City signed a resolution dated October 23, 1974, to purchase 18,000 acre-feet of municipal and industrial water from the Jensen Unit. In addition, support has been expressed by the Utah Department of Natural Resources, Utah Division of Wildlife Resources, and other interested water user organizations.

CHAPTER II

ECONOMIC JUSTIFICATION

Introduction

Current policy requires that a multipurpose water resource project be justified monetarily and a benefit-cost comparison is used to establish project justification. While many benefits can easily be measured monetarily, there are others that are difficult if not impossible to quantify.

Our land area is limited. With a population expanding in numbers and affluency, growing requirements for land and the resources therefrom must be met. At the same time the environment should be protected and improved to the maximum practical extent. The well being of society, alleviation of depressed conditions, and population distribution are important factors and should be given consideration in evaluating project justification.

The benefit-cost analysis is made recognizing the widespread effects of reclamation which are not incorporated in other studies. Consideration is given to all project effects, beneficial or adverse, to whomsoever they may accrue. Such effects are evaluated as completely as possible on a comparable basis so that the analysis approaches full coverage from a public or National viewpoint. These comparisons were made for a 100-year period in accordance with Bureau of Reclamation policy. Benefits have been evaluated in monetary terms so far as possible; however, consideration has also been given to intangible or unmeasurable benefits in reaching final judgment on project justification.

The effects of the Jensen Unit, comprising increases in available goods and services, are converted to monetary terms by the use of market prices expected to prevail at the time costs are incurred and benefits received. Total costs comprise those expenditures which will be made under the authority granted to the Secretary of the Interior in Public Law 485 (70 Stat. 105) for construction and operation of the project. Construction costs are based upon the level of prices that prevailed generally as of January 1975. Operation and maintenance costs are based on prices which prevailed during the three calendar years prior to 1974, and benefits are based on current normalized prices. Irrigation benefits reflect the use of an agricultural price index of 158 for prices received by farmers and 142 for prices paid by farmers (1967=100) as more fully discussed in the Agricultural Economy Appendix.

Table 8
Summary of project benefits

Project purpose	Average annual benefits			
	Basin Fund (Section 5)			Benefits
	Direct	Indirect and public	Subtotal	
Municipal and industrial water	\$2,055,000		\$2,055,000	\$2,055,000
Irrigation	166,000	\$17,000	183,000	183,000
Recreation ^{1/}	18,000		18,000	88,000
Fish and wildlife	22,000		22,000	24,000
Flood control	24,000		24,000	24,000
Total	2,285,000	17,000	2,302,000	2,374,000

^{1/} Recreation benefits are the result of both joint and specific expenditure and, in this instance, are distributed 20 percent to the resource and 80 percent to recreation facilities.

Benefits

Benefits from municipal and industrial water use, fish and wildlife enhancement, recreation, irrigation, and flood control would result from construction of the Jensen Unit. These benefits have been appraised by the Bureau of Reclamation and other cooperating agencies. Benefits are summarized in Table 8 on the foregoing page.

Municipal and Industrial Water

Vernal City, Uintah County Water Conservancy District, and Central Utah Water Conservancy District support construction of the Jensen Unit. This support has been expressed by a Vernal City resolution, adopted October 23, 1974, to purchase 18,000 acre-feet of municipal and industrial water from Jensen Unit. This water will be required to meet existing shortages and to meet future demands associated with population increases and some industrial development as described in Chapter I of this appendix.

Benefits from the annual use of 18,000 acre-feet of municipal and industrial water have been approximated as the annual equivalent cost of developing this amount of water by the most likely means in the absence of a multipurpose project. The most likely single purpose municipal and industrial alternative to the Jensen Unit (the Green River Alternative) would be to pump water from the Green River to Ashley Creek, a distance of about 16 miles. This would require three pumping plants (46-second-foot capacity) and 16.3 miles of aqueduct. The pump lift from the Green River to Ashley Creek is over 1,000 feet. Itemized costs of this alternative and the methodology used in estimating municipal and industrial benefits are shown in Tables 9 and 10. Figure 3 is a map showing the location of features needed for this alternative.

Table 9
Municipal and industrial water--single purpose alternative
(Unit=\$1,000)

Feature	Con- struc- tion cost	Interest during construc- tion (7 percent)	Annual operation, maintenance, and replace- ment costs
Municipal and industrial water			
Pumping plant #1 and discharge line (46 c.f.s.)	\$7,746	\$678	\$96
Siphon (46 c.f.s.)	3,071	269	
Pumping plant #2 and discharge line (46 c.f.s.)	8,555	748	93
Pumping plant #3 and discharge line (46 c.f.s.)	3,845	336	37
Total	23,217	2,031	226

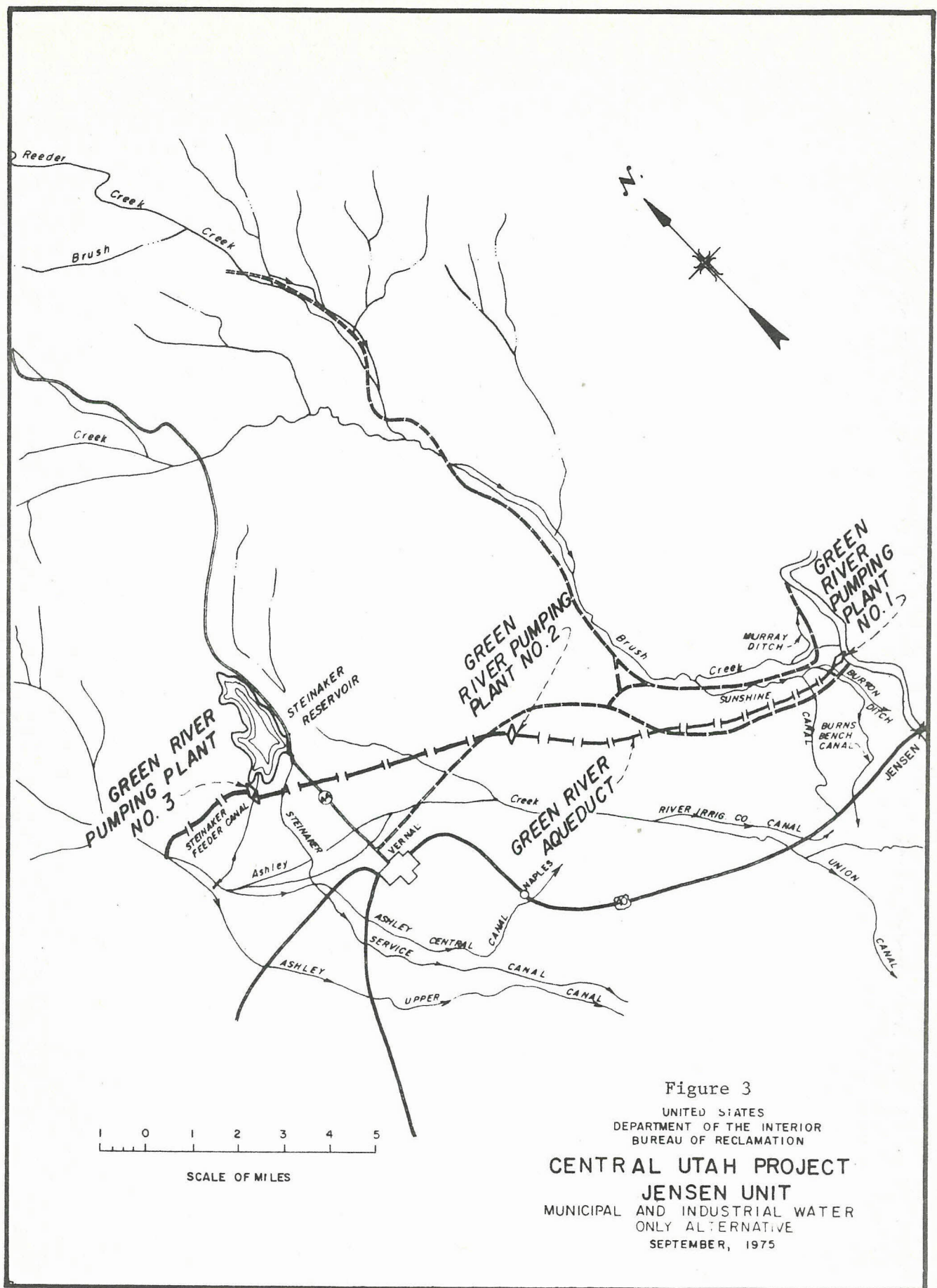


Figure 3

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL UTAH PROJECT JENSEN UNIT

MUNICIPAL AND INDUSTRIAL WATER
ONLY ALTERNATIVE
SEPTEMBER, 1975

Table 10
Computation of municipal and industrial water benefits

<u>Single-purpose alternative costs</u>	
Construction	\$23,217,000
Interest during construction (7 percent)	<u>2,031,000</u>
Total	25,248,000
Annual equivalent cost (50 years at 7 percent)	1,829,000
Plus annual operation, main- tenance, and replacement	<u>226,000</u>
Total	2,055,000
Annual benefit per acre-foot (18,000 acre-feet)	114.17
Rounded	<u>114.00</u>

Water pumped from Green River to Ashley Creek would be used for irrigation in exchange for water from Ashley Spring. Ashley Spring water is high quality water and is easily divertible into Vernal City's municipal water system. Water for industrial purposes not requiring a high quality water can be delivered directly from Steinaker Reservoir or diverted from the aqueduct. Water for phosphate or bituminous sands is an example of this type of use.

Irrigation

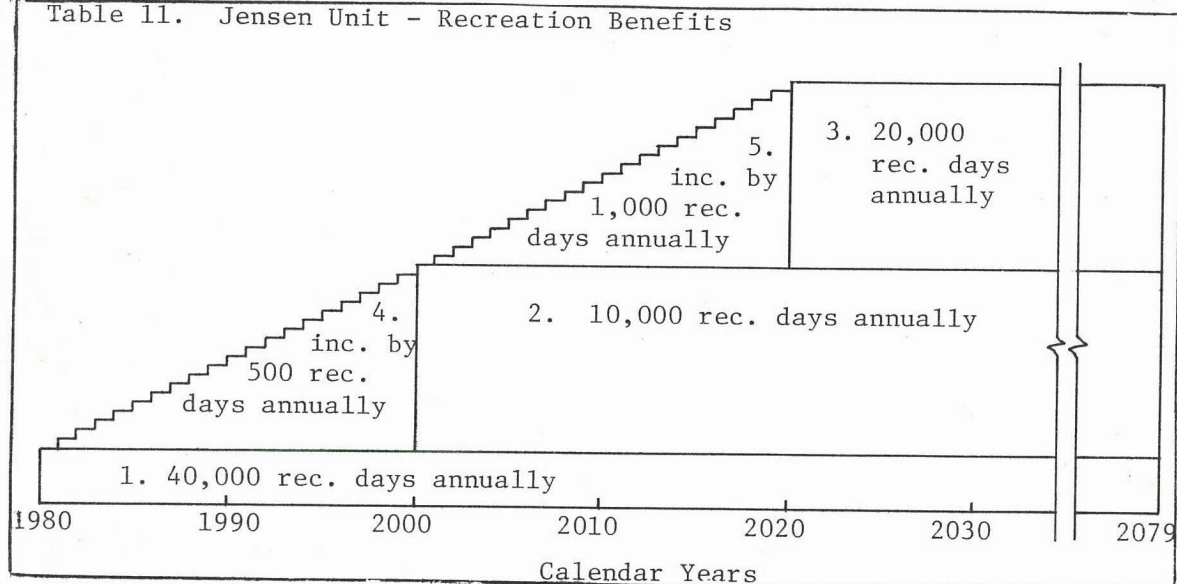
Irrigation benefits are estimated and explained in detail in the Agricultural Economy Appendix of this report. Annual benefits are estimated at \$183,000 adjusted for a 3-year development period and reduced by agricultural losses caused by the inundation of about 500 acres of land at Tyzack Reservoir. Direct irrigation benefits total \$166,000 annually and public and indirect benefits total \$17,000. Benefits per acre-foot are \$36 direct and \$4 for indirect and public.

Recreation

Recreation facilities are planned for Tyzack Reservoir. These facilities will be financed with Section 8 funds. National Park Service estimates

(NPS letter dated June 28, 1974) that 40,000 recreation days of use will be made during the first year of reservoir operation and by the year 2020 there will be 70,000 recreation days of use annually. The rate of increase during the first 20 years of operation is expected to be 500 recreation days annually. Thus by 2000 there will be 50,000 recreation days per year. During the second 20 years the rate of increase is expected to average 1,000 recreation days annually. Table 11 shows the methodology used to determine the average annual equivalent benefit value from recreation. This value, computed to be \$88,000 annually, was divided between specific Section 8 recreation facility costs and joint use facility costs on the assumption that 80 percent are specific facility oriented. Benefits were determined from the annual use figures by valuing each recreation day at \$1.60. This figure is updated from guidelines given in Senate Document 97 to comply with data published in the Federal Register, Vol. 38, No. 174, September 10, 1973.

Table 11. Jensen Unit - Recreation Benefits



Beginning of period of analysis to which all present-worth calculations are reduced is January 1, 1980.

Segments 1, 2, and 3 are uniform series of lengths 100, 80, and 60 years, respectively, which are discounted using the present worth of 1 factor for the appropriate years as follows: segment 1, no discount; segment 2, 20 years; and segment 3, 40 years. Segments 4 and 5 represent series increasing uniformly by 500 and 1,000 recreation days annually. Each series is composed of 19 increases. Segment 4 discounts to January 1, 1980, using the present worth of 1 factor for 1 year. Segment 5 discounts using the factor for 21 years. Dollar values are rounded to the nearest \$1,000.

Computation of recreation benefits

Segment	Amount annually		Capitalized value		Present worth value		
	Recreation days	Value at \$1.60	Factor	Value	Years	Factor	Value
1	40,000	\$64	29.513	\$1,890	0	1.000	\$1,890
2	10,000	16	28.388	455	20	.527	230
3	20,000	32	26.254	840	40	.278	234
4	500	1	126.757	127	1	.969	123
5	1,000	2	126.757	254	21	.511	130
Total							2,607
Annual equivalent value for 100 years (0.03388)							88

Recreation facilities are estimated to cost \$757,000. Annual replacement costs at 3.25 percent for 25 years are \$20,000. Operation and maintenance costs vary with annual use and range from \$20,000 in 1980 to \$35,000 by 2020, with an increase of \$250 per year the first 20 years and \$500 per year the second 20. Table 12 shows how the operation and maintenance costs are evaluated and discounted to obtain an average equivalent value for use in the economic analysis.

Table 12
Jensen Unit recreation annual costs
(operation and maintenance)

Project years	Amount annually	Capitalized value		Present worth value		
		Factor	Value	Years	Factor	Value
1-100	\$20,000	29.513	\$590,000	0	1.000	\$590,000
2- 20	Increased annually by 250	126.757	32,000	1	.969	31,000
21-100	5,000	28.388	142,000	20	.527	75,000
22- 40	Increased annually by 1,000	126.757	127,000	21	.511	65,000
41-100	10,000	26.254	262,000	40	.278	73,000
Total						834,000
Annual equivalent value for 100 years (3¼ percent)						28,000
Annual replacement cost						20,000
Total recreation operation, maintenance, and replacement						48,000

Fish and Wildlife

Specific facilities are planned to enhance fish and wildlife. A 1,900-acre-foot fishery pool will be provided at Tyzack Reservoir and operation of Stewart Lake Waterfowl Management Area will be improved by firming up the water supply and providing a better delivery system. The Fish and Wildlife Service has estimated an increase of 9,500 man-days of

fishing annually resulting from project development. The value of a fisherman day, estimated by Fish and Wildlife Service and updated to the criteria published in the Federal Register Vol. 38, No. 174, September 10, 1973, is \$2.25. At this rate increased fishing benefits are estimated to be \$21,400 annually. In addition it is expected that there will be an annual benefit of \$300 from increased pheasant hunting and \$2,000 from improvements in Stewart Lake Waterfowl Management Area. Total annual fish and wildlife benefits resulting from the Jensen Unit are estimated at \$23,700 (rounded to \$24,000). This \$24,000 annual benefit is distributed as \$22,000 for Basin Fund enhancement and \$2,000 Section 8 enhancement.

Flood Control

The Corps of Engineers estimated that project flood control benefits determined as the annual value of flood damages that would be prevented below Tyzack Reservoir, attributable to Tyzack Dam, would average \$24,000. These benefits are based on control of floods not exceeding the 100-year event and will depend on evacuation of the reservoir on the basis of snowmelt forecasts and on use of surcharge storage capacity to reduce damaging flood flows below the reservoir.

Costs

All costs associated with the project are identified and considered in the financial and economic analysis. Costs for the Jensen Unit have been divided into the following categories: (1) construction costs, (2) interest during construction, (3) annual operation, maintenance, and replacement costs, and (4) costs for regulatory features of the Colorado River Storage Project.

The last category is not a cost associated directly with construction of the Jensen Unit. It is an indirect cost used only in the benefit-cost analysis associated with large mainstem storage on the Colorado River required under terms of the Colorado River Compact.

Construction Costs

Items included in construction costs are labor, materials, supplies, rights-of-way, investigation costs, and expenditures for mitigation of damages. In determining costs by feature, no credit is given for salvage value because it would not be significant at the end of 100 years. Total construction cost for the project is estimated at \$33,263,000 as shown in Table 13.

Table 13
Project costs
(Unit: \$1,000)

Feature	Capacity	Construction cost	Interest during construction at 3.25 percent	Annual operation, maintenance, and replacement costs
Basin Fund costs				
Tyzack Dam and Reservoir (acre-feet)	25,000	\$18,455	\$1,237	\$20
Tyzack Pumping Plant and Aqueduct (c.f.s.)	46	9,420	538	85
Tyzack Pumping Plant Switchyard (kva)	5,000	121		
Tyzack Pumping Plant Transmission Line		97		
Facilities to connect to CRSP		121		
Burns Pumping Plant and Discharge Line (c.f.s.)	97	3,290	113	23
Burns Pumping Plant Switchyard (kva)	2,500	65		
Burns Pumping Plant Transmission Line		93		
Project drains		774		
Permanent operating facilities		27		
Flood forecasting operation and maintenance				
Subtotal		32,463	1,888	129
Section 8 costs				
Recreation		757		48
Tyzack Reservoir				
Fish and wildlife				
Mitigation (big game)				
Range		20		
Enhancement		23		
Subtotal		800		48
Total		33,263	1,888	177

Included are \$32,463,000 for construction of project features including rights-of-way, \$757,000 for specific recreation facilities, \$23,000 for specific fish and wildlife facilities, and \$20,000 for big game range mitigation. Preauthorization costs of \$69,000 and advance planning costs of \$695,800 have been included in the total construction cost of \$33,263,000.

Interest During Construction

For benefit-cost comparisons it is assumed that all project features will be completed as indicated on the construction schedule, PF-2 on the following three pages. Specific recreation, fish, and wildlife facilities are not included.

Interest during construction has been computed at 3.25 percent simple interest on funds expended as shown on the PF-2. Interest is computed on one-half the expenditure for the current year plus all expenditures for previous years. These costs are carried in an interest-cost status until the particular feature produces benefits. It should be noted that the interest rate applicable in the final analysis for interest-bearing costs will be the rate appropriate for units of the CRSP at the time construction of the unit begins. Interest was not computed on costs of irrigation drains and other facilities for which the time lapse between initial construction and facility use is too short for significant interest accrual. Total interest during construction is estimated at \$1,888,000. Table 14 shows interest during construction computations for project features.

Annual Operation, Maintenance, and Replacement Cost

Annual operation, maintenance, and replacement costs are those expenditures for materials, labor, and supplies necessary to operate the project and make repairs that will incur proper operation of the project throughout its 100-year economic life. Total annual costs are estimated at \$177,000. Of this amount, \$48,000 is for operating, maintaining, and replacing specific recreation facilities, \$84,000 is the cost for pumping energy at the Burns and Tyzack Pumping Plants, \$1,000 is for flood forecasting, and \$44,000 is for administration, maintenance, operation, and replacement of other project facilities. These costs are based on prices which prevailed during calendar years 1972, 1973, and 1974. They have been allocated along with other project costs and are included in the benefit-cost comparisons.

Operation, maintenance, and replacement costs of the Jensen Unit are lower than they would have been without the existing Vernal Unit. Much of the overhead costs of personnel and equipment will be shared by the two units. A detailed analysis of operation, maintenance, and replacement is shown in the Designs and Estimates Appendix.

LEGEND: Types of Activity

Preconstruction
and Other Work

Construction

[illegible]

NOTES: Estimated costs based on January & July 1975 prices.

1/ Includes \$680,000 for incremental cost of constructing county road to current standards over costs of replacing road in kind.

2/ Includes \$65,000 from nonreimbursable Colorado River Development Fund and \$4,000 from Reclamation Fund expended prior to project authorization and \$49,000 in nonappropriation costs, property transfers, and miscellaneous costs.

RECOMMENDED:

(Operating Office Head)

RECOMMENDED:

(Regional Director)

RECOMMENDED:

(Chief, Div. of P C & F)

APPROVED:

(Commissioner)

REVISÉ: _____
(Date)

(Operating Office Head) (Date)

(Regional Director)

(Date)

(Chief, Div. of P C & F) (Date)

(Commissioner)

(Date)

(Date)

SHEET 2 OF 3 SHEETS

PF-2 (6-75)

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

CONTROL SCHEDULE

CENTRAL UTAH PROJECT-JENSEN UNIT
UPPER COLORADO RIVER BASIN FUND

(Section 5 of Colorado River Storage Project Act)
Utah Activities Dec. 3, 1975 UC

OFFICE	DATE	REGION
<input type="checkbox"/> GENERAL INVESTIGATIONS <input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> LOAN PROGRAM <input type="checkbox"/> OTHER	

Construction

FISCAL YEARS

Utah Activities _____
OFFICE

Dec. 3, 1975 _____
DATE

UC _____
REGION

☐ GENERAL INVESTIGATIONS
☒ CONSTRUCTION

☐ LOAN PROGRAM
☐ OTHER

Table 14

Construc- tion year	Plant in service at end of year	Interest during construction			Interest- bearing expenditure	Interest ^{1/}
		Preconstruction and annual expenditure	Cumulative expenditure			
Tyzack Dam and Reservoir						
		\$1,001,203				
1976		2,035,000	\$3,036,203		\$2,018,703	\$66,000
1977		6,537,000	9,573,203		6,304,703	205,000
1978		6,147,000	15,720,203		12,646,703	411,000
1979	\$18,455,000	2,734,797	18,455,000		17,087,602	555,000
Subtotal		18,455,000			38,057,711	1,237,000
Tyzack Pumping Plant and related facilities						
		378,606				
1978		3,406,000	3,784,606		2,081,606	68,000
1979		3,917,000	7,701,606		5,743,106	187,000
1980	9,699,000	1,997,394	9,699,000		8,700,303	283,000
Subtotal		9,699,000			16,525,015	538,000
Burns Pumping Plant and related facilities						
		454,204				
1983		1,045,000	1,499,204		976,704	32,000
1984	2,219,204	720,000	2,219,204		1,859,204	60,000
Subtotal		2,219,204			2,835,908	92,000
1989	1,289,796	1,289,796	1,289,796		644,898	21,000
Subtotal						113,000
Total project interest during construction						1,888,000
1/ 3.25 percent.						

Cost of Regulatory Features of the
Colorado River Storage Project

Large holdover storage capacity for stream regulation is required before the Upper Colorado River Basin can utilize its compact apportioned share of the Colorado River water. This storage capacity is provided by Glen Canyon, Flaming Gorge, Curecanti, and Navajo Units of the Colorado River Storage Project. An equitable portion of the costs of these storage units has been included in the benefit-cost analysis. The participating projects deplete the flow of the Colorado River and thereby benefit from these reservoirs. Based on an assigned depletion cost of \$2 per acre-foot and an estimated depletion of 15,000 acre-feet, the estimated annual cost to the Jensen Unit is \$30,000.

Externalities

The net effect of the project on salt loading of the Colorado River is estimated to be 880 tons annually. This would increase the salinity concentration at Imperial Dam by an estimated 0.1 mg/l. The value of this negative externality (assumed at 230,000 per mg/l) would be \$23,000 (\$19,000 direct effects and \$4,000 indirect effects). Salt concentrating effects resulting from the 15,000 acre-feet of streamflow depletion would increase the salinity concentration of the river at Imperial Dam by an estimated 1.5 mg/l. This negative externality has an estimated value of \$345,000 (\$282,000 direct effects and \$63,000 indirect effects). This has not been included in the benefit-cost analysis, since it is considered that the rights to divert and deplete streamflows in the Upper Colorado River Basin provided by the Colorado River Basin Compact of 1922 are accompanied by a corresponding right to concentrate the salt load of the stream without penalty.

Section 8 Costs

Pursuant to Section 8 of Public Law 485, costs for public recreational facilities and costs of facilities to mitigate losses of and improve conditions for fish and wildlife propagation are nonreimbursable and nonreturnable. Included are \$757,000 for construction costs of specific recreation facilities at Tyzack Reservoir, \$23,000 for an improved conveyance system to provide an additional water supply for Stewart Lake Waterfowl Management Area, and \$20,000 mitigation costs to improve about 500 acres of big game range. The range improvement will consist of two-way chaining and reseeding with a grass-legume mix. This will offset big game range lost by inundation of grazing lands at Tyzack Reservoir site.

Annual Equivalent Costs

Average annual equivalent costs are determined for comparison with benefits on a common time basis. These include capital investment amortized over a 100-year period of analysis at 3.25 percent interest, plus annual operation, maintenance, and replacement costs and an assigned cost for river regulatory features of the Colorado River Storage Project. Capital investment includes construction cost and interest during construction. Investigation expenditures prior to authorization have been excluded since they have no bearing on the relationship of future costs and benefits. Also excluded are road improvements for which benefits have not been evaluated. Total annual equivalent costs have been computed as \$1,371,000.

Benefit-Cost Comparison

Total annual equivalent costs of \$1,371,000 were compared with annual direct benefits of \$2,357,000 and total annual benefits of \$2,374,000. For the 100-year period of analysis, using a 3.25 percent interest rate, direct benefits compare with annual costs in a ratio of 1.72:1 and total annual benefits compare with total annual costs in a ratio of 1.73:1. A comparison of annual benefits and costs is shown in Table 15.

Benefit-Cost Summary Tables

To facilitate recomputation of the benefit-cost ratio with different interest rates, summary Tables 16, 17, and 18 are presented. Table 16 is a summary of the annual occurrence of benefits for each of the project purposes. Benefits begin to accrue at the beginning of the construction period and vary annually until the end of the period of analysis. Table 17 summarizes the occurrence of costs from the time of project authorization through the life of the project. Included in the annual cost is an assigned cost for stream depletion as discussed earlier. Table 18 summarizes the occurrence of services provided.

Economic Rate of Return

A project economic rate of return has also been computed to facilitate project evaluation under different interest rates. The economic rate of return is that rate of interest at which the present worth of project benefits is equal to the present worth of project costs. The present worth is measured at the beginning of the 100-year period of analysis. Table 19 shows the computation of the economic rate of return. For the Jensen Unit, the economic rate of return is approximately 6.375 percent when rounded to the nearest 1/8 of 1 percent.

Table 15
Benefit-cost analysis
(Unit: \$1,000)

	Municipal and industrial water	Irriga- tion	Flood control	Highway improve- ment	Fish and wildlife Mitiga- tion	Enhance- ment	Recrea- tion	Total
Project construction cost	\$25,668	\$4,933	\$609	\$680	\$20	\$596	\$757	\$33,263
Interest during construction (3.25 percent)	1,485	275	41	48		39		1,888
Less								
Colorado River Development Fund and con- tributed funds	-58	-11						-69
Highway improvement costs				-680				-680
Construction				-48				-48
Interest during construction								
Total project investment	27,095	5,197	650		20	635	757	34,354
Annual equivalent costs								
Project investment (3.25 percent, 100 years)	918	176	22		1	21	26	1,164
Operation, maintenance, and replace- ment	120	6	2			1	48	177
Stream depletion cost								30
(acre-feet of depletion)								(15)
Total annual cost	1,038	182	24		1	24	74	1,371
Annual benefits								
Direct	2,055	166	24			24	88	2,357
Indirect and public		17						17
Total	2,055	183	24			24	88	2,374
Negative externalities								
Concentrating effects of stream deple- tion								282,000
Direct effects								63,000
Indirect effects								345,000
Total								18,800
Increase in salt load								4,200
Direct effects								23,000
Indirect effects								
Total								
Benefit-cost ratios								
Without externalities								
Direct	1.98:1.00	0.91:1.00	1.00:1.00			1.00:1.00	1.19:1.00	1.72:1.00
Total	1.98:1.00	1.00:1.00	1.00:1.00			1.00:1.00	1.19:1.00	1.73:1.00
With salt loading externalities								
Direct								1.70:1.00
Total								1.71:1.00

Table 16
Occurrence of project costs (interest during
construction excluded)
(Unit: \$1,000)

Project year	Dam and reservoir	Pumping plants and discharge lines	Section 8	Project drains	Highway improve- ment costs	Permanent oper- ating facil- ities	Total	Annual costs
Preauthorization ^{1/}	\$60	\$9					\$69	
Advance planning ^{2/}	941	522					1,463	
3/-4	2,035						2,035	
-3	6,197	86			\$340		6,623	
-2	5,807	3,406			340		9,553	
-1	2,735	3,917					6,652	
4/0			\$800	\$774			1,574	\$115
1		1,997					1,997	115
2								115
3		216					216	115
4		1,045					1,045	115
5		719				\$27	746	177
6								177
7								177
8								177
9								177
10							1,290	177
11-100								5/207
Total	17,775	13,207	800	774	680	27	33,263	

1/ Preauthorization costs (\$65,000 CRDF and \$4,000 contributed); no interest during construction will accrue on these costs.

2/ Advance planning and preconstruction costs to June 30, 1975.

3/ Project construction starts in year -4.

4/ "0" is a point in time, not a year. It is at the beginning of year 1.

5/ Includes \$177,000 operation, maintenance, and replacement costs and \$30,000 stream depletion.

Table 17
Occurrence of project benefits
(Unit: \$1,000)

Project Year	Municipal and indus- trial water	Irrigation		Flood con- trol	Fish and wild- life	Recrea- tion	Total (all benefits)	
		Direct	Total				Direct	Total
0	\$2,055							
1	↑	\$57	\$63	\$24	\$24	\$64	\$2,224	\$2,230
2		115	127	↑	↑	65	2,283	2,295
3		172	190			66	2,341	2,359
4		↑	↑			67	2,342	2,360
5						68	2,343	2,361
6						68	2,343	2,361
7						69	2,344	2,362
8						70	2,345	2,363
9						71	2,346	2,364
10						71	2,346	2,364
11-15						73	2,348	2,366
16-20						77	2,350	2,370
21-25						83	2,356	2,376
26-30						91	2,364	2,384
31-35						99	2,372	2,392
36-40		↓	↓	↓	↓	107	2,380	2,400
41-100	2,055	172	190	24	24	112	2,385	2,405

Table 18
Occurrence of water supply services

Project year Number	Calendar year	Municipal and indus- trial water (acre-feet)	Irrigation		Total water delivered (acre-feet)
			Acres served	Acre-feet delivered	
1	1980	6,000	1,345	1,533	7,533
2		↑	2,694	3,067	9,067
3		↑	4,040	4,600	10,600
4		↓	↑	↑	↑
5		↓			↓
6	1985	12,000			16,600
7		↑			↑
8		↑			↑
9		↓			↓
10		↓			↓
11	1990	18,000			22,600
		↑			↑
		↓			↓
100	2079	18,000	4,040	4,600	22,600

Table 19
Economic rate of return
(Unit: \$1,000)

Project year	Annual benefits	Annual costs ^{1/}	Net benefits	6.500 percent		6.250 percent	
				Factor	Present worth	Factor	Present worth
AP		\$1,463	\$-1,463	1.260	\$-1,843	1.250	\$-1,829
-4		2,035	-2,035	1.228	-2,499	1.219	-2,481
-3		6,283	-6,283	1.163	-7,307	1.156	-7,263
-2		9,213	-9,213	1.098	-10,116	1.094	-10,079
-1		6,652	-6,652	1.033	-6,872	1.031	-6,858
<u>2/0</u>		1,574	-1,574	1.000	-1,574	1.000	-1,574
1	\$2,230	2,112	118	.938	111	.941	111
2	2,295	115	2,180	.882	1,923	.886	1,931
3	2,359	331	2,028	.828	1,679	.834	1,691
4	2,360	1,160	1,200	.777	932	.785	942
5	2,361	923	1,438	.730	1,050	.739	1,063
6	2,361	177	2,184	.685	1,496	.695	1,518
7	2,362	177	2,185	.644	1,407	.654	1,429
8	2,363	177	2,186	.604	1,320	.616	1,347
9	2,364	177	2,187	.567	1,240	.579	1,266
10	2,364	1,467	897	.533	478	.545	489
11-15	2,366	<u>3/</u> 207	2,159	2.214	4,780	2.282	4,927
16-20	2,370	207	2,163	1.615	3,493	1.685	3,645
21-25	2,376	207	2,169	1.180	2,559	1.244	2,698
26-30	2,384	207	2,177	.861	1,874	.919	2,001
31-35	2,392	207	2,185	.628	1,372	.679	1,484
36-40	2,400	207	2,193	.459	1,007	.501	1,099
41-100	2,405	207	2,198	1.210	2,660	1.379	3,031
Total					-830		588

^{1/} Excludes \$69,000 preauthorization investigation costs and \$680,000 highway improvement costs.

^{2/} At "zero" point in time, which is beginning of a 100-year period of analysis.

^{3/} Includes \$177,000 operation, maintenance, and replacement costs and \$30,000 assigned stream depletion costs.

Interpolation of economic rate of return:

difference at 6.500 percent = -850 = 59 percent

difference at 6.250 percent = 588 = 41 percent

1,418

41 percent of 0.250 = 0.102 above 6.250 percent or 6.250 + 0.102 = 6.352 percent = economic rate of return.

CHAPTER III

COST ALLOCATION

Introduction

The objective of a cost allocation is to equitably distribute the costs of a multipurpose project to the purposes served. Jensen Unit costs are allocated to municipal and industrial water, irrigation, fish and wildlife, recreation, flood control, and highway improvement. The cost allocation establishes the amount of the reimbursable cost by project purposes. It also establishes the amounts assigned to nonreimbursable purposes.

Cost allocations presented in this chapter conform to legislation governing reclamation in general and the Central Utah Project in particular. The following acts have been considered: (1) Reclamation Act of 1939 (53 Stat. 1187), revised and simplified by the Fish and Wildlife Coordination Act of August 12, 1958 (72 Stat. 563), and (2) Public Law 485 known as the Colorado River Storage Project Authorizing Act of April 11, 1956 (70 Stat. 105). Because this unit was authorized prior to the enactment of the Federal Water Project Recreation Act, Public Law 89-72 of July 9, 1965, provisions of this act do not apply.

Costs to be allocated include all project construction costs, interest during construction, and annual operation, maintenance, and replacement costs. Pursuant to Section 8, Public Law 485, specific costs for recreation, fish and wildlife enhancement, and mitigation are nonreimbursable. Costs of relocating or rebuilding a public road to current standards which exceed costs of replacement in kind are allocated to road improvement.

Method of Allocation

The separable cost remaining benefit method has been used in allocating costs. This method requires determination of project benefits, single purpose alternatives, justifiable expenditure, separable costs, remaining justifiable expenditure, and remaining joint costs.

Benefits

The annual benefits of each of the project purposes have been derived and are summarized in the preceding chapter.

Alternative single purpose costs

The cost of the most likely single purpose means of providing benefits comparable to those provided by the multipurpose project has been estimated for municipal and industrial water and irrigation. In each instance, construction costs, interest during construction, and operation, maintenance, and replacement costs have been estimated using the same price level, interest rates, time period estimating procedures and, where appropriate, the same cost estimates as the multipurpose project.

The most likely single purpose alternative to supply the 18,000 acre-feet of municipal and industrial water is to pump from the Green River to Ashley Creek, a distance of about 16 miles. This alternative would require three pumping plants, a small siphon, and a buried pressurized conveyance system. As shown in Table 20, costs of this alternative would be \$23,217,000 for construction, \$929,000 interest during construction, and \$226,000 annual operating costs.

Table 20
Alternative single purpose projects
(Unit: \$1,000)

Feature	Construction cost	Inter-est dur- ing con- struction	Annual operation, maintenance, and replace- ment costs
Municipal and industrial water			
Pumping plant #1 and discharge line (46 c.f.s.)	\$7,746	\$310	\$96
Siphon (46 c.f.s.)	3,071	123	
Pumping plant #2 and discharge line (46 c.f.s.)	8,555	342	93
Pumping plant #3 and discharge line (46 c.f.s.)	3,845	154	37
Total	23,217	929	226
Irrigation			
Small Tyzack Reservoir (10,000 acre-feet)	12,800	890	15
Drains	774		
Total	13,574	890	15

The most likely irrigation alternative would be a 10,000-acre-foot reservoir on Big Brush Creek, the construction of project drains, and the associated annual operation, maintenance, and replacement costs. Irrigation water users have indicated this alternative is their choice in the absence of the multiple-purpose project. A summary of the single purpose alternative costs is shown in Table 20.

Single purpose alternative costs were not estimated for fish and wildlife, recreation, and flood control since such costs would greatly exceed the benefits.

Justifiable Expenditure

The maximum cost which can be allocated to any project purpose should not exceed either the present worth of the annual benefits of such purpose or the cost of the most likely single purpose alternative. Thus the lesser of the single purpose alternative or the present worth of the annual benefits is the justifiable expenditure and upper limit of costs which can be allocated to a purpose. Total project costs cannot exceed the total justifiable expenditure.

Separable costs

The separable cost for any purpose is the difference between the cost of the multipurpose project and the cost of the project with that purpose omitted. Thus the separable costs for each purpose include the costs of those project facilities used solely for that purpose (specific costs) plus the difference in costs of the joint-use facilities that would change in size or design with the purpose omitted. Separable costs are determined by assuming each purpose in turn as the last purpose added to the multipurpose project. The remaining joint costs are the cost remaining after the sum of the separable costs are subtracted from total project costs. Derivation and summary of separable costs for each purpose are shown in Table 21. A cost capacity curve has been prepared for several size dams and reservoirs at the Tyzack site to provide data necessary in determination of separable costs. This curve is shown in Figure 4.

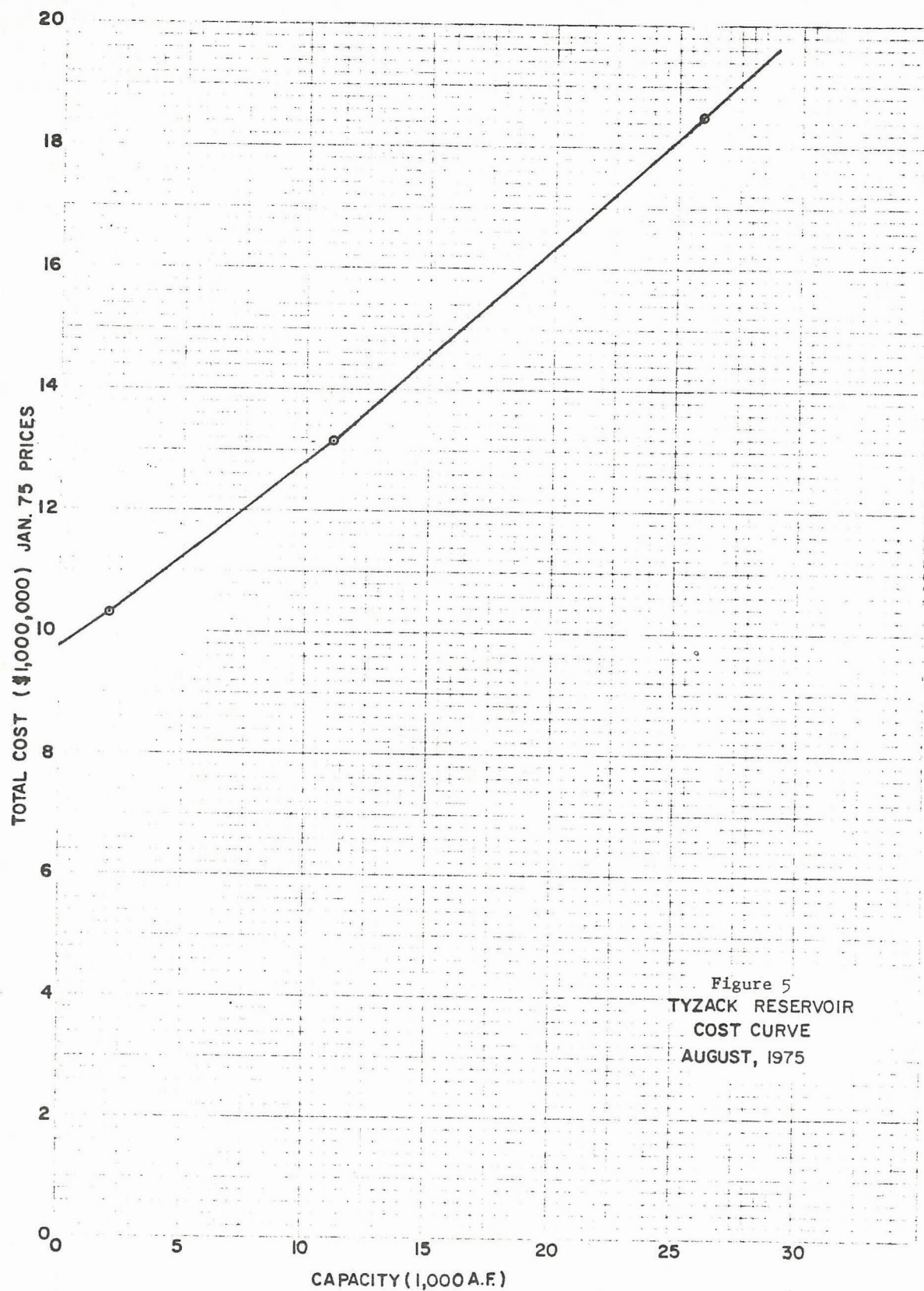
Multipurpose project without municipal
and industrial water

Without the municipal and industrial water purpose Tyzack Reservoir could be reduced in size to 8,000 acre-feet, and Tyzack Pumping Plant, Tyzack Aqueduct, Burns Pumping Plant, along with the switchyards, powerplants, and power facilities could be eliminated. These reductions would result in cost decreases of \$19,462,000 construction cost, \$1,068,000 interest during construction, and \$112,000 operating costs. These cost decreases are separable to municipal and industrial water. Of the 18,000 acre-feet of capacity in Tyzack Reservoir, separable to municipal and industrial water use, 67 percent or 12,000 acre-feet is capacity for future demands.

Multipurpose project without irrigation

Without irrigation as a project purpose Tyzack Reservoir could be reduced in size to 18,000 acre-feet and the project drains could be omitted. These reductions would result in cost decreases of \$3,629,000 construction costs, \$187,000 interest during construction, and \$4,000 in annual operating costs. These cost reductions are separable to irrigation.

Table 21 Separable and Remaining Joint Costs																																
	Multi-Purpose Project				Project W/O M&I Water				Project W/O Irrigation				Project W/O Flood Control				Project W/O Highway Improvement				Project W/O Recreation				Project W/O F&W Enhancement				Project W/O F&W Mitigation			
	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R	Capacity	Const. Cost	IDC @ 3.25%	Annual OM&R
Tyzack Dam & Reservoir	26,000 A.F.	\$18,455	\$1,237	20	8,000 A.F.	\$12,200	\$ 820	\$ 16	18,000 A.F.	\$15,600	\$1,050	\$ 16		\$18,455	\$ 1,237	\$ 20		\$17,775	\$1,189	\$ 20		\$18,455	\$1,237	\$ 20		\$18,455	\$1,237	\$ 20		\$18,455	\$1,237	\$ 20
Tyzack pumping plant, discharge line, switchyard, transmission line, and facilities to connect to CRSP		9,699	538	85						9,699	538	85		9,699	538	85		9,699	538	85		9,699	538	85		9,699	538	85		9,699	538	85
Burns pumping plant, discharge line, switchyard, transmission line, and facilities to connect to CRSP		3,508	113	23						3,508	113	23		3,508	113	23		3,508	113	23		3,508	113	23		3,508	113	23		3,508	113	23
Project Drains		774				774								774				774				774				774				774		
Permanent operating facilities		27				27				27				27				27				27				27				27		
Flood forecasting O.&M.				1				1					1				1				1				1						1	
Recreation facilities at Tyzack		757		48		757		48		757		48		757		48		757		48		757		48		757		48		757		48
Fish and Wildlife Enhancement Mitigation		23 20				23 20				23 20				23 20				23 20				23 20				23 20				23		
Totals		33,263	1,888	177		13,801	820	65		29,634	1,701	173		33,263	1,888	176		32,583	1,840	177		32,506	1,888	129		32,240	1,888	177		33,243	1,888	177
Separable Costs		24,571	1,303	165		19,462	1,068	112		3,629	187	4				1		680	48			757		48		23				20		
Remaining Joint Costs		8,692	585	12																												



Multipurpose project without fish and wildlife

The only cost reduction which would result from omitting fish and wildlife as a project purpose would be the \$20,000 specific costs for an improved conveyance system to supply water to Stewart Lake and \$23,000 for big game range rehabilitation. These costs totaling \$43,000 are separable to fish and wildlife.

Multipurpose project without flood control

Annual operating costs could be reduced \$1,000 if flood control were omitted as a project purpose. This reduction is separable to flood control.

Multipurpose project without highway improvement

Section 13 of the Water Resources Development Act of 1974 (P.L. 93-251) permits the improvement of roads requiring relocation from the level of replacement in kind to the level of current standards. Incremental costs of this improvement are to be treated as a nonreimbursable cost and allocated to the purpose of "highway improvement."

In the Jensen Unit a 3.3-mile stretch of an existing road which follows Brush Creek between Utah Highway 44 and Utah Highway 149 will have to be relocated and improved. Also the road that allows access to Ty-zack Dam will be improved and enlarged. The incremental cost of improving these roads from "replacement in kind" to "current standards" is estimated to be \$680,000 construction cost and \$48,000 interest during construction. Figure 5 shows the location of the needed road improvement and associated costs.

Remaining justifiable expenditure

The remaining justifiable expenditure for each purpose is the justifiable expenditure for each purpose less the separable costs for such purpose (construction cost, interest during construction, and capitalized value of the operating costs). The total remaining justifiable expenditure is the total justifiable expenditure less total separable costs.

Remaining joint costs

The remaining joint costs are the total project costs less the total separable costs. These costs are allocated among the project purposes using the same percentage that exists between each purpose's remaining justifiable expenditure and the total justifiable expenditure.



ROAD	WIDTH	LENGTH	CURRENT STD. TOTAL COST	REPL. IN KIND COST	INCREMENTAL ROAD COST
Dam Access Road	20'	.80 Mi	\$ 215,000	\$ 206,000	\$ 9,000
Road Relocation	20'	3.30 Mi	\$ 1,043,000	\$ 372,000	\$ 671,000
Totals (Rounded)			\$ 1,258,000	\$ 578,000	\$ 680,000

Costs indexed to January 1975

Standards

Replacement in Kind - 6" gravel on grades 10% or greater; maximum grade, 15%; Minimum sight distance, 200 feet

Current Standard - 6" gravel surface, maximum grade, 10%; minimum sight distance, 500 feet.

Figure 5

8-12-75 418-WEN	REVISED COSTS
2-10-75 418-LAG.	REVISED COSTS AND COUNTY ROAD RELOCATION
<div> <div> </div> <div> ALWAYS THINK SAFETY </div> </div>	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION JENSEN UNIT TYZACK DAM AND RESERVOIR ROAD COSTS	
DRAWN: H.N.S. SUBMITTED TRACED: R.G.C. RECOMMENDED CHECKED: APPROVED	
PROVO, UTAH	JANUARY 1972

Total allocated costs

Total allocated costs for each purpose are the sum of the separable costs for such purpose and the remaining joint costs for that purpose.

Table 22 shows the allocation of project costs among the various participating purposes of the Jensen Unit.

Table 22

Allocation of project costs
(Unit: \$1,000)

	Basin Fund costs					Section 8 costs				Total project costs
	Municipal and industrial water	Irrigation	Flood control	Fish and wild-life	High way im-prove-ment	Subtotal	Recreation	Fish and wildlife Enhance-ment	Mitigation	
Costs to be allocated										
Construction costs						\$38,158	\$2,174	\$23	\$20	\$40,375
Interest during construction (3.25 percent)						32,463	757	23	20	33,263
Operation, maintenance, and replacement costs										
Present worth (100 years)						1,888				1,888
Annual value						(129)	1,417	(48)		5,224
Benefits										
Present worth	\$60,649	\$5,401	\$708	\$649						
Annual value	(2,055)	(183)	(24)	(22)						
Alternative single purpose	30,816	14,907								
Construction cost	23,217	13,574								
Interest during construction (3.25 percent)	929	890								
Operation, maintenance, and replacement costs										
Present worth	6,670	443								
Annual value	(226)	(15)								
Justifiable expenditure	30,816	5,401	708	649	\$728	38,302				
Separable costs	23,835	3,934	30		728	28,527				
Construction costs	19,462	3,629			680	23,771				
Interest during construction (3.25 percent)	1,068	187			48	1,303				
Operation, maintenance, and replacement costs										
Present worth	3,305	118	30			3,453				
Annual value	(112)	(4)	(1)			(117)				
Remaining justifiable expenditure	6,981	1,467	678	649		9,775				
Percent	71.4	15.0	7.0	6.6						
Remaining joint costs	6,876	1,445	675	635		9,631				
Construction costs	6,206	1,304	609	573		8,692				
Interest during construction (3.25 percent)	417	88	41	39		585				
Operation, maintenance, and replacement costs										
Present worth	253	53	25	23		354				
Total allocation	30,711	5,379	705	635	728	38,158	2,174	23	20	40,375
Construction costs	25,668	4,933	609	573	680	32,463	757	23	20	33,263
Interest during construction (3.25 percent)	1,485	275	41	39	48	1,888				1,888
Operation, maintenance, and replacement costs										
Present worth	3,558	171	55	23		3,807	1,417			5,224
Annual value	(120)	(6)	(2)	(1)		(129)	(48)			(177)
Reimbursable costs										
Construction costs	25,668	4,933				30,601				
Interest during construction (5.116 percent)	2,338					2,338				
Total	28,006	4,933				32,939				
Less funds prior to authorization	-58	-11				-69				
Reimbursable investment	27,948	4,922				32,870				
Annual operation, maintenance, and replacement costs	120	6				126	48			174

CHAPTER IV

PROJECT REPAYMENT

Repayment Organization

The Uintah Water Conservancy District was established December 18, 1956. It will contract with the United States Government for the repayment of specified reimbursable construction costs.

Operation of the project will be by the Uintah Water Conservancy District. The district also operates the Vernal Unit of the Central Utah Project. By combining operation of the two units considerable savings in overhead costs will be realized. The two units are adjacent to each other and in the case of municipal water use will serve essentially the same water users. A combined operation will be more efficient than separate operations.

The Uintah Water Conservancy District, although a separate legal entity, is also a part of the Central Utah Water Conservancy District (CUWCD). Repayment policy between the two districts is that the larger CUWCD will, with ad valorem tax revenue, pay 34 percent of the reimbursable investment costs allocated to municipal and industrial water use. This leaves 66 percent of the investment cost and the annual operation, maintenance, and replacement costs to be paid by the Uintah Water Conservancy District.

Reimbursable and Nonreimbursable Costs

Construction costs and interest during construction allocated to municipal and industrial water are reimbursable with interest at the rate in effect when construction starts (assumed in this report to be FY 1976 at 5.116 percent), pursuant to the Water Supply Act of 1958 and the Colorado River Storage Project Act (P.L. 485).

Construction costs allocated to irrigation would be reimbursable without interest. All construction costs and interest during construction identified as either Section 8 or Section 5 costs allocated to fish and wildlife, flood control, and recreation are nonreimbursable. Provisions of Public Law 485 are applicable to repayment of cost allocated to these purposes. The Federal Water Project Recreation Act of July 9, 1965, does not apply to the Jensen Unit.

The allocation of costs to highway improvement is in accordance with provisions of the 1974 Water Resources Development Act, and is the incremental cost incurred in constructing or relocating roads leading to or around Tyzack Reservoir to current standards rather than replacement in

kind. These costs are nonreimbursable. A summary of cost allocation and repayment is shown in Table 23.

Repayment of Operation, Maintenance,
and Replacement Costs

Operation, maintenance, and replacement costs are estimated to be \$177,000 annually. Of this, \$129,000 is associated with facilities constructed with Section 5 (Basin Fund) funds and \$48,000 for specific recreation (Section 8) facilities. These costs, as shown in Table 23, have been allocated to the various project purposes. Operation, maintenance, and replacement costs allocated to municipal and industrial irrigation are reimbursable and will be paid by water users.

Operation, maintenance, and replacement costs of the Tyzack Reservoir allocated to flood control and fish and wildlife amounting to \$3,000 which will be operated by the Uintah Water Conservancy District will be paid by the district with appropriate adjustments in the district's repayment obligation. The at-site operation, maintenance, and replacement costs will be about \$1,000 annually when Tyzack Reservoir is operated so as to provide flood control benefits and \$1,000 to provide fishery benefits in accordance with the plan of development.

Annual off-site costs of \$1,000 for flood forecasting will be funded by the Bureau of Reclamation since the bureau will be responsible for flood forecasting and administration of flood control.

Operation, maintenance, and replacement costs associated with facilities for recreation and fish and wildlife will be paid by the operating agency which will be the State of Utah (for both recreation and fish and wildlife).

Project Revenues

Revenues to repay reimbursable investment costs, as shown in Table 23, will be obtained from the following sources: municipal and industrial water users, ad valorem tax revenues, irrigation water users, and from net power and other revenues of the Colorado River Storage Project apportioned to Utah.

Municipal and Industrial Water Repayment

The Uintah Water Conservancy District has agreed to contract for 18,000 acre-feet of municipal and industrial water. Repayment will be pursuant to provisions of the Water Supply Act of July 3, 1958 (72 Stat. 319). This act provides that storage may be included in any reservoir

Table 23
Summary of cost allocation and repayment
(Unit: \$1,000)

Item	Construction costs	Reimbursable inter-est dur-ing construction (5.116%)	Annual operation, maintenance, and replacement costs
Cost allocation			
Reimbursable costs			
Municipal and industrial water	\$25,668	\$2,338	\$120
Irrigation	4,933		6
Flood control			
Recreation			48
Fish and wildlife			
Subtotal	30,601	2,338	174
Nonreimbursable costs			
Fish and wildlife			
Enhancement	596		1
Mitigation	20		
Recreation	757		
Flood control	609		2
Highway improvement	680		
Subtotal	2,662		3
Total allocation	33,263	2,432	177
Repayment of reimbursable costs			
Municipal and industrial water			
Water users	16,903	1,543	120
Prepayment	58		
Ad valorem tax revenue	8,707	795	
Subtotal	25,668	2,338	120
Irrigation			
Water users	750		6
Prepayment	11		
Paid with apportioned Upper Colorado Region Basin Fund	4,172		
Subtotal	4,933		6
Recreation			48
Total	30,601	2,338	174

for future municipal and industrial demand and repayment of a proportionate share of costs of water supply facilities to provide storage for future demand may be deferred interest-free for up to 10 years. The maximum amount of costs which can be deferred is the lesser of the relative percentage of the municipal and industrial allocation for future use or 30 percent of the total project cost. Table 24 shows the determination of the municipal and industrial repayment obligation that could be deferred and the allocation of costs to the various blocks of municipal and industrial water. The maximum amount that could be deferred is 30 percent of the total project cost, or \$10,680,000. Only the costs associated with future use storage in Tyzack Reservoir have been deferred. Other costs associated with future water demands are construction costs that will not occur until the water is needed. They include additional pumps at the Burns Pumping Plant and additional discharge lines leading to various canals.

Tyzack Reservoir has a capacity of 26,000 acre-feet. Approximately 8,000 acre-feet of this capacity are needed to provide irrigation with 4,600 acre-feet of water each year. This leaves 18,000 acre-feet allocated to municipal and industrial water storage. Burns Pumping Plant and Discharge Line are instrumental in providing the water to make Tyzack Reservoir an efficient storage facility. Without Burns, the yield from Tyzack for both municipal and industrial and irrigation would be reduced from 18,000 acre-feet annually to 10,600 acre-feet.

Based on an estimated population growth in Ashley Valley and corresponding municipal and industrial water demands (Table 7) about 6,000 acre-feet will be needed by the time water is available (1980). This leaves 12,000 acre-feet available for future demand. By 1985, another 6,000 acre-feet will be needed leaving 6,000 acre-feet to be deferred for the full 10-year deferral period. If, however, water associated with the deferred costs should be used prior to the end of the interest-free period, costs associated with this water would become interest bearing at the time the water was first used. The interest-free period is limited to 10 years, and following the end of the 10-year period all allocated municipal and industrial water costs which have not been repaid would be interest bearing whether or not all of the municipal and industrial water is needed or used.

Table 25 illustrates how the payout of costs allocated to municipal and industrial water could be accomplished. The actual payout will be established through contract negotiations and the demand for municipal and industrial water. In this repayment analysis, it is anticipated the reimbursable costs associated with each block of municipal and industrial water will be repaid over a period of 50 years each. Revenue required for repayment will come from two sources. Water users are expected to pay 66 percent and 34 percent is anticipated from ad valorem tax revenue collected by the Central Utah Water Conservancy District. This latter source of revenue is in accordance with policy of the Central Utah Water

Table 24
Determination of municipal and industrial
water repayment under provisions of the
1958 Water Supply Act

Item	Capacity (acre-feet)	Cost
Total project cost		
Construction		\$33,263,000
Reimbursable interest during construction		2,338,000
Total		35,601,000
Tyzack Reservoir capacity	26,000	
Allocated to irrigation	8,000	
Allocated to municipal and industrial water	18,000	
Initial use	(6,000)	
Future use	(12,000)	
Maximum deferral pursuant to Water Supply Act (30 percent x \$35,601,000)		10,680,000

Allocated by blocks and amount of deferred costs
including interest during construction^{1/}

Item	Initial use	Deferred costs or sub- sequent construction ^{2/}		Total
	Block 1 (6,000 acre-feet)	Block 2 (6,000 acre-feet)	Block 3 (6,000 acre-feet)	
Tyzack Reservoir	\$4,565,000	\$4,566,000	\$4,566,000	\$13,697,000
Tyzack Pumping Plant and related facilities	10,546,000			10,546,000
Burns Pumping Plant and related facilities		2,363,000	1,323,000	3,686,000
Permanent operating facilities		19,000		19,000
Total	15,111,000	6,948,000	5,889,000	27,948,000
Annual payment (50 years)	842,600	387,400	328,400	1,558,400

^{1/} Costs shown include \$2,338,000 in reimbursable interest during construction but exclude \$58,000 in prepayments.

^{2/} "Subsequent construction" refers only to Burns Pumping Plant and related facilities.

Conservancy District which encompasses all of the Central Utah Project area, including the area covered by the Uintah Water Conservancy District. Cooperation between the two districts is excellent. Both districts have taxing authority of a normal 2 mills but have agreed that the tax in the Uintah Water Conservancy District area shall not exceed 2 mills from both districts combined, or an amount greater than that assessed in other parts of the Central Utah Project area. As long as the larger district (1974 assessed valuation of \$1.5 billion) pays 34 percent of the municipal and industrial water cost, this is to the advantage of the smaller district (1974 assessed valuation of \$41.4 million). The following table shows the projected assessed valuation in the Uintah Water Conservancy District, assuming an annual increase of 8 percent caused primarily by "moderate" oil shale development and an annual increase of 4 percent caused by "prototype" oil shale development.

Present (1974) and projected Uintah Water Conservancy District assessed valuation		
Year	Assuming moderate oil shale development and 8 percent growth rate	Assuming prototype oil shale development and 4 percent growth rate
1974	<u>1</u> / \$41,464,000	<u>1</u> / \$41,464,000
1980	65,760,000	52,465,000
1985	96,690,000	63,832,000
1990	142,000,000	77,661,000
1995	306,670,000	94,486,000
2000	373,111,000	114,957,000

1/ Actual valuation as published in "Statistical Review of Government in Utah," Utah Foundation, 1975.

The 8 percent growth rate, with a 2-mill limitation, will give the contracting district enough revenue potential to accomplish repayment requirements without help from the Central Utah Water Conservancy District. During the first few years, however, the amount of revenues available might not be sufficient and some deficit interest may accrue. Even at a 4 percent growth rate and with some help from the Central Utah Water Conservancy District, repayment requirements could be met over the specified repayment period.

The repayment requirements for each municipal and industrial water block are shown in Table 25. For repayment of the total municipal and industrial water obligation, \$77,824,010 will be required. Of this amount, \$27,948,000 will be for construction and reimbursable interest during construction costs and \$49,876,010 for interest. The average cost per acre-foot of water over the repayment period was \$78.60, exclusive of annual operation, maintenance, and replacement charges of

approximately \$6.60 per acre-foot. The cost per acre-foot will vary, however, for each block of municipal and industrial water and depending on actual sales of water.

Irrigation Revenues

The total recommended payment capacity of the irrigators as developed in the Agricultural Economy Appendix is \$21,000 annually. Of this amount, \$6,000 is required for operation, maintenance, and replacement costs, leaving \$15,000 to be paid on construction costs. Over a 50-year repayment period a total of \$750,000 will be repaid using revenue from this source. The Jensen Unit is authorized as part of the Central Utah Project, a participating project of the Colorado River Storage Project. Thus Basin Fund revenues apportioned to Utah may be used to repay that portion of the irrigation construction not paid from other sources. Thus, of the \$4,933,000 allocated to irrigation, \$750,000 will be repaid by the district using water users' revenues, \$11,000 will be a prepayment from the Colorado River Development Fund, and \$4,172,000 will be repaid from Utah's apportioned share of revenues from the Upper Colorado River Basin Fund. Water users' revenues will repay about 15 percent of the construction costs allocated to irrigation, leaving about 85 percent to be obtained from the Upper Colorado River Basin Fund.

Table 26 is a payout schedule which demonstrates how repayment of project costs allocated to irrigation use can be accomplished. This table also shows that Colorado River Storage Project revenues apportioned to Utah will not be available to repay irrigation costs of the Jensen Unit until the 50th year of repayment (2032).

Ad valorem tax revenues will not become part of the repayment obligation because in the contract between the United States and the Central Utah Water Conservancy District (December 28, 1965, No. 14-06-400-4286, Article 366) it was stipulated that no additional ad valorem tax would be charged for repayment of the Upalco or Jensen Units of the Central Utah Project.

Table 26. Repayment Schedule of Reimbursable Costs Allocated to Irrigation 1/

YEAR	CRSP APPORTIONED REVENUES	WATER USERS REVENUES	TOTAL NET REVENUES	PAYMENT TO PRINCIPAL	UNPAID BALANCE	PLANT IN SERVICE AT END OF YEAR	ALLOWABLE UNPAID BALANCE AT END OF YEAR
					4922000	4922000	4922000
1980	0	0	0	0	4922000		
1981	0	0	0	0	4922000		
1982	0	0	0	0	4922000		
1983	0	15000	15000	15000	4907000		
1984	0	15000	15000	15000	4892000		
1985	0	15000	15000	15000	4877000		
1986	0	15000	15000	15000	4862000		
1987	0	15000	15000	15000	4847000		
1988	0	15000	15000	15000	4832000		
1989	0	15000	15000	15000	4817000		
1990	0	15000	15000	15000	4802000		
1991	0	15000	15000	15000	4787000		
1992	0	15000	15000	15000	4772000		
1993	0	15000	15000	15000	4757000		
1994	0	15000	15000	15000	4742000		
1995	0	15000	15000	15000	4727000		
1996	0	15000	15000	15000	4712000		
1997	0	15000	15000	15000	4697000		
1998	0	15000	15000	15000	4682000		
1999	0	15000	15000	15000	4667000		
2000	0	15000	15000	15000	4652000		
2001	0	15000	15000	15000	4637000		
2002	0	15000	15000	15000	4622000		
2003	0	15000	15000	15000	4607000		
2004	0	15000	15000	15000	4592000		
2005	0	15000	15000	15000	4577000		
2006	0	15000	15000	15000	4562000		
2007	0	15000	15000	15000	4547000		
2008	0	15000	15000	15000	4532000		
2009	0	15000	15000	15000	4517000		
2010	0	15000	15000	15000	4502000		
2011	0	15000	15000	15000	4487000		
2012	0	15000	15000	15000	4472000		
2013	0	15000	15000	15000	4457000		
2014	0	15000	15000	15000	4442000		
2015	0	15000	15000	15000	4427000		
2016	0	15000	15000	15000	4412000		
2017	0	15000	15000	15000	4397000		
2018	0	15000	15000	15000	4382000		
2019	0	15000	15000	15000	4367000		
2020	0	15000	15000	15000	4352000		
2021	0	15000	15000	15000	4337000		
2022	0	15000	15000	15000	4322000		
2023	0	15000	15000	15000	4307000		
2024	0	15000	15000	15000	4292000		
2025	0	15000	15000	15000	4277000		
2026	0	15000	15000	15000	4262000		
2027	0	15000	15000	15000	4247000		
2028	0	15000	15000	15000	4232000		
2029	0	15000	15000	15000	4217000		
2030	0	15000	15000	15000	4202000		
2031	0	15000	15000	15000	4187000		4922000
2032	4172000	15000	4187000	4187000	0		0
2033	0	0	0	0	0		
2034	0	0	0	0	0		
2035	0	0	0	0	0		
2036	0	0	0	0	0		
2037	0	0	0	0	0		
2038	0	0	0	0	0		
2039	0	0	0	0	0		
NP= 60	4172000	750000	4922000	4922000	0	4922000	

1/ Excludes \$11000 of investigation costs paid from Colorado Development Fund and Contributed from the State of Utah.

TABLE 27

Recapitulation of Project Repayment ^{1/}

YEAR	TOTAL NET REVENUES	REVENUES APPLIED TO:		UNPAID BALANCE	PLANT IN SERVICE AT END OF YEAR	ALLOWABLE UNPAID BALANCE AT END OF YEAR
		PAYMENT TO INTEREST	PAYMENT TO PRINCIPAL			
				29165000	29165000	29165000
1980	843000	773079	69921	29095079		
1981	843000	769502	73498	29021581		
1982	843000	765741	77259	28944322		
1983	858000	761789	96211	28848111	29165000	29165000
1984	858000	757634	100366	31129745	31547000	31547000
1985	1246000	1108726	137274	30992471		
1986	1246000	1102471	143529	30848942		
1987	1246000	1095895	150105	30698837		
1988	1246000	1088983	157017	30541820	31547000	31547000
1989	1246000	1081718	164282	31700538	32870000	32870000
1990	1574000	1375362	198638	31501900		
1991		1365967	208033	31293867		
1992		1356091	217909	31075958		
1993		1345710	228290	30847668		
1994		1334799	239201	30608467		
1995		1323328	250672	30357795		
1996		1311271	262729	30095066		
1997		1298598	275402	29819664		
1998		1285275	288725	29530939		
1999		1271272	302728	29228211		
2000		1256552	317448	28910763		
2001		1241078	332922	28577841		
2002		1224813	349187	28228654		
2003		1207716	366284	27862370		
2004		1189745	384255	27478115		
2005		1170854	403146	27074969		
2006		1150996	423004	26651965		
2007		1130123	443877	26208088		
2008		1108181	465819	25742269		
2009		1085117	488883	25253386		
2010		1060874	513126	24740260		
2011		1035389	538611	24201649		
2012		1008601	565399	23636250		
2013		980443	593557	23042693		
2014		950844	623156	22419537		
2015		919731	654269	21765268		
2016		887026	686974	21078294		
2017		852648	723152	20356942		
2018		816511	757489	19599453		
2019		778525	795475	18803978		
2020		738596	835404	17968574		
2021		696624	877376	17091198		
2022		652505	921495	16169703		
2023		606128	967872	15201831		
2024		557380	1016620	14185211		
2025		506137	1067863	13117348		
2026		452272	1121728	11995620		
2027		395652	1178348	10817272		32870000
2028	1574000	336155	1237865	9579407		17759000
2029	1489451	273573	1215878	8363529		
2030	731000	212136	518864	7844665		
2031	731000	186359	544641	7300024		17759000
2032	4903000	159262	4743738	2556286		12837000
2033	716000	130780	585220	1971066		5889000
2034	592220	100840	491580	1479686		
2035	328000	75701	252299	1227387		
2036	328000	62793	265207	962180		
2037	328000	49225	278775	683405		
2038	328000	34963	293037	390368		5889000
2039	410339	19971	390368	0		0
NP= 60	82746010	49876010	32870000		32870000	

^{1/} Excludes \$69000 of investigation costs paid from Colorado River Development Fund and contributed from the State of Utah.