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LETTER OF TRANSMITTAL

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Office of Indian Affairs  
Irrigation Division

Los Angeles, California

June 28, 1946

Commissioner of Indian Affairs,  
Merchandise Mart,  
Chicago, Illinois.

Sir:

There is respectfully submitted herewith a report entitled "Report on Conditions Found to Exist on the Flathead Irrigation Project, Montana." The report represents information and conclusions reached after a study made by the Agricultural Economics Unit, Irrigation Division, Office of Indian Affairs, acting in compliance with provisions of the Act of June 22, 1936 (49 Stat. 1803) and your letter of instructions to me dated August 10, 1937.

The report consists of Volume I, which evaluates the situation existing on the project and contains recommendations that if approved, will correct many erroneous conditions; Volume II which contains section plats showing land classification, land ownership, location of the so-called private water rights, etc.; Appendix A consisting of a set of tabulations showing by 1/16 part of each section the acreage of land by classes as found in 1930; the General Land Office acreage; the acreage of land by classes as determined by a land classification survey completed by this Unit in 1943-1944; the irrigable acreage as determined by investigation by this Unit; and the difference between the total of Class 1, Class 2 and Class 3 land in the 1930 classification and the acreage determined irrigable in this investigation; and Appendix B, in two parts, which consists of agreements executed by landowners on the project for the adjustment of and fixing irrigable acreage within the project.

Very truly yours,

*A. L. Walker*  
A. L. Walker

Principal Agricultural Economist

REPORT  
ON CONDITIONS FOUND TO EXIST  
on the  
FLATHEAD IRRIGATION PROJECT,  
MONTANA

VOLUME I

United States Department of the Interior  
Office of Indian Affairs  
Irrigation Division  
Agricultural Economics Unit  
Los Angeles, California

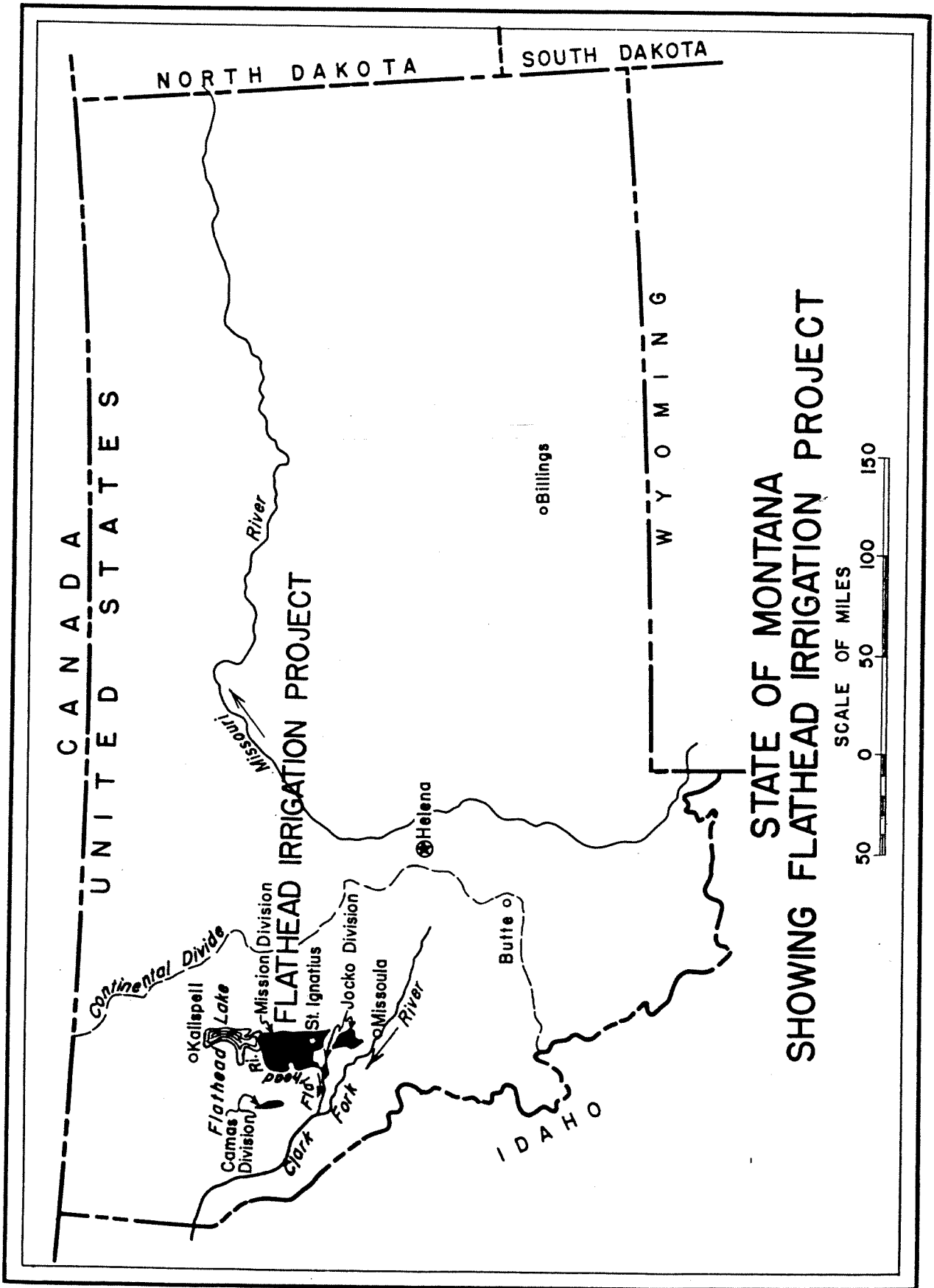
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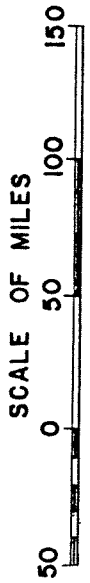
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**STATE OF MONTANA**  
**SHOWING FLATHEAD IRRIGATION PROJECT**



## RECOMMENDATIONS

It is respectfully recommended that:

1. The Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana, be reimbursed the sum of \$64,161.18 with interest at 4 per cent from 1916 for tribal funds used in the construction of the Flathead Irrigation Project and not refunded as provided by the Act of May 18, 1916 (39 Stat. 123).
2. The regulation defined in Section 130.18, Title 25, Code of Federal Regulations be amended to provide that the charge for service by the project systems to areas covered by private water rights be the same as the regular operation and maintenance assessments made against project lands.
3. A duty of water be fixed for the project ranging from a relative duty of 100 to 300 as shown for each 1/16 section on Map No. 3 of this report.
4. The Confederated Salish and Kootenai tribes of the Flathead Reservation, Montana be paid a sum to be agreed upon by the said tribes and the Flathead, Mission, and Jocko Valley Irrigation Districts for damages by reason of occupancy of reservoir and camp sites from the date of taking by the United States; and that an appraised value be determined and used as the basis of arriving at an annual rental price to be paid the tribes for future use of the lands occupied by said reservoir and camp sites.
5. Consideration be given to the preparation of justifications and the authorization and appropriation of funds in the amount of \$1,490,000 for project improvements, \$705,000 of which is urgently needed.
6. Consent and request agreements to adjust irrigable acreage be approved and the irrigable area of the project be fixed at 116,816.49 acres made up of 116,359.36 acres shown in Appendix A of this report, 178.43 acres in towns and villages, and 278.70 acres previously irrigated with project water acquired on a lease basis, and that assessments be regularly made for all the land designated herein except that shown as temporary non-irrigable land as provided by the Act of June 22, 1936. (49 Stat. 1803).
7. The Commissioner of Indian Affairs advise the Commissioner of the General Land Office that the owners of 60 farm unit tracts have executed agreements requesting the elimination of all irrigable lands within these units from the Flathead Irrigation Project under provisions contained in the Act of June 22, 1936 (49 Stat. 1803) and request that the said farm units be canceled. It is also recommended that the Commissioner of Indian Affairs request the Commissioner of the General Land Office to amend farm unit plats in certain instances in cases where lands belonging to the State of Montana are involved in order that economic farm units will be provided.

8. A modified plan for the repayment of project construction charges be adopted whereby the non-Indian owned land be assessed, through irrigation district organizations where possible, for the repayment of construction charges over a 50-year period and that assessments for construction charges be regularly made but that net power revenues be distributed on an irrigable acre basis to pay to the extent they will: (a) The construction charge assessments for non-Indian land in the project, and concurrently (b) the annual operation and maintenance charges assessed against Indian land .

9. Refunds amounting to \$560.98 be granted non-Indian owners for construction charges paid where agreements requesting elimination from the project have been executed.

10. Cancellations for the purposes stated and in the following amounts be made:

- (a) \$1,526,999.04 representing construction charges existing against 21,835.19 acres of land for which requests for elimination have been executed, and power reserve land that was previously included as irrigable.
- (b) \$574.45 of deferred operation and maintenance charges existing against non-Indian land and \$4,277.68 of delinquent operation and maintenance charges existing against Indian-owned land in order that these charges will not stand on the books as obligations against lands to be eliminated from the project.
- (c) \$40,549.86 of operation and maintenance charges that accrued prior to the passage of the Act of May 10, 1926.
- (d) \$5,313.32 to legalize the alterations of assessments posted to the books of the project following the 1930 classification of land, and,
- (e) \$2,195.16 of uncollectible power accounts.

## SUMMARY

The Flathead Irrigation Project is located in northwestern Montana and is contained in the counties of Lake, Sanders and Missoula. The project consists of three separate physiographic divisions known as the Camas, Jocko and Mission Valleys. Of these three, the Mission Valley is the most extensive and important.

The climate of the Flathead area is typical of Montana's lower mountain valleys. Annual precipitation at St. Ignatius averages 15 inches and temperatures average 24 degrees in January and 66.7 degrees in July. The average growing season is 125 days in length and at St. Ignatius there are about 2,700 heat units available for plant growth. The main line of the Northern Pacific Railway traverses the Jocko Division of the project and a branch line extends northward from Dixon to Polson.

About 80 per cent of the resident population are native whites, 6 per cent are foreign-born whites and 13 per cent are Indians. Over 50 per cent of the Indians have more white than Indian blood.

The Flathead Reservation was first established as a result of a treaty concluded at Hell Gate in the Bitterroot Valley July 16, 1855. The Executive Order of November 14, 1871 ordered all Indians residing in the Bitterroot Valley removed to a general reservation located in the Jocko Valley. It was not until 1891, however, that the last group of Indians was forced, through privation, to move from the Bitterroot Valley to the present reservation. Beginning in 1907 the Indians were given their choice of allotments and in 1908 patents were issued to 2,390 individuals. Every member of the tribe was given an allotment varying from 80 acres of land classed as irrigable to 160 acres of dry land. After allotments were made, the remaining lands were inspected, classified and appraised, and opened to homestead entry on May 2, 1910. In 1920 there were 920 allotments made to Indian children born after the close of the first allotment period.

While the Act of April 23, 1904 provided a foundation for the Flathead Irrigation Project, the Act of April 30, 1908 (35 Stat. 70) authorized the beginning of construction. Withdrawn from settlement and from use as irrigable land were certain power site reserves located principally along the Flathead River. Early in 1909 construction was started on the Newell Tunnel at the site of Kerr Dam. This work continued for two years but was then deferred until the need of power for pumping water for irrigation became apparent. It was not until 1926 that Congress appropriated additional funds for power development and, although plans were drawn for the construction of a small plant, the Rocky Mountain Power Company secured a license and built Kerr Dam and generating station. Under the terms of the license the power company agreed to pay the Flathead tribes \$180,000 to \$200,000 per year for use of the site and agreed to supply the project with 15,000 h.p. of

electrical energy for pumping and other purposes at rates varying from one to two and one-half mills per kilowatt hour.

The Act of May 10, 1926 provided that all construction costs and operation and maintenance charges, except the excess cost of Camas Division, be made a first lien against all lands in the project and required further that appropriate repayment contracts be executed by irrigation districts organized under State law. As provided by this act, three irrigation districts were organized, namely; the Flathead Irrigation District, the Mission Irrigation District, and the Jocko Valley Irrigation District.

The project has thirteen storage reservoirs and two catchment basins used to help regulate flow in long canal systems, to minimize fluctuation in flows and to avoid excessive waste. Supplying these reservoirs are 76 miles of feeder canals. There are six main canals with a total length of 60 miles in which 146 structures have been built. There are 910 miles of laterals and 30 miles of drainage canals. In the laterals there are 9,211 structures. Many of the structures and parts of the concrete lining of certain canals are so badly deteriorated that complete rebuilding is necessary. Three pumping plants have been constructed on the project. Largest of these is the Flathead River plant, which lifts water 335 feet from Flathead River. Water is lifted 43 feet by the Crow Creek pumping plant, and the Revais Creek pumping plant lifts water 79 feet. The power system consists of approximately 410 miles of distribution lines, one 320 k.w. generating station and several sub-stations. The system serves 3,150 customers and applications are on file from approximately 200 more.

In 1929 the Bureau of Chemistry and Soils, United States Department of Agriculture, issued a report entitled "Soil Survey of the Lower Flathead Valley Area, Montana." In this survey about 47 different types of soil were recognized. The parent material of practically all the agricultural soils has been transported to the area and deposited during recession of a large glacier which completely filled Flathead Valley and Little Bitter-root Valley. Soils which have developed in place by weathering of parent materials are classified into three main groups based on differences in profile and permeability of sub-soil materials.

In 1930, classification of the soils of the Flathead Project was carried on by the same men and at the same time the detailed soil survey was made. Six classes of soil were recognized, the first three of which were excellent, good and fair, while the fourth, fifth and sixth classes were marginal and submarginal in quality. Following this, classification of land was made in which the six classes of soils were combined into four land classes. The class one and two lands were those that it was possible to irrigate with existing facilities and included only land of a quality best suited for irrigation agriculture. The class four lands were definitely non-irrigable and the class three lands consisted of two main groups, good land without irrigation facilities and marginal and submarginal lands largely classed as four, five and sometimes six by the soil scientists. About 56 per cent of all the lands included in the class

three group in the 1930 classification was marginal or submarginal in quality and 44 per cent was fair, good and excellent land.

Beginning in 1940 a representative of the Agricultural Economics Unit reclassified all of the lands in the project and also covered a considerable acreage of land lying adjacent to what had previously been considered as project land. Following the precedent set in the 1930 classification four classes were recognized: Class one, good and excellent agricultural land; class two, fair agricultural land; class three, poor land having definitely inferior or questionable characteristics; and class four, land considered submarginal for crop production and definitely not suited for irrigation agriculture. Approximately 191,000 acres of land were covered. Of this acreage 63,000 acres were class one land, 59,000 acres were class two land, 5,700 acres were class three land and the balance was class four land. Classification is shown for each one-sixteenth section subdivision in a series of tabulations included as Appendix A of this report. In performing the classification work it was assumed that the irrigable area as finally determined would be confined to class one, class two and, in some instances, class three land. } 127,701

On April 21, 1923, the Secretary of the Interior approved a schedule granting rights to the use of water from reservation streams to 348 users. Of these 348 so-called water right grants, 136 are on streams where the Flathead Project has no material interest. Under the rights granted by the Secretary, these so-called private water right lands, some 6,500 acres of which are of concern to the Flathead Project, were granted water in the amount of two acre-feet per acre or less. These so-called private water right lands are commingled with project lands and in many instances the private water right ditch serves a portion of the irrigable area within a one-sixteenth subdivision and the project ditch serves the remainder.

In the conduct of this investigation, a duty of water was determined for all of the lands within the project as shown by Map No. 3 in this report. The duty is expressed in relative terms rather than in acre-feet per acre. The lands capable of producing optimum yields of crops with the smallest quantity of water were assigned a relative duty of 100. The six other duty areas were expressed in relative terms as follows: 125, 150, 175, 200, 230 and 300. In years when there is an adequate quantity of water to supply the 100 duty areas with 1.33 acre-feet per acre at the land, the 150 duty areas, for example, would be supplied two acre-feet and the 300 duty areas four acre-feet per acre.

Stream flow records for some Mission Valley streams date as far back as 1906, while records of flow for other streams began in 1911 and continued to a greater or lesser extent until 1924 when project operation and construction work was discontinued by the Bureau of Reclamation and was taken over by the Office of Indian Affairs. Stream flow measurements were resumed in 1931 but were discontinued after two or three years. Definite data on water supply for the area, therefore, are rather difficult to compile. However, a careful analysis of all the data available was made in the conduct

of this investigation in order that a basis for irrigable area would be at hand. The records were complete enough to permit an analysis of supply and use during years when average maximum and minimum flows were experienced. Using the data thus obtained for average flows and applying the needs of the better quality lands on the basis of the duty of water as determined in this investigation, it was found that existing supplies will provide only enough water to irrigate 120,000 acres, assuming good management by the project and optimum use of water by farm operators.

The project's irrigable area has been the subject of numerous estimates and several determinations of it have been attempted. In the early history of the project it was planned that development would cover 152,000 acres. In 1921 the Secretary of the Interior approved section plats showing the irrigable area to be about 103,000 acres. On November 1, 1930, when Public Notice was issued, the area made subject to the payment of construction charges was 124,500 acres. The 1930 land classification schedule approved by the Secretary in January 1931 and authorized for use for assessment purposes in 1933, was assumed to constitute authority to spread construction charges to 138,195 acres. Based on the assumption that the irrigable area of the project consists of the lands that have actually been assessed for irrigation charges, the project area approximates 110,000 acres.

From 1917 to 1939 the United States constructed reservoirs, camp sites and pump installations on lands belonging to the Flathead tribes. Appraisals have been made of the 9,000 acres of lands so taken; the latest one, completed in 1937, placing the value at approximately \$100,000. The Confederated Salish and Kootenai tribes of the Flathead Reservation have never been compensated for these lands nor have they been paid for damages which have accrued as a result of occupancy by the United States.

Revenues accruing from operation of the project's power system have increased from a gross of \$40,000 in the 1932 fiscal year to \$221,000 in the 1945 fiscal year. The net income after deducting a charge for depreciation has gradually increased from \$5,300 in 1932 to \$110,400 in 1945.

Many of the original structures built at the time the project was begun, which is more than 35 years ago, are still in place, but most of them are in bad condition. It is estimated that \$1,490,000 would be required to put the Flathead Irrigation Project system in a good state of repair. Of this amount, \$705,000 is urgently needed.

The lower Flathead Valley, in which the Flathead Irrigation Project is located, is dependent upon agriculture and related industries for practically 95 per cent of its income. General economic conditions have varied greatly during the project's existence, but for the most part landowners have had difficulty in meeting their obligations from the production of the land. This has come about largely because an adequate supply of water for the irrigation of lands obligated for payment of charges under the project has not been available; mineral deficiencies of many of the soils does not permit the production of high yields; the exchange

value of farm prices has been relatively low, and farms are too small to constitute economic units. The project since 1917 has developed from an area principally devoted to crop production to one where the production of livestock and livestock products is exceedingly important. The acreage irrigated has increased about 40 per cent since 1934. Crop yields are relatively low and gross income per farm has been low also. Prior to the experiencing of high prices during the years of World War II was in progress, the gross income per irrigable acre seldom exceeded \$20.00. In recent years farmers have shown a tendency to utilize power machinery in production, with the result that the irrigable acres per farm worker has increased about 60 per cent since 1931. In Lake County, delinquency of state and county taxes averaged approximately \$140,000 from 1930 to 1940, inclusive. During this period the gross farm income per farm was in the neighborhood of \$650, and when adjusted to the exchange value of the farm dollar, was about \$500 per farm. From 1941 to and including 1944, the gross farm income more than doubled and tax delinquency dropped from a figure of approximately \$140,000 in 1940 to \$40,000 in 1944.

Reimbursable construction charges for irrigation and power systems, after crediting the amount paid by the Rocky Mountain Power Co. for the Government's investment in the Newell Tunnel, total \$9,723,320.52 to June 30, 1945. Assuming that construction charges cover 138,195 acres of land, the reimbursable construction costs per acre are \$66.97 in the Mission Valley Division; \$115.25 in the Camas Division and \$54.41 in the Jocko Division.

In an attempt to analyze the income available on farms of 80 acres and 160 acres in size under different types of set-up, budget analyses were made covering seven plans of farm operation. The analyses show that 80-acre farms, regardless of the type of organization, do not constitute an economic unit on the Flathead Irrigation Project. The analyses further show that 160-acre farms, except under unusual circumstances, provide only reasonable incomes. If expenses of farm operation are reduced by assuming that family labor will be available to perform all of the tasks except contract work, the 160-acre farms provide a reasonable income when favorable economic conditions exist. The conclusion is reached that except in unusual circumstances irrigation charges cannot exceed \$1.75 to \$2.50 per acre per year if farmers are to maintain a reasonable level of living.

Results obtained from the land classification study completed by the Unit in 1943-1944, combined with the data available from the study of water supplies and water use, show that there are not more than 120,000 acres of excellent and good land available in the area which can be reached by existing project facilities and that the water supply is not adequate for an acreage exceeding this figure. Had it been possible in the conduct of this investigation to assume that the irrigable acreage figure of the project in 1945 was the acreage that was being assessed for irrigation charges, it would have been easily possible to obtain the consent of project landowners to fix the irrigable acreage within the project at a figure somewhere between 110,000 and 115,000 acres. Since, however, construction charges have been spread to 138,195 acres of land in the project,



it was deemed logical to use this figure as a base in the work of adjusting irrigable acreage to fit existing water supply conditions. Consent and request agreements have been obtained from a large percentage of landowners on the project where the irrigable area as determined in this investigation was shown to be different from the total area of class 1, 2 and 3 land in 1930 classification. On the basis of agreements with landowners the irrigable area as determined by this Unit is 116,816.49 acres. This figure includes an estimate of 178.43 acres within towns and villages on the project, that will demand water for irrigation and also includes a figure of 278.7 acres of land belonging to individuals in the area who have in past years purchased water on a rental basis from the project.

Landowners in the Flathead Irrigation Project have executed agreements to exclude from the project 60 irrigable farm units established as provided by law and regulations of the General Land Office. Of these, 22 apply to lands to be eliminated from the project at the request of the State of Montana. Immediate steps should be taken to cancel these farm units and where changes in farm units are indicated, the change should be reported to the General Land Office.

A modified plan for the repayment of construction charges is suggested by which the time allowed for repayment would be extended to 50 years. In the execution of this plan it is proposed that assessments be made as provided by existing law, but that net power revenues, after provision is made for repaying the reimbursable construction cost of the power system, would be applied on an equal per acre basis to repay to the extent they will the annual construction assessments for non-Indian owned lands in the project and be applied to pay operation and maintenance charges for Indian lands in the project. Existing law and contracts with irrigation districts provide that net power revenues, after the reimbursable construction costs of the power system and the excess costs of construction of the Camas Division are paid, shall be applied to reduce the number of annual payments for construction but not the amount of the current charge.

For 16 tracts of non-Indian owned land for which requests for elimination from the project have been executed, landowners have paid construction charges in the amount of \$560.98. A refund of this amount should be made to the owners of the lands when the elimination agreements are approved. Total reimbursable construction charges of the project should be adjusted by canceling the charges applicable to the 21,835.19 acres of land proposed for elimination from the project. This is calculated to be \$1,526,999.04. Operation and maintenance charges that accrued against non-Indian owned land prior to May 10, 1926 in the amount of \$40,549.89 should be canceled. Delinquent operation and maintenance charges standing against non-Indian owned land proposed for elimination from the project should be canceled when the eliminations are approved. These amount to \$574.35. Following approval of the land classification schedule by the Secretary of the Interior in 1931, project officials modified assessments appearing on the water users' ledger by reducing such assessments to reflect the difference in irrigable acreage as previously assessed and that shown to be irrigable by the 1930 classification. Owners of the land involved are not aware of

the fact that Congressional authority has not been obtained to cancel the assessments. To legalize the cancellations, it is suggested that \$5,313.32 be reported to Congress for cancellation. In the operation of the power system there have accrued uncollectible accounts in the amount of \$2,195.16 and these should be canceled also. Standing against Indian lands, owners of which have requested that said lands be eliminated from the project, is a total of \$4,277.68 of unpaid operation and maintenance charges. It is proposed that these charges be canceled under the provisions of the 1932 Act, (47 Stat. 564).

A careful study and audit of the financial records and accounts of the Flathead Irrigation Project was made by representatives of the Agricultural Economics Unit. Adjustments were made in instances where accounts were found to disagree with Treasury compiled statements, General Accounting Office statements of disbursements and/or other records known to be correct. These data were compiled into condensed financial statements and are made a part of this report.

In 1944 Flathead Agency officials, in cooperation with the Flathead Tribal Council, prepared a report outlining a long-time program for the Indians on the Flathead Indian Reservation. This plan has as its objective the establishment of all Flathead Indian families on a basis where a reasonable standard of living will be assured. An income of \$1,200 per year per family or its equivalent is established as the goal. It is estimated that \$2,000,000 will be required to complete the plan, a large part of which would be supplied by royalties received from the Rocky Mountain Power Company for the use of the site for Kerr Dam. Principal features of the plan is a land program. It is proposed that there be purchased alienated lands and lands from non-Indians who obtained them under provisions of homestead law or otherwise where such tracts are desirable for Indian use.

value of farm prices has been relatively low, and farms are too small to constitute economic units. The project since 1917 has developed from an area principally devoted to crop production to one where the production of livestock and livestock products is exceedingly important. The acreage irrigated has increased about 40 per cent since 1934. Crop yields are relatively low and gross income per farm has been low also. Prior to the experiencing of high prices during the years of World War II was in progress, the gross income per irrigable acre seldom exceeded \$20.00. In recent years farmers have shown a tendency to utilize power machinery in production, with the result that the irrigable acres per farm worker has increased about 60 per cent since 1931. In Lake County, delinquency of state and county taxes averaged approximately \$140,000 from 1930 to 1940, inclusive. During this period the gross farm income per farm was in the neighborhood of \$650, and when adjusted to the exchange value of the farm dollar, was about \$500 per farm. From 1941 to and including 1944, the gross farm income more than doubled and tax delinquency dropped from a figure of approximately \$140,000 in 1940 to \$40,000 in 1944.

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In an attempt to analyze the income available on farms of 80 acres and 160 acres in size under different types of set-up, budget analyses were made covering seven plans of farm operation. The analyses show that 80-acre farms, regardless of the type of organization, do not constitute an economic unit on the Flathead Irrigation Project. The analyses further show that 160-acre farms, except under unusual circumstances, provide only reasonable incomes. If expenses of farm operation are reduced by assuming that family labor will be available to perform all of the tasks except contract work, the 160-acre farms provide a reasonable income when favorable economic conditions exist. The conclusion is reached that except in unusual circumstances irrigation charges cannot exceed \$1.75 to \$2.50 per acre per year if farmers are to maintain a reasonable level of living.

Results obtained from the land classification study completed by the Unit in 1943-1944, combined with the data available from the study of water supplies and water use, show that there are not more than 120,000 acres of excellent and good land available in the area which can be reached by existing project facilities and that the water supply is not adequate for an acreage exceeding this figure. Had it been possible in the conduct of this investigation to assume that the irrigable acreage figure of the project in 1945 was the acreage that was being assessed for irrigation charges, it would have been easily possible to obtain the consent of project landowners to fix the irrigable acreage within the project at a figure somewhere between 110,000 and 115,000 acres. Since, however, construction charges have been spread to 138,195 acres of land in the project,

## INTRODUCTION

This report deals with a diversity of problems existing on the Flathead Irrigation Project, Montana, most of which are economic or engineering in character. It is one of a series of reports which have been prepared by the Agricultural Economics Unit, Irrigation Division, Office of Indian Affairs and completed under authority provided by the Acts of July 1, 1932 (47 Stat. 564) and June 22, 1936 (49 Stat. 1803). The report consists of two volumes and in addition Appendix "A" and Appendix "B". Volume I is a narrative report describing conditions found to exist on the Flathead Irrigation Project and Reservation. It includes a summary of findings as a result of the study and a group of recommendations setting forth the action necessary to accomplish the solution of problems involved. Volume II consists of section plats which show the classification of land by use of symbols and shading; the location and boundary of so-called private water rights; land ownership as of 1945; and location of roads, canals and other project features. In a tabulation made a part of each section plat involving project acreage there is shown for each one-sixteenth part of the section, acreage as determined by the General Land Office; the class of land as determined by the 1940-1944 reclassification of land; the total acreage irrigable both from project facilities and from so-called private water right sources; the acreage temporarily non-irrigable and the acreage permanently non-irrigable. Appendix "A" consists of a tabulation for each section and one-sixteenth part thereof showing the General Land Office acreage, the irrigable area as determined by the 1930-1931 classification; the classification on the basis of land productivity in 1940-1944, and the irrigable acreage as now determined. Appendix "B" consists of forms of agreement to exclude lands from or to include lands in the Flathead Irrigation Project. These forms of agreement have been duly executed by landowners and are in form for approval by the Secretary of the Interior.

The necessity for a thorough investigation of the Flathead Irrigation Project was made evident following a preliminary study by the Unit in 1938 when a brief analysis of the problems involved led to a Joint Resolution by Congress (53 Stat. 1221) deferring construction charge repayments. In the conduct of the 1938 study a number of meetings was held with landowners. At these meetings facts were presented showing the need for a reclassification of land; a careful analysis of water supply and water use; a determination of the duty for the various areas in the project; a coordination between quantity of water available and the area of excellent, good and fair quality land within the boundaries of the project; a review and analysis of accounts to determine total reimbursable costs and the breakdown of costs between irrigable area units, the power system and irrigation works; the need for canceling changes; an equitable plan for the repayment of construction charges; the extent and importance of so-called private water rights; the adequacy and condition of project works and several other subjects which have a bearing on the economic well-being of the population in the area served by the Flathead Irrigation Project.

In May 1940 a reclassification of land was begun and the field work was completed in June 1944. The data obtained from this classification were necessary before the work of correlating land quality with water requirements and water use could be undertaken. The data were needed also for the purpose of formulating recommendations proposing a determination of and adjustments in the irrigable acreage of the project.

The work of the Unit was interrupted on numerous occasions to permit, without interference: (a) the consummation of a court case involving the use of water rising on the reservation; (b) an attempt by the then District Counsel to settle the numerous so-called private water right problems by agreement with the owners thereof, and lastly in November 1944 a break in the activities of the Unit was ordered; (c) to allow for time to draft and to have approved by local interests a bill incorporating many of the conclusions reached by the Unit in its investigations and studies of the problems involved. The court case was dismissed without prejudice; the attempt to negotiate agreements with landowners having so-called private water rights failed, and the draft of bill first prepared, although introduced, was not further considered by the Congress and a revised draft is now under consideration.

On August 7, 1945 the Commissioner of Indian Affairs issued instructions to proceed with the investigation and since that time every effort has been made to complete Volume I, Appendix "A" and Appendix "B" of the report by June 30, 1946. Because of the tremendous amount of work involved Volume II will not be ready for release until June 30, 1947 or later.

#### LOCATION OF PROJECT

The Flathead Irrigation Project lies in what is known as the Lower Flathead Valley within the boundaries of the Flathead Indian Reservation in Lake, Sanders and Missoula Counties in northwestern Montana. The lands served are contained within Townships 15 to 24 North and Ranges 19 to 25 West of the Montana Principal Meridian. The area served by the project generally is bounded on the north by the Flathead Lake, on the east by the Mission Range of mountains, on the west by the Cabinet Range and on the south by Nine Mile Divide.

#### DESCRIPTION OF THE AREA

##### Physical Features

The Flathead Irrigation Project consists of three separate physiographic divisions known as the Camas, Jocko and Mission Valleys.

The Camas Valley in Sanders County is located about 20 miles west of the town of Polson, Montana. It is enclosed by the Cabinet Mountains on the west and a low range of hills on the other three sides, and is drained by Little Bitterroot River, a tributary of the Flathead. The

topography of the Camas Valley is smoothly rolling and the elevation is about 2850 feet above sea level.

The Jocko Valley lies mostly in Lake County although a small portion on the south is in Missoula County and another small area on the west is in Sanders County. Approximate center of the Jocko Valley is Arlee. The area is practically surrounded by mountains except on the north where a low range of hills separates it from the Mission Valley. The area is drained by Jocko River, a tributary of the Flathead. Average elevation is 3100 feet above sea level.

The Mission Valley is much the larger of the three and lies entirely in Lake County. The Mission Range rises immediately to the east, Flathead Lake forms the north boundary, the Flathead River lies to the west and the south boundary consists of a low range of hills extending in a northwesterly direction from the Mission Range. "Several stony ridges lie in the valley. Two of the larger ridges rise from 300 to 400 feet above the average level of the surrounding land and in general parallel the course of Flathead River. The northern ridge beginning at a point about three miles south of Polson, extends southward about 6 miles, and the southern ridge extends about 7 miles southward from Crow Creek toward Moiese. The district west of the northern ridge is known as Valley View and that west of the southern ridge is called Moiese Valley." <sup>1/</sup> Average elevation of the Mission Valley area is 2900 feet above sea level.

Mission Valley slopes toward the south and west and is drained by Mud, Crow, Post, Mission and other smaller creeks. About two miles south of Flathead Lake a high gravelly sandy ridge runs in an east-west direction and extends from the Mission Range to Flathead River. South of this the lands are level or gently rolling and distinct drainage courses are absent. South of Crow Creek there exists another gravelly ridge and south from this lies Charlo flat which slopes to the south and west. This area is nearly level and drainage is poor, the only outlet being Big Coulee. In this area, and in the area to the east, are many pot holes of various sizes some attaining a depth of 75 feet. Points in the Mission Range, one of the most rugged of the Rocky Mountain chain, reach elevations of nearly 10,000 feet above sea level. Drainage water from these mountains is the principal source of supply for irrigable lands in the area.

At one time large valley glaciers completely filled the Flathead and Little Bitterroot River valleys and most of the parent soil materials were transported and deposited during the recession of these accumulations of ice and snow. In the recession process the glaciers left numerous terminal moraines and in some instances lakes were formed, while in others the glacial material was carried away by rivers. All the drainage waters of the Flathead Project area eventually find an outlet through Flathead River.

<sup>1/</sup> Soil Survey of Lower Flathead Valley, Montana, United States Department of Agriculture, Bureau of Chemistry and Soils - P. 1

## Climate

The climate in the Flathead area is typical of Montana's lower mountain valleys. The winters are quite mild and severe winds are prevented by the surrounding mountains. Table 1 has been prepared to show precipitation, temperature, dates of killing frosts, length of growing season, and the number of heat units and their distribution for St. Ignatius, Polson and Lonepine.

Table 1. Precipitation, Temperature, Dates of Killing Frost, Length of Growing Season, Heat Units and their Distribution, for St. Ignatius, Polson and Lonepine, Montana.

	St. Ignatius	Polson	Lonepine
<u>Elevation</u>	2900	2927	2875
<u>Precipitation</u>			
Length of record (Years)	33	29	17
Average Annual	15.13	14.56	10.10
Greatest	25.15	20.94	16.02
Lowest	8.77	10.55	6.13
<u>Temperature</u>			
Length of record (Years)	30	28	17
January average	24.0	24.0	23.2
July average	66.7	67.7	69.6
Highest	103.0	104.0	105.0
Lowest	- 36.0	- 27.0	- 40.0
<u>Killing Frost average dates</u>			
Length of record (Years)	31	30	18
Last in spring	May 21	May 12	May 22
First in fall	Sept. 23	Sept. 27	Sept. 19
Growing Season (days)	125	138	120
<u>Total Heat Units and their distribution</u>			
	2732	2691	2684
April	72	42	—
May	298	282	341
June	492	522	549
July	735	766	825
August	713	716	651
September	354	363	306
October	68	—	12

Data from "Climate of the State of Montana." U.S. Weather Bureau 1941

The records for St. Ignatius are representative of the larger part of the irrigable area except for the fact that the amount of rainfall may be somewhat higher than for a greater portion of the remainder of the project by virtue of its being located near the base of the Mission Range

of mountains. In the Flathead area precipitation is greatest at the east side of the project near the base of the Mission Range and decreases toward the west. This fact, which is clearly shown by the precipitation records for St. Ignatius, Polson and Lonepine, has a very important bearing, particularly for the Camas area of the project, as the annual precipitation at Lonepine is about 67 per cent of the rainfall at points in the Mission and Jocko Valley areas. Winter temperatures are relatively moderate at Polson and in the surrounding area because of close proximity to Flathead Lake, a large body of inland water. The influence of the lake makes the growing season at Polson 18 days longer than at Lonepine and 13 days longer than at St. Ignatius.

#### Transportation Facilities

The main line of the Northern Pacific Railway traverses the Jocko Division of the project with shipping points at Arlee, Ravalli, and Dixon. A branch line extends northward from Dixon through the Mission Valley Division to the north edge of the project at Polson. A hard-surfaced highway connects the principal part of the project with Missoula to the south and with Kalispell to the north. The Camas Division is somewhat handicapped in railroad facilities, it being located an average of about 20 miles from the nearest railroad shipping points of Plains and Perma. Lonepine and Hot Springs, towns of the Camas Division of the project are connected with one another and with Kalispell, Plains and Polson by an oiled highway.

#### Characteristics of Population

Since Lake County has probably 80 per cent of the total population of the project, characteristics of the population of that county may be considered as representative of the entire project area. In 1940 there were about 14,500 people residing in Lake County, principally rural. About 81 per cent were native whites, 6 per cent were foreign born whites and 13 per cent were Indians. Over 50 per cent of the Indians have more white than Indian blood. The population density was nine persons per square mile.

#### Area Economy

The economy of the Flathead Reservation and Irrigation Project area is dependent upon agriculture and related industries, lumbering and recreational facilities with agriculture furnishing fully 95 per cent of the income. Business conditions in the area therefore are, and will continue to be, related to the level of production of agricultural products and their exchange value. According to the 1939 census for Lake County, 53 per cent of all employed workers were engaged in agriculture; 3 per cent were engaged in timbering and the manufacture of lumber; 1 per cent in food processing; and about 43 per cent of all those gainfully employed performed services as a source of income.



## BRIEF HISTORY OF THE FLATHEAD INDIAN RESERVATION

The history of the Flathead Indians for the last two centuries has been closely related to the expansion of white civilization in the Pacific Northwest. Each successive wave of white influence, as borne by the explorer, the fur trader, the missionary and the emigrant, contributed not only to the development of the Northwest country but also to the decline and collapse of the native culture of these Indians. The Flathead of today are a product of this historic process.

The Indians of the Flathead Reservation are descended from three tribes, the Selish or Flathead proper, the Pend d'Oreille and the Kutenai. The aboriginal economy of the Flathead was that of simple hunting-gathering type. The varieties of food included buffalo, deer, elk, roots and berries. 1/

The buffalo contributed greatly to the economic existence of these Indians. Buffalo meat was the chief article of food. From the hide were made tepees, robes, shields, boats and almost every conceivable article of dress and furnishings. Every portion of the animal from its horns to its hoofs contributed in some way to the economic existence of the Indians. Although the buffalo were hunted by the Indians, the greater herds were never appreciably depleted by them. It remained for the white man to accomplish extinction of the vast herds. This disaster resulted not only in a tremendous loss of the Indians' food supply but in the destruction of much of their social and religious life as well. 2/

The earliest important effect of indirect white influence was the introduction of the horse. The stimulus provided by the new mode of transportation was responsible for considerable changes in the life of Flathead Indians. It enabled them to engage more fully in buffalo hunting and to transport large supplies of dried meat for future use.

The second important event of this period was the western movement of the British fur trade. As a result of the armed superiority of their enemies the three Flathead tribes began to join together in buffalo hunting east of the Rockies and were saved from complete disaster only by the arrival of the white fur traders. 3/

David Thompson in 1809 established two trading posts in or near the territory of the Flathead groups which offered trading facilities to these Indians. To satisfy their immediate needs for trade goods the Flathead at once engaged actively in trapping, securing pelts to exchange for articles most in demand.

The immediate effect of fur trade activity was to promote a rise in the Indians' standard of living. To secure this advantage the Indian was obliged to make a business of hunting and to become a producer of surplus

1/ Shafer's Present Day Flathead.

2/ History of Montana by Helen Fitzgerald Sanders

3/ History of Flathead Indians by Major Peter Ronan

goods. This required greater effort, as before then he had seldom planned beyond his immediate needs.

The process of racial intermixture also had its inception at this time, with many social consequences. Many of the fur traders as well as the French-Canadian halfbreeds, intermarried among the Flathead and brought up families of mixed-blood children. 1/

The rapid development of the Pacific Northwest indicated the need for a definite policy in regard to the Indians. General Isaac I. Stevens, Governor of the new Territory of Washington, whose duty it was to negotiate treaties with the different Indian tribes, passed through the Flathead country in 1853 and became acquainted with several of the tribal chiefs. In 1855 he returned to arrange for the cession of tribal lands to the Government and the selection of a reservation for the Indians. The chiefs and warriors, numbering 300, were assembled and plans were made with them for the treaty council. (Stevens observed that the Indians were extremely friendly, very desirous of following the white man's road and of coming under the protection of the Great White Father). 2/

The Flathead Reservation was first established as a result of the treaty concluded at Hell Gate, in the Bitterroot Valley, July 16, 1855, ratified March 8, 1859 and proclaimed April 18, 1859 (12 Stat. 975). By the terms of this treaty the confederated tribes of the Flathead, Kootenai and Upper Pend d'Oreilles ceded and conveyed to the United States all right, title and interest in the country occupied or claimed by them in exchange for use and occupation by the said confederated tribes and as a general reservation upon which other friendly tribes could be placed, a tract of land included within the following described boundaries: "Commencing at the source of the main branch of the Jocko River; thence along the divide separating the waters flowing into the Bitterroot River from those flowing into the Jocko to a point on Clarke's Fork between the Camas and Horse prairies; thence northerly to and along the divide bounding on the west the Flathead River, to a point due west from the point half way in latitude between the northern and southern extremities of the Flathead Lake; thence on a due east course to the divide where the Crow, the Prune, the So-ni-el-em and the Jocko Rivers take their rise, and thence southerly along said divide to the place of beginning."

In return for the cession of a very large territory to the United States, the treaty granted privileges and benefits to the Flathead. The most important of these were, the establishment of a hospital, a saw-mill and a flour-mill on the reservation; the payment of \$120,000 over a period of 20 years for the use and benefit of the Indians, and for each chief, a salary of \$500 a year for twenty years, a comfortable house, etc.

Executive Order of November 14, 1871 ordered all Indians residing in the Bitterroot Valley removed to the general reservation located in the Jocko Valley near Arlee. In 1872 General James A. Garfield, Special Commissioner drew up an agreement which granted assistance and remuneration to the Selish for removal to the reservation in the Jocko Valley.

1/ Adopted from "Present Day Flathead" by Shaffer

2/ Stevens 1900-1918

Only a few took advantage of this offer. Chief Charlo refused to sign or to move from Bitterroot Valley and it was not until 1891 that the last group was forced through privation to move to the reservation.

By the Act of April 23, 1904 (33 Stat. L. 302), Congress inaugurated the policy of allotting lands to the Indians in severalty and authorized the survey and allotment of lands of the Flathead Reservation, and the sale and disposal of surplus lands not allotted to the Indians.

Beginning in 1907 the Indians were given their choice of allotments and in 1908 patents were issued to 2,390 individuals. Every member of the tribe was given an allotment varying from 80 acres of land classed as irrigable to 160 acres of dry land. Timber in some cases was selected in place of agricultural land. A commission was appointed to inspect, classify and appraise the surplus land. Land not selected by the Indians, except timber land, was classified and made into farm units where considered irrigable, and into dry-land units where the land was believed capable of producing crops under dry farming methods. These homesteads were opened for entry May 2, 1910 and were entered immediately after the opening. In 1920 additional allotments were made to Indian children born after the close of the first allotment period. These allotments provided 40 acres of irrigable land, or 160 acres of grazing land to an individual.

After the opening of the reservation the surplus Indian lands were rapidly homesteaded by white farmers and cattlemen. These, in turn, were followed by merchants and tradesmen. Communication facilities kept pace with economic development and highways were soon traversing the reservation in all directions. The Government day schools were replaced by public schools in which Indian children were obliged to compete with white children. The white population increased until at the present time it is estimated that there are about seven white persons to one Indian.

#### IMPORTANT LEGISLATION AND HISTORY OF PROJECT DEVELOPMENT

Of special significance in the legislative and development history of the project are the following: (a) authorization of the project; (b) the action of Congress to finance the project with public rather than tribal funds; (c) legislation making all irrigation charges a lien against the land; (d) the act requiring the organization of irrigation districts under state law; (e) provisions for power development and distribution; and (f) the various acts of Congress providing for deferring payment of project construction charges, including the Joint Resolution of Congress (53 Stat. 1221) dated August 5, 1939.

#### Irrigation Project Authorized

The Act of April 30, 1908 (35 Stat. 70) provided for surveys, plans, estimates and the beginning of construction of an irrigation project, and \$50,000 was appropriated for this purpose. Congress, by the passage of the Act of March 3, 1909 (35 Stat. 701) appropriated \$250,000 for construction

purposes to be repaid from proceeds of sale of lands. Actual construction was begun in the Jocko Valley in 1909.

#### Power Site Reserves

The Act of March 3, 1909 also provided for the reservation of lands valuable for power or reservoir sites. On April 21, 1909 and on subsequent dates the Secretary of the Interior reported to the Congress the lands withdrawn. With few exceptions no lands have been restored. Practically all of the power reserve lands lie along the Flathead River.

#### Authority to Finance Project with Public Funds

The Act of May 18, 1916 (39 Stat. 123) provided that all tribal funds appropriated and used for construction of the irrigation project should be returned to the tribe and that payments for the irrigation work should be made by the owners of lands benefited. It also provided for the assessment of construction charges against the lands of Indians, but this was later abrogated by provisions of the Act of July 1, 1932 (47 Stat. 564). In accordance with the provisions of the 1916 act, the Flathead tribes were reimbursed for all monies expended from receipts of sale of lands for construction except \$64,161.18. It is recommended that this amount with interest at four per cent from 1916 be returned to the Flathead tribes.

#### Power Development

Early in 1909 construction was started on the Newell Tunnel at the site of what is now known as Kerr Dam. This work continued for two years but was deferred until the need of power for pumping water for irrigation became apparent.

It was not until 1926 that Congress appropriated additional funds for power development. Preliminary plans were drawn up for the construction of a small power plant on the Flathead River but through negotiation the Rocky Mountain Power Company secured a license and built Kerr Dam in lieu of the smaller plant proposed by the project. Under the license the Power Company agreed to pay the Flathead tribes \$200,000 a year for use of the site and agreed to supply the Flathead Irrigation Project with 15,000 horse power of electrical energy for pumping and for other purposes at rates varying from one to two and one-half mills per kilowatt hour. Under provisions of this agreement the project's distribution system has been supplied with most of the energy utilized for pumping irrigation water and for distribution to domestic and commercial users.

#### Irrigation Charges a Lien Against Land

In the Act of May 10, 1926 (44 Stat. 453) it is provided that all construction, operation and maintenance charges, except excess costs of the Camas Division be made a first lien against all lands within the project.

### Irrigation District Contracts Required

The Act of May 10, 1926 supra, appropriated \$560,000 for construction and surveys on condition that no part of the appropriation except the \$15,000 for surveys would be expended until an appropriate repayment contract has been executed by irrigation districts organized under State law. Following this the Flathead Irrigation District was organized to include all non-Indian project lands in the Mission Valley north of Post Creek and non-Indian lands in the Camas Division; the Mission Irrigation District was organized to include non-Indian project lands in the Mission Valley south of Post Creek; and the Jocko Valley Irrigation District was organized to include all non-Indian owned lands in the Jocko Valley. Each of these districts executed a repayment contract.

### Construction Charges Deferred

By Public Notice issued November 1, 1930, the Secretary of the Interior declared the first construction charge assessments thereunder to be due on February 1, 1932. By the Act of February 14, 1931 (46 Stat. 1115) the first payment of construction charges was deferred until the calendar year 1935. The Act of May 9, 1935 again deferred the payment of construction charges until December of 1938. Due to the existence of unfavorable economic conditions on the project brought about by low prices for farm products and the project's inability to deliver sufficient water to irrigate lands under the project, the Secretary of the Interior issued an order dated April 10, 1939 by which construction charges were deferred until the Agricultural Economics Unit completed an investigation of the project as provided by the Act of June 22, 1936 (49 Stat. 1803). Congress by Joint Resolution (53 Stat. 1221) dated August 5, 1939, approved the action of the Secretary.

### PROJECT WORKS

The Flathead Irrigation Project is divided by geographical features into three main divisions known as Camas, Jocko, and Mission Valley. The Camas Division is in the western part of the reservation and obtains its water supply from the Little Bitterroot River and its tributaries. The Jocko Division is in the southern part of the reservation and obtains its water supply from Jocko River and its tributaries and Revais Creek. The Mission Valley Division lies between the Mission Range in the east, Flathead Lake on the north and Flathead River on the west. It obtains its water supply from creeks rising in the Mission Range, from Flathead River, by pumping, and from excess flow of Jocko River.

The Camas Division has no subdivisions or parts. The Jocko Division and subdivision consists of two parts i.e., Upper Jocko terminating in Section 15, T. 17 N., R. 20 W., Montana Principal Meridian and Lower Jocko beginning at a point approximately one-half mile west of the town of Ravalli and terminating at Revais Creek approximately three and one-half miles west of Dixon, Montana.

The Mission Valley Division consists of three principal subdivisions, namely, the Mission subdivision, containing lands lying south of Post Creek, the Post subdivision containing land in the area lying between Post Creek on the south, the Mission Range on the east, Crow Creek and the South Fork thereof on the north and Flathead River on the west; and the Pablo subdivision, containing all project lands to the north of Crow Creek and the south fork of Crow Creek.

The Mission subdivision contains no parts. The Post subdivision is divided into two parts, the Post and Moiese. The Pablo subdivision consists of four parts, i.e., Pablo, Round Butte, Valley View and Polson.

Three diagrams are included herein to show irrigation features in the three main divisions of the project.

The project has 13 storage reservoirs and two catchment basins used to help regulate extremely long canal systems in order to minimize fluctuation and avoid excessive waste. Supplying the 13 reservoirs are 76 miles of feeder canals varying in capacity from 65 to 500 second-feet. There are six main canals which feed the lateral system with a total length of 60 miles and in them are 146 structures. There are 910 miles of laterals for the delivery of water and in these laterals there are 9211 structures. In addition to the above there are also 30 miles of drainage canals. This makes a total of 1076 miles of canals including drainage, 9357 structures in the canals, and 15 reservoirs including the two catchment basins. Included in the above figure for the total canal mileage are approximately 13.1 miles of concrete lined canal. Approximately 69 per cent, or 7.7 miles, of this lining needs extensive repairs at this time. Part of it is so badly deteriorated that it will require complete rebuilding. Many of the structures were built of wood and they too are in bad state of repair.

Used to supplement gravity flow of streams rising on the reservation are three pumping plants. The Flathead River pumping plant near the north end of the project consists of three 67 c.f.s. electrically driven pumps each requiring 3000 horse power for its operation. Water lifted 335 feet by these pumps is dumped into a canal leading into the Pablo Reservoir. The Crow Creek pumping plant near the town of Ronan consists of one 26 c.f.s. unit requiring 150 horse power for its operation. Water is lifted 43 feet by this pump and may be diverted to Nine Pipe Reservoir or directly into the distribution system. The Revais Creek pumping plant located near Dixon consists of one 9 c.f.s. unit requiring 100 horse power for its operation. Water is lifted 79 feet into Revais "R" Canal.

Electric energy for pumping and for resale to commercial users is obtained from the Montana Power Company at rates varying from one to 2-1/2 mills per kilowatt hour. The power system consists of approximately 410 miles of distribution lines, one 320 KW generating station and several substations. The 410 miles of line consist of 89 miles of 33 KV line, 7 miles of 16 KV line and 314 miles of 6900/11,500 volt distribution line. At the present time the project lines are serving 3,150 customers and there are approximately 200 applications for service on file with the Project Engineer. Extension of the lines has been delayed temporarily by reason of the limitation of cost contained in repayment contracts.



Diagram No.III, Showing Camas Division Water Supply and Distribution Features, Flathead Irrigation Project, Montana

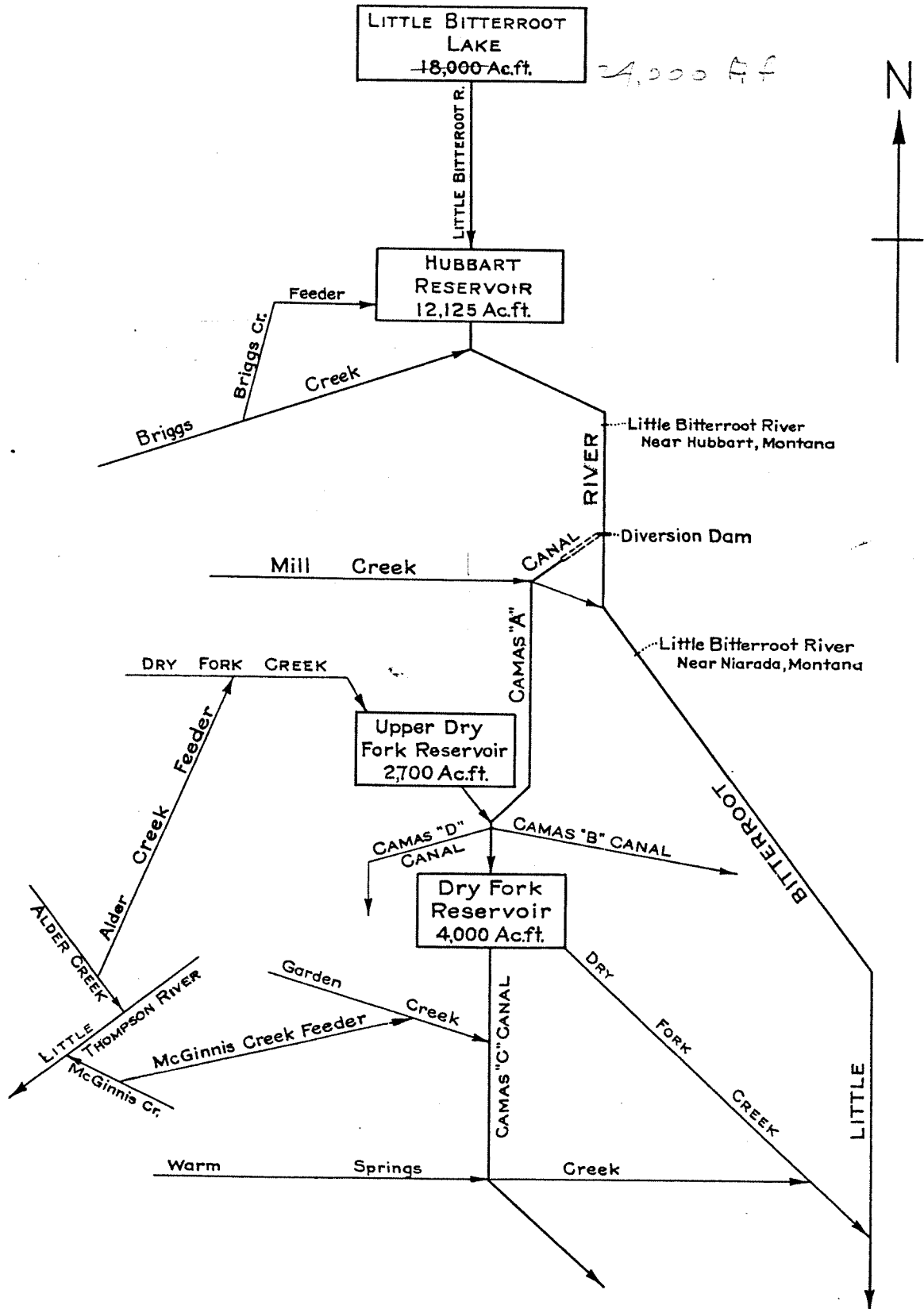
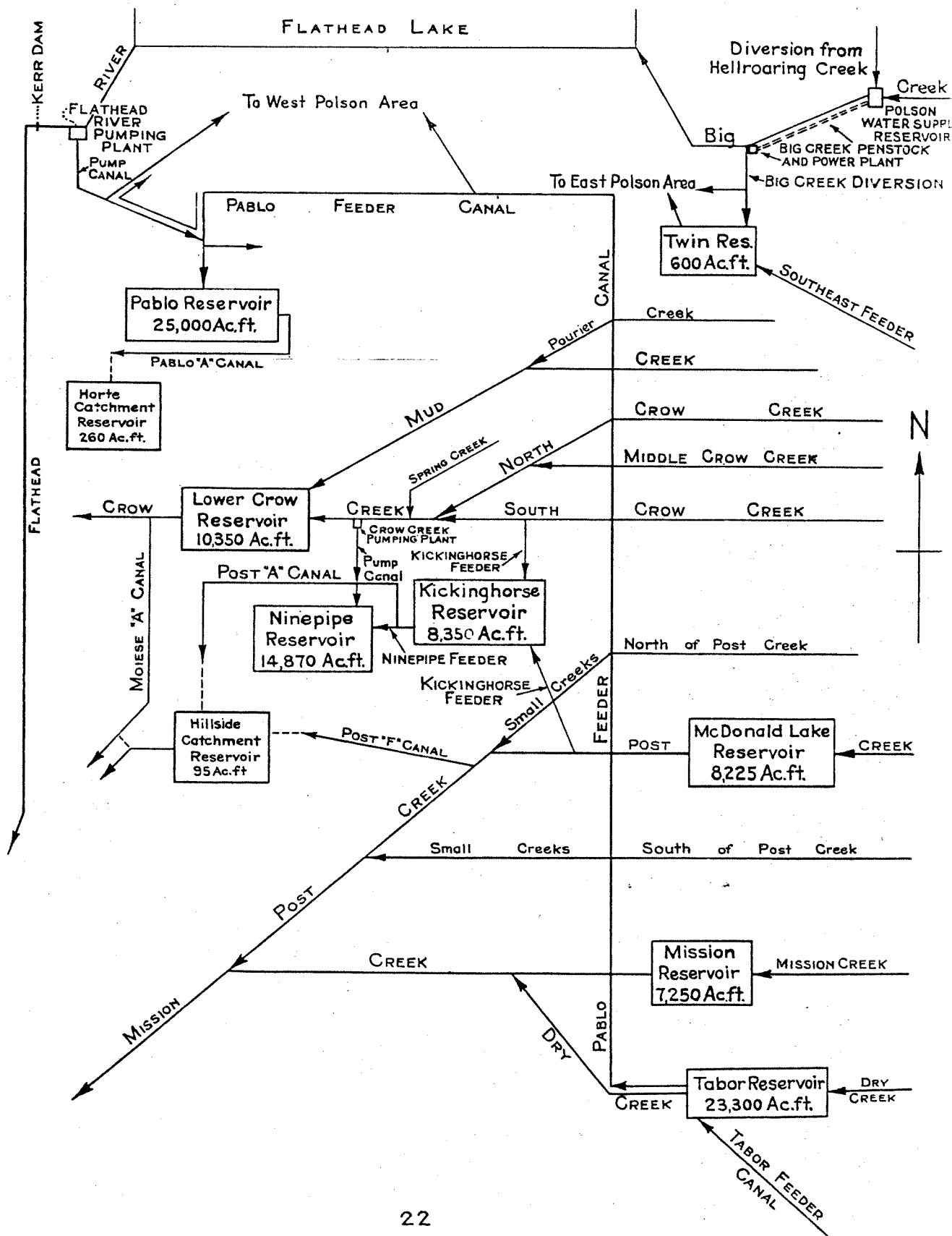




Diagram No. II, Showing Mission Valley Water Supply and Distribution Features, Flathead Irrigation Project, Montana



## SOILS

A soil survey of the Lower Flathead Valley area was completed in 1929 by William DeYoung, Montana Agricultural Experiment Station, in charge, and R. C. Roberts, United States Department of Agriculture. A report was published in 1929 covering the area occupied by the Flathead Project. The geological accumulation or deposition of the sediments from which soils of the area have been formed, the factors affecting or resulting in the present soil forms, and the characteristics of each type are described in the report. The delineation of each soil type is shown on Map No. 1.

The descriptions and data given in the report not only contribute essentially to an understanding of the soils but are directly related to the factors that determine how the soils should be classified for irrigation. Since detailed information is available in the report only a partial summation is given in the following paragraphs:

"The soils which have developed in place by weathering of parent materials are classified in three groups based on differences in profile and permeability of subsoil materials. These are further subdivided on the bases of organic-matter content and color, which reflect environment conditions of rainfall and vegetation.

"The dark-colored soils of the first group having permeable but firm subsoils are represented by soils of the McDonald, Millville, and Polson series. They have developed under a comparatively heavy prairie-grass vegetation and a moderate rainfall. They are well adapted to agriculture, except the areas of excessively gravelly or stony character, and they constitute the most important grazing and wheat-producing soils of the area. Wheat is grown with and without irrigation, and alfalfa and other crops are grown to some extent. Of the dark-colored soils of this group the Missville soils are somewhat more permeable than the McDonald soils, and they require more frequent and copious irrigation. The Polson soils, represented by a single type, have less permeable subsoil materials and less well developed subdrainage.

"The brown grassland soils of the first group are developed under slightly lower rainfall and less abundant grass cover. They are represented by the Trenton soils which have weathered from old glacial-lake sediments of fine texture and highly calcareous character. Alfalfa is an important crop on these soils."

"The lighter-colored soils of this group include the Loneline soils. Exclusive of a steep phase, these are important soils in the production of grains and alfalfa.

"The soils of the second group are characterized by the presence of a tough and comparatively impervious clay layer in the subsoil. These soils are more difficult to handle, have a narrower range of adaptability to crops, and surface drainage and subdrainage are less well developed than in the soils of the first group.

"The darker-colored grassland soils of this group are represented by the Post soils; the lighter-colored soils developed under lower rainfall and prairie and semidesert-land vegetation by the Round Butte soils; and the light-colored timbered soils of the Crow soils.

"The Post soils are extensive. Wheat grown largely without irrigation under a system of summer fallow in alternate years, and alfalfa, grown under irrigation, are the most important crops. Yields average somewhat lower than on the dark-colored soils of the first group.

"The Round Butte soils have somewhat less impervious and intractable subsoils. These soils are of low organic-matter and nitrogen content but are capable of improvement in this respect, under irrigation.

"The Crow soils are mainly timbered or include cut-over but unbroken areas, and they are used mainly for pasture.

"The soil of the third group are characterized by loose sandy and gravelly subsoils and substrata of low water-holding capacity. They are represented by the dark-colored soils of the Flathead and the Hyrum series, and by the lighter-brown soils of the Moiese series. They are of low value for dry-farmed crops but under irrigation are adapted to a wider range of crops than the soils of the other two groups. Potatoes, sugar beets, alfalfa, and truck crops are grown on these soils.

"Flathead very fine sandy loam and Flathead fine sandy loam are extensive, and they are productive under irrigation, though at present they are utilized in part for dry-farmed crops.

"The Hyrum soils consist mainly of gravelly and stony soils which are subject to drought and require large quantities of water in irrigation. They are of little agricultural importance.

"The Moiese soils are developed under conditions of low rainfall and are of low organic-matter content. They are poorly adapted to dry farming and require much water in irrigation but are of favorable character and well located for the production of early truck crops and potatoes, under irrigation. At present they are used mainly for alfalfa.

"The imperfectly developed alluvial soils consist of recently accumulated stratified stream-laid sediments. They are comparatively inextensive and unimportant. They consist of dark-colored soils of the Corvallis series, used to a small extent for farming, and a group of undifferentiated alluvial soils of light color and of variable texture, which are subject to overflow, are poorly drained, and are utilized mainly for grazing.

"The lighter-textured soils, particularly the Round Butte and Flathead soils, are rather low in nitrogen, and some of them are low in phosphorus.

"Most of the subsoil materials are of moderate or high lime content, but the surface soils are in general leached of lime, and the darker-colored soils particularly the Hyrum, McDonald, and the Millville soils tend to become somewhat acid."

Some of the areas of Trenton series in the south and southeastern part of the Jocko Valley consist principally of old stream terrace material and are not underlaid by the pinkish or gray glacial lake sediments.

The more successfully irrigated areas of the Flathead fine sandy loam and Flathead very fine sandy loam have subsoils that are somewhat finer in

texture than are described for these types. They consist of a rather erratic stratification of brownish-gray silt loam fine sandy loam or very fine sand and have fairly good water holding capacity.

#### THE 1930 CLASSIFICATION OF LAND

A soil classification of the Flathead Irrigation Project was carried on by Messrs. Roberts and DeYoung of the Department of Agriculture at the same time the detailed soil survey was being made.

The classification was based on soil, topography and drainage, little distinction being made between farmed and unfarmed lands except where one farm was leveled and the adjoining field had rough, uneven surface relief, which put the latter field in a lower class. The distinction between classes, especially any two consecutive ones, is not sharply defined as the factors of soil, topography, drainage and alkali are often extremely variable within very short distances. Six classes were recognized and defined as follows:

"Class 1 lands include those lands which, with sufficient water, and when farmed under approved systems of crop rotation and good irrigation practices, should be the best lands on the project. These lands handle easily, they have good soil, favorable surface relief and drainage; and are well adapted to diversified farming. These lands should give the maximum returns.

"Class 2 lands include those whose topography, soil or subsoil conditions are slightly more unfavorable than Class 1 lands. They may be more difficult to farm or irrigate than Class 1 but they are not necessarily less productive than Class 1. Some of these lands may have good soil but under irrigation may require inexpensive drainage. They may have a compact subsoil structure which will require greater care in irrigating than the loose, friable nature of Class 1 lands; they may contain many loose stones or may be somewhat rolling or uneven in topography but are always capable of being plowed and irrigated and are adapted to nearly as many crops as Class 1 land.

"Class 3 lands include those lands which, on account of some inherent feature, such as claypan, heavy soil, excessive gravel near the surface, anticipated poor drainage or some other feature will give lessened production over an extended period but are usually so situated and have such surface relief that they may be easily irrigated; however, in some cases they have undulating surface relief. Many farmers on this class of land are making a scant living by milking cows in connection with raising alfalfa and pasture grass.

"Class 4 lands are similar in general character to those in Class 3, but have poorer surface relief and crop production is carried on with difficulty. The soils of this class often have a very gravelly subsoil which comes close to the surface and this sort of land requires prohibitive amounts of water for any crop under irrigation. Some of Class 4

land has a level surface relief but has a very heavy surface soil and a heavy compact clay subsoil and may contain small quantities of alkali. In most cases the land will produce fair yields of alfalfa once a stand is obtained. This land can always be made to produce pasture, but is usually only farmed in connection with better land.

"Class 5 lands are lands which are water-logged or poorly drained or quite steep and rocky; these cannot be irrigated in their present condition, but with considerable expenditure for drainage leveling or clearing may be made of some agricultural value. They are very seeped and may contain alkali in amounts unfavorable for crop production.

"Class 6 lands are those which, for any reason, are unsuited for irrigation."

From the definitions given it is obvious that the soils classed as 1, 2, or 3 were super marginal, the class 4 soil was marginal and in most instances could not be farmed with profit, while the classes 5 and 6 soils were definitely inferior. On the basis of these determinations the acreage of Classes 4, 5 and 6 included within the project should have been held to an absolute minimum. It will be pointed out later that a considerable acreage of the inferior or submarginal lands has been burdened with irrigation charges.

Following the soil survey and the classification of land by Roberts and DeYoung another classification was made by a committee consisting of a soils man, an engineer and a farmer which represented an attempt to combine an irrigability classification with a productive capacity classification, with stress laid on the individual farm as a unit. The six groups or classifications of soils defined by Roberts and DeYoung were condensed into four classes as follows:

"Class one includes land which is presumed to be in such a condition as regards crops, topography and fertility as to be capable of paying both construction and operation and maintenance charges. In general in this class has been placed those areas having classes one and two soils, whether in permanent crop or not and also classes three and four soil where the land has been improved and is in some permanent crop such as hay or pasture. Some of the land with one or two soil has, however, been placed in class two where the land is rough, in irregular tracts or for some reason is not considered to be in a productive state.

"Class two includes lands most of which were placed in classes three and four in the soil survey, lands not in permanent crop, or fields in permanent crop, but which cannot produce maximum returns without considerable additional improvement \* \* \*. This class includes those lands which at present are not believed to be in a sufficiently productive state to enable them to start the repayment of construction charges for a period of five or more years, but which will necessarily pay operation and maintenance charges.

"Class three includes lands placed in class five and in some cases in class six in the soil survey. It includes lands which are very rough, have very thin soil, are seeped, alkaline, or temporarily high but which may be leveled or reclaimed at some future time. (Underscoring supplied) In class three is also included lands which may be advanced to classes one or two when ditches have been constructed to points which are at present non-irrigable from existing canals or laterals. It is considered that this class should be exempt from the payment of both construction, and operation and maintenance charges for a period of five or more years; provided that in case ditches are extended, or turnouts given to the areas of soil classes one, two, three, or four, they shall automatically be advanced to class two, or should water be requested for land placed in class three then operation and maintenance charges should be assessed.

"Class four includes lands placed in class six by the soil survey, lands which will always be non-irrigable because of being high, steep, rocky or for some other reason which renders them permanently non-irrigable. This class should be eliminated from the project and bear no charges due to construction of canals."

The following table was prepared to accompany the report to the Commissioner of Indian Affairs in July 1930.

Table 2. The Acreage of Classes 1, 2, 3 and 4 land as Determined by the 1930 Classification.  
Flathead Irrigation Project, Montana

Division	Totals	Class 1	Class 2	Class 3	Class 4
Totals	161,565.94	43,921.81	59,607.18	34,665.56	23,371.39
Mission Valley No. of Post Cr.	103,817.08	33,929.01	34,812.59	20,735.86	14,339.62
Mission Valley So. of Post Cr.	24,835.49	4,535.68	11,104.76	6,541.75	2,653.30
Jocko Valley	17,851.97	2,019.34	6,861.28	4,484.25	4,487.10
Camas Valley	15,061.40	3,437.78	6,828.55	2,903.70	1,891.37

Total Classes 1, 2, and 3 = 138,194.55

It will be observed from a reading of the definition of Class 3 land that there was included in this group almost every class of soil recognized by DeYoung and Roberts. The Class 1, 2 and 4 lands were reasonably well defined but it was found in working with the 1930 classification data that the Class 3 group contained lands of every conceivable quality, a considerable percentage of which could be irrigated from the system as then constructed. From the standpoint of fertility and use there were two distinct classes of soil included in the Class 3 group. They consist of (a), supermarginal lands without irrigation facilities, and (b) the marginal and submarginal lands largely classed as four, five and six by the soil scientists. In the course of the investigation conducted by the Agricultural Economics Unit every attempt was made with data available to classify

the Class 3 lands within farm units, as to productivity. In the majority of cases these attempts met with failure. In the 1931 classification, lands contained within areas reserved for power site purposes were included, but no record was made of, nor does the schedule approved by the Secretary of the Interior on March 28, 1931 show any figure for, the so-called private water right lands lying within the boundaries of the Flathead Irrigation Project, some of which are served from the project system. There are numerous instances also where the total of acreage of all classes of land does not correspond to the acreage determined by the General Land Office.

An analysis of data that existed in 1940 relative to the soil classification of lands contained in a 25,000 acre block was attempted in order to determine the quality of soil contained within the Class 3 group of lands approved by the Secretary in 1931. The results, while not entirely satisfactory, are indicative of the inherent quality of such lands, and show that it is and will continue to be virtually impossible for farmers to pay irrigation charges from the production of much of the Class 3 land included in the schedule approved by the Secretary of the Interior in 1931. Of the land in this 25,000 acre block, about 25 per cent was classified as No. 3 and 11 per cent was classified as No. 4. Of the Class 3 land included in the schedule, 56 per cent was marginal or submarginal in quality and 44 per cent was fair, good, and excellent land. The larger proportion of the better quality Class 3 land included in the 1931 schedule has been put in irrigable condition and is being assessed for irrigation charges at present.

#### THE 1943-1944 CLASSIFICATION OF LAND

In this report lands of the Flathead Project have been placed in four classes as follows: Class 1, good and excellent agricultural land; Class 2, fair agricultural land; Class 3, poor land having definitely inferior or questionable characteristics, and Class 4, land which is submarginal for crop production, and definitely not suited for irrigation agriculture. Symbols used on Section Plats forming Volume II are T for topography, S for soil, A for alkali, D for drainage, H for high areas, C for a lack of facilities to irrigate the land, P for pot holes, Tim for timber, and R for reservoir or stock ponds. A minus sign following the "C" is used to indicate that the area should be considered non-irrigable and that the construction of irrigation facilities now lacking cannot be recommended. The number preceding the symbol indicates the land classification, such as 1T for first class and 3 T for third class topography, 2S for second class and 3S for third class soil; 2A for second class and 3A for third class land because of alkali conditions, and 4D or 4T for areas that are fourth class because of drainage conditions or topographic features.

Ordinarily soil scientists recognize five or six classes of land in detailed land classification work. Such procedure allows for fine distinctions in the delineation of all factors and makes possible greater similarity insofar as topography of land and character of soil are concerned. By placing land in five or six classes the boundaries of the

various units can be easily defined and therefore the data are of maximum value to individuals and agencies concerned with land appraisals, crop production and the economic use and application of water.

In this report lands of the Flathead Irrigation Project have been placed in four classes as shown on Map No. 2, only two of which are considered above marginal for irrigation. A precedent was established on this project following a classification made in 1930 by which all project lands were placed into four classes. Landowners have become accustomed to this system, all irrigation records have been maintained on the basis of there being four classes of land in the project, and orders of the Secretary of the Interior fixing operation and maintenance charges recognize Class 1, Class 2, and certain Class 3 lands as subject to assessment for irrigation charges. For these reasons four classes of land were designated in this work and they conform in most respects to the original classification made in 1930, except that in the designation of Class 3 land only topography, character of soil, alkali accumulations, drainage and other physical factors were considered. In previous classifications Class 3 land included those areas that were considered third class because of land quality and in addition it incorporated those lands of Class 1 and Class 2 quality to which irrigation facilities had not been extended.

Following are explanations of the meaning of symbols and the numbers preceding them. An area marked 1T 2S has first class topographic features but the soil is of only fair quality. Such an area would be second class land. An area marked 1T 1S 4D has smooth topographic features, good or excellent soil but is fourth class land because of drainage. An area marked 3T 1S 2A is considered too rough or too steep to be irrigated and contains small quantities of salts or alkali, although the soil is of good or excellent quality. Such an area is considered third class land. The land is not placed in a class higher than that indicated by its poorest factor whether it be topography, soil, alkali, drainage or elevation.

Symbol 1T - First Class Topography: Areas marked 1T are comparatively easy to irrigate. They include both smooth gently sloping land that can be used for growing row crops and comparatively smooth-surfaced rolling lands that are not difficult to irrigate by flooding from contour ditches.

Symbol 1S - First Class Soil: First class soil includes good and excellent land for growing irrigated crops. In some places it includes also land that originally was of fair or poor quality but which has been improved and is now producing good yields.

Soils mapped first class include many types that differ in quality and potential productivity. It is believed, however, that Class 1 soil can be kept in a high productive condition for many years if good farming is practiced.

Symbol 2S - Second Class Soil: The soil shown as second class is of fair quality or in a limited number of places is of poor quality for the production of irrigated crops. In many places soil is mapped second class



because of tight clay in either or both the surface and subsoil. In other places the soil is designated second class because it is very sandy or gravelly and leachy in either or both the surface and subsoil, while in some places the soil contains a large quantity of gravel or stone. Some of the land mapped Class 2 because of stoniness would be equal to first class land if the rocks and stones were removed.

Symbol 2A - Second Class Alkali: Where the symbol 2A appears, salt or alkali are present at or near the surface in such quantities that the quality or yields of crops are lower than they would be from similar soils in salt or alkali free areas. These areas may consist of small spots where practically no crops can be produced or they may be rather extensive. In the latter event alkali is present in small quantities and of sufficient intensity to cause a comparatively low yield of the less salt tolerant crops. Most areas of 2A can be improved by growing pasture grasses or other crops that shade the ground surface.

Symbol 2D - Second Class Drainage: The symbol 2D is used to show areas where the underground water level is relatively close to the surface and water is present in sufficient quantity to reduce the yield of crops or to limit the kind of crops that can be grown. The wet condition of soils designated 2D is not considered serious, however, and in most places the excess seepage can be controlled at little expense.

Symbol 3T - Third Class Topography: It is believed that land having third class topographic features is too steep or too rough to be farmed economically under irrigation. Because some individuals can successfully irrigate very steep or very rough land it is some times difficult to delineate the areas of land that should or should not be considered irrigable. In the final analysis the irrigable status of these marginal areas was decided upon by landowners by the execution of agreement either to include or exclude them.

Symbol 3S - Third Class Soil: Third class soil is of such poor quality that it is not recommended for irrigation. In places the soil consists of a compact tenacious clay while elsewhere it may be stony, gravelly, or too sandy for irrigation. Like some of the areas mapped 3T it is possible that careful and painstaking farmers could successfully irrigate areas mapped 3S but practically everywhere the soil is not highly productive.

Symbol 3A - Third Class Alkali: Where symbol 3A appears the land is so highly impregnated with salts or alkali that reclamation is required before crops can be grown. Under conditions existing at present the cost of reclaiming land classified 3A is so high that it was considered non-irrigable from an economic standpoint.

Symbol 3D - Third Class Drainage: The symbol 3D has been used to indicate areas where seepage from higher lands, canals or reservoirs has taken place, or where the underground water table is so close to the surface that only specific grasses and sedges, tules and other water-loving plants grow. Drainage and reclamation in most of these areas would be very

expensive but in some places improvement could be attained at a relatively low cost per acre.

Symbol 4T, 4S: Areas designated 4T are too steep or too rough for irrigation and areas marked 4S are of such poor quality that the land could not be made to pay irrigation charges under average conditions.

Other symbols: Areas too high to be supplied water by canals have been indicated by the symbol H. Potholes too deep to be filled or made suitable for crop production are shown by Symbol P. Potholes that are used for reservoirs or stock watering ponds and marked with the letter R are considered irrigable.

Some of the very poor land that is not being farmed but which is being assessed by the project for operation and maintenance or by the District for administration has been designated Class 3. In the final analysis, however, it is not possible to eliminate these Class 3 areas from the project without the consent of the owner.

#### First Class Land:

First Class land, 1T - 1S, includes several types of soil that differ somewhat in character. All are highly productive, although it is recognized that seepage, alkali accumulation, weed infestation, or poor farming practices may lower the production possibilities on land of this type. By following good farm practices, seepage and alkali can be avoided, weeds controlled, and the land maintained in a productive condition.

Soils of the McDonald, Millville and Polson series, and that of the Flathead series mapped as first class all have dark-colored fertile surface soils, permeable subsoils and favorable subdrainage. As described in the detailed soil survey report, the Flathead types have leachy subsoils that are sandy or gravelly in character. In many places, however, especially in the case of the very fine sandy loam, and to some extent the fine sandy loam, the subsoil consists of strata of silt loam, loam, or fine sandy loam all of which are very permeable but not leachy. Where this more favorable type of subsoil occurs the soil has been mapped as first class.

Small areas of some soils that are heavy and of rather poor quality have been included as first class because the farmer has improved the soil. These include practically all of the Post gravelly silty clay loam, Post clay loam and Post silty loam in T. 18 N., R. 20 W., in the southern half of T. 19 N., R. 20 W., and in the area west and northwest of D'Aste. It is questionable whether any of this land should be mapped as first class but where so classified the land has been improved by growing alfalfa and the soil appears to be in good tilth and highly productive. Usually the surface soils are rather low in organic matter content. The land is of heavy texture in both the surface and subsoil and percolation is so slow that more irrigation water is lost by runoff and evaporation than is true on the medium-textured or more permeable soils. Another area of very similar heavy textured soils placed in first class includes most of the Post silty clay loam, Post gravelly silty clay loam and that part of Round Butte silt loam located

west, northwest and southwest of the Round Butte school. Some areas covering other series and types, although not fully described herein, have been mapped as first class.

Second Class Land 2T, 2S, 2A, 2D

Land may be second class because of rough topographic features, poor quality of the soil, alkali accumulation, adverse drainage conditions, or because of a combination of these. Little or nothing can be done to improve topographic features but frequently drainage can be improved and alkali conditions can be corrected. Soils that are second class because of a preponderance of rocks usually can be made first class by removing the rocks. On the other hand it is very difficult or practically impossible to improve soils mapped second class because of gravelly, sandy or leachy characteristics or because of tight heavy clay surface and subsoil.

Much of the area of Hyrum gravelly loam in Jocko Valley, the Moiese gravelly loam in Moiese Valley, much of the Hyrum fine sandy loam dark colored phase, which is located east and northeast of the Pablo Reservoir, and part of the Moiese fine sandy loam in Moiese Valley and near Pablo, are so gravelly and porous that excessive quantities of water are required to produce crops. The surface soil is moderately fertile in all these locations except in fields where the plant nutrients have been depleted by continuous cropping. Nearly everywhere, however, the surface soil is shallow and because of this, fertility is low. It is very probable that the most gravelly of these soils cannot produce sufficient crops to pay irrigation charges even if supplied more water than is required by 95 per cent of the project land.

Peas produced on this land for seed or vegetables have been reported to return fair profits provided they are grown for a comparatively short period of years. The land utilized for this purpose, however, has usually not been farmed every year and on much of it peas have been grown for two years after which the land has been left idle for two years before being planted again. Such land, even under the best kind of management, is not capable of producing returns over a long period sufficient to pay farm operation costs and irrigation charges.

Several areas of Flathead fine sandy loam have been classified second class because of the leachy character of that soil.

The areas in sections 16 and 21, T. 20 N., R. 21 W. are not only so sandy and leachy that large quantities of water are required for irrigation, but water losses are excessive where canals pass through non-crop sandy lands immediately north and northeast of these areas. Because of these excessive water losses, and regardless of classification, it is suggested that all land in that area be eliminated. The 1930 classification placed these lands in Class 1 and Class 2. A few other small areas of similar character are found where Flathead sandy loam is underlaid by fine sand or loamy fine sand.

Several areas of land have been designated second class because of heavy textured soils and low fertility. The Post silty clay loam, Post gravelly silty clay loam, Post clay loam, Post clay loam heavy phase, Round Butte silt loam and Round Butte silty clay, heavy phase, are all of rather heavy texture. Where these soils have not been farmed enough to show marked improvement or where, on the slopes, erosion has left only a thin layer of surface soil, they have been mapped second class, and where the quality is very poor they have been mapped third class.

#### Third Class Land, 3T, 3S, 3A, 3D

Third classland includes that having a topography too rough to be economically and efficiently irrigated, having soil too poor in quality to return appreciable profits, having alkali or salts in such quantities to prevent crops from making favorable growth or having a watertable too high to permit growth of other than a limited number of water tolerant plants. Limited acreages of steep or rough land, ordinarily considered too rough for irrigation farming, might be farmed successfully by careful farmers who are experienced in irrigating and farming steep or rough land, but generally all of the 3T areas should not be included in the project.

Soils mapped third class because they are stony, gravelly or leachy and therefore having poor production possibilities include extensive areas in the Jocko and Moiese Valleys. In these areas third class land is too droughty to be considered irrigable.

Heavy soils mapped third class include extensive areas of Round Butte silty clay, heavy phase, and Post Clay loam, eroded phase. Other third class areas occur where the surface soil has been eroded from Post Clay loam, Post gravelly silty clay loam, Post silty clay loam and where virgin areas of Round Butte silt loam are undeveloped or where they are somewhat slick or slightly puddled by alkali. Possibly some of these lands could be improved, but because of cost and the time necessary to accomplish this, and considering the relatively poor yields of crops these soils would produce as compared with the cost of operating them, it is inadvisable that any of the third class soil be included in the project.

Some few areas mapped third class because of alkali could be reclaimed whereas others would be too difficult or costly to reclaim.

Excessive quantities of salts or alkali have had their origin principally in the lake laid sediments rather than in the moraine terrace, or glacial outwash material. The lake strata are identified with or underlie the Lonepine soils and Round Butte soils and form the subsoil of part of the Polson, Flathead and Trenton soils. Alkali has accumulated as a result of poor drainage in several parts of the project. Where adequate drainage has been provided, much of the alkali has been removed by growing shade crops such as barley, grasses, or sweet clover. These tolerate moderate quantities of alkali. Strawberry clover, a shade crop which provides good pasture and tolerates wet and salty conditions should be planted, at least experimentally, on land where foxtail grass is displacing alfalfa and other farm crops. Shade reduces evaporation while irrigation water leaches the alkali

down and out of the soil. It is difficult to reclaim the heavier-textured soils that are very slowly permeable. In places where seepage has occurred and alkali has accumulated on the lower hillside slopes reclamation is equally difficult. The alkali on these lower slopes is deposited at the surface by evaporation of water that has percolated through the lake deposited material and usually appears at the surface immediately above a stratum that is less pervious than the overlying material. Water applied on sloping land moves down into the soil and then tends to follow the channels of least resistance. It is difficult therefore on a steep slope to get water to penetrate a slowly permeable or slightly dense stratum if the material above it is less dense and allows a more rapid movement of water.

Areas mapped third class that would be somewhat difficult to reclaim but which can be reclaimed when adequately drained include the flat lands south and southwest of Polson in sections 8, 9, and 10, T. 22 N., R. 20 W., and in sections 35 and 36, T. 20 N., R. 21 W. Many alkali affected areas occur in or adjacent to small drainage channels in the Lonepine soils and could be reclaimed at reasonable cost.

Many areas mapped third class because of poor drainage conditions could be reclaimed if adequate drainage were provided. It is obvious that in some places drainage and reclamation would not be expensive and should be provided. In many other places the cost would be high and the effects of rather extensive ditching might not provide adequate drainage. Many of these areas are of nominal value for pasture and the difference between what they produce now and what they would produce after being drained would not justify the cost of installing drains.

#### Timbered Areas or Stump Land

The timbered areas or stump land include both smooth and rough land having soil of both good and poor quality. These characteristics are indicated on the map and in some places it is recommended that timbered areas be included. In other areas, where the timber is very dense or the soil is of poor quality, the land is not well suited for irrigation. Most of the timbered areas of Crow gravelly silt loam or Crow stony loam are not recommended for irrigation. Because the surface horizon of these soils is very low in humus and the subsoil consists in most places of tight clay which is very slowly pervious to water, the soils are considered as being very poorly suited to irrigation agriculture. The body of Crow gravelly silt loam soil east of North Crow Creek in sections 29 and 32, T. 21 N., R. 19 W., is of better quality than other areas so designated. In that area the timber is not dense, and because of this there has been considerable grass growth, the residue of which has enriched the top 6 or 8 inches of surface soil. The surface soil is comparatively free of stone and the subsoil is more like that of the McDonald soils than the subsoil of Crow gravelly silt loam.

#### Fourth Class Land

Fourth class land includes all areas where topographic features, quality of soil, alkali, drainage, or dense timber cover are such that the land obviously should not be considered irrigable. Other class four lands

include roads, canals and main laterals and areas that are so high that irrigation is impossible from the system as now constructed.

Table 3 has been prepared to show the classification of 190,975 acres of land within or adjacent to the Flathead Irrigation Project, Montana. The table shows that of the total acres classified 62,664 are class 1; 59,473 are class 2; 5,673 are class 3; and 63,165 are class 4. The relatively large area of class 4 land needs some explanation. The figure includes rough land, swamps and marshes, land with thin soils and drainage courses. Also included in the Class 4 group are areas of land occupied by the highway, project canal and lateral right of ways. Portions of one-sixteenth section subdivisions above the project main canal, where some land within said subdivision is possible of irrigation from project facilities, is included as Class 4 land.

Table 3. The Classification of 190,975 Acres of Land within and/or Adjacent to Flathead Irrigation Project, Montana.

Division	G. L. O. Total Acres	Land Classes			
		1	2	3	4
Total Area	190,974.96	62,664.05	59,473.30	5,673.10	63,164.51
Jocko Division	21,382.04	4,921.59	7,141.37	538.68	8,780.40
Mission Valley South of Post Creek	29,851.78	14,315.71	8,178.49	326.86	7,030.72
Mission Valley North of Post Creek	120,094.18	37,512.43	39,461.10	4,028.42	39,092.23
Camas Division	19,646.96	5,914.32	4,692.34	779.14	8,261.16

The data shown in Table 3 include all of the lands that were classified in the 1930 survey except lands withdrawn for power site purposes and in addition certain tracts located adjacent to project lands where at some future date it may be possible to extend project facilities for their irrigation. In addition the classification of the so-called private water right lands are included.

#### PRIVATE WATER RIGHTS

In 1854 Catholic missionaries established a mission for the Flathead Indians at St. Ignatius and almost immediately began to grow crops on lands nearby. Because of sparse rainfall during the growing season and the existence of a copious flow of water in Mission Creek and other streams with their source in the surrounding mountains, irrigation was resorted to. "Some of the Indians, upon their own initiative or urged on by the agents of the reservation or the advice and example of the missionaries, took up from the lands of the reservation little allotments of their own, where they built their homes \* \* \* and fenced them in \* \* \*. Upon their enclosed lands, they gradually began to raise crops, wheat, potatoes and other vegetables, etc. To better succeed in this, some built ditches and \* \* \* used water for the necessary irrigation of their enclosed lands \* \* \*. Their

little farms were individual \* \* \*. No one ever interfered with these Indians in the use of water required for the beneficial and necessary irrigation of their lands to raise their crops." <sup>1/</sup> Thus prior to authorization of the irrigation project many Indians, and whites in behalf of Indians, had constructed ditches leading from streams of the reservation to their lands.

In a letter from Mr. C. J. Moody, then Project Engineer, to Mr. Porter J. Preston dated March 16, 1928, the question of private ditches was covered substantially as follows: "In the construction of the Flathead Project the plan has been to interfere as little as possible with private ditches. Private ditch systems in the Jocko Division used for the irrigation of 1,334 acres, were destroyed but in Mission Valley and Camas owners of so-called private water rights have been allowed to continue the use of their old ditch systems. Most private rights cover a part only of the entire irrigable area of the farm. Where the government system has been constructed to the farm, water is delivered to the part not having a right the same as to other irrigable areas. All of the original private water rights were acquired while the land was in Indian ownership. The areas irrigated were determined by survey covering the period from 1913 to 1917 and the rights thereof were approved by the Secretary's Office on April 21, 1923. There are many white owners of land formerly belonging to Indians who think that the extent of the water rights granted should be increased. Such cases often warrant a hearing. These are considered by a committee composed of the Superintendent of the Flathead Agency, the Project Engineer and a member of the Flathead tribe following which a recommendation is made to the Commissioner of Indian Affairs regarding the action which should be taken."

Questions concerning so-called private water rights have been the subject of many controversies and in two cases court action was involved, i.e., the McIntire case and the Alexander case. Legally, there were far-reaching opinions rendered in the McIntire case, and the Alexander case was dismissed without prejudice. From a practical standpoint, however, the control of water used on these so-called private water right lands is almost as far from solution as at the time the project was begun. In a survey completed by representatives of the Agricultural Economics Unit and project employees in 1943 it was found that of the 348 Secretarial water right grants there are 136 on streams where the Flathead Project has no material interest such as Sullivan and Valley Creeks. These 136 rights covered 2893.4 acres of land.

Of the water rights of concern to the project that were granted by the Secretary of the Interior, seven have been surrendered; four at various times between 1931 and 1939, and three were surrendered by landowners during the time this investigation was in progress.

After dismissal of the Alexander case an attempt was made to negotiate agreements with non-Indian landowners who acquired lands formerly allotted to Indians to which the Secretary had granted a water right. In order to obtain the necessary information a representative of the Agricultural Economics Unit spent a large part of the 1943 year on the Flathead working with project employees in surveying the lands to which a so-called private

<sup>1/</sup> From report by Rev. J. Tealman, S. J., Missionary to the Flathead Indians.

water right had been granted by the Secretary of the Interior. It was found that of the rights granted which are of concern to the project, the Secretarial water right had been extended to cover about 12 per cent more land. It was also apparent that a number of the non-Indian private water right users had practically abandoned their Secretarial water right grants. Most of these latter cases involved such lands where the original acreage was apparently too great for the water supply available in the streams from which the private ditches diverted. In other cases, project construction crews, in the process of building project facilities, had cut or destroyed the private ditches and landowners were obtaining necessary supplies from project sources and/or through project facilities. It is significant, however, that while many of the owners appeared willing to pay the full operation and maintenance charge on acreage for which Secretarial water right grants had been made, they were not willing to sign agreements surrendering their rights to the Flathead Project.

At a meeting with landowners having so-called private water rights at St. Ignatius, Montana, in February 1944, attended by the Assistant Commissioner, Chief Engineer, and District Counsel of the Indian Service, landowners were encouraged to execute agreements to surrender their so-called private water rights and place distribution of all Flathead Reservation waters of concern to the Flathead Project, under Flathead Project officials. A proposition was advanced by the government officials in attendance to allow a paid-up construction charge on all Secretarial water right acreage as extended. Except for this one meeting where interested landowners attended en masse, interest in the proposed plan has apparently subsided.

For the most part, lands which were originally served by private ditches lie adjacent to stream courses or are located where ditches could be constructed with little expense. Many of these lands are marginal or submarginal in quality and in fact, many of the so-called private water right lands were shown as Class 4 land in the 1930 classification. However, when working up the schedule of classes 1, 2 and 3 lands in the project in 1931 the so-called Secretarial water right acreage was extended to lands not reached by private ditches and shown as Class 1 or Class 2 land in the survey. The irrigable area of a tract, when a so-called private water right was involved, apparently was determined by subtracting the acreage of the so-called private water right land granted by the Secretary from the acreage of classes 1 and 2 land as determined in the 1930 land classification. The schedule submitted and approved by the Secretary in March 1931, contains no data showing the acreage of private water right land considered. That is to say the procedure used in setting up the 1930 land classification extended the Secretarial water rights to hundreds of acres of the better quality lands that can be served by project facilities.

Nothing was done in the course of this investigation to disturb the procedure used by the 1930 land classification committee and to be consistent in cases where private water right acreage existed, the same procedure was used in the determination of the area of project lands. This procedure established in 1930 and approved by the Secretary of the Interior March 28,



1931, apparently without a full knowledge of the facts, cannot be considered equitable or fair. It in reality, grants the private water right user water supplies for the inferior lands within the boundaries of his farm and usually used for pasture, and allows the use of water on a similar acreage of land that theoretically should be considered as project lands inasmuch as the private ditches at the time of the construction of the project could not serve the better quality lands within the same legal subdivision. Where the regulation defined in Sec. 130.18 of Title 25 Code of Federal Regulations is enforced, a landowner pays 50¢ per acre for service. However, on tracts where a private ditch is used in whole or in part the project receives no remuneration for the delivery of water to lands outside the boundary of the original Secretarial water right grants. Moreover, this low charge for service is not adequate to pay costs of operation and maintenance, and it is recommended that the regulation be modified to provide that the charge of service be the same as the regular operation and maintenance assessment against project lands.

#### DUTY OF WATER

As indicated in those sections of this report describing soils and the 1943-44 land classification, the water requirements for optimum yields of crops varies greatly, generally in accordance with soil types, topography, water holding capacity of the soil, availability of soil moisture to plants, length of growing season, and the types of crops grown. Attempts have been made by project officials to provide for these differences by allowing above average quantities of water for lands having characteristics believed to justify such procedure to obtain good yields of crops. Many landowners expressed dissatisfaction with this method, however, which resulted in a duty of water determination being made by this Unit. This determination was based upon: (a) soil characteristics; (b) topography; (c) location of land; (d) the water requirements deemed necessary during the growing season to grow alfalfa, pasture, sugar beets and other crops requiring relatively large applications of water for optimum growth; and (e) results obtained by landowners applying various quantities of water over a seven-year period. These data are shown for each one-sixteenth section by color on Map No. 3.

Because of the wide variation in supply from year to year it was thought desirable to express the duty of water in relative terms rather than in terms of so many acre-feet per acre. When project officials estimate the probable supply for a given year from snow surveys, quantities in storage, etc. they can vary the amount delivered in accordance with the relative duty as determined and shown.

Lands of the project were divided into seven groups depending upon their requirements for water to produce optimum yields of crops. Those lands requiring the smallest quantity for the production of good yields were assigned a relative duty of 100. The six other duty areas expressed in relative terms are as follows: 125, 150, 175, 200, 230 and 300. The 100 duty lands are shown in blue and the remaining six duties are as follows: Yellow - 125, Green - 150, Purple - 175, Orange - 200, Pink - 230, and Brown - 300.

Assuming average water supply conditions, the 100 duty areas would be supplied 1.3 acre-feet per acre at the land. Under like conditions of flow, lands in the six other areas would be supplied water at the land as follows: (a) 125 duty = 1.6 acre-feet; (b) 150 duty = 2.0 acre-feet; (c) 175 duty = 2.3 acre-feet; 200 duty = 2.6 acre-feet; (e) 230 duty = 3.0 acre-feet and (f) 300 duty = 4.0 acre-feet per acre. Assuming that only 120,000 acres of excellent, good, and fair land in the area will demand water, the requirements at the land under average conditions of runoff will be about 1.77 acre-feet per acre for the project as a whole.

The surface soils of areas shown to require a relative duty of 100 are practically all permeable and the subsoils are either easily or slowly permeable. No soils in this water duty grouping are leachy, and the water holding capacity of both the surface soil and subsoil is good.

Land for which a relative duty of 125 is required includes some soils that are very permeable but not leachy, and other soils that are not readily permeable. The less permeable include the heavy-textured soils that take water very slowly although they have a high water holding capacity and the moisture available to plants in the finer colloidal clay is less than in the medium textured soils. For this reason more frequent irrigations are needed on the clay than on the soils of medium texture and losses by evaporation are higher because the water must remain on the land for comparatively long periods before it penetrates to the deepest plant roots. Land with soils of good or fair quality having rough or steep topography or lands which are cut by drains or canals to such an extent that it is difficult to irrigate without considerable loss by run-off, have been included in the 125 duty group. In Moiese Valley, near the Flathead Agency, in the lower Jocko district and to some extent in the Valley View district and the western part of the Round Butte district, there are areas of good quality soil and smooth gently sloping surface which have been placed in the group requiring a relative duty of 125. All of these areas are in localities where the rainfall is slightly less and the growing season slightly longer than in the more easterly part of the project. Because of this, such land usually requires one more irrigation per season than is necessary in other parts of the project. The dividing line between 100 and 125 duty groups in the area northeast of St. Ignatius was located near the boundary line separating soils of the Post series from soils of the McDonald series. The McDonald soils in that part of the area, namely, in sections 8, 17, 20, 29 and 32, T. 19 N., R. 19 W. do not contain as much gravel in the surface or subsoil as in many other parts of the area and because of this it is thought that a relative duty of 125 is appropriate. Isolated areas of comparatively flat lands in those sections may not require that much water. The soil is sufficiently porous that water may be lost if run on the land for long periods.

Soils of very different character are designated as requiring a relative duty of 150. Large areas containing the less gravelly parts of the McDonald gravelly loam northeast of St. Ignatius have been included in this group. The areas of Millville gravelly loam in the central and western parts of Sec. 31, T. 18 N., R. 19 W., have characteristics more

nearly like those of McDonald gravelly loam than those of Millville gravelly loam, and for that reason have been designated as requiring a relative duty of 150 rather than the lower duty as recommended for most of the Millville soils. Other rather extensive areas where a relative duty of 150 is recommended consist of a large part of the Flathead fine sandy loam, Flathead very fine sandy loam, and Polson silt loam including its gravelly and spotted phases. The subsoil of these types and phases is not considered leachy but owing to the rather erratic stratification of different textured materials, slightly leachy spots exist in many places. Generally, however, a relative duty of 150 is adequate for these soils. The areas of Millville loam, hilly phase in sections 11 and 12, T. 22 N., R. 20 W., and in sections 23 and 24, T. 22 N., R. 21 W., are not as leachy as typical Millville loam. Part of the Post very fine sandy loam near Ronan has subsoil characteristics very similar to that of the better areas of Flathead very fine sandy loam and for this reason has been shown to require a relative duty of 150. Ordinarily a relative duty of 100 would be adequate if the subsoils were of silty clay loam or clay texture like those under most of the Post soils.

Soils for which a relative duty of 175 is recommended include Flathead fine sandy loam and small areas of Flathead very fine sandy loam and Flathead fine sand. Extensive areas also of Millville loam, McDonald stony loam, and limited areas of Hyrum stony loam have been shown to require a relative duty of 175. A few 40-acre tracts included under this duty occur where Corvallis silty clay loam, brown phase, occupies part of the tract and Post soils comprise the rest of it. Post soil is, of course, not leachy. In all areas where a relative duty of 175 is recommended the soils are considered slightly leachy and water is lost by percolation. An economic use of water on these areas can be effected by using comparatively short runs, close spacing of ditches where possible and by holding the irrigation water on the land only until it has penetrated to the moist subsoil. The farmer can determine this by using a soil auger to study the depth of penetration as he irrigates.

The areas for which a relative duty of 200 is recommended are very similar to those for which a relative duty of 175 is recommended except that they are somewhat more gravelly or sandy resulting in a greater loss of water through the subsoil. Included are extensive areas of both Millville gravelly loam and the Hyrum soils. Other soils requiring this duty include Flathead fine sand and Moiese fine sandy loam.

Soils for which a relative duty of 230 is recommended include soils of the Hyrum series, those of the coarser textured Moiese series and areas of undifferentiated alluvial soils. These soils are known by both farmers and project officials to be of poor quality and of very leachy character.

A large portion of the Hyrum gravelly loam of the Jocko district and most of the Moiese gravelly loam in Range 22 W., are exceptionally gravelly or stony and so leachy that a relative duty of 300 has been considered proper. It is more practical in the Moiese area than in other parts of the project to irrigate the leachy land because the growing season there is slightly longer, certain vegetables do well on the coarse-textured and warmer soils, and water supplies are usually adequate.

## WATER SUPPLIES AND IRRIGATION REQUIREMENTS

Stream flow records for some Mission Valley streams date as far back as 1906, when investigations for the Flathead Project were initiated by the United States Reclamation Service. Records of flow for other streams in Mission Valley began at later dates, principally in 1911 or 1912 and from 1917 to 1919. Flow records for Jocko Valley streams cover in general the period 1912 to 1920. Practically all records of flow for project streams were discontinued in 1924 when project operation and construction work was turned over to the United States Indian Irrigation Service. Stream flow measurements were resumed in 1931 and 1932 but were again discontinued after one or two years. Data used in this report were obtained from available stream flow records, from monthly reports submitted to the project engineer by watermasters of the various divisions and from other project sources. All project stream flow records available for years prior to 1939 were systematically compiled and published by the U. S. Geological Survey in water supply paper No. 916. Stream flow data were contained in Mr. Paul V. Hodges' report on water supply and irrigation of the Flathead Project and submitted in September 1939. Mr. Hodges in a number of cases showed no records of flow for some of the winter months and in a few instances only total annual discharges were given. In this report estimated monthly flows have been supplied in most of these cases to complete monthly flow data for the entire year. Missing data pertaining to monthly flows were obtained by applying the ratio existing between the total flow of record during the year and the total of average flows of record for corresponding months to the recorded average flow for each month to be supplied. Missing records in the nearly all cases were those of winter flows. Since recorded flows during the remainder of the year represent from 75 to 90 per cent, and in the majority of cases from 85 to 90 per cent of the total annual flow, it is obvious that no errors of consequence would result from the use of the ratio method. Also, it is probable that such errors would, to some degree, be compensating. In cases where only the total annual discharge was given, monthly distribution was computed on the basis of monthly averages of all recorded flows.

Monthly flow data in Mr. Hodges' compilations of stream flow have been completed for the years shown in his report, with the exception of those in the Camas area, and similar data have been added for years subsequent to 1938, based upon records and information obtained from the watermasters and from other project sources. Flows for several small streams not included in Mr. Hodges' compilations have been added.

### Total Discharge of Mission Valley Streams

The total annual discharge of Mission Valley streams above the Pablo Feeder Canal has been estimated for all years from 1907 to 1943 inclusive. The estimate for each year is based on the relationship existing between the total discharge of all streams for which complete discharge data have been compiled for that year, and the total computed average annual discharge of such streams. The same relationship was presumed to exist between the computed average discharge of all Mission Valley streams and the total

estimated discharge of all streams for each year. The resulting estimated total annual discharge in acre-feet and per cent of average, together with departures from average in acre-feet, are shown in Table 4. The estimated total annual discharges over the 37-year period are plotted on Chart I., together with records of climatic year precipitation in inches for the stations located at Polson and St. Ignatius, Montana.

Table 4 shows that for the 37-year period, the average annual runoff of Mission Valley streams above the Pablo Feeder Canal was 164,600 acre-feet, the maximum runoff was 261,900 acre-feet or 159.1 per cent of average, and the minimum runoff was 112,600 acre-feet or 68.4 per cent of average. In 15 of the 37 years annual runoff was above average, and in 22 of the 37 years it was below average.

Table 4. Estimated Annual Runoff of Mission Valley Streams above Pablo Feeder Canal, Departures from Average and Percent of Average, from 1907 to 1943, Inclusive. <sup>1/</sup> Flathead Irrigation Project, Montana.

(All runoff quantities are expressed in acre-feet)

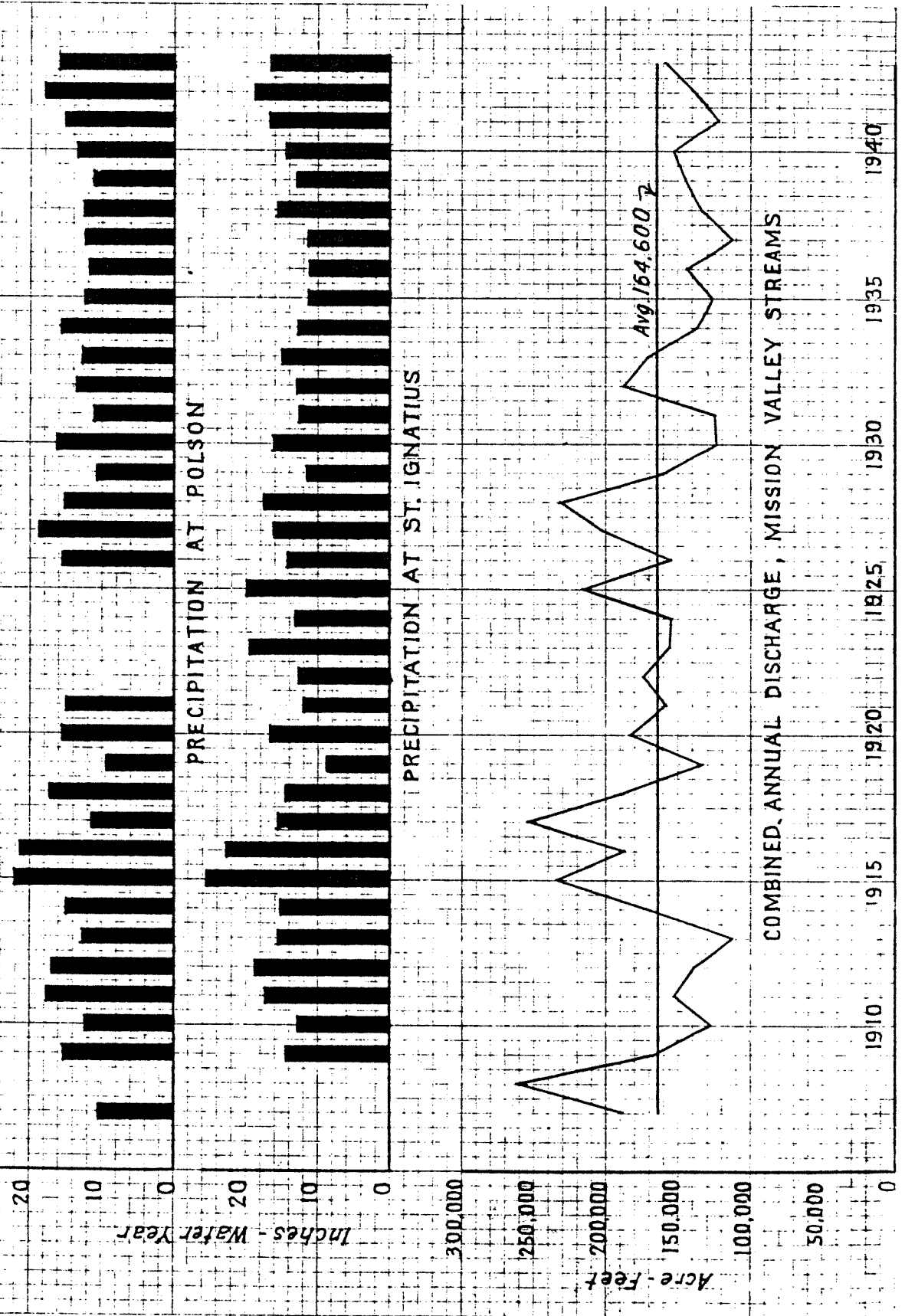
Year	Total Discharge	Departure from Avg.	Per cent of Avg.	Year	Total Discharge	Departure from Avg.	Percent of Avg.
Average	164,600	0	100.0	1925	215,000	50,400	130.6
1907	187,900	23,300	114.2	26	156,400	- 8,200	95.0
8	261,900	97,300	159.1	27	202,100	37,500	122.8
9	168,600	4,000	102.4	28	231,900	67,300	140.9
1910	127,600	-37,000	77.5	29	159,100	- 5,500	96.7
11	153,000	-11,600	93.0	1930	124,300	-40,300	75.5
12	139,600	-25,000	84.8	31	126,400	-38,200	76.8
13	112,900	-51,700	68.6	32	189,500	24,900	115.1
14	172,200	7,600	104.6	33	170,200	5,600	103.4
15	235,300	70,700	143.0	34	137,000	-27,600	83.2
16	187,500	22,900	113.9	35	128,800	-35,800	78.2
17	254,600	90,000	154.7	36	143,800	-20,800	87.4
18	183,700	19,100	111.6	37	112,600	-52,000	68.4
19	133,100	-31,500	80.9	38	133,100	-31,500	80.9
1920	181,600	17,000	110.3	39	143,800	-20,800	87.4
21	158,100	- 6,500	96.0	1940	152,100	-12,500	92.4
22	173,100	8,500	105.2	41	120,900	-43,700	73.5
23	157,200	- 7,400	95.5	42	138,700	-25,900	84.3
24	156,000	- 8,600	94.8	43	159,400	- 5,200	96.8

<sup>1/</sup> Maximum discharge occurred in 1908 and minimum discharge occurred in 1937.

### General Plan of Analysis

The general plan followed in making the analysis of water supply and use was to apply the supply available to the estimated diversion requirements by months, taking into account the capacities of feeder canals and assuming full utilization of existing storage facilities. Because of the comparatively few years for which complete runoff data for all of the main streams are available and because of breaks in the sequence of such years, applications of supply to requirements were made only for average, maximum and minimum years of supply. For this reason the supply available in each

Chart 1: Hydragraph Showing Combined Annual Discharge of All Mission Valley Streams Above Pablo Feeder Canal by Calendar Years from 1907 to 1943, and Annual Precipitation for Corresponding Water Years of Record at Polson and St. Ignatius, Montana  
 FLATHEAD IRRIGATION PROJECT, MONTANA



of the three typical years was applied independently to requirements for the one year only, i.e. in a manner that would leave all reservoirs empty at the end of the irrigation season, thus eliminating the factor of possible storage carry-over. Because of limited storage capacity available for the Jocko and Mission Valley lands combined with the necessity of heavy use of storage after July 1st in any year, the total storage carry-over for these units, even in a year of maximum runoff, would never exceed 30,000 acre-feet. In the Camas area all surplus above requirements in any year can be carried over in the reservoirs.

#### Determination of Average, Maximum and Minimum Flows

Practically all runoff data available were used to determine the supply in the average year from all Mission Valley streams. The highest and lowest annual flows for each stream were used for maximum and minimum years respectively. This was true except for a few small creeks for which average flow data only were available. Figures for the maximum and minimum years for these creeks were obtained by applying to the average flows the percentages of average annual flow shown in Table 4 for the maximum and minimum years.

Available discharge records for Jocko Valley streams in most cases covered only the period 1912 to 1920 inclusive. Because of this fact, flows for the average, maximum and minimum years of record were adjusted by proportion to correspond to the average, maximum and minimum flows for all Mission Valley streams. For example, referring to Table 4, the average flow of Mission Valley streams for the 37-year period is 92.5 per cent of the average flow of these streams from 1912 to 1920 inclusive; therefore, the average flows of Jocko Valley streams computed from the 1912-1920 records, were converted to the 37-year average by applying the above percentage. The maximum and minimum flows of Jocko Valley streams as shown by the 1912 to 1920 records were those of 1917 and 1919 respectively. These flows were adjusted to the 37-year maximum and minimum for Mission Valley streams by applying the ratio existing between the flows for 1917 and 1919, and the 37-year maximum and minimum flows respectively. Since the 37-year maximum flow which occurred in 1908, is 102.8 per cent of the flow shown for 1917, this percentage was applied to the 1917 record flows of Jocko Valley streams to obtain the adjusted maximum flows. The 37-year minimum flow which occurred in 1937 is 84.6 per cent of that in 1919; therefore, this percentage was applied to the recorded flows of Jocko streams to obtain the adjusted minimum flows used in the analysis. Diversions from Placid Creek to the Middle Fork of Jocko River were begun in 1937. Average, maximum and minimum annual diversions since that time were used and converted to the 37-year average, maximum and minimum years for Mission Valley streams in the same manner as explained for Jocko Valley streams. Data on average, maximum and minimum flows above diversions for Jocko Valley, Mission Valley, and Camas Division streams are shown in Table 5.

Average monthly flows originating below the Pablo Feeder Canal that are tributary to the Lower Crow Reservoir were estimated by Mr. Hodges and are included in his report of September 1939. Additional records that have been kept of such flows are not sufficient to make possible a dependable revision of these estimated. However, calculations made from available data show

substantially the same average annual yield from this source, and for this reason Mr. Hodges' estimates of average monthly flows were used. These average monthly flows were converted to the estimated 37-year maximum and minimum flows by proportion, using the percentages of average shown in Table 4 for maximum and minimum flows.

Table 5 - Average, Maximum and Minimum Annual Discharges in Acre-feet for Jocko Valley, Mission Valley and Camas Division Streams, and Years in which Maximum and Minimum Flows Occurred. Flathead Irrigation Project, Montana. (All quantities of water are expressed in acre-feet)

Stream or Streams	Average Discharge	Maximum		Minimum	
		Year	Discharge	Year	Discharge
<u>Jocko Valley</u>					
Placid Creek Diversions	7,347	1943	10,183	1941	3,043
Middle Fork Jocko River	22,788	1917	37,336	1919	12,625
North Fork Jocko River	42,900	1917	67,631	1919	25,316
Falls Creek <u>1/</u>	9,335	1917	13,961	Est.	5,477
So. Fork Jocko River, Small Creeks & Revais Creek Pumping Plant. <u>2/</u>	88,854	1917	129,836	1919	47,781
<u>Mission Valley (Discharges above Pablo Feeder Canal)</u>					
Dry Creek	16,414	1917	26,000	1919	10,853
Mission Creek	35,395	1925	52,194	1937	22,790
Ashley and Small Creeks South of Post Creek <u>3/</u>	7,050	Est.	11,216	Est.	4,822
Post Creek	56,008	1908	81,160	1941	41,317
Small Creeks North of Post Creek	7,330	1942	9,192	1941	5,482
South Crow Creek	13,620	1920	17,968	1937	9,630
Middle Crow Creek	6,950	1932	8,625	1941	4,918
North Crow Creek	13,557	1920	23,125	1941	8,473
Mud Creek	3,203	1922	7,833	1938	1,152
Fourier Creek	697	1943	969	1942	493
Big Creek	5,048	1917	8,796	1920	3,214
Southeast Feeder (Twin Res.) <u>3/</u>	700	Est.	1,112	Est.	480
Hellroaring Creek <u>4/</u>	644		0		949
<u>Camas Division <u>5/</u></u>					
Little Bitterroot River at Lake	4,050	1916	10,500	1941	1,950
" " " below Lake	14,380	1916	25,500	1941	3,430
Mill Creek	2,550	Est.	3,825	Est.	600
Alder and Dry Fork Creeks	1,880	1942	3,074	1941	770
Warm Springs Creek	360	Est.	540	Est.	200

- 1/ No records for 1919. Minimum estimated on basis of 1919 discharge of North Fork Jocko River.
- 2/ Discharges shown for this group are those during the irrigation season only from May 1 through September.
- 3/ Maximum and minimum computed as 159.1 and 68.4 per cent respectively, of average discharges.
- 4/ Discharges shown for this stream represent computed diversions required.
- 5/ The methods used to determine discharges of streams contributing to this area are explained in the Camas section of this report.



Estimates of pumpage at the Crow Creek and Flathead River pumping plants were based in general upon needs for such pumpage, limited by the maximum capacity of the plants and requirements of lands to which it could be applied. The Crow Creek plant pumps water from Lower Crow Creek to the Ninepipe Reservoir and distribution system, thus making possible a more even distribution of supplies available for lands under the Lower Crow Reservoir and other lands in the Post Division. The Flathead River pumping plant pumps water from Flathead River to the Pablo Reservoir, thereby furnishing a supplemental supply for the project.

For the Crow Creek plant, average pumpage by months has been estimated on the basis of available records since 1936, when the plant was first put into operation. Although the pumped water must be carried for a short distance in a canal the records show that this plant has been operated consistently throughout the winter months. For this reason no restriction of operation was assumed on account of weather conditions. Estimates of monthly pumpage at the Crow Creek plant for both the maximum and minimum years of runoff, follow the same schedule from October 1 to the following April 1 as shown for the average year. This was done on the assumption that until results of late winter snow surveys are available, usually around April 1, no dependable prediction of water supplies for the coming season, and the consequent pumping requirement at this plant, can be made. For the maximum year no pumping is shown from April 1 to September 30, since supplies from gravity sources other than Lower Crow Creek would be more than sufficient for lands of the Post Division. For the minimum year pumping at maximum capacity of the plant beginning April 1 is assumed but continued only to the extent that season deficiencies are equalized for lands in the Post Division and lands under the Lower Crow Reservoir.

For the Flathead River pumping plant it was assumed that no water would be pumped from October 1 to the following April 1 in any year. Two reasons for this assumption are given: (1) dependable prediction of supplies from runoff and consequent estimates of need for supplemental water cannot be made until late winter snow survey data are available; and (2) use of the concrete lined pump canal under winter weather conditions would not be advisable. For the average year, season pumpage was computed as the difference between total diversion requirements and the average total supply available from other sources for Mission Valley lands less the East Polson area and that part of the Moiese Subdivision under the Lower Crow Reservoir. The latter area was excluded in determining the required amount of Flathead River pumpage for the reason that in the average year considerable surplus from the supply available for this area would be passed down Crow Creek and such surplus could not be used on any other lands in the Mission Valley area. Subject to maximum capacity limitations of the plant, monthly distribution of pumpage from Flathead River was computed on the basis of the supply of gravity water available for the areas on which the pumped water could be used and the monthly diversion requirements of such areas. For a maximum year supplies from runoff sources used in conjunction with storage, were more than adequate for all diversion requirements, and no pumpage from Flathead River was needed. For the minimum year the total deficiency in runoff supplies for the Mission Valley areas was much greater than the total quantity of Flathead River water that could be pumped from April 1 through the irrigation season. For this reason the pumping plant is shown to be operated at full capacity from April 1 through

August. The quantity pumped during September was limited by diversion requirements of the areas that could be served with Flathead River pumpage.

The monthly quantities used for average, maximum and minimum years for runoff originating below the Pablo Feeder Canal tributary to the Lower Crow Reservoir, and quantities used for the Crow Creek and Flathead River pumping plants are shown in detail in a comprehensive report covering the subject, prepared by this Unit in June 1945. The data presented in this report show the effect of making monthly applications of irrigation requirements to available supplies for the Post, Pablo and Lower Crow Reservoir areas.

#### Irrigable Acreages and Water Requirements

Irrigable acreages and water requirements at the land were derived from the preliminary compilations made from field sheets of the 1943 irrigable land classification and duty of water studies conducted by the Agricultural Economics Unit.

Table 6. - The Approximate Number of Acre-feet of Water Required for the Entire Project and by Divisions for 114,254 Acres of Project Land and 6,422 Acres of So-called Private Water Right Land as Determined from the 1943-44 Land Classification and Duty of Water Studies. 1/  
Flathead Irrigation Project, Montana

Divisions	Irrigable Land Classification Acres				Total Acres	Water Required	
	Class 1	Class 2	Class C 2/	P. W. R.		Acre ft.	Per Acre
Total	58,475	54,718	1,061	6,422	120,676	213,854	1.77
Jocko Valley	4,045	6,361	3	1,546	11,955	32,124	2.69
Mission Valley	48,897	43,933	1,058	4,719	98,607	167,794	1.70
Camas	5,533	4,424	—	157	10,114	13,936	1.38

1/ Acreage figures do not conform exactly to the acreage recommended for designation as the irrigable acreage in this report.

2/ Temporarily non-irrigable because of lack of facilities.

Table 6 shows tentative irrigable acreages, and water requirements at the land for the entire project and for the three main irrigation divisions.

In the detailed tabulations from which data in Table 6 were compiled, figures for Mission Valley lands were further segregated as to the various irrigation divisions and subdivisions comprising that portion of the project. In order that water delivery areas might conform more closely to the geophysical features of water supply sources and distribution facilities, certain areas were regrouped and proper adjustments made in the irrigable acreage and water requirement totals shown in the original detailed tabulations by irrigation divisions and subdivisions. The regrouping of areas consisted of separating lands under the Lower Crow Reservoir from other lands in the Post Division, and dividing lands in the Pablo Division into three subareas, comprised of lands below the Pablo Reservoir, lands in the East Polson area irrigated from Big Creek and Twin Reservoir, and lands above the Pablo Reservoir including the west Polson area which can be served directly from the Pablo Feeder Canal and the Flathead River pumping plant. Since all of the latter area can be served from the Pablo Feeder Canal but only part of it is irrigable from the Flathead River pumps, it was further divided to show the acreage and water

requirements of the portion that could be served from the pump canal. The east Polson area was also divided as to lands that can be served directly from the Big Creek Canal and lands that can be served only from Twin Reservoir.

The Camas Division was divided into two areas to show lands above Dry Fork Reservoir and lands under Camas "C" Canal located below the reservoir. The reason for this was that water entering Dry Fork Reservoir, together with the small quantity available from Warm Springs Creek, can be used only on the area shown as below Dry Fork Reservoir.

Adjustments in total irrigable acreage and water requirements to conform to the above regrouping of areas were made from the original detailed tabulations in which irrigable lands are listed by legal subdivisions. The regrouping of areas with the corresponding total irrigable acreage; average annual water requirements at the land; and average annual diversion requirements for each area are shown in Table 7.

Table 7 - Total Irrigable Acreages, Annual Water Requirements in Acre-feet at the Land and at Diversion Points for Jocko, Mission Valley and Camas Division Lands.

Flathead Irrigation Project, Montana			
Unit	Total Irrigable Areas Acres	Annual Requirement at Land Acre-feet	Annual Requirement At Diversions Acre-feet
<u>Jocko Valley</u>	<u>11,955</u>	<u>32,124</u>	<u>64,248</u>
<u>Mission Valley</u>	<u>98,607</u>	<u>167,794</u>	<u>289,602</u>
Mission Division	22,936	41,095	68,492
Post Division 1/	24,403	34,663	57,772
Lower Crow Reservoir Area	5,294	16,454	28,370
East Polson Area 2/	1,200	2,400	4,286
Pablo Division 3/	<u>44,774</u>	<u>73,182</u>	<u>130,682</u>
Below Pablo Reservoir	(31,605)	(46,646)	(83,295)
Above Pablo Reservoir 4/	<u>(13,169)</u>	<u>(26,536)</u>	<u>(47,387)</u>
Excluding W. Polson Area	(11,242)	(22,569)	(40,302)
West Polson Area	<u>(1,927)</u>	<u>(3,967)</u>	<u>(7,085)</u>
Maximum Flathead River Pumping Plant, Direct 5/	<u>(2,827)</u>	<u>(5,927)</u>	<u>(10,585)</u>
East Polson, served only from Twin Reservoir	<u>(244)</u>	<u>(448)</u>	<u>(800)</u>
<u>Camas Division</u>	<u>10,114</u>	<u>13,936</u>	<u>23,220</u>
Above Dry Fork Reservoir	6,143	8,040	13,400
Below " " "	3,971	5,896	9,820

1/ Post Irrig. Division less Lower Crow Reservoir Area. 2/ Twin Reservoir and Big Creek Area. 3/ Pablo Irrigation Division less East Polson Area. 4/ Includes West Polson Area. 5/ West Polson Area plus additional area above Pablo Reservoir possible to serve from Flathead River Pumping Plant.

## Overall Losses

In this report, the percentage of losses, including reservoir losses, between points of diversion and delivery at the land was determined to be 50 percent for the Jocko Division; 40 percent for the Mission Division, 40 percent for the post Division exclusive of Lower Crow Reservoir; 42 percent for the Lower Crow Reservoir area; 44 percent for the Pablo Division; and 40 percent for the Camas Division.

Conclusions of Mr. Paul V. Hodges relative to irrigation losses were based upon the relationship between quantities diverted and quantities delivered at the land as determined from project records and other data. Table 8 shows quantities compiled for the Mission Valley and Camas areas from records and data for the years 1939 through 1943 and also for the portion of Mission Valley under the Lower Crow Reservoir from records covering the period 1933 through 1943. Partial estimates were used for a relatively small percentage of the total amount diverted, but the results are believed accurate.

For purposes of comparison, Table 9 was prepared from U.S. Reclamation Service project histories showing diversions, deliveries, waste and losses. These data covered the period 1911 to 1923 for the entire project, and from 1919 to 1923 for each of the three main divisions, Jocko, Mission Valley and Camas. These data show consistently higher percentages of loss in all three divisions than those determined by Mr. Hodges or those shown in Table 8.

Table 8 - Total Diversions, Deliveries and Computed Waste and Losses for the Mission Valley and Camas Divisions for the Years 1939 to 1943, Inclusive, and for the Lower Crow Reservoir Area from 1933 to 1943 Inclusive. <sup>1</sup>/ Flathead Irrigation Project, Montana.

MISSION VALLEY DIVISION						
(All quantities of water are expressed in acre-feet)						
Source	Average	1939	1940	1941	1942	1943
From Jocko River	33,924	39,976	43,746	24,412	26,102	35,386
Dry Creek	11,688	11,000	12,000	10,000	11,028	14,414
Mission Creek	34,995	33,000	35,000	30,000	42,258	34,115
Post Creek	44,404	43,214	45,182	38,560	43,390	51,672
South LaRose Creek	778	749	680	482	978	1,000
North LaRose Creek	1,665	1,609	1,755	1,547	1,621	1,793
South Marsh Creek	598	513	615	196	871	797
Middle Marsh Creek	3,935	4,645	3,828	3,013	4,729	3,457
North Marsh Creek	939	2,636	285	244	993	535
South Crow Creek	14,286	14,305	13,541	11,854	15,299	16,431
Middle Crow Creek	5,326	5,359	7,284	918	6,629	6,440
North Crow Creek	10,228	9,510	10,654	8,473	9,884	12,617
Mud Creek	2,768	1,689	1,751	3,800	2,630	3,969
Pourier Creek	692	700	400	900	493	969
Hellroaring & Big Creeks	2,164	2,200	2,000	2,300	2,000	2,321
South East Feeder	630	650	600	650	600	651
Crow Pumps	6,813	3,510	5,411	9,257	6,758	9,129
Flathead Pumping Plant	14,690	8,981	23,038	35,316	2,485	3,631
Total Diversions	190,523	184,246	207,770	181,922	179,348	199,327
Delivered at Land	89,451	84,455	109,937	82,531	68,542	101,700
Waste and Losses	101,072	99,791	97,833	99,391	101,806	97,537
Percent of Diversions	53	54	47	55	62	49

<sup>1</sup>/ Data on Diversions to Jocko Division are not available for recent years.

Table 8 (Continued)

## CAMAS DIVISION

## Camas "A" Canal below Mill Creek

(Quantities computed from gage height records or obtained from watermasters' monthly reports)

Month	Average	1939	1940	1941	1942	1943
January						
February	62		238		72	
March	438	159	523	369	640	300
April	1,201	1,545	922	238	1,800	1,500
May	2,073	3,393	2,244	807	1,922	2,000
June	1,417	2,216	1,487	223	1,200	1,960
July	1,499	3,801	860	1,105	490	1,240
August	1,055	2,258	149	267	620	1,980
September	372	180			180	1,500
October	14		67			
November	144		74	210	270	165
December	120			566	36	
Total	8,395	13,552	6,564	3,785	7,430	10,645
Alder & Dry Fork Creeks	1,876	2,014	1,207	771	3,054	2,332
Warm Springs Creek	290	600	300	200	350	500
Total Diversions	10,661	16,166	8,071	4,756	10,834	13,477
Delivered at Land	6,515	9,642	4,443	3,040	6,836	8,616
Losses	4,146	6,524	3,628	1,716	3,998	4,861
Percent of diversions <sup>1/</sup>	39	40	45	36	37	36

<sup>1/</sup> Losses for the period excluding 1943, in which some of the quantities are estimated, averaged 40 percent of diversions.

## LOWER CROW RESERVOIR AREA

Moiese "A" Canal Diversions, Deliveries at Land and Computed Losses for Period 1933 through 1943

Year	Diverted Moiese "A" Canal	Delivered at Land	Distribution Losses	
			Acre-feet	Per cent
Average	18,810	10,851	7,959	42.3
1933	19,700	11,267	8,433	42.8
1934	17,846	10,190	7,656	42.9
1935	17,922	10,577	7,345	41.0
1936	19,273	10,654	8,619	44.7
1937	13,547	8,117	5,430	40.1
1938	16,744	10,896	5,848	34.9
1939	16,815	10,315	6,500	38.7
1940	24,032	13,828	10,204	42.5
1941	18,944	9,330	9,614	50.7
1942	21,487	12,123	9,364	43.6
1943	20,602	12,069	8,533	41.4

Note: Over-all losses of 42 percent were used in the analysis for the Lower Crow Reservoir area.

Table 9 - Diversions, Waste, Losses and Deliveries at the Land Compiled from Records Contained in the U.S. Reclamation Service Project Histories for the Periods 1911-1923 and 1919-1923. Flathead Irrigation Project, Montana (All quantities of water are expressed in acre-feet)

<u>Entire Project</u>					
Year	Diversions	Waste	Losses	Waste & Losses	Deliveries
Average 1911-1923	57,370	5,052	28,922	33,974	23,396
Percent of Diversions	100	8.8	50.4	59.2	40.8
1911	10,177	2,455	3,252	5,707	4,470
1912	17,598	488	8,765	9,253	8,345
1913	15,421	2,079	7,328	9,407	6,014
1914	23,778	2,611	12,415	15,026	8,752
1915	16,112	648	11,827	12,475	3,637
1916	23,942	5,986	12,205	18,191	5,751
1917	54,853	2,905	30,257	33,162	21,691
1918	84,448	4,659	45,093	49,752	34,696
1919	112,183	8,649	52,123	60,772	51,411
1920	80,961	5,104	36,647	41,751	39,210
1921	113,114	7,300	58,369	65,669	47,445
1922	108,854	11,858	56,616	68,474	40,380
1923	84,367	10,934	41,086	52,020	32,347
Average 1919-1923	99,895	8,769	48,968	57,737	42,158
Percent of Diversions	100	8.8	49.0	57.8	42.2
<u>Jocko Division</u>					
Average	18,628	585	10,676	11,261	7,367
Percent of Diversions	100	3.1	57.3	60.4	39.6
1919	25,842	531	12,583	13,114	12,728
1920	21,398	—	12,748	12,748	8,650
1921	19,138	—	11,754	11,754	7,384
1922	15,834	2,396	9,288	11,684	4,150
1923	10,930	—	7,005	7,005	3,925
<u>Mission Division</u>					
Average	71,314	6,106	33,755	39,861	31,453
Percent of Diversions	100	8.6	47.3	55.9	44.1
1919	76,050	3,286	35,666	38,952	37,098
1920	54,523	3,912	21,155	25,067	29,456
1921	83,755	6,238	41,564	47,002	35,953
1922	78,424	8,078	39,179	47,257	31,167
1923	63,818	9,018	31,209	40,227	23,591
<u>Camas Division</u>					
Average	9,953	2,077	4,538	6,615	3,338
Percent of Diversions	100	20.8	45.5	66.3	33.7
1919	10,291	4,832	3,874	8,706	1,585
1920	5,040	1,192	2,744	3,936	1,104
1921	10,221	1,062	5,051	6,113	4,108
1922	14,596	1,384	8,149	9,533	5,063
1923	9,619	1,916	2,872	4,788	4,831

Monthly Distribution of Water Use

Table 10 shows water deliveries at the land by months for the several divisions in the project. These figures were compiled from quantities shown in the Watermasters' monthly reports for the years 1933 through 1943, and also from project records of deliveries from 1935 through 1941. In Table 11 averages obtained from the quantities in Table 10 are shown both in acre-feet and in per cent of average season deliveries.

Table 10:

Water Deliveries at the Land by Months, Irrigated Acreages and Use of Water in Acre-feet per Acre by Years, as Shown by Watermasters' Monthly Reports from 1933 to 1943 inclusive, and as Shown by Project Water Delivery Records to Farms from 1935 to 1941 inclusive. Flathead Irrigation Project, Montana.  
(All quantities of water are expressed in acre-feet.)

Year	JOCKO DIVISION		Mission Division		Post Division		Fablo Division		TOTAL MISSION VALLEY		CAMAS DIVISION		ENTIRE PROJECT 1/
	Monthly Reports	Water Records	Monthly Reports	Water Records	Monthly Reports	Water Records	Monthly Reports	Water Records	Monthly Reports	Water Records	Monthly Reports	Water Records	
1933 Apr.	204												204
May	1,277				1,534		947		2,581		1,433		5,291
June	5,870		4,721		9,842		11,063		25,628		3,397		34,693
July	5,284		7,553		11,109		12,531		31,293		3,540		40,117
Aug.	4,008		4,035		8,332		8,229		20,596		1,777		26,381
Sept.	1,272		702		2,332		2,306		5,340				6,612
Oct.													
Total	17,715		17,011		33,249		35,176		85,436		10,147		113,298
Acreage	5,524		8,976		16,174		21,879		47,029		6,359		56,912
Ac.Ft.per Ac.	3.21		1.90		2.06		1.61		1.82		1.60		1.92
1934 Apr.	33		101				11		112		159		304
May	3,557		8,274		5,500		6,946		17,720		3,563		24,940
June	4,364		2,120		5,405		6,686		14,211		2,355		20,930
July	4,157		4,914		8,840		8,918		24,412		4,802		33,371
Aug.	2,972		2,781		6,734		5,830		15,545		2,535		20,852
Sept.	1,471		2,612		2,114		272		2,998		632		5,101
Oct.	431												431
Total	16,965		16,101		28,393		30,304		74,798		14,146		105,329
Acreage	4,550		9,721		17,428		21,496		48,645		7,020		60,215
Ac.Ft.per Ac.	3.73		1.66		1.63		1.41		1.54		2.02		1.76
1935 Apr.							15		15				15
May	1,524		1,459		943		4,948		3,996		3,732		10,010
June	4,472		5,651		5,559		8,347		9,524		9,893		1,880
July	5,700		3,596		4,914		7,808		6,908		8,918		3,278
Aug.	3,027		2,719		2,356		5,590		8,313		21,640		2,823
Sept.	1,600		1,649		1,065		2,082		4,058		12,377		1,874
Oct.	271		842				968		830		4,233		3,765
Total	16,594		15,054		16,348		28,898		28,023		27,049		74,871
Acreage	5,740		4,500		10,887		19,550		23,627		23,661		54,364
Ac.Ft.per Ac.	2.89		3.34		1.56		1.44		1.22		1.15		1.37
1935 Apr.							6		6				6
May	2,172		2,022		1,694		6,327		5,756		5,581		13,776
June	4,458		4,325		5,201		4,745		4,594		7,940		17,753
July	4,564		4,252		6,030		10,718		13,806		12,279		32,504
Aug.	2,458		2,374		2,544		6,587		3,709		3,521		15,242
Sept.	992		1,070		257		2,863		2,710		40		149
Oct.	235												2,903
Total	14,599		14,043		17,637		31,522		31,528		31,125		29,570
Acreage	5,807		4,687		11,169		19,803		19,874		24,003		23,617
Ac.Ft.per Ac.	2.57		3.00		1.58		1.59		1.58		1.30		1.25
1937 Apr.													
May	3,454		3,249		1,806		3,368		5,694		5,731		4,628
June	4,322		4,015		4,011		3,626		4,480		4,778		6,469
July	4,500		4,253		5,812		7,485		7,485		9,891		9,365
Aug.	2,064		2,046		1,893		1,708		3,716		3,606		3,779
Sept.	1,064		924		864		814		1,401		399		384
Oct.													2,664
Total	15,384		14,487		14,386		13,031		22,886		22,783		27,166
Acreage	6,202		4,867		12,735		12,462		20,787		20,668		24,689
Ac.Ft.per Ac.	2.45		2.96		1.13		1.05		1.10		1.10		1.10
1938 Apr.													
May	943		911		888		895		5,622		5,647		4,114
June	5,206		4,966		5,681		4,688		6,351		6,394		4,782
July	4,447		4,318		5,724		5,686		8,166		8,373		9,303
Aug.	3,286		3,098		2,920		3,187		7,183		5,137		5,635
Sept.	657		976		1,662		1,355		4,243		4,259		1,354
Oct.	362												1,334
Total	14,901		14,269		16,875		15,811		31,783		31,856		30,281
Acreage	6,323		4,918		12,523		12,020		21,964		21,906		27,127
Ac.Ft.per Ac.	2.36		2.90		1.35		1.32		1.45		1.45		1.12
1939 Apr.													
May	2,649		3,335		1,959		1,790		7,205		7,834		8,910
June	1,393		1,454		1,257		1,125		3,346		3,346		2,945
July	5,662		6,225		7,448		6,869		11,003		11,077		12,263
Aug.	4,418		3,876		4,932		4,567		7,224		7,430		7,000
Sept.	560		1,302		2,308		2,240		3,156		3,029		1,977
Oct.													1,948
Total	16,045		16,175		17,946		16,691		35,087		32,739		35,422
Acreage	6,234		6,249		12,161		12,103		21,961		21,878		28,802
Ac.Ft.per Ac.	2.57		2.59		1.46		1.37		1.51		1.49		1.17
1940 Apr.													
May	3,197		3,315		2,196		7,714		7,968		8,314		6,578
June	6,712		6,289		6,642		6,657		8,782		11,052		10,690
July	6,440		5,748		6,074		12,401		12,308		15,313		14,062
Aug.	3,124		2,945		5,592		5,141		8,178		9,098		7,134
Sept.	1,011		1,156		2,479		2,527		3,964		3,849		4,749
Oct.							513						4,419
Total	20,502		19,454		23,782		24,566		40,854		42,005		45,301
Acreage	6,572		6,227		11,630		12,342		22,331		22,331		29,286
Ac.Ft.per Ac.	3.12		2.94		2.04		2.06		1.83		1.88		1.56
1941 Apr.													
May	2,642		3,011		1,659		1,349		8,042		7,956		7,720
June	4,454		3,585		2,802		2,462		4,705		4,725		7,517
July	4,224		4,035		7,774		7,801		9,451		9,211		14,081
Aug.	2,196		2,170		3,808		3,576		5,931		5,935		8,888
Sept.	947		900		369		363		1,774		1,110		1,200
Oct.													1,344
Total	14,591		13,701		15,910		15,371		29,303		28,937		36,718
Acreage	7,281		7,283		10,949		10,943		21,818		21,821		29,372
Ac.Ft.per Ac.	2.00		1.88		1.45		1.40		1.37		1.35		1.25
1942 Apr.													
May	574						1,937		780				2,717
June	496						1,032		966				1,932
July	5,774				4,683		9,387		6,480				29,750
Aug.	3,969				7,205		11,009		13,660				34,215
Sept.	832				1,990		5,783		2,996				10,769
Oct.					120		324						444
Total	11,671				14,198		29,472		24,872				68,542
Acreage	7,474				8,915		21,734		26,654				57,305
Ac.Ft.per Ac.	1.56				1.60		1.34		0.93				1.20
1943 Apr.													
May	194				80				174				234
June	1,124				438		5,122		5,015				6,482
July	7,481				9,368		18,337		12,677				40,382
Aug.	6,423				8,562		13,281		14,122				35,966
Sept.	1,328				3,676								

Table 11 - Average Annual and Monthly Water Deliveries at the Land, Average Acreage Irrigated, Average Percent of Use by Months, and Average Season Use of Water in Acre-feet Per Acre, Computed from Watermasters' Monthly Reports from 1933 to 1943, Inclusive, and Computed from Project Delivery Records to Farms from 1935 to 1941, Inclusive.  
 - Flathead Irrigation Project, Montana

(All quantities of water are expressed in acre-feet)

Month or Season	Jocko Division		Mission Division		Post Division		Pablo Division		Camas Division	
	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records
April	70		13		105		55		23	
May	2,015	2,472	1,498	1,479	4,968	6,658	4,571	5,793	1,943	2,071
June	4,061	4,321	3,428	4,125	5,424	5,706	7,331	7,848	2,088	1,930
July	5,205	4,632	6,799	6,558	10,414	9,410	11,456	11,255	2,725	2,394
August	3,452	2,747	4,270	3,297	7,654	6,429	7,216	5,329	1,477	1,044
September	1,067	1,140	1,431	1,230	3,407	2,607	2,077	1,487	490	341
October	117		153		76				11	
Season	15,987	15,312	17,592	16,689	32,048	30,810	32,706	31,712	8,757	7,780
Acreage $\frac{1}{}$ Ac.Ft.per Ac.	2.52	2.42	1.60	1.52	1.55	1.49	1.26	1.22	1.19	1.06

$\frac{1}{}$  Irrigated acreages shown in the watermasters' reports were used to compute acre-feet per acre for project delivery records to farms.

Monthly Deliveries in Percent of Season Total

Month or Season	Jocko Division		Mission Division		Post Division		Pablo Division		Camas Division	
	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records	Monthly Reports	Delivery Records
April	.4		.1		.3		.2		.3	
May	12.6	16.1	8.5	8.9	15.5	21.6	14.0	18.3	22.2	26.6
June	25.4	28.2	19.5	24.7	16.9	18.5	22.4	24.7	23.8	24.8
July	32.6	30.3	38.6	39.3	32.5	30.5	35.0	35.5	31.1	30.8
August	21.6	17.9	24.3	19.7	23.9	20.9	22.1	16.8	16.9	13.4
September	6.7	7.5	8.1	7.4	10.6	8.5	6.3	4.7	5.6	4.4
October	.7		.9		.3				.1	
Season	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.



In Table 11 schedules of monthly water requirements in per cent of season requirements are shown for each area. These schedules were obtained from Table 10, from Mr. Hodges' 1939 report, and from United States Reclamation Service records covering the period 1919 through 1923. The table shows also the percentage schedule used in this study which was derived from the other schedules shown. Percentages computed from United States Reclamation Service records are for the Jocko and Camas divisions only since the data were not broken down for the several areas comprising Mission Valley.

The schedules of monthly requirements in acre-feet appear under appropriate headings in the operation tables for the different areas which are included elsewhere in this report. The purpose of these tables is to show in detail the application of water supplies to irrigation requirements. The schedules were computed by applying the percentages shown in Table 12 under "Schedule of Percentages Used," to the season diversion requirements for the respective areas shown in Table 11.

Briefly the analyses show that in the average year Jocko Valley supplies are adequate to furnish estimated annual diversion requirements of 64,250 acre-feet for the Jocko Division and also a surplus above such requirements of 49,000 acre-feet for diversion to Mission Valley. In a maximum run-off year Jocko Division requirements could be supplied and 90,000 acre-feet of surplus water would be available for diversion to Mission Valley. In a minimum year of runoff the supply for the Jocko Division would be 19,300 acre-feet short of requirements which is equivalent to a deficiency of 28.3 per cent. In such a year 12,250 acre-feet could be diverted to Mission Valley without affecting the quantity that could be used in the Jocko Division. The deficiency shown would to some extent be reduced by use of return flow not accounted for. In any year considerable quantities of water not shown by the analyses would be passed down the Jocko River because there are no additional storage sites available.

In an average year of run-off, supplies for Mission Valley, including surplus water from Jocko Valley and supplemental pumpage from Flathead River of 45,000 acre-feet, are adequate for estimated annual diversion requirements of 289,600 acre-feet. Approximately 8,950 acre-feet (8,000 acre-feet in the Lower Crow Reservoir area and 950 acre-feet in the East Polson area) would unavoidably be passed by diversions. In a year of maximum runoff supplies would be more than adequate with no pumpage from Flathead River and there would be a surplus of between 145,000 and 150,000 acre-feet. The analyses show that not more than 30,000 acre-feet of this surplus could be carried over in reservoirs. In a minimum runoff year supplies, including Jocko Valley surplus and 68,200 acre-feet pumped from the Flathead River, would be inadequate to satisfy requirements by 63,700 acre-feet, which is equivalent to an average deficiency of 22.0 per cent. Practically no water would be passed by diversions in such a year.

The analysis for the Camas Division shows that the estimated annual diversion requirement of 23,220 acre-feet would be available in an average year of runoff. In a maximum runoff year supplies would be more than adequate for diversion requirements by approximately 20,200 acre-feet, all of which surplus could be carried over in storage reservoirs. In a minimum year of runoff, supplies without carry-over storage would be insufficient to furnish estimated diversion requirements by approximately 16,300 acre-feet, which is equivalent to a deficiency of 70 per cent. Even if the extreme minimum year was disregarded, data show that in several of the shorter runoff years deficiencies of more than 50 per cent would result.

Table 12 - Monthly Water Requirements in Percent of Season Requirements for Jocko, Mission Valley and Camas Areas, together with the Schedule of Percentages Used. Data from United States Reclamation Service Records from 1919 through 1923, from Hodges' 1939 Report, Computed from Watermaster's Monthly Reports from 1933 through 1943 and Computed from Project Delivery Records from 1935 through 1941. Flathead Irrigation Project, Montana.

Division or Area	Month	Schedule of Percentages Used	United States Reclamation Service	Hodges' 1939 Report	Watermasters' Monthly Reports	Project Delivery Records
Jocko	April				.4	
	May	13.0	11.0	15.0	12.6	16.1
	June	25.4	27.0	26.5	25.4	28.2
	July	32.6	36.0	31.5	32.6	30.3
	Aug.	21.6	21.0	18.4	21.6	17.9
	Sept.	7.4	5.0	8.6	6.7	7.4
	Oct.				.7	
Mission	April				.1	
	May	9.0	—	10.0	8.5	8.9
	June	24.0	—	29.0	19.5	24.7
	July	39.0	—	35.0	38.6	39.3
	Aug.	20.0	—	18.0	24.3	19.7
	Sept.	8.0	—	8.0	8.1	7.4
	Oct.				.9	
Post 1/	April				.3	
	May	19.0	—	21.0	15.5	21.6
	June	20.0	—	22.0	16.9	18.5
	July	31.0	—	31.0	32.5	30.5
	Aug.	21.0	—	18.0	23.9	20.9
	Sept.	9.0	—	8.0	10.6	8.5
	Oct.				.3	
Pablo 2/	April				.2	
	May	15.0	—	16.0	14.0	18.3
	June	23.0	—	28.0	22.4	24.7
	July	34.0	—	31.0	35.0	35.5
	Aug.	20.0	—	17.0	22.1	16.8
	Sept.	8.0	—	8.0	6.3	4.7
	Oct.					
Lower Crow Reservoir 3/	April	4.0	—	4.0	—	
	May	17.0	—	17.0	—	21.2
	June	20.0	—	20.0	—	17.4
	July	27.0	—	27.0	—	27.6
	Aug.	22.0	—	22.0	—	22.3
	Sept.	10.0	—	10.0	—	9.7
Camas	April				.3	
	May	20.0	13.0	16.0	22.2	26.6
	June	24.0	25.0	26.0	23.8	24.8
	July	31.0	36.0	32.0	31.1	30.8
	Aug.	17.0	17.0	18.0	16.9	13.4
	Sept.	8.0	9.0	8.0	5.6	4.4
	Oct.				.1	

1/ Post Irrigation Division less lower Crow Reservoir Area. 2/ The "Schedule of Percentages Used" shown for the Pablo Division, was used for all areas within that division. 3/ For the reason that percentages derived from project delivery records included Hillside lands irrigated from Post Division, the percentages used are identical with those shown by Mr. Hodges.

## PREVIOUS ESTIMATES REGARDING PROJECT AREA

In 1907 an arrangement was made with the United States Reclamation Service whereby that organization would furnish the engineering personnel to make surveys and to carry on the construction work of the Flathead Irrigation Project. In accordance with this arrangement, survey work was started on July 8, 1907. Reservoir sites were selected and surveyed; topographic surveys were made of all lands to which it appeared possible to extend the irrigation system; power possibilities on the Flathead River were investigated; and hydrographic studies were undertaken to the extent of beginning stream gauging on all the principal streams of the project.

The irrigable area of the project was first determined to be 152,000 acres. This figure was reduced by elimination of areas considered too rough for irrigation and areas along Flathead Lake where it was originally planned to apply water by pumping. Specifically, the 152,000-acre figure was adjusted by excluding 6,000 acres of land adjoining Flathead Lake, by reducing the acreage in Mission Valley by 10,000 acres, eliminating completely from consideration 3,000 acres along Sullivan Creek, decreasing the acreage along the Little Bitterroot River by 1,000 acres and deducting 2,900 acres from the area near Dixon and Ravalli where it was at first thought possible to irrigate 4,000 acres, and by completely eliminating 5,000 acres in the Camas Prairie area. A slight increase from the original 152,000-acre figure was indicated in the Jocko Division near Arlee where the acreage first set at 12,000 acres was increased to 12,400 acres. Taking these adjustments into consideration, the figure of 124,500 acres was arrived at and reported as irrigable. This acreage was made subject to construction charges under the public notice issued by the Secretary of the Interior on November 1, 1930. At the time the public notice was issued, it was estimated that, of the 124,500 acres considered irrigable, 112,000 acres could be served from then-existing facilities. Prior to the opening of the reservation to non-Indian settlement in 1910, allotments had been made to Indians and the remainder of the lands appraised in accordance with the provisions of the Act of April 23, 1904. Following appraisal, the lands were divided into farm units consisting largely of 80-acre tracts; although some 40-acre units were established and there were some units containing as much as 160 acres. In acquiring homesteads under the Flathead Project system, the non-Indian entrymen were obligated to pay the appraised price of the land included in the unit and they could not acquire more acreage than was established in a single unit as determined prior to the opening of the reservation to homestead entry.

On December 7, 1921, the First Assistant Secretary approved a series of section plats and tabulations showing the total irrigable acreage in the project divided as to privately-owned lands, Indian allotments and State-owned lands. The total acreage included in tabulations made a part of these farm unit plats was approximately 103,500 acres. It has not been possible in the course of this investigation to determine how the acreage considered irrigable was changed from 103,500 acres in 1921 to 124,500 acres on November 1, 1930. It is clearly evident, however, that prior to the time the public notice was issued, there was nothing definite concerning the

irrigable acreage of the project. Because of this fact, a sum of not to exceed \$15,000 was authorized by the Act of March 4, 1929 (45 Stat. 1639) for the classification of land in the Flathead Irrigation Project. These funds were made available, the classification was completed in July 1930 and was approved by the Secretary of the Interior on March 28, 1931. In a letter of March 23, 1931, signed by the Commissioner of Indian Affairs which was approved by the Secretary of the Interior on March 28, 1931, it is stated that "during the last two sessions of the 71st Congress proposed legislation was under consideration with a view to authorizing the Secretary of the Interior to have lands within Indian irrigation projects investigated and classified as to productiveness and irrigability for the purpose of adjusting payments of irrigation charges thereon. Such proposed legislation was embraced in H.R. 7459 (71 Congress) but the Congress adjourned without having enacted legislation along the lines proposed. \* \* \*

"However, with a view to having the land classification as worked out by the land classifiers (in July 1930) and designated in their report ready for immediate use at such time as legislation may be enacted, it is respectfully requested that the classification as transmitted herewith be approved."

It is rather conclusively shown that the classification approved by the Secretary on March 28, 1931 was not considered to be a designation of irrigable acreage by reason of the fact that on March 31, 1933 he issued the first operation and maintenance order following the classification, in which it was stated that the assessment for lands in the Flathead Irrigation District involves an area of approximately 65,620 acres; whereas the acreage of class 1 and 2 land in non-Indian ownership within the Flathead Irrigation District was 63,640 acres and the area of class 1, 2 and 3 land was about 88,500 acres. On the same date the Mission Irrigation District was notified that the assessment involved approximately 10,500 acres of irrigable land; whereas 9,694 acres was shown as class 1 and 2 in the land classification schedule. Furthermore, on March 3, 1933, the Commissioner of Indian Affairs issued instructions to H. V. Clotts, Assistant Director of Irrigation, to designate the irrigable lands in the Flathead Project but the work was never completed.

On January 7, 1933 the Secretary approved a letter written by the Assistant Commissioner of Indian Affairs to W. S. Hanna, Supervising Engineer stating that "In view of the fact contemplated legislative action was not secured to enable full approval of the recommendations of the findings of the land classifiers on the Flathead Project, and with the intention that the data secured may be utilized by the project officials, you are directed to use the acreage shown in this report under classes "one" and "two", totaling 103,528.99 acres, plus any additional areas to which water for irrigation purposes can be delivered under constructed works or which are provided with irrigation facilities as construction work is continued, as the assessable area of the project. These lands thus listed are to be carried on the project ledgers as assessable both for operation and maintenance and construction repayment purposes."

The Supervising engineer and project officials understood the letter approved by the Secretary of the Interior to constitute endorsement of the

land classification schedule approved in 1931 as the designated area of the project. In accordance with this interpretation, construction charges have been spread to 138,195 acres of class 1, 2 and 3 land in the Project. At a conference in the Indian Office at Chicago on April 19, 1946, attended by A. L. Wathen, Chief Engineer, E. C. Fortier, Director of Irrigation, W. S. Hanna, Supervising Engineer, S. J. Flickinger, Attorney, E. G. Swindell, Attorney, Howard M. Gullickson, newly appointed District Counsel for the Billings office, W. F. Farmer, Engineer in the Billings office and A. L. Walker, Agricultural Economist, it was argued that the 1930 classification did not constitute a designation of lands but that the letter approved January 7, 1933 constituted a designation of the class 1 and class 2 lands included in the 1930 schedule, plus any class 3 land that had been brought under irrigation after 1930. Operation and maintenance charges are assessed against only 110,000 acres in the project, indicating that since 1930 about 6,500 acres of land classed as No. 3 has been included in the project. In a letter signed by the Assistant Commissioner of Indian Affairs to A. L. Walker, dated June 24, 1940, it is stated that the land classifications will not constitute land designation until finally approved by the Department. The land designations for both the Flathead and Wind River projects are still pending. It further states: "It is suggested, therefore, that you proceed with your investigation of the Flathead Project with the idea in mind of including in your report recommendation that the assessable areas as listed in the pending land designation schedules be approved with any modification, of course, that you find necessary."

#### RESERVOIR AND CAMP SITES

From 1917 to 1936 the United States constructed twelve reservoirs or catchment basins and three camp sites on land belonging to the Flathead Tribes. These sites were withdrawn by order of the Secretary pursuant to the Acts of Congress of March 3, 1909 and April 12, 1910 (35 Stat. 795, 36 Stat. 296), but the Indians have received no remuneration for them either for rental or for damages.

"Before any appropriation was made by Congress to compensate the Flathead Tribe of Indians for these sites, and while these sites remained the property of the Flathead Tribe, the United States Indian Irrigation Service constructed numerous reservoirs and dams on these sites for the benefit of the Flathead Irrigation Project. On April 10, 1922, at the request of the Commissioner of Indian Affairs, C. J. Moody and Charles E. Coe, the then project engineer and superintendent of the Flathead Reservation, made appraisals of these sites as of the date of their withdrawals. These appraisals totaled the sum of approximately \$40,000, including North Pablo and Polson sites, not used. It was not until April 22, 1932, that Congress appropriated the sum of \$55,000 to pay the Flathead Tribe for these sites. In May of 1933 through agents of the United States the Flathead Tribe was offered approximately \$48,000 for said sites. Such offer was based upon the original appraisals made as of date of withdrawals plus interest at 4 per cent per annum on said sums from the dates of use to 1932. This offer was finally rejected as grossly inadequate by the Flathead Tribe on June 5, 1935 and the appropriation lapsed.

"Prior to the enactment into law of the Wheeler-Howard Act of June 18, 1934 (48 Stat. 984), plans were drafted for the construction on the Jocko Lakes site. No order of withdrawal of this site was made under the acts of Congress of March 3, 1909, and April 12, 1910, supra. Active construction work commenced on the Jocko Lakes site in the spring of 1936, despite the lack of consent by the Flathead Tribal Council, with funds made available by the Public Works Administration. Vigorous protest has been made from time to time by the Superintendent of the Flathead Indian Reservation and by the Flathead Tribe of Indians through their tribal council against this invasion by the United States of the tribe's vested rights in these lands, which rights were guaranteed against interference in the tribal constitution approved October 28, 1935. Demand has also been made for just compensation for the taking by the United States of the old reservoir sites." 1/

By order of the Secretary a committee of seven was authorized to make appraisals of the reservoir sites and irrigation camp sites. Under date of September 21, 1937 this committee submitted a report indicating the procedure used and listing the values placed on the fifteen different sites and the damages which accrued to December 31, 1937. In making appraisals it was declared to be the intention of the committee to deduct rentals for the use of said lands received by the Flathead Tribe since the date of occupancy of the various reservoir and camp sites. The committee was in complete understanding that this amount should be deducted from the total appraised value. The committee had for a guide a report made by Charles E. Coe and C. J. Moody, Superintendent of the Flathead Agency and Flathead Project Engineer respectively, submitted on March 16, 1932. In that report the lands were divided into two groups and four sub-groups as follows: the agricultural lands were subdivided into class 1 valued at \$20.00 per acre, and class 2 land valued at \$10.00 per acre. Grazing lands were subdivided into class 1 group valued at \$3.50 per acre and a class 2 group appraised at \$1.25 per acre. These figures were used for appraisal purposes by the committee submitting the report of September 21, 1937.

In the Secretary's order the committee was instructed to estimate the amount of damages by reason of occupancy of the lands used. In this determination the following values were used: class 1 agricultural lands, \$1.00 per acre per annum; class 2 agricultural lands \$0.30 per acre per annum, class 1 grazing lands, \$0.17 $\frac{1}{2}$  per acre per annum; class 2 grazing land \$0.05 per acre per annum.

Table 13 has been prepared to show appraised value of reservoir sites as determined by the committee which submitted its report in September 1937; the appraised value of those sites; the damages by reason of occupancy to December 31, 1937, and the amount of damages which accrued from January 1, 1938 to December 31, 1944. In the last column is shown the total damages arrived at by adding the figures contained in the two previous columns. The appraised value of all sites as determined by the committee was \$99,937.08. This figure, however, did not include the value of the land occupied by the Flathead River pumps; neither did it include a value for the Hellroaring Creek power site. The total of damages which accrued to December 31, 1944 was \$89,496.35. Income

1/ Memorandum from Office of Solicitor, Dept. of Interior, to the Secretary of the Interior, dated November 12, 1936.

from rentals compiled from special reports submitted by the superintendent of the Flathead Agency amounts to \$33,789.78. The balance remaining after deducting income from rentals from the total damages accrued to December 31, 1944 is \$55,706.57.

Table 13 - Appraised Value of Reservoir and Camp Sites, <sup>1/</sup> Damages by Reason of Occupancy of the United States and Income from Rentals to December 31, 1944. Flathead Irrigation Project, Montana

Reservoir or Camp Site	Acres	Appraised Value	Damages to 12-31-1937	Damages 1-1-1938 to 12-31-1944	Total Damages
1. St. Mary's Lake (Tabor Reservoir)	535.94	\$ 669.92	\$ - - -	\$ - - -	\$ - - -
2. Mission Reservoir	395.55	944.44	60.00	313.44	373.44
3. McDonald Lake Res'r.	574.49	949.17	480.00	290.93	770.93
4. Kickinghorse Res'r.	784.85	7,848.50	1,569.11	1,648.22	3,217.33
5. North Pablo Res'r.	65.00	1,300.00	107.50	455.00	562.50
6. South Pablo Res'r.	2452.83	40,478.30	28,233.88	12,966.45	41,200.33
7. Twin Reservoir	215.20	2,152.00	373.68	451.92	825.60
8. Ninepipe Reservoir	2019.50	31,395.00	19,248.60	9,728.95	28,977.55
9. Lower Crow Res'r.	562.89	2,372.36	575.00	804.23	1,379.23
10. Horte Reservoir	185.00	3,700.00	3,700.00	1,295.00	4,995.00
11. Dry Fork Reservoir	565.80	6,089.19	3,304.80	1,506.47	4,811.27
12. Pablo Camp Site	20.00	400.00	540.00	140.00	680.00
13. Headquarters Camp	4.41	88.20	132.30	30.87	163.17
14. Valley View Camp	40.00	800.00	960.00	280.00	1,240.00
15. Jocko Lakes Res'r.	600.00	750.00	90.00	210.00	300.00
Total	9021.46	\$99,937.08	\$59,374.87	\$30,121.48	\$89,496.35
Income from Rentals					33,789.78
Balance					\$55,706.57

<sup>1/</sup> Does not include Flathead River Pump Site

From information gained at meetings with the Flathead Tribal Council, it appears that the Indians were never satisfied with the appraisal completed in 1937 and in addition it was the conclusion of this body that the Indian Reorganization Act and the Flathead charter and constitution prevented the disposal of lands belonging to the Tribe. The Tribal Council has been strongly of the opinion that the title to the lands should be retained in the Tribe, that the Government should compensate them for past damages and that a higher value should be established for the reservoir and camp sites taken. It was stated on numerous occasions that the tribes should receive an annual rental for the lands used for camp and reservoir sites the amount thereof to be based on a higher appraised value than that determined by the 1937 Committee. At a joint meeting held in May 1946, attended by the commissioners of the three irrigation districts, the Tribal Council and representatives of the Indian Service, it was tentatively agreed that the appraised value, including the land occupied by the Flathead pumps, should be \$200,000. In addition it was agreed that damages in like amount should be paid to the tribes by reason of occupancy to June 30, 1946.

POWER REVENUES

The revenues accruing from the operation of the project's power system have increased from a gross of \$40,000 in the fiscal year 1932 to a gross of \$221,000 in 1945. Total gross sales for the 15-year period ending June 30, 1945 were \$1,794,000. Costs of operation, maintenance and administration have approximated \$770,000 leaving a balance before depreciation of \$1,024,000. Depreciation has been computed to amount to \$313,000 leaving a net income of about \$711,000. The following statement shows these data by fiscal years.

Table 14. Financial Statement - Power System, Fiscal Years 1931 to 1945 Inclusive.

Flathead Irrigation Project, Montana

FISCAL YEAR	SALES	OPERATION & MAINTENANCE COSTS	ADMINISTRATION COSTS	NET REVENUE BEFORE DEPRECIATION	DEPRECIATION	NET INCOME
1931	\$ 1,449.08	\$ ---	\$ ---	\$ 1,449.08	\$ ---	\$ 1,449.08
1932	40,043.93	28,960.19	553.12	10,530.62	5,242.32	5,288.30
1933	54,233.58	43,309.17	2,008.85	8,915.56	11,206.46	2,290.90 <sup>D/</sup>
1934	61,251.97	25,714.95	694.30	34,842.72	12,147.06	22,695.66
1935	67,978.81	34,634.84	1,077.82	32,266.15	12,685.80	19,580.35
1936	84,117.34	34,588.08	1,622.74	47,906.52	13,099.70	34,806.82
1937	111,402.28	42,320.59	2,201.75	66,879.94	13,893.96	52,985.98
1938	136,167.65	42,590.73	2,043.68	91,533.24	14,788.36	76,744.88
1939	144,682.74	44,950.86	1,049.22	98,682.66	15,397.94	83,284.72
1940	159,289.33	63,882.53	1,732.85	93,673.95	25,072.53	68,601.42
1941	177,142.54	53,601.82	2,348.03	121,192.69	35,310.65	85,882.04
1942	182,766.48	81,845.04	5,993.27	94,928.17	36,734.78	58,193.39
1943	164,967.22	94,338.64	7,817.77	62,810.81	38,022.65	24,788.16
1944	187,673.05	74,115.43	5,756.43	107,801.19	39,213.52	68,587.67
1945	221,145.80	70,200.11	1/	150,945.69	40,533.42	110,412.27
	\$1,794,311.80	\$735,052.98	\$ 34,899.83	\$ 1,024,358.99	\$ 313,349.15 <sup>2/</sup>	\$ 711,009.84

D/ DEFICIT

1/ NOT AVAILABLE

2/ THE AMOUNTS SET UP FOR DEPRECIATION BY FISCAL YEARS HAVE BEEN ESTIMATED TO A CERTAIN EXTENT, BUT THE TOTAL AMOUNT IS IN AGREEMENT WITH PROJECT RECORDS AND IS ASSUMED TO BE NEARLY CORRECT.

PROJECT IMPROVEMENTS AND ESTIMATED COSTS

Construction of the Flathead Irrigation Project was begun more than 35 years ago and many of the original structures, the majority of which are in a bad state of repair, are still in use. Listed below are seven items with a brief justification for each, the first four of which are exceedingly important. The remaining three items may be placed in a deferred group although all are essential to the most successful operation of the project.

1. Project Buildings - \$65,000.

The crowded condition of office and filing space at project headquarters, and inadequate repair shops, equipment sheds, employees'



quarters, etc., make necessary an immediate and continuing program of modernization, replacement and construction of new facilities. Enlargement of the project office and repair shops will require the expenditure of \$25,000 in the first year, followed by an annual expenditure of at least \$10,000 a year for four years, to complete the modernization program.

2. Hydrography, \$25,000

Immediate construction of new gaging stations and the repair or replacement of damaged or obsolete installations is necessary in order to resume a program designed to obtain necessary records of water supply and water use. Surveys can be started and a few structures placed the first year with the balance programmed in the succeeding two years for a total expenditure of \$25,000.

3. Lateral Betterments, \$600,000.

A majority of the existing structures on the Flathead Project are from 20 to 35 years old. Concrete structures and linings are failing and many timber structures have rotted away. Canals constructed by old time methods should be straightened to reduce transportation losses. Banks have sloughed to a point where the freeboard is inadequate and they must be raised and leveled to permit travel along the banks and to facilitate the operation of ditch-cleaning equipment. Both steel and timber flumes, many of them now practically unusable after 25 years or more of service, can in many cases be economically replaced with earth fills, thereby increasing the efficiency of water transportation. Upper basin structures, subject to rigorous weather conditions, have deteriorated to the point where the percentage of recovery of the precious runoff is decreasing annually. One failure that occurred in June 1945 caused the loss of hundreds of acre-feet of water. An expenditure of at least \$5,000 will be required to repair this break. Over 1,000 miles of canals and laterals are involved in the rehabilitation program. Certain stretches of canal may cost \$10,000 or more per miles for repairs. It is estimated that the average cost of canal and lateral betterment will be about \$600 per mile.

4. Mission "H" Canal, \$15,000.

A small, isolated irrigated area around the Flathead Agency is served by a canal diverting from Mission Creek. The broken country traversed by the canal is made up chiefly of the unstable lacustrine silts. Earth canal sections and flumes along steep slopes, and inverted siphons through badly broken ground make this canal extremely precarious and costly. Because improvement of this canal would be very difficult, if not impossible, it is believed that it should be abandoned and that an electrically driven pump should be installed just above the irrigated area, to deliver water directly from Mission Creek.

Participation by the Agency has been discussed with the Superintendent and some cooperative agreement appears possible.

5. Miscellaneous Surveys, \$25,000.

Improvement of the existing system and development of additional water supplies will require extensive surveys. Storage sites are known to exist but have not been surveyed to the point of feasibility determination. One crew can well be used for the next three years to carry on this investigation.

6. Reservoir Enlargements, \$635,000

Probably the most important proposal for improving the Flathead Project is the development of additional storage. Mission and McDonald dams can be raised to increase those reservoir capacities by about 40,000 acre-feet at an estimated cost of \$625,000, or about \$15.00 per acre-foot. This increase in storage capacity would be of immense value to the project in stabilizing its water supply and impounding water that would otherwise escape. Other minor enlargements proposed would cost \$10,000.

7. Drainage, \$125,000.

As is natural in an irrigation project such as Flathead, seepage and drainage problems are becoming increasingly acute. The estimate of \$125,000 is made without adequate surveys and with the knowledge that deferment of the program might well double or treble this figure in a short time.

#### GENERAL ECONOMIC CONDITIONS

The lower Flathead valley is an agricultural area typical of the northern intermountain region. The principal source of income is from agriculture with livestock the most important enterprise. The production of dairy products is particularly important. There are no specialty crops except sugar beets and potatoes. In 1945 these two crops utilized about 3 per cent of the irrigated acreage and yielded 14 per cent of the gross crop income. Sugar beets have to be transported 35 or more miles to a sugar factory in Missoula, Montana for processing. Consequently, beets are grown only on those areas best adapted to their production. It is entirely possible that eventually a sufficient acreage will be grown in the project area to justify the establishment of a factory on the project, but this may be in the distant future. Potatoes have been rather profitably grown during some years and on some soils, but the enterprise is not a common one.

The Flathead Irrigation Project is somewhat handicapped because of its location with respect to large markets. Bulky crops cannot be profitably shipped to other than Spokane, Washington and other nearby points. Spokane is undoubtedly the most important outlet for both crops and livestock produced on the project. When irrigation is further developed in the Pacific Northwest

region there will be a greater volume of agricultural products produced for sale in that general area. As a consequence the Flathead Project landowners will suffer because proposed new irrigation projects will be in a position to supply fully most of the needs of the markets to which Flathead products now go. It is possible there will always be a place for dairy products and certain other enterprises but unless some specialty crop can be developed, it is doubtful that the Flathead Irrigation Project will progress as rapidly as many hope and anticipate.

Practically 75 per cent of the non-Indian owned tracts are operated by owners or owners renting additional land. A large percentage of the Indian-owned land, however, is leased to non-Indian operators and no doubt will continue to be for some time. The Flathead Indian Agency and Tribal Council have devised a program, however, wherein plans for full utilization of all Indian-owned land by Indians is outlined.

The Flathead Indian Reservation was opened to white settlement in 1910. The land was disposed of by the lottery method and many of the first settlers knew little about agriculture. Although construction of the Flathead Irrigation Project system was begun in 1909, progress was slow and only a relatively small quantity of the water that had been promised for irrigation was made available until the Flathead pumps were installed. Up to 1928 only about 30 per cent of the potential irrigable acreage was actually irrigated. In 1928 Congress began making funds available in adequate amounts to carry on a comprehensive construction program and agricultural development followed construction of irrigation works. The acreage irrigated increased rapidly, beginning in the early 1930's.

An analysis of data pertaining to crop production on the project shows that in 1917 and 1918 alfalfa and irrigated pasture accounted for only about 15 per cent of the total crop acreage. Wheat and oats represented about 70 per cent of the irrigated acreage at that time. By 1928 about 60 per cent of the crop acreage was devoted to alfalfa production and pasture, while 15 per cent was devoted to the production of wheat and oats. Since 1928 the relative percentage of irrigated land devoted to alfalfa, irrigated pasture and the small grains, including oats, wheat and barley, has varied only slightly from year to year.

The production of livestock and livestock products has shown a phenomenal increase since 1917. In that year there were 3,000 head of cattle, 2,000 head of hogs and 100 head of sheep on project farms. In 1928 cattle numbers had increased to more than 10,000, hogs to 9,000, and sheep to 6,000. In 1944 there were reported to be 32,000 head of cattle, 12,000 head of hogs and 8,600 head of sheep on farms in the project. Of the 32,000 head of cattle on farms over 55 per cent were dairy cattle. These data supply evidence to show that agricultural economy of the region shifted from the growing of small grains in the early stages of project development to the production of crops needed for livestock. The increase in numbers of livestock on project farms has been gradual and continuous. Except for a relatively small percentage of the total project acreage that may be used for the production of the more intensive type of crops such as sugar beets and potatoes, it appeared that the production of

livestock and livestock products is basic to the success of agricultural endeavor on the Flathead Project. Most farms on the project are too small to constitute an economic farm unit for a livestock type of farming. However, the more progressive and experienced farmers are obtaining control of land sufficient to provide economic farm units.

The policy adopted in making allotments to Indians of 80 irrigable acres followed by the establishment of farm units as provided by the Act of June 23, 1910 and July 17, 1914 (36 Stat. 592; 38 Stat. 510) which were mostly 40 and 80 acres in size, has affected and continues to influence, the size of farms operated on the project. In 1935 approximately 25 per cent of project farms were 40 acres in size and about 35 per cent consisted of 80 acre tracts. While marked changes have occurred in recent years with respect to the irrigable acres handled per operator it is estimated that approximately 50 per cent of the farms operated are too small to constitute economic units.

An analysis made of individual crop reports in 1940 shows that the 2150 farms in the project were combined under the operation of about 1300 entrepreneurs. The trend in combination of farms under owners renting additional land and tenant operations was accelerated during the war and it is probable that small farm operation and/or development will not again occur to a marked extent.

Chart II has been prepared which shows the distribution of irrigable acreage per operator and the average size of farm for each size group on the project.

Chart II - Farms Grouped on Basis of Acreage Irrigated Showing Average Size of Farm in 1940.

Flathead Irrigation Project, Montana







Acres Irrigated	Percent of farms	Per cent	Average size of farm
Under 40	35		48 acres
40 to 79	39		90 acres
80 to 119	13		149 acres
120 to 159	7		183 acres
160 to 199	3		245 acres
200 and over	3		354 acres

Table 15 has been prepared to show the trend in crop yields per acre on the Flathead Irrigation Project from 1934 to 1945. It will be observed from the data contained in this table that yields of alfalfa hay, clover hay, sugar beets and peas have tended to decline, while apparently the yields of small grains have increased and potato yields have not changed materially in

the 12-year period. Yields of all crops, however, are relatively low, a condition no doubt caused by mineral deficiencies in the soils, particularly phosphorous. In several acres on the project stands of leguminous crops have about run out and new stands are difficult to obtain.

Table 15 - Trend in Crop Yields Per Acre 1934-1945  
Flathead Irrigation Project, Montana

Year	Alfalfa	Clover	Potatoes	Sugar	Wheat	Oats	Barley	Peas
	Hay Ton	Hay Ton	Bu.	Beets Ton	Bu.	Bu.	Bu.	Bu.
1934	2.06	1.63	123.60	12.38	19.50	37.50	25.20	17.90
1935	1.87	1.39	121.20	10.18	18.70	33.30	24.50	19.80
1936	2.07	1.46	134.20	10.37	20.30	34.50	27.80	16.80
1937	1.75	1.24	114.90	9.38	18.30	31.90	26.00	15.30
1938	1.84	1.10	118.60	9.92	20.30	39.90	29.80	18.70
1939	1.86	1.37	121.00	10.04	20.00	35.80	31.20	21.50
1940	1.94	1.25	162.90	11.72	19.10	34.80	28.30	18.70
1941	1.78	1.24	167.60	10.41	20.50	40.40	35.00	13.40
1942	1.99	1.37	105.90	10.60	27.50	49.50	37.50	13.80
1943	1.91	1.31	118.00	8.58	25.40	43.00	31.40	17.00
1944	1.43	1.26	128.30	8.79	23.10	38.50	31.30	14.70
1945	1.76	1.16	124.00	9.79	23.40	43.70	30.00	14.40

Table 16 - Index of Crop Yields 1/ for Various Subdivisions  
and Parts of the Project.  
Flathead Irrigation Project, Montana

Year	The Project	Mission Valley Division				Jocko Div.	Camas Div.
		Mission	Pablo	Post			
				Post	Moiese		
1934	109	100	104	106	123	98	142
1935	101	102	97	89	108	94	132
1936	106	101	103	109	110	84	128
1937	94	90	97	79	100	92	116
1938	101	90	101	102	106	92	120
1939	99	92	102	94	111	95	104
1940	103	91	113	96	111	81	98
1941	97	92	109	98	105	89	70
1942	111	101	111	123	119	85	121
1943	106	100	107	110	103	88	120
1944	89	98	79	95	87	82	101
1945	100	101	104	102	102	82	95

1/ Yields of 10 major crops from 1935 to 1941 = 100  
Yields per acre:- Alfalfa hay, 1.87 tons; Alfalfa Seed, 93 lbs.; Clover hay, 1.28 tons; Clover seed, 143 lbs.; Grass hay, 1.27 tons; Sugar beets, 10.40 tons; Barley, 29.56 bu.; Oats, 35.99 bu.; Wheat, 19.58 bu.; Peas, 17.33 bu.

Table 16 has been prepared to show an index of crop yields for various subdivisions and parts of the project from 1934 to 1945. In this table yields of ten major crops grown on the project from 1935 to 1941, inclusive, equals 100. It will be observed from these data that relative yields of crops in the Camas area are high when compared with the remainder of the project. Water supplies have been low in this part of the project during most years but this has been offset to some extent by the fine quality of the soils used for crop production. By contrast the yields in the Jocko area are relatively low. Water supplies are adequate in the Jocko area during most years, but the gravelly character of the soil prevents operators from obtaining high yields of crops. By comparison the Mission area of the Mission Valley Division has produced relatively low yields of crops during the past 12 years, while the Moiese area on the other hand has produced relatively good yields of crops. The Moiese subdivision while having a considerable area of gravelly soils, has a relatively long growing season and adequate water supply. Lands in the Post and Pablo subdivisions have produced near average yields during most years.

As shown by Chart III the acreage irrigated on the Flathead Project has increased rather steadily since 1934. During the period an increase of approximately 40 per cent is shown. The increase in acreage irrigated has been constant except in 1942 when, because of war conditions, considerable land in the project was not operated. Shown also in Chart III is the trend of crop yields. While the change is not so pronounced as in acreage irrigated, the trend has been downward since 1934 and in 1945 was about 91 per cent of the 1934 average. This indicates that as the project irrigable acreage is increased, the poorer quality lands are brought under irrigation. This statement is proven by the fact that when uniform prices are assumed, the total value of crop production on the project has not changed materially since 1934.

Contrary to the ideas expressed by many that the agricultural land resources of the Flathead Irrigation Project will support an appreciable increase in farm population, data are shown in Chart IV which indicate that while the number of farms has increased somewhat since 1931, the number of workers engaged in agriculture has decreased since 1936. This has no doubt resulted from the fact that the efficiency of farm workers has been materially increased by the utilization of power machinery in agricultural production. Proof of this statement is definitely brought out in Chart V, where the change in irrigated acres per farm worker is shown to have increased 65 per cent from 1931 to 1945. On the same chart there is a curve which shows that the value of crops produced per irrigated acre after being adjusted for price changes, has steadily decreased on the project since 1934. The conclusions to be reached from these data are these: Farmers on the project are operating larger acreage per farm worker than was true in 1931; the value of crops produced per man has increased, while the value of crops produced per acre has decreased. The trend in this direction will probably continue and particularly so until the value of farm labor is more nearly comparable to the value of other factors of production.

As stated in other sections of this report, conditions among farmers on the Flathead Project were exceedingly serious from 1930 to 1939. The

exchange value of the crops produced by Flathead Project farmers was relatively low. Mortgage indebtedness increased greatly during the period and tax delinquency was at a high level. (See Chart VI) With the changes brought about by virtue of a higher exchange value of crops produced and consequently a higher production value per man, delinquent taxes were paid and mortgage indebtedness appreciably decreased in the period from 1940 to 1945. In 1946 economic conditions on the Flathead Project are favorable, but there exists a tendency on the part of the more progressive farmers to sense the fact that the more favorable years for agricultural producers have passed and for the next several years economic conditions may be much less favorable. Many who experienced different economic conditions on the project than exists at present, have prepared themselves for changes and are in strong enough financial condition to withstand periods when exchange values of farm products are much less favorable than at present.

Chart III. Percentage of Changes in Acreage Irrigated and Changes in Yields of Crops - 1934-1945. 1934 - Base Year. Flathead Irrigation Project, Mont.

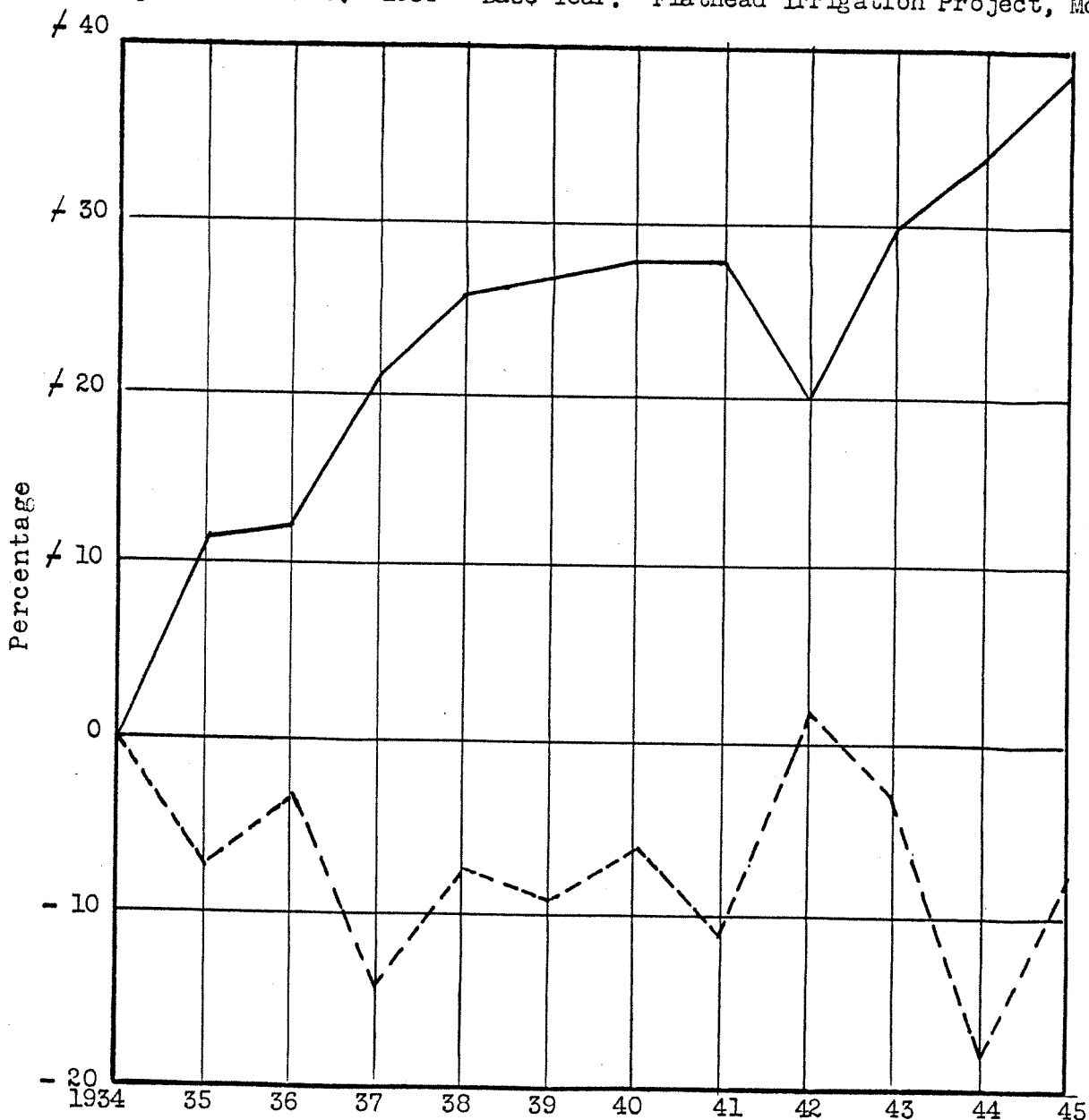


Chart IV - Number of Farms Operated and Number of Workers Engaged in Agriculture, 1931 to 1945, Inclusive. Flathead Irrigation Project, Montana

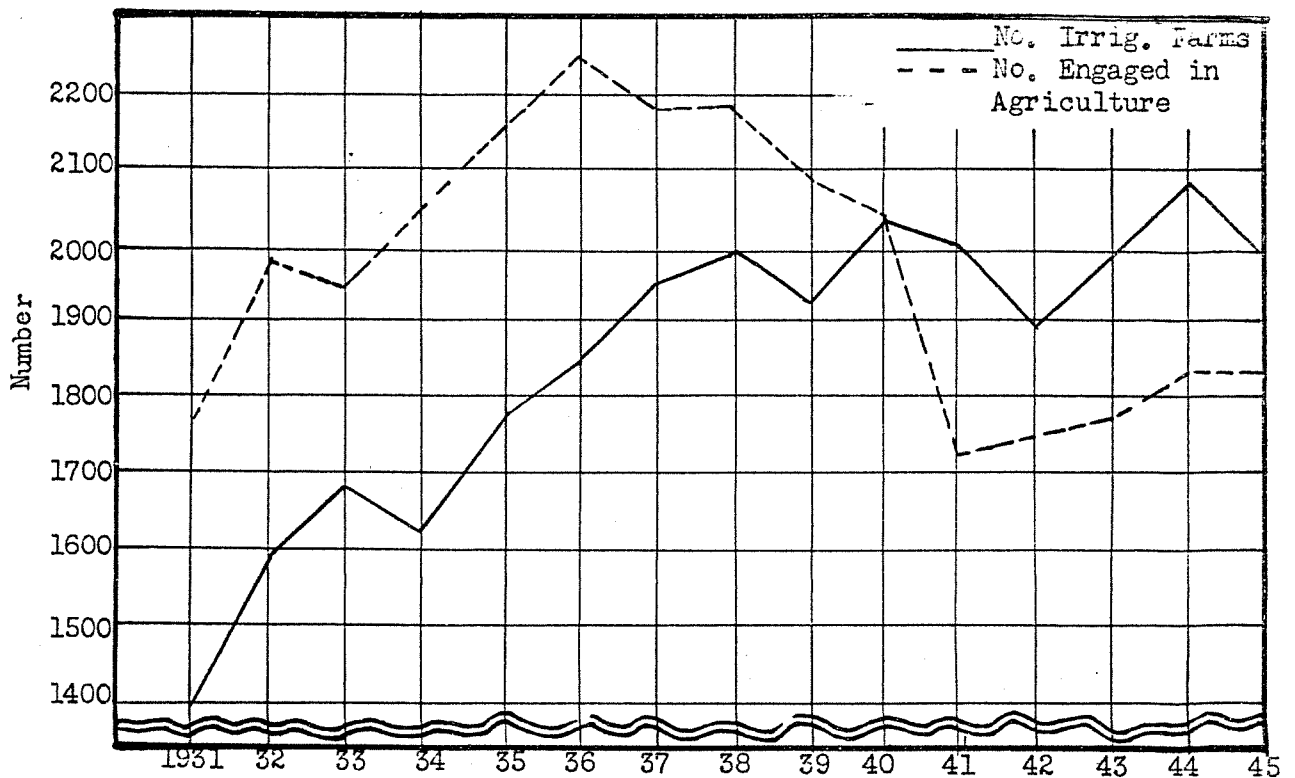
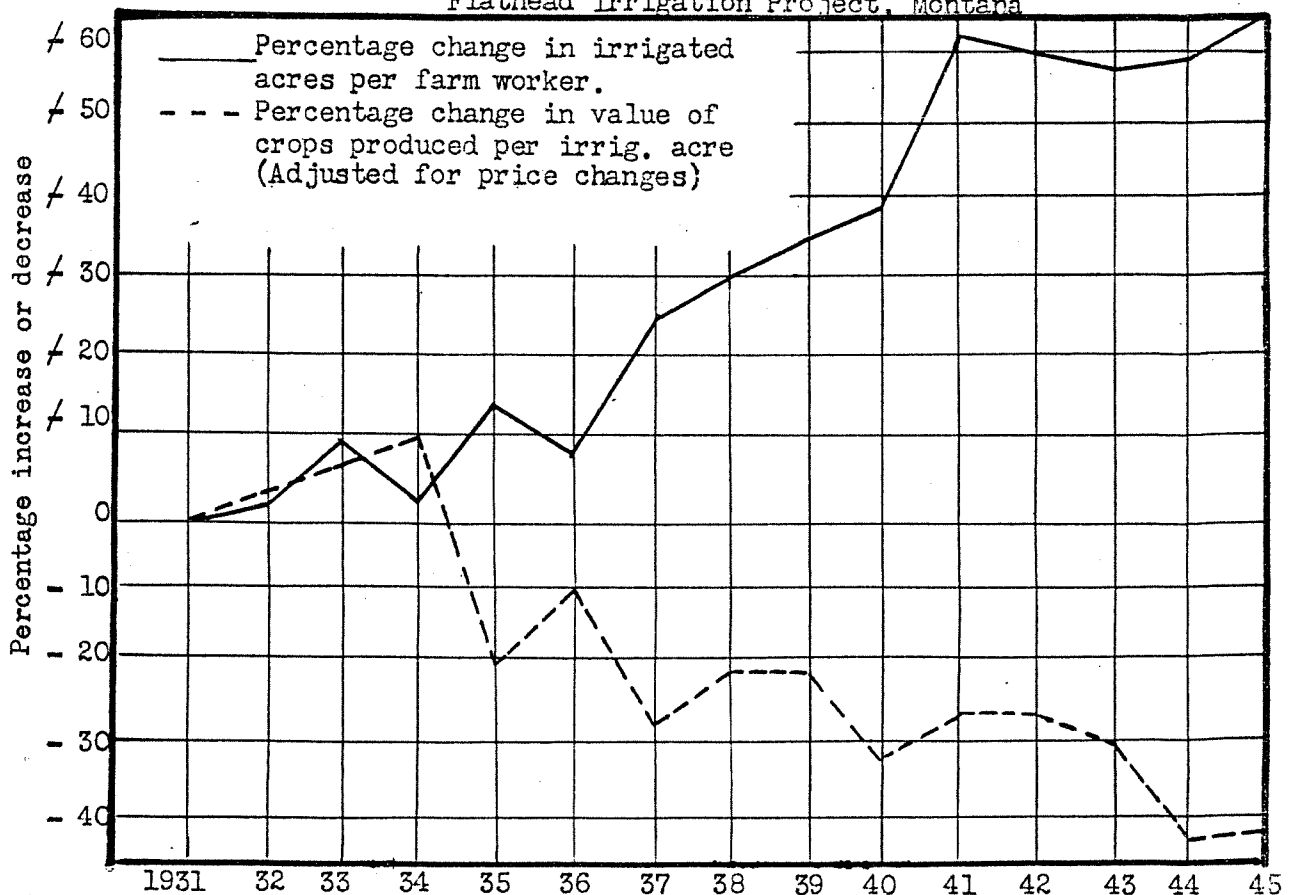


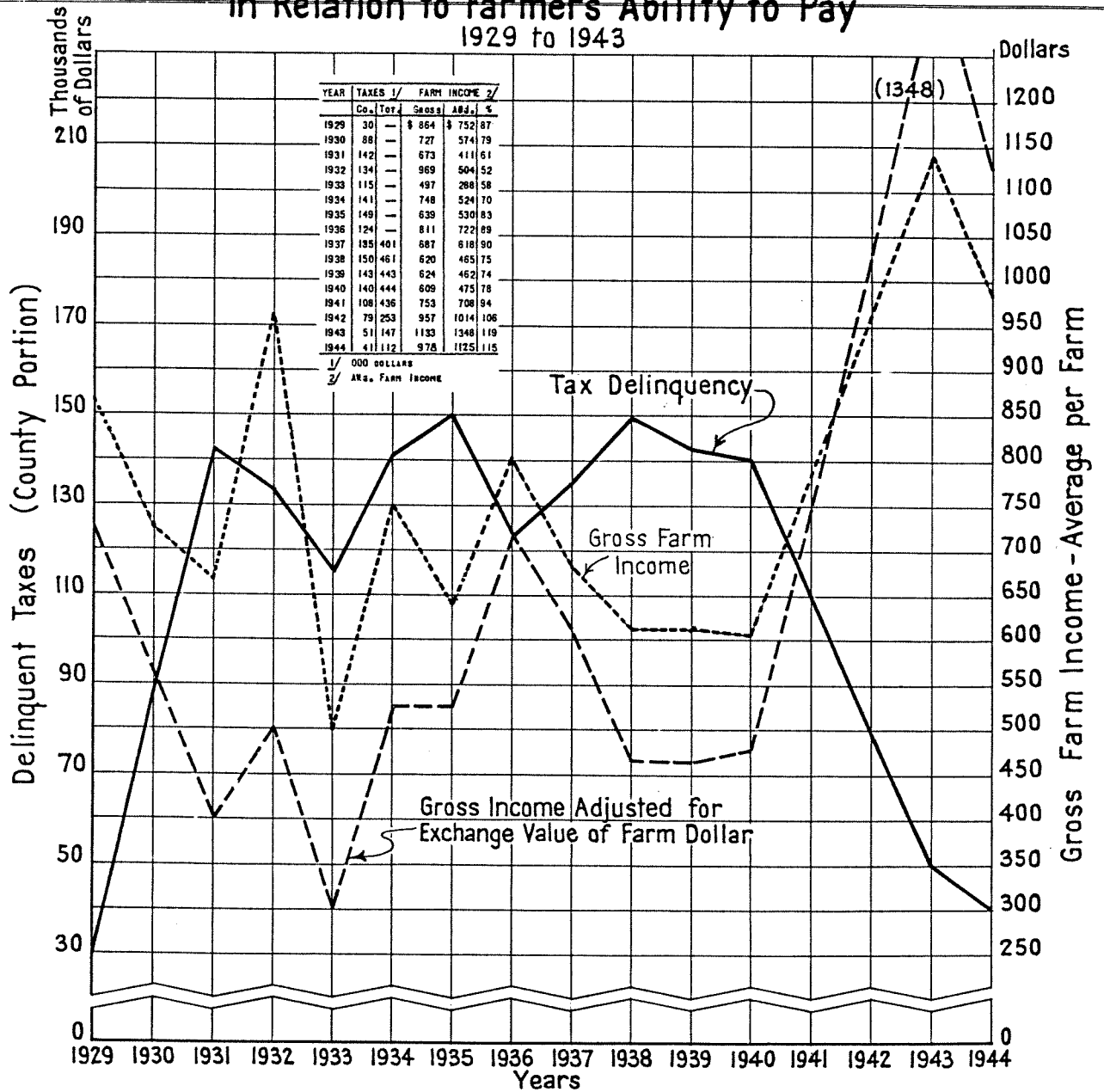
Chart V. - Trend in Irrigated Acres Operated per Farm Worker and Value\* of Crops Produced per Irrigated Acre, 1931 to 1945 Inclusive. Flathead Irrigation Project, Montana



\*Annual crop values adjusted for change in prices, i.e., uniform prices used throughout.



Chart VI: Lake County, Montana, Tax Delinquency  
In Relation to Farmers' Ability to Pay  
1929 to 1943



## REIMBURSABLE CONSTRUCTION CHARGES

While details of the cost of various features of the project are contained in the section entitled "Analysis of Accounts Pertaining to the Flathead Irrigation Project and Power System, Montana," it is important that the reimbursable construction cost of irrigation and power systems be shown separately and computations made as to the reimbursable construction cost per acre within the various divisions of the project. Table 17 has been prepared for this purpose and shows in summary form the essential data.

Table 17. Reimbursable Construction Cost of the Irrigation and Power Systems  
by Divisions to June 30, 1945.  
Flathead Irrigation Project, Montana

Reimbursable Construction Cost	Mission Valley Division	Camas Division	Jocko Division
Irrigation Works	\$6,566,645.94	\$1,326,307.37	\$622,473.12
Pro-rata Share, Reimbursable Construction Cost - Power System	620,742.75	125,375.37	58,842.16
Pro rata Share - Administration Cost, Irrigation and Power	114,161.06	23,057.84	10,821.69
Undistributed Operation and Maintenance Cost	255,173.70	58,886.14	42,518.49
Less Amount Received from Rocky Mountain Power Co. for Government's Investment in Newell Tunnel. 1/	RE 78,414.17	RE 15,837.81	RE 7,433.13
<b>Total Reimbursable Construction Cost</b>	<b>\$7,478,309.28</b>	<b>\$1,517,788.91</b>	<b>\$727,222.33</b>
<b>Reimbursable Cost per Acre</b>	<b>\$ 66.97</b>	<b>\$ 115.25</b>	<b>\$ 54.41</b>

1/ The sum of \$101,685.11 paid by the Rocky Mountain Power Company for the Government's investment in the Newell Tunnel, was covered into the Treasury during fiscal year 1931. The deposit was made to the account "Construction Charges, Flathead Irrigation Project, Montana." Although the \$101,685.11 has been shown as a reverse entry in the above table, project records do not reflect the collection or deposit of this amount.

Total reimbursable construction cost of the project, allowing for payment made by the Rocky Mountain Power Company for the Government's investment in Newell Tunnel, is \$9,723,320.52. Reimbursable cost, based on a total of 138,195 acres is \$66.97 per acre in the Mission Valley Division; \$115.25 per acre in the Camas Division and \$54.41 per acre in the Jocko Division. Except in the Jocko Division, the reimbursable construction cost per acre is in excess of the charges that will be reimbursed by the lands included in the project, under terms of existing contracts with irrigation districts. This provision applies only to non-Indian owned land. Presumably no limitations of cost have been established for Indian-owned land in the project.

## CONSTRUCTION CHARGE REPAYMENTS AND FARM ORGANIZATION

The ability of Flathead Project farmers to repay irrigation construction charges is dependent upon a number of factors, most important of which are:

(1) Prices of farm products and the relationship between farm prices and commodities and services bought by farmers; (2) size of farm; (3) the acreage it is possible to irrigate; (4) intensity of farm operations; (5) fertility of soil and yield of crops; (6) productiveness of livestock; (7) quantity of water available; and (8) managerial ability of the operator.

The Flathead Project area is located in a climatic zone where crop selection is limited because of the short growing season. At St. Ignatius the average length of growing season is 125 days; number of heat units during this period is about 2732, and seasonal rainfall is about 8 inches per annum. This combination of climatic factors permits the production of short season crops only. Small grains do well and wheat will often yield a crop without the application of irrigation water. Alfalfa, clover, peas and sugar beets do fairly well but corn production is limited to areas of lowest elevation. Native grasses can be pastured for about five months while some grass mixtures that do well can be pastured for about five and one-half months.

Efficiency in the use of labor is affected by the selection and combination of enterprises. Land is the prime requisite with crop farming. Moreover, in a crop system of farming, demands for labor are heavy during the growing season but extremely light during the winter months. It follows, therefore, that some degree of balance in labor use can be obtained by incorporating livestock into the farm plan. In the livestock enterprise capital and labor are the factors of most importance. To be successful with the livestock enterprises constant attention is required, and a dairy herd, if included, allows for little or no variation in the timing of labor operations. The best distribution of labor can be attained with a combination of crop production and the feeding of cattle or sheep during the winter months.

Amount of land required to utilize fully the labor and equipment available depends upon whether intensive or extensive operations are followed. The production of small grains is an extensive operation while sugar beet growing constitutes an intensive type in the Flathead country. Alfalfa and clover for hay require more labor per acre than the small grains but are considered extensive types of crops.

In the feeding of livestock, only a small area of land is required. If, however, the enterprise is linked with the production of livestock, the necessity for pasture or relatively large areas of grazing land becomes imperative. However, growth of animals may be maintained and finish secured in dry lot. Provided feeds can be purchased at a price comparable with the cost of production on the farm of the operator, there would be no necessity or advantage in taking the additional risk of producing the feeds required.

To attain good balance between the factors of production, the selection and combination of crops and livestock are essential considerations. The acreage of irrigable land available in relation to the total farm acreage is directly correlated with the problem, in fact, it is one of the important considerations. Size of farm and the yields of crops are of major importance in the production of income with which to meet costs of operation. The livestock enterprises, when incorporated into the farm plan, offer a desirable

means of disposing of the crops produced, yield revenue throughout the year, and provide a means of using labor regularly.

The most effective and scientific approach to a measurement of the landowners' ability to pay irrigation charges is by use of the budget method. "Farm budgets represent a systematized means of presenting anticipated types of farm organization and of estimating farm income and expenditures under specified conditions." <sup>1/</sup> In the preparation of budgets general over-all results and averages are dispensed with and specific situations only are considered. In farm budget analyses it is necessary to keep in mind the limitation of the factors of production and it must be realized that soil characteristics, size of farm, labor requirements, the proportion of crop land to the total farm acreage, capital outlay, or any number of other factors with which an individual farm operator has to deal may require that one system be given precedence over another although the plan chosen may not yield the highest net income. In connection with the application of these factors the ability of men to organize and manage a farm business differs greatly.

The relatively high yields of crops used throughout this analysis are based on the assumption that 1.75 acre-feet of water will be available to each acre of land irrigated. This figure was arrived at after careful study of soils, topography, and use of water on the many project farms and is the average quantity required for 120,000 acres of the best quality land within the exterior boundaries of the project. The use of greater quantities of water might result in higher yields of crops, at least for a time, but any quantity materially less than 1.75 acre-feet per acre would, on the average, act to reduce the yield of certain crops such as alfalfa hay, pasture, and sugar beets. Shortage of water during the late summer months cuts the yield of these crops 20 to 50 per cent. From 1929 to 1944 there were only four years where the water supply was adequate to deliver 1.74 acre-feet per acre or more.

In the calculation of farm returns the price level which existed in western Montana during 1941 was used. This was about 125 per cent of the 1909-1914 level. The price of farm commodities is of importance in the determination of returns from farming. More important, however, is the relationship between the price of farm products and the cost of labor supplies and commodities that farmers have to buy in the conduct of their business, called for convenience, exchange value. In 1941 the exchange value of farm products in general stood at 100. That is to say, while farm product prices in western Montana were about 125 per cent above the 1909-1914 level, the cost of commodities and service that farmers used stood at about 125 per cent of the 1909-1914 level also.

In Table 18 the sale and inventory prices of crops and livestock are shown along with the cost and rates for the principal expense items used in the budget analyses. Attention is called to the relatively high price for inventory purposes, for dairy cows and accompanying stock. The rates of production assumed for all the livestock enterprises is relatively high as compared with the average production on the project. To obtain good production of meats or livestock products good stock must be well fed and well managed.

<sup>1/</sup> San Joaquin Valley Water Investigation Report, October 1944.

Table 18 - Prices of Farm Products as of October-November 1941 taken from Project Reports and From Publications, Division of Crop & Livestock Estimates, Helena, Montana.

Flathead Irrigation Project, Montana

Crops, Livestock and Products	Unit	Price per Unit	Livestock and Products	Unit	Price per Unit
Alfalfa Hay	Ton	\$ 7.00	Dairy Cows (Inv.Purposes)	Head	\$100.00
Barley	Bu.	.60	Calves	"	25.00
Wheat	Bu.	.85	Heifers 1's	"	50.00
Oats	Bu.	.40	Heifers 2's	"	85.00
Sugar Beets	Ton	8.00	Horses	"	100.00
Peas (dry)	Bu.	1.70	Feeder Cattle (purchase)	Cwt.	7.00
Garden	Acre	80.00	Feeder Cattle ( sales )	"	9.25
Silage	Ton	5.00	Hogs	"	9.00
Butterfat	Lb.	.35	Hens (Inv.Purposes)	Each	.60
			Eggs	Doz.	.30

Rates for Principal Items

Item	Unit	Cost per Unit	Item	Unit	Cost per Unit
<u>Custom Operations:</u>			<u>Labor Costs:</u>		
Threshing Grain	Bu.	\$ .05	Hired Labor, day or mo.	Hour	\$ .50
Threshing Peas	Bu.	.10	Sugar Beets Contract Work	Acre	30.00
Feed Grinding	Cwt.	.15			

Items of Livestock Expense

<u>Feed Purchased:</u>					
Dairy Concentrates	Cwt	\$5.00	Miscellaneous Expense per	Cow	2.00
Laying Mash	"	5.00	" " per 100	Hens	4.00
Hog Feed	"	5.00	" " per	Sow	3.00
Chick Starter	"	5.00	" " per	Horse	10.00
Semi Solid Butterfat	"	6.00	" Farm Expense	Acre	1.25
Grain	"	1.00			
Cotton Seed Meal	"	3.00			

Building and Equipment Expense

<u>Equipment Expense:</u>			<u>Depreciation Rates:</u>		
Fuel, Oil, Grease & Repairs:			Tractor, Combine, Truck	\$100 of Cost	\$10.00
Tractor, 10-15 H.P.	\$ 0.30		Farm Auto	Farm Share	50.00
Auto, Annual Cost, Farm Share	50.00		General Farm Equip.	\$100 of Cost	7.00
Repairs per \$100 of Cost			Farm Buildings	"	4.00
General Farm Equipment	3.00		Farm Fences	"	6.00
Well & Water Systems	2.00		Irrig. Structures	"	4.00
Farm Bldgs. & Fences	1.00		Well & Water System	"	4.00
Irrigation Structures	1.00		<u>Other Expense:</u>		
			Treble Super Phos.	Ton	50.00
			State & County Tax	Per \$100 val.	1.50
			Twine	Per Lb.	.15

All budgets include items for miscellaneous expense amounting to \$1.25 an acre and in addition a certain amount for each animal included in the farm plan. These over-all charges are included to take care of items of minor expense not otherwise provided for.

Costs included in the budget for land included interest at 4 per cent on a \$25 an acre valuation. This valuation was arrived at from a study of county tax records and from opinions of project farmers and others. It is intended to represent a conservative value of the raw land plus cost of leveling and conditioning for irrigation farming. In none of the budgets is the value of the dwelling considered. However, interest on the investment in buildings and improvements, calculated at one-half the original cost, is included.

In setting up farm budgets for the Flathead area variations in intensity of labor use and capital requirements were measured for farms that are 80 acres and 160 acres in size. Regardless of size of the farm a procedure was followed: first, to calculate returns for farm organization where all crops produced are fed to livestock as in plans I, IV and VII; second, to calculate returns where receipts from sales of crops and sales of livestock and livestock products are nearly equal as in plans II and V; and third, to measure the returns when the major source of income is from crop sales as in plans III and VI.

Dairy cows, sows and hens in numbers sufficient to utilize the feeds produced were included in plans I and IV, while in plan VII feed crops are used on the farm to fatten beef cattle and hogs. These plans provide for the production of feed crops only, on the assumption that labor requirements for crop production would be held to a minimum. In all cases small quantities of certain concentrated feeds have to be purchased to supply a balanced ration for the livestock enterprises incorporated in the plans. The results give evidence of the effect of the extensive application of labor to crop production and using it intensively in the conduct of the livestock enterprises. In all three of these plans, yields of crops were assumed that are about 33 per cent above project averages and yields of milk and eggs at 30 per cent above average. The return of crop residues to the land in form of manure should justify the assumption of above average yields.

In plans II and V livestock production is not especially emphasized. Dairy cows and chickens are the only two enterprises incorporated into the plans. Crops grown include those needed for feed for livestock and in addition there is a small acreage devoted to sugar beet production. Total amount of crop sales compares favorably with the amount received from sales of livestock and livestock products in these two plans. Yields of crops were assumed that are 25 per cent above average, while milk and egg production was assumed at 30 per cent above average.

In plans III and VI provision was made for cows and hens in numbers sufficient only to supply home needs at all times. Sales of livestock and livestock products accounted for 12 per cent of gross income with a 160-acre farm, and about 25 per cent on an 80-acre farm. Crop production was emphasized and sugar beets and peas were included in the plan as cash crops. Yields about 12 per cent above average were assumed.

In the budget set-ups, an attempt was made to duplicate actual conditions with respect to the percentage of acreage irrigated per farm. In each case, lands included as waste, roads, canals and laterals were set at 10 per cent or less and the actual irrigated and cropped acreages represented 70 per cent of the gross farm acreage. In order to give maximum advantage to maintaining the systems now in use, it was assumed that non-irrigated pasture land is capable of supporting one cow or her equivalent for 5-1/2 months during the summer. Operation and maintenance charges were made only on that acreage actually cropped. These are distinct financial advantages, incorporated into the plans to favor the set of conditions now existing on the project. Better results could be expected under conditions of more economic utilization of the good quality land and water available.

In the detailed plans that follow a brief description of the important practices followed, feeds utilized, production, etc., is given in plan I. The same general practices were used with all the set-ups and therefore the descriptive material relating to plans II to VII, inclusive, is reduced to a minimum.

#### Plan I. Budget for an 80-acre Farm with 8 Cows, 6 Sows and 100 Hens

In the set-up for this and subsequent plans certain conditions were assumed. Every effort was made to select the most workable and practicable systems possible so that the land would benefit from the growing of soil building crops at least one-half the time. In plan I which is a livestock plan, all crops grown are marketed through livestock. There are 8 cows, 6 sows and 100 hens kept.

Of the 80 acres in the farm it is assumed that 72 acres, or 90 per cent of the farm acreage, are irrigable; 57 acres, or 71 per cent of the total, are irrigated, and 15 acres, or 19 per cent of the farm acreage, is pasture land suitable for cows and adequate to supply grazing for 8 head of cows and accompanying young stock for 5.5 months of the year. The 57 irrigated acres consist principally of Class I and Class II land, but there is some Class III land included also.

The high yields obtained are conditioned on there being 1.75 acre-feet of water available at the land for the 57 irrigated acres, or a total of 100 acre-feet per annum. Alfalfa was allowed 2.50 acre-feet per acre, silage crops 1.50 acre-feet per acre, and small grains 1.40 acre-feet per acre. Alfalfa hay yields were set at 2.50 tons per acre or about 20 per cent above average for the project. Small grain yields, barley at 45 bushels per acre, oats at 60 bushels per acre and wheat at 33 bushels per acre, are 50 to 60 per cent above the project average for these crops. A mixture of oats and peas is grown for silage production with assumed yields of approximately 8 tons per acre.

A combination of livestock enterprises was selected consisting of dairy cows, hogs and chickens in numbers sufficient to consume all roughage and concentrates grown or produced on the farm. In addition some grain and some prepared feed will need to be purchased.

The dairy herd consists of eight cows, two long yearling heifers, two heifer calves and one-half interest in a bull. Computations for feed needed and products produced are based on a yield of 7200 pounds of 3-1/2 per cent milk per cow per year. Eight cows will be on pasture 165 days, four calves 60 days and two long yearling heifers will be pastured for 165 days. Neither the bull nor the short yearling heifers will be pastured.

While on pasture the eight cows will be supplied with 3.5 pounds of ground barley and oats per head per day; the four calves will be fed 1.7 pounds ground oats and ground barley; and the long yearling heifers 1 pound of ground oats and ground barley per head.

Cows will be dry for eight weeks each year and heifers will be bred to drop their first calves at two years of age. Ordinarily one cow is all that need be replaced each year because of age. The plan provides for withholding two heifer calves each year. However, it is assumed that either a cow or a mature heifer can be disposed of each year and the milking herd maintained at eight head.

During the eight weeks of each year that the cows are dry, 3-1/2 pounds of grain, 12 pounds of alfalfa hay and 16 pounds of silage will be fed. Cows freshen in fall or early winter.

When not on pasture the cows will be fed a ration consisting of 15 pounds alfalfa hay; 20 to 25 pounds of silage and 5 pounds of mixed oats and barley ground to a medium fineness.

Calves to 6 months of age will be fed 15 pounds of skim milk and 1.7 pounds ground oats and barley per day, and when not on pasture 3.5 pounds of alfalfa hay.

Two heifers during the period from 6 months to 12 months of age will be fed 2.5 pounds ground oats and barley, 6 pounds alfalfa hay and 8 pounds of silage per head per day.

Heifers one to two years old while on pasture for 5.5 months will be fed 1 pound grain per head per day and while on dry feed 3 pounds of ground oats and ground barley, 10 pounds of alfalfa hay and 10 pounds of silage.

The bull, kept 180 days, will be fed 4 pounds ground oats and ground barley, 16 pounds of alfalfa hay and 18 pounds of silage.

Products of cows will be sold as butter fat and the skim milk fed to calves, chickens and hogs.

The hog enterprise will consist of 6 sows producing two litters of 6 pigs each and will be fed as follows:

During gestation period of 240 days, 5 pounds ground barley and ground oats, 5 pounds skim milk and during one-half time when not on alfalfa pasture, 5 pounds of alfalfa hay. During the suckling periods, two of 62 days each,



the sows will be fed 12 pounds of oats and barley, 7.5 pounds of skim milk daily and during one gestation period 3 pounds of alfalfa hay will be added. It is assumed that pigs will weigh 15 to 20 pounds each at the end of the nine weeks suckling period and will gain the next 80 to 85 pounds per head in 100 days.

During the period from weaning until a weight of 100 pounds is reached the pigs will be fed an average of 2.2 pounds of ground oats and barley, 1/4 pounds of alfalfa hay and 2.5 pounds of skim milk. Pasture will be available one-half time or more, and during this period alfalfa hay will be dropped from the ration.

It is assumed that 60 days will be required for the pigs to gain the second 100 pounds. They will be fed an average daily ration of 5.5 pounds of grain, one-half pound of alfalfa hay and 6.8 pounds of skim milk. In the event skim milk is not available 1.2 pounds of tankage or meat meal will be fed daily.

The poultry flock will consist of 100 laying hens with enough chickens to provide the farm family with broilers and roasters. Three hundred baby chicks will be purchased annually and a 10 per cent death loss is assumed, which will give a total of 270 chickens at maturity.

There will be 120 pullets kept which will permit the selection of 105 to 110 of the best birds each year for the laying flock. Hens will be disposed of at the end of the first laying season.

The 120 pullets grown to 28 weeks will require about 12 pounds of wheat for scratch, 30 pounds of skim milk and 8 pounds of mash consisting of 2 pounds of ground barley, 2 pounds of ground oats, 2 pounds of wheat bran and 2 pounds of middlings per bird.

The 150 broilers to 10 weeks of age will require 5.5 pounds of ground wheat and ground barley and 8 pounds of skim milk per bird.

Hens are to be fed a mixture of wheat and barley with skim milk in quantity. Production is calculated at 120 eggs per bird. There will be required 58 pounds of grains and 100 pounds of milk per hen per year. Hens will be allowed a run of alfalfa pasture during summer and in winter one ton of alfalfa hay(leaves) will be required for the 100 hens.

Horses will be fed 3 tons of alfalfa hay and 3500 pounds of grain per head.

All grains fed except those fed horses will be ground and mixed at home by utilizing a small hammer mill and a 1/8" screen pulled by a 10-15 H.P. tractor. Capacity of mill is estimated at 610 pounds of grain or 450 pounds of alfalfa hay per hour. All grain straw will be preserved and used for bedding.

The operator will be expected to perform 2900 hours of labor per year and allowance of \$1450 is made for this in computing the returns to land and water. Labor in excess of 2900 hours per year will be hired at 50 cents per hour.

Financial operations are advantageous for this set-up because of the favorable feed livestock ratio.



Table 19 - Farm Budget - Plan I (continued)

Acres in Farm - 80

Irrigable Acres 72  
Irrigated 57

Water Duty 1.75 ac. ft.  
at land

Crop Production and Disposal:

Crop	Acres	Unit	Yields		Used For		Sales Quan.	Average Inventory		
			Acres	Total	Seed	Feed		Quan.	Price	Value
Alfalfa hay	11	T	2.50	28	-	-	none	14 T	\$7.00	\$ 98
" pasture	4	-	-	-	-	-	"	-	-	-
Barley	19	Bu.	45	855	40	815	"	447 Bu	0.60	268
Oats	16	Bu	60	960	30	930	"	500 Bu	0.40	200
Wheat	3	Bu	33	100	6	94	"	53 Bu	0.85	45
Oats & Peas	4	T	8	32	-	32 T	"	16 T	5.00	80
Garden				\$80						
Pasture, Non-Irrigable	15	Cow Mo.	5							
Farmstead	8									
<b>Total</b>	<b>80</b>									<b>\$691</b>

Water and Labor Requirements - Crops

Crop	Acres	Number of Irrigations	Water Requirements		Man Work Days
			Per Acre	Total	
Alfalfa	15	5	2.50	38.0	375
Barley	19	3	1.45	28.0	(
Oats	16	3	1.45	24.0	( 760
Wheat	3	3	1.45	4.0	(
Oats & Peas	4	4	1.50	6.0	180
<b>Total</b>	<b>57</b>			<b>100 ac.ft.</b>	<b>1315</b>

Purchase of Seed:

Kind	Amount	Price	Total
Peas	400 Lb.	\$ 2.00 bu.	13.00
Alfalfa	20	.30	6.00
<b>Total</b>			<b>19.00</b>

TABLE 19 - FARM BUDGET - PLAN I (CONTINUED)  
FEED REQUIREMENTS FOR LIVESTOCK

KIND	NO.	TONS OF ROUGHAGE						CONCENTRATES POUNDS				PASTURE ANIMAL MONTHS				OTHER FEED			
		ALFALFA HAY		SILAGE		OTHER		GRAIN		OTHER		PER HEAD	TOTAL	BLUE GRASS	OTHER ALF. PAST.	PER HEAD	SKIMMILK TOTAL		
		PER HEAD	TOTAL	PER HEAD	TOTAL	PER HEAD	TOTAL	PER HEAD	TOTAL	PER HEAD	TOTAL								
COWS	8	1.25	10.00	2.00	16.00	-	-	1500	12,000	-	-	5.5	44.00	44.00	-	-	-	-	
CALVES	4	.25	1.00	-	-	-	-	306	1,225	-	-	1.0	4.00	4.00	-	-	-	-	
HFS. 1'S	16	.54	1.10	.70	1.40	-	-	450	900	-	-	-	-	-	-	-	-	-	
HFS. 2'S	26	1.00	2.00	1.00	2.00	-	-	765	1,530	-	-	4.2	8.40	8.40	-	-	-	-	
BULL	1/2	3.00	1.50	3.20	1.60	-	-	1440	720	-	-	-	-	-	-	-	-	-	
SOWS	6	.40	2.40	-	-	-	-	2700	16,200	-	-	5.5	11.00	11.00	-	-	-	-	
FEEDERS	72	-	1.00	-	-	-	-	550	39,600	-	-	5.5	33.00	33.00	-	-	-	-	
HENS	100	-	1.00	-	1.00	-	-	-	8,400	-	-	5.5	5.50	5.50	-	-	-	-	
HORSES	2	3.00	6.00	.50	1.00	-	-	3500	7,000	-	-	-	-	-	-	-	-	-	
TOTAL			26.00		23.00				87,575				105.90	56.40	49.50				55,000*

(\* TO 6 MONTHS OF AGE)

LIVESTOCK PRODUCTION, IN KIND

KIND	UNIT	INVENTORY AVERAGE		ANNUAL SALES		ANNUAL PURCHASES		USED IN HOME						
		NO.	VALUE PER HEAD	TOTAL VALUE	NO.	PRICE	VALUE	NO.	PRICE	VALUE				
COWS	HEAD	8	100	\$ 800	2	\$ 40	\$ 80	-	-	-	-	-	-	-
CALVES (6 MO)	"	2	25	50	-	-	-	-	-	-	-	2	20	\$ 40
HFS. 1'S	"	2	50	100	-	-	-	-	-	-	-	-	-	-
HFS. 2'S	"	2	85	170	-	-	-	-	-	-	-	-	-	-
BULL	"	1/2	300	150	-	-	-	1/4	300	75	-	-	-	-
SOWS	"	6	30	180	-	-	-	1 BOAR	50	50	-	-	-	-
FEEDERS	"	36	10	360	68	18	1224	-	-	-	-	2	10	20
CHICKENS	A.U.	1	60	60	-	-	-	-	-	-	-	-	-	-
HORSES	HEAD	2	100	200	-	-	-	300	.15	45	-	-	-	-
TOTAL				\$2070			\$1304			\$170				60

LIVESTOCK PRODUCTS, PRODUCTION AND DISPOSITION

PRODUCTS	ANNUAL PRODUCTION		FED	USED IN HOME		ANNUAL SALES		FEED PURCHASED				
	UNIT	TOTAL		AMOUNT	VALUE	QUANTITY	PRICE	VALUE	QUANTITY	PRICE	AMOUNT	
BUTTERFAT	#	1964	-	77 @ 35	27	.35	660	HOGS	TANKAGE	42 CWT.	\$5.00	\$ 210
MILK	7200 #	(57,600)	-	1500 #	75	-	-	HOGS	GRAIN	81 CWT	1.00	81
EGGS	10 DOZ.	1000 DOZ.	-	100 DOZ.	25	.25	225	CHICKENS	MASH	5 CWT.	5.00	25
SKIMMILK			55,300									
HENS			15	8	.54	40						
BROILERS			50	20	.40	40						
TOTAL			155	155		965						\$ 316

Table 19 - Farm Budget - Plan I, (continued)

## Buildings and Improvements: Repairs and Depreciation

Item	Original Cost	Inventory Value	Annual Repairs	Annual Depreciation
Barn	600	300	6	24
Implement Shed	400	200	4	16
Fences	400	200	4	16
Water System (1/2)	500	250	5	20
Irrigation Structures	200	100	2	8
Garage (farm share)	100	50	1	4
Other - Poultry House	300	150	3	12
Hog House	300	150	3	12
Silo	200	100	2	8
Total	3,000	1,500	30	120

## Machinery and Equipment

Item	Original Cost	Inventory Value	Annual Repairs Lubrication, etc.	Annual Depreciation
Plow	1/	-	-	-
Disk	190	95	6	14
Harrow	70	35	2	5
Leveling Equipment	75	35	2	5
Drill	250	125	8	17
Mower	170	85	5	12
Rake, S. D.	165	80	5	12
Rake, Sulky	70	35	2	5
Planter	1/	-	-	-
Cultivator	1/	-	-	-
Wagon	150	75	5	10
Trailer	100	50	3	7
Manure Spreader	180	90	6	13
Grain Binder	300	150	9	20
<u>Special Equipment</u>				
Ensilage Cutter	450	225	15	32
Feed Grinder	130	65	4	10
Cream Separator	125	65	4	9
Water Heater	125	65	4	9
Total	2550	1275	80	180

## Power Machinery

Tractor 10-15 h.p.	1200	600	183	120
Truck	-	-	-	-
Auto (farm share)	300	150	50	50

1/ Included with tractor

Table 19 - Farm Budget, Plan I, (continued)

Labor Requirements for Crops, Livestock and General Work

Crops:

Crop or Item	Acres or Head	Hours per acre or per Head			Total Hours		
		Man	Tractor	Horse	Man	Tractor	Horse
Alfalfa Hay	11 Acs.	25	7	10	375	105	150
" Pasture	4 "						
Small Grains	38 "	20	8	11	760	304	418
Oats & Pea Silage	4	45	15	20	180	60	80
Pasture, Non- Irrig.	15	2		1/2	30	-	8
<b>Total on Crops</b>					<b>1345</b>		

Livestock:

Cows	8	120	-	1	960	-	8
Sows	6	100	-	1	600	-	6
Hens	100	.15	-	.02	15	-	2
Horses	2	50	-	1	100	-	2
<b>Total on Livestock</b>					<b>1675</b>		

Other Work:

Fence Repair	-	35	-	40	35	-	40
Haul Manure	-	100	-	200	100	-	200
Machine Repair	-	50	-	-	50	-	-
Grinding Feed*	-	140	140	-	140	140	-
Overhead	-	100	-	100	100	-	100
<b>Total Other</b>					<b>425</b>		

Summation:

Total Farm Work					3445	609	1014
Work by Operator					2885		
Hired Labor					560		

\* Feed grinding: mixing of rations  
 450# alfalfa hay per hour  
 610# grains per hour

Plan II - An 80-Acre Farm with 4 Cows and 350 Hens:

In this plan, as in Plan I, 57 acres are irrigated and 15 acres, temporarily non-irrigable because of drainage or topography, are used for pasture. The 57 irrigated acres are used for alfalfa hay, alfalfa pasture, small grains and sugar beet production. A silage crop is not grown and sugar beets are included to provide an intensively cultivated cash crop. Crop yields assumed are considerably above average for the project but are not as high as in Plan I because of there being only moderate amounts of manure to apply to the land and because alfalfa acreage represents less than 30 per cent of the total cropped area.

The plan provides for the keeping of four good cows. The skim milk produced is fed to 3 calves and a flock of 350 hens. Power for field work is supplied by four horses.

Feeds consisting mostly of oats, wheat, barley and alfalfa ground by use of a hammer mill and drawn by a 15-horse-power electric motor, will be used as concentrates for cows and chickens. Roughage will consist principally of alfalfa hay although in winter alfalfa will be supplemented by oat straw. The rate of feeding and the mixtures used are about as shown in Plan I. The milk required by poultry cannot be supplied by four cows so it is anticipated that semi-solid buttermilk will be purchased to supplement the skim milk produced.

Except for contract work on beets, calculated at \$30 per acre all labor required amounting to 2400 hours will be supplied by the operator. Jobs requiring more than one man can be cared for by an exchange of labor.





Plan III - An 80 Acre Farm with 2 Cows and 100 Hens:

In this plan an 80-acre farm with 57 irrigated acres is assumed. There are 15 acres of Class 3 pasture land not irrigated and not assessed for irrigation charges. The remaining 8 acres are Class 4 land.

The irrigated land, 32 acres of which are given to the production of alfalfa and sugar beets, was used to maximum advantage in the production of crops with high acre value or having soil building qualities. Small grains are grown on the remainder; oats and barley for feed, and wheat for sale and feed for poultry. Yields assumed are 110 per cent of average for alfalfa and sugar beets and about 120 per cent of average for grains.

The average quantity of water applied, amounting to 1.75 acre-feet per acre was used as in plans I and II but because of the relatively large acreage of crops with high water requirements included in this plan 2.25 acre-feet is all that is available for alfalfa and beets, and 1.10 acre-feet is available for grains. This is not sufficient water to produce good yields except on the very best land in the project.

This plan requires 210 man-days of work. No hired labor, except contract labor on beets, is provided for, it being anticipated that an exchange of work will be possible between the operator and his neighbors.

From the standpoint of long-time use of land and water this plan has less to commend it than either plan I or plan II because a great deal of plant food is disposed of each year by the sale of crops. It will be observed also that the plan provides for only 2100 hours of man labor per year valued at \$1050.



PLAN IV - A 160 Acre Farm with 20 Cows, 8 Sows and 240 Hens:

In plan IV a 160-acre farm is used principally for the production of grains, hay and silage for the feeding of cows, sows and hens. There are 118 irrigated acres, 27 irrigable acres not supplied with water and used for pasture, and 15 acres are waste or used for roads, canals and laterals. The set up for plan IV is almost the same as for plan I, the two principal differences being that the farm is larger and 10 acres of sugar beets are added as a cash crop in plan IV.

Twenty cows, 8 sows and 240 hens are kept. Livestock and livestock products income consists principally of hogs, butterfat, and eggs. Cows produce 7200 pounds of 3.5 per cent milk each and hens are credited with the production of 10 dozen eggs per bird per year. Skim milk is produced in sufficient quantity to provide the protein requirements for hogs and chickens.

Cows are fed alfalfa hay, silage and mixture of ground oats and ground barley during the winter months. In summer, pasture supplies the succulent feeds; however, a small quantity of ground oats and ground barley is fed to maintain high production. Hens are fed skim milk, cracked wheat and cracked barley. Hogs are fed skim milk, ground barley and ground oats. Two litters per sow are produced annually and feeder pigs are sold when they attain a weight of 200 pounds. Power for field operations is provided by a 10-15 H.P. tractor and 4 horses. Feed is ground with power supplied by the tractor.

The man labor requirements are relatively heavy in this set-up there being 6784 hours needed to carry on the operations. Except for November and December there is more work than one man can do, and from April to September two to three men are required to perform the labor necessary.

This plan incorporates two enterprises where labor must be used intensively. The capital investment is also relatively high. This system represents the type of farm organization calling for high caliber management, and unless good production can be obtained from both land and livestock the net income will be disappointing.

Table 22: Farm Budget, Plan IV.  
 Budget Summary Flathead Project, Montana; 160 acre farm with 145 irrigable and 118 irrigated acres; 20 cows,  
 8 sows and 240 hens

Land Use	Land Irrigation		Man Work Days	Production		Disposal of Products		Current Farm Expense																																																																			
	Acres	Water per Acre		Unit Yield or Wt.	Total	Amt.	Price	Value	Fed																																																																		
Alfalfa Hay)	21	2.50	70	T	2.5	53	-	-	53	\$ 211																																																																	
" Pasture)	8	2.50								\$ 148																																																																	
Oats & Peas	8	1.50	12	T	7	58	-	-	58	\$ 60																																																																	
Sugar Beets	10	2.50	27	T	15.0	150	8	1200	20	\$ 88																																																																	
Oats	26	1.40	52	Bu	60.0	1560	-	-	1500	\$ 44																																																																	
Barley	37	1.40	74	Bu	45.0	1665	-	-	1590	\$ 300																																																																	
Wheat	8	1.40	12	Bu	33.0	264	-	-	248	\$ 43																																																																	
Pasture Non Irrigable	27	-	5	-	-	-	-	-	-	\$ 175																																																																	
Garden										\$ 100																																																																	
Farmstead & Waste	15									\$ 424																																																																	
Farm Total	160		225					1200		\$ --																																																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Farm Investment</th> <th colspan="2">Days of Work</th> <th colspan="2">Return to Water</th> </tr> <tr> <th>Land @ \$25 per Ac.</th> <th>Farm Bldgs. &amp; Imp.</th> <th>Total</th> <th>Operator</th> <th>Net farm income</th> <th></th> </tr> </thead> <tbody> <tr> <td>\$4,000</td> <td>\$2,100</td> <td>678</td> <td>300</td> <td>\$ 705</td> <td></td> </tr> <tr> <td></td> <td>\$1,470</td> <td>376</td> <td>Hired</td> <td>\$ 370</td> <td></td> </tr> <tr> <td></td> <td>\$ 600</td> <td></td> <td>Water Use</td> <td>\$ 1500</td> <td></td> </tr> <tr> <td></td> <td>\$ 150</td> <td></td> <td>1.75 ac.ft.</td> <td>\$ 403</td> <td></td> </tr> <tr> <td></td> <td>\$4,200</td> <td></td> <td>on 118 acs.</td> <td>\$- 828</td> <td></td> </tr> <tr> <td></td> <td>\$1,300</td> <td></td> <td>Total 206</td> <td>\$ 160</td> <td></td> </tr> <tr> <td></td> <td>\$ 250</td> <td></td> <td>acre ft.</td> <td>\$- 988</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>\$-8.37</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>\$-6.81</td> <td></td> </tr> </tbody> </table>										Farm Investment		Days of Work		Return to Water		Land @ \$25 per Ac.	Farm Bldgs. & Imp.	Total	Operator	Net farm income		\$4,000	\$2,100	678	300	\$ 705			\$1,470	376	Hired	\$ 370			\$ 600		Water Use	\$ 1500			\$ 150		1.75 ac.ft.	\$ 403			\$4,200		on 118 acs.	\$- 828			\$1,300		Total 206	\$ 160			\$ 250		acre ft.	\$- 988						\$-8.37						\$-6.81	
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\* Miscellaneous and Livestock purchases

Plan V - A 160 Acre Farm with 10 Cows and 400 Hens:

In this system emphasis is placed on the production of butterfat, eggs, sugar beets and wheat. Sugar beet production is of major importance in the plan; wheat, butterfat and eggs are produced in moderate quantity.

Power for field operations is furnished by 8 horses while feed grinding and other stationary power operations are performed by a 15-H.P. electric motor.

The same method of feeding and livestock management described in other plans is used. Practically all feed consumed is produced on the farm. Cows are fed alfalfa hay, ground oats and ground barley during the winter season, there being no silage crops included in this plan. In summer roughages will be supplied by native blue grass pasture produced on land in draws or coulees not irrigated. Only 10 cows and 400 hens are kept. There are no hogs included. The 10 cows are assumed to produce 7200 pounds of 3.5 per cent milk annually and skim milk not consumed by calves is fed to hens. By this procedure costly protein supplements need not be purchased for the feeding of poultry.

In producing 20 acres of sugar beets it is realized that under present conditions of manufacture and disposal, the devotion of 20 acres of land to sugar beet production would be the exception rather than the rule. If sugar beets can be grown successfully, however, there is no reason why farmers could not specialize to this extent. The plan is also dependent on there being plenty of contract labor available for crop operations. During years of labor shortage a near loss of the entire beet crop could be expected.

Table 23: Farm Budget, Plan V.  
 Budget Summary Flathead Project, Montana; 160 acre farm with 145 irrigable and 118 irrigated acres; 10 cows and 400 hens

Land Use	Land Acres	Irrigation Water per Acre	Man Work Days	Production		Disposal of Products		Current Farm Expense																			
				Unit	Yield or Wt.	Total Amt.	Price	Value	Fed	State and County Taxes @ \$0.015	O. & M. charges @ \$1.25 per ac.	Farm share of electricity	Seed	Fertilizer 3500# @ \$2.50 cwt	Contract work 20x30 acres	Twine, sacks, etc. 4# per ac. @ 15¢	Other crop expenses, Thresh @ 5¢ cwt	Purchased feed	General Livestock expense	Livestock purchased	Labor, hired	Tractor, gas, oil & repair	Auto, gas, oil, repair, farm share	Repairs to bldgs. & fences	Repairs to mach. & equipment	Depreciation mach. & equipment	Depreciation on automobile
Alfalfa Hay)	26	2.50	90	T	2.25	59	-	-	59	\$ 162																	
" Pasture)	5	2.50	-	-	-	-	-	-	-	\$ 148																	
Sugar Beets	20	2.50	54	T	15.00	300	300	8.0	2400	\$ 75																	
Tops									160	\$ 104																	
Oats	18	1.20	36	Bu	55.00	990	50	.40	20	\$ 88																	
Barley	14	1.20	28	Bu	40.00	560	90	.60	54	\$ 600																	
Wheat	35	1.20	70	Bu	30.00	1050	530	.85	451	\$ 40																	
Garden						80				\$ 130																	
Pasture Non-Irrigable	27									\$ 228																	
Farmstead & Waste	15									\$ 341																	
Farm Total	160		278						3085	\$ 1,012																	
Farm Investment																											
Land @ \$25 per Ac.	\$4,000									\$ 50																	
Farm Bldgs. & Imp.	\$1,700									\$ 39																	
Mach. & Equip.	\$1,405									\$ 88																	
Tractor	--									\$ 202																	
Auto, farm share	\$ 150									\$ 50																	
Livestock	\$2,510									\$ 156																	
Feed and supplies	\$ 811									\$ 200																	
Farm well	\$ 250									\$ --																	
Total	\$10,826									\$ 3713																	
Receipts:																											
Crop sales									\$1,625	\$ 3085																	
Livestock sales									\$ 340	\$ 80																	
Livestock products sales									\$1,500	\$ 2173																	
Other									\$ 273	\$ --																	
Total cash farm income									\$ 192	\$ 5338																	
Total current farm expense									\$ 160	\$ 3713																	
Net farm income									\$ 32	\$ 1625																	
Interest on investment									\$ 0.27	\$ 433																	
Value of family labor									\$ 0.22	\$ --																	
Operator's labor income										\$ 1192																	

Plan VI - A 160 Acre Farm with 3 Cows and 100 Hens:

This set-up involves the production of crops for sale. Horses are used for power in field operations; 3 cows and 100 hens are kept to produce eggs and milk, principally for home use although livestock sales amount to considerable. Except for feed consumed by 8 horses, 3 cows and 100 hens, all grain and hay produced are sold.

Sugar beets and peas are grown as the principal cash crops although most of the alfalfa hay produced is sold also.

This system could be worked as well with a tractor and no horses. By eliminating the horses more of the crops grown would be available for sale. The effect of the substitution can be measured by calculating the charges involved for each type of power and allowing some credit to horses for the manure produced.

In the set-up as worked out, 17,400 pounds of oats, 5,800 pounds of barley and 24 tons of alfalfa hay were fed to the 8 horses. At 40¢ a bushel the oats consumed would be worth \$217.50; the barley at 60¢ a bushel would be worth \$58.00 and the hay at \$7.00 per ton would be worth \$168.00; a total for feed of \$444.00. There were 400 hours of man-labor spent on the horses which when calculated at 50¢ per hour amounted to \$200. Miscellaneous expense per horse (for harness, etc.) was calculated at \$10 making a total of \$80. Interest on investment in horses was \$32, and if no horses were kept the investment in barn could be cut to \$100 which would involve a saving of \$4 more. Total of these items is \$760. Allowing \$2.50 per ton for the 48 tons of manure produced, a total of \$120 is obtained leaving a balance of cost amounting to \$640. The horses performed an estimated 4491 hours of labor.

Investment in tractor is \$1200 and an average inventory value of \$600 is assumed. This at 4 per cent interest amounts to \$24. Depreciation is calculated at \$120. Fuel, oil, grease and repairs for a 10-15 h.p. tractor is estimated to cost 30¢ per hour. In an attempt to substitute tractor labor for horse labor for farm operations the following estimates for tractor labor are used:

Alfalfa hay per acre . . . . .	12 hrs. x 50	= 600 hours
Sugar beets " " . . . . .	10 " x 12	= 120 "
Small grains " " . . . . .	13 " x 26	= 340 "
Peas " " . . . . .	12 " x 30	= 360 "
Fence repair . . . . .		= 35 "
Manure hauling . . . . .		= 20 "
Overhead . . . . .		= 100 "
Total		<u>1575</u>
1575 hours @ 30¢ per hour		= \$472.50

Interest, depreciation, grease, fuel oil and repair totals \$616. The difference is \$24 in favor of the tractor although there are other elements to consider. Labor used on horses would be available for other purposes if tractor was used for power in feed grinding operations but this is not consequential in this set-up as much of the labor required comes during the winter months when the operator has little remunerative work to do.

With this set-up as with all others where crop specialization is followed there is no opportunity for full time labor by the operator.

Table 24: Farm Budget, Plan VI  
 Budget Summary Flathead Project, Montana; 160 acre farm with 145 irrigable and 118 irrigated acres; 3 cows and 100 hens.

Land Use	Land Acres	Irrigation Water per Acre	Man Work Days	Production Unit	Disposal of Products Amt.	Price Value	Current Farm Expense	
							State and County Taxes @ \$0.015	O. & M. charges @ \$1.25 per acre
Alfalfa Hay	50	2.50	150	T 2.0	68	476	Seed	\$ 130
Wheat	5	1.25	10	Bu 25	-	-	Fertilizer 2100# @ \$2.50 per cwt.	\$ 148
Oats	15	1.25	30	Bu 45	-	-	Contract work 12x30 acres	\$ 10
Barley	6	1.25	12	Bu 35	-	-	Twine, sacks, etc.	\$ 84
Sugar Beets Tops	12	2.50	33	T. 12	144	1152	Other crop expenses, thresh *	\$ 52
Peas	30	1.10	72	Bu. 20	510	1020	Purchased feed	\$ 360
Pasture Non-irrigable	27	-	5				General livestock expense	\$ 16
Garden							Livestock purchased	\$ 110
Farmstead & Waste	15						Labor, hired	\$ 43
Farm Total	160					2721	Feed Grinding @ 15¢ cwt.	\$ 148
Farm Investment							Auto, gas, oil, repair, farm share	\$ --
Land @ \$25 per Ac.	\$4,000						Repairs to bldgs. & fences	\$112
Farm Bldgs. & Imp.	\$1,350						Repairs to mach. & equipment	\$ 23
Mach. & Equipment	\$1,275						Depreciation on mach. & equip.	\$ 50
Tractor	\$ --						Depreciation on automobile	\$ 37
Auto, farm share	\$ 150						Depreciation on buildings	\$ 79
Livestock	\$1,110						Depreciation on tractor	\$ 182
Feed and supplies	\$ 555						Misc. farm expense @ \$1.25 per ac	\$ 50
Farm well	\$ 250						Total current expense	\$ 128
Total	\$8,690							\$ --
								\$200
								\$2962
Receipts:								
Crop sales								
							Livestock sales	\$2721
							Livestock products sales	\$ --
							Other	\$ 410
							Total cash farm income	\$3131
							Total current farm expense	\$2962
							Net farm income	\$ 169
							Interest on investment	\$ 348
							Value of family labor	\$ --
							Operator's labor income	\$-179

\* Grains @ 5¢ per bu. Peas @ 10¢ per bu.



Plan VII - A 160 Acre Farm with 18 Cows, 50 Feeder Cattle, 3 Sows and 50 Hens;

In plan VII a 160-acre farm set-up is worked out to provide for a near equal monthly distribution of labor by including a beef cattle feeding enterprise. The purpose sought in this plan was to utilize the hay, pasture and grain produced. Breeding cows are kept in sufficient number to utilize fully the 27 acres of native non-irrigated pasture included in this plan. It is estimated that 15 calves are produced annually. Five are needed for replacement and home consumption, and 10 put in the feed lot about October 1 along with 40 purchased calves and fed for about 200 days. Weight at beginning of feeding period was calculated at 450 pounds per animal and the finished weight 850 pounds. Daily grains of 2 pounds per animal were counted on which are good gains but not out of line when good management is followed.

In addition to the small beef cattle herd, three sows and 50 hens are included in the plan. Principal purpose of keeping hogs is to provide feeder pigs to follow the cattle in order that maximum utilization of the grains fed will be made. Two litters of 6 pigs each were counted of which 16 were used to follow the cattle on feed. The 50 hens were included principally to provide eggs and chickens for home use.

Crops produced consist principally of alfalfa hay, silage crops, and small grains, all of which are fed to the livestock. Eight acres of sugar beets are included as a cash crop. Beet tops are utilized by the feeder calves.

Power for field work is supplied by a 10-15 h.p. tractor and four horses. In addition to field work performed the tractor is used for belt work in feed grinding and ensilage operations.

Livestock feeding is a specialty enterprise and one involving high financial risks. The best time to purchase feeder cattle, the age of animal to buy and feed, the price ratio between meat animals and feed, the degree of finish and the best time to sell are the principal economic factors that must be considered. In addition to these, experience in the feeding of stock counts for a great deal. Preventing cattle from getting "off feed" involves cleanliness of feed bunks and water troughs, the watchful eye of the feeder with respect to feeds and the thriftiness of the animals, and the prevention of overfeeding.

Desirable features of the plan include good balance in labor use throughout the year, some income from crop sales, the retention of all crop residues on the farm and a relatively small investment in buildings and improvements.



In an attempt to determine the financial returns that would be obtained from the operation of 80-acre farms with different types of organization, it has been shown that the only plan which shows a reasonable return to the operator for his labor and management is plan II. This plan is principally a cash crop system, with the products of cows and hens contributing to the income. Its principal fault is that there is a relatively small acreage of soil-building crops. Only enough alfalfa hay was grown to supply feed for the livestock kept on the farm. The principal cash crop is sugar beets. The plan provides for 8 acres of beets and the value of the produce sold, including tops, amounts to \$1,020. This plan, while rather common in certain parts of the project, lacks balance. There is not enough livestock kept to produce manure sufficient to maintain the productivity of the soil. Its advantage is that the only labor that is hired consists of contract work for sugar beets. The plan does not provide labor sufficient to keep the operator engaged in productive work on his own farm.

It is rather obvious from the analyses made that 80-acre farms in general are not adequate in size to produce net income sufficient to provide a decent level of living for a farm family.

In the analysis of the 160-acre farms, plan V seems to be the most remunerative to the operator for his labor and management. The operator's labor income in plan VII is next in line, while in plan IV the operator's labor income is computed to be \$142.

In Table 26 are shown the significant results for the three plans for 80-acre farms and the four plans for 160-acre farms. Shown in this table are the cash farm income, the current farm expense including depreciation of buildings and equipment, net farm income, interest on investment and a value for the operator's labor income. Shown also is a figure for the value of farm privileges, which consists of garden crops and livestock products that are furnished by the farm.

Table 26 - Comparison of Returns for 80 and 160-acre Farms  
Flathead Irrigation Project, Montana

Item	80-Acre Farms			160-Acre Farms			
	Plan I	Plan II	Plan III	Plan IV	Plan V	Plan VI	Plan VII
Cash Farm Income	\$2,269	\$2,626	\$1,316	\$5,491	\$5,338	\$3,131	\$5,727
Current Farm Expense	2,135	1,892	1,258	4,786	3,713	2,962	4,769
Net Farm Income	134	734	58	705	1,625	169	958
Int. on Investment	331	270	222	563	433	348	532
Operator's Labor Inc.	-197	464	-164	142	1,192	-179	426
Val. Farm Privileges	295	275	275	370	340	320	286
Cash Farm Income	\$2,269	2,626	1,316	5,491	5,338	3,131	5,727
Cash Farm Expense	1,665	1,547	926	4,224	3,305	2,602	4,260
Balance	604	1,079	390	1,267	2,033	529	1,467
Labor hired	280	-	-	1,892	1,012	1,112	907
Balance if Members of Family Performed all Labor except Contract Work	884	1,079	390	3,159	3,045	1,641	2,374

Persons not well acquainted with agriculture and farm accounting fail to understand how farmers with low labor incomes manage to continue operations for a time and to maintain a fairly satisfactory level of living. There are several reasons for this. More often than not a farmer does not deduct a value for the interest on investment he has in the farm business and neither does he provide a sinking fund for depreciation of buildings and equipment. In addition to these, most farm families are of such size that considerable of the labor, besides that of the operator, is supplied by members of the immediate family thereby eliminating the need for a cash outlay for this item.

In order to give some idea of how the seven plans work out, pertinent determinations were made and shown in the lower portion of Table 26. Cash farm expenses were subtracted from cash farm receipts to obtain the cash balance. To this figure the value of labor hired was added to arrive at a cash balance that could be expected, provided the operator and members of the family performed all the labor required except contract work. When this procedure was used, plan II for 80-acre farms showed a balance of \$1,079 and plan III a balance of \$390. The balance for the 160-acre farms is much more favorable and with the exception of plan VI amounts to approximately \$2,400 per farm or more. Plan IV shows the greatest amount of cash available; plan V second, plan VII third, and plan VI shows a balance of only \$1,641.

A charge of \$1.25 was made for operation and maintenance charges for the various farm budget set-ups, but nothing was included for construction charges. Construction charge repayments, except for a charge of 50 cents per acre in early years, has not been collected and it is quite possible that if power revenues are applied to repay construction charges, the amount farm owners will be obliged to pay may be very small. It is rather conclusively shown, however, that total irrigation charges per acre cannot exceed \$1.75 to \$2.50 per acre as 60 per cent or more of the farms operated in the project are 80 acres or less in size. Until farmers on the project provide economic units for their operations, the possibilities of collecting construction charges as provided by existing law will be exceedingly remote.

#### IRRIGABLE AREA DETERMINATION

Flathead Project landowners have suffered appreciable crop losses in the past because of shortages in water supply. This was especially true in the early stages of project development and continued during most years until the Flathead pumps were installed in 1939, although they were not used to a maximum extent until 1940. At no time in the history of the project have more than 110,000 acres been assessed for operation and maintenance charges and in the maximum year of use, about 90,000 acres, exclusive of so-called private water right lands, were irrigated. Reliable data at hand show the losses sustained on account of the shortage of water have been so great that most farm operators were unable to produce more than enough to pay farm operating costs. It was necessary to allow large areas of improved farms to lie idle in summer fallow or waste in order that the operators could apply their entire water allowance to selected parts of their farms. The moratorium granted by joint resolution of Congress dated August 5, 1939 (53 Stat. 1221) was based on the

fact that water supplies were grossly inadequate to permit the production of optimum yields of crops, returns from which would be used to pay irrigation charges and other costs of agricultural production. As indicated in previous sections of this report, it is difficult to understand how existing water supplies could be spread to irrigate to advantage 138,195 acres of land. This figure represents the total of class 1, class 2 and class 3 land in the project as determined by the 1930 land classification survey, details of which are shown in a schedule that was approved as a land classification report in 1931. In 1933 that portion of the 138,195 acres that was classified as 1 and 2, and a small part of class 3 land was made subject to the payment of irrigation charges. It has been the contention of some that while construction charges are applicable to the full 138,195 acres, the time may never come when assessments for operation, maintenance and construction charges would be assessed against all of this acreage. It is the opinion of representatives of this Unit that eventually irrigation charges will have to be paid, both operation and maintenance and construction, on all the irrigable acreage in the project to which construction charges are spread, excepting only those lands which cannot be reached by the project's irrigation facilities. Eventually lands that could not be reached by project works would be eliminated from the project. Facilities now constructed are capable of delivering water to at least 90 per cent of the 138,195 acres of land, but the productive capacity of 15 to 20 per cent of the area is exceedingly low and the production therefrom would not justify the collection of irrigation charges in full.

Meetings with landowners in the Flathead Irrigation Project in 1938 brought out the fact that water supplies were inadequate for 138,000 acres, and that there was not that much land lying under or adjacent to project facilities, of a quality to produce returns sufficient to justify its irrigation.

In a letter from the Jocko Valley Irrigation District, dated December 21, 1938, it was stated, "The Commissioners of the Jocko Valley Irrigation District believe that an economic investigation of the Flathead Irrigation Project will disclose the necessity for a readjustment in the terms of existing repayment contracts.

"When the program of construction is completed a thorough examination should be made of all the lands in the project so that they may be placed in their proper classification as to soil and quantity of water available."

The Mission Irrigation District, in a letter dated May 24, 1939, stated "Commissioners of the Mission Irrigation District request that the A. L. Walker Commission recommend a detailed classification of all the irrigable lands on the Flathead Irrigation Project and that all lands be classified on their ability to pay, with production as the guiding factor. That unproductive lands be dropped \* \* \* from assessment rolls."

The Flathead Irrigation District, in a letter dated November 30, 1938 stated,

"At a meeting of the commissioners it was pointed out that owing to a shortage of water for irrigation it has been impossible for farmers in the Flathead Project to concentrate upon an intensive irrigation type of farming

with any reasonable assurance of raising maximum or profitable crops.

"We therefore recommend that a preliminary study be made covering only the general situation on the project and pending completion of your (detailed) study, construction on the Flathead Irrigation Project be suspended."

The contentions of the landowners and boards of commissioners are borne out by an analysis of production on class 1, class 2 and class 3 lands as shown in the 1930 classification. It was found that the class 1 and class 2 lands produced crops with about 20 per cent less water per acre than class 3 lands and the yields were far greater than on class 3 lands. On the basis of an analysis of representative acreage in the project and assuming crops produced to be worth \$8.00 per unit, the value of an acre-foot of water applied to class 1 lands was \$12.32. On class 2 lands the value of crop produced per acre-foot of water was \$10.80 and on the class 3 lands the value of crop produced per acre-foot of water was about \$5.00.

It has been the opinion of practically all independent investigators of the Flathead Project that 138,195 acres is far in excess of the acreage that can be irrigated adequately with existing water supplies. This point was stressed by Porter J. Preston and Charles A. Engle in 1929. The analysis of water supplies by Paul V. Hodges, and subsequently by the late Henry S. Kollenborn of this Unit, showed definitely that existing supplies are not adequate for 138,000 acres. After careful investigation by this Unit it is concluded that not more than 120,000 acres can be adequately irrigated in the Flathead Project area with existing water supplies. The 6,000 acres of so-called private water right lands were assumed to have a priority for 2 acre-feet of water per acre or less and must be considered in the calculations. This means that there are supplies available for not to exceed 114,000 to 115,000 acres of project lands located approximately as follows:

Mission Valley Division,	94,500 acres
Jocko Division	10,500 "
Camas Division	8,000 to 10,000 acres

The consensus of all investigators seems to be that the acreage included in the 1930 classification for the Jocko Division of the project is substantially correct, but that the acreage included for the Camas area is at least 40 per cent too great and that the acreage included for the Mission Valley Division is 15 or 20 per cent too great. The 1930 classification included about 112,000 acres in the Mission Valley Division exclusive of the so-called private water right lands, in the class 1, 2 and 3 groups, and it is to be presumed that unless an adjustment is made in this acreage as recommended in this report, all of the above acreage will be entitled to a portion of the water supply and likewise will be obligated for the payment of irrigation charges. It is the conclusion of this Unit that not to exceed 94,000 acres of project land should be included as irrigable in the Mission Valley Division. This, combined with the so-called private water right lands amounting to approximately 6,000 acres, would make a total of 100,000 acres dependent on water supplies available to the Mission Valley area.

While contending that the land classification submitted in 1930 and approved by the Secretary in 1931 is substantially correct and that the full 138,195 acres should be included in the project, the Supervising Engineer of the area in which the project is located, in a letter addressed to the Director of Irrigation on April 15, 1939, wrote as follows:

"The Flathead Project was authorized by specific legislation and a complete and unified plan for the irrigation of approximately 100,000 acres in what was named the Mission Valley Division was worked out as one unit of the project, with the definite intention that the available water supply was to be uniformly distributed over this entire area. Also, the original plan proposed the pumping of water from the Flathead River to supplement the gravity supply available on the western slope of the Mission Range. This complete plan was developed at the time the project was initiated; construction work was started with this plan definitely in mind and all construction work accomplished to date, including storage, feeder canal, diversion canal, lateral and pumping plant construction has been in strict conformity with the original plan. Without some such plan it is extremely doubtful if it would have been economically feasible to have provided irrigation benefits to this entire area."

In the conduct of the investigation by this Unit, a reclassification of the lands in the Flathead Irrigation Project area was completed in 1943-1944. The basis upon which this classification was made was the productive capacity of the lands surveyed. Following the land classification, an irrigable area determination was made, including in practically all cases only class 1 and class 2 lands. There were some exceptions to this procedure in instances where class 3 lands were surrounded by or lay adjacent to class 1 and class 2 areas within a farm unit and where landowners maintained that they could operate the class 3 land with profit. In the work of defining irrigable acreage from the land classification report as submitted in 1943-1944, lands classed as 1 and 2 and so located that facilities could not be extended to them at reasonable cost, or where it was believed the landowner could not operate them with profit because of location or some other condition, were placed in a separate category and designated as (C-). Where this character appears on section plats or tabulations it means that construction of facilities to irrigate the class 1 and class 2 lands is not recommended or the lands should not be included in the project for economic reasons.

After the results of the land classification and water supply studies were prepared in preliminary form, a series of conferences were held in the field and in the Indian Office with the object of arriving at a definite plan of procedure in using and presenting the data.

It was finally concluded by the Indian Office that the irrigable acreage of the project should be determined from the results of detailed soil and water supply studies by this Unit, provided that agreements could be reached with landowners to adjust the irrigable acreage as determined in the 1930 classification to conform with conditions that existed in 1945 and in 1946. It was agreed that the acreage of class 1, 2 and 3 lands as shown in the 1930 classification report should be used as a basis in adjusting the irrigable acreage of the project. Accordingly, steps were taken to work out the details of this procedure. Many difficulties were encountered in using the 1930 classification as a basis for the following reasons: (a) In preparing the schedule

of land classification in 1930, the General Land Office figure for total acreage within one-sixteenth section subdivisions was not always used and there are a great many discrepancies in the schedule resulting from this fact; (b) The acreage of the so-called private water right lands was supposedly deducted from the acreage of class 1 and class 2 land as determined by the classifiers, but it was found that there are many instances where deductions for private water right acreage do not conform to the acreage approved by the Secretary in 1921, while in other instances the existence of the private water right was ignored altogether; (c) Lands reserved for power site purposes as provided by the acts of March 3, 1909 (35 Stat. 781) and April 12, 1910 (36 Stat. 296) were included. Under provisions of these Acts, the Secretary of the Interior reserved certain lands, most of which lie along the Flathead River, for power site purposes. With few exceptions they have never been restored. The land classification committee had every reason to classify these lands from a productive standpoint, but there appears no logical reason for including them as irrigable and spreading irrigation charges to them; (d) In the development of the irrigation project, about 250 acres of land were withdrawn from the project by special agreements approved by the Secretary of the Interior, one in 1917 and one in 1928. These lands lie particularly in the Camas area and in the Pablo Subdivision of the Mission Valley Division. Here again the land classifiers were undoubtedly correct in classifying the lands, but since the agreements specifically provide that charges shall not be spread to the lands covered, they should not have been included in the irrigable area figure; (e) The land classifiers covered certain other tracts of land that were withdrawn from the project at the request of the owners early in the development of the project. Irrigation ditches have not been constructed to such tracts and assessments have never been made. Lands in this category, however, were included in the 138,195-acre figure and therefore have construction charges spread to them.

A series of meetings were held on the project in October 1945 with more than 400 landowners in attendance. The results of this Unit's water supply and water use studies were presented; duty of water determinations were discussed and the results of the 1943-1944 land classification work were explained. All of the details involved in the plan for adjusting the acreage were discussed and the agreements proposed for use in making the adjustments were explained. Following these meetings an explanatory letter was sent to all non-Indian landowners on the project on whose lands adjustments in irrigable acreage were contemplated. Letters were sent also to Indian landowners who did not reside on the Flathead Indian Reservation. With these letters were included approved forms of agreement designed to adjust the irrigable acreage, using as a base the total of the class 1, 2 and 3 acreage as shown in the schedule approved by the Secretary in 1931.

Most landowners of the Flathead Irrigation Project prior to the meetings held in October 1945 assumed their irrigable acreage to be that to which assessments had been spread. It is estimated that not over five per cent of them realized that land within their farm units classified as 3 in 1930 was covered by lien for construction charges or that it was considered irrigable. The confusion resulting from the plan that this Unit was obliged to use in the adjustment of acreage, wherein the acreage classi-



fied as irrigable in 1930, and covered by construction charges, differed from the irrigable acreage as proposed following the reclassification of 1943-1944, and in many cases both of these figures differing from the acreage actually assessed for operation and maintenance charges, made it necessary to write many follow-up letters and to call on many of the landowners living on the project to explain the details of the adjustments proposed.

About 85 per cent of all landowners contacted agreed substantially with the results of the analysis made by the Agricultural Economics Unit and signed agreements to adjust their irrigable acreage to conform to the 1943-1944 land classification survey. Inasmuch as the total of class 1, class 2 and class 3 land within a farm unit was used as the base in making adjustments in irrigable acreage, it was the desire of about 10 per cent of the landowners contacted to retain the acreage so classified in 1930 as the irrigable area as now determined. Approximately 5 per cent of the landowners either refused to sign the agreements submitted to adjust their irrigable acreage or did not reply to the letters that were sent them with agreements enclosed. In these instances, the 1931 acreage was allowed to stand as the irrigable acreage as now determined except in cases where errors were made in the 1930 classification or where lands for highway or canal right-of-way have been taken since the 1930 classification was completed. Based upon results thus obtained, the irrigable acreage of the project has been determined and is shown in Appendix "A" of this report for every 1/16 part of a section and the tabulations contained therein are based on agreements or letters contained in Appendix "B" of this report.

Table 27 has been prepared to show the irrigable area of the Flathead Irrigation Project. The figures represent the results of the land classification completed in 1943-1944 as agreed to by the landowners of the Flathead Irrigation Project.

Table 27 - Irrigable Area of the Project by Divisions, Subdivisions and Parts as Determined by the Agricultural Economics Unit, 1945-1946.  
Flathead Irrigation Project, Montana

Division	Total	Irrigable Acreage	
		Non-Indian	Indian <sup>1/</sup>
Total	116,359.36	91,980.50	24,378.86
Camas	11,219.22	11,030.16	189.06
Jocko	11,017.04	6,446.33	4,570.71
Mission Valley	94,123.10	74,504.01	19,619.09
Mission South of Post Creek	19,897.02	13,044.69	6,852.33
Mission North of Post Creek	74,226.08	61,459.32	12,766.76
Post	24,744.92	20,380.69	4,364.23
Moiese	5,863.21	5,389.36	473.85
Pablo	19,309.33	14,772.45	4,536.88
Round Butte	13,636.35	12,176.40	1,459.95
Valley View	8,286.95	6,868.10	1,418.85
Polson	2,385.32	1,872.32	513.00

<sup>1/</sup> Government-owned land included with Indian.

In addition to the lands shown in Table 27, it is estimated that there are small tracts in towns and villages within the Flathead Irrigation Project boundaries with acreages as follows: Polson, 18.13; Pablo, 60.00; Ronan, 45.70; Charlo, 35.00; Dixon 2.00; St. Ignatius, 3.00; Arlee, 4.60; Lonepine, 10.00; Total, 178.43 acres. This acreage should be provided with water on condition that an agreement is executed by the landowners within each of the above towns or villages whereby they take delivery at one or two points and be responsible for the distribution of water and collection of irrigation charges.

Table 28 - Ownership, Description and Acreage of Land in Instances where the Opportunity Should be Given to Include Land in the Project.  
Flathead Irrigation Project, Montana

Name of Owner	Serial Number	Land Description	S. T. R.	Acres Irrig.
<u>JOCKO</u>				
H.F. Daniels	3647	Part E $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$	18 18 21	0.5
W.A. Olson & Geo.A. Lloyd		E $\frac{1}{2}$ SE $\frac{1}{4}$	2 16 20	35.0
<u>CAMAS</u>				
Ira M. Booth	4157	NE $\frac{1}{4}$ NE $\frac{1}{4}$	21 23 24	1.0
Robt. B. Whitehead	3287	NW $\frac{1}{4}$ NE $\frac{1}{4}$	21 23 24	17.0
<u>MISSION VALLEY</u>				
Mrs. Emma Wynne	621-a	W $\frac{1}{2}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$	5 22 19	3.0
Elmer Richwine		N $\frac{1}{2}$ SW $\frac{1}{4}$	28 22 19	10.0
Carl Carpenter	3916	Part SE $\frac{1}{4}$ SE $\frac{1}{4}$	29 22 19	2.5
S. L. Croft		SE $\frac{1}{4}$ SE $\frac{1}{4}$	29 22 19	15.0
Mr. Moe	2198	N $\frac{1}{2}$ SE $\frac{1}{4}$	32 22 19	2.0
V. C. McCleary		SE $\frac{1}{4}$ SE $\frac{1}{4}$	32 22 19	1.0
Luke Smith	396	Lots 1 and 2	5 21 19	2.5
C. E. Livingston		Lot 4	5 21 19	20.0
Mr. Tauresech		Near Ronan		8.0
Bob Johnson	3946	N $\frac{1}{2}$ NE $\frac{1}{4}$	29 21 19	30.0
Frank Wolf		NW $\frac{1}{4}$ SE $\frac{1}{4}$	29 21 19	5.0
H. L. Barber	3946	S $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$	29 21 19	5.0
H. S. Barber	3947	Small Part E $\frac{1}{2}$ SE $\frac{1}{4}$	29 21 19	5.0
Roscoe Sparks	616	NW $\frac{1}{4}$ NW $\frac{1}{4}$	32 21 19	20.0
J. W. Reimers	3927	E $\frac{1}{2}$ SW $\frac{1}{4}$	32 22 19	40.0
A. H. Rogers	1439b	Part SE $\frac{1}{4}$ SW $\frac{1}{4}$	2 22 20	2.0
E. C. Caffey	4303	Part NE $\frac{1}{4}$ SW $\frac{1}{4}$	10 22 20	5.0
Clarence Rogers		Part SE $\frac{1}{4}$ NW $\frac{1}{4}$	13 22 20	4.6
Oscar Erlanslson		Lot 4	4 20 19	1.0
Thomas Cotrell	4656	NW $\frac{1}{4}$ SW $\frac{1}{4}$	7 20 19	14.6
Frank Grant	380	Part NW $\frac{1}{4}$ NE $\frac{1}{4}$	28 20 19	24.0
Mrs. W. J. Hayes		W $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$	24 18 20	5.0
Total				278.70

In the development of the project it has been customary to sell water to landowners interested in irrigating small acreages of land not included within an irrigation district and not considered in the project. Intermittent use of water has been made on these tracts for various acreages. At the present time a number of landowners mostly located within the Mud or Crow Creek drainage areas are desirous of being permitted to purchase water when it is needed. Many of these landowners have purchased former Indian-owned timber allotments and have cleared some land that is used for crop production. It is believed that a policy should be established to discontinue the sale of water on all tracts where the lands are not bound for the payment of regular construction, operation and maintenance charges. Owners of tracts who have purchased water in years past but are not considered as being in the project, should be allowed to acquire water for not to exceed the maximum acreage they irrigated prior to the 1946 irrigation season and then only on condition that they sign agreements to petition for admission into the irrigation district in which their lands are located. On this basis, not to exceed 278.70 acres should be supplied project water with delivery confined to the tracts shown in Table 28.

It is respectfully recommended that the irrigable acreage of the project be established at not to exceed 116,816.49 acres, the final determination to be dependent upon the action taken by associations of lot owners within towns and villages to distribute water and make collections therefor and further, upon the action of landowners, who have heretofore purchased water on a lease basis, regarding the execution of agreements to petition their respective irrigation districts for inclusion therein.

#### FARM UNIT CHANGES AND CANCELLATIONS

The Flathead Irrigation Project was constructed under provisions of the Act of April 23, 1904 (33 Stat. 302), as amended by the Act of May 29, 1908 (35 Stat. 448). As provided, the United States Reclamation Service conducted the surveys and proceeded with the construction work for the United States Indian Service. This arrangement was continued until 1924.

Inasmuch as the Reclamation Service was responsible for the construction work and the general plan of the project, laws providing for the operation of the General Land Office were adhered to in making homestead entries for the opened unsold lands.

The Act of April 23, 1904 (33 Stat. 302) provided for the allotment of lands in severalty to the Indians of the Flathead Reservation and upon the completion of said allotments the President was directed to appoint a commission to inspect, appraise and value all of the lands not so allotted. This act also provided that the Commissioners, within 30 days after appointment by the President, were to proceed to inspect and classify the land appraised, by the smallest legal subdivision of 40 acres. The lands were divided into the following classes: agricultural land of the first class, agricultural land of the second class, timber lands, mineral lands and grazing lands.

Section 8 of the 1904 act provided that when the Commission shall have completed the classification and appraisal of all the lands and the same shall have been approved by the Secretary of the Interior, the land shall be disposed of under the general provisions of the homestead, mineral and town-site laws of the United States. Following this appraisal the agricultural lands of the first and second class were combined into "farm units", which consisted largely of 80-acre tracts, although some 40 and some 160-acre tracts were set up. In the settlement of the project each entryman was allowed only one farm unit and the regulations prescribed on March 10, 1915 regarding lands in the Flathead Irrigation Project, provided that persons who enter farm units must pay that part of the cost of building, operating and maintaining the irrigation works which is assessed against their tracts, in addition to the Indian price or appraised value of the lands. These entries were made subject to the commutation provisions of the homestead law. The regulations state: "Only those lands designated as farm units on farm unit plats approved by the Secretary of the Interior or under his specific authority and those lands irrigable from the project embraced in Indian allotments are within the Flathead Irrigation Project. The designation of any tract or tracts of land as a farm unit or farm units includes those lands in the Flathead Project, and the cancellation of any farm unit or farm units eliminates the lands formerly designated as such farm unit or farm units from the project."

In the conduct of this investigation owners of 60 tracts, previously designated as farm units have requested elimination from the project. Of these, 22 are owned by the State of Montana. It is respectfully recommended that the Commissioner of Indian Affairs advise the Commissioner of the General Land Office that the owners of 60 farm unit tracts have requested that all the irrigable land within said farm units be eliminated from the Flathead Irrigation Project as provided by the Act of June 22, 1936 (49 Stat. 1803) and that the farm units be canceled in order that the owners thereof may obtain a patent in fee for the lands so designated. The 60 tracts, with a description of each, are shown in Table 29.

Table 29 - Lands Contained within Flathead Irrigation Project and Formerly Designated as Farm Units for which Requests for Elimination have been Executed.

Sec. Twp. & R.			LAND DESCRIPTION	
			Subdivision	Farm Unit
14	17	20	E 1/2 NW/4; E 1/2 SW/4 SE/4	A C
24	17	20	E/2 SW/4; W/2 SE/4	D
22	18	20	S/2 NW/4; N/2 SW/4	C
23	18	20	SE/4 SW/4; W/2 SW/4; NW/4 NE/4 SW/4 S/2 NE/4 SW/4	D
22	19	21	NW/4 SW/4	E
25	19	21	W/2 SE/4	K
3	19	21	NE/4 SW/4	H
16	19	20	NE/4 NW/4 E/2 SW/4	A, D B, C F, G
				<u>1/</u> <u>1/</u> <u>1/</u>

Table 29 (continued)

LAND DESCRIPTION						
Sec.	Twp.	R.	Subdivision	Farm Unit		
23	20	21	NE/4 NE/4 )	A		
24	20	21	NW/4 NW/4 )			
			S/2 SE/4	N	<u>1/</u>	
12	19	22	SE/4 NE/4; NE/4 SE/4	A		
			SE/4 SE/4 )	B		
13	19	22	NE/4 NE/4 )			
21	20	21	NE/4 NE/4 )			
22	20	21	N/2 NW/4; NW/4 NE/4 )	A		
5	20	20	N/2 SW/4	F		
13	20	20	N/2 NW/4 SW/4	K		
16	21	20	NW/4	C.D.E.	<u>1/</u>	
21	21	20	W/2 SE/4	M	<u>1/</u>	
28	21	20	SW/4 NE/4; NW/4 SE/4	L		
29	21	20	E/2 SE/4	J	<u>1/</u>	
36	21	21	NE/4 NW/4	B	<u>1/</u>	
			S/2 NW/4	C	<u>1/</u>	
10	21	21	SW/4 SE/4	H		
20	21	21	S/2 SE/4; SE/4 SW/4	E		
7	20	21	SE/4 SW/4; SW/4 SE/4	G		
8	20	21	N/2 SE/4; SW/4 SE/4	F		
15	20	21	S/2 NE/4; SE/4 NW/4	D		
33	21	20	W/2 NW/4	M	<u>1/</u>	
16	21	21	SE/4	G. K	<u>1/</u>	
36	21	21	NW/4 NW/4	B	<u>1/</u>	
3	21	21	SW/4 SW/4	J		
			SE/4 SW/4	F		
5	21	21	E/2 SW/4	J		
			Lot 4)	D		
6	21	21	Lot 1)			
8	21	21	N/2 SE/4	B		
			S/2 SE/4	C		
9	21	21	SE/4 NE/4; NE/4 SE/4	E		
36	22	21	SW/4	C,D,E,F	<u>1/</u>	
6	21	23	SE/4 NW/4	C		
			Lots 6 & 7; E/2 SW/4	E		
			Lots 4 & 5 )	D		
31	22	23	Lot 4			
7	21	23	Lot 1; N/2 NE/4; NE/4 NW/4	A		
			Lots 2 & 3; SE/4 NW/4; NE/4 SW/4	B		
12	21	24	W/2 SE/4)	M		
13	21	24	W/2 NE/4)			
1	21	24	NW/4 SE/4	G		
18	22	23	Lot 2; SE/4 NW/4; SW/4 NE/4; Lot 7	F		
13	22	24	NW/4 SW/4	H		
35	22	24	SE/4 NE/4	F		
27	23	24	W/2 NW/4 )	A		
28	23	24	SE/4 NE/4; NE/4 SE/4 )			

1/ State-owned land

In connection with the work of adjusting irrigable acreage on state-owned lands within the Flathead Irrigation Project, it was found that there were numerous cases where the farm unit plat should be amended and lands combined to provide economic farm units. This program was approved by the Montana State Land Commissioner and it is recommended that the Commissioner of Indian Affairs request the permission of the General Land Office to make modifications in farm unit plats for State lands as shown in Table 30.

Table 30 - Farm Unit Changes Recommended. Flathead Irrigation Project, Mont.

Sec.	Twp	R	Changes Recommended
16	21	20	(a) Units A, B, F and G should be canceled and the lands involved combined into Unit "H" (Irrigated) (b) Units C, D and E should be canceled and the lands involved combined into Unit "J" (Dry Land). (c) Unit "K" should be established to include the SE/4. (Irrigated)
16	19	20	(a) Units A and D should be canceled and the lands involved combined into Unit "J". (Dry Land) (b) Units B and C should be canceled and the lands involved combined into Unit "K" (Dry Land). (c) Units F, G and E should be canceled and the NE/4 SW/4 and SE/4 SW/4 be considered a dry land portion of Unit "L" along with the irrigated portion described as the N/2 SE/4 (Irrigated)
19	20	20	(a) Units H and J should be canceled and the lands involved combined into Unit "K". (Irrigated)
14 23	21 21	21 ) 21 )	(a) Establish Unit "N" to include the SW/4 SW/4, Sec. 14; the W/2 NW/4 and NW/4 SW/4, Sec. 23 (Irrigated).
32	21	20	(a) Units Q and R should be canceled and lands involved combined into Unit "S" (Irrigated).
36	21	21	(a) Units F and G should be canceled and lands involved combined into Unit "J" (Irrigated). (b) Units E and H should be canceled and lands involved combined into Unit "K" (Irrigated).
16	21	21	(a) Units G and K should be canceled and lands involved combined into Unit "N"(Dry Land).
36	22	21	(a) Units C, D, E and F should be canceled and lands involved combined into Unit "J" (Dry Land) (b) Units A, B and G should be canceled and lands involved combined into Unit "K" (Irrigated).
26	19	20	(a) Unit A should be canceled and lands involved combined with the SW/4 NE/4 to form Unit "B" (Irrigated). (b) Unit C should be established to include the NE/4 SE/4 and the S/2 SE/4 (Irrigated).

## PROPOSED MODIFICATION IN THE REPAYMENT PLAN

By provision of law and under terms of existing repayment contracts, non-Indian landowners will be assessed construction charges immediately following the completion and submittal of this report. Existing law provides that net power revenues shall be applied, first, to liquidate the costs of power development; second, to liquidate payment of the deferred obligation on the Camas Division; third, to liquidate construction costs on an equal per-acre basis for each acre of irrigable land within the project; and, fourth, to liquidate operation and maintenance costs against project lands. These provisions specifically apply to non-Indian owned lands, since the Act of July 1, 1932 puts construction charges existing against Indian-owned lands in the project in a deferred status and not to be collected until the title passes from Indian ownership. It is planned, also, that the net revenues from the power system when applied to irrigation construction cost shall be applied in such a manner that the number of annual assessments will be reduced, rather than to lessen the amount of construction charge assessment that the landowners shall be obligated to pay.

Landowners on the Flathead Irrigation Project have developed their farms and homes at tremendous cost and individual sacrifice. Many came to the project in 1910 under the assumption that irrigation water would be made available immediately and that living conditions could be made reasonably satisfactory. They knew that they were pioneering, but few of them realized that the hardships they would be obliged to endure would extend over so long a period. Many lost faith and sold out or, being unable to meet State and County taxes and operation and maintenance charges, were compelled to surrender their property. Others stayed on, and as a result of their tenacity and foresight, the Flathead Project has developed into what it is today. These people and those who have come to the project in more recent years seemingly are entitled to expect a reasonable assurance that they can continue to live on the project without undergoing unnecessary personal hardships. The people on the Flathead Project are entitled to a reasonable level of living and likewise the Government should be interested in seeing that reasonable standards of living are maintained. It is doubtful, however, if the repayment plan as now provided in existing law is continued, especially when the exchange value of farm products again reaches a normal level, that landowners on the Flathead Irrigation Project will be able to meet irrigation charges, pay State and County taxes and meet the necessary costs of agricultural production. As shown in previous sections of this report, the productive value of the land is low compared with other irrigation projects and with the rest of the State of Montana. It may be possible to materially increase the yields of crops but this can be done only at considerable expense to the landowner for fertilizers, drainage and other items. The average farm is so small on the project, made so largely by a mistaken policy regarding the acreage necessary for an economic unit, that the total returns from crop production will not provide returns sufficient to meet the cost of production and pay irrigation charges if such charges exceed \$2.50 per acre per annum. It is for this reason that a modified repayment plan should be adopted which will enable project landowners to retain their lands and provide reasonable standards of living for themselves and families. To this end it is recommended that the time required for repayment be extended to 50 years and that assessments for construction charges be regularly made

but that net power revenues be distributed on an irrigable acre basis and be used to pay, to the extent they will, the construction charge assessments for non-Indian owned land in the project; for Indian-owned land it is recommended that the credit accruing from the application of net power revenues be applied to the payment of current operation and maintenance charges assessed against Indian lands. If and when power revenues fully repay the reimbursable construction cost of the project, including deferred charges existing on the Camas Division, the said revenues should be used to pay irrigation operation and maintenance charges for all project lands.

#### REFUNDS OF CONSTRUCTION CHARGES PAID

In the course of the Unit's investigation in making adjustments in acreage of irrigable lands in the Flathead Project, there were 72 tracts of non-Indian owned land carried on assessment rolls, exclusive of State-owned lands, the owners of which requested complete elimination from the project. In sixteen instances the owners of land now listed for elimination from the project, paid some irrigation construction charges. Since the requests for elimination presumably will be approved, it seems right and proper that the present owners of these lands should have returned to them the amount of construction charges paid. It is therefore, recommended that a refund of \$560.98 be made to the owners of the following described tracts in the amount specified.

<u>Serial Number</u>	<u>Description</u>	<u>Sec.</u>	<u>Twp.</u>	<u>R.</u>	<u>Construction Charges Paid</u>
720	SE/4	14	17	20	\$ 6.00
718	E/2 NW/4; E/2 SW/4	14	17	20	8.00
860	S/2 SW/4	23	17	20	32.30
2924	Lots 4 and 5, and Lot 4	6	21	23)	124.50
3099	NW/4 SE/4	1	21	24	30.00
1442-b	East 3 acres of Lot 2	3	22	20	1.50
2162	E/2 SW/4	5	21	21	5.00
2537	SE/4 SE/4, and NE/4 NE/4	12	19	22)	45.00
449-b	SE/4 SE/4; S/4 NE/4 SE/4	17	19	19	4.00
1610	SE/4 SW/4; SW/4 SE/4	7	20	21	104.90
1651	S/2 NE/4; SE/4 NW/4	15	20	21	17.50
951	N/2 SW/4	5	20	20	4.50
1461-a	NE/4 SW/4	15	22	20	42.78
1480	E/2 SW/4	23	22	20	25.00
3514-b	NE/4 NW/4	26	22	20	40.00
1459-a	NW/4 NW/4	26	22	20	70.00



## CANCELLATION AND ADJUSTMENT OF CHARGES

Charges recommended for cancellation on the Flathead Project fall into several different categories. In connection with this investigation and the proposed elimination of land from the project, construction charges should be canceled, represented by the difference in acreage between the 138,195 acres to which construction charges have been spread in accordance with the schedule approved in 1931 and the acreage determined as irrigable in this investigation. This amounts to \$1,526,999.04. The second group of cancellations represents operation and maintenance charges that accrued against non-Indian owned land prior to the date of the Lien Act, which was passed on May 10, 1926. Prior to the passage of this act, operation and maintenance assessments were nothing more than personal obligations. Therefore, it is believed desirable to cancel all delinquent charges against non-Indian owned land that accrued prior to that date. The amount of such charges is \$40,549.89.

Another type of charge that should be canceled is the operation and maintenance delinquency standing against the 72 tracts of non-Indian owned land for which the owners requested elimination in connection with this investigation. Since these lands presumably will be eliminated from the project by approval of the Secretary of the Interior, it seems logical that the irrigation districts should not be held liable for the unpaid operation and maintenance charges that accrued from 1926 to and including June 30, 1946. Total amount in this category is \$574.35.

Following the classification made in 1930 and approval of the schedule for assessment purposes in 1931, project officials, under instructions from the Supervising Engineer, reduced assessments that had been placed on the books and were standing delinquent for non-Indian owned land where the class 1 and class 2 acreage as determined in the 1930 survey, was less than the acreage that had been assessed for operation and maintenance prior to that time. The water users ledgers were changed by crossing out the original assessment and inserting instead a revised figure based on the 1930 classification. This procedure was followed on the pretext that the original assessments were erroneous.

This position has been continually challenged by this Unit for the following reasons: (a) If adjustments were authorized on the basis of the 1930 classification, landowners who had paid their operation and maintenance assessments prior to the 1930 classification should likewise have been granted a credit on future assessments for adjustments made in irrigable acreage. This, of course, was not done. Moreover, increased assessments were not spread to lands where it was found that the irrigable acreage was greater than had been assessed prior to the 1930 classification. (b) By the very nature of the facts, these assessments could not be considered erroneous. They were legitimate assessments placed against the land on the basis of irrigable acreage as determined by project officials and agreed upon by the operators of the land. Prior to 1931 when the Secretary approved the land classification schedule for assessment purposes, the Project Engineer had authority to modify the acreage subject to assessment to the extent of 10 per cent of the irrigable acreage each year. Since the landowners in question had not taken advantage of this rule, there is no legitimate reason why the assessments placed on the books could be considered erroneous. As a further justification of this contention, the Secretary of the Interior,

acting under authority provided by the Act of July 1, 1932, canceled approximately \$101,900 of delinquent operation and maintenance assessments existing against Indian lands effective December 1, 1934. Project officials acting under direction of the Supervising Engineer modified the irrigable acreage and the assessments on Indian lands in a manner similar to that for non-Indian lands. In posting the cancellations against Indian lands, it was found that there were approximately \$20,000 of assessments represented in the total of \$101,900 canceled that were reduced because of changes recognized following the 1930 classification. In order to account for the total cancellations and to obtain a balance this amount was spread to the Indian tracts in order that the total \$101,900 cancellation could be accounted for. This procedure had the approval of the Indian Office. (c) It is doubted that authority exists to consider these assessments canceled without Congressional action. The amount that should be canceled to legalize these modifications in assessments is \$5,313.32.

In the operation of the power system during the period since power has been sold on a commercial basis, there have accrued \$2,195.16 of uncollectible accounts that should be canceled. These came about largely as a result of users changing their place of residence and leaving the area with the bills unpaid.

There stands on the records of the Flathead Irrigation Project the total of \$4,277.68 operation and maintenance charges which have been assessed against Indian lands, the owners of which have requested that these lands be eliminated from the project. In many instances these operation and maintenance charges accrued because the land was considered to be irrigable from the system as constructed, although the lands were in most instances of inferior quality and could not be operated profitably.

It is respectfully recommended that a total of \$1,526,999.04 of construction charges be canceled; that \$50,715.24 of operation and maintenance charges be canceled and \$2,195.16 representing unpaid power bills, be canceled.

LIST OF DELINQUENT OR DEFERRED OPERATION AND MAINTENANCE  
CHARGES AGAINST LANDS THAT ARE TO BE ELIMINATED FROM THE PROJECT

Serial No.	Description	S.	T.	R.	Deferred O. & M. Charges
<u>Jocko Non-Indian</u>					
330	E $\frac{1}{2}$ SW $\frac{1}{4}$	28	16	19	\$ 22.50
<u>Jocko State</u>					
723	SE $\frac{1}{4}$	15	17	20	21.17
<u>Jocko Indian</u>					
64	W $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$	15	16	19	20.00
98	E $\frac{1}{2}$ NW $\frac{1}{4}$	19	16	19	\$ 205.30
18	NE $\frac{1}{4}$ SW $\frac{1}{4}$ Except 0.50 acre in SE Corner	19	16	19	100.78
89	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$	18	16	19)	420.72
302	NE $\frac{1}{4}$ SW $\frac{1}{4}$	24	16	20)	158.00
357	NE $\frac{1}{4}$ NW $\frac{1}{4}$ ; SW $\frac{1}{4}$ NE $\frac{1}{4}$	20	16	19	265.42
554	SW $\frac{1}{4}$ SE $\frac{1}{4}$ ; SE $\frac{1}{4}$ SW $\frac{1}{4}$	32	16	19	139.43
3974	S $\frac{1}{2}$ SE $\frac{1}{4}$	2	16	20	5.00
17	W $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$	24	16	20	95.82
		5	16	19	

<u>Serial No.</u>	<u>Description</u>	<u>S.</u>	<u>T.</u>	<u>R.</u>	<u>Deferred O. &amp; M. Charges</u>
<u>Camas Non-Indian</u>					
3505-a	NE $\frac{1}{4}$ NE $\frac{1}{4}$	13	22	24	\$ 15.68
3413	SE $\frac{1}{4}$ NE $\frac{1}{4}$	35	22	24	28.96
3456	W $\frac{1}{2}$ NW $\frac{1}{4}$	27	23	24)	
3099	SE $\frac{1}{4}$ NE $\frac{1}{4}$ ; NE $\frac{1}{4}$ SE $\frac{1}{4}$	28	23	24)	9.76
3218	NW $\frac{1}{4}$ SE $\frac{1}{4}$	1	21	24	26.96
	NE $\frac{1}{4}$ SW $\frac{1}{4}$	3	21	24	2.44
<u>Polson Indian</u>					
3882	SW $\frac{1}{4}$ NE $\frac{1}{4}$ ; SE $\frac{1}{4}$ NE $\frac{1}{4}$	7	22	19	<u>Delinquent O &amp; M</u> 867.88
<u>Valley View Non-Indian</u>					
2167	N $\frac{1}{2}$ SE $\frac{1}{4}$	8	21	21	<u>Deferred O. &amp; M. Charges</u> 21.84
<u>Moiese Non-Indian</u>					
2536	SE $\frac{1}{4}$ NE $\frac{1}{4}$ ; NE $\frac{1}{4}$ SE $\frac{1}{4}$	12	19	22	16.00
2537	SE $\frac{1}{4}$ SE $\frac{1}{4}$	12	19	22)	
	NE $\frac{1}{4}$ NE $\frac{1}{4}$	13	19	22)	36.00
<u>Mission Non-Indian</u>					
225	S $\frac{1}{2}$ SW $\frac{1}{4}$	21	18	19	89.18
826	NW $\frac{1}{4}$ NE $\frac{1}{4}$ ; N $\frac{1}{2}$ NW $\frac{1}{4}$	26	18	20	4.08
1425-a	10 Ac. of E. side of NE $\frac{1}{4}$ NE $\frac{1}{4}$	36	19	20	12.00
<u>Mission Indian</u>					
485	S $\frac{1}{2}$ NE $\frac{1}{4}$	21	19	19	<u>Delinquent O &amp; M</u> 189.14
<u>Post Non-Indian</u>					
2060	W $\frac{1}{2}$ SE $\frac{1}{4}$	25	19	21	<u>Deferred O. &amp; M</u> 22.40
<u>Post State</u>					
—	NW $\frac{1}{4}$	16	19	20	9.33
<u>Post Indian</u>					
2037	N $\frac{1}{2}$ NW $\frac{1}{4}$	23	19	21	<u>Delinquent O &amp; M</u> 751.43
<u>Round Butte State</u>					
1824	W $\frac{1}{2}$ NW $\frac{1}{4}$	33	21	20	<u>Deferred O. &amp; M.</u> 48.96
4771	NW $\frac{1}{4}$	16	20	21	43.57
—	SE $\frac{1}{4}$	16	20	21	28.72
<u>Pablo Non-Indian</u>					
3525-a	SW $\frac{1}{4}$ SE $\frac{1}{4}$	12	20	20	1.60
1461-a	NE $\frac{1}{4}$ SW $\frac{1}{4}$	15	22	20	29.52
4033-a	SE $\frac{1}{4}$ SW $\frac{1}{4}$	15	22	20	28.44
<u>Pablo State</u>					
1791	E $\frac{1}{2}$ SE $\frac{1}{4}$	29	21	20	19.44
1871	W $\frac{1}{2}$ SE $\frac{1}{4}$	21	21	20	35.80
<u>Pablo Indian</u>					
3632	E $\frac{1}{2}$ SW $\frac{1}{4}$	26	22	20	<u>Delinquent O &amp; M</u> 412.38
3558	Lot 2	34	22	20)	
	Lot 4; SE $\frac{1}{4}$ NW $\frac{1}{4}$	35	22	20)	184.15
1828	E $\frac{1}{2}$ NE $\frac{1}{4}$	33	21	20	323.57
1838	SE $\frac{1}{4}$ SW $\frac{1}{4}$	35	21	20	138.66

ANALYSIS OF ACCOUNTS PERTAINING TO THE  
FLATHEAD IRRIGATION PROJECT AND POWER SYSTEM, MONTANA

Financial records and accounts of the Flathead Irrigation Project were studied and audited by the Agricultural Economics Unit. Adjustments were made in instances where accounts were found to disagree with Treasury combined statements, General Accounting Office statements of disbursements, and/or other records known to be correct. The accounts and records were analyzed and the data compiled into condensed financial statements to give a comprehensive picture of the financial background of the project, and to furnish a reliable source of information for future use.

Principal records studied for the purpose of the audit and analysis were:

Cash Books	Register of Cost Transactions
Journal Vouchers	Treasury Cash Cards
Accounts Current	Treasury Combined Statements of
General Ledgers	Receipts and Expenditures
Appropriation Ledgers	U. S. Statutes at Large
Abstract of Disbursements	Statements of Disbursements,
Official Receipts	compiled by General Accounting
Certificates of Deposit	Office for irrigation projects.
Water Users' ledgers	

History:

Financial records of the irrigation system of the Flathead Irrigation Project began with funds appropriated under provisions of the Act of March 3, 1909 (35 Stat. 795). The Act of May 10, 1926 (44 Stat. 453), provided funds to commence the construction of a power plant.

Subsidiary records of cost were maintained from 1909 to 1914. Pursuant to the provisions of Acts of Congress approved April 4, 1910, and August 1, 1914, a uniform cost accounting system was installed.

Expenditures from the appropriation "Irrigation System, Flathead Reservation, Montana, Reimbursable" began in fiscal year 1909 and continued through fiscal year 1934.

Expenditures from the appropriation "Construction, etc., Irrigation Systems, Indian Reservations, Reimbursable" began in fiscal year 1938 and have continued during each fiscal year through June 30, 1945.

Expenditures from emergency funds began in fiscal year 1934 and continued through 1940. Separate reports were prepared covering expenditures of funds for emergency activities. The reports covering emergency accounts were consolidated with regular project accounts during fiscal year 1940.

Reimbursable funds appropriated for the construction, operation and maintenance of the irrigation system amount to \$9,733,519.03 of which

\$9,391,223.85 have been expended. Reimbursable funds appropriated for the power system amount to \$878,380.65. Disbursements amount to \$868,934.09.

During the third quarter of the fiscal year 1940, A. W. Empie, Senior Accountant and Auditor, assisted by project personnel, audited and analyzed the accounts of the project which pertained to the power system. Upon completion of the audit on April 1, 1940, the necessary financial data were taken out of the general project accounts by reverse entries and assembled into new accounts to conform with the uniform system prescribed for public utilities and licensees.

Since April 1, 1940, the Flathead Irrigation Project has had two separate and distinct accounting systems, one for power activities, which conform to the uniform system of accounts as prescribed under the Federal Power Commission Act (49 Stat. 838), and one for irrigation activities which conforms to the uniform cost accounting system as prescribed by Order 506.

The following tables, numbered 31 to 44, contain financial history up to and including June 30, 1945, of the Flathead Irrigation Project system, and the Flathead Irrigation Project power system.

Table 31 is a balance sheet of the irrigation system which has been arranged to show, by grouping the accounts, the different classes of assets and liabilities of the irrigation system. It shows construction cost to be \$8,849,006.04, and funds expended for construction from reimbursable appropriations to be \$8,656,753.85, of which \$91,386.37, has been repaid and is shown as receipts from construction charges. After crediting the payments of \$91,386.37 there is a balance due the United States for construction charges amounting to \$8,565,367.48. This amount is exclusive of the item of undistributed operation and maintenance cost amounting to \$356,578.33.

Table 32 is a schedule of appropriations and disbursements of the irrigation system which shows total appropriations, disbursements, balance to surplus and unexpended. Total appropriations amount to \$11,806,909.03 of which \$11,307,056.69 have been disbursed.

Table 33 shows appropriation control accounts in which the appropriations have been segregated into groups representing their class, such as construction, reimbursable, construction non-reimbursable, etc. The appropriation title and the net allotments by years are given. The amounts shown include unexpended balances.

Table 34 shows collections of assessments. The total operation and maintenance collections are \$1,830,500.50 and construction collections are \$91,386.37.

Table 35 is a statement of construction costs allocated to the principal features of the three divisions into which the project is divided.

Table 36 is a statement of operation and maintenance costs showing the amounts charged to each of the three divisions.

Table 37 is a statement of administration costs and shows that \$109,520.05 are chargeable to construction features and \$38,558.94 are chargeable to operation and maintenance features.

Table 38 is a statement of accounts receivable and shows separately the amounts due from lands within, and lands not within irrigation districts.

Table 39 is a balance sheet of the power system which has been prepared to show current and accrued assets, fixed assets, current and accrued liabilities, long-term debt, reserve for depreciation, reserve for uncollectible accounts and surplus. The total long-term debt of the power system is shown to be \$878,380.65.

Table 40 is a schedule of appropriations and disbursements of funds for the power system and shows that \$706,258.37 has been appropriated as regular funds for the power system and \$172,122.28 has been appropriated as emergency funds. The total of regular and emergency funds appropriated amounts to \$878,380.65 of which \$868,834.09 has been expended.

Table 41 is a schedule showing appropriations by classification as provided by the uniform system of accounts for public utilities. The appropriation title, symbol, and the amount expended each year are shown.

Table 42 is an analysis of construction costs of the electric plant, the sales of electric energy and disbursements from special funds.

Table 43 is a financial statement of the power system for the fiscal years 1931 to 1945, inclusive, and shows sales, operation and maintenance costs, administration costs, net revenues before allowance for depreciation, and net income or deficit after allowance for depreciation.

Table 44 is a schedule showing receipts from the sale of electric energy. Both fiscal year receipts and accumulated amounts are shown. Total receipts at the end of June 1945 amounted to \$1,739,559.63.

LIABILITIES AND OTHER CREDITS

LONG-TERM LIABILITIES

REIMBURSABLE APPROPRIATIONS

CONSTRUCTION

REGULAR FUNDS	\$ 1,451,931.15
REGULAR FUNDS, COMBINED	5,980,079.22
EMERGENCY FUNDS	1,105,458.62
ADMINISTRATION FUNDS (WASHINGTON)	109,520.05
IMPOUNDMENT ECONOMY ACT	<u>9,764.81</u>
	8,656,753.85

LESS: REPAYMENTS

RECEIPTS, CONSTRUCTION CHARGES	<u>91,386.37</u>	\$8,565,367.48
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OPERATION AND MAINTENANCE

REGULAR FUNDS	105,352.18
REGULAR FUNDS, COMBINED	623,433.23
ADMINISTRATION FUNDS (WASHINGTON)	<u>38,558.94</u>
	<u>767,344.35</u>

TOTAL LONG-TERM LIABILITIES

\$9,332,711.83

CURRENT AND ACCRUED LIABILITIES

ACCOUNTS PAYABLE

LABOR	10,877.79
PURCHASES	2,269.23
TRANSPORTATION	<u>1,175.19</u>
	<u>14,322.21</u>

TOTAL LIABILITIES

\$9,347,034.04

OTHER CREDITS

NON-REIMBURSABLE APPROPRIATIONS

REG. FUNDS, O & M, ACT 5/18/16	734,663.53
REG. FUNDS, O & M, RECEIPT LIM.	975,834.02
OTHER FUNDS, CONST.(INCREASE COMP.)	156,319.91
TRIBAL FUNDS, CONST.	64,570.56
ALLOWANCE FOR LABOR & CONST. WORKS	<u>3,173.59</u>
	1,934,561.61

LESS: ADVANCE PAYMENTS

RECEIPTS, O & M, ACT 5/18/16	756,813.29
RECEIPTS, O & M RECEIPT LIM.	1,073,047.51
RECEIPTS, O & M SALES & SERVICE	639.70
RECEIPTS, O & M LABOR & CONST. WORKS	<u>3,173.59</u>
	<u>1,833,674.09</u>

NET NON-REIMB. APPROPRIATIONS

100,887.52

CANCELLATIONS

REIMBURSABLE CHARGES, O & M	149,853.85
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ADVANCE PAYMENTS

CONST. CHARGES, INDIAN LANDS	3,295.56
CONST. CHARGES, NON-INDIAN LANDS	<u>66,235.49</u>
	69,531.05

ASSESSMENTS

CONST. CHARGES, INDIAN LANDS	780.00
CONST. CHARGES, NON-INDIAN LANDS	21,075.32
O & M CHARGES, INDIAN LANDS	276,844.88
O & M CHARGES, NON-INDIAN LANDS	<u>1,816,442.77</u>
	<u>2,115,142.97</u>

TOTAL OTHER CREDITS

2,435,415.39

TOTAL LIABILITIES AND OTHER CREDITS

\$ 11,782,449.43

TABLE 32 - SCHEDULE OF APPROPRIATIONS AND DISBURSEMENTS; JUNE 30, 1945, FLATHEAD IRRIGATION PROJECT, MONTANA

APPROPRIATION TITLE	APPROPRIATIONS	DISBURSEMENTS	BALANCE	
			To SURPLUS	UNEXPENDED
<u>PUBLIC FUNDS, REIMBURSABLE, IRRIGATION REGULAR</u>				
IRRIGATION SYSTEM, FLATHEAD RESN. REIMB.	\$6,918,650.27	\$6,613,277.26 1/	\$305,373.01	
CONST. ETC. IRRIG. SYS. IND. RESN. FLATHEAD RESN. MONT.	1,414,532.08	1,382,720.14		\$31,811.94
IRRIG. IND. RESN. REIMB. (DISTRICT OFFICE)	20,084.49	20,084.49		
IRRIGATION, INDIAN RESERVATIONS, REIMB.	17,314.58	17,314.58		
MAINT. OPER. IRRIG. SYS. FLATHEAD RESN. REIMB.	36,400.00	35,249.64	1,150.36	
MAINT. IRRIG. SYSTEM, FLATHEAD RESN. MONT. REIMB.	73,000.00	69,040.13	2,682.91	1,276.96 2/
ADMIN. FUNDS, WASHINGTON OFFICE	148,078.99	148,078.99		
<u>PUBLIC FUNDS REIMBURSABLE IRRIGATION EMERGENCY</u>				
N. I. R. INTERIOR, INDIAN	900,387.52	900,387.52		
PUBLIC WORKS ADMIN. 1935	110,617.17	110,617.17		
PUBLIC WORKS ADMIN. 1938	94,453.93	94,453.93		
<u>TRIBAL FUNDS, CONST. NON-REIMB. IRRIGATION</u>				
PROCEEDS FLATHEAD RESERVATION	64,161.18	64,161.18		
INDIAN MONEY PROCEEDS OF LABOR	409.38	409.38		
<u>PUBLIC FUNDS NON-REIMB. IRRIGATION REGULAR</u>				
INCREASE OF COMPENSATION	156,319.91	156,319.91		
<u>PUBLIC FUNDS, IRR. ACT 5/18/16, SPL. FUND</u>				
MAINT. IRR. SYS. FLATHEAD RESN. MONT. SPL. FUND	734,663.53	734,663.53		
<u>PUBLIC FUNDS, IRRIG. RECEIPT LIM. REGULAR</u>				
MAINT. IRR. SYS. FLATHEAD RESN. MONT. REC. LIM.	1,117,836.00	960,278.84	124,641.42	32,915.74 3/
<b>TOTAL PUBLIC AND TRIBAL FUNDS</b>	<b>\$11,806,909.03</b>	<b>\$11,307,056.69</b>	<b>\$433,847.70</b>	<b>\$66,004.64</b>
<u>RECAPITULATION</u>				
PUBLIC FUNDS, REIMBURSABLE, IRRIGATION REGULAR	\$ 8,628,060.41	\$ 8,285,765.23	\$309,206.28	\$33,088.90
PUBLIC FUNDS REIMBURSABLE IRRIGATION EMERGENCY	1,105,458.62	1,105,458.62		
TRIBAL FUNDS, CONST. NON-REIMB. IRRIGATION	64,570.56	64,570.56		
PUBLIC FUNDS NON-REIMB. IRRIGATION REGULAR	156,319.91	156,319.91		
PUBLIC FUNDS, IRR. ACT 5/18/16, SPL. FUND	734,663.53	734,663.53		
PUBLIC FUNDS, IRRIG. RECEIPT LIM. REGULAR	1,117,836.00	960,278.84	124,641.42	32,915.74
<b>TOTAL PUBLIC AND TRIBAL FUNDS</b>	<b>\$11,806,909.03</b>	<b>\$11,307,056.69</b>	<b>433,847.70</b>	<b>66,004.64</b>

1/ COMPENSATION DEDUCTIONS INCLUDED HEREIN AS DISBURSEMENTS, THOUGH IMPOUNDED AND DEPOSITED IN THE TREASURY AS "SURPLUS-ECONOMY ACT." (12-COMP. GEN. 182 I. D. 312)

2/ \$214.55 CLEARED FROM PROJECT RECORDS

3/ \$17,360.56 CLEARED FROM PROJECT RECORDS



TABLE 33 APPROPRIATION CONTROL ACCOUNTS, FLATHEAD IRRIGATION PROJECT, MONTANA, JUNE 30, 1945

CLASS 11

NUMBER	ACCOUNT TITLE	YEAR	SYMBOL	APPROPRIATION TITLE	AMOUNT BY YEARS	TOTAL	TOTAL AMOUNT				
201	REGULAR CONSTR. REIMB.	1938	1482344.029	CONST. ETC. IRR. SYS.	\$198,908.37	\$	\$				
		1938	1482344.036	IND. RESN. REIMB.	51,266.25						
		1939	148/92344.029		307,409.08						
		1940	149/02344.029		420,301.99						
		1941	140/12344.029		234,707.48						
		1942	14X2344.029		94,684.93						
		1943	14X2344.029		47,997.30						
		1944	14X2344.029		13,046.08						
		1945	14X2344.029		46,210.60						
								1,414,532.08			
		1884-1914		IRRIG. IND. RESN. REIMB.	17,314.58						
		1915			136.95						
		1916			88.75						
	1924			300.00							
	1925			600.00							
	1926			500.00							
	1927			500.00							
	1928			750.00							
	1929			1,500.00							
	1930			5,700.00							
1931			5,000.00								
1932			4,300.00								
1933			708.79								
						37,399.07	1,451,931.15				
203	REGULAR O & M REIMB.	1927-1928	57/862	MAINT. & OPER. IRR. SYS. FLATHEAD REIMB.	24,686.05						
		1935	1452317		10,563.59						
		1936	1462317	MAINT. IRR. SYS.	11,086.73						
		1937	1472317	FLATHEAD RESN.	11,834.71						
		1938	1482317	MONT. REIMB.	11,560.90						
		1939	1492317		9,205.00						
		1940	1402317		9,703.05						
		1941	1412317		6,926.70						
		1944	1442317		4,285.45						
		1945	1452317		5,590.00						
						70,102.54	105,352.18				
205	REGULAR O&M SPL. FUND ACT MAY 18 1916	1912-1924	1-1523-5	MAINT. IRR. SYS.	175,458.29						
		1925	1-1523-5	FLATHEAD RESN.	25,199.82						
		1926	1-1523-5	MONT. SPL. FUND	52,781.13						
		1927	5S786		48,999.05						
		1928	5S786.08		51,108.41						
		1929	5X786.09		39,333.02						
		1930	REFUNDS		Cr. 971.53						
		1930	5X786		61,758.93						
		1931	5S786.01		55,708.47						
		1932	5S786.02		78,429.12						
		1933	5S786.03		49,321.20						
		1934	5S786.04		43,111.92						
		1935	5S786.05		61,285.30						
		1936	5-S786		Cr. 6,958.06						
		1937	5-S786		98.46						
						734,663.53	734,663.53				

TABLE 33 - APPROPRIATION CONTROL ACCOUNTS (CONTINUED)

NUMBER	ACCOUNT TITLE	YEAR	SYMBOL	APPROPRIATION TITLE	AMOUNT BY YEARS	TOTAL	TOTAL AMOUNT	
206	REGULAR O & M RECEIPT LIMIT.	1936	56786	MAINT. IRR. SYS.	\$ 65,931.95			
		1937	1476542.001	FLATHEAD RESH.	78,363.58			
		1938	1486542.001	RECEIPT LIM.	86,610.68			
		1939	1492323.001		96,624.14			
		1940	1402323.001		91,309.21			
		1941	1412323.001		107,102.96			
		1942	1422323.001		86,369.82			
		1943	1432323.010		101,146.24			
		1944	1442323.010		122,466.95			
		1945	1452323.010		139,908.49		\$ 975,834.02	\$ 975,834.02
209	REGULAR CONST., O & M REIMB	1909		IRR. SYS. FLATHEAD	44,400.27			
		1910		RESERVATION	174,318.53			
		1911		MONTANA	269,562.48			
		1912		REIMB.	315,305.01			
		1913			341,931.01			
		1914			325,000.00			
		1915			29,614.78			
		1916			168,976.90			
		1917			865,365.60			
		1918			798,174.03			
		1919			373,347.60			
		1920			348,315.68			
		1921			224,507.56			
		1922			205,497.95			
		1922-23	5-864			198,814.41		
		1924	5-864			554,570.60		
		1925	5-864			156,382.07		
		1926	56864			34,941.32		
		1927-28	57/8864			13,957.58		
		1929	59864			78,695.16		
1930	50864			307,731.98				
1931	51864			202,469.92				
1932	52864			309,381.69				
1933	53864			225,448.12				
1934	54864			36,802.17	\$6,603,512.45	\$6,603,512.45		
211	TRIBAL CONSTR. N.R.	1911		PROCEEDS FLATHEAD RESERVATION	64,161.18	64,161.18		
		1926	5T3.6198	I.M.P. OF LABOR	409.38	409.38	\$ 64,570.56	
215	EMERG. CONSTR. REIMB.	1933-39	14-443/90643	NAT'L. IND. RECOVERY	900,387.52	900,387.52		
		1935-37	5-05/7687.1	P.W.A. 1935	110,617.17	110,617.17		
		1938-40	14-40800546	P.W.A. 1938	94,453.93	94,453.93	\$1,105,458.62	
221	OTHER FUNDS CONSTR. NON- REIMB.	1918		INCREASE OF COM-	27,148.47			
		1919		PENSATION	16,798.15			
		1920		RECLAMATION	40,267.27			
		1921		SERVICE	42,691.02			
		1922			9,899.23			
		1923			8,600.86			
1924			10,914.91	\$ 156,319.91	\$ 156,319.91			

TABLE 33 - APPROPRIATION CONTROL ACCOUNTS (CONTINUED)

NUMBER	ACCOUNT TITLE	YEAR	SYMBOL	APPROPRIATION TITLE	AMOUNT BY YEARS	TOTAL	TOTAL AMOUNT
225	ADMIN. FUNDS WASH. OFFICE REIMB.	1916		IRR. IND. RESNS. AND CONST. ETC. IRR. SYSTEM	\$ 2,352.58		
		1917			2,243.38		
		1918			100.00		
		1924			816.18		
		1925			1,311.16		
		1926			948.00		
		1927			632.40		
		1928			114.96		
		1929			954.28		
		1930			3,258.81		
		1931			2,704.47		
		1932			8,194.36		
		1933			14,414.73		
		1934			9,699.10		
		1935			5,457.61		
		1936			1,802.39		
		1937			8,144.09		
		1938			15,379.16		
		1939			5,918.67		
1940		16,518.54					
1941		16,414.21					
1942		7,198.38					
1943		13,366.68					
1944		12,134.85					
					\$148,078.99	\$148,078.99	
226	COMPENSA- TION DE- DUCTIONS REIMB.	1933	53864	IRR. SYS. FLAT- HEAD RESV. REIMB.	6,595.80		
		1934	54864		3,169.01	9,764.81	9,764.81
228	ALLOWANCE CONST. WORKS.				3,169.09	3,169.09	3,169.09
229	ALLOWANCE LABOR O & M				4.50	4.50	4.50

Table 34 - Collections of Assessments - Irrigation System, June 30, 1945  
Flathead Irrigation Project, Montana

Fiscal Year	Operation and Maintenance Receipts	Construction Receipts
1912	\$ 3,039.91	\$ - - -
1913	3,877.42	- - -
1914	3,766.03	- - -
1915	3,324.48	- - -
1916	4,076.47	- - -
1917	4,353.79	- - -
1918	8,627.22	- - -
1919	16,832.24	- - -
1920	20,501.30	- - -
1921	25,999.10	4,431.26
1922	22,840.84	9,225.16
1923	29,603.15	11,848.01
1924	32,640.48	16,309.83
1925	35,262.37	10,136.20
1926	52,754.30	11,387.70
1927	45,812.30	11,440.57
1928	49,795.96	6,142.00
1929	46,066.15	5,172.85
1930	62,908.50	3,964.80
1931	63,247.94	551.60
1932	54,195.97	2.40
1933	58,198.54	- - -
1934	52,031.65	524.50
1935	61,008.65	249.49
1936	92,626.74	- - -
1937	74,042.56	- - -
1938	95,498.18	- - -
1939	89,842.08	- - -
1940	101,953.24	- - -
1941	123,666.34	- - -
1942	148,185.14	- - -
1943	109,995.61	- - -
1944	110,284.20	- - -
1945	123,641.65 <sup>1/</sup>	- - -
Totals	\$ 1,830,500.50	\$ 91,386.37

<sup>1/</sup> Includes \$639.70 collected for sales and service.

TABLE 35 - Statement of Construction Costs, Irrigation System, June 30, 1945  
Flathead Irrigation Project, Montana.

Principal Features By Divisions	Cost of Principal Features	Total Cost of Principal Features
<u>MISSION VALLEY DIVISION</u>		
Examinations and Surveys	\$ 99,705.06	
Storage System	3,442,665.89	
Canal System	781,203.75	
Lateral System	2,147,416.58	
Drainage System	91,130.26	
Farm Units	52,789.80	
Permanent Improvements and Lands	47,098.86	
Telephone System	18,243.68	
Transferred from Oper. & Maint.	58,829.70	
Suspense Account - Undistributed	345.23	
Total	\$ 6,739,428.81	
<u>CAMAS DIVISION</u>		
Examination and Surveys	13,890.04	
Storage System	643,548.88	
Canal System	383,141.76	
Lateral System	301,176.94	
Farm Units	6,666.38	
Permanent Improvements and Lands	10,334.59	
Telephone System	1,350.17	
Transferred from Oper. & Maint.	931.08	
Suspense Account - Undistributed	165.59	
Total	\$ 1,361,205.43	
<u>JOCKO DIVISION</u>		
Examination and Surveys	16,145.56	
Storage System	255,996.54	
Lateral System	352,311.80	
Farm Units	5,904.18	
Permanent Improvements and Lands	1,631.50	
Telephone System	1,687.71	
Transferred from Oper. & Maint.	5,174.46	
Total	\$ 638,851.75	\$ 8,739,485.99

TABLE 36 Statement of Operation and Maintenance Costs, Irrigation System,  
June 30, 1945

Mission Valley Division	\$ 1,885,909.22	
Camas Division	302,219.46	
Jocko Division	207,049.71	\$ 2,395,178.39

TABLE 37 - Statement of Administration Costs, Irrigation System, June 30, 1944

Construction Features	\$ 109,520.05	
Operation and Maintenance Features	38,558.94	\$ 148,078.99

TABLE 38 - Statement of Accounts Receivable, Irrigation System, December 31, 1945.

Flathead Irrigation Project, Montana

CHARACTER OF ASSESSMENTS

Operation and Maintenance Assessments

Due from Non-Indian Lands

Due from lands not in irrigation districts:

Jocko Division	\$ 4,273.46
Mission Valley Division	3,216.42
Camas Division	74.37

Due from Irrigation Districts, Deferred Accounts:

Jocko Irrigation District	19,041.46
Mission Irrigation District	16,473.60
Flathead Irrigation District	44,626.36

Due from Irrigation Districts, Current Accounts:

Jocko Irrigation District	- - -
Mission Irrigation District	24.33
Flathead Irrigation District	5,876.35

Total

\$ 93,606.35

Due from Indian Lands

Jocko Division	22,191.98
Mission Valley Division	79,008.98
Camas Division	859.94

Total

\$102,060.90

Special Deposit Account Undistributed

Total

RE. 64.54

RE. 64.54

Uncollected Miscellaneous:

Due from other activities for labor,  
material and supplies furnished

Total

1,162.04

\$ 1,162.04

Table 39 - Balance Sheet, Power System  
Flathead Irrigation Project, Montana  
June 30, 1945.

ASSETS

Current and Accrued Assets

Cash:

Unappropriated Receipts	\$903,497.68	
Appropriations	59,845.69	
Miscellaneous Deposits	7,796.04	
Accounts Receivable - Customers	22,176.93	
Accounts Receivable - Other	52.69	
Material and Supplies	<u>30,146.20</u>	\$1,023,515.23

Fixed Assets

Electric Plant

945,221.41

Total Assets

\$1,968,736.64

LIABILITIES

Current and Accrued Liabilities

Accounts Payable:

Labor	5,404.68	
Purchases	32,239.40	
Transportation	348.10	
Customers' Deposits	7,796.04	
Collections, Overdeposit	<u>22.00</u>	
Total		45,810.22

Long-Term Debt

Public Funds:

Regular - Construction Reimb.	632,838.00	
Emergency - Construction Reimb.	172,122.28	
Regular - Administration, Reimb.	<u>73,420.37</u>	
Total		878,380.65

Reserves

Depreciation - Electric Plant	313,349.15	
Depreciation - Misc. Equipment	17,056.56	330,405.71
Reserve for Uncollectible Accts.		<u>3,130.22</u>

Surplus

Invested in Elec. Plant, Allowances	32,597.24	
Invested in Elec. Plant, Disbur'mts.	69,143.35	
Unappropriated Surplus	<u>609,269.25</u>	
Total		<u>711,009.84</u>

Total Liabilities

\$1,968,736.64

TABLE 40 - SCHEDULE OF APPROPRIATIONS AND DISBURSEMENTS, POWER SYSTEM, JUNE 30, 1945.  
FLATHEAD IRRIGATION PROJECT, MONTANA

APPROPRIATION TITLE	APPROPRIATIONS	DISBURSEMENTS	BALANCE	
			TO SURPLUS	UNEXPENDED
<b>PUBLIC FUNDS REIMBURSABLE</b>				
<u>POWER REGULAR</u>				
IRRIG. SYSTEMS FLATHEAD RESERVATION, MONTANA, REIMBURSABLE	\$ 370,109.73	\$ 370,109.73		\$
CONSTRUCTION, ETC., IRRIGATION SYSTEM, FLATHEAD RESERVATION, MONT. REIMB.	262,728.27	253,181.71		9,546.56
WASHINGTON OFFICE ADMINISTRATION FUNDS	73,420.37	73,420.37		
<u>POWER EMERGENCY</u>				
NATIONAL INDUSTRIAL RECOVERY	153,995.80	153,995.80		
PUBLIC WORKS ADMINISTRATION 1935	14,382.83	14,382.83		
PUBLIC WORKS ADMINISTRATION 1938	3,743.65	3,743.65		
<b>TOTAL REIMB. PUBLIC FUNDS</b>	<b>\$878,380.65</b>	<b>\$ 868,834.09</b>		<b>\$ 9,546.56</b>
<b>PUBLIC FUNDS REIMBURSABLE</b>				
POWER REGULAR	\$706,258.37	\$ 696,711.81		\$ 9,546.56
POWER EMERGENCY	172,122.28	172,122.28		
<b>TOTAL</b>	<b>\$878,380.65</b>	<b>\$ 868,834.09</b>		<b>\$ 9,546.56</b>

TABLE 41 - APPROPRIATION CONTROL ACCOUNTS, POWER SYSTEM, JUNE 30, 1945. FLATHEAD IRRIGATION PROJECT

NUMBER	ACCOUNT TITLE	YEAR	SYMBOL	APPROPRIATION TITLE	AMOUNT BY YEARS	TOTAL	TOTAL AMOUNT
213.1	REGULAR FUNDS CONSR. REIMB.	1926-27	56/7864	IRR. SYS. FLATHEAD	\$ 4,824.36	\$ 370,109.73	\$
		1931	51864	RESV. MONT. REIMB.	120,368.53		
		1932	52864		244,916.84		
		1938-39	148/92344.029	CONST. ETC. IRR.	43,704.09		
		1939-40	149/02344.029	SYS. FLATHEAD	65,158.58		
		1940-41	140/12344.029	RESV. MONT. REIMB.	94,512.84		
		1942	14X2344.029		47,991.71		
		1943	14X2344.029		1,538.58		
1944	14X2344.029		9,822.47	262,728.27	\$632,838.00		
213.15	EMERGENCY FUNDS, CONST REIMB.	1934-39	14-443/90643	NAT'L. IND. REC.	153,995.80		
		1935-37	5-05/7678.1	P.W.A. 1935	14,382.83		
		1938-40	14-808/00546	P.W.A. 1938	3,743.65	172,122.28	172,122.28
213.25	ADMIN. FUNDS WASH. OFFICE	1931-44		IRR. IND. RESH. & CONST. ETC.	\$ 73,420.37	\$ 73,420.37	\$ 73,420.37



Table 42 - Analysis of Power Accounts, June 30, 1945

Flathead Irrigation Project, Montana

CONSTRUCTION COSTS OF ELECTRIC PLANT

Regular Funds - Construction, Reimb.	\$ 632,838.00	
Emergency Funds - Construction, Reimb.	172,122.28	
Regular Funds - Construction, Reimb. Admin	38,520.54	
Revenues invested in Electric Plant Allowances	32,597.24	
Revenues invested in Electric Plant Disbursements	<u>69,143.35</u>	
Total		<u>\$ 945,221.41</u>

SALE OF ELECTRIC ENERGY

Cash - Receipts Undeposited	\$ RE 22.00	
Cash - Receipts	1,739,559.63	
Accounts Receivable	22,176.93	
Revenue Deductions for Construction Allowances	<u>32,597.24</u>	
Total		<u>\$1,794,311.80</u>

DISBURSEMENTS FROM SPECIAL FUND

Total Receipts - Special Fund		\$1,739,559.63
Available Cash - Appropriations:		
Allotted 1442323.020	\$ 567.40	
1452323.020	49,731.73	
Unallotted, Special Fund	<u>903,497.68</u>	
Total		<u>953,796.81</u>
Special Fund Disbursements		<u>\$ 785,762.82</u>

TABLE 43 - FINANCIAL STATEMENT - POWER SYSTEM, FISCAL YEARS 1931 TO 1945 INCLUSIVE.  
FLATHEAD IRRIGATION PROJECT, MONTANA

FISCAL YEAR	SALES	O. & M. COSTS	ADMINISTRATION COSTS	NET REVENUE BEFORE DEPRECIATION	DEPRECIATION	NET INCOME
1931	\$ 1,449.08	\$ --	--	\$ 1,449.08	\$ --	\$ 1,449.08
1932	40,043.93	28,960.19	553.12	10,530.62	5,242.32	5,288.30
1933	54,233.58	43,309.17	2,008.85	8,915.56	11,206.46	2,290.90 D/
1934	61,251.97	25,714.95	694.30	34,842.72	12,147.06	22,695.66
1935	67,978.81	34,634.84	1,077.82	32,266.15	12,685.80	19,580.35
1936	84,117.34	34,588.08	1,622.74	47,908.52	13,099.70	34,806.82
1937	111,402.28	42,320.59	2,201.75	66,879.94	13,893.98	52,985.98
1938	136,167.65	42,590.73	2,043.68	91,533.24	14,788.36	76,744.88
1939	144,682.74	44,950.86	1,049.22	98,682.66	15,397.94	83,284.72
1940	159,289.33	63,882.53	1,732.85	93,673.95	25,072.53	68,601.42
1941	177,142.54	53,601.82	2,348.03	121,192.69	35,310.85	85,882.04
1942	182,766.48	81,845.04	5,993.27	94,928.17	36,734.78	58,193.39
1943	164,967.22	94,338.64	7,817.77	62,810.81	38,022.65	24,788.16
1944	187,673.05	74,115.43	5,756.43	107,801.19	39,213.52	68,587.67
1945	221,145.80	70,200.11	1/	150,945.69	40,533.42	110,412.27
1946	240,318.24	125,634.09	4,939.24	109,744.91	41,505.36	68,239.55
1947	308,561.51	125,634.22	*6,000.00	171,927.09	41,505.36	130,421.73
1948	389,727.66	202,542.64	*6,000.00	181,185.02	42,640.08	138,544.94
D/ DEF.	2,727,919.01	1,188,863.93	57,862.24	1,481,192.84	438,999.95	1,042,192.89

\*Estimated

THE AMOUNTS SET UP FOR DEPRECIATION BY FISCAL YEARS HAVE BEEN ESTIMATED TO A CERTAIN EXTENT BUT THE TOTAL AMOUNT IS IN AGREEMENT WITH PROJECT RECORDS AND IS ASSUMED TO BE NEARLY CORRECT.

TABLE 44 - RECEIPTS FROM SALE OF ELECTRIC ENERGY, POWER SYSTEM, JUNE 30, 1945. FLATHEAD IRRIGATION PROJECT, MONTANA

FISCAL YEAR	AMOUNT	ACCUMULATED AMOUNTS
1931	\$ 1,449.08	\$ 1,449.08
1932	40,043.93	41,493.01
1933	54,233.58	95,726.59
1934	61,251.97	156,978.56
1935	67,978.81	224,957.37
1936	84,117.34	309,074.71
1937	101,667.78	410,742.49
1938	128,593.39	539,335.88
1939	142,080.79	681,416.67
1940	155,187.44	836,604.11
1941	171,270.74	1,007,874.85
1942	173,112.89	1,180,987.54
1943	161,743.02	1,342,730.56
1944	178,966.73	1,521,697.29
1945	217,862.34	1,739,559.63

## PRINCIPAL FEATURES OF AN ECONOMIC PROGRAM FOR INDIANS

In 1944 Flathead Agency officials, in cooperation with the Tribal Council, prepared a report outlining a long-time program for the Indians on the Flathead Indian Reservation. The following excerpts present the more significant features of the program outlined therein.

### Basic Data

The Indians on what is now the Flathead Reservation were removed from the Bitterroot Valley in compliance with the Executive Order of November 14, 1871, and the Act of June 5, 1872. The reservation was then known as the Jocko Reservation, and contained 1,243,969 acres. Since that time 612,764 acres have been alienated. Many years were required to get all the various tribes settled on the reservation. Among the larger groups moving to the reservation were Flathead, Kootenai, Kalispel, Spokane, Nez Perce, Pend d'Oreille and Colville Indians. Also represented were the Crees, Chippewas, Blackfeet, Snakes, Shoshones, Chinooks and Iroquois.

Total Indian population at the close of 1942 was 3,349, of whom 326, or 9.7 per cent, are full bloods. The mixed bloods represent a mixture of French, Scotch and Scandinavian, as result of early intermarriage between the Indians and Hudson Bay fur traders. From 1933 to 1942 the population increased by 384, or 1.4 per cent per year. There are 688 families.

Social and cultural conditions among the Flathead Indians, except the full bloods, are similar to or identical with those of typical non-Indian rural communities. About 25 per cent of the population are of one-eighth or less Indian blood, and they, with possibly many others of the mixed blood groups, are a part of the non-Indian population except for their designations as Indians by the government. The full bloods, most of whom think and act in terms of their Indian culture, probably will remain a strong minority for a long time. In general, their economic and social conditions are farthest down in the scale.

Indian-owned irrigable land under the project totals 24,378.86 acres. In addition, there are 10,615 acres of dry farm agricultural land in Indian ownership.

Range land consists of 313,401 acres, of which 257,786 acres are timbered and 55,615 acres are open.

Accessible merchantable timber is estimated at 1,000,000 M Ft. B.M.

The reservation has been extensively prospected for minerals, but output has been very small. Principal showings, copper and lead. There is one quartz crystal prospect and lease.

Wildlife is important to the Indians as a source of food. Trapping of muskrat and beaver is increasing because of present high prices for furs.

A valuable resource only partially developed are the medicinal waters at Camas Hot Springs. Recreation possibilities are plentiful and varied.

The following figures on Indian net income on the Flathead Reservation are taken from the report of the Office of Indian Affairs "Individual Income, Resident Population, 1942":

<u>Source of Income</u>	<u>Amount</u>
Native Products	\$ 6,320
Arts and Crafts	700
Agriculture, including livestock	242,115 <sup>1/</sup>
Private business	5,000
Total wages	123,039
Timber sales	9,430
Leases and Permits	61,868
Social Security Assistance	27,577
Other unearned Income	70,075
	<u>\$ 546,124</u>

<sup>1/</sup> 74 per cent Livestock and Livestock Products; 26 per cent Crops and gardens.

For 688 families this is an average of \$794 per family. There were reported to be 288 families engaged in agriculture in 1943 and that their average net income was \$1,330. The reservation's basic economy is beef cattle, with the dairy business second.

Tribal income from use of power sites was \$180,000 in 1943 and will be \$200,000 in 1945 and subsequent years. Revenue obtained by the tribe from sale of timber in 1943 was \$42,000.

Relief received from the counties is supplemented by an annual appropriation of \$6,000 from tribal funds, used for support of old and indigent Indians.

#### ECONOMIC OBJECTIVES

The economic goal sought is an income of \$1,200 per year per family or its equivalent. A major item of planning for the next 10 years is to derive the greatest benefit for the Indians from the tribal income of \$200,000 per year from power interests.

It is estimated that 400 families will need funds to help in raising their standard of living to the goal mentioned. At \$5,000 per family on a long-time loan basis, \$2,000,000 would be required, at least half of which could come from tribal funds. This would amount to about \$1,350 per capita for those receiving help. The tribal council has outlined a plan for lending tribal funds to members of the tribe for land purchases and a general start in farming or other business.

It is planned to increase Indian use of the range by eliminating white use or by the acquisition of additional land, or both.

It is planned to inaugurate a forest management plan.

In cooperation with the Northern Plains Indian Arts and Crafts Association, a systematic plan may be undertaken for encouragement in arts and crafts and sale of the products.

Scenic and recreational resources are almost unlimited and full development and use of them is planned. An expansion and improvement program for the Hot Springs health resort also is contemplated.

Plans for conservation of wild life call for a licensing system for fishing on the reservation, building of hatcheries, restocking of rivers and lakes and suitable safeguards for preventing the entry of fish into canals and ditches.

#### Services to be Furnished by Indian Office

1. Forestry: A summer maintenance crew of three men and equipment to be organized. Appraisal of all timber lands to determine correct value will require three experienced men. An additional Forest Examiner and two additional scalers will be required. Annual cost estimated at \$6,500 in 1945, and increasing thereafter.

2. S.M.C.O.: Planned for this division is a "detailed intensive" range management survey. Estimated cost \$2,500 in 1945.

3. Extension: A greatly enlarged staff of extension workers will be necessary to cooperate with and assist the tribal land program. Two additional Farm Agents to be established, one at the agency and one at Polson; two Farm Aids to be stationed at Hot Springs and Ronan. A Home Demonstration Agent to be employed for the reservation.

4. Arts and Crafts: It is estimated that one part-time employee and a working fund of about \$2,000 will be needed to assist in increasing interest in arts and crafts.

5. Education: It is planned to attempt an arrangement by which public schools that have borrowed improvement money from the government will assume the education of all Indian children in their districts for all time, in consideration of cancellation of their debt to the government. The tribal council will then assume the education of all other Indian children within the reservation. It is believed this plan could be completed in 5 years, after which the government would be relieved of all education cost on the reservation. At present the government pays \$10,781.28 tuition annually for 219 children in public schools on the reservation, of which \$7,660.96 is returned to the government in payment of principal and interest.

6. Health: No change in present arrangements is contemplated.

7. Law and Order: If a program of game regulations and conservation is adopted, several game wardens will need to be employed. No other changes contemplated. No details were given as to personnel or costs, present or proposed.

8. Land Administration: It is proposed to establish a land office at the agency with one employee to handle land problems, one employee to handle lease administration in cooperation with land adjustment program, and one clerk-typist. Estimated cost \$6,000 annually.

9. Roads: The road program comprises the following: Type I, construct 10 miles, surface and re-surface 19.25 miles; Type II, construct or re-surface 24.6 miles; Trails, 29.5 miles; Agency streets, improvements, 1 mile; total 74.35 miles. Estimated total cost \$392,000. No data as to personnel. It is stated that "a large part of this program is actually done in cooperation with the State and County road organization." No data were given as to sharing cost of construction or maintenance.

10. Administrative Facilities: Proposed administrative construction includes: coal storage sheds; cold storage locker house; agency water system; machine and lumber sheds; employees' dining club; dial telephone system; Flathead River bank protection adjacent to agency grounds; agency buildings repair and alteration; central heating plant. Total cost, estimated \$78,300.

Services to be Furnished by State, County or Indians.

Social services and relief are administered by State and Counties. State and Counties cooperate in road program. State and Counties receive tuition for Indian children of more than 1/4 Indian blood, but also provide education for many of less than that blood quantum for whom no tuition is paid, but whose parents are not tax payers.

It is presumed that the annual appropriation from tribal funds of \$6,000 for relief of old and indigent Indians will be continued.

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