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PAKISTAN

SCARP IV

PUBLIC SAFETY ADMINISTRATION PROJECTS (700 PURPOSE CODES)

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391-H-123

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

CAPITAL ASSISTANCE PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

PAKISTAN: SCARP IV

391-22-120-2982

A.I.D.
Reference Center
Room 1656 NS

AID-DLC/P-579

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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

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AID-DLC/P-579
June 12, 1967

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Pakistan: SCARP IV

Attached are revised and renumbered pages to be inserted in the subject Capital Assistance Paper.

The recommendations for authorization of a loan in an amount not to exceed $10,700,000 to the President of the Government of Pakistan to assist in financing the foreign exchange costs of goods and services required for the installation and electrification of approximately 1062 tubewells in the Upper Chenab Unit of the Upper Rechna Doab region of West Pakistan were discussed at a meeting of the Development Loan Staff Committee on Friday, June 2, 1967.

Rachel C. Rogers
Assistant Secretary
Development Loan Committee

Attachments: (Revised June 12, 1967)
Project Analysis, pp. 37, 40 and 48
Project Analysis, renumbered pp. 41, 42, 43 and 44
(NOTE: Page 41 was deleted.)

Previously Distributed: May 26, 1967
Summary and Recommendations
Project Analysis
ANNEXES I-III

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TABLE 10

CASH FLOW
(Value in Rupees)

Year	Annual Income 1/	Estimated Project Cost: Operation Cost 2/	Estimated Project Cost: Loan Repayment 3/	Estimated Project Cost: Total Annual Cost	Annual Surplus or (Deficit)	Accumulated Balance Surplus or (Deficit)
1		297,000		297,000	(297,000)	(297,000)
2	3,186,000	2,792,000		2,792,000	394,000	97,000
3	6,156,000	5,126,000		5,126,000	1,030,000	1,127,000
End of Construction Period						
4	8,676,000	10,904,000		10,904,000	(2,228,000)	(1,101,000)
5	10,404,000	12,004,000		12,004,000	(1,600,000)	(2,701,000)
6	12,150,000	13,104,000		13,104,000	(954,000)	(3,655,000)
7	13,896,000	14,205,000		14,205,000	(309,000)	(3,964,000)
8	16,974,000	14,816,000		14,816,000	2,158,000	(1,806,000)
End of Development Period						
9-43	23,575,000 p.a.	15,749,000 p.a.	6,947,000 p.a.	22,696,000 p.a.	879,000 p.a.	

1/ Based on Rs 18 per harvested acre through development period and Rs 25 per harvested acre thereafter. (A charge per harvested acre of Rs 24.06 is sufficient to pay the total annual cost of Rs 22,696,000 after development. An additional Rs 0.11 would be required to amortize the 1,806,000 deficit accumulated through the period of development).

2/ O & M Costs from Schedule 5 plus replacement reserve costs calculated on an even annual basis.

3/ Beginning at end of development period of 35 years at 4-3/4% rate of interest per annum.

VII. ECONOMIC FEASIBILITY

A. GENERAL

Vast areas of the Indus Plain have been developed for irrigation without considering the need for either supplying sufficient irrigation water to achieve high agricultural production per unit or controlling soil salinity. The amount of surface water available per cultivable command acre is very small and the irrigated acres contain inherent self-destructive features. Large areas of irrigated land are being severly affected or going out of cultivation because of waterlogging and salinity. Also there are no further large tracts of new lands that can be developed cheaply for irrigation. Thus West Pakistan has only one major means of increasing agricultural production: intensification of cropping of presently-irrigated lands.

To increase food production, the following measures are required:

1. Increasing the harvested acreage by increasing the water supply;

2. Increasing the amount of water applied per acre;

3. Controlling the water-table depth;

4. Removing salts from the root zones of plants; and

5. Improving agricultural methods and increasing the availability of such other inputs as fertilizer, improved seed, pesticides, etc.

To achieve the dramatic breakthrough which will be required to achieve self-sufficiency in food by 1970 will require a carefully integrated program employing all of the above. The SCARP projects are the primary means by which the GOWP is proceeding to accomplish the first four measures.

As the following analysis shows, this project is highly desirable on economic grounds. Cropping intensity will increase from 92 percent to 150 percent. Changes in the cropping pattern will occur to grow more fruits and vegetables presently deficient in the national diet, fodder crops to make possible better nutrition of draft and milk animals, wheat, sugarcane and other needed crops. In this connection, it is the policy of the Government of Pakistan to encourage the production of food crops such as wheat, rice and maize through public promotion and by establishing price levels which, consistent with the requirements of economic stability, will serve as an effective incentive for production. Cash crops, such as cotton, are not being encouraged by incentives (in fact cotton bears the disincentive of an export tax). Production increases will result from higher per-acre yields. Most important, with the removal of water and salinity as limiting factors, other inputs can be used, such as fertilizer, pesticides and improved seeds, making possible two and three-fold yield increases.

(iv) Benefits are calculated to include additional water, drainage and full development plus exported water.

The first and second benefit cash flows plus $800,000 per annum for exported water are calculated as the third and fourth alternative.

3. Benefit/Cost Ratios and Internal Rate of Return

The benefit/cost ratios resulting from the four alternative calculations of benefit are summarized as follows:

Alternative	Benefit/Cost
1. Additional water and drainage only	2.4/1
2. Additional water, drainage and full development	4.1/1
3. Additional water and drainage plus exported water	2.6/1
4. Additional water, drainage and full development plus exported water	4.3/1

The true benefit/cost ratio lies somewhere between these values, depending on what part of the benefits from full agricultural development are attributed to the availability of sufficient water.

Internal rate of return is calculated for the alternatives without exported water.

Alternative	Internal Rate of Return
1. Additional water and drainage only	22%
2. Additional water, drainage and full development	27%

Exhibit 2 sets forth the detailed calculation of these figures.

4. Private Tubewell Development

The question of private versus public tubewell development has been given considerable publicity and is regarded in some quarters as a major issue. In a capital-scarce environment, it is generally felt public funds should not replace private investment. The GOP in its revised Third Plan

reconciles the issue by including as an objective "the maximization of the relatively easy development of sweet ground water in the Province (West Pakistan) through an expanded and integrated public and private tubewell programme." The Plan states further, "Construction of private tubewells has been accelerating rapidly and it is now estimated to be running at 6,500 per year. It is proposed to give the development of private tubewells every assistance... With such assistance, some 40,000 new tubewells can be expected during the Third Plan period. The development of those private tubewells will proceed side by side with the development of the public tubewells, areas for each being determined with phased priorities. To achieve the maximum possible water development, care will be taken that the public program is sufficiently flexible to minimize adverse effects on private development. Care will also be taken to insure that the private development does not lead to a less than optimal ultimate development of the Basin, to an inefficient use of public resources or to major social inequities. This new strategy has the great advantage of mobilizing the full energies of individual farmers to supplement the resources and skills of the public agencies".

Based on the Tipton and Kalmbach 1965 SCARP IV Report, there were approximately 2,400 private tubewells in the Upper Rechna area in 1965. These tubewells serviced 45 to 250 harvested acres each, as compared with an average 940 harvested acres to be serviced by each tubewell in this project. Private development in the Upper Chenab area is not a feasible alternative for the following reasons:

a. The investment costs of just electrifying the area for private tubewells would exceed the total costs of the public project (tubewell installation and electrification).

b. Private tubewell development has been concentrated in specific locations of the SCARP IV area which include (a) cultivation of high value, (b) high water-use crops, and (c) above average size of farm holdings. Within the SCARP IV area, the eastern sector meets these criteria and is left for further private tubewell development. It is Tipton and Kalmbach's opinion, supported by A.I.D., that private development would proceed at a much slower pace than a public project in the project area. Even assuming that private development would be less costly than public development (which it does not), the economic benefits from tubewell development of the project area are so great as to preclude acceptance of an alternative which would delay these benefits for many years.

c. Tubewells in this Unit will be required to replace about 238,000 A.F. of canal water exported to other areas with unfavorable supplies. Problems of implementing and coordinating this replacement scheme with private wells would be difficult if not impossible.

For these reasons, public development of the project area is the only acceptable approach being considered by the GOP, and its consultants Tipton and Kalmbach. A. I. D. strongly supports this approach. As indicated in the section describing the History of the Loan Application, every effort has been made to maximize the role of private tubewells in SCARP IV. The conditions extant in the Upper Chenab Unit, described in this section, however, point to the wisdom of public development of the project area and this decision appears consistent with the strategy for public-private development outlined in the Third Plan document. Consequently, the private tubewell question is not regarded as an issue in the project area to be financed from this loan.

C. CONCLUSIONS

The benefit/cost and internal rate of return analyses fully justify the project from an economic standpoint. While economic benefits would undoubtedly result from private tubewell development of the area, the special conditions extant in the Upper Chenab Unit and the additional benefits to be derived from the export of water justify A.I.D. support of this project in the public sector.

VIII. IMPLEMENTATION PLAN

A. TIME SCHEDULE

The time schedule prepared by Tipton and Kalmbach and presented on the following page indicates that engineering, procurement and construction of the project will take about three years from the date a loan agreement is signed. If the loan is authorized in May/June 1967, it should be possible to execute a loan agreement within the next quarter. Project completion should then be possible by December 1970. A schedule for disbursement is set forth in Section VI.

B. CONSULTING SERVICES

The project feasibility was studied by Tipton and Kalmbach, Inc., Denver, Colorado. The firm has made similar studies for the three previous SCARPs and has prepared the designs and specifications and supervised construction. It is expected that the firm will operate in a similar capacity on the SCARP iv areas. Under its existing contract with WAPDA prior studies were carried out under funds provided by AID loans No. 391-H-069 and 391-H-107 for general investigations and consulting services. The costs for the preparations of designs and specifications and for supervision of construction for this project are to be provided from funds made available under this loan.

Preparation of designs, specifications and supervision of construction for the power system serving the tubewells in previous SCARPs has been done through a variety of consultants. Most recent assignment was SCARP II-A to Commonwealth Associates of Jackson, Michigan. Contracts are handled by the Power Wing of WAPDA who has furnished the consultant with personnel for carrying out the work.

As mentioned in Section IV, timely execution of the electrification phases of prior SCARPs has been a problem. With respect to SCARP II-A the consulting services contract with Commonwealth Associates was not signed until 14 months after the loan agreement was signed. On SCARP II-B, although the loan agreement was signed in December 1966, a contract for services of an electrification consultant has not yet been finalized. This topic will be fully discussed with WAPDA during the course of negotiations on the loan agreement, and satisfactory deadlines for signing the consulting services contract for electrification will be prescribed as a condition precedent to the loan. WAPDA will be notified of this in a timely manner to encourage them to expedite their negotiations with the electrification consultants.

Project Schedule

UPPER CHENAB UNIT - SCARP NO. IV

ITEM	YEAR			
	1967/68	1968/69	1969/70	1970/71
TUBEWELLS				
PROJECT PREPARATION				
CONSTRUCTION				
ELECTRIFICATION				
PROJECT PREPARATION				
SURVEY, PROCUREMENT AND CONSTRUCTION				

NOTE: Upper Chenab Unit consists of 1062 Tubewells constructed and electrified.

Renumbered June 12, 1967
(Formerly page 44a)

The following convenants will be included in the Loan Agreement:

1. Borrower to review water user rates generally with a view of ensuring that rates for sale of water are set at levels appropriate to the increased income of users and that projects such as the project being financed from this loan can cover their operating costs and amortize their capital cost out of revenues earned by the projects.

2. Borrower to ensure that adequate training programs exist within the agencies of the West Pakistan provincial government so that the operating agency that is assigned the responsiblity of operating the project financed by this loan will have sufficient, well-trained personnel capable of handling all aspects of the operation of the project.

A. IMPACT ON U. S. ECONOMY

The initial effect of this loan would be to establish a demand on U. S. industry for equipment and transportation items for tubewell installations and electrification of tubewells. Imported spare parts requirements are expected to be minimal as most permanently installed equipment is expected to be of local manufacture and no funds are being provided under this loan for that purpose. U. S. personnel would be employed in providing engineering services for the project.

It is not expected that as a result of the project any substantial quantity of agricultural products will enter the world market in general or in significant competition with U. S. products in the foreseeable future. As mentioned elsewhere in this paper, the Government of Pakistan is actively encouraging production of food crops through price incentives and public promotion, and not cash crops. The major impact of this project will be to raise Pakistan's foodgrain output and reduce its need for PL 480 assistance.

B. REPAYMENT PROSPECTS

The Borrower will be the Government of Pakistan and the implementing agency the West Pakistan Water and Power Development Authority (WAPDA). It will be the obligation of the GOP to make interest and principal payments on this loan to A.I.D.

An assessment of Pakistan's external debt position and prospects leads us to share the view of other observers, including the IBRD, that Pakistan can support additional debt as long as the blend of terms continues to be soft. Pakistan's external public debt amounted to less than $200 million at the end of the First Plan. By June 1966, Pakistan had received long and medium term load aid commitments or contracted for loan aid totaling $2.4 billion requiring service in foreign exchange, of which $1.3 billion had actually been disbursed and was subject to such debt service as specified by the loan terms. The service on this debt calls for about $111.0 million in 1967, of which $16 million is for privately placed debt and the balance of $95 million is for publicly placed debt. This service is equivalent to about 12-14 percent of prospective foreign exchange earnings. During FY 1967 Pakistan has been offered about $600 million of additional credits and

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

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AID-DLC/P-579
May 26, 1967

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Pakistan: SCARP IV

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed $10,700,000 to the President of the Government of Pakistan to assist in financing the foreign exchange costs of goods and services required for the installation and electrification of approximately 1062 tubewells in the Upper Chenab Unit of the Upper Rechna Doab region of West Pakistan.

This loan proposal is scheduled for consideration by the Development Loan Staff Committee at a meeting on Friday, June 2, 1967.

Rachel C. Rogers
Assistant Secretary
Development Loan Committee

Attachments:
Summary and Recommendations
Project Analysis
ANNEXES I-III

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AID-DLC/P-579
May 26, 1967

SALINITY CONTROL AND RECLAMATION PROJECT IV

UPPER CHENAB UNIT

Table of Contents

GLOSSARY

Page No.

I. SUMMARY AND RECOMMENDATIONS

A. BORROWER 1
B. AMOUNT OF LOAN 1
C. DESCRIPTION OF PROJECT 1
D. PURPOSE OF PROJECT 1
E. BACKGROUND 1
F. PROJECT COST 2
G. ECONOMIC JUSTIFICATION 2
H. EXPORT IMPORT BANK INTERESTS 2
I. MISSION VIEWS 2
J. STATUTORY CRITERIA 2
K. ISSUES 3
L. RECOMMENDATIONS 4
M. CAPITAL ASSISTANCE COMMITTEES 4

II. BACKGROUND

A. GENERAL 5
B. DEVELOPMENT OF THE SCARP PROGRAM 6
C. FUTURE SCARP PROGRAM 11
D. HISTORY OF THE LOAN APPLICATION 12

III. BORROWER

A. GENERAL 14
B. THE WEST PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY (WAPDA) 14
C. WAPDA's CONSULTANTS 15
D. U.S. ASSISTANCE TO WAPDA 15

IV. PROJECT DESCRIPTION AND ENGINEERING ANALYSIS

A. PROJECT LOCATION AND OBJECTIVES 17
B. THE PROJECT 17
C. CONCLUSIONS 23

Page No.

V. MANAGEMENT & OPERATIONS

A. GENERAL 25
B. HISTORY 25
C. THE LAND AND WATER DEVELOPMENT BOARD 27
D. CONCLUSIONS 28

VI. FINANCIAL ANALYSIS

A. PROJECT COSTS 29
B. PROJECT FUNDING 29
C. OPERATION, MAINTENANCE AND REPLACEMENT OF TUBEWELLS 31
D. WATER RATES AND USERS' ABILITY TO PAY 33
E. CASH FLOW OF PROJECT 34
F. CONCLUSIONS 35

VII. ECONOMIC FEASIBILITY

A. GENERAL 37
B. ECONOMIC ANALYSIS 38
C. CONCLUSIONS 43

VIII. IMPLEMENTATION PLAN

A. TIME SCHEDULE 44
B. CONSULTING SERVICES 44
C. CONSTRUCTION SERVICES 45
D. PROCUREMENT OF EQUIPMENT AND MATERIALS 45
E. CONDITIONS AND COVENANTS 46

IX. MISCELLANEOUS

A. IMPACT ON U. S. ECONOMY 48
B. REPAYMENT PROSPECTS 48

X. CONCLUSIONS AND RECOMMENDATIONS 49

Plates and Exhibits:
Plate 1 - Map of Indus Plains
Plate 2 - SCARP No. 4 - Upper Rechna Doab
Exhibit 1 - Comparison of Projected Peak Loads and Generating Capability
Exhibit 2 - Benefit/Cost and Internal Rate of Return Analysis

Annexes:
Annex I - Accomplishments in SCARP I
Annex II - Checklist of Statutory Criteria
Annex III - Draft Capital Assistance Loan Authorization

GLOSSARY

Acre foot	43,560 cubic feet, the volumetric equivalent of one acre covered to a depth of one foot.
Barani	An Urdu term describing the type of agricultural practice which relies upon no water supplemental to the natural rainfall of the area.
Chak	An Urdu term used to designate all the land served with water from one irrigation outlet. The word is also applied to designate a village.
Coir	A stiff coarse fiber from the outer husk of the coconut.
Cropping intensity	A seasonal cropping intensity is defined as the percentage of the culturable area cropped in one planting season. The annual cropping intensity is the total of all the seasonal intensities during one year. Harvest intensities will be less than cropping intensities by the percentages of culturable area in sugarcane, orchards, or other crops occupying land in both seasons but harvested only in one.
Culturable area	That portion of the gross area which is culturable.
Culturable commanded area	The culturable area within a canal system which can be irrigated by gravity-flow from the existing canal system.
Cusec	One cubic foot per second, a term used to describe the flow rate of water. Abbreviation: cs.
Doab	An Urdu term referring to the land between any two adjacent rivers in the Punjab.
Kharif	An Urdu term for the summer growing season, which includes the six months beginning April 16 and ending October 15.
Nonperennial canal	A canal that carries water only during one growing season (Kharif) each year.

Rabi	An Urdu term for the winter growing season which includes the six months from October 15 to April 15.
Rupee	Basic local currency unit exchange value used in this paper is of Rs. 4.7617 = U.S. dollar, or U. S. 0.21001 = Rs. 1.0.
Specific capacity	The discharge-drawdown ratio of a well expressed as cusecs (or gpm) per foot.
Specific yield	The ratio, expressed as a percentage, of the volume of water a saturated rock or soil will yield when under gravity to the gross volume of the medium.
Tubewell	A drilled well, cased and screened, usually gravel packed.
Watercourse	The ditch used to carry water from an irrigation outlet on the distributary to the fields served by the outlet. Watercourses are maintained by the cultivators.

AID-LLC/P-579
May 26, 1967

SALINITY CONTROL AND RECLAMATION PROJECT IV

UPPER CHENAB UNIT

I. SUMMARY AND RECOMMENDATIONS

A. BORROWER

The President of Pakistan, for relending to the West Pakistan Water and Power Development Authority (hereafter referred to as WAPDA) through the central and provincial governments.

B. AMOUNT OF LOAN

$10.7 million.

C. DESCRIPTION OF PROJECT

The SCARP IV area lies in the Upper Rechna Doab, the area of the Indus Plains between the Chenab and Ravi Rivers. The Upper Chenab Unit, which would be financed by this loan, is the northwestern sector of SCARP IV, covering 720,000 acres of gross area of which 669,000 are culturable within the boundaries of SCARP IV (see Plates 1 and 2). Present cropping intensity on the culturable area is approximately 92 percent.

This project is to provide for construction of about 1,062 irrigation/drainage tubewells equipped with deep well turbine pumps powered by electric motors and necessary power transmission and distribution facilities for electrification of tubewells.

D. PURPOSE OF PROJECT

The 1,062 tubewells to be installed with the funds of this loan would: (1) increase the irrigation water supply by recirculating ground water to the cropped area, (2) reclaim 70,000 acres of saline and alkali-affected lands by leaching with ground water, (3) remove the hazard of waterlogging lands by drawing the water table down to a safe level below ground surface, and (4) increase the cropping intensity from about 92 to 150 percent.

E. BACKGROUND

In the irrigated areas of West Pakistan, the effort to increase agricultural production has been handicapped due to a variety of causes, among which one of the most critical has been insufficient water supplies and the salinization and waterlogging of lands.

A.I.D. and its predecessors have made four direct loans for SCARPs since 1959 totaling $40,613,315. In addition, A.I.D. had made two loans for general consulting services to WAPDA totaling $11,600,000, part of which has been for consultants for the SCARPs, and has supported a ground water and soils resources survey through a technical assistance project (391-11-120-035) carried out under a PASA agreement by the U.S.G.S. In June 1965, WAPDA submitted an application to A.I.D., based on a feasibility report prepared by its consultants Tipton and Kalmbach, Inc., for $44 million to finance the foreign exchange costs of 2,973 tubewells and related equipment to be installed in the SCARP IV area. In September of that year, hostilities with India occurred and new projects were delayed. Since the original application, WAPDA has negotiated with Yugoslavia to provide an increased number of wells and a larger sector has been defered for private tubewell development. As a result of these changes, in April 1967, WAPDA submitted a revised application requesting $10.7 million to cover costs of a more limited project.

F. PROJECT COST

Total cost of the project is estimated to be $33.0 million equivalent. This includes $11.7 million in foreign exchange to be financed under this loan and Rs. 166.4 million (equivalent $22.3 million) in local currency to be provided from Pakistan governmental sources.

G. ECONOMIC JUSTIFICATION

As a direct result of this project, it is estimated that the cropping intensity in the project area of SCARP IV will increase from about 92 percent to 150 percent. Net agricultural returns per farm will rise from about Rs. 630 to Rs. 1,450 per annum. The economic analysis indicates that the project will have a benefit-cost ratio in the order of 2.6 to 1.0 for the physical works under this loan. In addition, the project affords improved soil conditions for agricultural advancements which if added to this project would raise the benefit-cost ratio to 4.3 to 1.0. The internal rate of return is calculated to be between 22 and 27 percent.

H. EXPORT-IMPORT BANK INTERESTS

The Export-Import Bank decided on March 6, 1967 that it would not consider a loan for this project.

I. MISSION VIEWS

The Mission recommends approval of the loan with the terms and conditions indicated below.

J. STATUTORY CRITERIA

All are satisfied (see Annex III).

K. ISSUES

1. Establishment of responsibility for operation and management of SCARP IV.

At present, the administration of SCARPs in the Indus Plains is in a state of flux. Operating responsibility for SCARP I is assigned to the newly created Land and Water Development Board (LWDB). The Board's responsibilities include comprehensive agricultural development as well as tubewell operation and maintenance. A.I.D. understands that the West Pakistan Provincial Ministerial Council has assigned operating responsibility for SCARP II, including SCARP II-B (A.I.D. Loan 391-H-087) to the Department of Irrigation and Power. A.I.D., however, has not yet been officially notified of this decision. Satisfactory resolution of operating responsibility with respect to SCARP IV will be a condition precedent to disbursement under this loan.

2. Satisfactory plans for operation and maintenance of SCARP IV.

The creation of the LWDB and the problems in building up a new organization have highlighted the operational and maintenance requirements of the SCARPs. Not only is there a need to acquire and train operators, but also to provide for adequate communications, motor re-wind and machine shop facilities, maintenance crews and similar services to get dependable performance. Satisfactory plan for operation and maintenance of SCARP IV will be a condition precedent of this loan.

3. Timely plans for electrification.

In the earlier SCARP projects assisted by A.I.D. loans, electrification has lagged as much as one or two years behind completion of civil works. This is partly due to the inherent factor that design and construction of the final links of the electrical distribution system cannot be completed until tubewell construction begins. However, much of the delay has occurred in signing electrical engineering services and construction contracts. A satisfactory implementation plan for electrification, coordinated with civil works schedules, will be a condition precedent to disbursement under this loan.

4. Adequate plans for construction and rehabilitation of ancilliary works.

In SCARP II-A and previously SCARP I, there have been cases where the wells were fully operable, but could not be utilized because there was no channel from the well to the existing water distribution facilities. This is primarily a problem of jurisdiction and funding. In addition, to efficiently convey and manage the water supplies, both from the SCARP wells and surface sources, the various classes of channels beyond the main ditches of the existing irrigation systems need considerable rehabilitation and modernization and an adequate maintenance program is necessary to keep the facilities in proper working condition. Establishment of adequate plans both for connection of the tubewells into the distribution system and for rehabilitation, modernization and maintenance of the existing water distribution system will be made a condition precedent of this loan.

L. RECOMMENDATION

It is recommended that a loan to the President of Pakistan be authorized in the amount of $10.7 million for the proposed project, subject to the following conditions:

1. Borrower to repay the loan to A.I.D. in U.S. dollars within forty (40) years from the date of the first disbursement under the loan, including a grace period of not to exceed ten (10) years from the date of such first disbursement.

2. Borrower to pay interest to A.I.D. in U.S. dollars of one percent (1%) per annum on the amount of principal outstanding during the grace period. From and after the expiration of the grace period, Borrower to pay interest in U.S. dollars of two and one-half (2-1/2%) percent per annum on the amount of principal outstanding.

3. Terms and conditions of relending or other financial arrangements between the GOP and WAPDA to be acceptable to A.I.D.

4. Borrower to assure A.I.D. that adequate rupee funds for the project and ancillary works have been and/or will be made available.

5. All procurement of A.I.D. financed goods and services to be from the United States.

6. Such other terms and conditions as A.I.D. may deem advisable.

M. CAPITAL ASSISTANCE COMMITTEES

	Mission	AID/W
Loan Officer	F. J. Moennighoff	E. Gardner
Engineer	L. Mastrofini	W. Romig
Lawyer	N. B. Angell	D. Harbinson
Desk	----	T. Arndt

DRAFTING OFFICERS:

Mastrofini/Gardner/Moennighoff/Harbinson

II BACKGROUND

A. GENERAL

"The Indus Plains of West Pakistan features perhaps the world's most favorable environment for rapid, intensive agricultural development. Here occurs a unique juxtaposition of the natural factors essential to irrigated agriculture - vast areas of arable lands highly suited for irrigation, abundant supplies of surface water from the Indus system of rivers and large ground water storage, and a favorable climate which permits year-round cropping. More than this, the plains are served by a complex system of modern irrigation canals which distribute more water to more land than any other canal system and about [illegible] some 12 percent of the world's irrigated acreage."

Despite all those advantages described in the above quote taken from the feasibility report for Salinity Control and Reclamation Program, Project No. 4, Upper Rechna Doab, prepared by Tipton and Kalmbach in June 1965, the agricultural economy of the Indus Plains remained stagnant through most of this century until the 1960's. The returns from agriculture, expressed in terms of either yields per acre or total annual production, did not change significantly over that period while the population increased three-fold. Although significant strides were made in increasing agricultural output during the Second Plan period (1960-1965), production from the Indus Plain is still not sufficient to meet the requirements at the relatively low per capita consumption levels, not to mention supplying the export market. At the end of the Second Plan period the deficit between production and these requirements was more than a million tons.

The problems of irrigated agriculture, as practiced in this area, are manifold, but should not be regarded as unique or insurmountable. They include the full gamut of soil, water and crop management problems. Among the major factors supressing agriculture and impeding efforts to introduce modern practices are the problems associated with water - poorly timed rainfall, insufficient and unreliable irrigation supplies to the fields, and inadequate sub-surface drainage of irrigated land. These factors restrict the intensity of cultivation, cause widespread salinization and waterlogging of irrigated lands, and frequently lead to the adoption of inefficient practices.

The importance of the reclamation program, which would help remedy these conditions, is clearly demonstrated by Pakistan's current economic situation.

Population is acknowledged to be growing at a rate of 2.6 percent, and in reality is believed to be growing somewhat faster than that. Agricultural output during the Second Five Year Plan period and the first two years of the Third Plan has increased at rates of 3.5 percent and 2.2 percent per annum respectively compared with growth of about one percent, or virtual stagnation, during the first Plan. Two consecutive years of drought in West Pakistan are mainly responsible for the low growth rate so far in the Third Plan period. During FY 1967 it is estimated that food grain and edible oil imports for all of Pakistan will total about $209 million, requiring outlays of its own foreign exchange of about $50 million in addition to

P. L. 480 and other food aid. US AID estimates of increases in GNP at an annual rate of 5.8 percent and in per capita income from Rs. 430 to Rs. 570 during the Third Plan period are based on dramatic improvement in agricultural production, which it is hoped will make Pakistan self-sufficient in food by 1970. To meet this goal, it will be necessary to increase agricultural production by about 20 percent during the remainder of the Third Plan.

Several things are happening which indicate that Pakistan is on the threshold of a major breakthrough in agricultural production. One of the important catalytic agents in the process is the development and [illegible] application of improved seeds such as the Mexican type wheats and short-stemmed rice, which show a high yield response to heavy applications of fertilizer. Results are so dramatic when the right combination of improved seeds, fertilizer, water, insecticides and other improved practices are used, that the more progressive farmers quickly adopt the new methods, and the practices are bound to spread.

The Third Plan was recently revised by the Government of Pakistan to put more emphasis on agriculture. Broadly speaking, the aim is to make available and to encourage the use of the production requisites necessary to achieve food grain self-sufficiency by 1970. Through increased domestic production capacity and imports, the inputs such as fertilizer, insecticides, and seeds are to be provided. Credit is to be made more widely available to help farmers finance the required inputs. Water remains the primary limiting factor to achieving success in the overall effort.

In West Pakistan, water is even more limiting than land. Under present circumstances, it is more economical to let some land lie idle and do a more adequate job of irrigating the reduced area than to try to cover all the irrigable area. Therefore, the optimum development of agriculture in West Pakistan depends on timely completion of the series of SCARPs aimed at putting the entire irrigated portion of the Indus Plains under command of SCARPs.

B. DEVELOPMENT OF THE SCARP PROGRAM

Beginning as far back as 1945, the Government began a series of tubewell projects, some of which have been incorporated into today's several SCARPs. A brief description of these undertakings follows:

1. Rasul Tubewell Scheme

This scheme has some 1,800 tubewells located along the main canals of the Rechna and Chaj Doabs. The project was begun in 1945 with the intent to recover seepage from the canals and thus lower the ground water level in nearby waterlogged areas. In its strictest

sense it was not a present day SCARP where the pumped water is being used to reclaim and service lands in the immediate vicinity. The project was not successful in lowering the ground water level principally because the pumping capacity did not exceed the rate of accretion to the underground water.

2. Chuharkana Project

This project, undertaken in 1952, was the first model of today's SCARPs where the pumped water is used in reclaiming and irrigating the surface area in the immediate vicinity of the pumps. The project area comprised 9,200 acres in which there were installed 24 tubewells with combined capacity of 48 cusecs. The pumping was able to effect a slight lowering of the water table, but under the adverse conditions of abnormally high recharge brought about by inundation of the area, the underground reservoir rebounded to original levels. This experiment demonstrated clearly that for the tubewell system to be effective, the areas undertaken must be much larger so as to minimize surrounding influences on the underground reservoir; and pump capacities, at least in the earlier stages when the reservoir is being drawn down to desired levels, must exceed the rate of recharge of the underground reservoir.

3. Jaranwala Project

This project was planned in 1954 and construction begun in 1955. The project area is a 90,000 acre tract in the Rechna Doab served by the Lower Chenab canal system. The project works consist of 131 project wells and the inclusion of 14 of the Rasul wells located within the area. The 145 wells have a combined capacity of 350 cusecs. Also 65 tubewells on the Burala, and 36 on the Lower Chenab Gugera branch canals (both groups are part of the Rasul tubewells) are known to draw on the underground supply for use outside the area. This project marked the advancement from the model or pilot type project to the true prototype.

Evaluation of these projects clearly supported the view that given sufficient pumping capacity over a large enough area of influence, the underground water could be drawn down to safe limits; and the pumped water, where of suitable quality, could be used effectively to increase surface supplies. These results together with analysis of data being obtained in connection with an intensive and massive underground water investigation program undertaken by the Ground Water Development Organization, furnished the necessary justification to undertake SCARPs of a million or more acres. It was at this point that the U. S. A.I.D. Mission became active in participating in the financing of Salinity Control and Reclamation Projects (SCARP).

4. Salinity Control and Reclamation Project I (SCARP I)

The project area includes 1,200,000 gross acres serviced by 2,043 tubewells located in the Central Rechna Doab. This first large project of its type to be undertaken by the Government of West Pakistan was constructed by WAPDA and has 1,796 tubewells, consisting of mild steel pump housings and well casings, for which the foreign exchange cost component of $15.0 million was provided under A.I.D. Loan No. 391-A-012 (DLF 25). These wells were installed from 1958 through 1961. The first well went into operation in November 1960; final commissioning was in early 1963.

An additional 247 tubewells have internationally-supplied equipment. The pump housings and blank casing sections are of mild steel; the screen sections are either brass or coir strainers. These wells are located in the Chichoki Mallian, Shadman II and Jaranwala schemes of SCARP I. They were constructed between 1954 and 1960, with the earliest going into operation in 1955.

Management of SCARP I was vested in a series of agencies before coming to rest in the newly created Land and Water Development Board (LWDB). The LWDB is considered by A.I.D. to have done a reasonably good job in its first few years of administering and operating the tubewells in the SCARP I area. At the time it was established, it was planned to extend its operating responsibilities to additional SCARP areas as they were activated. However, for various reasons the GOWP has chosen to assign administration and operating responsibility for the SCARP II area to the Department of Irrigation and Power. This matter is discussed more fully in Section V.

The annual report for the year ending September 1965 (the latest year available) provides useful information on the results of the project, covering essentially the first three years of project operation. Some wells went into use earlier and some later but the average was three years. These results are little affected by the impact of the current agricultural programs and thus show the effectiveness of the SCARP wells. Of a total of 424,717 acres that had gone out of production due to salinity and waterlogging, 247,372 acres had been returned to use. The per acre yields of all crops throughout the area show significant increases. For example, wheat yields have increased by about 59 percent. Also the crop pattern is shifting to more desirable crops and some intensification of cropping has occurred. Taken as a whole, the on-farm value of the crops grown in the SCARP I area has increased by 87 percent. This effect will continue for several years, at a progressively slower rate of improvement. In addition, the additional water supply provided by the wells virtually eliminated the effects of the drought of late 1965 whereas the surrounding areas suffered badly in late 1965 and early 1966. The return of abandoned lands to crops and the increase of yields due to improved soil conditions will continue for several years, at a continuously decreasing rate. The added water supply will provide a continuing opportunity including double cropping. Furthermore, the improved water and soil conditions afford a favorable area for agricultural advances such as improved seed plus fertilizer, and these programs are now

beginning to show encouraging progress. For a more detailed description of the progress made in SCARP I, see Annex I.

5. Salinity Control and Reclamation Project II (SCARP II)

This project lies within the Chaj Doab, the plains area between the Jhelum and Chenab Rivers, and occupies the portion of the doab served by both the Upper and Lower Jhelum canals together with the Gujrat plain. The entire irrigated area is roughly 2.2 million acres, and complete development would entail installation of nearly 2,100 tubewells. The foreign exchange cost of a tubewell and surface drainage project covering the entire area was estimated at $34.5 million. A.I.D. received a loan application from WAPDA to finance the foreign currency portion of the entire project. Upon review it developed that proper handling of the underground supply in saline water areas required further investigations and studies. It was decided to support development of a portion of the area underlain by non-saline water and to make further studies over the remaining area.

a) SCARP II-A

The area selected for development at that time has been designated the Upper Jhelum Unit (SCARP II-A) and was financed by A.I.D. Loan 391-H-055 in the amount of $10,800,000. There are 623,000 acres within the project boundary containing 884 irrigation/drainage tubewells.

Electrification is still in the process of completion. Under an early electrification scheme, it was planned to electrify 250 of the tubewells using temporarily the existing substations in the vicinity of the area. This work was completed in April 1967. As the new substations are completed, the distribution circuits will be switched over to the new stations. Construction of the 132 KV circuits and the substations that will serve the area are now scheduled for completion in mid-1968. Electrification has lagged behind the civil works for one major reason: the engineering for the civil works was done under the General Consultants Loans (A.I.D. Loan 391-H-069, extended in 391-H-107) whereas the engineering for the electrification was performed under the project loan. Under these circumstances, design of the reclamation works was well underway when A I.D. Loan 391-H-055 was signed for SCARP II-A (March 1963). The civil works were contracted in January 1964. On the other hand, selection of the electrical engineering consultant did not occur until May 1964, with designs prepared subsequently. The distribution circuit construction contract was signed February 1966 and the two transmission facilities contracts in March 1966 and January 1967. These long delays in executing electrification contracts were primarily responsible for the slowness in project completion--from March 1963, when the loan was signed to July 1968, when the electrification is expected to be completed, a total ellapsed time of over five yaars. This compares with the schedule of three years for completion of SCARP IV.

In SCARP II-A, and previously in SCARP I, there have been some cases where the wells were fully operable, but could not be utilized because there was no channel from the well to the existing water distribution facilities. Such channels connect physically between the SCARP project facilities built by WAPDA and the existing surface water facilities operated by the Department of Irrigation and Power. Inherently, these are jurisdictional problems, which A.I.D. believes can and must be resolved with respect to the SCARP projects. A condition precedent covering this matter will be included in the loan agreement for this project.

The GOWP has assigned management of the completed SCARP II-A project to the Department of Irrigation and Power, with the Agricultural Department providing agricultural assistance.

b) Lalian Unit

The Lalian Unit of 137,000 acres with 163 tubewells was constructed by Yugoslavia. This unit is being operated by the Department of Irrigation and Power, with the assistance of the Agricultural Department.

c) Mona Unit

The Mona Unit of 112,000 acres with 138 tubewells, was financed locally and assisted by equipment purchased earlier by ICA. This unit is being operated by WAPDA, acting for the LWDB. The Mona Unit is being treated as an experimental project with A.I.D. - provided technical assistance.

d) Khadir Unit

The Khadir Unit, of 170,000 acres with 216 tubewells, was constructed by Yugoslavia and will be operated by the Irrigation Department.

e) SCARP II-B

The Lower Jhelum (SCARP II-B) unit of 620,000 acres with 760 planned tubewells, will complete placement of the SCARP II area under SCARP command except for an area centrally located within SCARP II-B where project works are yet undecided. A. U. S. loan for $14,100,000 signed on December 30, 1966 (Loan 391-H-087) will provide the foreign currency component of project costs. Pre-qualification information for construction contractors has been received. It is expected that invitations for bids will be sent out shortly.

6. Salinity Control and Reclamation Project III (SCARP III)

This project area in the Lower Thal Doab has been set up in three units for construction purposes:

a) Kot Adu Unit

This unit of 400,000 acres occupies the northwest portion of Lower Thal Doab. It is planned to construct 475 tubewells in the area. This project is presently under construction and is being financed under a loan of D.M. 27 million from West Germany.

b) Alipur Unit

This unit occupies the lower portion of the Lower Thal Doab and has 400,000 acres with 500 tubewells planned. This unit is under contract to Yugoslavia and is being financed as part of its barter agreement.

c) Third Unit

Plans for the remaining area have not been finalized as yet.

7. Salinity Control and Reclamation Project IV(SCARP IV)

This area is located in the Upper Rechna Doab. It is the specific area of concern of this loan paper and the various aspects of the project are reviewed in greater detail in Section IV.

A summary of the SCARPs to date with significant information on the number of tubewells, acreage served, sources of financing, status, etc., is contained in Table 1 on the following page.

C. FUTURE SCARP PROGRAM

At the inception of the Third Five Year Plan (1965/66 to 1969/70) WAPDA planned to increase the availability of water at head of water-courses by 22 million acre feet (MAF) annually by additional (1) river diversions of 2 MAF, (2) public tubewell supplies of 14 MAF; and (3) private tubewell supplies of 6 MAF. To meet these targets WAPDA has planned 12,000 tubewells in SCARP areas and the electrification of 40,000 private tubewells. Financing this program required Rs. 104 crores for civil works and Rs. 54 crores for electrification in the SCARPs. Recently the Economic Council has reduced these values to 83.9 crores and 30 crores respectively. With the reduced budget WAPDA now plans installation of 9,000 tubewells of which 7,855 will be electrified. To accomplish the SCARP electrification WAPDA plans to transfer 10 crores from the 15.7 crores village electrification budget to the SCARP program. Through coordination of the rural electrification plans (SCARPs, villages and private tubewells) it is expected that 5,000 private tubewells will be electrified with the remaining 5.7 crores of the village plan.

WAPDA anticipates no difficulty in obtaining foreign financing for its SCARP program. The U.S.A.I.D., West Germany, Yugoslavia and I.D.A. are committed in financing SCARPs in varying degrees while Hungary and Poland have

TABLE I

PERTINENT DATA FOR EXISTING SALINITY CONTROL & RECLAMATION PROJECTS

Project	Gross Area	No. of Tubewells	Commencement	Completion	External Finance From	Foreign Cost Eq. Rs.	Local Rupees	Total Eq. Rs.	Construction Status
						(All values in million Rupees)			
RECHNA DOAB (SCARP I)									
SCARP-I	1,200,000	1796	April 1965	Nov. 1962	U.S. AID	42.19	51.95	94.14	Completed
Under Contract		1014				30.21	9.27	39.48	
WAPDA/WASID		782				3.89	25.59	29.48	
Apptt. Features & Duties						0.00	6.54	6.54	
Administration & Engineering						8.09	10.55	18.64	
CHAJ DOAB (SCARP II)									
Lalian	140,000	163	Oct. 1962	July 1963	Yugoslavia	4.98	1.59	6.57	Completed
Mona	118,000	138	Sept. 1964	Nov. 1965	WAPDA's own Funds	.50	1.81	2.31*	Completed
Khadir	174,000	213	Apr. 1964	May 1960	Yugoslavia	5.27	4.88	10.15	Completed
Upper Jhelum	754,000	884	Jan. 1964	Apr. 1967	U.S. AID Loan 055	22.00	20.50	42.50	Completed
LOWER THAL (SCARP III)									
Alipur	395,000	542	June 1965	-	Yugoslavia	13.51	14.27	27.78	Underway
Kot Adu	385,000	523	June 1966	-	West Germany KFW-Loan	7.18	14.73	21.91	Underway

Note: SCARP-II and III figures do not include Administration and Engineering Cost. Data does not include electrification.

* Permanent equipment installed in Mona tubewells came under A.I.D. (formerly I.C.A.) loan.

expressed an interest in new SCARPs. The revised WAPDA program for construction and electrification of tubewells is shown on Tables 2 through 5 on the following pages.

D. HISTORY OF THE LOAN APPLICATION

A comprehensive program of data collection, investigations and analysis of the surface and ground water and soil resources of the former Punjab and Bahawalpur areas of the Indus Plain has been under way with A.I.D. technical and commodity assistance since 1954. GOWP responsibility for this program was originally placed with the Ground Water Development Organization of the Irrigation Department but was shifted to the Water and Soils Investigation Division (WASID) of WAPDA in 1960, at which time the program was further intensified.

The engineering firm of Tipton and Kalmbach, Inc., Denver, Colorado, was retained by WAPDA to plan, design and supervise construction of Salinity Control and Reclamation Projects in the northern portion of the Indus Plain, which includes the Upper Rechna Doab. Its work in this latter area resulted in the publication of a feasibility report entitled "Salinity Control and Reclamation Program, Project No. 4, Upper Rechna Doab" dated June 1965. This report recommended a 3,273 tubewell project embracing the entire Upper Rechna Doab area, comprising some 1,860,000 culturable acres. Surface water is supplied from the Chenab River through the Upper and Lower Chenab Canals with diversion made at the Marala and Khanki Headworks respectively.

WAPDA in June 1965, submitted a loan application in the amount of $44,082,000 to provide the foreign exchange component for 2,973 tubewells of the 3,273 tubewell project. At the time the loan application was submitted, about 300 of the 3,273 tubewells along the Indian border in the service area of the Marala-Ravi Link Canal were to be built by Yugoslavian interests. Later hostilities on the frontier prevented drilling in the border areas and WAPDA moved the operation to a 300 well area bordering SCARP I and serviced by the Mangtanwala Canal (Mangtanwala Unit). WAPDA has since negotiated with the Yugoslavians for 580 more wells in the Muridke Unit (see Plate 2). It was also decided to defer a decision on whether to proceed with public development in an area bordered on the west roughly by the Grand Trunk Road and on the south by the Muridke Unit. This area has the highest intensity of private tubewells and the conditions most favorable for further private tubewell development (see discussion beginning page 40). The remaining SCARP IV area has been designated the "Upper Chenab Unit" and is the project area under consideration in this paper.

In April 1967, WAPDA submitted a revised loan application, in the amount of $10.7 million to finance the foreign exchange portion of the construction costs for the Upper Chenab Unit, including some 1,062 tubewells. Aside from modifications in the project area, the application is based on T & K's 1965 report on the feasibility of the SCARP IV project. The revised loan application and T & K report are the basis for this loan paper.

TABLE 2

Drainage, Reclamation and Tubewells

Construction Programme as per Revised Plan Allocation
(Completed Tubewells)

Sr. No.	Project	C. A. Million Acres	Total T/Wells	SCHEDULE OF CONSTRUCTIONS						Plans	Total Area (Million Acres)
				Pre-Plan	65/66	66/67	67/68	68/69	69/70	T/Wells	
1.	SCARP I Chaj Doab	1.9	2500	300	380	720	300	500	300	2200	1.60
2.	SCARP III Lower Thal	1.0	1550	-	-	540	500	510	-	1550	1.00
3.	SCARP IV Upper Rechna	1.8	3273	-	-	300	500	500	400	1700	0.90
4.	SCARP V Lower Rechna	1.4	2300	-	-	-	-	500	600	1100	0.67
5.	SCARP VI Bahawalpur	0.82	1400	-	-	-	-	100	500	600	0.35
6.	SCARP VII Bari I	1.03	1600	-	-	-	-	-	200	200	0.13
7.	SCARP Khairpur	0.32	568	-	-	240	328	-	-	568	0.32
8.	SCARP Larkana Shikarpur	0.58	Drains	-	-	-	-	-	-	Drains	0.58
9.	SCARP Rohri North	0.70	1500	-	-	-	-	500	600	1100	0.51
10.	SCARP Rohri South	0.60	1600	-	-	-	-	-	-	-	-
	TOTAL:	10.15	16291	300	380	1800	1628	2610	2600	9018	6.06

TABLE 3

Tubewell Energization Programme

Sr. No.	Project	No. of T/Wells	SCHEDULE OF TUBEWELL COMMISSIONING						PLAN TOTAL	
			Pre Plan	65/66	66/67	67/68	68/69	69/70	Tubewells	Area(Million)
1.	SCARP II Chaj Doab	2500	163	138	463	637	600	499	2337	1.80
2.	SCARP III Lower Thal	1550	-	-	-	500	500	550	1550	1.00
3.	SCARP IV Upper Rechna	3273	-	-	-	300	400	700	1400	0.77
4.	SCARP V Lower Rechna	2300	-	-	-	-	300	600	900	0.55
5.	SCARP VI Bahawalpur	1400	--	-	-	-	-	200	200	0.12
6.	SCARP VII Bari I	1600	-	-	-	-	-	-	-	-
7.	SCARP Khairpur	568	-	-	80	488	-	-	568	0.32
8.	SCARP Rohri North	1500	-	-	-	-	300	600	900	0.42
9.	SCARP Rohri South	1600	-	-	-	-	-	-	-	-
		16291	163	138	543	1925	2100	3149	7855	4.98

TABLE 4

IN MILLION RUPEES

DRAINAGE RECLAMATION AND TUBEWELLS
ANNUAL CAPITAL OUTLAY AS PER REVISED PLAN ALLOCATION

Sr. No.	Project	No. of T/wells	Pre-Plan	Annual Expenditure 65/66	66/67	67/68	68/69	69/70	Plan Total
1.	SCARP II Chaj Doab	2500	63.47	35.2	27.5	35.3	35.0	27.7	160.7
2.	SCARP III Lower Thal	1550	10.04	5.8	41.0	46.7	25.0	-	118.5
3.	SCARP IV Upper Rechna	3273	5.10	1.3	23.4	30.0	35.0	50.7	140.4
4.	SCARP V Lower Rechna	2300	-	-	-	20.7	32.0	49.4	102.1
5.	SCARP VI Bahawalpur	1400	-	-	-	-	14.7	45.3	60.0
6.	SCARP VII Bari I	1600	-	-	-	-	6.5	13.0	19.5
7.	SCARP Khairpur	568	21.63	17.1	35.5	60.0	-	-	112.6
8.	SCARP Larkana Shikarpur	Drains	2.71	3.0	6.0	11.1	-	-	20.1
9.	SCARP Rohri North	1800			-	9.1	39.6	49.0	97.7
10.	SCARP Rohri South	1000			-	-	-	7.5	7.5
		TOTAL:	102.95	62.4	133.4	212.9	187.8	242.6	839.1
		Foreign Exchange		10.2	42.5	73.0	71.0	93.0	289.7
		Internal		52.2	90.9	139.9	116.8	149.6	549.4

IN MILLION RUPEES

TABLE - 5
Tubewell Electrification
Annual Capital Outlay

Sr. No.	Project	No. of T/Wells	Pre-Plan	Annual Expenditure 65/66	66/67	67/68	68/69	69/70	Plan Total
1.	SCARP II Chaj Doab	2500	8.19	1.4	42.0	25.5	30.0	15.0	113.9
2.	SCARP III Lower Thal	1550	2.30	-	12.5	30.0	30.0	5.0	77.5
3.	SCARP IV Upper Rechna	3273	3.19	-	9.5	20.5	25.0	20.0	75.0
4.	SCARP V Lower Rechna	2300	-	-	-	-	20.0	30.0	50.0
5.	SCARP VI Bahawalpur	1400	-	-	-	-	-	15.0	15.0
6.	SCRAP VII Bari I	1600	-	-	-	-	-	-	-
7.	SCARP Khairpur	568	-	0.3	5.7	15.6	-	-	21.6
8.	SCARP Rohri North	1500	-	-	-	-	20.0	30.0	50.0
9.	SCARP Rohri South	1600	-	-	-	-	-	-	-
		TOTAL	13.68	1.7	69.7	91.6	125.0	115.0	403.0
		Foreign Exchange		-	23.2	30.5	41.6	38.3	133.6
		Internal		1.7	46.5	61.1	83.4	76.7	269.4

E. CONCLUSIONS

Pakistan is striving to achieve self-sufficiency in food by 1970. To achieve this goal, the GOP has recently revised the Third Plan to put increasing emphasis on agriculture, a decision strongly supported by A.I.D. It is estimated by A.I.D. that such a target will require an increase of about 20 percent in agricultural production during the remainder of the Third Plan.

The optimum development of agriculture in West Pakistan depends on timely completion of the SCARPs, which are designed to assist in increasing production by lowering the ground water below the levels at which land and crops are damaged by waterlogging and salinization and by providing additional irrigation water which will permit better utilization of available lands and an increased cropping intensity.

The feasibility of the SCARP concept was tested in several forerunner projects from which emerged the principles and practices employed in the SCARPs. The progress of reclamation in SCARP I demonstrates the ability of the program to increase culturable acreages and yields. Although the increases in agricultural yields in SCARP I are not solely attributable to that project, it is clearly evident that SCARPs play a major role in increasing yields and are the key element in expanding the culturable area.

Operational problems have emerged which prevent the realization of maximum benefits from the SCARP program. While it is too early to evaluate progress being made, indications are that the steps being taken will correct these problems and prevent similar problems from arising in the new SCARP areas.

The GOWP has not yet resolved the question of operating responsibility for SCARPs. Separate approaches have been tried in SCARPs I and II. Experience gained in these approaches will lead to a decision on assigning operating responsibility for future SCARPs. Satisfactory resolution of this matter, as it applies to operation of Upper Chenab Unit, will be a condition precedent to disbursement for construction on this loan.

The benefits of SCARPs to date justify A.I.D. giving serious consideration to the loan requested for the Upper Chenab Unit in SCARP IV.

III. BORROWER

A. GENERAL

The Borrower will be the Government of Pakistan and the implementing agency, through the construction phase and possibly initial maintenance phase, will be the West Pakistan Water and Power Development Authority (WAPDA) who will assign "action responsibility" to its Ground Water and Reclamation Division. Upon completion of the project, management and operation will be turned over to an agency of the GOWP satisfactory to A.I.D. (See Section V).

B. THE WEST PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY (WAPDA)

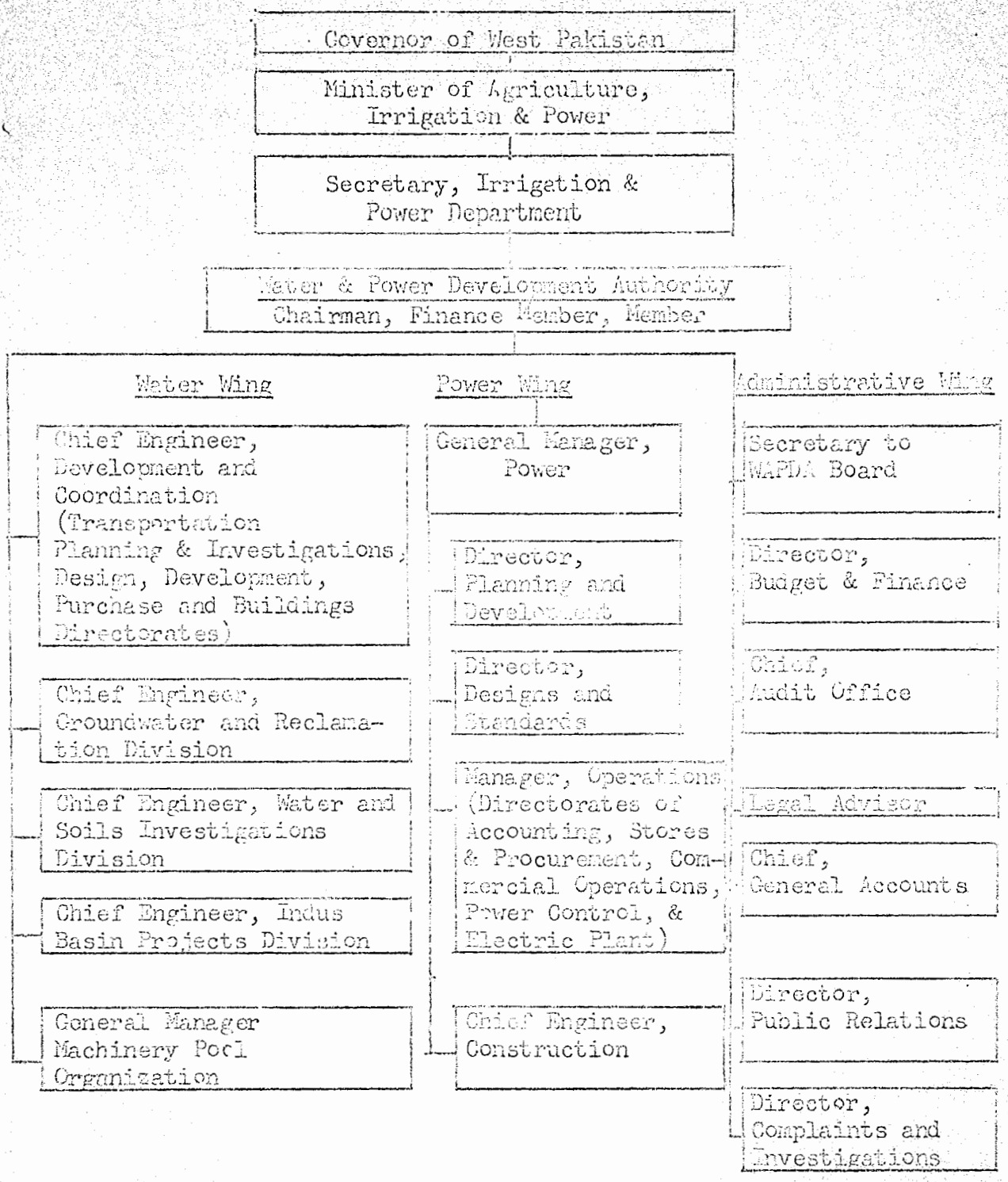
WAPDA is a semi-autonomous corporate body established by the Government of West Pakistan in 1958 with full responsibility for the unified and coordinated development of the water and power resources of West Pakistan, a land area of some 310,000 square miles. The organizational structure of WAPDA is depicted on the chart on the following page. While WAPDA nominally reports to the Governor of West Pakistan through the Department of Irrigation and Power and the Minister of Agriculture, Irrigation and Power, it is a semi-autonomous agency directed by a three-man board.

During the Third Plan (1965/66 - 1969/70), WAPDA's total allocation is Rs. 3,185.9 million ($669.0 million) of which Rs. 1,139 million ($239 million) is earmarked for reclamation. Allocation for reclamation work in the Second Plan (1960/61 - 1964/65) was Rs. 345 million ($74 million) of which Rs. 183.5 million ($38.5 million) was actually spent. Expenditure during 1965/66 was only $16.7 million, but the GOP does not consider this representative because of the impact of hostilities and the suspension of aid. The revised budget for the current year ending June 30, 1967 calls for expenditure on reclamation of Rs. 173.6 million ($36.4 million) which is well below the average required to reach the cumulative total of Rs. 1,139 million ($239 million) allocated for the Third Plan.

It is evident from the above analysis that if the goals of the Third Five Year Plan are to be met with respect to the SCARP program, it will be necessary to accelerate and maintain a much higher rate of tubewell installation. As more and more of the component parts of the installations become available from local manufacturers (e.g. pumps and motors), WAPDA will probably be restricted to procuring such parts locally. The objective of such a course of action is to save foreign exchange and to stimulate local industry and availability of spare parts and replacement. This may be a delaying factor and the GOP may yet be required to decide the price it can afford to pay in delaying the work in order to build local industry.

WAPDA should experience no difficulty in administering the accelerated program. Since the engineering and construction services are being furnished by others there would not appear to be any limitation on progress since any number of firms might be employed.

WAPDA ORGANIZATION CHART INDICATING PRINCIPLE UNITS



C. WAPDA'S MANAGEMENT

In 1959, WAPDA contracted with the Harza Engineering Company International to serve as its general consultant, assist in investigations leading to development plans, advise on its current program, and review the work of other consultants assigned to specific projects. In 1962, WAPDA contracted with Tipton and Kalmbach, Inc. to assist in the planning, project preparation and supervision of construction of salinity control and reclamation projects in the Punjab and Bahawalpur regions. Until June 1963, WAPDA financed the services of Harza and Tipton and Kalmbach with its own resources. In November 1963, A.I.D. Loan No. 391-H-069 for $5.6 million was signed to finance the foreign exchange costs of WAPDA's contracts with these firms for a two year period. Financing under this loan was sufficient to fund services through June 1966, and A.I.D. Loan No. 391-H-107 for $6.0 million has been executed since to continue these services an additional two years. It is expected that by the time these consulting services are phased out, WAPDA will have a viable, trained organization capable of carrying on future programs independently. Tipton and Kalmbach reports that in the planning now being done for SCARP VIII, WAPDA is preparing the primary studies itself.

D. U.S. ASSISTANCE TO WAPDA

A.I.D. has made fourteen dollar development loans, exclusive of the Indus Basin financing, to the GOP for use by WAPDA in its power and reclamation projects. They are:

	LOAN NUMBER	AMOUNT	PURPOSE
Power			
1.	391-A-013 (DLF-29)	$11.838,206	High Tension Grid
2.	391-A-015 (DLF-79)	21,681,449	Secondary Grid
3.	391-A-034 (DLF-177)	6,000,000	Quetta Thermal Power
4.	391-H-083	18,100,000	Lyallpur Power Station
5.	391-H-090	12,500,000	Power Distribution
6.	391-H-102	8,200,000	Mangla Dam Transmission Lines
	Sub-total	$78,319,655	
Water			
7.	391-A-012 (DLF-25)	$14,963,315	SCARP I
8.	391-H-055	10,800,000	SCARP II-A
9.	391-H-060	750,000	SCARP I (Operations)
10.	391-H-087	14,100,000	SCARP II-B
	Sub-total	$40,613,315	

	LOAN NUMBER	AMOUNT	PURPOSE
Other			
11.	391-H-069	$ 5,600,000	General Consultants
12.	391-H-072	5,000,000	Machinery Pool Organization
13.	391-H-088	6,000,000	Machinery Pool Organization(II)
14.	391-H-107	6,000,000	General Investigating and Consulting Services (II)
	Sub-total	$22,600,000	
	GRAND TOTAL	$141,532,970	

The overall implementation of the foregoing dollar development loans has been reasonably satisfactory. Problems have developed, however, in coordinating the electrification aspects with the reclamation aspects. These problems are discussed in detail elsewhere in the paper. Recent projects have been slowed by long lead times on procurement which are attributable to both unwieldly procedures on the part of WAPDA and the level of economic activity in the U. S. The war with India also affected several of the WAPDA projects. Both WAPDA and A.I.D. are attempting to correct the problem areas which produce these delays. SCARP IV will embody several of these improved procedures, as described in the section on implementation.

In addition to dollar support, A.I.D. has provided substantial rupee loan and grant support as well as a variety of technical assistance. Details of this assistance are mentioned in the appropriate places throughout this loan paper.

IV. PROJECT DESCRIPTION AND ENGINEERING ANALYSIS

A. PROJECT LOCATION AND OBJECTIVES

The SCARP IV area lies in the Upper Rechna Doab, the area of the Indus Plain between the Chenab and Ravi Rivers. The project gross area is 2,050,000 acres of which 1,800,000 are considered culturable and 1,650,000 are commanded by the Upper Chenab, Marala-Ravi Link and the Lower Chenab Canal systems. Solely for purposes of construction, implementation of SCARP IV has been separated into construction units. The Upper Chenab Unit which is under consideration in this paper, is the northwestern sector of SCARP IV and includes 720,000 gross acres and 669,000 culturable acres within the boundaries of the Upper Rechna Doab area. This Unit is served by the laterials of the Upper Chenab Canal with a perennial water supply exclusive of the Mangtanwala lateral and, in addition, the service areas of the Lower Chenab Canal and the Nokhar Branch (of Upper Chenab Canal) exclusive of Kot Jaffar sub-lateral. The project boundary is shown in Plate 2. After selection of the project area, the boundary was made meandering in order to folllow the service area boundaries of the canals along the boarder, the purpose being to either include or exclude entire canal service areas so that all customers of any canal would be receiving the same service.

The SCARPs are aimed at the initial or first stage of an intensive effort to increase agricultural production from the area through the installation of a series of irrigation/drainage tubewells. With these installations it is planned to lower the water table to a safe limit below ground surface thus eliminating the impending danger of waterlogging and salinization of lands, and to provide a dependable supplemental irrigation supply. The increased water supply will permit better utilization of available lands and an increased cropping intensity.

B. THE PROJECT

1. The Area and Present Surface Water Supply

The Upper Rechna Doab receives all its surface supplies from the Chenab River through the Marala-Ravi Link and the Upper and Lower Chenab Canal systems. The Marala-Ravi Link commands 163,000 acres of which about 105,000 acres are irrigated but receive water only in Kharif (April to October) season. The remaining 58,000 acres are unirrigated at present. The Upper Chenab Canal serves a cultural command area of 1,367,000 acres within the Upper Rechna Doab of which 535,000 acres receive a perennial supply and 832,000 a non-perennial supply. The Lower Chenab Canal through four of its distributary canals with non-perennial supplies commands 132,500 acres of project lands of which 116,000 are culturable. The overall Upper Rechna Doab area with a non-perennial supply aggregates 1,053,000 acres and that with a perennial supply 535,000 acres, and 58,000 acres are unirrigated. The average annual diversions for the Upper Rechna Doab area duringthe Kharif season have been 5,500 cusecs, which is

equivalent to 1 cusec per 290 acres for the 1,588,000 irrigated acres. The corresponding Rabi (October to April) figures are 950 cusecs or 1 cusec per 560 acres for the 535,000 acres irrigated. A need to augment the surface supply is clearly evident to supply more water per acre and irrigate additional acres in the rabi season. Furthermore, it is planned to export the winter water supply of the perennial canals for use on other areas with unfavorable ground water supplies. These winter entitlements are considered to yield 728,000 acre feet annually, measured at river for export.

The Upper Chenab Unit, covered by this loan, has within its boundaries 376,000 of the perennially served acres and 293,000 of the culturable non-perennial acres. It is estimated that 238,000 A.F. of the export supply originates from lands within the Upper Chenab Unit with 116,000 A.F. more available in May and October. The 1,062 tubewells of the Unit will furnish replacement of the exported water as well as the additional irrigation supply required to maintain a cropping intensity of 150 percent.

2. Ground Water Supply

The ground water supply characteristics are of prime importance in the salinity control and reclamation program. The importance of the hydrological features of the underground water supply has long been recognized by the GOP and a program to study the hydrology of the underground supply has been supported by A.I.D. and its predecessor agencies since 1954. Results of these studies have been made available to the consulting engineer and the reviewing engineer groups through a series of Water and Soils Investigation Division (WASID) reports.

The entire northern zone of the Indus Plain is an alluvium deposit of eroded materials from the northern mountain ranges where the Indus and its tributaries originate. About 70 percent of the deposit is water bearing sands which coupled with the extreme thickness of the deposit makesfor one of the world's largest unconfined underground reservoirs.

3. Ground Water Quality

A survey of the quality of the surface and underground supplies has been underway for several years and is being carried out by WASID at present. Their surveys show the surface water supplies to be safe in all respect for irrigation use in accordance with the following adopted standards:

WATER QUALITY CLASSIFICATION STANDARDS

Criterion	Safe Less than	Marginal	Hazardous Greater than
TDS (ppm)	1000	1000 to 2000	2000
SAR	5	5 to 10	10
RCS (me/l)	1.25	1.25 to 2.50	2.50
Calc ESP (%)	20	20 to 40	40

Note: TDS - Total dissolved solids
SAR - Sodium absorption ratio
RSC - Residual Sodium Carbonate

However, about 50% of the deep ground water supply is found to be marginal in one or more of the above governing criteria. Mixing with equal parts of canal water or intermittant use of equal parts of well and canal water is considered sufficient to render the total supply safe. Some shallow well water indicates a dilution of 2:1 is necessary for a similar upgrading in classification.

4. Development Plan

The plan contemplates using the under ground reservoir as a source of irrigation supply and as a regulating reservoir to firm the annual fluctuations in surface flows and to effect consequential subsurface drainage through the lowering of the water table. This will be accomplished through the installation of some 1,062 tubewells in the Unit area. Agricultural production will be enhanced as a result of the increased water supply; waterlogged areas will be drained, and saline areas reclaimed while the impending waterlogging of large areas within the project will be eliminated.

5. Water Requirements

Water requirements were computed for a proposed cropping pattern from consumptive use values determined by the Blaney-Criddle formula. A cropping pattern was developed for each of three types of soil textures encountered in the area. For each type a Kharif and Rabi cropping scheme was predicted and the consumptive use requirement computed.

The consumptive use values were reduced by effective precipitation and then converted to equivalent values at canal headworks. Deficiencies in canal supplies constitute the requirements for pumped water from which pump capacities are established. These values were then modified in accordance with the criteria set forth in the next paragraph.

6. Tubewell Designs

Tubewell capacity was determined by meeting the highest requirement according to the following three criteria:

a) peak month pumping requirements computed under average climatic conditions and average surface supplies for the period May 10 through October 18.

b) pumping requirements in the month of September assuming no effective precipitation.

c) pumping requirements in October assuming no canal supplies.

The export of canal supplies for the months of November through May was determined not to a critical governing criterion and the condition of

exporting water did not increase installed pump capacities. Pumping power requirements were, however, increased. To allow for peak demands within the month of maximum demand, pumping capacities as determined above were increased by 20 percent.

Individual tubewells will have capacities of 2,3,4, or 5 cusecs as governed by the demands of the area served. Wells are to be gravel packed and will have a mild steel casing in the pump housing section and a noncorrosive casing in the perforated sections. The material being used at present in the SCARP II-A area wells is fiberglass and its use is expected to be extended to this area. Depths and dimension of wells will be in accordance with the requirements of the specific well capacity. A fifty foot penetration of water bearing material is being provided for the first second foot capacity of the well. The pumps will be vertical shaft, mixed flow turbine pumps powered by electric motors of appropriate horsepower.

7. Electrification

WAPDA has experienced a severe power shortage in its Northern Grid area since June 1966, but some load shedding has been necessary since the summer of 1965. This shortage has been due primarily to three factors: (1) delay in the installation of the gas turbines at Lahore, (2) breakdown of WAPDA's Multan plant and (3) delay in completion of its new thermal plant at Lyallpur. The first of these necessitated a small amount of selective load shedding during the peak loan period for several months during the latter half of 1965 and the first half of 1966. The installation of these units was completed in the summer of 1966 and have been operated at their full capability since their completion.

The breakdown of the Multan plant and the delay of the completion of the Lyallpur plant reduced system capability to the point where daily load shedding exceeded 200 MW. This resulted in reduced industrial production and reduced agricultural pumping. The crucial questions now are, what is WAPDA doing to increase its generating capacity and what is WAPDA doing to prevent a recurrence of the Multan disaster?

Operation of the first two units at the Mangla power plant and start-up of the Lyallpur thermal plant are scheduled for mid-summer 1967. When in full operation these plants are expected to provide between 260 and 400 MW of additional capability depending on water levels in the Mangla reservoir, river flows, and irrigation requirements. The third unit at Mangla is scheduled for operation in September 1968 and the 4th unit should be completed by late 1968 or early 1969. The most recent data available on system planning schedules the installation of the 5th and 6th units at Mangla in the later half of 1970, but no financing has been arranged for such units at this date. WAPDA also plans to install four more gas turbines in Lahore which would increase the capacity of this plant by 60 MW. No other new generating capacity is scheduled for installation in the Northern Grid area before 1972.

The capability of WAPDA's generating capacity in the Northern Grid area is dependent on stream flows, reservoir levels, irrigation requirements, and other factors. Load conditions and system capability must therefore be analyzed on a monthly and daily basis. Harza Engineering has prepared monthly estimates of load, generating capacity, and generating capability for the period of 1967 through 1978. These tabulations are included in Exhibit I, sheets 1 to 12. This exhibit shows that a precarious reserve situation exists in March, one of the peak pumping months and a time of low hydro capability, through 1972. Table 6 on the following page summarizes the March situation for the initial years of operation of the pumps to be installed under this project. In addition, capacity reserves are marginal during January and February each year in the period 1969 thru 1972, considering there are no scheduled outages on the system and capacity reserves are in the order of only 50 to 140 MW (see Exhibit I).

Unless the installation of units 5 and 6 at Mangla can be advanced some load shedding is likely to be necessary in these critical months. Immediate financing and procurement of these units is essential if an earlier operating date is to be realized. A loan application to A.I.D. to finance the foreign exchange costs of units 5 and 6 is being considered, but no formal application has been received. Even after the installation of units 5 and 6 at Mangla the deficit will be 33 MW in March 1971.

Power capability can be improved substantially depending on how the Mangla reservoir is managed. By holding the drawdown to 1075' elevation an additional 118 MW can be obtained with six units. To do so requires holding back some 400,000 acre feet of irrigation water. This gain in power output would therefore be attained at the expense of agriculture. Computer studies which have been made of the relative benefits to agriculture and power. These show that much greater benefits accrue to the economy of Pakistan by operating the reservoir at the lower elevation for the benefit of agriculture than from operating it at the higher elevation for the benefit of power production. The actual operating situation in any given year would depend on rainfall, stream flows, availability of thermal units, affect of load shedding on industrial and agricultural outputs and many other factors. A pattern for reservoir operation can not be fixed several years in advance but must be established monthly depending on the conditions prevailing and expected to prevail in the weeks immediately ahead. It is probable that operation at the higher elevation may become necessary in the period from 1969 to 1972 in order to maintain reliability of electric service, assure operation of the public and private tubewells, maintain industrial production and attain the optimum overall benefit to the economy.

Some relief by transfer of power from the southern zone is possible if the first two 100 MW thermal units at Mari are completed by the December 1970 scheduled date. It is estimated that the double circuit 132 KV transmission line from Mari to Multan would be able to supply from 80 - 100 MW by displacement. The availability of this power could not be relied on during a period of plant shakedown and possible transmission instability. Some load shedding probably would be necessary and may be severe.

TABLE 6

MARCH POWER CONDITIONS

(in Megawatts)

NORTH ZONE	1969	1970	1971	1972
Peak pumping load	263	314	363	362
Peak base load	545	616	690	770
TOTAL PEAK LOAD	808	930	1053	1132
Hydro-capability				
Canal plants	82	82	81	72
Warsak	100	100	100	170
Mangla	250	249	368	369
Total	432	431	549	611
Thermal Capability				
Lyallpur	133	133	133	133
Multan	260	260	260	260
Lahore GTs	25	25	25	25
Misc.	[illegible]	55	53	53
Total	[illegible]	471	471	490
TOTAL CAPABILITY	900	902	1020	1067
Reserves (N. Zone)	92	-28	-33	-65
SOUTH ZONE				
Peak pumping load	25	35	44	71
Peak base load	73	95	109	124
TOTAL PEAK LOAD	98	130	153	195
Thermal Capability				
Mari		196	198	388
Sukkur	50	50	50	50
Gas turbines	40	40	40	40
Misc.	61	61	61	61
TOTAL CAPABILITY	151	349	349	539
Reserves (S. Zone)	53	219	196	344

Reserves in the Northern Grid area continue to be precarious in the critical January-March months until the first units are projected to come into service at Tarbela in 1975. Even with the addition of further units at Tarbela, reserves become critical again in the early winter months by 1977. WAPDA is proposing to alleviate this situation by adding 200 KV to the Mari thermal station. From there WAPDA would install an EHV transmission line to carry surplus capacity from Mari to the northern load center. The EHV facilities would be used later to transport surplus hydro energy to the lower Sind area. Both projects appear to have been financed. Completion of this scheme, or a more economical alternative, is necessary to maintain adequate service on the Northern Grid during the early seventies.

If loads materialize as indicated the situation described above would require WAPDA to rely on the total capability of its machines during the system peak periods for several months of the next few years. (Some load shedding would also be required). Operations of this type can be maintained over short periods but even then extremely good maintenance and operation would be required. The experience at WAPDA' Multan plant during 1966 and 1967 is disconcerting in this respect. Two of the machines had been in operation only two years at the time of failure. The other two had been operating no more than four years. All information available indicates that maintenance practices were not up to the standard required for a plant of this type. Nearly one-third of WAPDA's generating capability in its Northern Zone will be in the Multan and Lyallpur plants between 1966 and 1972. Past experience seems to cast considerable doubt on the ability of WAPDA to maintain the level of maintenance and operations required to keep all machines in operation during the daily peak period.

As a result of the Multan problem WAPDA has made arrangements with the General Consultants to establish a training program at Multan for preventive maintenance and general machine overhaul. Operation and maintenance training is also being provided at Lyallpur under A.I.D. Loan 391-H-053. Continued emphasis on these training programs should bring about some of the improved maintenance practices which are necessary to attain the reliability required during the next several years.

The IBRD and its consultants have recently reviewed the power situation in West Pakistan. Their estimates of load growth are somewhat less than those indicated in Exhibit I. The difference is largely in the tubewell requirements. The Bank's estimate of West Pakistan's tubewell needs are much lower than those included in the accompanying table. The Bank's estimate is based on the requirements as projected by the Bank's agricultural consultants. Even though the Bank's long range estimates may be reasonable, with the emphasis on attainment for self-sufficiency in food grains by the end of the third plan period if the necessary inputs are made, it is probable that the Bank's load estimates will prove too conservative during the period from 1969 to 1972. A.I.D. considers the higher load estimates included herein to be more realistic for the immediate future.

WAPDA can also schedule the public tubewell operation during critical peak periods in order to meet essential loads. When the public tubewell load reaches the magnitude estimated for the early seventies such scheduling can make a significant contribution to WAPDA's ability to meet the power requirements of the Northern Grid. Scheduling of the private tubewell operations would also help substantially to maintain adequate service. No satisfactory and economical method of controlling the operating practices of the private tubewell owners has been found to date. Study of this problem by WAPDA and its consultants is continuing.

A.I.D. considers that curtailing tubewell power during peaking hours during one to three months a year will not materially affect the SCARP operations nor reduce their productiveness. Admittedly some operating difficulties are inherent in pump shutdowns but these have not been found unsurmountable in operation of SCARP I since its commissioning. The reduction in water supply brought about through a 2 to 3 hour shut down daily, during an emergency power period, will not create a comparable deficiency in water supply since the canal supplies will remain unaffected. In a period of 100 percent pumping load factor, a two hour shut down period, at a time when canal supplies are providing one third the water supply, will result in only a five percent deficiency in crop water requirements. Such deficiencies are well within good design limits of water projects.

8. Irrigation system maintenance

The maintenance of irrigation distribution systems throughout the general area is not up to acceptable standards in all respects and the facilities are outdated and inadequate for modern irrigation. This applies to other areas generally, as well as to SCARP I. Of particular concern to the SCARP program is the normally poor condition of the water courses (small distribution laterals serving individual farms or groups of farms). Maintenance of these ditches is generally left to the farmers directly involved and most channels are choked by silt or sand and weeds. Therefore they are inefficient water carriers. Water lost due to leakage, excessive evaporation, or non-beneficial use by weeds results in a requirement for additional pumping from the wells, or reduced water deliveries. The condition of many of the water courses is such that extensive rehabilitation is needed. It is essential, for the maximum utilization of the overall irrigation facilities (including wells and surface sources of water) that an adequate rehabilitation, upgrading and maintenance program be instituted, and a requirement to this effect will be included in the loan agreement. This work is not appropriately a part of the SCARP project and should be carried out as a part of the operation and maintenance program for the surface water facilities. This permits full coordination of the operation of ditches with repair or rehabilitation on them to result in a minimum of interference with water deliveries.

C. CONCLUSIONS

The SCARPs are designed to assist the effort to increase agricultural production through the installation of a series of irrigation/drainage tubewells. With these tubewells it is planned to lower the water table in order to eliminate the danger of waterlogging and salinization and to provide a dependable supplemental irrigation supply which will permit better land utilization and increased cropping intensity.

Extensive hydrological studies, available through WASID reports, indicate that the entire Northern Indus Plain is underlain by one of the world's largest unconfined underground reservoirs. Further WASID studies have determined the safety for irrigation uses of the surface water supplies. Although about 50 percent of the deep ground water is marginal in terms of irrigation use, mixing with canal water can render it safe.

Tubewell pumping capacity has been determined by the consumptive use requirements of proposed cropping patterns. The 1,062 tubewells of the Upper Chenab Unit will furnish the necessary additional irrigation requirements required to reach a cropping intensity of 150 percent as well as provide replacement for waters exported from the winter water supply of the perennial canals of the Unit for use on areas with unfavorable ground water supplies. The design to achieve these objectives is based on extensive investigations and data collection by the Soil Reclamation Board of the West Pakistan Irrigation Department and by WASID, with the assistance of WAPDA's general consultants, Harza Engineering Co., and WAPDA's reclamation consultants, Tipton and Kalmbach. Experience to date on other SCARPs indicates the projects are soundly designed and engineered. A.I.D. has reviewed in detail and approved the engineering feasibility of this project.

Past experience has shown that the electrification aspects of the SCARPs presents a major problem affecting the productivity of tubewells. The serious power shortage in the Northern Grid area has and will continue to affect the SCARP operations during a limited period of the year by curtailing tubewell power during peaking hours. Operating difficulties attributable to pump shutdowns are not regarded as insurmountable. A.I.D. considers projected deficiencies in crop water requirements attributable to power shortages to be within good design limits of water projects.

The engineering analysis of this project supports the feasibility of the SCARP IV Upper Chenab Unit.

V. MANAGEMENT & OPERATIONS

A. GENERAL

As mentioned in Section II, there have been several systems for management and operation of the SCARP areas. When responsibility for SCARP I was assigned to the newly established Land and Water Development Board in 1963, it then was intended that future SCARPs would be assigned to this organization. As noted, however, it has been decided to assign management of SCARP II to the Department of Irrigation and Power, including Upper Jhelum (II-A), Lallian, Chadir and, we understand, Lower Jhelum (II-B) Unit. Mona Unit is being operated as an experimental project by WAPDA as an agent of the GOWP. Thus, a definite pattern for management and operation of the completed SCARPs has not emerged. With respect to SCARP II-B, A.I.D. will require a satisfactory plan for operation before disbursement (other than for consulting services) can begin. A similar requirement will be included in the loan agreement for this project, and this topic will be fully discussed during the course of negotiations on the loan agreement.

The capability of the GOWP to construct SCARPs has been indicated in Section II and III. The capability to operate and maintain must be developed as each SCARP becomes operational and will depend heavily on the operational personnel available in the Department of Irrigation and Power; design and construction personnel developed through WAPDA construction operations; and, to the extent possible, transfer of experienced cadre from SCARPs in an operational status. Development of SCARP I operational capability has depended essentially on the first two sources noted above, supplemented by training and technical assistance provided under A.I.D. Loan 391-H-060. The question of continued reliance on foreign training or dependence on transferability of SCARP I experience remains to be answered. A covenant will be added to the Loan Agreement which will provide that the Borrower must ensure that training plans and programs exist within agencies of the GOWP capable of providing in a timely manner sufficient, well-trained personnel to operate and maintain the project being financed by this loan.

B. HISTORY

The tubewells of SCARP I were placed under the operational control of WAPDA's Directorate of Land and Water Management in September 1961. It was envisioned that, at least as an interim measure, this organization would assume responsibility for three aspects of the project; (a) physical operation and maintenance of tubewells, (b) water distribution below the canal outlet and the collection of canal and tubewell hydrologic data, and (c) reclamation and agriculture extension services, supply of seed and fertilizer collection and analysis of agricultural and economic data, et cetera. However, due to conflicting interests within GOWP and the lack of firm guidelines for this new approach, only the first of these responsibilities were fully

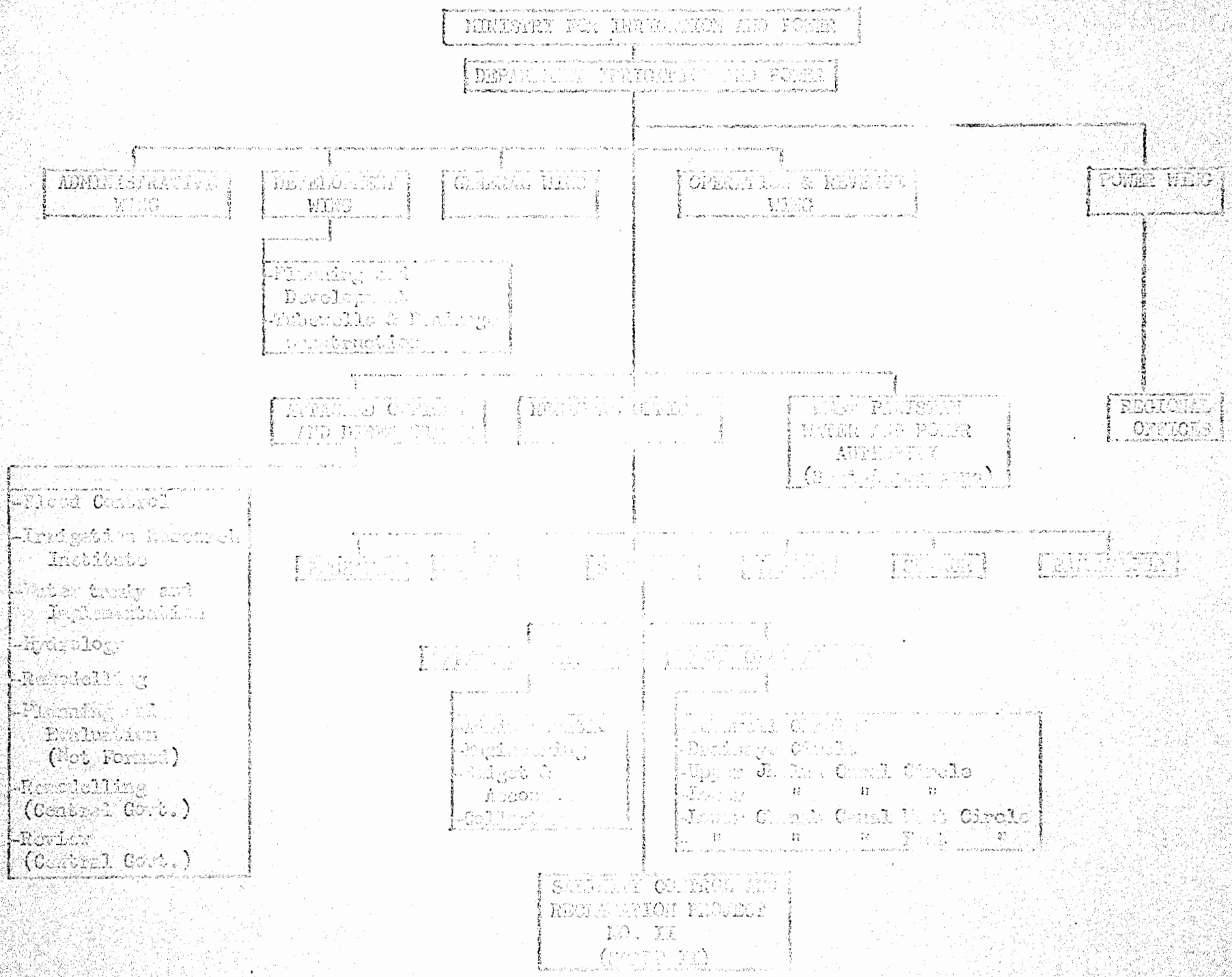
assumed by that organization. The Water and Soils Investigation Division of WAPDA, however, did initiate (and is continuing) a program of ground water and soil monitoring. Apart from the WAPDA organization, the Soil Reclamation Board, a semi-independent body, had been operating four small schemes in adjoining areas, but lack of staff prevented them from undertaking effective reclamation activities over the entire project area.

A few GOWP officials recognized the need to undertake a new, comprehensive approach to Indus Plain agriculture problems, related not only to salinity control and reclamation per se but to the entire spectrum of agricultural activity. While the WAPDA Act of 1958 clothed it with sufficient authority to undertake a program of this scope it was recognized that WAPDA was fully occupied with a tremendous water and power development construction program and it would, therefore, not be appropriate to burden it with a long range operating program of great magnitude. Accordingly the Provincial Governor in December of 1962 directed transfer of SCARP I operational activities, whether tubewell or agricultural, to the GOWP Department of Irrigation and Power which operated the project and had prepared future development plans prior to the transfer of operations to the LWDB in the spring of 1964.

During this period September, 1962 - January 1964, the White House - Interior Panel on Waterlogging and Salinity (Revelle Committee) recommended that salinity control and reclamation projects, once completed, be placed under the direction of, ".....a Board having high prestige which is representative of the principal agencies. The responsibility of this Board would be broad policy formulation and general supervision of successive project areas." The "Panel Report" further recommended that the GOWP,"...mobilize for agriculture production and general development in the project areas around the powers of the Soil Reclamation Act of 1958 and that the Punjab Soil Reclamation Board be reoriented and reconstituted for a larger and more dynamic Mission." The Land and Water Development Board, as described in Section C following, substantially reflects the thinking underlying this recommendation.

In 1965, the GOWP undertook studies to determine methods designed to ascertain methods and/or management changes which might lead to reduction in operation and maintenance expenditures. It was determined by the Ministerial Council that SCARP II should be assigned to the Department of Irrigation and Power for operation and development in conjunction with other regularly established departments of government for purposes of comparison with the LWDB and other forms of organization. Operation of SCARP II units are in a generally transitory state - construction to operation - consequently, no conclusions can be drawn at this time. A general chart indicating the function and organization of the Department is presented on the following page.

GENERAL ORGANIZATION AND FUNCTIONS DEPARTMENT OF IRRIGATION AND POWER



C. THE LAND AND WATER DEVELOPMENT BOARD

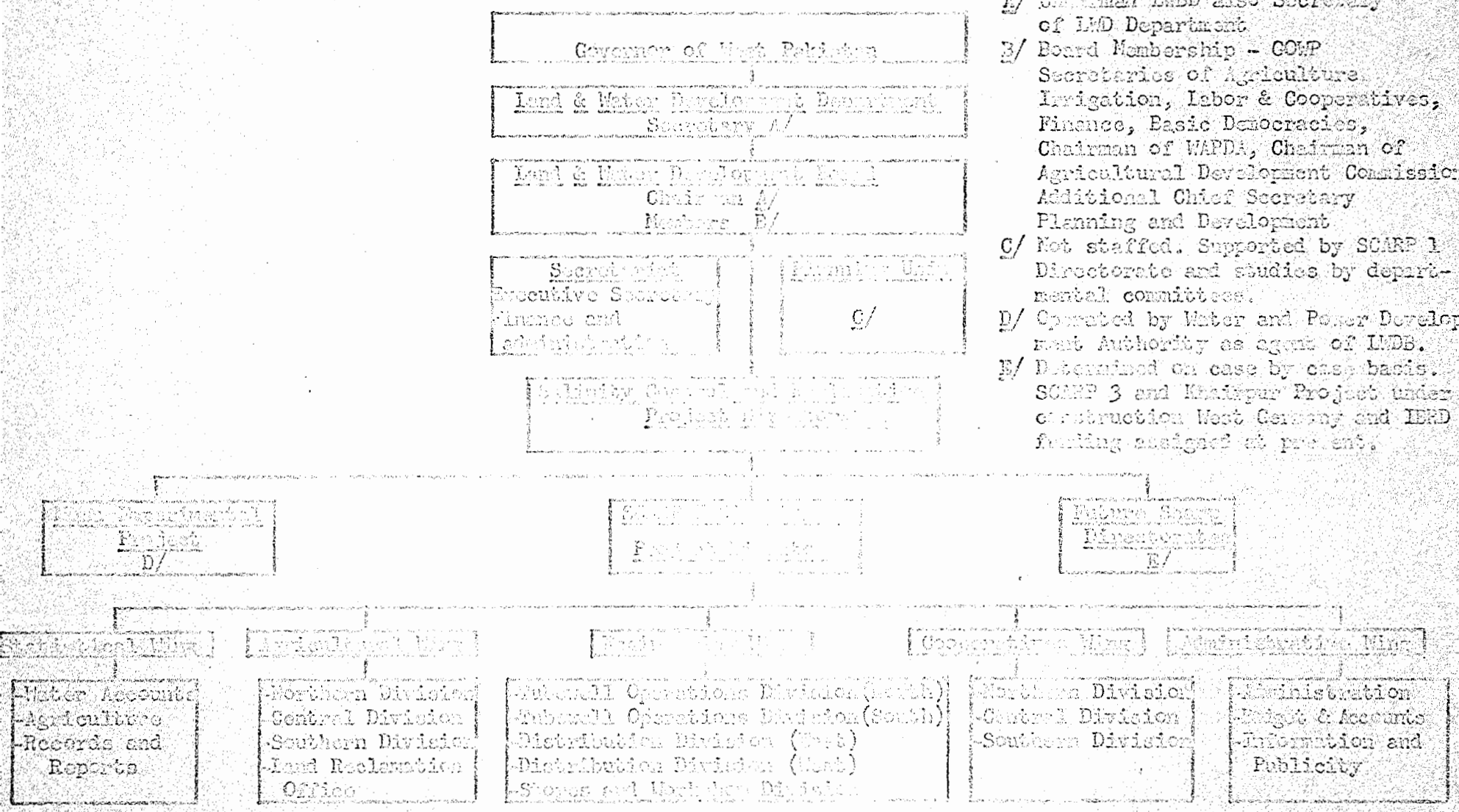
The Land and Water Development Board (LWDB) was established in June 1963 by executive action of the Governor. This was a reconstituted Soil Reclamation Board with increased membership, established at an organizational level giving it direct access to the Governor. The LWDB is a policy making body composed of a chairman and the senior representatives of eight GOWP departments and organizations. The Chairman also acts as (1) Secretary of the Land and Water Development Department, which is responsible to the Minister of Agriculture, Irrigation and Power, and (2) administrator of the Soil Reclamation Board (the LWDB operates under powers of the Soil Reclamation Act). The organization chart on the following page depicts the LWDB organization as well as that established for SCARP I.

The Board assumed operating responsibility for the SCARP I area from February 1964. These responsibilities, set up under a Project Director, include comprehensive agricultural development as well as tubewell operation and maintenance and water distribution from the farm distributaries(water courses). The Engineering Wing, through its various divisions, is responsible for maintenance and operation of tubewells, distribution of irrigation supplies, and construction and maintenance of project servicing facilities. The Tubewell Operations Divisions are responsible for the operation and field maintenance of installed tubewell facilities. The Water Distribution Divisions coordinate operation of the tubewells with canal supplies and are responsible for assessment of irrigation water rates and reclamation fees; rehabilitation of water courses; and establishment of water schedules. The Irrigation Department continues to be responsible for delivery of canal supplies to water courses. The Shops and Stores Division is responsible for all major repairs and maintenance of tubewells and other installed and operating equipment and for the purchase, warehousing and distribution of spare parts, materials and supplies in support of SCARP operations.

Under A.I.D. Loan 391-H-060, $750,000 in foreign exchange has been made available to the Board for spare parts, maintenance equipment, training aids, and services of training personnel. Spare parts for pumping equipment, transportation vehicles, and well maintenance and renovating equipment are being purchased and Ralph G. Parsons Corporation is providing three full time U. S. specialists for a two year period in well, pump and electrical operation and maintenance to advise and train local personnel. This contract is due to expire about December 1967, by which time it will be necessary to decide whether further assistance is required. This matter is under consideration as indicated in Annex I.

Great emphasis is being placed on increasing agricultural production from the SCARP I area through the adoption of improved farming methods. The Board with the assistance of A I.D. personnel is offering an intensive extension service to the local farmers. A.I.D. presently has 12 agricultural

LAND & WATER DEVELOPMENT DEPARTMENT & LAND & WATER DEVELOPMENT BOARD FUNCTIONAL ORGANIZATION CHART



Notes:

A/ Chairman LWBD also Secretary of LWD Department

B/ Board Membership - GOWP Secretaries of Agriculture, Irrigation, Labor & Cooperatives, Finance, Basic Democracies, Chairman of WAPDA, Chairman of Agricultural Development Commission, Additional Chief Secretary Planning and Development

C/ Not staffed. Supported by SCARP 1 Directorate and studies by departmental committees.

D/ Operated by Water and Power Development Authority as agent of LWDB.

E/ Determined on case by case basis. SCARP 3 and Khairpur Project under construction West Germany and IBRD funding assigned at present.

advisors attached to the Land and Water Development Board and the Department of Agriculture who devote a major portion of their time to providing support to the SCARP program. Present planning calls for continuing agricultural assistance to promote development in SCARPs through 1970 at which time it is felt that local government agencies will be able to effectively handle the agricultural programs in the SCARP areas. Improved farming methods of tillage, seed bed preparation and water application are being taught; new seeds of better producing varieties are being introduced; training in use of commercial fertilizers and insecticides is being provided.

Through use of P. L. 480, Section 104(e) funds, A.I.D. has backed a two year rural development program aimed at improving some 100 miles of roads and 480 water courses, providing five new demonstrational grain storage facilities, and construction of a storage and repair building. Further P. L. 480, Section 104(g) funds have been allocated for acquisition of locally manufactured repair equipment, tools, spare parts, and electrical and pumping equipment. The following lists categories and allocations to date:

Item	Allocation Rupees
Rehabilitation of water courses	3,117,000
Road construction	8,063,000
Grain storage	250,000
Warehouse and shop building	850,000
Equipment and tools	600,000
Total	Rs. 12,850,000

D. CONCLUSIONS

No clear pattern for management and operation of the completed SCARPs has emerged. These responsibilities are assigned to the newly established LWDB for SCARP I, while SCARP II responsibilities, with the exception of the Mona Unit, are assigned to the Irrigation Department. Sufficient experience is lacking on which to base a comparison of operation of the two projects.

In the implementation of SCARP III-B, A.I.D. is discussing with WAPDA and the GOWP the advisability of designating an interim operating agency to operate the project during the construction/initial maintenance phase prior to turning the project over to a permanent operating agency. A decision on this question will undoubtedly have implications for SCARP IV.

A.I D. views a satisfactory plan of operation as crucial to the attainment of the SCARP targets. Although the responsibility for selection of the operating agency rests with the GOWP, A.I.D., through its loan conditions, will ensure that the matter is adequately treated. In spite of a lack of resolution on this question for the present, there is no reason why it should prevent favorable consideration of the requested loan, since the solution to the problem will draw on the experience of previous SCARPs.

VI. FINANCIAL ANALYSIS

A. PROJECT COSTS

The estimated capital costs of the project are $10.7 million in foreign exchange plus Rs. 106.4 million (equivalent $22.3 million) in local currency, or a total equivalent of $33.0 million. These cost estimates were submitted by Tipton and Kalmbach in April 1967, based on the latest tenders received for other SCARPs and consultation with Commonwealth Associates, Inc., which has performed the electrification work on SCARP II-A. It is assumed that locally manufactured pumps, motors and motor controls will be used to the extent available. Electrical cables and hardware sub-station equipment and construction and transportation equipment are assumed to be U.S.-supplied and financed from funds of this loan. Interest during construction and Revolving period is assumed to be 4.75%, based on rates paid by WAPDA in the past for its funds. These cost estimates, as set forth in Table 7, are considered reasonably firm and adequate to provide a basis for the loan.

B. PROJECT FUNDING

Year-by-year requirements for the project are set forth in Table 8. Foreign exchange requirements are to be met by the proposed loan. Local currency requirements will be included in the AID Development Budget and will be provided by loans from the Central or Provincial Government, sales proceeds of bonds issued by WAPDA under the authority of the government or other sources.

Upon completion of the project, operating responsibility will be transferred from Ground Water and Reclamation Directorate, WAPDA, to an operating organization. However, it will be the direct responsibility of the GOP to make repayment of this dollar loan to A.I.D.

For purposes of amortization the terms of the GOP loan to WAPDA are assumed to provide for a repayment grace period through the first five years of development, during which interest on the total debt will accrue at 4.75 percent per annum. Project debt at the end of the development period will then be Rs. 117,438,000 (equivalent $24,663,000) to be amortized over the ensuing 35 years of project life at an interest rate of 4.75 percent per annum, or an annual payment of Rs. 6,941,000.

The electric power transmission and distribution system will be maintained and operated by WAPDA (Power Wing), with funds to cover operation and maintenance, replacement and amortization of initial capital cost derived from revenues resulting from sale of power to the project. Sale of electric energy will be made at the authorized agricultural tubewell rate of Rs. 0.07 per kwh. This figure has been used in the financial statements in determining operating costs. However, according to Harza's Technical and Economic Appraisal of SCARP I (hereafter referred to as Harza Appraisal) ".... the

TABLE 7

ESTIMATE OF CAPITAL COSTS

I. RECLAMATION ITEMS	Dollar Costs $(1000)	Rupee Costs Rs.(1000)	Total Costs Eq. $(1000)
1. Tubewell and appurtenant works			
(a) Tubewell construction	3,905	9,406	5,881
(b) Pumps, motors, controls	695	16,189	4,159
(c) Spare parts	53	1,340	335
(d) Pumphouse and quarters)	212	7,487	1,785
(e) Water distribution works)			
(f) Land		[illegible]	111
Sub-total	4,865	35,252	12,271
2. Structures		100	21
3. Construction plant equipment and facilities furnished by MPWH:			
(a) Camps and facilities	[illegible]	1,[illegible]	183
(b) Transportation equipment)	27	[illegible]	227
(c) Spare parts)			
(d) Engineering equipment	[illegible]	[illegible]	17
Sub-total	[illegible]	2,[illegible]	668
4. Administration engineering and supervision	738	5,743	1,941 1/
5. Contingencies (15%)	[illegible]	[illegible]	2,231
6. Customs duties and sales taxes		3,[illegible]	756
7. Interest during construction (1.75%)		[illegible]	1,572
8 Sub-total	6,527	61,545	19,440
8. Investigations, planning and project preparation (1-1/2%)	112	866	274
9. Less salvage of construction vehicles and equipment		850	179
Sub-total	6,629	61,541	19,555

1/ Engineering services estimated to be 6 percent of capital costs, or equivalent $778,000.

ESTIMATE OF CAPITAL COSTS (Continued)

II. ELECTRIFICATION	Dollar Costs $(1000)	Rupee Costs Rs.(1000)	Total Costs Eq. $(1000)
1. Construction of Power Facilities			
(a) Transmission line	54	1,019	268
(b) Substations (less transformers)	1,479	3,789	2,275
(c) Power transformers	402	431	503
(d) Distribution lines	711	13,547	3,557
(e) Transformers and services	303	5,799	1,517
(f) Land		38	8
(g) Capacitors		[illegible]	69
Total	2,949	24,982	8,197
2. Construction plant, equipment and facilities furnished by WAPDA:			
(a) Camps and facilities	2	205	45
(b) Transportation equipment	-	109	25
(c) Spare parts	1	14	4
(d) Engineering equipment	2	5	2
Total	5	333	75
3. Administration, engineering and supervision 1/	575	3,665	1,343
4. Contigencies (Total - 13%)	473	3,656	1,241
5. Customs duties and sales taxes	-	7,126	1,497
6. Interest during construction (4.75%)	-	5,152	1,082
Sub-total	4,000	44,914	13,435
Total All Costs	10,629	106,455	32,990

1/ Engineering services estimated to be 7 percent of capital costs, or equivalent $579,000.

TABLE 8

ANNUAL EXPENDITURE FOR CAPITAL WORKS
(Values in Thousands)

Item	1st Year		2nd Year		3rd Year		Total	
	$	Rs.	$	Rs.	$	Rs.	$	Rs.
Tubewells & Associated Items	1,941	18,013	2,975	26,237	1,713	9,606	6,629	54,056
Mechanization	1,106	13,042	1,694	19,655	1,200	7,065	4,000	39,762
Interest During Construction	-	1,604	-	4,565	-	6,468	-	12,637
Total:	3,047	32,659	4,669	50,457	2,913	23,359	10,629	106,455

actual overall cost of power in the Northern Grid (including generation) is about Rs. 0.11 per kwh." Harza assumes a charge of Rs. 0.10 per kwh would meet costs if pumping during the daily peak power demand (7 p.m. to 9 p.m.) is avoided. If Harza's figures are correct, WAPDA will be subsidizing the cost of power to the extent of about Rs. 0.03 per kwh.

C. OPERATION, MAINTENANCE AND REPLACEMENT OF TUBEWELLS

Tipton and Kalmbach has estimated an annual operation and maintenance charge of Rs. 2,000 per tubewell plus Rs. 618 per tubewell for maintenance of equipment and vehicles, or a total of Rs. 2,618 per tubewell per annum. In addition, there will be a power cost of Rs. 9,7[illegible] per tubewell after the development period, based on an annual consumption of 139,[illegible] kwh per tubewell. Total annual operating costs thus come to Rs. 1[illegible] per tubewell. Costs of operation and maintenance are set forth in Table [illegible].

These projected costs for operation [illegible] (excluding power) appear low in comparison with [illegible] comparable costs for SCARP I, [illegible] to Rs. 3,682 per tubewell. This is [illegible] estimated by Tipton and Kalmbach [illegible] stated that its estimates [illegible] operating agency. The [illegible] be quite substantial. [illegible] heavy maintenance costs [illegible] However, part of these [illegible] spare parts, components [illegible] tenance charges. For [illegible] administrative overhead [illegible] per tubewell for operation and maintenance [illegible] maintenance plus maintenance of [illegible] per tubewell per annum. [illegible] operation of SCARP I (all figures [illegible]).

Operation and maintenance [illegible] the beginning of the development period [illegible] be in operation. Thereafter, the only increase will be [illegible] the project as more water is pumped each year during the [illegible] period. During the remaining life of the project, operation and maintenance costs are assumed to remain constant.

Replacement of tubewells and [illegible] will be provided for by establishment of a reserve fund [illegible] amortizing initial investments over their useful life at current rates of interest.

TABLE 5

ANNUAL COST OF OPERATION AND MAINTENANCE

Year	No. of Tube-wells	Estimated Annual Cost				Acres Served
		O & M Tubewells 1/	Cost of Power 2/	Maintenance of Equipment and Vehicles	Total	
	No.	Rs.	Rs.	Rs.	Rs.	Acres
1				297,000	297,000	
2	340	850,000	1,[illegible]	500,000	2,792,000	177,000
3	770	1,925,000	2,[illegible]	595,000	5,126,000	342,000
			End of Crash Plan Period			
4	1062	2,655,000	5,[illegible]	656,000	8,814,000	482,000
5	1062	2,655,000	6,[illegible]	656,000	9,914,000	578,000
6	1062	2,655,000	7,[illegible]	656,000	11,014,000	675,000
7	1062	2,655,000	8,[illegible]	656,000	12,115,000	772,000
8	1062	2,655,000	9,[illegible]	656,000	13,726,000	943,000
			Total Thereafter Period			
9-43	1062	2,655,000	10,[illegible]	656,000	13,[illegible]	943,000

NOTE: 1/ Based on annual O & M Cost of Rs. 2,500 tubewell (Rs. 2 collapsible plus Rs. 500 for administrative overheads).

2/ Cost of power based on Rs. 0.07 per kwh and a pumping head of 40 feet during construction and 60 feet thereafter.

D. WATER RATES AND USERS' ABILITY TO PAY

All operating project income is to be derived from charges to water users for tubewell water. Tipton and Kalmbach calculated an average charge of Rs. 18 per harvested acre through the development period and Rs. 25 thereafter to be sufficient to cover cost of the project amortized through its useful life at 4-3/4 percent. This compares with average charges recommended in the SCARP II-B loan paper of Rs. 15 and Rs. 30 for similar periods.

While these rates are well within the earning value of irrigation water and the farm operators ability to pay, nonetheless, they are over twice the customary rates charged throughout the area heretofore. In the area served by gravity canals, a Schedule of Occupier rates, which accounts for types of crops being irrigated, has long been in effect and receives an average of Rs. 8.60 per harvested acre. The Council of Ministers, Government of West Pakistan, decided in 1958-59 that the following water rates shall be effective in the SCARPs.

1. Reclamation Fee

   i) reclamation fee at Rs. 15.[illegible] per acre shall be levied on cultivable area which can be irrigated either by canal or tubewell or both;

   ii) the fee to be recovered in [illegible] equal installments at each harvest [illegible] the fourth harvest subsequent to commissioning the project.

2. Water Rates

   i) In addition to the Schedule of Occupier's rates, a water rate none [illegible] to yield a sufficient revenue of Rs. 15 per acre was to be worked out.

The Government has approved an average water rate of Rs. 17.20 per matured cropped acre in SCARP I and has experienced some organized resistance from farm operators to the increased levy. This resistance is believed to stem from both the levy and from the [illegible] service. In spite of the increased water supply, the availability of water has not been assured because of power failures, inadequate water carrying capacity of water courses, and other operational problems. The economic analysis of these reports presupposes complete dependability in water supply and water service. Unless these services are upgraded to the standards assumed, the project benefits will not be achieved and resistance to increased charges will prevail. A graduated increase accompanied by a comparable better water service through the development period would appear to offer a suitable compromise. Such progress we believe will be attainable only through the assurance that water levies collected are retained and used for operation and maintenance

of the project from which the collections are made, or increases in direct appropriations commensurate with project costs and collections.

A covenant will be inserted in the Loan Agreement for this project which will require the GOAP to review its water user rates with a view to ensuring that projects such as this project can cover their operating costs and amortize capital costs out of revenue earned by the project.

The ability of the farmer to pay the costs of water is clearly illustrated by the following figures based on Tipton and Kalmbach's 1965 SCARP IV Report and Harza's Appraisal for SCARP I:

	Net Agricultural Income Before Taxes (in Rupees Per Acre)		
Area	Without Project	With Project 1/	Addition Due to Project
SCARP I	112	185	73
SCARP IV	92 2/	146	54

Another comparison can be made in terms of over water prevailing. Private tubewell operations of Rs. 40 per acre on the gross crop value for all crops except rice for which the charge is increased to one-third of gross crop value. The water payment originally calculated for 1964-65 on this basis would be Rs. 75 per cropped acre.

These data indicate the farmer will recover the costs of water as projected several items over by his increased income.

E. CASH FLOW OF PROJECT

A cash flow statement of the revenues and cash outlays of the project indicates the project can operate on a self-sufficiency basis. It is expected that deficits will occur during the period of development up to a maximum accumulated level of Rs. 3,984,000 in year seven of the project. After

---

1/ Included benefits from additional water only
2/ Includes canal water charges

this the project will show an annual surplus. If the accumulated deficit at the end of the development period (year eight) is capitalized and amortized over the remaining life of the project, all costs of the project including amortization can be met by a charge of Rs. 25.0 per acre. A small adjustment could be made in water rates after the development period if costs prove higher than expected or it is desired to amortize the accumulated debt over a shorter period of time. This figures are detailed in Table 10.

F. CONCLUSIONS

The [illegible] estimating the capital costs and the operating/maintenance costs are based on the latest available costs for [illegible] regards these as being realistic, given present circumstances. Operation and maintenance charges used by Tipton and Kalmbach have been adjusted upward by 20 percent by A.I.D. to bring them more nearly in line with the current experience on SCARP I. The annual charge for replacement reserve is sound, assuming the validity of a 4-3/4 percent rate of interest.

Annual income or water rates must be at or above rates sufficient to cover the cost of the project amortized over the useful life at 4-3/4 percent. These rates compare favorably with [illegible] used to establish the feasibility of SCARP II-B. At the rates used, [illegible] easily pay for the cost of water out of the additional [illegible] generated by the use of the water.

The cash flow analysis [illegible] appears satisfactorily from a financial standpoint. The excess of annual costs over annual income through the end of the development period will result in a cumulative deficit of Rs. 1,606,000 at that time. This will be capitalized and amortized over the remaining life of the project out of operating surpluses which will develop in the eighth year of the project. Minor adjustments in water rates might be necessary at that time to compensate for presently unforeseen rises in costs. A.I.D. will write a covenant into the Loan Agreement to encourage the GOMP to consider the need for flexibility on water rates so that they can at least adequately cover costs.

The project, as presented, appears to be financially viable.

TABLE 10

CASH FLOW
(Value in Rupees)

Year	Annual Income 1/	Estimated Project Cost: Operation Cost 2/	Estimated Project Cost: Loan Repayment 3/	Estimated Project Cost: Total Annual Cost	Annual Surplus or (Deficit)	Accumulated Balance Surplus or (Deficit)
1		297,000		297,000	(297,000)	(297,000)
2	3,186,000	2,792,000		2,792,000	394,000	97,000
3	6,156,000	5,126,000		5,126,000	1,030,000	1,127,000
			End of Construction Period			
4	8,676,000	10,904,000		10,904,000	(2,228,000)	(1,101,000)
5	10,404,000	12,004,000		12,004,000	(1,600,000)	(2,701,000)
6	12,150,000	13,104,000		13,104,000	(954,000)	(3,655,000)
7	13,896,000	14,205,000		14,205,000	(309,000)	(3,964,000)
8	16,974,000	14,816,000		14,816,000	2,158,000	(1,806,000)
			End of Development Period			
9-43	23,575,000 p.a.	15,719,000 p.a.	6,977,000 p.a.	22,696,000 p.a.	879,000 p.a.	

1/ Based on Rs 18 per harvested acre [illegible] Rs 24 per harvested acre thereafter. (A charge per harvested acre of Rs [illegible] would be sufficient to pay the total annual cost of Rs 22,696,000 after development. An additional Rs 0.[illegible] would be required to amortize the 1,806,000 deficit accumulated through the period of development).

2/ O & M Costs from Schedule 5 plus replacement reserve costs calculated on an even annual basis.

3/ Beginning at end of development period of 35 years at 4-3/4% rate of interest per annum.

VII. ECONOMIC FEASIBILITY

A. GENERAL

Vast areas of the Indus Plain have been developed for irrigation without considering the need for either supplying sufficient irrigation water to achieve high agricultural production per unit or controlling soil salinity. The amount of surface water available per cultivable command acre is very small and the irrigated acres contain inherent self-destructive features. Large areas of irrigated land are being severly affected or going out of cultivation because of waterlogging and salinity. Also there are no further large tracts of new lands that can be developed cheaply for irrigation. Thus West Pakistan has only one major means of increasing agricultural production: intensification of cropping of presently-irrigated lands.

To increase food production, the following measures are required:

1. Increasing the harvested acreage by increasing the water supply;

2. Increasing the amount of water applied per acre;

3. Controlling the water-table depth;

4. Removing salts from the root zones of plants; and

5. Improving agricultural methods and increasing the availability of such other inputs as fertilizer, improved seed, pesticides, etc.

To achieve the dramatic breakthrough which will be required to achieve self-sufficiency in food by 1970 will require a carefully integrated program employing all of the above. The SCARP projects are the primary means by which the GOWP is proceeding to accomplish the first four measures.

As the following analysis shows, this project is highly desirable on economic grounds. Cropping intensity will increase from 92 percent to 150 percent. Changes in the cropping pattern will occur to grow more fruits and vegetables presently deficient in the national diet, fodder crops to make possible better nutrition of draft and milk animals, wheat, sugarcane and other needed crops. Production increases will result from higher per-acre yields. Most important, with the removal of water and salinity as limiting factors, other inputs can be used, such as fertilizer, pesticides and improved seeds, making possible two and three-fold yield increases.

Direct results of the project, which would occur by the end of the five-year development period, and secondary results occuring after full development with other inputs over the next 15 years have been computed by A.I.D., based on information supplied by Tipton and Kalmbach, to be as follows:

	Current (1965)	Increase from Water Supply & Drainage	Increase from Full Development
Net Agricultural Return	Rs. 58,000,000	Rs. 138,000,000	Rs. 249,000,000
% Increase Over Current		+138%	+330%
Net Agricultural Return Per Farm	Rs. 631	Rs. 1,477	Rs. 3,086
% Increase Over Current		+134%	+389%
Harvested Acres Per Farm	7.6	11.25	11.25

These figures dramatically demonstrate the value of the project.

B. ECONOMIC ANALYSIS

Economic feasibility of the Project has been analyzed in terms of benefit/cost ratios and internal rates of return based on the discounted cash flow method.

1. Cash Outlays

Cash outlays for investment are the same as set forth in the financial statements in Section VI, with the exception of customs duties, sales taxes and interest which have been excluded. Replacement costs for equipment and facilities have been averaged over their useful life and shown as an annual expense, with the exception of "Irrigation tubewells" and "Pumps, Motors & Controls" which have been listed in the years when they actually occur. Costs of operating and maintenance of tubewells, cost of power, and maintenance of equipment and vehicles are the same as shown in Section VI. No adjustment is made in the cost of power because facilities amortized at Rs. 0.025 per kwh result in a total value of Rs. 0.05 per kwh, or approximately the value of Rs. 0.10 per kwh estimated in the Harza Appraisal.

2. Benefits

Benefits are measured in terms of increase in net agricultural revenue which will accrue to land and family labor as a result of the project. Current and future harvested acreage, unit yields and net return per unit are based on Tipton and Kalmbach's 1965 SCARP IV report adjusted by them to the

acreage within the Upper Chenab Unit. Tipton and Kalmbach has assumed that:

(i) No benefits will accrue to the project during the three construction years;

(ii) Benefits due to added water and drainage will accrue on a uniform basis during the five year development period as cropping intensity increases from 92 percent (present) to 150 percent (end of development period).

(iii) Benefits from full development (e.g., increased fertilizer, introduction of pesticides and hybrid seeds, better farming practices, etc.) will accrue on a uniform basis for the first 15 years after the development period, then remain constant during the last twenty years of the project.

The Mission considers these assumptions conservative. The projected increases in the yields per acre by the end of the development period are very marginal over current yields shown in the Tipton and Kalmbach 1965 SCARP IV Report. The increase projection in net agricultural benefits to farmers from current conditions to conditions at the end of the five year development period is 138 percent. In the SCARP I area, net agricultural benefits to farmers increased 152 percent between the years 1959-60 and 1965-66, according to the Harza Appraisal, and the great majority of public tubewells in this area only came into use beginning in 1962-63.

Benefits have been calculated on four bases.

(i) Benefits which are attributable only to the additional water and drainage are calculated. These all accrue during the five year development period.

(ii) Benefits which would accrue due to additional water and drainage <u>and</u> subsequent full development are calculated. The net agricultural benefits under this alternative are net of the costs of the additional inputs (e.g., fertilizer, pesticides, hybrid seed, etc.). Some of these benefits would be realized if the SCARP IV project never were undertaken, but to a large measure full development is dependent on adequate water supplies. Thus part of this increase can rightly be attributed to the SCARP IV project.

(iii) Benefits are calculated to include a nominal return of Rs. 16 per acrefoot of water which Tipton and Kalmbach estimates will be available from export of river water downstream during the rabi season. They estimate that 238,000 acrefeet will be exported downstream during May and October, but this is excluded from the benefit calculation.

(iv) Benefits are calculated to include additional water, drainage and full development plus exported water.

The first and second benefit cash flows plus $800,000 per annum for exported water are calculated as the third and fourth alternative. Table 11 summarizes the data used in calculating benefits realized from current conditions with additional water and drainage, and future conditions after full development.

3. Benefit/Cost Ratios and Internal Rate of Return

The benefit/cost ratios resulting from the four alternative calculations of benefit are summarized as follows:

Alternative	Benefit/Cost
1. Additional water and drainage only	2.4/1
2. Additional water, drainage and full development	4.1/1
3. Additional water and drainage plus exported water	2.6/1
4. Additional water, drainage and full development plus exported water	4.3/1

The true benefit/cost ratio lies somewhere between these values, depending on what part of the benefits from full agricultural development are attributed to the availability of sufficient water.

Internal rate of return is calculated for the alternatives without exported water.

Alternative	Internal Rate of Return
1. Additional water and drainage only	22%
2. Additional water, drainage and full development	27%

Exhibit 2 sets forth the detailed calculation of these figures.

4. Private Tubewell Development

The question of private versus public tubewell development has been given considerable publicity and is regarded in some quarters as a major issue. In a capital-scarce environment, it is generally felt public funds should not replace private investment. The GOP in its revised Third Plan

TABLE 11

CROPS, ACREAGES, CROP YIELDS, AND NET RETURN TO LAND AND FAMILY LABOR FOR CURRENT AND FUTURE

Crop	Current Harvested Acres	Future with Project Harvested Acres	Current			Future with Project Water Reclamation & Drainage			Future with Full Project Development		
			Unit Yield (Mds.) 1/	Net Unit Return (Rs.)	Net Return (Thousands of Rs.)	Unit Yield (Mds.)	Unit Net Return (Rs.)	Net Return (Thousands of Rs.)	Unit Yield (Mds.)	Net Unit Return (Rs.)	Net Return (Thousands of Rs.)
Rice 2/	216,623	177,845	20	113	24,478	22	163	28,989	35	268	47,662
Sugar Cane	24,069	46,801	30	- 16	- 385	33	113	5,289	75	585	27,379
Cotton	19,369	56,162	6	3	58	7	56	3,145	15	195	10,952
Maize	12,703	34,767	12	59	749	13	95	3,303	30	214	7,440
Millets	18,052	34,767	7	- 11	- 199	7	10	348	15	88	3,059
Fooder	21,395	81,568	-	145	3,102	-	175	14,274	-	277	22,594
Wheat	177,845	256,739	11	3	534	11	36	9,243	30	276	70,860
Pulses	6,017	47,470	10	41	247	11	81	3,845	20	233	11,061
Oilseeds	8,023	32,092	6	25	201	6	51	1,637	15	232	7,445
Berseem	76,784	117,093	-	350	26,874	-	415	48,556	-	428	50,077
Vegatables	4,680	26,744	-	436	2,040	-	541	14,469	-	578	15,458
Fruit	1,337	9,360	-	690	923	-	813	7,610	-	1,061	9,931
Juice	5,349	21,395	-	- 11	- 59	-	18	385	-	49	1,048
Sub-Total	592,266	942,713			58,563			141,093			284,966
Less:											
Government Share of Fertilizer Costs					425			645			27,997
Government Share of Plant Protection Costs					287			394			5,656
Canal Water Charges 3/					-			2,693			2,693
Net Value (thousands of Rupees)					57,851			137,361			248,620

Notes: 1/ One mound (md) = 82.3 lbs.
2/ Unit values on basis of paddy
3/ Current canal water charges included in production costs for current situation; not included in production costs for future situations, but deducted from sub-total net return on basis of current total canal water charges.

reconciles the issue by including as an objective "the maximization of the relatively easy development of sweet ground water in the Province (West Pakistan) through an expanded and integrated public and private tubewell programme." The Plan states further, "Construction of private tubewells has been accelerating rapidly and it is now estimated to be running at 6,500 per year. It is proposed to give the development of private tubewells every assistance... With such assistance, some 40,000 new tubewells can be expected during the Third Plan period. The development of those private tubewells will proceed side by side with the development of the public tubewells, areas for each being determined with phased priorities. To achieve the maximum [illegible] care will be taken that the public programme is [illegible] flexible to minimize adverse effects on private development. Care will also be taken to ensure that the private development does not lead to a less than optimal ultimate development of the Basin, to an inefficient use of public resources or to major social inequities. This new strategy has the great advantage of mobilizing the [illegible] resources of individual farmers to supplement the resources and skills of the public agencies".

Based on the Thipton and Kalnbach 1967 SCARP IV Report, there were approximately [illegible] 30 private tubewells in the Upper Rechna area in 1967. These tubewells serviced 45 to 250 harvested acres each, as compared with an average 940 harvested acres to be serviced by each tubewell in this project. Private development in the Upper Chenab area is not a feasible alternative for the following reasons:

a. The investment costs of [illegible] electrifying the area for private tubewells would [illegible] the total costs of the public project (tubewell installation and electrification).

b. Private tubewell development has been concentrated in specific areas in the SCARP IV area which include (a) cultivation of high value, (b) high water-use crops, and (c) above average size of farm holdings. Within the SCARP IV area, the eastern sector meets these criteria and is left for further private tubewell development. It is Thipton and Kalnbach's opinion, supported by A.I.D., that private development would proceed at a much slower pace than a public project in the project area. Even assuming that private development would be less costly than public development (which it does not), the economic benefits from tubewell development of the project area are so great as to preclude acceptance of an alternative which would delay these benefits for many years.

c. Tubewells in this Unit will be required to replace about 238,000 A.F. of canal water exported to other areas with unfavorable supplies. Problems of implementing and coordinating this replacement scheme with private wells would be difficult if not impossible.

For these reasons, public development of the project area is the only acceptable approach being considered by the GOP, and its consultants Tipton and Kalmbach. A. I. D. strongly supports this approach. As indicated in the section describing the History of the Loan Application, every effort has been made to maximize the role of private tubewells in SCARP IV. The conditions extant in the Upper Chenab Unit, described in this section, however, point to the wisdom of public development of the project area and this decision appears consistent with the strategy for public-private development outlined in the Third Plan document. Consequently, the private tubewell question is not regarded as an issue in the project area to be financed from this loan.

C. CONCLUSIONS

The benefit/cost and internal rate of return analyses fully justify the project from an economic standpoint. While economic benefits would undoubtedly result from private tubewell development of the area, the special conditions extant in the Upper Chenab Unit and the additional benefits to be derived from the export of water justify A.I.D. support of this project in the public sector.

VIII. IMPLEMENTATION PLAN

A. TIME SCHEDULE

The time schedule prepared by Tipton and Kalmbach and presented on the following page indicates that engineering, procurement and construction of the project will take about three years from the date a loan agreement is signed. If the loan is authorized in May/June 1967, it should be possible to execute a loan agreement within the next quarter. Project completion should then be possible by December 1970. A schedule for disbursement is set forth in Section VI.

B. CONSULTING SERVICES

The project feasibility was studied by Tipton and Kalmbach, Inc., Denver, Colorado. The firm has made similar studies for the three previous SCARPs and has prepared the designs and specifications and supervised construction. It is expected that the firm will operate in a similar capacity on the SCARP IV areas. Under its existing contract with WAPDA prior studies were carried out under funds provided by AID loans No. 391-L-069 and 391-H-137 for general investigations and consulting services. The costs for the preparations of designs and specifications and for supervision of construction for this project are to be provided from funds made available under this loan.

Preparation of designs, specifications and supervision of construction for the power system serving the tubewells in previous SCARPs has been done through a variety of consultants. Most recent assignment was SCARP II-A to Commonwealth Associates of Jackson, Michigan. Contracts are handled by the Power Wing of WAPDA who has furnished the consultant with personnel for carrying out the work.

As mentioned in Section IV, timely execution of the electrification phases of prior SCARPs has been a problem. With respect to SCARP II-A the consulting services contract with Commonwealth Associates was not signed until 14 months after the loan agreement was signed. On SCARP II-B, although the loan agreement was signed in December 1966, a contract for services of an electrification consultant has not yet been finalized. This topic will be fully discussed with WAPDA during the course of negotiations on the loan agreement, and satisfactory deadlines for signing the consulting services contract for electrification will be prescribed as a condition precedent to the loan. WAPDA will be notified of this in a timely manner to encourage them to expedite their negotiations with the electrification consultants.

Project Schedule

UPPER CHENAB UNIT - SCARP NO. IV

ITEM	YEAR			
	1967/68	1968/69	1969/70	1970/71
TUBEWELLS				
PROJECT PREPARATION				
CONSTRUCTION				
ELECTRIFICATION				
PROJECT PREPARATION				
SURVEY, PROCUREMENT AND CONSTRUCTION				

NOTE: Upper Chenab Unit consists of 1052 tubewells commissioned and electrified.

C. CONSTRUCTION SERVICES

1. Tubewells

In the construction of tubewells WAPDA expects to make maximum use of local contractors. In SCARP III-B approximately 200 tubewells have been reserved for construction by local contractors. These contractors will have had some experience in the construction, and will have trained workers and some equipment to contribute to the project. WAPDA will select the local contractors from their experience records and past performance. These contractors will need foreign-made drilling and transportation equipment which will be procured by WAPDA from the loan and turned over to the contractors. Well and pump parts which are not available locally will likewise be provided by WAPDA from the loan. Under this arrangement construction equipment procured for and utilized on the job would become the property of the local contractor. WADPA, however, intends to safeguard its and U.S. interests in this respect by inclusion of an equipment and material escape clause to become operable if the contractor does not complete the job in substantial conformance with the contract. One or more local contractors will be selected.

The remaining 800 or so tubewells would be provided by a U.S. contractor (s), based on competitive bidding. The selected contractor(s) would be responsible for all phases of work including procurement of construction and/or installed equipment, construction of wells and installation of pumps and motors.

2. Electric Power Facilities

Electrical power facilities required to serve the project include additional substation equipment of the 132 KV primary grid; 66 KV transmission lines and 66/11 KV substations; 11 KV distribution lines and 11000/400 V-3 phase transformers and meters. It is planned that work at the 132 KV sub-stations be switchgear and appurtenant equipment will be financed from the loan. All other facilities will be provided by contracts issued to local contractors on a competitive basis for furnishing and installing all equipment. WAPDA will arrange all letters of credit for foreign purchased equipment.

D. PROCUREMENT OF EQUIPMENT AND MATERIALS

Equipment and materials will be purchased locally to the extent available. Items not available from local supply sources will be purchased from U.S. suppliers under letters of credit made available under the loan.

Foreign contractors engaged on tubewell construction will be expected to furnish all supplies, equipment and materials necessary to their operation and for permanent installation. Acquisition of all items and of manpower will be the responsibility of the contractor. Local contractors employed in tubewell installation will be required to furnish all items which are available on the local market. Installation and equipment items which are not available locally will be procured from U. S. suppliers and made available to contractors, under letters of credit issued by WAPDA to the U. S. suppliers from funds provided by this loan.

For contractors on electrification works procurement of materials, supplies and installed equipment will be the responsibility of the local contractors, with WAPDA making necessary arrangements for imported items.

E. CONDITIONS AND COVENANTS

A.I.D. proposes to include the following non-standard conditions precedent in the Loan Agreement:

1. Borrower to name the agency which will be responsible for operating and maintaining SCARP IV;

2. Borrower to submit plans satisfactory to A.I.D. for operation and maintenance of SCARP IV;

3. Borrower to submit evidence satisfactory to A.I.D. that all phases of project engineering and construction will be completed in a timely manner, including electrification works;and

4. Borrower to submit evidence satisfactory to A.I.D. that provision has been made for construction and/or rehabilitation of all ancillary works necessary to incorporate the pumped water with the available canal surface waters and that execution of these works will be carried out in coordination with the progressive completion of contract items at each pump location. Borrower also to submit plans satisfactory to A.I.D. for the rehabilitation and maintenance of the entire water distribution system down to and including the water-courses leading to the farms. These plans shall include not only the cleaning and repairing of the ditches but also the provision of gates and other water control equipment to permit efficient handling of the water.

The following convenants will be included in the Loan Agreement:

1. Borrower to review water user rates generally with a view of ensuring that rates for sale of water are set at levels appropriate to the increased income of users and that projects such as the project being financed from this loan can cover their operating costs and amortize their capital cost out of revenues earned by the projects.

2. Borrower to ensure that adequate training programs exist within the agencies of the West Pakistan provincial government so that the operating agency that is assigned the responsiblity of operating the project financed by this loan will have sufficient, well-trained personnel capable of handling all aspects of the operation of the project.

IX. MISCELLANEOUS

A. IMPACT ON U.S. ECONOMY

The initial effect of this loan will be to establish a demand on U. S. industry for equipment and transportation items for tubewell installations and electrification of tubewells. Imported spare parts requirements are expected to be minimal as most permanently installed equipment is expected to be of local manufacture and no funds are being provided under this loan for that purpose. U. S. personnel would be employed in providing engineering services for the project.

It is not expected that the project will impact any of its products in the foreseeable future and will not enter the world market in competition with U. S. products. The tubewell water will be absorbed in the local domestic market filling the food and textile needs of the indigenous population. There has been some apprehension that a further small increase in cotton production might result as a result of the SCARPs. Experience to date in the operating SCARPs does not support this contention. The cropping pattern forecast for the project predicts 56,000 acres, or 6 percent, of the project area will be devoted to cotton growing. At the outset this would yield about 22,000 bales of long fiber cotton which could be comfortably absorbed in the local market. The Government of Pakistan hopes to be in a position to export one million bales of long fiber cotton in 1970. If this export target is achieved, which seems highly unlikely (current exports are in the order of 250,000 bales) and assuming the 1960-61 ratio of very short ("dead" valley) to short and short-medium would apply, only 60 percent or 600,000 bales of the export would enter the world market in competition with U. S. cotton.

B. REPAYMENT PROSPECTS

The Borrower will be the Government of Pakistan and the implementing agency the West Pakistan Water and Power Development Authority (WAPDA). It will be the obligation of the GOP to make interest and principal payments on this loan to A.I. D.

An assessment of Pakistan's external debt position and prospects leads us to share the view of other observers, including the IBRD, that Pakistan can support additional debt as long as the blend of terms continues to be soft. Pakistan's external public debt amounted to less than $200 million at the end of the First Plan. By June 1966, Pakistan had received long and medium term loan aid commitments or contracted for loan aid totaling $2.4 billion requiring service in foreign exchange, of which $1.3 billion had actually been disbursed and was subject to such debt service as specified by the loan terms. The service on this debt calls for about $110. 5 million in 1967, of which $16 million is for privately placed debt and the balance of $95 million is for publicly placed debt. This service is equivalent to about 12-14 percent of prospective foreign exchange earnings. During FY 1967 Pakistan has been offered about $600 million of additional credits and

expects disbursements of about $500 million. If Pakistan's additional requirements for foreign capital are met on the existing average terms (after adjusting for recent changes in the rates of interest and terms of payment from some sources) its debt service on long and medium term debt will probably average over $200 million a year for the Fourth Plan. However, if earnings of foreign exchange continue to rise by 10 percent a year for the balance of the Third Plan and in a range of at least 7-10 percent thereafter, the foreseeable debt service should remain within the range of 15-20 percent of earnings for the next decade. Even if every effort is made to sustain the good export performance there remain uncertainties outside Pakistan's control, such as the future of jute, on which its foreign exchange earnings are heavily dependent. It would, therefore, not be prudent to propose any significant hardening of terms at present. Although Pakistan can continue to accept some debt on conventional terms, its ability to do so depends on a degree of continuity in such relations and on the availability of the bulk of its requirements on soft terms.

We consider that Pakistan's favorable development prospects support its long term capability to repay debt on the scale and terms projected. It is the judgment of A.I.D. that there is a reasonable prospect of repayment of this loan under the terms and conditions being recommended.

X. CONCLUSIONS AND RECOMMENDATIONS

In this paper A.I.D. has concluded in the foregoing sections that:

1. The SCARP program can be of crucial assistance to Pakistan in its efforts to achieve self-sufficiency in food by 1970 and that the results achieved in previous SCARPs justify A.I.D. giving serious consideration to a loan for the project in SCARP IV.

2. The SCARP IV is feasible from an engineering standpoint, and, as designed, will furnish the necessary additional irrigation water required to establish and maintain a cropping intensity of 150 percent.

3. The power situation in West Pakistan will affect the SCARP IV but that projected deficiencies in crop water requirements due to power shortages are within good design limits of water projects.

4. The present lack of resolution on the issue of operating responsibility for the facilities being built under the SCARP loans should not prevent favorable consideration of this loan since steps are being taken which should produce a timely solution to the problem.

5. The existing water distribution system, into which the well water will be pumped, is in poor condition and is obsolete in some respects. This results in some wasteage of water (both pumped and from surface sources). Rehabilitation and modernization is desirable for maximum effectiveness but not essential to the justification for the project.

6. The project is financially feasible. Costs are realistic and farmers can easily pay for the cost of water at the present rates or at substantially increased rates. The cash flow analysis indicates the project can be operated satisfactorily from a financial standpoint.

7. The question of water rates should be reviewed by the GOWP to achieve a self supporting basis for this and other SCARP projects.

8. The project is economically very attractive.

9. The implementation plan is sound in light of experience on previous SCARPs.

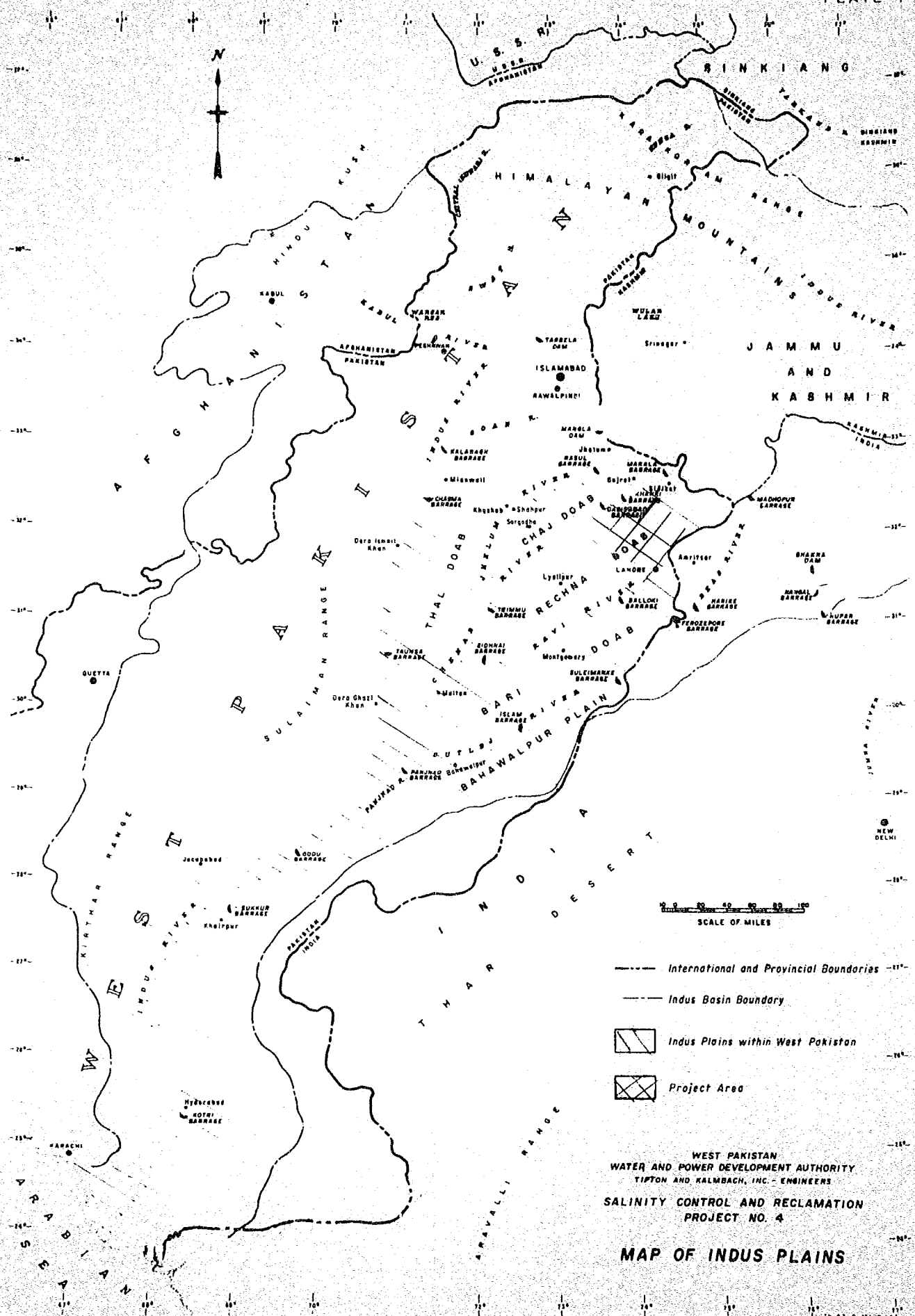
10. WAPDA has made satisfactory use of previous A.I.D. assistance.

11. There is reasonable expectation that the loan can be repaid under the terms and conditions recommended.

12. As shown in Annex III, all A.I.D. statutory criteria have been met.

In view of the foregoing, we recommend authorization of a loan of $10.7 million to the GOP subject to the terms and conditions outlined in Section VIII, D., page 46.

PLATE I

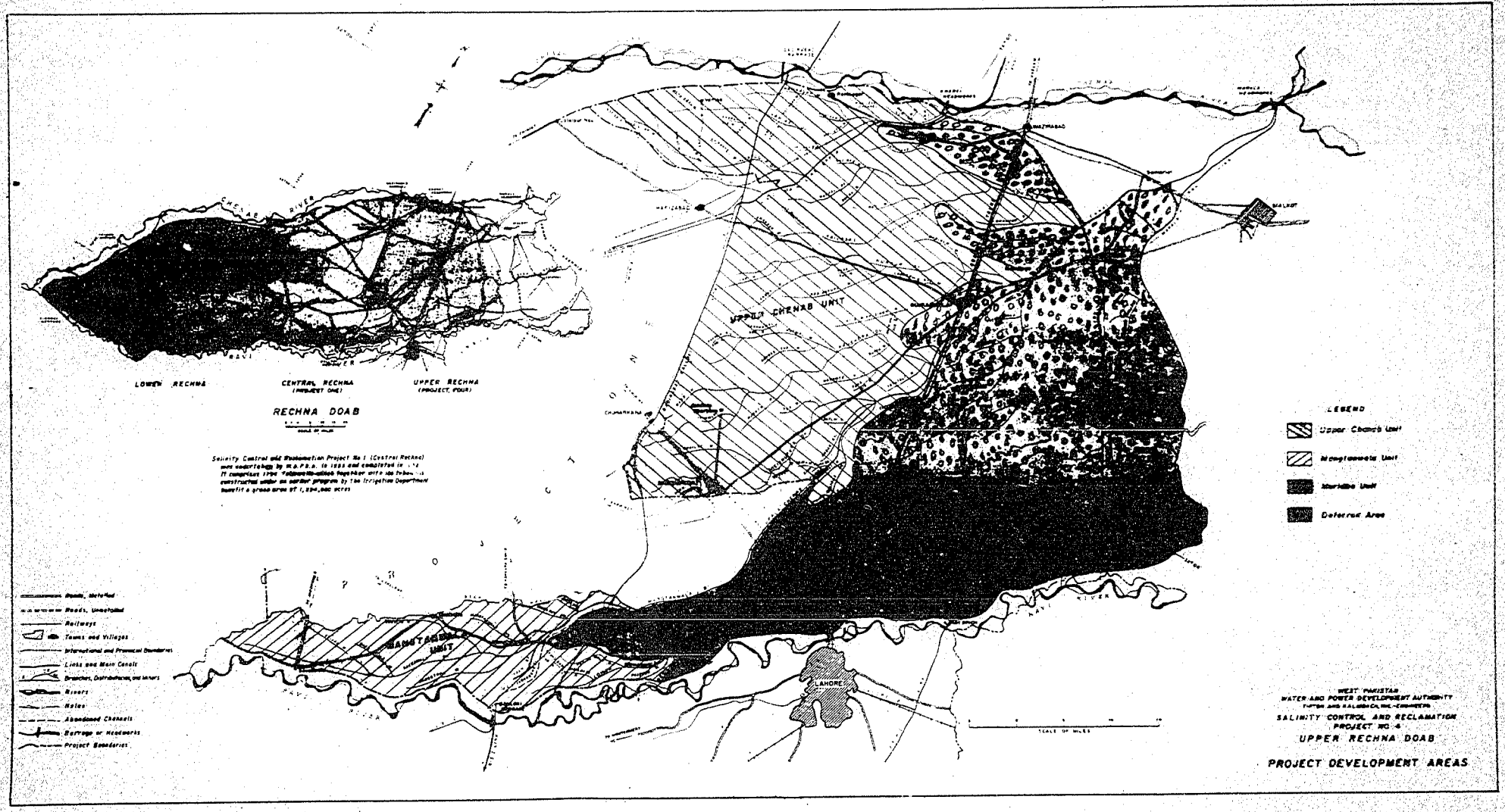


WEST PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY
TIPTON AND KALMBACH, INC. - ENGINEERS

SALINITY CONTROL AND RECLAMATION
PROJECT NO. 4

MAP OF INDUS PLAINS

PLATE 2


LOWER RECHNA
CENTRAL RECHNA
(PROJECT ONE)
UPPER RECHNA
(PROJECT FOUR)
RECHNA DOAB
UPPER CHENAB UNIT
MANGLA
LAHORE
LEGEND
Upper Chenab Unit
Mangla Unit
Waterlogged Unit
Deferred Area
Roads, Metalled
Roads, Unmetalled
Railways
Towns and Villages
International and Provincial Boundaries
Links and Main Canals
Branches, Distributaries and Minors
Rivers
Nullas
Abandoned Channels
Barrage or Headworks
Project Boundaries
WEST PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY
SALINITY CONTROL AND RECLAMATION
PROJECT NO. 4
UPPER RECHNA DOAB
PROJECT DEVELOPMENT AREAS

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1967 (IN MEGAWATTS)

EXHIBIT 1

NORTH ZONE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Peak Pumping Load	150	106	90	137	132	162	102	133	153	143	137	178
Peak Base Load	395	395	410	430	430	415	435	455	465	465	475	475
Total Peak Load	545	501	500	567	562	577	537	588	618	608	612	653
Hydro Capability												
Canal Plants	68	59	49	55	52	84	92	86	84	84	84	84
Warsak	100	100	100	100	100	100	160	160	160	160	160	160
Mangla	0	0	0	0	0	0	0	0	0	237	264	268
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	168	159	149	155	152	184	252	246	244	481	508	512
Hydro Plant Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Available Hydro Capability	168	159	149	155	152	184	252	246	244	481	508	512
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	377	342	351	412	410	393	285	342	374	127	104	141
Thermal Capacity	287	287	287	287	287	287	287	350	413	413	413	413
Thermal Plant Maintenance	0	0	0	0	0	0	0	0	63	63	63	0
Available Thermal Capacity	287	287	287	287	287	287	287	350	350	350	350	413
Total Available Capacity	455	446	436	442	439	471	539	596	594	831	858	925
Capacity Reserve-N.Zone	- 90	- 55	- 64	-125	-123	-106	2	8	- 24	223	246	272
1/ Thermal Transfer Capacity S.Zone	9	- 13	12	38	34	49	55	41	52	47	46	51
SOUTH ZONE(EXCLUDING KARACHI)												
Peak Pumping Load	15	15	12	9	12	9	2	2	4	8	8	2
Peak Base Load	48	45	48	49	50	50	51	51	52	53	54	55
Total Peak Load	63	60	60	58	62	59	53	53	56	61	62	57
Thermal Capacity	72	72	72	96	96	108	108	108	108	108	108	108
Thermal Plant Maintenance	0	25	0	0	0	0	0	14	0	0	0	0
Available Thermal Capacity	72	47	72	96	96	108	108	94	108	108	108	108
Capacity Reserve	9	- 13	12	38	34	49	55	41	52	47	46	51
1/ Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

1/ Theoretical only. No transmission interconnection exists between North and South Zones.

AID-ILC/P-579
EXHIBIT 1
May 26, 1967

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1968 (IN MEGAWATTS)

NORTH ZONE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Peak Pumping Load	209	157	122	166	171	212	106	145	185	165	162	221
Peak Base Load	455	450	460	475	475	455	485	500	510	510	525	525
Total Peak Load	664	[illegible]	582	641	646	667	591	645	695	675	687	746
Hydro Capability												
Canal Plants	74	66	56	55	63	71	84	86	84	84	84	84
Warsak	100	100	100	100	100	100	160	160	160	160	160	160
Mangla	258	237	218	200	175	137	219	260	290	350	385	404
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	432	403	374	355	338	308	463	506	534	594	629	648
Hydro Plant Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Available Hydro Capability	432	403	374	355	338	308	463	506	534	594	629	648
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	232	204	208	286	308	359	128	139	161	81	58	98
Thermal Capacity	413	413	413	425	440	454	468	468	468	468	468	468
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	350	350	350	425	440	454	439	439	405	405	405	442
Total Available Capacity	782	753	724	780	778	762	902	945	939	999	1034	1090
Capacity Reserve-N.Zone	118	146	142	139	132	95	311	300	244	324	347	344
1/ Thermal Transfer Capacity S.Zone	- 11	1	31	27	37	54	88	58	75	72	73	81
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	30	23	18	21	25	21	2	2	13	15	13	3
Peak Base Load	59	56	59	60	60	61	61	63	63	64	65	67
Total Peak Load	89	79	77	81	85	82	63	65	76	79	78	70
Thermal Capacity	108	108	108	108	122	136	151	151	151	151	151	151
Thermal Plant Maintenance	30	28	0	0	0	0	0	28	0	0	0	0
Available Thermal Capacity	78	80	108	108	122	136	151	123	151	151	151	151
Capacity Reserve	- 11	1	31	27	37	54	88	58	75	72	73	81
1/ Hydro Transfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

1/ Theoretical only. No transmission interconnection exists between North and South Zones.

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1969 (IN MEGAWATTS)

EXHIBIT 1

NORTH ZONE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Peak Pumping Load	268	207	156	196	216	263	113	157	207	197	193	264
Peak Base Load	485	495	505	565	565	545	570	595	610	610	625	625
Total Peak Load	753	702	661	761	781	808	683	752	817	807	818	889
Hydro Capability												
Canal Plants	84	63	46	55	57	82	88	84	84	84	84	84
Warsak	100	100	100	100	100	100	160	160	160	160	160	160
Mangla	386	341	328	300	263	250	237	334	400	457	512	536
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	570	504	474	455	420	432	485	578	644	701	756	780
Hydro Plant Maintenance	0	113	0	100	0	0	0	0	0	0	0	0
Available Hydro Capability	570	391	474	355	420	432	485	578	644	701	756	780
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	183	311	187	406	361	376	198	174	173	106	62	109
Thermal Capacity	468	468	468	468	468	468	468	468	468	468	468	468
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	405	405	405	468	468	468	439	439	405	405	405	442
Total Available Capacity	975	796	879	823	888	900	924	1017	1049	1106	1161	1222
Capacity Reserve-N. Zone	222	94	218	62	107	92	241	265	232	299	343	333
1/ Thermal Transfer Capacity S.Zone	10	26	32	57	53	53	74	44	66	62	61	64
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	40	29	24	22	25	25	2	4	9	11	11	7
Peak Base Load	71	68	70	72	73	73	75	75	76	78	79	80
Total Peak Load	111	97	94	94	98	98	77	79	85	89	90	87
Thermal Capacity	151	151	151	151	151	151	151	151	151	151	151	151
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	0	0	0	0
Available Thermal Capacity	121	123	126	151	151	151	151	123	151	151	151	151
Capacity Reserve	10	26	32	57	53	53	74	44	66	62	61	64
1/ Hydro Transfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

1/ Theoretical only. No transmission interconnection exists between North and South Zones.

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1970 (IN MEGAWATTS)

NORTH ZONE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Peak Pumping Load	327	263	186	226	261	314	120	169	244	224	219	307
Peak Base Load	580	590	600	640	640	616	650	671	690	690	705	705
Total Peak Load	907	853	786	866	901	930	770	840	934	914	924	1012
Hydro Capability												
Canal Plants	82	72	42	48	66	82	86	84	84	84	84	84
Warsak	100	100	100	100	100	100	160	160	160	160	160	160
Mangla	515	474	436	400	350	249	237	334	398	457	512	671
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	697	646	578	548	516	431	483	578	642	701	756	915
Hydro Plant Maintenance	0	116	109	100	0	0	0	0	0	0	0	0
Available Hydro Capability	697	530	469	448	516	431	483	578	642	701	756	915
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	210	323	317	418	385	499	287	262	292	213	168	97
Thermal Capacity	471	471	471	471	471	471	471	471	471	471	471	471
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	408	408	408	471	471	471	442	442	408	408	408	445
Total Available Capacity	1105	938	877	919	987	902	925	1020	1050	1109	1164	1360
Capacity Reserve-N. Zone	198	85	91	53	86	- 28	155	180	116	195	240	348
1/ Thermal Transfer Capacity S. Zone	- 9	12	5	228	223	219	251	218	242	239	229	236
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	52	37	34	29	33	35	2	6	9	10	19	9
Peak Base Load	86	82	95	92	93	95	96	97	98	100	101	104
Total Peak Load	138	119	129	121	126	130	98	103	107	110	120	113
Thermal Capacity	159	159	159	349	349	349	349	349	349	349	349	349
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	0	0	0	0
Available Thermal Capacity	129	131	134	349	349	349	349	321	349	349	349	349
Capacity Reserve	- 9	12	5	228	223	219	251	218	242	239	229	236
1/ Hydro Transfer Capacity-N. Zone	0	0	0	0	0	0	0	0	0	0	0	0

1/ Theoretical only. No transmission interconnection exists between North and South Zones.

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1971 (IN MEGAWATTS.

EXHIBIT 1

NORTH ZONE	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Peak Pumping Load	386	314	216	254	304	363	125	179	279	249	243	348
Peak Base Load	680	685	682	717	717	690	726	754	774	774	790	790
Total Peak Load	1066	999	898	971	1021	1053	851	933	1053	1023	1033	1138
Hydro Capability												
Canal Plants	84	75	57	[illegible]	53	81	89	84	34	84	84	34
Warsak	100	100	100	100	100	100	160	160	160	160	160	160
Mangla	645	591	655	601	525	368	351	500	596	684	770	806
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	829	736	812	746	6[illegible]	5[illegible]	600	744	840	928	1014	1050
Hydro Plant Maintenance	0	11[illegible]	109	100	[illegible]	0	0	0	0	0	0	0
Available Hydro Capability	829	648	703	646	67[illegible]	5[illegible]	600	744	840	928	1014	1050
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	237	351	155	325	3[illegible]	[illegible]	251	189	213	95	19	88
Thermal Capacity	471	471	471	471	[illegible]	471	471	471	471	460	460	460
Thermal Plant Maintenance	63	63	62	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	408	408	408	471	471	471	442	442	408	397	397	434
Total Available Capacity	1237	1056	1111	[illegible]	1149	1[illegible]	042	1186	1248	1325	1411	1484
Capacity Reserve-N.Zone	171	57	213	[illegible]	[illegible]	[illegible]	191	253	195	302	378	346
1/ Thermal Transfer Capacity S.Zone	140	169	172	[illegible]	199	196	236	200	220	216	202	217
SOUTH ZONE(EXCLUDING KARACHI)												
Peak Pumping Load	69	47	43	38	43	44	3	9	16	18	30	13
Peak Base Load	110	105	109	107	107	109	110	112	113	115	117	119
Total Peak Load	179	152	152	145	150	153	113	121	129	133	147	132
Thermal Capacity	349	349	349	349	349	349	349	349	349	349	349	349
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	0	0	0	0
Available Thermal Capacity	319	321	324	349	349	349	349	321	349	349	349	349
Capacity Reserve	140	169	172	204	199	196	236	200	220	216	202	217
1/ Hydro Transfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

1/ Theoretical only. No transmission interconnection exists between North and South Zones.

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1972 (IN MEGAWATTS)

EXHIBIT I

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	443	363	244	244	307	362	128	192	314	284	283	388
Peak Base Load	736	745	762	800	800	770	810	840	860	860	880	880
Total Peak Load	1179	1108	1006	1044	1107	1132	938	1032	1174	1144	1163	1268
Hydro Capability												
Canal Plants	82	66	55	63	48	72	84	84	84	84	84	84
Warsak and Jomal	170	170	170	170	170	170	270	310	310	310	310	310
Mangla	772	710	655	601	526	369	350	500	596	684	769	806
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	1024	946	880	834	744	611	704	894	990	1078	1163	1200
Hydro Plant Maintenance	0	118	109	135	35	0	0	0	0	0	0	0
Available Hydro Capability	1024	828	771	699	709	611	704	894	990	1078	1163	1200
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	155	280	235	345	398	521	234	138	184	66	0	68
Thermal Capacity	456	456	456	456	456	456	456	456	456	456	456	456
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	393	393	393	456	456	456	427	427	393	393	393	430
Total Available Capacity	1417	1221	1164	1155	1165	1067	1131	1321	1383	1471	1556	1630
Capacity Reserve-N.Zone	238	113	158	111	58	-65	193	289	209	327	393	362
Thermal Transfer Capacity S.Zone	110	132	141	360	350	344	409	361	288	285	372	379
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	82	67	57	58	66	71	4	24	28	28	35	25
Peak Base Load	127	122	126	121	123	124	126	126	128	131	132	135
Total Peak Load	209	189	183	179	189	195	130	150	156	159	167	160
Thermal Capacity	349	349	349	539	539	539	539	539	539	539	539	539
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	95	95	0	0
Available Thermal Capacity	319	321	324	539	539	539	539	511	444	444	539	539
Capacity Reserve	110	132	141	360	350	344	409	361	288	285	372	379
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1972 (IN MEGAWATTS)

EXHIBIT 1

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
INTEGRATED SYSTEM												
Hydro to Load	1024	820	771	699	709	611	704	894	990	1078	1163	1200
Thermal to Load	364	469	418	524	587	716	364	288	340	225	167	228
Total Peak Load	1388	1287	1189	1223	1296	1327	1068	1182	1330	1303	1330	1428
Hydro Capability	1024	943	890	834	744	611	704	894	990	1078	1163	1200
Thermal Capacity	805	805	805	805	805	805	995	995	995	995	995	995
Total Capability	1829	1751	1685	1820	1730	1606	1699	1889	1985	2073	2158	2195
Plant Maintenance	93	209	107	135	35	0	29	57	158	158	63	26
Total Available Capability	1736	1542	1488	1684	1704	1606	1670	1832	1827	1915	2095	2169
Capacity Reserve-NW System	348	245	299	471	408	279	602	650	497	612	765	741

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1973 (IN MEGAWATTS)

EXHIBIT 1

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	510	417	272	282	300	455	142	219	364	317	337	439
Peak Base Load	820	830	850	890	890	860	900	930	955	955	980	980
Total Peak Load	1330	1247	1122	1172	1290	1315	1042	1149	1319	1272	1317	1419
Hydro Capability												
Canal Plants	80	50	51	45	44	73	82	84	84	84	84	84
Warsak and Gomal	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	774	710	655	603	526	360	350	500	596	685	769	806
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	1059	974	911	853	775	647	737	929	1025	1114	1198	1235
Hydro Plant Maintenance	0	110	109	135	35	0	0	0	0	0	0	0
Available Hydro Capability	1059	864	802	718	740	647	737	929	1025	1114	1198	1235
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	271	301	320	454	549	660	305	220	294	158	119	184
Thermal Capacity	456	456	456	456	456	456	456	456	456	456	456	456
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	393	393	393	456	456	456	427	427	393	393	393	430
Total Available Capacity	1452	1249	1195	1174	1196	1103	1164	1356	1418	1507	1591	1665
Capacity Reserve-N.Zone	122	2	73	2	-93	-212	122	207	99	235	274	246
Thermal Transfer Capacity	277	296	306	330	317	316	391	331	260	255	345	347
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	88	77	65	70	81	80	4	33	37	39	42	35
Peak Base Load	144	138	143	139	141	143	144	147	147	150	152	157
Total Peak Load	232	215	208	209	222	223	148	180	184	189	194	192
Thermal Capacity	539	539	539	539	539	539	539	539	539	539	539	539
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	95	95	0	0
Available Thermal Capacity	509	511	514	539	539	539	539	511	444	444	539	539
Capacity Reserve	277	296	306	330	317	316	391	331	260	255	345	347
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1973 (IN MEGAWATTS)

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	1050	876	802	718	740	647	737	929	1025	1114	1198	1235
Thermal to Load	503	586	528	663	771	891	453	400	478	347	313	376
Total Peak Load	1532	1462	1330	1381	1511	1538	1190	1329	1503	1461	1511	1611
Hydro Capability	1050	874	911	853	775	647	737	929	1025	1114	1198	1235
Thermal Capacity	995	995	995	995	995	995	995	995	995	995	995	995
Total Capability	2054	1869	1906	1848	1770	1642	1732	1924	2020	2109	2193	2230
Plant Maintenance	93	300	197	135	35	0	29	57	158	158	63	26
Total Available Capability	1961	1570	1709	1713	1735	1642	1703	1867	1862	1951	2130	2204
Capacity Reserve-INT System	399	208	379	332	224	104	513	538	359	490	619	593

EXHIBIT 1

COMPARISON OF PROJECTED NEW LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1974 (IN MEGAWATTS)

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	558	448	207	314	441	483	159	240	305	340	300	476
Peak Base Load	910	930	940	990	990	955	1000	1040	1070	1070	1000	1000
Total Peak Load	1468	1378	1237	1304	1431	1438	1159	1280	1465	1410	1470	1566
Hydro Capability												
Canal Plants	80	50	51	45	44	73	82	84	84	84	84	84
Warsak and Gomal	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	774	710	655	603	526	300	350	500	506	605	700	806
Tarbela	0	0	0	0	0	0	0	0	0	0	0	0
Total	1059	974	911	853	775	647	737	929	1025	1114	1100	1235
Hydro Plant Maintenance	0	110	100	135	35	0	0	0	0	0	0	0
Available Hydro Capability	1059	864	812	718	740	647	737	929	1025	1114	1108	1235
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	409	522	435	586	691	791	422	351	440	302	272	331
Thermal Capacity	456	456	456	456	456	456	456	456	456	456	456	456
Thermal Plant Maintenance	63	63	63	0	0	0	20	20	63	63	63	26
Available Thermal Capacity	393	393	393	456	456	456	427	427	393	393	393	430
Total Available Capacity	1452	1240	1105	1174	1196	1103	1164	1356	1418	1507	1501	1665
Capacity Reserve-N.Zone	-16	-120	-42	-130	-235	-335	5	-76	-47	91	121	99
Thermal Transfer Capacity	253	272	284	305	292	300	307	308	339	233	225	322
SOUTH ZONE (INCLUDING KARACHI)												
Peak Pumping Load	93	92	70	77	88	70	10	38	41	42	47	40
Peak Base Load	163	157	160	157	150	160	162	165	166	160	172	177
Total Peak Load	256	239	230	234	247	230	172	203	207	211	219	217
Thermal Capacity	530	530	530	530	530	530	530	530	530	530	530	539
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	0	95	95	0
Available Thermal Capacity	500	511	514	530	530	530	539	511	539	444	444	539
Capacity Reserve	253	272	284	305	292	300	367	308	332	233	225	322
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1974 (IN MEGAWATTS)

EXHIBIT 1

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	1059	856	802	718	740	647	737	929	1025	1114	1198	1235
Thermal to Load	665	761	665	820	938	1030	594	554	647	513	491	548
Total Peak Load	1724	1617	1467	1538	1678	1677	1331	1483	1672	1627	1689	1783
Hydro Capability	1059	974	911	853	775	647	737	929	1025	1114	1198	1235
Thermal Capacity	995	995	995	995	995	995	995	995	995	995	995	995
Total Capability	2054	1969	1906	1848	1770	1642	1732	1924	2020	2109	2193	2230
Plant Maintenance	93	200	197	135	35	0	29	57	63	158	158	26
Total Available Capability	1961	1769	1709	1713	1735	1642	1703	1867	1957	1951	2035	2204
Capacity Reserve-INT System	237	143	242	175	57	-35	372	384	285	324	346	421

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1975 (IN MEGAWATTS)

EXHIBIT 1

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	626	514	336	336	459	521	168	268	460	384	454	560
Peak Base Load	1015	1035	1070	1050	1050	1010	1060	1100	1130	1130	1150	1150
Total Peak Load	1641	1549	1406	1386	1509	1531	1228	1368	1590	1514	1604	1710
Hydro Capability												
Canal Plants	70	59	40	55	52	84	78	84	84	84	84	84
Warsak and Gomal	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	774	710	655	603	526	369	350	500	596	685	769	806
Tarbela	0	0	0	0	0	0	0	0	298	386	402	404
Total	1058	974	900	863	783	658	733	929	1323	1500	1600	1639
Hydro Plant Maintenance	128	118	100	135	35	0	0	0	0	0	0	0
Available Hydro Capability	930	856	800	728	748	658	733	929	1323	1500	1600	1639
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	711	693	606	658	761	873	495	439	267	14	4	71
Thermal Capacity	456	456	456	456	456	456	456	456	456	456	456	456
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	393	393	393	456	456	456	427	427	393	393	393	430
Total Available Capacity	1323	1249	1193	1184	1204	1114	1160	1356	1716	1893	1993	2069
Capacity Reserve-N.Zone	-318	-300	-213	-202	-305	-417	-68	-12	126	379	389	359
Thermal Transfer Capacity S.Zone	227	246	258	292	283	279	345	286	215	209	202	203
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	99	89	76	71	77	80	12	40	43	45	49	42
Peak Base Load	183	176	180	176	179	180	182	185	186	190	193	199
Total Peak Load	282	265	256	247	256	260	194	225	229	235	242	241
Thermal Capacity	539	539	539	539	539	539	539	539	539	539	539	539
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	95	95	95	95
Available Thermal Capacity	509	511	514	539	539	539	539	511	444	444	444	444
Capacity Reserve	227	246	258	292	283	279	345	286	215	209	202	203
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1975 (IN MEGAWATTS)

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	930	856	800	728	748	658	733	929	1323	1500	1600	1639
Thermal to Load	993	958	862	905	1017	1133	689	664	496	249	246	312
Total Peak Load	1923	1814	1662	1633	1765	1791	1422	1593	1819	1749	1846	1951
Hydro Capability	1058	974	900	863	783	658	733	929	1323	1500	1600	1639
Thermal Capacity	995	995	995	995	995	995	995	995	995	995	995	995
Total Capability	2053	1969	1904	1858	1778	1653	1728	1924	2318	2495	2595	2634
Plant Maintenance	221	209	197	135	35	0	29	57	158	158	158	121
Total Available Capability	1832	1760	1707	1723	1743	1653	1699	1867	2160	2337	2437	2513
Capacity Reserve-INT System	-91	-54	45	90	-22	-138	277	274	341	588	591	562

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1976 (IN MEGAWATTS)

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	602	540	367	366	502	577	173	307	525	420	524	636
Peak Base Load	1170	1099	1110	1170	1170	1130	1190	1230	1260	1260	1290	1290
Total Peak Load	1762	1639	1477	1536	1672	1707	1363	1537	1785	1680	1814	1926
Hydro Capability												
Canal Plants	84	60	53	53	48	93	81	84	84	84	84	84
Warsak and Canal	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	774	710	655	603	526	369	350	500	596	605	769	806
Tarbela	396	571	534	482	406	306	286	348	595	770	800	807
Total	1459	1546	1447	1343	1185	973	1022	1277	1620	1804	1998	2042
Hydro Plant Maintenance	128	308	291	295	35	0	0	0	0	0	0	0
Available Hydro Capability	1331	1238	1156	1048	1150	973	1022	1277	1620	1804	1998	2042
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	204	184	116
Thermal Requirement	431	401	321	488	522	734	341	260	165	0	0	0
Thermal Capacity	456	456	456	456	456	456	456	456	456	456	456	456
Thermal Plant Maintenance	63	63	63	0	0	0	20	20	63	63	63	26
Available Thermal Capacity	393	393	393	456	456	456	427	427	393	393	393	430
Total Available Capacity	1724	1631	1549	1504	1606	1429	1449	1704	2013	2277	2391	2472
Capacity Reserve—N.Zone	-38	-8	72	-32	-66	-278	86	167	228	597	577	546
Thermal Transfer Capacity S.Zone	220	237	260	272	276	267	332	256	227	224	221	218

SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	84	78	63	72	68	74	4	49	5	8	7	5
Peak Base Load	205	196	191	195	195	198	203	206	212	212	216	221
Total Peak Load	289	274	254	267	263	272	207	255	217	220	223	226
Thermal Capacity	530	530	539	539	539	539	539	539	539	539	539	539
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	95	95	95	95
Available Thermal Capacity	500	511	514	539	539	539	539	511	444	444	444	444
Capacity Reserve	220	237	260	272	276	267	332	256	227	224	221	218
Hydrotransfer Capacity—N.Zone	0	0	0	0	0	0	0	0	0	204	184	116

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING DEC. 1976 (IN MEGAWATTS)

EXHIBIT 1

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	1331	1238	1156	1048	1150	973	1022	1277	1620	1884	1998	2042
Thermal to Load	720	675	575	755	785	1006	548	515	382	16	39	110
Total Peak Load	2051	1913	1731	1803	1935	1979	1570	1792	2002	1900	2037	2152
Hydro Capability	1459	1546	1447	1343	1185	973	1022	1277	1620	1884	1998	2042
Thermal Capacity	995	995	995	995	995	995	995	995	995	995	995	995
Total Capability	2454	2541	2442	2338	2180	1968	2017	2272	2615	2879	2993	3037
Plant Maintenance	221	399	379	295	35	0	29	57	158	158	158	121
Total Available Capability	2233	2142	2063	2043	2145	1968	1988	2215	2457	2721	2835	2916
Capacity Reserve-INT System	182	229	332	240	210	-11	418	423	455	821	798	764

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPACITY
WATER YEAR ENDING SEPT. 1977 (IN MEGAWATTS)

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	730	571	366	303	534	506	100	336	566	456	550	670
Peak Base Load	1200	1220	1244	1330	1330	1275	1340	1390	1425	1425	1460	1460
Total Peak Load	1930	1791	1610	1713	1864	1871	1520	1726	1991	1881	2010	2130
Hydro Capability												
Canal Plants	85	51	47	45	44	75	81	84	84	84	84	84
Warsak and Gomal	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	773	700	654	601	526	367	340	502	597	605	767	805
Tarbela	703	759	606	641	540	408	200	340	594	759	801	805
Total	1856	1722	1602	1492	1315	1055	1021	1279	1620	1873	1997	2039
Hydro Plant Maintenance	120	300	291	295	35	0	0	0	0	0	0	0
Available Hydro Capability	1720	1414	1311	1197	1280	1055	1021	1279	1620	1873	1997	2039
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	0	0	0
Thermal Requirement	210	377	299	516	584	816	499	447	371	8	21	91
Thermal Capacity	453	453	453	453	453	453	453	453	453	453	453	453
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	390	390	390	453	453	453	424	424	390	390	390	427
Total Available Capacity	2110	1804	1701	1650	1733	1508	1445	1703	2010	2263	2387	2466
Capacity Reserve-N.Zone	180	13	91	-63	-131	-363	-75	-23	19	382	369	336
Thermal Transfer Capacity S.Zone	147	165	174	193	190	189	251	146	144	136	133	128
SOUTH ZONE (INCLUDING KARACHI)												
Peak Pumping Load	100	100	92	102	104	102	37	111	39	42	42	40
Peak Base Load	220	221	223	219	220	223	226	229	231	236	239	246
Total Peak Load	337	321	315	321	324	325	263	340	270	278	281	286
Thermal Capacity	514	514	514	514	514	514	514	514	514	514	514	514
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	100	100	100	100
Available Thermal Capacity	484	486	489	514	514	514	514	486	414	414	414	414
Capacity Reserve	147	165	174	193	190	189	251	146	144	136	133	128
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	0	0	0

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1977 (IN MEGAWATTS)

EXHIBIT 1

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	1728	1414	1311	1197	1280	1055	1021	1279	1620	1873	1997	2039
Thermal to Load	547	698	614	837	908	1141	762	787	641	286	302	377
Total Peak Load	2275	2112	1295	2034	2188	2196	1783	2066	2261	2159	2299	2416
Hydro Capability	1856	1722	1602	1492	1315	1055	1021	1279	1620	1873	1997	2039
Thermal Capacity	967	967	967	967	967	967	967	967	967	967	967	967
Total Capability	2823	2689	2569	2459	2282	2022	1988	2246	2587	2840	2964	3006
Plant Maintenance	221	399	379	295	35	0	29	57	163	163	163	126
Total Available Capability	2602	2290	2190	2164	2247	2022	1959	2189	2424	2677	2801	2880
Capacity Reserve-INT System	327	178	265	130	59	-174	176	123	163	518	502	464

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1978 (IN MEGAWATTS)

NORTH ZONE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Peak Pumping Load	783	500	417	435	582	640	192	372	610	504	622	742
Peak Base Load	1360	1380	1410	1460	1460	1400	1475	1530	1570	1570	1605	1605
Total Peak Load	2143	1970	1827	1895	2042	2040	1667	1902	2180	2074	2227	2347
Hydro Capability												
Canal Plants	48	40	34	34	44	53	93	84	84	84	84	84
Warsak and Coral	205	205	205	205	205	205	305	345	345	345	345	345
Mangla	773	708	654	601	526	367	349	502	597	685	767	806
Tarbela	793	758	888	801	676	511	358	436	744	962	1003	1009
Total	1819	1711	1781	1641	1451	1136	1105	1367	1770	2076	2199	2244
Hydro Plant Maintenance	128	308	291	295	35	0	0	0	0	0	0	0
Available Hydro Capability	1601	1403	1490	1346	1416	1136	1105	1367	1770	2076	2199	2244
Hydro Transfer Capability	0	0	0	0	0	0	0	0	0	2	0	0
Thermal Requirement	452	567	337	549	626	904	562	535	410	0	28	103
Thermal Capacity	453	453	453	453	453	453	453	453	453	453	453	453
Thermal Plant Maintenance	63	63	63	0	0	0	29	29	63	63	63	26
Available Thermal Capacity	390	390	390	453	453	453	424	424	390	390	390	427
Total Available Capacity	2081	1793	1880	1799	1869	1589	1529	1791	2160	2466	2589	1671
Capacity Reserve-N.Zone	-62	-177	53	-96	-173	-451	-138	-111	-20	392	362	324
Thermal Transfer Capacity	101	126	142	168	160	173	220	90	104	95	93	92
SOUTH ZONE (EXCLUDING KARACHI)												
Peak Pumping Load	130	117	98	101	109	90	39	135	47	52	52	49
Peak Base Load	253	243	249	245	245	251	255	261	263	267	269	273
Total Peak Load	383	360	347	346	354	341	294	396	310	319	321	322
Thermal Capacity	514	514	514	514	514	514	514	514	514	514	514	514
Thermal Plant Maintenance	30	28	25	0	0	0	0	28	100	100	100	100
Available Thermal Capacity	484	486	489	514	514	514	514	486	414	414	414	414
Capacity Reserve	101	126	142	168	160	173	220	90	104	95	93	92
Hydrotransfer Capacity-N.Zone	0	0	0	0	0	0	0	0	0	2	0	0

EXHIBIT 1

COMPARISON OF PROJECTED PEAK LOADS AND GENERATING CAPABILITY
WATER YEAR ENDING SEPT. 1978 (IN MEGAWATTS)

INTEGRATED SYSTEM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP
Hydro to Load	1691	1403	1490	1346	1416	1136	1105	1367	1770	2076	2199	2244
Thermal to Load	835	927	684	895	980	1245	856	931	720	317	349	425
Total Peak Load	2526	2330	2174	2241	2396	2381	1961	2298	2490	2393	2548	2669
Hydro Capability	1819	1711	1781	1641	1451	1136	1105	1367	1770	2076	2199	2244
Thermal Capacity	967	967	967	967	967	967	967	967	967	967	967	967
Total Capability	2786	2678	2748	2608	2418	2103	2072	2334	2737	3043	3166	3211
Plant Maintenance	221	399	379	295	35	0	29	57	163	163	163.	126
Total Available Capability	2565	2279	2369	2313	2383	2103	2043	2277	2574	2880	3003	3085
Capacity Reserve-INT System	39	-51	195	72	-13	-278	82	-21	84	487	455	416

BENEFIT/COST AND INTERNAL RATE OF RETURN ANALYSIS

(in thousands of dollars)

Project Year	Year	CAPITAL INVESTMENT			ANNUAL COSTS				
		Reclamation		Electrification	O&M Tubewells	Cost of Power	Maintenance	Total Outlay	Total Outlays Discounted @ 8%
		Original	Replacement						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	1968	5,671		3,376			62	9,109	8,434
2	1969	8,135		5,105	179	233	125	13,827	11,334
3	1970	3,438		2,270	404	546	138	6,796	5,396
4	1971		46		558	1,156	138	1,898	1,395
5	1972		46		558	1,387	138	2,129	1,449
6	1973		46		558	1,618	138	2,360	1,487
7	1974		46		558	1,849	138	2,591	1,512
8	1975		46		558	1,977	138	2,719	1,469
9	1976		46		558	2,123	138	2,915	9,110
10	1977		46		558	2,123	138	2,915	
11	1978		46		558	2,123	138	2,915	
12	1979		46		558	2,123	138	2,915	
13	1980		46		558	2,123	138	2,915	
14	1981		46		558	2,123	138	2,915	
15	1982		46		558	2,123	138	2,915	
16	1983		46		558	2,123	138	2,915	
17	1984		46		558	2,123	138	2,915	
18	1985		5,944		558	2,123	138	8,859	2,217
19	1986		46		558	2,123	138	2,915	5,568
20	1987		46		558	2,123	138	2,915	
21	1988		46		558	2,123	138	2,915	
22	1989		46		558	2,123	138	2,915	
23	1990		46		558	2,173	138	2,915	
			46		558	2,173	138	2,915	
32	1999		46		558	2,173	138	2,915	
33	2000		5,944		558	2,173	138	8,859	699
34	2001		46		558	2,173	138	2,915	1,330
			46		558	2,173	138	2,915	
43	2010	Less Salvage (1,900)			558	2,173	138	1,015	37
									51,957

Total Outlays Discounted @ 8% = 51,957

Benefit/Cost Analysis

Year	Benefits Resulting Directly From Added Water & Drainage: Full value (10)	Disc.@ 8% (11)	Benefits Resulting From Full Development: Full Value (12)	Disc. 8% (13)	Columns (10) & (11) Plus Diverted Water: Full Value (14)	Disc. 8% (15)	Columns (12) & (13) Plus Diverted Water: Full Value (16)	Disc. 8% (17)
1968								
69								
70								
71	3,306	2,430	3,306	2,430	4,106	3,018	4,106	3,018
72	6,612	4,500	6,612	4,500	7,412	5,051	7,412	5,051
73	9,918	6,250	9,918	6,250	10,718	6,754	10,718	6,754
74	13,244	7,716	13,244	7,716	14,024	8,183	14,024	8,183
75	16,530	104,641	16,530	8,931	17,360	109,895	17,360	9,379
76	16,530		18,100	9,055	17,360		18,900	9,455
77	16,530		19,670	9,111	17,360		20,470	9,481
78	16,530		21,240	9,109	17,360		22,040	9,453
79	16,530		22,810	9,058	17,360		23,600	9,372
80	16,530		24,380	8,965	17,360		25,180	9,259
81	16,530		25,950	8,835	17,360		26,750	9,107
82	16,530		27,520	8,675	17,360		28,300	8,921
83	16,530		29,090	8,462	17,360		29,890	8,725
84	16,530		30,660	8,286	17,360		31,460	8,503
85	16,530		32,230	8,066	17,360		33,030	8,266
86	16,530		33,800	7,832	17,360		34,600	8,017
87	16,530		35,370	7,589	17,360		36,170	7,760
88	16,530		36,940	7,339	17,360		37,740	7,497
89	16,530		38,510	7,084	17,360		39,310	7,231
90	16,530		40,080	67,022	17,360		40,880	69,745
	16,530		40,080		17,360		40,880	
99	16,530		40,080		17,360		40,880	
2000	16,530		40,080		17,360		40,880	
2001	16,530		40,080		17,360		40,880	
	16,530		40,080		17,360		40,880	
2010	16,530		40,080		17,360		40,880	
Present Value Benefits		125,537		214,315		132,901		223,177
Present Value Cost (from Col. 9)		51,957		51,957		51,957		51,957
Benefit/Cost Ratio		2.4/1		4.1/1		2.6/1		4.3/1

(Spread by parts)

(Spread by parts)

(Spread by parts)

(Spread by parts)

Internal Rate of Return

Year	Benefits Resulting Directly From Added Water & Drainage Col.(10)-Col.(8)	Disc.@ 22%	Benefits Resulting From Full Development Col.(12)-Col.(8)	Disc.@ 27%
	(18)	(19)	(20)	(21)
1968	(9,109)	(7,466)	(9,109)	(7,169)
69	(13,827)	(9,290)	(13,827)	(8,573)
70	(6,798)	(3,744)	(6,798)	(3,317)
[illegible]	1,408	636	1,408	541
[illegible]	4,483	1,659	4,483	[illegible]
73	7,558	2,292	7,558	1,799
74	10,655	[illegible]	10,655	2,003
75	13,811	2,814	13,811	[illegible]
76	13,615	2,610	13,169	1,761
77	13,615	[illegible]	16,755	[illegible]
78	13,615	[illegible]	[illegible]	[illegible]
79	13,615	[illegible]	[illegible]	[illegible]
80	13,615	[illegible]	[illegible]	[illegible]
81	13,615	[illegible]	[illegible]	[illegible]
82	13,615	[illegible]	[illegible]	[illegible]
83	13,615	[illegible]	[illegible]	[illegible]
84	13,615	[illegible]	[illegible]	[illegible]
85	7,671	[illegible]	[illegible]	327
86	13,615	1,328	[illegible]	340
87	13,615	[illegible]	[illegible]	[illegible]
88	13,615	[illegible]	[illegible]	258
89	13,615	[illegible]	[illegible]	142
90	13,615	[illegible]	[illegible]	111
	13,615		[illegible]	
99	13,615	[illegible]	37,165	
2000	7,671	11	31,221	
2001	13,615	51	37,165	
	13,615		37,165	
2010	15,515	3	39,065	
	Totals:	(20,500)		(19,059)
		+20,267		+18,834

May 26, 1967

ACCOMPLISHMENTS IN SCARP I

A SCARP has the ultimate objective of increasing agricultural production. This requires in the final analysis the combined efforts of both the SCARP organization and the individual farm operator upon whom rests the responsibility of putting to productive uses the services afforded through the project. A SCARP endeavors to accomplish its objective through (1) lowering the ground water below the damaging level to lands and crops, and (2) providing additional irrigation water through pumping from the underground reservoir. Through the increased water supply the farm operator is able to [illegible] land areas and to [illegible] more intensive farming practices. Progress in the endeavors of both the project and the farm operator have been monitored and reviewed by various government agencies and related groups for the purpose of economic and technical evaluation of SCARP I. The results of these findings are given in part in the following paragraphs.

1. Waterlogging

At the time of construction of SCARP I [illegible], the depth to ground water was measured and recorded. Periodic [illegible] the water of [illegible] of the wells. The measurements taken during the period April - June 1965 are the most recent available at time of this writing. The table [illegible] when extracted from the [illegible]'s October 1[illegible] - [illegible] 1967 [illegible] lists the average depths ground water by [illegible] time of construction and during the period April to June 1965. The differences indicate an average lowering of ground water in the various parts of schemes from slightly less than 6 feet to over 12 feet with an average of [illegible] feet [illegible] inches. It is generally accepted that a depth of 10 feet would eliminate potential for damage by accumulation of salts through upward movement of ground water and that maximum utilization of ground water for irrigation under total SCARP development will occur at depths of 40 feet or more over a long period of years.

Sr. No.	Name of Scheme	Initial Static Water Level		Average [illegible] Water Level During the Month [illegible] 4/65-6/65		Decline of Water Table Between the Initial Testing and June 1965	
		Feet	Inches	Feet	Inches	Feet	Inches
1.	Khoso Sheikh	13	5	19	0	7	7
2.	Lurnwala	9	9	19	7	9	9
3.	Pinid Bhattian	16	11	21	1	-	-
4.	Hafizabad	9	5	15	0	9	6
5.	Khungah Dogran	6	11	1[illegible]	0	11	1
6.	Sangla Hill	7	7	19	10	12	2
7.	Shahkot	9	6	16	1	6	17
8.	Shadman-I	7	9	15	7	7	1
9.	Zafarwal	13	0	10	2	5	11
10.	Jaranwala	13	4	20	9	7	0
	Average	10	8	18	11	8	3

2. Reclamation

At the time of project construction there were 209,600 acres which had gone out of production and 215,000 acres which were considered affected to the extent of 20 percent or more. As of September 1965 the LWDB reports that 78,400 acres of the area gone out of production had been "brought back under reclamation" through leaching of salts in conjunction with introduction of crops having salt-resistent characteristics. The progress of reclamation to September 1965 is shown in Table 12 reproduced from the LWDB report.

3. Pumping

The historical use of project-pumped water in the area from 1961 to 1965 is shown in Table 13. Examination of the values indicates that pumps operate at a load factor of 52 to 75 percent during the Rabi season (October to May) and on a slightly greater load factor of 63 to 75 percent during the Kharif season (May to October). Annual pumping since complete implementation of project has been near 2.5 million acre feet. Though canal supplies are not as closely monitored, it is a reasonable conservative estimate that the pump water was more than double the canal supply. The impact of the increased water supply on farm production is illustrated in the following sections.

4. Increase in Production

Increase in agricultural production is not solely attributable to the project. Other inputs have been sufficient to achieve the production accomplishments reported in the LWDB report. Some of the principal non-project factors are such items as improved agricultural extension services, better seeds, insecticides and an increased supply of fertilizers. The increased production is the result of both increased per acre yields and increased acreages cultivated. The history of the increased per acre yields of major crops is recorded by LWDB in their annual report. Table 14 extracted from the 1964-65 report shows the progress made in increasing per acre yields of certain principal crops of the area.

The increase in acreage of principal crops for the period 1959 to 1965 is recorded by Harza Engineering Company International (Harza) in their Technical and Economic Appraisal Report of the Project. Table 15 listing acreages of each crop was taken from the Harza report. These increases were achieved despite two consecutive years of drought in West Pakistan.

5. Operating Problems

Historically the project area has been divided into twelve schemes (areas). Most of the information is gathered, assembled and reported by scheme areas. The number of tubewells, year of commissioning, capacities, and areas relative to each scheme are tabulated in Table 16. Some 247 wells in the Pindi Bhattian, Chuharkana, Chichoki Mallian, Shadman II and Jarnwala schemes were constructed between 1954 and 1960 and have internationally supplied equipment. Colombo Plan and FAO contributed to these efforts. The

TABLE 12

SCALE 1

PROGRESS REPORT OF THE REGLANATION OPERATION FOR THE PERIOD ENDING SEPTEMBER 30, 1968

S. No.	Name of Scheme	Gross Area	Culturable Area	Area zone out of cultivation	Area damaged to the extent of 20% or more	Total area affected	% age of area affected to the total area	Total area brought back under cultivation under the operation 1965	% age of area broken to the area zone out of cultivation Column 7 to 5	Area affected to the extent of 20% and more brought under Reclamation after the operation Column 7 to 8	% age area affected to the 20% and more brought under Reclamation Column 11 to 6	Total area brought under Reclamation Column 11	% age of area put Reclaimed to area affected Column 13 to 7	Total area Reclaimed	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Narse Shahi ..	26013	24021	26[illegible]	[illegible]	6[illegible]	99.17	2[illegible]	7[illegible]	1760	39.40	3797	56.06	620	
2	Doranwala ..	81[illegible]	75[illegible]	14[illegible]	10[illegible]	2[illegible]	35.[illegible]	[illegible]	43.[illegible]	6[illegible]	65.86	13135	53.26	—	
3	Pindi Bhaudin ..	[illegible]	7[illegible]	5	—	5[illegible]	19.03	5[illegible]	97.3[illegible]	—	—	5321	95.58	2009	
4	Hafizabad ..	171159	164047	47[illegible]	[illegible]	[illegible]	40.55	16[illegible]	37.5[illegible]	14[illegible]	57.47	30267	44.64	4770	
5	Khanqah Dogran	121619	11[illegible]	24[illegible]	[illegible]	[illegible]	42.[illegible]	6[illegible]	24.87	9[illegible]	39.15	15569	31.56	—	
6	Sangla Hill ..	15[illegible]71	12[illegible]	2[illegible]	[illegible]	4[illegible]	31.23	4[illegible]	29.[illegible]	20[illegible]	90.23	25154	57.13	—	
7	Sialkot ..	24[illegible]93	24[illegible]	2[illegible]	3[illegible]	6[illegible]	28.7	3[illegible]	16.67	5[illegible]	85.25	37524	60.56	—	
8	Chuharkana ..	10[illegible]	9955	3[illegible]	409	[illegible]	41.[illegible]	3[illegible]	81.13	[illegible]	100.00	3703	66.55	—	
9	Shadman ..	79[illegible]	74[illegible]	24[illegible]	[illegible]	3[illegible]	47.19	5[illegible]	28.[illegible]	10[illegible]	100.00	15320	43.60	—	
10	Chichoki Mallian ..	7122	6[illegible]	[illegible]	[illegible]	[illegible]	67.[illegible]	1[illegible]	50.20	[illegible]	100.00	2941	66.40	—	
11	Zafarwal ..	2[illegible]	2[illegible]	2[illegible]	[illegible]	85[illegible]	35.70	[illegible]	42.47	[illegible]	100.00	70316	82.24	—	
12	Jaranwala ..	[illegible]	[illegible]	1[illegible]	[illegible]	[illegible]	41.[illegible]	6[illegible]	61.67	[illegible]	75.00	26535	60.54	16134	
	Total ..	1[illegible]	1[illegible]	20.[illegible]	[illegible]	4[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	76.76%	[illegible]	62.18%	24621	

TABLE [illegible]

S C [illegible]

PUMPAGE AND UTILISATION FOR THE PERIOD
OCTOBER [illegible] SEPTEMBER [illegible]

1) Pumpage (Million Acre Feet)

YEAR	1961		1962	1962		1963	1963		1964	1964		1965
	Rabi 61-62	Kharif 1962	Total	Rabi 62-63	Kharif [illegible]	TOTAL	Rabi 63-64	Kharif 1963	Total	Rabi 64-65	Kharif 1965	Total
Installed	1.208	1.429	2.637	1.830	2.028	3.858	1.939	1.947	3.886	1.959	1.955	3.914
Pumpage	0.655	1.065	1.720	1.197	1.239	2.436	1.109	1.369	2.478	1.065	1.299	3.364

2) Percentage Utilisation

Percentage Utilisation	52.50	72.70	62.60	65.40	72.90	6[illegible].15	57.52	63.86	61.69	52.96	63.63	58.30

TABLE 5

AVERAGE YEAR YIELDS PER ACRE OF VARIOUS CROPS DURING THE PERIOD 1959-60 TO 1964-65

S.No.	Name of Crop	Average yield per acre in maunds				Increase in yield per acre over 1959-60		No. of plots harvested to obtain ave yield/acre in 1964-65
		1959-60	1962-63	1963-64	1964-65	In Maunds	Percentage	
1.	Wheat ..	8.66	8.55	10.12	13.77	5.11	50%	225
2.	Barley ..	6.15	7.74	9.00	9.20	3.05	50%	---
3.	Grams ..	5.95	8.25	8.30	8.80	2.85	48%	---
4.	Rice ..	10.55	12.75	13.32	16.50	5.95	57%	174
5.	Cotton ..	5.15	7.41	7.37	7.90	2.75	3%	75
6.	Sugarcane ..	26.35	31.43	30.50	40.10	13.75	52%	177
7.	Maize ..	8.65	10.37	10.62	12.00	3.15	36%	180

TABLE 1[illegible]

ACREAGES FOR DIFFERENT CROPS - SCARP I

Crops	1959-60 Acreage	1962-63 Acreage	1962-63 Percent Increase 1959-60	1963-64 Acreage	1963-64 Percent Increase 1959-60	1964-65 Acreage	1964-65 Percent Increase 1959-60
1	2	3	4	5	6	7	8
Rabi Crops							
Garden & Veg.	9,460	10,494	11	11,323	20	9,880	4
Oil Seeds	8,8[illegible]	13,460	52	14,525	64	39,052	340
Wheat	256,478	352,013	37	380,170	48	336,349	31
Barley	2,098	1,027	-51	1,165	-44	7,345	250
Gram	6,045	8,669	43	9,299	54	32,446	437
Fodder	121,314	168,022	39	181,[illegible]38	50	163,997	35
Misc.	19,358	29,201	51	31,513	63	49,694	157
Sub Total:	423,624	582,886	38	6[illegible],431	49	638,763	51
Kharif Crops							
Sugarcane	72,116	73,117	1	74,936	9	81,127	13
Rice	112,592	147,37[illegible]	31	157,235	40	162,310	44
Cotton	84,755	84,524	-(0)	91,203	8	87,143	3
Maize	60,197	52,813	-12	57,115	-5	57,997	-4
Bajra	28,414	21,559	-24	23,233	-18	24,312	-14
Kharif Fodder	65,544	103,231	57	111,465	70	130,548	99
Misc	65,600	75,171	15	81,211	78	72,287	59
Sub Total:	469,178	557,790	28	600,401	28	615,724	31
GRAND TOTAL	892,802	1,140,676	28	1,229,832	38	1,254,487	41

TABLE 15

BASIC DATA FOR GROUP I CANALIZED AREAS (SCHEMES)

Sr. No.	Name of Scheme	Total No. of Tubewells in Scheme	Commissioning, Date of	Installed Capacity (Cusecs)	Gross Area Acres	Culturable Area Acres
1.	Harse Sheikh	44	1960	188.50	26013	21921
2.	Bar[illegible]wala	120	1961	404.50	81124	75232
3.	Pindi Bhattian	21	1963	52.00	8305	7969
4.	Hafizabad	318	[illegible]	933.[illegible]	171100	164047
5.	Khanqah Dogran	209	1962	695.[illegible]	131810	114083
6.	Sangla Hill	293	[illegible]	633.00	138971	120592
7.	Shah[illegible]	384	[illegible]	[illegible]	247153	231387
8.	Chuhar[illegible]	24	[illegible]	48.00	10770	9355
9.	Shah[illegible] I Shah[illegible] II	94 50	[illegible] [illegible]	431.00	79252	74136
10.	Zafarwal	[illegible]	[illegible]	303.00	231900	228933
11.	Chichoki Malian	12	[illegible]	36.00	7122	6556
12.	Jaranwala	120	1960	[illegible]	93875	88335
	Total	2040		[illegible]	1,277,221	1,140,673

pump housing sections and the blank casing sections are of mild steel; the screen sections are either brass or coir type strainers; the deep well turbine pumps were manufactured by Bombra from Australia; and the motors are from Newman Motors of the United Kingdom. In the U.S. AID-financed installations (1704 tubewells) the tubewell casings are of mild steel. The turbine pumps are from Worthington Corporation, the motors from U.S. Motors Company, and the control panels from the Allen Bradley Company, all of the United States. Operational difficulties with the installations has centered principally around tubewell deterioration, motor burnouts, and supply problems related to the need for foreign exchange required to acquire a variety of spare parts from a number of manufacturers in various countries.

The tubewell deterioration results from [illegible] in soil locations undergoing rapid corrosion and incrustation processes which clog the screen openings and result in a loss in specific capacity of the well. The LWDB reports that 714 tubewells are extensively deteriorated and 81 seriously deteriorated, with 47 more approaching serious deterioration. The distribution of deteriorated wells [illegible] separate schemes is shown on Table 17. The causes of deterioration affecting mild steel have been extensively studied in the area by the LWDB under an AID technical assistance program and by other local [illegible]. As a result, for LWDB's constructed since 1964, WASA has adopted the policy of using fiberglass well casing and screens. Evidence to date, while not conclusive, gives great promise that this material will not be affected by corrosion and incrustation. It is the intent of [illegible] that fiberglass casing will be used in the Upper Chenab Unit. The remedial measures required for mild steel casing maintenance are not clearly defined. Some beneficial effects have been derived by blasting, acid treating and surging. This work was carried out by WAPDA in the earlier history of the project and is being done at present by the LWDB with the assistance of their consultants, the Parsons Corporation. In a few cases, the existing wells were replaced by new wells with brass strainers. Fiberglass casing on replacement wells have not been used as yet, but the LWDB is looking at the possibility of employing this material. As the material is not yet available on the local market, the delay by LWDB in adopting fiberglass has been due to the scarcity of foreign exchanges required to import the casings from abroad.

The abnormal number of motor burnouts has been investigated by various interested groups and found to be from numerous determined and undetermined causes. By far the greater percentage of motor burnouts has occured in the area of the older installations. Here it was found that the magnetic control switches have deteriorated to an extent that they fail to maintain contact. To keep pumps running, operators have been known to lock these switches in position, thereby nullifying the motor protection. The LWDB has launched a program to replace these switches with locally manufactured switches. An order has been placed for one hundred new units. In some cases, the cause of motor burnout is believed to have been caused by improper ventilation of motors due to clogging up

TABLE 17

TUBEWELL PROGRAMME PHASE I

(1964-65)

No.	Scheme Name	Tubewells Installed	Tubewells Commissioned	Tubewells in the Scheme: Positively Deteriorated	Approaching Serious Deterioration	Seriously Deteriorated
1.	Harse Sheikh	44	44	18	-	1
2.	Beranwala	180	188	11	-	1
3.	Pindi Bhattian	21	21	3	4	0
4.	Mahizabad	318	318	104	5	9
5.	Khanqah Dogran	209	209	15	-	-
6.	Bangla Hill	238	238	85	1	4
7.	Shahkot	384	383	113	7	2
8.	Shadman	145	143	100	18	8
9.	Chichoki Mallian	12	14	3	1	3
10.	Zafarwal	300	330	211	6	3
11.	Jaranwala	180	180	50	7	14
12.	Chuharkana	24	24	Data not available		
	Total	2,043	2,020	712	47	53
	Percentage			35.3%	2.4%	2.6%

of vent passages. A program has been launched to service, clean, and re-varnish motors. In other instances, motor burnouts are believed attributable to abnormalities in the power supply. Low voltage, single phasing and low power factors are believed to be contributing causes. Safety precautions against known causes are being built into the presently designed SCARPs by embedding thermo protection detectors in all three phases of motor windings. The Upper Chenab Unit will have this added motor protection.

To lessen the problem of spare parts supply within SCARP I, the U.S. has provided $475,000 under loan No. N-000 for spare parts and operation and maintenance equipment for U.S. supplied equipment. Further, development of local sources of replacement of electrical equipment for older installations has been initiated by LWDB. Both electric motors and pumping equipment of all but exceptionally large sizes is now being manufactured in Pakistan which are satisfactory for replacement and new SCARP construction as illustrated by their use in SCARP 11-A. Thus future supply problems have been generally reduced.

Some adverse effects on farm lands have been experienced in limited areas through the use of well water with too high salt content. This matter is being investigated at present by GOP and A.I.D. technicians. The use of gypsum as a soils amendment and the proper mixing of canal and pump water are under experimentation.

During the past six months, the project has been adversely affected by a power shortage caused by failure of one of WAPDA's major generating units. During this period, power was furnished generally during the off-peak night hours and resulted in a reduction of pumped water of some 50 percent as compared to a similar period in the previous year. The power supply is now relatively normal.

A basic operational problem confronting SCARP I has been the division of responsibility for management of water from surface and ground water sources between two departments which tends to produce duplication of personnel and support equipment, operational inflexibilities, and conflicts of interest.

These difficulties have been further aggravated by a lack of the associated environments existing in a fully developed area which go to support an undertaking such as a SCARP. Such items as communications, tubewell drilling and rehabilitating enterprises, reliable motor rewind shops and pump rebuilding machine shops have not been available to provide service to the operating agency. Because of this lack of supporting private industry, the operating agencies have been expected to perform maintenance which is not normally within the scope of work of such an organization. The SCARP I Directorate of LWDB is preparing to meet these

problems by establishing a well-equipped maintenance shop and warehouse installation for the maintenance of fixed pumping and transportation equipment. Training courses in maintenance are being given to employees. A.I.D. has supported the training program with a U.S. dollar loan (A.I.D. 391-H-060) and the maintenance facilities with a PL 480 rupee funds. As the nucleus of trained personnel increases and the facilities become operative it is expected that the maintenance service will be markedly improved. To date, however, significant results have not been achieved in these areas and a proposal is under consideration with the GOAP for additional training. It will be necessary to decide whether further assistance will be required.

In summary, experience on SCARP I demonstrates the significant benefits which can be derived from such schemes. It has also pointed up problem areas which responsible agencies are taking steps to remedy.

AID DLC/P-579

ANNEX II

AID 1210.1 (11-65)

May 26, 1967

CHECK LIST OF STATUTORY CRITERIA

Development Loan Fund

In the right-hand margin, summarize for each item the information or conclusion requested. As necessary, reference the section(s) of the Capital Assistance Paper, or other clearly identified and available document, in which the matter is further discussed. This form may be made a part of the Capital Assistance Paper.

The following abbreviations are used:

FAA - Foreign Assistance Act of 1961, as amended by the Foreign Assistance Act of 1966.

App. - Foreign Assistance and Related Agencies Appropriations Act, 1967.

1. FAA § 251. Conditions that have been or are being met so that loan proceeds are not used to meet balance of payments emergency purposes (military, balance of payments, or military purposes) or any other purpose not essential to the country's long-range economic development.	1. The loan proceeds will not be diverted to short-term uses but will be used for the engineering, and construction costs required for the development of tubewells in the Upper Rachna Doab region of Pakistan. See Section IV.
2. FAA § 102. Information on measures taken to utilize U. S. Government excess personal property in lieu of procurement of new items.	2. This is provided in the Loan Agreement.
3. FAA § 102. Information whether the country permits or fails to take adequate measures to prevent the damage or destruction, by mob action, of U. S. property.	3. Pakistan protects US property.
4. FAA § 201(b). Manner in which loan will promote country's economic development, emphasizing help for long range plans and programs designed to develop economic resources and increase productive capacities.	4. The loan will promote long range economic development of agriculture in West Pakistan. See Sections IV and VII.
5. FAA § 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within the United States.	5. This assistance is being provided under consortium arrangements. Subject to confirmation it is thought the Export-Import Bank would not consider this application. Section I.
6. FAA § 201(b)(2). Information and conclusion on activity's economic and technical soundness, including the capacity of the recipient country to repay the loan at a reasonable rate of interest.	6. The project is economically and technically sound. Pakistan should be able to repay the loan at the rate of interest provided therefor. Sections IV, VII and IX.

7. FAA §.201(b)(3). Information and conclusion on existence of reasonable promise activity will contribute to development of economic resources or increase of productive capacities.	7. The project will contribute to economic development by materially assisting agricultural development. See Section VII.
8. FAA §.201(b)(4). Information and conclusion on activity's relationship to other development activities, and its contribution to realizable long-range objectives.	8. The project will assist in Pakistan's efforts to become agriculturally self sufficient. See Section II and VII.
9. FAA §.201(b)(5). Country's self-help measures, including institution of Foreign Assistance Act investment guaranty programs.	9. Pakistan has instituted the A.I.D. Investment Guaranty Program with the exception of the war risks. The GOP will provide the necessary local currency for the Project and is supporting the Project with its own staff. Section VI.
10. FAA §.201(b)(6). Information and conclusion on possible effects on U. S. economy, with special reference to areas of substantial labor surplus.	10. Contracts for engineering and construction to be paid for under the loan will be with US firms.
11. FAA §.201(b)(7). Information and conclusion on the degree to which the country is making progress toward respect for the rule of law, freedom of expression and of the press, and recognition of the importance of individual freedom, initiative, and private enterprise.	11. Pakistan is making progress in this regard.
12. FAA §.201(b)(8). Information and conclusion on the degree to which the country is taking steps to improve its climate for private investment.	12. Pakistan encourages private investment.
13. FAA §.201(b)(9). Information and conclusion on whether or not the activity to be financed will contribute to the achievement of self-sustaining growth.	13. By providing basic agricultural needs the activity will encourage self-sustaining growth.
14. FAA §.201(b). Information on applicability of the ten-country ceiling.	14. This loan is authorized under the ten country limitation.
15. FAA §.201(b). Information and conclusion on reasonable prospects of repayment.	15. Pakistan is making a determined effort to develop its economy and become self-supporting, and there are reasonably good prospects for the repayment of the Loan. See Section IX.

16. FAA §.201(d). Information and conclusion legality (under laws of the country and t U. S.) and reasonableness of lending and relending terms.

17. FAA §.201(e). Information and conclusion availability of an application together wi sufficient information and assurances to indicate reasonably that funds will be used in an economically and technically sound manner.

18. FAA §.201(f). If a project, information and conclusion whether it will promote the economic development of the requesting country, taking into account the country's human and material resource requirements and the relationship between the ultimate objectives of the project and the country's overall economic development.

19. FAA §.201(f). If a project, information and conclusion whether it specifically provides for appropriate participation by private enterprise.

20. FAA §.202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources.

21. FAA §.281. Extent to which the loan will contribute to the objective of assuring maximum participation in the task of economic development on the part of the people of the developing countries, through the encouragement of democratic private and local governmental institutions.

22. FAA §.601(a). Information and conclusions whether loan will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry agriculture, and commerce; (f) strengthen free labor unions.

16. Lending and relending rates will be reasonable and legal under the laws ofthe U.S. and Pakistan. Relending terms will be approved by AID.

17. An application has been received with sufficient information to assure that the funds will be used in an economically and technically sound manner. See Sections IV and VII.

18. The project fulfills these objectives by providing support in an area basic to economic development. Sections II & VII.

19. Private US companies would provide the services and equipment to be provided under the loan. See Section VIII.

20. All services and goods financed from the loan will be procured from private sources in the US. See Section. VIII.

21. The project provides a basic requirement for economic development and will stimulate private and regional development.

22. (a) All services equipment, materials and services, financed from the loan would be procured in the US and result in increased trade between the US and Pakistan.
(b) Availability of water for agriculture will encourage private sector development.
(c) No direct effect.
(d) No direct effect.
(e) The loan should assist in improving the technical efficiency of agriculture.
(f) No effect.

23. FAA §.601(b). Information and conclusion on how the loan will encourage U. S. private trade and investment abroad, and how it will encourage private U. S. participation in foreign assistance programs (including use of private trade channels and the services of U. S. private enterprise).

24. FAA §.601(d). Conclusion and supporting information on compliance with the Congressional policy that engineering and professional services of U. S. firms and their affiliates are to be used in connection with capital projects to the maximum extent consistent with the national interest.

25. FAA §.601. Information and conclusions whether loan will permit American small business to participate equitably in the furnishing of goods and services financed by it.

26. FAA §.604(a); Ann.§.102. Compliance with restriction of commodity procurement to U. S. except as otherwise determined by the President and subject to statutory reporting requirements.

27. FAA §.604(b). Compliance with bulk commodity procurement restriction to prices no higher than the market price prevailing in the U. S. at time of purchase.

28. FAA §.604(d). Compliance with requirement that marine insurance be purchased on commodities if the participating country discriminates, and that insurance be placed in the U. S.

29. FAA §.611(a)(1). Information and conclusion on availability of engineering, financial, and other plans necessary to carry out the assistance and of a reasonably firm estimate of the cost of the assistance to the United States.

30. FAA §.611(a)(2). Necessary legislative action required within recipient country and basis for reasonable anticipation such action will be completed in time to permit orderly accomplishment of purposes of loan.

23. The loan will not have a direct effect on encouraging US investment abroad but does encourage private US participation in foreign assistance programs by the use of US firms.

24. The engineering services provided under this loan will be provided by US firms. See Section VIII.

25. Any goods procured under this loan will be sold by US private enterprise; the procurement procedures under this loan will permit equitable participation of US small business.

26. The procurement of goods and services financed by this loan will be limited to the US. See Section VIII.

27. The Loan Agreement will provide for limitation of price of bulk commodity procurement to prices no higher than the market price prevailing in the US at time of purchase.

28. The Loan Agreement will so provide.

29. The plans have been formulated and a reasonably firm cost estimate has been developed. Sections IV and VI.

30. No legislative action required.

31. FAA §.611(b); App.§.101. If water or water-related land resource construction project or program, information and conclusion on a benefit-cost computation.

32. FAA §.611(c). Compliance with requirement that contracts for construction be let on competitive basis to maximum extent practicable.

33. FAA §.612(b) and 636(h). Appropriate steps have been taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services and foreign currencies owned by the U. S. are utilized to meet the cost of contractual and other services.

34. FAA §.618. Compliance with requirement that assistance to newly independent countries be furnished through multilateral organizations or plans to maximum extent appropriate.

35. FAA §.620(a); App.§.101(a) and (b). Compliance with prohibitions against assistance to Cuba and any country (a) which furnishes assistance to Cuba or failed to take appropriate steps by February 14, 1964, to prevent ships or aircraft under its registry from carrying equipment, materials, or supplies from or to Cuba; or (b) which sells, furnishes, or permits any ships under its registry from carrying items of primary strategic significance, or items of economic assistance.

36. FAA §.620(b). If assistance to the government of a country, existence of determination it is not controlled by the international Communist movement.

37. FAA §.620(c). If assistance to the government of a country, existence of indebtedness to a U. S. citizen for goods or services furnished or ordered where such citizen has exhausted available legal remedies or where the debt is not denied or contested by such government or the indebtedness arises under an unconditional guaranty of payment given by such government.

38. FAA §.620(d). If assistance for any productive enterprise which will compete with U. S. enterprise, existence of agreement by the recipient country to prevent export to the U. S. of more than 20% of the enterprise's annual production during the life of the loan.

31. The cost/benefit computation is favorable. Section VII.

32. Construction contracts will be let on a competitive basis. Section VIII.

33. The Loan Agreement provides that local currency costs will be paid by Pakistan.

34. This loan will be made under consortium arrangements.

35. Pakistan is not providing assistance to Cuba and none of its ships or aircraft are now stopping at Cuba.

36. Pakistan is not controlled by the international communist movement.

37. Pakistan is not indebted within the terms of this statute.

38. This project will not compete with US enterprise.

39. FAA §.620(o)(1). If assistance to the government of a country, extent to which it (including government agencies or subdivisions) has, after January 1, 1962, taken steps to repudiate or nullify contracts or taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U. S. citizens or entities beneficially owned by them without taking appropriate steps to discharge its obligations.

39. Pakistan has not nationalized, expropriated or otherwise seized property of US citizens.

40. FAA §.620(f); Amn.§.108. Compliance with prohibitions against assistance to any Communist country.

40. Pakistan is not a communist country.

41. FAA §.620(g). Compliance with prohibition against use of assistance to compensate owners for expropriated or nationalized property.

41. Loan funds would not be used to compensate owners for expropriated or nationalized property.

42. FAA §.620(h). Compliance with regulations and procedures adopted to insure against use of assistance in a manner which, contrary to the best interests of the U. S., promotes or assists the foreign aid projects or activities of the Communist-bloc countries.

42. Provisions will be made in the Loan Agreement prohibiting any of the funds from being used to assist communist bloc activities or projects.

43. FAA §.620(i). Existence of determination that the country is engaging in or preparing for aggressive military efforts.

43. Pakistan is not ineligible under this section.

44. FAA §.620(j). Information on representation of the country at any international conference when that representation includes the planning of activities involving insurrection or subversion against the U. S. or countries receiving U. S. assistance.

44. Pakistan has not participated in such conferences and is not ineligible under this section.

45. FAA §.620(j). Indonesia restriction.

45. Not applicable.

46. FAA §.620(k). If construction of productive enterprise where aggregate value of assistance to be furnished by U. S. will exceed $100 million, identification of statutory authority.

46. The loan will not exceed this amount.

47. FAA §.620(l). Consideration which has been given to denying assistance to the government of a country which after December 31, 1966, has failed to institute the investment guaranty program for the specific risks of inconvertibility and expropriation or confiscation.

47. Pakistan has instituted an investment guaranty program covering everything but war risks.

48. FAA §.620(n); Amn.§.107(b); Amn.§.115. Compliance with prohibitions against assistance to countries which traffic or permit trafficking with North Viet-Nam.

48. Pakistan does not traffic or permit trafficking with North Viet-Nam.

49. FAA §.620(o). If country has seized, or imposed any penalty or sanction against, any U. S. fishing vessel on account of its fishing activities in international waters, information on the consideration which has been given to excluding the country from assistance.

49. Pakistan is not ineligible under this statute.

50. FAA §.620(p); App.§.117. U. A. R. restrictions

50. Not applicable.

51. FAA §.620(q). Existence of default under any Foreign Assistance Act loan to the country.

51. Pakistan is not in default, under any FAA loan.

52. App.§.102. Compliance with requirement that payments in excess of $25,000 for architectural and engineering services on any one project be reported to Congress.

52. Architectural and engineering services contracts financed from the loan would be reported to Congress.

53. App.§.104. Compliance with bar against funds to pay pensions, etc., for military personnel

53. Funds from the loan would not be used for paying pensions.

54. App.§.106. If country attempts to create distinctions because of their race or religion among Americans in granting personal or commercial access or other rights otherwise available to U. S. citizens generally, application which will be made in negotiations of contrary principles as expressed by Congress.

54. Pakistan does not create such distinctions.

55. App.§.111. Compliance with existing requirements for security clearance of personnel.

55. Security clearances of personnel under contracts for services will be obtained as required.

56. App.§.112. Compliance with requirement for approval of contractors and contract terms for capital projects.

56. This will be provided in the Loan Agreement.

57. App.§.114. Compliance with bar against use of funds to pay assessments, etc., of U. N. member.

57. The loan funds would not be used to pay UN assessments.

58. App.§.115. Compliance with regulations on employment of U. S. and local personnel in funds obligated after April 30, 1964 (Regulation 7).

58. Regulations regarding use of US and local personnel will be complied with.

59. App.§.118. Viet-Nam iron and steel restrictions.

59. This provision will be complied with.

60. App.§.401. Compliance with bar against use of funds for publicity or propaganda purposes within U. S. not heretofore authorized by Congress.

60. None of the loan funds would be used for publicity or propaganda purposes within the US.

AID-DLC/P-579/A Draft
Annex III
Draft

CAPITAL ASSISTANCE LOAN AUTHORIZATION

Provided from Development Loan Funds

PAKISTAN: SCARP IV

Pursuant to the authority vested in the Administrator, Agency for International Development (hereinafter called the "A.I.D.") by the Foreign Assistance Act of 1961, as amended, and the Delegations of Authority issued thereunder. I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title I, the Development Loan Fund to the President of the Government of Pakistan of not to exceed Ten Million Seven Hundred Thousand Dollars ($10,700,000) to assist in financing the foreign exchange costs of goods and services required for the installation and electrification of approximately One Thousand and Sixty Two (1062) tubewells in the Upper Chenab Unit of the Upper Rechna Doab region of West Pakistan. This loan is subject to the following terms and conditions:

1. Interest and Terms of Repayment. The interest on the loan shall be one percent (1%) per annum on the disbursed balance of the loan during the grace period and thereafter two and one-half percent (2-1/2%) per annum. The loan shall be repaid within forty (40) years from the date of the first disbursement under the loan, including a grace period of not to exceed ten (10) years.

2. Currency of Repayment. Provision shall be made for repayment of the loan and payment of the interest in United States Dollars.

3. Other Terms and Conditions:

(a) Goods, materials and services financed under the loan shall be procured from the United States of America;

(b) Relending terms or other similar financial arrangements by the Borrower shall be subject to A.I.D. approval;

(c) A.I.D. will require satisfactory evidence that the required local currency has been or will be made available; and

(d) This loan will be subject to such other terms and conditions as the A.I.D. may deem advisable.

William S. Gaud
Administrator
Agency for International Development

Dated