

CAMEROUN
MINISTERE DE L'AGRICULTURE
ET DU DEVELOPPEMENT RURAL

CAMEROUN
ETUDE PREPARATOIRE POUR
LE PROJET D'AMENAGEMENT DES
INFRASTRUCTURES AGRICOLES
AU CAMEROUN

RAPPORT FINAL
Annexe

FEVRIER 2017
AGENCE JAPONAISE DE COOPERATION
INTERNATIONALE
NTC INTERNATIONAL CO., LTD.
EARTH AND HUMAN CORPORATION CO., LTD.

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1. List of the persons to be interviewed

No	Name	Positi
MINADER		
	MVONDO NNA Patrick	MINADER-Direction des Etudes des Programmes et de la Coopération
	FALAINA	MINADER-Direction du Génie Rural et de l'Amélioration du Cadre de Vie en Milieu Rural
	ONDOA MANGA Tobie	MINADER-Cellule des Projets & Programmes
	Louissette Clémence Bamzok	MINADER-Cellule des Projets & Programmes
	ZUE MINTSA OFFRE	MINADER-Direction du Génie Rural et de l'Amélioration du Cadre de Vie en Milieu Rural
	TETKA JULES	Centre National d'Etudes et d'Experimentation du Machinisme Agricole
	Ernest Roland ELA EVINA	Centre National d'Etudes et d'Experimentation du Machinisme Agricole
	CHIN Richard	UNVDA
	Francis FONAYI WAINDIM	UNVDA-Direction du Génie Rural
	DJAKOU Dagobert	MINADER-Direction des Organisations Professionnelles Agricoles et de l'Appui aux Exploitations Agricoles(DOPA)
	Emmanuel BODO	MINADER-Direction des Enquêtes et Statistiques Agricoles
	BILLE Elise	MINADER-Direction Ressouce Humaine
MINTP		
	Guy Daniel Abune Zoa	MINTP-Direction Générale des etudes techniques
	Mathurin Zanga	MINTP-Direction Générale des Travaux d'infrastructures Cellule Bad-Banque Mondiale
	OLINGA O.Vitalis	MINTP Direction Générale des Travaux d'infrastructures Cellule Bad-Banque Mondiale
	NIWA LONG OTHON	Parc National de Matériel de Génie Civil
	ZAMBO Simon Crépin	Parc National de Matériel de Génie Civil
	NDZANA I. Firmin	Parc National de Matériel de Génie Civil
	TANDONG VICTOR NUOH	Parc National de Matériel de Génie Civil Agence Régionale du Sud
	AMOUGUI AHANDA Timothée	Parc National de Matériel de Génie Civil Agence Régionale du Sud
	NGOULMA Josaphat René	Parc National de Matériel de Génie Civil Agence Régionale du Sud
	TANG AHANDA Barnabé	MINTP-Division de la Planification, de la Programmation et des Normes
	Ndilassi Innocent	MINTP-Direction Générale des travaux d'infrastructures Direction des Routes Rurales
MINT		
	Alexis Christian EWOLO	MINT- Direction de Metro
	MPELE ONANA Serge	MINT-Service de la Climatologie et de la Banque des Données
MINPEDED		
	KAMQUEM DIEUDONNE	MINPEDED-Direction de la Promotion du Développement Durable
MINEPAT		
	MISSI Augustine Annette	MINEPAT-General Department of Cooperation and Regional Integration
	Mme NOAH Epouse OBAMA Albertine Liliane	MINEPAT-Direction Générale de la Cooperation
	Nekemé Issac	PNDP(MINEPAT)
	NBOLO Rostan	PNDP(MINEPAT)
MINEPJA		
	Ekeme née Ndome Lobe Esther Désirée	ACEFA(MINADER+MINEPJA)
他ドナー		
	Luc NDIMI	World Bank(PIDMA)-Unité de Coodination du Projet
	André MBAIRANODJI	World Bank(PIDMA)-Unité de Coodination du Projet
	François KWONGANG	EU-Section Développement Rural, Environnement et Société Civile
	AMADOU Fotougboun Kou	Islamic Development Bank(MINADER)
	Justinius	Grassfield Project(BAD)
PRODERIP		
	SOKEI Yoshimi	PRODERIP
	SASAGE Teruhiko	PRODERIP
	KURIHARA Kazutoshi	PRODERIP
	SHIINA Suguru	PRODERIP
	MATSUMOTO Shunsuke	PRODERIP

2. Minutes of Meeting (Inception Report)

MINUTES OF MEETING ON THE INCEPTION REPORT
FOR
THE PREPARATORY SURVEY
ON
RURAL INFRASTRUCTURE IMPROVEMENT PROJECT
IN
THE REPUBLIC OF CAMEROON

Yaoundé, FEBRUARY 23, 2016

Mr. Mvondo Nna Patrick
Director of DEPC, Ministry of Agriculture and
Rural Development (MINADER)

Dr. Takashi KOTEGAWA
Sub-Team Leader, JICA Study Team



The Study Team for the Preparatory Survey on Rural Infrastructure Improvement Project in Cameroon (hereinafter referred to as "the Study Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Dr. Akira IWAMOTO as Team Leader, and the Ministry of Agriculture and Rural Development (hereinafter referred to as "MINADER") headed by Mr. Mvondo Nna Patrick as Director of MINADER, held a kick-off meeting and discussed on the Inception Report explained by the Study Team.

The list of participants is attached in Annex.

1. Submission of the Inception Report

The MINADER received 10 copies of the Inception Report submitted by the Study Team on February 23, 2016.

2. Kick-off Meeting

A kick-off meeting was held between the Study Team and the MINADER at the Conference room of the MINADER in Cameroon on February 23, 2016 to discuss on the Inception Report.

3. Presentation

The JICA explained the direction of cooperation of MINADER-JICA which is consisted of the technical cooperation named as Upland Rice Development of the Tropical Forest Zone in Cameroon (hereinafter referred to as "PRODERiP" and the Project for the Development of Irrigated and Rainfed Rice Cultivation (hereinafter referred to as "PRODELIP") and the loan project named as Rural Infrastructure Improvement Project in Cameroon. Moreover, the Study Team explained to the MINADER the Inception Report that contains the objectives, approaches and methodologies of the Preparatory Survey on Rural Infrastructure Improvement Project in Cameroon.

4. Discussion

Based on the discussion, the MINADER and the Study Team confirmed their agreement on the contents of the Inception Report. Meanwhile, the following matters were discussed between both the parties.

- (a) MINADER and the Study Team agreed that the coordination mechanism with PRODERiP and PRODELIP would become a key for the success of the project.
- (b) MINADER and the Study Team agreed that the MINADER would nominate Counter Parts for each expert of the Study Team in order to conduct the survey smoothly.

Annex : LIST OF ATTENDANTS


Cameroon		JAPAN	
Name	Title	Name	Title
Henri Eyebe Ayissi	Minister / MINADER	Shinji Umemoto	Reperesentitive / JICA
EKO'O A. Jean Claude	Secretary General / MINADER	Yuumi Ushiro	Country Officer / JICA
Mvondo Nna Patrick	DEPC / MINADER	Ryosuke Moritaki	Senior Advisor / JICA
Mveng Pauline	Inspector General / MINADER	Takayuki Muraoka	Sub-representitive / JICA
Nka Charles Noël	CT2 / MINADER	Gaston Galamo	Program Officer /JICA
Voundi Jacquinet	I1/IGDR / MINADER	Sokei Yoshimi	Expert / PRODERIP
Bedoung Gisele	I2/IGDR / MINADER	Akira IWAMOTO	Leader of Consultant
Mbili Oloume Jean Pierre	DDA / MINADER	Takashi Kotegawa	Sub-leader of Consultant
Mohamadou Saoudi	DRFP/ MINADER	Shigeru Takagi	Consultant
FALAINA	DGRCV / MINADER	Yusuke NAKAYAMA	Consultant
Ondoa Manga Tobie	CCPP/DEPC / MINADER	Hiroshi ISHII	Consultant
Vundi Fidele Magloire	Cadre Technique / MINADER	Hiroyuki KURONUMA	Consultant
Chin Richard	DG / UNVDA	Ayako MORISHIMA	Consultant
Francis Fonayi Waindim	DGR / UNVDA	Donors	
Mathias Mawo Lon	DAP / UNVDA		
Olinga O.Vitalis	IP/ Cellule RAD/BM / MINTP	CADILLA FALCO JORDI	Gestion de Programmes Infrastructures / EU
Obama Albertine Liliane	IE/DNS / MINEPAT	FERNANDEZ OSUMA juan	Gestion de Programmes Infrastructures / EU
Monono Absalom Woloa	Secretary General / North West Governor's office	Ndimi Luc	Secretary General / PIDMA
Keyantio Augustin	Inspector General / East Governor's office		

Handwritten signature and initials

3. Minutes of Meeting (Interim Report)

MINUTES OF MEETING ON THE INTERIM REPORT
FOR
THE PREPARATORY SURVEY
ON
RURAL INFRASTRUCTURE IMPROVEMENT PROJECT
IN
THE REPUBLIC OF CAMEROON




Mr. Mvondo Nna Patrick
Director of DEPC, Ministry of Agriculture and
Rural Development (MINADER)

Yaoundé, JUNE 22, 2016



Dr. Akira IWAMOTO
Team Leader, JICA Study Team



Mr. Shinji UMEMOTO
Representative, JICA Cameroon Office



The Study Team for the Preparatory Survey on Rural Infrastructure Improvement Project in Cameroon (hereinafter referred to as "the Study Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Dr. Akira IWAMOTO as Team Leader, and the Ministry of Agriculture and Rural Development (hereinafter referred to as "MINADER") headed by Mr. Mvondo Nna Patrick as Director of MINADER, held a meeting and discussed on the Interim Report explained by the Study Team.

The list of participants is attached in Annex.

1. Meeting

A Meeting was held between the Study Team and the MINADER at the Conference room of the MINADER in Cameroon on JUNE 22, 2016 to discuss on the Interim Report.

2. Presentation

Dr.Kotegawa from the Study Team made a presentation for the contents stated below.

A. The following topics were introduced:

1. Overall objectives of the need to increase rice production in the country
2. Objectives and zones of the studies

B. The various components of the project was elaborated as follows :

1. Component of Irrigation Development
 - Explanation of the identified problems and the proposed solutions.
 - Explanation of the 4 options proposed and the costs.
2. Component of Road Access Improvement
 - Explanation of the basic criteria for the selection of the candidate roads.
 - Explanation of the methodology of the road selection.
 - Presentation of the selection list in terms of prioritization and the site located maps.
 - Explanation of advantages of using a stabilizer to reinforce groundworks compared to conventional methods used locally.
 - Proposition of road dimensions.
 - Presentation of 2 costing options for selected road list.
3. Component of Installation of Agricultural Machinery and Equipment
 - Presentation of the concerned machines.
 - Explanation of the identified problems and the proposed solutions.



- Presentation of the Japanese fabricated machinery and its rice-polishing potentiality to improve the quality of rice.
- Explanation of the Proposed Installation Site.
- Presentation of the 3 costing options for the type and number of machines to be acquired.

4. For Soft Component

- Explanation of how training programs can be organized for the various components.

- C. Explanation for the most advantageous option combination amongst the components and its costs
- D. Presentation of the special terms and conditions for applying the STEP scheme to the Japanese Loan Projects.
- E. Presentation of the Preparatory Study Calendar
- F. Invitation of the attendees to a question-comment session.

3. Discussion

Comment 1:

Mr Mvondo expresses his appreciation for the Study Team who has always carried out the studies in a participative manner. He reminds the attendees that the Study Team has always worked closely with the various members of MINADER and UNVDA in the last months.

Comment 2 :

Mr Falaina's first question

1. For the road component, he wonders if it is necessary to use the stabilizer to upgrade the inland farm roads. He thinks that if the existing laterite would be compacted on site the results should be good enough for such roads.

Reply from Mr Sato from the Study Team

The stabilization machine is only applicable to roads with heavy traffic and the on-site laterite will be combined with cement to strengthen its base capacity. This method will not be used on internal farm roads.

Mr Falaina's second question

-
2. As for the promotion of fully polished rice production, he wonders if this would not deprive the consumers from its nutritive value as it is often considered as less nutritional than brown rice.

Reply from Mr Nagaoka from the Study Team

Basically, the milling machine to be used is adaptable to the needs of the markets. Should the market require less polished rice, the degree of the polishing process can be adjusted as per the demand requires.

Mr Chin of UNVDA adds that the most important factor in the rice-polishing process lies in the rice seed that is to be planted. The actual problem why the rice polishing process has been unsuccessful is because various rice originating from different seeds have been combined together during the process. As a result, the whiteness of the rice reacts differently after the process. Thanks to the technical team (PRODERIP), this problem will be solved basically with the plantation of a single rice seed at the origin.

Comment 3 :

Mrs Bamzok is very impressed by findings of the Study Team and thinks that the propositions made by the Study Team are very reasonable. She would like to know though for the STEP scheme how the 30% of the tied loan works; that is, if Cameroonian candidate companies would have to go to Japan to obtain Japanese products.

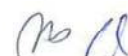
Replies from Dr Kotegawa and Mr Umemoto

Basically, more than 30% of the project costs will be allocated to Japanese companies for the supply of Japanese products. Nevertheless, the rest of the project costs will be used on locally obtainable products and services.

Mrs Bamzok finds this tied loan is very reasonable compared to loan projects offered by other donors.

Comment 4 :

Mr Mvondo asks if the maintenance of the concerned roads after rehabilitation has been taken into consideration. Will the construction machines be left to the disposal of the local authorities?



Reply from Dr Iwamoto of the Study Team

Dr Iwamoto explains that this is where the importance of the Soft Component comes in place. Training will be provided to the various staff for not only maintaining the roads, but also the construction and agricultural machines.

Reply from Mr Umemoto

Mr Umemoto stresses that Japan is 'together' with Cameroon on this project. Hence, if the training is judged not sufficient when the time comes, other solutions may be proposed should the need arise.

Mr Mvondo shares two news:

- The UNVDA Development Plan now figures as part of the Triennial Urgency Development Plan thanks to the Cameroonian Prime Minister.
- The candidate road list has been approved by the Minister of MINADER.

Mr Mvondo concludes that all attendees appreciate the good works proposed by the Study Team and confirms that the propositions made are acceptable and reasonable.

On this note, Mr Mvondo thanks all the attendees for their presence and ends the meeting session.



Annex : LIST OF ATTENDANTS

Cameroon		JAPAN	
Name	Title	Name	Title
Mvondo Nna Patrick	DEPC / MINADER	Shinji Umemoto	Reperesentative / JICA
FALAINA	DGRCV / MINADER	Takayuki Muraoka	Sub-representative / JICA
Mbili Oloume Jean Pierre	DDA / MINADER	AGNES OKODOMBE	Chargée Programmes Agriculture, Pêche et Environnement /JICA
Bamzok Louissette	DEPC/PPP	Akira IWAMOTO	Leader of the Study Team
MBALLA ONANA Maigueite	CEAA/PPP	Takashi Kotegawa	Sub-leader of the Study Team
Mbock Clestin	Cellule de Suivi des MINADER	Shigeru Takagi	Member of the Study Team
Chin Richard	DG / UNVDA	Fusashige Sato	Member of the Study Team
Francis Fonayi Waindim	DGR / UNVDA	Akihiro Fukuda	Member of the Study Team
Mathias Mawo Lon	DAP / UNVDA	Hirokazu Nagaoka	Member of the Study Team
Olinga O.Vitalis	IP/ Cellule RAD/BM / MINTP	Hiroyuki KURONUMA	Member of the Study Team
Ngou Tamdem Gilberte	Chef Service de la Coopération Bilatérale /SDC	Ayako MORISHIMA	Member of the Study Team
MEYOMESSE ENGOLO Calvin	Consultant	Polly Le MOIGNE	Coordinator of the Study Team
		SOPTCHOM Victor	Civil Engineer of the Study Team
		NOAH Taustin	Interpreter of the Study Team

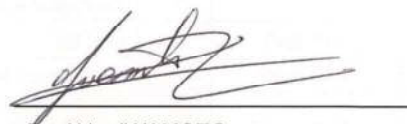
4. Minutes of Meeting (Japan Visit)

**MINUTES OF MEETING ON THE JAPAN VISIT
FOR
THE PREPARATORY SURVEY
ON
RURAL INFRASTRUCTURE IMPROVEMENT PROJECT
IN
THE REPUBLIC OF CAMEROON**

Tokyo, JULY 17, 2016



H.E. Mr. Eyebe Ayissi Henri
Minister, Ministry of Agriculture and
Rural Development (MINADER)



Dr. Akira IWAMOTO
Team Leader, JICA Study Team

The Study Team for the Preparatory Survey on Rural Infrastructure Improvement Project in Cameroon (hereinafter referred to as "the Study Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Dr. Akira IWAMOTO as Team Leader held the visit program in Japan for Ministry of Agriculture and Rural Development (hereinafter referred to as "MINADER"). The three delegations, H.E. Mr. Eyebe Ayissi Henri, Minister of MINADER, Mr. MVONDO NNA Patrick, Director of Department of Studies, Programmes, Cooperation and Mr. VOUNDI Jacquinet, Inspector general, Rural Development came to Japan. They visited the Japanese companies which can provide the proposed machines such as tractors, rice milling machine, country elevator, etc. Through the visit they discussed on the Preparatory Survey which is being carried out by the Study Team.

The executed schedule of program is following;

No	Date	Time	Activity
1	7/10 (sun)		21:05 Dept. from Yaoundé (AF909)
2	7/11 (mon)	AM	07:10 Arrival at Paris
		PM	13:55 Dept. from Paris (AF276)
3	7/12 (tue)	AM	8:30 Arrival at Tokyo (Narita airport)
		PM	14:30-16:30 Visit KUBOTA factory (Tractor and etc.) at Tsukuba city, Ibaraki Pref.
4	7/13 (wed)	AM	10:00 -11:00 Courtesy call to Cameroon Embassy 11:30 -12:30 Courtesy call to JICA HQ
		PM	13:30-14:30 Courtesy call to Ministry of Agriculture, Forestry and Fisheries 17:25 Dep. from Haneda airport 18:45 Arrival at Hiroshima airport
5	7/14 (thu)	AM	10:00-11:30 Visit SATAKE HQ at Higashi Hiroshima City
		PM	13:00 Dep. from Hiroshima airport 14:35 Arrival at Haneda airport 18:00-18:30 Courtesy call to Ministry of Foreign Affairs
6	7/15 (fri)	AM	10:00-11:30 Visit Country Elevator of JA Utsunomiya at Utsunomiya city, Tochigi Pref.
		PM	15:00-16:30 Visit rice milling plant of ITAMI SANGYO at Tsurugashima city, Saitama Pref.
7	7/16 (sat)		Off Day
8	7/17 (sun)	PM	22:55 Dept. from Tokyo (AF293)
9	7/18 (mon)	AM	04:30 Arrival at Paris
		PM	14:15 Dept. from Paris (AF900) 19:40 Arrival at Yaoundé

Contents of the visit

- A. Courtesy calls:
1. JICA Head Quarters
 2. Cameroon Embassy
 3. Ministry of Agriculture, Forestry and Fisheries
 4. Ministry of Foreign Affairs

B. The tours at the factories and the facilities of Agricultural Machinery:

1. Kubota
 - Observation of the assemblage at tractors factory
 - Explanation of the advantage of Japanese tractor compared with other country's one
2. Satake
 - Explanation of Satake products
 - Demonstration of Optical Sorter
3. Country Elevator
 - Explanation and observation of the facility
4. Rice Milling Plant
 - Explanation and observation of the plant

During the program, the following points have been discussed:

- i. The Cameroonian side requests to introduce the Agricultural Machinery which meets meteorological and geological condition in Cameroon.
- ii. Japan will continue to support Cameroon for the agriculture development especially for rice farming sector as the one of most important countries for the development in Central Africa area.
- iii. The Cameroonian side requests to increase the loan volume for the project being prepared by the Study Team.

Future Programs are shown below:

- The presentation of Draft Final Report (The beginning of October)
- The fact finding mission of JICA (The beginning of October)
- The Submission of Final Report (December)

After the submission of Final Report, JICA will execute the following events:

- The appraisal mission
- The signing Exchange of Note
- The signing Loan Agreement

H.E. Mr. Henri Eyebe Ayissi expresses his appreciation for the Study Team who organized this visit program in Japan. He reminds all members that the Study Team and MINADER will continue to work together to finalize the Preparatory Survey and realize the Yen Loan project.



5. Minutes of Meeting (Draft Final Report)

**MINUTES OF MEETING ON THE PRESENTATION OF DRAFT FINAL REPORT
FOR
THE PREPARATORY SURVEY
ON
RURAL INFRASTRUCTURE IMPROVEMENT PROJECT
IN
THE REPUBLIC OF CAMEROON**

Yaoundé, December 14, 2016

Mr Mvondo Nna Patrick
Director of DEPC, Ministry of Agriculture and
Rural Development (MINADER)

*Le Directeur des Etudes
des Programmes et de la
Coopération*
Mvondo Nna Patrick
Ingénieur Agro-Economiste



Mr Shinji UMEMOTO
Representative, JICA Cameroon Office



Dr Akira IWAMOTO
Team Leader, JICA Study Team

The Study Team for the Preparatory Survey on Rural Infrastructure Improvement Project in Cameroon (hereinafter referred to as "the Study Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Dr Akira IWAMOTO as Team Leader, and the Ministry of Agriculture and Rural Development (hereinafter referred to as "MINADER") headed by Mr Mvondo Nna Patrick as Director of MINADER, held a meeting and discussed on the Draft Final Report explained by the Study Team.

The list of participants is attached in Annex.

Minutes of Presentation-Meeting on 14 December 2016

15H35 Opening Speech by Mr. Mvondo (Director of DEPC) welcoming and thanking everyone's presence at the meeting

15H40 Introduction Speech by Mr Umemoto (Director of JICA Cameroon) thanking all the Cameroonian parties' support to the study team and asking for continued support to the Japanese Team for the realization of the Project. He emphasized that all questions and comments, if any, should be made this meeting as this is the last occasion to do so.

He also introduced Mr Furukawa (First Secretary of Japan Embassy in Cameroon) who just arrived in Cameroon recently.

15H50 Presentation of the Draft Final Report by the study team: Mr Iwamoto, Mr Sato and Mr Fukuda

Contents of the Presentation

- A. The following topics were introduced:
1. Significance of the project implementation for Cameroon and Japan
 2. Progress of the preparatory survey
 3. Objectives and target area for the project
- B. The following components of the project were elaborated :
1. For Irrigation Component
 - Explanation of the identified problems and the proposed solutions
 2. For Access Road Component
 - Explanation of procedures for target road selection
 - Presentation of summary of selected target roads
 - Explanation of the identified problems and the proposed solutions



3. For Agricultural Machinery Component
 - Explanation of the identified problems and the proposed solutions
 - Presentation of the Japanese fabricated machinery and its rice-polishing potentiality to improve rice production capacity
 - Presentation of drawings relating to the country elevator and the transformation unit
 4. Explanation of how training programs (soft component) can be organized for the various components (Irrigation, Access Road, Agricultural Machinery and Marketing)
-
- C. Explanation of the Overall Concept of the Project
 - D. Explanation of the Project Implementation Schedule and Organization
 - E. Explanation of the procurement system
 - F. Invitation of the attendees to a question-comment session.

16h35 Opening of the Question-Comment Session

Comments and answers

Question 1 :

During the Fact Finding Mission, the request to modify the name of the project was made and was approved. Mr Mvondo wondered why this change has not been taken into account in the draft final report.

Answer from the study team :

Dr Iwamoto explained that the draft final report is based on the contract made between the study team and JICA office in Japan since the beginning of the year. Hence, the team has to abide to this project name for the submission of all the output documents related to this contract.

Question 2 :

Mr Mvondo would also like to know why the costs of the project are not mentioned at all in the presentation.

Answer from the study team :

Dr Iwamoto explained that the study team has been contracted by JICA to formulate the technical aspect of the project. As far as the costs of the project are concerned, the details were discussed between the Cameroonian authorities and the Fact Finding Mission dispatched by JICA headquarters in October 2016 and a consensus was reached between both parties.



Mr Ondo also thinks that the Ministry of Commerce should be included in the steering committee as the rice produced will have to be sold on a national basis.

Answers:

1. Mr Iwamoto explained that the annual harvest of 15 000 t is not only based on the paddy rice to be collected from the 918 ha of the selected site but also includes the 3000 ha actually owned by UNVDA.

As for annual double rice crop production, Mr Iwamoto thinks it may be socially and economically difficult for farmers to plant only rice and not other crops which they may need for personal consumption or economic purposes as well.

As for the steering committee, the organization of the steering and implementation committees was clearly agreed upon during the Fact Finding Mission by both Cameroonian and Japanese sides. The study team suggests that MINADER discuss this matter directly with the JICA Appraisal Mission next year.

2. Mr Chin explained that in the past, rice crops were produced twice a year but it is no longer the case especially with the existence of cattle farming. The Ndop valley is a grazing area for the cattle and until there is another option, there is a need to respect this.

Mr Chin also reminded everyone that the NDOP valley is often known for its rice but in reality, the other crops like tomatoes and corns produced in the zone are also very important sources of income for the farmers.

As for the need to install a levy system to be paid by the farmers, Mr Chin thinks that it is an important issue to be discussed internally. Many years ago, the levy system existed but it was abolished due to the economic crisis.

3. Mr Mvondo agrees that this levy issue concerns basically the Cameroonian side and needs to be discussed internally in the near future.

17h00 Mr Mvondo thanked all the attendees for their presence and ended the meeting session.

After the presentation, MINADER received 10 copies of the Draft Final Report submitted by the study team.

MINADER has been requested to submit all comments, if any, concerning the draft final report before 20th December 2016. No comments will be taken into account after the mentioned-date.



Annex : LIST OF ATTENDANTS

Cameroon		JICA	
Name	Title	Name	Title
Mvondo Nna Patrick	DEPC / MINADER	Shinji Umemoto	Reperesentitive / JICA
Chin Richard	DG / UNVDA	Takayuki Muraoka	Sub-representitive / JICA
Francis FONAYI Waindim	DGR / UNVDA	OKODOMBE Agnes	Program Officer /JICA
FALAINA	DGRCV / MINADER	Japan Embassy	
ONDOA Tobie	CCPP/DEPC / MINADER	Hiroshi FURUKAWA	First Secretary
VESSAH Daouda	SDMA/ MINADER	JICA Study Team	
MESSIA MESSIA Georges Cheistian	CS / MINADER	Akira IWAMOTO	Leader of consultant
Mme Ngou Tamdem G.A	CS/ MINADER	Fusashige SATO	Consultant
TSANGUE poul yves	Cardre MINADER	Akihiro FUKUDA	Consultant
ZUE	CS/DGRCV/MINADER	Hiroyuki KURONUMA	Consultant
EONE NSOGA OSCAR	Cadre/MINEPAT	Ayako MORISHIMA	Consultant
DJAKOU Dagobert	DOPA/MINADER	Polly Le MOIGNE	Local Staff
		SOPTCHOM T. Victor	Local Staff
		ZAMBOU Djibril	Local Consultant

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6. Annex of Irrigation Component

Result of Soil Profile Survey (1)

Upper Site of Upper Bumenda

Date of Soil Survey : 14th/Mar/2016

Surveyor : Takashi KOTEGAWA

Location : 5°58'38.30"N、10°24'37.99"E

Altitude : 1,179 m

Soil Classification :

Remarks : The soil pit is located in the rice seed producing farmland managed by the UNVDA. Since the farmland belongs to UNVDA, the cultivation activities are rarely conducted in dry season. The farmland was reclaimed approximately 40 years ago. The clear horizons are observed between each layer. The soil texture is assumed to be high in clay contents in the soil. Moreover, the viscosity, plasticity and compactness are also high indicating that the amount of vertical drainage of the water would be low, while the soil could retail the soil nutrients for the favourable growth of rice. The mottles of iron are observed from the upper layer to lower layer though its abundance is different depending on the layers.



Horizon	Range(cm)	Profile
Ap	0-14/16	【Horizon】 : Smooth, Abrupt、【Color (Wet)】 : 5YR 3/4、【Mottles】 : Irregular, Few、【Soil Texture】 : Light Clay、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Weak, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Medium (20-24mm)、【Hardness】 : Slightly Hard、【 Plant roots】 : Fine, Common、
Ad	14/16-30	【Horizon】 : Smooth, Clear、【Color (Wet)】 : 5YR 3/4、【Mottles】 : Irregular, Few、【Soil Texture】 : Clay Loam、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Weak, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【 Plant roots】 : Fine, Very few、
B	30-45/50	【Horizon】 : Smooth, Clear、【Color (Wet)】 : 5YR2/3、【Mottles】 : Irregular, Common、【Soil Texture】 : Clay Loam、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Very compact (>29)、【Hardness】 : Hard、【 Plant roots】 : Fine, Very few
C1	45/50-68	【Horizon】 : Smooth, Clear、【Color (Wet)】 : 5YR3/3、【Mottles】 : Irregular, Common、【Soil Texture】 : Light Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Very compact (>29)、【Hardness】 : Hard、【 Plant roots】 : None
C2	68-85+	【Color (Wet)】 : 5YR4/4、【Mottles】 : Irregular, Common、【Soil Texture】 : Clay Loam、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Very compact (>29)、【Hardness】 : Very Hard、【 Plant roots】 : None

Result of Soil Profile Survey (2)

Middle Site of Upper Bumenda

Date of Soil Survey : 14th/Mar/2016

Surveyor : Takashi KOTEGAWA

Location : 5°58'17.39"N, 10°25'2.84"E

Altitude : 1,170 m

Soil Classification :

Remarks : The soil pit is located in the farmland managed by the local farmer. The farmland is cultivated for maize, beans etc. in dry season while paddy cultivation is conducted in rainy season. The farmland was reclaimed approximately 40 years ago. The soil clay contents are assumed to be high in the soil of each layer. The mottles of iron in the lower soil layer are more abundant than that of Upper site. Moreover, the accumulation of iron is observed in the B horizon indicating that the permeability of surface layer could be low and the reduced condition of the soil in the lower layer might be affected by the ground water.



Horizon	Range(cm)	Profile
Ap	0-15/18	【Horizon】 : Wavy, Claer、【Color (Wet)】 : 5YR 3/1、【Mottles】 : Irregular, Few、【Soil Texture】 : Clay Loam、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Week, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Medium (20-24mm)、【Hardness】 : Slightly Hard、【 Plant roots】 : Fine, Common、
Bdgir	15/18-20/22	【Horizon】 : Wavy, Clear、【Color (Wet)】 : 5YR 4/4、【Mottles】 : Irregular, Common、【Soil Texture】 : Light Clay、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Slightly Hard、【Plant roots】 : Fine, Very few
Cg1	20/22-50	【Horizon】 : Smooth, Clear、【Color (Wet)】 : 5YR 5/1、【Mottles】 : Irregular, Abundant、【Soil Texture】 : Clay Loam、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Very compact (>29)、【Hardness】 : Very Hard、【Plant roots】 : Fine, Very few
Cg2	50-80+	【Color (Wet)】 : 5YR 6/1、【Mottles】 : Irregular, Abundant、【Soil Texture】 : Light Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Very Hard、【 Plant roots】 : None

Result of Soil Profile Survey (3)

Lower Site (1) of Upper Bumenda

Date of Soil Survey : 14th/Mar/2016

Surveyor : Takashi KOTEGAWA

Location : 5°58'22.02"N、10°25'51.79"E

Altitude : 1,161 m

Soil Classification :

Remarks : The soil pit is located in the farmland managed by the local farmer. The farmland is cultivated for maize, beans etc. in dry season while paddy cultivation is conducted in rainy season. The farmland was reclaimed approximately 40 years ago. The soil clay contents are assumed to be high in the soil of each layer. The ground water are observed in this soil pit. The height of ground water is around 60 cm from the surface. The mottles of iron are found in the lower layer, but most of soil colors in this pit are greyish, indicating the strongly reduced condition of the soil.



Horizon	Range(cm)	Profile
Ap	0-15/22	【Horizon】 : Irregular, Clear、【Color (Wet)】 : 5YR 3/1、【Mottles】 : None、【Soil Texture】 : Light Clay、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Weak, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Slightly Hard、【Plant roots】 : Fine, Common
BC	15/22-42/45	【Horizon】 : Wavy, Diffuse、【Color (Wet)】 : 5YR 3/2、【Mottles】 : Irregular, Few、【Soil Texture】 : Heavy Clay、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Slightly Hard、【 Plant roots】 : None
Cg1	42/45-68/70	【Horizon】 : Wavy, Diffuse、【Color (Wet)】 : 5YR 6/1、【Mottles】 : Irregular, Common、【Soil Texture】 : Light Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【 Plant roots】 : None
Cgir2	68/70-85+	【Color (Wet)】 : 7.5YR 6/6、【Mottles】 : Irregular, Common、【Soil Texture】 : Heavy Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【 Plant roots】 : None

Result of Soil Profile Survey (4)

Lower Site of Upper Bumenda 2

Date of Soil Survey : 15th/Mar/2016

Surveyor : Takashi KOTEGAWA

Location : 5°58'10.84"N、10°26'50.50"E

Altitude : 1,161 m

Soil Classification :

Remarks : The soil pit is located in the farmland managed by the local farmer. The farmland is cultivated for maize, beans etc. in dry season while paddy cultivation is conducted in rainy season. The farmland was reclaimed approximately 7 years ago, which is different from the other soil pits. The agricultural machines such as tractor are not utilized in this area since the suitable internal road for the machines are not well constructed. The ground water are observed in this soil pit. The height of ground water is around 90 cm from the surface. The mottles of the iron are observed in B horizon, indicating the low water permeability.



Horizon	Range(cm)	Profile
Ap	0-10/15	【Horizon】 : Wavy, Diffuse、【Color (Wet)】 : 5YR 3/1、【Mottles】 : Root-like, Few、【Soil Texture】 : Clay Loam、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Weak, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Medium (20-24mm)、【Hardness】 : Slightly Hard、【Plant roots】 : Fine, Common
AB	10-15/20-25	【Horizon】 : Irregular, Diffuse、【Color (Wet)】 : 5YR 3/1、【Mottles】 : Root-like, Few、【Soil Texture】 : Light Clay、【Gravel】 : Fine gravel, Sub-angular, Few、【Structure】 : Weak, Fine, Sub-angular blocky、【Viscosity】 : Sticky、【Plasticity】 : Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【Plant roots】 : Fine Few、
Bg	20-25/45-53	【Horizon】 : Wavy, Clear、【Color (Wet)】 : 7.5YR 5/1、【Mottles】 : Root-like & Irregular, Common、【Soil Texture】 : Heavy Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【Plant roots】 : Fine, Very few、
C1	45-53/70	【Horizon】 : Smooth, Clear、【Color (Wet)】 : 5YR 5/1、【Mottles】 : Irregular, Common、【Soil Texture】 : Heavy Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【Plant roots】 : None
C2	70-85+	【Color (Wet)】 : 7.5YR 4/1、【Mottles】 : Irregular, Few、【Soil Texture】 : Heavy Clay、【Gravel】 : None、【Structure】 : Massive、【Viscosity】 : Sticky、【Plasticity】 : Very Plastic、【Compactness】 : Compact (25-28mm)、【Hardness】 : Hard、【Plant roots】 : None

Results of the calculation of Irrigation Requirement

1.ETc&Irrigation Requirement

Beneficiary area: 918 ha

Description	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
ETo on Modified Penman	(mm/month)	125.70	129.62	140.07	125.74	121.78	105.20	99.58	99.72	101.58	111.67	116.24
↓												
Selected Eto	(mm/month)	125.70	129.62	140.07	125.74	121.78	105.20	99.58	99.72	101.58	111.67	116.24

ETC=ETO*Kc*Area												
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Dry Season (Mar. to End of May)		Crop Area (ha)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1. Maize	597	Kc			0.55	0.85	0.88	0.28					
		ETC	0	0	45,992	63,809	63,979	17,585	0	0	0	0	0
2. Beans	31	Kc			0.56	0.83	1.00	0.63					
		ETC	0	0	1,826	2,562	3,091	1,984	0	0	0	0	0
3. Poteto	31	Kc			0.57	0.91	0.82						
		ETC	0	0	1,859	2,809	2,535	0	0	0	0	0	0
4. Tomato	30	Kc			0.45	0.75	1.15	0.80					
		ETC	0	0	1,420	2,240	3,440	2,438	0	0	0	0	0
Rainy Season (Jun. to End of Dec.)													
1. Paddy	459	Kc							1.10	1.10	1.05	1.00	0.18
		ETC	0	0	0	0	0	0	50,277	50,346	48,955	51,255	9,604
Adding for pre sowing (Special needs)													
Total consumptive use in the month			0	0	51,097	71,421	73,045	22,006	50,277	50,346	48,955	51,255	9,604
Net Irrigated area (ha)			0	0	665	665	665	665	568	568	568	537	475
Net Irrigation reqd. mm/ha			0	0	77	107	110	33	89	89	86	95	20
Effective Rainfall in mm (Koundja)			0	0	62	105	122	129	226	242	237	182	22
Net Irri. Required per month			0	0	15	2	-12	-96	-137	-153	-151	-87	-2
Net Irri. Required in cum			0	0	148	24	-122	-959	-1,375	-1,534	-1,508	-866	-18
Net Irri. Required per day			0	0	5	1	-4	-32	-46	-51	-50	-29	-1
Gross Irri Reqd. inclusive losses			0	0	11	2	-9	-68	-98	-109	-107	-62	-1
Irrigation required for whole area			0	0	7,028	1,137	-5,758	-45,426	-55,621	-62,044	-61,012	-33,104	-603
Design discharge lps/day			0	0	81	13	-67	-526	-644	-718	-706	-383	-7

PEAK WATER REQUIREMENT

81 lps

2. Kc per Growth Stage

DURATION OF GROWTH STAGE FOR FIELD CROP

Approximate Duration of Growth Stages for Various Field Crops

Crops	Initial Stage	Crop Development Stage	Mid Season Stage	Late Season Stage	Total	Remarks
Maize (grain)	20	30	30	25	105	*UNVDA hearing
Beans	20	30	50	20	120	*UNVDA hearing
Paddy	30	30	45	30	135	*UNVDA hearing
Poteto	20	25	25	20	90	*UNVDA hearing
Tomato	30	30	40	20	120	*UNVDA hearing
JamJam	N.A.	N.A.	N.A.	N.A.	N.A.	

Source : FAO Irrigation and Drainage Paper No.24, 56, "Crop evapotranspiration", published 1998

Crop Factor (Kc)

Values of the Crop Factor (Kc) for Various Crops and Growth Stages

Crops	Initial Stage	Crop Development Stage	Mid Season Stage	Late Season Stage	Remarks
Maize (grain)	0.45	0.75	1.05	0.55	*FAO24 p.60, 61
Beans	0.47	0.74	1.00	0.45	*FAO24 p.60, 62
Paddy	1.10	1.10	1.05	0.95	*FAO24 p.71。但し、Late season 後半は0.95から大幅に減少し、0.35と仮定した。
Poteto	0.47	0.76	1.05	0.70	*FAO24 p.60, 61
Tomato	0.47	0.76	1.05	0.60	*FAO24 p.60, 62
JamJam	0.47	0.74	1.00	0.45	同期間に育成可能で、必要水量の少ないBeansと同等とみなした。

3. Kc per month

Maize

Month	1st Month					2nd Month					3rd Month					4th Month					5th Month																			
Groth Stage	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30										
Groth Duration	20					30					30					25																								
Kc per Groth stage	0.45					0.75					1.05					0.55																								
Calculation I	$20/30 \times 0.45$					$10/30 \times 0.75$					$20/30 \times 0.75$					$10/30 \times 1.05$					$20/30 \times 1.05$					$10/30 \times 0.55$					$15/30 \times 0.55$									
	a					b					a					b					a					b														
Calculation II	$(20/30 \times 0.45 + 10/30 \times 0.75)$										$(20/30 \times 0.75 + 10/30 \times 1.05)$										$(20/30 \times 1.05 + 10/30 \times 0.55)$										$(15/30 \times 0.55)$									
Kc per month (a+b)	0.55										0.85										0.88										0.28									

Paddy

Month	1st Month					2nd Month					3rd Month					4th Month					5th Month																													
Groth Stage	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30																				
Groth Duration	30					30					45					15					15																													
Kc per Groth stage	1.1					1.1					1.05					0.95					0.35																													
Calculation I	$30/30 \times 1.1$					$30/30 \times 1.1$					$30/30 \times 1.05$					$15/30 \times 1.05$					$15/30 \times 0.95$					$15/30 \times 0.35$																								
	a					a					a					a					b					a																								
Calculation II	$(30/30 \times 1.1)$										$(30/30 \times 1.1)$										$(30/30 \times 1.05)$										$(15/30 \times 1.05 + 15/30 \times 0.95)$										$(15/30 \times 0.35)$									
Kc per month (a+b)	1.1										1.1										1.05										1.00										0.18									

Beans (Redbeans/Blackbeans)

Month	1st Month					2nd Month					3rd Month					4th Month					5th Month																			
Groth Stage	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30										
Groth Duration	20					30					50					20																								
Kc per Groth stage	0.47					0.74					1.00					0.45																								
Calculation I	$20/30 \times 0.47$					$10/30 \times 0.74$					$20/30 \times 0.74$					$10/30 \times 1.00$					$30/30 \times 1.00$					$10/30 \times 1.00$					$20/30 \times 0.45$									
	a					b					a					b					a					b														
Calculation II	$(20/30 \times 0.47 + 10/30 \times 0.74)$										$(20/30 \times 0.74 + 10/30 \times 1.00)$										$(30/30 \times 1.00)$										$(10/30 \times 1.00 + 20/30 \times 0.45)$									
Kc per month (a+b)	0.56										0.83										1.00										0.63									

Potato

Month	1st Month					2nd Month					3rd Month					4th Month					5th Month									
Groth Stage	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
Groth Duration	20					25					25					20														
Kc per Groth stage	0.47					0.76					1.05					0.7														
Calculation I	$20/30 \times 0.47$					$10/30 \times 0.76$					$15/30 \times 0.76$					$15/30 \times 1.05$					$10/30 \times 1.05$					$20/30 \times 0.7$				
	a					b					a					b					a					b				
Calculation II	$(20/30 \times 0.47 + 10/30 \times 0.76)$										$(15/30 \times 0.76 + 15/30 \times 1.05)$										$(10/30 \times 1.05 + 20/30 \times 0.7)$									
Kc per month (a+b)	0.57										0.91										0.82									

Tomato

Month	1st Month					2nd Month					3rd Month					4th Month					5th Month																			
Groth Stage	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30										
Groth Duration	30					30					40					20																								
Kc per Groth stage	0.45					0.75					1.15					0.8																								
Calculation I	$30/30 \times 0.45$					$30/30 \times 0.75$					$30/30 \times 1.15$					$10/30 \times 1.15$					$20/30 \times 0.8$																			
	a					a					a					a					b																			
Calculation II	$(30/30 \times 0.45)$										$(30/30 \times 0.75)$										$(30/30 \times 1.15)$										$(10/30 \times 1.15 + 20/30 \times 0.8)$									
Kc per month (a+b)	0.45										0.75										1.15										0.92									

4. Irrigation efficiency

Irrigation efficiency (Ep) = Ea*Eb*Ec=0.32*0.8*0.9= 0.2304

a. Conveyance Efficiency (Ec)				
Continuous supply with no substantial change in flow			0.9	
Rotational supply in projects of 3000 - 7000 ha and rotation areas of 70 - 300 ha, with effective management			0.8	
Rotational supply in large schemes (> 10000 ha) and small schemes (< 1000ha) with respective	based on predetermined schedule		0.7	
	based on advance request		0.65	
b. Field Canal Efficiency (Eb)				
Blocks larger than 20 ha:	unlined		0.8	
	lined or piped		0.9	
Blocks up to 20 ha:	unlined		0.7	
	lined or piped		0.8	
c. Distribution Efficiency (Ed = Ec * Eb)				
Average for rotational supply with management and communication	adequate		0.65	
	sufficient		0.55	
	insufficient		0.4	
	poor		0.3	
d. Field Application Efficiency (Ea)				
Surface methods	light soils		0.55	
	medium soils		0.7	
	heavy soils		0.6	
	graded border	0.60 - 0.75		0.53
	basin and level border	0.60 - 0.80		0.58
	contour ditch	0.50 - 0.55		-
	furrow	0.55 - 0.70		0.57
	corrugation	0.50 - 0.70		-
Subsurface	up to 0.80		-	
Sprinkler	hot dry climate	0.6		-
	moderate climate	0.7		0.67
	humid and cool	0.8		-
Rice				0.32

Reference: FAO Irrigation and Drainage Paper 24 (Revised 1977) Crop Water Requirements

5. Eto Penman Montieith

Method: Penman-Montieith equation
Place: Ndop

Table Crop Evapotranspiration

Longitude: 10 E°
Latitude : 6 N°
Altitude : 1,160 m above sea level

Data and elements	Unit	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
		1	2	3	4	5	6	7	8	9	10	11	12
1. Monthly average daily maximum temperature	Tmax °C	29.2	30.5	29.6	28.0	26.7	25.7	24.7	24.8	25.2	25.9	27.2	28.4
2. Monthly average daily minimum temperature	Tmin °C	14.7	15.9	17.2	17.5	17.0	16.4	16.2	16.7	16.0	16.2	15.3	14.3
3. Wind speed	uz m/sec	1.30	1.60	1.60	1.40	1.20	1.10	1.10	1.00	1.10	1.20	1.30	1.20
4. Mean relative humidity	RI mean %	61.0	60.0	64.0	70.0	71.0	73.0	74.0	74.0	74.0	72.0	68.0	63.0
5. Sunshine hour	n hour	7.8	8.0	6.8	6.5	6.8	5.8	4.5	4.3	4.6	5.8	7.5	8.2

Parameters

Mean monthly temprature	Tmean °C	22.0	23.2	23.4	22.8	21.9	21.1	20.5	20.8	20.6	21.1	21.3	21.4
Slope of saturation vapour pressure curve	Δ kPa/°C	0.16	0.17	0.17	0.17	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.16
Altitude [atmospheric pressure]	P kPa	88.3											
Latitude [radian]	φ rad	0.1											
Psychrometric constant	γ kPa/°C	0.059											
Height of wind speed measurement	z m	10											
Windspeed at 2 m above ground surface	u2 ms ⁻¹	0.97	1.20	1.20	1.05	0.90	0.82	0.82	0.75	0.82	0.90	0.97	0.90
1+0.34u2		1.33	1.41	1.41	1.36	1.31	1.28	1.28	1.25	1.28	1.31	1.33	1.31
Δ/(Δ+γ*(1+0.34*u2))		0.67	0.68	0.68	0.68	0.68	0.67	0.66	0.67	0.67	0.67	0.66	0.67
γ/(Δ+γ*(1+0.34*u2))		0.25	0.23	0.23	0.24	0.25	0.26	0.26	0.26	0.26	0.26	0.25	0.25
(900/(Tmean+273))*u2		2.97	3.64	3.63	3.19	2.74	2.52	2.52	2.26	2.52	2.75	2.97	2.74

Vapour pressure deficit

Saturation vapour pressure for Tmax	e°(Tmax) kPa	4.05	4.37	4.15	3.78	3.50	3.30	3.11	3.13	3.21	3.34	3.61	3.87
Saturation vapour pressure for Tmin	e°(Tmin) kPa	1.67	1.81	1.96	2.00	1.94	1.87	1.84	1.90	1.82	1.84	1.74	1.63
Saturation vapour pressure	es kPa	2.86	3.09	3.05	2.89	2.72	2.58	2.48	2.52	2.51	2.59	2.67	2.75
Actual vapour pressure	ea kPa	1.24	1.32	1.49	1.63	1.59	1.57	1.55	1.59	1.55	1.53	1.40	1.24
Vapour pressure deficit	es-ea kPa	1.62	1.77	1.56	1.26	1.13	1.02	0.92	0.92	0.97	1.06	1.27	1.51

Radiation

Number of the day in the year	J days	15	45	76	106	137	167	197	228	258	289	319	349
Inverse relative distance Earth-Sun	dr rad	1.032	1.024	1.009	0.992	0.977	0.968	0.968	0.977	0.991	1.009	1.023	1.032
Solar declination	δ rad	-0.37	-0.24	-0.03	0.17	0.34	0.41	0.37	0.23	0.04	-0.18	-0.33	-0.41
Sunset hour angle	ωs rad	1.530	1.546	1.567	1.589	1.608	1.616	1.612	1.596	1.575	1.552	1.534	1.525
sin(φ)sin(δ)		-0.038	-0.024	-0.003	0.018	0.035	0.041	0.038	0.024	0.004	-0.018	-0.034	-0.041
cos(φ)cos(δ)		0.927	0.967	0.994	0.980	0.939	0.913	0.927	0.968	0.994	0.979	0.939	0.913
Extraterrestrial radiation	Ra MJm ⁻² day ⁻¹	33.7	35.7	37.5	37.6	36.5	35.6	35.9	36.9	37.3	36.0	34.1	32.9
Maximum possible duration of daylight hours	N hours	11.7	11.8	12.0	12.1	12.3	12.3	12.2	12.0	11.9	11.7	11.7	11.7
Solar radiation	Rs MJm ⁻² day ⁻¹	19.66	21.04	20.01	19.45	19.21	17.28	15.54	15.74	16.43	17.83	19.42	19.82
Clear-sky solar radiation	Rso MJm ⁻² day ⁻¹	26.05	27.63	28.97	29.05	28.20	27.55	27.77	28.55	28.80	27.87	26.34	25.46
Net solar radiation	Rns MJm ⁻² day ⁻¹	15.14	16.20	15.41	14.98	14.79	13.30	11.97	12.12	12.65	13.73	14.95	15.26
Monthly average daily maximum temprature	Tmax K	302.4	303.7	302.8	301.2	299.9	298.9	297.9	298.0	298.4	299.1	300.4	301.6
Monthly average daily minimum temprature	Tmin K	287.9	289.1	290.4	290.7	290.2	289.6	289.4	289.9	289.2	289.4	288.5	287.5
σTmax,K ²		41.0	41.7	41.2	40.3	39.6	39.1	38.6	38.6	38.9	39.2	39.9	40.5
σTmin,K ²		33.7	34.2	34.9	35.0	34.8	34.5	34.4	34.6	34.3	34.4	33.9	33.5
(σTmax,K ⁴ +σTmin,K ⁴)/2		37.3	38.0	38.0	37.7	37.2	36.8	36.5	36.6	36.6	36.8	36.9	37.0
0.34*0.14*√ea		0.18	0.18	0.17	0.16	0.16	0.16	0.17	0.16	0.17	0.17	0.17	0.18
1.35*Rs/Rso-0.33		0.67	0.68	0.58	0.55	0.57	0.50	0.41	0.39	0.42	0.51	0.65	0.70
Net longwave radiation	Rnl MJm ⁻² day ⁻¹	4.6	4.6	3.7	3.4	3.5	3.0	2.4	2.4	2.5	3.1	4.2	4.8
Net radiation	Rn MJm ⁻² day ⁻¹	10.5	11.6	11.7	11.6	11.3	10.3	9.5	9.8	10.1	10.6	10.8	10.5
Soil heat flux	G MJm ⁻² day ⁻¹	0.08	0.18	0.03	-0.09	-0.13	-0.11	-0.08	0.04	-0.02	0.06	0.03	0.01
Rn-G		10.46	11.41	11.64	11.71	11.45	10.40	9.60	9.72	10.13	10.51	10.77	10.47
0.408*(Rn-G)		4.27	4.65	4.75	4.78	4.67	4.24	3.92	3.97	4.13	4.29	4.39	4.27
(Δ/(Δ+γ*(1+0.34u2)))*(0.408(Rn-G))		2.87	3.14	3.22	3.24	3.16	2.85	2.60	2.66	2.75	2.86	2.92	2.86
(γ/(Δ+γ*(1+0.34u2)))*(900/(T+273))*u2*(es-ea)		1.18	1.49	1.30	0.95	0.77	0.66	0.61	0.55	0.64	0.74	0.95	1.05

Grass reference evapotranspiration	ETo mm/day	4.05	4.63	4.52	4.19	3.93	3.51	3.21	3.22	3.39	3.60	3.87	3.91
	mm/month	126	130	140	126	122	105	100	100	102	112	116	121

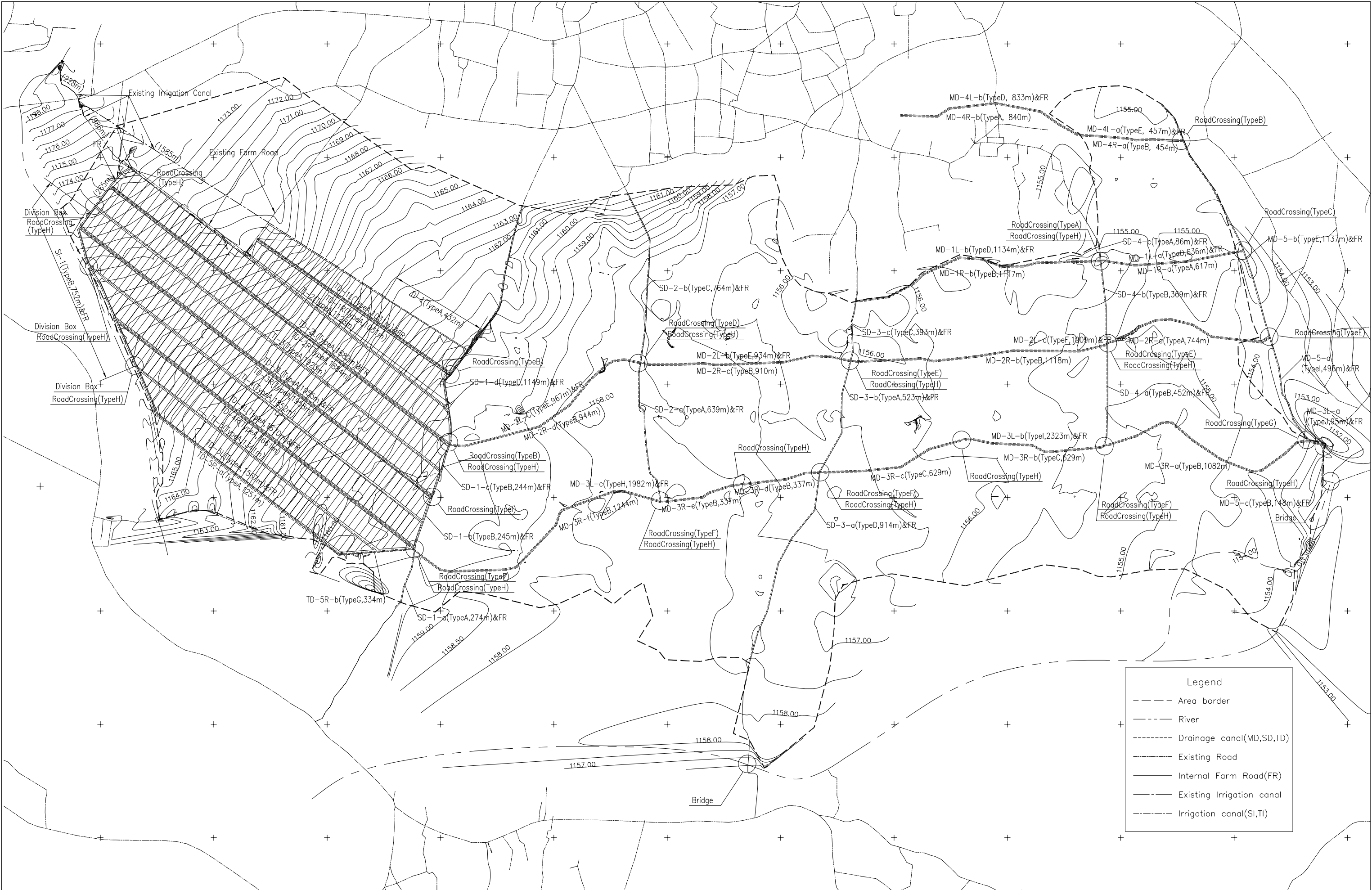
Source : FAO Irrigation and Drainage Paper No.56, "Crop evapotranspiration", published 1998

mm/year 1398.07

7. List of Drawings (Irrigation Component)

Title	Nos	Page
General Plan	1	A-30
Drainage Canal and Farm Road	1	A-31
Main Drainage Plan and Profile	9	A-32, 33, 34, 35, 36, 37, 38, 39,40
Tractor Passage	1	A-41
Farm Road Crossing	2	A-42, 43
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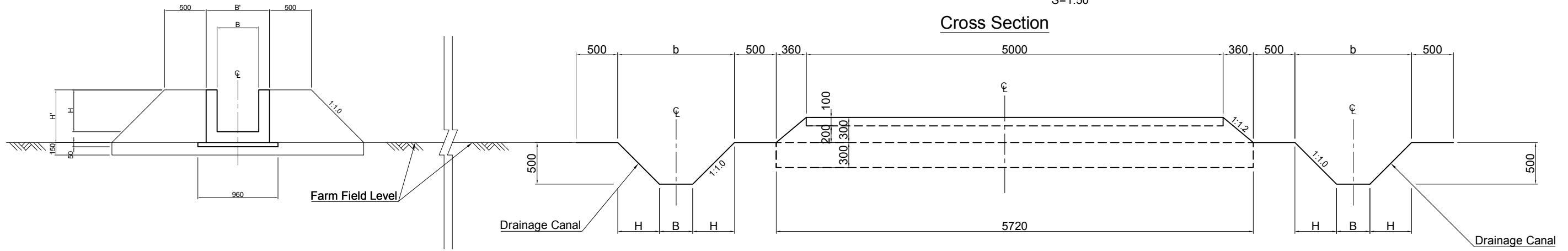
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	NTC		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			GENERAL PLAN			

Drainage Canal and Farm Road

Farm Road TypeA

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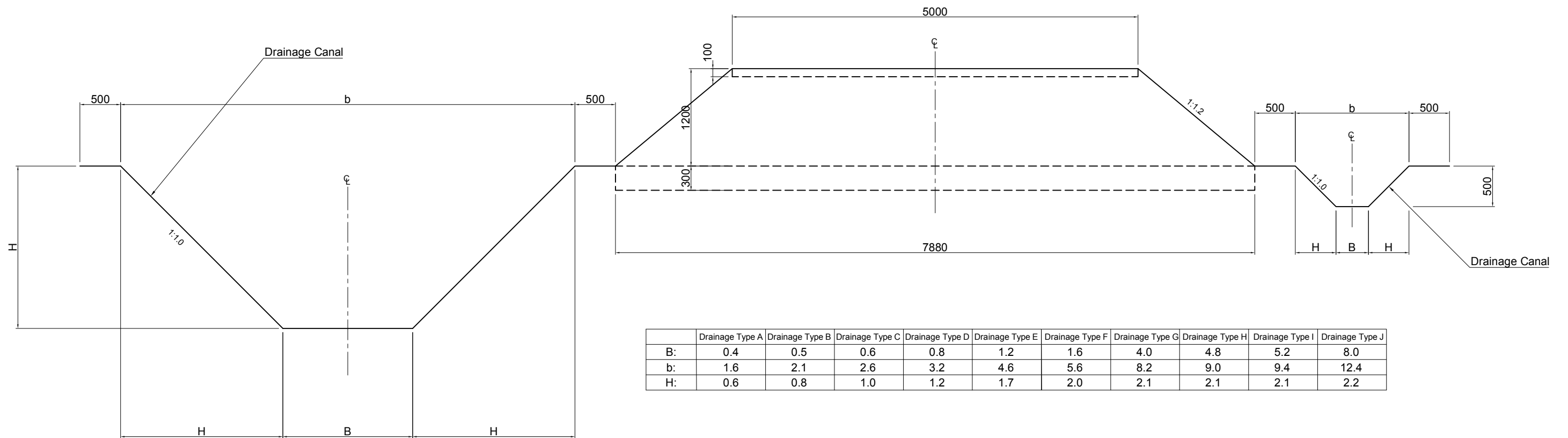
Cross Section



Farm Road TypeB

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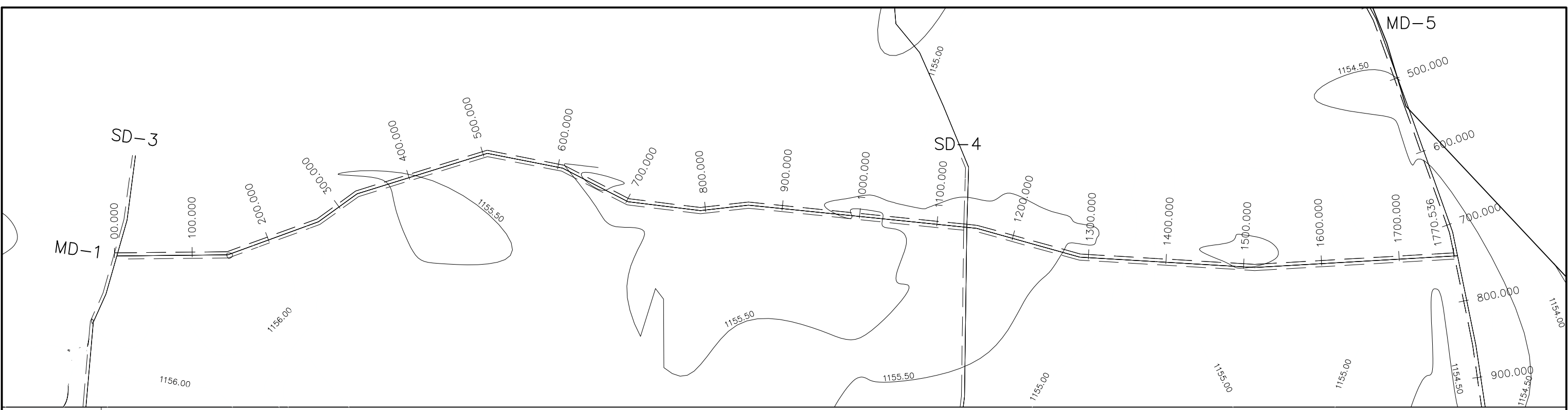
Cross Section



	Drainage Type A	Drainage Type B	Drainage Type C	Drainage Type D	Drainage Type E	Drainage Type F	Drainage Type G	Drainage Type H	Drainage Type I	Drainage Type J
B:	0.4	0.5	0.6	0.8	1.2	1.6	4.0	4.8	5.2	8.0
b:	1.6	2.1	2.6	3.2	4.6	5.6	8.2	9.0	9.4	12.4
H:	0.6	0.8	1.0	1.2	1.7	2.0	2.1	2.1	2.1	2.2

 MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT JAPAN INTERNATIONAL COOPERATION AGENCY NTC INTERNATIONAL CO., LTD.	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
		DRAINAGE CANAL AND FARM ROAD	1:50		

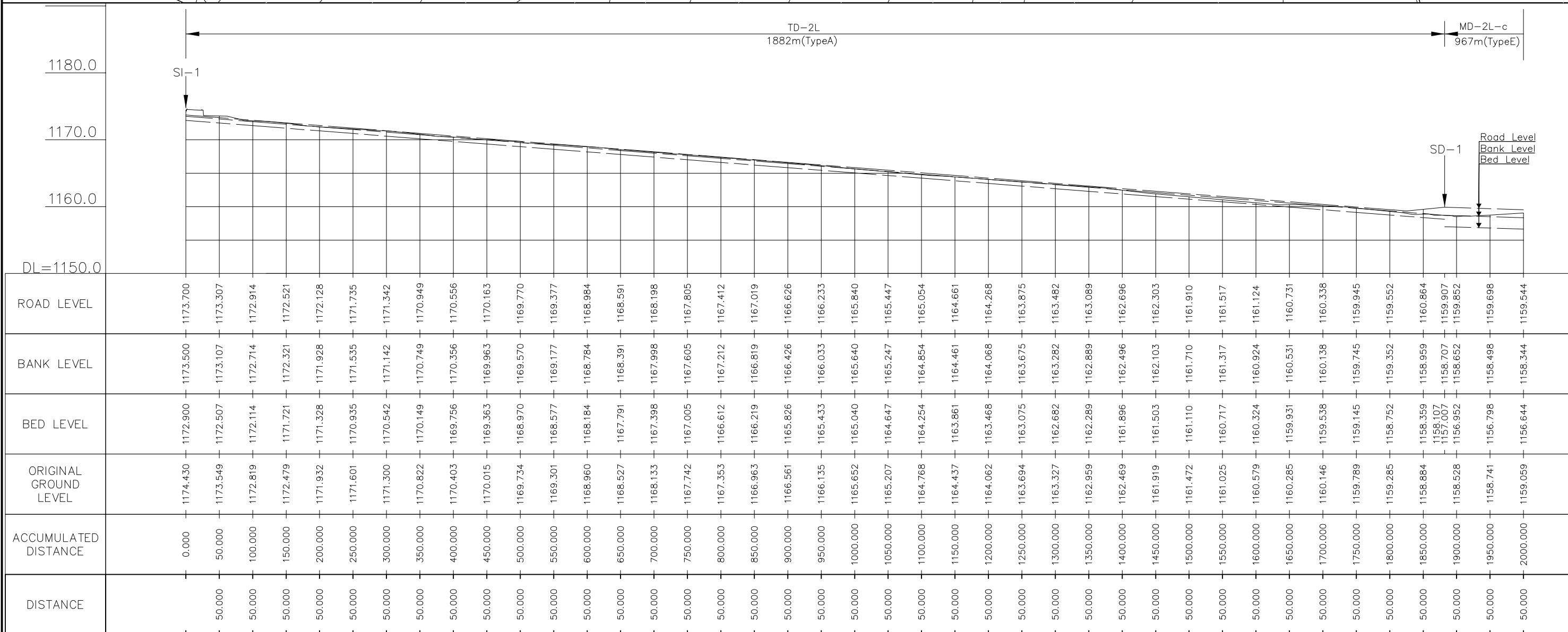
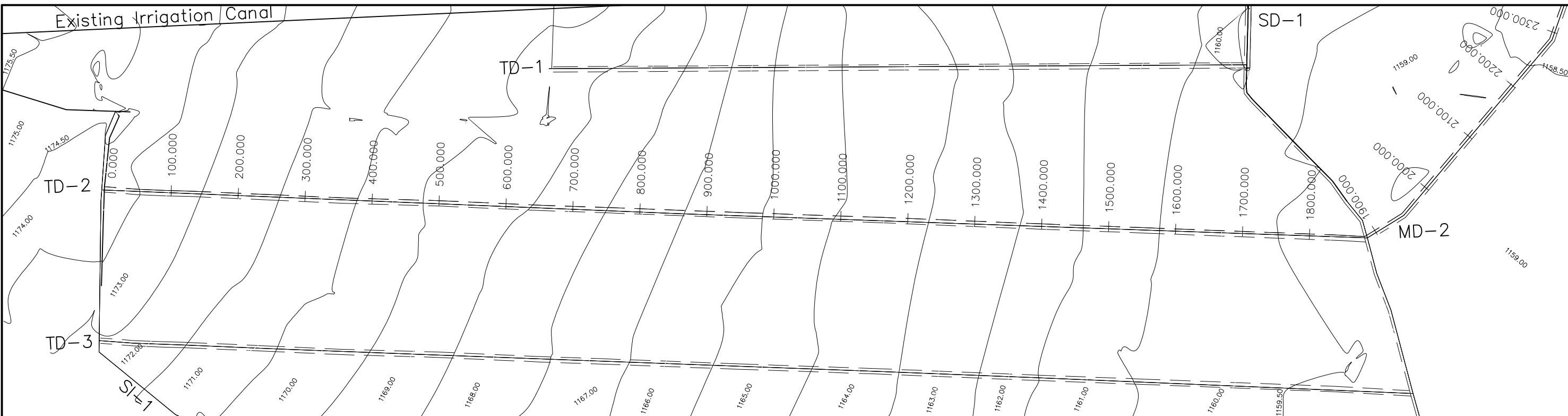
A-32



	MD-1L-b 1134m(TypeD)																	MD-1L-a 636m(TypeD)																				
ROAD LEVEL	1157.210	1157.181	1157.153	1157.124	1157.096	1157.067	1157.039	1157.010	1156.981	1156.953	1156.924	1156.896	1156.867	1156.839	1156.810	1156.781	1156.753	1156.724	1156.696	1156.667	1156.639	1156.610	1156.581	1156.562	1156.553	1156.524	1156.496	1156.468	1156.439	1156.411	1156.382	1156.354	1156.325	1156.297	1156.269	1156.240	1156.212	1156.200
BANK LEVEL	1156.010	1155.981	1155.953	1155.924	1155.896	1155.867	1155.839	1155.810	1155.781	1155.753	1155.724	1155.696	1155.667	1155.639	1155.610	1155.581	1155.553	1155.524	1155.496	1155.467	1155.439	1155.410	1155.381	1155.362	1155.353	1155.324	1155.296	1155.268	1155.239	1155.211	1155.182	1155.154	1155.125	1155.097	1155.069	1155.040	1155.012	1155.000
BED LEVEL	1154.810	1154.781	1154.753	1154.724	1154.696	1154.667	1154.639	1154.610	1154.581	1154.553	1154.524	1154.496	1154.467	1154.439	1154.410	1154.381	1154.353	1154.324	1154.296	1154.267	1154.239	1154.210	1154.181	1154.162	1154.153	1154.124	1154.096	1154.068	1154.039	1154.011	1153.982	1153.954	1153.925	1153.897	1153.869	1153.840	1153.812	1153.800
ORIGINAL GROUND LEVEL	1156.010	1156.241	1156.107	1155.941	1155.989	1156.385	1156.188	1155.956	1155.688	1155.855	1156.079	1156.014	1155.827	1155.895	1155.292	1155.305	1155.557	1155.481	1155.652	1155.813	1155.474	1156.129	1156.160	1156.543	1156.157	1155.906	1155.711	1155.256	1155.620	1155.764	1155.898	1155.816	1155.657	1155.575	1155.356	1155.312	1155.501	
ACCUMULATED DISTANCE	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000	1250.000	1300.000	1350.000	1400.000	1450.000	1500.000	1550.000	1600.000	1650.000	1700.000	1750.000	1770.536	
DISTANCE		50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	20.536		

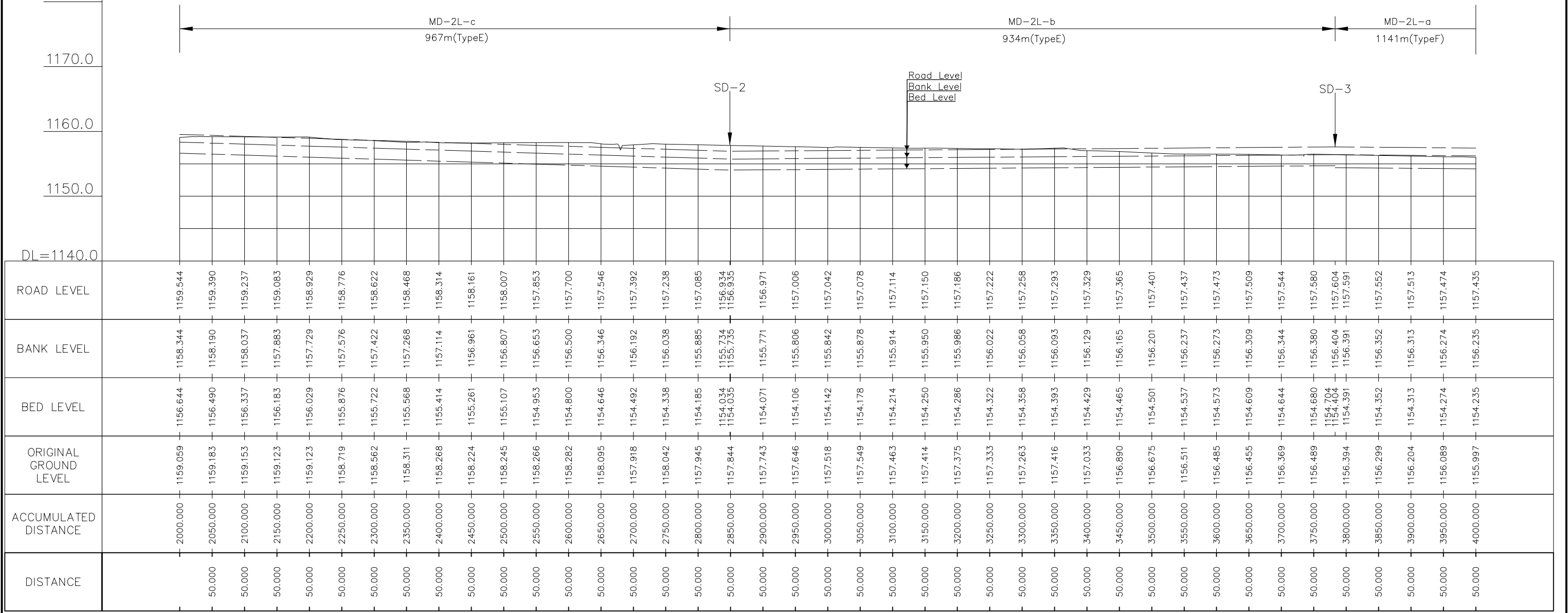
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD1-1
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 1 PLAN AND PROFILE 0.000-1770.536	SCALE	APPROVED BY	SERIAL NO.
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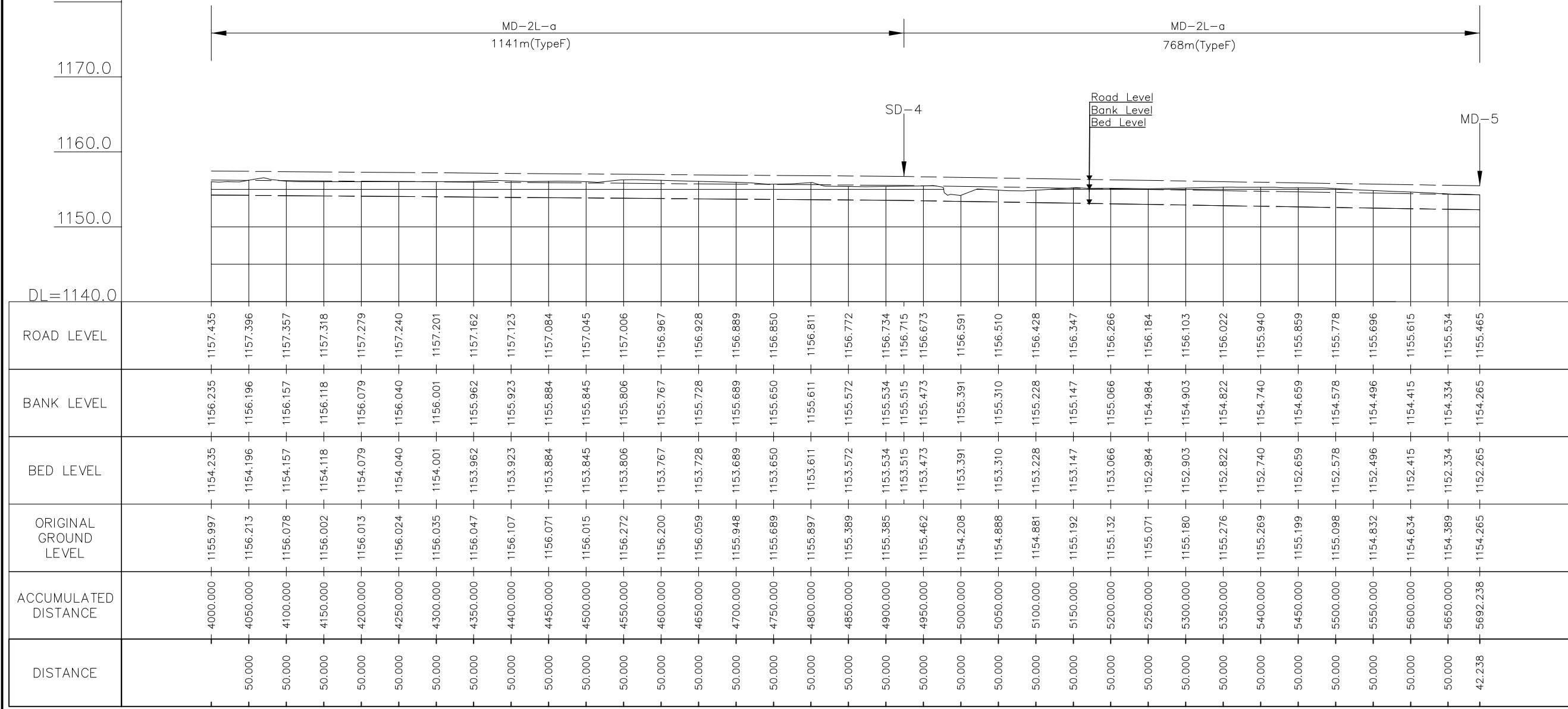
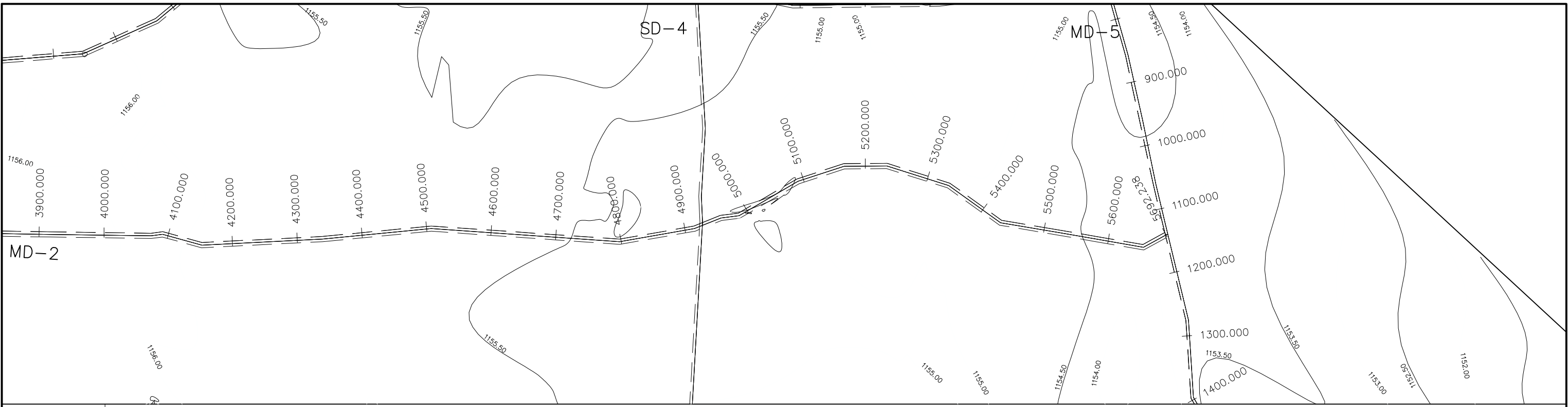
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD2-1
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 2 PLAN AND PROFILE 0.000-2000.000	SCALE	APPROVED BY	SERIAL NO.
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A-34



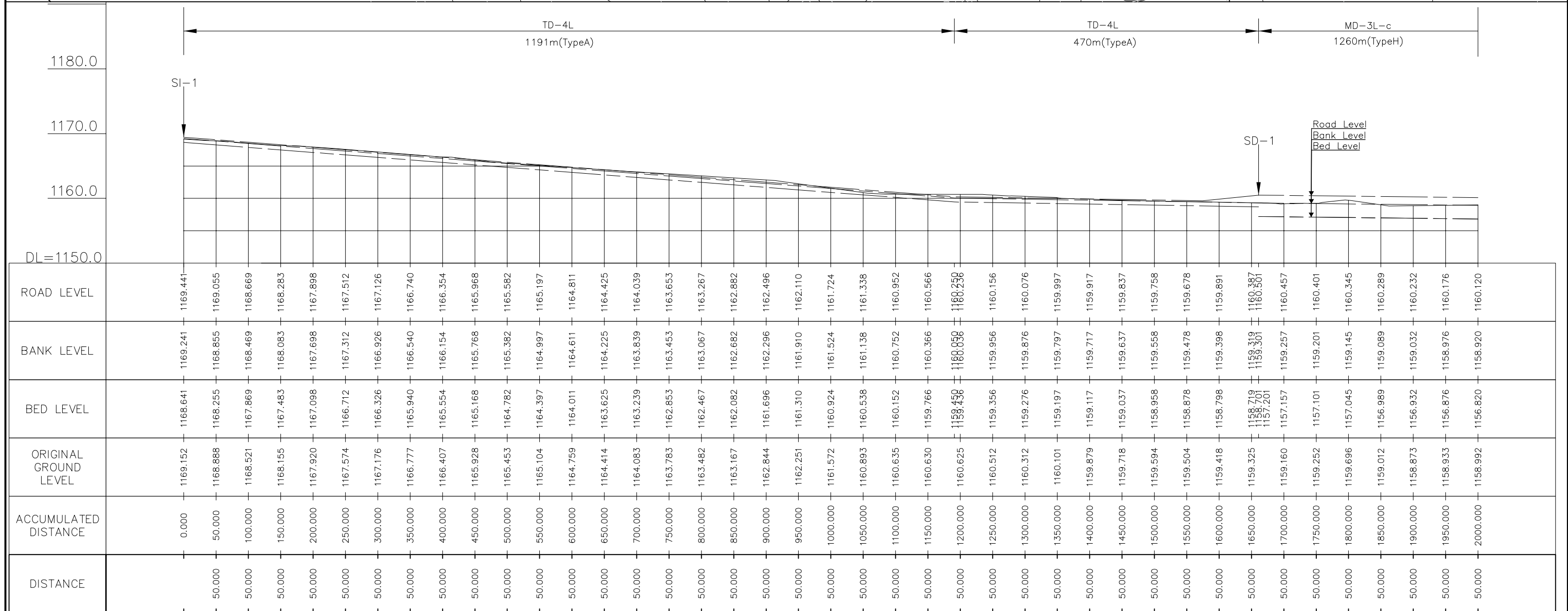
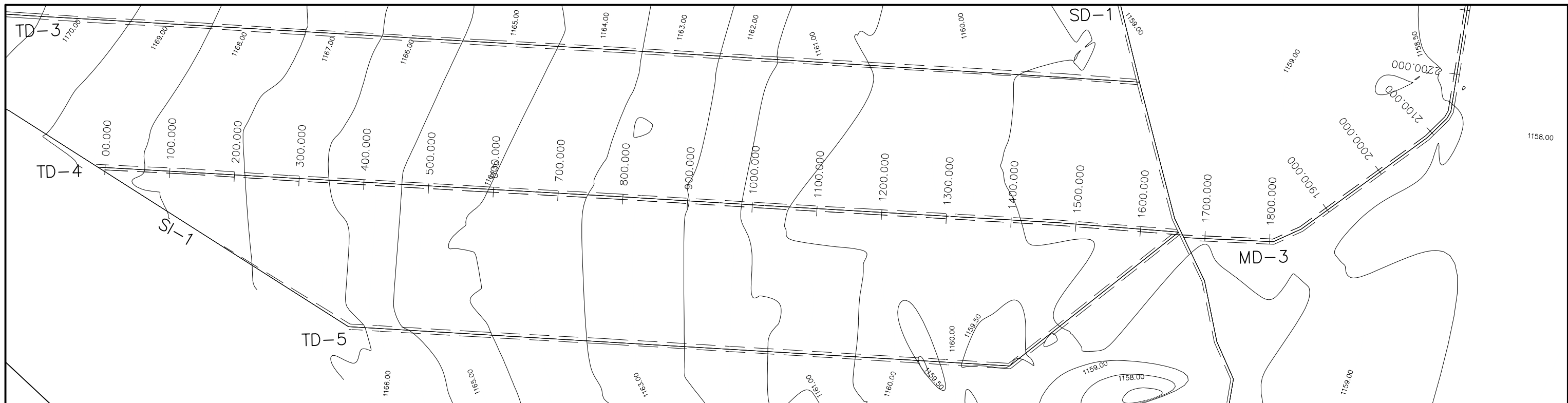
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD2-2
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 2 PLAN AND PROFILE 2000.000-4000.000	SCALE	APPROVED BY	SERIAL NO.
				1:6000		

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ROAD LEVEL	BANK LEVEL	BED LEVEL	ORIGINAL GROUND LEVEL	ACCUMULATED DISTANCE	DISTANCE
1157.435	1156.235	1154.235	1155.997	4000.000	0.000
1157.396	1156.196	1154.196	1156.213	4050.000	50.000
1157.357	1156.157	1154.157	1156.078	4100.000	50.000
1157.318	1156.118	1154.118	1156.002	4150.000	50.000
1157.279	1156.079	1154.079	1156.013	4200.000	50.000
1157.240	1156.040	1154.040	1156.024	4250.000	50.000
1157.201	1156.001	1154.001	1156.035	4300.000	50.000
1157.162	1155.962	1153.962	1156.047	4350.000	50.000
1157.123	1155.923	1153.923	1156.107	4400.000	50.000
1157.084	1155.884	1153.884	1156.071	4450.000	50.000
1157.045	1155.845	1153.845	1156.015	4500.000	50.000
1157.006	1155.806	1153.806	1156.272	4550.000	50.000
1156.967	1155.767	1153.767	1156.200	4600.000	50.000
1156.928	1155.728	1153.728	1156.059	4650.000	50.000
1156.889	1155.689	1153.689	1155.948	4700.000	50.000
1156.850	1155.650	1153.650	1155.689	4750.000	50.000
1156.811	1155.611	1153.611	1155.897	4800.000	50.000
1156.772	1155.572	1153.572	1155.389	4850.000	50.000
1156.734	1155.534	1153.534	1155.385	4900.000	50.000
1156.715	1155.515	1153.515	1155.462	4950.000	50.000
1156.673	1155.473	1153.473	1155.208	5000.000	50.000
1156.591	1155.391	1153.391	1154.888	5050.000	50.000
1156.510	1155.310	1153.310	1154.881	5100.000	50.000
1156.428	1155.228	1153.228	1155.192	5150.000	50.000
1156.347	1155.147	1153.147	1155.132	5200.000	50.000
1156.266	1155.066	1153.066	1155.071	5250.000	50.000
1156.184	1154.984	1152.984	1155.180	5300.000	50.000
1156.103	1154.903	1152.903	1155.276	5350.000	50.000
1156.022	1154.822	1152.822	1155.269	5400.000	50.000
1155.940	1154.740	1152.740	1155.199	5450.000	50.000
1155.859	1154.659	1152.659	1155.098	5500.000	50.000
1155.778	1154.578	1152.578	1154.832	5550.000	50.000
1155.696	1154.496	1152.496	1154.634	5600.000	50.000
1155.615	1154.415	1152.415	1154.389	5650.000	50.000
1155.534	1154.334	1152.334	1154.265	5692.238	42.238

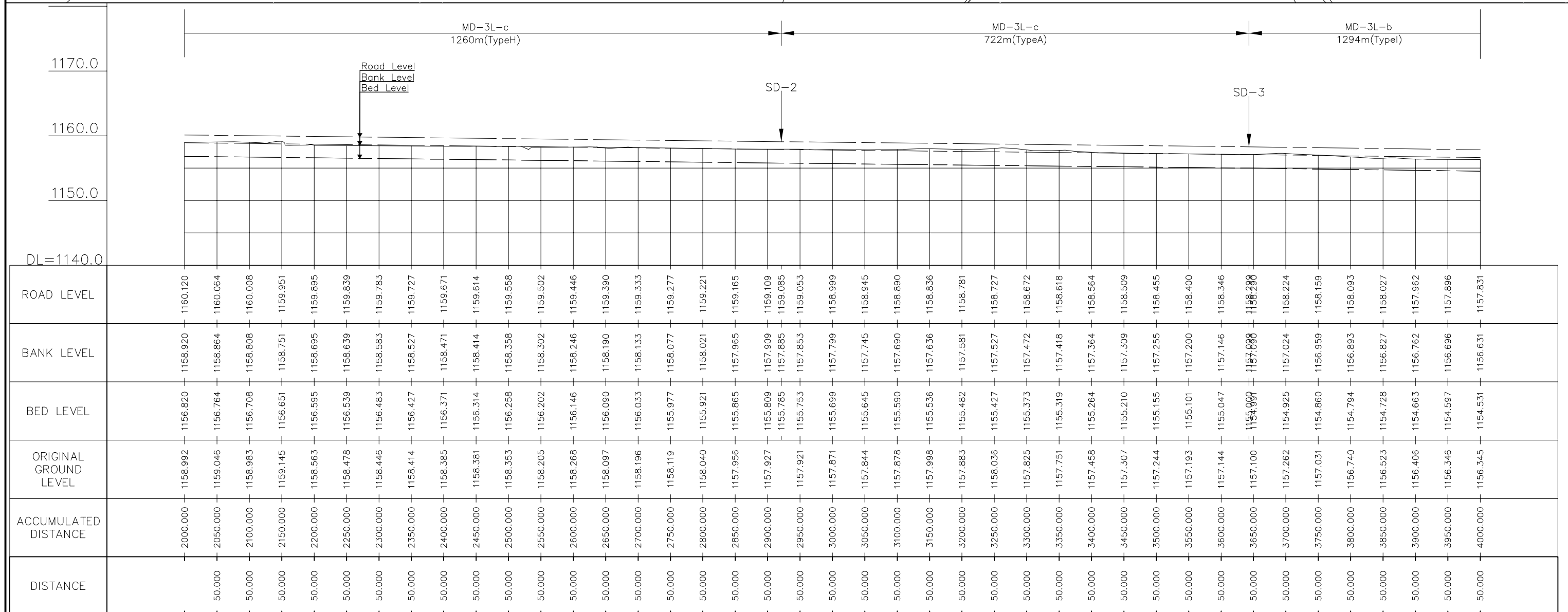
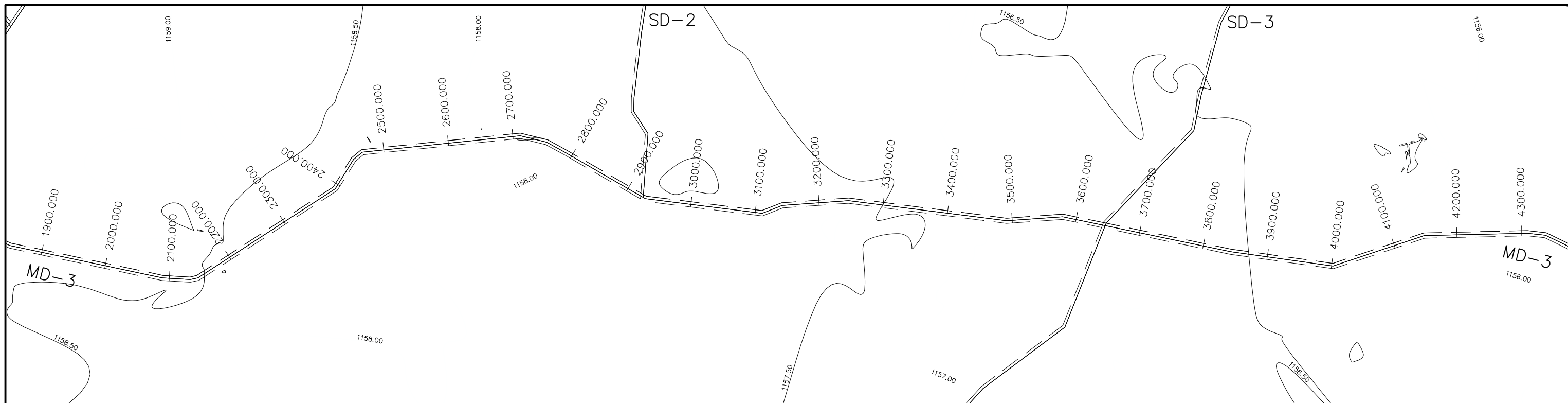
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	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 2 PLAN AND PROFILE 4000.000-5692.238	SCALE	APPROVED BY	SERIAL NO.
				1:6000		



ROAD LEVEL	BANK LEVEL	BED LEVEL	ORIGINAL GROUND LEVEL	ACCUMULATED DISTANCE	DISTANCE
1169.441	1169.241	1168.641	1169.152	0.000	0.000
1169.055	1168.855	1168.255	1168.888	50.000	50.000
1168.669	1168.469	1167.869	1168.521	100.000	100.000
1168.283	1168.083	1167.483	1168.155	150.000	150.000
1167.898	1167.698	1167.098	1167.920	200.000	200.000
1167.512	1167.312	1166.712	1167.574	250.000	250.000
1167.126	1166.926	1166.326	1167.176	300.000	300.000
1166.740	1166.540	1165.940	1166.777	350.000	350.000
1166.354	1166.154	1165.554	1166.407	400.000	400.000
1165.968	1165.768	1165.168	1165.928	450.000	450.000
1165.582	1165.382	1164.782	1165.453	500.000	500.000
1165.197	1164.997	1164.397	1165.104	550.000	550.000
1164.811	1164.611	1164.011	1164.759	600.000	600.000
1164.425	1164.225	1163.625	1164.414	650.000	650.000
1164.039	1163.839	1163.239	1164.083	700.000	700.000
1163.653	1163.453	1162.853	1163.783	750.000	750.000
1163.267	1163.067	1162.467	1163.482	800.000	800.000
1162.882	1162.682	1162.082	1163.167	850.000	850.000
1162.496	1162.296	1161.696	1162.844	900.000	900.000
1162.110	1161.910	1161.310	1162.251	950.000	950.000
1161.724	1161.524	1160.924	1161.572	1000.000	1000.000
1161.338	1161.138	1160.538	1160.893	1050.000	1050.000
1160.952	1160.752	1160.152	1160.635	1100.000	1100.000
1160.566	1160.366	1159.766	1160.630	1150.000	1150.000
1160.180	1160.058	1159.458	1160.625	1200.000	1200.000
1159.794	1159.956	1159.356	1160.512	1250.000	1250.000
1159.408	1159.876	1159.276	1160.312	1300.000	1300.000
1159.022	1159.797	1159.197	1160.101	1350.000	1350.000
1158.636	1159.717	1159.117	1159.879	1400.000	1400.000
1158.250	1159.637	1159.037	1159.718	1450.000	1450.000
1157.864	1159.558	1158.958	1159.594	1500.000	1500.000
1157.478	1159.478	1158.878	1159.504	1550.000	1550.000
1157.092	1159.398	1158.798	1159.418	1600.000	1600.000
1156.706	1159.319	1158.719	1159.325	1650.000	1650.000
1156.320	1159.240	1158.640	1159.252	1700.000	1700.000
1155.934	1159.161	1158.561	1159.160	1750.000	1750.000
1155.548	1159.082	1158.482	1159.074	1800.000	1800.000
1155.162	1159.003	1158.403	1159.012	1850.000	1850.000
1154.776	1158.924	1158.324	1158.873	1900.000	1900.000
1154.390	1158.845	1158.245	1158.733	1950.000	1950.000
1154.004	1158.766	1158.166	1158.633	2000.000	2000.000

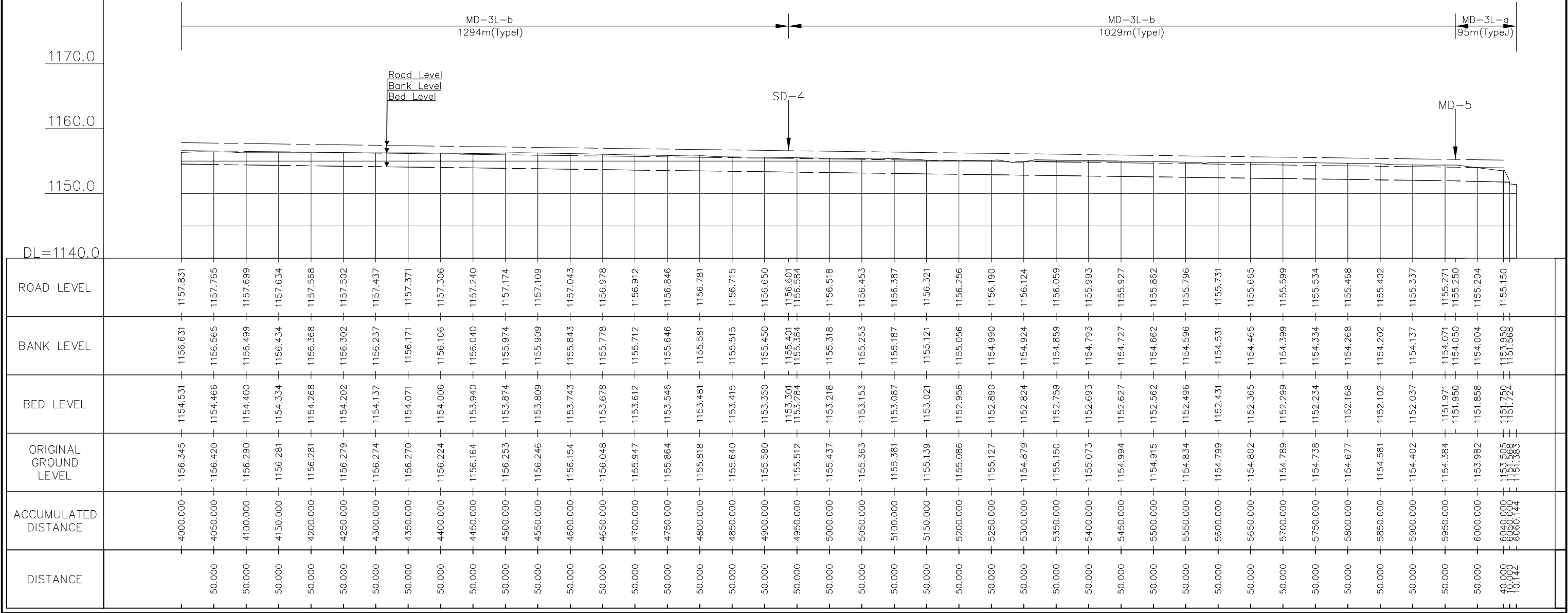
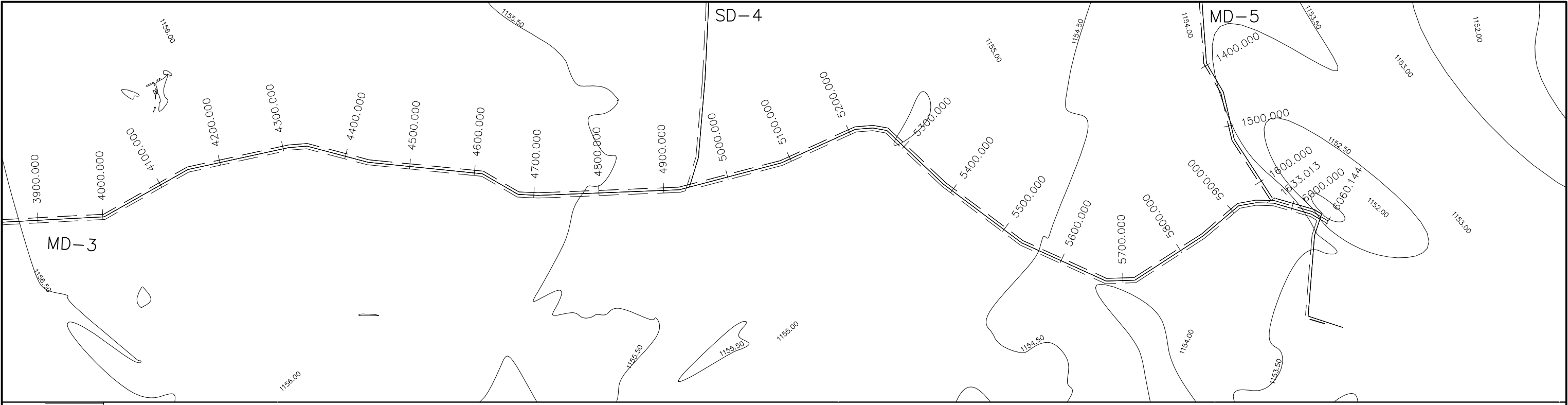
	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD3-1
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 3 PLAN AND PROFILE 0.000-2000.000	SCALE	APPROVED BY	SERIAL NO.
				1:6000		

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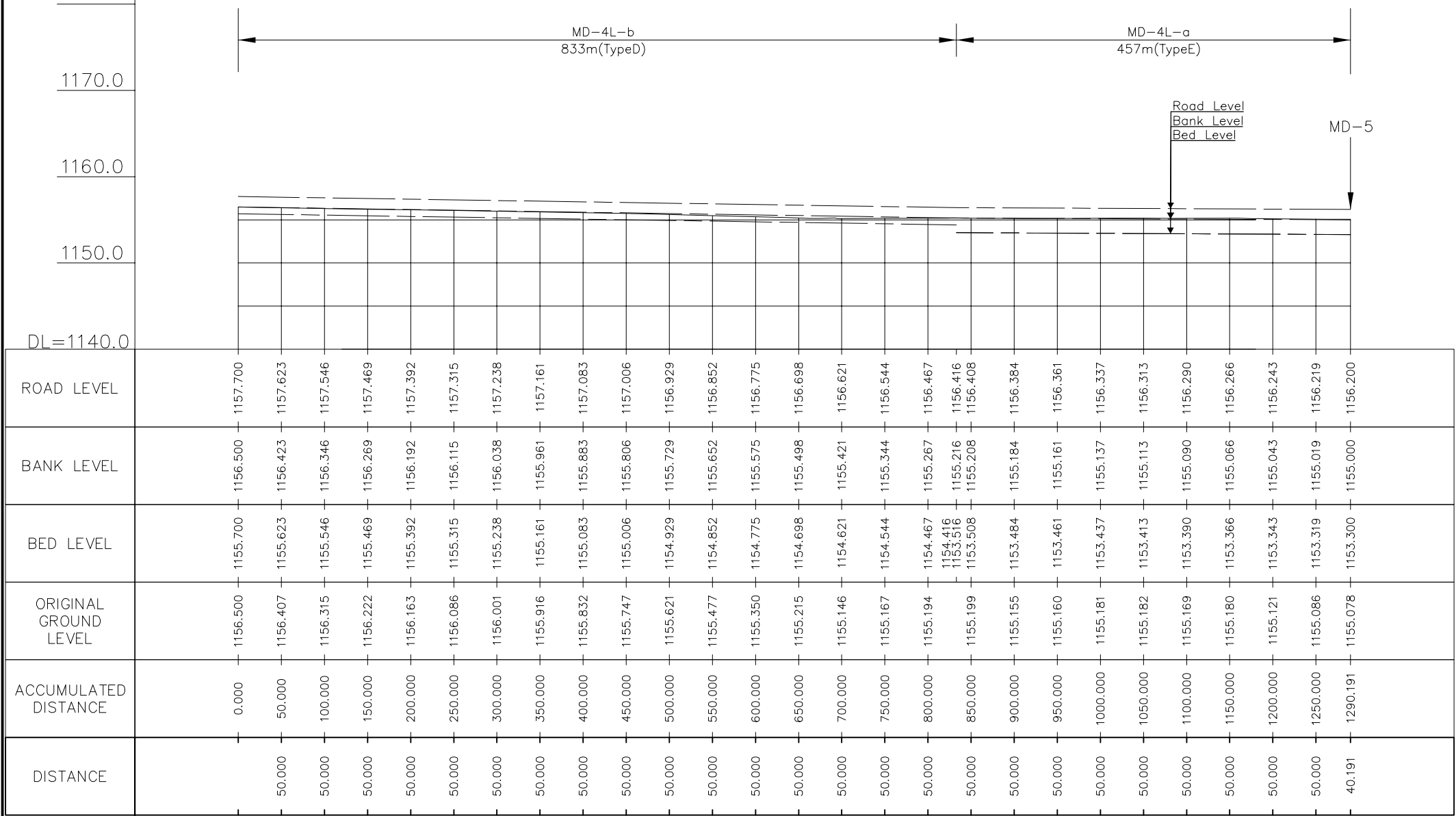
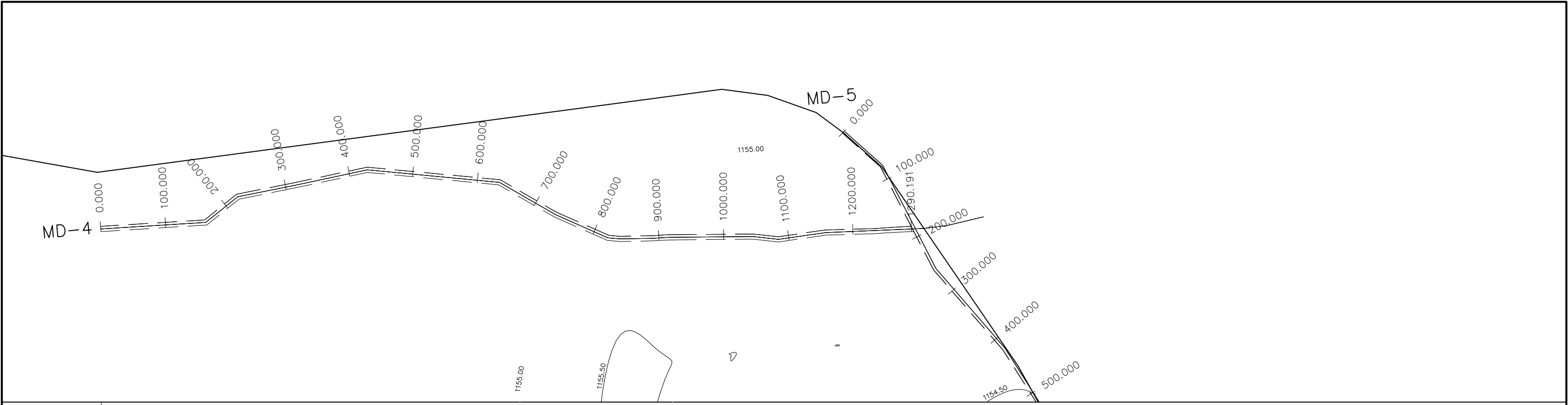


	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD3-2
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 3 PLAN AND PROFILE 2000.000-4000.000	SCALE	APPROVED BY	SERIAL NO.
				1:6000		

A-38



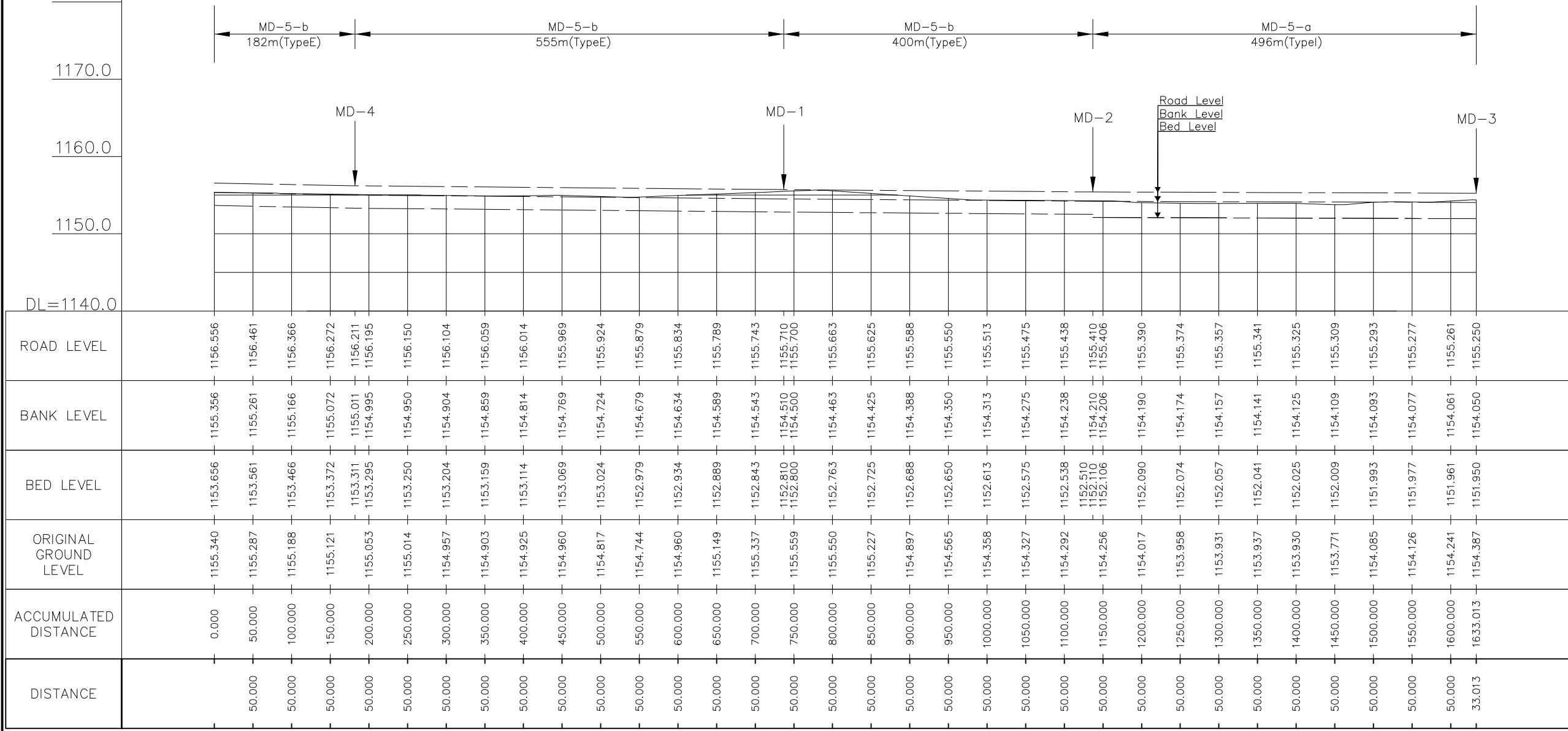
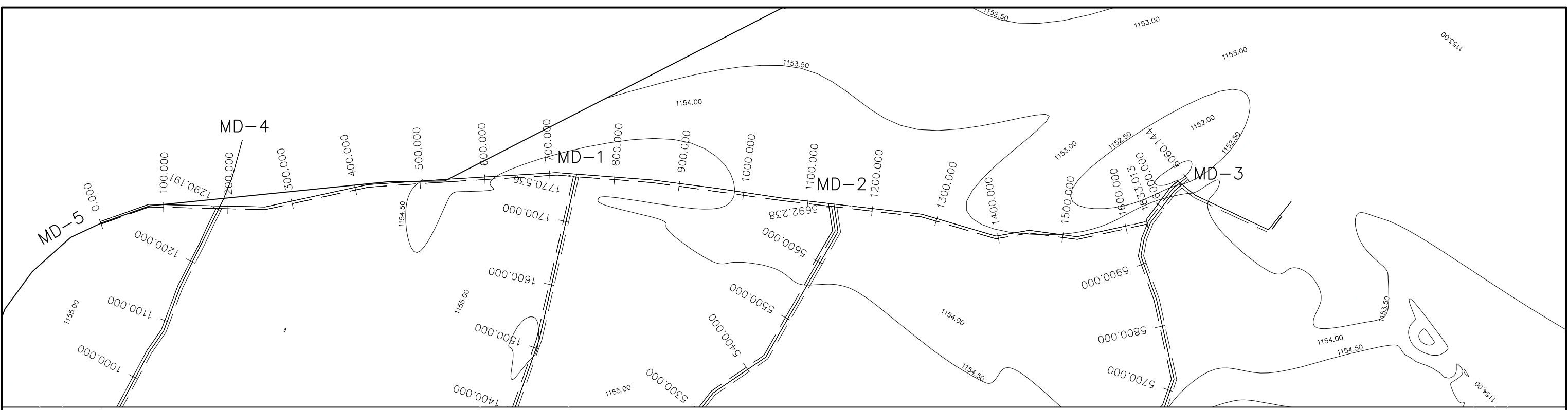
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD3-3
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 3 PLAN AND PROFILE 4000.000-6060.144	SCALE	APPROVED BY	SERIAL NO.
				1:6000		



	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000	1250.000	1290.191	
ROAD LEVEL	1157.700	1157.623	1157.546	1157.469	1157.392	1157.315	1157.238	1157.161	1157.083	1157.006	1156.929	1156.852	1156.775	1156.698	1156.621	1156.544	1156.467	1156.416	1156.408	1156.384	1156.361	1156.337	1156.313	1156.290	1156.266	1156.243	1156.219	1156.200
BANK LEVEL	1156.500	1156.423	1156.346	1156.269	1156.192	1156.115	1156.038	1155.961	1155.883	1155.806	1155.729	1155.652	1155.575	1155.498	1155.421	1155.344	1155.267	1155.216	1155.208	1155.184	1155.161	1155.137	1155.113	1155.090	1155.066	1155.043	1155.019	1155.000
BED LEVEL	1155.700	1155.623	1155.546	1155.469	1155.392	1155.315	1155.238	1155.161	1155.083	1155.006	1154.929	1154.852	1154.775	1154.698	1154.621	1154.544	1154.467	1153.516	1153.508	1153.484	1153.461	1153.437	1153.413	1153.390	1153.366	1153.343	1153.319	1153.300
ORIGINAL GROUND LEVEL	1156.500	1156.407	1156.315	1156.222	1156.163	1156.086	1156.001	1155.916	1155.832	1155.747	1155.621	1155.477	1155.350	1155.215	1155.146	1155.167	1155.194	1155.199	1155.155	1155.160	1155.181	1155.182	1155.169	1155.180	1155.121	1155.086	1155.078	
ACCUMULATED DISTANCE	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000	1250.000	1290.191	
DISTANCE		50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	40.191	

	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD4-1
	NTC INTERNATIONAL CO., LTD.		MAIN DRAINAGE 4 PLAN AND PROFILE 0.000-1290.191	SCALE 1:6000	APPROVED BY	SERIAL NO.

A-40



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ROAD LEVEL	1156.556	1156.461	1156.366	1156.272	1156.211	1156.195	1156.150	1156.104	1156.059	1156.014	1155.924	1155.879	1155.834	1155.789	1155.743	1155.710	1155.700	1155.663	1155.625	1155.588	1155.550	1155.513	1155.475	1155.438	1155.410	1155.390	1155.374	1155.357	1155.341	1155.325	1155.309	1155.293	1155.277	1155.261	1155.250
BANK LEVEL	1155.356	1155.261	1155.166	1155.072	1155.011	1154.995	1154.950	1154.904	1154.859	1154.814	1154.724	1154.679	1154.634	1154.589	1154.543	1154.510	1154.500	1154.463	1154.425	1154.388	1154.350	1154.313	1154.275	1154.238	1154.210	1154.190	1154.174	1154.157	1154.141	1154.125	1154.109	1154.093	1154.077	1154.061	1154.050
BED LEVEL	1153.656	1153.561	1153.466	1153.372	1153.311	1153.295	1153.250	1153.204	1153.159	1153.114	1153.024	1152.979	1152.934	1152.889	1152.843	1152.810	1152.800	1152.763	1152.725	1152.688	1152.650	1152.613	1152.575	1152.538	1152.510	1152.090	1152.074	1152.057	1152.041	1152.025	1152.009	1151.993	1151.977	1151.961	1151.950
ORIGINAL GROUND LEVEL	1155.340	1155.287	1155.188	1155.121	1155.053	1155.014	1154.957	1154.903	1154.925	1154.960	1154.817	1154.744	1154.960	1155.149	1155.337	1155.559	1155.550	1155.227	1154.897	1154.565	1154.358	1154.327	1154.292	1154.256	1154.017	1153.958	1153.931	1153.937	1153.930	1153.771	1154.085	1154.126	1154.241	1154.387	
ACCUMULATED DISTANCE	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000	1250.000	1300.000	1350.000	1400.000	1450.000	1500.000	1550.000	1600.000	1633.013	
DISTANCE		50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	33.013	

	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			MD5-1
	NTC INTERNATIONAL CO., LTD.		SECONDARY DRAINAGE 5 PLAN AND PROFILE 0.000-1633.013	SCALE 1:6000	APPROVED BY	SERIAL NO.

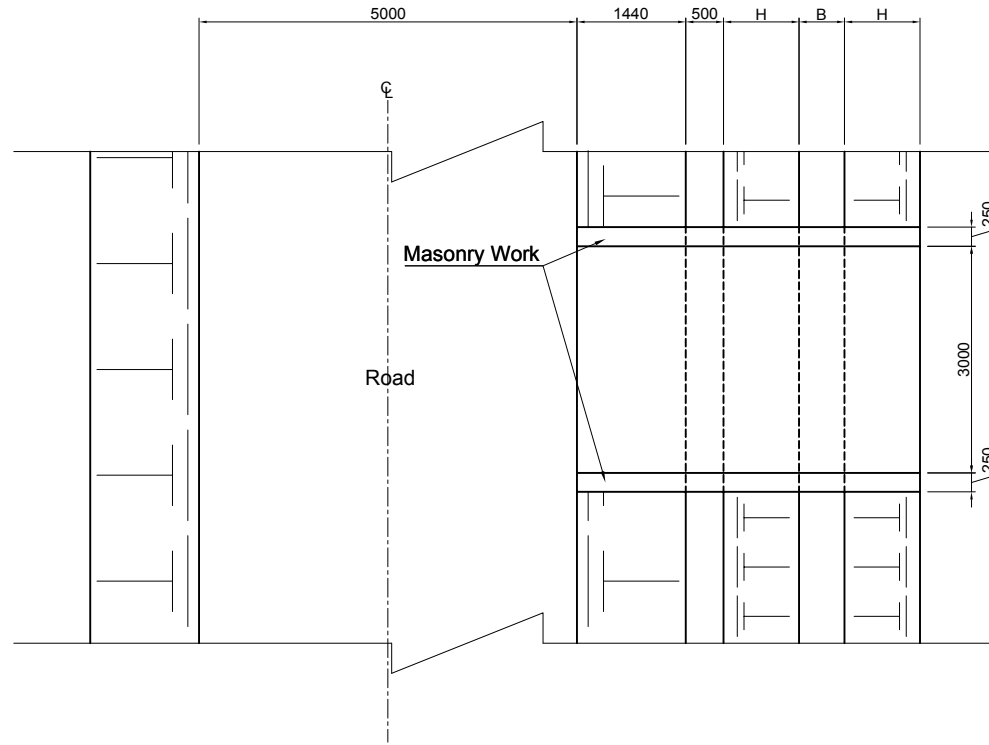
Tractor Passage

Tractor Passage Type A~E

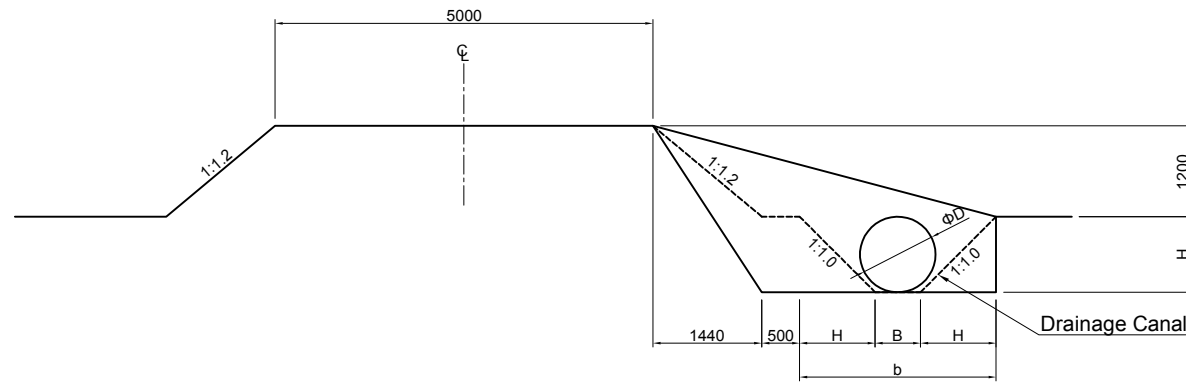
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NOTE: Construction of Tractor Passage Type A~E @120m along Farm Road in Middle and downstream area.

Plan



Cross Section



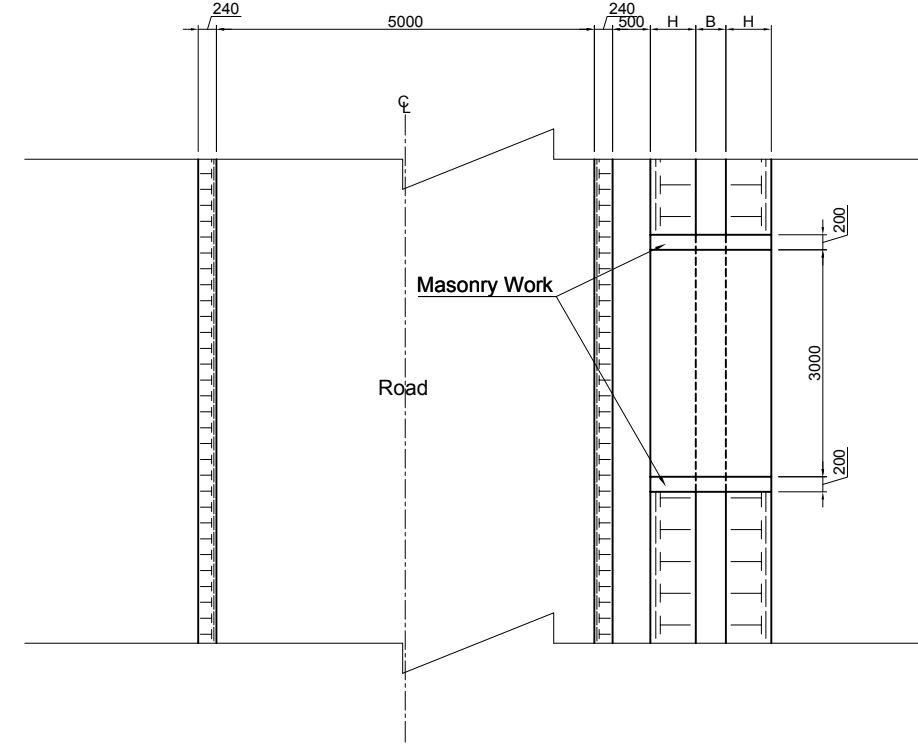
	Drainage Type A			Drainage Type B			Drainage Type C			Drainage Type D			Drainage Type E		
	B:	b:	H:	B:	b:	H:	B:	b:	H:	B:	b:	H:	B:	b:	H:
Tractor Passage TypeA D=φ800	0.4	1.6	0.6	0.5	2.1	0.8	0.6	2.6	1.0	0.8	3.2	1.2	1.2	4.6	1.7
Tractor Passage TypeB D=φ1000															
Tractor Passage TypeC D=φ1000x2															
Tractor Passage TypeD Box w1.5xh1.0															
Tractor Passage TypeE Box w2.0xh1.0															

Tractor Passage Type F

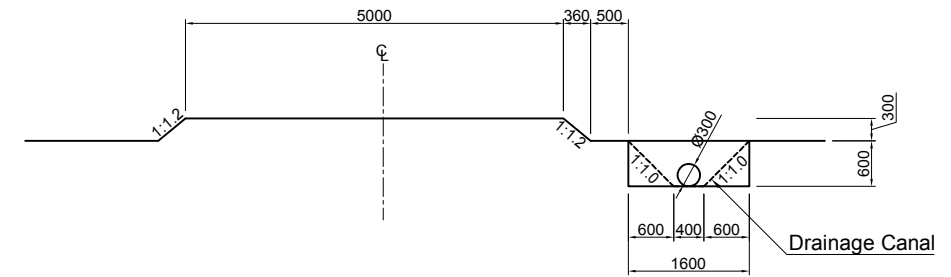
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NOTE: Construction of Tractor Passage Type F @20m along Farm Road in upstream area.

Plan



Cross Section

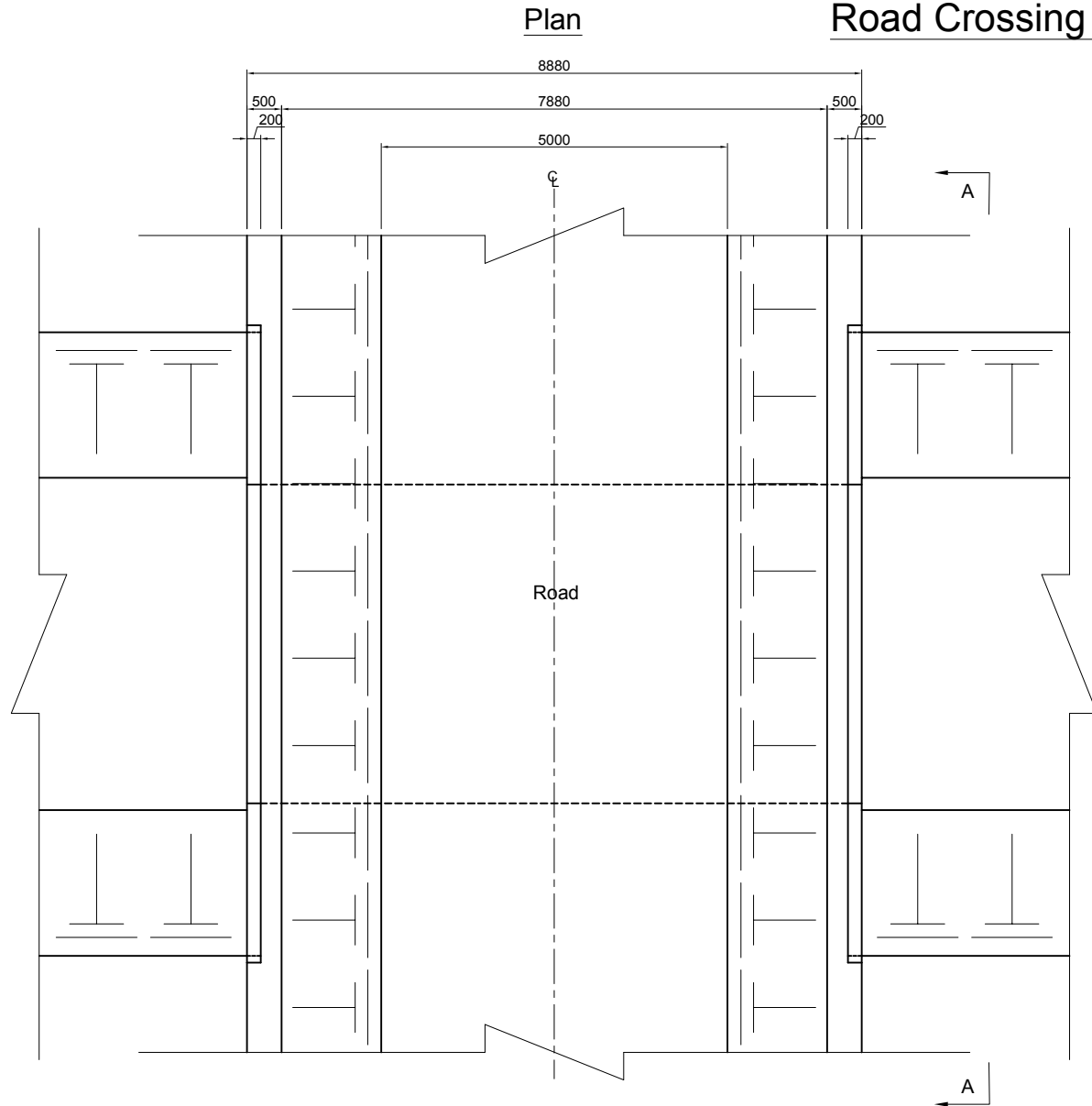


	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JICA JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			TRACTOR PASSAGE	1:100		

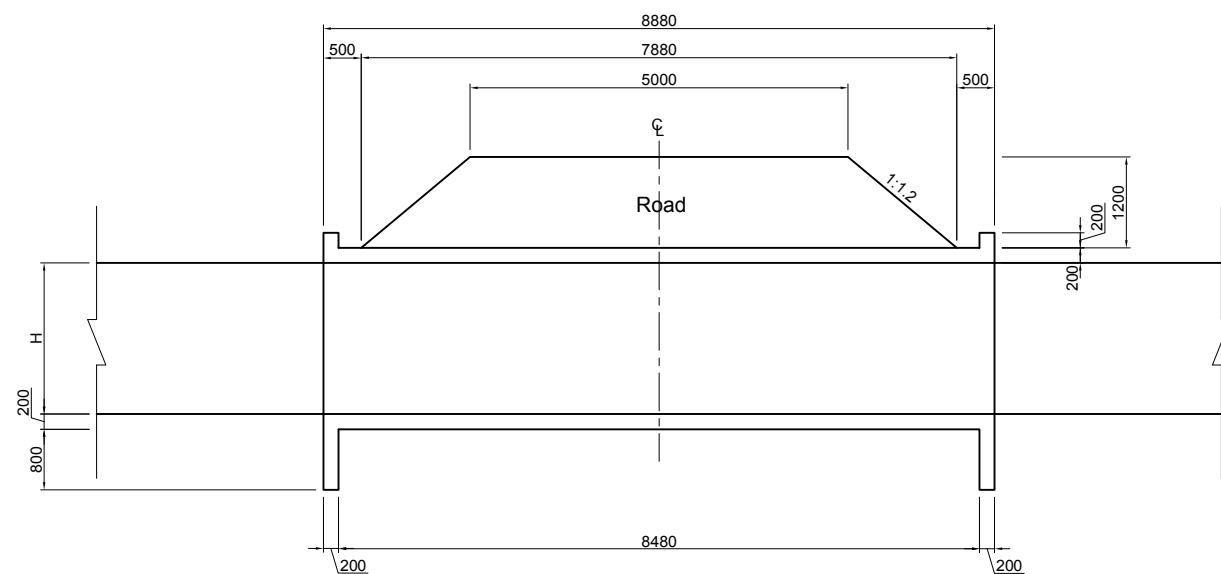
Farm Road Crossing

Road Crossing Type A~G

S=1:100

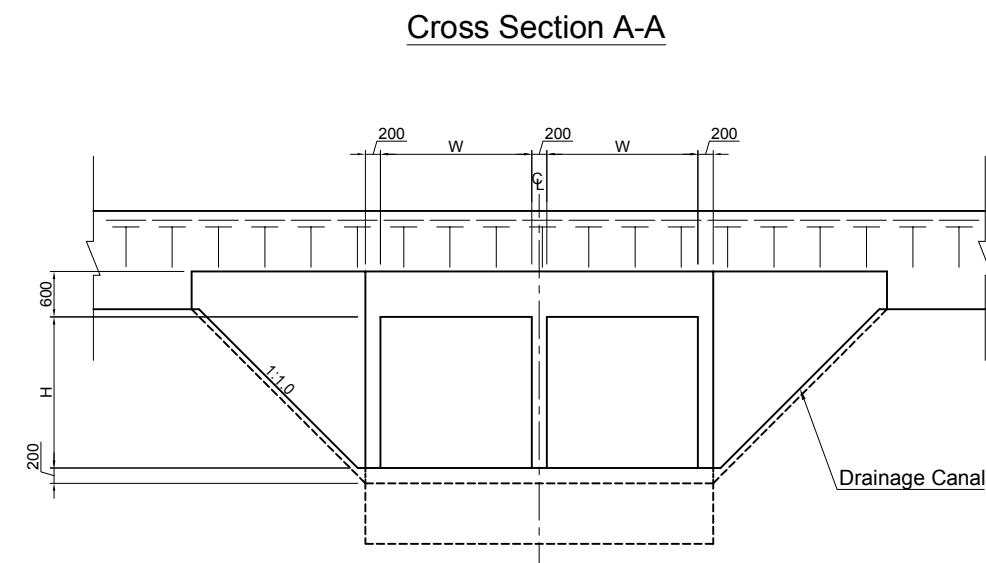


Cross Section



Cross Section A-A

Farm Road Crossing Type A	Farm Road Crossing Type B	Farm Road Crossing Type C	Farm Road Crossing Type D	Farm Road Crossing Type E	Farm Road Crossing Type F	Farm Road Crossing Type G
W1.0xH1.5	W2.0xH1.0	W2.0xH1.5	W2.0xH2.0	W2.0xH2.0 (Double)	W2.5xH2.5 (Double)	W2.5xH2.5 (Triple)



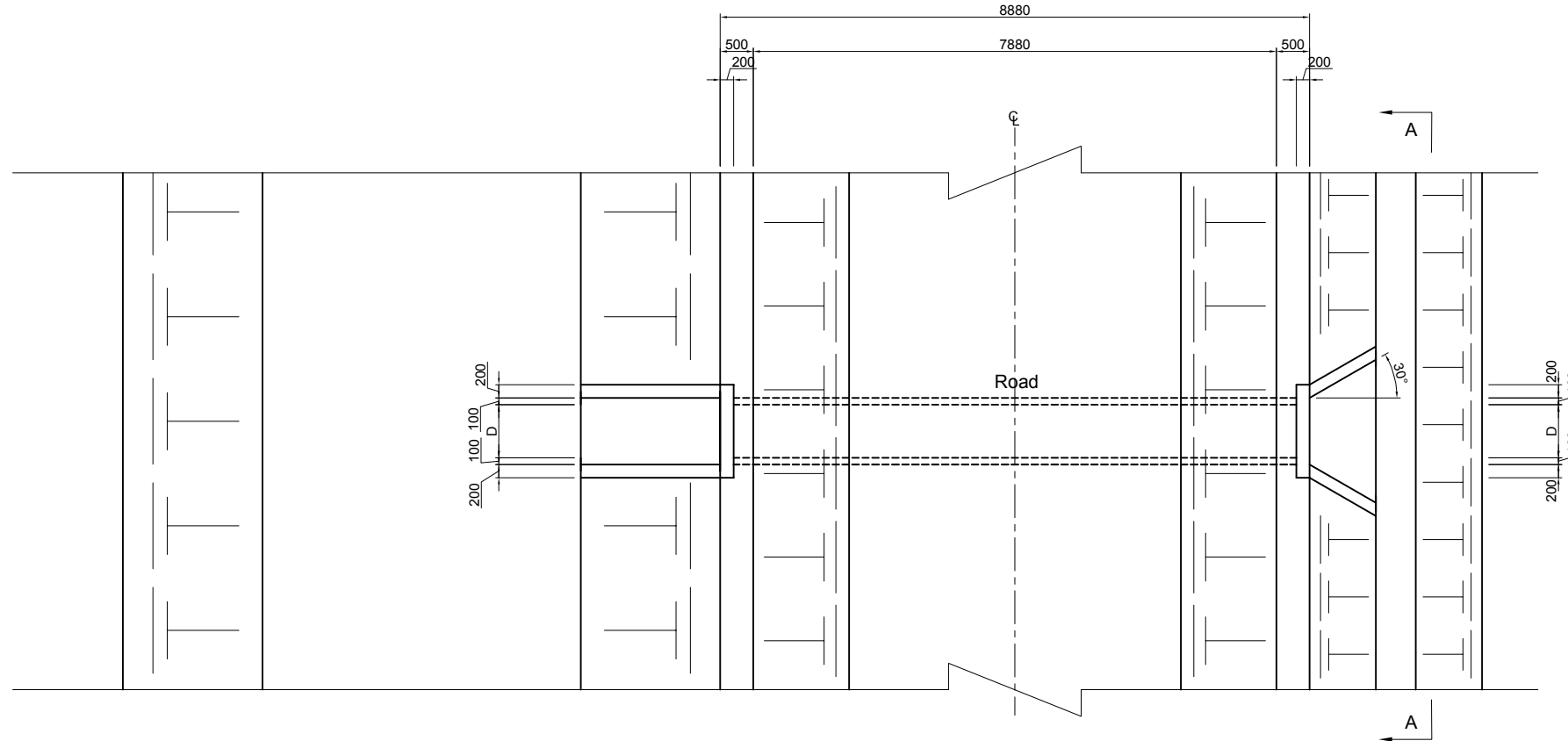
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			Farm Road Crossing Type A~G	1:100		

Farm Road Crossing

Road Crossing Type H~I

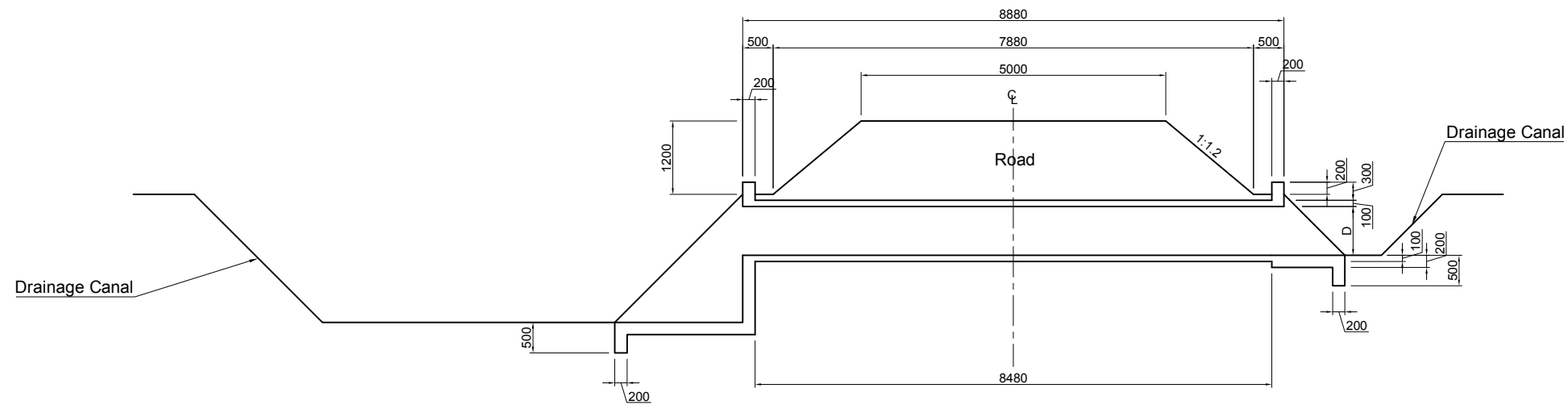
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Plan

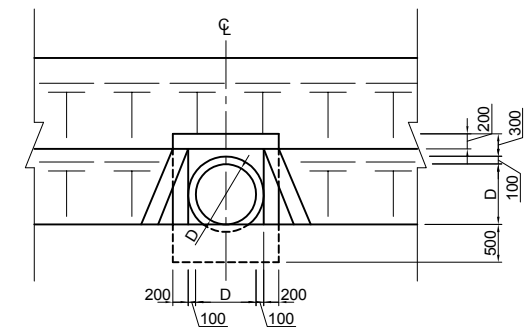


Farm Road Crossing Type H	Farm Road Crossing Type I
D800	D1000

Cross Section



Cross Section A-A

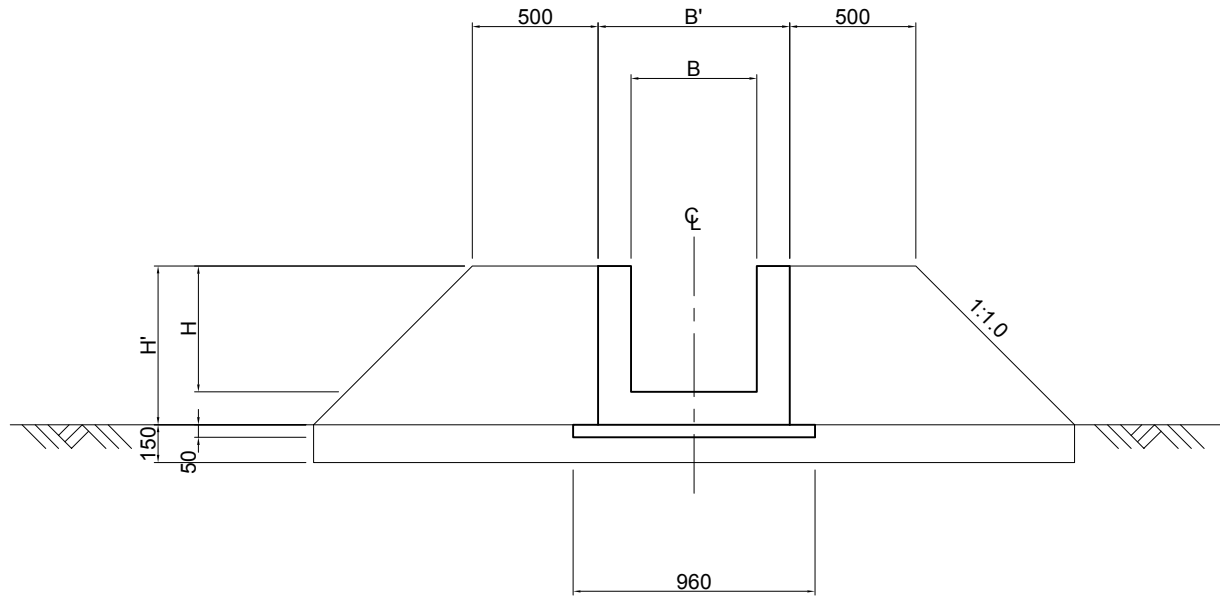


	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			Farm Road Crossing Type H~I	1:100		

Irrigation Canal

Irrigation Canal
S=1:30

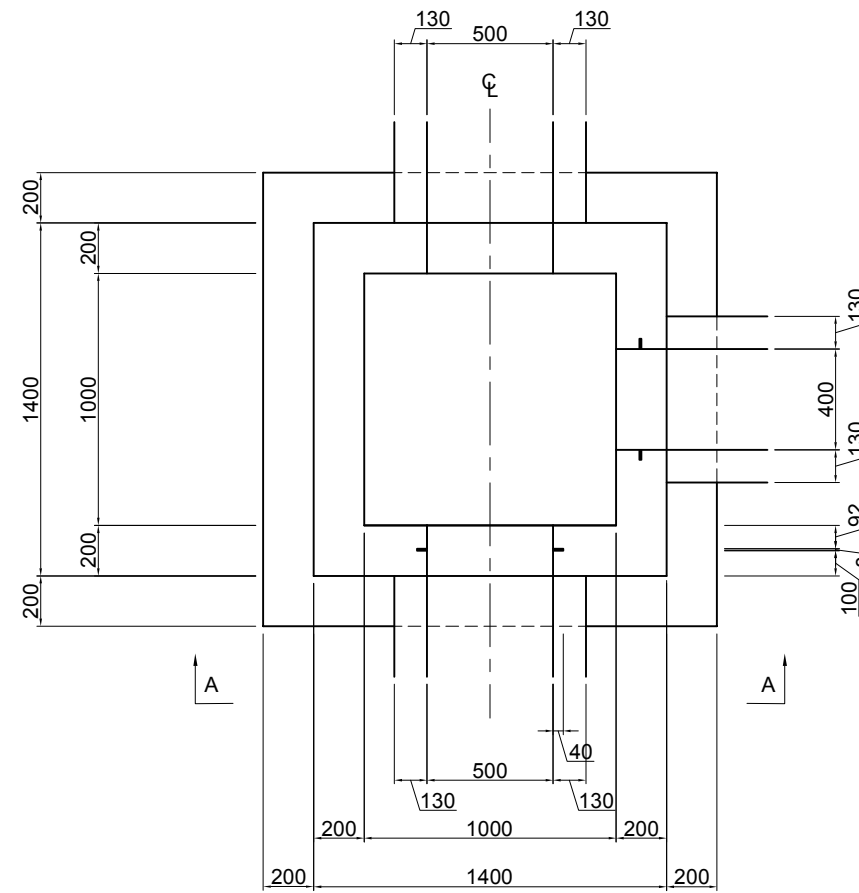
Cross Section



	Irrigation Type A	Irrigation Type B
B:	0.4	0.5
B':	0.66	0.76
H:	0.4	0.5
H':	0.53	0.63
b:	0.86	0.96

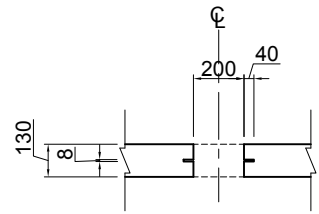
Division Box
S=1:30

Plan

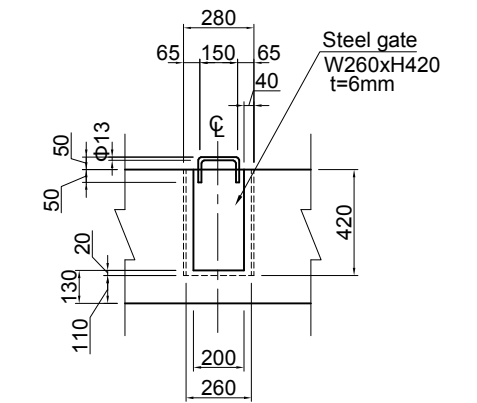


Inlet
S=1:30

Plan

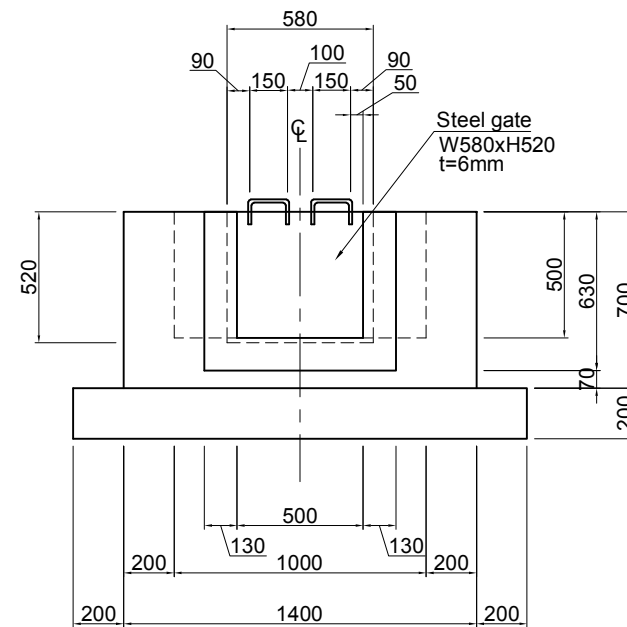


Cross Section



NOTE: Construction of inlet @10m along Irrigation canal.

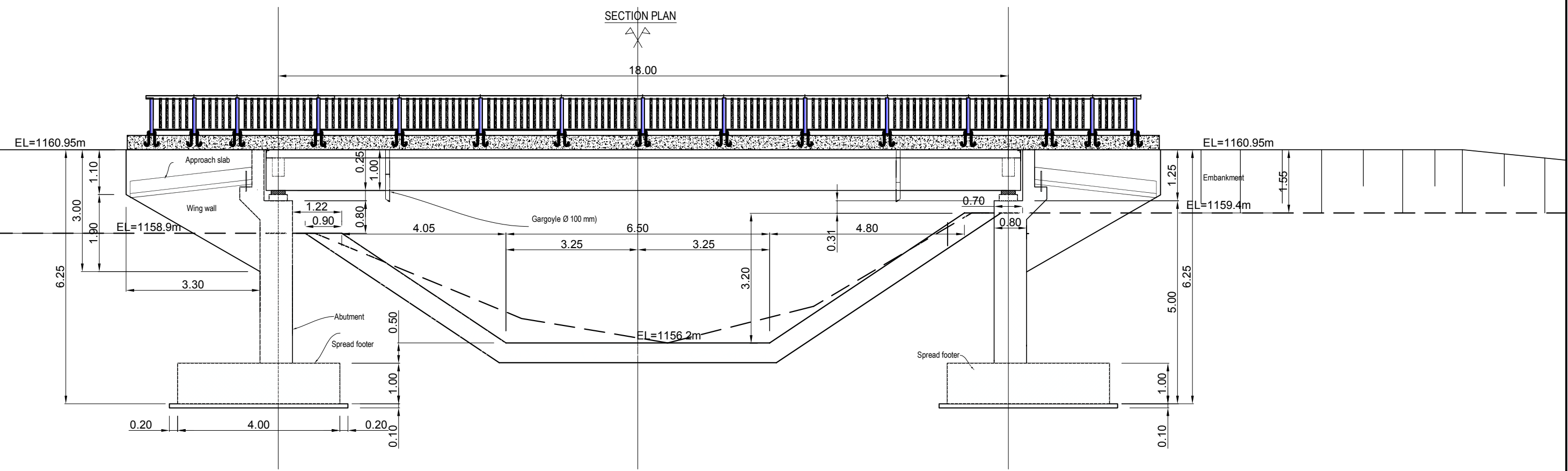
Cross Section A-A



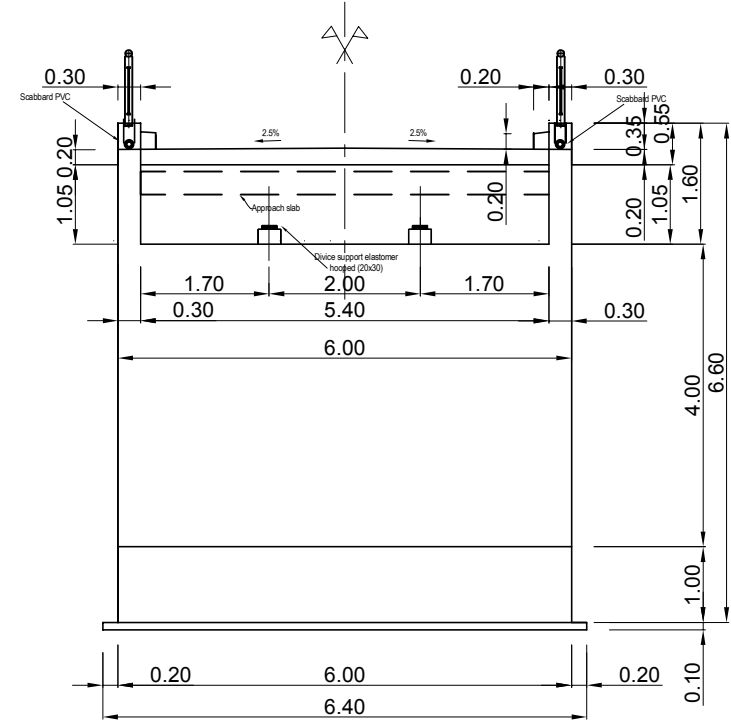
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			IRRIGATION CANAL	1:30		

A-45

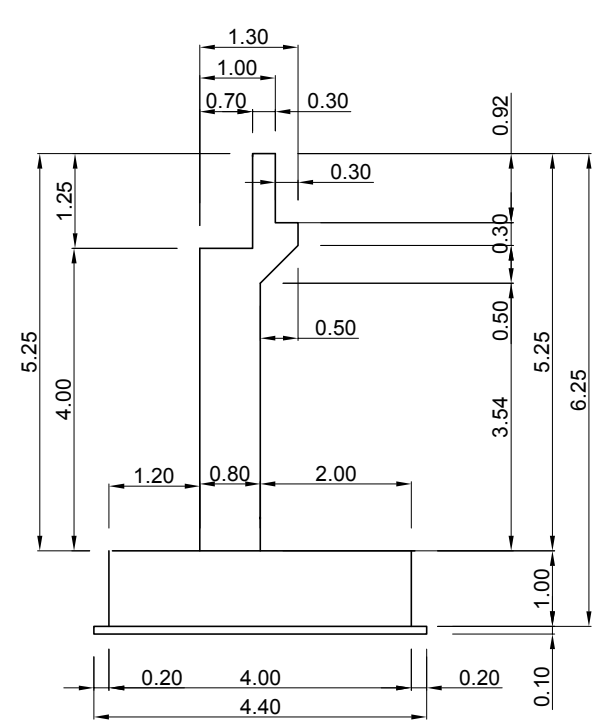
SECTION PLAN



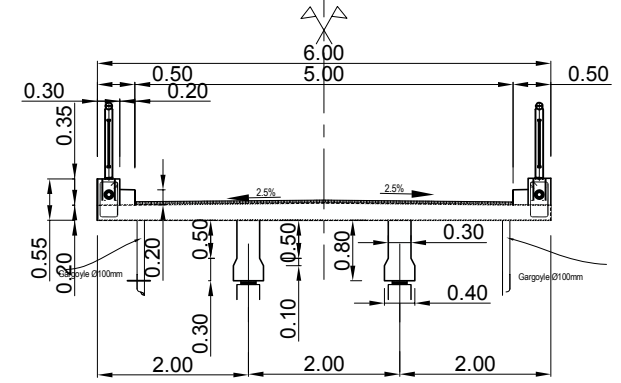
FORM PLAN ABUTMENT



ABUTMENT SECTION

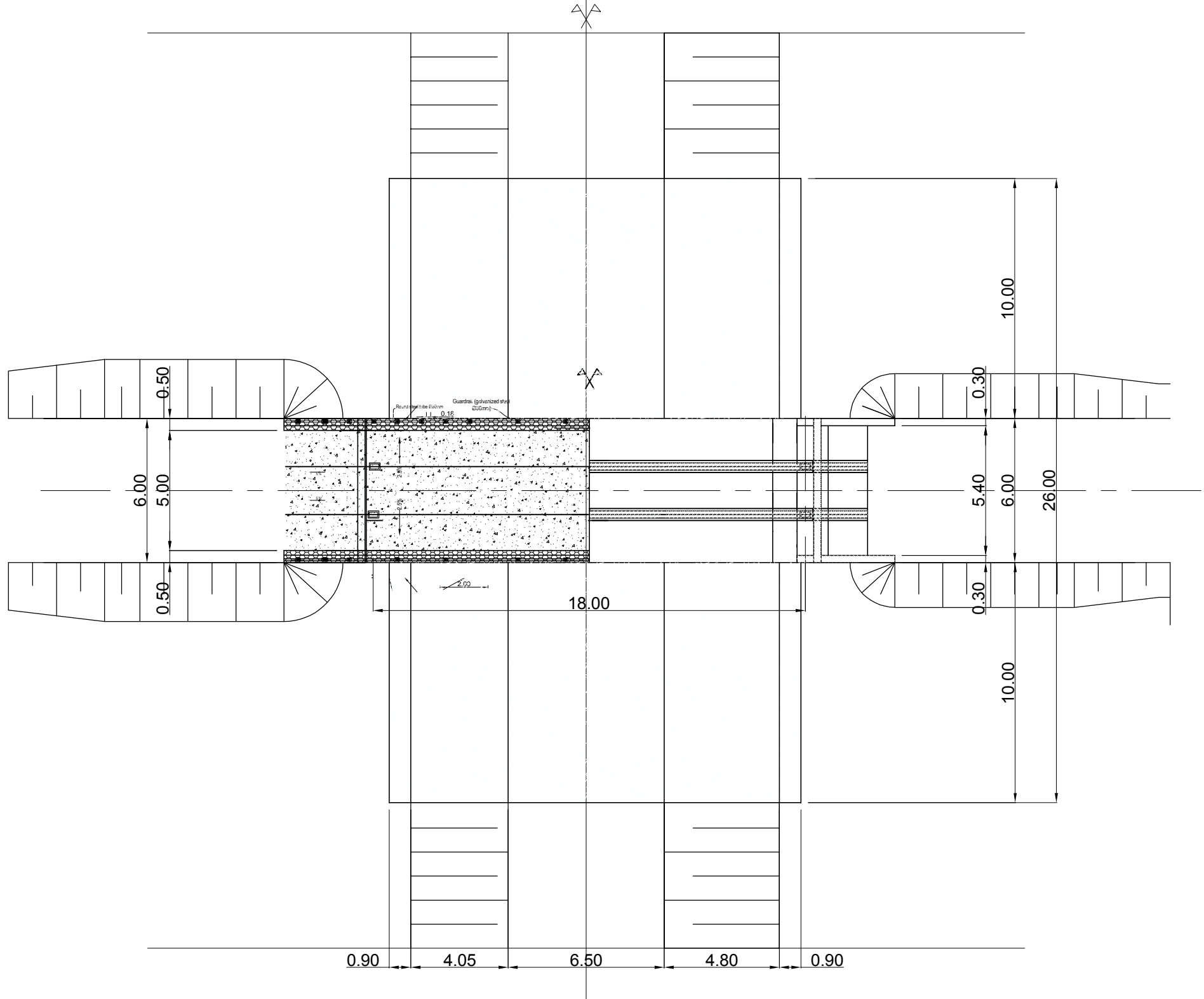


CROSS SECTION



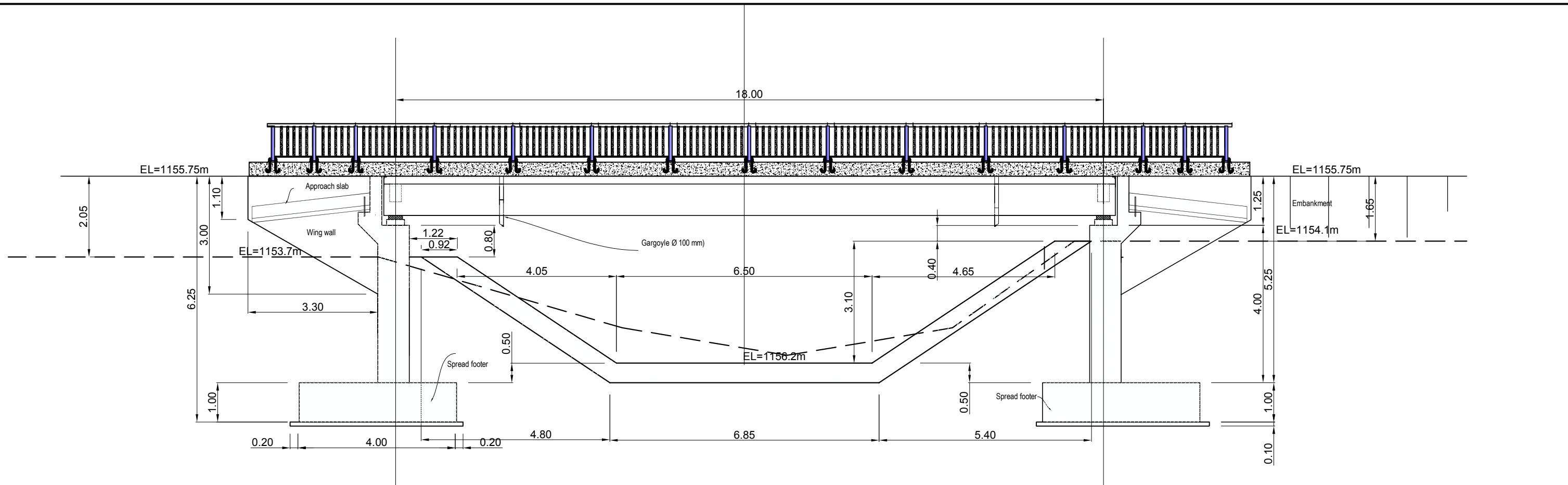
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	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		BRIDGE No.1 (1/2)	SCALE	APPROVED BY	SERIAL NO.

PLAN VIEW

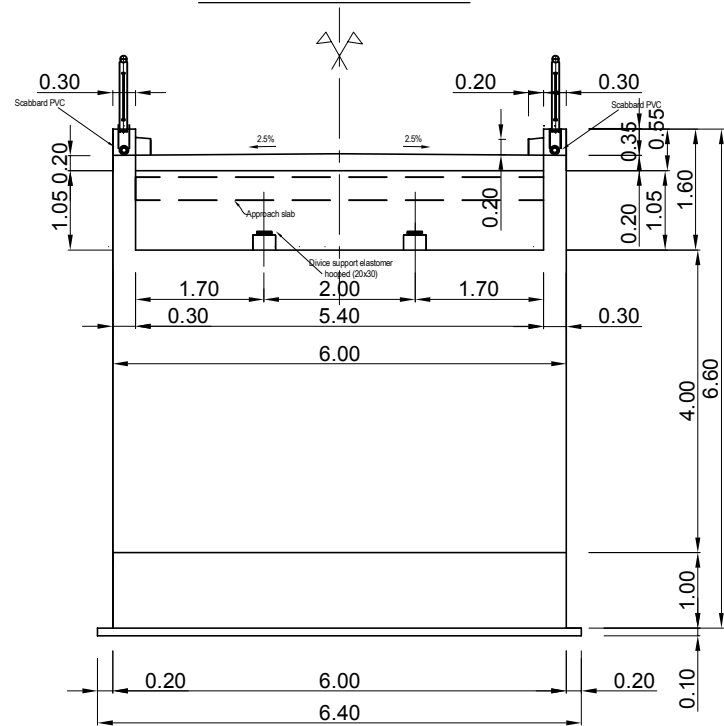


A-46

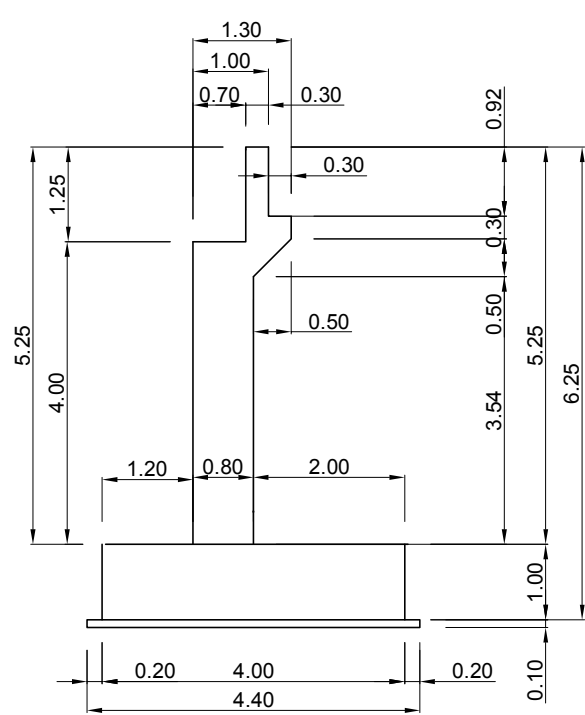
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	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			BRIDGE No.1 (2/2)			



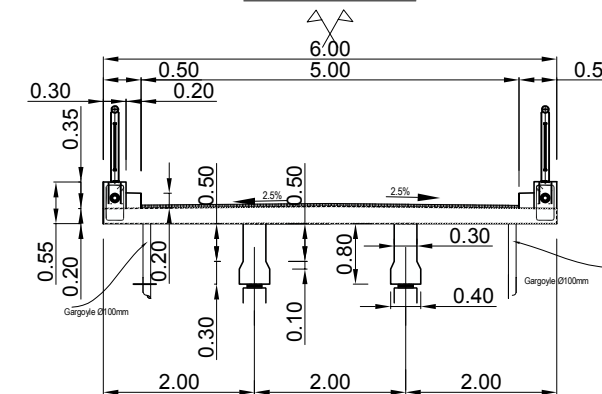
FORM PLAN ABUTMENT



ABUTMENT SECTION



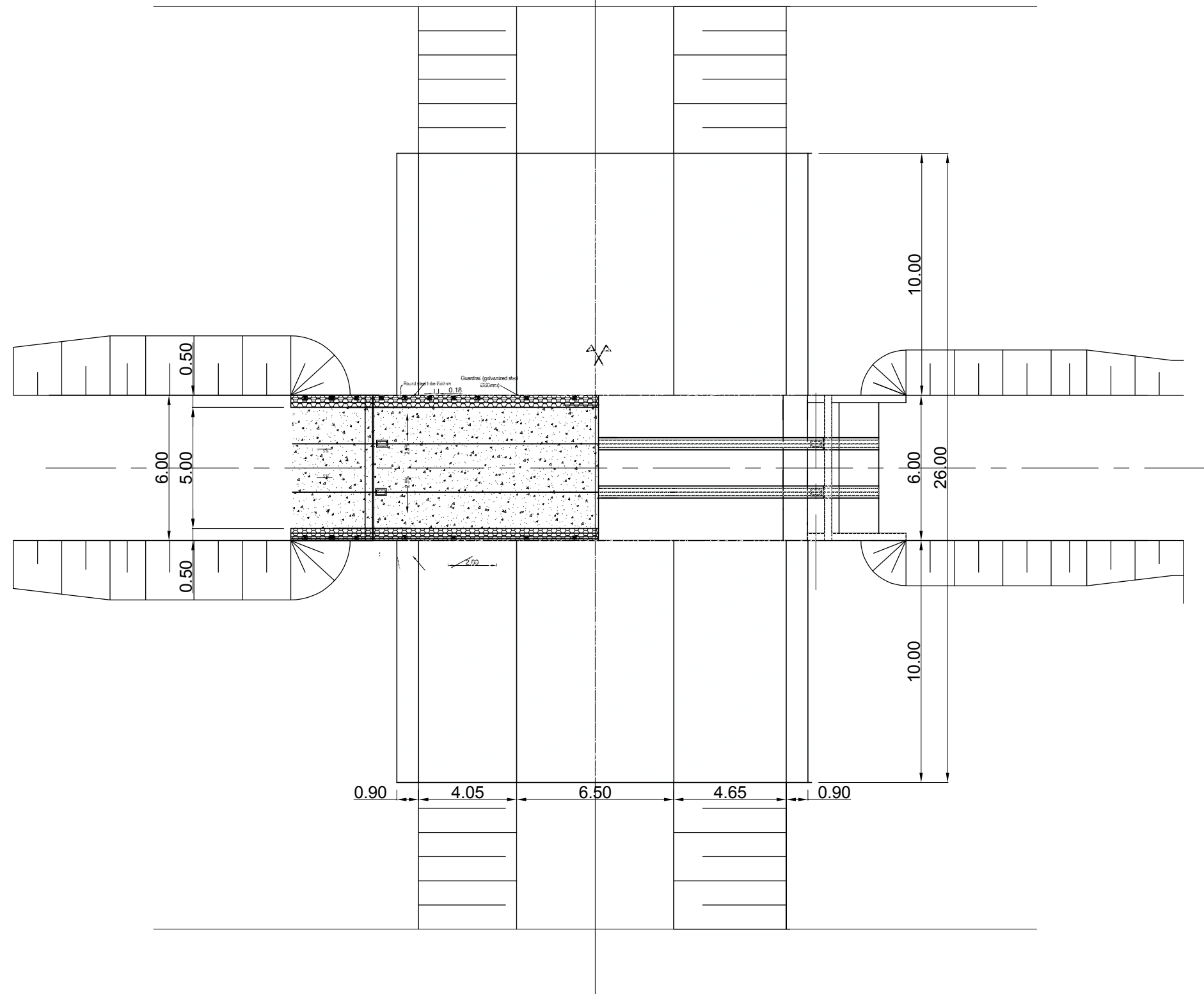
CROSS SECTION




	MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
	JAPAN INTERNATIONAL COOPERATION AGENCY		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
	NTC INTERNATIONAL CO., LTD.		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
			BRIDGE No.2 (1/2)			

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PLAN VIEW



 MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT JAPAN INTERNATIONAL COOPERATION AGENCY NTC INTERNATIONAL CO., LTD.	REVISION	PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
		RURAL INFRASTRUCTURE IMPROVEMENT PROJECT			
		DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
		BRIDGE No.2 (2/2)			