

2.6 Environmental Conservation Plan

2.6.1 Conservation Plan for Water Quality Environment

(1) Prevention of Water Quality Pollution in the Irrigation and Drainage Canals

Monitoring of water canals should be initially implement in Kafr the El Sheikh Governorate as it occupies occupied 88 % of Feasibility Study Area through the establishment of water quality monitoring subdivision.

(2) Establishment of Women's Conference in the WUA

It is planned to establish Women's Conference in the WUA. The conference aims to discuss water environmental matters, as prohibition of garbage throwing at the canals, proper washing and bathing of cattles in the canals, etc., Through the conferences, it is expected that residents will improve environmental activity concerns.

(3) Maintenance around Watercourses, especially beside the Canals through the Town

It is necessary to make effective use of the area between the road and canal by tree-planting and provide amenities to maintain clean environment, especially beside the canal in the town areas.

2.6.2 Conservation Plan for Soil Environment

(1) Avoidance of Salt-affected Soils by Input of Soil Amendments

It is planned to avoid salt-affected soils of the midstream and/or downstream areas by adding gypsum and super-phosphate before planting irrigation to reduce the effect of SAR. It is necessary to add manure etc., to reduce salt accumulation and dispersion of soil particles. To increase permeability, amount of organic fertilizer should be higher than present application (refer to Appendix K).

(2) Conservation of Root Zone by Conversion of Cropping Pattern

Irrigation system of save water by conversion of cropping pattern changes the water situation of the crop root zone. Therefore, chemical fertilizers could be splitted in surface layer to increase salts concentration before each irrigation. In case of surplus rice straw and wheat straw for animal feeds, it is needed to mulch the soil surface with these available materials to improve soil moisture status and reduce salinization in root zone. Moreover, land

leveling is effective to assure good distribution of available water.

2.7 Cost Estimate

2.7.1 Conditions of Cost Estimate

The project costs are estimated based on the unit price prevailing in MPWWR in November, 1998. The price escalation is applied by a sources in the world Bank Commodity Market in November, 1998 to foreign portion and for local portion, Wholesale Price Index in 1997 applied respectively. The implementation method of the construction work is a contract base with the following conditions :

- 1) The unit price of the local portion for civil work is applied based on the prevailing unit costs in MPWWR. These basic unit cost is including costs for temporary work, administration and overhead in all work.
- 2) The foreign portion cost is including price for which the equipment and materials are not product in Egypt while the cost is estimated at CIF Alexandria for the foreign portion and transportation fee to the project site for the local portion respectively.
- 3) Consultants remuneration and administration cost are estimated at 11 % of the construction cost.
- 4) The exchange rate is applied by 1.0 US\$ = 3.4 LE based on the Central Bank in Egypt.

2.7.2 Plan of Farmers' Organization

Based on the dimensions of the Priority Area and "Problems on financial supports to WUAs", each described in 2.1.7 and 1.9.1(3), costs related to the farmers' organization are estimated as shown below. In this estimation, a supposition is adopted that a half of the Priority Area ($56,900 \times 1/2 = 28,450F$) will submit requests for IIP implementation within 5 years after the introduction of new financial supporting system(which is anticipated in year 2005 when the effectiveness of the new system is verified through the project activities by Japanese team), thus this half only can accept various advantages in finance. It means the remaining half (28,450F) will be implemented IIP without financial advantages.

- a) Cost necessary for 3 years' subsidy for O/M :

$$1^{\text{st}} \text{ year : } LE70/fed \times 0.75 = LE 52.5/fed$$

$$2^{\text{nd}} \text{ year : } LE70/fed \times 0.50 = LE 35/fed$$

$$3^{\text{rd}} \text{ year : } LE70/fed \times 0.25 = LE 17.5/fed$$

$$\text{Totally } LE 105/fed \times 28,450 \text{ feddan(net)} = LE 2,987,250 \text{ of increase}$$

- b) Expected cost decrease in O/M by means of unified O/M executed by farmers' organization for the whole meska cum delivery canal domain :

(Saving from LE5/fed/year to LE2.9/fed/year) x 56,900 feddan = LE 284,500/year to LE165,010/year x 15 years' durable period = from LE4,267,500 to LE2,475,150 of decrease

- c) Accordingly, new financial systems will cause to a rather low cost, and surplus will be used for institutional and technical strengthening of farmers' organizations by means of collection of data/information etc. by themselves necessary for improved O/M cum M/E purposes. In passing, a newly raised cost such as training expense for the PP methodology targeted for IAS staffs (estimated at 285,200 LE) will be absorbed in an expected decrease of training costs currently used mainly for leader farmers because in a new system farmers will not be trained but be encouraged as facilitators for IIP implementation through their discussions and mutual consent.
- d) After all in conducting the proposition, the O&M of the government for terminal canals down from delivery canals will be reduced compared to the present condition. Therefore the government's burden related to the farmers' organization will be supposed to stay as present.
- e) From the long term viewpoint, the government should prepare a cost for permanent service centers for pump repairmen which will cost 325,000 LE.

2.7.3 Agricultural Development Plan

(1) Objective and Phasing

The utmost target of IIP is to improve crop production especially through raising irrigation efficiency at on farm level with timely adequate water supply. Therefore, aside from physical and institutional development of irrigation system under IIP, there is a need to have the on-farm demonstration activities covering land and soil improvement, agricultural extension on the improved crop production and introduction of new crops in accordance with the improved water management. This Demonstration Farm will be operated for ten (10) years to attain the target in 51 locations of whole Marwa in the project area (3 categories of delivery canals x one location x 17 Water Districts). The average area of pilot farm will be about 7.8 feddan (3.3 ha).

(2) Summary of Demonstration Farm

The Demonstration shall be operated with joints effort of IIS, Agricultural Extension Department(AED), Soil Water and Environment Research Institute (SWERI), Executive Authority for Land Improvement Projects(EALIP), MALR for 51 locations in IIP project area. Each concerned agency of AED, SWERI, and EALIP will be responsible for land and soil improvement, agricultural extension and on-farm water management respectively. For

execution of Demonstration Farm, MALR will have coordinating the other concerned agencies.

(3) Project Cost

The project of Demonstration Farm has the cost for soil improvement of saline soils, land leveling by laser beam, agricultural extension including the supply of farm inputs of seeds and seedlings and other farm inputs, and training and other operation costs of current cost of personnel.

2.7.4 Plan of Irrigation and Drainage Facilities

The improvement plan of irrigation and drainage facilities are composed of local civil work and required foreign portion for various equipment and materials including electric motor, gate operation board and instrument as well as sheet pile for particular using in the Rahbeen regulator.

2.7.5 Water Management Plan

(1) Basic Line for Cost Estimate

A basic line for the cost estimate of the proposed PC Network Plan under the water management plan is as follows.

- (a) In conformity with the objective that aims at the establishment of the integrated information system to support the water administration, it is proposed to maintain the personal deployment under the current administration system. Therefore no additional human input is considered except the system administration/secretariat.
- (b) The human-ware development accompanied with the system introduction will be coped with the in house training program and the external training program as well.
- (c) A primary significance will be given to the equipment configuration to provide the information infrastructure for the improved water management practices.
- (d) The proposed system will be pushed on with an initiative of the organizational setup consisting of the Steering Committee, the Working Groups and the Executing Organizations.

(2) Breakdown of Cost Estimate

Cost items of the PC Network Plan comprise (a) Cost for Equipment and Softwares,

(b) Cost for System Administration/Secretariat (d) Cost for Seminar Assembly and (c) Cost for Miscellaneous Expenses. The cost items are based on the following estimates.

The equipment cost covers 144 sets of PC. As the other costs, the system administration/secretariat set up in MPWWR with 4 permanent staff during 5 years, the external training for 4 trainees per annum during 5 years, the seminar assembly for twice a year during 5 years, and weed cut equipment will be included.

No price escalation is considered due to characteristics of the computer equipment and software. Each cost includes guarantee for the furnished equipment, fees for support and dues for software upgrading. The necessary expenses for telecommunication, ISP (Internet Service Provider) and office supply are accounted to administration expenditures and are excluded from the above cost estimate.

2.7.6 Summary of Project Cost

The project cost is estimated sum of 270 million LE based on the following table :

Project Component	Cost (,000 LE)				
	Share		Total	(F/C)	(L/C)
	Beneficiary	Government			
1. Improvement of Mahjor Irrigation and Drainage Facilities					
Improvement of Rahbeen Regulator	-	69,660	69,660	(44,346)	(25,314)
Improvement of Bahr Tera Intake Gate	-	360	360	(258)	(102)
Improvement of Abshan Regulator	-	271	271	(181)	(90)
Replacement of Hamoul MPS	-	28,800	28,800	(22,798)	(6,002)
Slop Protection and Embankment of Bahr Tera Main Canal	-	1,050	1,050	(316)	(734)
Subtotal	=	100,141	100,141	(67,899)	(32,242)
2. Improvement of Delivery Canal					
Installment of Check Gate	-	2,200	2,200	(1,668)	(532)
Canal Slope Protection	-	350	350	(105)	(245)
Replacement Intake Gate	-	170	170	(127)	(43)
Subtotal	=	2,720	2,720	(1,900)	(820)
3. Improvement of Meska	112,152	-	112,152	(44,860)	(67,292)
4. Improvement of Water Management	-	9,100	9,100	(8,416)	(684)
5. Field Drainage	9,390	-	9,390	(1,878)	(7,512)
6. Pilot Scheme	-	8,933	8,933	(4,083)	(4,850)
7. Demonstration Farm	-	293	293	(35)	(258)
8. Water Conservation	-	231	231	(208)	(23)
9. Repair Shop for Pump, Gate, and Apparatus	325	-	325	(195)	(130)
10. Cost Administration and Consultants	13,405	13,359	26,764	(13,382)	(13,382)
Grand Total	135,272	134,777	270,049	(142,856)	(127,193)

Note: Physical contingency and Price escalation contingency are excluded.

Cost allocation

**Beneficial farmers: Improvement of Meska; Field Drainage; Pump, Gate and Apparatus
Repair Shop**

Total cost: 135,272,000 LE

Government : Remaining components

Total cost: 134,777,000 LE

2.8 Disbursement Schedule

One of the objects for the proposed projects is to supply irrigation water created in the Priority Area by rationalizing irrigation efficiency into the downstream reaches of the Priority Area. Therefore the ID and IIS of MPWWR will be in charge of the projects in cooperation with MALR except for tile drainage project and project for demonstration farm which will be undertaken by General Egyptian Authority for Drainage Projects and MALR respectively.

The cost of Meska improvement and the O & M cost for the Meska and delivery canals will be paid by the beneficial farmers. The farmers will organize a WUA on a Meska basis and a federation of WUAs on a delivery canal basis to implement, operate and maintain the facilities by themselves. Structural improvement is required to transfer the management of such irrigation facilities to farmers and support farmers' willingness to organize themselves, while it will take considerable time to organize WUA.

Under the condition above, the major facilities to distribute irrigation water to the Priority Area such as Rahbeen regulator, Bahr Tera intake gate, Hamoul MPS, will be rehabilitated and improved in short term period. Also Re-embankment and slope protection of Bahr Tera main canal will be implemented in short time period to be capable for distributing increased water into downstream reaches of the Priority Area. Replacement of intake gates at three (3) delivery canals will be also required to implement in short term for the federation of WUAs is organized by a delivery canal. (Refer to Figure 2.8.1)

WUA's take-off and its expansion will need enough time and to demonstrate its efficiency. Therefore the pilot scheme will be started in short time period to demonstrate and attract neighboring farmers to participate in the project.

With the prospect of the pilot scheme, Meska improvement will be implemented all over the Priority Area through Medium term period. To take over and develop the result of the pilot scheme, water management improvement, demonstration farm, pump, gate and apparatus repair shop etc. will be implemented in medium term.

Figure 2.8.1 Disbursement Schedule of Proposed Component

Project Components	Year									
	1	2	3	4	5	6	7	8	9	10
	Short Term Development					Medium Term Development				
1. Improvement of Major Facilities										
Rahbeen Regulator										
Bahr Tera Intake Gate										
Abshan Regulator										
Hamoul MPS										
Reembankment of Bahr Tera Main Canal										
Slope Protection of Bahr Tera Main Canal										
2. Improvement of Delivery Canal										
Replacement Of Intake Gate										
Slope Protection										
Installation of Check Gate										
3. Meska Improvement										
4. Water Management Improvement										
5. Drainage Improvement										
6. Pilot Scheme										
7. Demonstration Farm										
8. Pump, Gate and Apparatus Repair Shop										
9. Water Conservation Plan										

2.9 Operation and Maintenance Plan

Among the proposed facilities, Meska and delivery canals will be operated and maintained by WUA and Federation of WUAs after they obtain legal license as farmers' organization and get transferred the improved facilities from the government. IIS and ID at MPWWR will support them technically or financially when they need a large-scale repair by an emergency or unexpected accident. Intakes of the delivery canals will be operated and maintained by MPWWR. The other major facilities such as Rahbeen regulator, Bahr Tera intake gate, Abshan regulator, Bahr Tera main canal and weed control vessels will be operated and maintained by MPWWR as present. Hamoul MPS will be also operated and maintained as present by MED. The pilot scheme will be operated and maintained by IIS at MPWWR. Pump, gate and apparatus repair shop will belong to a federation of WUAs. The demonstration farm will be managed by Agricultural Extension Department at MALR. As for tile drainage implemented by General Egyptian Authority for Drainage Projects, farmers themselves maintain the it and the cost will be paid in 20 years to the Authority.

As mentioned above, a Federation of WUA will operate and maintain Meska and a delivery canal. The cost for the O&M is dues of the farmers. Although the amount of dues depend on the size of the federation of WUAs, empirically 70 LE per feddan is the standard.

2.10 Project Evaluation

2.10.1 Project Evaluation

(1) Project Evaluation Method

The economic validity for the project is mainly evaluated by calculating the Economic Internal Rates of Return (EIRR) and Financial Internal Rates of Return (FIRR) . The EIRR and FIRR are calculated by adopting the economic prices and financial prices for the project costs and benefits respectively. The main method for the Priority project evaluation is shown as follows;

- 1) The project costs and benefit is calculated with Egyptian currency (LE)
- 2) The project evaluation term is adopted as 30 years. These IRRs are calculated based on equalizing the present value of the project costs and benefits during 30 years by discounting with the rate of 12%, which is recognized officially as the economic opportunity cost at the Ministry of Planning .
- 3) The economic prices of trade commodities for the project benefits are calculated by using the projected prices in year 2010 of world Bank, which are adjusted to prices in year 1998. Those of non-trade commodities are calculated by using the shadow prices of market prices, which are converted by the standard conversion factor (SCF).
- 4) Foreign exchange rate between Egypt pound and US dollar is adopted with an average ratio from July to December in 1998, that is, 1 US\$ = 3.40 L.E.
- 5) The opportunity cost of farm labor wage is calculated by using labor conversion factors estimated basing on the labor balance sheet with the result of farm economic survey in the Priority Area. (Refer to Appendix N, Table n.1.17)
- 6) At the financial evaluation, the price contingency of the project cost is estimated by using the World Bank inflation rate projection in regard to foreign costs, and using the inflation rate of 4.2 % got from the wholesale prices of CAMPAS of the latest year in regard to local costs.

(2) Project Benefits

The project benefits can be brought by the implementation of the works which are the improvement of Rahbeen Regulator and Bahr Tera intake, replacement of Hamoul M P S,

rehabilitation of right embankment of Bahr Tera main canal, and improvement of delivery canals and Meska canals. These projects are conducted with an aim of the increase and equalizing of farm income by the rational use and equitable supply of irrigation water. Accordingly, the economic effect is considered as follows;

a) Reduction effect of the operation and maintenance(O&M) costs for improvement and replacement of irrigation facilities

This effect is calculated as the difference of the O&M costs without and with project situation. With a Meska improvement, the pumping cost and Meska maintenance cost will be paid from dues of a WUA. O&M cost of Meska and pumping including the cost of a delivery canal whose administration will be transferred from the government to WUAs will be reduced from 201LE/fed to 72 LE/fed by WUA control instead of farmers' individual O&M. (Refer to Appendix N)

In the case of replacement of existing facilities such as Hamoul MPS, the difference of O&M cost between with and without project is trivial. As for Rahbeen regulator, Bahr Tera Intake Gate, and Abshan regulator on which motor driven system will be additionally installed, the O&M cost will be increased for the additional investment. Also the new construction works such as check gates in each delivery canal will require additional O&M cost. (Refer to Appendix N)

b) Incremental effect of crop production

The incremental effect of crop production is calculated as the difference between the total net benefits of crop production with and without project situation in the Priority Area. The total benefits of crop production with project situation consist of unit yield increase by crops and crop diversion effect which can be brought by the elimination of constraints on irrigation water (incessant to continuous irrigation) and be realized with the governmental policy for reducing the rice cultivated area in terms of saving water. The incremental effect of crop production occurs from the first (1) year after a Meska is improved and increases gradually up to achieving the full effect in four (4) years.

c) Unavoidable beneficial effect in the downstream reaches of the Priority Area

The amount of irrigation water which will be saved in the Priority Area will be conveyed through Bahr Tera main canal into the downstream reaches of the Priority Area, and used as irrigation water in the area. Besides, the area has been directly irrigated by mixed reuse water from the point of Hamoul MPS, which will be replaced by the Project proposed.

Therefore, this area is an unavoidable beneficial area of the Priority Project and the command area is 106,740 feddan.

The rising effect of cropping intensity (148 % to 167 %) with the present cropping pattern will be calculated. However, since the improvement works of delivery canals and Meska will not be conducted in this area, the irrigation water will be kept just as the existing incessant irrigation system. As the result, the reduction effect of the O&M cost of canals and the incremental effect of crop production will not be expected.

As the result of above calculation, the financial and economic incremental benefits of the Priority Project Area are as follows;

<u>Benefit</u>	<u>Reduction of O&M cost</u>	<u>Incremental Effect of Crop Production</u>	<u>Benefit downstream reaches of the Priority Area</u>	<u>Total</u>
Financial Benefit	-79	1,160	234	1,315
Economic Benefit	-70	1,200	192	1,322

Note: Because the reduction of pumping cost is counted at reduction of production cost by crops, the effect of reduction of O&M is counted as minus.

(3) Project Costs

Financial costs of the project are calculated based on market prices, and consist of local and foreign currency costs. Economic costs are calculated with economic prices by converting local currency costs of financial costs with SCF excluding transfer items like import tax, financial interest, land tax, subsidies, imputed capital costs and expenses for land acquisition from financial costs. The total financial and economic cost of the project (including price escalation and physical contingency) is 266 million LE and 213 million LE respectively. The cost of Rahbeen regulator is allocated by the discharge to adjust the cost of the Priority Area.

a) Operation and Maintenance Costs of Improvement and replacement Facilities

The increment of O&M cost for additional investment is nine (9) million LE and the annual O&M costs are dependent on the disbursement schedule of the project costs and will be kept constantly from first (1) year after the completion of construction.

b) Replacement Costs of Facilities' Equipment

pump equipment for improved Meska will be replaced every 10 years.

(4) Internal Rates of Return (IRR)

As the result of calculating to equalize the present value of project costs and project benefits of the Priority Project which will occur during evaluation term of thirty (30) years, EIRR of 17.2 % and FIRR of 14.1 % are obtained, respectively. Both IRRs surpass the Egyptian economic opportunity cost of 12%. Accordingly, it is shown that the project at the Priority Area is appropriate in terms of national economic situation and business situation. (Refer to Appendix N)

(5) Sensitivity Analysis

In order to test the Priority Project's resilience to possible risky variable, the sensitivity analysis was carried out. EIRR of each case is as follows;

Case	With benefit downstream	Without benefit downstream
1. Without benefit downstream	—	15.9
2. 20% decrease of benefit	14.3	13.0
3. 20% increase of project cost	14.8	13.5
4. 20% decrease of benefit and 20% increase of project cost	12.2	10.9
5. 30% decrease of agricultural products price	11.8	11.7
6. 50% decrease of unit yield increase	12.2	10.2
7. delay of full benefit by from 4 to 6 years	15.7	14.4
8. 3 years delay of Meska Improvement	14.0	12.9

This result of analysis shows that the Priority Project Area has high resilience and stability to risky variable. The contribution of the benefit the downstream reaches of the Priority Area is one (1) to 1.3 % and the most strongly affecting factor for the evaluation is agricultural products prices and ratio of unit yield increase.

2.10.2 Cost Sharing by Farmers and Payment/Income Ratio

(1) Cost Sharing by farmers

In the Priority Area, the project costs of Meska improvement, field drainage and

pump, gate and apparatus repair shop will be repaid by beneficiary farmers. Also the O&M costs for Delivery canals and Meska at financial prices are shouldered by beneficiary farmers.

a) Repayment Cost of Project Cost

Above mentioned project cost repaid by beneficiary farmers are calculated at 2,996 LE/fed. The annual repayment method of the project cost is suggested as the following three financing plans which are 1) no interest and 15 years repayment (present IIP condition), 2) no interest and 20 years repayment, and 3) 10.4% interest, 15 years repayment. For all the three alternative methods, there is five (5) years grace included. The annual repayment cost per feddan in each case will be 200 LE, 150 LE and 403 LE for case 1), case 2), and case 3) respectively.

b) O&M costs for Delivery and Meska Canals

With the establishment of a WUA, the O&M costs shared by farmers is 72 LE/fed including operators' cost, pumping cost, Meska and delivery canal maintenance and contingency.

c) Annual Repayment Costs sharing by Farmer per feddan

As the result above, the annual payment cost shared by farmers per feddan is 272 LE in case of 1), 222 LE in case of 2), and 475 LE in case of 3).

(2) Ratio of Repayment Cost / Incremental Income

In case of the average small-scale farmer (1.8 fed) and average middle-scale farmer (3.8 fed) in the Priority Area, a ratio of annual repayment cost to annual incremental income with financial term is shown as follows;

	Income Increase	Small-scale farmer (1.8 fed)			Ratio
		Repayment			
		Project Cost	O&M	Total	
15 years	1,888	360	130	490	0.26
20 years	1,888	270	130	400	0.21
10.4%, 15 years	1,888	725	130	855	0.45

	Income Increase	Middle-scale farmer (3.8 fed)			Ratio
		Repayment			
		Project Cost	O&M	Total	
15 years	3,743	760	274	1,034	0.28
20 years	3,743	570	274	844	0.23
10.4%, 15 years	3,743	1,531	274	1,805	0.48

Accordingly, the farmer can be paid his repayment cost sharing from his incremental income. The case with 20 years repayment is proposed as it is the most advantageous to farmers. Enhancement of establishing WUA will be expected with the government's subsidies mentioned above.

2.10.3 Financial Budget Analysis for the Representative Farm Household

About farm household economy with representative farm-scale (2.1 feddan), family size (5.2 persons), and family labor composition (3.2 persons), financial budget analysis has been conducted in order to estimate an impact which can be brought by the implementation of the project, based on present farm household economic analysis from farm economic survey. The result of the analysis is shown as follows. After implementation of the project, the farmer will be able to get farm-household income at 8,396 LE in combine with 2,000 LE of non-farm income (result of farm economy survey). This exceeds the target income of 7,900 LE of the development plan. Accordingly, it shows that the project is adequate for farmers in terms of farm-household economy.

	Present (LE)	Incremental Income (LE)	After Implementation (LE)
Agricultural income	4,919	1,477	6,396
Farm household income	6,919	1,477	8,396
Household expenditure	5,570	0	5,570
Farm-household economic surplus	1,349	1,477	2,826

2.10.4 Other Socio-Economic Extend Effect

(1) Creation of Labor opportunity

The increment of agricultural labor requirements for crop cultivation by introducing high labor-intensive crops with high profitability and increase of crop production quantities based on rising of unit yield will be prospected in the Priority Area. The increment is 10.4 % wth project situation. (Refer to Appendix N, Table N.1.18)

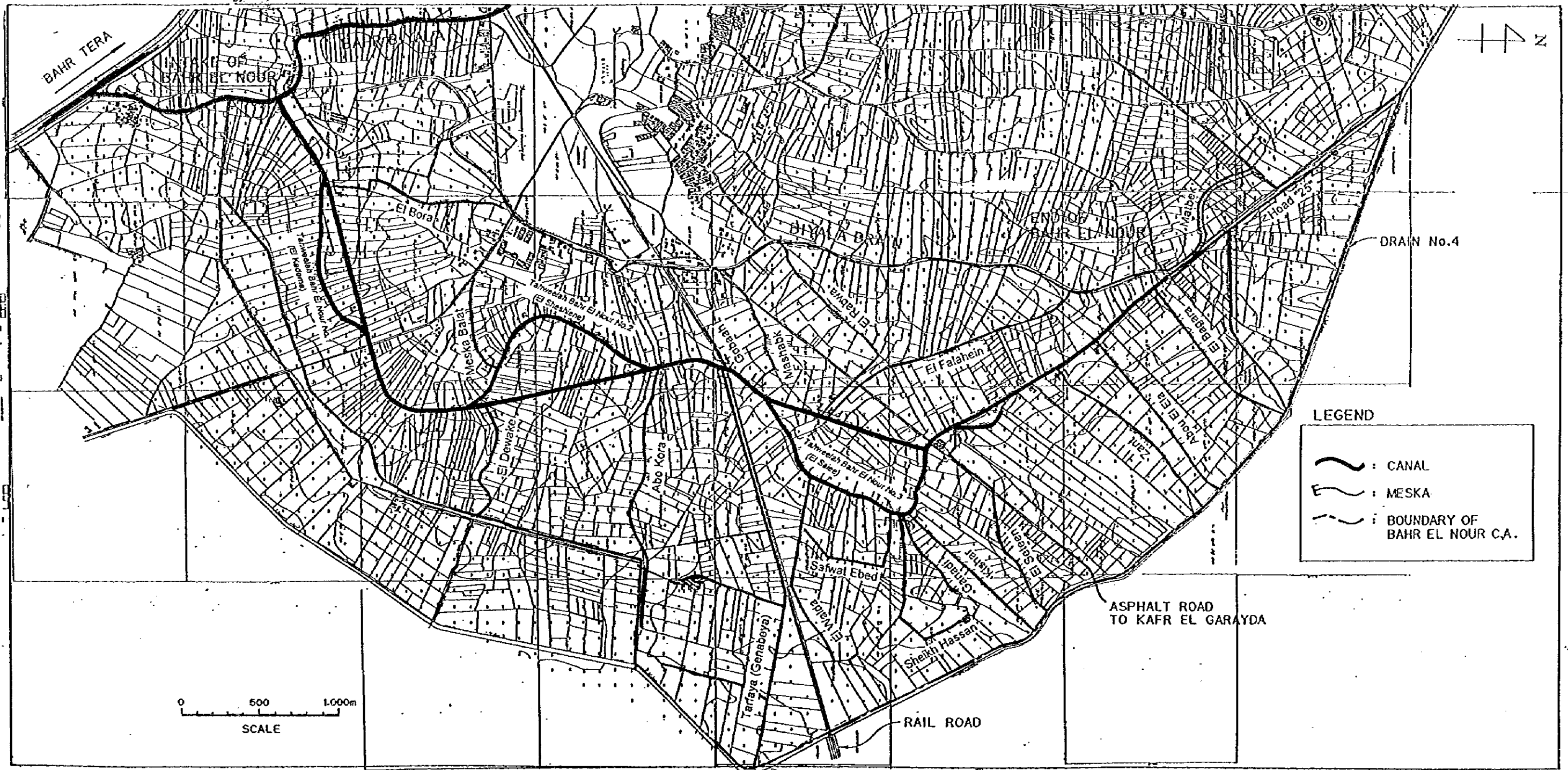
(2) The Others Effect

Though the calculation of economic value would be difficult, the following socio-economic impacts will be also expected by the project.

- The canal administrative roads created by Meska improvement will be expected to contribute to improvement of transportation and prevent the products from damaging.
- The improvement of water environment realized by change to continuous flow and by improvement works of water quality in irrigation and drainage canals will bring sanitation improvement of canal used as living and reduce infectious diseases.

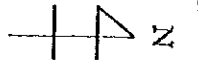
CHAPTER 3 PILOT SCHEME

Location Map of the Pilot Scheme Area



BAHR TERA

0 500 1000m
SCALE



LEGEND

- : CANAL
- : MESKA
- : BOUNDARY OF BAHR EL NOUR C.A.

DRAIN No.4

ASPHALT ROAD TO KAHR EL GARAYDA

RAIL ROAD

CHAPTER 3 PILOT SCHEME

3.1 Objectives of Pilot Scheme

The Pilot Scheme should be implemented prior to development of the Priority Area, as the core of the development plan on the Improvement of Irrigation Water Management and Environmental Conservation in the North-East Region of the Central Delta that aims to save water and to increase agricultural product as the goal of IIP under the economic liberalization policy of the Egyptian Government. The Pilot Scheme has the objectives to demonstrate the proposed improved facilities and to verify the results on the irrigation improvement project with a farmers' participatory planning project from point of view quick implementation and spread of government policy on IIP, and sustainable operation, maintenance and management of the improved irrigation facilities.

In order to achieve this target of water saving, WUA including WUG on Meska level and Federation of WUAs on a delivery canal unit would be organized, and it is proposed that new self water-management system operated by farmers, will be introduced. Increasing agricultural products would be increased with timely irrigation and introduce of new profitable crops.

Most of farmers show a passive and/or deliberate attitude against introducing new water management system and new profitable crops as well as changing from the present situation without a farmer's organization to joining the proposed Federation of WUAs. Because nobody will compensate the risk caused by those new systems, and farmers have to shoulder all risk by themselves. The Pilot Scheme includes to organize the Federation of WUAs and WUA and to transfer jurisdiction on operation and maintenance of the proposed irrigation facilities. As effective countermeasure to hasten the improvement/development plan while protecting farmer's risk, the Pilot Scheme will play very important role as a showcase to farmers in the rural area. This procedure as well known in the world, is one of the effective countermeasures to become popular and demonstrate those new systems to the rural people. IIP will be carried out with the feedback of the result of the pilot scheme.

In this Pilot Scheme, GOE shall organize a Project Team which consists of various engineers and experts and the team would train and transfer necessary technique and knowledge on IIP to IIS staffs including IAS staffs who are in charge of enlightenment, guidance and assistance on WUA's activities. And also the proposed improved facilities as one of priority facilities chosen by farmers, would be demonstrated to the farmers. It is one of the PP methods that those farmers could chose most favorable facility by themselves.

3.2 Outline of Pilot Scheme

3.2.1 Technical Transfer on PP(Participatory Planning) Methodology

Several technical transfers are expected throughout the PP procedure. They are 1) selection of groups and participants as representatives in each group (by means of "Participation analysis" etc.), 2) materials to be prepared before starting group meetings, 3) means to carry out democratic and practical discussions and to consolidate participants' opinions in each group, 4) means to systemize directions and conclusions obtained in each group (by means of "Problem analysis", "Objectives analysis", "Alternative analysis", and "PDM" etc.), and 5) means of categorization and standardization of the PP results

Such components will be repeatedly testified at (a) selected delivery canal(s) in the Pilot Scheme area, in terms of each basis of unified Marwa, Meska and the whole delivery canal, in turn. Through such procedures, farmers could be expected to grasp a sense of ownership for water as well as a sense of belonging for facilities. These senses are deemed as the most essential components towards farmers' self-governing irrigation and attendant effective use of water for the future. In order to achieve the above activities, the technical transfer would be carried out to the IIS staffs including IAS staffs. Through those activities, the farmers will be trained and assisted by those IIS staffs.

3.2.2 Agricultural Supporting Service on Improvement of Farm Management

It is proposed to have the following activities for the improvement of farm management with IIP in the pilot scheme area;

(1) Technology Transfer of Detailed Soil and Land Classification Survey

The available data on soils and land classification needs renewal because the existing data are based on the survey conducted more than 20 years ago with reconnaissance level. With irrigation improvement project, it is proposed to improve cropping pattern and crop production through introducing high efficiency crops like vegetables in term of water utilization. Especially in order to promote crop diversification with IIP, the data on land classification based on the more detailed survey than semi-detailed will be required to prepare guidelines on soil improvement and crop selection for diversified crops.

It is expected suitable diversified crops will be introduced utmost and the production of these crops will be improved appropriately with applying the guidelines. Then the IIP project will attain the project target in term of improvement of crop production. Technology transfer on these issues will be conducted to IIS staffs or others.

(2) Technology Transfer of Land Improvement Works and its Implementation

The existing plan on land improvement including gypsum application and sub-soiling, which is prepared by Executive Authority for Land Improvement Project will be reviewed to prepare the land improvement plan including land leveling by laser beam. It is proposed to make a trial to introduce or establish the land leveling technology for small-scaled farmers. Applying this technology, the effects such as water saving and increasing yield of farm products, would be verified and the technology would be transferred.

(3) Technology Transfer on Collection and Renewal of the Basic Data on Water Management

The system on collection and renewal of basic data on water management shall be introduced or established by WUA with the assistance by IIS, MPWWR. The basic data includes the command area, crop rotation block area, irrigation area by crop at the level of delivery canal and Meska. These data will be required to estimate water demand and to have efficient on-farm water management. The necessary technique would be transferred to the IIS staffs.

(4) Survey on model of farm management improvement with IIP

The study on improvement of farm management with IIP will be conducted for the typical farming types in term of balance on cost and return and the economical benefit of IIP. The methodology of farm management improvement with IIP would be transferred and those data would be utilized for monitoring and evaluation of IIP.

3.2.3 Technical Transfer on Irrigation and Drainage

To know the difference between before- and after-project and verify the saving of water, discharge measurements at the delivery intake shall be started as early stage as possible to cover at least one year-round discharge data. This annual discharge shall also be the basis of the volume, at maximum, to be allocated to the delivery and agreed and adjusted between the Federation of WUAs and the Government. The intake water volume should be checked at the intake of the delivery canal and the rating curve of the intake facilities should be established. Through those works, the verification of water saving before- and after-project could be possible and important. Monitoring the water volume delivered into the delivery canal as well as to prevent to intake more water than the agreed and allocated.

The requirement data shall be gathered and verified with reference to the local conditions as well as according to new variety such as short duration rice. Based on the above

crop consumption requirement, a water application table by crop including water losses, which consist of the necessary amount of irrigation water by Meska and of the necessary amount to be taken from the delivery canal, should be established. The table will give the standard of pump operation hour, and it makes easy to estimate the necessary amount of irrigation water agreed and adjusted between the Federation of WUAs and the Government. Also, the table will be a standard to determine the cropping area within the agreed amount of water. Those techniques would be transferred to IIS staffs. The results of those works could be utilized for forecasting water requirement, that is, establishment of a water distribution plan on the next water year.

On-farm irrigation is the most probable area that irrigation efficiency could be improved. Irrigation over-dosages, where excessive water goes to, return of the excessive water, as well as water shortages shall be experimentally investigated. With the results, on-farm irrigation improvement associated with the introduction of new Meska system shall be programmed. These methods and tequn

3.2.4 Water Management

(1) Water Distribution Management

a) Establishment of water management measure on introduction of continuous flow

Along with Meska improvement and formation Federation of WUAs, continuous flow shall be introduced to the delivery canal upon request from the farmers. The flow will be realized and verified with downstream water level control gate.

b) Rotational irrigation technique along Meska

Farmers are not familiar to group based rotational irrigation to be practiced along the improved Meska. A training shall be provided to the farmers such as: how group based rotational irrigation be practiced, how often the irrigation shall be done, how long pump operation shall be done according to the crops and so on. This aspect is very important to mitigate inequitable water distribution strongly felt by the farmers between upstream and downstream of Meska. The related techniques regarding to rotational irrigation on Meska level would be transferred to IIS staffs, and the IIS staffs will train farmers. And also the irrigation techniques on the irrigation interval by crop and operation of a pump(s) would be transferred to the IIS staffs and farmers as same as the rotational irrigation on Meska level.

c) Operation and maintenance on Meska and delivery canal

In line with the training above, operation and maintenance of Meska shall be

programmed, as an example to facilitate the farmers' own O&M. Also, operation and maintenance of the delivery shall be programmed and tested together with the Federation of WUAs. Through the test run, standard operation and maintenance by the farmers themselves shall be proposed.

(2) Information Management

A Pilot Project implementation is conceived to lead and materialize the PC Network Plan proposed in the water management plan. The Monitoring and Evaluation of Improved IIP in combination with the Standardization of Drawing and Document under CALS concept is one of the major subjects under the Pilot Project. Those techniques would be transferred to the IIS staffs.

The equipment configuration and organizational setup in the Pilot Project would be consistent with the procedures described in Part 2, 2.4 in principle. Six sets of PC with stand-alone style will be introduced in the initial stage. The PC sets will be deployed from peer-to-peer LAN to client-server LAN. The networking with MPWWR side PC Network Plan depends on the schedule, office layout and communication status in future but the Intranet is considered at present. Those techniques would be transferred to the IIS staffs.

3.2.5 Irrigation and Drainage Facilities

The irrigation and drainage facilities proposed for the Pilot Scheme is composed of facilities and various kind of equipment. The facilities would be demonstrated to the farmers, members of Federation of WUAs, WUAs WUGs as users for features of facilities and those operation and maintenance. The team members and the trainee of the IIS staffs could use those equipment for their works.

(1) Facilities

The civil work is composed of improvement for the Meska and Nour canal extending 7.4 km long with the canal capacity of 1.69 cu.m/sec traversed on the existing canal course. The proposed facility consists of a measuring water level meters at US and DS of the intake structure of the Bahr Nour canal as well as a gate opening meter at the site. While two check gate structures would be installed and demonstrated at KM 0.5 and KM 4.5 in the Nour canal to maintain water level at the downstream of the check gate and to keep the night storage water in the canal. (Refer to Drawing No. FS-12)

The 38 Meska which consist of 23 existing Meska to be improved and 15 to be newly constructed, would be improved with a 34.3 km length in total. The proposed types of buried

pipeline Meska, raised open Meska with J-shape, raised open Meska with brick lining would be proposed. (Refer to Drawing No. DD-21 to DD-24).

(2) Equipment for Water Management

The equipment for water management of 6 sets of a computer with the necessary soft wares would be introduced for making data-base of the daily work. Considering the necessary offices in Cairo and Tanta and moreover trainee, the necessary number would be determined.

(3) Equipment for Irrigation and Drainage

For irrigation, it is important to measure water levels and discharge. The 14 sets of a automatic water level recorder would be proposed. For measuring the discharge, two sets of a current meter would also be proposed with two (2) 4WD vehicles for transportation.

(4) Equipment for Agriculture

The equipment for agriculture consists of soil survey equipment, soil salinity survey equipment, survey equipment such as theodolite, level, etc. to solve a undulated farm plot, GPS, etc. For land leveling works a tractor with 80 ps with leveler attachment would be proposed.

(5) Water Quality Checker

Two sets of a water quality checker and rapid water quality analyzer for N, P, K, etc. elements would be proposed.

3.2.6 Water Environment

The water conservation component aims to raise awareness as to water quality preservation of inhabitant. A simple prevention plan to be implemented on water quality pollution in the rural area is proposed as follows.

- Periodic measurement of water quality of irrigation and drainage water and water from a crop field. These are basic information needed for the implementation of the project
- Examination for water quality conservation measure, for example retention of use equipment of irrigation water for life and animals
- Examination for protection of canal slope passing through the big village, for example concrete lining of canal, covered canal by using metal net or concrete
- Establishment of supporting system for water management, irrigation and drainage facilities, and organizations of a women's conference to secure participation of

women in the WUA .

3.3 Alternative Plans of Farmers' Organization

An alternative study was done for probable plans of farmers' organization for Bahr El Nour and Ganabia No.6 R. canals. For this purpose, as mentioned in 2.1.7, basic concepts of "Ergonomics consideration" were commonly adopted for each alternative. As a result of the study, in some cases, a Federation of Federation, i.e. the 4th layer, is necessary in contacting and consulting with the government side. However, this complicated frame may not be suitable to the Egyptian background where grouping activities in the field of irrigation is still in its infancy. Also, it is noticed that rural background of Egypt such as the existence of so-called mother villages and Aila groups should be respected as much as possible when considering optimal farmers' organizations.

From these viewpoints of Plan-1 in the Table 3.3.1 may be the most suitable alternative for Bahr El Nour canal although it is foreseen that reaching to a mutual consent among the relevant farmers as per IIP implementation is a rather tough work due to its large size (4,000 feddan) and attendant big number of farmers (about 1,100). In passing, to dissolve direct irrigation some connected Meska canals are necessary in any alternatives. It is estimated that 15 Meska canals in Bahr El Nour should be newly constructed for this purpose. (Refer to Table 3.3.1)

3.4 Plan of Operation

GOE shall organize a Project Team, which consists of various experts such as irrigation, farmers' organization etc., to operate and manage the pilot project with the objects of demonstrating the technologies and improved facilities and feedback of the results to IIP in other site.

3.4.1 Location

Selecting Pilot Scheme Area refer to; 1) farmers' willingness, 2) demonstration effects, 3) easy contact to governmental office concerned, 4) farmers' zeal to advanced farming 5) better condition of farming practices, and 6) others.

The area of the pilot scheme would be selected taking into consideration farmers' willingness to IIP. According to the results of the group meeting done during Phase 2 field survey in the Priority Area, the Bahr Nour command area has a high priority.

In order to demonstrate the effect of the proposed facilities, organization and management technique, etc., the area should have preferable accessibility so that others

interested in IIP could visit the area easily. The Biyala area is suitable under this condition because the area is located on the intersection of the national roads that are running from west to

To quickly respond to and solve various problems that may occur on the course of executing the pilot scheme program, it is desirable to locate the pilot scheme at an area, near which there are governmental organizations concerned. Biyala town has such organizations as Inspection Office, Water District Office under MPWWR, and branch offices of MALR and Village Bank.

There are many farmers who have much zeal to perform an advanced farming such as green house farming in the Biyala area. This fact may show the farmers have much zeal to introduce the new technique of IIP.

An area, having better farming conditions with adequate supply of irrigation water and suitable soil without requiring any treatment, would have high priority in the selection of the pilot scheme area. The Bahr Nour delivery canal is a second delivery canal that branches off from the Bahr Biyala delivery canal, however, the intake is located at the upper point of the Bahr Biyala canal. Also, the Bahr Nour canal is not passing through any village area. Therefore the canal does not have problem in term of water quality.

The soil irrigated by Bahr Nour canal has less salinity so that leaching is not required. Since subsurface drain facility has been already provided in the area, there is no harmful elements for crop cultivation caused by any upward movement of the groundwater table. It is therefore easy to evaluate the effects of water saving by IIP and increment of agricultural products if the pilot scheme was introduced in the Bahr Nour command area.

On basis of above discussions, Bahr Nour delivery canal is proposed to be the Pilot Scheme area. Also, there is another delivery canal command area that does not need an improvement of the basic irrigation facilities. This is Ganabia No. 6 Right, which would be considered as another type of IIP Pilot Scheme that does require less project cost mainly depending on soft-ware activities such as establishment of water users associations.

3.4.2 Operation

The Egyptian Government should form a Project Team, which consists of various engineers and experts who make a technical guidance for the above purposes, to carry out the Pilot Scheme. The Project Team would be composed of a team leader, irrigation/drainage, water management, and farmers' organization/rural sociologist. Also, experts dealing with

facilities, monitoring/evaluation, and environment, etc. are to be required during a certain period as the Pilot Scheme proceeds.

The team shall mainly stay in Cairo and Tanta, so that IIS engineers and IAS officers working in MPWWR, responsible for IIP projects in the Middle Delta, can be coordinated. Through the activities coordinated between them, a technology relating to water management and advanced irrigation endorsed by high irrigation efficiencies shall be accumulated and referred to in the Priority's project. Another issues such as establishment of WUA, Federation of WUAs, the operation and training of the organizations, and monitoring and evaluation of IIP shall also be undertaken and feed-backed into the projects of the Priority area.

National Water Research Center and its affiliated research institutes shall also participate especially in such activities as data collection of crop consumption such as new variety of rice, percolation of paddy field under existing of subsurface drainage, as well as monitoring and evaluating the effect of IIP.

3.5 Cost Estimate

The total cost of the pilot scheme is 9,916 thousand LE which consists of 1,130.2 thousand LE for equipment, and the remaining 8,785.8 thousand LE for civil work. The breakdown of the cost is as follows;

Item	Total Cost (‘000 LE)	E/C (‘000 LE)	L/C (‘000 LE)
Earth work	8,785.6	3,514.3	5,271.3
Equipment	1,130.4	1,020.1	110.3
-Water quality	45.6	41.1	4.5
-Agriculture	508.5	458.4	50.1
-Irrigation and Drainage	304.2	274.2	30.0
-Water management	272.1	246.4	25.7
Total	9,916.0	4,534.4	5,381.6

3.6 Pilot Scheme Duration

The Pilot Scheme is to start with current measurement at the delivery canal concerned, and shall put an emphasis on organizing WUG and the Federation of WUGs at the early stage. It is envisaged that it takes at least 2 years to form the federation based on participatory planning. Therefore, facility construction is to start at the beginning of 3rd year, works of

which are composed of Meska improvement, rehabilitation of Bahr El Nour delivery canal such as slope protection and bank road improvement, and installation of automatic check gate.

The construction works are supposed to complete during the 3rd year, thereby the conventional rotational irrigation shall be changed to continuous flow. The continuous flow would start as early as at the beginning of 4th year. However, there is a possibility that the continuous flow may be postponed until as late as the beginning of 5th year due mainly to the unwillingness of the farmers presently depending on individual pumping.

After continuous flow realizes, at least 1 year round monitoring shall be done, based on which evaluation be done. Therefore, the Pilot Scheme is to require at least 5 years duration. Then, with the completion of the first 5 years program, second 5 years program should be envisaged in order to facilitate the farming, on basis of the IIP, associated with training and also to evaluate the effect of IIP in terms of agricultural production. Also, the second 5-year's program should try to form a large Federation (Federation of Federation) commanding whole Bahr Biyala irrigation area.

Phase	1st Phase					2nd Phase	
	1	2	3	4	5	1	2~
Current Measurement	[Hatched pattern]						
Field Survey	[Hatched pattern]						
WUG & Federation	[Hatched pattern]						
Agreement with the farmers	[Hatched pattern]						
Meska Construction	[Hatched pattern]						
Delivery Contraction	[Hatched pattern]						
Continuous Flow	[Hatched pattern]						
Training to Farmers	[Hatched pattern]						
Mid Evaluation	[Hatched pattern]						
Field Survey for Evaluation	[Hatched pattern]						
Final Evaluation	[Hatched pattern]						
Fed. of Federation of Bahr Biyala	[Hatched pattern]						

Table 33-1 Alternative Plans of Farmers' Organization each in Bahr El Nour and Ganabia No.6 R.

Subjects		Bahr El Nour Canal	Ganabia 6 R. Canal		
Net irrigated area (also, Large farmers' area)	4,000F (515F) (information gathered from gate-keepers and checked by planimeter)	1,150F (320F)	1,150F (320F)		
(Main canal)	2,780F (380F)	-	-		
(A sub-canal)	180F	-	-		
(B sub-canal)	220F (135F)	-	-		
(C sub-canal)	940F	-	-		
Number of farmers (also, number of large farmers)	1,116 (12)	511 (10)	511 (10)		
(Main canal)	900 (8)	-	-		
(A sub-canal)	24	-	-		
(B sub-canal)	70 (4)	-	-		
(C sub-canal)	122	-	-		
Average cultivated area excluding large farmers	(4,000F - 515F) / (1,116 - 12) = 3,485F / 1,104 = 3.2F/farmer	1.7F/farmer	3.2F/large farmer (equ to 19farmers)		
Average cultivated area of large farmers	515F/12 = 43F/large farmer (equivalent area to that held by 13.4 farmers)	32F/large farmer (equ to 19farmers)	501/15 + 10 = 43WUGs (27F/WUG)		
Estimated number of WUG	Ideally, 1 WUG should be composed by farmers less than 15, thus 1,104 farmers / 15 = 78 WUGs. In addition, large farmer is regarded as a WUG. Accordingly, 78 + 12 = 90 WUGs in total (45F/WUG in average)				
Estimated number of WUA	Number of meskas: 14 in main canal, 5 in C sub-canal and each A & B sub-canal regarded as a meska, thus 21 meskas in total. Irrigated area by meskas is 2,942F in total, thus around 120F/meska. A WUA is to be established in each meska basis (or in each 2-3 WUGs basis), thus 30-45WUAs in total (90F-135F/WUA)		Ave. meska area = 920/4 = 205F, thus around 6WUAs (190F/WUA)		
Area ratio fed by meskas & direct irrigation	2,542F by meskas : 1,458F by direct irrigation = 64% : 36%		71% * 29%		
Subjects	Plan 1 (Single Federation)	Plan 2 (Plural Federations by area background)	Plan 3 (Plural Federations by hydraulic background)	Plan 4 (Compromised plan between Plan 2 & 3)	Plan 1 (Single Federation)
Number of Federation, division of each Fed., & each area	1 Fed.(Whole area, 4,000F)	2 Fed.(Upper side of railway, 1,800F, and Lower side of railway, 2,200F)	4 Fed.(Areas each fed by main canal, 2,780F, A sub canal, 160F, B subcanal, 220F, and C subcanal, 840F)	3 Fed.(Upper side of railway, 1,800F, each fed areas by Lower main canal, 1,360F, and C subcanal, 840F)	1 Fed.(Whole area, 1,150F)
Number of WUAs in each Fed.	*21 by meskas + by Direct irrig (1,458F/120F/per meska) = 33 WUAs	*6 by M. + 7 by D. = 13 *15 by M. + 5 by D. = 20 Totally 33 WUAs	*14 by M. + 8 by D. = 22 *1 by M. + 1 by D. = 2 *5 by M. + 4 by D. = 9 Totally 33 WUAs	*6 by M. + 7 by D. = 13 *10 by M. + 1 by D. = 11 *5 by M. + 4 by D. = 9 Totally 33 WUAs	*4 by meskas + 2 by direct = 6 WUAs
Anticipated advantages	*Single Fed., thus unified coordination with Gov't side	*Solid cooperation among farmers due to homogeneous background & same domain of agri. cooperative			*Single Fed., thus unified coordination with Gov't side
Anticipated disadvantages	*Difficulty of establishment of Fed. due to large number of farmers	*Necessity of Fed of Fed *Upper & Lower Feds to be established at the same time because expected demo-fami belongs to the Lower Fed.	*Same as the left *Extreme difference of size among Feds	*Same as the left	

Note: * Area of each farmer does not mean registered own area but actually cultivated area

* To dissolve direct irrigation, 12 and 2 connected meska canals should be newly constructed each in Bahr El Nour and Ganabia 6 R canal

CONCLUSION AND RECOMMENDATION

Conclusion

Implementation of the IIP that consists of various components in the Priority Area would annually produce 118 MCM of fresh water that may improve the water shortage condition at the downstream of the Bahr Tera command area. Since the project proposed to be implemented in the Priority Area would show the direct effect of water savings at the upstream area of the Bahr Tera command area, the projects proposed will be considered as models that will showcase IIP. Improvement of the Rahbeen barrage and renewal of the Hamoul mixed pump stations including the main irrigation canals are essential in carrying out an efficient water distribution and rationalization of water management. In the proposed farmers' organization plan under the Privatization Policy of the Egyptian Government, the new management system such as "Joint Committee", "Federation of WUAs", "WUA" and "WUG" would be proposed at each delivery canal unit. The Pilot Project scheme, which consists of demonstration and verification of the improved facilities with the new management system should be implemented prior to the implementation of all components of the Priority Area. Also, the IIS staff should be provided the necessary technical training needed to undertake implementation activities. MPWWR should accelerate the execution of the projects proposed in the Priority Area by requesting technical and economical cooperation from international agencies and/or development countries because this project is technically, financially and economically feasible.

Recommendations

1. Prior to the execution of the project in the Priority Area, it is recommended that the Pilot Scheme should be implemented. MPWWR as the representative of the Egyptian Government has to organize "the Project Team" that shall compose of various engineers and experts for quick execution of the Pilot Scheme. MPWWR should seek cooperation and assistance from international agencies and/or development countries, if there are technical and financial constraints to implement the project.
2. The IAS staff activities should be shifted to considering the opinions, desires, and willingness of farmers including influential persons and women to IIP to effect a smooth implementation of the IIP.
3. The inhabitants in the rural area should be provided training and education on the value of environmental cleanliness and sanitation, specifically on the dumping of waste and garbage in the irrigation canals. Measures should be implemented to prevent dumping of waste and garbage in the canals and the use of the canals for washing and others to maintain the

quality of irrigation canal and smooth flow of water.

4. The groundwater is one of the precious water resources in not only the Nile delta but also Egypt. For developing the groundwater resources, the research/monitoring and analysis in all over the Nile delta area would be necessary.

LIST OF DRAWINGS

A	Master Plan Study : MS	
	• General Plan of Master Plan Study in the Central Delta	MS-01
B	Feasibility Study : FS	
	• General Plan of Feasibility Study in the Priority Area	FS-02
	• Improvement Plan of <u>Rahbeen Regulator</u> in the Bahr Shebin Main Canal	FS-03
	• Improvement Plan of Motorization for <u>Tera</u> Intake Gates in the Bahr Tera Main Canal	FS-04
	• Improvement Plan of Motorization for <u>Epshan</u> Regulator's Gates in the Bahr Tera Main Canal	FS-05
	• Improvement Plan of Hamoul Pump Station	FS-06
	• Proposed Location of Pilot Farm	FS-07
	• Improvement Plan of El Nur Canal Plan and Profile (1/4)	FS-08
	• Improvement Plan of El Nur Canal Plan and Profile (2/4)	FS-09
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C	Detailed Design : DD	
	• Improvement Plan and Profile (El Mashabik Canal)	DD-13
	• Cross Section El Mashabik Canal	DD-14
	• Improvement Plan and Profile (El Rabwa West Canal)	DD-15
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	• Improvement Plan and Profile (El Rabwa East Canal)	DD-17
	• Cross Section El Rabwa East Canal (1/3)	DD-18
	• Cross Section El Rabwa East Canal (2/3)	DD-19
	• Cross Section El Rabwa East Canal (3/3)	DD-20
	• Typical Drawing for One Point Lifting Meska	DD-21
	• Typical Drawing for Open Meska	DD-22
	• Typical Drawing for Pipe Meska	DD-23
	• Typical Drawing for Pump House	DD-24
	• Miscellaneous	DD-25

NOTES:

FIG. NOMS-1

1. THIS DRAWING IS SHOWN A GENERAL PLAN OF MASTER PLAN STUDY IN THE CENTRAL NILE DELTA.
2. THE MASTER PLAN STUDY AREA CONSISTS OF FOUR GOVERNORATES: GHARBIA, KAFR EL SHEIKH, DAKAHLIA AND DAMIETTA.
3. STUDY AREA: 799 500 Feddan (333,800 ha)

LIST OF DRAWINGS

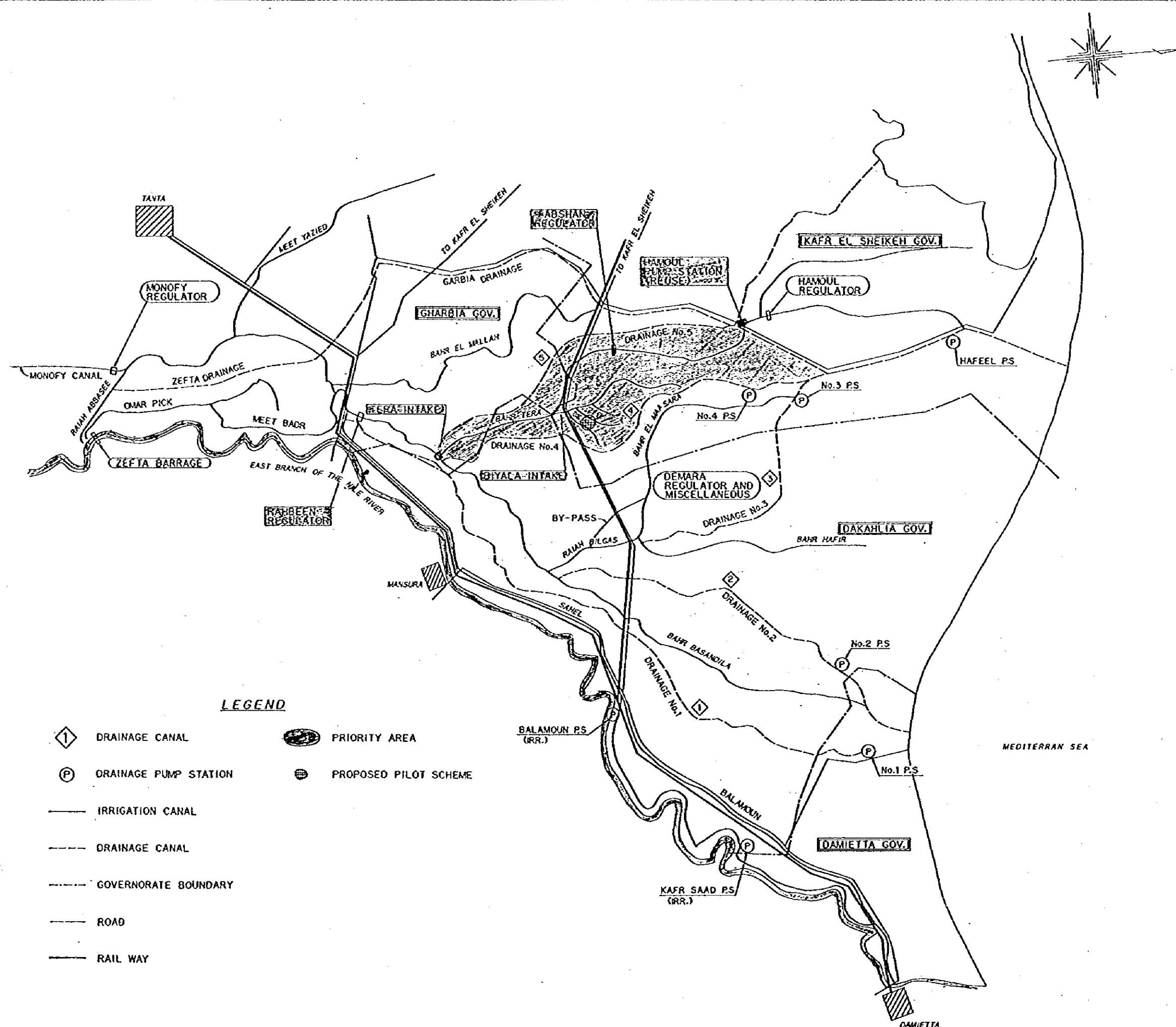
TITLE	No.
A. MASTER PLAN STUDY (MS)	
• GENERAL PLAN OF MASTER PLAN STUDY IN THE CENTRAL DELTA	MS-01
B. FEASIBILITY STUDY (FS)	
• GENERAL PLAN OF FEASIBILITY STUDY IN THE PRIORITY AREA	FS-02
• IMPROVEMENT PLAN OF RAMBEEN REGULATOR IN THE BAHR SHEBIN MAIN CANAL	FS-03
• IMPROVEMENT PLAN OF MOTORIZATION FOR TERA INTAKE GATES IN THE BAHR TERA MAIN CANAL	FS-04
• IMPROVEMENT PLAN OF MOTORIZATION FOR ABSHAN REGULATOR'S GATES IN THE BAHR TERA MAIN CANAL	FS-05
• IMPROVEMENT PLAN OF HANDUL PUMP STATION	FS-06
• PROPOSED LOCATION OF PILOT SCHEME	FS-07
• IMPROVEMENT PLAN OF EL NUR CANAL PLAN AND PROFILE (1/4)	FS-08
• " " (2/4)	FS-09
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• PLAN OF CHECK GATE IN THE DELIVERY CANAL	FS-12
C. DETAILED DESIGN (DD)	
• IMPROVEMENT PLAN AND PROFILE (EL MASHABIK CANAL)	DD-13
• CROSS SECTION (EL MASHABIK CANAL)	DD-14
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• IMPROVEMENT PLAN AND PROFILE (EL RABWA EAST CANAL)	DD-17
• CROSS SECTION (EL RABWA EAST CANAL) (1/3)	DD-18
• " " (2/3)	DD-19
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• TYPICAL DRAWING FOR ONEPOINT LIFTING MESKA	DD-21
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• MISCELLANEOUS	DD-25

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
 MINISTRY OF PUBLIC WORKS AND
 WATER RESOURCES (MPWWR)

THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

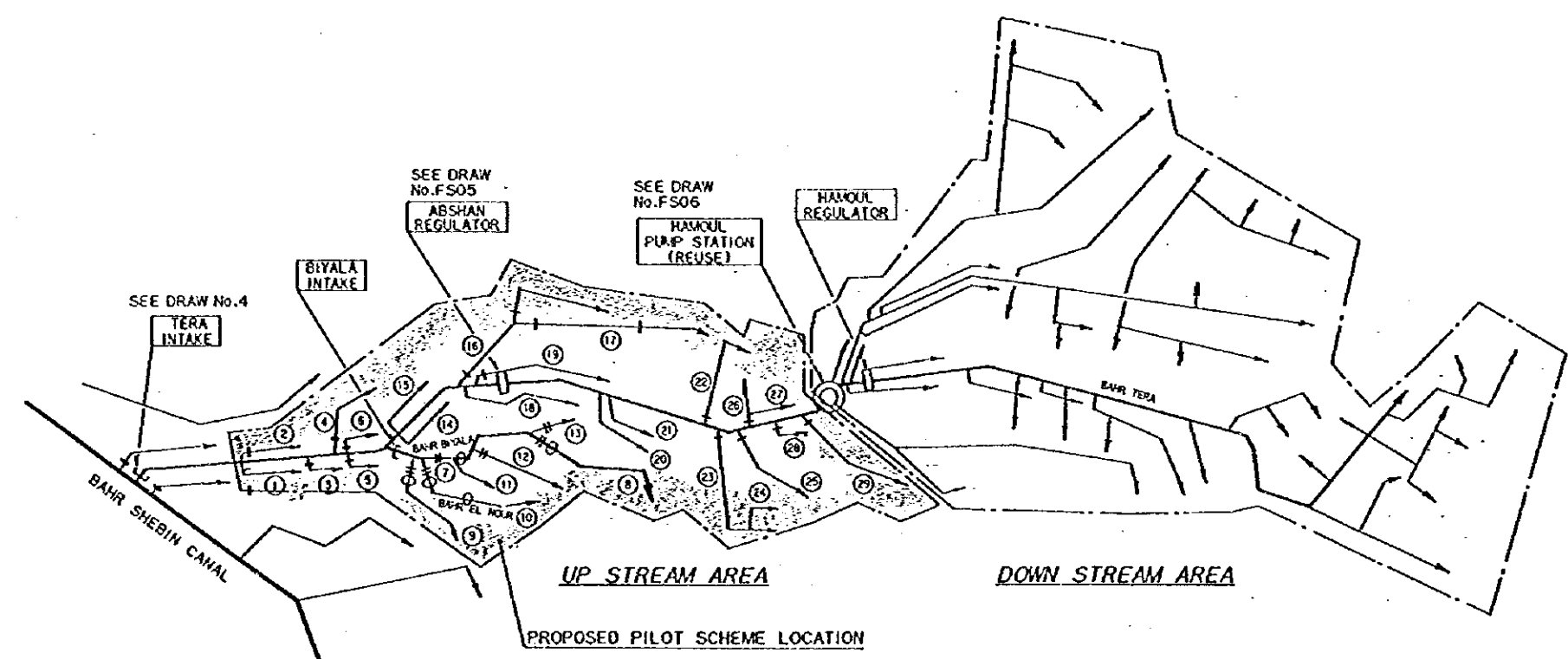
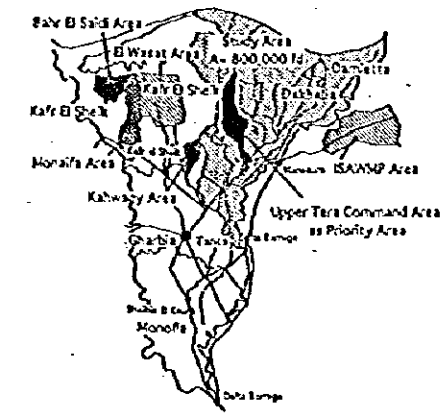
GENERAL PLAN OF MASTER PLAN STUDY
 IN THE CENTRAL DELTA

DATE	MARCH, 1999	FIGURE NO.	MS-1
SANYU CONSULTANTS INC., JAPAN			



LEGEND

- ① DRAINAGE CANAL
- Ⓟ DRAINAGE PUMP STATION
- IRRIGATION CANAL
- - - DRAINAGE CANAL
- - - GOVERNORATE BOUNDARY
- ROAD
- RAIL WAY
- PRIORITY AREA
- ⊕ PROPOSED PILOT SCHEME



DERIVERY CANALS IN THE PRIORITY AREA(FEASIBILITY STUDY)

No.	NAME OF CANAL	AREA(fa)	No.	NAME OF CANAL	AREA(fa)
1	GANABIA No.2 RIGHT	1400	17	EBSHAN	3750
2	GANABIA No.2 LEFT	840	18	EL SHARKAMEIAH	1712
3	GANABIA No.3 RIGHT	680	19	EL NEZAM	2850
4	FODA	1650	20	MARZOUK	1000
5	GANABIA No.4 RIGHT	1440	21	GANABIA No.7 RIGHT	450
6	GANABIA No.3 LEFT	300	22	EL KAFR EL SHARKIE	1425
7	BAHR BIYA & EL NOUR	1150	23	EL BANAWAN EL ASFAL	5000
8	BAHR BIYALA	5470	24	EL BANAWAN BRANCH	2000
9	EL AGAWY	850	25	RAGHEB BASHA	2050
10	BAHR EL NOUR	4000	26	EL MAHATTA	2500
11	TAMMEELAH BAHR BIYALA	1320	27	GANABIA No.7 LEFT	1150
12	EL SHORAFI	840	28	GANABIA No.10 RIGHT	500
13	HAZEK	750	29	ZOSAA	3800
14	GANABIA No.6 RIGHT	1150		DIRECT IRRIGATION	4253
15	GANABIA No.4 LEFT	1950			
16	KOM EL HEGNA	700		F/S AREA TOTAL	56930

LEGEND

- |—|— EXISTING GATE IN THE BAHR BIYALA
- |—|— PROPOSED CHECK GATE IN THE BAHR BIYARA
- |—|— PROPOSED CHECK GATE IN PRIORITY AREA (SEE DRW.No.FS-12)

NOTES:

1. GENERAL
 - (1) THIS DRAWING IS SHOWN A GENERAL PLAN OF THE PRIORITY AREA (UPPER AREA) IN THE TERA COMMAND AREA
 - (2) THE PRIORITY AREA CONSISTS OF THREE GOVERNORATES : Gharbia, KAfr EL SHEKH AND DAKAHLIA.
 - (3) THE PRIORITY AREA: 62,200 Fedden (26,000 ha)
2. IMPROVEMENT PLAN OF MAJOR FACILITIES
 - (1) RAHFEEN REGULATOR ON THE BAHR SHEBIN CANAL (SEE FIG. NO. FS-03)
 - (2) TERA INTAKE GATE MOTORIZATION (SEE DRAW. NO FS-4)
 - (3) ABSHAM REGULATOR GATE MOTORIZATION IN THE TERA MAIN CANAL (SEE FIG. NO FS-5)
 - (4) IMPROVEMENT OF HAMOUL PUMP STATION (SEE FIG. NO. FS-6)
 - (5) INSTALLATION OF CHECK GATE ON THE DELIVERY CANALS (SEE FIG. NO FS-12)
3. PROPOSED PILOT SCHEME IN BAHR EL NOUR COMMAND AREA (4,000 Fedden : 1,680 ha)

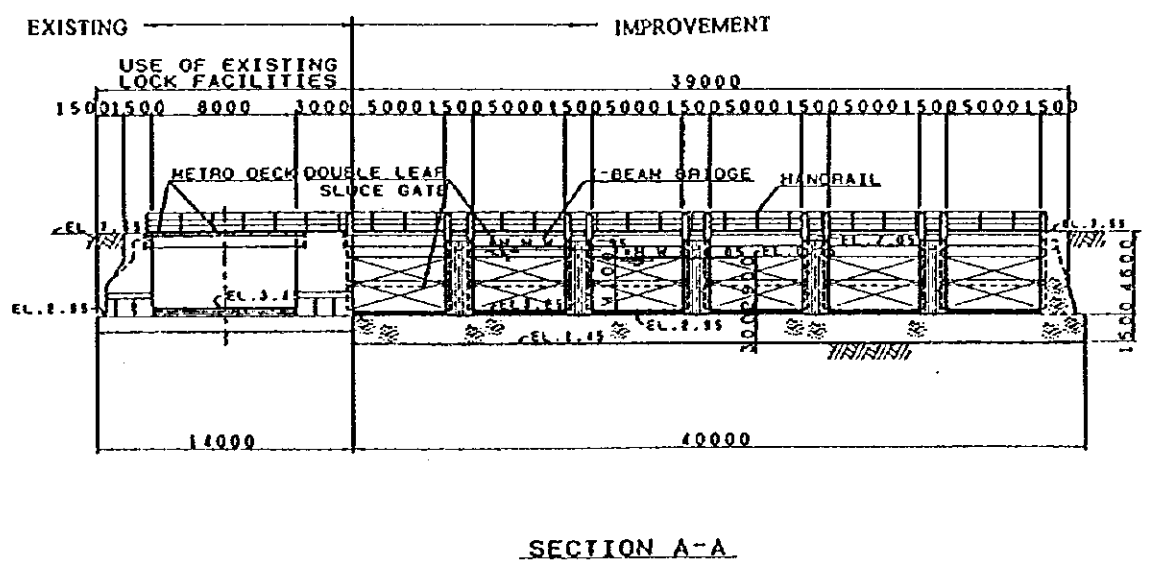
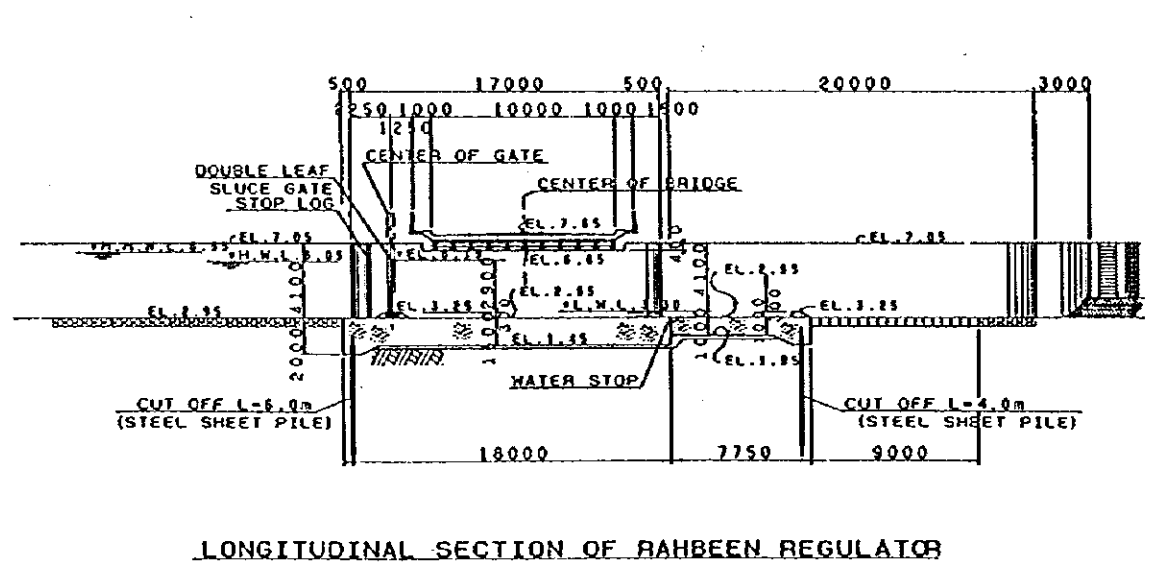
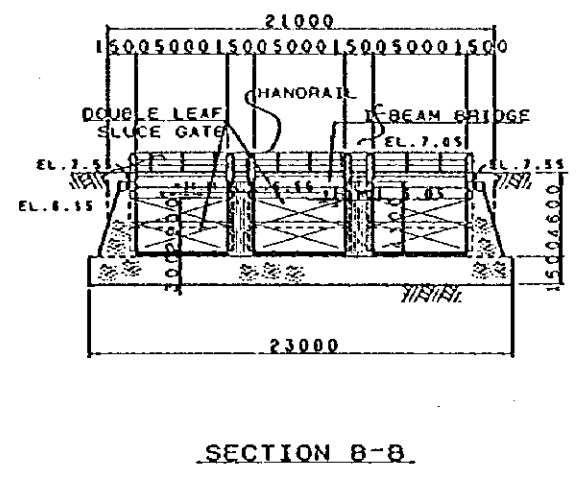
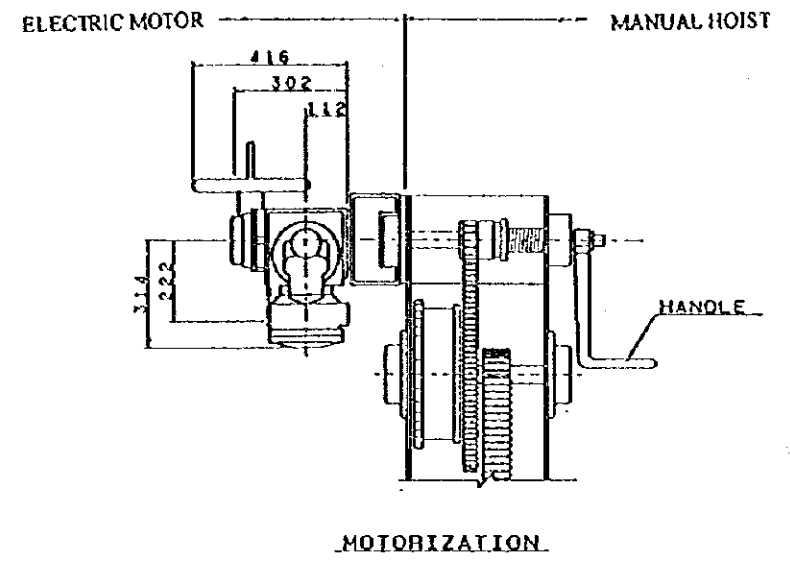
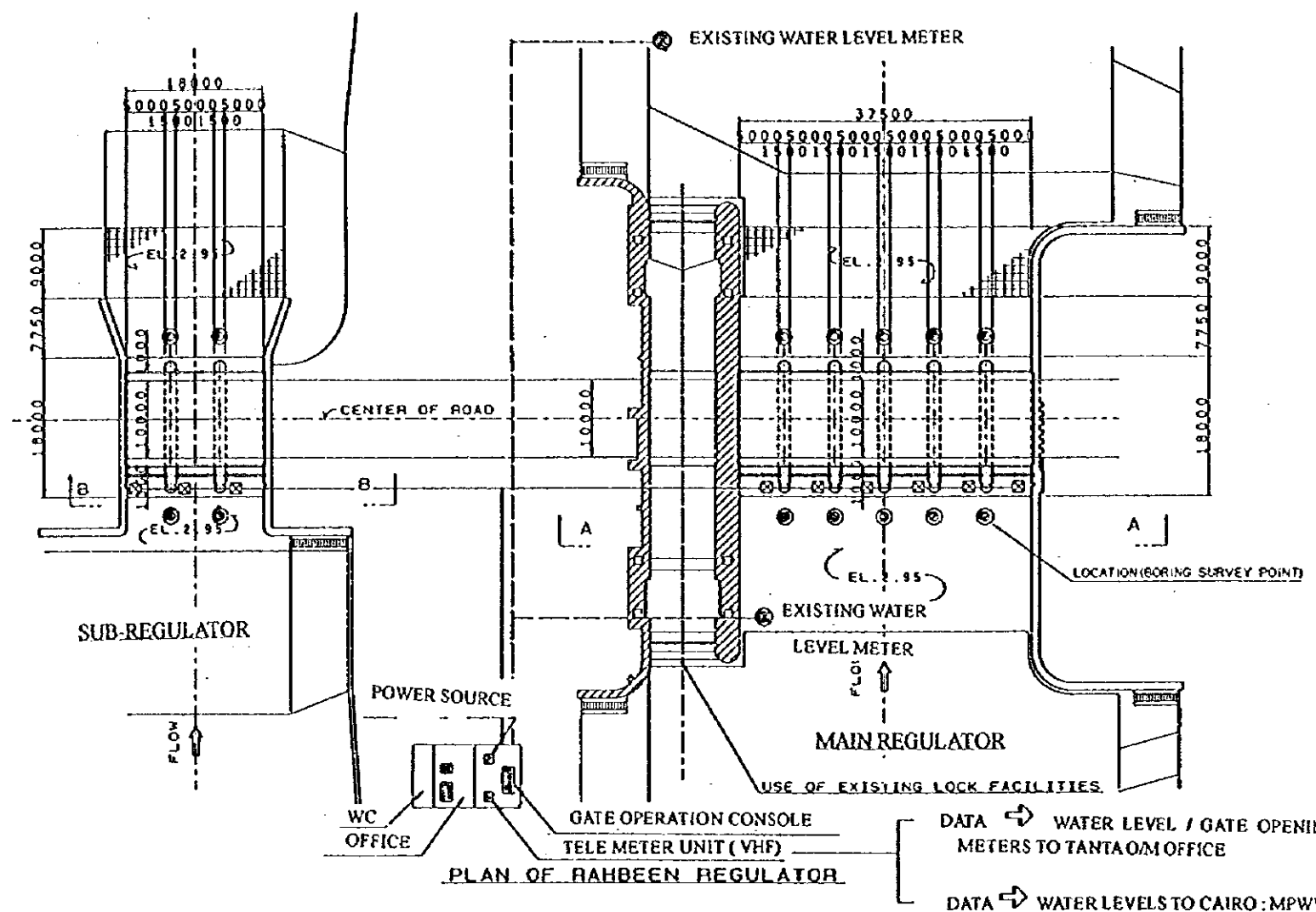
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GENERAL PLAN OF FEASIBILITY
STUDY IN THE PRIORITY AREA

DATE | MARCH, 1999 | FIGURE NO. | FS-02

SANYU CONSULTANTS INC., JAPAN



- NOTES:**
- (1) THIS DRAWING IS SHOWN THE RAHBEEN REGULATOR IMPROVEMENT.
 - (2) THE LOCATION OF REGULATOR IS INDICATED ON THE FIGURE (NOMS-1).
 - (3) THE MAJOR DIMENSIONS, GATE OPERATION AND MISCELLANEOUS:
 - a) MAIN REGULATOR: 37.5 m (6 gates)
 - b) SUBREGULATOR: 18.0 m (3 gates)
 - c) NAVIGATION LOCK (8.0 m)
 - d) ROAD BRIDGE: 12 m (10 m : 2-way of traffic and 2 m : side walks) WITH STEEL GIRDER.
 - e) GATE OPERATION: (Manual, Motor, Remote Operation at near site)
 - f) MONITORING ON A PANEL AT TANTA OM OFFICE (Water level, Gate Opening meter and Discharges)
 - g) GEOLOGICAL SURVEY LOCATION (BORING) IS INDICATED AT 14 POINTS (20 meter deep / One point)
 - (4) IMPLEMENTATION PROGRAMME: Two Years
 - (5) THE IMPLEMENTATION WORK IS DIVIDED INTO THREE SECTIONS AND ONE (SECTION OF BY-PASS TEMPORARY)
 - (6) NON STOP WATER SUPPLY WILL BE OPERATED TO THE COMMAND AREA THROUGH THE BY-PASS-WATER WAY INSTEAD OF ONE SECTION WORKING.
 - (7) ALL DIMENSIONS ARE SHOWN IN MM.

NOTES :

- (1) THIS DRAWING IS SHOWN THE TERA INTAKE GATE MOTORIZATION IN THE TERA MAIN CANAL.
- (2) THE LOCATION OF INTAKE IS INDICATED ON THE FIGURE (NOMS - 1)
- (3) MAJOR DIMENSIONS, EXISTING GATE MOTORIZATION GATE OPERATION AND MISCELLANEOUS :
 - a) THE EXISTING GATE WILL BE OPERATED BY A MOTOR IN ADDITION TO THE MANUAL OPERATION AT THE SITE AND REMOTE AT NEAR THE SITE.
 - b) THE GATE OPENING AND/OR CLOSING THROUGH THE MOTOR WILL BE CARRIED OUT RELATED TO THE EXISTING MANUAL HOIST AND NEW EQUIPMENT AS SHOWN ON THE DRAWN (Motorization: New equipment and existing manual Hoist).
 - c) THE GATE OPENING AND/OR CLOSING WILL BE CARRIED OUT AT THE SITE AND REMOTE OPERATION.
 - d) THE REMOTE OPERATION WILL BE CARRIED OUT AT A REMOTE OPERATION BOARD INSTALLED IN THE BUILDING (5.0 m x 4.0 m) AT NEAR THE SITE.
- (4) IN THE REMOTE OPERATION BUILDING, WHICH PROVIDED A GATE OPERATION CONSOLE OR BOARD, POWER RECEIVING PANEL, TELEMETER UNIT TO MOVING FROM OUT SIDE TO IN SIDE OF BUILDING.
- (5) THE CABLE WORK IS REQUIRED BETWEEN THE SITE OF GATE OPERATION LOCATION AND REMOTE OPERATION BUILDING.
- (6) THE WATER LEVEL METERS AND GATE OPERATION METERS WILL SENT TO TANEA OFFICE THROUGH VHF FOR MONITORING.

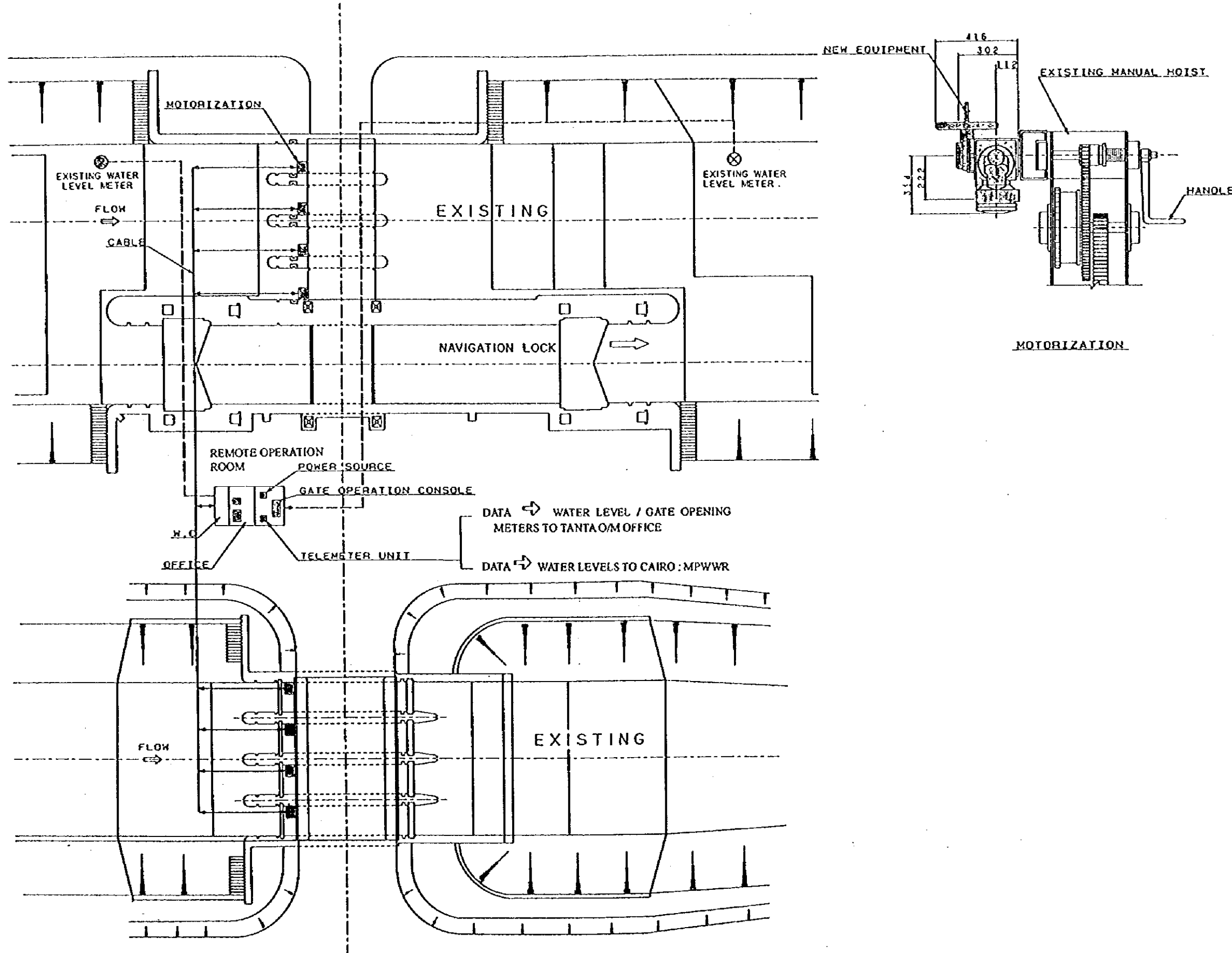
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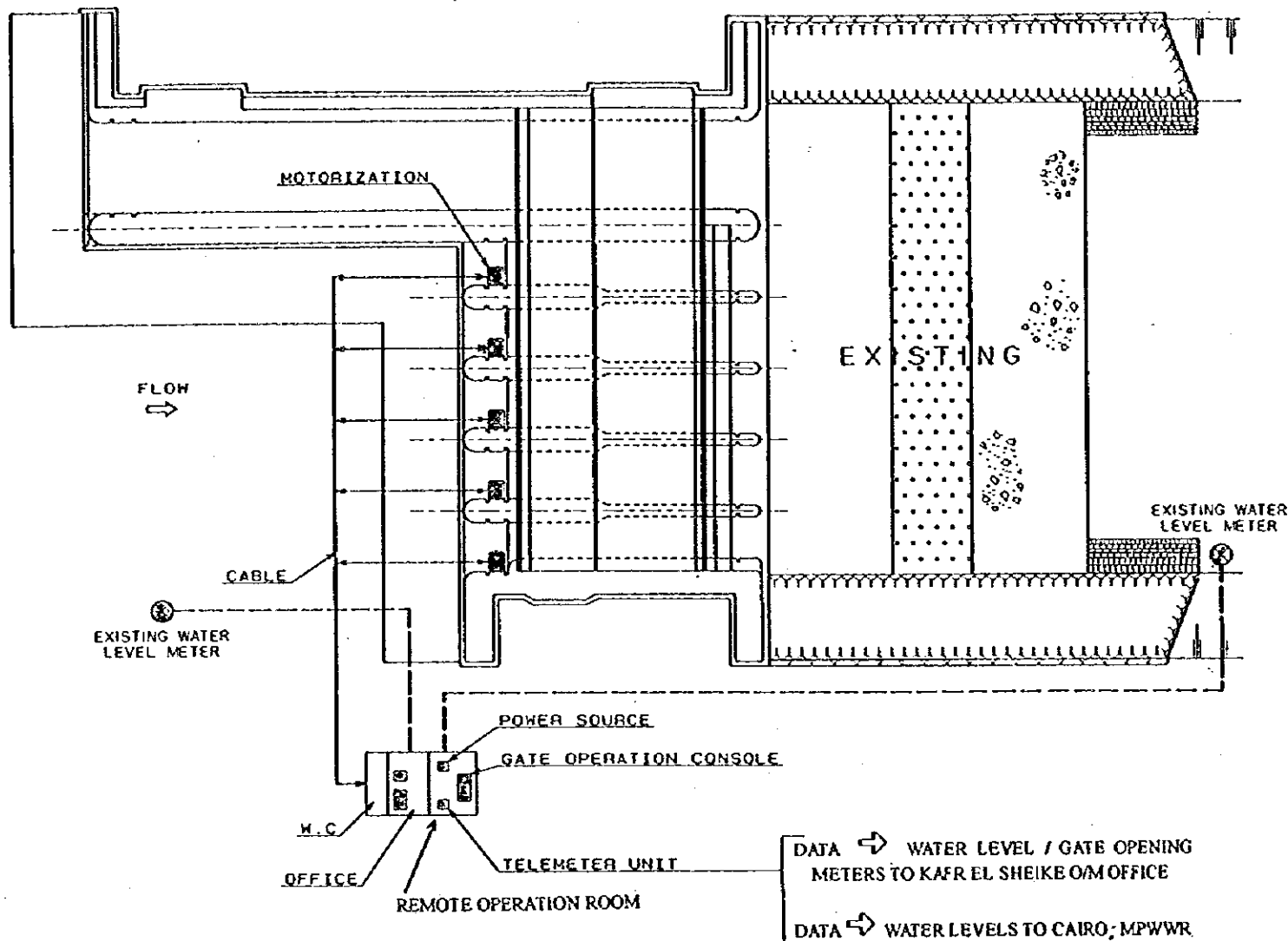
IMPROVEMENT PLAN OF MOTORIZATION FOR TERA
 INTAKE GATES IN THE BAH-1 TERA MAIN CANAL

DATE	MARCH, 1999	FIGURE NO.	FS -04
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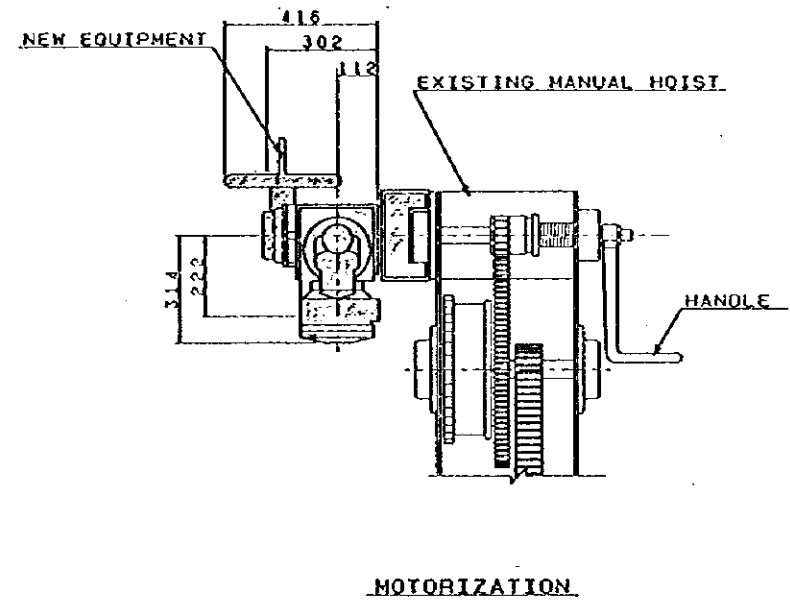
SANYU CONSULTANTS INC., JAPAN



PLAN OF TERA INTAKE GATES

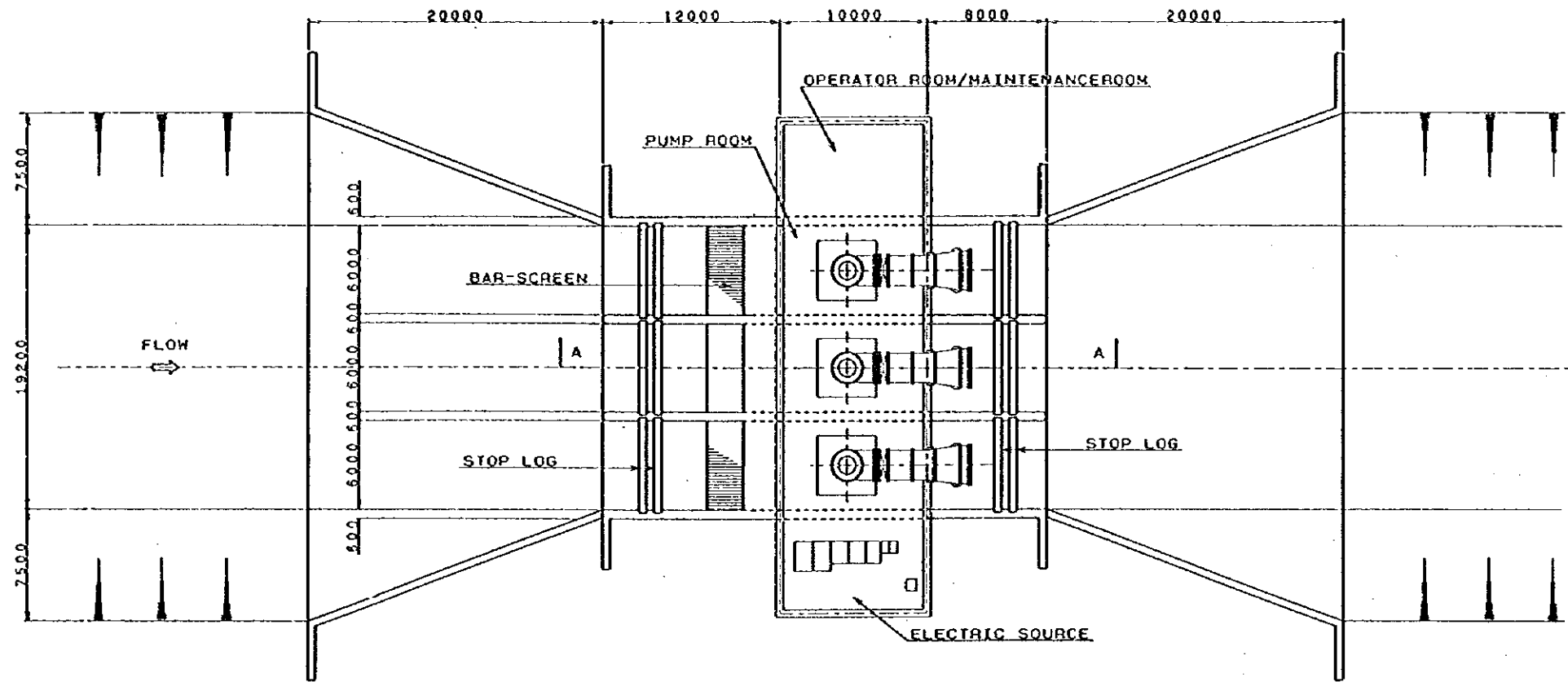


PLAN OF ABSHAN REGULATOR'S GATE OPERATION

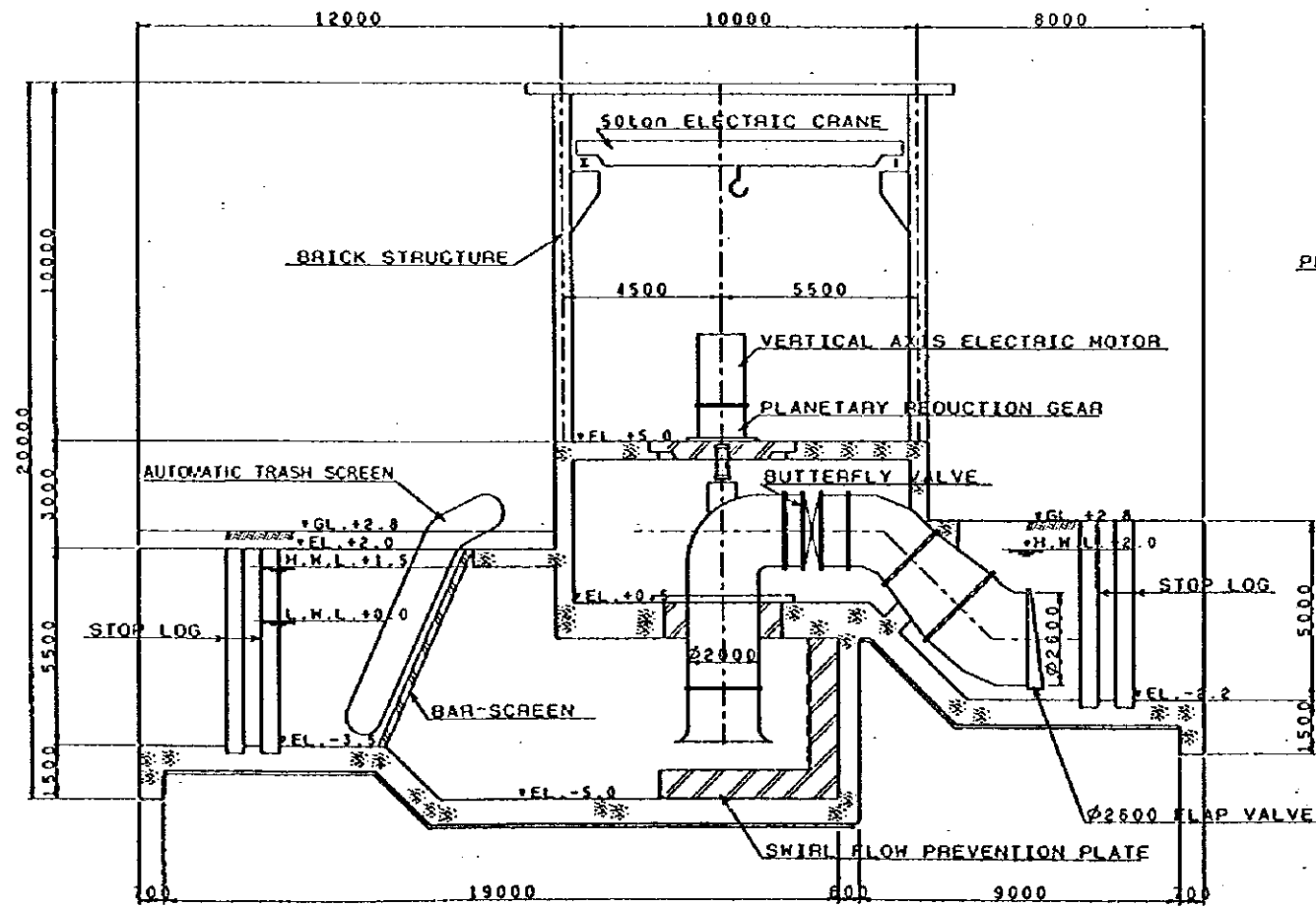


MOTORIZATION

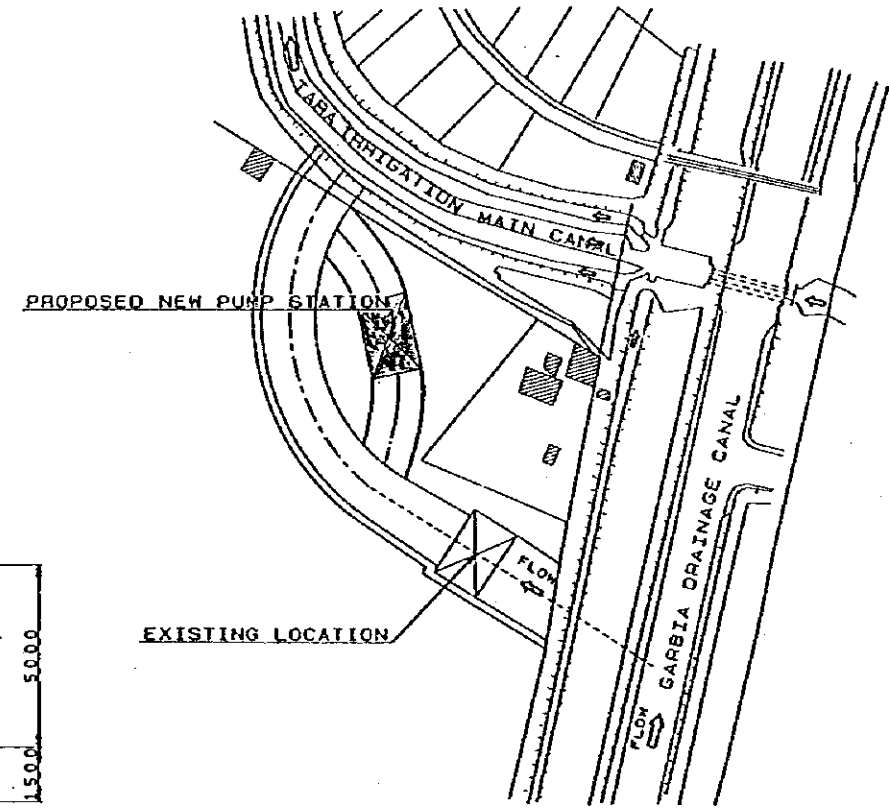
- NOTES:
- (1) THIS DRAWING IS SHOWN THE ABSHAN REGULATOR GATE MOTORIZATION IN THE TERA MAIN CANAL.
 - (2) THE LOCATION OF REGULATOR IS INDICATED ON THE FIGURE (NO MS - 1)
 - (3) MAJOR DIMENSIONS, EXISTING GATE MOTORIZATION, GATE OPERATION AND MISCELLANEOUS:
 - a) THE EXISTING GATE WILL BE OPERATED BY A MOTOR IN ADDITION TO THE MANUAL OPERATION AT THE SITE AND REMOTE AT NEAR THE SITE.
 - b) THE GATE OPENING AND/OR CLOSING THROUGH THE MOTOR WILL BE CARRIED OUT RELATED TO THE EXISTING MANUAL HOIST AND NEW EQUIPMENT AS SHOWN ON THE DRAWN (Motorization: New equipment and existing manual Hoist).
 - c) THE GATE OPENING AND/OR CLOSING WILL BE CARRIED OUT AT THE SITE AND REMOTE OPERATION.
 - d) THE REMOTE OPERATION WILL BE CARRIED OUT AT A REMOTE OPERATION BOARD INSTALLED IN THE BUILDING (5.0 m x 4.0 m) AT NEAR THE SITE.
 - (4) IN THE REMOTE OPERATION BUILDING, WHICH PROVIDED A GATE OPERATION CONSOLE OR BOARD, POWER RECEIVING PANEL, TELEMETER UNIT TO MOVING FROM OUT SIDE TO IN SIDE OF BUILDING.
 - (5) THE CABLE WORK IS REQUIRED BETWEEN THE SITE OF GATE OPERATION LOCATION AND REMOTE OPERATION BUILDING.
 - (6) THE WATER LEVEL METERS AND GATE OPERATION METERS WILL SENT TO KAFR EL SHEIKH OFFICE THROUGH VLF FOR MONITORING.



PLAN OF HAMOUL PUMP STATION



SECTION A-A



LOCATION MAP

NOTES:

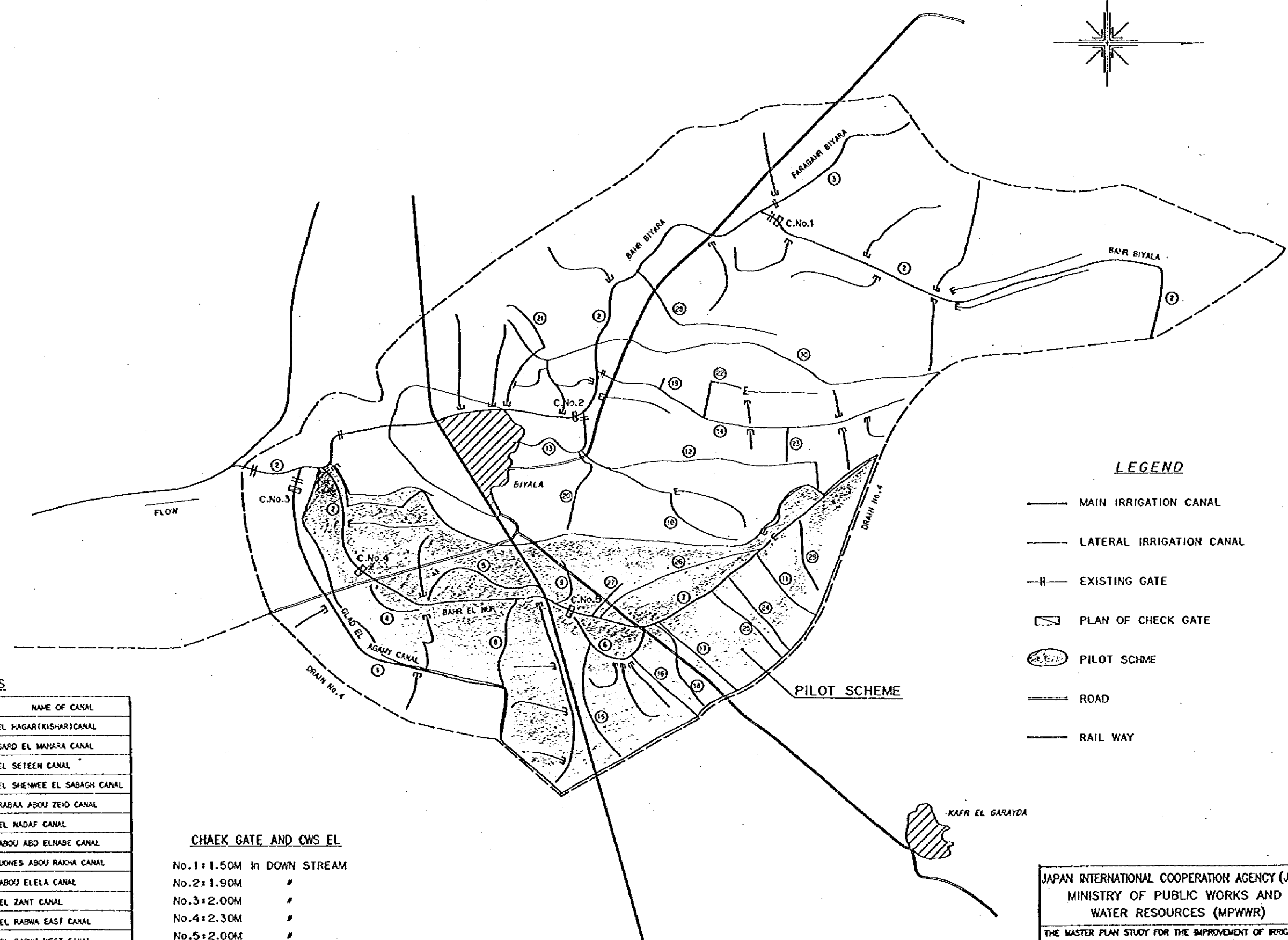
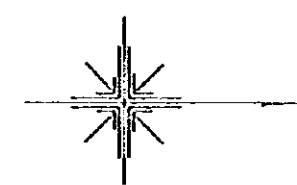
- (1) THIS DRAWING IS SHOWN IMPROVEMENT OF THE HAMOUL PUMP STATION.
- (2) THE LOCATION OF PUMP STATION IS INDICATED ON THE FIGURE (NO. MS - 1).
- (3) MAJOR DIMENSIONS, PUMP OPERATION PURPOSE AND MISCELLANEOUS:
 - a) PURPOSE: GHARBIA DRAINAGE WATER LIFTING FOR REUSE TO IRRIGATION IN TERA DOWN STREAM AREA.
 - b) PUMP NO : 3 SETS / 30 CUM / SEC (10 cum / sec / unit)
 - c) PUMP TYPE: VERTICAL AXIAL FLOW PUMP (2000 mm BORE)
 - d) CONSUMPTIVE USE OF POWER: 410 KW / hr / unit
 - e) SUCTION WATER LEVEL (Low) : + L.W.L. : 0.00 m
 - f) DELIVERY WATER LEVEL (High) : + H.W.L. : 1.00 m
- (4) ALL DIMENSIONS ARE SHOWN IN MILLIMETER AND ELEVATIONS (EL) IN METERS.
- (5) PROPOSED LOCATION OF NEW PUMP STATION IS LOCATED AT MED PROPERTY LAND

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IMPROVEMENT PLAN OF HAMOUL
 PUMP STATION

DATE	MARCH 1999	FIGURE NO.	FS-06
SANYU CONSULTANTS INC., JAPAN			



LEGEND

- MAIN IRRIGATION CANAL
- LATERAL IRRIGATION CANAL
- ||— EXISTING GATE
- ▭ PLAN OF CHECK GATE
- ⊙ PILOT SCHEME
- ROAD
- RAIL WAY

NAME OF CANALS

No.	NAME OF CANAL	No.	NAME OF CANAL
1	GARD EL AGAMY CANAL	16	EL HAGAR(KISHAR)CANAL
2	BAHR BIYALA CANAL	17	GARD EL MAHARA CANAL
3	FARA BIYALA CANAL	18	EL SETEEN CANAL
4	BAHR ELMUR(1) CANAL	19	EL SHEWEE EL SABAGH CANAL
5	BAHR ELMUR(2) CANAL	20	RABAA ABOU ZEID CANAL
6	BAHR ELMUR(3) CANAL	21	EL NADAF CANAL
7	BAHR ELMUR CANAL	22	ABOU ABD ELNABE CANAL
8	ABO KORA CANAL	23	LOHES ABOU RAJHA CANAL
9	EL MASHAK CANAL	24	ABOU ELELA CANAL
10	ZAKORA CANAL	25	EL ZANT CANAL
11	BAGARA CANAL	26	EL RABWA EAST CANAL
12	EL BAHRIA - A CANAL	27	EL RABWA WEST CANAL
13	EL BAHRIA - B CANAL	28	KHAMMO CANAL
14	EL SHURFA CANAL	29	BAHR EL NUR EXTENSION CANAL
15	EL WALDA CANAL	30	BAB EL FASHOOL CANAL

CHAEK GATE AND CWS EL

- No.1:1.50M In DOWN STREAM
- No.2:1.90M "
- No.3:2.00M "
- No.4:2.30M "
- No.5:2.00M "

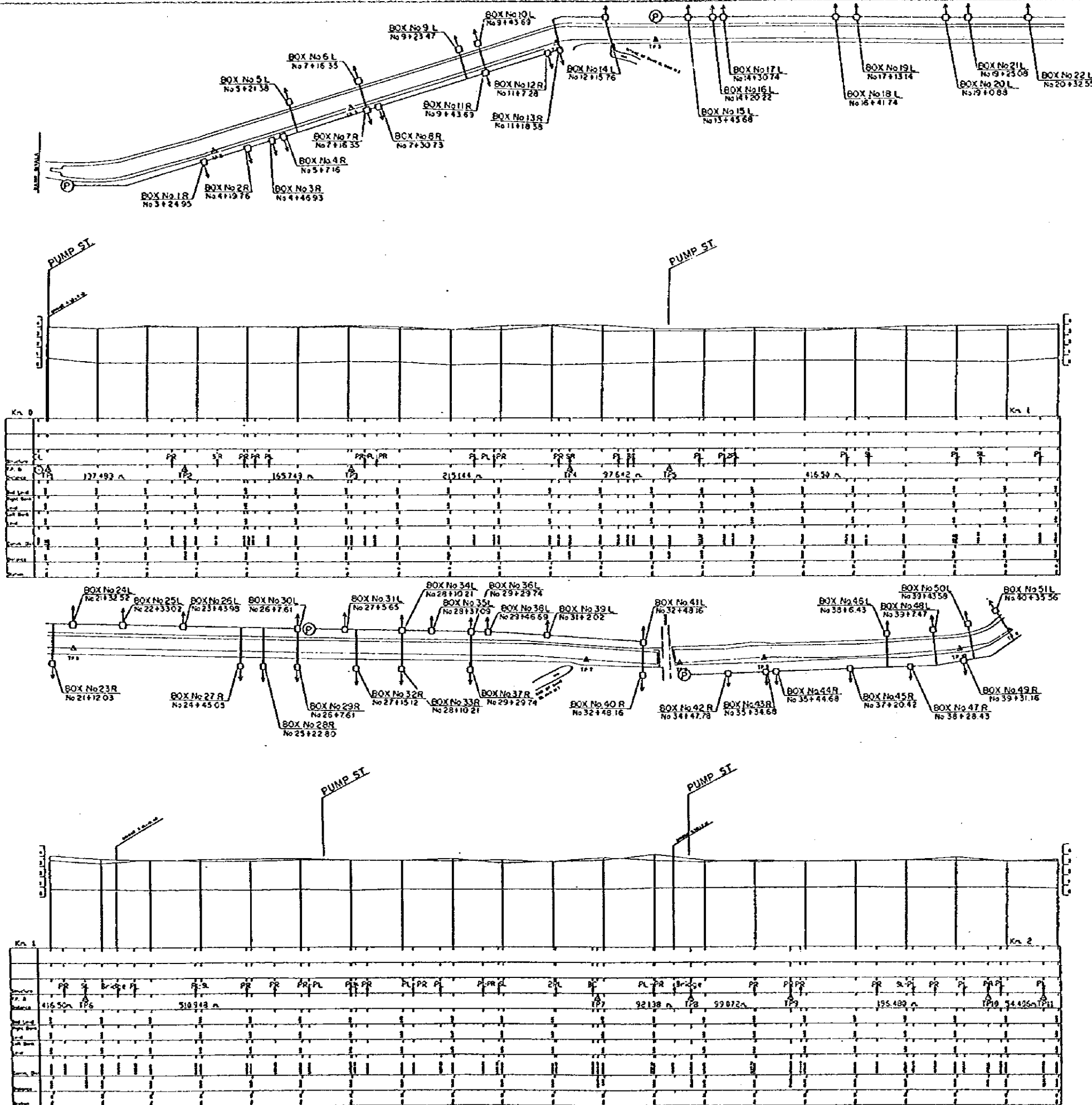
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PROSED LOCATION OF PILOT SCHEME

DATE	MARCH, 1999	FIGURE NO.	FS-07
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SANYU CONSULTANTS INC., JAPAN



NOTES:

- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT OF MESKA WATER SUPPLY SYSTEM IN PLACE OF THE EXISTING FARMER'S PUMP TO MURUWA DIRECTLY FROM NUR CANAL (DELIVERY CANAL)
- (2) THE LOCATION OF NUR CANAL IS SHOWN ON THE FIGURE NO MS-1 AND FS-07.
- (3) THE PLAN AND PROFILE DRAWINGS ALONG THE NUR CANAL CONSIST OF FIGURE NO (FS 08,09,10 AND 11)
- (4) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING:
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

REFERENCE	
△	TRANSVERSE POINT
BL	BEL LEVEL
L.B.	LEFT BANK LEVEL
R.B.	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

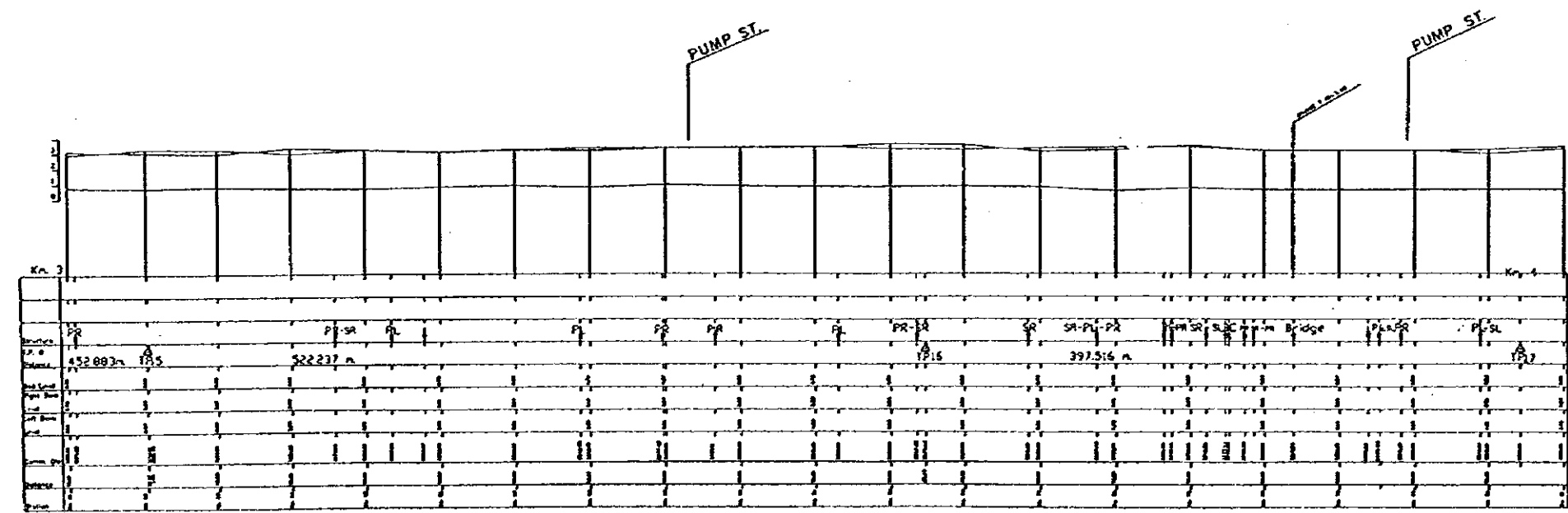
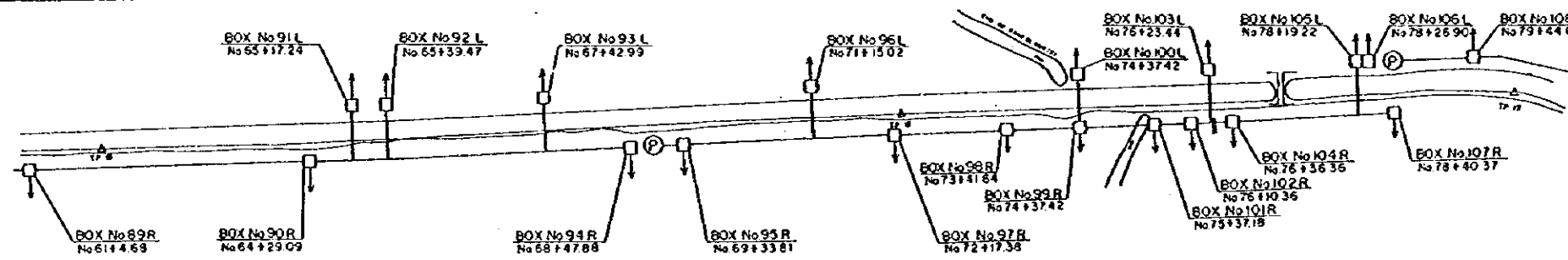
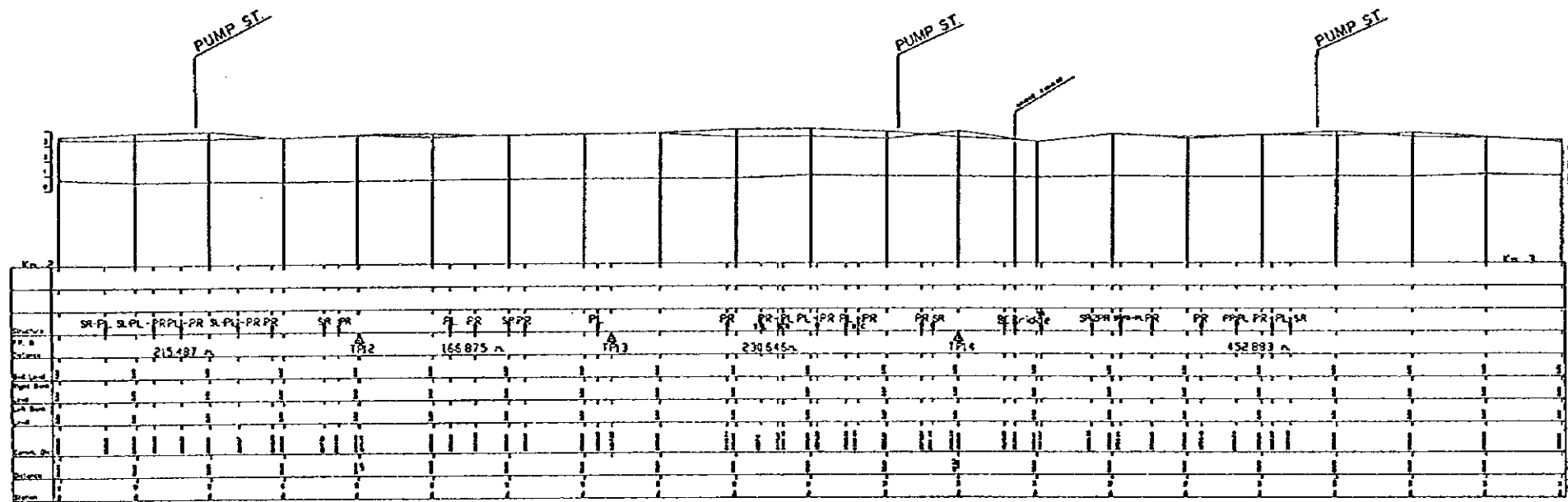
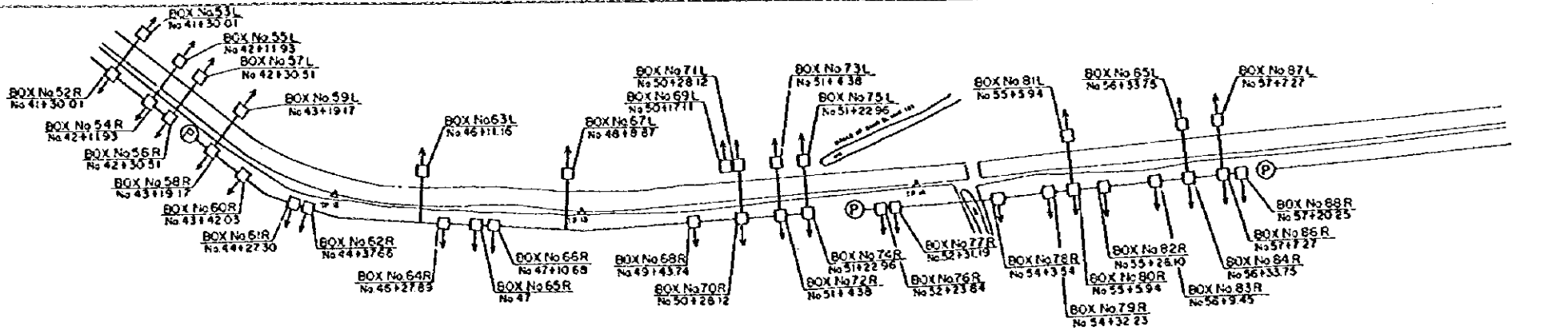
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IMPROVEMENT OF EL NUR CANAL
 PLAN AND PROFILE (1/4)

DATE MARCH, 1999 FIGURE NO. FS-08

SANYU CONSULTANTS INC., JAPAN



NOTES :

- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT OF MESKA WATER SUPPLY SYSTEM IN PLACE OF THE EXISTING FARMER'S PUMP TO MARUWA DIRECTLY FROM NUR CANAL (DELIVERY CANAL)
- (2) THE LOCATION OF NUR CANAL IS SHOWN ON THE FIGURE NO. MS-1 AND FS-07.
- (3) THE PLAN AND PROFILE DRAWINGS ALONG THE NUR CANAL CONSIST OF FIGURE NO (FS-08,09,10 AND 11).
- (4) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING:
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

REFERENCE	
△	TRAVERSE POINT
R	BOX LEVEL
L.B.	LEFT BANK LEVEL
R.B.	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

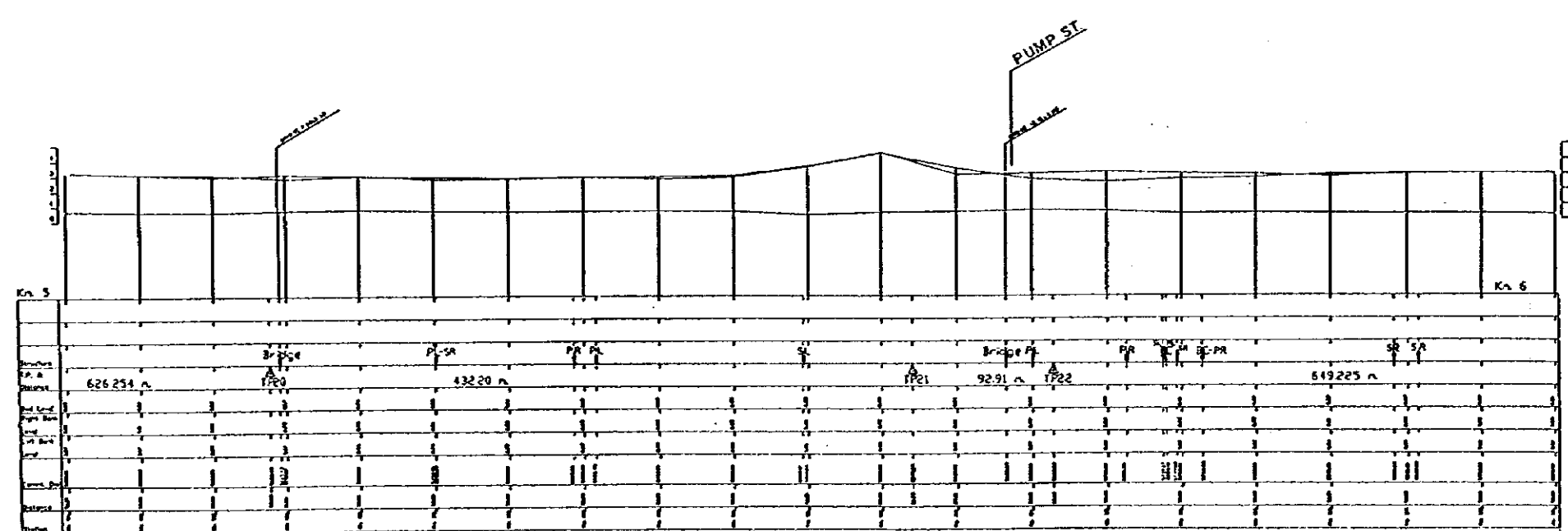
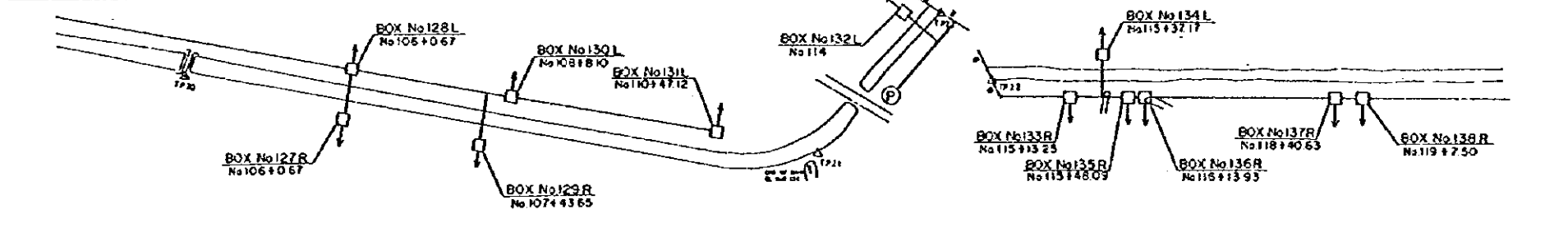
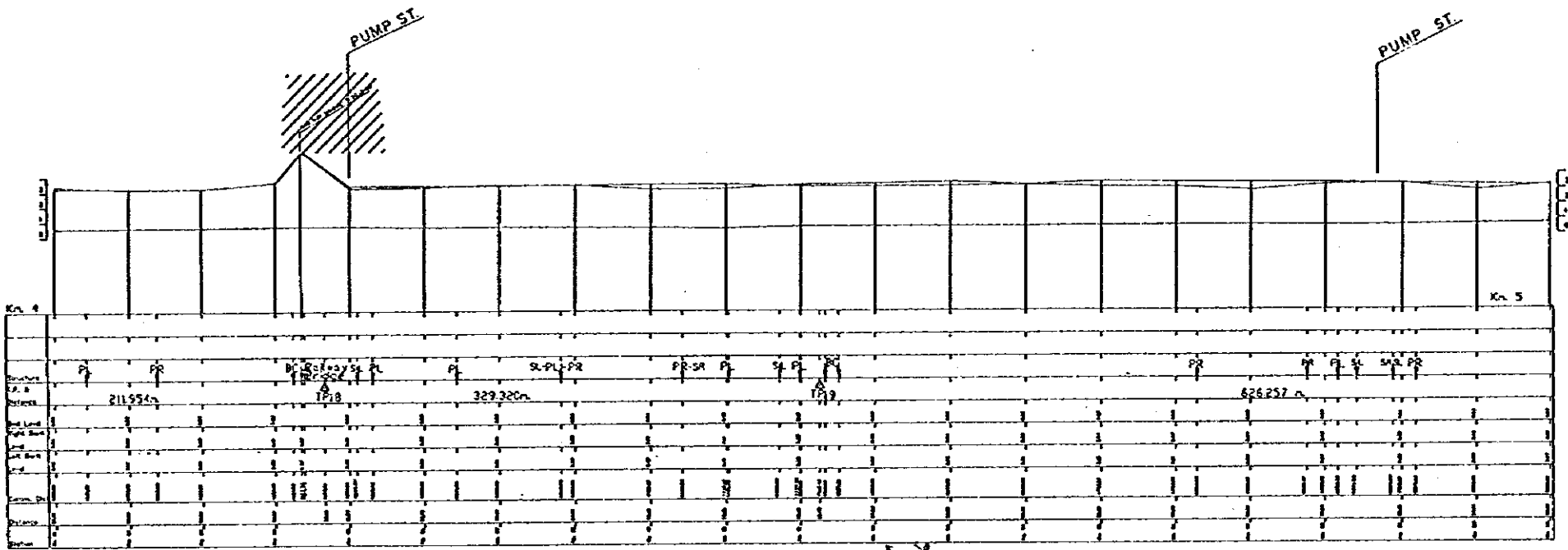
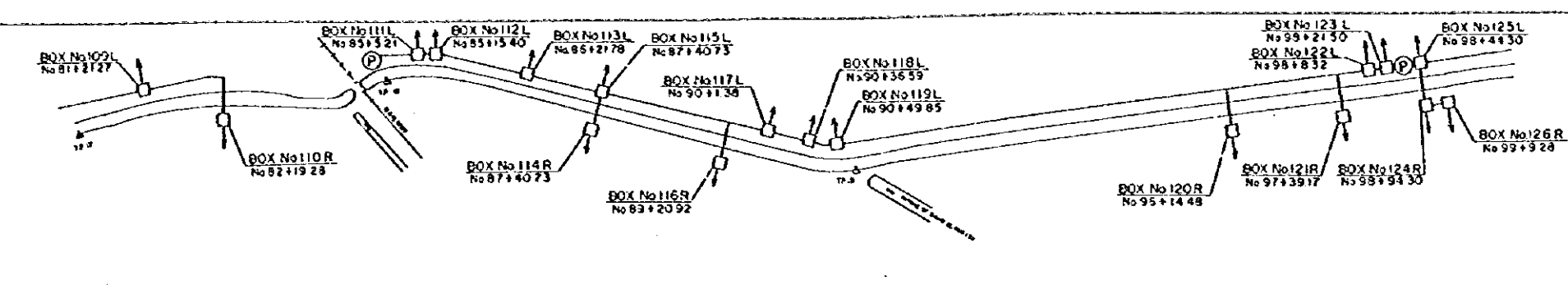
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IMPROVEMENT OF EL NUR CANAL
 PLAN AND PROFILE (2/4)

DATE MARCH, 1999 FIGURE NO. FS-09

SANYU CONSULTANTS INC., JAPAN



- NOTES:
- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT OF MESKA WATER SUPPLY SYSTEM IN PLACE OF THE EXISTING FARMER'S PUMP TO MARUWA DIRECTLY FROM NUR CANAL (DELIVERY CANAL)
 - (2) THE LOCATION OF NUR CANAL IS SHOWN ON THE FIGURE NO MS-1 AND FS-07.
 - (3) THE PLAN AND PROFILE DRAWINGS ALONG THE NUR CANAL CONSIST OF FIGURE NO (FS-08,09,10 AND 11).
 - (4) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING:

- a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
- b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
- c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
- d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
- e) MISCELLANEOUS (FIG. NO DD-25)

REFERENCE	
△	TRAVERSE POINT
BL	BED LEVEL
LBL	LEFT BANK LEVEL
RBL	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
∩	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

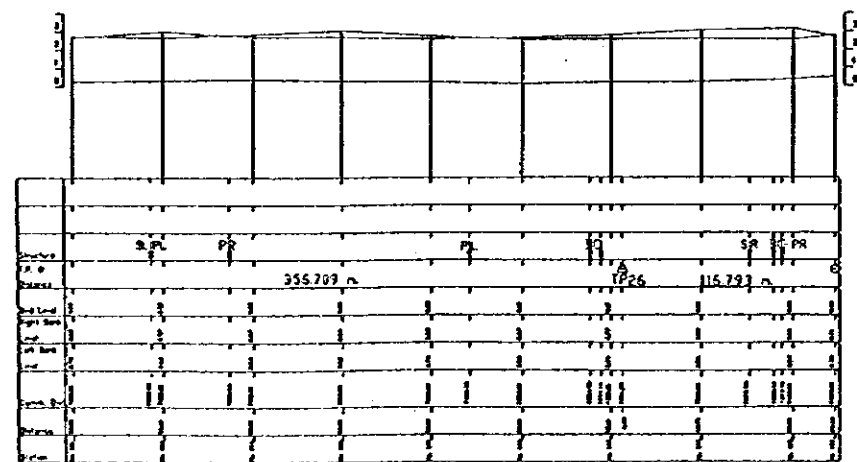
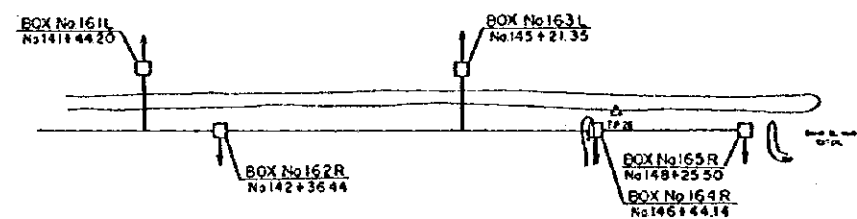
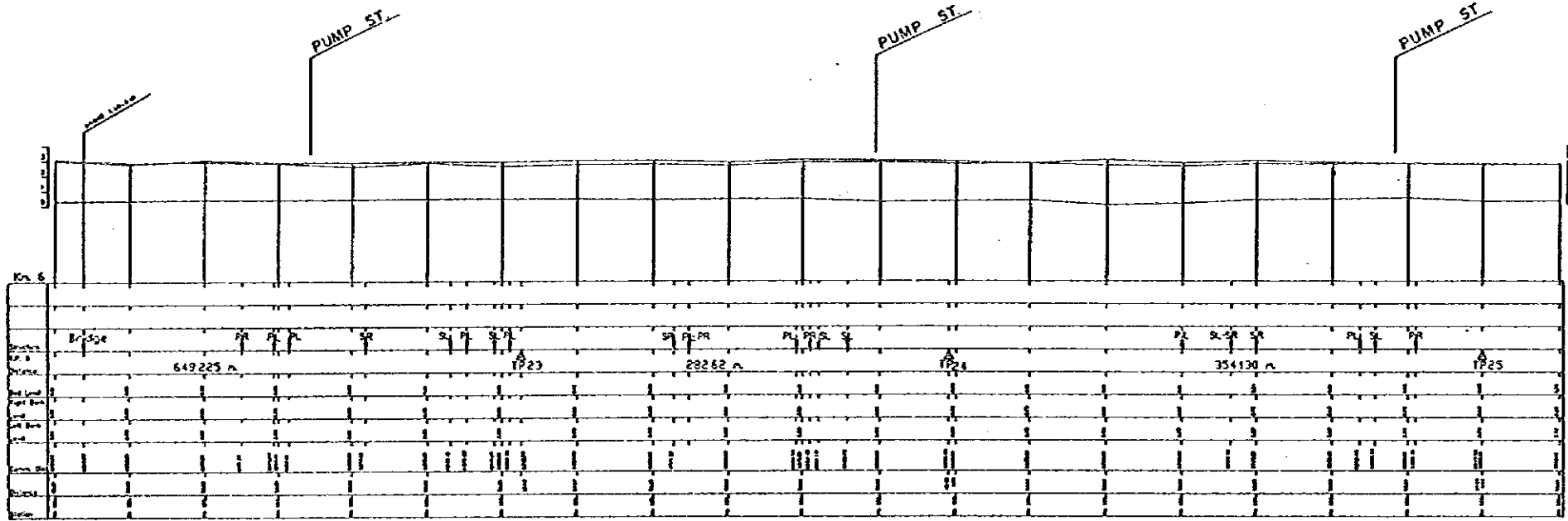
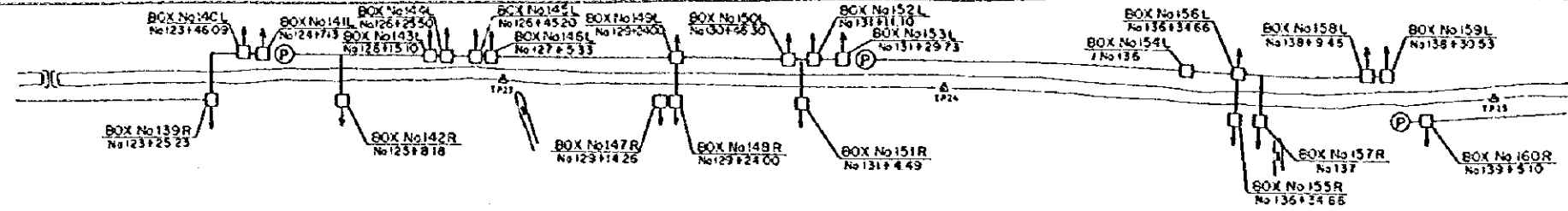
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IMPROVEMENT OF EL NUR CANAL
 PLAN AND PROFILE (3/4)

DATE MARCH, 1999 FIGURE NO. FS-10

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- NOTES :
- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT OF MESKA WATER SUPPLY SYSTEM IN PLACE OF THE EXISTING FARMER'S PUMP TO MARUWA, DIRECTLY FROM NUR CANAL (DELIVERY CANAL)
 - (2) THE LOCATION OF NUR CANAL IS SHOWN ON THE FIGURE NO MS-1 AND FS-07.
 - (3) THE PLAN AND PROFILE DRAWINGS ALONG THE NUR CANAL CONSIST OF FIGURE NO (FS-08,09,10 AND 11).
 - (4) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING:
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

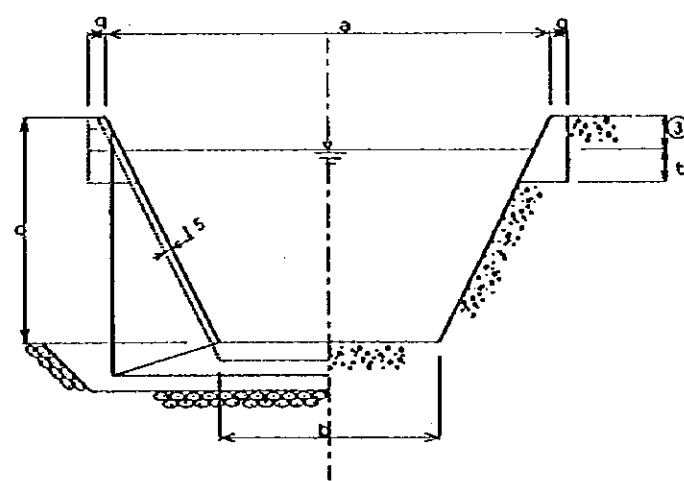
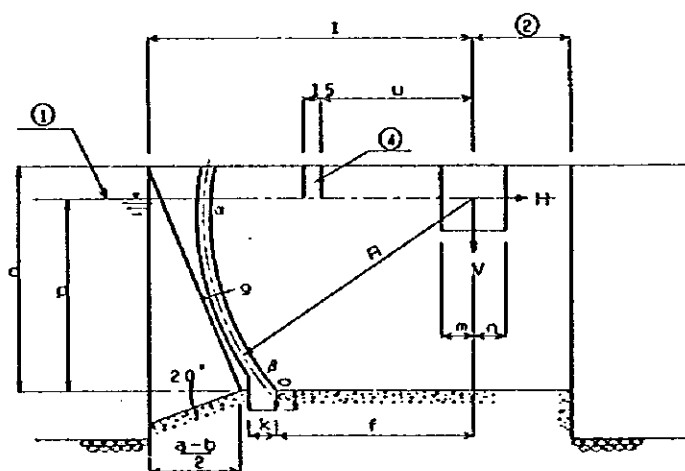
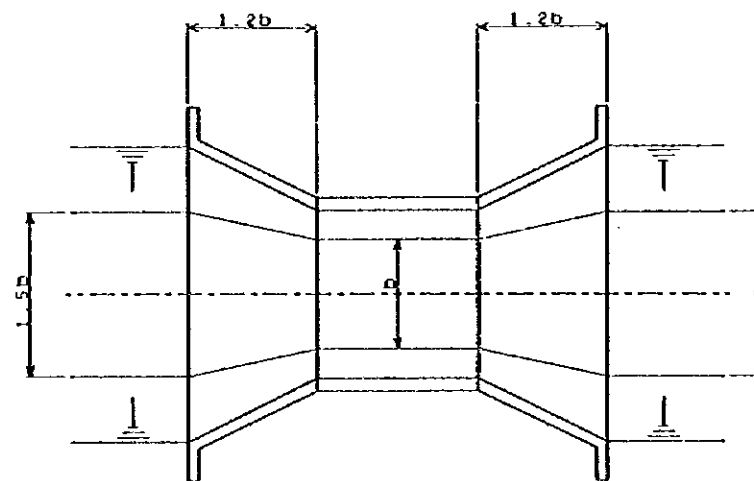
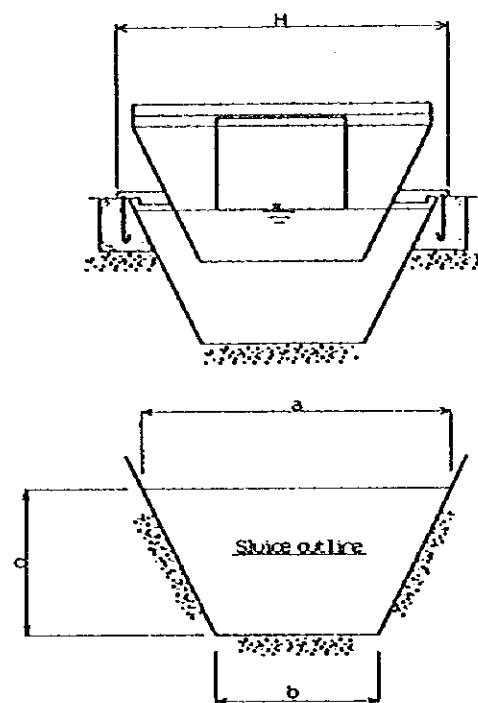
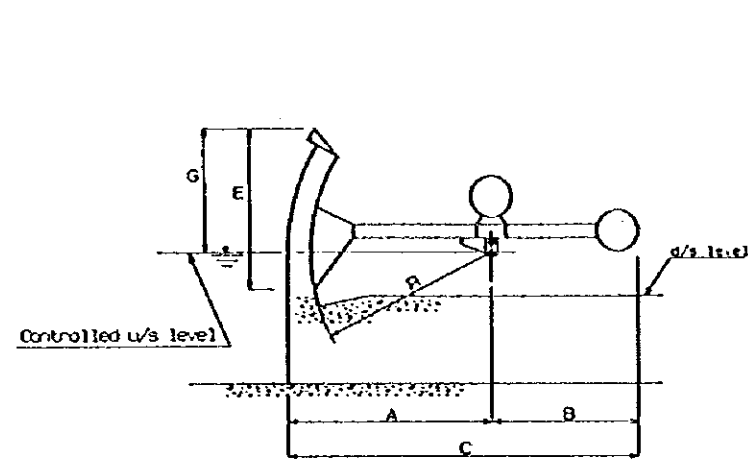
REFERENCE	
△	TRAVERSE POINT
PL	BED LEVEL
LB	LEFT BANK LEVEL
RB	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

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IMPROVEMENT OF EL NUR CANAL
 PLAN AND PROFILE (1/4)

DATE MARCH, 1999 FIGURE NO. FS-11
 SANYU CONSULTANTS INC., JAPAN



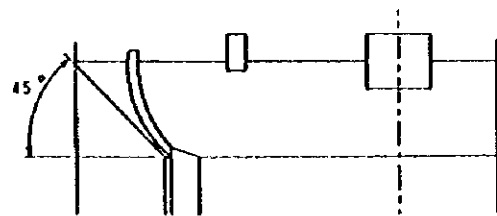
Dimensions in cm

AMIL		OVERALL DIMENSIONS (Gate open)						SLUICE OUTLINE DIM.		
D	R	A	B	C	E	G	H	a	b	c
140	90	104	71	175	81	50	171	150	80	71
160	90	106	71	177	95	60	191	170	90	80
180	125	143	101	244	102	68	214	190	100	90
200	125	145	101	246	117	73	236	212	112	100
220	125	148	101	249	134	85	260	236	125	112
250	160	185	117	301	144	91	303	265	140	125
280	160	188	117	304	166	105	336	300	160	140
315	200	232	145	377	181	112	390	335	180	160
355	200	236	145	381	214	135	430	375	200	180
400	250	290	185	475	234	145	474	425	224	200
450	250	295	185	480	268	170	520	475	250	224
500	315	365	236	601	289	183	540	530	280	250
560	315	371	236	607	333	211	605	600	315	280
630	400	463	298	761	361	233	677	670	355	315
710	400	471	298	769	419	265	762	750	400	355
800	450	530	333	863	481	305	871	850	450	400

Dimensions in cm

TYPE	SLUICE			u/s depth	STRUCTURE DEFINITION													THRUSTS on STRUCTURE	
	D	R	a		b	c	p	e	f	g	k	i	m	n	q	t	u	v	H
140	90	150	80	71	63	35	-	-	-	108	18	18	15	20	-	-	-	0.10	0.15
160	90	170	90	80	71	40	-	-	-	108	18	18	15	20	-	-	-	0.15	0.20
180	125	190	100	90	80	45	86	15	30	150	23	23	16	20	-	-	150	0.20	0.30
200	125	212	112	100	90	50	76	15	30	150	23	23	16	20	-	-	149	0.30	0.40
220	125	236	125	112	100	55	62	15	30	150	23	23	16	20	-	-	148	0.40	0.40
250	160	265	140	125	112	62	108	15	30	192	25	25	25	15	-	-	190	0.80	0.50
280	160	300	160	140	125	70	87	15	30	192	25	25	25	15	-	-	189	1.00	0.80
315	200	335	180	160	140	77	128	20	40	240	25	25	35	17	-	-	238	1.50	1.00
355	200	375	200	180	160	87	102	20	40	240	25	25	35	17	-	-	236	2.00	1.50
400	250	425	224	200	180	100	159	20	40	300	33	33	35	22	-	-	298	3.00	2.00
450	250	475	250	224	200	112	133	20	40	300	33	33	35	22	-	-	295	4.00	3.00
500	315	530	280	250	224	125	207	20	40	378	60	60	40	20	60	200	375	5.00	4.00
560	315	600	315	280	250	142	175	20	40	378	60	60	40	20	60	200	372	8.00	5.00
630	400	670	355	315	280	157	272	20	40	480	70	50	30	80	250	476	10.00	8.00	
710	400	750	400	355	315	175	230	20	40	480	70	50	30	80	250	472	14.00	10.00	
800	450	850	450	400	360	200	253	20	40	540	80	50	40	90	275	531	20.00	18.00	

- H. Horizontal thrust on the concrete, per bearing (in metric tons)
 V. Vertical thrust on the concrete, per bearing (in metric tons)
- Controlled upstream level.
 - To be defined according to structure stability and concrete strength.
 - Freeboard depending on local conditions.
 - One grouting hole on left bank, for AMIL D 500 and larger.
- a, b: For determining the groove edge position in the plane of the side walls, find the centre of the circle of radius ρ passing through points a and b. Distance between a and the axis = $R - g$; distance between b and the vertical line passing through the axis = f . The trace from this centre the circles of radii ρ and $\rho + g$.



NOTES:

- THIS DRAWING IS INDICATED A TYPICAL DIMENSIONS OF THE CHECK STRUCTURE AND RELATED TO AN OPEN TRANSITION AT FRONT AND BACK STREAMS ON THE DELIVERY CANAL.
- SCOPE OF WORK FOR CHECK STRUCTURE IS LIMITED INCLUDING A PART OF CHECK STRUCTURE AND OPEN TRANSITIONS.
- DETAILED PLAN AND DESIGN ARE APPLIED BASED ON THESE DIMENSIONS INDICATED IN CENTIMETER.
- THE CHECK STRUCTURES WORKS WILL BE CARRIED OUT BASED ON THE FOLLOWING SPECIFICATIONS APPROVED BY THE IIS.
 - CIVIL WORK
THE CIVIL WORK IS APPLIED BY THE IIS SPECIFICATIONS, INCLUDING EARTH, CONCRETE AND MISCELLANEOUS
 - STEEL MATERIALS
THE STEEL WORKS, INCLUDING MATERIAL ASSEMBLY TO BE ATTACHED MILL SHEET OF CERTIFICATE FOR THE MATERIALS.
 - MANUFACTURE
MANUFACTURE'S SPECIFICATIONS, ASSEMBLY, CUTTING, WELDING, TESTING, PAINTING AND TRANSPORTATION.
 - INSTALLATION WORK AND TAKE OVER
HANDING, INSTALLATION, TESTING AT THE SITE AS WELL AS PROVISIONAL / FINAL TAKE OVER AND OR GUARANTEE PERIOD

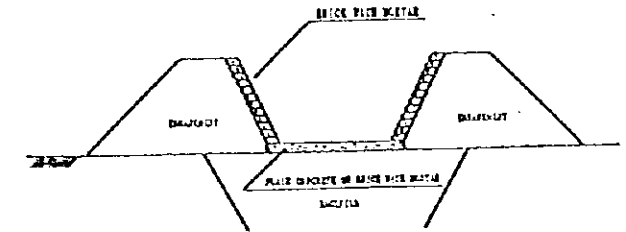
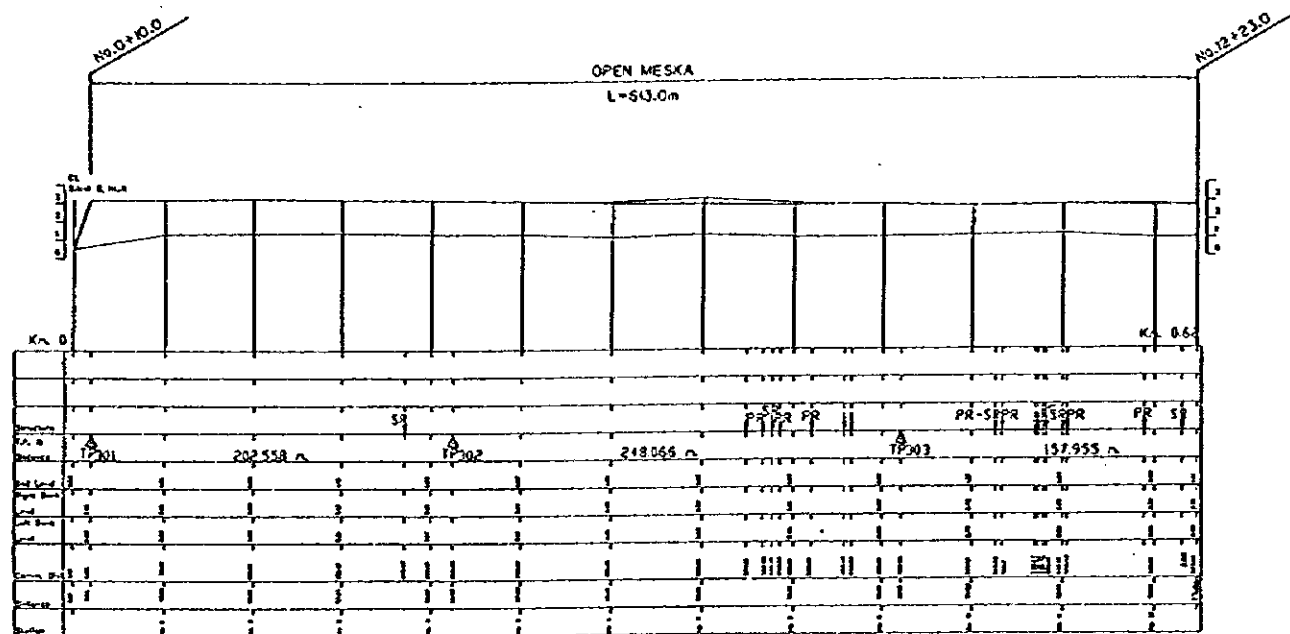
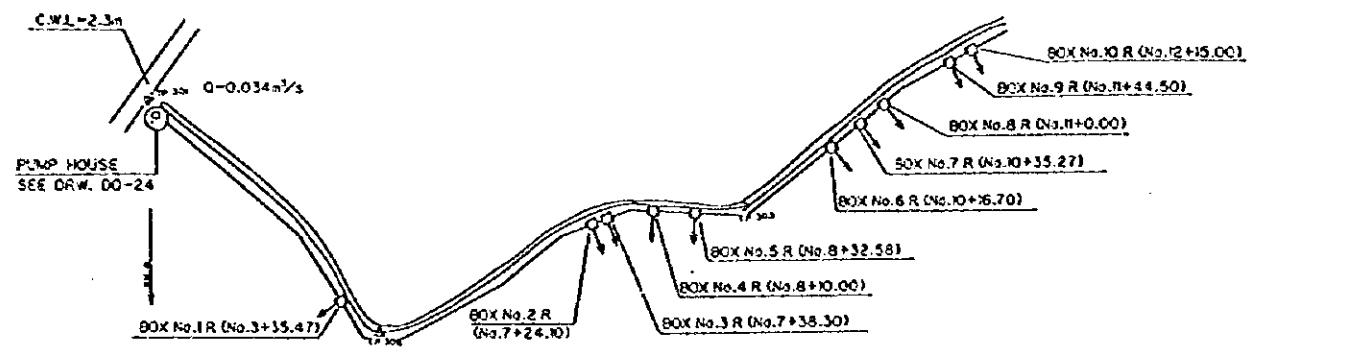
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
 MINISTRY OF PUBLIC WORKS AND
 WATER RESOURCES (MPWWR)

THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

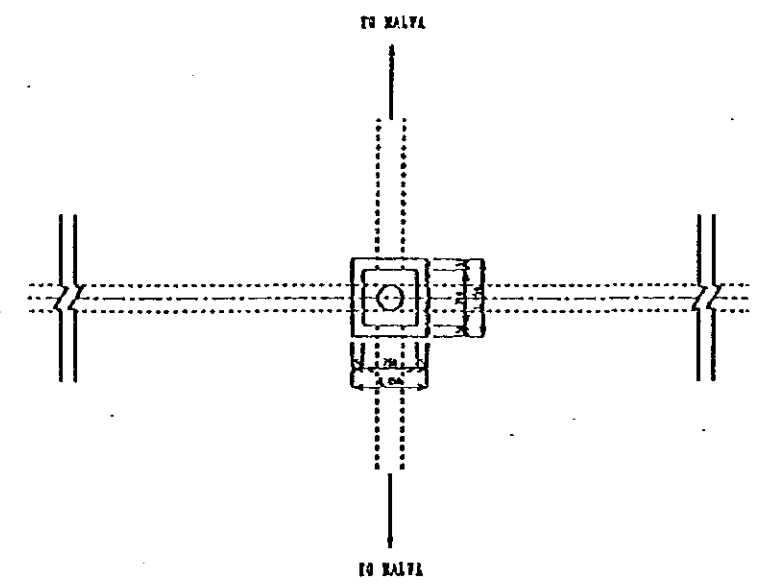
PLAN OF CHECK GATE
 IN THE DELIVERY CANAL

DATE: MARCH, 1999 | FIGURE NO.: FS-12

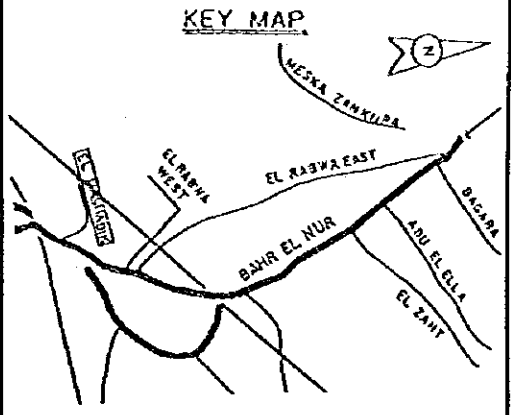
SANYU CONSULTANTS INC., JAPAN



TYPICAL SECTION
OPEN MESKA
SEE DRW. 00-22



BOX TURNOUT
SEE DRW. 00-22



NOTES:

- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT FOR MESKA (EL MASHABIK CANAL) WATER SUPPLY TO A MALUWATROUGH A PUMP STATION, NEW MESKA AND MALWA (TURNOUT BOX).
- (2) THE LOCATION OF EL MASHABIK CANAL IS INDICATED ON THE DRAWING (FIGURE NO FS-07) IN THE BAHAR EL NUR CANAL.
- (3) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING.
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA. (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

REFERENCE	
△	TRANSVERSE POINT
SL	SEA LEVEL
LM	LEFT BANK LEVEL
RM	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

IMPROVEMENT PLAN AND PROFILE
 (EL MASHABIK CANAL)

DATE	MARCH, 1999	FIGURE NO.	DD-13
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SANYU CONSULTANTS INC., JAPAN

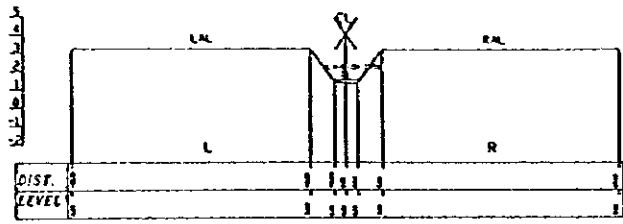
NOTES :

(1) THIS DRAWING IS SHOWN AN ORIGINAL CROSS SECTION ALONG THE EL MASHABIK CANAL FOR 50 M INTERVALS.

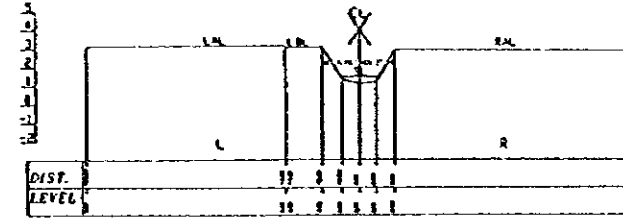
(2) THE FOLLOWING DRAWING AND NOTES ARE RELATED TO THIS DRAWING.

a) IMPROVEMENT PLAN AND PROFILE (EL MASHABIK CANAL, FIGURE NO DD-13).

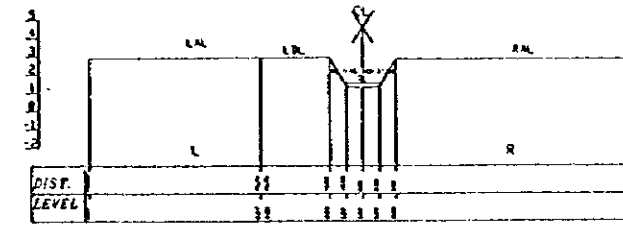
b) ALL NOTES INDICATED ON THE FIGURE NO DD-13.



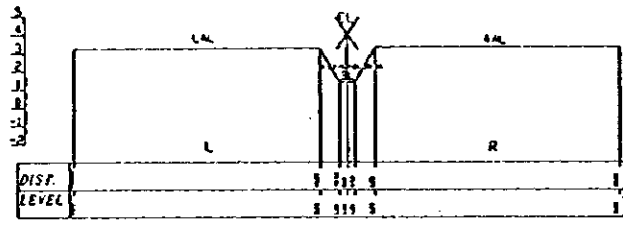
CROSS SECTION 0050 M - No.1



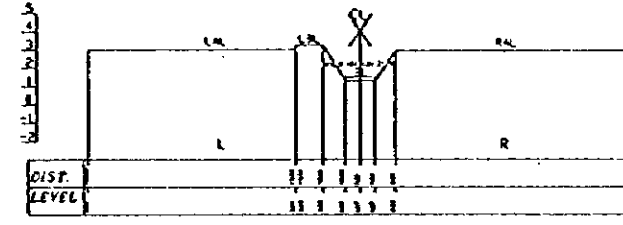
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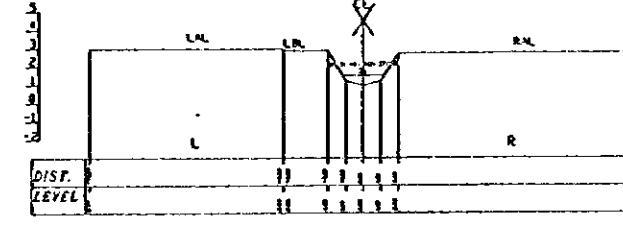
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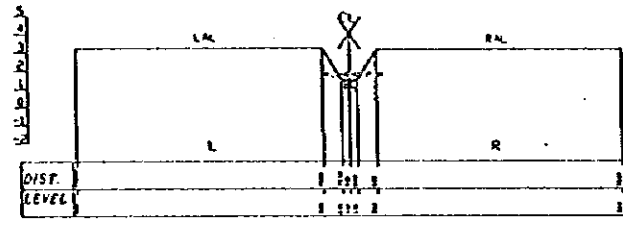
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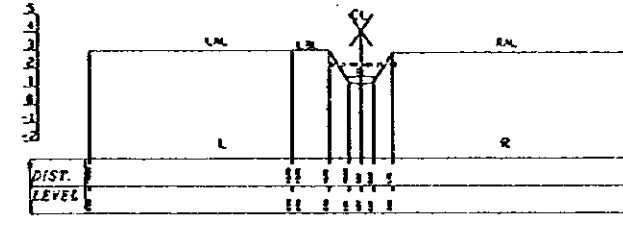
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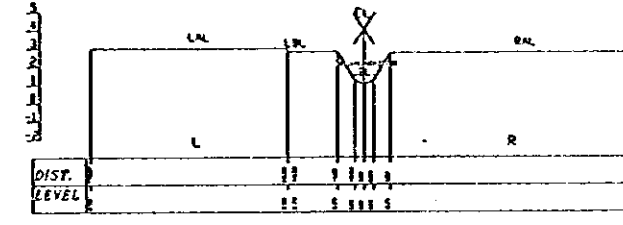
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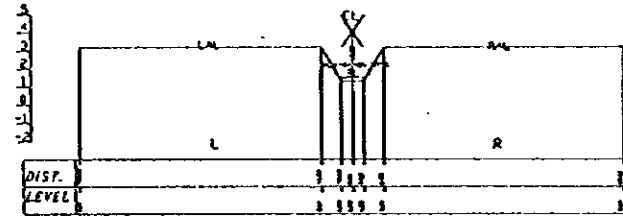
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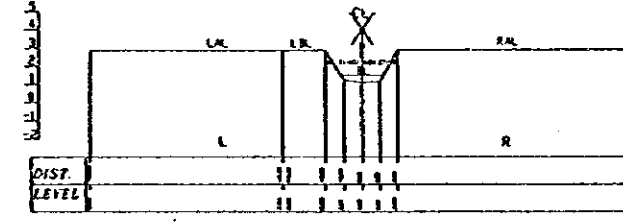
CROSS SECTION 0400 M - No.8



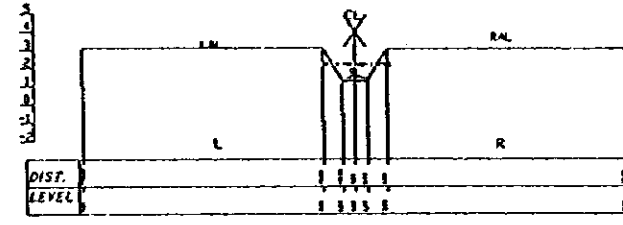
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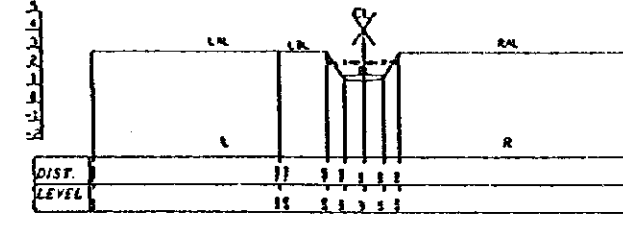
CROSS SECTION 0200 M - No.4



CROSS SECTION 0450 M - No.9



CROSS SECTION 0250 M - No.5



CROSS SECTION 0500 M - No.10

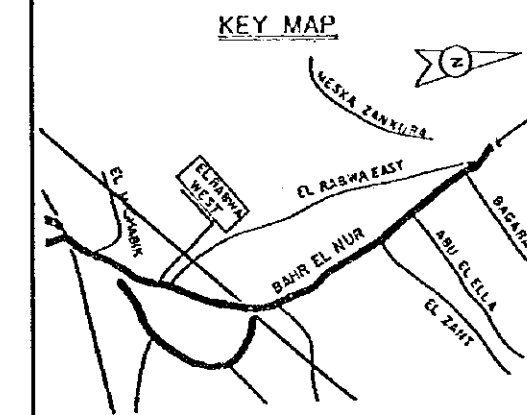
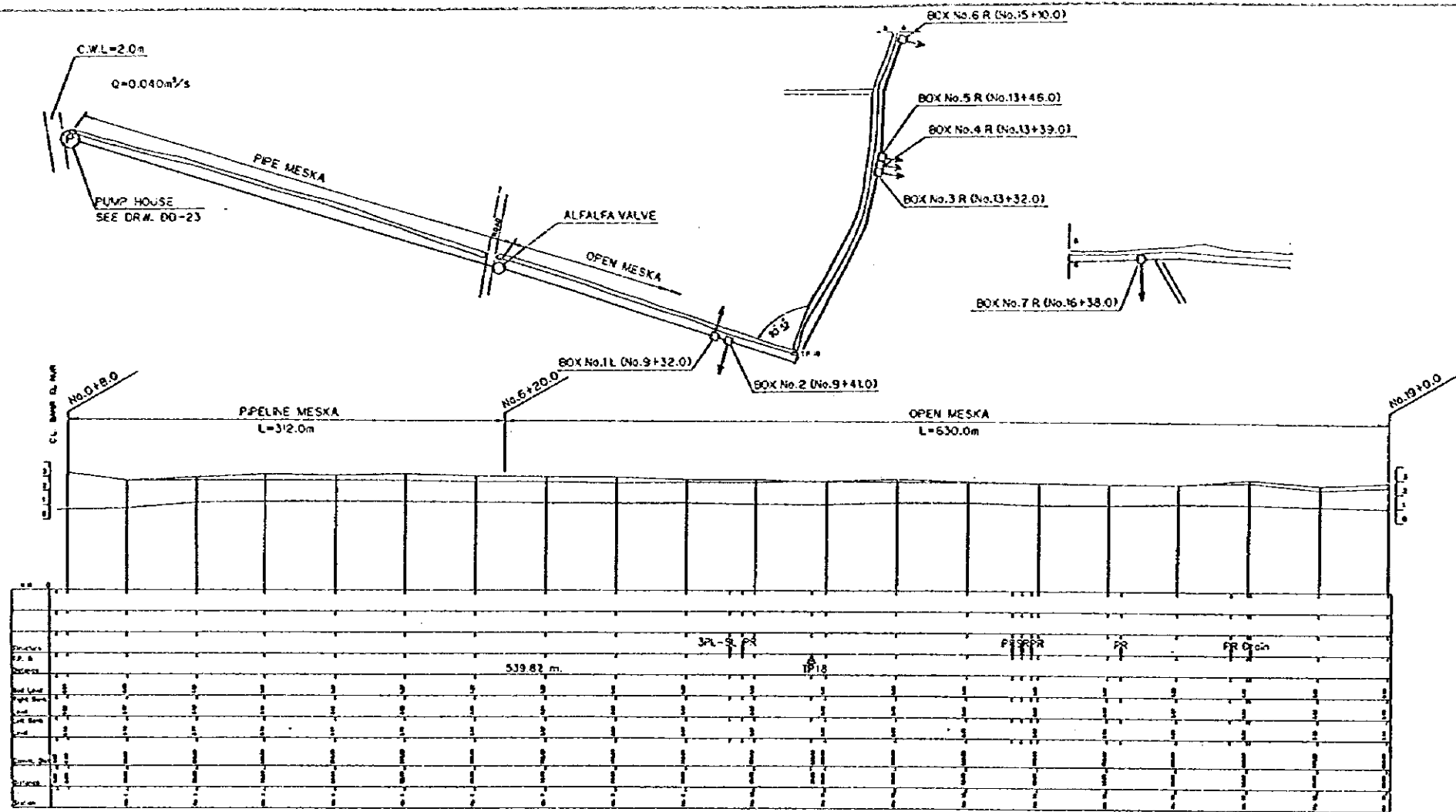
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
NORTH-EAST REGION OF THE CENTRAL NILE DELTA

CROSS SECTION
IN EL MASHABIK CANAL

DATE | MARCH, 1999 | FIGURE NO. | DD-14

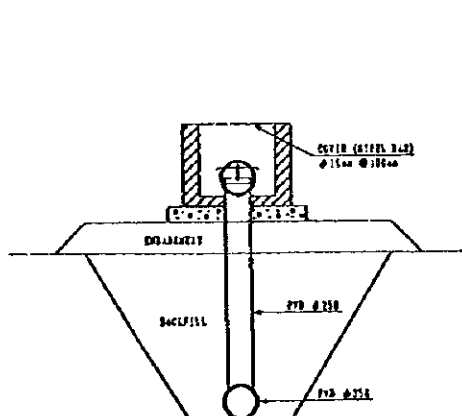
SANYU CONSULTANTS INC., JAPAN



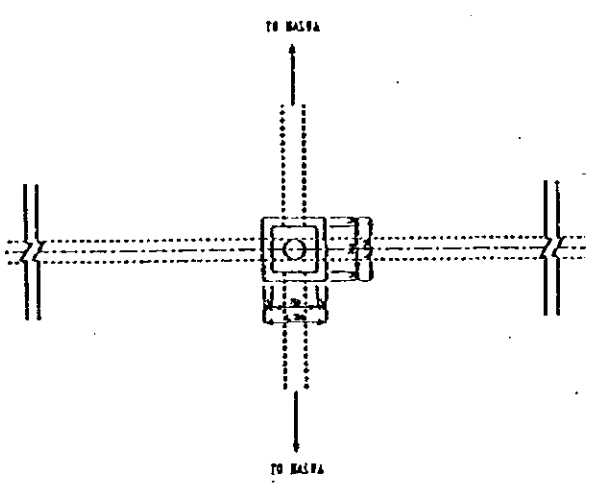
NOTES :

- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT FOR MESKA (EL RABWA WEST CANAL) WATER SUPPLY TO A MALWA THROUGH A PUMP STATION, NEW MESKA AND MALWA (TURNOUT BOX).
- (2) THE LOCATION OF EL RABWA WEST CANAL IS INDICATED ON THE DRAWING (FIGURE NO FS-07) IN THE BAHAR EL NUR CANAL.
- (3) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING.
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

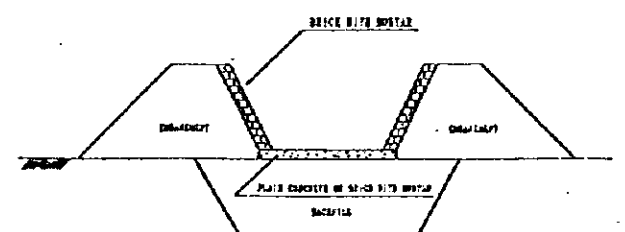
REFERENCE	
△	TRAVERSE POINT
R	RED LEVEL
L.R.	LEFT BANK LEVEL
R.R.	RIGHT BANK LEVEL
SL	LEFT SAKYA
SR	RIGHT SAKYA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CD	CROSS DRAIN



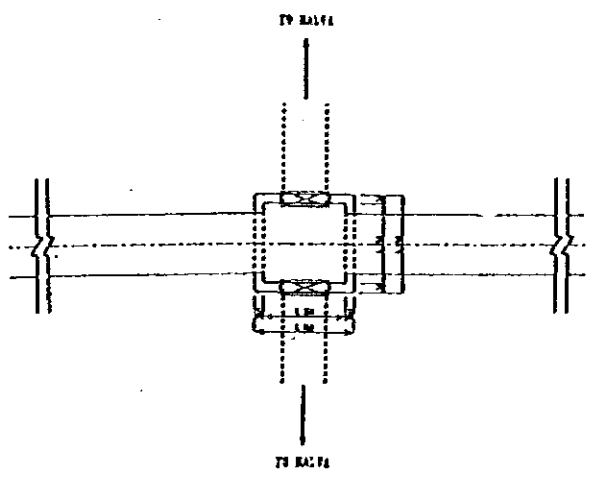
TYPICAL SECTION PIPELINE MESKA
SEE DRW. DD-23



BOX & ALFALFA VALVE
SEE DRW. DD-23



TYPICAL SECTION OPEN MESKA
SEE DRW. DD-22



BOX TURNOUT
SEE DRW. DD-23

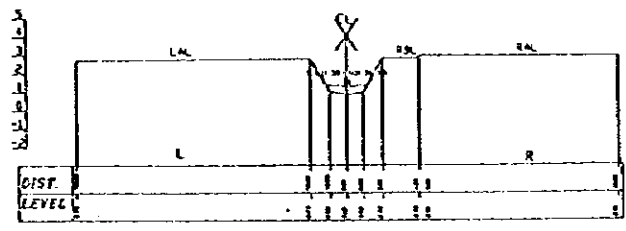
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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WATER RESOURCES (MPWWR)

THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
NORTH-EAST REGION OF THE CENTRAL NILE DELTA

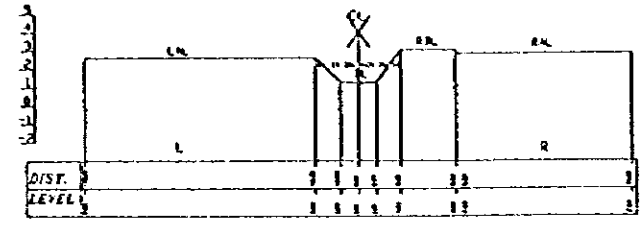
IMPROVEMENT PLAN AND PROFILE
(EL RABWA WEST CANAL)

DATE	MARCH, 1999	FIGURE NO.	DD-15
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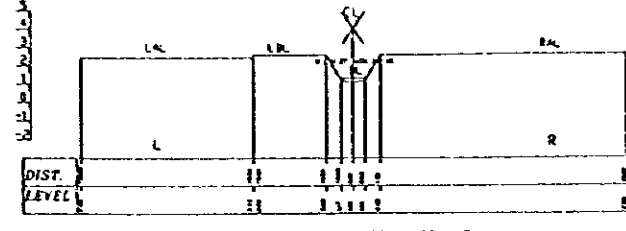
SANYU CONSULTANTS INC., JAPAN



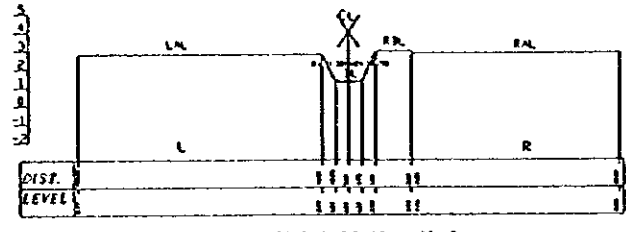
CROSS SECTION 0050 M - No.1



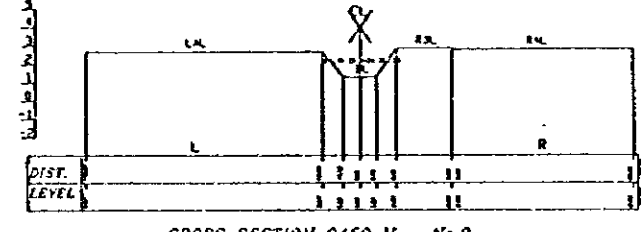
CROSS SECTION 0400 M - No.8



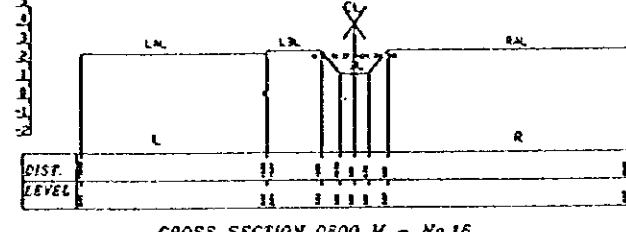
CROSS SECTION 0750 M - No.15



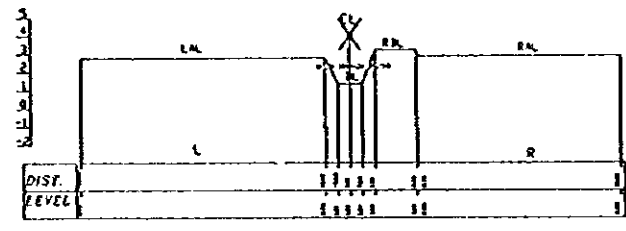
CROSS SECTION 0100 M - No.2



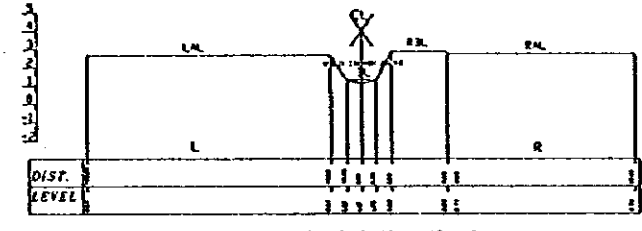
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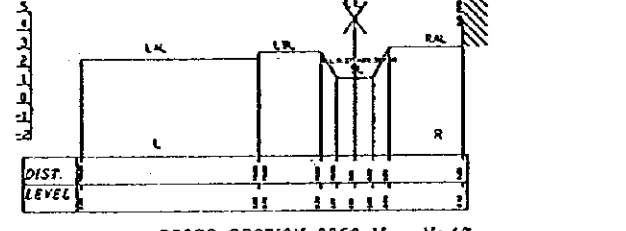
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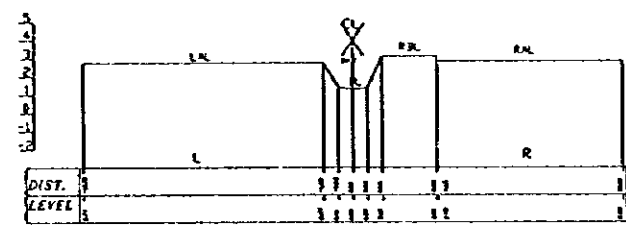
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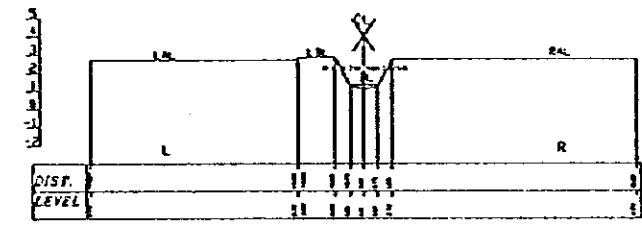
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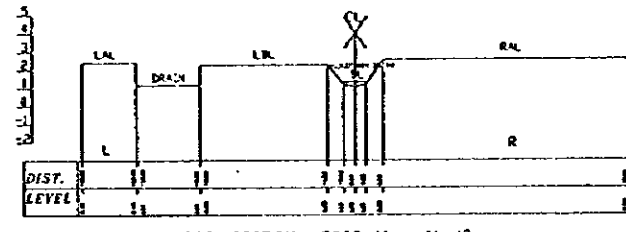
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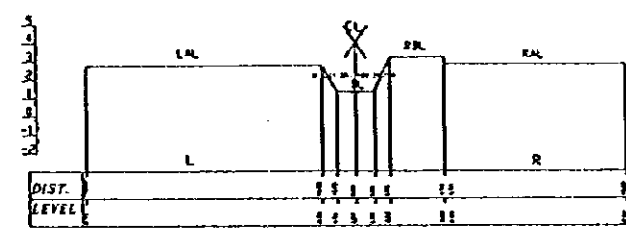
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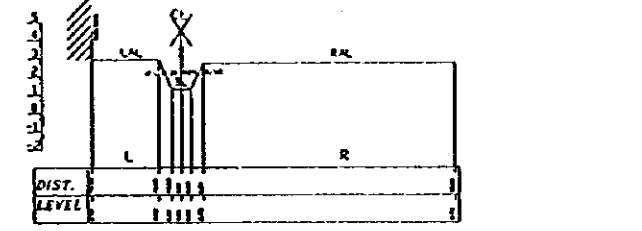
CROSS SECTION 0550 M - No.11



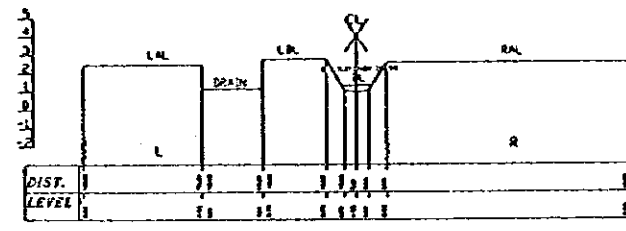
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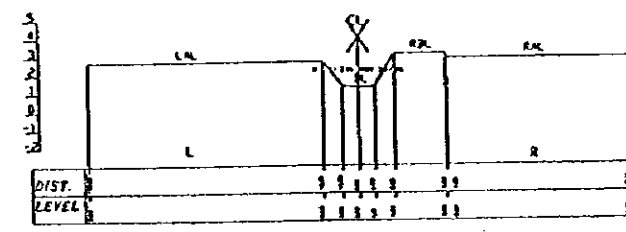
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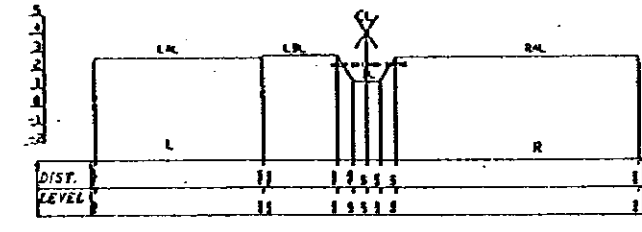
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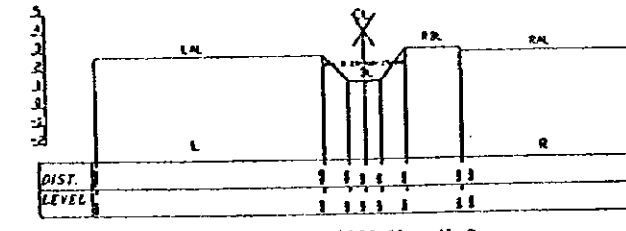
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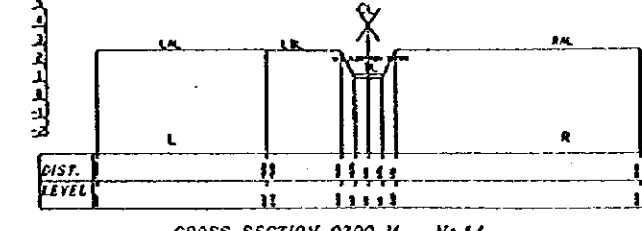
CROSS SECTION 0300 M - No.6



CROSS SECTION 0650 M - No.13



CROSS SECTION 0350 M - No.7



CROSS SECTION 0700 M - No.14

NOTES :

- (1) THIS DRAWING IS SHOWN AN ORIGINAL CROSS SECTION ALONG THE EL. RABWA WEST CANAL FOR 50 M INTERVALS.
- (2) THE FOLLOWING DRAWING AND NOTES ARE RELATED TO THIS DRAWING.
 - a) IMPROVEMENT PLAN AND PROFILE (EL. MASHARA CANAL, FIGURE NO DD-15)
 - b) ALL NOTES INDICATED ON THE FIGURE NO DD-15.

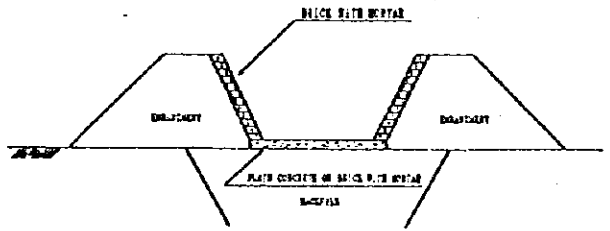
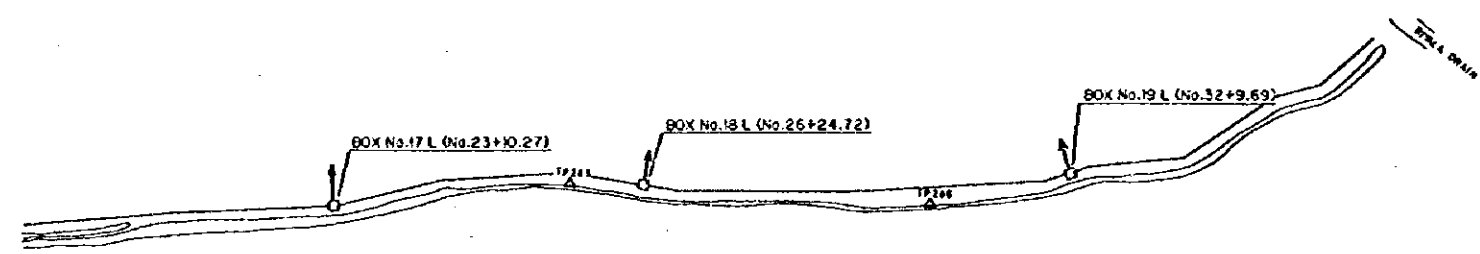
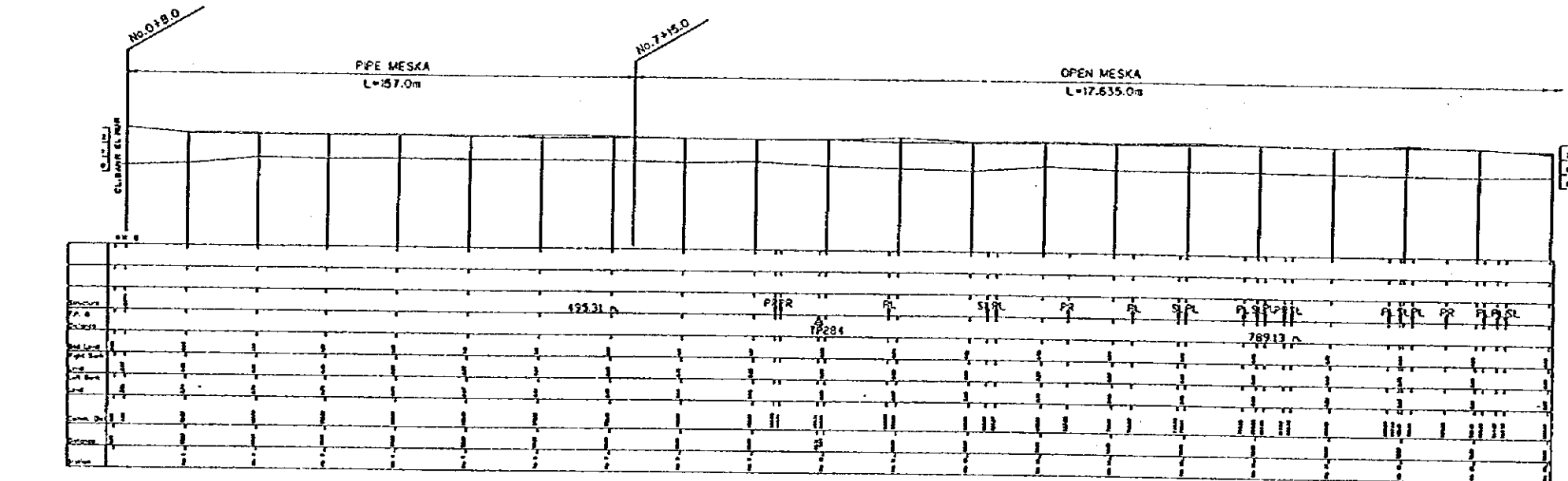
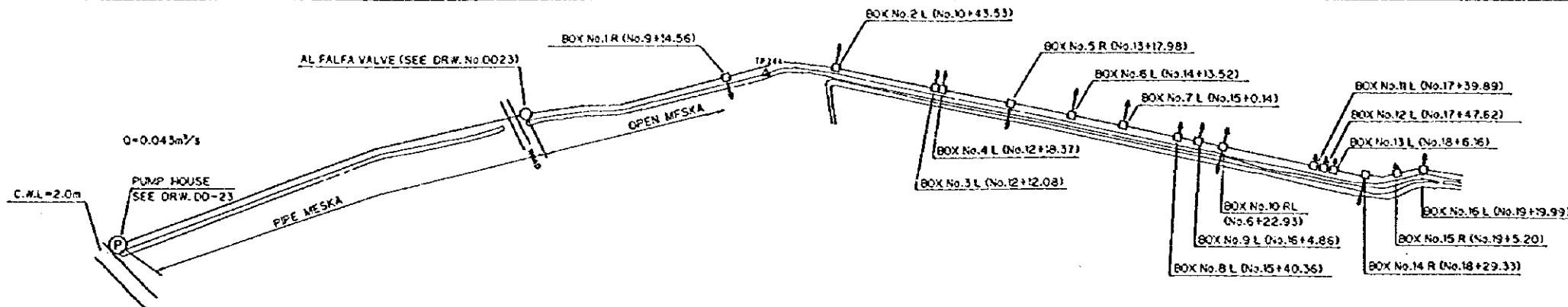
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
 MINISTRY OF PUBLIC WORKS AND
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THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

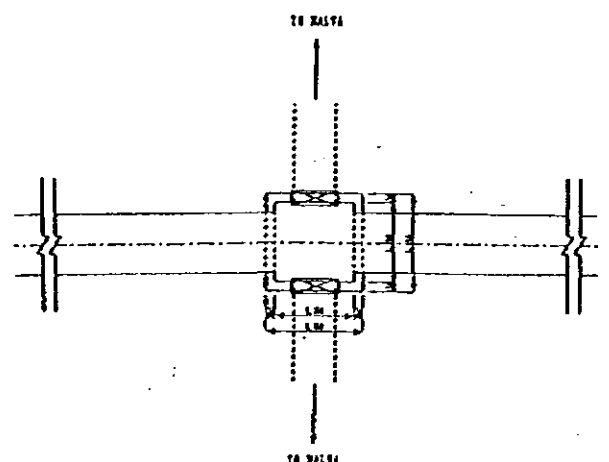
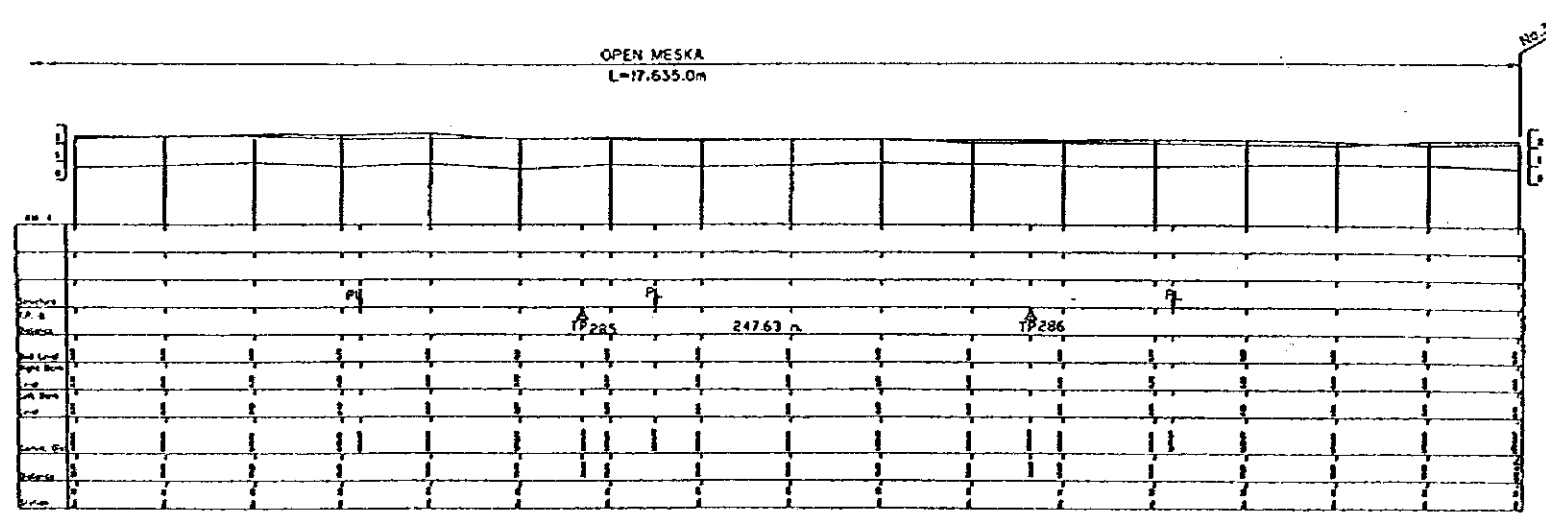
CROSS SECTION IN
 EL RABWA WEST CANAL

DATE MARCH, 1999 FIGURE NO. DD-16

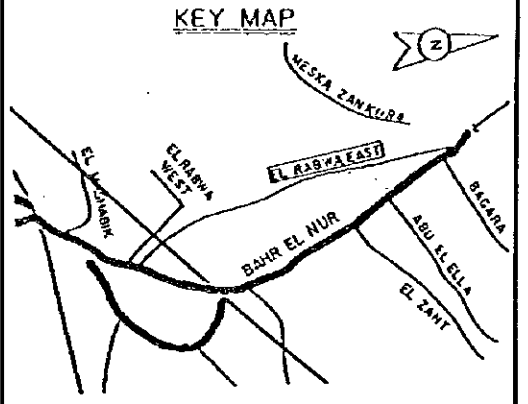
SANYU CONSULTANTS INC., JAPAN



TYPICAL SECTION
OPEN MESKA
SEE DRW. DD-22



BOX TURNOUT
SEE DRW. DD-22



- NOTES:
- (1) THIS DRAWING IS SHOWN AN IMPROVEMENT FOR MESKA (EL RABWA EAST CANAL) WATER SUPPLY TO A MALWA THROUGH A PUMP STATION, NEW MESKA AND MALWA (TURNOUT BOX).
 - (2) THE LOCATION OF EL RABWA EAST CANAL IS INDICATED ON THE DRAWING (FIGURE NO FS-07) IN THE BAHAR EL NUB CANAL.
 - (3) THE FOLLOWING DRAWINGS ARE RELATED TO THIS DRAWING
 - a) TYPICAL DRAWING FOR ONE POINT LIFTING MESKA (FIG. NO DD-21)
 - b) TYPICAL DRAWING FOR OPEN MESKA (FIG. NO DD-22)
 - c) TYPICAL DRAWING FOR PIPE MESKA (FIG. NO DD-23)
 - d) TYPICAL DRAWING FOR PUMP HOUSE (FIG. NO DD-24)
 - e) MISCELLANEOUS (FIG. NO DD-25)

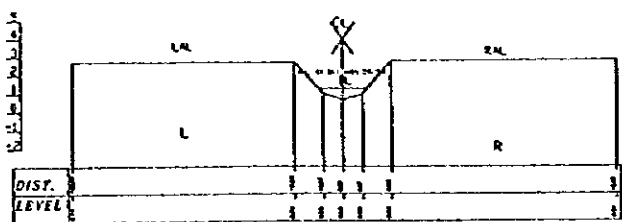
REFERENCE	
△	TRAVERSE POINT
R	BED LEVEL
L.R.	LEFT BANK LEVEL
R.R.	RIGHT BANK LEVEL
SL	LEFT SAKTA
SR	RIGHT SAKTA
PL	LEFT PUMP
PR	RIGHT PUMP
B	BRIDGE
BC	BRANCH CANAL
CB	CROSS DRAIN

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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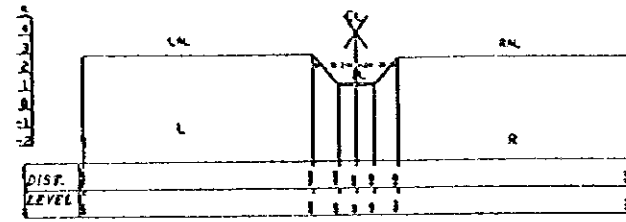
THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

IMPROVEMENT PLAN AND PROFILE
 (EL RABWA EAST CANAL)

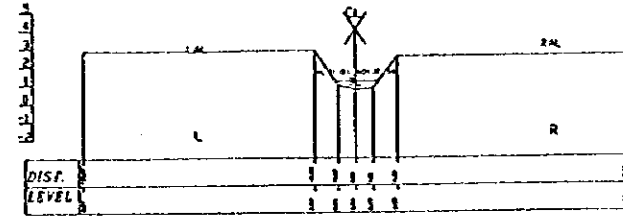
DATE MARCH, 1999 FIGURE NO. DD-17
 SANYU CONSULTANTS INC., JAPAN



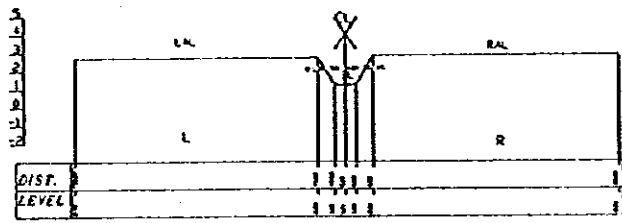
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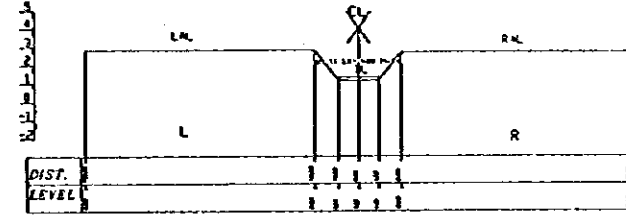
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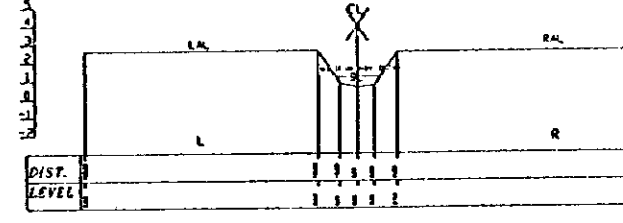
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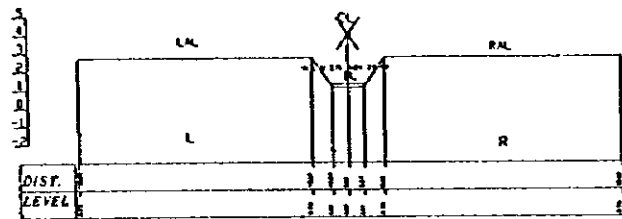
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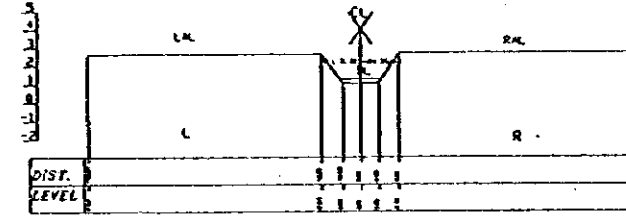
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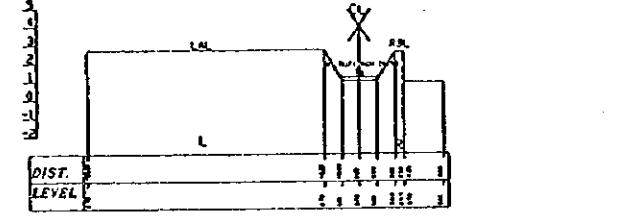
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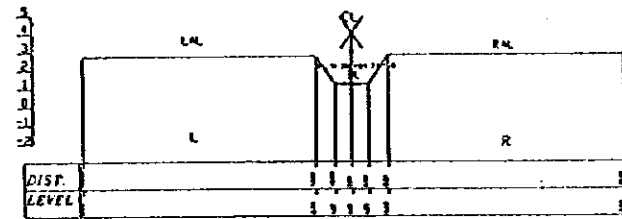
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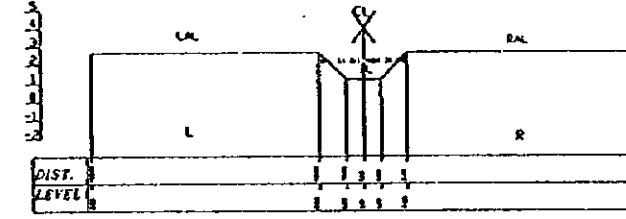
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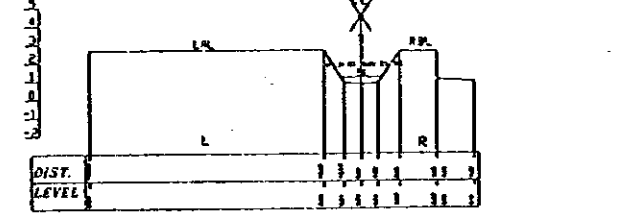
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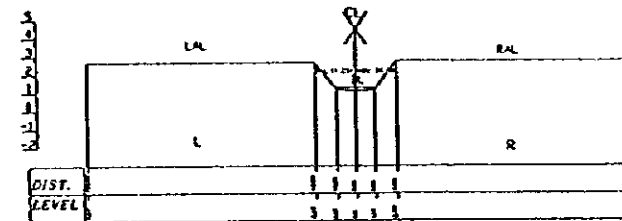
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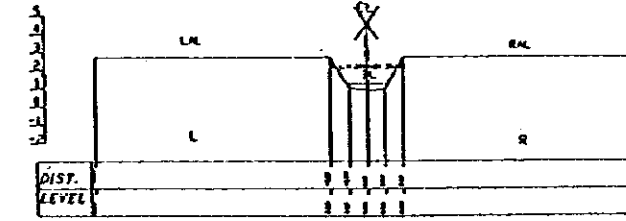
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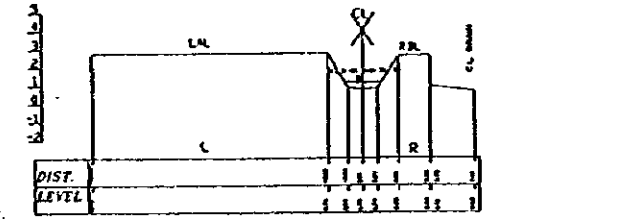
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CROSS SECTION 0250 M - No.5



CROSS SECTION 0500 M - No.10



CROSS SECTION 0750 M - No.15

NOTES :

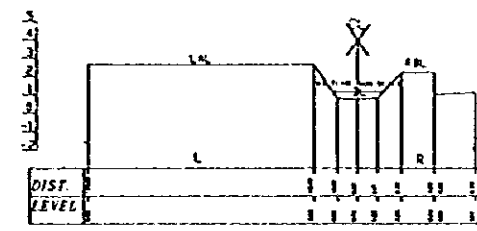
- (1) THIS DRAWING IS SHOWN AN ORIGINAL CROSS SECTION ALONG THE EL RABWA EAST CANAL FOR 50 M INTERVALS.
- (2) THE FOLLOWING DRAWING AND NOTES ARE RELATED TO THIS DRAWING.
 - a) IMPROVEMENT PLAN AND PROFILE (EL RABWA EAST CANAL, FIGURE NO DD-17).
 - b) ALL NOTES INDICATED ON THE FIGURE NO DD-17.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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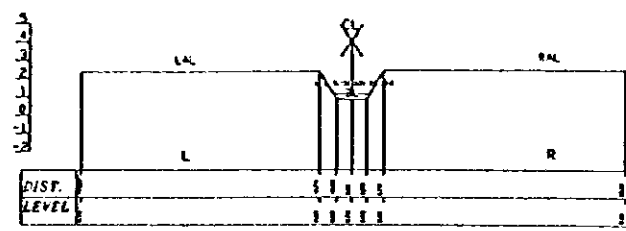
THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
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 NORTH-EAST REGION OF THE CENTRAL NILE DELTA

CROSS SECTION IN
 EL RABWA EAST CANAL (1/3)

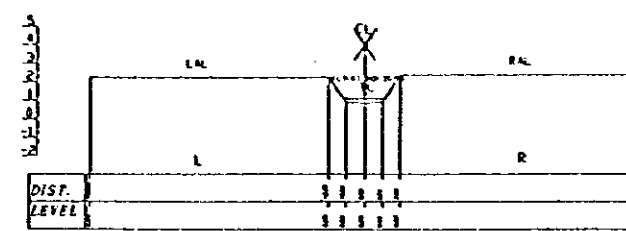
DATE	MARCH, 1999	FIGURE NO.	DD-18
SANTU CONSULTANTS INC., JAPAN			



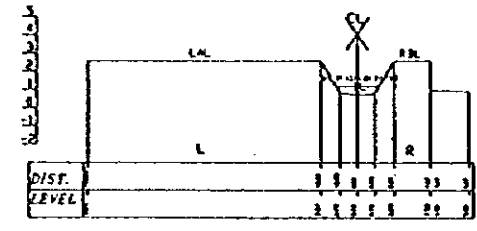
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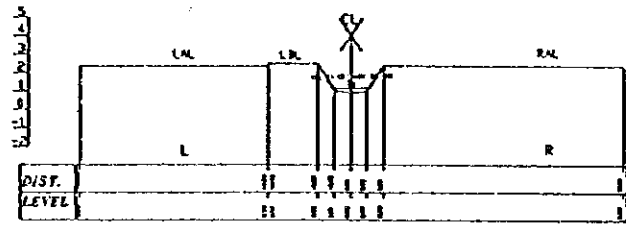
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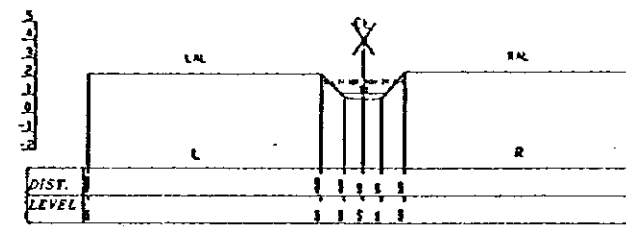
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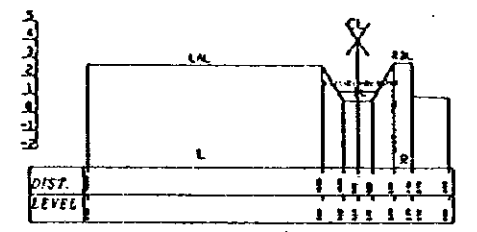
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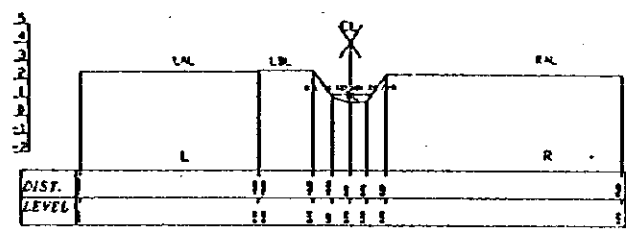
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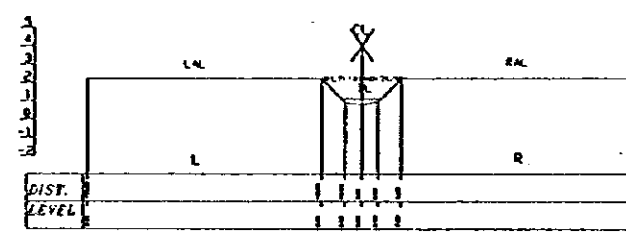
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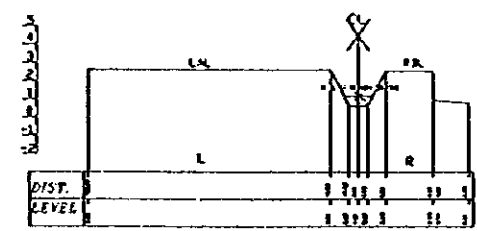
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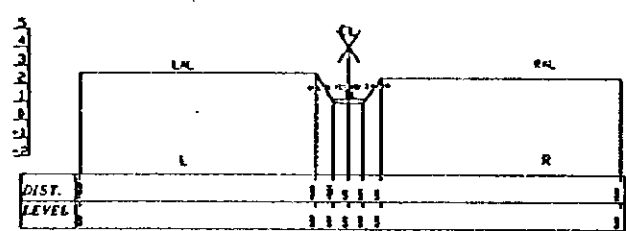
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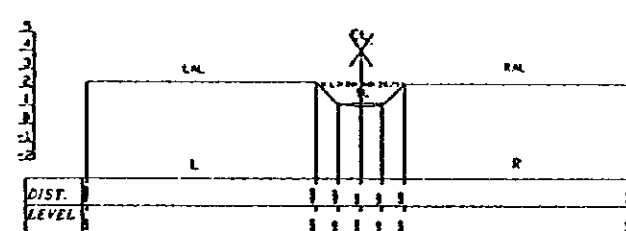
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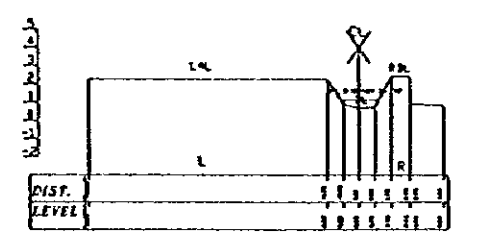
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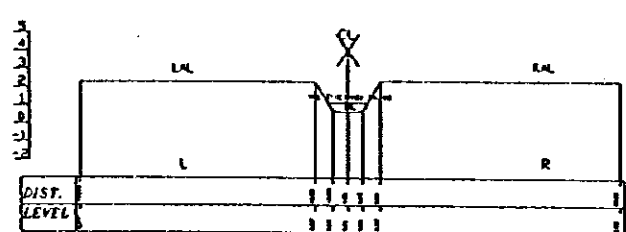
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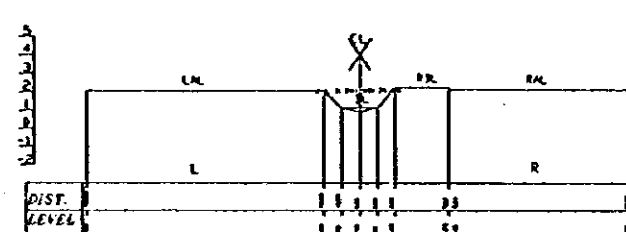
CROSS SECTION 1450 M - No.29



CROSS SECTION 1000 M - No.20



CROSS SECTION 1250 M - No.25



CROSS SECTION 1500 M - No.30

- NOTES:
- (1) THIS DRAWING IS SHOWN AN ORIGINAL CROSS SECTION ALONG THE EL RABWA EAST CANAL FOR 50 M INTERVALS.
 - (2) THE FOLLOWING DRAWING AND NOTES ARE RELATED TO THIS DRAWING.
 - (3) IMPROVEMENT PLAN AND PROFILE (EL RABWA EAST CANAL, FIGURE NO DD-17).
 - (4) ALL NOTES INDICATED ON THE FIGURE NO DD-17.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			
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CROSS SECTION IN EL RABWA EAST CANAL (2/3)			
DATE	MARCH, 1999	FIGURE NO.	DD-19
SANYU CONSULTANTS INC., JAPAN			

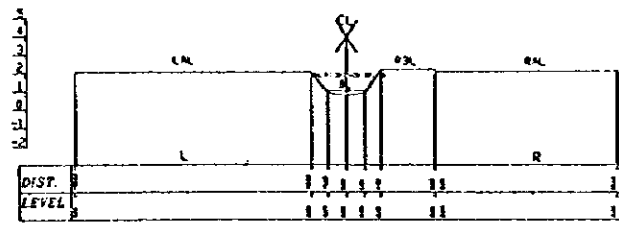
NOTES :

(1) THIS DRAWING IS SHOWN AN ORIGINAL CROSS SECTION ALONG THE EL RABWA EAST CANAL FOR 50 M INTERVALS.

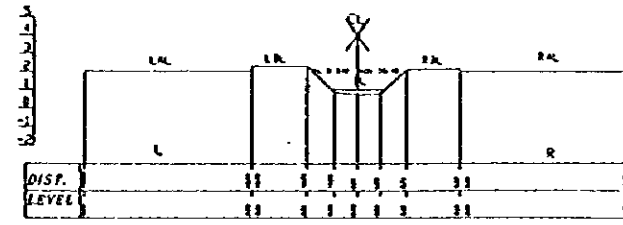
(2) THE FOLLOWING DRAWING AND NOTES ARE RELATED TO THIS DRAWING.

a) IMPROVEMENT PLAN AND PROFILE (EL RABWA EAST CANAL, FIGURE NO DD-17)

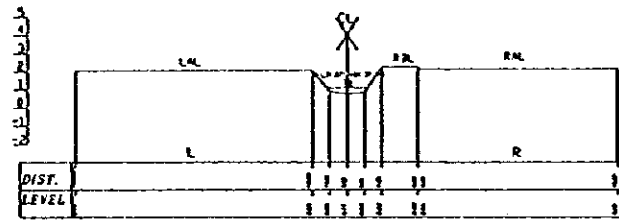
b) ALL NOTES INDICATED ON THE FIGURE NO DD-17.



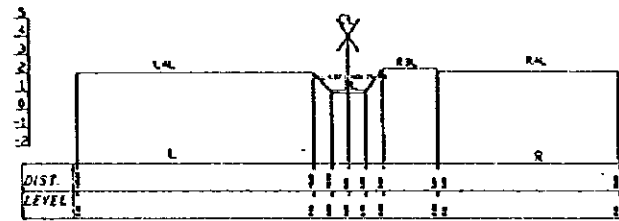
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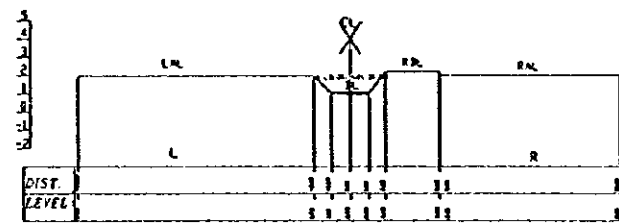
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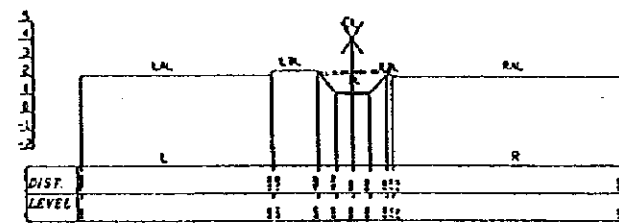
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CROSS SECTION 1650 M - No.33



CROSS SECTION 1700 M - No.34



CROSS SECTION 1750 M - No.35

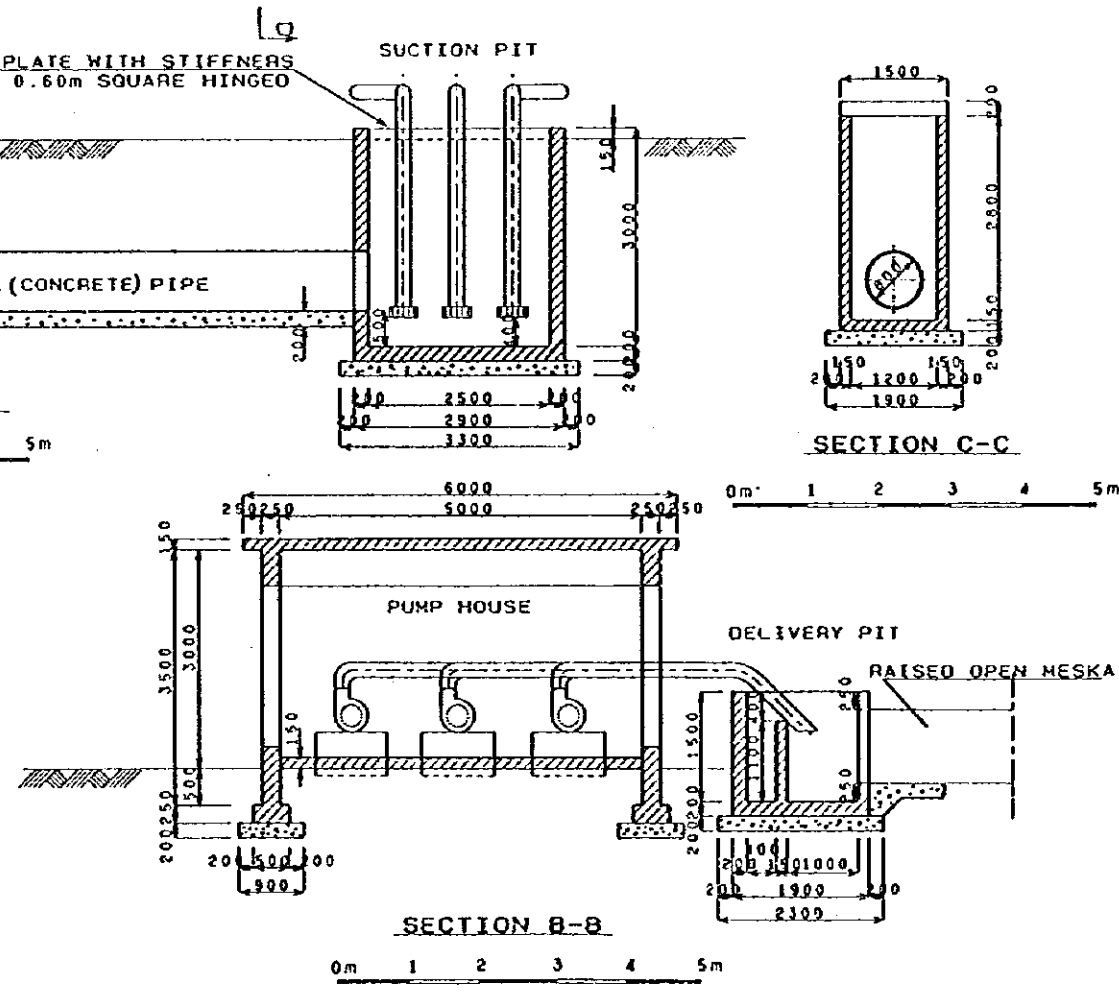
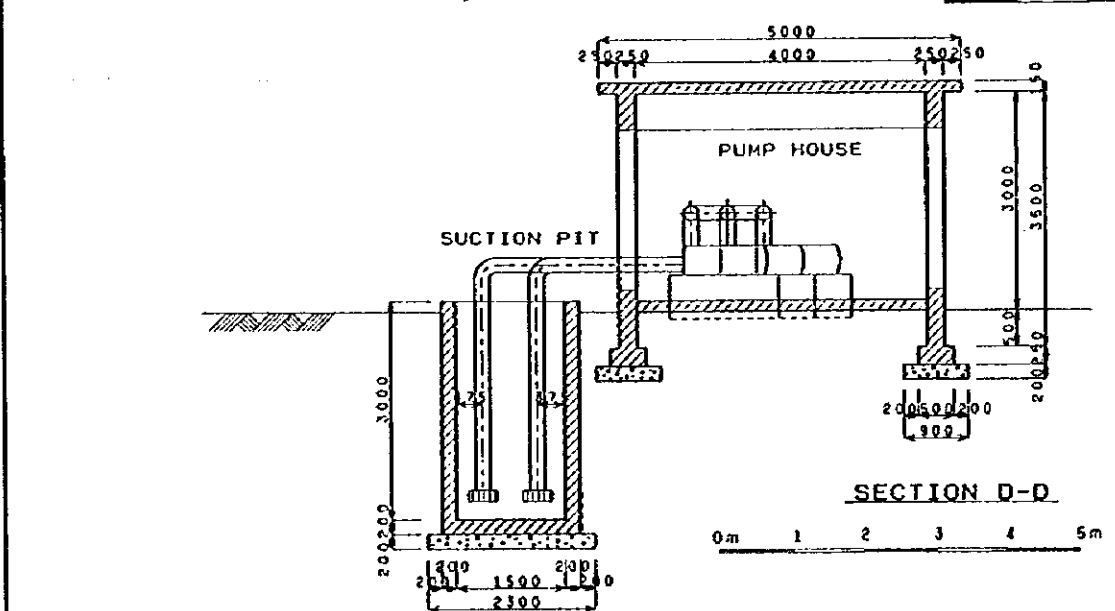
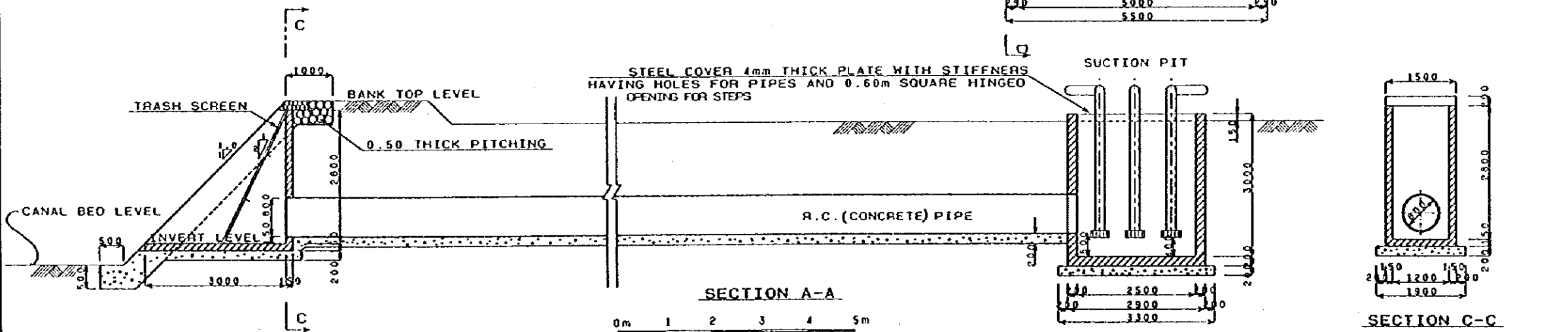
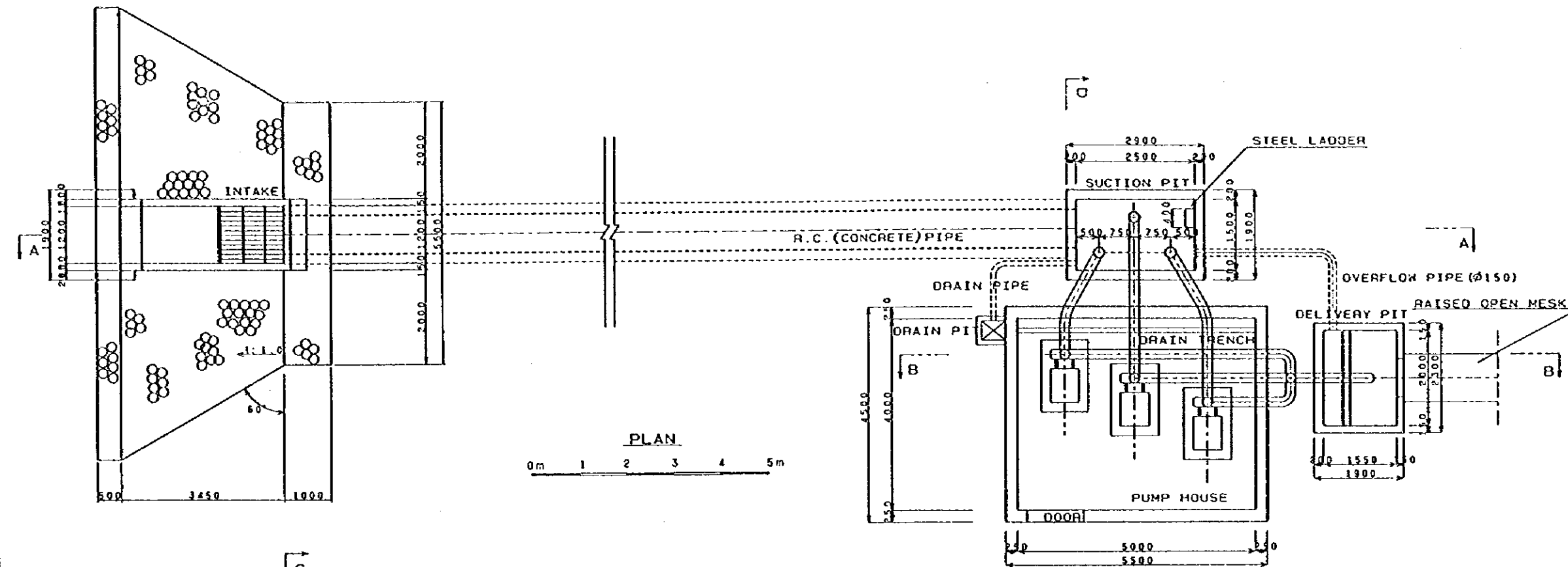
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
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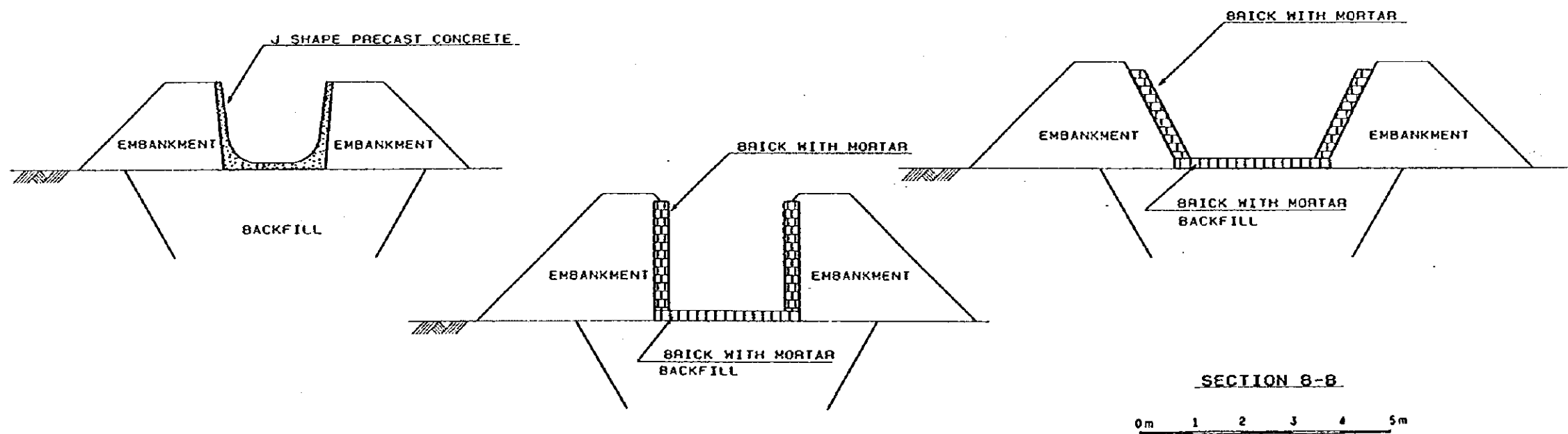
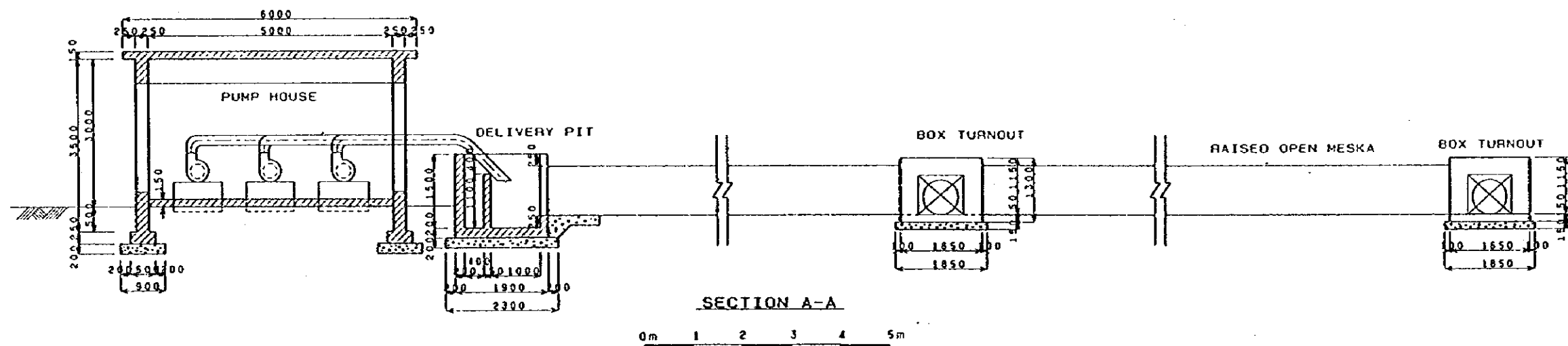
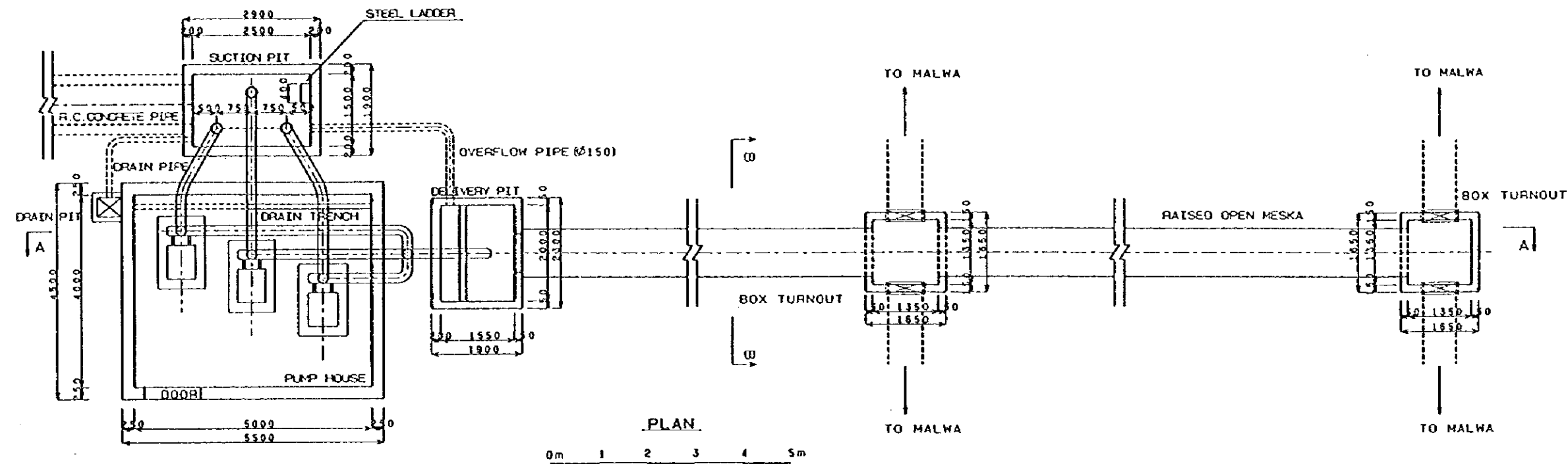
CROSS SECTION IN
EL RABWA EAST CANAL (3/3)

DATE	MARCH, 1999	FIGURE NO.	DD-20
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SANTU CONSULTANTS INC., JAPAN



- NOTES:
- (1) THIS DRAWING IS SHOWN A TYPICAL DRAWING FOR ONE POINT LIFTING MESKA BETWEEN INLET WORK AND OUTLET WORK OF THE PUMP STATION.
 - (2) THE FOLLOWING FOUR (4) DRAWINGS ARE RELATED TO THE MESKA IMPROVEMENT WORK:
 - a) TYPICAL DRAWING FOR OPEN MESKA (FIGURE NO DD-22)
 - b) TYPICAL DRAWING FOR PIPE MESKA (FIGURE NO DD-23)
 - c) TYPICAL DRAWING FOR PUMP HOUSE (FIGURE NO DD-24)
 - d) MISCELLANEOUS (FIGURE NO DD-25)
 - (3) THE MAIN STRUCTURES AND IMPLEMENTATION WORK WILL BE CARRIED OUT BY THE FOLLOWING SPECIFICATIONS TO BE APPROVED BY THE IIS.
 - a) CIVIL WORK
THE CIVIL WORK IS INCLUDING SPECIFICATIONS FOR EARTH WORK, CONCRETE, BRICK WORK AND MISCELLANEOUS.
 - b) PROCUREMENT OF EQUIPMENT
THE PROCUREMENT OF EQUIPMENT IS INCLUDING PUMPS AND APPARATUS.



NOTES :

- (1) THIS DRAWING IS SHOWN A TYPICAL DRAWING FOR ONE POINT LIFTING MESKA BETWEEN INLET WORK AND OUTLET WORK OF THE PUMP STATION.
- (2) THE FOLLOWING FOUR (4) DRAWINGS ARE RELATED TO THE MESKA IMPROVEMENT WORK :
 - a) TYPICAL DRAWING FOR OPEN MESKA (FIGURE NO DD-22)
 - b) TYPICAL DRAWING FOR PIPE MESKA (FIGURE NO DD-23)
 - c) TYPICAL DRAWING FOR PUMP HOUSE (FIGURE NO DD-24)
 - d) MISCELLANEOUS (FIGURE NO DD-25)
- (3) THE MAIN STRUCTURES AND IMPLEMENTATION WORK WILL BE CARRIED OUT BY THE FOLLOWING SPECIFICATIONS TO BE APPROVED BY THE IIS.
 - a) CIVIL WORK
THE CIVIL WORK IS REFERRED THE IIS SPECIFICATIONS FOR EARTH WORK, CONCRETE, BRICK WORK AND MISCELLANEOUS.
 - b) PROCUREMENT OF EQUIPMENT
THE PROCUREMENT OF EQUIPMENT IS INCLUDING PUMPS AND APPARATUS.

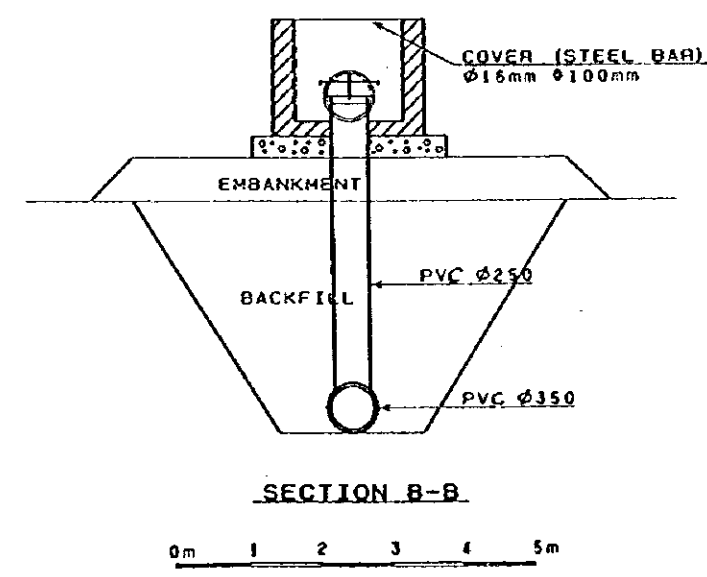
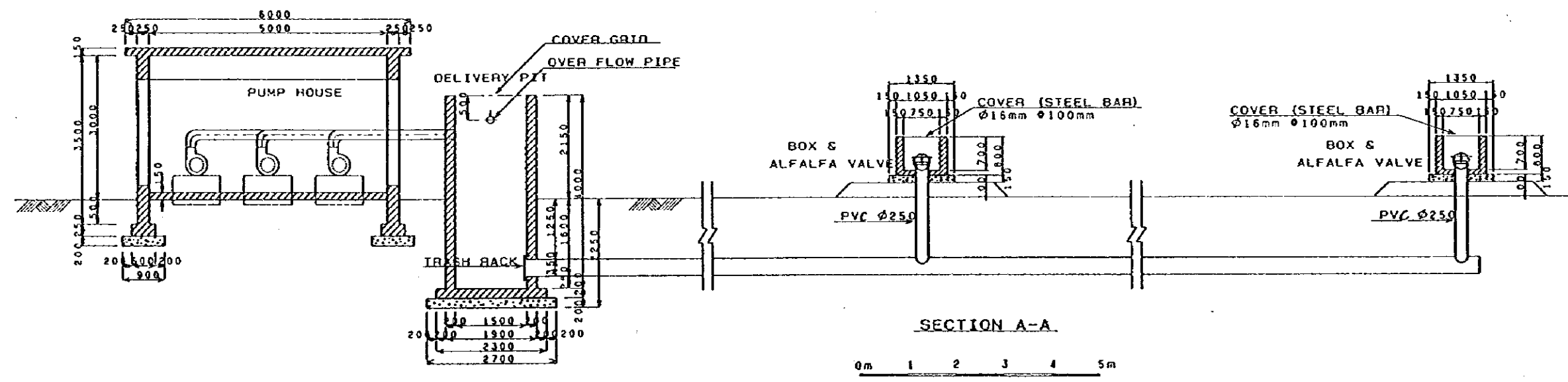
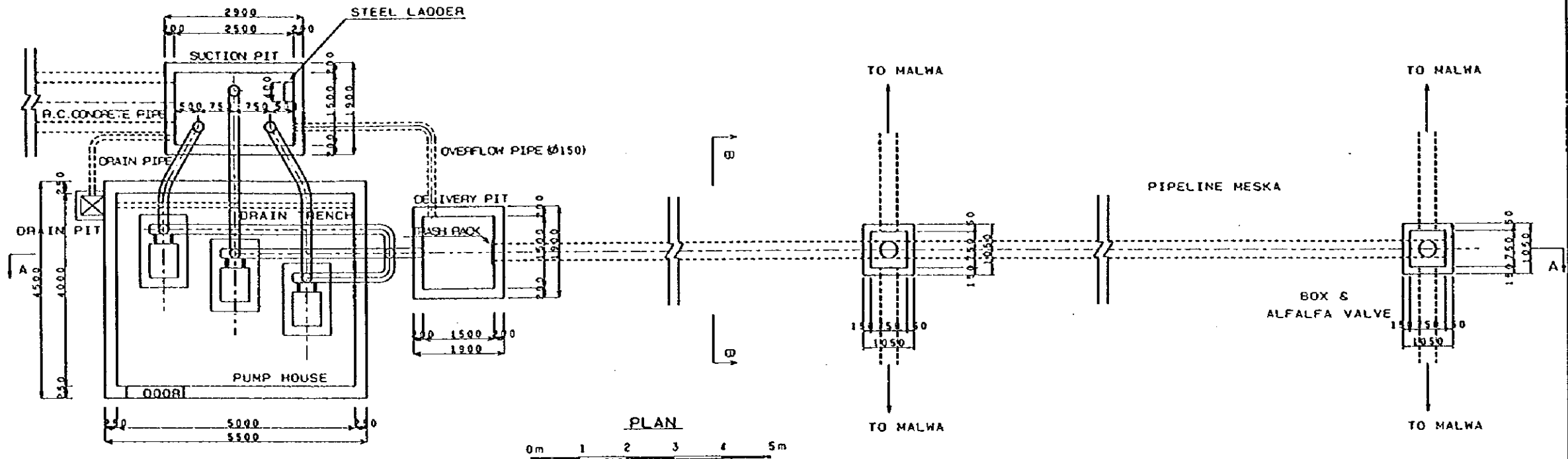
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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THE MASTER PLAN STUDY FOR THE IMPROVEMENT OF IRRIGATION
 WATER MANAGEMENT AND ENVIRONMENT CONSERVATION IN
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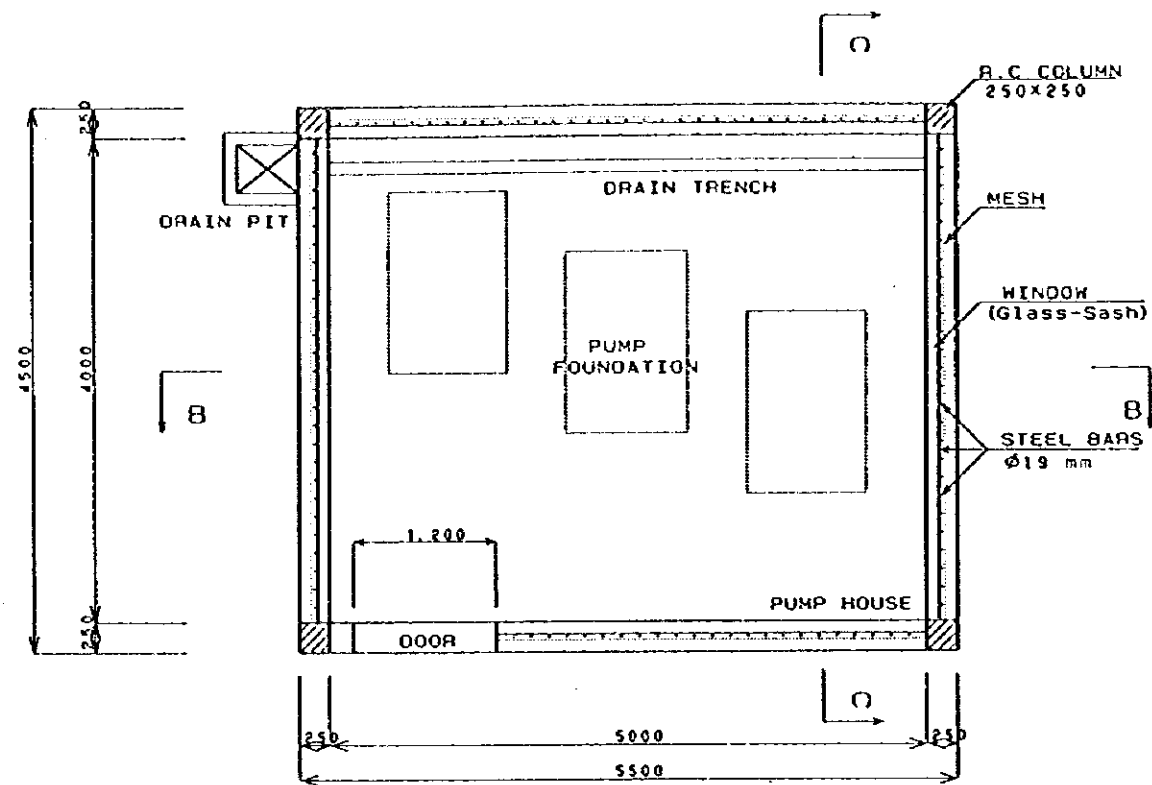
TYPICAL DRAWING FOR OPEN MESKA

DATE: MARCH, 1999 FIGURE NO. DD - 22

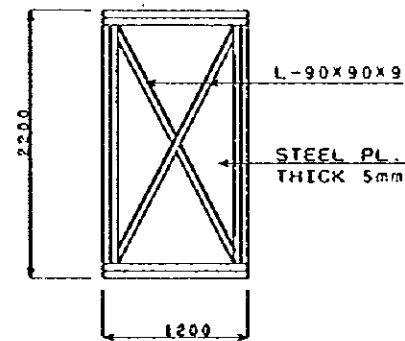
SANYU CONSULTANTS INC., JAPAN



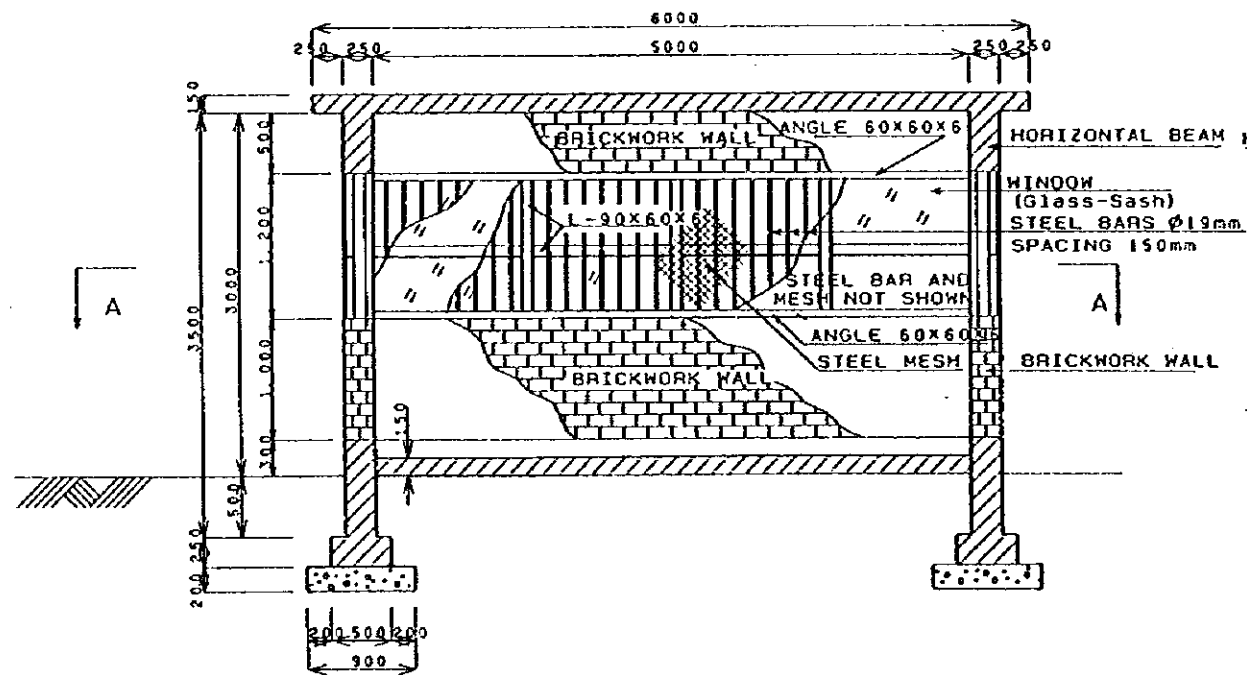
- NOTES:
- (1) THIS DRAWING IS SHOWN A TYPICAL DRAWING FOR PIPE (PVC) MESKA
 - (2) TO WATER SUPPLY ONTO MALWA, AN ALFALFA VALVE IS USED FOR TURNOUT WATER FROM THE MESKA TO MALWA.
 - (3) THE FOLLOWING FOUR (4) DRAWINGS ARE RELATED TO THE MESKA IMPROVEMENT WORK:
 - a) TYPICAL DRAWING FOR PIPE MESKA (FIGURE NO DD-23)
 - b) TYPICAL DRAWING FOR PUMP HOUSE (FIGURE NO DD-24)
 - c) MISCELLANEOUS (FIGURE NO DD-25)
 - d) CIVIL WORK. THE CIVIL WORK IS REFERRED THE IIS SPECIFICATIONS FOR EARTH WORK, CONCRETE, BRICK WORK AND MISCELLANEOUS.



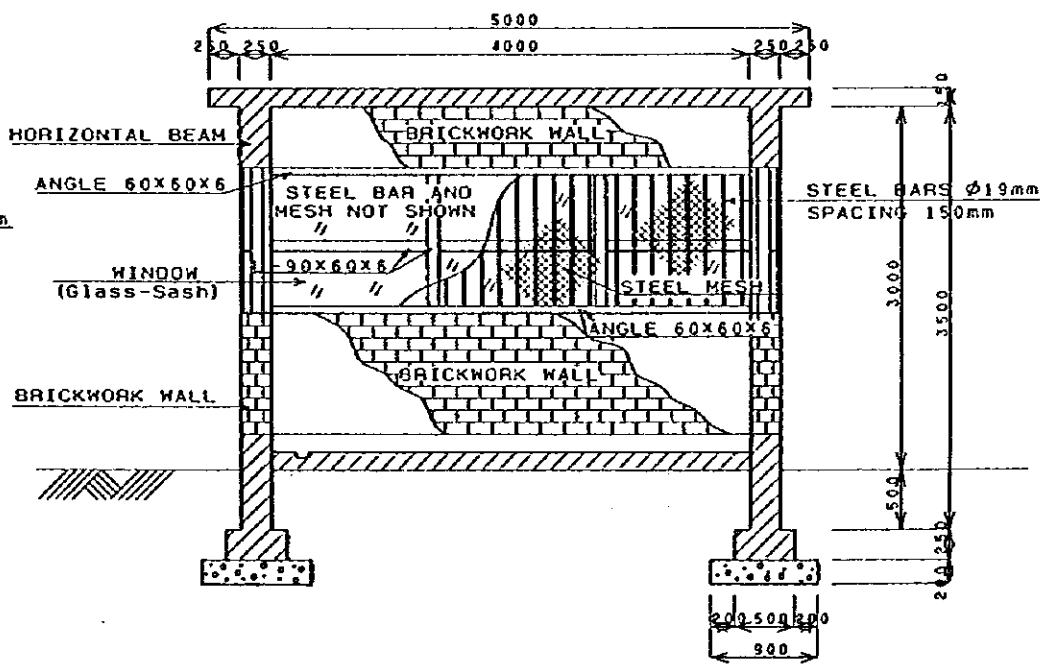
PLAN ON A-A



DETAIL OF DOOR



SECTION B-B



SECTION C-C



NOTES :

- (1) THIS DRAWING IS SHOWN A TYPICAL DRAWING FOR PUMP HOUSE TO USE ONE POINT LIFTING WATER AT BEGINNING OF MESKA.
- (2) THE PUMP HOUSE IS COMPOSED OF REINFORCING CONCRETE FOR FRAME WORK (BEAM, COLUMN AND FOUNDATION).
- (3) A WALL AND ROOF ARE MADE BY A BRICK WHILE A WINDOW IS MADE BY STEEL BARS AND MESH.
- (4) THE FOLLOWING WORKS ARE REFERRED THE IIS SPECIFICATIONS.
 - a) EARTH WORK OF FOUNDATION OF THE PUMP HOUSE WHILE CONCRETE WORK.
 - b) CONCRETE AND BRICK WORKS.
 - c) STEEL WORK FOR THE REINFORCING BAR, WINDOW AND DOOR WORKS.

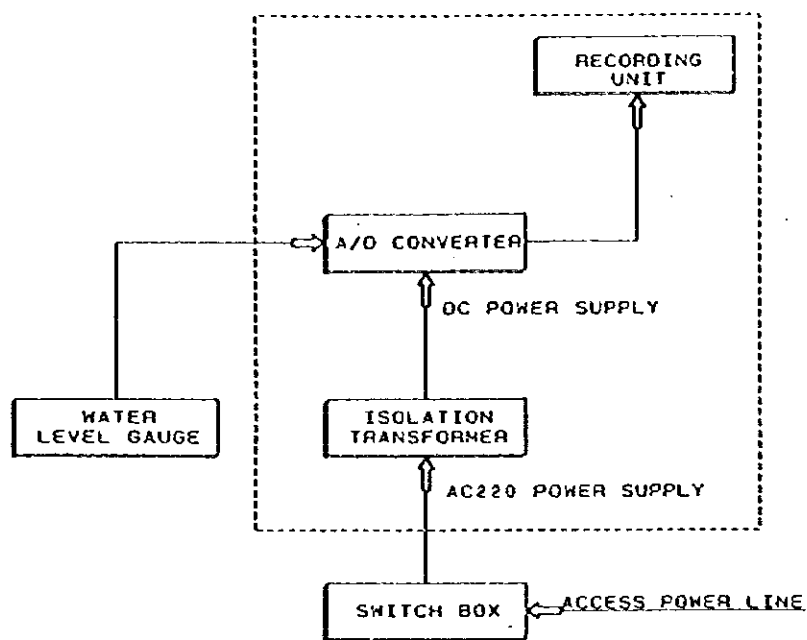
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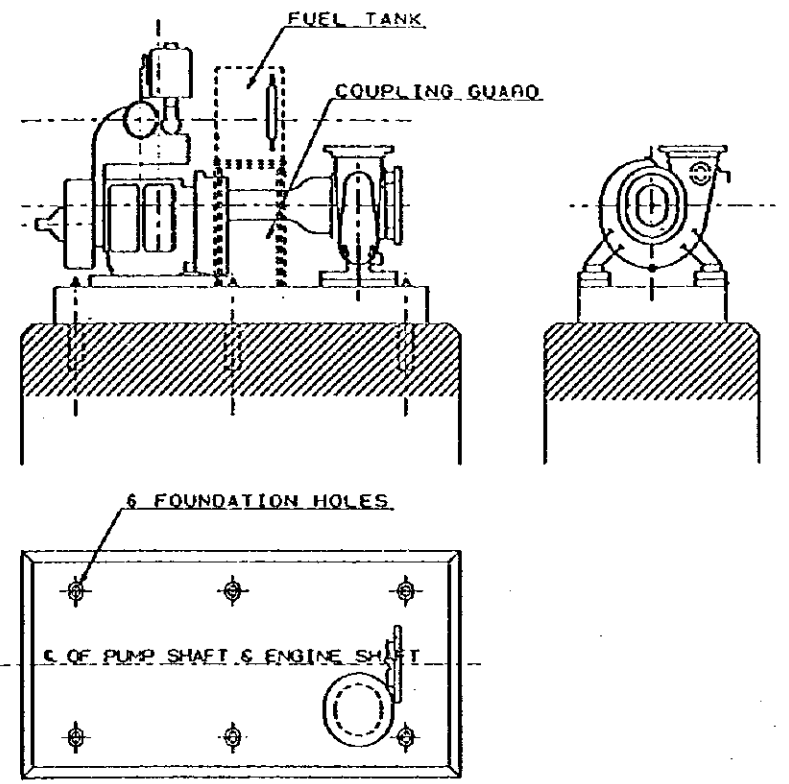
TYPICAL DRAWING FOR PUMP HOUSE

DATE MARCH, 1999 FIGURE NO. DD - 24

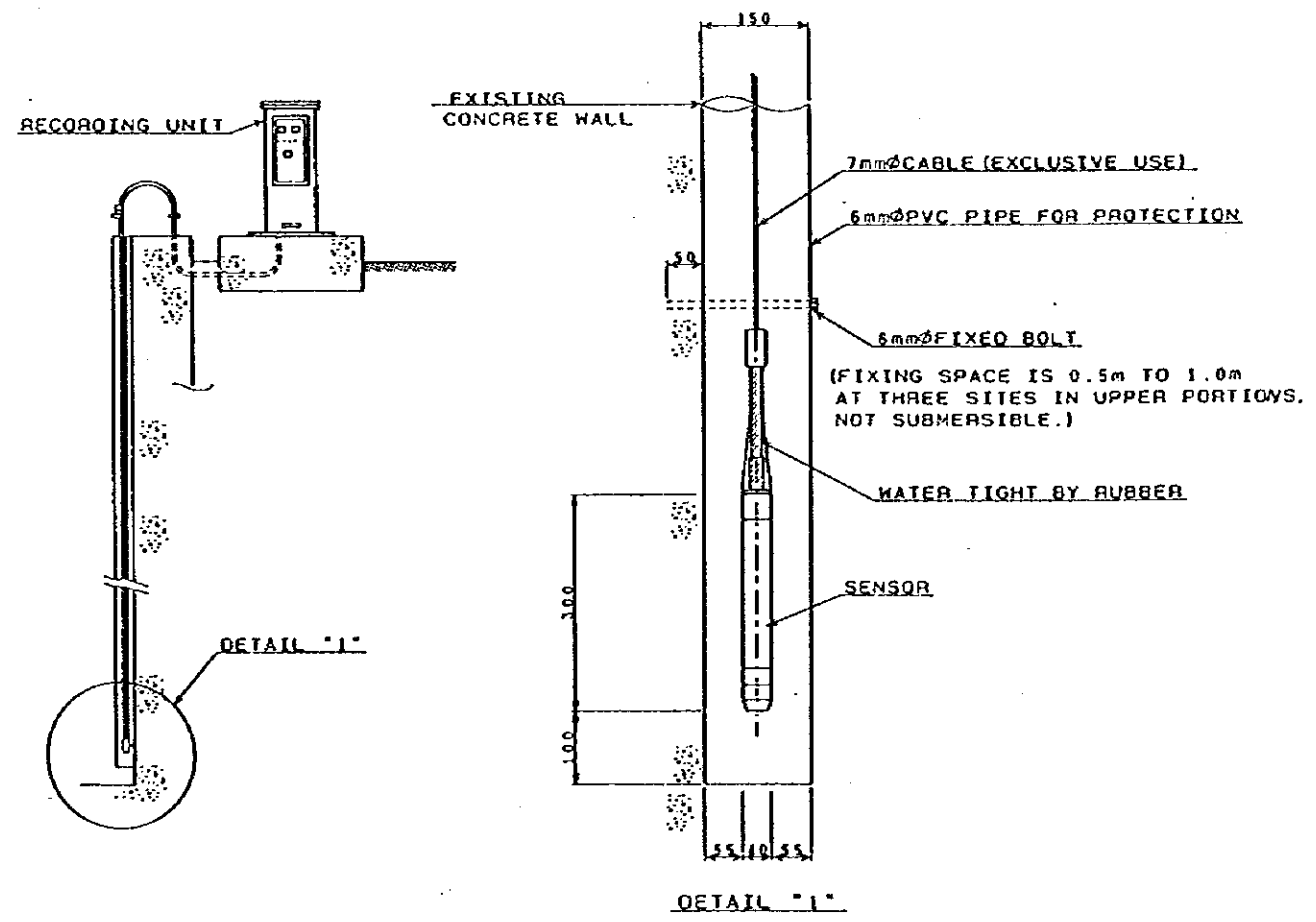
SANTU CONSULTANTS INC., JAPAN



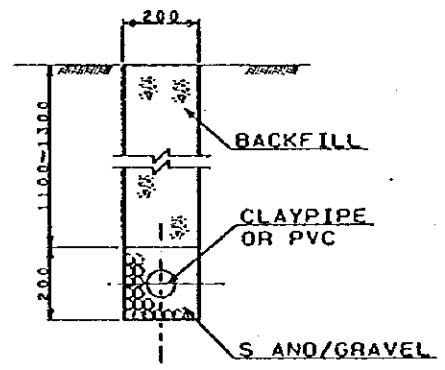
SYSTEM CONFIGURATION



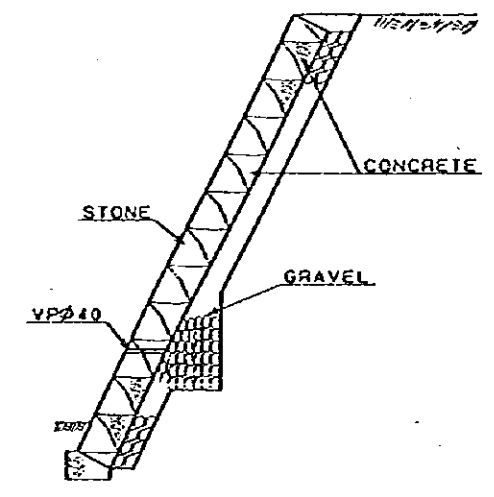
PUMP BASE



VERTICAL WATER LEVEL GAUGE



PIPE DRAINAGE



SLOPE PROTECTION (WET PITCHING)

- NOTES :
- (1) A VERTICAL WATER LEVEL GAUGE WILL BE INSTALLED AT FRONT AND BACK IN THE SUR INTAKE GATE IN THE CANAL.
 - (2) THIS WATER LEVEL METER WILL BE APPROVED BY THE HS.
 - (3) THE FIXING PUMP BODY IS ON THE PUMP BASE RELATED TO THE PUMP FIXING LOCATION AS PER THE SHOP DRAWING.
 - (4) A PIPE DRAINAGE WORK IS SHOWN BY A TYPICAL STANDARD, SHOWN A CLAY PIPE, PVC AND GRAVELS AT THE BOTTOM.
 - (5) SLOPE PROTECTION WORK IS SHOWN BY AN WET PITCHING FOR COLLAPSE LOCATION ALONG THE IRRIGATION CANAL NETWORK.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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MISCELLANEOUS

DATE	MARCH, 1999	FIGURE NO.	00-25
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