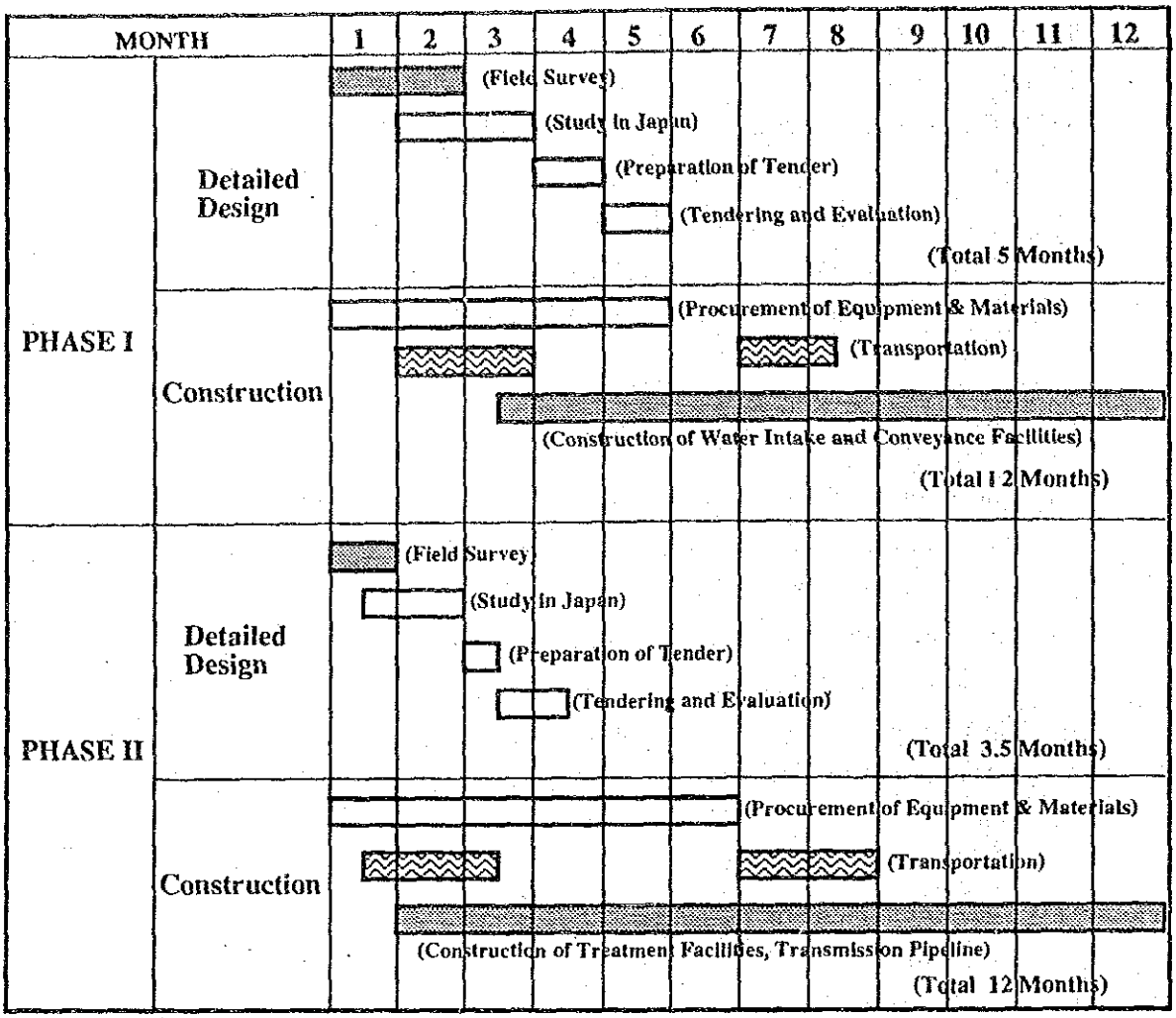


Fig. 22 Project Implementation Schedule

4.4.7 Role of Philippines Side in the Project

(1) Project costs borne by the Philippines side

Besides the works undertaken by the Japanese side, the Philippines side shall undertake the works which are its responsibility. The total cost of these works are estimated at Peso, as shown below;

(i) Land acquisition	504,900	Pesos
(ii) Installation of power line	468,100	Pesos
(iii) Land preparation by clearing vegetation and roots	3,086,800	Pesos
(iv) Vegetation and turfing	807,100	Pesos
(v) Drains outside the plant	119,300	Pesos
Total	4,986,200	Pesos

(2) Operational costs of the proposed facilities

After completion of construction, the LMWD will operate all the new facilities. The LMWD will then have to spend a higher operation cost than in the past. The cost of operation of the facilities under the Project has been estimated in section 3.3.3 in this report as follows:

Electricity cost	70,400 Peso/month
Chemical cost	260,500 Peso/month
Personnel cost	27,000 Peso/month
Total	357,900 Peso/month x 12 months = 4,294,800 Peso/year

CHAPTER 5. PROJECT EVALUATION AND CONCLUSIONS

5.1 Evaluation of the Project

The water supply system of Leyte Metro Area, the political and industrial center of East Visayan Region, was severely affected by the typhoon that struck this area. Added to this, the high turbidity of raw water drawn from the river has increased beyond the treatment capacity of the existing facilities resulting in a severe shortage of water supply which badly affects the healthy living environment of the people and their commercial and industrial activities. As a result, a water supply population of about 80,000 in this area are being compelled to depend on insanitary water from shallow wells for their daily domestic water needs, and this has led to increased incidence of diarrhea and dysentery.

With the implementation of this project the capacity of water supply facilities will be restored to the previous level before the typhoon and it will be possible to provide a stable supply of water uninterrupted even during the rainy periods. Moreover , with the construction of a new transmission pipeline for the Dagami System, leakage and pilferage of water from the transmission pipeline can be largely reduced and as a result, the population benefited is expected to increase to 89,000 from the pre-typhoon figure of 77,800 and from the present figure 58,700.

The LMWD, despite it had a plan for the expansion of water supply facilities in response to the demand for water supply in the district, was not in a position to proceed with the plan in the absence of budgetary support. Typhoon damage has affected the organizational operation itself of the LMWD bringing the daily water supply activities to an unsatisfactory condition. Under these circumstances, implementation of this project will not only contribute to the healthy improvement of financial situation of the LMWD, but also help to bring the activities and organizational operations of the LMWD back to normal and to open prospects for improvement and expansion projects etc., in the future. The impact of this project and the degree of improvement to the present conditions are summarized in Table 32.

5.2. Conclusions

This project, while expected to bring in large benefits and impact as mentioned above, conforms excellently with the future plans because the rehabilitation of the LMWD's existing facilities centered on Tacloban City has been identified as a priority item in the Eastern Visayas Regional Development Plan (1993~1998).

Table 32 Project Impact and Degree of Improvements to the Present Status

Present Status and Problem	Planned Solution/s	Degree of Improvement and Project Impact
1. The water supply facilities were damaged by the typhoon in 1991, but,they have not been adequately rehabilitated up to now. Therefore, there is a severe shortage of water supply and the quality of water has deteriorated hindering the daily life of the people and the urban activities.	Intake, conveyance and treatment facilities of the same scale as of the existing facilities will be constructed in safe locations not vulnerable to flood hazards.	A stable supply of sanitary water can be provided to the people and the local industries within the existing water supply area of the LMWD at the rate of 26,000 m3/day, which was the capacity before the typhoon.
2. The facilities are stopped during rainy period as the turbidity of river water rises beyond the treatment capacity of the existing facilities. This is a major reason for the lack of water and pressure.	The existing slow sand filter treatment system will be replaced by a rapid sand filter treatment system which can effectively respond even when the turbidity is high. In the planning of the new facilities, they are designed to make the best of gravity flow thereby minimizing mechanical equipment to make them economical.	It will be possible to operate the facilities irrespective of the turbidity of river water and therefore an uninterrupted water supply can be assured. As a result, the production capacity will increase to 22,600 m3/day from the present 17,600 m3/day. Moreover, with the economical planning of the treatment facilities, the increase in water charges can be brought to a minimum.
3. Leakage and theft of water in the urban area and along the transmission pipeline is frequent and the ratio of the volume of water billed to the total volume transmitted is only 60%. Therefore it is necessary to control leakage and theft of water and to improve the economical efficiency.	Transmission pipeline of the Dagami system, along which incidence of leakage and theft are frequent, will be replaced along a new route. However, measures against leakage and theft of water in the urban area will be left to the self efforts of the LMWD and therefore are not covered under this project.	With the laying of new transmission pipeline of the Dagami System, it is possible to make effective use of the available water resources and the revenue from water sales in the LMWD can be improved from the present 60% to 66%. This is equivalent an increase in water supply population by 11,200.
4. The existing transmission pipeline of the Dagami System passes through marshy land which is an area infected with schistosomes and as there are no proper roads maintenance of the pipeline has become difficult. This is the reason why leakage and theft of water cannot be controlled along the pipeline.	Transmission pipeline of the Dagami System will be laid along the national highway.	Maintenance of the transmission pipeline becomes easy and the burden on the LMWD will be reduced.
5.Due to problems mentioned above, the capacity of the entire water supply system has now reduced to the figures as summarised below; Production capacity: 21,600 m3/day (83%) Supply capacity: 13,000 m3/day (83%) Population benefited: 58,700 (75%) Note: The figures in () is the percentage compared to the situation before the typhoon.	Measures to be taken are mentioned above.	Situation after implementation of the project will be as follows; Production capacity: 26,000 m3/day (100%) Supply capacity: 17,200 m3/day (110%) Population benefited: 89,000 (114%) Note: The figures in () is the percentage compared to the situation before the typhoon.

Moreover, as the facilities that will be constructed under the project are planned in such a way to minimize the power requirements, these facilities can be accommodated with the available technical capabilities and operation system on the Philippine side with out difficulties.

As mentioned above, it is clearly evident that this project, which when implemented will provide a stable and good quality drinking water supply to the people in the region, will also contribute to stabilize the activities of the people by relieving them from the inconveniences and insecurity in sanitary conditions that they are now confronted with, and therefore is judged to be appropriate for implementation under the Japanese Grant Aid Program.

However, a few suggestions are presented below as it is anticipated that the impact of this project can be further enhanced by the implementation of these suggestions.

(1) The upstream area of Binahaan River which is the main water source, is also the area for geothermal power development which has become a direct cause of the high turbidity of raw water. Although geothermal power development in the Binahaan River catchment is abandoned at present, river flow still continues to be highly turbid during the rainy period. On the other hand, although the catchment is presently covered with relatively dense forest, promotion of plantation development and denudation of the forest etc., need to be apprehended. In order to prevent further deterioration of the source of water supply, administrative guidance is urgently needed to seek a balance between development activities and protection of the catchment.

(2) The existing water treatment system is an economical system by which water is distributed under gravity flow making use of the topographical advantage in the elevation differences. However, due to lack of pressure adjustment facilities in the existing distribution facilities, the high pressure head between the treatment plant and the supply area acts directly on the pipes and this has become also the cause of heavy leakage. Moreover, as the transmission pipeline is directly tapped for supplying water along its way to the urban area, this has contributed to the reduction in water pressure and volume.

Primarily speaking, a transmission pipeline does not function as a water distribution pipeline and fundamentally, the water is supplied using a distribution pipeline network laid in the supply area after the water is transmitted in to a distribution reservoir. Considering also from the point of view of effective utilization of the limited water resources, it is recommended to avoid direct tapping of water from the transmission pipeline and to provide, the service areas with independent distribution reservoirs and distribution pipeline networks as part of the future water supply development plans.

(3) At present, the total capacity of the four distribution tanks installed within the service area is 10,700 m^3, which corresponds to about 10 hours equivalent of the daily supply volume, and this is of a quantitatively satisfactory scale. However, these facilities do not function normally either being abandoned due to superannuation or as the water cannot be stored in them owing to inadequate pressure head in the transmission pipeline.

A distribution reservoir plays an important role within the water supply system, as it not only has a buffer effect during distribution peaks, but also helps reducing the burden on treatment plant and ensures a continuous water supply even during power cuts or accidents when the treatment plant operations have to be stopped. Solution to the problem, although connected to the suggestion made in (2) above, is found in the adoption of an economical and perpetual system, by restoring a normal water supply system after repairing the distribution tanks and using the pressure head in the transmission pipeline to its maximum.

(4) The billed water ratio in the entire LMWD service area is estimated to be presently about 60%. The remaining 40% of the water covers the unmetered water distributed to the villages along the transmission pipeline and through 54 public faucets and also the leakage and pilferage. Without proper maintenance of the facilities and public cooperation with respect to leakage and pilferage, this situation is likely to deteriorate in the future. With the implementation of this project, the transmission pipeline in the Dagami System which has a high incidence of leakage and pilferage will be replaced and as a result, the billed water ratio is expected to improve by about 6%. Further, with the operation of the new treatment plant, the water supply capacity will also be increased. In order to truly make the best of these advantages to the benefit of the LMWD's activities, it is desirable to endeavor to further upgrade the billed water ratio by strengthening control measures against leakage and pilferage, and changing the unmetered water supply to metered supply by increasing the number of water meters installed.

1. Member List of the Study Team

(1) On the Field Survey

Masao, TAKAI	Leader Deputy Director, Planning Division Grant Aid Project Management Department Japan International Cooperation Agency (JICA)
Tokuji, ANNOURA	Assistant Chief Development Section Fukuoka City Waterworks Bureau
Mashio, YAMAHA	Water Supply Facilities Planner Manager, Engineering Dept. Kyowa Engineering Consultants Co., Ltd.
Shigeo, OTANI	Water Intake Facilities Planner Assistant Manager, Overseas Dept. Kyowa Engineering Consultants Co., Ltd.
Masayuki, TAGUCHI	Water Treatment Facilities Planner Manager, Overseas Dept. Kyowa Engineering Consultants Co., Ltd.
Mitsuru, MASHIO	Pipe Network Planner Senior Engineer, Engineering Dept. Kyowa Engineering Consultants Co., Ltd.

(2) On the Explanation of Draft Final Report

Hisatoshi, OKUBO	Leader First Basic Design Study Division Grant Aid Study & Design Department Japan International Cooperation Agency (JICA)
Mashio, YAMAHA	Water Supply Facilities Planner Manager, Engineering Dept. Kyowa Engineering Consultants Co., Ltd.
Shigeo, OTANI	Water Intake Facilities Planner Assistant Manager, Overseas Dept. Kyowa Engineering Consultants Co., Ltd.
Masayuki, TAGUCHI	Water Treatment Facilities Planner Manager, Overseas Dept. Kyowa Engineering Consultants Co., Ltd.

2. Schedule of the Survey

(1) On the Field Survey

Date	Movement	Accommodation	Activities
Jan. 27 (Wed)	Arrive in Manila	Manila	Meeting with JICA. Courtesy call on the Embassy of Japan.
28 (Thu)	Move to Tacloban	Tacloban	Courtesy call on LWUA. Explanation on the Inception Report. Courtesy call on LMWD. Explanation on the Inception Report.
29 (Fri)		Tacloban	Site survey of Tingib System.
30 (Sat)		Tacloban	Site survey of Tingib System.
31 (Sun)		Tacloban	Internal meeting, data filing.
Feb. 1 (Mon)		Tacloban	Site survey and signing of contract for topographic survey.
2 (Tue)	2 members move to Manila	Manila Tacloban	Site surveyor Dagami System. Supervision of the field survey works.
3 (Wed)	Team leader arrive in Manila	Manila Tacloban	Meeting with JICA. Courtesy call on the Embassy of Japan. Internal meeting. Site survey and other studies.
4 (Thu)	4 members move to Tacloban	Tacloban	Courtesy call, meeting with LWUA. Site survey.
5 (Fri)		Tacloban	Courtesy call, meeting with LMWD.Site survey of Tingib System.
6 (Sat)			Site survey of Dagami System.
7 (Sun)	4 members move to Manila	Manila Tacloban	Internal meeting. - do -
8 (Mon)		Manila Tacloban	Discussion with LWUA on the Minutes. Site survey and other studies.
Feb. 9 (Tue)		Manila Tacloban	Discussion with LWUA on the Minutes. Site survey and other studies.
10 (Wed)		Manila Tacloban	Signing of the Minutes of Discussions. Site survey and other studies.
11 (Thu)	2 members return, to Japan, others move to Tacloban	Tacloban	Site survey and other studies.
12 (Fri)		Tacloban	Site survey and other studies.
14 (Sun)	1 member moves to Manila	Tacloban	Site survey and other studies.
15 (Mon)	1 member return to Japan	Tacloban	Site survey and other studies.
25 (Thu)	1 member move to to Manila	Tacloban Manila	Site survey and other studies. Survey on construction prices etc.
Mar. 2 (Tue)		Manila Tacloban	Survey on construction conditions. Meeting with LMWD.
3 (Wed)	2 members move	Manila	Discussion with LWUA on Technical Notes. Data collection and filing.
4 (Thu)		Manila	Signing of the Technical Notes with LWUA. Report to JICA & EOJ.
5 (Fri)	Return to Japan		

(2) On the Explanation of Draft Final Report

Date	Movement	Accommodation	Activities
May 27 (Thu)	3 members Arrive in Manila	Manila	Meeting with JICA. Courtesy call on the Embassy of Japan.
28 (Fri)	Move to Tacloban	Manila	Courtesy call on LWUA. Explanation on the Draft Final Report.
29 (Sat)	3 members move to Tacloban	Tacloban	Courtesy call on LMWD. Explanation on the Draft Final Report.
30 (Sun)		Tacloban	Site survey.
31 (Mon)		Tacloban	Discussion with LMWD on the Report. Visit to NEDA, LEYECO III
	Team leader arrive in Manila	Manila	Meeting with JICA. Courtesy call on the Embassy of Japan.
June 1 (Tue)	2 members move to Manila	Manila	Internal meeting. Discussion with LWUA.
		Tacloban	Preparation of ICC Data.
2 (Wed)	1 members move to Manila		Discussion with LWUA on the Minutes.
		Manila	Meeting with NEDA.
3 (Thu)		Manila	Signing of the Minutes of Discussions.
4 (Fri)		Manila	Report to JICA and Embassy of Japan.
5 (Sat)	3 members return to Japan	Manila	Data collection.
6 (Sun)		Manila	Data collection.
7 (Mon)		Manila	Data collection. Report to JICA.
8 (Tue)	1 member return to Japan		

3. Member List of Concerning Party in the Philippines

(1) On the Field Survey

a. LWUA

Mr. Antonio R. de Vera	:	Administrator
Mr. Simplico C. Belisario, Jr.	:	Deputy Administrator
Mr. Hermilo S. Balucan	:	Manager, Area III Engineering Services
Mr. Jorge C. Mateo	:	Planning Department, Water Resources Engineer

b. LMWD

Mr. Cayo U. Emnas	:	General Manager
Engr. Apolonio F. Loteyro	:	AGM, Technical Services
Mrs. Erlinda S. Calo	:	AGM, Administrative Services
Mrs. Lilia Riel	:	AGM, Commercial Services
Engr. Sergio Boyano	:	Technical Assistant
Mr. Brigido S. Urmeneta, CPA	:	Manager, Finance Division
Engr. Florencio M. Cañete	:	Manager, Engineering Division
Engr. Reynaldo Cañas	:	Manager, Production Division
Mr. Eulogio Latoja	:	Manager, Maintenance Division
Mrs. Celestina Sarmiento	:	Manager, Customer Services Division
Mrs. Remedios Cesar	:	Manager, Customers' Accounts

c. Other Parties

Mr. Augustus L. Momongan	:	DENR Regional Executive Director
Mr. Luis V. Mallari Jr.	:	DPWH Region 8, Chief Planning & Design Div.
Mr. Perfect C. Españor	:	NIA Region 7 & 8, Regional Manager
Mr. Francisco D. Garcia	:	NIA Tanauan Office, Irrigation Superintendent
Mr. Bonifacio G. Furing	:	Chief Airport Station, PAGASA
Mr. Edmundo C. Sumayod	:	LEYECO III, Engineering Department Manager

d. Embassy of Japan in the Philippines

Mr. Kazuo Sunaga	:	First Secretary
Mr. Etsuro Kashiwagi	:	First Secretary

e. JICA

Mr. Masataka Iijima	:	Resident Representative
Mr. Satoshi Machida	:	Vice Resident Representative

Mr. Kenji Matsumoto	:	Assistant Resident Representative

(2) On the Explanation of Draft Report

a. LWUA

Mr. Antonio R. de Vera	:	Administrator
Mr. Simplico C. Belisario, Jr.	:	Deputy Administrator
Mr. Hermilo S. Balucan	:	Manager, Area III Engineering Services
Mr. Jorge C. Mateo	:	Planning Department, Water Resources Engineer

b. LMWD

Mr. Cayo U. Emnas	:	General Manager
Engr. Apolonio F. Loteyro	:	AGM, Technical Services
Mrs. Erlinda S. Calo	:	AGM, Administrative Services
Mrs. Lilia Riel	:	AGM, Commercial Services
Engr. Sergio Boyano	:	Technical Assistant
Mr. Brigido S. Urmeneta, CPA	:	Manager, Finance Division
Engr. Florencio M. Cañete	:	Manager, Engineering Division
Engr. Reynaldo Cañas	:	Manager, Production Division
Mr. Eulogio Latoja	:	Manager, Maintenance Division

c. NEDA

Mr. Joji B. Inocentes	:	AD, P/S
Mr. Paulo Rodelio M. Haliti	:	EDS II, P/S
Mr. Florante G. Ijiben	:	SDS, P/S
Mr. Buenaventura C. Go-Soco, Jr.	:	Region 8, Regional Director
Mr. Jose V. Mazo	:	Region 8, Assistant Regional Director
Mr. William N. Resma	:	Region 8, Economic Development Specialist

d. Embassy of Japan in the Philippines

Mr. Kazuo Sunaga	:	First Secretary
Mr. Yugo Matsuda	:	First Secretary

e. JICA

Mr. Masataka Iijima	:	Resident Representative
Mr. Satoshi Machida	:	Vice Resident Representative
Mr. Kenji Matsumoto	:	Assistant Resident Representative

4. Minutes of Discussion

(1) Minutes of Discussion at the Field Survey

MINUTES OF DISCUSSIONS

THE BASIC DESIGN STUDY ON THE PROJECT FOR
EMERGENCY REHABILITATION PROGRAM FOR
TYPHOON-DAMAGED WATER SUPPLY SYSTEM IN LEYTE
IN THE REPUBLIC OF THE PHILIPPINES

Based on the results of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Project for Emergency Rehabilitation Program for Typhoon-damaged Water Supply System in Leyte (hereinafter referred to as "the Project").

JICA sent to the Philippines a study team, headed by Mr. Masao TAKAI, Deputy Director, Planning Division, Grant Aid Management Department, from 27th January to 5th March, 1993.

The team held a series of discussions with the officials concerned of the Government of the Philippines and conducted a field survey in the project area.

As a result of the discussions and field survey, both sides confirmed the main items described on the attached sheets. The team will proceed to further work and prepare the Basic Design Study report.

Manila, 10th February, 1993

Mr. Masao TAKAI
Leader
Basic Design Study Team

Mr. Antonio R. De Vera
Administrator
Local Water Utilities
Administration, Philippines

ATTACHMENT

1. Objective

The Objective of the Project is to rehabilitate water supply facilities constituting the Leyte Metro Water District water supply system which was damaged by Typhoon Uring in November, 1991, in order to restore the original water supply capacity of the system.

2. Project site

The site of the Project is the Leyte Metro Water District. (Site map is attached as Annex I)

3. Executing Agency

The executing agency will be the Local Water Utilities Administration (LWUA) which is responsible for planning, designing and construction. Completed works will be turned over to the Leyte Metro Water District for operation.

4. Project Components requested by the Government of the Philippines

After discussions with the Basic design Study Team, the following items have been finally requested by the Philippine side:

A. Tingib System
   1) Rehabilitation of intake facilities on Binaha-an River
   2) Rehabilitation of treatment facilities
   3) Repair of the existing transmission pipeline to Palo

B. Dagami System
   1) Supply of pipe materials to rehabilitate the raw water transmission line which was washed out by the typhoon then replaced.
   2) Construction of a transmission pipeline from Dagami to Tanauan which will substitute the existing one to Palo.

5. Grant Aid Program extended by Japan

1) The components of the Project requested above will be decided after the studies in Japan.
2) The Philippines side has understood the system of Japan's Grant Aid explained by the Team.
3) The Government of the Philippines will take necessary measures, described in Annex II, for smooth implementation of the Project, on the condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Other Points in Discussions

1) Regarding the land acquisition for facilities construction, the Team requested the Philippines' side to continue negotiations with the land owners and send the copies of the each agreement as soon as it is concluded.
2) Regarding transmission main, the Team understood as follows through the site investigation,

A. The existing Tingib-Palo transmission main was free from the typhoon damage and leaks and deteriorated parts are not so much. Therefore, its capacity may be kept as nearly same as the original.

B. It is more than 50 years since the existing Dagami-Palo transmission main was constructed. Its capacity has been lowered due to many leaks, water stealings and a damaged river crossing etc. along the line. And the maintenance road is not available because the line is laid in the paddy fields or swampy areas.

As transmission A or B routs in Tingib system were recommended on the Preliminary Study stage, the Team recognizes that a new transmission main shall be constructed in order to secure the original transmission capacity.

The Team also recognizes that utilizing Dagami treatment system is quite effective to cater the demand of some LMWD's service areas due to its stable water source. Therefore, the Team considers that construction of a new transmission main between Dagami and Tanauan is more effective than the above two routs in Tingib system from easy construction and economical points of view.

7. Schedule of the Study

1) The consultants will proceed to further studies in Philippines until 5th March, 1993.
2) JICA will prepare a draft final report in English and dispatch a mission to explain the contents of the report to the Philippines side around May 1993.
3) In case that the contents of the report are accepted in principle by the Philippines side, JICA will complete the final report and send it to the Government of Philippines around June 1993.

Annex II

Undertakings by the Government of the Republic of the Philippines.

1. To acquire the land necessary for the construction of the Project facilities and clear the site prior to commencement of the Project.

2. To provide facilities for distribution of electricity and other incidental facilities up to the proposed site where Project facilities will be constructed.

3. To ensure speedy unloading, tax exemption, custom clearance of the products under the grant at the port of disembarkation.

4. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

5. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of equipment/machines and services under the verified contracts.

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

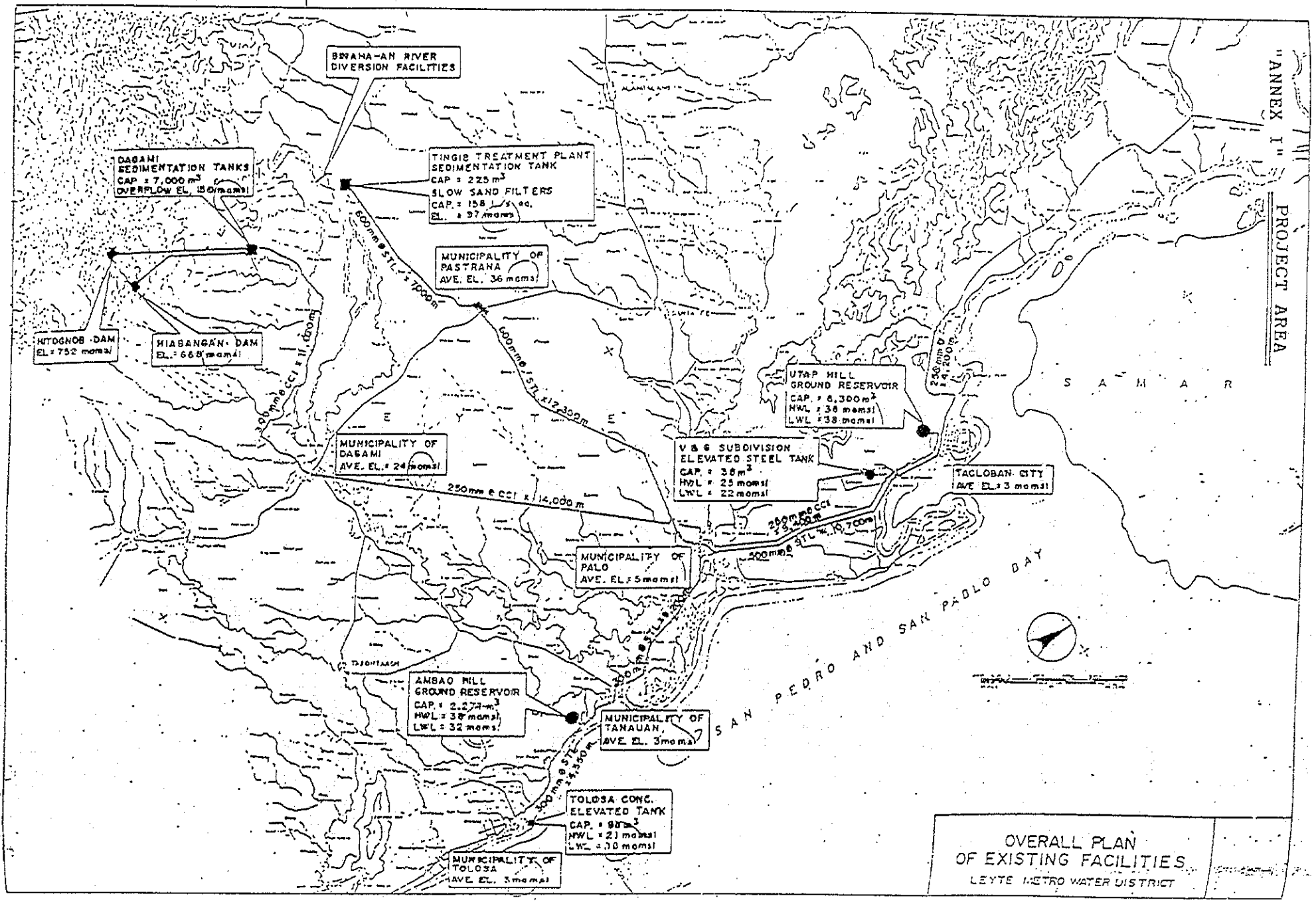
7. To bear all expenses, other than those to be covered by the Grant Aid necessary for the execution of the Project.

8. To assign exclusive counterpart engineers/technicians, for the Project.

9. To use and maintain properly and effectively the facilities constructed and equipment procured by the Grant.

10. To secure smooth implementation of the Project in accordance with the internal procedures to be necessary in the Philippines.

M.T.


"ANNEX I"
PROJECT AREA
BINAHA-AN RIVER DIVERSION FACILITIES
DAGAMI SEDIMENTATION TANKS
CAP. = 7,000 m³
OVERFLOW EL. 150 mamsl
TINGIB TREATMENT PLANT
SEDIMENTATION TANK
CAP. = 225 m³
SLOW SAND FILTERS
CAP. = 158 l/s ea.
EL. = 97 mamsl
MUNICIPALITY OF PASTRANA
AVE. EL. 36 mamsl
600mm ø STL x 1000m
600mm ø STL x 12,300m
HITOGNOB DAM
EL. = 752 mamsl
HIABANGAN DAM
EL. = 668 mamsl
300mm ø CCI x 11,600m
MUNICIPALITY OF DAGAMI
AVE. EL. = 24 mamsl
250mm ø CCI x 14,000 m
UTAP HILL GROUND RESERVOIR
CAP. = 6,300 m²
HWL = 38 mamsl
LWL = 38 mamsl
250mm ø CCI x 14,200m
V & G SUBDIVISION ELEVATED STEEL TANK
CAP. = 36 m³
HWL = 25 mamsl
LWL = 22 mamsl
TACLOBAN CITY
AVE. EL. = 3 mamsl
250mm ø CCI x 3,200m
300mm ø STL x 16,700m
MUNICIPALITY OF PALO
AVE. EL. = 5 mamsl
300mm ø STL x 5,000m
AMBAO HILL GROUND RESERVOIR
CAP. = 2,274 m³
HWL = 38 mamsl
LWL = 32 mamsl
MUNICIPALITY OF TANAUAN
AVE. EL. 3 mamsl
300mm ø STL x 14,350m
TOLOSA CONC. ELEVATED TANK
CAP. = 90 m³
HWL = 21 mamsl
LWL = 10 mamsl
MUNICIPALITY OF TOLOSA
AVE. EL. 3 mamsl
SAMAR
SAN PEDRO AND SAN PABLO BAY
OVERALL PLAN OF EXISTING FACILITIES
LEYTE METRO WATER DISTRICT

A-10

(2) Technical Note at the Field Survey

TECHNICAL NOTES
ON
THE PROJECT FOR EMERGENCY REHABILITATION PROGRAM
FOR TYPHOON-DAMAGED WATER SUPPLY SYSTEM IN LEYTE

The Minutes of Discussion on the Project for Emergency Rehabilitaion Program for Typhoon-damaged Water Supply System in Leyte (hereinafter referred to as "the Project") was signed and exchanged between the JICA Basic Design Study Team (hereinafter referred to as "the JICA Team") and the Local Water Utilities Administration (hereinafter referred to as "LWUA") of the Republic of Philippines on February 10, 1993.

In accordance with the Minutes of Discussions, the JICA Team continued field survey and had a series of discussions with officers concerned on the technical aspect of the Project up to 5th of March, 1993 in the Philippines.

This Technical Notes is prepared in order to understand mutually results obtained by the JICA Team during the field survey in the Philippines. The project components and conceptual drawings of facilities are attached herewith as Attachment I. These will be analyzed and studied further in detail in Japan. Finally theses will be justified and described in the Draft Final Report.

Issues which were raised in the field survey but not concluded are mentioned on Attachment II for following-up to be undertaken by the Philippines side.

The Philippines side earnestly requests an operational training on the newly introduced treatment plant for the LMWD's staff on an on-the-job basis for at least half year after commencement of the new system. The JICA Team responded that this shall be informed to the Japanese officials concerned.

The JICA Team and the Philippines side both understand the present status of the Project and share a recognition that both sides will adopt necessary measures for urgent implementation of the Project.

Manila, 4th March, 1993

Mr. Mashio Yamaha
Chief Engineer
Basic Design Study Team
Japan International
Cooperation Agency

Mr. Simplicio C. Beligario, JR.
Deputy Administrator
Engineering Services
Local Water Utilities
Administration, Philippines

ATTACHMENT I.

1. Project Alternatives

The JICA Team studied three alternatives for the Project considering the request made by the Philippines side. These will be analyzed and justified based on the most efficient and economical point of views.

Case 1.
- A Water Intake on Binaha-an river
- A Raw Water Transmission Main
- A Treatment plant at Tingib - Cap. around 20,000 c-meter/day

Case 2.
- A Water Intake on Binaha-an river
- A Raw Water Transmission Main
- A Treatment Plant at Tingib - Cap. around 20,000 c-meter/day
- A Transmission Line (Dagami-Tanauan)

Case 3.
- A Water Intake on Binaha-an river
- A Raw Water Transmission Main
- A Treatment Plant at Tingib - Cap. around 24,000 c-meter/day
- A Transmission Line (Tingib-Pastrana-St. Fe-Palo)

2. Conceptual Drawings

Conceptual Drawing of facilities to be constructed by the Project are delineated hereunder as follows;

1) Location Map of the Proposed Facilities
2) Intake on Binaha-an River
3) Plan of Treatment Plant at Tingib
4) Main Water Purification System

3. Others

Along the existing transmission main from Tingib to Palo, some leaks were observed at air valves. Some of the existing air valves were already deteriorated and not functioning. Therefore, the JICA Team considered that these air valves shall be replaced for prevention of water leak.

Dagami raw water transmission main consists of CCI pipe which was not damaged by the typhoon and PVC pipe which are replacement of the Typhoon washed-out CCI pipeline. The PVC pipes are about 200 meters along Hiabangan river and 40 meters along Hitognob river. The PVC pipe is bound by a steel wire and hanged on the steep slope along the river but a reliable support was not erected on the rocky river bed. Therefore, there is the possibility that this PVC pipe may be washed out again by another typhoon. Then the JICA Team considers to supply some PVC pipe materials as spare parts of the existing PVC line.

ATTACHMENT II.

undertakings by the Philippines side were expressed on the Minutes of Discussions. Besides these, the JICA Team pointed out some items as follows which were raised during the field survey and to be cleared by the Philippines side.

1. Land Acquisition

The JICA Team decided a proposed water intake & treatment system in Tingib site. The Philippines side is able to negotiate on land acquisition with the owners of the sites of proposed intake and raw water transmission line as well. As mentioned on the Minutes of Discussions, the JICA Team requested the Philippines side to continue the negotiation and send copies of the agreements to Japan.

2. Electricity Supply to Proposed Treatment Plant Site

An electricity supply line reaches around 3 Km from the proposed Tingib treatment plant site at present. A request letter regarding the line extension to the site was mailed to LEYECO III by the LMWD but no reply was received so far. As the Philippines side is obliged to provide electricity to the site, the JICA Team requested the Philippines side to follow-up this matter and inform the JICA Team an estimate of the line expansion work.

3. Obtaining of Permission on Pipe Laying in Highway

If the proposed transmission main is constructed, permissions for pipe laying along the highways and using the existing bridges for support shall be needed. Regarding this, discussions were held between the DPWH and the LMWD in Tacloban and reached a basic agreement that proposed pipeline can be laid in the highway. Proposal on pipe support for bridge crossing was submitted to the DPWH in Leyte. However, the DPWH's decision has not been received. The JICA Team requested the Philippines side to inform the result as soon as it is made, because the JICA Team has to consider this decision for the design work.

4. Maiton Dam Project

The road construction for Maiton Dam Project which is now on going may be partly used as a pipeline route of the proposed raw water transmission main. Some parts of this road are eroded seriously. Therefore, the JICA Team requests the Philippines side to take proper counter measures against the erosion and complete the construction before the JICA Project commenced.

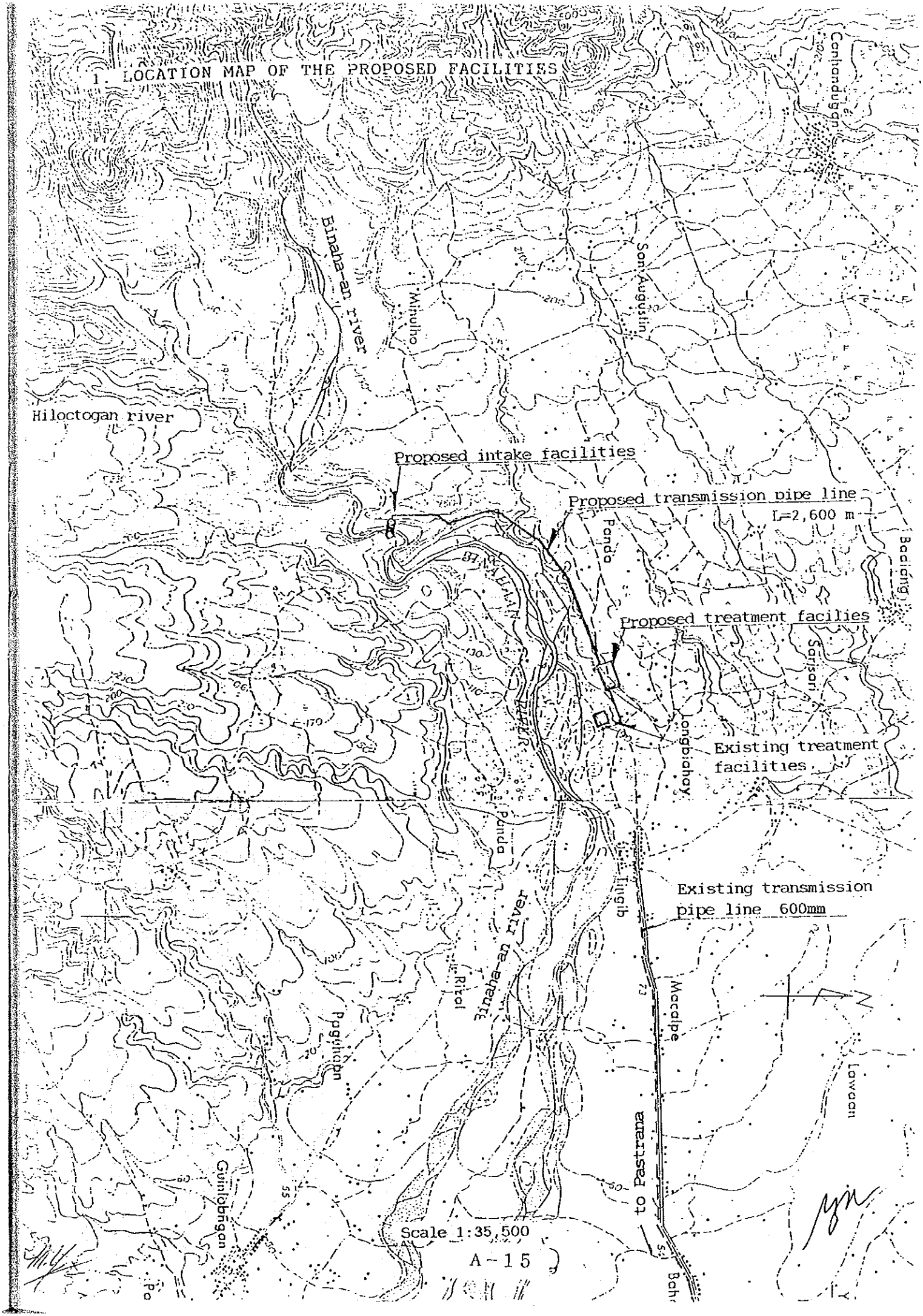
5. Irrigation Project

The National Irrigation Administration (NIA) has a new dam construction project in Binaha-an river and requested ADB to carry out a feasibility study on it. According to information we received the dam will be constructed near the existing treatment plant. The JICA Project shall be proceeded without considering the NIA project along the schedule of the Japanese grant Aid. Therefore, the JICA Team requested the Philippines side to have discussion with NIA and to prepare the pertinent documents in which it will be expressed that the NIA will pay careful attention on the water supply facilities to be constructed by the JICA Project.

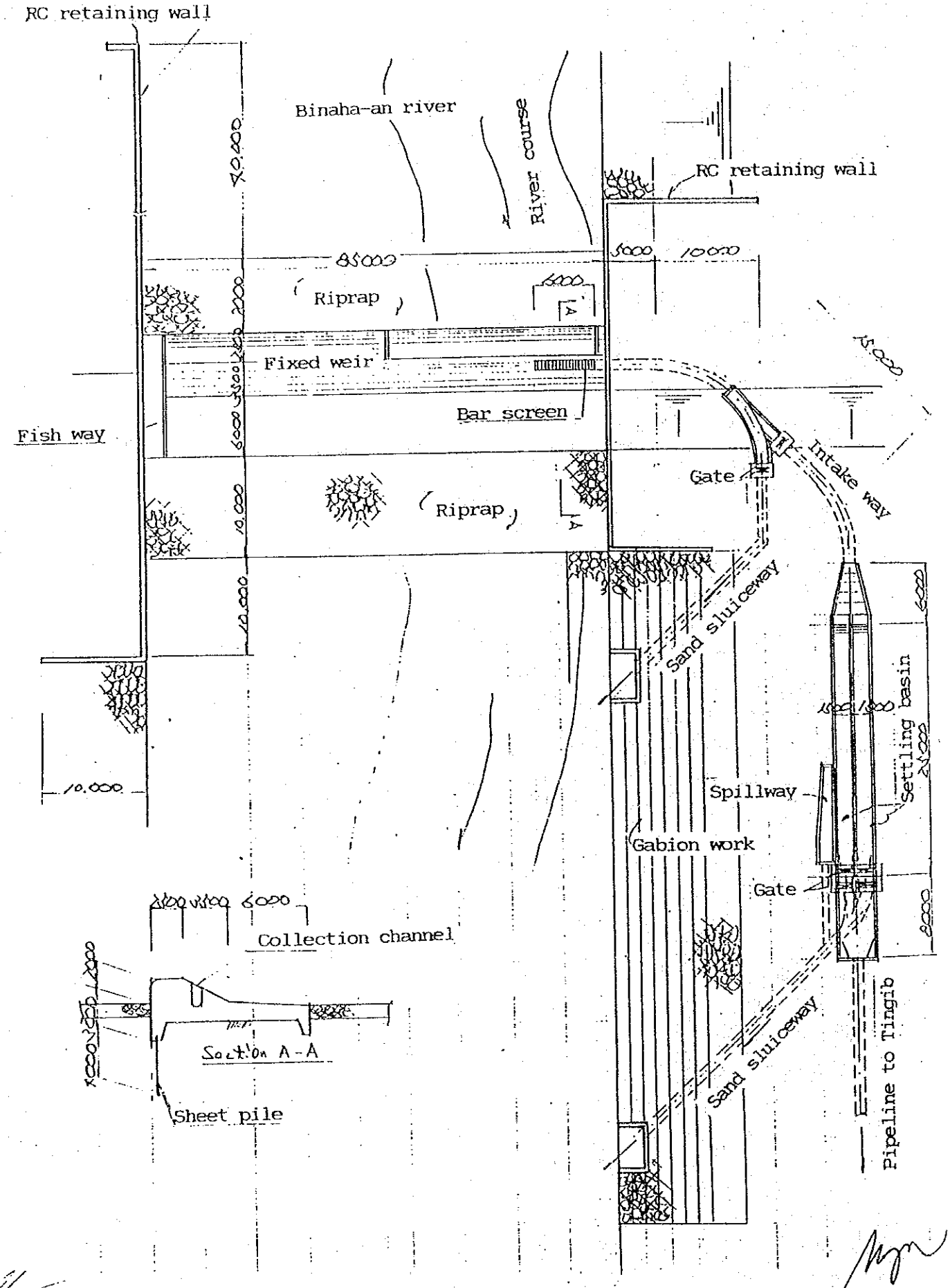
6. Environment Impact Assessment

The Department of Environment & Natural Resources in Tacloban said to JICA Team that there is the need to carry out an Environment Impact Assessment. The JICA Team requested the Philippines side to confirm it and take proper steps necessary.

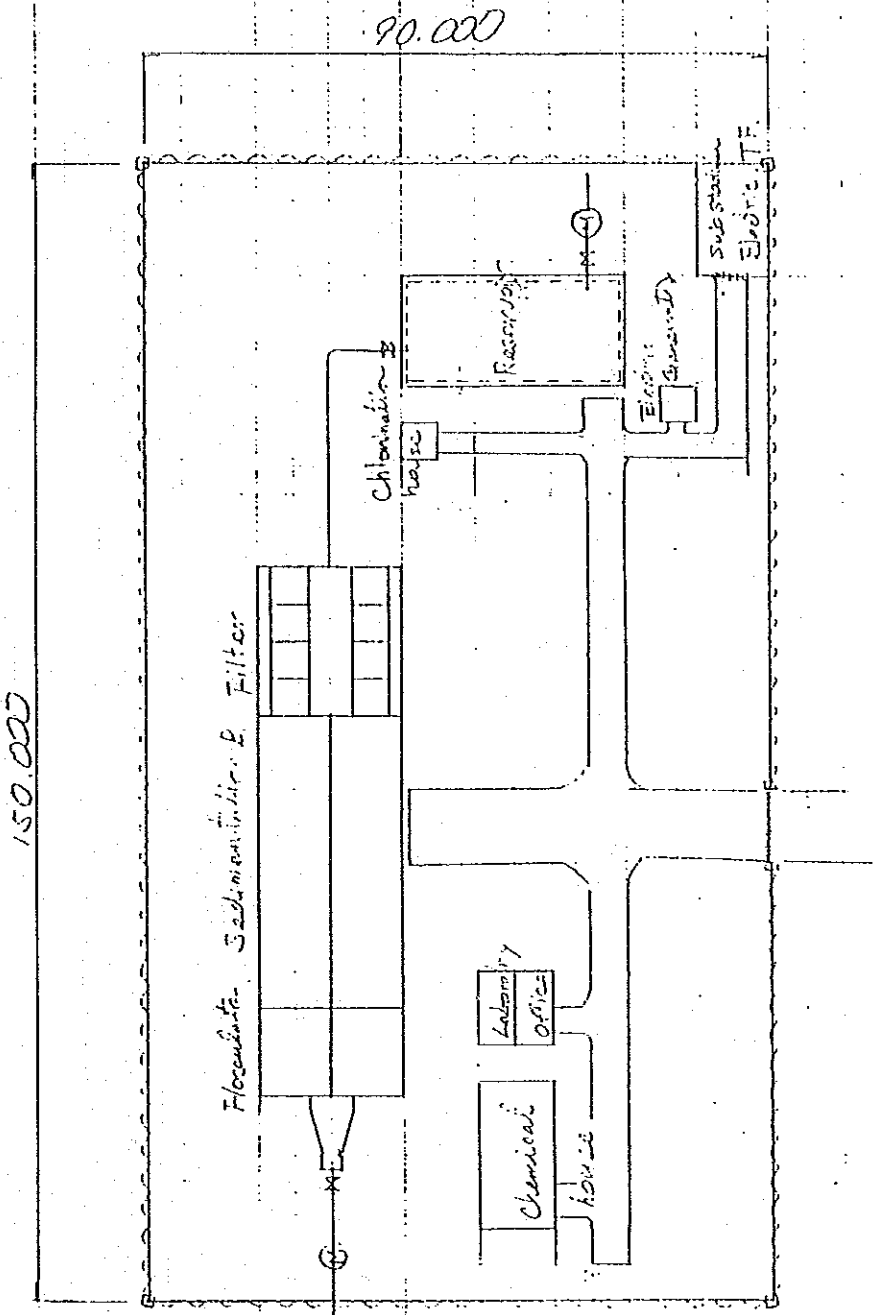
1. LOCATION MAP OF THE PROPOSED FACILITIES



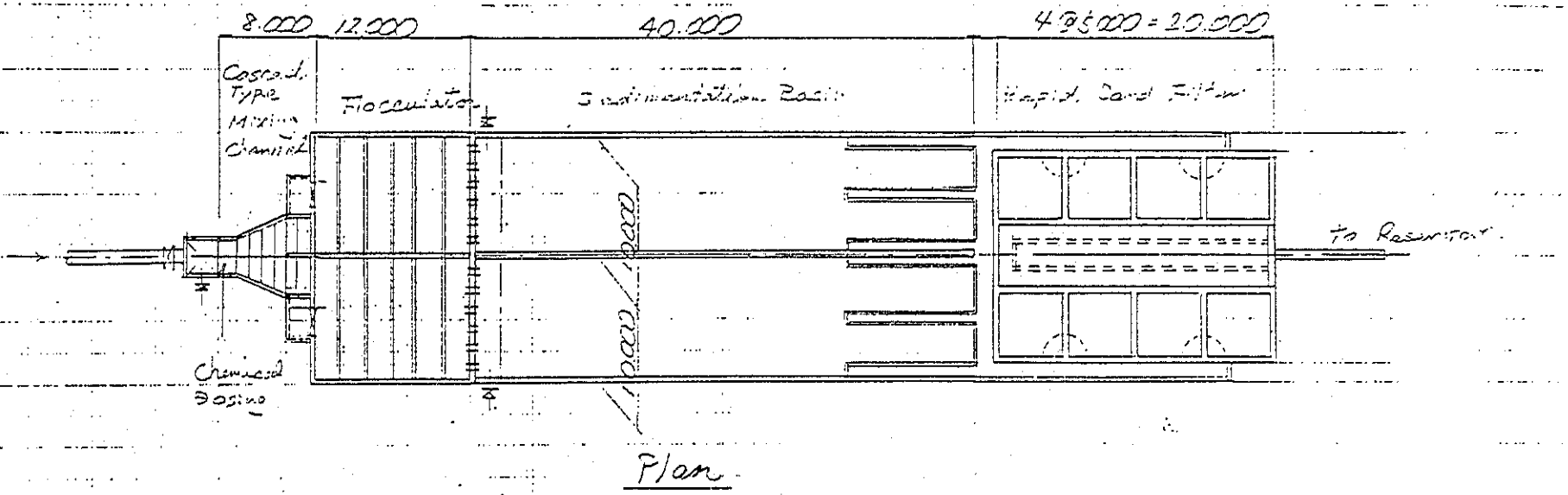
2. INTAKE ON BINAHA-AN RIVER



3. PLAN OF TREATMENT PLANT AT TINGIB



4. MAIN WATER PURIFICATION SYSTEM



(3) Minutes of Discussion at the Explanation of Draft Final Report

MINUTES OF DISCUSSIONS
OF
THE BASIC DESIGN STUDY ON THE PROJECT FOR
EMERGENCY REHABILITATION FOR
TYPHOON-DAMAGED WATER SUPPLY SYSTEM IN LEYTE
IN THE REPUBLIC OF THE PHILIPPINES
(CONSULTATION ON DRAFT FINAL REPORT)

From January through February, 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for Emergency Rehabilitation for Typhoon-Damaged Water Supply System in Leyte (hereinafter referred to as "the Project"), to the Republic of the Philippines. Through discussions, field surveys, and technical examination of the results in Japan, the team has prepared the draft final report of the study.

In order to explain and to consult the Philippine side on the components of the draft final report, JICA sent to the Philippines a Study Team (hereinafter referred to as "the Team"), headed by Mr. Hisatoshi Okubo, 1st Basic Design Study division, Grant Aid Study and Design Department, JICA, from 27th May to 5th June, 1993.

As a result of discussions, both parties have confirmed the main items described on the attached sheets.

Manila, 3rd June, 1993

Mr. Hisatoshi Okubo
Leader
Draft Final Report
Explanation Team, JICA.

Mr. Antonio R. De Vera
Administrator
Local Water Utilities
Administration, Philippines

Mr. Cayo U. Emnas
General Manager
Leyte Metropolitan Water District

ATTACHMENT

1. Components of Draft Final Report

The Government of the Philippines has agreed and accepted in principle the components of the Draft Final Report proposed by the Team.

2. Responsible and Executing Agencies

1) The executing agency will be the Local Water Utilities Administration (LWUA), which is responsible for planning, designing and construction.

2) The Leyte Metropolitan Water District (LMWD) will be responsible for operation and maintenance of the works after completion.

3. Grant Aid Program Extended by Japan

1) The Philippine side has understood the system of Japan's Grant Aid explained by the Team.

2) The Government of the Philippines will take necessary measures described in Annex I for smooth implementation of the Project, on the condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

4. Further Schedule

1) The Philippine side will send further comments on the Draft Final Report, if any, to JICA, Manila, not later than 11th June, 1993.

2) The Team will prepare the Final Report in accordance with the confirmed items, considering the comments and suggestions by the Philippine side on the Draft Final Report. The Final Report will be sent to the Government of the Philippines around July, 1993.

5. Technical Cooperation

The Philippine side has expressed the need for Japan's technical cooperation in connection with the Project; namely dispatch of a Japanese expert and technical training of counterpart personnel in Japan. The list of requests for technical cooperation is shown in Annex II. The Philippine side will make separate official requests through diplomatic channels.

6. Necessary Internal Approvals

1) The Philippine side will take necessary measures to satisfy the internal criteria concerning environment impact assessment as required by the Environmental Management Bureau (EMB), not later than the end of June, 1993.

2) The clearance from the Government Corporate Monitoring & Coordinating Committee (GCMCC) should be obtained not later than the end of June, 1993.

3) The Philippine side should secure approval from the Investment Coordinating Committee (ICC) not later than the end of June, 1993 and send copies of the approval to JICA, Manila, immediately.

7. Other important Issues

1) Both sides have confirmed all the items appearing in the Minutes of Discussions signed on 10th February 1993, a copy of which has been reproduced in the Draft Final Report.

2) The Philippine side will continue negotiations with the land owners concerning the land acquisition for the facilities to be constructed under the Project and will send copies of agreement as soon as they are concluded.

Annex I

Undertakings by the Government of the Republic of the Philippines.

1. To secure the land necessary for the construction of the Project facilities and clear the site prior to commencement of the Project.

2. To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site.

3. To ensure speedy unloading, tax exemption, custom clearance of the products under the grant at the port of disembarkation.

4. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

5. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of equipment/machines and services under the verified contracts.

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

7. To bear all expenses, other than those to be covered by the Grant Aid necessary for the execution of the Project.

8. To assign exclusive counterpart engineers/technicians, for the Project.

9. To use and maintain properly and effectively the facilities constructed and equipment procured by the Grant.

Annex II

1. Japanese Expert (long term)

- Water Treatment Facilities	one.

2. Technical Training in Japan

- Water Supply Management	two.
- Water Treatment Facilities	two.

5. List of Collected Data

(1) Developmentment Plan

1. Medium-Term, Philippine Development Plan, 1987-1992 Manila, Philippines
2. Medium-Term, Philippine Development Plan, 1990-1992 Manila, Philippines
3. 1993-1998 Medium Term Regional Development Plan, Eastern Visayas Region, NEDA
4. 1993-1998 Provincial Development Plan, Leyte, NEDA
5. The Leyte Island Development Program, NEDA
6. Provincial Development Investment Program 1993-1998, NEDA
7. Major Development Programs and Projects 1986-1992, Leyte, NEDA
8. Major Development Programs and Projects 1986-1992, Tacloban City, NEDA
9. Water Supply, Sewerage & Sanitation Master Plan of the Philippines, 1988-2000

(2) Natural

1. The Geology and Mineral Resources of Leyte Island
2. Daily Rainfall Data at Tacloban City, 1961-1991, PAGASA

(3) Law and Regulation

1. P.D.No.198, Authorizing the Formation of Local Water Districts(Amend of P.D.No.768)
2. Provincial Water Utilities Act of 1973, Manila
3. Rules and Regulations, Governing the Operations of the LWWD, 1979, LWWD
4. Water Right Permit No.2396 on Binahaan River, March,1977, NWRC
5. Guidelines for Accomplishing ICC-PE forms
6. Philippine Law on Natural Resources, The Water Code P.D. No.1067, etc.
7. Rules and Regulations of the National Pollution Control Commission for Domestic Wastewater Disposal, Ministry of Human Settlement, June, 1981
8. Annotated Environmental Impact Statement Outline, DENR
9. P.D.No.1121, Creating National Environmental Protection Council
10. P.D.No.1586, Establishing an Environmental Impact Statement System including other Environmental Management Related Measures and for other purposes
11. By-Laws of Leyte II Electric Cooperative, Inc.

(4) Standard

1. Technical Standards Manual, LWUA
2. LWUA Standard Specifications for Water System Construction, August 1986, LWUA

3. National Standard for Drinking Water, National Committee on Drinking Water Standards
4. Inspecttor's Construction Manual, LWUA

(5) Study

1. Feasibility Study & Detailed Design on LMWD, October 1991, LWUA
2. Rulal Water Supply Project, June 1981, Ministry of PW, Bureau of Water Supply
3. Technical Assesment, LMWD Water System Appurtenances, Feb. 1993, LMWD
4. Special countermeasures against typhoon and flood, 1993, LMWD
5. Disaster Report, Nov. 1991, Provincial Disaster Coordinating Council
6. Special Rehabilitation and Recovery Program for Leyte and Ormoc City, Feb. 1992, Resional Development Council
7. Progress Report Emergency Rehabilitation Program, LMWD, Dec. 1992 & Jan. 1993, LMWD
8. Upgrading of the LMWD Supply System, LMWD
9. Binahaan-Tibak RIS, Basic Information for Proposed Improvement Work ISIP-II, NIA

(6) Survey/Observation Data

1. 1990 Census of Population and Housing Leyte, Report No. 3-51 H, NSO
2. 1990 Census of Population and Housing Leyte, Report No. 4-51 H, NSO
3. Monthly Billed Consumption Data, Jan-Dec 1989, Jun-Dec 1991, Jan. 1992, LMWD
4. Pressure Survey along Transmission Line, June4-5 and June8-9, 1991, LMWD
5. OMAP Office and LMWD Pressure Monitoring, Apr. Aug. Nov., 1991, May, June, 1992
6. Survey Report of Binaha-an River, Quality of Water, Dec., 1991, DENR Leyte

(7) Operation & Maintenance

1. Upgrading of the LMWD Supply System, O and M Manual, Nov., 1991, LMWD
2. Operation Guideline for Tingib Production/Treatment Facilities, LMWD, 1991

(8) Organization

1. Corporate Plan 1993-1998, Dec. 1992, LWUA
2. Annual Report, LWUA, 1986, 1987, 1989, 1990, 1991
3. Organization Chart of the LMWD, 1992
4. Cash Flow Statement, 1992, 1991, LMWD
5. The MWSS yesterday and Today, July 1992, MWSS

(9) Construction Cost

1. Unit Price Ceiling of Civil Works Pay Items, 4th Quarter 1992, DPWH Resional Office
2. Detailed Cost Estimate, Feb. 1992, West Leyte Road Improvement Project, DPWH
3. Unit Cost, LMWD

(10) Other List

1. List of Suppliers/Manufacturers of Materials & Equipment, LWUA
2. List of LMWD's Office Equipment and their Present Condition, Feb. 1993, LMWD

(11) Drawings

1. Topografic Map, Ormoc, Bybay, Bogo, Cebu, S=1/250,000
2. Topografic Map, Ormoc, Palo, Carigara, Tacloban, reprinted by NAMRIA 1989, S=1/50000
3. Vicinity Plan of LMWD (VP) S=1/50,000 1 sheet
4. LMWD Water System Improvement Proposed to Year 2000 S=1/50000 1 sheet
5. Billed Collection Area 1 sheet
6. Road Diagram and Bridge List, 1988, DPWH
7. Drawings of Tingib Treatment Plant
8. Drawings of Hitugunob Intake Dam
9. Layout & Profile, LMWD Improvement, Hitognob and Hiabangan 1 sheets
10. Proposed Tingib Transmission Line between Tingib and Tacloban 3/24-21/24 19 sheets
11. Proposed Transmission Line between Santa Fe and Alang-Alang (SA) 6 sheets
12. Proposed Transmission Line between Santa Fe and Pastrana (SP) 4 sheets
13. Profile & Hydraulic Grade Line from Palo to Santa Fe (PS) 5 sheets
14. Proposed Distribution Main Santa Fe Town Proper, LMWD 1 sheets
15. Proposed ϕ250mm Transmission Line between Dagami and Digahungan (DT) 2 sheets
16. Proposed ϕ250mm Transmission Line between Digahungan and Tanauan (DDT) 6 sheets
17. Pipeline Networks, Tacloban, Palo, Tanauan, Tolosa, Pastrana, Dagami, LMWD
18. Plan & Profile of Maitom Water Source, LMWD V=1/ 500, H=1/1000, 2 sheets
19. Plan & Profile of Maitom-Atipolo Water Source V=1/1000, H=1/8000, 1 sheet
20. Zamboanga City Water District, Water Treatment Facilities, 10 sheets

6. Data of the Water Quality Test

Result of Water Quality Test of Binahaan River Tested by the Study Team

Sample	Water Source of Binahaan River										
Collection Date	Feb. 16	Feb. 17	Feb. 18	Feb. 20	Feb. 21	Feb. 22	Feb. 23	Feb. 24	Feb. 25	Feb. 22	Feb. 28
Weather	Clear	Clear	Clear	Cloudy	Clear	Clear	Rainy	Cloudy	Rainy	Rainy	Rainy
Temperature (℃)	27.5	30.5	28.0	27.0	18.0	26.5	27	28	26.5	26.0	24.0
pH	7.7	–	8.0	7.95	–	7.8	7.7	7.8	7.8	–	7.45
Turbidity	<10	<10	5	18	10	3	3	20	120	100	40
EC (μS/cm)	280	305	293	295	290	295	292	260	205	235	250
Alkalinity (mg/ℓ)	70.3	–	71.6	65.9	66.5	–	–	–	–	–	6
Cℓ Ion (mg/ℓ)	6	–	7.2	6.7	6	–	–	–	–		–

7. Data of the Geological Survey

BOREHOLE NO.: BH - 02 INTAKE
LOCATION: San Agustin, Jaro, Leyte
PROJECT SITE: Intake (wiersite)
DATE STARTED: Feb. 16, 1993
DATE COMPLETED: Feb. 18, 1993

INCLINATION: 0°
COLLAR ELEVATION:
BOTTOM ELEVATION:
DEPTH: 25.0 m
COORDINATES:

FINAL WATER TABLE	SIZE OF HOLE	CORE RECOVERY GRAPHIC	CORE RECOVERY % C.R.	RQD 20 40 60 80	DEPTH (m)	GEOLOGIC PROFILE	DISCONTINUITIES FEATURES	LITHOLOGICAL DESCRIPTION	WEATHERING	HARDNESS (H)	JOINTING (J)	SPT N VALUE 10 30 50	WPT Section Tested (M)	WPT Total Flow (l/min)	WPT ADJUSTED PRESSURE kg/cm²	INNER TUBE Ø LUGEON .1 1.0 10
3/3	NQ		30					0.0-1.45 coarse-grained w/ several pea-size gray.					23			
			45					1.45-4.0 Porphyritic sandstone, gravel, gray medium grained.	WI	H1 to H2	J2 to J3					
			27										35			
					5		SC	4.0-9.0 Dense silty sand; brownish to violet gray, w/ mixture of sub-rounded hard pea-sized gravels					42			
							GC						32			
							GW						50			
							GM						50			
			40					9.0-11.5 Porphyritic sandstone, gravel gray pebble -sized cores	WI	H2	J3					
			23		10											
			30					11.5-13.5 Volcanic breccia boulder; gray to brown, pea-sized clasts	W2 to W3	H4	J2					
			30		15			13.5-18.0 same w/ 9.0-11.5, generally slightly weathered, minor iron staining along joint surfaces	W2	H3	J3					
			18													
			30					18.0 assumed top of firm rock								
					20			18.0-24.0 Volcanic breccia; violet gray to gray, pea-sized clasts embedded in a sandy matrix	WI	H2	J2					
			33													
			33		25			24.0-25.0 Porphyritic sandstone, gray	WI	H2	J2					
								BOTTOM OF HOLE								

LEGEND

L	CONTACT ROCK TO ROCK SMOOTH	SI	SLUDGE
R	CONTACT ROCK TO ROCK ROUGH	OX	OXIDIZED JOINT
I	CONTACT ROCK TO ROCK IRREGULAR	Ag	JOINT WITH CLAY
E	CONTACT ROCK TO ROCK STRIATED	M	MINERALIZATION
A	OPEN JOINT	J	MAIN DISCONTINUITY (FAULTS, SHEARED ZONES)

WEATHERING		HARDNESS		JOINTING	
WI	SOUND	H1	VERY HARD (Metallic sound hardly broken by hammer	J1	JOINT/m SLIGHTLY JOINTED
W2	SLIGHTLY WEATHERED (appreciable oxidation of joint)	H2	HARD (Death sound easily broken by hammer	J2	1-5 JOINTS/m JOINTED
W3	MINIMUM WEATHERED (matrix slightly weathered)	H3	MEDIUM HARD (Echo, hardly broken by hammer)	J3	6-10 JOINTS/m VERY JOINTED
W4	DEEPLY WEATHERED (matrix deeply weathered)	H4	SLIGHTLY HARD (Hardly squeezed by fingers)	J4	EXTREMELY 11-20 JOINTS/m JOINTED
W5	TOTALLY WEATHERED AMMILLIZED (only traces of the original structure)	H5	SOFT (Easily broken by fingers)	J5	20 JOINTS/m GROUND

PROJECT: LEYTE WATER SUPPLY REHABILITATION
CLIENT: RYOWA ENGINEERING CONSULTANTS CO., LTD.
GRAPHICAL LOG OF
SHEET OF

BOREHOLE NO.: BH - 01 TREATMENT
LOCATION: Tingib, Pastrana, Leyte
PROJECT SITE: Treatment Plant
DATE STARTED: March 1, 1993
DATE COMPLETED: March 2, 1993

INCLINATION: 0°
COLLAR ELEVATION:
BOTTOM ELEVATION:
DEPTH: 30.0 m
COORDINATES:

FINAL WATER TABLE	SIZE OF HOLE	CORE RECOVERY GRAPHIC	CORE RECOVERY % C.R.	RQD	DEPTH (m)	GEOLOGIC PROFILE	DISCONTINUITIES FEATURES	LITHOLOGICAL DESCRIPTION	WEATHERING	HARDNESS (H)	JOINTING (J)	SPT N VALUE	WPT Section Tested (N)	WPT Total Flow (l/min)	WPT Adjusted Pressure (kg/cm²)	INNER TUBE Ø LUGEON
	NQ		29					0.0-1.45 Gravelly sand					26			
			15					1.45-5.0 Gravels, por. sandstone, gray to violet, w/ calcite in-filling	W1	H2						
			10				SP-SM									
			14		5			5.0-6.5 Medium dense gray sand								
			43					6.5-12.3 same with 1.45 to 5.0, generally cobble-sized cores	W1	H2						
			10													
			13		10											
			7													
			4				SM									
								12.3-14.0 same with 5.0-6.5 m								
			23		15			14.0-20.0 Coarse grained sandstone boulders, brownish; generally soft	W1 to W3	H5 to H4	J5					
			20													
			50													
			13													
			10		20			20.0-30.0 Medium-grained sandstone boulders; gray hard, minor iron staining noted at few sections	W1 to W3	H2	J3					
			28													
			13													
			36		25											
			13													
					30			BOTTOM OF HOLE								

LEGEND

L	CONTACT ROCK TO ROCK SMOOTH	SI	SLUDGE
R	CONTACT ROCK TO ROCK ROUGH	OX	OXIDIZED JOINT
I	CONTACT ROCK TO ROCK IRREGULAR	Ag	JOINT WITH CLAY
E	CONTACT ROCK TO ROCK STRIATED	M	MINERALIZATION
A	OPEN JOINT	J	MAIN DISCONTINUITY (FAULTS, SHEARED ZONES)

WEATHERING		HARDNESS		JOINTING	
W1	SOUND	H1	VERY HARD (Metallic sound hardly broken by hammer	J1	JOINT/m SLIGHTLY JOINTED
W2	SLIGHTLY WEATHERED (appreciable oxidation of joint)	H2	HARD (Dooth sound easily broken by hammer	J2	1-5 JOINTS/m JOINTED
W3	MINIMUM WEATHERED (matrix slightly weathered)	H3	MEDIUM HARD (Echo, hardly broken by hammer)	J3	6-10 JOINTS/m VERY JOINTED
W4	DEEPLY WEATHERED (matrix deeply weathered)	H4	SLIGHTLY HARD (Hardly squeezed by fingers)	J4	EXTREMELY 11-20 JOINTS/m JOINTED
W5	TOTALLY WEATHERED ARGILLIZED (only traces of the original formation)	H5	SOFT (Easily broken by fingers)	J5	20 JOINTS/m GROUND

PROJECT:
CLIENT:
GRAPHICAL LOG OF
SHEET OF

8. Selection of the Pipe Matererial

Piping material used for the construction of Tingib Conveyance pipeline and Dagami transmission pipeline is selected on the basis of the comparison of the properties, workability, life period, construction cost etc. as shown in the below table. According to this table it is very clearly understand that DCIP has excellent properties that is long life period, economical construction cost, high reliability on safety against internal and external pressures, water tightness, flexibility of joint. Therefore, DCIP will be used for the pipe materials for the Project.

Items	---- DCIP ----		----- SP -----		-- FRPMP --
1. Specification/ Properties					
a. Diameter (mm)	ø600	ø250	ø600	ø250	ø600
b. Class	4 cl	3 cl	t=6mm	t=6mm	3 cl
c. Guaranty pressure (kg/cm2)	70	100	10 *	10 *	14
d. Bearing pressure**(kg/cm2)	20	20	7	20	6
Design pressure*** (kg/cm2)	4.8	19.6	4.8	19.6	4.8
e. Weight (kg/m)	154	46	89	42	50
f. Joint type	Push-on		Welding		Push-on
g. Flexibility of joint (degree)	3	5	good		4
h. Water tightness	Good		Good		Fair
2. Workability					
a. Excavation for joint	not required		required		not required
b. Pipe Bedding	not required		Sand well compacted		Sand well compacted up to the top of Pipe
c. Jointing	easy		required skilled worker for welding & internal and external coating		easy
3. Depreciation life year	40		38		25

* = hydrostatic pressure

** = maximum internal pressure when external pressure by traffic load and soil pressure is considered

*** = internal pressure

Tingib system : hydrostatic pressure= 24 m, water hammer = 24 m, total= 48m

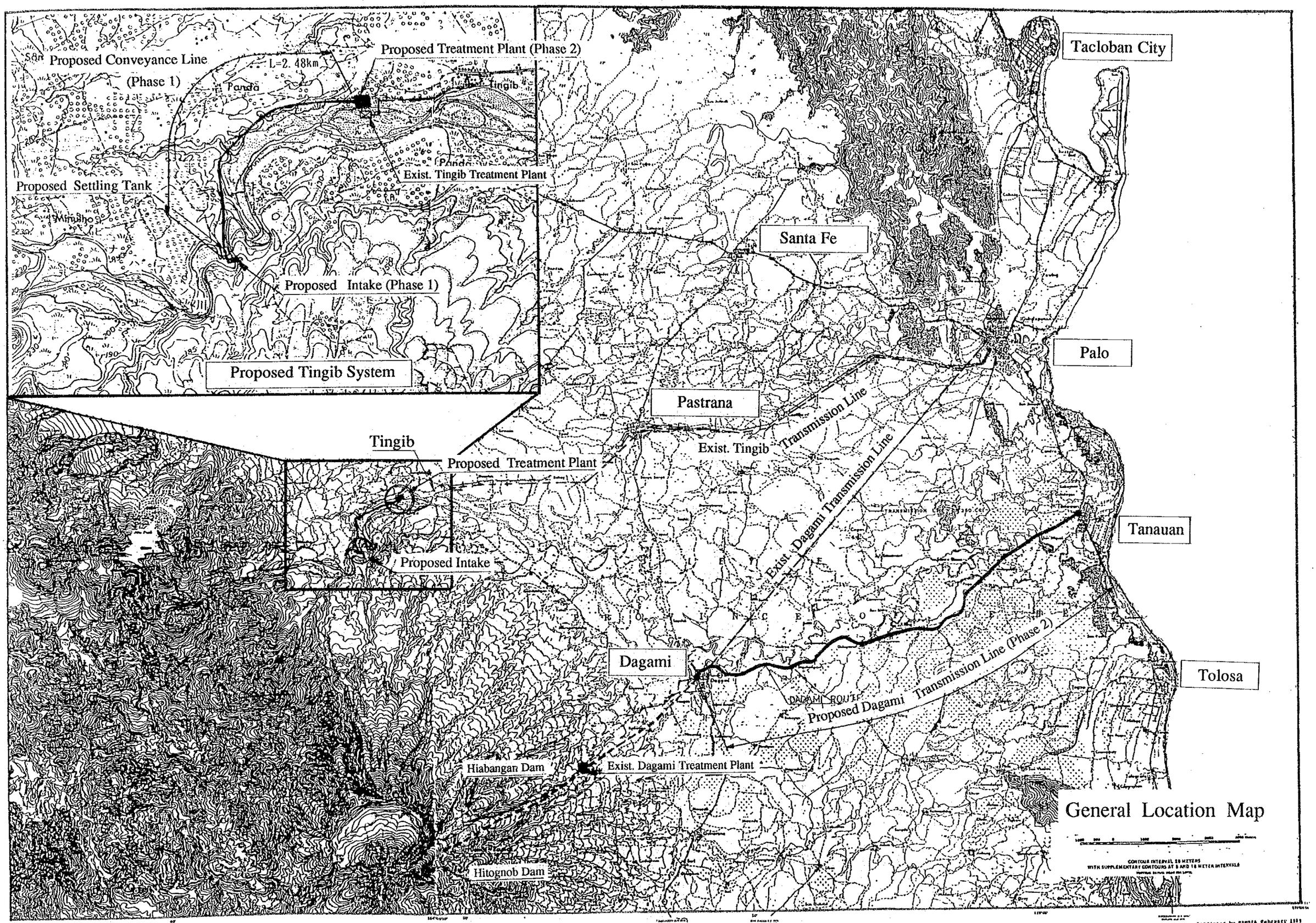
Dagami system : hydrostatic pressure=140 m, water hammer = 56 m, total=196m

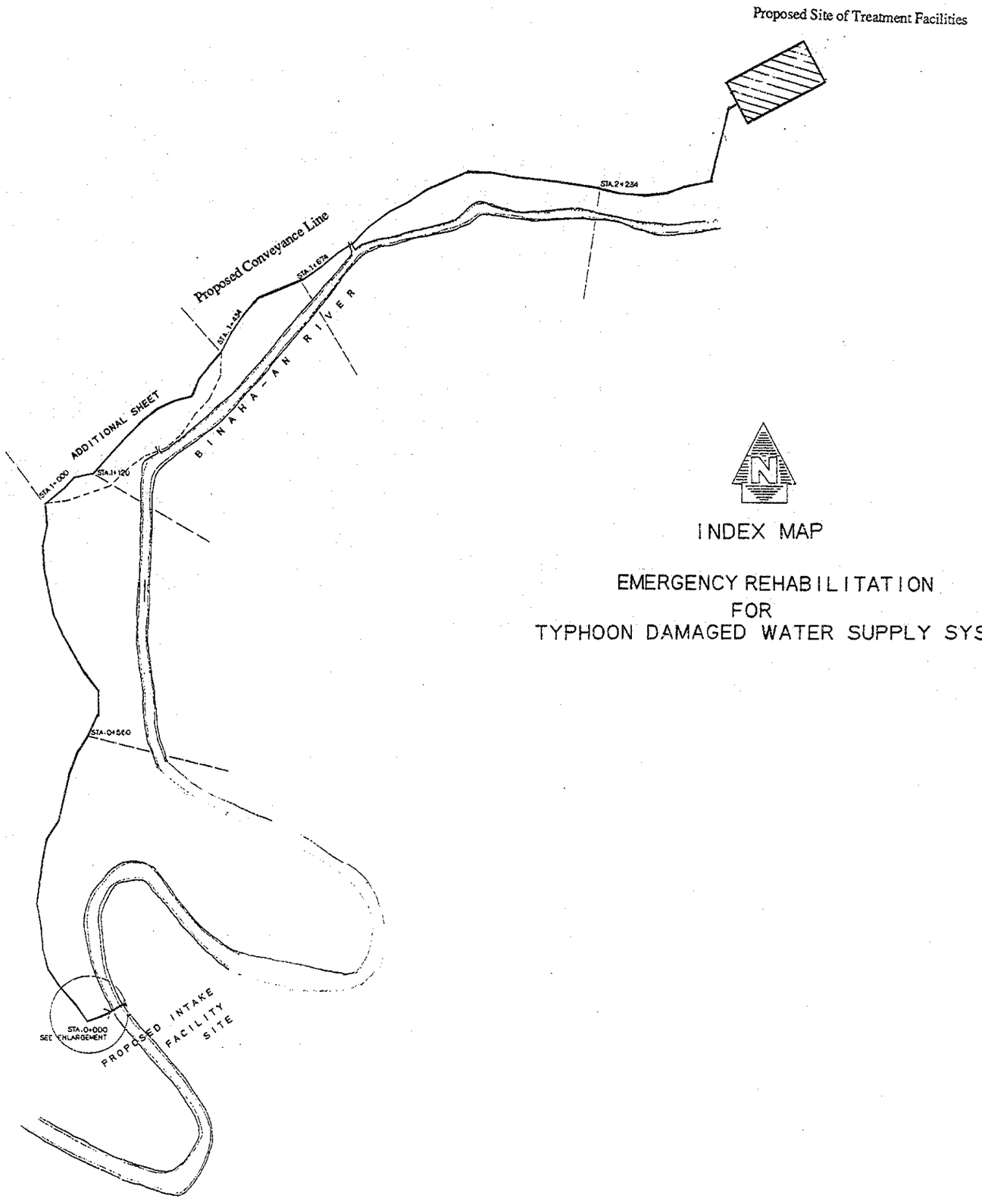
4. Construction cost for Tingib Conveyance Pipeline Ø600 mm (J. Yen/m)

a. Type	DCIP, T-4cl	SP, t=6mm	FRPMP 3cl
b. Material	24,600	20,600	20,800
c. Installation	1,730	8,070	1,560
d. Thrust block	1,600	0	2,400
e. Total	27,930	28,670	24,760

5. Construction cost for Dagami Transmission Pipeline Ø250 mm (J.Yen/m)

a. Type	DCIP, T-3cl	SP, t=6mm	FRPMP
b. Material	7,380	11,340	not available
c. Installation	800	3,400	
d. Thrust block	700	0	
e . Total	8,880	14,740	

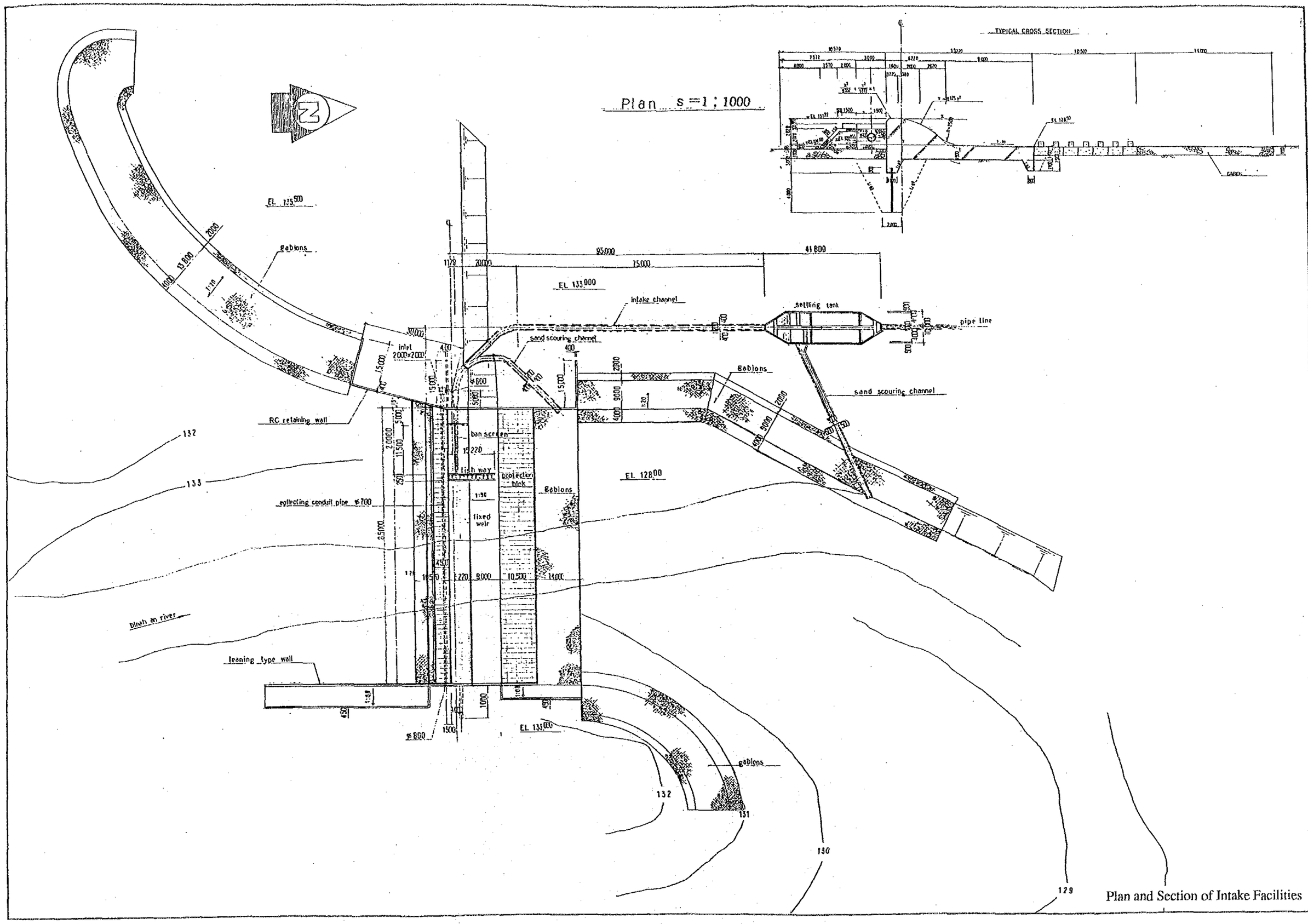

Proposed Conveyance Line
(Phase 1)
L=2.48km
Proposed Treatment Plant (Phase 2)
Panda
Tingib
Exist. Tingib Treatment Plant
Proposed Settling Tank
Proposed Intake (Phase 1)
Proposed Tingib System
Tacloban City
Santa Fe
Palo
Pastrana
Exist. Tingib Transmission Line
Exist. Dagami Transmission Line
Tingib
Proposed Treatment Plant
Proposed Intake
Tanauan
Dagami
Tolosa
DAGAMI ROUTE
Proposed Dagami Transmission Line (Phase 2)
Hiabangan Dam
Exist. Dagami Treatment Plant
Hitognob Dam
General Location Map
CONTOUR INTERVAL 20 METERS
WITH SUPPLEMENTARY CONTOURS AT 5 AND 10 METER INTERVALS



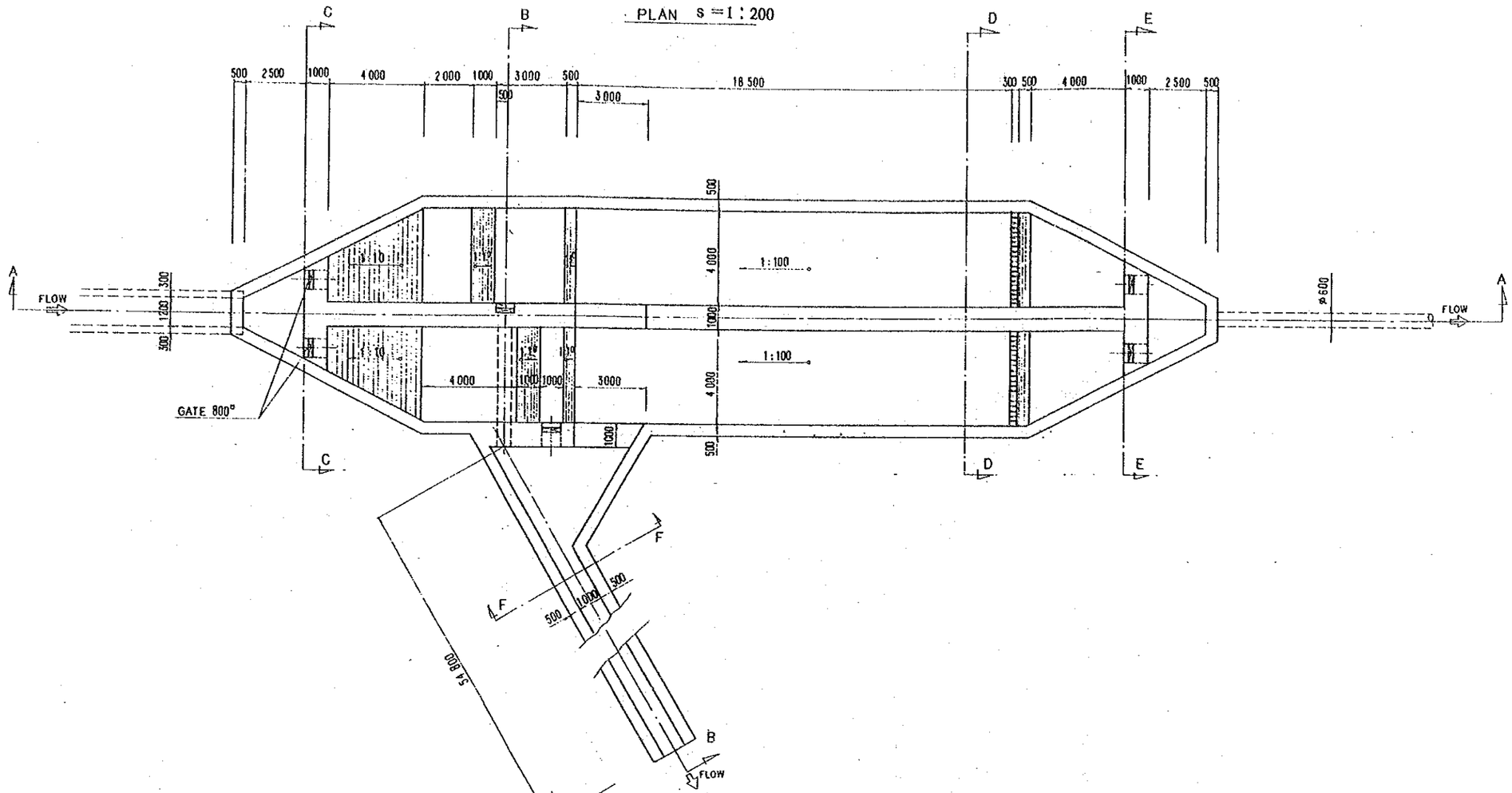
INDEX MAP

EMERGENCY REHABILITATION
FOR
TYPHOON DAMAGED WATER SUPPLY SYSTEM

General Plan of Proposed Tingib System

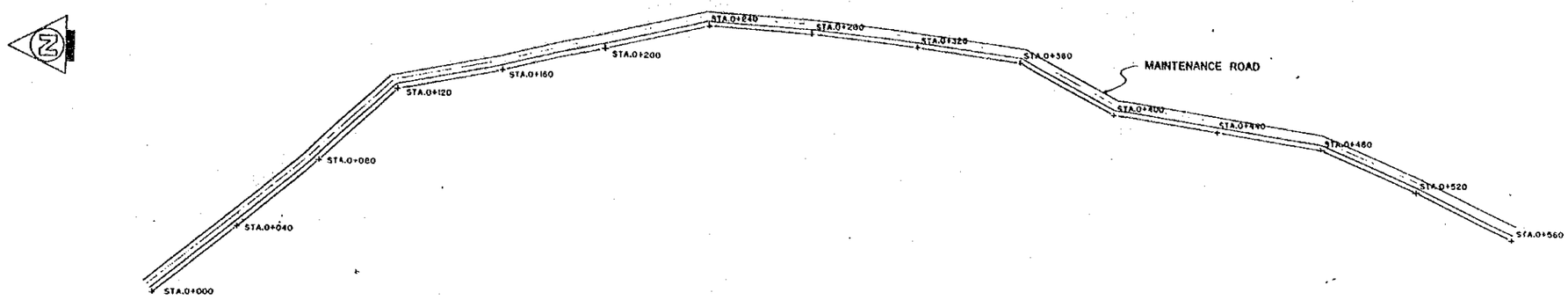


Plan and Section of Intake Facilities

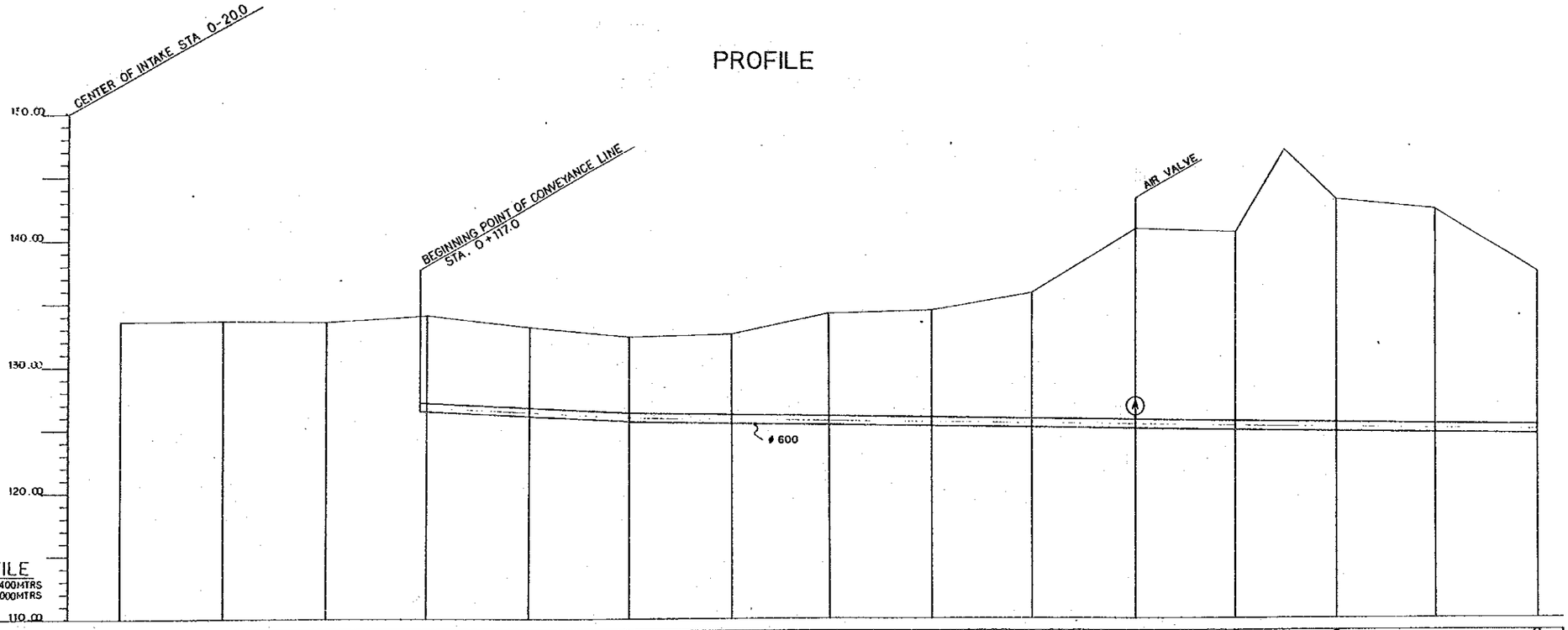


Settling Tank of Intake Facilities(1/2)

PLAN s = 1 : 2000



PROFILE



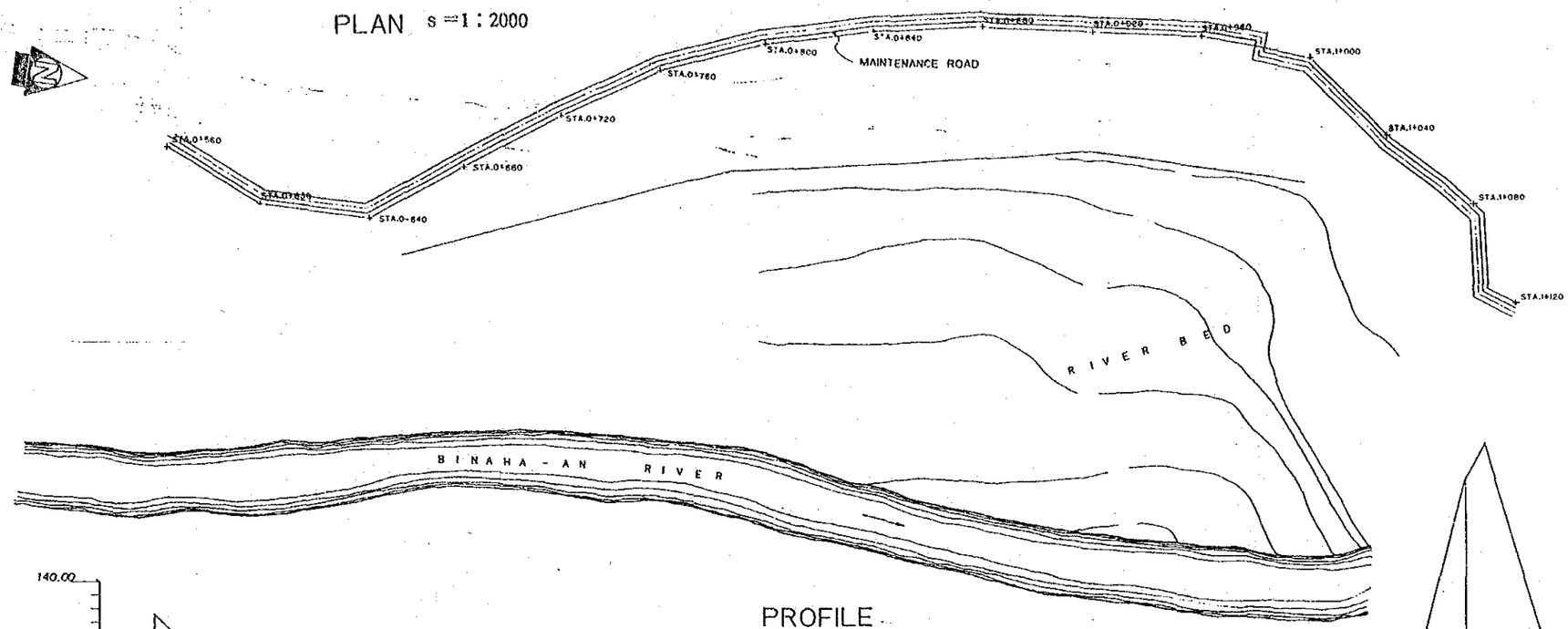
PROFILE
SCALE VERT.1 : 400MTRS HOR.1:2000MTRS

PIPE CENTER ELEVATION				126.923	126.782	126.376		125.970		125.860		125.750		125.640	
GLAND ELEVATION	133.708		133.755	134.125	134.180	133.159		132.424		132.607		134.349		134.530	
TOTAL DISTANCE	0.000		0.040	0.080	0.117	0.120	0.160	0.200		0.240		0.280		0.320	
PARTIAL DISTANCE	0.000		0.040	0.040	0.037	0.003	0.040	0.040		0.040		0.040		0.040	
STATION	0+000	0+020	0+040	0+080	0+117	0+120	0+160	0+200		0+240		0+280		0+320	
ANGLE			0° - 16'		3° - 10'		32° - 21'		2° - 05'		2° - 00'		16° - 55'		2° - 49'

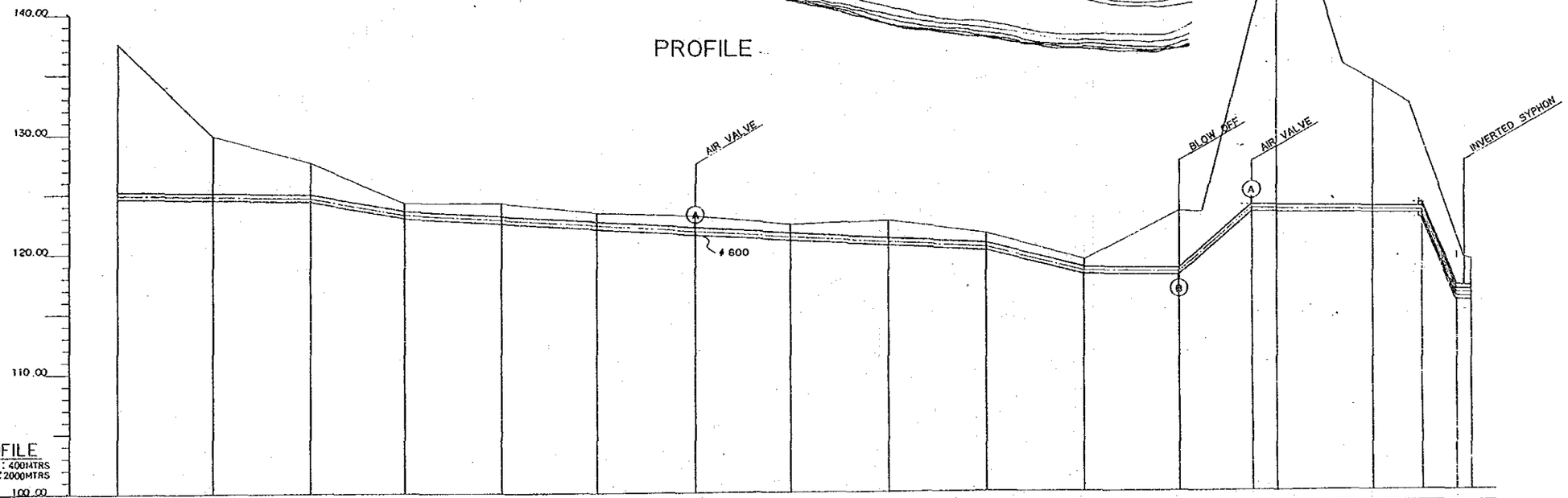
PIPE CENTER ELEVATION		125.540		125.430		125.320		125.220		125.110		125.000			
GLAND ELEVATION		135.965		140.815		140.799		143.284		142.575		137.545			
TOTAL DISTANCE		0.360		0.400		0.440		0.480		0.520		0.560			
PARTIAL DISTANCE		0.040		0.040		0.040		0.040		0.040		0.040			
STATION		0+360		0+400		0+440		0+480		0+520		0+560			
ANGLE	21° - 14'		21° - 20'		0° - 01'		13° - 49'		2° - 55'		3° - 54'				

Plan and Profile of Tingib Conveyance Pipeline(1/5)

PLAN s = 1 : 2000



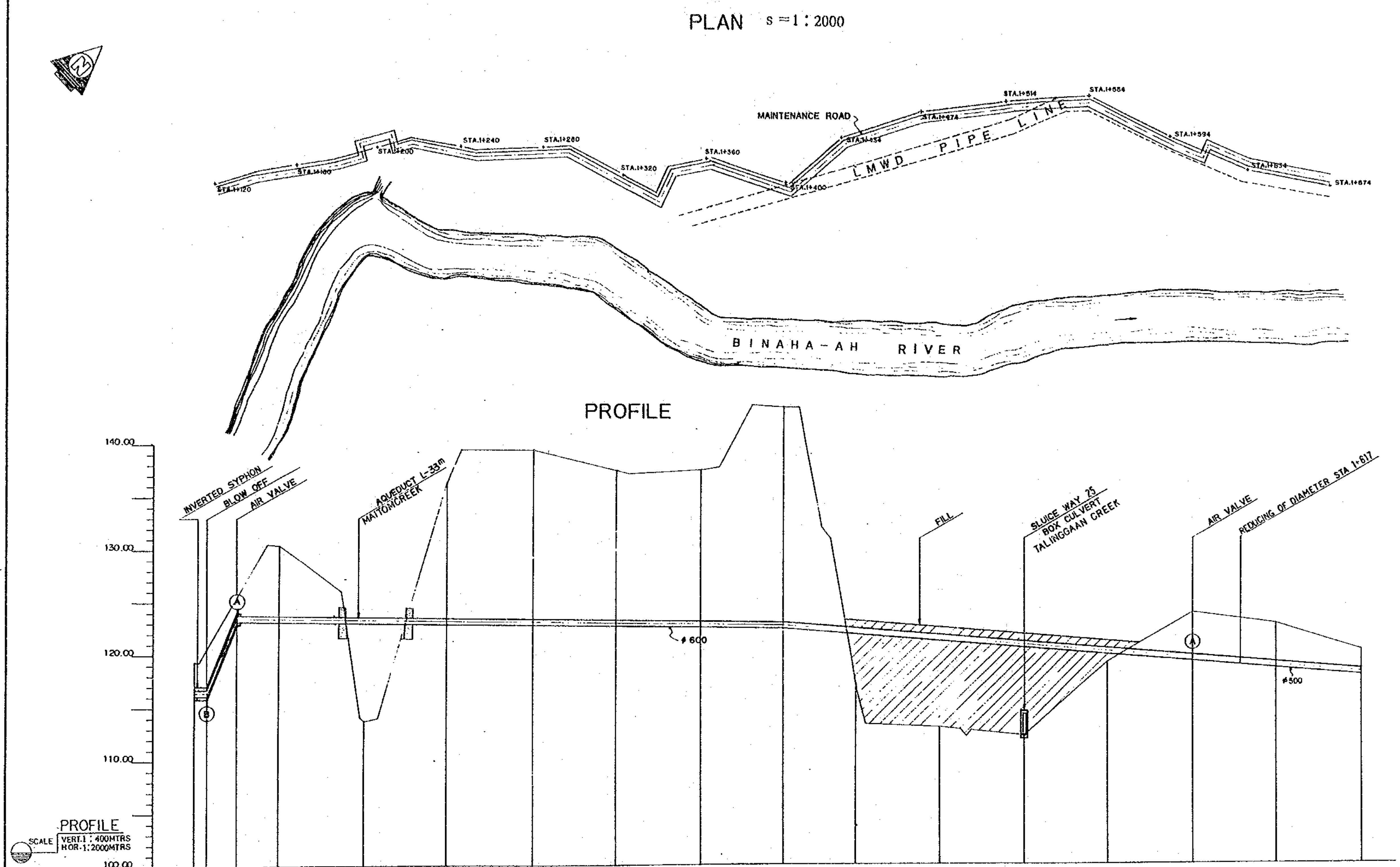
PROFILE



PROFILE
SCALE VERT.1 : 400MTRS
HOR-1:2000MTRS

PIPE CENTER ELEVATION	125.000	124.900	124.790	124.400	122.933	122.467	122.000	121.533	121.067	120.600	119.500	118.400	123.748	123.720	123.610	123.560	116.560	116.505			
GLAND ELEVATION	137.543	137.504	137.687	137.339	134.250	133.439	133.172	132.500	132.324	131.658	130.424	129.335	147.5		134.4			119.3			
TOTAL DISTANCE	0.560	0.600	0.640	0.680	0.720	0.760	0.800	0.840	0.880	0.920	0.960	1.000	1.040		1.080			1.120			
PARTIAL DISTANCE	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040		0.040			0.040			
STATION	0 + 560	0 + 600	0 + 640	0 + 680	0 + 720	0 + 760	0 + 800	0 + 840	0 + 880	0 + 920	0 + 960	1 + 000	1 + 030	1 + 040	1 + 080	1 + 100	1 + 114	1 + 120			
ANGLE	3° - 54'	23° - 56'	34° - 09'	1° - 38'	4° - 21'	5° - 27'	9° - 59'	3° - 35'	9° - 08'	6° - 08'	0° - 24'										

Plan and Profile of Tingib Conveyance Pipeline(2/5)

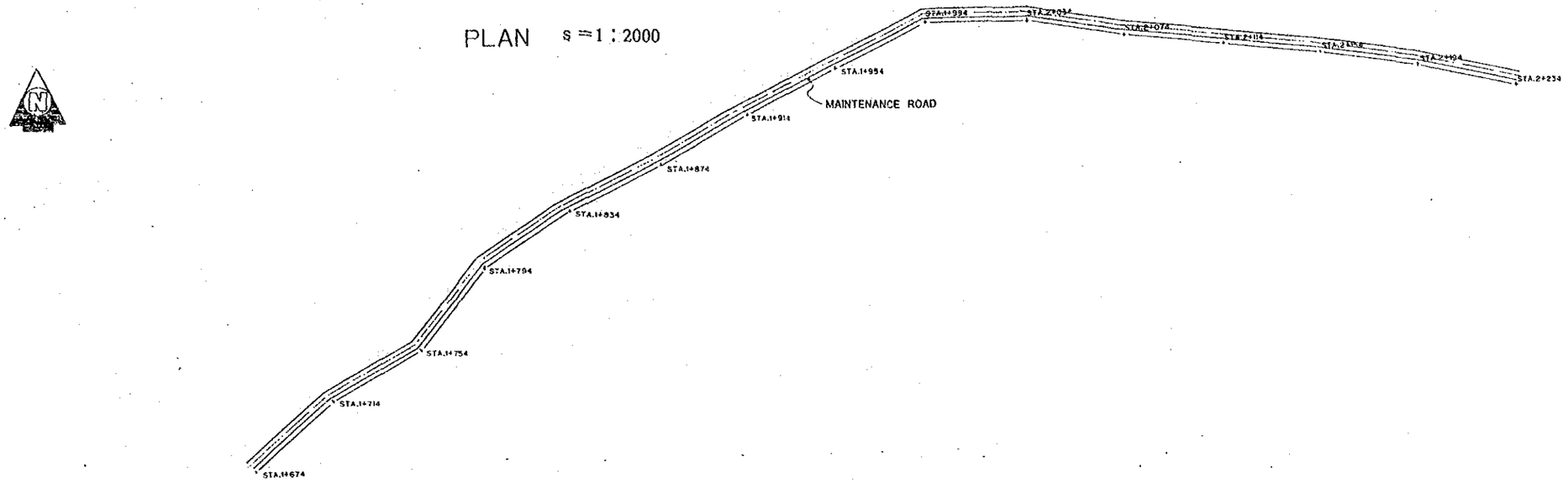


PIPE CENTER ELEVATION	116.508	116.455	123.455	123.400	123.290	123.190	123.080	122.970	122.860
GLAND ELEVATION	119.3			130.3	113.8	136.4	139.5	137.5	137.6
TOTAL DISTANCE	1.120			1.160	1.200	1.240	1.280	1.320	1.360
PARTIAL DISTANCE	0.040			0.040	0.040	0.040	0.040	0.040	0.040
STATION	1+120	1+126	1+140	1+160	1+200	1+240	1+280	1+320	1+360
ANGLE									

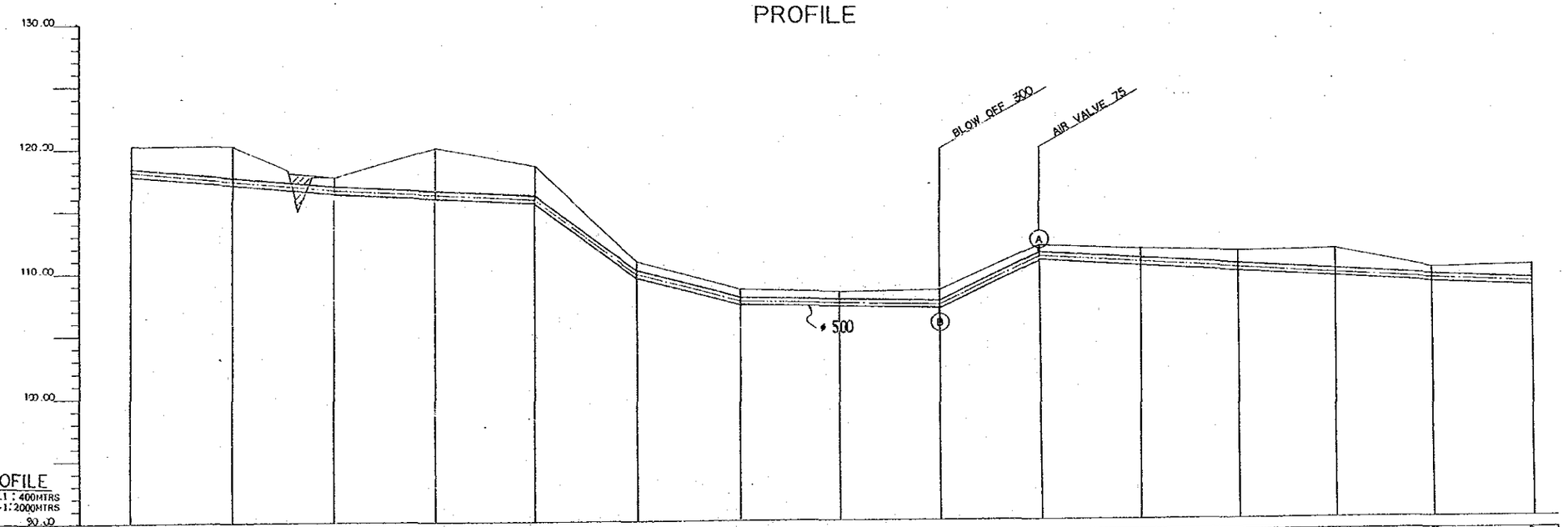
PIPE CENTER ELEVATION	122.760	122.388	121.514	120.841	120.167	119.494	119.106	118.820	118.147
GLAND ELEVATION	143.5	116.8	113.067	112.230	119.159	123.914	123.267	122.759	120.281
TOTAL DISTANCE	1.400	1.434	1.474	1.514	1.554	1.594	1.617	1.634	1.674
PARTIAL DISTANCE	0.040	0.034	0.040	0.040	0.040	0.040	0.023	0.017	0.040
STATION	1+400	1+434	1+474	1+514	1+554	1+594	1+617	1+634	1+674
ANGLE				1°-47'	30°-31'	2°-58'		11°-45'	5°-04'

Plan and Profile of Tingib Conveyance Pipeline(3/5)

PLAN s = 1 : 2000



PROFILE

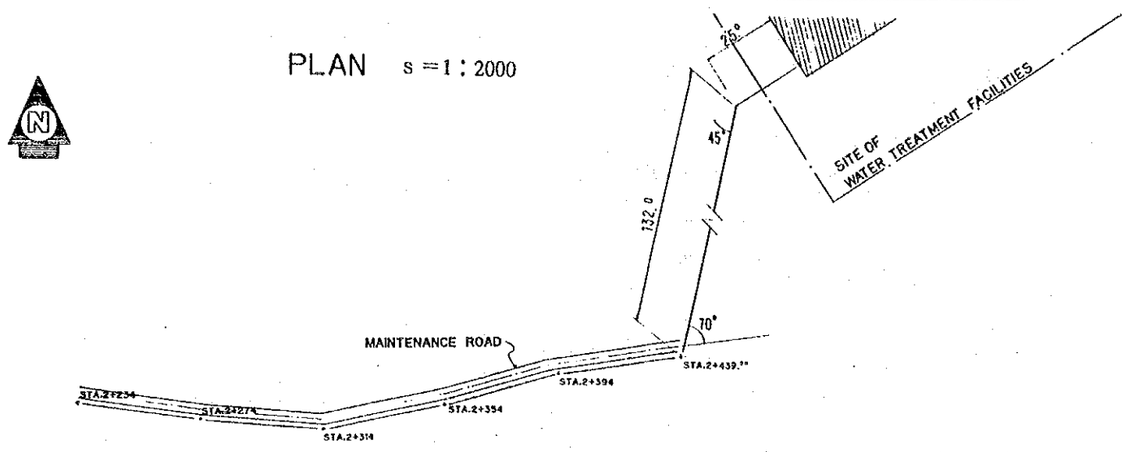


PROFILE
SCALE VERT.1 : 400MTRS
HOR.1:2000MTRS

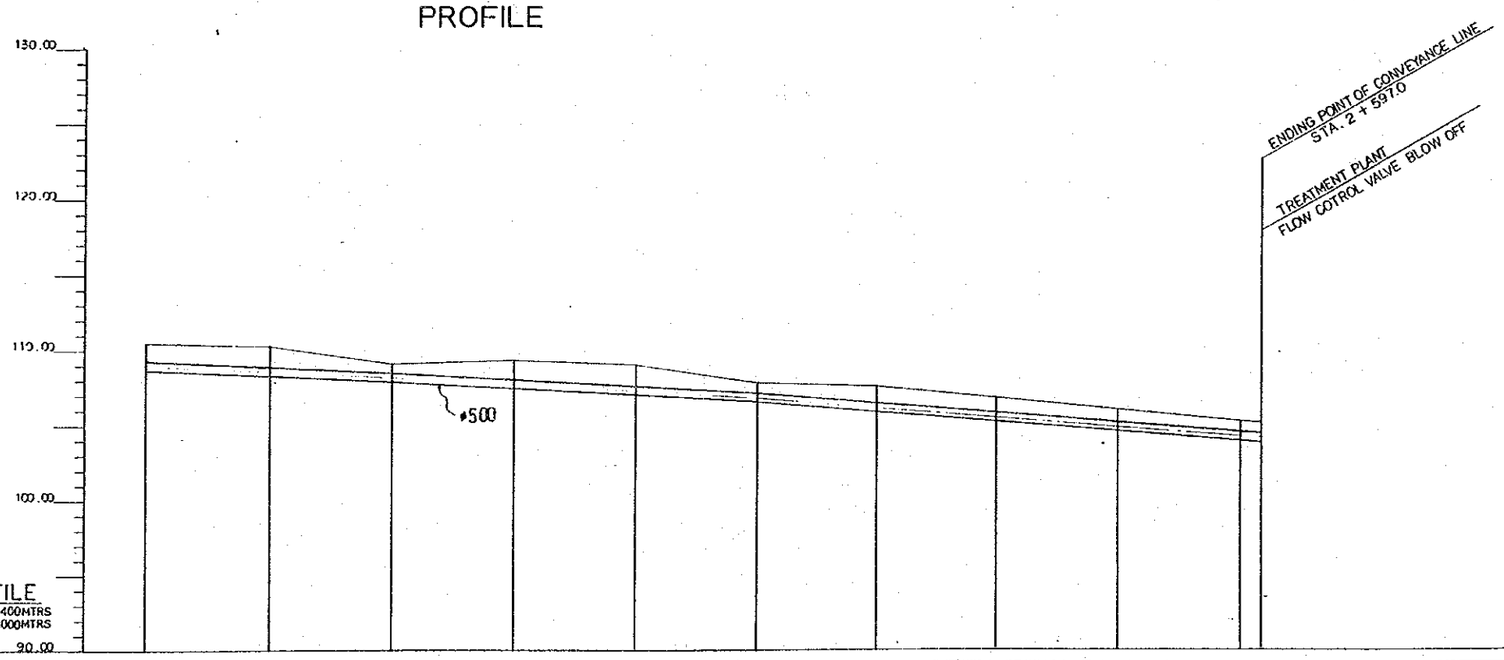
PIPE CENTER ELEVATION	118.147		117.473		116.800		116.400		116.000		110.000		107.800		107.600		107.400		110.900		110.300		109.800		109.300		108.967
GLAND ELEVATION	120.281		120.342		117.750		120.114		118.689		110.935		108.755		108.505		108.694		112.212		111.626		111.826		110.220		110.474
TOTAL DISTANCE	1.674		1.714		1.754		1.794		1.834		1.874		1.914		1.954		1.994		2.034		2.114		2.154		2.194		2.234
PARTIAL DISTANCE	0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040		0.040
STATION	1+674		1+714		1+754		1+794		1+834		1+874		1+914		1+954		1+994		2+034		2+074		2+114		2+154		2+194
ANGLE		5°-04'		11°-59'		22°-36'		18°-17'		5°-13'		2°-51'		4°-25'		0°-55'		23°-46'		11°-35'		6°-16'		1°-23'		1°-37'		4°-27'		2°-54'

Plan and Profile of Tingib Conveyance Pipeline(4/5)

PLAN s = 1 : 2000



PROFILE



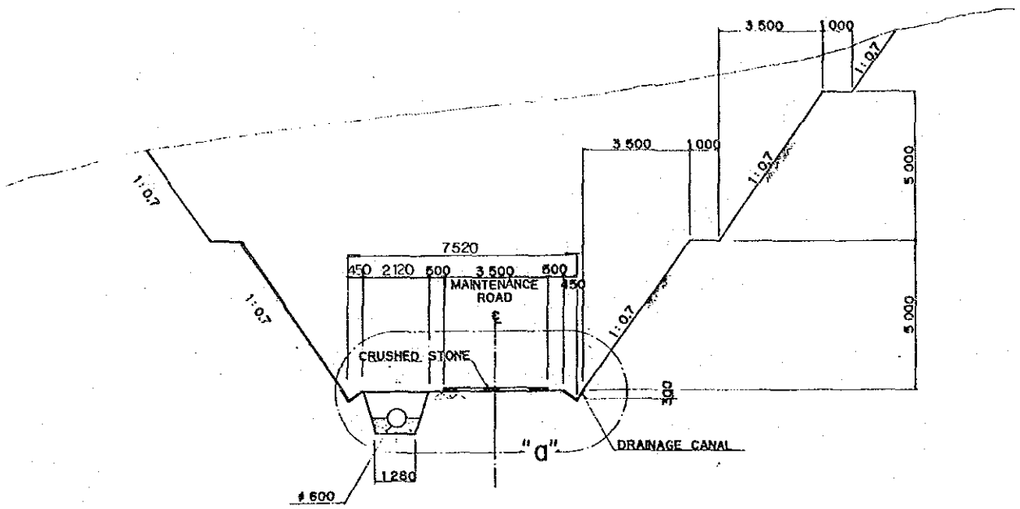
PROFILE
SCALE VERT.1 : 400MTRS
HOR-1:2000MTRS

PIPE CENTER ELEVATION	108.967	108.633	108.300	107.833	107.367	106.900	105.600	105.190	104.770	104.360	104.300
GLAND ELEVATION	110.474	110.290	109.263	109.474	109.174	107.950	107.649	106.885	106.122	105.359	105.245
TOTAL DISTANCE	2.234	2.274	2.314	2.354	2.394	2.434	2.474	2.514	2.554	2.594	2.600
PARTIAL DISTANCE	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.046	0.6
STATION	2+234	2+274	2+314	2+354	2+394	2+439	2+474	2+514	2+554	2+572	2+594	2+597
ANGLE	2°-54'	5°-17'	14°-40'	1°-06'	4°-18'	70°				45°		

Plan and Profile of Tingib Conveyance Pipeline(5/5)

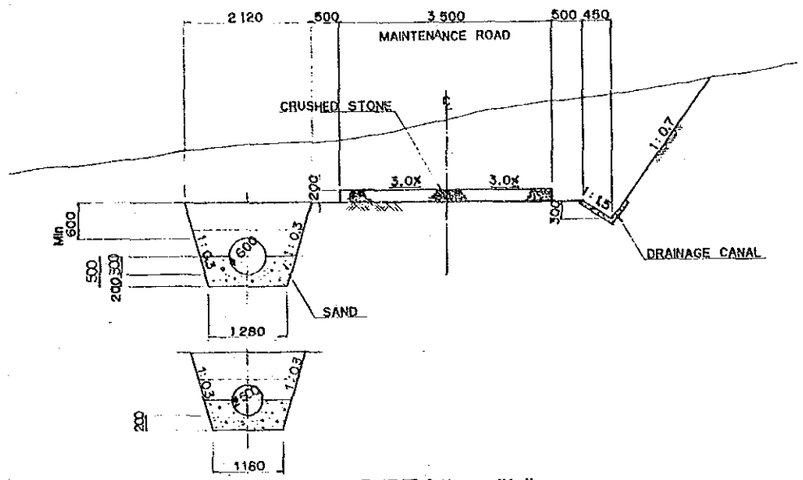
TRANSVERSE SECTION (CUT)

s =1 : 200



DETAIL "a"

s =1 ; 100

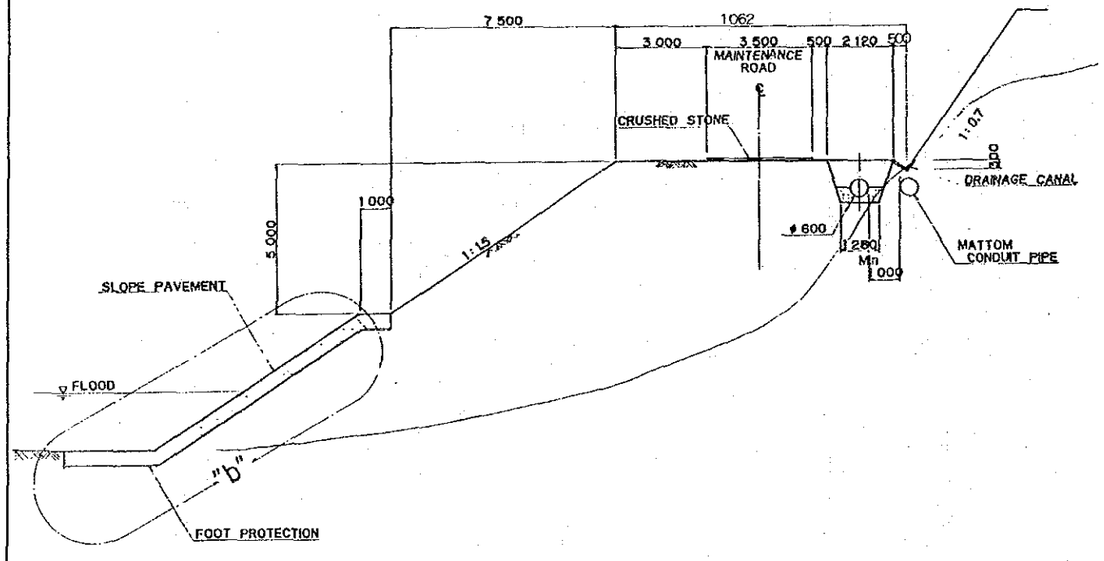


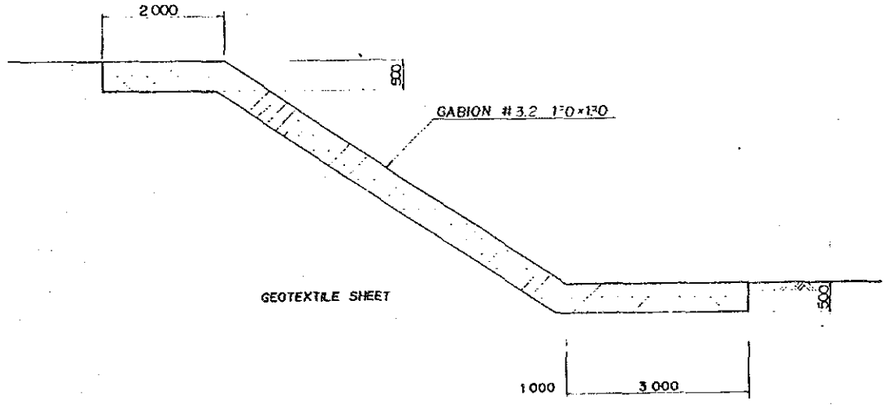
DETAIL "b"

s =1 : 100

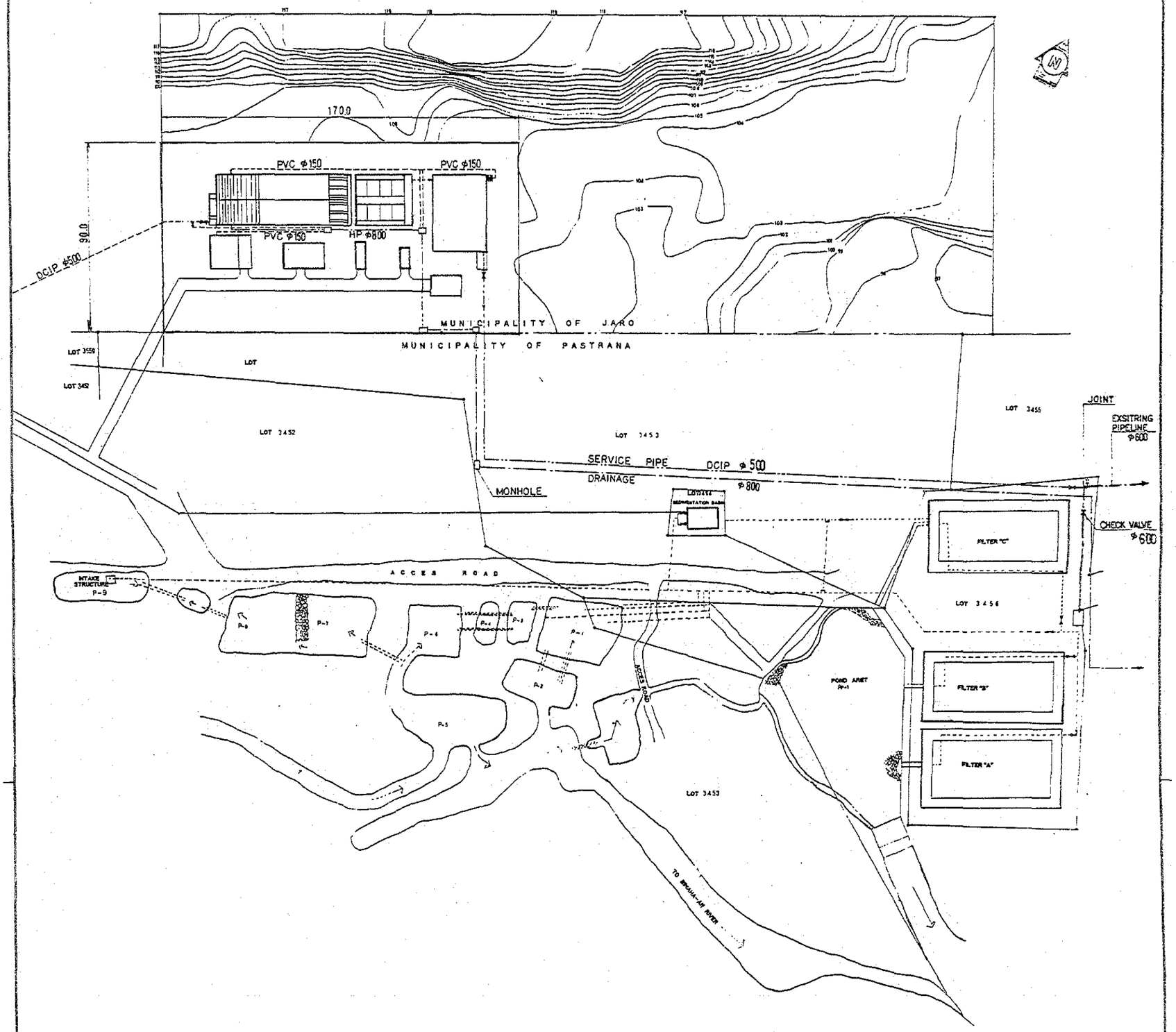
TRANSVERSE SECTION (FILL)

s =1 : 200

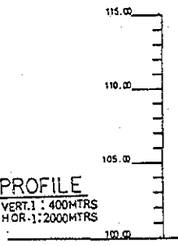




Typical Section of Pipeline and Maintenance Road

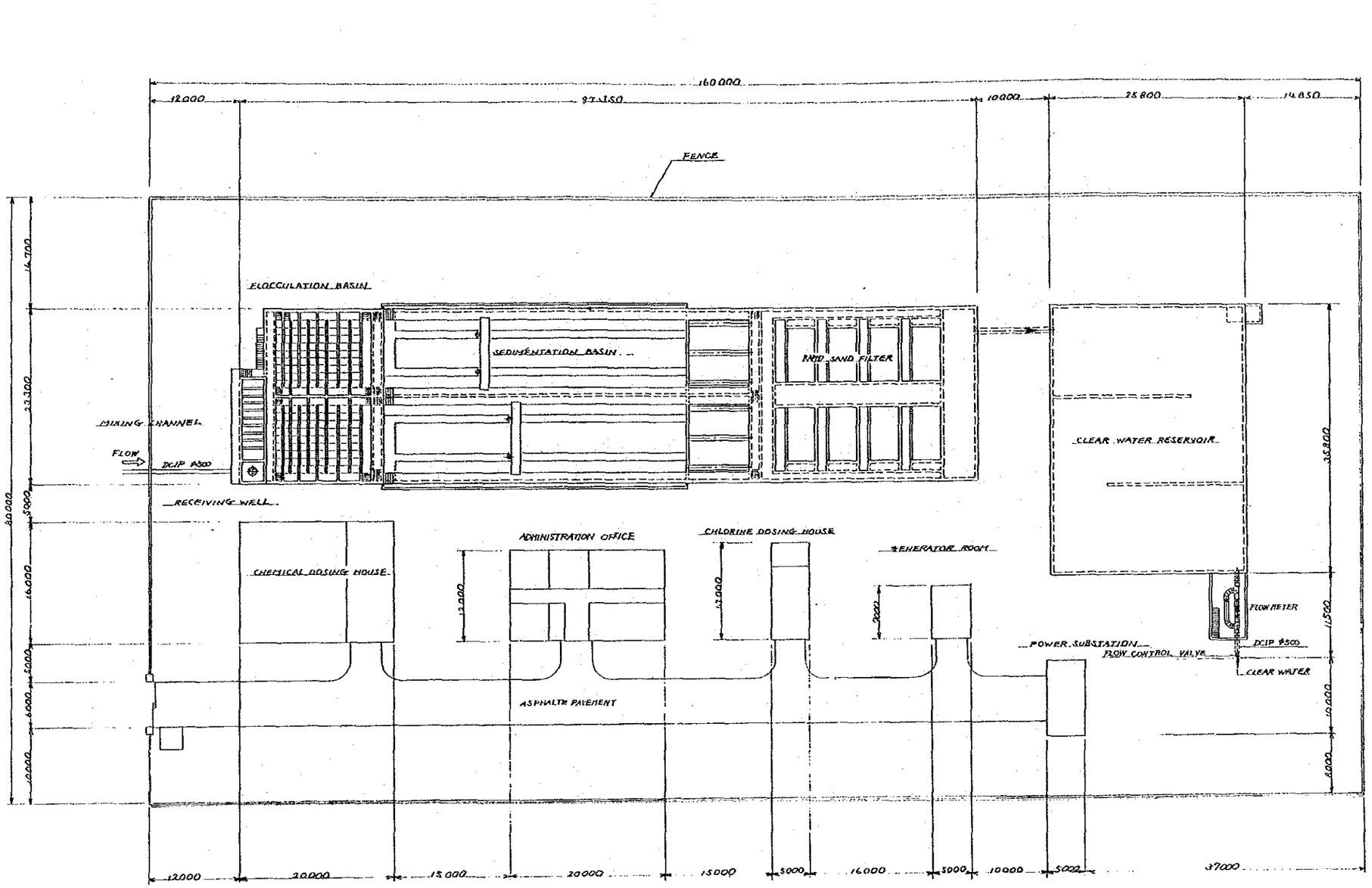


PROFILE
SCALE VERT.1 : 400MTRS
HOR-1:2000MTRS



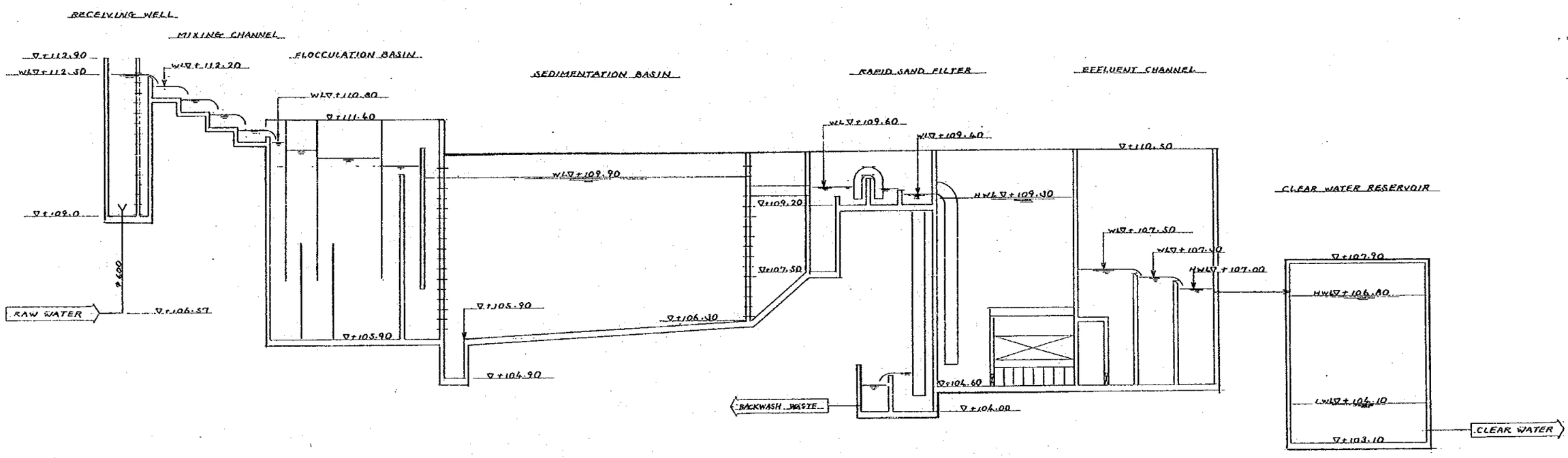
GLAND ELEVATION	107.466	107.154	106.786	107.725	105.562	104.356	104.128	103.961	103.537	103.469	102.649
TOTAL DISTANCE	0.000	0.040	0.080	0.120	0.160	0.200	0.240	0.280	0.320	0.360	0.400
PARTIAL DISTANCE	0.000	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
STATION											

General Plan of Tingib Treatment Plant



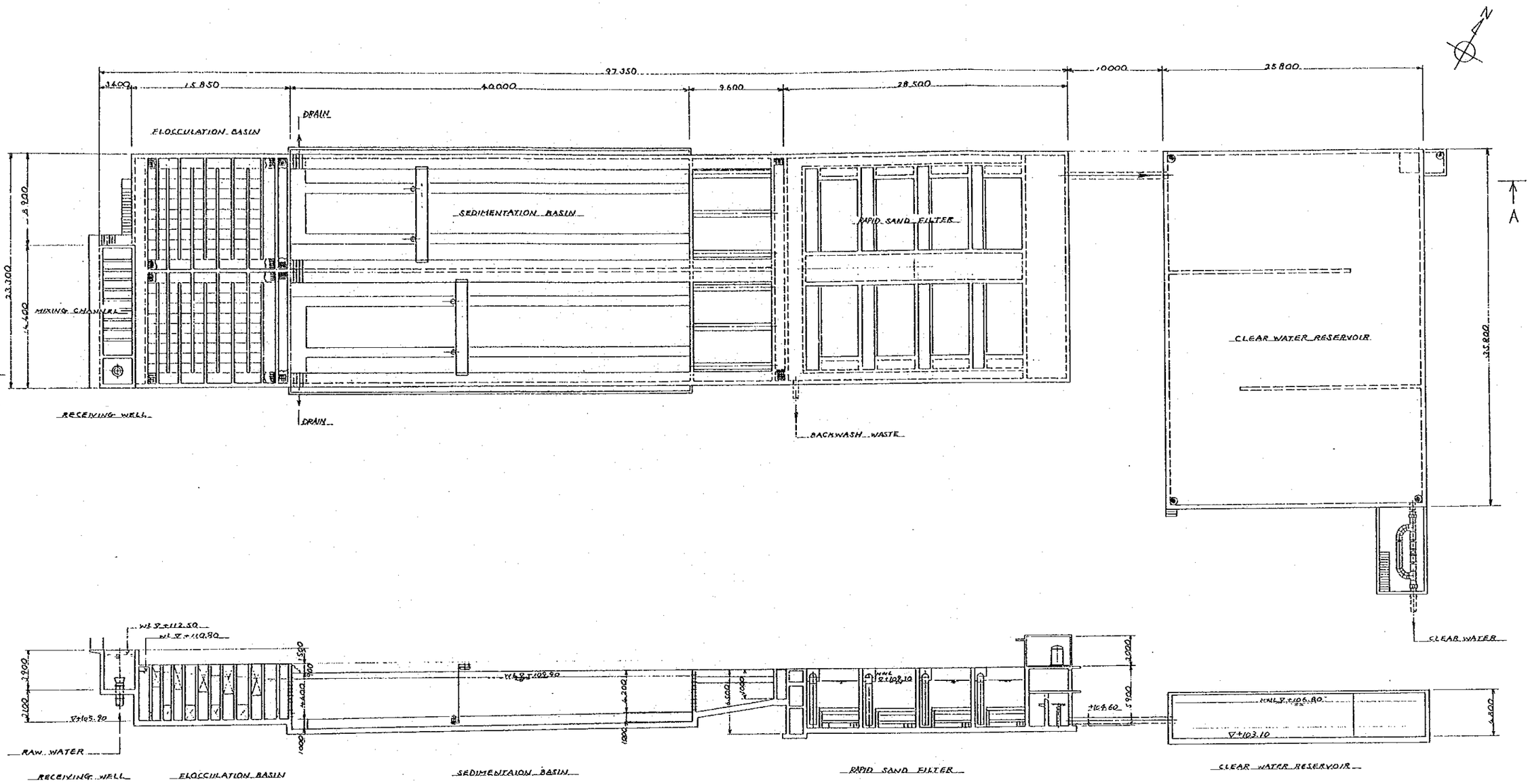
s = 1 : 600

Layout of Treatmemt Facilities



s = 1 : 100

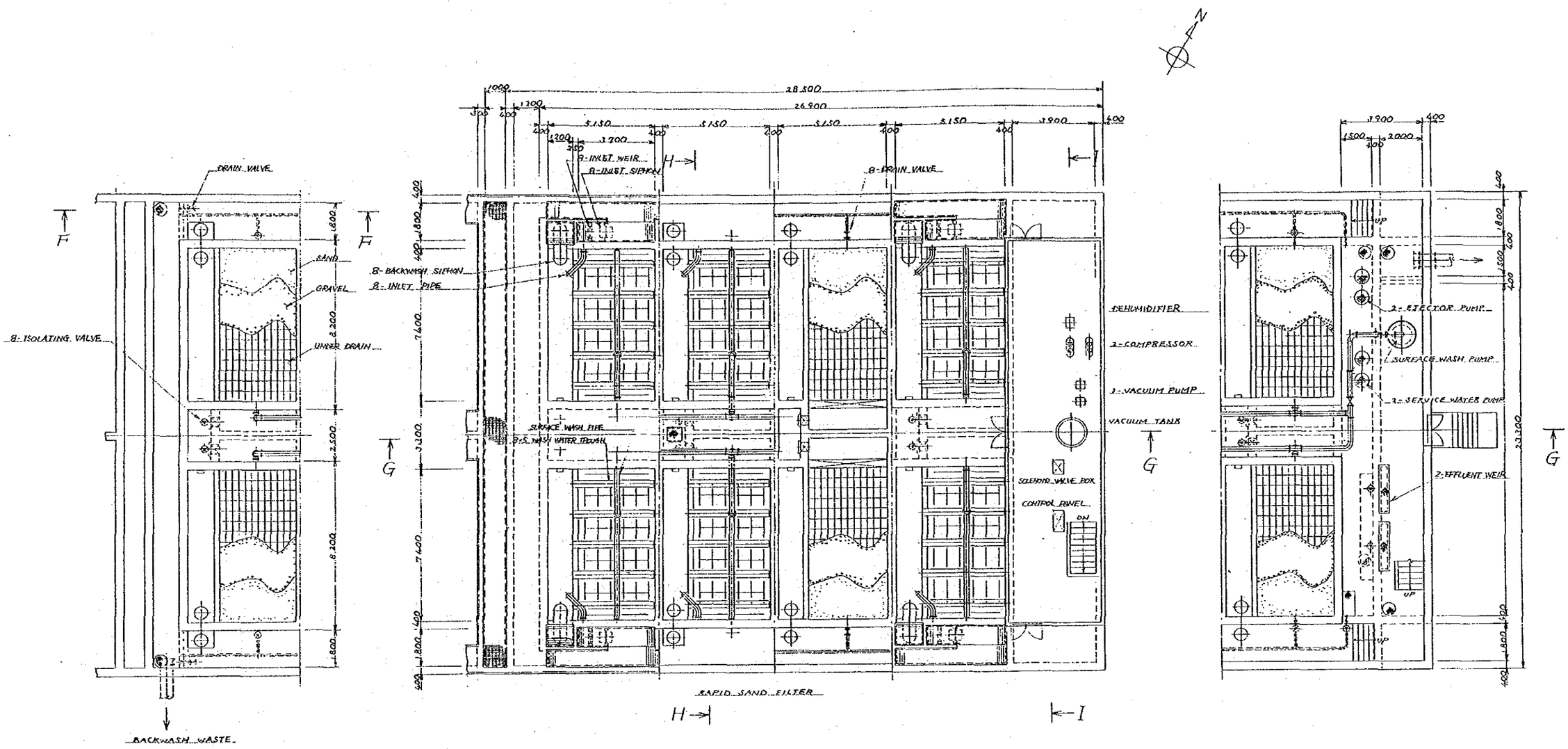
Hydraulic Profile of Treatment Facilitis



SECTION A A

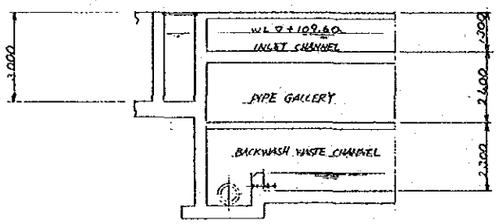
s = 1 : 400

General Structure of Treatment Plant

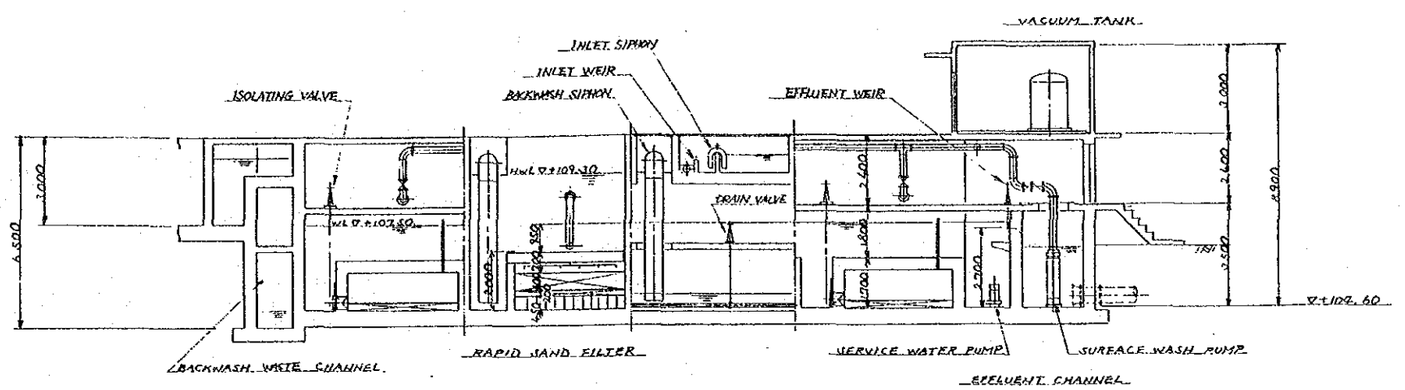


s = 1 : 200

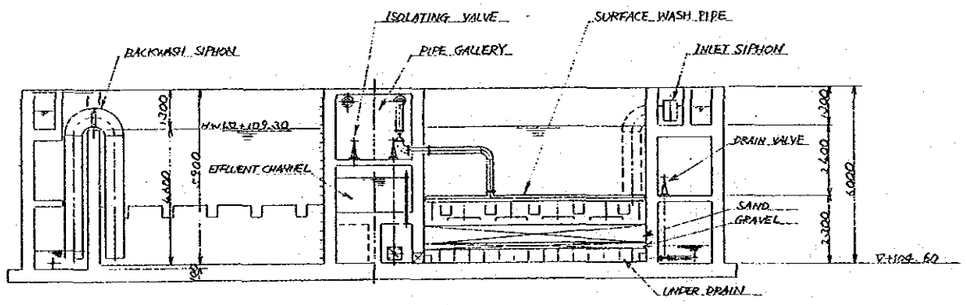
Plan of Rapid Sand Filter



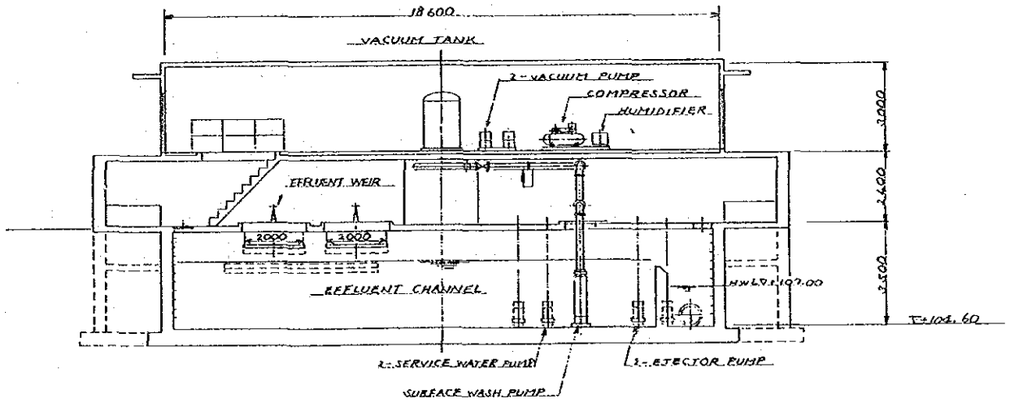
SECTION F F



SECTION G G



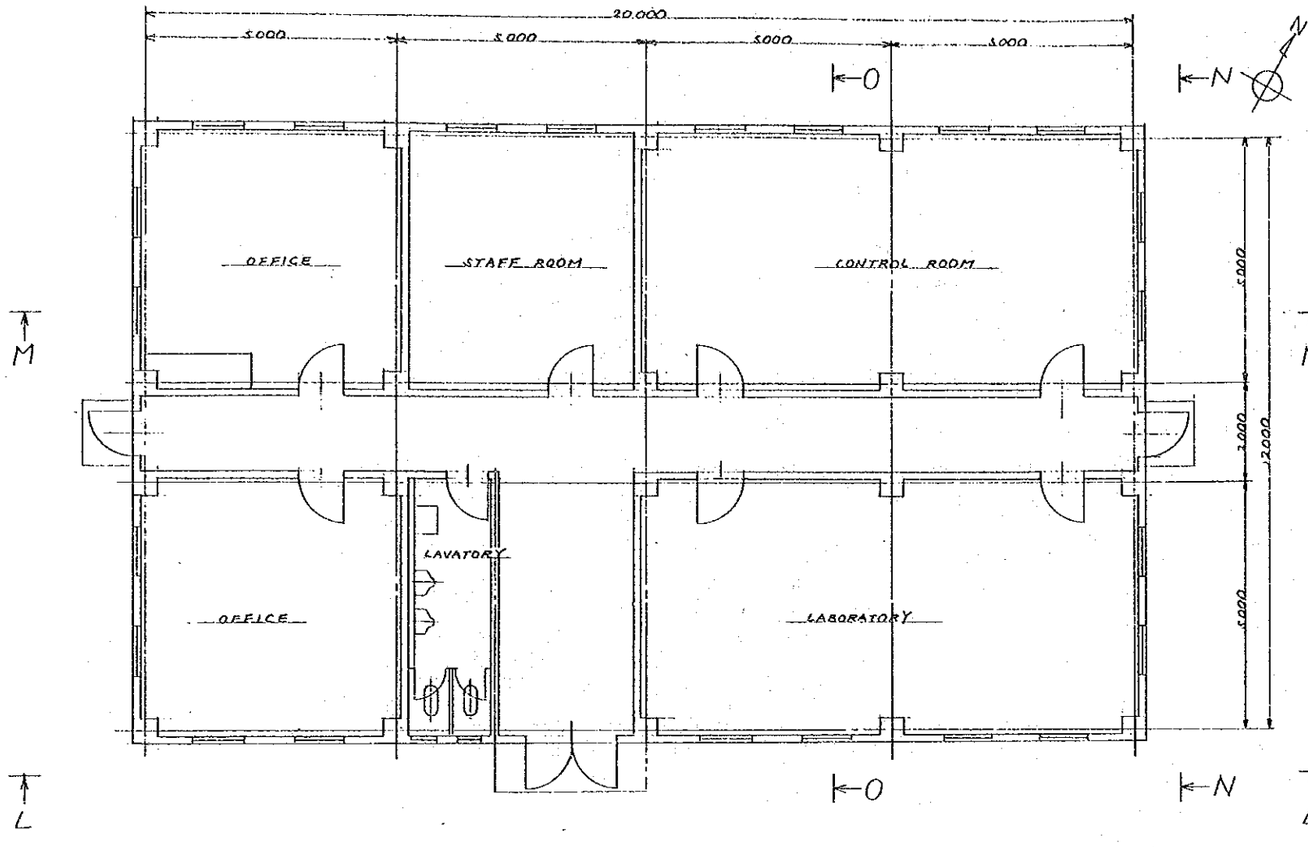
SECTION H H

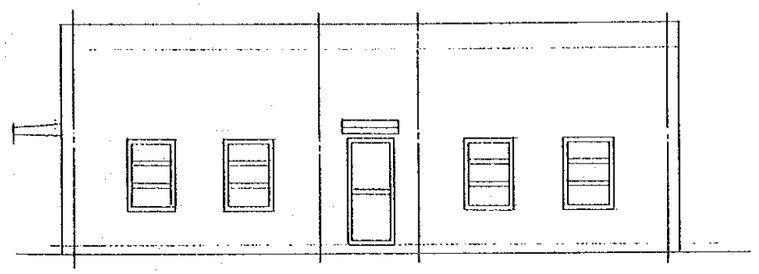


SECTION I I

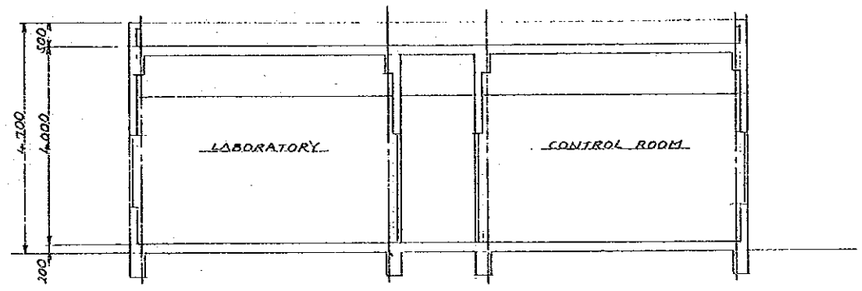
s = 1 : 200

Setion of Rapid Sand Filter

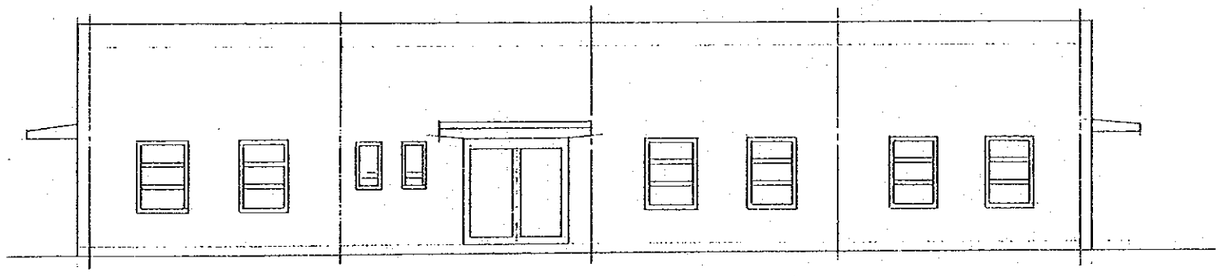




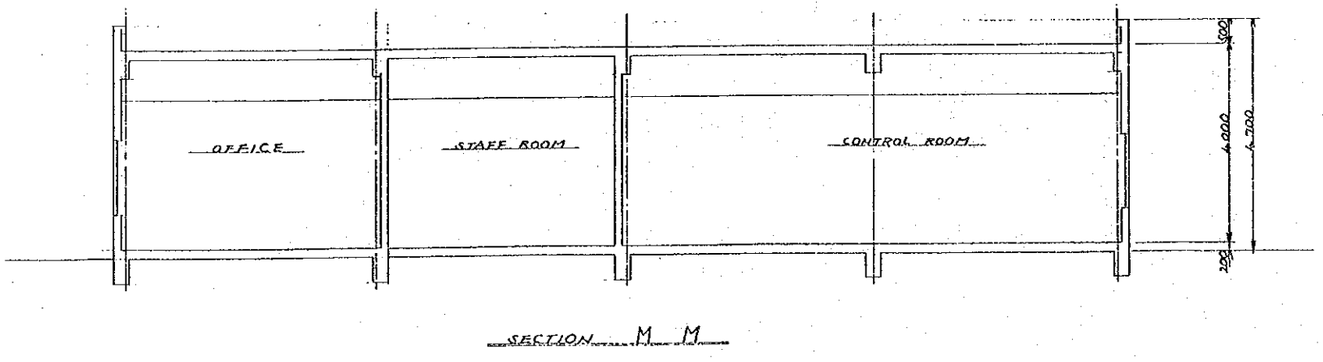
VIEW N N



SECTION O O



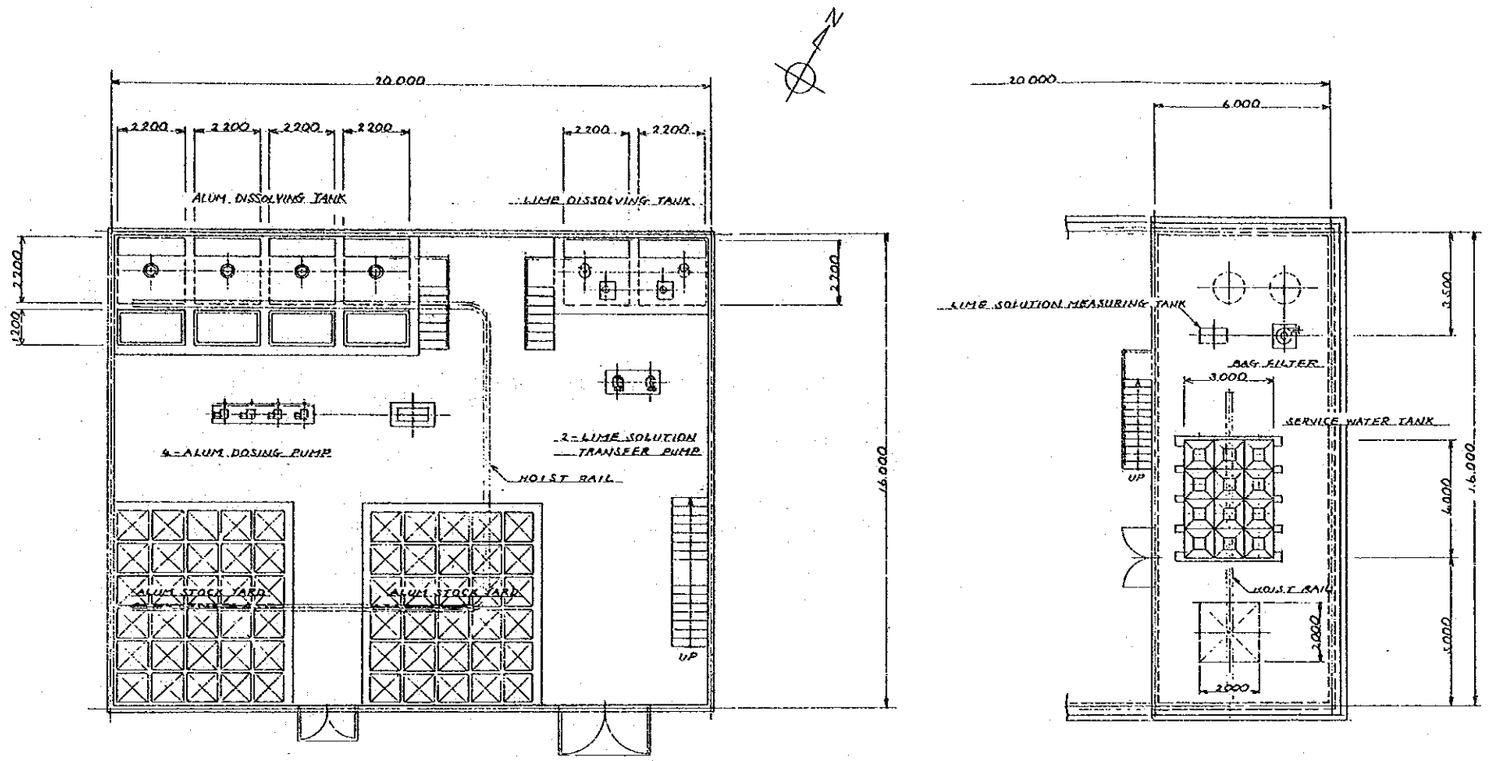
VIEW L L

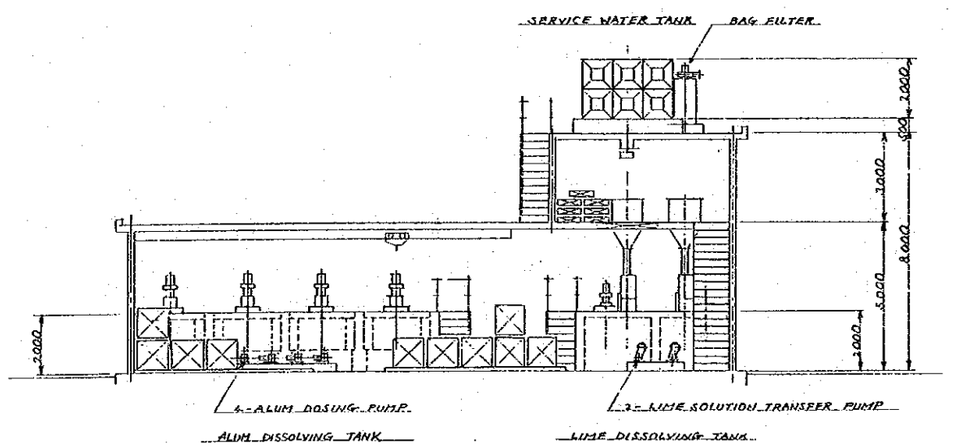


SECTION M M

s = 1 : 120

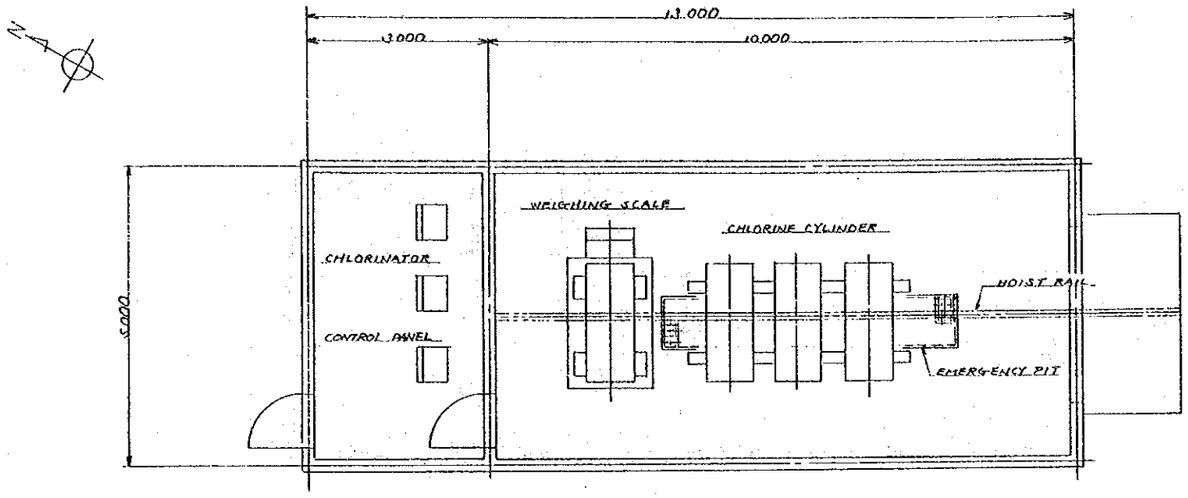
Administrative Building

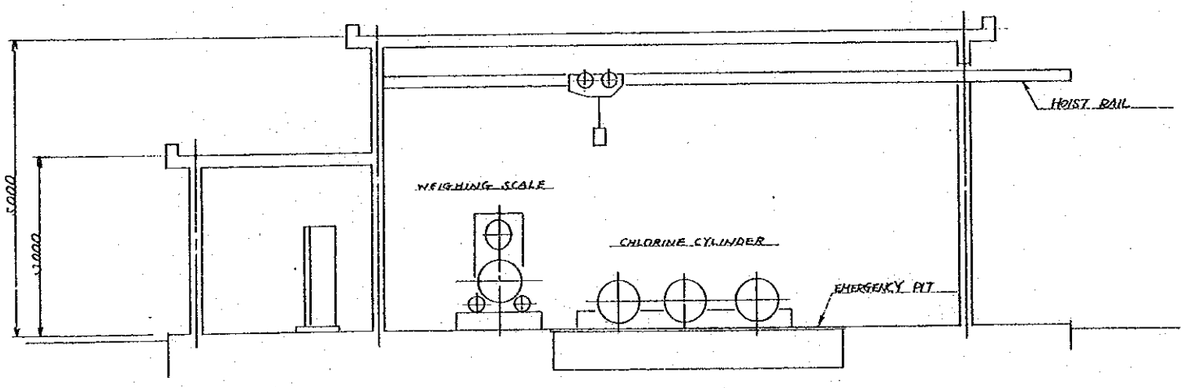




s =1 : 200

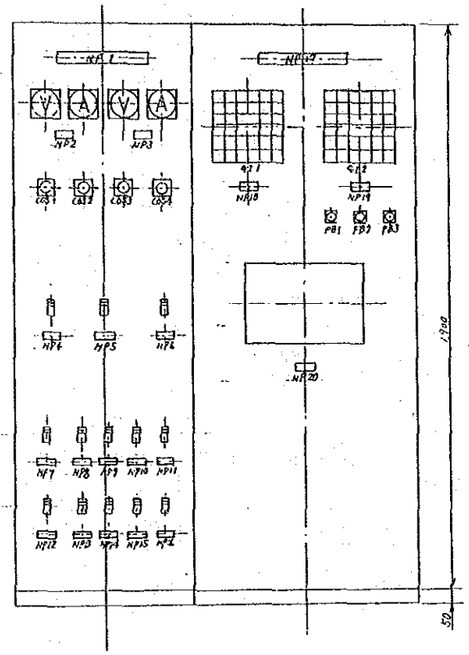
Coagulants Chemicals Injection House

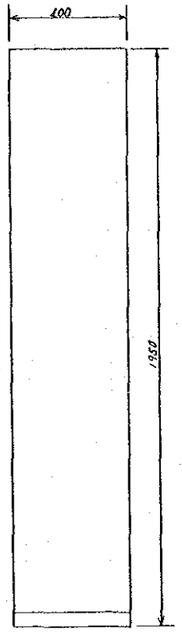


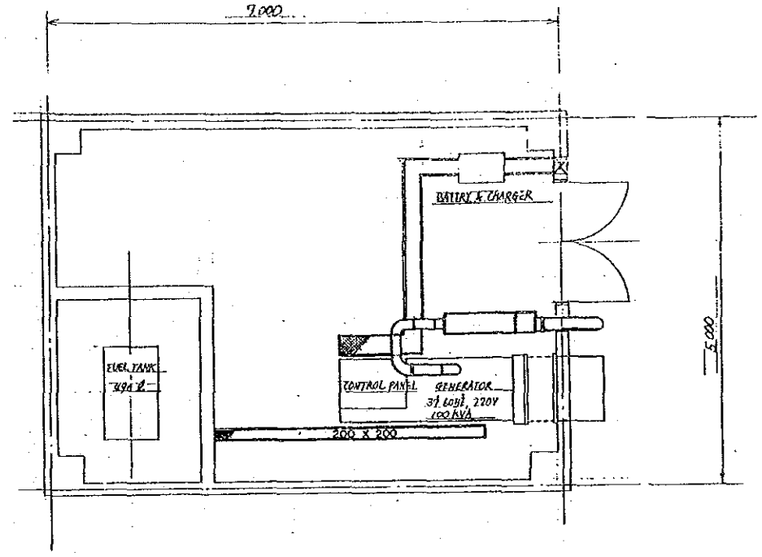


s = 1 : 100

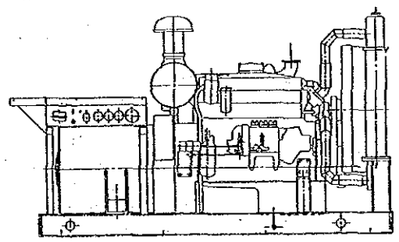
Disinfectant Injection House







STANDBY GENERATOR ROOM



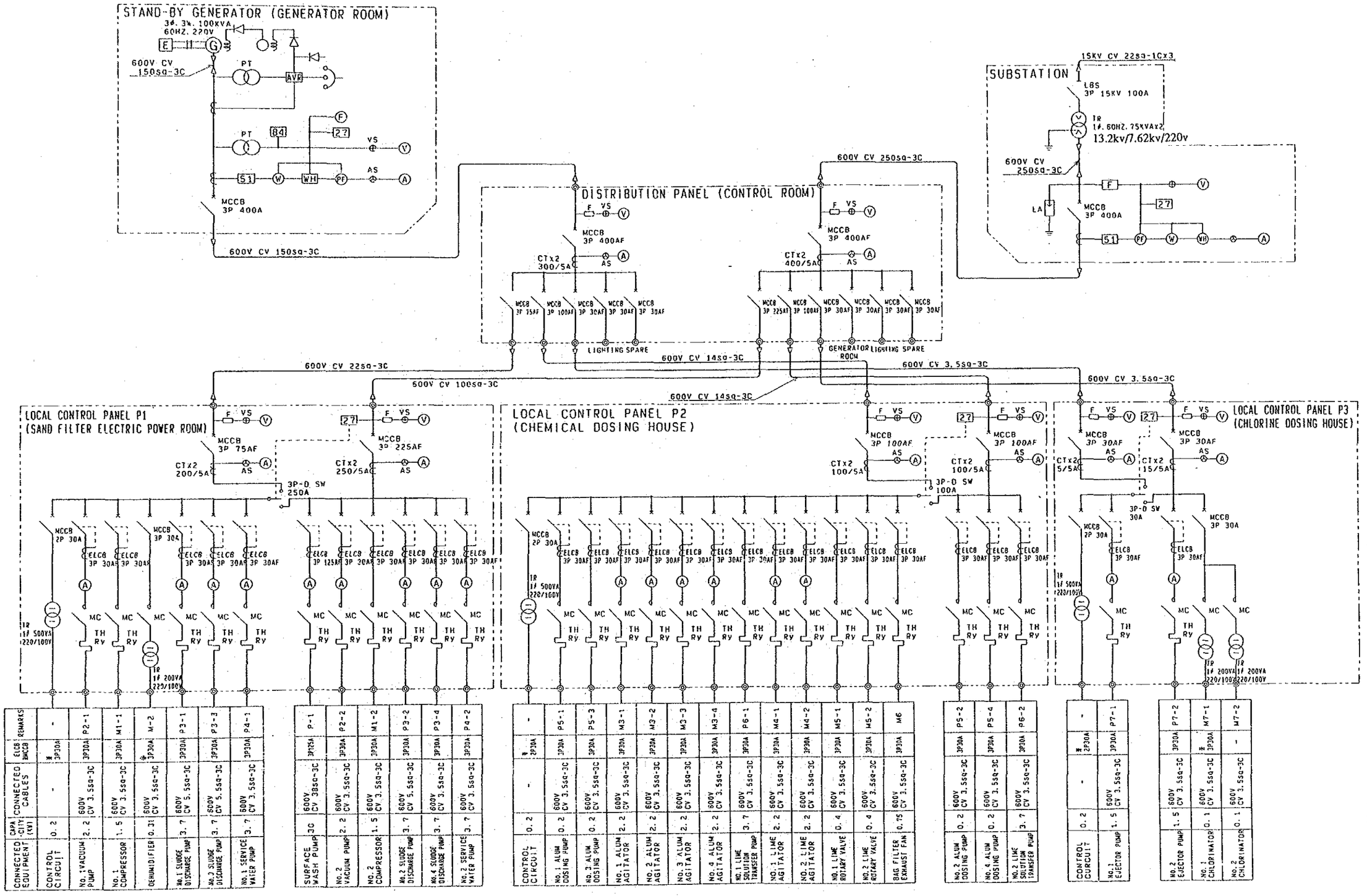
NAME PLATE

NO.	DESCRIPTION
NP 1	DISTRIBUTION PANEL
2	INCOMING LINE
3	STANDBY GENERATOR
4	INCOM. MAIN CIRCUIT
5	GEN. MAIN CIRCUIT
6	LOCAL CONTROL PANEL P1 (INCOM.)
7	LOCAL CONTROL PANEL P1 (GEN.)
8	LOCAL CONTROL PANEL P2 (INCOM.)
9	LOCAL CONTROL PANEL P2 (GEN.)
10	LOCAL CONTROL PANEL P3 (INCOM.)
11	LOCAL CONTROL PANEL P3 (GEN.)
12	GENERATOR ROOM
13	LIGHTING (INCOM.)
14	LIGHTING (GEN.)
15	SPARE (INCOM.)
16	SPARE (GEN.)
17	SUPERVISION PANEL
18	OPERATION INDICATOR
19	ALARM INDICATOR
20	GLF CONTROL UNIT

PUSH BUTTON

NO.	DESCRIPTION
PB 1	BUZZER STOP
2	LAMP CHECK
3	RESET

Emergency Power Generator Disinfectant



EQUIPMENT	CIRCUIT	CAPACITY (KW)	CONNECTED CABLES	ELCB/MCCB	REMARKS
CONNECTED	CONTROL CIRCUIT	0.2	-	* 3P30A	-
	No.1 VACUUM PUMP	2.2	600V CV 3.5sq-3C	3P30A	P2-1
	No.1 COMPRESSOR	1.5	600V CV 3.5sq-3C	3P30A	M1-1
	DEHUMIDIFIER	0.31	600V CV 3.5sq-3C	* 3P30A	M-2
	No.1 SLUDGE DISCHARGE PUMP	3.7	600V CV 5.5sq-3C	3P30A	P3-1
	No.3 SLUDGE DISCHARGE PUMP	3.7	600V CV 5.5sq-3C	3P30A	P3-3
	No.1 SERVICE WATER PUMP	3.7	600V CV 3.5sq-3C	3P30A	P4-1
	SURFACE WASH PUMP	30	600V CV 38sq-3C	3P125A	P-1
	No.2 VACUUM PUMP	2.2	600V CV 3.5sq-3C	3P30A	P2-2
	No.2 COMPRESSOR	1.5	600V CV 3.5sq-3C	3P30A	M1-2
	No.2 SLUDGE DISCHARGE PUMP	3.7	600V CV 5.5sq-3C	3P30A	P3-2
	No.4 SLUDGE DISCHARGE PUMP	3.7	600V CV 5.5sq-3C	3P30A	P3-4
	No.2 SERVICE WATER PUMP	3.7	600V CV 3.5sq-3C	3P30A	P4-2
	CONTROL CIRCUIT	0.2	-	* 2P30A	-
	No.1 ALUM DOSING PUMP	0.2	600V CV 3.5sq-3C	3P30A	P5-1
	No.3 ALUM DOSING PUMP	0.2	600V CV 3.5sq-3C	3P30A	P5-3
	No.1 ALUM AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M3-1
	No.2 ALUM AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M3-2
	No.3 ALUM AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M3-3
	No.4 ALUM AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M3-4
	No.1 LIME SOLUTION TRANSFER PUMP	3.7	600V CV 3.5sq-3C	3P30A	P6-1
	No.1 LIME AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M4-1
	No.2 LIME AGITATOR	2.2	600V CV 3.5sq-3C	3P30A	M4-2
	No.1 LIME ROTARY VALVE	0.4	600V CV 3.5sq-3C	3P30A	M5-1
	No.2 LIME ROTARY VALVE	0.4	600V CV 3.5sq-3C	3P30A	M5-2
	BAG FILTER EXHAUST FAN	0.75	600V CV 3.5sq-3C	3P30A	M6
	No.2 ALUM DOSING PUMP	0.2	600V CV 3.5sq-3C	3P30A	P5-2
	No.4 ALUM DOSING PUMP	0.2	600V CV 3.5sq-3C	3P30A	P5-4
	No.2 LIME SOLUTION TRANSFER PUMP	3.7	600V CV 3.5sq-3C	3P30A	P6-2
	CONTROL CURCUIT	0.2	-	* 2P30A	-
	No.1 EJECTOR PUMP	1.5	600V CV 3.5sq-3C	3P30A	P7-1
	No.2 EJECTOR PUMP	1.5	600V CV 3.5sq-3C	3P30A	P7-2
	No.1 CHLORINATOR	0.1	600V CV 3.5sq-3C	* 3P30A	M7-1
	No.2 CHLORINATOR	0.1	600V CV 3.5sq-3C	-	M7-2

Single Line Diagram of Electrical facility