

**CHAPTER 5 PROJECT EVALUATION
AND CONCLUSION**

Chapter 5 PROJECT EVALUATION AND CONCLUSION

5-1 Project Evaluation

The effects of this project are summarized in Table 5-1.

5-2 Conclusion

- (1) The project is expected to bring about the effects as stated in the above, and at the same time, it will contribute to the enhancement of people's awareness on the public hygiene. Hence, it is judged to be proper to carry out this project under the grant aid of Japan.
- (2) As the construction of upstream trunk sewer by ADB loan is the prerequisite of this project, approval of ADB loan is necessary before the start of this project.
- (3) For successful implementation of this project, the following works shall be executed without delay by Indonesian side.
 - 1) The land acquisition of the project site
 - 2) The land clearance for the treatment plant
 - 3) Acquisition of approvals from the authorities concerned regarding the construction of trunk sewer and discharge line
 - 4) Electric supply to the treatment plant
 - 5) Water supply to the treatment plant
 - 6) Installation and supply of incidental outdoor works such as gardening, fencing, gate and exterior lighting within and around the treatment plant
 - 7) Supply of telephone and general furnitures for the control house in the treatment plant
- (4) The following measures are recommended to maintain the sound operation of the sewerage facilities and the financial soundness of the sewerage organization as a public corporation.
 - 1) Elimination of illegal connection, and promotion of pipe connection
 - 2) Improvement of tariff collection rate

- 3) Preparation of replacement plan for the equipment of treatment plant and acquisition of the budget required

Table 5-1 Effects of the Project

| Present Situation | Effects |
|--|---|
| <p>1. Dissemination rate of sewerage system</p> <p>About 14 % of the population of Yogyakarta City is covered by the sewerage system. However, the system is provided with no treatment plant. Wastewater is directly discharged to the rivers.</p> | <p>This project will increase the dissemination rate to 22 % in 2002 and 53 % in 2012 along with the other related sewerage works of YUDP plan.</p> |
| <p>2. Contamination of river and groundwater</p> <p>The river water quality is as much polluted as BOD 42 mg/l on average, resulting in creation of bad river environments. A large number of Fecal Coliform are recognized in the shallow groundwater which is being used for drinking of 85 % of the population.</p> | <p>The river water quality as well as river scenery will be improved. The groundwater pollution will also be mitigated. These effects will much contribute to the tourism development and environmental improvement of the city.</p> |
| <p>3. Waterborne diseases</p> <p>Many people are afflicted with waterborne diseases. The number of diarrhea patients in the city are 145 persons/week on average.</p> | <p>Contraction of waterborne diseases will be much reduced by the improvement of river and groundwater quality.</p> |
| <p>4. Sewerage system in Indonesia</p> <p>There are only a few full-scaled sewage treatment plants in Indonesia.</p> | <p>Successful operation of this sewage treatment plant will facilitate the sewerage development in other cities.</p> <p>Training of engineers and operators by this treatment plant will improve the technology level of sewerage in Indonesia.</p> |

APPENDICES

Appendix 1. Member List of Study Team (1st Study Team)

| No. | Name | Assignment | Office, Company |
|-----|-----------------|-----------------------------------|---|
| 1. | Masashi KONO | Team Leader | Ministry of Foreign Affairs |
| 2. | Kaoru KITO | Sewerage System Planning | Nagoya Municipal Office |
| 3. | Hideo MIYAMOTO | Grant Aid Planning | Japan International Cooperation Agency |
| 4. | Naohito MURATA | Sewerage System/O & M Planning | Pacific Consultants International |
| 5. | Terutoshi OZAWA | Sewerage Facility Design | Pacific Consultants International |

(From July 6, 1992 to July 19, 1992)

Appendix 2. Member List of Study Team (2nd Study Team)

| No. | Name | Assignment | Office, Company |
|-----|------------------------|--|--------------------------------------|
| 1. | Naohito MURATA | Team Leader, Sewerage System/O & M Planning | Pacific Consultants International |
| 2. | Terutoshi OZAWA | Sewerage Facility Design | ditto |
| 3. | Toshikatsu ISHIMARU | Sewerage Facility Design | ditto |
| 4. | Isao MISONO | Construction Planning | ditto |
| 5. | Hiroshi KADOWAKI | Mechanical/Electrical Design | ditto |

(From August 20, 1992 to September 19, 1992)

Appendix 3 Member List of Study Team (Explanation of Draft Report)

| No. | Name | Assignment | Office, Company |
|-----|-----------------|--------------------------------|--|
| 1. | Hideo MIYAMOTO | Team Leader | Japan International Cooperation Agency |
| 2. | Naohito MURATA | Sewerage System/O & M Planning | Pacific Consultants International |
| 3. | Terutoshi OZAWA | Sewerage Facility Design | ditto |

(From November 22, 1992 to December 1, 1992)

Appendix 4. Study Schedule (1st Study Team)

(1992)

| Day | Date | Itinerary | Survey item, etc. |
|-----|---------------|-------------------------------|---|
| 1 | July 6 (Mon) | Lv. Tokyo Ar. Jakarta | Traveling |
| 2 | July 7 (Tue) | Jakarta | (1) Courtesy Call and Meeting with Cipta Karya (2) Courtesy Call and Meeting with BAPPENAS (3) Courtesy Call and Meeting with the Embassy of Switzerland (4) JICA Office |
| 3 | July 8 (Wed) | Jakarta | (1) Meeting with BAPPENAS (2) Meeting with Cipta Karya (Explanation of Inception Report, etc.) (3) Courtesy Call and Meeting with ADB |
| 4 | July 9 (Thu) | Lv. Jakarta | Traveling Courtesy Call and Meeting with BAPPEDA Province |
| 5 | July 10 (Fri) | Yogyakarta | Site Survey |
| 6 | July 11 (Sat) | Yogyakarta | Meeting with BAPPEDA Province and YUDP |
| 7 | July 12 (Sun) | Yogyakarta | Data Arrangement |
| 8 | July 13 (Mon) | Yogyakarta | Meeting with BAPPEDA Province and YUDP |
| 9 | July 14 (Tue) | Lv. Yogyakarta Ar. Jakarta | Courtesy Call to the Governor of Yogyakarta Meeting with BAPPEDA, CIPTA KARYA Traveling |
| 10 | July 15 (Wed) | Jakarta | Meeting with BAPPENAS Meeting with ADB Internal Meeting |
| 11 | July 16 (Thu) | Jakarta | Discussion with Cipta Karya (Minutes) |
| 12 | July 17 (Fri) | Jakarta | Report to the Embassy of Japan and JICA Office Sign of the Minutes |
| 13 | July 18 (Sat) | Lv. Jakarta | Traveling |
| 14 | July 19 (Sun) | Ar. Tokyo | |

Appendix 5. Study Schedule (2nd Study Team)

(1992)

| Day | Date | Itinerary | Survey item, etc. |
|-----|----------------------|-------------------------------|---|
| 1 | August 20 (Thu) | Lv. Tokyo Ar. Jakarta | Traveling |
| 2 | August 21 (Fri) | Jakarta | Courtesy Call and Meeting with JICA Office Courtesy Call and Meeting with Cipta Karya |
| 3 | August 22 (Sat) | Jakarta | Meeting with Cipta Karya (Explanation of Inception Report, etc.) Site Survey (Setia Budi Pond) |
| 4 | August 23 (Sun) | Lv. Jakarta Ar. Yogyakarta | Traveling |
| 5 | August 24 (Mon) | Yogyakarta | Meeting with Environmental Sanitation Project Office Meeting with YUDP Meeting with Public Works Office (Dinas PU) |
| 6 | August 25 (Tue) | Yogyakarta | Meeting with Public Works Office Preparation for Project Office (JICA Team) |
| 7 | August 26 (Wed) | Yogyakarta | Preparation for Project Office |
| 8 | August 27 (Thu) | Yogyakarta | Site Survey (Main Sewer Route and Plant Site) |
| 9 | August 28 (Fri) | Yogyakarta | Internal Meeting (Topographical Survey and Soil Investigation) |
| 10 | August 29 (Sat) | Yogyakarta | Meeting with Public Works Office Study of Treatment System |
| 11 | August 30 (Sun) | Yogyakarta | Data Arrangement |
| 12 | August 31 (Mon) | Yogyakarta | Meeting with BAPPEDA Meeting with YUDP (Results of Feasibility Study) Data Collection |
| 13 | September 1 (Tue) | Yogyakarta | Opening of Project Office (JICA Team) Meeting with BAPPEDA, etc. (Explanation of Inception Report, etc.) |
| 14 | September 2 (Wed) | Yogyakarta | Internal Meeting Discussion with YUDP (Results of Feasibility Study) |

| Day | Date | Itinerary | Survey item, etc. |
|-----|------------------------|----------------|--|
| 15 | September 3 (Thu) | Yogyakarta | Topographical Survey Data Collection Meeting with YUDP |
| 16 | September 4 (Fri) | Yogyakarta | Data Collection Topographical Survey and Soil Investigation |
| 17 | September 5 (Sat) | Yogyakarta | Meeting with BAPPEDA Topographical Survey and Soil Investigation |
| 18 | September 6 (Sun) | Yogyakarta | Internal Meeting |
| 19 | September 7 (Mon) | Yogyakarta | Meeting with BAPPEDA Study of Treatment System Topographical Survey and Soil Investigation |
| 20 | September 8 (Tue) | Yogyakarta | Meeting with YUDP Data Collection Survey for Power Source (Meeting with PLN) |
| 21 | September 9 (Wed) | Yogyakarta | (Holiday) Internal Meeting |
| 22 | September 10 (Thu) | Yogyakarta | Basic Design of Main Sewer, Treatment Plant and Outlet Works |
| 23 | September 11 (Fri) | Yogyakarta | ditto |
| 24 | September 12 (Sat) | Yogyakarta | Explanation of Progress Report (Meeting with Cipta Karya, Local Government and YUDP) |
| 25 | September 13 (Sun) | Yogyakarta | Data Arrangement |
| 26 | September 14 (Mon) | Yogyakarta | Data Collection Preparation of Progress Report |
| 27 | September 125 (Tue) | Lv. Yogyakarta | Data Collection Preparation of Progress Report Site Survey Traveling |
| 28 | September 16 (Wed) | Jakarta | Meeting with Cipta Karya (Explanation of Progress Report) Preparation of Minutes |
| 29 | September 17 (Thu) | Jakarta | Meeting with Cipta Karya (Sign of the Minutes of Discussions) |

| Day | Date | Itinerary | Survey item, etc. |
|-----|-----------------------|-------------|--|
| 30 | September 18 (Fri) | Lv. Jakarta | Report to the Embassy of Japan Report to JICA Office Traveling |
| 31 | September 19 (Sat) | Ar. Tokyo | Traveling |

Appendix 6. Study Schedule (Draft Report Explanation Team)

(1992)

| Day | Date | Itinerary | Survey item, etc. |
|-----|----------------------|-------------------------------|--|
| 1. | November 22 (Sun) | Lv. Tokyo Ar. Jakarta | Traveling |
| 2. | November 23 (Mon) | Jakarta | Courtesy Call and Meeting with JICA Office Courtesy Call and Meeting with Cipta Karya |
| 3. | November 24 (Tue) | Jakarta | Courtesy Call and Meeting with Embassy of Japan Meeting with ADB Meeting with Cipta Karya (Draft Report) |
| 4. | November 25 (Wed) | Lv. Jakarta Ar. Yogyakarta | Traveling Meeting with BAPPEDA Province, etc. (Draft Report) |
| 5. | November 26 (Thu) | Lv. Yogyakarta Ar. Jakarta | Traveling Internal Meeting (Minutes of Discussions) |
| 6. | November 27 (Fri) | Jakarta | Meeting with Cipta Karya Sign of the Minutes of Discussions Report to the Embassy of Japan |
| 7. | November 28 (Sat) | Jakarta | Internal Meeting |
| 8. | November 29 (Sun) | Jakarta | Internal Meeting Data Arrangement |
| 9. | November 30 (Mon) | Lv. Jakarta | Report to JICA Office Meeting with BAPPENAS Traveling |
| 10. | December 1 (Tue) | Ar. Tokyo | Traveling |

Appendix 7. Main Interviewee's List

1. Directorate General of Human Settlements (Cipta Karya)
 - Mr. Rachmadi B.S. Director General of Human Settlement
 - Mr. Soeratmo Notodipoera Secretary for Directorate General of Cipta Karya
 - Mr. Darmawan Saleh Director of Environmental Sanitation
 - Mr. Jacob Ruzuar Head of Wastewater Subdirectorate of Directorate of Environmental Sanitation
2. National Development Planning Agency (BAPPENAS)
 - Mr. Saad A. Basaib Bureau Chief of Social Welfare and Public Housing
 - Mrs. Budhy Tjahjati S. Soegijoko Bureau Chief of Social Economy and Special Planning
3. Yogyakarta Province
 - K.G.P.A.A. PAKU ALAM VIII Governor of Yogyakarta
 - Mr. Bondan Hermanislament Head of BAPPEDA Province
 - Mr. Soeripto Koesoemowinoto Head of Regional Office of Ministry of Public Works
 - Mr. Sugeng Kartodihardjo Head of Public Works Office
 - Mr. Djoko Setiarso Head of Infrastructure Division of BAPPEDA
4. YUDP Consultants
 - Mr. Rik L. Frenkel Team Leader, Electrowatt Engineering Services Ltd.
 - Mr. Jan Bierling Electrowatt Engineering Services Ltd.
 - Mr. Alit Merthayasa ditto
5. Asian Development Bank
 - Mr. Eiji Kobayashi Chief of Resident Office
6. Embassy of Switzerland in Indonesia
 - Mr. Georges E. Capt. Counselor
 - Mr. Walter S. Hofer First Secretary
7. Embassy of Japan in Indonesia
 - Mr. Toshio Sano First Secretary
 - Mr. Hiroshi Ishikaway First Secretary

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
THE CONSTRUCTION OF YOGYAKARTA SEWAGE TREATMENT PLANT
IN THE REPUBLIC OF INDONESIA


Based on the result of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Project for the construction of Yogyakarta Sewage Treatment Plant (hereinafter referred to as "the Project").

JICA sent to the Republic of Indonesia a study team, which is headed by Mr. Masashi Kono, Assistant Director, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, and is scheduled to stay in the country from 6 to 18 in July, 1992.

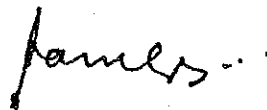
The team held a series of discussions with the officials concerned of the Government of Indonesia and conducted a field survey at the study area.

In the course of discussions and field survey, both sides have confirmed the main items described in the attached sheets.

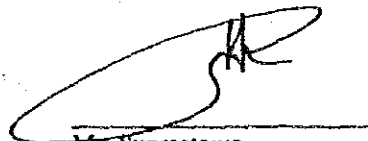
Jakarta, July 17, 1992



Mr. Masashi Kono
Leader of Basic Design Study Team,
JICA



Mr. Rachmadi B.S.
Director General of
Human Settlement,
Ministry of Public Works



Mr. Suprastowo
Provincial Executive
Secretary,
D.I. Yogyakarta

1. Background of the Project

- (1) The Government of Indonesia (GOI) prepared a master plan of the sewerage development project for the Yogyakarta Urban Area in February, 1992 and completed the feasibility study for the sewage treatment plant (STP) prepared in the master plan in July, 1992.

The master plan will be implemented in two (2) phases of the medium and long term plans. The medium term plan targeting the year of 2002 will cover an area of 1,330 ha with served population of 110,000 persons. The long-term plan targeting the year of 2012 will cover an area of 2,400 ha with served population of 273,000 persons.

The project components included in the medium term plan are as follows:

- (i) Lateral Sewer : approximately 7 km
- (ii) Trunk Sewer : approximately 17 km
- (iii) Sewage Treatment Plant : design capacity of 15,500 m³/day (daily average)

The medium term plan is expected to be implemented during the period from 1992 to 1996.

Location of the served area and project components of the medium term plan are shown in Annex I.

- (2) The GOI has requested the financial support from the Asian Development Bank (ADB) and the grant aid from the Government of Japan to implement the medium term plan mentioned above.

However, the original grant aid request to the Government of Japan was not based on the medium term plan and, therefore the GOI is sending the revised request to the Government of Japan.

2. Objective of the Project

The objective of the Project is to improve sanitary condition and river water quality in the Yogyakarta Urban Area by constructing the STP.

3. Project Site

The site for the STP is located in Desa Pendowoharjo, Kabupaten Bantul, approximately 5 km south from the boundary between Yogyakarta city and Kabupaten Bantul (see Annex I).

4. Executing Agency

Directorate General of Human Settlements, Ministry of Public Works is responsible for the administration and execution of the Project.

5. Revised Request by the GOI

The revised components of the Project requested by the GOI are as follows.

- (1) To construct the STP with a daily average capacity of 15,500 m³/day.
- (2) To construct the trunk sewer of approximately 6 km length extending from the STP toward the north (see, Annex I)

6. Other Major Issues Discussed

(1) Site for the STP

The Yogyakarta Provincial Government has made efforts to acquire the land which would be most suitable for the STP from the socio-economic, environmental as well as technical points of view, including the possibility of acquiring the site recommended in the Feasibility Study Report. The site of 6.2 ha was finally selected in Desa Pendowoharjo, Kabupaten Bantul and the Indonesian side confirmed that the Yogyakarta Provincial Government has made budgetary arrangements to acquire the site in the fiscal year of 1992/1993. The site map is shown in Annex II.

The Basic Design Team conducted field survey and confirmed that the selected site is suitable for the Project.

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(2) Capacity of the STP

The design capacity of 15,500 m³/day for the STP could change subject to the results of the full survey of illegal house connections. The design capacity will finally be determined by the end of August, 1992 according to the results of the above survey. However, the final design capacity will not exceed 15,500 m³/day.

(3) Type of the STP

Aerated pond and trickling filter are the possible alternatives for the STP. The most suitable system will be determined through elaborate comparative studies of both systems. The comparative evaluation of both systems will be made from the aspects of investment cost, O&M cost, easiness of O&M, effluent quality and environmental effects under the condition that the maximum available land space is 6.2 ha.

(4) Procedural Actions to be taken by the GOI.

For the smooth implementation of the Project, the GOI will;

- (i) send the revised request document to the Government of Japan through the official channel before late July, 1992.
- (ii) finalize the ADB loan for approx. 11 km of trunk sewer and approx. 7 km of lateral sewer as early as possible so that the construction of those sewers will be completed by 1996, and send the confirmed information about the ADB loan to the Government of Japan by the end of November, 1992.
- (iii) take necessary measures to have the environmental impact assessment for the project approved and inform the Government of Japan of its approval by the end of November, 1992.

7. Japan's Grant Aid System

- (1) The Indonesian side has understood the system of Japanese Grant Aid explained by the team.

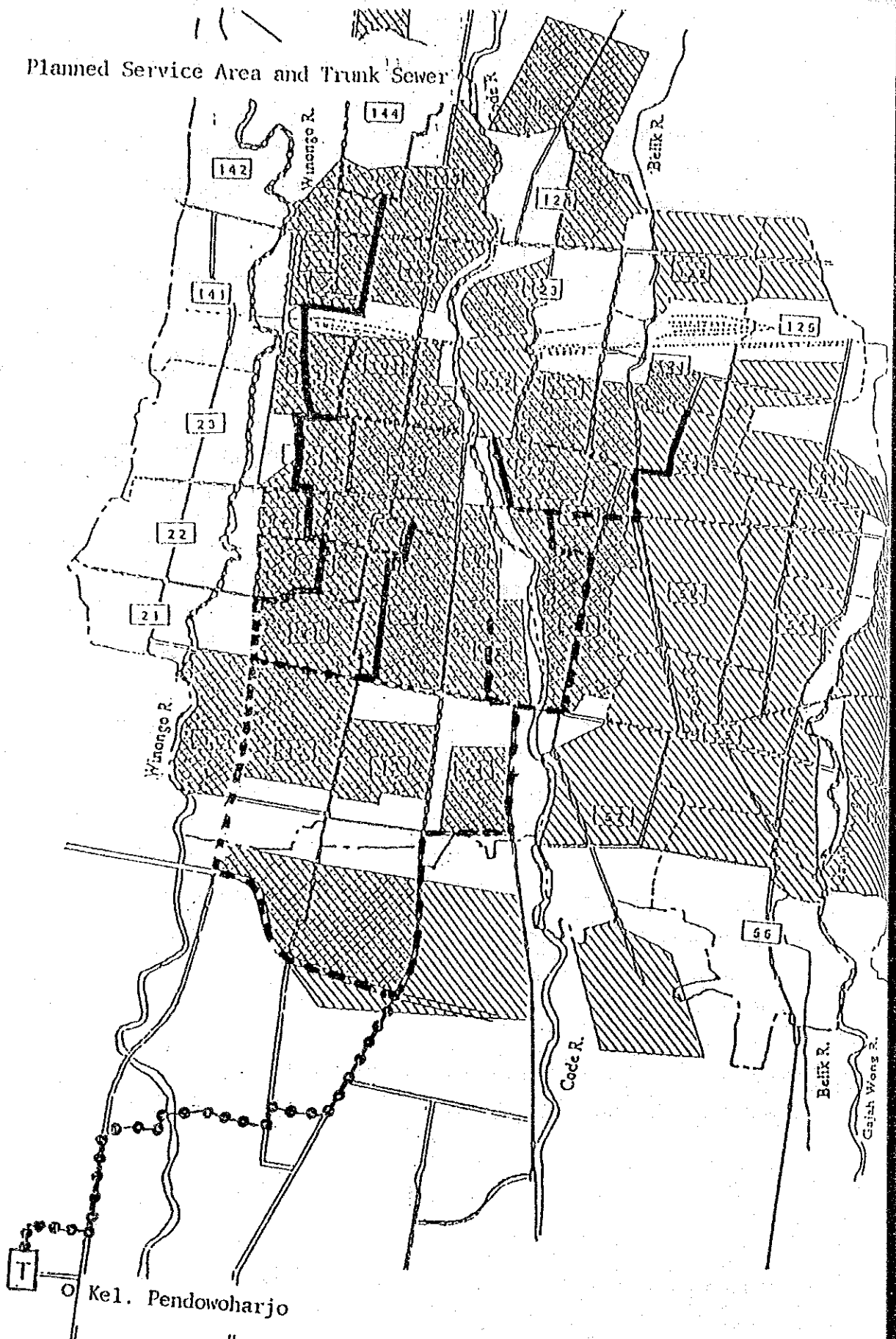
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- (2) The GOI will take necessary measures, as described in Annex III for smooth implementation of the Project, on condition that the Grant Aid by the Government of Japan is extended to the Project.



6. Schedule of the Study




- (1) JICA will dispatch another Basic Design Study team to proceed with further studies in Indonesia from August to September, 1992.
- (2) The study team will continue further studies in Japan from September to November, 1992 and the Draft Basic Design Study Report will be prepared.
- (3) JICA will dispatch the study team to explain the contents of the Draft Basic Design Study Report in late November, 1992.

Planned Service Area and Trunk Sewer

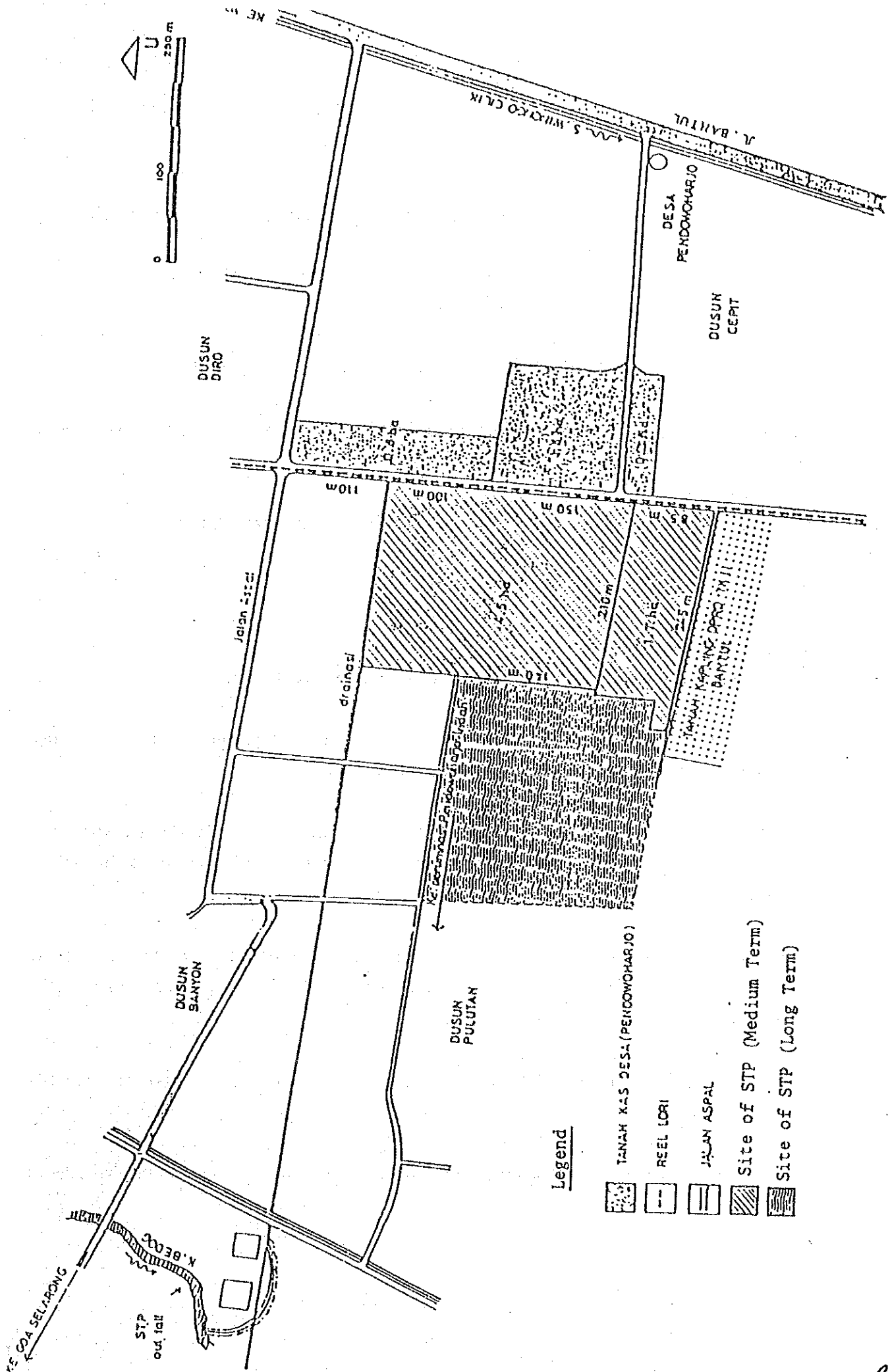


Legend:

-  : Planned Service Area (2002)
-  : Planned Service Area (2012)

-  : Existing Sewer
-  : Planned Sewer (Medium Term JICA)
-  : Planned Sewer (Medium Term JICA)

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R. Duta
1/11/11

ANNEX III

Necessary measures to be taken by the Government of Indonesia on condition that Japan's Grant Aid is extended;

1. To secure the land acquisition of the Project Site,
2. To clear, level and reclaim the site prior to commencement of the construction,
3. To undertake incidental outdoor works such as gardening, fencing, gate and exterior lighting within and around the site,
4. To construct the access road to the site prior to commencement of the construction,
5. To provide the following facilities to the Project site:
 - 1) electric supply,
 - 2) gas and water supply,
 - 3) general furniture such as tables, chairs, and others for the control house,
6. To exempt taxes and to take necessary measures for custom clearances of the materials and equipment brought for the Project at the port of disembarkation,
7. To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in Indonesia with respect to the supply of the products and services under the verified contracts,
8. To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities as may be necessary for the performance of their work,
9. To use and maintain properly and effectively the facilities constructed and equipment purchased under the Grant Aid.
10. To bear all the expenses, other than those to be borne by the Grant, necessary for the execution of the Project.

MINUTES OF DISCUSSIONS
ON
PROGRESS REPORT OF THE BASIC DESIGN STUDY
ON
THE PROJECT FOR THE CONSTRUCTION OF
YOGYAKARTA SEWAGE TREATMENT PLANT
IN
THE REPUBLIC OF INDONESIA

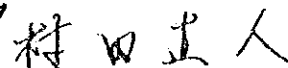
Jakarta, September 16, 1992



Ir. Soeramo Notodipoero
Secretary for
Directorate General
of Human Settlements,
Ministry of Public Works



Ir. Bondan Hermanislamet MSc.
Head of Planning and
Development Agency
D.I. Yogyakarta



Naohito Murata
Acting Leader of
JICA Basic Design
Study Team

The Basic Design Study Team of the Japan International Cooperation Agency (JICA) and the Government of Indonesia (GOI) held two meetings to discuss the Progress Report for the Basic Design Study on the Project for the Construction of Yogyakarta Sewage Treatment Plant.

The first meeting was held on September 12, 1992 at the meeting room of the Bappeda of D.I. Yogyakarta in Yogyakarta city under the chairmanship of Ir. Bondan Hermanislamet MSc., Head of the Planning and Development Agency, D.I. Yogyakarta Province.

The second meeting was held on September 16, 1992 at Prambanan room of Cipta Karya of Ministry of Public Works under the chairmanship of Ir. Soeratmo Notodipoero, Secretary for Directorate General of Human Settlements of Ministry of Public Works.

The attendants of the meetings held in Yogyakarta and Jakarta are listed in Attachment 1 and Attachment 2 respectively.

The Progress Report for the Basic Design Study on the Project for the Construction of Yogyakarta Sewage Treatment Plant was accepted as satisfactory by the Government of Indonesia (GOI). GOI expressed the following comments during the discussions.

1. The Study Team will conclude the countermeasures against the existing shallow groundwater table in the STP site based on the results of the on-going geological borings.
2. Principally, electrical power supply to the STP will be provided by PLN. However, an emergency generator of the STP shall be installed by the Japanese grant aid project.
3. Provision of workshop, vehicles, trucks, and other equipment required for O & M of the STP and sewer pipes will be made in accordance with the regulation of the Japanese Government in the same way as the previous Japanese grant aid projects.
4. Detailed technical comments will be sent soon to the Study Team.

Attachment 1:

List of Attendants of the Meeting held in Yogyakarta

Attachment 2:

List of Attendants of the Meeting held in Jakarta

Attachment 1:

List of Attendants of the Meeting held in Yogyakarta
Meeting of September 12, 1992 in Yogyakarta

(Indonesian Side)

1. Bondan Hermanislamet : Head of Planning and Development Agency D.I. Yogyakarta Province.
2. Soeripto Koesoemowinoto : Head of Regional Office of Ministry of Public Works D.I. Yogyakarta Province.
3. Sugeng Kartodihardjo : Head of Public Works Office of D.I. Yogyakarta Province.
4. Djoko Setiarso : Head of Infrastructure Division of Bappeda D.I. Yogyakarta Province.
5. Jacob Ruzuar : Head of Wastewater Subdirectorate of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
6. Supodo : Head of Subsection of Cleansing and Gardening of Kodya Yogyakarta.
7. Wayan : Environmental Sanitation Project of D.I. Yogyakarta Province .
8. Aris Riyanto : Infrastructure Division of Bappeda D.I. Yogyakarta Province.
9. Budi Antono : Public Works Office of D.I. Yogyakarta Province.
10. Suratno : Public Works Office of D.I. Yogyakarta Province.
11. Sarwidi : Public Works Office of D.I. Yogyakarta Province.
12. Handy B. Legowo : Subdirectorate of Waste Water of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
13. Erwin Mustika : Directorate of Bina Program of Directorate General of Cipta Karya.
14. Jan Bierling : YUDP Consultant

(Japanese Side)

JICA Study Team

1. Naohito Murata : Acting Team Leader
2. Terutoshi Ozawa : Member
3. Toshikatsu Ishimaru : Member
4. Isao Misono : Member
5. Hiroshi Kadowaki : Member

Attachment 2:

List of Attendants of the Meeting held in Jakarta

Meeting of September 16, 1992 in Jakarta

(Indonesian Side)

1. Soeratmo Notodipoero. : Secretary for Directorate General of Cipta Karya, Ministry of Public Works
2. Soeripto Koesoemowinoto : Head of Regional Office of Ministry of Public Works D.I. Yogyakarta Province.
3. Sugeng Kartodihardjo : Head of Public Works Office of D.I. Yogyakarta Province.
4. Jacob Ruzuar : Head of Wastewater Subdirectorate of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
5. Djoko Setiarso : Head of Infrastructure Division of Bappeda D.I. Yogyakarta Province.
6. Mulyono : Head of Public Works Office of Kodya Yogyakarta
7. Supodo : Head of Subsection of Cleansing and Gardening of Kodya Yogyakarta.
8. Aris Riyanto : Infrastructure Division of Bappeda D.I. Yogyakarta Province.
9. Suhadi : Bappeda Kodya Yogyakarta.
10. Saptorini : Directorate of Bina Program of Directorate General of Cipta Karya
11. Noeradhi Iskandar : Directorate of Bina Program of Directorate General of Cipta Karya
12. Luthfiel Annam : Directorate of Bina Program of Directorate General of Cipta Karya
13. Zuarti : Directorate of Bina Program of Directorate General of Cipta Karya
14. Subandiyo : Bureau for Technical Foreign Cooperation, Ministry of Public Works.
15. Budi Antono : Public Works Office of D.I. Yogyakarta Province.
16. Sarwidi : Public Works Office of D.I. Yogyakarta Province.
17. Wayan B. : Environmental Sanitation Project of D.I. Yogyakarta Province.



18. Susmono : Subdirectorate of Waste Water of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
19. Handy B. Legowo : Subdirectorate of Waste Water of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
20. Harry Simanjuntak : Subdirectorate of Waste Water of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
21. Nurmandi Yusuf : Subdirectorate of Waste Water of Directorate of Environmental Sanitation of Directorate General of Cipta Karya.
22. S. Omori : JICA Expert, Directorate General of Cipta Karya.
23. Rik L. Frenkel : YUDP Consultant
24. Jan Bierling : YUDP Consultant
25. Alit Merthayasa : YUDP Consultant

(Japanese Side)
JICA Study Team

1. Naohito Murata : Acting Team Leader
2. Terutoshi Ozawa : Member
3. Toshikatsu Ishimaru : Member
4. Isao Misono : Member
5. Hiroshi Kadowaki : Member

(Switzerland)

1. Georges E. Capt. : Counsellor of Development Cooperation of Swiss Embassy



MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR THE CONSTRUCTION OF YOGYAKARTA SEWAGE TREATMENT PLANT
IN
THE REPUBLIC OF INDONESIA
(CONSULTATION ON DRAFT REPORT)

In July 1992, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for the Construction of Yogyakarta Sewage Treatment Plant (hereinafter referred to as "the Project") to the Republic of Indonesia, and through discussion, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

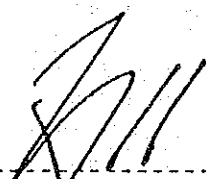
In order to explain and to consult the Indonesian side on the contents of the draft report, JICA sent to the Indonesia the Team, which is headed by Mr. Hideo MIYAMOTO, staff of First Basic Design Study Division, Grant Aid Study and Design Department, JICA, and is scheduled to stay in the country from November 22 to 30, 1992.

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

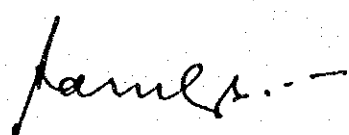
Jakarta, November 27, 1992

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1. Contents of Draft Report

The Government of Indonesia has agreed and accepted in principle the contents of the Draft Report proposed by the team.

2. Japan's Grant Aid System

(1) The Government of Indonesia has understood the system of Japanese Grant Aid explained by the team.

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

3. Further Schedule

The team will make the Final Report in accordance with the confirmed items, based on discussions on the Draft Report and send it to the Government of Indonesia by the end of January 1993.

4. Major Items Discussed

(1) ADB Loan

The Indonesian side explained that the ADB loan to Central Java and D.I. Yogyakarta urban development (sector) project, which includes the sewerage component necessary to integrate the Yogyakarta Sewage Treatment Plant into the overall sewerage system, has been already negotiated between ADB and the Government of Indonesia and will be approved by Board of Directors of ADB by the end of November, 1992, and the Loan Agreement will be signed in early December, 1992.

The Indonesian side expressed that the Government of Indonesia will take necessary measures to construct the 11 km of trunk sewer and 7 km of lateral sewer on time so that the sewage treatment plant will function upon completion.

(2) Environmental Impact Assessment

The Indonesian side explained that Environmental Impact Assessment of the Project was evaluated by the EIA Provincial Commission and approved by the Governor of Yogyakarta Province on the 23rd of November, 1992.

(3) The Indonesian side explained that land acquisition of the site for the sewage treatment plant is in progress and will be completed in early December, 1992.

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ANNEX I

Necessary measures to be taken by the Government of Indonesia on condition that Japan's Grant Aid is extended;

1. To secure the land acquisition of the Project Site,
2. To clear, level and reclaim the site prior to commencement of the construction,
3. To undertake incidental outdoor works such as gardening, fencing, gate and exterior lighting within and around the site,
4. To construct the access road to the prior to the construction,
5. To provide the following facilities to the site:
 - 1) electric supply and telephone
 - 2) water supply,
 - 3) general furniture such as tables, chairs, and others for the control house,
6. To exempt taxes and to take necessary measures for custom clearances of the materials and equipment brought for the project at the port of disembarkation,
7. To exempt from custom duties, internal taxes and other fiscal levies which may be imposed in Indonesia with respect to the supply of the products and services under the verified contracts,
8. To accord Japanese nationals, whose services may be required in connection with the supply of the product and services under the verified contracts, such facilities as may be necessary for the performance of their work,
9. To use and maintain properly and affectively the facilities constructed and equipment purchased under the Grant Aid,
10. To bear all the expenses, other than those to be borne by the Grant, necessary for the execution of the Project.

Appendix 11. Alternative Study of Sewage Treatment System

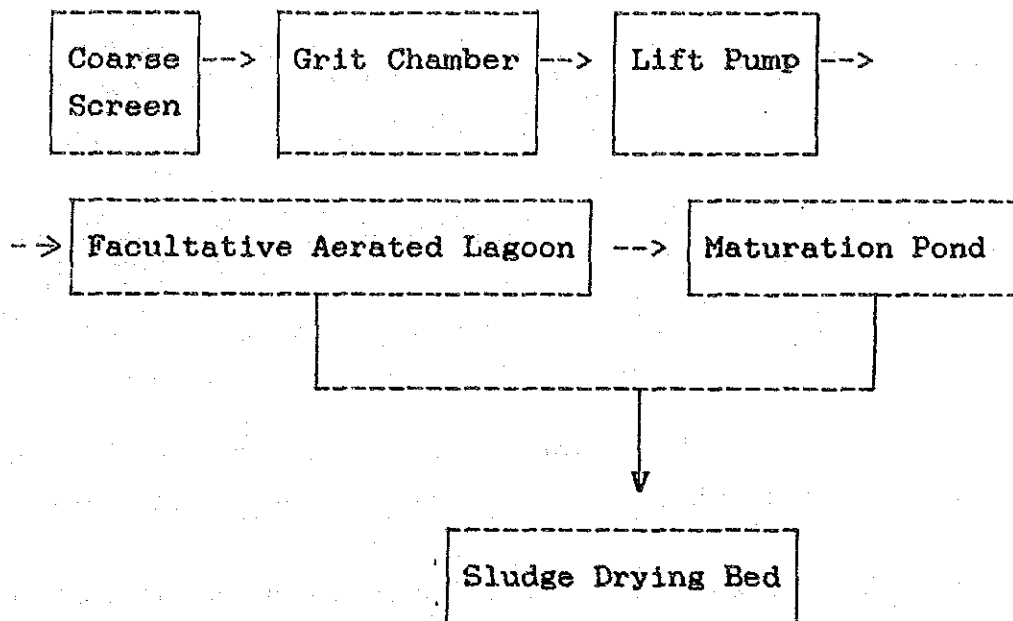
1. In September 1992, a comparative study for the facultative aerated lagoon and trickling filter with facultative pond was conducted by the 2nd Study Team.

The results are shown below.

2. Facultative Aerated Lagoon.

(1) Treatment System

The flow of this treatment system is shown below.



The layout of the proposed STP is shown in Fig. 1.

(2) BOD Removal

BOD removal rate of the facultative aerated lagoon (partial mix aerated lagoon) constructed in the series can be estimated by using the following formula.

$$\frac{C_n}{C_o} = \frac{1}{\left[1 + \frac{K_{PT} \cdot t}{n} \right]^n}$$

where,

C_n : effluent BOD concentration in pond (n), mg/l

C_o : influent BOD concentration, mg/l

K_{PT} : partial mix first order reaction rate constant at $T^{\circ}\text{C}$ of water temperature, 1/day

t : total retention time of ponds, day

n : number of ponds in series

K_p is calculated based on the standard reaction rate constant at 35 °C as follows.

$$K_{pT} = K_{35} (1.085)^{T-35}, K_{35} = 1.2/\text{day} \quad [*]$$

[*] : Marais, G.V.R : Dynamic Behavior of Oxidation Ponds, 1970.

The partial mix first order reaction rate constant of the Project is $K_{25} = 0.531/\text{day}$, assuming the water temperature as 25 °C.

Final effluent BOD concentration of the proposed facultative aerated lagoon is calculated as follows.

- (i) 30 % of the influent BOD concentration is removed by settling and anaerobic digestion at the bottom of the lagoon. Hence, the remaining soluble BOD is $332 \times 0.7 = 232 \text{ mg/l}$.
- (ii) The proposed facultative aerated lagoon has an effective depth of 4.0 m and a total effective storage volume of 85,284 m³. Hence, retention time is 5.50 days. Number of ponds in series : $n = 2$.
- (iii) Final effluent BOD concentration of the facultative aerated lagoon : $C_2 = 38 \text{ mg/l}$

(3) Power Requirement

Oxygen requirement for oxidation and microbial synthesis is estimated as follows.

$$R_{O_2} = 1.46 (C_o - C_n)$$

where ;

Q = wastewater discharge (15,500 m³/day)

C_o = influent BOD concentration (232 mg/l)

C_n = effluent BOD concentration (38 mg/l)

$$R_{O_2} = 183 \text{ kg/hr}$$

Power requirement of aerator is calculated to be 114 kw, assuming the oxygen transfer rate of aerator as 1.6 kg O₂ /kwh.

Hence, aerator of 30 kw x 4 units are provided. The power supply per unit effective wastewater storage volume is 1.4 w/m³.

(4) Fecal Coliform Reduction

The reduction of fecal coliform in ponds in series is estimated by using the following formula.

$$N_e = \frac{N_i}{(1 + K_b T \cdot t_1)(1 + K_b T \cdot t_2) \dots (1 + K_b T \cdot t_n)}$$

where,

N_e : number of FC/100 ml of effluent

N_i : number of FC/100 ml of influent

$K_b T$: first order rate constant for FC removal at T °C of water temperature, 1/day

t_n : retention time in pond (n)

$K_b T$ is calculated based on the standard rate constant at 20 °C as follows.

$$K_b T = K_{20} (1.19)^{T-20}, \quad K_{20} = 2.6/\text{day} \quad [*]$$

[*] = Duncan Mara : Sewage Treatment in Hot Climates

The first order rate constant for FC removal of the Project is $K_{25} = 6.20$, assuming the water temperature as 25 °C

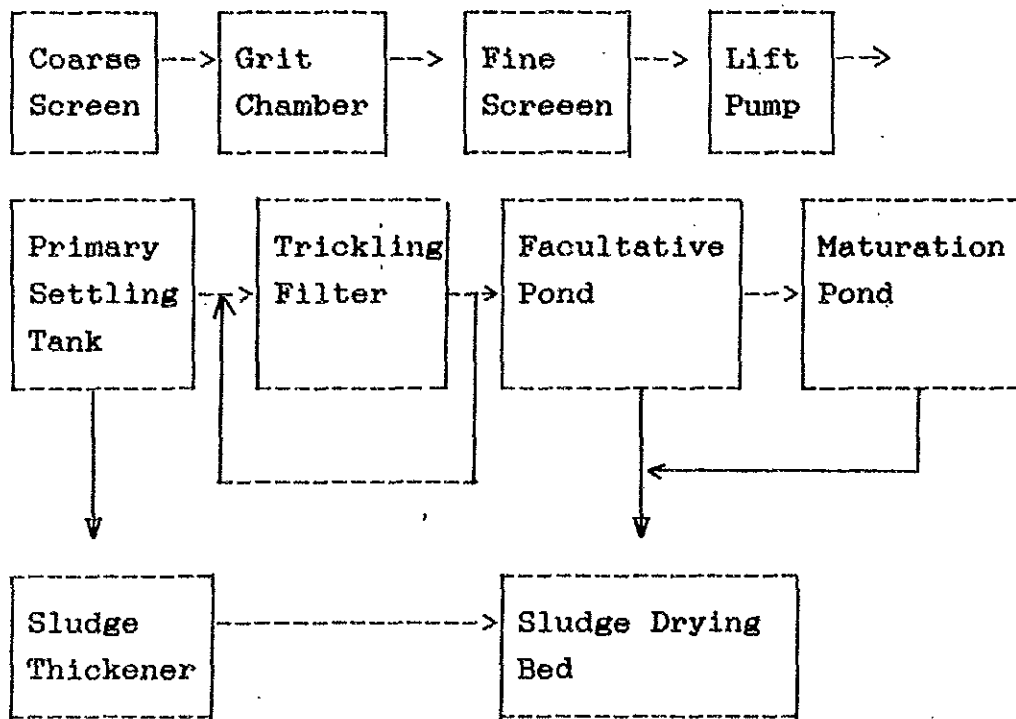
The proposed treatment plant consists of two (2) parallel streams of identical treatment units. Each treatment unit includes two (2) facultative aerated lagoon and one (1) maturation pond. Retention time of the respective facultative aerated lagoon is 2.75 days and that of the maturation pond is 1.03 day.

Number of FC/100 ml of the effluent from the maturation pond is $N_e = 4 \times 10^4/100$ ml, assuming the number of FC/100 ml of influent as $N_i = 10^8/100$ ml. This FC number of effluent is considered to be in a satisfactory level.

3. Trickling Filter with Facultative Pond

(1) Treatment System

The flow of this treatment system is shown below.



The layout of the proposed STP is shown in Fig. 2.

(2) BOD Removal

- (1) 30 % of the influent BOD concentration is removed by the primary settling tank. Hence, the remaining soluble BOD is $332 \times 0.7 = 232$ mg/l.

- (ii) According to the Japanese standard, the BOD removal rate of trickling filter is 65 ~ 75%. In this study, 75% is adopted in view of the hot climate condition of the Project Area. The effluent BOD concentration from the trickling filter is calculated to be 58 mg/l.
- (iii) The proposed treatment system is provided with a facultative pond after the trickling filter. The effective depth and the total effective storage capacity of the facultative pond are 2.0 m and 20,150 m³. Then, retention time of the facultative pond is calculated at 1.3 days.
- (iv) For calculation of BOD removal of the above facultative pond, the formula used for the foregoing facultative aerated lagoon is applied. Because the proposed facultative pond is shallow enough and required oxygen can be supplied under natural conditions.

Effluent BOD of the facultative pond is estimated as follows.

$$C = \frac{C_0}{1 + K_p T \cdot t} = \frac{58.0}{1 + 0.531 \times 1.3} = 34.3 \text{ mg/l}$$

(3) Reduction of Fecal Coliform

This system also can reduce the number of FC in the effluent upto a satisfactory level.

4. Comparative Evaluation

The above two (2) sewage treatment systems are comparatively evaluated as shown in Table I. As evident from the table, the facultative aerated lagoon is more preferable than the trickling filter with facultative pond in almost all the evaluation points.

Moreover, flexibility for the future extension of the proposed sewage treatment system is examined.

The above facultative aerated lagoon and trickling filter systems require approximately 15.0 ha and 14.5 ha of land space in future to treat the wastewater discharge in the year of 2012. However, some grade-up of the treatment efficiency of the above systems are necessary to meet the wastewater discharge in the year 2012 within the existing available land space, if additional land acquisition is difficult.

The above two (2) alternative systems will be converted as follows.

- (1) The facultative aerated lagoon of partial mix with maturation pond is converted into the aerated lagoon of complete mix with settling tank and chlorination.

This converted system can attain the target effluent quality of BOD 30 ~ 40 mg/l within the existing available land space. However, it requires more electric power.

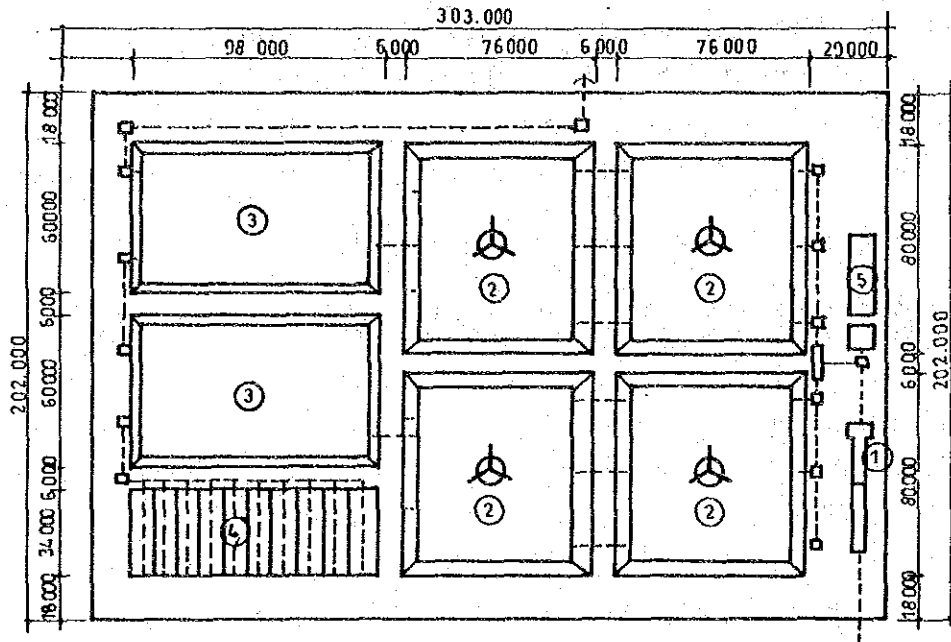
- (2) The trickling filter with facultative and maturation ponds is converted into the trickling filter with secondary settling tank and chlorination.

This converted system, however, is difficult to attain the target wastewater quality of BOD 30 ~ 40 mg/l within the existing available land space. It will be able to treat upto 50 ~ 60 mg/l at most.

Layout of the future extension of the alternative STP within the existing available land space are shown in Fig. 3.

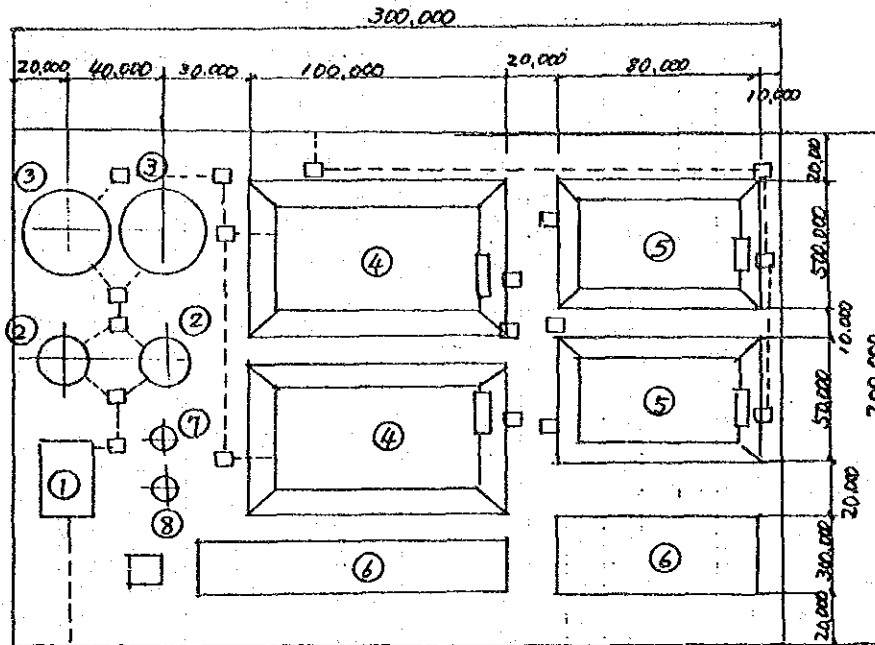
The facultative aerated lagoon system is recommended.

Fig. 1. Treatment Plant Layout
(Facultative Aerated Lagoon with Maturation Pond)



- (1) Coarse Screen/Grit Chamber/Fine Screen/Pump Pit/Pump
- (2) Facultative Aerated Lagoon
- (3) Maturation Pond
- (4) Sludge Drying Bed
- (5) Administration Building

Fig 2. Treatment Plant Layout
(Trickling Filter With Facultative Pond)



- ① Coarse Screen/Grit Chamber/Fine Screen/Pump Pit/Pump
- ② Primary Sedimentation
- ③ Trickling Filter
- ④ Facultative Pond
- ⑤ Maturation Pond
- ⑥ Sludge Drying Bed
- ⑦ Sludge Thickener
- ⑧ Operation Building

Table 1 Comparison of Treatment System

| Items | Alternative A: Trickling Filters with Ponds | Alternative B: Facultative Aerated Lagoon with Maturation Pond |
|---|--|--|
| <p>1. Flow Diagram Cap.: 15,500 m³/d Inflow BOD: 332mg/l</p> | | |
| 2. Effluent BOD | 30 - 40 mg/l | 30 - 40 mg/l |
| 3. Sludge Volume | 150 l/person/Year | 30 l/person/Year |
| 4. Site Space | 6.5 ha | 6.7 ha |
| 5. Cost for Electric Power | Rp. 158 million (Yen 10.3 million)/Year 1,189 x 10 ³ KWH/Year | Rp. 161 million (Yen 10.5 million)/Year, 1,213 x 10 ³ KWH/Year |
| 6. Environmental Aspects | <p>(1) Bad odor (Primary Sedimentation Basin, Sludge Thickener, Drying Bed) (2) Insects Generation (Flies in Trickling Filter, Mosquitoes in Ponds)</p> | <p>(1) Mosquitoes generation in Lagoon and Pond</p> |
| 7. Operation and Maintenance | <p>(1) There are many equipment compared with alternative B. To maintain the function, following maintenance will be required. (I) Periodical dredging of primary sedimentation basin and sludge thickener. (II) Periodical cleaning of spray nozzles of trickling filters. (III) Back washing for trickling filters. (2) Continuous handling of sludge from thickeners is required.</p> | <p>(1) Removal Works of floating materials in the Facultative Aerated Lagoon are required, if any. (2) However, O & M are much easier than Alternative A, because there are few equipment compared with A.</p> |
| 8. Future Extension Measures in case land is available (See attached layout) | | |
| 9. Conclusion | Alternative B is recommended from the above facts and Considerations | |

FIG. 3. FUTURE EXTENSION OF ALTERNATIVE STP

