



**Bureau of Soils and Water Management**  
**PHILIPPINE BIDDING DOCUMENTS**

**Construction/ Rehabilitation of Small  
Water Impounding Projects (SWIPs)  
for CY 2024**

**IB NO: BSWM-2024-08-057**

**Date issued**

**August 2024**

# **PHILIPPINE BIDDING DOCUMENTS**

# **Procurement of INFRASTRUCTURE PROJECTS**

Government of the Republic of the Philippines

**Sixth Edition  
July 2020**

# Preface

These Philippine Bidding Documents (PBDs) for the procurement of Infrastructure Projects (hereinafter referred to also as the “Works”) through Competitive Bidding have been prepared by the Government of the Philippines for use by all branches, agencies, departments, bureaus, offices, or instrumentalities of the government, including government-owned and/or -controlled corporations, government financial institutions, state universities and colleges, local government units, and autonomous regional government. The procedures and practices presented in this document have been developed through broad experience, and are for mandatory use in projects that are financed in whole or in part by the Government of the Philippines or any foreign government/foreign or international financing institution in accordance with the provisions of the 2016 revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184.

The PBDs are intended as a model for admeasurements (unit prices or unit rates in a bill of quantities) types of contract, which are the most common in Works contracting.

The Bidding Documents shall clearly and adequately define, among others: (i) the objectives, scope, and expected outputs and/or results of the proposed contract; (ii) the eligibility requirements of Bidders; (iii) the expected contract duration; and (iv) the obligations, duties, and/or functions of the winning Bidder.

Care should be taken to check the relevance of the provisions of the PBDs against the requirements of the specific Works to be procured. If duplication of a subject is inevitable in other sections of the document prepared by the Procuring Entity, care must be exercised to avoid contradictions between clauses dealing with the same matter.

Moreover, each section is prepared with notes intended only as information for the Procuring Entity or the person drafting the Bidding Documents. They shall not be included in the final documents. The following general directions should be observed when using the documents:

- a. All the documents listed in the Table of Contents are normally required for the procurement of Infrastructure Projects. However, they should be adapted as necessary to the circumstances of the particular Project.
- b. Specific details, such as the “*name of the Procuring Entity*” and “*address for bid submission*,” should be furnished in the Instructions to Bidders, Bid Data Sheet, and Special Conditions of Contract. The final documents should contain neither blank spaces nor options.
- c. This Preface and the footnotes or notes in italics included in the Invitation to Bid, BDS, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings, and Bill of Quantities are not part of the text of the final document, although they contain instructions that the Procuring Entity should strictly follow.
- d. The cover should be modified as required to identify the Bidding Documents as to the names of the Project, Contract, and Procuring Entity, in addition to date of issue.

- e. Modifications for specific Procurement Project details should be provided in the Special Conditions of Contract as amendments to the Conditions of Contract. For easy completion, whenever reference has to be made to specific clauses in the Bid Data Sheet or Special Conditions of Contract, these terms shall be printed in bold typeface on Sections I (Instructions to Bidders) and III (General Conditions of Contract), respectively.
- f. For guidelines on the use of Bidding Forms and the procurement of Foreign-Assisted Projects, these will be covered by a separate issuance of the Government Procurement Policy Board.



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# ***Glossary of Terms, Abbreviations, and Acronyms***

**ABC** – Approved Budget for the Contract.

**ARCC** – Allowable Range of Contract Cost.

**BAC** – Bids and Awards Committee.

**Bid** – A signed offer or proposal to undertake a contract submitted by a bidder in response to and in consonance with the requirements of the bidding documents. Also referred to as *Proposal* and *Tender*. (2016 revised IRR, Section 5[c])

**Bidder** – Refers to a contractor, manufacturer, supplier, distributor and/or consultant who submits a bid in response to the requirements of the Bidding Documents. (2016 revised IRR, Section 5[d])

**Bidding Documents** – The documents issued by the Procuring Entity as the bases for bids, furnishing all information necessary for a prospective bidder to prepare a bid for the Goods, Infrastructure Projects, and/or Consulting Services required by the Procuring Entity. (2016 revised IRR, Section 5[e])

**BIR** – Bureau of Internal Revenue.

**BSP** – Bangko Sentral ng Pilipinas.

**CDA** – Cooperative Development Authority.

**Consulting Services** – Refer to services for Infrastructure Projects and other types of projects or activities of the GOP requiring adequate external technical and professional expertise that are beyond the capability and/or capacity of the GOP to undertake such as, but not limited to: (i) advisory and review services; (ii) pre-investment or feasibility studies; (iii) design; (iv) construction supervision; (v) management and related services; and (vi) other technical services or special studies. (2016 revised IRR, Section 5[i])

**Contract** – Refers to the agreement entered into between the Procuring Entity and the Supplier or Manufacturer or Distributor or Service Provider for procurement of Goods and Services; Contractor for Procurement of Infrastructure Projects; or Consultant or Consulting Firm for Procurement of Consulting Services; as the case may be, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

**Contractor** – is a natural or juridical entity whose proposal was accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded. Contractor as used in these Bidding Documents may likewise refer to a supplier, distributor, manufacturer, or consultant.

**CPI** – Consumer Price Index.

**DOLE** – Department of Labor and Employment.

**DTI** – Department of Trade and Industry.

**Foreign-funded Procurement or Foreign-Assisted Project** – Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).

**GFI** – Government Financial Institution.

**GOCC** – Government-owned and/or –controlled corporation.

**Goods** – Refer to all items, supplies, materials and general support services, except Consulting Services and Infrastructure Projects, which may be needed in the transaction of public businesses or in the pursuit of any government undertaking, project or activity, whether in the nature of equipment, furniture, stationery, materials for construction, or personal property of any kind, including non-personal or contractual services such as the repair and maintenance of equipment and furniture, as well as trucking, hauling, janitorial, security, and related or analogous services, as well as procurement of materials and supplies provided by the Procuring Entity for such services. The term “related” or “analogous services” shall include, but is not limited to, lease or purchase of office space, media advertisements, health maintenance services, and other services essential to the operation of the Procuring Entity. (2016 revised IRR, Section 5[r])

**GOP** – Government of the Philippines.

**Infrastructure Projects** – Include the construction, improvement, rehabilitation, demolition, repair, restoration or maintenance of roads and bridges, railways, airports, seaports, communication facilities, civil works components of information technology projects, irrigation, flood control and drainage, water supply, sanitation, sewerage and solid waste management systems, shore protection, energy/power and electrification facilities, national buildings, school buildings, hospital buildings, and other related construction projects of the government. Also referred to as *civil works or works*. (2016 revised IRR, Section 5[u])

**LGUs** – Local Government Units.

**NFCC** – Net Financial Contracting Capacity.

**NGA** – National Government Agency.

**PCAB** – Philippine Contractors Accreditation Board.

**PhilGEPS** - Philippine Government Electronic Procurement System.

**Procurement Project** – refers to a specific or identified procurement covering goods, infrastructure project or consulting services. A Procurement Project shall be described, detailed, and scheduled in the Project Procurement Management Plan prepared by the agency which shall be consolidated in the procuring entity's Annual Procurement Plan. (GPPB Circular No. 06-2019 dated 17 July 2019)

**PSA** – Philippine Statistics Authority.

**SEC** – Securities and Exchange Commission.

**SLCC** – Single Largest Completed Contract.

**UN** – United Nations.

## ***Section I. Invitation to Bid***

### **Notes on the Invitation to Bid**

The Invitation to Bid (IB) provides information that enables potential Bidders to decide whether to participate in the procurement at hand. The IB shall be posted in accordance with Section 21.2 of the 2016 revised IRR of RA No. 9184.

Apart from the essential items listed in the Bidding Documents, the IB should also indicate the following:

- a. The date of availability of the Bidding Documents, which shall be from the time the IB is first advertised/posted until the deadline for the submission and receipt of bids;
- b. The place where the Bidding Documents may be acquired or the website where it may be downloaded;
- c. The deadline for the submission and receipt of bids; and
- d. Any important bid evaluation criteria.

The IB should be incorporated into the Bidding Documents. The information contained in the IB must conform to the Bidding Documents and in particular to the relevant information in the Bid Data Sheet.



Republic of the Philippines  
Department of Agriculture  
**BUREAU OF SOILS AND WATER MANAGEMENT**  
SRDC Bldg., Elliptical Road corner Visayas Avenue,  
Diliman, Quezon City 1101

## Invitation to Bid for Construction/ Rehabilitation of Small Water Impounding Projects (SWIPs) for CY 2024 - IB NO: BSWM-2024-08-057

1. The **Bureau of Soils and Water Management**, through the **General Appropriation Act for CY 2024** intends to apply the sum of:

LOT	DESCRIPTION	ABC (PhP)
1	<b>Construction of Matampay SWIP</b> Brgy. Matampay, Munai, Lanao del Norte	15,207,050.54
2	<b>Construction of Naglilimpiyaan SWIP</b> Brgy. Baloy, Cuyapo, Nueva Ecija	23,761,464.97
3	<b>Construction of Mabalbalanay SWIP</b> Brgy. Agbannawag, Tabuk City, Kalinga	23,760,000.00
4	<b>Rehabilitation of Libasan SWIP</b> Brgy. Libasan, Nabunturan, Davao de Oro	4,455,160.14
5	<b>Rehabilitation of Bussaoit SWIP</b> Brgy. Bussaoit, Bacnotan, La Union	15,841,175.80
6	<b>Rehabilitation of Placido SWIP</b> Brgy. San Andres, Balungao, Pangasinan	3,959,550.02
	<b>TOTAL:</b>	<b>86,984,401.47</b>

being the Approved Budget for the Contract (ABC) to payments under the contract for **Construction/Rehabilitation of Small Water Impounding Projects (SWIPs) for CY 2024 - IB NO: BSWM-2024-08-057**. Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The **Bureau of Soils and Water Management** now invites bids for the above Procurement Project. Completion of the Works is required **as stated in Section VI**. Bidders should have completed a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II (Instructions to Bidders).
3. Bidding will be conducted through open competitive bidding procedures using non-discretionary “pass/fail” criterion as specified in the 2016 revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184.
4. Interested bidders may obtain further information from the **Bureau of Soils and Water Management** and inspect the Bidding Documents at the address given below from *Mondays- Fridays 8:00-5:00PM (Office hours)*.



5. A complete set of Bidding Documents may be acquired by interested bidders until **October 02, 2024, 3:00PM** from given address and website/s below, *upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB, in the amount of:*

LOT	DESCRIPTION	ABC (PhP)	BID DOCS COST(PhP)
1	Construction of Matampay SWIP	15,207,050.54	15,000.00
2	Construction of Naglilimpiyaan SWIP	23,761,464.97	19,000.00
3	Construction of Mabalbalanay SWIP	23,760,000.00	19,000.00
4	Rehabilitation of Libasan SWIP	4,455,160.14	4,000.00
5	Rehabilitation of Bussaoit SWIP	15,841,175.80	14,000.00
6	Rehabilitation of San Andres SWIP	3,959,550.02	4,000.00

The Procuring Entity shall allow the bidder to present its proof of payment for the fees *on or before the deadline of submission of bids.*

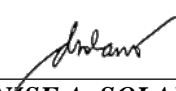

6. The *Bureau of Soils and Water Management* will hold a **Pre-Bid Conference** on **September 10, 2024, 09:30AM** at **BSWM Convention Hall**. *Pre-Bid Conference will be available “live” thru BSWM Procurement Service FB Page (<https://www.facebook.com/bswmpms>), which shall be open to prospective bidders. Furthermore, all interested bidders can participate through **videoconferencing**. Please coordinate with BAC Secretariat at least a day before the meeting at [bac@bswm.da.gov.ph](mailto:bac@bswm.da.gov.ph)*
7. Bids must be duly received by the BAC Secretariat through manual submission at the office address as indicated below, on or before **October 3, 2024, 9:00AM**. Late bids shall not be accepted.
8. All bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in **ITB** Clause 16.
9. Bid opening shall be on **October 3, 2024, 9:30AM** at the given address below and through videoconferencing/webcasting via ZOOM and streamed live through BSWM Procurement Service Facebook Page. Bids will be opened in the presence of the bidders’ representatives who choose to attend the activity.
10. The BSWM strictly adheres to the policies stated under the Data Privacy Act 10173 of 2021.
11. The *Bureau of Soils and Water Management* reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Sections 35.6 and 41 of the 2016 revised Implementing Rules and Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.

12. For further information, please refer to:

FRANCE JOSEPHINE C. BAUTISTA  
BAC SECRETARIAT  
BIDS AND AWARDS COMMITTEE SECRETARIAT'S OFFICE  
2ND FLOOR, SRDC BLDG.,  
VISAYAS AVE. COR. ELLIPTICAL ROAD, DILIMAN, QUEZON CITY TELEFAX NUMBER: +63-2-8273-2474  
Loc 3218  
EMAIL ADDRESS: [bac@bswm.da.gov.ph](mailto:bac@bswm.da.gov.ph) WEBSITE: [www.bswm.gov.ph](http://www.bswm.gov.ph) FB Page:  
<https://www.facebook.com/bswmpms>

13. You may visit the following websites:

For downloading of Bidding Documents: PhilGEPS- <https://notices.philgeps.gov.ph/> , BSWM Website- [www.bswm.gov.ph](http://www.bswm.gov.ph) or BSWM Procurement Service Facebook Page- <https://www.facebook.com/bswmpms>

  
Digitally  
signed by  
Solano Denise  
**DENISE A. SOLANO**  
BAC Chairperson Araullo  


## ***Section II. Instructions to Bidders***

### **Notes on the Instructions to Bidders**

This Section on the Instruction to Bidders (ITB) provides the information necessary for bidders to prepare responsive bids, in accordance with the requirements of the Procuring Entity. It also provides information on bid submission, eligibility check, opening and evaluation of bids, post-qualification, and on the award of contract.

## 1. Scope of Bid

The Procuring Entity, *Bureau of Soils and Water Management* invites Bids for the *Construction/Rehabilitation of Small Water Impounding Projects (SWIPs) for CY 2024 - IB NO: BSWM-2024-08-057*.

The Procurement Project (referred to herein as “Project”) is for the construction of Works, as described in Section VI (Specifications).

## 2. Funding Information

2.1. The GOP through the source of funding as indicated below for the General Appropriation Act for CY 2024 in the amount of:

LOT	DESCRIPTION	ABC (PhP)
1	<b>Construction of Matampay SWIP</b> Brgy. Matampay, Munai, Lanao del Norte	15,207,050.54
2	<b>Construction of Naglilimpiyaan SWIP</b> Brgy. Baloy, Cuyapo, Nueva Ecija	23,761,464.97
3	<b>Construction of Mabalbalanay SWIP</b> Brgy. Agbannawag, Tabuk City, Kalinga	23,760,000.00
4	<b>Rehabilitation of Libasan SWIP</b> Brgy. Libasan, Nabunturan, Davao de Oro	4,455,160.14
5	<b>Rehabilitation of Bussaoit SWIP</b> Brgy. Bussaoit, Bacnotan, La Union	15,841,175.80
6	<b>Rehabilitation of Placido SWIP</b> Brgy. San Andres, Balungao, Pangasinan	3,959,550.02

2.2. The source of funding is:

~~*[If an early procurement activity, select one and delete others:]*~~

- a. ~~—NGA, the National Expenditure Program.~~
- b. ~~—GOCC and GFIs, the proposed Corporate Operating Budget.~~
- c. ~~—LGUs, the proposed Local Expenditure Program.~~

~~*[If not an early procurement activity, select one and delete others:]*~~

- a. **NGA, the General Appropriations Act or Special Appropriations.**
- b. ~~GOCC and GFIs, the Corporate Operating Budget.~~
- c. ~~LGUs, the Annual or Supplemental Budget, as approved by the Sanggunian.~~

### **3. Bidding Requirements**

The Bidding for the Project shall be governed by all the provisions of RA No. 9184 and its 2016 revised IRR, including its Generic Procurement Manual and associated policies, rules and regulations as the primary source thereof, while the herein clauses shall serve as the secondary source thereof.

Any amendments made to the IRR and other GPPB issuances shall be applicable only to the ongoing posting, advertisement, or invitation to bid by the BAC through the issuance of a supplemental or bid bulletin.

The Bidder, by the act of submitting its Bid, shall be deemed to have inspected the site, determined the general characteristics of the contracted Works and the conditions for this Project, such as the location and the nature of the work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) other factors that may affect the cost, duration and execution or implementation of the contract, project, or work and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

### **4. Corrupt, Fraudulent, Collusive, Coercive, and Obstructive Practices**

The Procuring Entity, as well as the Bidders and Contractors, shall observe the highest standard of ethics during the procurement and execution of the contract. They or through an agent shall not engage in corrupt, fraudulent, collusive, coercive, and obstructive practices defined under Annex "I" of the 2016 revised IRR of RA No. 9184 or other integrity violations in competing for the Project.

### **5. Eligible Bidders**

- 5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.
- 5.2. **The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to**

current prices using the PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.

A contract is considered to be "similar" to the contract to be bid if it has the major categories of work stated in the **BDS**.

- 5.3. For Foreign-funded Procurement, the Procuring Entity and the foreign government/foreign or international financing institution may agree on another track record requirement, as specified in the Bidding Document prepared for this purpose.
- 5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.2 of the 2016 IRR of RA No. 9184.

## 6. Origin of Associated Goods

There is no restriction on the origin of Goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN.

## 7. Subcontracts

- 7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than fifty percent (50%) of the Project.

~~The Procuring Entity has prescribed that:  
[Select one, delete other/s]~~

- ~~a. Subcontracting is allowed. The portions of Project and the maximum percentage allowed to be subcontracted are indicated in the **BDS**, which shall not exceed fifty percent (50%) of the contracted Works.~~
- b. Subcontracting is not allowed.

~~7.1. [If Procuring Entity has determined that subcontracting is allowed during the bidding, state:] The Bidder must submit together with its Bid the documentary requirements of the subcontractor(s) complying with the eligibility criteria stated in **ITB** Clause 5 in accordance with Section 23.4 of the 2016 revised IRR of RA No. 9184 pursuant to Section 23.1 thereof.~~

~~7.2. [If subcontracting is allowed during the contract implementation stage, state:] The Supplier may identify its subcontractor during the contract implementation stage. Subcontractors identified during the bidding may be changed during the implementation of this Contract. Subcontractors must submit the documentary requirements under Section 23.1 of the 2016 revised IRR of RA No. 9184 and~~

~~comply with the eligibility criteria specified in **ITB** Clause 5 to the implementing or end-user unit.~~

~~7.3. Subcontracting of any portion of the Project does not relieve the Contractor of any liability or obligation under the Contract. The Supplier will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants, or workmen as fully as if these were the Contractor's own acts, defaults, or negligence, or those of its agents, servants, or workmen.~~

## **8. Pre-Bid Conference**

The Procuring Entity will hold a pre-bid conference for this Project on the specified date and time and either at its physical address and/or through videoconferencing/webcasting} as indicated in paragraph 6 of the **IB**.

## **9. Clarification and Amendment of Bidding Documents**

**Prospective bidders may request for clarification on and/or interpretation** of any part of the Bidding Documents. Such requests must be in writing and received by the Procuring Entity, either at its given address or through electronic mail indicated in the **IB**, **at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.**

## **10. Documents Comprising the Bid: Eligibility and Technical Components**

10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **Section IX. Checklist of Technical and Financial Documents.**

10.2. If the eligibility requirements or statements, the bids, and all other documents for submission to the BAC are in foreign language other than English, it must be accompanied by a translation in English, which shall be authenticated by the appropriate Philippine foreign service establishment, post, or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines. For Contracting Parties to the Apostille Convention, only the translated documents shall be authenticated through an apostille pursuant to GPPB Resolution No. 13-2019 dated 23 May 2019. The English translation shall govern, for purposes of interpretation of the bid.

10.3. A valid special PCAB License in case of Joint Ventures, and registration for the type and cost of the contract for this Project. Any additional type of Contractor license or permit shall be indicated in the **BDS.**

10.4. A List of Contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen) assigned to the contract to be bid, with their

complete qualification and experience data shall be provided. These key personnel must meet the required minimum years of experience set in the **BDS**.

- 10.5. A List of Contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be, must meet the minimum requirements for the contract set in the **BDS**.

## **11. Documents Comprising the Bid: Financial Component**

- 11.1. The second bid envelope shall contain the financial documents for the Bid as specified in **Section IX. Checklist of Technical and Financial Documents**.
- 11.2. Any bid exceeding the ABC indicated in paragraph 1 of the **IB** shall not be accepted.
- 11.3. For Foreign-funded procurement, a ceiling may be applied to bid prices provided the conditions are met under Section 31.2 of the 2016 revised IRR of RA No. 9184.

## **12. Alternative Bids**

Bidders shall submit offers that comply with the requirements of the Bidding Documents, including the basic technical design as indicated in the drawings and specifications. Unless there is a value engineering clause in the **BDS**, alternative Bids shall not be accepted.

## **13. Bid Prices**

All bid prices for the given scope of work in the Project as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as determined by the NEDA and approved by the GPPB pursuant to the revised Guidelines for Contract Price Escalation guidelines.

## **14. Bid and Payment Currencies**

- 14.1. Bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.
- 14.2. *Payment of the contract price shall be made in:*



*[Select one, delete other/s]*

a. Philippine Pesos.

b. ~~*[indicate currency if procurement involves a foreign denominated bid as allowed by the Procuring Entity, which shall be tradeable or acceptable by the BSP.]*~~

## **15. Bid Security**

15.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in the amount indicated in the **BDS**, which shall be not less than the percentage of the ABC in accordance with the schedule in the **BDS**.

15.2. The Bid and bid security shall be valid until *[indicate date]*. Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

## **16. Sealing and Marking of Bids**

Each Bidder shall submit one copy of the first and second components of its Bid.

The Procuring Entity may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.

If the Procuring Entity allows the submission of bids through online submission to the given website or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be digitally signed. An electronic copy that cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

## **17. Deadline for Submission of Bids**

The Bidders shall submit on the specified date and time and either at its physical address or through online submission as indicated in paragraph 7 of the **IB**.

## **18. Opening and Preliminary Examination of Bids**

18.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.

In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.

- 18.2. The preliminary examination of Bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

## **19. Detailed Evaluation and Comparison of Bids**

- 19.1. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*" using non-discretionary pass/fail criteria. The BAC shall consider the conditions in the evaluation of Bids under Section 32.2 of 2016 revised IRR of RA No. 9184.
- 19.2. If the Project allows partial bids, all Bids and combinations of Bids as indicated in the **BDS** shall be received by the same deadline and opened and evaluated simultaneously so as to determine the Bid or combination of Bids offering the lowest calculated cost to the Procuring Entity. Bid Security as required by **ITB** Clause 15 shall be submitted for each contract (lot) separately.
- 19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

## **20. Post Qualification**

Within a non-extendible period of five (5) calendar days from receipt by the Bidder of the notice from the BAC that it submitted the Lowest Calculated Bid, the Bidder shall submit its latest income and business tax returns filed and paid through the BIR Electronic Filing and Payment System (eFPS), and other appropriate licenses and permits required by law and stated in the **BDS**.

## **21. Signing of the Contract**

The documents required in Section 37.2 of the 2016 revised IRR of RA No. 9184 shall form part of the Contract. Additional Contract documents are indicated in the **BDS**.

## ***Section III. Bid Data Sheet***

### **Notes on the Bid Data Sheet (BDS)**

The Bid Data Sheet (BDS) consists of provisions that supplement, amend, or specify in detail, information, or requirements included in the ITB found in Section II, which are specific to each procurement.

This Section is intended to assist the Procuring Entity in providing the specific information in relation to corresponding clauses in the ITB and has to be prepared for each specific procurement.

The Procuring Entity should specify in the BDS information and requirements specific to the circumstances of the Procuring Entity, the processing of the procurement, and the bid evaluation criteria that will apply to the Bids. In preparing the BDS, the following aspects should be checked:

- a. Information that specifies and complements provisions of the ITB must be incorporated.
- b. Amendments and/or supplements, if any, to provisions of the ITB as necessitated by the circumstances of the specific procurement, must also be incorporated.

# Bid Data Sheet

ITB Clause	
5.2	<p>For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work.</p> <ul style="list-style-type: none"> <li>● <b>Contracts on Construction/Rehabilitation of Small Water Impounding Projects.</b></li> </ul> <p><b>Note: Bidder shall submit the following (as part of your Technical Proposal):</b></p> <ol style="list-style-type: none"> <li>1. <b>Constructor's Performance Evaluation System (CPES) with Satisfactory Rating; or</b></li> </ol> <p style="padding-left: 40px;"><b>Certificate of Performance Evaluation with at least Satisfactory Rating from your declared SLCC;</b></p> <ol style="list-style-type: none"> <li>2. <b>Final Acceptance</b></li> </ol>
7.1	N/A
	<p><b>Additional requirement under Section VII. Technical Specification</b></p> <ul style="list-style-type: none"> <li>✓ <b>Certificate of Site Inspection</b> <ul style="list-style-type: none"> <li>- <b>Interested bidders shall coordinate with the End-user for the schedule of Site Inspection. The date for site inspection will be discussed at the Pre Bid Conference.</b></li> </ul> </li> </ul>
10.3	<p><b>Valid PCAB License:</b></p> <p style="padding-left: 40px;"><b>Classification: General Engineering (GE-3) Category B</b></p> <p style="padding-left: 40px;"><b>Size: Medium A, License Category: B</b></p>
10.4	<p>The key personnel must meet the required minimum years of experience set below:</p>
	<ul style="list-style-type: none"> <li>● <b>Project Engineer (ABE / CE) with minimum 3 years experience relevant in Earth dam construction</b></li> <li>● <b>Materials Engineer must be accredited by DPWH</b></li> <li>● <b>Safety Officer with minimum of 1 year experience</b></li> <li>● <b>Construction Foreman with minimum of 3 years experience</b></li> </ul>
10.5	<p>The list of equipment which is owned, leased, and/or purchased agreement to be utilized for the project shall be, and to be supported with proof of ownership, purchase agreement and certification of availability from the equipment lessor/vendor for the duration of the project</p> <ul style="list-style-type: none"> <li>● <b>Roller</b></li> <li>● <b>Water Pump</b></li> <li>● <b>Dump Truck</b></li> <li>● <b>Bulldozer</b></li> <li>● <b>Loader</b></li> <li>● <b>Water Truck</b></li> </ul>

12	<i>[Insert Value Engineering clause if allowed.]</i>																					
15.1	<p>The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:</p> <p>a. The amount of not less (2%) <i>of ABC</i>, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit;</p> <p>b. The amount of not less than (5%) <i>of ABC</i> if bid security is in Surety Bond.</p>																					
19.2	<p>The project will be awarded as separate contracts <b><u>per lot:</u></b></p> <table><tr><th>LOT</th><th>DESCRIPTION</th><th>ABC (PhP)</th></tr><tr><td>1</td><td><b>Construction of Matampay SWIP</b> Brgy. Matampay, Munai, Lanao del Norte</td><td>15,207,050.54</td></tr><tr><td>2</td><td><b>Construction of Naglilimpiyaan SWIP</b> Brgy. Baloy, Cuyapo, Nueva Ecija</td><td>23,761,464.97</td></tr><tr><td>3</td><td><b>Construction of Mabalbalanay SWIP</b> Brgy. Agbannawag, Tabuk City, Kalinga</td><td>23,760,000.00</td></tr><tr><td>4</td><td><b>Rehabilitation of Libasan SWIP</b> Brgy. Libasan, Nabunturan, Davao de Oro</td><td>4,455,160.14</td></tr><tr><td>5</td><td><b>Rehabilitation of Bussaoit SWIP</b> Brgy. Bussaoit, Bacnotan, La Union</td><td>15,841,175.80</td></tr><tr><td>6</td><td><b>Rehabilitation of Placido SWIP</b> Brgy. San Andres, Balungao, Pangasinan</td><td>3,959,550.02</td></tr></table>	LOT	DESCRIPTION	ABC (PhP)	1	<b>Construction of Matampay SWIP</b> Brgy. Matampay, Munai, Lanao del Norte	15,207,050.54	2	<b>Construction of Naglilimpiyaan SWIP</b> Brgy. Baloy, Cuyapo, Nueva Ecija	23,761,464.97	3	<b>Construction of Mabalbalanay SWIP</b> Brgy. Agbannawag, Tabuk City, Kalinga	23,760,000.00	4	<b>Rehabilitation of Libasan SWIP</b> Brgy. Libasan, Nabunturan, Davao de Oro	4,455,160.14	5	<b>Rehabilitation of Bussaoit SWIP</b> Brgy. Bussaoit, Bacnotan, La Union	15,841,175.80	6	<b>Rehabilitation of Placido SWIP</b> Brgy. San Andres, Balungao, Pangasinan	3,959,550.02
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20	<i>[List licenses and permits relevant to the Project and the corresponding law requiring it, e.g. Environmental Compliance Certificate, Certification that the project site is not within a geohazard zone, etc.]</i>																					
21	<p>Additional contract documents relevant to the Project <b>(to be provided during contract signing)</b>:</p> <ul style="list-style-type: none"><li>● <b>construction schedule and S-curve</b></li><li>● <b>manpower schedule</b></li><li>● <b>construction methods</b></li><li>● <b>equipment utilization schedule</b></li><li>● <b>construction safety and health program approved by the DOLE</b></li><li>● <b>other acceptable tools of project scheduling</b></li></ul>																					

	<ul style="list-style-type: none"> <li>• <i>Contractor's All Risk Insurance (CARI)</i></li> <li>• <i>PERT-CPM</i></li> </ul>
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## ***Section IV. General Conditions of Contract***

### **Notes on the General Conditions of Contract**

The General Conditions of Contract (GCC) in this Section, read in conjunction with the Special Conditions of Contract in Section V and other documents listed therein, should be a complete document expressing all the rights and obligations of the parties.

Matters governing performance of the Contractor, payments under the contract, or matters affecting the risks, rights, and obligations of the parties under the contract are included in the GCC and Special Conditions of Contract.

Any complementary information, which may be needed, shall be introduced only through the Special Conditions of Contract.

## 1. **Scope of Contract**

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

## 2. **Sectional Completion of Works**

If sectional completion is specified in the **Special Conditions of Contract (SCC)**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date shall apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

## 3. **Possession of Site**

3.1 The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the **SCC**, which corresponds to the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.

3.2 If possession of a portion is not given by the above date, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

## 4. **The Contractor's Obligations**

The Contractor shall employ the key personnel named in the Schedule of Key Personnel indicating their designation, in accordance with **ITB** Clause 10.3 and specified in the **BDS**, to carry out the supervision of the Works.

The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.

## 5. **Performance Security**



- 5.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.
- 5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

## **6. Site Investigation Reports**

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the SCC supplemented by any information obtained by the Contractor.

## **7. Warranty**

Audited11

- 7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GOP in his favor shall be offset to recover the costs.
- 7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the SCC.

## **8. Liability of the Contractor**

Subject to additional provisions, if any, set forth in the SCC, the Contractor's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

If the Contractor is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

## **9. Termination for Other Causes**

Contract termination shall be initiated in case it is determined *prima facie* by the Procuring Entity that the Contractor has engaged, before, or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to corrupt, fraudulent, collusive, coercive, and obstructive practices as stated in ITB Clause 4.

## **10. Dayworks**

Subject to the guidelines on Variation Order in Annex “E” of the 2016 revised IRR of RA No. 9184, and if applicable as indicated in the **SCC**, the Dayworks rates in the Contractor’s Bid shall be used for small additional amounts of work only when the Procuring Entity’s Representative has given written instructions in advance for additional work to be paid for in that way.

## **11. Program of Work**

- 11.1. The Contractor shall submit to the Procuring Entity’s Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the **SCC**.
- 11.2. The Contractor shall submit to the Procuring Entity’s Representative **for approval an updated Program of Work** at intervals no longer than the period stated in the **SCC**. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity’s Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

## **12. Instructions, Inspections and Audits**

The Contractor shall permit the GOP or the Procuring Entity to inspect the Contractor’s accounts and records relating to the performance of the Contractor and to have them audited by auditors of the GOP or the Procuring Entity, as may be required.

## **13. Advance Payment**

The Procuring Entity shall, upon a written request of the Contractor which shall be submitted as a Contract document, make an advance payment to the Contractor in an amount not exceeding fifteen percent (15%) of the total contract price, to be made in lump sum, or at the most two installments according to a schedule specified in the **SCC**, subject to the requirements in Annex “E” of the 2016 revised IRR of RA No. 9184.

## **14. Progress Payments**

The Contractor may submit a request for payment for Work accomplished. Such requests for payment shall be verified and certified by the Procuring Entity’s Representative/Project Engineer. Except as otherwise stipulated in the **SCC**, materials and equipment delivered on the site but not completely put in place shall not be included for payment.

## **15. Operating and Maintenance Manuals**

- 15.1. If required, the Contractor will provide “as built” Drawings and/or operating and maintenance manuals as specified in the **SCC**.

- 15.2. If the Contractor does not provide the Drawings and/or manuals by the dates stated above, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from payments due to the Contractor.

## ***Section V. Special Conditions of Contract***

### **Notes on the Special Conditions of Contract**

Similar to the BDS, the clauses in this Section are intended to assist the Procuring Entity in providing contract-specific information in relation to corresponding clauses in the GCC found in Section IV.

The Special Conditions of Contract (SCC) complement the GCC, specifying contractual requirements linked to the special circumstances of the Procuring Entity, the Procuring Entity's country, the sector, and the Works procured. In preparing this Section, the following aspects should be checked:

- a. Information that complements provisions of the GCC must be incorporated.
- b. Amendments and/or supplements to provisions of the GCC as necessitated by the circumstances of the specific purchase, must also be incorporated.

However, no special condition which defeats or negates the general intent and purpose of the provisions of the GCC should be incorporated herein.

# Special Conditions of Contract

GCC Clause			
2	[If different dates are specified for completion of the Works by section, i.e. “sectional completion,” these dates should be listed here.]		
	LOT	DESCRIPTION	SCHEDULE OF COMPLETION
	1	Construction of Matampay SWIP Brgy. Matampay, Munai, Lanao del Norte	The project must be completed within 253 Calendar days upon receipt of NTP
	2	Construction of Naglilimpiyaan SWIP Brgy. Baloy, Cuyapo, Nueva Ecija	The project must be completed within 291 Calendar days upon receipt of NTP
	3	Construction of Mabalbalanay SWIP Brgy. Agbannawag, Tabuk City, Kalinga	The project must be completed within 238 Calendar days upon receipt of NTP
	4	Rehabilitation of Libasan SWIP Brgy. Libasan, Nabunturan, Davao de Oro	The project must be completed within 153 Calendar days upon receipt of NTP
	5	Rehabilitation of Bussaoit SWIP Brgy. Bussaoit, Bacnotan, La Union	The project must be completed within 232 Calendar days upon receipt of NTP
	6	Rehabilitation of Placido SWIP Brgy. San Andres, Balungao, Pangasinan	The project must be completed within 152 Calendar days upon receipt of NTP
4.1	[Specify the schedule of delivery of the possession of the site to the Contractor, whether full or in part.]		
6	The site investigation reports are: [list here the required site investigation reports.]		
7	<b>One (1) year warranty.</b> <ul style="list-style-type: none"><li>The winning contractor shall provide a 1-year warranty for the project, commencing from the date of final acceptance by the End-user. This warranty shall cover all materials, workmanship, and any defects arising from the contractor's execution of the project.</li></ul>		

	The contractor agrees to repair or replace, at no progress additional cost to the End-user, any defects that may arise during the warranty period.
7.2	<i>[In case of permanent structures, such as buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures:]</i> <b>Fifteen (15) years.</b>
10	<b>a. Dayworks are applicable at the rate shown in the Contractor's original Bid.</b>
11.1	<b>Not Applicable</b>
11.2	<b>Not Applicable</b>
13	The amount of the advance payment is <i>15% of the total contract price.</i>
14	Materials and equipment delivered on the site but not completely put in place shall be included for payment.  <b>Progress billing is allowed.</b>
15.1	The date by which "as built" drawings are required is <b><i>upon completion prior to request for final payment.</i></b>
15.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is <b><i>[1 % of the contract price per lot].</i></b>

## *Section VI. Specifications*

### **Notes on Specifications**

A set of precise and clear specifications is a prerequisite for Bidders to respond realistically and competitively to the requirements of the Procuring Entity without qualifying or conditioning their Bids. In the context of international competitive bidding, the specifications must be drafted to permit the widest possible competition and, at the same time, present a clear statement of the required standards of workmanship, materials, and performance of the goods and services to be procured. Only if this is done will the objectives of economy, efficiency, and fairness in procurement be realized, responsiveness of Bids be ensured, and the subsequent task of bid evaluation facilitated. The specifications should require that all goods and materials to be incorporated in the Works be new, unused, of the most recent or current models, and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

Samples of specifications from previous similar projects are useful in this respect. The use of metric units is mandatory. Most specifications are normally written specially by the Procuring Entity or its representative to suit the Works at hand. There is no standard set of Specifications for universal application in all sectors in all regions, but there are established principles and practices, which are reflected in these PBDs.

There are considerable advantages in standardizing General Specifications for repetitive Works in recognized public sectors, such as highways, ports, railways, urban housing, irrigation, and water supply, in the same country or region where similar conditions prevail. The General Specifications should cover all classes of workmanship, materials, and equipment commonly involved in construction, although not necessarily to be used in a particular Works Contract. Deletions or addenda should then adapt the General Specifications to the particular Works.

Care must be taken in drafting specifications to ensure that they are not restrictive. In the specification of standards for goods, materials, and workmanship, recognized international standards should be used as much as possible. Where other particular standards are used, whether national standards or other standards, the specifications should state that goods, materials, and workmanship that meet other authoritative standards, and which ensure substantially equal or higher quality than the standards mentioned, will also be acceptable. The following clause may be inserted in the SCC.

#### **Sample Clause: Equivalency of Standards and Codes**

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards that ensure a substantially equal or higher quality than the standards and codes specified will be accepted subject to the Procuring Entity's Representative's prior review and written consent. Differences between the standards specified and the proposed alternative standards shall be fully described in writing by the Contractor and submitted to the Procuring Entity's Representative at least twenty-eight (28) days prior to the date when the Contractor desires the Procuring Entity's Representative's consent. In the event the Procuring Entity's Representative determines that such proposed deviations do not ensure substantially equal or higher quality, the Contractor shall comply with the standards specified in the documents.

These notes are intended only as information for the Procuring Entity or the person drafting the Bidding Documents. They should not be included in the final Bidding Documents.

## ***Section VI. Specifications***

Please refer to [Annex A. Technical Specifications](#)

### **Schedule of Requirements**

<b>LOT</b>	<b>DESCRIPTION</b>	<b>SCHEDULE OF COMPLETION</b>
1	<b>Construction of Matampay SWIP</b> Brgy. Matampay, Munai, Lanao del Norte	<i>The project must be completed within 253 Calendar days upon receipt of NTP</i>
2	<b>Construction of Naglilimpiyaan SWIP</b> Brgy. Baloy, Cuyapo, Nueva Ecija	<i>The project must be completed within 291 Calendar days upon receipt of NTP</i>
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6	<b>Rehabilitation of Placido SWIP</b> Brgy. San Andres, Balungao, Pangasinan	<i>The project must be completed within 152 Calendar days upon receipt of NTP</i>



## ***Section VII. Drawings***

*[Insert here a list of Drawings. The actual Drawings, including site plans, should be attached to this section, or annexed in a separate folder.]*

***Note: Please refer to Annex B. [Drawings/Plans](#).***

## ***Section VIII. Bill of Quantities***

### **Notes on the Bill of Quantities**

#### **Objectives**

The objectives of the Bill of Quantities are:

- a. to provide sufficient information on the quantities of Works to be performed to enable Bids to be prepared efficiently and accurately; and
- b. when a Contract has been entered into, to provide a priced Bill of Quantities for use in the periodic valuation of Works executed.

In order to attain these objectives, Works should be itemized in the Bill of Quantities in sufficient detail to distinguish between the different classes of Works, or between Works of the same nature carried out in different locations or in other circumstances which may give rise to different considerations of cost. Consistent with these requirements, the layout and content of the Bill of Quantities should be as simple and brief as possible.

#### **Daywork Schedule**

A Daywork Schedule should be included only if the probability of unforeseen work, outside the items included in the Bill of Quantities, is high. To facilitate checking by the Entity of the realism of rates quoted by the Bidders, the Daywork Schedule should normally comprise the following:

- a. A list of the various classes of labor, materials, and Constructional Plant for which basic daywork rates or prices are to be inserted by the Bidder, together with a statement of the conditions under which the Contractor will be paid for work executed on a daywork basis.
- b. Nominal quantities for each item of Daywork, to be priced by each Bidder at Daywork rates as Bid. The rate to be entered by the Bidder against each basic Daywork item should include the Contractor's profit, overheads, supervision, and other charges.

#### **Provisional Sums**

A general provision for physical contingencies (quantity overruns) may be made by including a provisional sum in the Summary Bill of Quantities. Similarly, a contingency allowance for possible price increases should be provided as a provisional sum in the Summary Bill of Quantities. The inclusion of such provisional sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arises. Where such provisional sums or contingency allowances are used, the SCC should state the manner in which they will be used, and under whose authority (usually the Procuring Entity's Representative's).

The estimated cost of specialized work to be carried out, or of special goods to be supplied, by other contractors should be indicated in the relevant part of the Bill of Quantities as a particular provisional sum with an appropriate brief description. A separate procurement procedure is normally carried out by the Procuring Entity to select such specialized contractors. To provide an element of competition among the Bidders in respect of any facilities, amenities, attendance, etc., to be provided by the successful Bidder as prime Contractor for the use and convenience of the specialist contractors, each related provisional sum should be followed by an item in the Bill of Quantities inviting the Bidder to quote a sum for such amenities, facilities, attendance, etc.

### **Signature Box**

A signature box shall be added at the bottom of each page of the Bill of Quantities where the authorized representative of the Bidder shall affix his signature. Failure of the authorized representative to sign each and every page of the Bill of Quantities shall be a cause for rejection of his bid.

These Notes for Preparing a Bill of Quantities are intended only as information for the Procuring Entity or the person drafting the Bidding Documents. They should not be included in the final documents.

***Note: Please refer to [Annex C. Bill of Quantities](#)***

## ***Section IX. Checklist of Technical and Financial Documents***

### **Notes on the Checklist of Technical and Financial Documents**

The prescribed documents in the checklist are mandatory to be submitted in the Bid, but shall be subject to the following:

- a. GPPB Resolution No. 09-2020 on the efficient procurement measures during a State of Calamity or other similar issuances that shall allow the use of alternate documents in lieu of the mandated requirements; or
- b. any subsequent GPPB issuances adjusting the documentary requirements after the effectivity of the adoption of the PBDs.

The BAC shall be checking the submitted documents of each Bidder against this checklist to ascertain if they are all present, using a non-discretionary “pass/fail” criterion pursuant to Section 30 of the 2016 revised IRR of RA No. 9184.

# Checklist of Technical and Financial Documents

<b>I. TECHNICAL COMPONENT ENVELOPE</b>	
<i>Class “A” Documents</i>	
<u>Legal Documents</u>	
<input type="checkbox"/>	(a) Valid PhilGEPS Registration Certificate (Platinum Membership) (all pages) in accordance with Section 8.5.2 of the IRR;
<u>Technical Documents</u>	
<input type="checkbox"/>	(b) Statement of the prospective bidder of all its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid; <b><u>and</u></b>
<input type="checkbox"/>	(c) Statement of the bidder’s Single Largest Completed Contract (SLCC) similar to the contract to be bid, except under conditions provided under the rules; <b><u>and</u></b>
<input type="checkbox"/>	(d) Special PCAB License in case of Joint Ventures <b><u>and</u></b> registration for the type and cost of the contract to be bid; <b><u>and</u></b>
<input type="checkbox"/>	(e) Original copy of Bid Security. If in the form of a Surety Bond, submit also a certification issued by the Insurance Commission <b><u>or</u></b> original copy of Notarized Bid Securing Declaration; <b><u>and</u></b>
	(f) Project Requirements, which shall include the following:
<input type="checkbox"/>	a. Organizational chart for the contract to be bid;
<input type="checkbox"/>	b. List of contractor’s key personnel ( <i>e.g.</i> , Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data;
<input type="checkbox"/>	c. List of contractor’s major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership or certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be; <b><u>and</u></b>
<input type="checkbox"/>	(g) Original duly signed Omnibus Sworn Statement (OSS) <b><u>and</u></b> if applicable, Original Notarized Secretary’s Certificate in case of a corporation, partnership, or cooperative; or Original Special Power of Attorney of all members of the joint venture giving full power and authority to its officer to sign the OSS and do acts to represent the Bidder.
<u>Financial Documents</u>	
<input type="checkbox"/>	(h) The prospective bidder’s computation of Net Financial Contracting Capacity (NFCC).
<i>Class “B” Documents</i>	

<input type="checkbox"/>	(i) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence <b><u>or</u></b> duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.
<b>II. FINANCIAL COMPONENT ENVELOPE</b>	
<input type="checkbox"/>	(j) Original of duly signed and accomplished Financial Bid Form; <b><u>and</u></b>
<i><u>Other documentary requirements under RA No. 9184</u></i>	
<input type="checkbox"/>	(k) Original of duly signed Bid Prices in the Bill of Quantities; <b><u>and</u></b>
<input type="checkbox"/>	(l) Duly accomplished Detailed Estimates Form, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; <b>and</b>
<input type="checkbox"/>	(m) Cash Flow by Quarter.



## **Annex A: Bid Securing Declaration Form**

**[ shall be submitted with the Bid if bidder opts to provide this form of Bid Security]**

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REPUBLIC OF THE PHILIPPINES)

CITY OF \_\_\_\_\_) S.S

### **BID SECURING DECLARATION**

**Project Identification No.: [Insert number]**

To: *[Insert name and address of the Procuring Entity]*

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid Securing Declaration.
2. **I/We shall furnish the required performance security within ten (10) calendar days in/ Case of receipt of Notice of Award (pursuant to GPPB Circular No. 04-2020 and GPPB Resolution No. 16-2020).**
3. I/We accept that: (a) I/we will be automatically disqualified from bidding for any procurement contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of the written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1(f), of the IRR of RA No. 9184; without prejudice to other legal action the government may undertake.
4. I/We understand that this Bid Securing Declaration shall cease to be valid on the following circumstances:
  - a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
  - b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right; and
  - c. I am/we are declared the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this \_\_\_\_\_ day of [month] [year] at [place of execution].

*[Insert NAME OF BIDDER OR ITS AUTHORIZED REPRESENTATIVE]*

*[Insert signatory's legal capacity]*

*Affiant*

**[Jurat]**

*[Format shall be based on the latest Rules on Notarial Practice]*



**Price Schedule for Goods Offered from Abroad**  
*[shall be submitted with the Bid if bidder is offering goods from Abroad]*

**For Goods Offered from Abroad**

Name of Bidder \_\_\_\_\_ Project ID No. \_\_\_\_\_ Page \_\_\_\_ of \_\_\_\_

1	2	3	4	5	6	7	8	9
Item	Description	Country of origin	Quantity	Unit price CIF port of entry (specify port) or CIP named place (specify border point or place of destination)	Total CIF or CIP price per Item (col. 4 x 5)	Unit Price Delivered Duty Unpaid (DDU)	Unit price Delivered Duty Paid (DDP)	Total Price delivered DDP (col 4 x 8)

Name: \_\_\_\_\_

Legal Capacity: \_\_\_\_\_

Signature: \_\_\_\_\_

Duly authorized to sign the Bid for and behalf of: \_\_\_\_\_

*[shall be submitted with the Bid if bidder is offering goods from within the Philippines]*

Name of Bidder \_\_\_\_\_ Project ID No. \_\_\_\_\_ Page \_\_\_\_\_ of \_\_\_\_\_

[illegible]

Legal Capacity: \_\_\_\_\_

Signature: \_\_\_\_\_

Duly authorized to sign the Bid for and behalf of: \_\_\_\_\_

## Contract Agreement Form for the Procurement of Goods (Revised)

*[Not required to be submitted with the Bid, but it shall be submitted within ten (10) days after receiving the Notice of Award]*

### CONTRACT AGREEMENT

THIS AGREEMENT made the \_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_ between [name of PROCURING ENTITY] of the Philippines (hereinafter called "the Entity") of the one part and [name of Supplier] of [city and country of Supplier] (hereinafter called "the Supplier") of the other part;

WHEREAS, the Entity invited Bids for certain goods and ancillary services, particularly [brief description of goods and services] and has accepted a Bid by the Supplier for the supply of those goods and services in the sum of *[contract price in words and figures in specified currency]* (hereinafter called "the Contract Price").

#### NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents as required by the 2016 revised Implementing Rules and Regulations of Republic Act No. 9184 shall be deemed to form and be read and construed as integral part of this Agreement, viz.:
  - i. Philippine Bidding Documents (PBDs);
    - i. Schedule of Requirements;
    - ii. Technical Specifications;
    - iii. General and Special Conditions of Contract; and
    - iv. Supplemental or Bid Bulletins, if any
  - ii. Winning bidder's bid, including the Eligibility requirements, Technical and Financial Proposals, and all other documents or statements submitted;  
  
Bid form, including all the documents/statements contained in the Bidder's bidding envelopes, as annexes, and all other documents submitted (e.g., Bidder's response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;
  - iii. Performance Security;
  - iv. Notice of Award of Contract; and the Bidder's conforme thereto; and
  - v. Other contract documents that may be required by existing laws and/or the Procuring Entity concerned in the PBDs. Winning bidder agrees that additional contract documents or information prescribed by the GPPB that are subsequently required for submission after the contract execution, such as the Notice to Proceed, Variation Orders, and Warranty Security, shall likewise form part of the Contract.
3. In consideration for the sum of *[total contract price in words and figures]* or such other sums as may be ascertained, *[Named of the bidder]* agrees to *[state the object of the contract]* in accordance with his/her/its Bid.

4. The *[Name of the procuring entity]* agrees to pay the above-mentioned sum in accordance with the terms of the Bidding.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of the Republic of the Philippines on the day and year first above written.

*[Insert Name and Signature]*

*[Insert Name and Signature]*

*[Insert Signatory's Legal Capacity]*

*[Insert Signatory's Legal Capacity]*

*for:*

*for:*

*[Insert Procuring Entity]*

*[Insert Name of Supplier]*

**Acknowledgment**

*[Format shall be based on the latest Rules on Notarial Practice]*

## Omnibus Sworn Statement (Revised)

*[shall be submitted with the Bid]*

REPUBLIC OF THE PHILIPPINES )  
CITY/MUNICIPALITY OF \_\_\_\_\_ ) S.S.

### AFFIDAVIT

I, [Name of Affiant], of legal age, [Civil Status], [Nationality], and residing at [Address of Affiant], after having been duly sworn in accordance with law, do hereby depose and state that:

1. *[Select one, delete the other:]*

*[If a sole proprietorship:]* I am the sole proprietor or authorized representative of [Name of Bidder] with office address at [address of Bidder];

*[If a partnership, corporation, cooperative, or joint venture:]* I am the duly authorized and designated representative of [Name of Bidder] with office address at [address of Bidder];

2. *[Select one, delete the other:]*

*[If a sole proprietorship:]* As the owner and sole proprietor, or authorized representative of [Name of Bidder], I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached duly notarized Special Power of Attorney;

*[If a partnership, corporation, cooperative, or joint venture:]* I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached [state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable)];

3. [Name of Bidder] is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board, by itself or by relation, membership, association, affiliation, or controlling interest with another blacklisted person or entity as defined and provided for in the Uniform Guidelines on Blacklisting;

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

5. [Name of Bidder] is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. *[Select one, delete the rest:]*

*[If a sole proprietorship:]* The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical



Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

*[If a partnership or cooperative:]* None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

*[If a corporation or joint venture:]* None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and
8. *[Name of Bidder]* is aware of and has undertaken the responsibilities as a Bidder in compliance with the Philippine Bidding Documents, which includes:
  - a. Carefully examining all of the Bidding Documents;
  - b. Acknowledging all conditions, local or otherwise, affecting the implementation of the Contract;
  - c. Making an estimate of the facilities available and needed for the contract to be bid, if any; and
  - d. Inquiring or securing Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.
9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.
10. In case advance payment was made or given, failure to perform or deliver any of the obligations and undertakings in the contract shall be sufficient grounds to constitute criminal liability for Swindling (Estafa) or the commission of fraud with unfaithfulness or abuse of confidence through misappropriating or converting any payment received by a person or entity under an obligation involving the duty to deliver certain goods or services, to the prejudice of the public and the government of the Philippines pursuant to Article 315 of Act No. 3815 s. 1930, as amended, or the Revised Penal Code.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_ day of \_\_\_\_, 20\_\_ at \_\_\_\_\_, Philippines.

*[Insert NAME OF BIDDER OR ITS AUTHORIZED REPRESENTATIVE]*

*[Insert signatory's legal capacity]*  
Affiant

*[Jurat]*

*[Format shall be based on the latest Rules on Notarial Practice]*

## SAMPLE FORMS

### Statement of all Ongoing Government & Private Contracts Including Contracts Awarded but not yet Started

Business Name: \_\_\_\_\_

Business Address: \_\_\_\_\_

Name of Contract/ Project Cost	a. Owner's Name b. Address c. Telephone Nos.	Nature of Work	Bidders Role		a. Date Awarded b. Date Started c. Date of Completion	% of Accomplishment		Value of Outstanding Works / Undelivered Portion
			Description	%		Planned	Actual	
<u>Government</u>								
<u>Private</u>								
Total Cost								

Submitted by: \_\_\_\_\_

(Printed Name and Signature)

Designation: \_\_\_\_\_

Date: \_\_\_\_\_

## Statement of Completed Similar Contracts

**Business Name:**

**Business Address:**

Name of Contract/ Project Cost	a. Owner's Name b. Address c. Telephone Nos.	Nature of Work	Bidders Role		a. Date Awarded b. Date Started c. Date of Completion	Value of Works
			Description	%		
Note: The following documents shall be presented for verification of the above statement during Post-Qualification:					Total	

1 Notice of Award OR Notice to Proceed issued by the End user OR its equivalent;

2 Copy of actual contract OR its equivalent; and

3 Certificate of Completion OR End-user's Acceptance OR Proof of payment

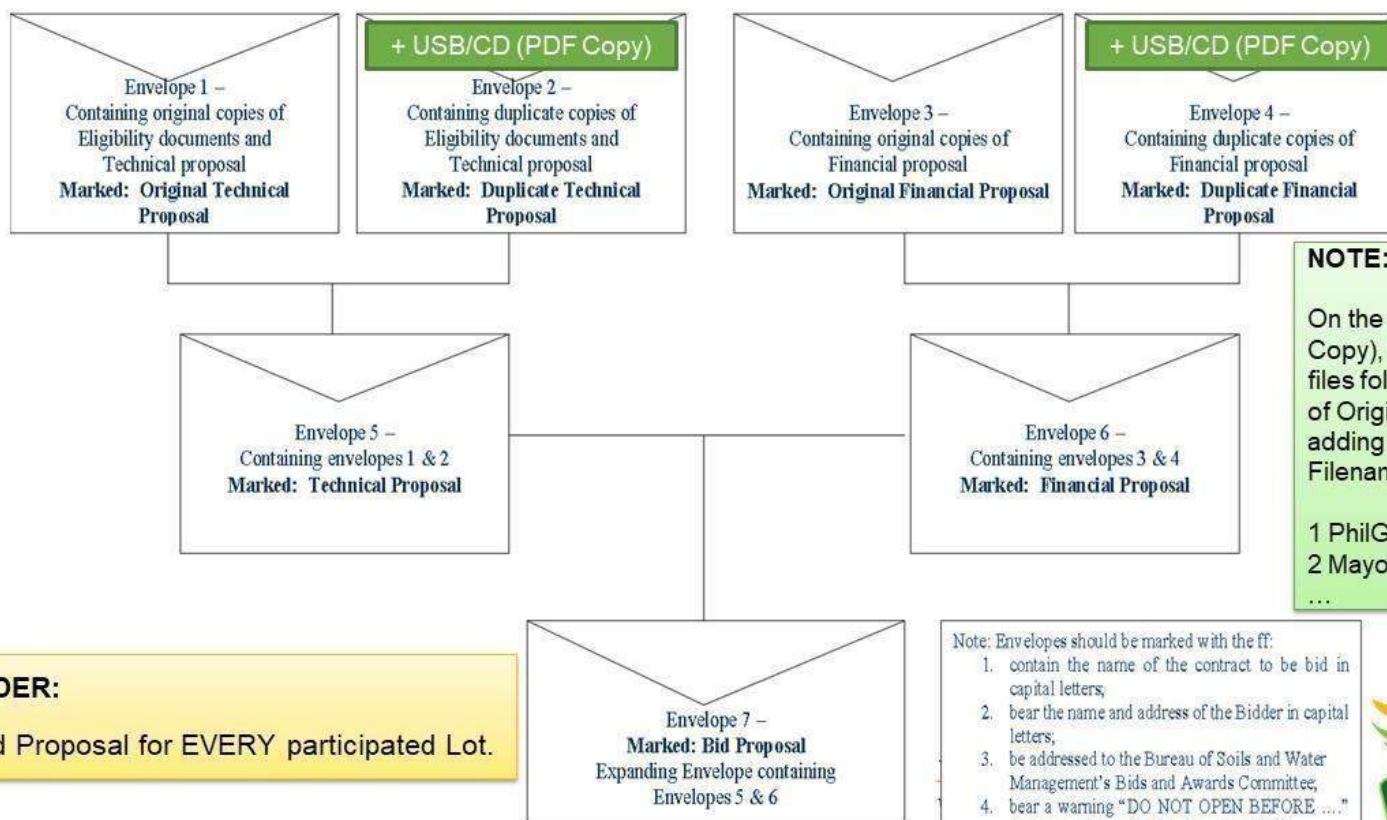
Submitted by: \_\_\_\_\_  
(Printed Name and Signature)

Designation: \_\_\_\_\_

Date: \_\_\_\_\_



# Sealing and Marking of Bid:



## NOTE:

On the USB/CD (PDF Copy), Please arrange files following sequence of Original Copy by adding number on the Filename.

1 PhilGEPS  
2 Mayors Permit  
...

## REMINDER:

One Bid Proposal for EVERY participated Lot.

Note: Envelopes should be marked with the ff:

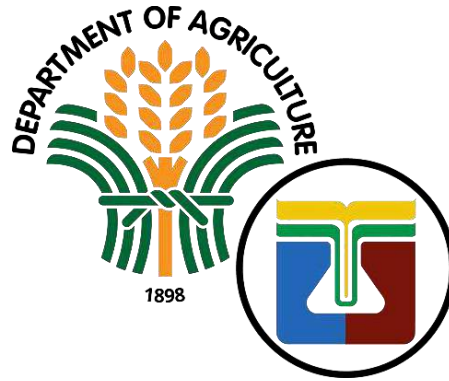
1. contain the name of the contract to be bid in capital letters;
2. bear the name and address of the Bidder in capital letters;
3. be addressed to the Bureau of Soils and Water Management's Bids and Awards Committee;
4. bear a warning "DO NOT OPEN BEFORE ...." the date and time for the Opening of Bids.





Department of Agriculture

## **Bureau of Soils and Water Management**



## **TECHNICAL SPECIFICATIONS**



## **SECTION 1**

### **CONSTRUCTION OF FIELD OFFICE AND TEMPORARY FACILITIES AND MOVEMENT OF EQUIPMENT**

#### **1.01 SCOPE**

a. Field Office

The Contractor shall furnish all materials labor, equipment, tools and establish the field office as necessary for the successful completion of the contract work.

The site for field office shall be as specified in the plans and specification or as may be designated by the DA/BSWM engineer or representative. The field office shall be strategically located. The field office shall have a minimum floor area of 36 sq.m. The field office shall be completed with facilities such as light and water.

b. Temporary Works

The Contractor shall furnish all materials, labor, equipment, tools and install such temporary works as are necessary for the successful completion of the Contract Work. The Contractor shall negotiate the site for his construction camp, office and work areas.

These temporary works and construction plant shall include but shall not be limited to the following:

1. Construction camp for housing, feeding and accommodation for all the Contractor's employees. The Contractor shall also, with-in close proximity of his camp, provide an office and sleeping quarter for Bureau of Soils and Water Management employees, complete with facilities and shall have a minimum floor area of 48 sq.m.
2. Facilities such as haul roads, potable water, supply, drainage, lighting, sewage disposal system, sanitation, first aid and fire protection facilities.
3. Workshops, laboratory, warehouses, site offices, stockpile areas, storage areas for materials, equipment, spare parts, fuel and oil.
4. River diversion system including construction of cofferdam.
5. All other temporary facilities not specifically listed but nevertheless required for the proper functioning of the camp set-up and construction activities.

Temporary works shall conform to all government standards and codes and shall meet the sanitary requirements of the Department of Health.

Contractor shall submit to BSWM for approval layout drawings, program of erection and specifications for the Temporary Works within thirty (30) calendar days following the date of receipt of the Notice to Proceed as stipulated in Article SC – 3. No construction or erection of Temporary Works shall be started without prior approval of BSWM.

c. Mobilization and Demobilization

The Contractor shall mobilize and move into the Project Site (in accordance with his approved Construction Program and Equipment Moving-in and Utilization Schedule) the required construction equipment needed for the successful completion of the Contract Work immediately after receipt of the approved Construction Program. Notwithstanding the approved Equipment Moving-in and Utilization Schedule, the initial equipment required to be mobilized by the Contractor to the Project Site within twenty (20) calendar days after date of receipt of the approved Construction Program are listed below:

***MINIMUM EQUIPMENT REQUIREMENT FOR SWIP***

		NUMBER	
		OWNED	LEASED
1.	Bulldozer 140 Hp & above with Shank Ripper	1 unit	
2.	Bulldozer 105 Hp		1 unit
3.	Wheel Loader	1 unit	
4.	Vibratory Roller		1 unit
5.	Concrete Mixer 1 bagger	1 unit	
6.	Water Truck or Watering Pump	1 unit	
7.	Dump Trucks 6.8 cu.m.	1 unit	2 units
8.	Service Vehicle, 4-wheel drive	1 unit	
9.	Survey Instrument		1 unit

***MINIMUM EQUIPMENT REQUIREMENT FOR DIVERSION DAM***

		NUMBER	
		OWNED	LEASED
1.	Concrete Mixer 1 bagger	1 unit	
2.	Dump Truck	1 unit	
3.	Bar Cutter & Bender	1 unit	
4.	Service Vehicle	1 unit	
5.	Survey Instrument		1 unit
6.	Water Pump		1 unit
7.	Portable Compactor		1 unit

If for the reasons or causes other than "major calamities", the Contractor fails to mobilize fully the initial equipment required within said period, and all other equipment listed in his approved Equipment Moving-in and Utilization Schedule, at the discretion of the Secretary/Director, he may be given an extension of time to mobilize them fully but in no case shall it exceed thirty (30) calendar days. Failure to fully mobilize the required construction equipment within said period will be a ground for contract rescission. During said extension period liquidated

damages equivalent to the ACEL operated daily rental rate for eight (8) hours of the undelivered equipment per day of delay shall be imposed and collectible from any subsequent payment due the Contractor. Delays caused by “major calamities” will not be counted. Delays shall be reckoned starting at 12:00 o’clock noon of the succeeding day after the date scheduled for the mobilization of the programmed equipment. The Project Engineer shall certify to the date of actual mobilization of the programmed equipment to the site.

The BSWM shall check and verify the number, type and actual condition of the equipment moved into the Project Site. The BSWM reserves the right to order the removal of such equipment that are not in good working condition from the Project Site at the Contractor’s expense and said equipment are not accounted for.

Construction equipment once moved into the Project Site, checked and accounted for the Project Engineer shall not be permitted, prior to the completion of the Contract Work, to be moved out or transferred by the Contractor to another Project Site without the written approval of the Project Engineer. Periodic check- up of the Contractor’s equipment moved-in for the Contract Work shall be conducted by BSWM. The Contractor will pay to BSWM the amount equivalent to the ACEL Rental Rate of any equipment not accounted for during said check- up for the number of calendar days the equipment has been removed (without the written consent of the Project Engineer) from the Project Site until the said equipment have been returned. Such cases are grounds for disapproval of claims for contract time extensions by the Contractor.

Demobilization shall include dismantling and removal from the site of Contractor’s Construction Plant, materials and equipment and all temporary facilities with the exception of some facilities which BSWM shall consider to remain and which shall be handled over to BSWM at the time of demobilization shall also include clean-up of the site after completion of the Contract Work as approved by BSWM and transportation from the site of Contractor’s employees.

## **1.02 BASIS OF PAYMENT**

Basis of payment shall be as follows unless other conditions are agreed mutually by contracting parties:

Payment for temporary works such as Contractors quarters, labor camps, water and electricity supply system, etc. and river diversion system including construction of cofferdam should be made in fixed percentage of this works. Seventy (70%) percent of the total lump sum price of this temporary works will be paid to the Contractor upon completion of these temporary facilities and the remaining thirty (30%) percent of these total price will be paid after removed or being handed over to DA/BSWM of these works.

Payment for furnishing all materials equipment and labor for other items shall be made on fixed lump sum price and is not subject to escalation. No payment for demobilization of construction equipment will be made.

## SECTION 2

### ACCESS ROAD

#### 2.01 *SCOPE*

The work under this Section shall consist of surface preparation and quarrying of materials including stockpiling, loading, hauling, dumping, spreading, and compaction of road surfacing materials into access road and service roads including the furnishing of equipment, supplies, labor and tools, all in accordance with these Specifications and in conformity with the Drawings.

The new roadway shall start from the existing barangay road to the project site. Rehabilitation of Bailey Bridges on existing barangay roads is not part of the work. Temporary diversion road section shall be provided.

#### 2.02 *MATERIALS*

Road surfacing materials for access and service roads shall consist of pit-run gravel, talus rock, volcanic cinders, sand collars, or other similar granular materials selected under the direction of the DA/BSWM Project Engineer. Oversized materials, if any, shall be removed at the borrow pit by screens or hand-picking except that if the material is of such nature that it will break under rolling, the DA/BSWM Project Engineer may permit the breaking down to the required size on the road. If necessary to obtain proper uniformity, additional materials shall be blended by mixing in the roadway. The Contractor if he so chooses, may crush the oversized materials lieu of wasting it. Road surfacing materials shall meet the following gradation requirements:

Sieve Designation	% Passing by Volume
50.8	100
38.1	75-95
19.05	55-85
9.53	40-75
#4	30-60
#10	20-45
#40	15-30
#200	8-15

The portion of the filler passing the No. 40 sieve, including blending filler for top coarse materials shall have a plasticity of 2-6 as determined by ASTM Designation D424-39.

Sources of road surfacing materials will be those indicated on the Drawings or those designated by the DA/BSWM Project Engineer. The Contractor shall clear and grub the sources of road surfacing materials within the limits staked by the BSWM; strip over-burdens and dispose all waste materials from said clearing and grubbing on stripping operations as directed by the DA/BSWM Project Engineer.

Road surfacing materials shall be excavated in accordance with the applicable provisions of Section 4.

### **2.03 MAINTAINING PUBLIC TRAFFIC**

In the rehabilitation of existing roadways, the Contractor shall make necessary provisions for the maintenance of public traffic and shall conduct his construction operations for the work involved such that public traffic may pass through the work area at all times with a minimum of obstructions and inconveniences. A traffic man shall be assigned by the Contractor to handle the smooth flow of traffic.

The safety of the travelling public shall be the responsibility of the Contractor. All barricades and obstructions shall be illuminated at night and all lights shall be kept burning from sunset to sunrise.

### **2.04 METHOD OF CONSTRUCTION**

#### **a. Subgrade Preparation**

##### **1. New Roadway**

Surfacing of embankments or protection dikes for roadway shall be performed after operations for the constructions of said embankments or protection dikes are completed.

All compacted embankments that are prepared for roadway subgrade shall be tested of each uniformity and degree of compaction before road surfacing materials are placed.

##### **2. Existing Roadways**

The Contractor shall prepare the subgrade of existing roadways before road surfacing materials needed in upgrading such existing roadways are to be placed.

#### **b. Placing, Rolling, and Grading of Road Surfacing Materials**

##### **1. Method of Placing**

All road surfacing materials shall be placed simultaneously with the road shoulder materials on the prepared subgrade for roadways as directed by the DA/BSWM Project Engineer.

##### **2. Spreading and Grading**

Spreading shall be done manually or mechanically at the option of the Contractor, in such a way that segregation of size will be avoided and such that road surfacing materials shall not be mixed with the road shoulder materials.



Spreading shall be performed immediately after every dumping. Whether to spread first the road surfacing materials within the limits of the road bed before spreading the road shoulder materials or vice-versa, or simultaneously shall be at the option of the Contractor provided that said materials will not mix. If additional fillers for blending are required, these filler materials shall be mixed with the loosely spread road surfacing materials by any method the Contractor may apply provided a satisfactory uniform mixture is obtained before compaction. Quantity of filler materials shall be as specified by the DA/BSWM Project Engineer. Addition of filler materials shall be such that the blend of added and original materials placed shall meet grading quality requirements in all aspects.

3. Rolling

Compaction operations shall only be started when ordered by the DA/BSWM Project Engineer, after the above operations have been duly inspected and verified by the Project Engineer or his authorized representative. The road surfacing and road shoulder materials shall be compacted simultaneously. All materials shall be compacted to the full width of the roadway by rolling. Rolling shall progress gradually from the sides to the center, parallel with the centerline of the road lapping each preceding rolled track by one-half the width of the roller. Rolling shall continue until the desired degree of compaction is attained.

Any irregularities or depressions that develop under such rolling shall be corrected by loosening the materials at these places and adding or removing materials until such surfaces are smooth and uniform. Road surfacing materials shall be compacted to achieve a relative density of 70% as determined by the USBR Relative Density Test, Designated E-12.

Placing, spreading, grading and compaction will not be measured for payment. Cost of these works shall be included in the lump sum price for access/service roads construction.

**2.05 METHOD OF MEASUREMENT**

Measurement for payment of access and service roads construction shall be based on the respective volumes of specific work items composing access/service road construction as specified in the bill of quantities. For common excavation, measurement shall be in accordance with Sub-section 5.09 of Section 5.0 (Excavation and Foundation Preparation). Fills and gravel surfacing shall be measured by the number of cubic meters of materials actually placed and accepted.

**2.06 BASIS OF PAYMENT**

Payment for works accomplished shall be based on the actual quantities of the different work items mentioned in the bill of quantities under this section and shall be computed based on the respective unit bid price for each of the pay item included in this work.

### **SECTION 3**

#### **DIVERSION OF WATER AND CARE OF CREEK AND REMOVAL OF WATER FROM FOUNDATION**

##### **3.01 GENERAL**

The Contractor shall construct and maintain all necessary cofferdams, channels, drains, sumps and/or other temporary diversion and protective works; shall furnish all materials, labor and equipment required therefore; and furnish, install, maintain and operate all necessary pumping and other equipment for removal of water. After having served their purpose, all cofferdams or other protective works downstream from the dam shall be removed or level to give a sightly appearance, so as not to interfere in anyway in the operation or usefulness of the reservoir, and in a manner approved by DA/BSWM.

The Contractor shall be responsible for and shall repair at his expense any damage to the foundations. Structures or any other part of works caused by floods, water or failures of any part of the diversion or protective works.

##### **3.02 BASIS OF PAYMENT**

Payment for the diversion of water and care of creek and removal of water shall be on lump sum price as included in the bill of quantities. The Contractor shall be paid seventy percent (70%) upon completion of construction of cofferdams, temporary diversions and protective works. The remaining thirty (30) percent will be paid after removal of this temporary works.

## **SECTION 4**

### **CLEARING AND GRUBBING**

#### **4.01 SCOPE**

The work under this Section shall include clearing, grubbing and disposal, in a manner approved by BSWM, of all vegetation, trees, stumps, roots, brush, rubbish and all objectionable or undesirable matters within the entire damsite, construction camp site borrow areas, road surfacing materials sources, stockpile areas and elsewhere as may be directed by the Project Engineer; all in accordance with Drawings and this Specifications or as directed by the Project Engineer.

#### **4.02 METHOD OF CONSTRUCTION**

a. Clearing on Lightly Vegetated Areas

The areas over which the dam and appurtenances shall be constructed, side borrow areas, borrow haul areas, aggregate sources and stockpile areas shall be cleared of all vegetation, trees and all other matters, except such trees or shrubs which the BSWM may ordered to preserve. All trees or shrubs ordered to be preserved including all existing adjacent shall be protected from injury or damage resulting from the Contractor's operations. All combustible materials from clearing operations shall be burned thoroughly or removed from the site of work or otherwise disposed to designated areas as directed by the Project Engineer.

All materials to be burned shall be piled nearby and when in a suitable condition shall be burned thoroughly. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk. The Contractor shall at all times take special precautions to prevent fire from spreading and shall have available at all times suitable equipment and supplies for use in preventing and fighting fires. No clearing shall be done on any areas where there are standing crops until such crops have been harvested or unless the Contractor shall have secured written permission from BSWM.

c. Clearing on Swampy Areas and/or Second Growth Forested Areas

Clearing on swampy areas and/or second growth forested areas where facilities will be constructed shall be started only when said areas are suitably dry or when directed by the Project Engineer. Clearing includes felling and buckling of trees using chain saws and cutting of tree branches extending over the entire right-of- way. Felled trees shall be cut into the longest usable lengths and shall be hauled and neatly stocked at designated stockpile areas. Small trees and stumps, branches, grass and litters shall be burned in accordance with the preceding paragraphs (a).

c. Grubbing

Grubbing shall consist of the removal of all trees, stumps, roots, brush and rubbish from the above-mentioned work areas. It shall include the surface to a

depth not more than 10 cms by effective means to remove all objectionable materials or organic matters from the said work areas. Stripping beyond the 10 cm. limit shall be subject to approval by the Project Engineer and payment thereof shall be considered under Excavation.

#### **4.03    *METHOD OF MEASUREMENT***

The area to be measured for payment shall be within the limit of the entire right-of- way as shown on the Drawings or as staked by the BSWM during construction operations.

Measurement shall be made by the square meters and shall be computed based on the projection on a horizontal plane of the dimension of all acceptably cleared and grubbed areas.

#### **4.04    *BASIS OF PAYMENT***

The cleared and grubbed areas measured as provided above shall be paid at the contract unit price per square meter in the Bill of Quantities which price and payment shall constitute full compensation for furnishing all labor, tools, equipment, supplies and all incidentals or subsidiary works.

## **SECTION 5**

### **EXCAVATION, STRIPPING AND FOUNDATION PREPARATION**

#### **5.01 SCOPE**

The work under this Section shall include clearing removal, hauling and disposal of all excavated materials tamping and trimming of foundation bed required for the construction of permanent structure, dam foundation, irrigation canals, spillway structure including roadway and drainage excavation for access road. It shall also include whenever necessary all coffer damming, temporary diversions and protection works, pumping and dewatering operations, all necessary draining, storing and clean-up of sight after construction.

#### **5.02 CLASSIFICATION**

Excavations under this Section shall either be open or confined excavation. Furthermore, excavations shall be classified as follows:

- a. Rock Excavation. Any massive formation of hard materials which cannot be excavated either by manual or mechanical means unless first blasted shall fall under this classification.
- b. Excavation of Indurated Materials. A massive formation of inorganic materials not falling under the classification of “Rock Excavation” such as adobe, hardpan and the like, shall be classified as “Indurated Materials”
- c. Common Excavation. All other materials not falling under the above classifications will be classified as “Common Materials”.

#### **5.03 OPEN EXCAVATION**

##### **5.03.1 General**

Open excavation denotes excavation to be carried out in the open air, in large quantities, with heavy or medium size equipment and without resorting to significant shoring. This consists of the loosening, hauling and satisfactory disposal of all materials within the lines and disposal of all materials within the lines and grades shown on the Drawings or as established by the DA/BSWM Project Engineer.

Excavated materials which are to be used later in cofferdams, in fill or backfill or in the manufacture of concrete aggregate shall be stockpiled in approved locations. Excavated materials to be wasted shall be disposed off properly in areas designated by the DA/BSWM Project Engineer.

Any over-excavation performed by the contractor for any purpose or reason, except as maybe ordered by the Project Engineer, shall at the Contractor's expense and any excess of excavation shall be refilled, where required, at the expense of the contractor.

Unsuitable materials, as determined by the DA/BSWM Project Engineer, which maybe encountered below established grade, shall be removed to a depth as directed and accordingly replaced with suitable materials approved by the DA/BSWM Project Engineer.

#### 5.03.2 Grading Excavation

Where shown in the plans or as directed by the DA/BSWM Project Engineer, the contractor shall perform grading excavation for the roadways, parking areas, switchyard, service yard, powerhouse ground, and other areas where grading work is required. Grading excavation shall be carried-out in such a manner that free drainage is maintained at all times and nowhere shall pondage be found in the work.

#### 5.03.3 Stripping

Stripping consists of the removal and satisfactory disposal off all plants, roots, vegetal earth and other detrimental matters existing on the ground surface within the foundation of all embankments and within quarry and borrow areas. The depth of stripping shall be shown on the drawing. Stripped materials shall either be removed and the foundation carried down to a level with satisfactory bearing capacity or as directed by the DA/BSWM Project Engineer.

#### 5.03.4 Final Grades and Lines

Subject to the approval by, and/or direction of the DA/BSWM Project Engineer, foundation surfaces at the lines and grades shown on the drawing consists of or containing unsuitable materials shall either be removed and the foundation carried down to a level with satisfactory bearing capacity, or replaced with suitable materials compacted to the required bearing capacity.

For those portions of the foundation surfaces to be covered with thick fills or massive concrete, isolated points on in-situ soil or undisturbed ledge rock extending not more than fifteen (15) cms within the prescribed lines, will be tolerated. For the foundation of concrete structures, heavy blasting, wherever needed, shall be stopped within seventy (70) centimeters of the required depth and the rest shall be completed by barring down and ripping. Soft blasting will be resorted only in case of hard massive rock or big boulders. For side slopes or walls of cuts in rock, pre-splitting maybe directed by the DA/BSWM Project Engineer.

### 5.04 ***STRUCTURE EXCAVATIONS***

Foundations shall be excavated according to the outline of the footings and floors of structure as shown on the Drawings or as directed by the DA/BSWM Project Engineer, and shall be of sufficient size to permit free movement of workers.

On excavation of common materials, the foundation bed upon which structures are to be placed shall be finished accurately to the established lines and grades after a

thorough compaction and trimming of the foundation with the use of suitable tools and equipment.

If at any point, material is excavated beyond the lines and grades any part of the structure, the over excavation shall be filled with selected materials approved by the DA/BSWM Project Engineer and shall be placed in layers of not more than 20 cms thick, moistened and thoroughly compacted by special roller, mechanical tampers or by other approved methods. The cost of filling over-excavation ordered by the DA/BSWM Project Engineer shall be borne by the Contractor.

On excavation of rock materials, the bottom and side surfaces of excavated rock excavation upon or against which concrete and weep holes are to be placed shall conform to the required grades and dimensions as shown on the drawing or as established by the DA/BSWM Project Engineer. If at any point, materials are excavated beyond the required limits, the over excavation shall be filled with concrete at the expense of the Contractor including the cost of all materials required.

All foundations for other types of structures on soft ground not requiring piling shall be excavated to a depth of 50 centimeters below the proposed bottom of concrete shown on the Drawings and to a maximum width of 60 centimeters of the outermost lines of said base and should be backfilled with selected materials in layers not exceeding fifteen (15) centimeters in thickness. Such layers shall be rammed firmly in place and the final surface shall be thoroughly wetted before any concrete is placed thereon. Measurement and payment for the backfill shall be made under Section 11

## **5.05 DISPOSAL OF EXCAVATED MATERIALS**

### **5.05.1 Fills**

Suitable materials for fills from required excavations may, at the Contractor's discretion, be placed directly on the appropriate zones of the fills. The suitability and manner of placing of such materials shall meet the requirements of Section 11 of this volume.

### **5.05.2 Stockpiles**

The Contractor may stockpile materials for his own and at his expense in areas approved by the DA/BSWM Project Engineer. Where excavation work progresses at a faster rate than placement in the fills, such excavated materials shall be graded to blend with existing ground or removed from the stockpile used for stockpiling purposes and shall be properly sloped for effective drainage.

### **5.05.3 Spoil Areas**

Excavated materials not suitable for fill or otherwise not needed shall be wasted in spoil areas indicated in the plans, in such areas approved by the DA/BSWM Project Engineer. Spoil areas shall be cleared of all downed and standing timber prior to placing spoil thereon as specified in Section 4, Clearing and Grubbing. Depleted areas of borrow and quarries maybe used

for disposing spoil materials. Spoil piles shall be constructed to the stable slopes of the materials being wasted. Any spoil pile exceeding ten (10) meters in height shall be provided with four-meter-wide berm for every ten (10) meters of height. Spoil materials shall be spread and graded so that the surface drainage will not be concentrated and will not cause or accelerate erosion.

#### **5.06 SLIDES**

When slides in open cut excavation occur along excavated slopes during the construction period, or after completion but prior to acceptance of the work, the contractor shall remove and dispose of such additional material, as in the opinion of the DA/BSWM Project Engineer, is necessary to leave the slopes in a safe and neat condition, all at the expense of the contractor, unless the occurrence of such slides were occasioned by causes beyond the control of the Contractor.

#### **5.07 SAFETY REQUIREMENTS**

To prevent accidents, the Contractor shall adopt and maintain a satisfactory system of inspection and scaling for all temporary rock excavations. The Contractor shall maintain all berm barriers which might be required and constructed under this contract in satisfactory condition and shall keep the berm clear of material. Materials so removed shall be disposed in designated spoil areas and no payment will be made for the removal and disposal thereof. Such work shall be considered incidental to the items of work in this contract. Adequate lighting facilities for night time operations shall be installed and maintained throughout the duration of the entire work.

#### **5.08 FOUNDATION PREPARATION**

##### **5.08.1 Fill on Earth**

All horizontal and sloped earth surfaces shown in the drawings or specified by the DA/BSWM Project Engineer, upon which embankment material is to be placed shall consist of undisturbed or well compacted material and shall be clean, damp, free from water and free from organic matter. They shall essentially be suitable as foundation material to be placed upon them. Earth foundations requiring compaction shall in all respects conform to the applicable provisions of Section 6 and as shown on the Drawings. No embankment material shall be placed on any earth foundation without prior approval of the DA/BSWM Project Engineer.

##### **5.08.2 Fill on Rock**

Foundation preparation shall consist of the completion of excavation to the surface upon which the fill material is to be placed. Where rock-fill is the specified fill material, sound rock or boulders meeting the requirements of the rock fill may be left in place. Foundation surfaces shall be cleaned with brooms and air and/or water jet under high pressure as directed.



For all embankments intended for retaining water, rock foundation shall be thoroughly inspected before any fill is placed. Open cracks shall be sealed with concrete or mortar, or provided with gravel grains and filters as approved by the DA/BSWM Project Engineer.

#### 5.08.3 Concrete on Rock

All rock surfaces upon or against which concrete is to be placed shall be prepared by drilling, barring, wedging, picking, light blasting, or similar methods which will leave the surface clean and in the best practicable condition. No heavy blasting will be permitted. The rock surface shall be left clean and rough so as to bond well with the concrete placed upon it. Faults, fissures, and seams in rock subjected to this surface preparation shall be cleaned to a satisfactory depth and to firm rock on the sides. Rock shall be free from water. All installations necessary to produce rock surfaces free of water shall be installed and securely fastened in place by Contractor. All loose rock and other objectionable materials shall be removed and the surface thoroughly cleaned by air and/or water jetting or other satisfactory means as directed.

#### 5.08.4 Concrete on Earth

Foundation on earth upon or against which concrete is to be placed shall be prepared in the same manner as mentioned on Sub-section 3.10.1 preceding this.

### **5.09 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

#### 5.09.1 Stripping

Stripping of ground surfaces after clearing trees, grubbing roots, and removing vegetable earth shall be measured based on the quantity in cubic meters at the different classes of excavation actually striped off and the unit price for the different classes of excavation.

#### 5.09.2 Grading Excavation and Open Excavation

A survey of the areas to be excavated shall be made by the Contractor and confirmed by the DA/BSWM Project Engineer prior to the start of the work. All measurements for excavations shall be based on this initial survey without regards to any change that may occur during the prosecution of the work. The quantity, in cubic meters to be paid shall be computed by the End- Area Method as determined from the original ground as surveyed and the final lines shown on the drawings or the lines directed in writing by the DA/BSWM Project Engineer during the prosecution of the work.

Slides, if any, shall be paid subject to the provisions set forth under Sub- section 5.08 and GC-16 of the Tender and Contract Provisions. Payments for grading and open excavation under this Contract shall be made at the corresponding contract unit bid prices for each class of material, which unit

price includes all direct and indirect expenses connected with grading and open excavation, including cost of proper disposal of materials. The Contractor shall be responsible for making himself thoroughly knowledgeable of the physical conditions at the site. In no case shall the BSWM be held responsible for any discrepancy between the information supplied by the BSWM and the actual conditions met during the progress of excavations.

The final trimming, barring down, and cleaning of foundation surfaces shall not be paid for separately, being covered by the relevant unit bid prices for concrete or fill placement.

#### 5.09.3 Foundation Preparation

No separate payment will be made for all foundation preparation under this Section. The Contractor shall include his cost thereof in his unit bid price for the pertinent concrete or fill in the Bid Proposal.

## **SECTION 6 DAM**

### **EMBANKMENT**

#### **6.01 SCOPE**

This section covers construction of the modified homogeneous earthfill dam consisting of impervious earthfill, filters as drain, rock toe drain, riprap and gravel surfacing.

#### **6.02 GENERAL REQUIREMENTS**

The dam embankment comprises of impervious earthfill, filter and drains, rock toe drain, riprap, gravel surfacing and sodding. Their positions are shown on the Drawings.

The embankment shall be constructed to the lines and grades shown on the Drawings or established by DA/BSWM Project Engineer. The lines and grades so established may be changed during construction by the DA/BSWM Project Engineer. And such revision shall not constitute justification for changes in unit prices.

In this specification, the terms “Optimum Moisture Content” and “Maximum Dry Density at Lower Compactive Effort” are abbreviated hereafter as “optimum” and “standard density”.

The moisture contents and dry density specified herein are considered the most suitable for achieving the desired compaction, impermeability and strength of core. The DA/BSWM Project Engineer, however, reserves the right to alter specified moisture contents according to the results obtained during construction. No additional payment shall be made if specified moisture contents are altered by the DA/BSWM Project Engineer as the work proceeds.

#### **6.03 FOUNDATION PREPARATION AND TREATMENT**

No material shall be placed on any section of the foundations until the section has been suitably prepared and has been approved by the DA/BSWM Project Engineer. All test pits or other cavities within the area shall be filled with compacted material and shall be considered as part of the embankment. The foundation shall be prepared so that the part of the surface materials shall be well compacted and bonded with the first layer of fill as herein specified for the subsequent layers of the fill. Foundation treatment shall include moisture conditioning to the approval of the DA/BSWM Project Engineer immediately prior to the first layer of fill being placed thereon.

Foundations in the core trench shall be prepared as detailed in this specification. Cavities, hollows and overhangs shall be filled with clay compacted to one hundred percent (100%) standard density as ordered by the DA/BSWM Project Engineer. Fissures which may be revealed in the core trench excavations shall be excavated out by means of open pits or shafts and backfilled with concrete or mortar. Friable rock shall be covered with concrete or brushed with sand-cement slurry when ordered by the DA/BSWM Project Engineer.

The foundation for the fill shall be prepared as specified in Section 11, Filling and Backfilling of this Specification. The foundation treatment will include moisture conditioning and rolling as approved by the DA/BSWM Project Engineer.

#### **6.04 IMPERVIOUS EARTHFILL**

##### **6. 04. 1 Materials**

Embankment materials shall consist of selected materials available from excavation of the core trench, foundations, borrow areas, spillway, or other excavations as approved by the DA/BSWM Project Engineer.

For the impervious earthfill materials to be used shall conform to the following gradations:

Sieve Designation Size	% Passing by Weight
9.52	85 - 100
# 4	75 - 100
# 10	70 - 100
# 40	50 - 90
# 200	15 - 85

The Contractor shall conduct his excavating operations for materials so as to achieve the best gradation of materials in the embankment as directed by the DA/BSWM Project Engineer.

Individual rocks having a maximum dimension of more than one hundred (100) millimeters must be removed before compaction commences.

##### **6. 04.2 Moisture Content**

Prior to and during compaction, the impervious fill materials shall have the moisture content as specified herein or as otherwise directed by the DA/BSWM Project Engineer.

Material in the impervious earthfill shall have a moisture content of plus or minus two percent ( $\pm 2\%$ ) standard proctor unless otherwise specified by the DA/BSWM Project Engineer.

To ensure uniformity in the embankment, every effort must be made to bring the material to the specified moisture content at the place of excavation. If the material in site is too wet, remedial drainage ditches shall be made and working the borrow area to expose the maximum surface to wind and sun and harrowing.

When it is necessary to bring the moisture content of the material up to the specified level after transporting to the embankment, water shall be evenly sprinkled on the material and shall be mixed uniformly throughout the layer by harrowing or other effective means.

Whatever method is used for the initial conditioning of the material, the Contractor shall provide suitable means of applying further water to the material on the embankment to counter the evaporation losses, and increased water demand due to breaking down of the material due to handling. Articulated water sprays shall be available at all times on the embankment for construction purposes.

If due to any cause a layer on the embankment has water content greater than specified, then it shall be harrowed and exposed to the sun before compaction, or alternatively, it shall be removed from the embankment. The Contractor shall bear the entire cost of harrowing, drying and compaction or re-compaction of material, and for the removal of material which is too wet and for the replacement and compaction of material at the specified moisture content.

The required degree of control of moisture conditioning is such that the mean moisture content shall be within the tolerances specified or as otherwise directed and the standard deviation of test results shall not be greater than 1.5%.

#### 6.04.3 Placing

The distribution and gradation of the materials shall be such that the dam will be free from lenses, pockets, streaks or layers of material differing substantially from the surrounding material. The excavation and placing operation shall be such that the material when compacted will be blended sufficiently to secure the best distribution of the material, and for this purpose the DA/BSWM Project Engineer may designate the locations on the embankment where individual load shall be deposited.

Earthfill materials shall be placed on the embankment in continuous in approximately horizontal layers not more than twenty (20) centimeters thick after compaction. If in the opinion of the of DA/BSWM Project Engineer surface of any layer of the embankment is too dry or too smooth to bond properly with the layer to be placed thereon, it shall be moistened and/or worked with harrow, scarifier or other suitable equipment, and to a sufficient depth to provide satisfactory bonding with the next layer to be placed.

#### 6.04.4 Compaction

The compaction requirements for the different types of soil placed in embankment shall be as shown below:

Soil Class	Proctor Maximum Dry Density (ASTM D-698), PCF	Maximum Compaction Required, % of in place Density w.r.t Proctor Maximum Dry Density
CL, SM & ML	85 – 89	100
CL, SM & ML	90 – 99	95
SC	100 – 109.9	90
GC	110 – 119.9	85
GC	120 – 129.9	80
GC	130 and above	80

The thickness of the layer which can be effectively compacted will depend on the compaction equipment employed and will be determined by the DA/BSWM Project Engineer. The thickness of the layer will be fifteen (15) centimeter compacted thickness.

The DA/BSWM Project Engineer will establish from time to time the required number of passes of the compaction equipment from test results on the embankment itself as the work proceeds. No claim will be accepted on account of the number of passes designated giving higher than specified densities.

Notwithstanding the designated number of passes having been made, if the specified compaction has not been achieved, the DA/BSWM Project Engineer may order additional passes and no extra payment will be made for those additional passes.

#### 6.04.5 Specifically Compacted Zone

In cavities, in areas adjacent to the abutments or where equipment clearances or the safety of structures does not permit compaction by normal methods, special care must be taken on the placing and compaction of the impervious earthfill.

The rock/concrete surface shall first be thoroughly cleaned and moisture with a fine mist of water. Impervious earthfill material of the more plastic type which is free from rock larger than twelve (12) millimeters maximum dimension shall be used. It shall have a moisture content determined by the DA/BSWM Project Engineer and shall be compacted by rollers, mechanical tampers or other approved methods so that the specially compacted earthfill shall have a dry density not less than that obtained in the remainder or the earthfill after compaction.

The DA/BSWM Project Engineer will designate the area and volume of the impervious earthfill which requires special compaction, which compaction shall be affected to his satisfaction.

#### **6.05     *FILTERS AND DRAINS***

Filters and drains shall be placed to the lines, grades and thickness shown on the Drawings or established by the DA/BSWM Project Engineer. The lines, grades and thicknesses may be changed during construction by the DA/BSWM; such revisions shall not constitute justification for changes in the tendered unit prices.

The materials required for filters and drains shall be natural sand and gravel of suitable gradation, or materials produced by crushing and screening processes from required excavations, quarries and banks or borrow pits as approved by the DA/BSWM Project Engineer. Representative samples of filter and drain materials shall be submitted by the Contractor for the approval of the DA/BSWM Project Engineer. Screening, blending and washing of the filter and drain materials may be required so that they conform with these Specifications.

The gradations of sand and gravel filters and drains shall conform to the limits given in Section 13, Filters.

The sand and gravel filters and drains shall be placed in layers not greater than three hundred (300) millimeters thick after compaction. They shall be sluiced with clean water the volume of which shall be at least half the volume of filter placed.

After sluicing, compaction shall consist of four (4) passes of a vibrating roller weighing not less than ten (10) tons.

Care must be taken to prevent any material which would interfere with free-draining properties of the filter drains from entering therein.

#### **6.06     *GRAVEL BLANKET***

Upstream of the impervious earthfill of the dam a layer of gravel blanket shall be placed along the face of rolled earthfill. The drainage blanket shall consist of gravel filter as specified in Section 11. The layer shall be compacted by four (4) passes of a vibratory roller weighing not less than six point five (6.5) tons.

The Contractor may suggest methods of placing the gravel blanket to ease placement problems, but any system used shall be approved by the DA/BSWM Project Engineer before use. Measurement will, however, only to be the neat dimensions shown on the embankment cross-section on the Drawings.

#### **6.07     *GRAVEL SURFACING***

The crest of embankment fill shall be protected by placing a gravel surface of not less than 150 mm. The material and placement shall be in accordance with Section 10.

#### **6.08     *RIPRAPPING***

The upstream of the dam shall be protected with a dry riprap facing. The material and material placement shall be in accordance with Section 9.

#### **6.09     *ROCK TOE DRAIN***

The toe of the dam shall be provided with a rock toe drain, materials for which are specified in Section 11.

Placement of the materials shall be in accordance with Section 11.04.4

#### **6.10 SPRIGGING AND SODDING**

The downstream of the dam shall be protected with sod. The material and placement shall be in accordance with Section 12.

#### **6.11 LABORATORY TESTING AND MATERIALS CONTROL**

All necessary tests for moisture content, abrasion, resistance, composition, classification, compaction, shear strength, permeability, etc., will be arranged by the Contractor and from these tests, corrections, adjustments, and modifications of methods, materials and moisture content shall be made in order to secure satisfactory properties of the materials. Tests in the borrow areas and on the fills will be arranged so as to cause the least possible inconvenience to the Contractor, but the Contractor shall have no claim for extra payment for any reason on account of this testing.

The test should be done based on the following standard and frequency.

##### **Test in the Borrow Area**

Item	Standard	Frequency
Earthfill Natural Moisture Content	ASTM D 2216-80	Twice a day
Atterberg Limits	ASTM D 4318-84	one/2,000 cu.m.
Particle Size Distribution	ASTM D 422-63	one/2,000 cu.m.
Specific Gravity	ASTM D 854-83	one/2,000 cu.m.
Compaction	ASTM D 698-78	one/1,000 cu.m.
Filter Particle Size Distribution	ASTM C 136-849	one/100 cu.m.
Drain Specific Gravity and Absorption	ASTM C 127-84 & C 128-80	one/100 cu.m.
Riprap Specific Gravity and Absorption	ASTM C 127-84 & C 128-80	one/100 cu.m.

##### **Test on the Embankment Dam Site**

Eartfill In-situ Density	ASTM D 1556-82	three
Field Permeability	USBR E-19	one/3,000 cu.m.
Filter In-situ Density	ASTM D 1556-82	one/100 cu.m.
Drain Field Permeability	USBR E-19 or ASTM D 2434-68	one/100 cu.m.



## **6.12 TOLERANCE FOR EARTHWORKS**

Where tolerances are not stated in the specification or drawings for any part of the works, permissible deviations will be interpreted in conformity with the following:

- (a) Rejected work will be remedied or removed and replaced by the Contractor at his own expense.
- (b) Tolerance in embankment's gradual variation of outlines and zoned from those shown on Drawings or specified shall be within plus or minus two hundred ( $\pm 200$ ) millimeters.
- (c) Tolerance over and above that defined above for protruding or shyness of individual rock fragments in placed backfill shall be within plus or minus two hundred ( $\pm 200$ ) millimeters.
- (d) Thickness of fine or course filter normal to slope shall be within plus or minus fifty ( $\pm 50$ ) millimeters.

## **6.13 MEASUREMENT AND PAYMENT**

All costs entailed in the construction, complete of the dam embankment in accordance to these specifications shall be deemed to be included in the unit bid priced as reflected in the Contractor's Bid Proposal.

### **6.13.1 Foundation Preparation and Treatment**

Costs involved in the preparation and treatment of foundations will be deemed to be covered in the corresponding unit prices for excavation, as classified in the Bill of Quantities, the method of measurement and payment for which is discussed in Section 5, Excavation, Stripping and Foundation Preparation.

### **6.13.2 Impervious Earthfill**

Measurement for payment for earthfill in the dam will be made to the neat lines and grades as shown in the Drawings or as directed by the DA/BSWM Project Engineer. Basis of payment shall be the unit bid price per cubic meter which includes all costs involved in mixing, moistening and conditioning the materials, excavation, treatment, placing, and compacting the earthfill materials.

### **6.13.3 Filters and Drains**

All measurements for payment of filters and drains in accordance with Sub-Sections 13.08.3 and 13.09.

### **6.13.4 Gravel Blanket**

Measurement of the actual volume placed as accepted by the DA/BSWM Project Engineer shall be basis of payments. The unit price per cubic meter for this item in the Bid Proposal of the Contractor shall be applied on said

actual measurements in determining the payments to be made. Such payments shall include all costs of excavation, washing, processing, compacting and placing the material.

6.13.5 Gravel Surfacing

Measurement and payment for gravel surfacing shall be in accordance with Section 16.

6.13.6 Rock Toe Drain

Measurement and payment for rock toe drain shall be in accordance with Sub-Sections 11.08 and 11.09.

6.13.7 Riprapping

Measurement and payment for riprap shall be in accordance with Section 9.

6.13.8 Sprigging and Sodding

Measurement and payment for riprap shall be in accordance with Section 12.

6.13.9 Laboratory Testing and Materials Quality Control

All costs to be incurred in laboratory testing and material control shall be at the expense of the Contractor and are deemed to be included in the unit price for materials subject to lab test and quality checks.

6.13.10 Tolerance for Earthworks

Measurements for payment will be made to the neat lines and dimensions shown on the Drawings or established by the DA/BSWM Project Engineer. The Contractor shall avoid using the tolerances as specified in TS-6.12, Tolerances for Earthworks, for the purpose of unduly increasing the quantity of materials above the actual measurements.

## **SECTION 7**

### **SIDE BORROW**

#### **7.01    *SCOPE***

When suitable materials from excavation are not sufficient to form the required section of road or dam embankment, additional suitable materials from adjacent side of the embankments within 200 m from centerline of dam shall be obtained by side borrowing as directed by the DA/BSWM Project Engineer.

The work under this Section shall include clearing, grubbing and stripping of the top soil on the side borrow area; excavation and placing or dumping of the side borrow materials to dam embankment or to structure backfill and returning and spreading the stripped top soil after the side borrow operations.

#### **7.02    *METHOD OF OPERATION***

After having determined that materials obtainable from side borrow areas are suitable for embankment construction per paragraph 6.04.1, these side borrow areas shall be cleared, grubbed and stripped to about 10 cm. thick of top soil before starting any excavation, pushing and dumping operation. The cleared and grubbed materials and/or stripped top soil shall be placed outside the limits of the entire right-of-way and side borrow areas as directed by the DA/BSWM Project Engineer, all in accordance with the provisions of Section 4, Clearing and Grubbing.

Excavation of side borrow materials needed for the construction of embankments shall be made more or less uniform in depth within the limits staked by the DA/BSWM Project Engineer and shall in no case exceed a depth of 90 cm. measured from the original ground surface, a berm of not less than five (5) meters in width shall be left between the outside toe of the embankment and the edge of the borrow pit with side slope provision not steeper than 3:1 or less otherwise shown on the Drawings or as directed by the DA/BSWM Project Engineer.

Materials from side borrow areas shall be placed and/or spread in the dam embankment, structure backfill areas or roadway embankment and subsequently compacted in accordance with the applicable provisions of Section 6, Dam Embankment.

Before the Contractor leaves any particular work after completion of side borrow operations, the side borrow area shall be releveled and destroyed paddy dikes restored; and cleared and grubbed materials or stripped top soil deposited outside the work shall be returned and spread uniformly throughout the borrow area to the satisfaction of the DA/BSWM Project Engineer. The Contractor shall not be allowed to shift his operation to another work area unless said works are completed and approved by the DA/BSWM Project Engineer.

### **7.03    *METHOD OF MEASUREMENT***

For Compacted Embankment

Side borrow materials for compacted embankment shall be measured in cu.m. in its final compacted volume. The volume shall be computed by average end area method. The volume calculated shall not exceed the theoretical volume of the embankment based from the shape of the original surface. The volume outside the neat lines or shown on the Drawing will not be measured for payment

### **7.04    *BASIS OF PAYMENT***

No direct payment shall be made under this item. The costs for excavation, stock filling, hauling and other cost for providing side borrow shall be considered included in the unit bid price for various items in the Bill of Quantities for which side borrow materials was used.

## **SECTION 8**

### **BORROW HAUL**

#### **8.01 SCOPE**

Borrow haul represents suitable fill materials obtained from borrow pits designated by the DA/BSWM Project Engineer, hauled and placed to the embankment in order to fully complete the required section. Borrow haul materials could be obtained from sources indicated on the Drawings and haul distances should not exceed the maximum haul distance of two (2) kilometers or as specified in the Bill of Quantities.

When suitable materials within this limit are not available, the Contractor may obtain materials beyond the said limit provided that the Contractor has served in writing the approval of the DA/BSWM.

When the materials excavated from the channels or from structure excavation and from side borrow, are sandy, said materials shall be blended with the borrow haul materials during the embankment construction and formation before compaction operation shall be done.

#### **8.02 METHOD OF OPERATION**

Borrow haul pits shall be cleared and grubbed or stripped as directed by the DA/BSWM Project Engineer to remove all unsuitable materials from the excavation area. Excavation shall be made within the limits staked out by the DA/BSWM Project Engineer and to such depth as directed. The depth of excavation throughout the borrow haul pit shall be as uniform as practicable and the side slope shall be dressed to such slope as the DA/BSWM Project Engineer may direct.

BSWM shall secure the designated borrow areas for borrow haul materials together with the necessary right-of-way and access thereto.

Notwithstanding the preceding paragraph, borrow haul materials may be obtained from any source the Contractor may propose provided that the location and materials are approved by the agency. In this case, the Contractor shall, at his own expense, secure the necessary right-of-way and access thereto. The Contractor shall be liable for any royalty imposed by the municipality were these borrow areas are situated.

In both cases, the Contractor shall construct and maintained the haul roads, together with the necessary right-of-way for such roads and right of access thereto. In securing of necessary "Permit to Enter" or "Quarrying Right" for borrow area designated by the DA/BSWM Project Engineer shall be BSWM's responsibility.

Borrow pits where practicable shall be so excavated that they will drain to the nearest natural outlet or to such outlet as directed by the DA/BSWM Project Engineer. The surveys of borrow pits shall be left in a reasonably smooth and even condition and the stripped top soil shall be returned and spread to the satisfaction of Project Engineer.

Materials from these borrow areas shall be hauled, dumped and placed in the dam embankments, or structure backfill areas and elsewhere as may be directed by the DA/BSWM Project Engineer and subsequently compacted in accordance with the applicable provisions of Section 6.

#### **8.03    *METHOD OF MEASUREMENT***

For Compacted Embankment

Borrow Haul materials for compacted embankment shall be measured in cubic meter in its final compacted volume in the embankment and computed by using the average end area method. The cross-sectioning work, before and after placing, spreading and compacting the materials on the dam embankment is a joint undertaking of the Project Engineer and Contractor. The volume subsequently calculated shall not exceed the theoretical volume based from the shape of the original surface of the embankment section. Volumes outside the neat lines as shown in the Drawing will not be measured for payment.

#### **8.04    *BASIS OF PAYMENT***

No direct payment shall be made under this item. The cost of excavation, stock filling, hauling and other cost for providing borrow haul shall be considered included in the unit bid price for various items in the Bill of Quantities for which Borrow Materials were used.

## **SECTION 9**

### **BOULDER RIPRAP**

#### **9.01 SCOPE**

The work under this Section shall include furnishing and placing the boulders and spalls of appropriate sizes of filler stones on the prepared subgrade, all in accordance with the Drawings and these Specifications or as directed by the DA/BSWM Project Engineer. Boulders and spalls shall be obtained from the sources approved or designated by the DA/BSWM Project Engineer.

#### **9.02 MATERIALS**

Rocks, boulders or stones for riprap shall be hard, dense, durable, and free of fissures or defects that would tend to foster deterioration from natural causes.

Rock or boulder materials shall have specific gravity of not less than 2.6.

The shape of the rock or boulders shall be such that the minimum dimension of a rock or boulder is not less than 20 centimeters.

The sizes of rocks or boulders shall be as specified on the Drawings.

#### **9.03 METHOD OF CONSTRUCTION**

Boulder riprap shall be placed immediately following completion of the embankment, channel or section of the structure involved, unless otherwise directed by the DA/BSWM Project Engineer.

On the prepared gravel blanket or subgrade, the boulders shall be laid and arranged properly as shown on the Drawings to offer maximum resistance to displacements due to high water velocity. Spalls of appropriate size filler stones shall be placed to fill spaces between the boulders. The rocks or boulders for riprap and boulders rockfill bank protection, after placement in their final position shall conform to the lines and grades as shown on the Drawings.

#### **9.04 METHOD OF MEASUREMENT**

Boulder riprap specified on the Drawings and the Bill of Quantities will be measured by the number of cubic meter of materials acceptably and computed based on the neat lines as shown on the Drawings.

#### **9.05 BASIS OF PAYMENT**

The volumes measured as provided above shall be paid for at the respective contract unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, tools, equipment and other incidentals of the work under this Section. Any excavation involved under this Boulder Riprap is not considered a subsidiary work, hence it will not be measured for payment under this Section. Rather, it will be measured and paid for under Section 5.

## **SECTION 10**

### **GRAVEL BEDDING AND SURFACING**

#### **10.01 SCOPE**

The work under this Section shall include furnishing, placing on approved subgrade and compacting the graded bedding to the thickness indicated on the Drawings or as established by the DA/BSWM Project Engineer.

#### **10.02 MATERIALS**

Materials for the gravel bedding shall meet the following requirements:

Sieve Size	% Passing by Volume
50.8 mm	100
38.1	75 - 95
19.05	55 - 85
9.53	40 - 75
# 4	30 - 60
# 10	20 - 40
# 40	15 - 30
# 200	8 - 15

#### **10.03 PLACING**

The materials shall be dumped on the prepared subgrade and spread in layer having an uncompacted thickness of not more than 25 centimeters. Each layer shall be compacted by four complete passes of a vibratory compactor. The Contractor has the option to adopt any method of compacting the layers of materials approved by the DA/BSWM Project Engineer.

#### **10.04 METHOD OF MEASUREMENT**

Gravel bedding/surfacing will be measured by cubic meter of materials acceptably placed and computed based on the neat lines and dimensions shown on the Drawings.

If materials placed by the Contractor are more than that is required, the excess materials will not be measured for payment.

#### **10.05 BASIS OF PAYMENT**

The volume measured as provided above will be paid at the unit contract price per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, tools, equipment and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section, excavation involved under this Section is not considered a subsidiary work for Gravel Bedding, hence it will not be measured for payment under this Section. Rather, it will be measured and paid for under Section 5.



## **SECTION 11**

### **STRUCTURAL BACKFILL/SAND AND GRAVEL FILTERS, ROCK TOE DRAIN**

#### **11.01 SCOPE**

Work under this Section shall consist of furnishing, placing, blending, conditioning and compaction of random fill, structural backfill, sand and gravel filters and drains, where required for the various structures included in the works.

#### **11.02 MATERIALS**

##### **11.02.1 Sources**

Materials for the various fills and backfills shall be obtained from required excavations and from borrow areas designated by the DA/BSWM Project Engineer. There is no guarantee that all the materials in any borrow area will be suitable for use in the fills and the Contractor shall move or modify his operations, as directed, to avoid unsuitable material. The Contractor shall move or modify his operations, as directed to avoid unsuitable material. The Contractor shall maintain and operate sufficient excavating and hauling equipment so that an adequate amount of fill material from all sources will be available as required. Operations in borrow areas should not endanger roads, buildings and other existing structures. Borrow areas shall be graded to provide ready drainage from all parts of the excavated areas. When operations in a borrow area have terminated, the area shall be dressed to a neat appearance with adequate drainage to the satisfaction of the DA/BSWM Project Engineer.

Materials for structural backfill shall consist of compactable soil taken from foundation or channel excavations. Any additional materials needed shall be obtained from borrow areas mentioned above.

##### **11.02.2 Suitability**

The suitability of fill or backfill materials shall be subject to the approval of the Project Engineer. Materials containing brush, roots, and others organic matter will not be considered suitable for fill or backfill. Unsuitable material to be wasted will be specifically designated by the DA/BSWM Project Engineer at the time the material is excavated.

##### **11.02.3 Types of General Fill and Backfill Materials Required in the Work**

- a. Structural Backfill. Materials for structural backfill shall consist of compactible soil approved by the DA/BSWM Project Engineer. It shall not contain individual particles larger than ten (10) centimeters.

- b. Sand and Gravel Filter and Drains. Sand and gravel or crushed stone of controlled gradation shall be used to function as filters or drains for the dam and other structures. Filter material shall consist of unweathered material obtained from river bed deposits or from quarries. To meet the gradation requirement, crushing, screening, and washing may be required. The material shall be composed of tough durable particles; shall be reasonably free from thin, flat and elongated placer and shall conform to the gradation requirements as specified in Section 13, Filters.
- c. Rock Toe Drain. Rock toe drain materials shall consist of hard, dense, and durable quarried rock or boulders.

Rock toe drain materials shall conform to the following gradation requirements:

<u>Sieve Size, mm.</u>	<u>% Passing by Volume</u>
500	90-100
400	40-65
100	20-30
40	5-15

A minimum specific gravity of 2.6 will be required for rock toe drain materials. The inclusion of earth, sand or rock dust in excess of five percent (5%) by volume shall not be permitted.

### **11.03 EQUIPMENT REQUIREMENT**

#### **11.03.1 Compaction Equipment**

- a. Vibratory Rollers. Vibrating rollers shall have a drum diameter of not less than 1.2 m. and a drum length between 1.5 m. and 2.2 m. The total static weight on the vibrating drum shall not be less than 6.5 tons. Self-propelled vibratory rollers shall be used.
- b. Discs, Harrows and Motor Graders. Discs, harrows and motor graders of adequate type and in sufficient number spreading, mixing and maintaining the fill.
- c. Vibratory Plate Compactor/Power Tampers. Compaction of material where it is impractical to use vibratory rolled shall be performed by the use of Vibratory/Power Tampers weighing not less than 80 kilograms.

### **11.04 HAULING AND PLACEMENT**

#### **11.04.1 GENERAL**

Placement of fill materials shall be in fill foundations, only after inspection and approval of the DA/BSWM Project Engineer. Approved undisturbed earth foundations shall be stripped as directed to a depth of 20 to 30 cm. by means of approved bulldozer attended by water sprinkling when necessary

and compacted at optimum moisture content to the density required or the fills to be placed on the foundations. The gradation and distribution of materials shall be such that the fills will be free from lenses, pockets, streaks and layer of material differing substantially in texture or gradation from surrounding material of the same class.

Equipment for hauling and placement shall be able to deliver the material without detrimental segregation. Truck and roller ruts in dumped layers shall be smoothed out before compaction. The contact surfaces shall be scarified and prepared so as to expose the dense undisturbed material of the embankment to produce a satisfactory bond between new materials and those already in place.

#### 11.04.2 Structural Backfill

Excavated areas around the structures shall be backfilled with materials from the required excavations or from the borrow areas in horizontal layers, with each layer not exceeding fifteen (15) centimeters in loose volume thickness, and compacted as directed. No backfill material shall be placed until the concrete of the structure has been cured sufficiently.

#### 11.04.3 Sand and Gravel Filters

The sand and gravel filters shall be placed where indicated to the thickness and in the manner specified on the Drawings or as directed by the DA/BSWM Project Engineer.

#### 11.04.4 Rock Toe Drain

The materials need not be hand-placed, but shall be dumped and smoothed by moving rock or boulders into position in such a manner as to ensure that the material when in place is stable and without tendency to slide, and so that there will be no unreasonable large unfilled spaces within the riprap. The inclusion of rock spalls or gravel in an amount to fill the voids of riprap, but not in excess of that amount, as determined by the DA/BSWM Project Engineer, will be required.

### **11.05 COMPACTION**

#### 11.05.1 Fill or Backfill on or Against Concrete Structures

No fill or backfill shall be placed on or against concrete surfaces before a period of fourteen (14) days has elapsed after placing the concrete. Passage of hauling and rolling equipment over the top of the conduits or other structures will be allowed when the depth of fill or backfill over the concrete shall, as inspected and approved by the DA/BSWM Project Engineer, be sufficient to permit such passage without inducing harmful stresses or vibration in the structure. Fill placed around and over the

conduits or other structures not accessible to the roller shall be placed in thin layers and shall be compacted by hand vibratory plate compactor/tampers to a density equal to that specified for the rolled fill.

#### **11.06 MOISTURE CONTENT**

Moisture content of the random fill and structural backfill materials shall be the optimum practicable required for compaction as determined by the DA/BSWM Project Engineer and shall be uniform throughout each layer.

All necessary tests for moisture content, composition and compaction shall be made continuously by the DA/BSWM Project Engineer, and from which corrections, adjustments and modifications of methods, materials and moisture content will be made in order to secure satisfactory density of the fill materials. The Contractor shall provide necessary skilled labor in obtaining and preserving samples.

#### **11.07 SLIP-OUTS**

In the event of slip-outs in any part of the fill prior to final acceptance of the work, the Contractor shall remove the material from the slip area, and shall rebuild such portion of the fill. If the slip-out was caused through the fault of the Contractor, the removal and disposal of material and rebuilding of the fill shall be performed without cost to the BSWM, otherwise the reconstruction of the fill will be paid for based on the contract unit price for the pertinent items of Fill in the Bid Proposal.

#### **11.08 METHOD OF MEASUREMENT**

##### **11.08.1 Structural Backfill**

Measurement for payment of random fills will be based on the number of cubic meters of approved materials backfilled satisfactorily compacted and accepted. Measurement will be made in accordance with the following:

- a. Case I - Structural Backfill for Foundation Below Graded Surface in Cut.

The Volume to be measured for payment will be the compacted volume bounded by the graded surface, excavation slopes and the structures.

- b. Case II – Structural Backfill for Foundation Below Original Ground Surface.

The volume to be measured for payment will be the compacted volume bounded by the original ground surface after stripping, excavation slopes and the structures.

Any backfill materials placed outside the established pay lines for excavation to replace slides, cave-ins or over excavation will not be paid.

11.08.2 Sand and Gravel Filter and Drains

Measurement for payments of sand and gravel filters and drains will be based on the number of cubic meters of compacted materials placed and accepted.

11.08.3 Rock Toe Drain

Measurement for payment of these items will be based on the number of cubic meters of materials in-place and accepted, in accordance with the lines, grades, and slopes as shown in the Drawings.

**11.09 BASIS OF PAYMENT**

11.09.1 Structural Backfill

Payment for structural backfill will be made at the contract unit price per cubic meter, backfill in the Bid Proposal, which payment shall constitute full compensation for furnishing all labor, equipment, and other incidentals necessary to complete the item.

11.09.2 Sand and Gravel Filters and Drains

Payment for these items shall be made based on the respective unit bid prices for sand and gravel filters and drains which payments shall constitute full compensation for furnishing and placing the materials.

11.09.3 Toe Drain

Payment will be made at the contract unit price per cubic meter for the Rock Toe Drain in the Bid Proposal, which payment shall constitute full compensation for preparation of bed, furnishing of all labor, materials, equipment and incidentals necessary to complete the work.

## **SECTION 12**

### **SPRIGGING AND SODDING**

#### ***12.01 SCOPE***

This work consists of providing sod facing on the downstream slope of the dam embankment constructed.

#### ***12.02 MATERIALS***

The sod used for downstream of dam embankment shall of the best qualities within the locality. The sod preferably amorsiko shall have a healthy living roots and stem and be obtained from heavy thickly matted soil in the approved locations having similar growing conditions.

The sod shall be free of weeds or undesirable plants. When the sods are cuts, grass height shall not exceed ten (10) centimeters and they shall have soil adhering to the roots when planted.

#### ***12.03 CONSTRUCTION REQUIREMENT***

The sod shall be planted in continuous lines on the slopes of the embankment within 24 hours after cutting. After planting operations, water shall be applied to the sodded areas as closely as practicable with approved equipment.

The Contractor shall protect the sodded area during the time when vegetation is becoming established. If objectionable weeds or other undesirable growths to smother the planted species are found, such vegetation shall be removed from the area.

#### ***12.04 METHOD OF MEASUREMMENT***

Measurement of sod facing will be made in square meters of the downstream slope of the dam embankment in accordance with the Drawings and these Specifications and as directed by the Engineer.

#### ***12.05 BASIS OF PAYMENT***

Payment will be made at the Unit Price in the Bill of Quantities, which Unit Price shall include the cost of furnishing all labor, equipment and materials necessary to complete the works and cutting, transporting, planting and maintaining of the sod and also the cost of all other works connected therewith.

## SECTION 13

### FILTER DRAIN

#### 13.01 SCOPE

The work under this Section shall include furnishing, excavation and hauling, placing on approved subgrade and compacting graded sand and gravel filters and drains in layers and to the thickness and dimensions indicated on the Drawings, including construction of weep holes where needed to provide outlet for filters all in accordance with these specifications or as directed by the DA/BSWM Project Engineer.

#### 13.02 MATERIALS

Filter materials shall consist of unweathered sand and gravel and cobbly obtained from river bed deposit or from designated quarries. To meet the gradation requirements, crushing, screening and washing shall be required. The materials shall be reasonably free from thin, flat and elongated pieces and shall be well graded between the limits of the filter distribution as follows:

Fine Materials		Coarse Materials	
Size, mm	% Passing by Weight	Size, mm	% Passing by Weight
0.075	0 - 5	100	80 - 100
0.149	0 - 10	38.1	60 - 90
0.42	15 - 60	9.52	30 - 70
1.19	20 - 80	2.00	10 - 40
2.00	25 - 90	0.42	0 - 20
4.76	40 - 100		
9.52	70 - 100		
38.10	90 - 100		

#### 13.03 METHOD OF CONSTRUCTION

The bed for the filter drain shall be excavated to the required elevation and dimensions shown on the Drawings and then properly compacted as directed by the DA/BSWM Project Engineer. The materials shall be dumped on the prepared bed and each layer shall be compacted by a suitable compactor to a degree approved by the DA/BSWM Project Engineer. Placement of succeeding layers will be allowed only after the DA/BSWM Project Engineer has approved the placement and compaction of the preceding layer. When concrete is to be placed directly on the filter, the entire surface upon which concrete is to be placed shall be covered with a layer of reinforced building paper before concrete is placed.

#### ***13.04 METHOD OF MEASUREMENT***

Filter drain will be measured by the number of cubic meter of materials acceptably laid, compacted and where necessary, provided with weepholes for outlets.

#### ***13.05 BASIS OF PAYMENT***

The volume measured as provided above will be paid at the contract unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, equipment, tools and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section.



## SECTION 14

### LEVELING COURSE/SUB BASE COURSE

#### 14.01 SCOPE

This item shall consist of approved granular fill material furnished and placed as required to replace unsuitable material encountered below foundation elevation of concrete structures, pipes, grouted riprap and concrete posts.

#### 14.02 MATERIALS

Gravel blanket shall consist of natural or processed aggregates such as gravel, sand or stone fragments, which shall conform to the following grading requirements:

##### Requirements for Grading

Sieve Size (mm)	Percent by Weight Passing		
	Grading A	Grading B	Grading C
75.00	100	100	100
5.00	35-70	40-90	50-100
0.075	0-20	0-25	0-30

In addition, that portion of the material passing the 0.425 sieve shall have a liquid limit not exceeding 35 and a plastic index not exceeding 11.

#### 14.03 METHOD OF CONSTRUCTION

After the unsuitable material has been removed as required by the DA/BSWM Project Engineer, gravel blanket shall be placed in thoroughly compacted layers, not exceeding those specified in the Drawing or as directed by the DA/BSWMM Project Engineer.

#### 14.04 METHOD OF MEASUREMENT

The volume to be paid for shall be the numbers of cubic meters, measured in its final position, and accepted, except that no volume will be included that is outside the vertical plans limiting the payment under excavation for structures.

#### 14.04 BASIS OF PAYMENT

The volume measured as provided above shall be paid for at the contract unit price per cubic meter for gravel blanket which price and payment constitute full compensation for furnishing, hauling and placing of materials and for all labor, equipment, tools and incidentals necessary to complete the item.

## **SECTION 15 PVC**

### **DRAIN PIPE**

#### **15.01 SCOPE AND DESCRIPTION**

The work under this Section shall consist of furnishing, transporting to the site, and installation of PVC Drain pipe of the size and dimensions as shown on the plans, in accordance with these specifications and in conforming with the lines and grades given.

This item includes the furnishing and installation of five (5) mm. wire mesh with 15 mm x 15 mm slots to the pipe as required to complete this item.

#### **15.02 MATERIALS**

Pipes and Couplings – Pipes shall of Polyvinyl Chloride made from Class 12454-A or Class 12454-B virgin compounds as defined in ATSM D1784 (Hydrostatic-design-basis rating 4,000 psi).

#### **15.03 CONSTRUCTION METHOD**

Pipe shall be homogenous throughout; free from dents, cracks, inclusions and other defects. Pipe surfaces shall be free from leaks, scratches and other blemishes. The joints surfaces of pipe spigots and of integral-bell and sleeve reinforced-bell sockets shall be free from gauges and other imperfections that might cause leakage at joints.

Pipe, couplings, and solvent cements that do not comply with the applicable requirements of these specifications or that are damaged when received shall be replaced without extra compensation.

#### **15.04 MEASUREMENT AND PAYMENT**

Pipe in placed and accepted shall be measured by the linear meter along the axis of the pipe.

The quantity measured, as provided above, completely installed and accepted, shall be paid for at the contract unit bid price per linear meter indicated in the Bill of Quantities and shall constitute full compensation for furnishing and installing the pipe, for jointing and joint materials and for all materials, labor, equipment and tools and incidentals necessary to complete the work.

## **SECTION 16**

### **DUMPED GRAVEL FOR EMBANKMENT**

#### ***16.01 SCOPE***

The work under this section shall consist of furnishing, placing gravel on dam slope embankment and compacting the gravel materials to the thickness indicated on the Drawings or as ordered by the DA/BSWM Project Engineer.

#### ***16.02 MATERIALS***

Materials for dumped gravel shall consist of hard, durable fragment of stone, gravel, filter of sand which meet the quality requirement. The composite materials shall be free from organic matter and humus of clay and other objectionable matter and shall be taken from the source approved by the DA/BSWM Project Engineer.

#### ***16.03 PLACING***

The materials shall be dumped on the prepared slope embankment and spread and layer with thickness of 15 cm. or as shown in the drawing when compacted. The Contractor has the option to adopt any method of compacting the layers of materials approved by the DA/BSWM Project Engineer.

#### ***16.04 METHOD OF MEASUREMENT***

Dumped gravel will be measured by the cubic meter of materials compacted in place as shown on the plans and accepted DA/BSWM Project Engineer.

#### ***16.05 BASIS OF PAYMENT***

The volume measured as provided above will be paid at the contract unit bid price per cubic meter as indicated in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all materials, handling, placing, compacting, labor, equipment, tools and incidentals necessary to complete the work.

## **SECTION 17**

### **WET RUBBLE MASONRY**

#### **17.01 SCOPE**

The work under this Section shall include construction of all necessary form work, placing rubble stone and concrete binder on an approved foundation and form work; the removal of forms and curing of the rubble masonry, all in accordance with the drawings and specifications or as directed by the DA/BSWM Project Engineer.

#### **17.02 MATERIALS**

Rubble stones shall consist of field stones. They are clean, sound, durable, resistant to the action of water, and must have specific gravity of at least two and six tenths (2.6), in diameters ranging from 15 cm. to 30 cm., sixty percent (60%) of which comprises the bigger sizes. Stones shall have the prior approval of the DA/BSWM Project Engineer before their use. Concrete binder shall be class A concrete with 1 ½ (37.5 mm) maximum size of aggregate.

#### **17.03 METHOD OF CONSTRUCTION**

The stone shall be thoroughly wet before they are installed in place. The entire surface of every stone shall be thoroughly covered with concrete binder, as specified in the drawing. Actual variation in this proportion will not entitle the Contractor to any price adjustment. The stones shall be well set such that no stone will project beyond the lines indicated on the drawings. The concrete binder shall be properly placed into the spaces between stones so that no void is left within the rubble masonry. Concrete layer of 10 cm. or as shown in the drawing shall be placed as outer layer of cover of the rubble masonry as finishing to coincide with neat lines of the structure. In case reinforcements are placed, no stone shall be closer than 3 inches (7.5 cm) to the nearest reinforcing bars. Rubble masonry shall be cured by water for five (5) days.

#### **17.04 METHOD OF MEASUREMENT**

Rubble masonry will be measured by the number of cubic meters of materials acceptably placed and computed based on the neat lines of construction drawings prepared and approved by the DA/BSWM Project Engineer.

#### **17.05 BASIS OF PAYMENT**

The volume measured as provided above will be paid for at the contract unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all labor, tools, equipment, supplies and materials and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section.

## **SECTION 18**

### **GROUTED RIPRAP**

#### **18.01 SCOPE**

The work under this Section shall include furnishing and placing appropriate sizes of stones or spalls for riprap and grouting the riprap with cement mortar, in accordance with these Specifications and as directed by the DA/BSWM Project Engineer. The stones and spalls shall be obtained from quarry areas or stockpile areas designated by the DA/BSWM Project Engineer and shall be placed at the road bank adjacent to the reservoir's normal water level limit. Specific areas to be protected with grouted riprap shall be determined by the DA/BSWM Project Engineer first before the Contractor works on them.

#### **18.02 MATERIALS**

Stones for riprap shall be at least 15 cm. in diameter and shall be sound, tough, durable, dense and resistant to the action of air and water with a specific gravity of at least two and six tenths (2.6).

Mortar for grouted riprap shall consist of one (1) part cement to three (3) parts sand by volume and sufficient water to produce a thick and creamy mixture conforming to the provisions of Section 19, Concrete.

#### **18.03 METHOD OF CONSTRUCTION**

The bed for grouted riprap shall be excavated to the required elevation and then properly tamped and trimmed. The stones shall be well laid with close joints by hand. The stones shall be well arranged in such a manner that the stones can resist appreciable disturbances. If big spaces occur between stone and foundation bed, said spaces shall be filled with spalls of appropriate sizes of stones. The spaces between the stones shall be completely filled with grout from bottom to top and the surface swept with stiff broom. The grouted riprap shall be cured with water like concrete for a minimum period of three (3) days.

#### **18.04 METHOD OF MEASUREMENT**

Grouted riprap will be measured by the number of cubic meter of materials acceptably placed and computed based on the neat lines of construction drawings prepared by the Contractor and approved the Project Engineer.

#### **18.05 BASIS OF PAYMENT**

The volume measured as provided above will be paid for at the contract unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all labor, tools, equipment, supplies and materials and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section. Excavation involved under this item is not considered a subsidiary work, hence, it will not be measured for payment under this Section. Rather, it will be measured and paid for under Section 5, Excavation and Foundation Preparation.

## **SECTION 19**

### **CONCRETE**

#### **19.01 GENERAL**

This section covers all the materials as cement, aggregates, water, admixtures and proportioning, mixing, transporting, placing, finishing, curing and protecting of concrete, including supplies, equipment, tools and all other incidentals necessary for concrete works.

All the applicable provisions of the latest revision of the ACI Building Code (ACI- 318 -85) and American Society for Testing Materials (ASTM) shall govern in all cases not specifically provided for herein.

#### **19.02 CONCRETE COMPOSITION**

Concrete shall be composed of Portland Cement, fine and coarse aggregates, water and if necessary, admixtures or agents approved by DA/BSWM. The design of the concrete mixtures and consistency shall be as specified in this Section.

#### **19.03 CEMENT**

- a. General. All cement requirements of concrete works for the contract shall contractor-furnished. The cement shall conform to the requirements of the standard specifications for Portland Cement (ASTM: C150 Type 1).
- b. Storage. Contractor shall immediately upon delivery of cement to the jobsite store the same in a dry, watertight and properly ventilated structure with adequate provisions for the prevention of absorption of moisture. All storage facilities shall be subject to the approval of DA/BSWM and shall be such as to permit easy access for the inspection and identification. In order that cement may not become unduly aged after delivery, Contractor shall use cement stored at the project site for not over four months. Same shall not be used unless retest proves it to be satisfactory.

Sacked cement shall not be stocked higher than 14 sacks for storage for a period of no longer than 30 days and not higher than seven (7) sacks for longer period.

#### **19.04 ADMIXTURES**

In order to reduce the cement content and/or the amount of mixing water, and to improve the concrete workability, the Contractor may be allowed to use admixtures and as such he shall submit to BSWM for approval such admixture he proposes to use. However, no additional payment will be made by BSWM to the Contractor in view of this as the cost thereof is considered included in the contract unit price for the different classes of concrete.

The following type of admixtures will be given consideration by the DA/BSWM provided that they conform to the provisions of this paragraph:

1. Air entraining agent
2. Water reducing admixtures
3. Water reducing and retarding admixtures
4. Water reducing and accelerating admixtures

Admixtures shall be furnished in a powder or liquid form. If furnished in a solution, it shall contain at least 50% solids and a mold inhibitor. The admixtures effect on the properties of Portland Cement concrete mixtures shall meet the requirements of ASTM: C- 494.

Admixtures shall be accepted on manufacturers certification of conformance with the specifications but permission to ship on certification shall in no way relieve the Contractor of responsibility for furnishing an admixture not meeting specification requirements. Where the BSWM has reason to believe that testing is necessary to prove compliance with the requirements of these specifications, it may order these admixtures to be sampled and tested anytime. The Contractor shall provide facilities satisfactory to the DA/BSWM for readily procuring samples for test.

**Air Entraining Agent.** Concrete produced with water reducing agent shall contain four to six percent of entrained air by volume. The air entraining agent shall conform to the requirements of ASTM C – 260, and shall be tested in accordance with ASTM C – 233. The total calculated air content of the concrete discharged from the mixer shall be as follows:

Coarse Aggregates Maximum Size	Total Air – Percent by Volume of Concrete (4-7%)
3/4" (2 cm.)	5 + 1
1 - 1/2" (3.8 cm.)	4 + 1

The agent in solution shall be maintained at uniform strength and shall be added to the batch in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement. When a retarded dispersing agent is used in the concrete, the portion of the mixing water containing the air- entraining agent shall be introduced separately into the mixer.

The Contractor may be allowed to use an approved water reducing agent or water-reducing and set retarding agent in concrete. The ASTM designations for these mixtures are Type A and Type D respectively. The agent used shall be either suitable calcium, sodium or ammonium salts of lignosulfonic acids or of the non-lignin, hydroxylated carboxylic and acid groups. The agent shall be of uniform consistency and quality within each container and from shipment to shipment.

The amount of water reducing or water reducing and set retarding agent to be used in each concrete mix shall in general be within the following limits:

Lignosulfonic Acid Type :	0.27 to 0.37 percent of solid crystalline lignin, by weight of cement
Hydroxylated Carboxylic :	0.25 to 0.50 percent of liquid, by Weight of cement

**Water Reducing and Accelerating Admixture.** The ASTM designation for this admixture is Type E. Water reducing and accelerating admixtures may be used by the Contractor for speeding up precasting and post-tensioning operations for precast and prestressed beams, girders, slabs and bearing pads if approved.

#### **19.05 WATER**

The water used in concrete, mortar and grout shall be free from objectionable quantities of silt, organic matter, alkali, salts and other impurities. The recommendation of the seventh edition of the U.S. Bureau of Reclamation Concrete Manual for mixing water shall be followed.

#### **19.06 FINE AGGREGATES**

- a. General. The term “Fine Aggregates” is used to designate aggregates in which the maximum size of particles is 3/16 of an inch (5 millimeters). Fine aggregates for concrete, mortar and grout shall be provided by the Contractor and shall consist of natural sand, manufactured sand or a combination of both. The different components shall be batched separately, or subject to the written approval of the Project Engineer, or blended prior to delivery to the batching plant. As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over porous drain to get rid of excess water and to stabilize the moisture content.
- b. Quality. Fine aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, tough, durable uncoated rock particles. The Contractor shall exercise every possible precaution in transporting, washing and screening operations to prevent contamination of sand particles. Fine aggregates shall conform to the following requirements:
  1. Grading – It is assumed that the sand available in natural deposits will require processing to provide a suitable gradation. Regardless of the source, the fine aggregates shall be well graded from fine to coarse and the gradation as delivered to the mixers shall conform to the following requirements unless otherwise approved:



Sieve Designation US Standard Square Mesh	Percent by Weight Passing Individual Sizes
3/8" (9.50 mm)	100
No. 4 (4.75 mm)	95 - 100
No. 8 (2.36 mm)	85 - 95
No. 10 (1.18 mm)	60 - 85
No. 30 (600 um)	25 - 60
No. 50 (300 um)	10 - 30
No. 100 (150 um)	2 - 10

In addition to the grading limits shown above, the fine aggregates as delivered to the mixer shall have the fineness modulus of not less than 2.30 or more than 3.00. The grading of the fine aggregates also shall be controlled so that the fineness moduli of at least 9 to 10 test samples of fine aggregates as delivered to the mixer shall not vary more than 0.10 from the average fineness modulus of all samples previously taken. The fineness modulus shall be determined by dividing by 100, the sum of cumulative percentages retained on U.S. Standard sieves Nos. 4, 8, 16, 30, 50 and 100. At the option of the Contractor fine aggregates may be separated into two or more sizes and classifications, but the resulting sand when combined before entering the concrete mixer shall be of uniform grading within the limits specified above.

2. Particle Shape – The shape of the particles shall be generally spherical or cubical and reasonably free from flat or elongated particles. A flat or elongated particle is defined as a particle having maximum dimension in excess of five times the minimum dimension. Rocks which break down into such shape, regardless of the type of processing equipment used, will not be approved for use in the production of fine aggregates.
3. Deleterious Substances – The maximum percentages of deleterious substances in the fine aggregates as delivered to the mixer shall not exceed the following values:

	<u>Percent by Weight</u>
Materials passing No. 200 screen (Designation 16)*	3
Shale (Designation 17)	1
Clay (Designation 13)	1
Total of other deleterious substances (such as alkali, mica, soft, flaky particles and loam)	2

\* The designation 1 parenthesis refers to methods of testing described in the seventh edition of the U.S. Bureau of Reclamation Concrete Manual and ASTM.

The sum of the percentages of all deleterious substances shall not exceed 5% by weight. Fine aggregates producing a color darker than the standard in the colorimetric test for organic impurity (USBR Design 14 or ASTM C-40) may be rejected. Fine aggregate having specific gravity (USBR Design 9 or ASTM C – 128, saturated surface dry basis) of less than 2.60 may be rejected. The fine aggregates may be rejected if the portion retained on No. 50 (300 um) screen when subjected to five cycles of sodium sulphate test for soundness (USBR Design No. 19 or ASTM C-88) shows an average loss of more than 18% by weight. Fine aggregates delivered to the batching plant may be rejected if it contains more than 0.15% soluble sulphate for any one sample or more than 0.10% for an average of at least 9 out of 10 consecutive test samples of finished sand, when samples are taken hourly. The percent soluble sulphate in fine aggregates shall be determined in accordance with the method of test prescribe in sub-paragraph.

4. Sampling – Sampling of fine and coarse aggregates shall be done in accordance with the appropriate requirements of Section 10, of ASTM C-33. The source from which fine and coarse aggregates is to be obtained shall be selected well in advance of the time when the materials will be required in the work. Unless otherwise specified, all test samples shall be taken under the supervision of the Project Engineer in sufficient time as approved to permit adequate testing and examination of results sufficiently in advance of the time for use in concrete. Routine control test and analysis of the fine and coarse aggregates at various stages in the processing operation shall be made. The approval of a source shall not be construed as containing approval of all materials from the source, and the Contractor will be held responsible for the specified quality of all such materials used in the work.
- c. Storage. Fine aggregates shall be stored in such a manner as to avoid the inclusion of any foreign materials in the concrete. The storage or stockpiles shall be constructed so as to prevent segregation. Depositing of materials in storage and its removal there from shall be done in such a manner as to result in increasing the uniformity of the grading insofar as this is practicable. All fine aggregates shall remain in free drainage storage for at least seventy-two (72) hours prior to use. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.
- d. Measurement and Payment. Fine aggregates will not be measured for payment. The cost of excavation, stockpiling, transporting, processing, blending, handling and other costs for providing fine aggregates shall be considered included in the unit price bid for the various items in the Bill of Quantities for which fine aggregates are use.

## 19.07 COARSE AGGREGATE

- a. General. The term "Coarse Aggregate" is used to designate aggregates of such sizes as to fall within the range of 3/16 inch to 3 inches (0.5 cm to 7.5 cm.) or any size or range of sizes within such limits. The coarse aggregate shall be reasonably well graded within the nominal size ranges hereinafter specified. Coarse aggregate for concrete shall be furnished by the Contractor and shall consist of crushed rock or mixture of natural gravel and crushed rock as provided in paragraph 19.08. Coarse aggregate as delivered to the batching plant shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregates shall be done prior to finish screening. Rewashing shall not be performed in finish screens.
- b. Quality. Coarse aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, dense, uncoated durable rock fragments.
  1. Grading – The coarse aggregates shall be well graded from fine to coarse. It shall be separated into the following specific size groups. The grading of the aggregates within the separated size groups as delivered to the mixer shall be as follows:

SIZE  Sieve Sizes US Standard Square Mesh	GROUPS				
	Percent by Weight		Passing Individual Size		
	1/2" Size	3/4" Size	1-1/2" Size	2" Size	3" Size
6" (150 mm)	-	-	-	-	-
3" (75 mm)	-	-	-	-	100
2-1/2" (63 mm)	-	-	-	100	90 - 100
2" (50 mm)	-	-	100	95 - 100	35 - 70
1-1/2" (37.5 mm)	-	-	90 - 100	-	0 - 15
1" (25 mm)	-	100	20 - 55	35 - 70	-
3/4" (19 mm)	100	90 - 100	0 - 15	-	0 - 5
1/2" (12.5 mm)	90 - 100	-	-	10 - 30	-
3/8" (9.5 mm)	40 - 70	20 - 55	0 - 5	-	-
No. 4 (4.75 mm)	0 - 15	0 - 10	-	0 - 5	-

Coarse aggregates shall contain no more than one and one-half (1-1/2%) percent of materials passing the No. 200 sieve by meshing nor more than 5 per cent of soft fragments.

It shall have an abrasion loss of not more than 45 percent of 500 revolutions.

Unless otherwise directed, the maximum sizes of the aggregates to be used in concrete for the various parts of the work shall be in accordance with the following:

General Use	Maximum Aggregate Diameter
Lean concrete to control water intrusion and other miscellaneous uses	1-1/2" (37.5 mm)
Concrete for footings, walls, slabs, beams, 0.22 to 0.75 meters thick	1-1/2" (37.5 mm)
Concrete for thin walls, slabs, beams, less than 0.22 meters thick	3/4" (19 mm)
Concrete for reinforced concrete pipe	1/2" (12.5 mm)

In all cases, the diameter of the aggregate shall not exceed 1/2 the distance between the bars of reinforcing steel of the members being place.

- Particle Shape – The particle shape of the crushed coarse aggregate shall be generally spherical or cubical and reasonably free from flat or elongated particles. A flat or elongated particle is defined as a particle having a maximum dimension in excess of five times the minimum dimensions. Rocks which break down into such shape will not be approved for the production of aggregate.
- Deleterious Substances – The deleterious substances in any size of coarse aggregate, as delivered to the mixer, shall not exceed the following values:

	Percent by Weight
Materials passing No. 200 screen (Designation 16)*	1/2
Shale (Designation 18)	1
Clay (Designation 13)	1/2
Total of other deleterious substances (such as alkali, mica, soft, flakey particles and loam)	1

The sum of the percentages of all deleterious substances in any size, as delivered to the mixer, shall not exceed 3%, by weight. Coarse aggregate may be rejected if it fails to meet the following requirements:

- a) Petrographic Examination – If more than 10% of poor aggregate particles can be identified in physical quality test and in case 20% of the particles would be classified with respect to the chemical quality (USBR Desig. 7 or ASTM C- 295).
  - b) Sodium-sulphate test for soundness (USBR Desig. 9 or ASTM C-88) – If the weighted average loss, after five cycles is more than 10% by weight.
  - c) Specific Gravity (USBR Desig. 10 or ASTM C-127) – If the specific gravity (saturated surface dry basis) is less than 2.60.
4. Sampling – All sampling of coarse aggregates shall be in accordance with paragraph 19.06 (b) 4.
- c. Storage. Coarse aggregate storage or stockpiles shall be built in such a manner as to avoid the inclusion of any foreign materials in the concrete and to prevent segregation and excessive breakage. Water sprayers shall be installed to keep that portion of the coarse aggregate stockpiles saturated which is intended for immediate use in the concrete. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.
  - d. Measurement and Payment. Coarse aggregates will not be measured for payment. The cost of excavation, stockpiling, processing, blending, handling and other cost for providing coarse aggregates shall be considered included in the unit price bid for the various items in the Bill of Quantities for which coarse aggregates are used.

#### **19.08 PRODUCTION OF FINE AND COARSE AGGREGATES**

- a. Source of Aggregates. Fine and coarse aggregates for concrete and fine aggregate for mortar and grout may be obtained by the Contractor from any approved source. Approval of deposit shall not be construed as constituting approval of all materials taken from the deposit, and the Contractor shall maintain the specified quality of all such materials used in concrete works. If the aggregates are to be obtained from deposits or quarry sources not previously tested and approved by BSWM, Contractor shall submit, for preliminary test and approval, a representative 90 kgs. (approximately 200 lbs.) sample of the fine aggregate and of the 3/16-inch (0.5 cm) to 3/4-inch (2 cm) size of coarse aggregate proposed for use in the work, at least 60 days before the materials are required for use.
- b. Developing Aggregate Deposit. The Contractor shall carefully clear the area, from which aggregates are to be taken, of trees, roots, brush, sod, soil unsuitable sand and gravel or aggregates and other objectionable matter. The portion of the deposit used shall be located and operated so as not to detract from the usefulness of the deposit or of any adjacent property and so as to preserve, insofar as practicable, the future usefulness or value of the deposit. Waste materials remove from the aggregate borrow areas shall be disposed of in approved locations.
- c. Processing Raw Materials. The Contractor shall employ processing equipment which will ensure well-shaped particle in all aggregate sizes and a minimum of particle which are flat or elongated. Processing of raw materials shall include screening, washing, and blending if necessary to produce fine and coarse

aggregate meeting the requirements of paragraph 10.05 and 10.07. Processing of aggregates produce from any source shall be done at an approved site. Water used for washing aggregates shall conform to paragraph 10.05. To utilize the greatest practicable yield of suitable materials in the portion of the deposit being worked, the Contractor may crush oversize material and any excess materials of the size of coarse aggregate to be furnished, until required quantity of each size has been secured, provided that the crushed aggregates shall be blended uniformly with the uncrushed aggregates. Crushing and blending operations shall at all times be subject to approval of the DA/BSWM Project Engineer.

Aggregates, as delivered to the mixers, shall consist of clean, hard and uncoated particles. When required, dust shall be removed from the coarse aggregate by adequate washing.

- d. Moisture Control. The free moisture control of the fine aggregate and smallest size group of coarse aggregates as delivered to the mixers shall be controlled so as not to exceed the value of 6.0 and 1.5, respectively, expressed as a percentage by weight of the saturated, surface dry aggregates. The percent variation of free moisture content in fine aggregate and the smallest size of coarse aggregate shall not exceed 0.5% and 2.0%, respectively, during any one hour of mixing plant operation. The free moisture of the other sizes of coarse aggregates shall be the least amount when delivered to mixers and variations shall be the least practicable under all job conditions. Sand shall have uniform and stable moisture content. Under no conditions shall the other sizes of coarse aggregates be delivered to the mixing plant bind dripping wet. The Contractor may accomplish the required moisture control by use of devices or any other satisfactory of free drainage storage, mechanical dewatering or any other means of dewatering.

#### **19.09 AGGREGATE SAMPLING AND TESTING**

Sampling of the aggregate materials approved for use in the work, shall be done by BSWM in accordance with ASTM Sampling Method at 10 days in advance of the time when placing of concrete is expected to begin. Aggregate studies and tests will be made by DA/BSWM at its own expense. It shall be the responsibility of the Contractor to designate the source(s) of aggregates early enough to give BSWM, sufficient time to obtain the necessary samples and subject them to test.

The samples of aggregates shall be obtained and tested in accordance with the following ASTM standard methods:

	<b>Concrete</b>
Sampling aggregate	D 75
Sieve analysis	C 136
Amount of material finer than 200 sieve	C 117
Organic impurities	C 40
Mortar strength	C 87
Soundness	C 88
Soft particles	C 235
Abrasion	C 131
Clay lumps	C 142

No aggregate shall be used until official advice has been received that it has satisfactorily passed all tests, at which time written authority shall be given

previously tested and shown satisfactory compliance with all the requirements given herein may be used without further testing upon written permission of BSWM. Test reports for previous test must be available before approval can be given.

During construction, aggregates will be sampled as delivered to the mixer to determine compliance with specification provisions. Test shall be made in accordance with the applicable ASTM Standards. Routine control test and analysis of aggregates at various stages in processing, transporting, stockpiling, retraining and batching, if used will be made by DA/BSWM. The Contractor shall provide such facilities as may be considered necessary for the ready procurement of representative test samples. All test and supervision will be made by DA/BSWM.

#### **19.10 CLASSIFICATION & PROPORTIONING OF CONCRETE MIXTURES**

- a. Classification and Design Mixtures. The mixtures for all classes of concrete shall be designed by the Contractor and approved by BSWM to obtain the compressive strength at the age of twenty-eight (28) days as specified below:

Class	Size of Maximum Dis. of Aggregate	Minimum Compressive Strength	Designated Size of Aggregate
Y	1/2" (12.5 mm)	3,000 psi	12.5 mm to 4.75 mm
AA	3/4" (19 mm)	3,000 psi	19 mm to 4.75 mm
A	1-1/2" (37.5 mm)	3,000 psi	37.5 mm to 4.75 mm
B	2" (50 mm)	2,400 psi	50 mm to 4.75 mm
C	3" (75 mm)	2,400 psi	75 mm to 4.75 mm
Z	3" (75 mm)	3,000 psi	75 mm to 4.75 mm

- b. Cement content. The minimum cement content per cubic meter of concrete for the different classes or gradation of aggregates shall be in accordance with the following:

Class and Gradation of Aggregate	Minimum Cement Content
Y with 1/2"	400 kgs/cu.m
AA with 3/4"	400 kgs/cu.m
A with 1/2"	360 kgs/cu.m
B with 2"	300 kgs/cu.m
C with 3"	270 kgs/cu.m
Z with 3"	340 kgs/cu.m

- c. Aggregate Content. Concrete mixtures shall be designed to use the largest size and the maximum amount of coarse aggregate as practicable for the intended use of the concrete.
- d. Consistency. The amount of water to be used in the concrete shall be regulated as required to secure concrete of the proper consistency and to adjust for any variation the moisture content or grading of the aggregate as they enter the mixer. It shall be such consistency that it will flow around reinforcing steel, but individual particles if the coarse aggregate when isolated shall have coating of

mortar containing its proportionate amount of sand. The consistency shall be gauged by the ability of the equipment to properly place it and not by the difficulty in mixing or transporting. Addition of water to compensate for stiffening of the concrete before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required.

The slump of the concrete at the time of placing shall not exceed 5 cms (2 inches) in heavy concrete sections and at top of walls, piers and parapets, 10 centimeters (4 inches) for pumped or air placed concrete, and 7.5 centimeters (3 inches) for concrete elsewhere.

The DA/BSWM reserves the right to require a lesser slump whenever concrete of lesser slump can be consolidated readily into place by means of the vibration specified in paragraph 19.17.

Notwithstanding the approval by DA/BSWM of the design mixtures and the above specified minimum cement content for different classes or gradation of aggregates, the Contractor shall be responsible that all the concrete meets the desired strength.

#### ***19.11 MEASUREMENT OF MATERIALS***

All materials from which the concrete will be manufactured shall be mechanically measured by weight, except as otherwise specified and/or authorized by the Project Engineer and admixture solutions which may be measured by volume.

Measuring devices shall be suitably designed and constructed for the purpose and shall be weighing separately the cement, fine and coarse aggregates. The accuracy of all weighing devices shall be such that successive quantities can be measured to one percent of the desired weights. Cement in standard bags (40 kgs) need not be weighed. The water measuring devices shall be of such type and made to be readily controlled to obtain an accuracy of one-half per cent of the desired quantity of water.

Whenever volumetric proportioning and measurement is permitted due to failure or malfunction of weighing devices, the equivalent volumetric proportions of weighed representative samples of the concrete ingredients shall be computed taking into consideration bulking effect of cement and variations of moisture content of the aggregates.

When sack or bag cement is used, the quantities of aggregates for each batch shall be for one or more full sack of cement. No batch requiring a fractional sack of cement will be tolerated.

#### ***19.12 MIXING CONCRETE***

- a. General. Concrete shall be machined mixed. Hand mixing shall be allowed only in cases of emergency when there is machine breakdown or malfunction and in the construction of small structures where the total volume of concrete is less



than 2 cubic meters. A written consent of the DA/BSWM Project Engineer must be secured by the Contractor in both cases.

- b. Mixing Site. Concrete shall be thoroughly mixed in a batch mixer of an approved capacity and type which will ensure a uniform and homogenous mixing of the concrete materials.

The minimum mixing time for each batch, after all materials and water are introduced into the mixer shall be as follows:

Capacity of Mixer	Mixing Time
0.60 cu. m. or smaller	1-1/2" minutes
0.60 to 1.20 cu. m.	1-1/2" minutes
1.50 to 2.30 cu. m.	2 minutes
3 cu. m.	2-1/2" minutes

Overmixing, requiring the introduction of additional water to preserve the required consistency, will not be permitted. Overmixed concrete shall be wasted.

- c. Truck Mixing. Truck mixing shall be of the revolving drum type, water-tight, and so constructed that the concrete can be mixed to ensure a uniform distribution of materials throughout the mass. All solid materials for the concrete shall be accurately measured at the proportioning plant before being charged into the drum. Except as subsequently provided, the truck mixer shall be equipped with a tank for carrying mixing water. Only the prescribed amount of water shall be placed in the tank unless the tank is equipped with a device by which the quantity of water added can readily be verified. The mixing water may be added directly to the batch in which case a tank shall not be required. Truck mixer must be provided with a device by which the mixing time can be readily verified by the DA/BSWM Project Engineer.

#### **19.13 RE-TEMPERING**

Concrete, mortar and grout mixers which have developed initial set shall not be used. Concrete, mortar and grout which have partially hardened shall not be re-tempered or remixed.

#### **19.14 SAMPLING AND TESTING OF CONCRETE**

The Contractor shall provide the required samples of concrete to DA/BSWM without cost. Sampling will, in all cases, be performed by or under the direct supervision of the Project Engineer and Contractor shall provide without cost to BSWM all available tools and labor as may be required. Concrete sampling shall be carried on during concrete operations at the rate of one standard sample for each 75 cubic meters of concrete or fraction thereof placed during each continuous placing operation but in no case shall there be less than one sample for each day concreting. Each standard sample shall consist of three (3) standard cylinders 6-inch high. The Contractor shall

keep a record of the samples and the portion of the structures and volume represented which shall be available to DA/BSWM on demand.

Sampling shall conform to ASTM Designations C-172, preparation, storage and curing to ASTM Designation C-31 and testing to ASTM Designation C-39. DA/BSWM shall have the sample tested by an approved testing laboratory at the expense of the Contractor.

#### **19.15 TIME OF HAULING AND PLACED MIXED CONCRETE**

Concrete shall be place at its final position in the forms within forty-five minutes after the introduction of the mixing water to the cement and aggregates, or the cement to the aggregates.

#### **19.16 DELIVERY**

The rate of the delivery of concrete during concreting operation shall be such as to provide for the proper handling and placing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The method of delivering and handling the concrete shall be as such as to facilitate proper placing with the minimum of handling and without damage to the concrete structure.

#### **19.17 CONVEYING AND PLACING CONCRETE**

- a. General. Approval of the Project Engineer shall be obtained before starting any concrete pour, concrete placement will not be permitted when, in the opinion of the Project Engineer, conditions prevent proper placement and consolidation. Before concrete is placed, all saw dust, chips and other construction debris and extraneous matters shall be removed from the interior of forms. Struts, stays and braces serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their location, shall be removed when the concrete placing has reached an elevation rendering their services unnecessary as the case may be. These temporary members shall be entirely removed from the forms and not to be buried in concrete. Surfaces of existing concrete left after partial demolition against which new concrete is to be placed, shall be cleared thoroughly of all loose concrete coating or concrete dust by brushing or other effective means followed by thorough washing or jetting. Such surfaces shall be kept moist for at least 24 hours before pouring the new concrete.

Concrete shall be placed only in the presence of the DA/BSWM Project Engineer or his duly authorized representatives. Any and all concrete placed in the absence of a Project Engineer and his duly authorized representatives will not be considered for measurement and payment, and shall be removed at the discretion of the Project Engineer with the Contractor assuming all losses.

Concrete shall be conveyed from mixers to forms, as rapidly as practicable, by methods which will prevent segregation, or loss of ingredients. In case of circular

siphons, pump-crete shall be used. There shall be no vertical drop greater than 1.50 meters except where suitable equipment is provided to prevent segregation and where specifically authorized by the DA/BSWM Project Engineer. Belt conveyors, clutch or similar continuously exposed flow, will not be permitted.

- b. Concrete on Earth Foundation. All concrete shall be placed on clean and damp surfaces free from standing or running water. Prior to placing concrete, the earth foundation shall be satisfactorily compacted in accordance with these Specifications.
- c. Concrete on Rock or Other Concrete. Rock surface or hardened concrete upon or against which concrete is to be placed shall be clean, free from oil, water, mud, objectionable coatings, debris, loose and semi-detached or unsound fragments. Fault, fissures and seams in rock shall be cleaned to a satisfactory depth and to firm rock on the sides. Immediately before concrete is placed, all surfaces shall be cleaned thoroughly by the use of high velocity air water jets, wet sand blasting or other satisfactory mean. When required by the Project Engineer, roughening by grooving with pneumatic tool of existing concrete surfaces against which concrete is to be placed is required. All surfaces shall be wetted before placing concrete and approximately horizontal surface shall be covered immediately, before the concrete is placed, with a layer of mortar not to exceed fifteen (15) millimeters in thickness and of the same cement-sand ratio as used in the concrete.
- d. Lift in Concrete. The permissible depth of concrete placed in one lift will be as shown in the detailed Drawings or as directed for each structure by the Project Engineer. Unless otherwise authorized or show, lifts of mass concrete shall not exceed 1.5 meters in height, and a minimum of seventy-two (72) hours shall elapse between the placing of each successive lifts. Lifts of three (3) meters will be permitted in piers and walls. Height of light specified herein will not apply where the use of slip form has been approved. All concrete when placed and vibrated shall be approximately horizontal layers not to exceed fifty (50) centimeters in thickness unless otherwise specifically authorized. The placement of concrete shall be done at such a rate that all underlying layers concrete surfaces shall not have reached their initial set before additional concrete is placed thereon. Slabs shall general be placed in one lift unless the depth is so great that this procedure will produce objectionable result.
- e. Consolidation of Concrete. Consolidation of concrete shall be by the use of mechanical vibratory equipment. The vibrating equipment shall be of the interval type and shall at all times be adequate in number of units and the power of each unit shall be capable to consolidate all concrete. The frequency of vibration shall not be less than 6,000 revolutions per minute. Forms or surface vibrations shall not be used, unless otherwise specified in other Sections of this Technical Specifications. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. In consolidating each layer of concrete, the vibrator shall be operated in a near vertical position and the vibrating head shall be allowed to penetrate under the action of its own weight and vibrate the concrete in the upper portion of the underlying layer.

- f. Finishing of Concrete Lift Surfaces. The manipulation of the concrete adjacent to the surface of the lift placement shall be the minimum necessary to produce not only the degree of consolidation desired in the surface layer of concrete but also a surface with the desired degree of roughness for the bond with the next lift. Surface vibration or excessive surface working will not be permitted. All unfinished top surface not covered by forms and which are not to be covered by additional concrete or backfill shall be carried slightly above grade, as directed, and struck off by board finish.
- g. Placing Concrete through Reinforcement. In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregates occurs. On the bottom of the beams and slabs, where the congestion of steel near the forms makes a placing difficult, a layer of mortar of the same cement-sand ratio as used in the concrete shall be first deposited to cover the surface.
- h. Depositing Concrete in Water. When specifically authorized, concrete may be deposited in water. The methods and equipment used shall be subject to the approval of the DA/BSWM Project Engineer.

#### **19.18 FORMS**

- a. General. Forms shall be used whenever necessary to confine the concrete during vibration and to shape it to the required lines. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in position. The strength and rigidity of the forms shall be such that formed surfaces will conform to specification requirements relating to the surface irregularities and tolerances for concrete construction. Forms shall be tight to prevent loss of mortar from concrete.

Chamber strips shall be placed in the corners of the forms for exposed exterior corners so as to produce beveled edges. Interior corners and edges of formed joints shall not be beveled unless requirement thereof is shown on the Drawings.

The tolerance limits specified in paragraph 10.23 and the surface irregularity limits specified in paragraph 10.21 are the maximum permissive limits of misalignment or irregularity surface which may occur despite workmanlike effort to construct and maintain the forms to the specified surfaces. These limits pertain only to inadvertent and occasional irregularities. Accordingly, these limits shall not be construed to be tolerances for aligning forms or determining acceptability of form materials.

Stub walls shall not be used, except that stub walls shall be used for walls having fillets at the bottom.

Concrete in such stub walls shall be re-vibrated after adjacent floor concrete is placed.

Forms for finishes F2 and F3 shall be construed with grade strips at the horizontal construction joints, unless the use of groove strips is specified in the Drawings.

Such forms shall be removed and reset from lift to lift and they shall be continuous from lift to lift. Sheathing of reset forms shall overlap the previous lift by not more than 1 inch. Forms shall be tightened against the concrete so that the forms will not spread and permit abrupt irregularities or loss of mortar or paste. Supplementary bolts or form ties shall be used as necessary to hold the rest forms against the concrete.

Forms of all wall openings shall be constructed so as to facilitate loosening.

- b. Form Sheathing and Lining. Wood sheathing or lining shall be of such kind and quality and shall be so treated or coated that there will be no chemical deterioration or discoloration of the formed concrete surfaces. The type and condition of form sheathing and lining, and the fabrication of forms for finishes F2, F3 and F4 shall be such that the form surfaces will be even and uniform. The ability of forms to withstand distortion caused by placement and vibration of concrete shall be such that the formed surfaces will conform with applicable requirements of these specifications pertaining to finish off formed surfaces. Where finish F3 is specified, the sheathing or lining shall be placed so that the joint marks on the concrete surfaces shall be in general alignment, both horizontally and vertically.

Plywood used for sheathing or lining shall be high density overlaid plywood specially manufactured for use in construction concrete forms as approved. Materials used for sheathing and lining shall conform with the following requirements, or other materials producing equivalent results as approved by the Project Engineer.

Required Finish of Formed Surface	Wood Sheathing or Lining**	Steel Sheathing of Lining*
F1	Any grade, surfaced on two edges (S2E) with not limits to defects except imposed by other requirements of these specifications	Steel sheathing permitted Steel lining permitted
F2	Selected lumber, surfaced on side and two edges (S1S2E) or plywood sheathing or lining	Steel sheathing permitted Steel lining permitted
F3	Selected lumber, surfaced on sides (S4S) or plywood	Steel sheathing permitted Steel lining not permitted
F4	For plane surfaces, selected lumber surfaced on four sides (S4S) T&G or plywood. For warped surfaces, the lumber shall be free from knots and	Steel sheathing permitted

\* Steel sheathing denotes steel sheets not supported by a backing of wood boards.

\*\* The lumber shall be free from warp and knotholes and shall have no knots larger than 5 centimeters in diameter. All knots shall be sound and tight. There will be no pitch pockets, barb or lack of wood on the face of the lumber against the concrete is to be placed.

- c. Form Ties. Embedded ties for holding forms shall remain embedded and, except for F1 finish, shall terminate within the concrete approximately two diameters or twice the minimum dimensions of the tie from the formed faces of the concrete. Embedded ties for F1 finish shall terminate within the concrete or shall be cut-off flush with the faces of the concrete. The ties shall be so constructed that ends and end fasteners can be removed by unskilled workmen without causing spalling at the faces of the concrete.
- d. Cleaning and Oiling of Forms. The surfaces of the forms in contact with the concrete shall be free from encrustations of mortar, grout or other foreign materials when the concrete is placed. The surfaces of the forms to be in contact with the concrete shall be coated with an approved coating which will enable the ready release of the forms and will not contaminate the concrete surfaces. Except as provided below, forms for surfaces which are to be painted shall be coated with straight, refined, pale, paraffin mineral oil, or other approved coating, and the coating for steel forms shall consist of refined mineral oil suitably compounded for the purpose.
- e. Forms of Curved Surfaces. Curved surfaces have been dimensioned at several sections. The Contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form lumber shall be built up to laminated splines cut to make tight, smooth form surfaces. The forms shall be constructed so that the joint marks on the concrete surfaces generally will follow the line of water flow. After the forms have been constructed, all surface imperfections shall be corrected, and all surface irregularities at matching faces of form materials shall be dressed to the specified curvature.
- f. Forms for Slopes or Battered Surfaces. Forms for sloped or battered surfaces shall be built so that the sheathing can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration, and inspection of the concrete. The sheathing shall be built so that the sheathing can be removed board-by-board from the bottom to top.
- g. Forms for Open Channel Transitions. When the warped surfaces of transitions are not back formed, natural or compacted earth shall be shaped to the specified surface and covered immediately with a plaster coat of cement-sand mortar at least 0.95 cm.

Forms for the warped surfaces shall be tied securely to the floor slab and braced against spreading. In the upper surface, forms shall be butt and removed as specified in the subparagraph (j), so as to enable ready access for placement, vibration, inspection, and repair and finishing of the concrete.

- h. Forms for Bridges. Forms for girders and slabs shall be cambered as specified by the DA/BSWM Project Engineer.

Forms shall be constructed so that form marks will conform to the general lines of the structure. Column form marks shall be spaced symmetrically.

Form bolts or clamps shall be used to fasten forms. The use of ties consisting of twisted wire loops will not be permitted. Bolts or clamps shall be positive in action and shall be of sufficient strength and number to prevent displacement of the forms. They shall be of such type that they can be entirely removed or cut back one inch or more below the finish surface of the concrete leaving no metal within one inch of the concrete surface. All forms for the outside surfaces shall be constructed with rigid wales at right angles to the studs and all form clamps shall extend through and fasten such wales.

Forms for exposed surfaces shall be constructed of plywood or material which will produce an equivalent surface. Form panels shall be furnished and placed in uniform widths of not less than 90 cm. and in uniform lengths of not less than 1.8 meters, except where the dimensions of the member formed are less than the specified panel dimensions. Plywood panels shall be placed with the grain of the outer plies perpendicular to the studding of joists, unless otherwise permitted by the DA/BSWM Project Engineer. Where form panels are attached directly to the studding or joists, the panels shall not be less than 1.6 cm. thick, and the studding joists, shall be spaced not more than 30 cm. center to center. Form panels less than 1.6 cm. thick, which otherwise conform to the requirements specified in this paragraph, may be used with a continuous backing of surface material 1.9 cm. thick. Form panels between studding or joists does not exceed that of a 1.6 cm panel attached to a studding or joists spaced at 30 cm. center to center. All form panels shall be placed in a neat, symmetrical pattern subject to the approval of the DA/BSWM Project Engineer.

- i. Falsework for bridges and Other Superstructures. False work for the support of a bridge or other superstructure shall be designed and constructed to support the load that would be imposed where the entire structure placed at one time.

Suitable jacks, wedges or camber strips shall be used in connection with falsework or centering to set the forms to the required grade or camber and to take up any settlement in the framework either before or during the placing of concrete.

- j. Forms of Large Circular Conduit. The contractor shall submit to DA/BSWM detailed Drawings for a collapsible steel form to be used as inner forms of the monolithic barrels. The length of one section of the barrels is at every 5.15 meters (16.9 ft) intervals as shown on the Drawings. The outer forms of the concrete barrels shall be made with butt joints throughout and form surfaces to be in contact with concrete shall be smooth and true. All forms shall be sufficiently tight with suitable gaskets provided at all form joints and gates to prevent leakage of mortar. Forms shall be braced and sufficiently stiff to withstand, without detrimental deformation, all operations incidental to the proper placement of



concrete within the forms. All forms shall be cleaned and oiled before pouring concrete.

- k. **Removal of Forms.** Forms shall be removed as soon as possible to enable the earliest practicable repair of surface imperfections, but in no case shall they be removed before approval of the DA/BSWM Project Engineer. Any needed repair of treatment shall be performed at once, and be followed immediately by the specified curing. Forms shall be removed with care so as to avoid injuring of the concrete and any concrete so damage shall be repaired. In field operation that are not controlled by beam or cylinder test the removal of forms and supports shall be governed by the following:

Type of Structure	Time of Removal After The Last Pouring
Arch, beam, girders and slabs	14 days
Slab in close span of less than three (3) meters	7 days
Side form of beams, railings, parapets, balustrade, walls and columns	Not less than 12 hours and more than 48 hours

#### **19.19 CONSTRUCTION JOINTS**

- a. **General.** After the top surface of a lift is finally compacted, it shall be immediately and carefully protected from direct rays of the sun, pedestrian traffic, materials being placed thereon, running water, heavy rains, or any activity upon the surface that in any manner will affect the setting of the concrete. Unless otherwise specified, vertical and horizontal joints on exposed surfaces shall be chambered as shown on standard detailed drawings and formed to produce a uniform and neat appearance.
- b. **Cleaning.** Horizontal construction joints on lifts with relatively open and accessible surfaces may be prepared for receiving the next lift by either wet sand blasting or by cutting by all-water jet, as specified below. If the surface of the lift is congested with reinforcements, or is relatively inaccessible, or if for any other reason the Project Engineer considers it undesirable to disturb the surface of a lift before final set has taken place, surface cutting by means of air-water jets will not be permitted and the use of wet sand blasting or light brush manning will be required. After approved cleaning, the surface of the construction joints shall be kept continuously wet for at least twelve (12) hours immediately prior to placing concrete. A mortar coating of approximately one centimeter in thickness shall be applied to all approximately horizontal surfaces immediately prior to the next lift of concrete. Any free water on the joint surface shall be removed prior to placing the mortar.

1. Air-water cutting of construction joint shall be performed after initial set has taken place but before the concrete has obtained its final set. The surface shall be cut by a high-pressure air-water jet to remove all laitance and expose clean, sound aggregate but not to undercut the edges of the larger particles of the aggregate. After cutting, the surfaced shall be washed and rinsed as long as there is a trace of cloudiness of the wash water.
2. Wet Sandblasting – When employed in the preparation of construction joints, wet sandblasting shall be performed immediately before placing the following lift. The operation shall be continued until all unsatisfactory concrete and laitance, coatings, stain, debris and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose materials.
3. Cleaning Vertical Construction Joint – The vertical construction joints shall be cleaned by wet sand blasting or by brush manner.

#### **19.20 REPAIR OF CONCRETE**

No repair of work or plaster finish of formed concrete in structures will be permitted, unless otherwise provided in these Specifications or directed by the DA/BSWM Project Engineer. All defective concrete shall be removed and replaced with the Contractor assuming all expenses and losses. If directed, the Contractor shall notify the Project Engineer of the start of the repair work at least 24 hours in advance thereof and shall repair concrete only in the presence of DA/BSWM representative, unless inspection of such repair work is waived.

Drypack shall be used for filling holes having at least one surface dimension little, if any, greater than the hole depth; for narrow slots cut for repair of cracks, for grout pipe recesses; and for tie-rod fastener recesses as specified. Drypack shall not be used for filling, behind reinforcement or for filling holes that extend completely through a concrete section. Mortar filling, placed under imposed by use of a mortar gun, may be used for repairing defects on surfaces designated to receive F1 and F2 finishes where the defects are too wide for drypack filling and too shallow for concrete filling and no deeper than the side of the reinforcement that is nearest the surface. Concrete filling shall be used for holes extending entirely through concrete sections; for holes in which no reinforcement is encountered and which are greater in area than 900 square centimeters and deeper than 20 cm; and for holes in reinforced concrete which are greater in area than 400 sq. cm. and which extends beyond reinforcement.

Workmanship methods, preparation of concrete for repair, materials, and curing shall be as directed. Only workmen skilled in the repair of concrete shall perform such work. Repairs of defective concrete shall be made within 48 hours after removal of forms.

Surfaces to which concrete is to be bonded shall be clean and dry when coated with epoxy.

Surfaces of concrete to be repaired with sealing compound method shall be cured by the water curing method for one day before application of the sealing compound. All

repairs shall be sound and free from shrinkage cracks and dummy areas after they have been cured and have dried 30 days.

Surfaces of repairs which will be exposed to view shall be blend inconspicuously with surrounding concrete surfaces.

Fins and encrustations shall be removed from surfaces which will be exposed to view.

#### **19.21 FINISHES AND FINISHING**

- a. General. Allowable deviations from established lines, grades and dimensions are set forth in paragraph 10.23. These allowable deviations are defined as “tolerance” and are to be distinguished from surface irregularities in finish as described herein. The class of finish and the requirements for finishing concrete surfaces shall be as specified in this paragraph.

Finishing of concrete surfaces shall be performed only by skilled workmen. The Contractor shall advise the BSWM as to when concrete will be finished. Unless inspection is waived in each specific case, finishing of concrete shall be performed only in the presence of the DA/BSWM Project Engineer. Concrete surfaces will be tested by the BSWM to determine that surface irregularities are within the limits hereinafter specified.

Surface irregularities are classified as “abrupt” or “gradual”. Offsets caused by displaced or misplaced form sheathing or lining or form sections or by loose knots in forms or otherwise defective form lumber will be considered abrupt irregularities, and will be tested by direct measurements. All other irregularities will be considered to be gradual irregularities and will be measured as the departure from the testing edge of an approved template held parallel to and in contact with the surface. The template shall consist of a straight-edge or the equivalent thereof for curved surfaces.

- b. Formed Surfaces. The classes of finish for formed concrete surfaces are referred to by symbols F1, F2, F3 and F4 faces. Grinding will not be required on formed surfaces except as necessary to reduce protrusions to specified limits. Recesses from removal of form ties shall be filled with drypack or epoxy mortar at the Contractor’s option; except that filling recesses in Finish F1 surfaces will be required only if the recesses are deeper than 2.5 cm. in walls less than 30 cm. thick or if unfilled recesses would reduce the required cover over reinforcements.

The filled recesses shall blend inconspicuously with the surrounding concrete surfaces or concrete that will be exposed to view.

The classes of finish and their application are as follows:

**Finish F1** – Finish F1 applies to formed surfaces where fill material or concrete is to be placed. The surfaces require no treatment after form removal except for repair of defective concrete and specified curing. Correction of surface irregularities will be required only for depressions which exceed 2.5 cm. when measured as described in sub-paragraph (a).

Abrupt irregularities on surfaces to which premolded joint filler is to be applied shall not exceed 0.30 cm.

**Finish F2** – Finish F2 applies to all formed surfaces not permanently concealed by fill materials or concrete, or not required to receive finish F3. Surface irregularities, measured as described in sub-paragraph (a) shall not exceed 0.60 cm. for abrupt irregularities and 1.20 cm. for gradual irregularities.

**Finish F3** – Finish F3 applies to formed surfaces of the stoplog guides, exposed faces of abutments, wing walls, girders, curbs, parapet railings, and decorative features on bridges. Surface irregularities, measured as described in sub- paragraph (a), shall not exceed 0.60 cm. for gradual irregularities and 0.30 cm. for abrupt irregularities, except that abrupt irregularities will not be permitted at construction joints.

**Finish F4** – Finish F4 applies to formed surfaces for which accurate alignment and evenness of surfaces are of paramount importance from the standpoint of eliminating destructive effects of high velocity flows. Formed surfaces to receive an F4 finish includes formed surfaces exposed to high velocity flowing water.

Except as hereinafter provided, abrupt irregularities on surfaces to receive F4 finish, when measured as described in sub-paragraph (a), shall not exceed 0.60 cm. for irregularities parallel to the direction of the flow and 0.30 cm. for irregularities not parallel to the direction of the flow. Gradual irregularities on surfaces to receive an F4 finish shall not exceed 1.60 cm.

Abrupt irregularities on formed surfaces exposed to high velocity flows shall be eliminated by grinding on a level of 1:20 ratio of height to length.

The Contractor will not be entitled to extra payment for reducing or eliminating irregularities on formed concrete surfaces which do not meet specification limits.

- c. **Unformed Surfaces.** The classes of finish for unformed concrete surfaces are referred to by symbols U1, U2, U3 or U4. Exterior surfaces will be sloped for drainage were shown on the Drawings or as directed. Exterior surfaces which otherwise would be level shall be sloped for drainage. Unless the use of other slopes or level surfaces is indicated on the Drawings or directed narrow surfaces, such as top of walls and curbs, shall be sloped approximately 3 cm. per meter of width; broader surfaces such as walks, roadways, platforms, and decks shall be sloped approximately 2 cm. per meter. These classes of finish and their applications are as follows:

**Finish U1** – Finish U1 (screeded finish) applies to unformed surfaces that will be covered by fill material or by concrete. Finish U1 is also used as the first stage of finishes U2 and U3. Finishing shall consist of sufficient leveling and screening to produce even uniform surfaces. Surface irregularities measured as described in sub-paragraph (a) shall not exceed 0.60 cm.

**Finish U2** – Finish U2 (floated finish) applies to unformed surfaces not permanently concealed by fill material or concrete, or not required to receive finish U3 and U4. Finish U2 is also used as the second stage of Finish U3, floating may be performed by use of hand or power-driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. If Finish U3 is to be applied, floating shall be continued until a small amount of mortar without excess water is brought to the surface, so as to permit effective trowelling. Surface irregularities measured as described in sub-paragraph (a), shall not exceed 0.60 cm.

**Finish U3** – Finish U3 (troweled finish) applies to inside floors of buildings. When the floated surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel trowelling shall be started. Steel trowelling shall be performed with firm pressure, so as to flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities, measured as described in sub-paragraph (a), shall not exceed 0.60 cm.

**Finish U4** – Finish U4 applies to canal lining. The finish surface shall be equivalent in evenness, smoothness and freedom from rock pockets and surface voids to the obtainable by effective use of a long-handled steel trowel. Light surface fitting and light trowel marks will not be considered objectionable. Surface irregularities measured as described in sub-paragraph (a), shall not exceed 0.60 cm. for bottom slabs and 1.20 cm. for side slopes.

- d. **Moisture Control for Unformed Surfaces.** In warm, dry or windy weather the moisture control measures specified herein shall be taken to inhibit loss of moisture from the surface of the concrete. Such surfaces shall be fog-sprayed, covered completely with white polyethylene sheet, or otherwise treated as approved. The curing specified in paragraph 19.22 shall be started as soon as the concrete hardens, however, the surface of the concrete shall be kept wet during the change in curing methods.

If surfaces are fog sprayed, the fog spray shall maintain a sheet of moisture on the concrete but shall not displace cement or create a wet surface during finishing operations. Surfaces shall be fog sprayed during and immediately following finishing operations. Such interruptions shall be of minimum duration and shall occur only in the immediate area being finished.

Plastic shrinkage cracks which occur before the concrete hardens shall be closed. Shrinkage cracks shall be closed by working; cracks shall not be sealed by troweling only.

## **19.22 CURING**

- a. **General.** All concrete except interior surfaces, shall be cured for a period of not less than 14 consecutive days.

All horizontal slabs and surfaces shall be cured by water curing in accordance with sub-paragraph (c) and all inclined or vertical surfaces of concrete shall be applied with membrane curing immediately after removal of forms to prevent dehydration in accordance with sub-paragraph (b) except that membrane curing shall not be allowed for mass concrete and for construction joints. Contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready for use before actual concrete placement begins. The curing medium and method or the combination of mediums used shall be subject to approval by DA/BSWM.

- i) Floors, stair threads, and horizontal construction joints shall be cured for 14 days by a covering of damp sand or curing mats, except that curing of construction joints surfaces may be discontinued in less than 14 days when the surfaces are to be covered with fresh concrete. The sand or curing mats shall not be kept so wet as to allow water to drain from it and stain concrete walls. The sand or curing mats shall be removed after the expiration of the curing period.
  - ii) Interior Surfaces – Concrete surfaces of interior walls, including ceilings and surfaces of construction joints and vertical construction joints will require no curing other than resulting from forms being left in place for at least 2 days. Interior walls shall be washed during and after completion of concrete operations at higher elevations. The washing shall be sufficient to keep the walls free from drips or runs of material that would cause streaking or staining of the concrete. Stair risers and large repairs on interior walls shall be cured for at least 4 days by damp mats but shall not be wet enough to cause dripping of water on to completed concrete. Small repairs and filled core holes on interior walls shall be cured for at least 4 days by masking tape or similar covering.
- b. Membrane Curing Method. The concrete shall be sprayed uniformly with sealing compound and shall conform to AASHTO Designation M-148, Type II. The component shall be of uniform consistency and quality within each container of each shipment and from shipment to shipment. Sealing compound used in confined spaces shall not be toxic to workmen. The Contractor shall furnish a manufacturer's certificate, shall identify the batch and include certified test results covering all requirements of the specifications for the sealing compound material.

Sealing compound shall be applied to unformed concrete surfaces immediately upon completion of moisture control measures taken as specified in paragraph 19.18. Where such measures are not required, sealing compounds shall be applied as soon as the concrete is hard enough to preclude damage from application of the sealing compound. BSWM will require that the side slopes and bottom of the canal lining be sprayed separately unless the surfaces are ready simultaneously to receive the sealing compound.

The sealing compound shall be applied to formed concrete surfaces immediately upon removal of the forms as specified in paragraph 19.18. The moisture control measures shall be taken until the forms have been removed. Formed surfaces shall be sprayed with water immediately after sealing compound shall be applied as soon as the surface film or water has disappeared but while the surface is still damp.

Sealing compound shall be applied in one coat to provide a continuous uniform membrane. Special care shall be taken to ensure coverage of edges, corners and rough spots of formed surfaces. The compound shall be agitated continuously in the spray pressure tank.

Concrete repair work shall be performed after the sealing compound has been applied and is dry to touch. In the event that application of sealing compound is delayed or interrupted, water shall be applied, as approved, until application of sealing compound is started or resumed.

Any membrane that is damaged or is determined to be defective within 28 days after application shall be repaired or replaced without delay, as approved. If the Contractor's operations require traffic on coated surfaces, the membrane shall be protected from damage.

Payment for membrane curing shall be included in the contract unit price for concrete in the Bill of Quantities where they are required.

- c. Water Curing. Water curing shall start as soon as practicable after placement of the concrete and shall continue until completion of the specified curing period or until covered with fresh concrete. Concrete, if cured by water, shall be kept wet by ponding method or by covering with an approved water saturated material, or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other methods, approved by DA/BSWM, which will keep all surfaces to be cured continuously (not periodically) wet.

### ***19.23 TOLERANCES FOR CONCRETE CONSTRUCTION***

- a. General. Permissible surface irregularities for the various classes of concrete surface finish, specified in paragraph 10.21 are defined as "finishes" that are to be distinguished from tolerances that are consistent with modern construction practice, yet governed by the effect that permissible deviations will have upon the structural action or operational function of the structure. Deviations from the established lines, grades and dimensions will be permitted to the extent set forth herein.

Where tolerances are not stated in the Specifications or Drawings for any individual structure or feature thereof, permissible deviations will be interpreted in conformity with the provisions of this paragraph. Concrete works that exceeds

the tolerance limits specified will be rejected and shall be corrected or removed and replaced, as ordered.

- b. Tolerance for Canal Structure

1. Concrete Canal Lining:

Departure from establishment alignment

- 5 cm. on tangents
- 10 cm. on curves

Departure from establishment profile grade – 2.5 cm.

Reduction in thickness of lining:

10 percent of the specified thickness; provided that the average of all thickness measurements made in 40 meters of lining shall be not less than the specified thickness, and provided further that the quantity of concrete actually use in 40 meters of lining shall be not less than the theoretical quantity, based on the lines shown on the Drawings.

Variation from specified width of section at any depth-- 3 cm.

Variation from established depth of lining ----- 3.7 cm.

Variation in surface:

Invert, in 3 meter	----- 0.60 cm.
Side slopes, in 3 meter	----- 1.20 cm.

2. Bridges, Inlets, Chutes and other Structures:

Departure from established alignment----- 1.20 cm.

Departure from established grades----- 1.20 cm.

Variation from the plump or the specified better in the lines and surfaces of columns, piers, walls and in rises:

Exposed in 3 meters	----- 1.20 cm.
Backfilled in 3 meters	----- 2.0 cm.

Variation in cross-sectional dimensions of columns, walls, piers, slabs, beams and similar parts:

Minus	----- 0.60 cm.
Plus	----- 1.20 cm.



3. Bridge Slabs:

Variation in thickness of slab:

Minus	-----	0.30 cm.
Plus	-----	0.60 cm.

Variations from specified width over curbs ----- -- 0.60 cm.

Variations from specified grade of top of curb in cambered position---- 0.60 cm

4. Foundations:

Variations in dimensions in plan:

Minus	-----	2.50 cm.
Plus	-----	5.00 cm.

Variations from established grade:

Minus	-----	1.20 cm.
Plus	-----	5.00 cm.

Misplacement of eccentricity:

2 percent of the footing width in the direction of misplacement but not more than	-----	5.00 cm.
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5. Bridge Seats:

Variation of any one bearing from established elevation----- -- 0.30 cm.

Difference in elevations of bearings for adjacent spans, maximum-- 0.60 cm

Difference in elevations of bearings for same spans on any one pier, maximum	-----	0.30 cm
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Horizontal, misplacement for any one bearing, maximum----- -- 0.70 cm.

Variations in the sizes and locations of slabs and wall openings ---- 1.20 cm

6. Sills and side walls for radial gates and similar watertight joints:

Variation from the plumb level not greater than 0.30 cm. in 3 meters

7. Stop log Slots:

Variation from a common plane between the sealing surface of each pier of related stop log slots shall be no greater than----- -- 0.15 cm.

Variation of widths of stop log guides:

Minus	-----	0.30 cm.
Plus	-----	0.60 cm.

c. Tolerances for Cast-in-Place Concrete Pipes:

Departure from established alignment or from established grade ---- 2.50 cm.

Variation in thickness at any point:

Minus 2-21/2 "or 0.60 cm. whichever is greater

Plus 5 % or 1.20 cm. whichever is greater

Variation from inside diameter----- 0.5%

Variation in surface invert ----- 0.60 cm. in 3 meters

d. Tolerances for Placing Reinforcement Steel :

Variation from indicated protective cover:

For 5 cm. cover	-----	0.60 cm.
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For 7.5 cm. cover	-----	1.20 cm.
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Variation from indicated spacing ----- -- 2.50 cm.

**19.24 FAILURE TO CURE**

The DA/BSWM shall have the authority to suspend the work wholly or in part, by written order, for such period as he may deem necessary for failure on the part of the Contractor to perform proper curing of the concrete work and to withhold payment for the corresponding work pending results of test, that shall subsequently be made on these concrete works. The Contractor shall immediately secure core samples of such members and from parts of the structure as shall be designated by the Project Engineer and shall have them tested in a Testing Laboratory approved by the DA/BSWM. If the results of the tests are found satisfactory payment of the concrete in question shall be made and the work ordered resumed, but if the results of test are unsatisfactory to meet the structural requirements, the Contractor shall remove, wholly or partly, the concrete work in question at the discretion and upon written order of the Project engineer and the Contractor shall replace such parts at his own expense.

#### **19.25 FAILURE TO MEET CONCRETE REQUIREMENTS**

All concrete designed, prepared and placed by the contractor for bridges that fails to meet the specified shall be removed and replaced by the Contractor at his own expense. For other structures, concrete that fails to meet the specified strengths may be accepted provided the Contractor shall pay as liquidated damages the amount based on the following schedule:

Percent (%) lower than the specified strength	Reduction in price per cu. m. of concrete
Up to -10	Less 5% of Contract Unit Price
-11 to -20	Less 10% of Contact unit Price
-21 to -30	Less 15% of Contract unit Price

Concrete for all structures other than bridges which are more than thirty percent (30%) lower than the specified strength shall be removed and replaced by the Contractor at his own expense.

#### **19.26 PROTECTION OF CONCRETE WORK**

The Contractor shall protect all concrete against injury until final acceptance by the DA/BSWM. Final acceptance shall be construed to mean acceptance of the whole work after the Contract has been completed or satisfactorily terminated.

#### **19.27 METHOD OF MEASUREMENT**

Concrete of Class Y, AA, A, B, C, or Z shall be measured by the cubic meters of concrete completion place and accepted measurement will be of the actual number of cubic meters within the neat lines of the structures as shown in the drawings or revised plans as approved by the Agency. No deduction shall be made for the volumes of concrete displaced by steel reinforcement, floor drains or expansion joint material. Fillets, scoring or chambers of 600 square millimeters in cross-section area or less, shall be disregarded in the computations.

#### **19.28 BASIS OF PAYMENT**

The volume of concrete measured above shall be paid for at the contract unit price per cubic meter for the class of concrete specified. Such prices and payment shall be full compensation for furnishing all materials including water stops, joints, pipes, drains, conduits, expansion angles, miscellaneous metal items: and for all forms and falseworks, for mixing, placing, finishing and curing concrete and for all labor, materials, equipment, tools and incidentals necessary to complete the works.

**SECTION 20**  
**CONCRETE STRUCTURES**

**20.01 SCOPE**

The Contractor shall construct all concrete structures shown on the Drawings.

Concrete shall be proportioned; mixed, placed, finished and cured as specified in Section 19, except as modified herein. The sequence of construction of the structures shall be subject to approval of the DA/BSW Project Engineer. Where the thickness of any portion of a concrete structure is variable, it shall vary uniformly between the dimensions shown. Cement mortar plastering is not allowed in the construction of structures, unless otherwise specified elsewhere in these Specifications.

All cement requirements for all concrete structures shall be furnished by the Contractor.

**20.02 CONCRETE CONSTRUCTION**

All concrete construction shall conform to the provisions of Section 19 and to detailed requirements of the following paragraphs. Concrete finishes shall conform to paragraph 19.21 and/or shall be as noted on the Drawings.

All structures shall be built to the specified lines, grades and dimensions. The location of all construction joints shall be shown on the Drawings. The Contractor shall place and embed or attach to each structure all timber, metal or other accessories necessary for its completion as shown on the Drawings.

The dimensions of each structure shown on the Drawings will be subject to change as may be found necessary by the DA/BSWM Project Engineer to adopt the structures to actual field conditions and conditions disclosed by excavation.

**20.03 CONCRETE FOR ALL STRUCTURES**

- a. General. The item “concrete” in the Bill of Quantities includes separately concrete in spillway, stilling basin, diversion intake, outlet works including diversion conduit, tailrace gate, drop inlet and other structures not otherwise specified elsewhere in these Specifications.

Concrete for diversion works and other structures will be measured and paid for as specified in paragraph 20.06. Structures not full and acceptably completed will not be measured for payment. Precast structures installed and acceptably completed in place shall be paid for as specified in paragraph 20.06

All materials used like cement, admixture, aggregate and steel reinforcing bars shall conform to the provisions of Sections 19 and 22, respectively. Classes of concrete to be used shall be those specified in the Drawings.

- b. Curing and Joints. All concrete shall be cured in accordance with paragraph 19.22, except that concrete for the ogee shall be cured until the concrete test cylinders shall have attained a strength of at least 211.4 kg/sq.cm. (3,000 psi).

The Contractor shall construct expansion and construction joints at sections specified on the Drawings all in accordance with the provisions of paragraph 19.19 and Section 21 and elsewhere in these Specifications.

#### **20.04 PRE-CAST CONSTRUCTION**

- a. Scope and Description. Pre-casting of reinforced concrete may be resorted to as an alternative to poured-in-place concrete. Should the Contractor choose to employ pre-cast construction on this structure, he must so inform the DA/BSWM in writing, submitting in detail his proposed design, modifications of concrete sections, concrete specifications, reinforcements and schemes of construction of all pre-casts units. The DA/BSWM may further require the Contractor to submit all other additional information as may be deemed necessary.

The DA/BSWM may approve the construction proposed on pre-casting of concrete with or without corrections. The approval, however, does not relieve the Contractor of any responsibility if such work does not meet specified results.

For this purpose, standard reinforced concrete pipes may be considered pre-cast construction, hence, are included under this section.

- b. Transporting and placing. Extreme care should be observed in handling, storing, moving and erecting to avoid cracking, twisting or other distortions that would result to cracking or damage to the pre cast concrete. Pre-cast concrete members shall be handled, transported and erected in an upright position and points of support and directions of the reactions with respect to the members shall be approximately the same as when the member is in final position.
- c. Sampling and Testing. The individual components of pre-cast concrete structures shall conform to the applicable provision of Section 19 and will be subject to the usual test for reinforced concrete.
- d. Sampling and Testing. The individual components of pre-cast pipe will be measured by the linear meter. It shall be measured to the neat lines as if these structures were constructed to the details shown on the Drawings.

#### **20.05 METHOD OF MEASUREMENT**

Measurement for payment of any and all classes of concrete structures will be by the cubic meter computed to the neat line of the structure, unless otherwise specifically shown on the Drawings or as specified in these Specifications. No measurement for payment will be made for bid items on lump sum basis in the Bill of Quantities. In the event cavities resulting from careless excavation or from excavation performed to facilitate the Contractor's operations as determined by the Project Engineer, are required to be filled with concrete, such refilling will be made by and at the expense

of the Contractor. In measuring concrete for payment, the volume within the concrete will be deducted.

***20.06 BASIS OF PAYMENT***

Payment for any and all classes of concrete in various parts of the work will be made at the applicable contract unit prices per cubic meter which price and payment shall include cost for furnishing all materials, equipment and labor, and all operations required in the construction as specified under Section 19, except that payment for reinforcing bars and joint materials will be made at the applicable separate contract unit prices in the Bill of Quantities.

## SECTION 21

### CONCRETE JOINTS AND JOINT MATERIALS

#### 21.01 SCOPE

This Section covers details of construction of expansion and construction joints in concrete including joint materials. Concrete joints and joint materials shall be in accordance with the Drawings and Specifications.

#### 21.02 JOINTS IN CONCRETE

- a. Construction Joints. Unless otherwise specified in these Specifications or shown in the Drawings, the location of all construction joints in concrete work shall be constructed in accordance with paragraph 10.19. To prevent feather-edges, construction joints which intercept surfaces at a relatively small angle shall be sloped, adjacent to the intersection, approximately normal to such surfaces to form a 15 to 20 centimeters offset.

Joints in concrete canal lining, if any, shall be constructed by using a wood strip, metal plate, or other suitable material, which will be subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The space between the concrete shall be at least 5 millimeters wide and shall be filled entirely with joint sealant. Joint sealant materials and placement shall be as specified in paragraph 10.03. The cost of constructing construction joints shall be included in the contract unit price of concrete where they are required.

In structures requiring water tightness and in which waterstops are specified for construction joints or as shown in the Drawings, construction joints introduced by the contractor, as approved, for the convenience of the Contractor shall be equipped with water stops at the expense of the Contractor.

- b. Contraction and Expansion Joints. Contraction joints of the types shown in the Drawings shall be constructed at the location indicated. The joints shall be made by forming the concrete on one side of the joint and allowing it to set before the concrete is placed on the other side of the joint. The surface of the concrete first placed at a contraction and expansion joint shall be cleaned and coated with sealing compound before the concrete on the other side of the joint is placed. The contractor shall furnish the sealing compound conforming to ASTM C-309. The cost of constructing contraction and expansion joints shall be included in the contract unit price of concrete where they are required.

#### 21.03 JOINTING AND COATING MATERIALS

- a. Waterstops
  1. General. The Contractor shall furnish and install polyvinylchloride or rubber waterstops in the shapes and dimensions as specified and in the locations as shown in the Drawings or as directed. For convenience of placement in

forms, a waterstops utilizing a split flange may be used; however, prior to placement of final concrete, the split flange portion shall be joined in an approved manner such that no concrete or mortar can enter between the two split portions of the flange.

2. Workmanship. The Contractor shall furnish all materials, equipment and electric energy required for making field splices for water stops as required, heating the ends to the melting point and joining the splice ends shall be made by means of the splicing machine recommended by the water-stops manufacturer or by any other approved electric heating device.

3. Types of Waterstops

- a) Rubber Waterstops. Rubber water-stops shall be fabricated from natural or synthetic rubber and shall have the following characteristics.

Tensile strength, pounds per square inch, minimum	- 2,100
Elongation at break, percent, minimum	- 450
Shore durometer (Type A)	- 60 to 70
Change in volume, water, water immersion Percent, maximum (2 days at 70° C)	- 5
Ozone resistance (4 hrs at 90 + 5°F)	No cracks
Tensile strength after oxygen pressure test (48 hrs, 70°C, 300 pounds per square inch) Percent of tensile strength before aging, minimum	- 80

- b) Polyvinyl Chloride. Water-stops shall be manufactured by extrusions process from elastomeric plastic compound, the basis resin of which is 100 percent polyvinylchloride (PVC). The product shall be dense, homogenous and free from holes and other imperfections, and shall have the following physical characteristics:

Specific gravity	- 1.33 + 0.03 at 73°F (ASTM: D792)
Tensile strength	- 2,200 to 2,500 psi @ 73°F (ASTM: D412)
Brittleness temp.	- 55°F (ASTM: D746)
Durometer	- 65-75 (ASTM: D676)

4. Inspection and Tests:

- a) Rubber Water-stops shall be tested in accordance with appropriate sections of Federal Test Method Standard No. 601. The ozone concentration when tested shall be 85 to 100 parts per million.



- b) Polyvinyl water-stop shall be tested in conformity with the requirements of Specifications CRD-C572 of the U.S. Army Corps of Engineers. It shall conform to the ozone resistance required for rubber water-stop.

- 5. Measurement and Payment. Measurement for payment of Rubber or PVC water-stops will be made for the number of linear meters water-stops acceptably placed and measured along the centerline of the water-stop.

Payment of water-stop will be made at the contract unit price per linear meter, which price and payment shall include all costs of furnishing, placing and testing of the rubber or PVC water-stop as described above.

b. Resilient-Type Joint Filler –

Preformed sponge rubber joint filler 25 millimeters in thickness shall be furnished and placed by the contractor in the joints were shown in the drawings or as described. The joint filler shall be performed highly resilient-type sponge or cellular rubber conforming to STM D1058 SBE 15 or SBE 45 rubber.

The preformed filler shall be cut and placed as shown on the drawings. The filler material shall be held securely in place against the completed side of an expansion joint by copper or brass nails pre-cast in the first placed concrete; provided that an adhesive suitable for the purpose may be used when approved. Joints in the filler material shall be made tight and shall be taped so that mortar from the concrete will not seep into the joints or the joint filler material. The joint filler shall be handled carefully and stored under cover away from the direct rays of the sun in a manner to prevent damage to the materials.

Resilient-type joint filler will be measured by the linear meters of fillers acceptably installed and measured along its centerline. Payment shall be made based on the contract unit price per linear meter which price shall include all necessary materials, labor and equipment used in placing and testing the joint filler.

c. Joint Sealer

- 1. General. Joints so designated on the drawings or were directed by the Project Engineer shall be sealed with Thioflex 600 polysulphide liquid polymer. Thioflex 600 is a tough, rubber like substance which will seal the joints against infiltration of water throughout repeated cycles of joint expansion and contraction. It is a combination of two materials, i.e., a base compound and a curing agent. Thioflex 600 is packed in dual container tins containing the correct proportions of base compound and curing agent. Thioflex 600 should be used as fresh as possible and must be used before the date of expiration as marked on each pack. Thioflex 600 should be stored under dry conditions at temperature not exceeding 27°C (80°F).
- 2. Inspection and Tests. Each pack of the base compound and curing agent shall be subject to inspection and approval by the DA-BSWM before acceptance or

shipment. The DA reserves the right to be present to observe the manufacturing process.

Samples shall be submitted to the DA-BSWM for testing at least thirty (30) days before use. Regardless of previous tests, material that has not been used after the expiry date as marked on each pack shall be rejected.

The base compound and curing agent packed in dual container tins shall each identify the name of the manufacturer, the manufacturer's lot number, the date of manufacture, expiry date and shall bear instructions for mixing and application.

3. Materials. Materials shall conform the American Standards Association Specification A-116. 1-1960.
4. Placing. Joints so designated on the drawings or as directed by the Project Engineer that are to be sealed with Thioflex 600 polysulphide liquid polymer shall be formed to the correct dimensions and thoroughly cleaned to the satisfaction of the Project Engineer. All dirt, dust, mortar, laitance, scale, oil, loose materials must be removed by wire brushing and where possible, the joints shall be blown out with compressed air. Wet joist must be thoroughly dried by means of a hot air blower or a propane gas torch. Where so designated, these joints shall be primed with the approximate Thioflex primer applied strictly in accordance with the manufacturer's printed instructions prior to sealing. Thirty-six (36) liters of Thioflex 600 will require one and one- tenth liters of Thioflex primer.

The sealing compound shall be applied to all the designated joints with the use of Gun Grade all in accordance with the manufacturer's standards conforming to the American Standards Association Specification A0116.1- 1960. Gun Grade pack yields one and a half (1.5) liters of mixed materials.

5. Curing. The curing time of the mixed material will vary with temperature. High temperature and low temperature will correspondingly decrease and increase the curing time. The temperature of the materials to which the Thioflex 600 is applied as well as the ambient air temperature will affect the setting and curing time. Since the mixed materials tend to heat up as it cures, the setting and curing time can also be affected by the volume of materials applied.

Payment for joint sealers shall be incorporated in the unit bid price for concrete where joint sealers are required and as such, shall not be paid as a separate pay item.

#### **21.04 GROUT**

Grout shall be composed of Portland cement, sand and water proportioned and mixed as specified in this paragraph.

Grout shall be furnished and placed in recesses and holes, on surfaces, under structural members, and at other locations as shown in the drawings or as specified by the DA.

The proportion of cement to sand measured volume shall be one (1) to two (2). Materials shall conform to the provisions of Section 10. The water cement ratio shall not exceed 0.50. The grout shall be mixed until smooth and free of lumps, but in no case less than three minutes. Grout is not placed within 45 minutes after mixing shall be wasted.

Concrete areas to be in contact with grout shall be cleaned of all loose or foreign materials that would in any way prevent bond between the grout and the concrete surfaces and shall be kept thoroughly softened with water for a period of not less than 24 hours immediately prior to placing of the grout. After placing, all surfaces of grout shall be cured.

Payment of work for Grouting, unless otherwise specified, shall be considered included in the various in the Bill of Quantities where it is required.

#### **21.05 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

All concrete construction joint materials and joint sealers shall not be measured separately for payment purposes. The costs of these materials are to be included in the cost per cubic meter of concrete structures to be constructed.

PVC or rubber waterstops shall be measured in linear meters each type of materials installed and accepted by the Project Engineer. Payment shall be made based on the unit bid price per linear meter of waterstop installed.

## SECTION 22

### REINFORCING STEEL BARS

#### 22.01 SCOPE

All reinforcing steel bars required for the works as detailed in the Construction Drawings or as directed by the Project Engineer shall be furnished by the BSWM unless otherwise specified in the Bill of Quantities.

The Length of each size of reinforcing steel bars to be furnished is computed by taking the theoretical length of steel bars shown in the Drawings multiplied by 1.07 to get the actual length required for the work.

All reinforcing steel bars will be furnished in commercial standard lengths and the Contractor shall cut and bend reinforcing steel bars to the details and dimensions shown on the Drawings.

#### 22.02 MATERIALS

All reinforcing steel bars shall be Grade 40 or PS 275, deformed type and conforming to the requirements of ASTM Designation A-615 or its latest revision. The nominal dimensions and unit weights of bar designation shall be in accordance with the following table:

Bar Designation Number	Unit Wt. (kg/m)	Diameter (mm)	Nominal Dimensions Cross-Section Area (mm <sup>2</sup> )	Perimeter (mm)
6 mm	0.222	6	28.27	18.85
8 mm	0.395	8	50.27	25.13
10 mm	0.616	10	78.54	31.42
12 mm	0.888	12	113.1	37.7
16 mm	1.579	16	201.1	50.27
20 mm	2.466	20	314.2	62.83
25 mm	3.854	25	491.9	78.54
28 mm	4.833	28	615.75	87.96
32 mm	6.313	32	804.25	100.53
36 mm	7.991	36	1,017.90	113.1

Bar number are based on the number of weights of an inch included in the nominal diameter of bars. The nominal diameter of a deformed bar is equivalent to the diameter of a plain bar having the same weight per foot of the deformed bar.

## **22.03 CONSTRUCTION REQUIREMENT**

Workmanship shall be at the highest grade and quality, and shall be in accordance with the latest standard practice of the industry. Workmanship shall conform to the following conditions:

### **a. Cutting and Bending**

Cutting and bending of reinforcing bars may be done in shop or at the jobsite. All bending works shall be in accordance with the latest standard practice and be approved machine methods. Radii for bends and hooks will be specified on the approved detailed reinforcement Drawings in accordance with sound design procedures.

### **b. Placing**

Reinforcement shall be laid, anchored and embedded in the concrete as shown on the Drawings or as directed by the Project Engineer. Unless otherwise directed, the spacing of reinforcement bars shall be measured along the center line of the bars. Reinforcement shall be inspected for compliance with requirements as to size, length, splicing, position and number after placement based on the approval reinforcement Drawings has been done.

Before reinforcement are placed, the surfaces of the bars and the surfaces of any metal bar support shall be cleaned of any flaky rust, loose scales, dirt, grease or other foreign substance which in the opinion of the Project Engineer are objectionable. After being placed, the reinforcing bars shall be maintained in a clean condition until completely embedded in the concrete.

Reinforcing bars shall be accurately placed and secured in position so as to avoid displacement during pouring of concrete. Special care shall be exerted to prevent any disturbance of the embedded reinforcement during the setting of the concrete. Metal chairs, hangers, spacers or other approved support may be used by the Contractor for supporting reinforcing bars. Metal supports shall be galvanized when they are to be exposed to view on completed concrete surfaces or where its use will contribute in any way to the discoloration or deterioration of the concrete.

### **c. Relation of Bars to Concrete Surfaces**

The minimum cover for all reinforcements shall conform to the dimensions shown on the detailed reinforcement Drawings.

### **d. Splicing**

All splices in reinforcement shall be as shown on the Drawings or as directed by the Project Engineer. The lapped ends to bars shall be either supported

sufficiently to permit the embedment of the entire surface of each bar in concrete or shall be securely wired.

e. Welding

Welding of bars shall be performed only where shown on the Drawings or as authorized in writing by the Project Engineer and shall conform to the requirements of AWS: D12.1, latest revision. All welders employed shall show proof of their welding qualifications to the Project Engineer. All welding shall be done using metal arc welding, pressure gas welding, submerged arc welding or thermit welding.

Coverings of low hydrogen electrodes must be thoroughly dry when used. The surfaces to be welded shall be clean and shall be free from rust and dirt. All welds shall develop the full strength of the bar on the smaller bar when two different sizes are welded. Test will be required of not more than five per cent (5%) of the welds. Approved testing equipment for testing welds shall be furnished by Contactor.

f. Protection

Reinforcement to remain exposed and intended for future concrete embedment shall be protected from corrosion or other damages in an approved manner where directed. The reinforcement protection shall be of such nature that it can be thoroughly cleaned without difficulty prior to encasement in concrete.

#### **22.04 PREPARATION OF REINFORCEMENT DRAWINGS**

Contractor shall submit for the approval of BSWM detailed reinforcement drawings in accordance with Article SC-8. These drawings will include bar-placing drawings, bar bending drawings, bar list, and any other reinforcement drawings, as may be required to facilitate placement and checking of reinforcing bars. No work shall be done by Contractor until such approval has been given.

The reinforcement Drawings submitted shall show the name of the structure location by stationing where the reinforcement drawings are intended and all the necessary information required by BSWM. It shall likewise bear the stamp or seal of Contractor as evidenced that the Drawings have been checked by Contractor.

Contractor shall be held responsible for any delay in the progress of the work occasioned by his failure to observe the requirements and the time for the completion of the contract will not be extended on account of his failure to promptly submit said drawings in strict adherence herewith.

#### **22.05 SAMPLING FOR TESTING AND ACCEPTANCE OF MATERIALS**

Sampling for testing and acceptance of all reinforcement steel bars furnished shall be the responsibility of contractor being the supplier of the materials. Thus, the Contractor shall not undertake sampling for tests except upon instruction by BSWM.

#### **22.06 METHOD OF MEASUREMENT**

Measurement for payment for reinforcing steel bars will be made on the weight of reinforcing steel bars actually placed with the concrete structure in accordance with the Drawings and Bar Schedule approved by BSWM or as directed by the Project Engineer and weights will be computed based on the published manufacturer's weights or in the absence thereof, on the weights specified in the table presented in paragraph 13.02.

Steel bars in laps or splices indicated in the approved reinforcement Drawings as required by BSWM will be measured for payment. Additional steel bars in laps which are authorized for the convenience of the Contractor and such items as wires, clips, chairs, or other devices for securing the steel bars in place will not be measured for the payment. Where weld splices are specified on the Drawings, weld splices will not be measured for payment but the weight for its equivalent lap splices will be measured for payment instead.

Where Contractor chooses to weld reinforcement bars for his convenience and welding is not specified, no separate payment will be made for such welds, but instead the weight for the lapped spliced shown on the Drawings will be measured for payment.

#### **22.07 BASIS OF PAYMENT**

Payment for installation of reinforcing steel bars measured as provided above, will be paid for at the contract unit price per kilogram of material installed which price and payment shall constitute full compensation for furnishing all materials, labor, tools, equipment and all incidentals and subsidiary works necessary for the successful handling and placing the materials.

## **SECTION 23**

### **REINFORCED CONCRETE CONDUIT**

#### **23.01 SCOPE**

The work under this Section includes construction of reinforced concrete conduit and barrel, laying or installation including jointing and construction of anti-seep collars of the construction diversion conduit all in accordance with the Drawings and these specifications. All reinforcing bars to be used in the fabrication or manufacture of reinforced concrete conduit shall be furnished by the contractor unless otherwise specified in the Bill of Quantities. The scope covers also the purchase and installation of waterstops and joint sealants.

#### **23.02 MATERIALS**

The quality of materials shall conform to the applicable provisions of Section 20, Concrete, Section 13, Reinforcing Steel Bars, and American Concrete Institute (ACI) Specifications for related works.

Concrete for above types of conduits shall be Class “Y” which shall have a cement factor of 392.12 kg per cubic meter of concrete and a minimum compressive strength of 3,000 psi in 28 days. The maximum size of aggregate shall be ½ inch. Reinforcing bars shall be as indicated in the Drawings. Lapping of ends of the hoop bars shall not be less than 40 cm.

#### **23.03 CONSTRUCTION OF REINFORCED CONCRETE CONDUIT**

Under these specifications, the Contractor shall install the construction diversion conduit by casting-in-place in accordance with the Drawings and standard specifications for reinforced Concrete Culver Pipes – ASTM C361-671 or latest revision.

For the conduit and barrel which have two alternating lines of circumferential reinforcement, the following shall be adhered to:

- a. Each line of circumferential reinforcement shall be assembled into a cage which shall contain sufficient member of longitudinal tie bars.
- b. The distance between the two layers shall not be less than what is shown in the Drawings.

Forms to be used in the casting of pipes shall all be steel forms unless otherwise authorized in writing by the Project Engineer.

#### **23.04 INSPECTION, SAMPLING, TESTING**

R. C. conduit casted-in-place by Contractor shall be tested by the BSWM.



Test at not more than three locations shall be taken at random among the entire length required for the diversion conduit.

The testing shall be in accordance with ASTM C-497 and shall meet the physical requirements of ASTM C-76. Cost for sampling and testing shall be at the expense of the Contractor. Sections with injurious defects shall be reconstructed without cost to the BSWM.

#### **23.05 REJECTION**

Sections shall be subject to rejection on account of failure to meet any of the specification requirements. Individual sections of pipe may be rejected due to any of the following:

- a. Fractures or cracks passing through the wall, except for a single crack that does not exceed the depth of the joint.
- b. Defects that indicate imperfect proportioning, making and molding.
- c. Surface defects indicating honeycombed or open texture.

#### **23.06 CURING**

The cast in-situ reinforced concrete conduit and barrel shall be cured in accordance with the provisions prescribed in Section 10, concrete.

#### **23.07 EXCAVATION**

Excavation for conduit and barrel shall be performed in accordance with Section 4-Excavation. Notwithstanding the provision of Section 4, where rock or other unyielding materials will be encountered, the rock or unyielding materials shall be similarly removed to a depth not less than 15 cm below the established grade and shall be refilled with suitable materials thoroughly compacted throughout. Recesses shall be excavated for all collars involve.

#### **23.08 BACKFILLING**

After the conduit/barrel have been constructed and cured after 28 days, selected materials from excavation or barrow shall be placed alongside the pipes in layer not exceeding 15 cm in thickness and compacted thoroughly. The backfilling of the conduit shall be done simultaneously at both sides and shall conform with the provisions prescribed in Section 7, Filling and Backfilling. When the construction calls for placing high embankment over the conduit, special instruction regarding the method of backfilling shall be given by the Project Engineer.

### **23.09 METHOD OF MEASUREMENT**

For the conduit and barrel, measurement shall be made on the length in linear meter of conduit and barrel actually constructed, all in accordance with the Drawings and these Specifications.

### **23.10 BASIS OF PAYMENT**

The total length measured for the conduit and barrel as provided above shall be paid at the contract unit price per linear meter for R.C. diversion conduit which price and payment shall constitute full compensation for furnishing all materials, labor, tools, equipment, supplies and all incidentals or subsidiary works necessary for the successful completion of the work described under this section.

Payment for the waterstops shall be excluded from the cost of conduit and barrel while joint sealants shall be included in the waterstops payments (see Section 12.03 of these specifications).

The cost of anti-seep collars shall not be included in the contract unit price per linear meter or per piece of R.R. conduit placed. These shall be paid for under cost of concrete.

Excavation and backfilling, works are not considered subsidiary works under this section, hence payments shall be under excavation and Fill and Backfill, respectively in the Bill of Quantities.

## **SECTION 24**

### **PRECAST REINFORCED CONCRETE PIPES**

#### ***24.01 SCOPE***

The work under this section shall include furnishing or the fabrication or manufacture of reinforced concrete pipe, laying or installation including jointing and construction of collars of the reinforced concrete pipes for culverts, and drainage crossing and other structures as shown on the Drawings and at such other places designated by the DA/BSWM Project Engineer all in accordance with the Drawings and these Specifications. All reinforcing bars to be used in the fabrication or manufacture or reinforce concrete pipes shall be furnished by the Contractor unless otherwise specified in the Bill of Quantities.

#### ***24.02 TYPES OF R.C. PIPES***

The type of the reinforced concrete pipes as shown on the Drawing shall be as follows:

- a.      Type A - 1      Pipe with a minimum overfill of 25 meters
- b.      Type A - 2      Pipe with a minimum overfill of 20 meters
- c.      Type A - 3      Pipe with a minimum overfill of 15 meters
- d.      Type A - 4      Pipe with a minimum overfill of 10 meters
- e.      Type A - 5      Pipe with a minimum overfill of 5 meters

#### ***24.03 MATERIALS***

The quality of materials shall conform to the applicable provisions of Section 19 “Concrete” and Section 22 “Reinforcing Steel Bars”.

Concrete for pipes shall be Class “Y” which shall have a cement factor of 400 kilograms per cubic meter of concrete and a minimum compressive strength of 3000 pounds per square inch in 28 days. The maximum size of aggregates shall be one half inch.

Reinforcing bars shall be as indicated in the Drawings. Lapping of ends of the ring bars shall not be less than 48 bar diameters.

#### ***24.04 MANUFACTURE OF R.C. PIPES***

Under these specifications, the Contractor could purchase finished products of R.C. pipes or fabricate some himself in accordance with these specifications.

The pipes shall meet the requirements of the standard specification for Reinforced Concrete Pipes ASTM: C361-571 or latest revision. The pipes manufactured according to these specifications shall further meet the requirements as specified on the Drawings. For pipes with one line of circumferential reinforcement, the nominal protective covering of concrete over the ring bars shall be 25% to 50% of the shell thickness reckoned from the inner surface of the pipe. For pipe with two lines of circumferential reinforcement, the following shall be adhered to:

- a. Each line of circumferential reinforcement shall be assembled into a cage which shall contain sufficient number of longitudinal tie bars.
- b. The distance between the two layers shall not be less than the diameter of the longitudinal tie bars plus  $\frac{1}{4}$  inch.
- c. The two-line layers shall be provided with space and tied together to form a single rigid cage.

For 20 centimeters R.C. pipes (and smaller diameter) the thickness shall be 0.5 centimeter and reinforced with 3-strand barb wire consisting of 10 centimeters pitch spiral and six longitudinal ties.

The Contractor shall fabricate the pipes and he shall designate the casting site within the project area subject to the approval of the DA/BSWM Project Engineer.

#### **24.05 INSPECTION, SAMPLING AND TESTING**

R.C. Pipes to be fabricated or manufactured by the Contractor shall be subject to periodic inspection during the process of fabrication or manufacture. Sampling for testing shall be done during said inspection.

R.C. Pipes purchased by Contractor shall be sampled for testing after delivery to Contractor's stockyard.

Sampling for test, not more than three pieces, shall be taken at random among the pipes in a lot. A lot shall consist of 50 pieces of the same size and type delivered at a time to Contractor's stockyard.

The lot represented by the samples tested which failed to meet the specified requirements shall be rejected and Contractor shall immediately remove from the stockyard the pipes comprising the lot.

The samples for testing shall be tested in accordance with ASTM: C-497, and shall meet the physical requirements of ASTM: C-76. Cost for sampling and testing shall be at the expense of Contractor. Pipes with injurious defects revealed subsequent to acceptance of pipes at Contractor's stockyards or fabrication site shall be rejected.

#### **24.06 REJECTION**

R.C. Pipes shall be subject to rejection on account of failure to meet any of the specification requirements. Individual sections of the pipe may be rejected due to the following:

- a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of joint.
- b. Defects that indicate imperfect proportioning, making and molding.
- c. Surface defects indicating honeycombed or open texture.
- d. Damaged ends, where such damage would prevent making a satisfactory joint.

#### **24.07 MARKING**

The following information shall be clearly marked on each section of R.C. Pipes delivered:

- a. The type of pipes, A-1, A-2 or A-3 and so on, and the diameter for the proper identification of the pipe.
- b. Date manufactured, and trade-mark of the manufacturer if purchased from other manufacturers.

#### **24.08 CURING**

Reinforced Concrete Pipes shall be cured in accordance with the provisions prescribed in Section 19 "Concrete".

#### **24.09 TRANSPORTATION AND DELIVERY OF SECTIONS**

Contractor shall load and transport the R.C. Pipes to the installation site in a manner as to avoid damage to pipes. The R.C. Pipes shall be handled carefully with belt slings or other approved devices. The width of belt or other approved handling devices shall be as adequate to prevent any damage. The R.C. Pipe shall be at no time be dropped but shall be lowered carefully and slowly into position. Any R.C. Pipe damaged during loading from the Manufacturer's plant or Contractor's fabrication site, or when in transit to the delivery site, or during unloading, or during installation will be rejected.

#### **24.10 EXCAVATION**

Excavation for R.C. Pipes shall be performed in accordance with Section 5 "Structure Excavation". Notwithstanding the provisions of Section where rock or other unyielding materials will be encountered, the rock or other unyielding materials shall

be similarly removed to a depth not less than 15 cm. below the established grade and shall be refilled with suitable materials thoroughly compacted throughout. Recesses shall be excavated for any collar involve.

#### **24.11 LAYING OR INSTALLATION OF R.C. PIPES**

The R.C. Pipes shall be laid carefully, ends fully and closely jointed, and true to the lines and grades as shown on the Drawings. Belts or other approved devices shall be provided for lowering the pipes when they are placed in trench. Each pipe section shall be securely attached to the adjoining sections unless, otherwise specified, shall be filled with stiff mortar composed of one part Portland cement and one-half parts of sand. Cement, sand and water shall conform to the requirements for these materials given for concrete. The mortar shall be placed so as to form a durable, water-tight joint. After each section of pipe is laid and before the succeeding section is laid, the lower portion of the hub shall be plastered thoroughly on the inside with mortar to such depth as to bring the inner surfaces of the abutting pipes flush and even. After the section is laid, the remainder of the joint shall then be wiped and finished smooth. After the initial set, the mortar on the outside shall be protected from the air and sun with a cover thoroughly wetted earth or burlap. After the setting of the mortar of the joint, the construction of the reinforced concrete collar shall be done in accordance with the Drawings. Any pipe which is not a true alignment or which shows any undue misalignment will be relaid or replaced without extra compensation.

#### **24.12 BACKFILLING**

After the pipes have been installed and the mortar joints and the reinforced concrete sufficiently set, selected materials from excavation or borrow shall be placed alongside the pipes in layer not exceeding 15 centimeters in thickness and compacted thoroughly. The backfilling of pipes shall be done simultaneously at both sides and shall conform to the provisions prescribed in Section Structure Backfill. When the construction calls for placing high embankment over the pipes, special instruction regarding the method of backfilling shall be given by the DA/BSWM Project Engineer.

#### **24.13 METHOD OF MEASUREMENT**

Reinforced Concrete Pipes of the various sizes and types specified in the Bill of Quantities will be measured by the number of pieces or by the number of linear meters of pipe as specified in the Bill of Quantities furnished and acceptably installed, jointed and provided with collar.

#### **24.14 BASIS OF PAYMENT**

The various sizes and types of pipes measured as provided above will be paid at the contract unit price per piece or per linear meter, as the case maybe, of the respective types and sizes of R.C. Pipes, which price and payment shall constitute full compensation for furnishing all materials, labor, tools, equipment, supplies and all

incidentals or subsidiary works necessary for the successful completion of the work described under this Section.

The costs of collars in R.C. Pipes are considered included in the contract unit price per piece or per linear meter of R.C. Pipe.

Excavation and backfilling works are not considered subsidiary works under this Section; hence, payment shall be made under “Structure Excavation” and “Structure Backfill” respectively in the Bill of Quantities.

## **SECTION 25**

### **STEEL PIPE, TRASH RACK, SLIDE GATES, FLANGES, CONTROL VALVES AND OTHER METAL AND WOOD WORKS**

#### **25.01 SCOPE**

The work under this Section shall include installation and testing of the following:

- a. Irrigation Pipe (C1 Outlet Pipe) with flanges
- b. CI Gate Valve with Flanges
- c. Vertical Slide Gate and Hoist
- d. Trashracks
- e. Flashboards

#### **25.02 CONTRACTOR'S DRAWINGS AND OTHER DATA**

Contractor shall submit to DA/BSWM Project Engineer for approval all necessary fabrication and installation Drawings.

Installation procedures shall be submitted in English.

#### **25.03 MATERIALS**

All materials shall be new, free from defects and shall be the best available for the purpose for which they are intended, considering strength, ductility, suitability for the intended service and best engineering practice. All steel or cast-iron materials needed for the works shall be furnished complete by the Contractor. All other materials covered by this Section shall be furnished by the Contractor.

Cast iron steel pipes shall conform to the provisions of the latest edition of International Organization for Standardization-ISO R13 Recommendation-"CI Pipes, Special Castings and CI Parts For Pressure Main Lines" or its equivalent. Steel pipe to be used shall be of continuous seamless pipe construction and shall conform to API Standard 5LXm x 42 grade or ASTM A53-62T, latest edition. Other materials which will be furnished shall conform to the following:

- a. Steel Plates. Steel plates for welded construction vertical gate shall conform to material specification ASTM A-7, latest revision.
- b. High Strength Steel Bolts, Nuts and Washers. Bolts, nuts and washers for watertight connection shall conform to ASTM designation A-325, "High Strength Steel Bolts for Structural Steel Joints", including Suitable nuts and "Plain Hardened Washers", and F436 "Standard specs for Hardened Washers for use with High Strength Bolts".



- c. Lock Washers. Lock washers shall conform to SAE proportions, regular series and shall be spring steel.
- d. Iron Castings. Cast iron for general purpose iron castings other than pressure pipe shall conform to ASTM Designation A-48, "Gray Iron Castings", Class 50.
- e. Rubber Gasket. Rubber gasket shall be the continuous ring type, made of a special composition rubber. The compound shall be of first grade natural crude, synthetic rubber, or a suitable combination thereof. The gasket shall be so formed and cured as to be dense, homogeneous, and have a smooth surface free of blisters, pits and other imperfections. The gasket shall be of sufficient volume to fill substantially the recess provided when the joint is assembled and shall be the sole element depended upon to make the joint water tight.
- f. Gate Valve. The main gate valve shall be made of grey cast iron conforming to ASTM A-48, "Grey Cast Iron Castings", Class 50. It shall be non-shock cold water, oil and gas (WOG), wedge-gate-type, bronze-mounted, outside screw and yoke (OS and Y) with bronze stem with integral disc faces and integral seats.
- g. Its flanges and drillings shall be in accordance with American Standard for Class 125 cast Iron Pipe Flanges and Flat- Faced Flange Fittings B16.1
- h. Steel Trashracks. The trashrack shall be made of standard structural steel which conforms with ASTM A- 6 specifications and shall be of type FY- 36. All steel plates, bars and angle members to be used shall be free of injuries and shall be of the dimensions as shown on the Drawings. Welding materials including equipment, electrodes, wires and fluxes to be used in the fabrication of the trashracks shall conform to AWS A-5-69 or A-5, 5-64.
- i. Vertical Steel Gate and Lifting Mechanism. The vertical steel gate and lifting mechanism shall conform to ASTM material specifications ASTM A-7, latest revision.
- j. Stoplogs/ Flashborads. All wood materials to be used for the vertical stoplogs of the intake structure shall be made of well-seasoned Yakal. Before installation, the stoplogs shall be pressure-treated with anti-termite asphalt-based compound. Before fabrication, the Contractor shall see to it that Yakal to be used shall be of the approved quality, free from large, loose and/or unsound knots, sap shakes or other imperfections which can impair the strength and durability of the stoplogs.

#### **25.04 METHOD OF CONTRUCTION**

- a. General. Workmanship shall be of the highest quality and in accordance with the best shop practice of the industry. All work shall be in accordance with practices and with approved machine methods. Like parts shall be interchangeable whenever possible. Machining of fits on renewable parts shall be accurate to specified dimensions so that replacement parts made in conformity with the Drawings may be installed.

b. Welding

1. Preparation for Welding. Members to be joined by welding shall be cut accurately to size and where required, shall be rolled or pressed to the proper curvature. The edges of the members shall be sheared, flame cut and machined to suit the required type of welding and to allow thorough penetration. The cut surfaces shall expose sound metal free from laminations, surface defects caused by shearing and flame-cutting operations and other injurious defects. The surfaces of the members to be welded shall be free from grease, rust and other foreign matter.
2. Welding Procedure. Unless otherwise authorized, all welding shall be fusion welding by the electric arc welding processes, using a method which excludes the atmosphere from the molten metals. Welding shall conform to the provisions of the ASME Boiler and Pressure Vessel Code, Section VIII, "Rules for Construction of Unfired Pressured Vessels", latest edition applicable to the work, except that thermal stress relief, stamping with the code symbol and reports will not be required.

The Contractor shall submit drawings of such attachments showing all details including welding, for approval before fabrication. All such temporary attachments shall be removed after installation and welds shall be ground flush.

During assembly and welding, adjoining sections shall be held rigidly by temporary fastenings and bracings in such a manner which maintains correct end spacings for full weld penetration. Dimensions and tolerances will be checked by the DA/BSWM Project Engineer prior to final welding of sections and joints. Cutting of plates or sections to obtain the necessary clearance between sections shall be done at the expense of the Contract.

c. Installation of Outlet Pipes with Flanges

The irrigation outlet pipes with flanges with thickness as specified in the Drawing shall be installed as shown in the Drawing or as directed by the DA/BSWM Project Engineer, be painted in accordance with Section 26 and tested by the Contractor.

In installing attachments to shells of brackets, clip angles, eye bolts, etc., will be permitted in erection, provided that such attachments do not impair the strength of the pipe sections. The Contractor shall design, furnish and install all bracings supports, anchorage and other temporary attachment, that may be required for accurately holding, setting, adjusting and aligning individual sections and elbows during transporting, placing and transporting, placing and welding. The Contractor shall submit drawings of such attachments showing all details including welding for approval before fabrication. All such temporary attachments shall be removed after installation and welds shall be ground flush.

During assembly and bolting, adjoining sections shall be held rigidly by temporary fastenings and bracings in such a manner which maintain correct end spacings for

full bolting. Dimensions and tolerances will be checked by the DA/BSWM Project Engineer prior to final bolting of sections and joints.

Cutting of plates or sections to obtain the necessary clearances between sections shall be done at the expense of the Contractor.

d. Installation of Gate Valve

All anchor bolts shall be set accurately to the grade and alignment designated on the Drawing or as directed.

Before installation, the rust preventive compounds on all thread joints shall be removed with a solvent and all joints shall be re-lubricated, where applicable.

The Contractor shall install a cast-bodied gate valve with steel flanges, bronze stem, bronze seat rings, bronze disc faces, bolted stuffing box glands and fitted with high grade packing. The valve shall be rated at 125 psi steam or 200 psi non- shock cold water. It shall be hydrostatically tested at the factory for a shell test pressure and seat test at 350 psi. The valve shall be provided with two slip-on forged steel companion flanges, bolts and nuts, rubber gaskets and other accessories.

Installation of the valve assembly shall be in accordance with the manufacturer's specifications, installation manuals and as shown on the Drawings. The Contractor shall install the valve with utmost care to set it in an upright position, centerline of the shaft and valve assembly perpendicular to the pipe's longitudinal axis.

During assembly, the necessary rubber seals and gaskets shall be seated firmly on flange surface and greased-machine bolts carefully inserted and tightened to maintain water tight connections and joints.

The body shall be prime-coated with anti-rust red-lead oxide paint and top-coated with gray or silver-colored steel paint. The valve wheel shall be painted with a red-colored steel paint.

After assembly, the Contractor shall see to it that the full open and close position of the valve shall be as shown on the Drawings.

e. Vertical Steel Gate and Lifting Mechanism

A vertical steel gate shall be installed in accordance with the details and specifications on the Drawings.

Prior to pouring of concrete, all anchor bolts and bars and other metalworks for the gate which are to be embedded in concrete shall be set and supported rigidly and accurately in position. Such will be maintained during pouring of concrete. The surface of concrete upon which grout will be applied shall be thoroughly cleaned of all laitance, loose concrete coatings or foreign materials by brushing, sand-

blasting or other effective cleaning method, and then followed by thorough washing.

For the steel gate, anchor bars fitted and welded into the gate frame shall be set and positioned as accurately as shown on the Drawings. The gate frame and guide shall be held plumb and erect before concrete is placed and during placement of grout.

The gates shall be handled carefully so that no parts will be bent, broken or otherwise damaged. Hammering that will injure or distort the members will not be permitted. Damage due to improper assembly or other damage due to other causes shall be immediately replaced or repaired to the satisfaction of DA/BSWM. The members shall not be overstressed during the erection.

Lifting Mechanism. The lifting mechanism shall be installed complete with lifting nut, shafting, sheet bearings, anchor bolts and all other materials for complete assembly. Lifting mechanism shall be assembled and accurately placed in correct alignment by the use of shims and wedges between the sole plates and base plates and concrete. Dry packing shall be done after the dry pack has set.

For best installation results, the gates should be assembled and in proper position before concrete is placed. The gate slide must be in position in the wedge block to prevent springing and leakage in gate seat.

If the concrete is placed before the gate is in position, a recess shall be provided at the proper place for subsequent grouting-in of the gate seat. Anchor bolts and bars shall be properly secured in their final positions when the concrete is placed. No anchor bolts and bar are embedded in concrete shall be disturbed, at least seven days after they have been installed. The surface of concrete against which grout is to be placed shall be cleaned thoroughly of all laitance, loose concrete coatings, or foreign materials by brushing, sand-blasting or other effective means followed by thorough washing and shall be kept moist for at least 24 hours before placing grout. The seat shall be carefully grouted. The gate shall never be tightened to an uneven concrete surface, as it will spring and cause leakage.

After the gate is installed, the Contractor shall make sure that all concrete is removed from the slots and seating surfaces, and the slide plate and stem are free to travel to full-open position. A removable handwheel lift and hand wheel pedestal lifts shall be installed in accordance with the Drawings.

Handwheel pedestal lifts shall be mounted on concrete. The pedestal lift shall be assembled and accurately placed in perfect alignment by the use of grout/and or shims under the pedestal.

Bolts, screws and all fittings shall be tightened firmly and uniformly. The alignment of all parts with respect to each other shall be true, and gate parts shall be set to the elevation shown on the Drawings.

f. Trashrack

Trashrack shall be fabricated in the shop and transported to the project site when needed for installation. All welded connections shall be 6-mm. continuous fillet welds done in accordance with AWS shielded arc welding. Anchor bolts in concrete shall be embedded to the depth and in shapes as shown on the Drawings. Nuts and washers shall be secured in place and nuts shall be tightened as specified by the Project Engineer.

All metalworks except cast-iron unless otherwise specified, shall be primed with red lead-oxide anti-rust paint before a final coat of coal tar epoxy paint is applied. Metal members to be immersed in water or metal members or parts have started to rust before paint is applied, such areas shall be thoroughly cleaned with steel brush or sand-blasting before the primer is applied.

g. Stoplogs

Vertical stoplogs of kiln-dried yakal or equivalent shall be constructed and installed to conform with the shape and dimension shown on the Drawings. The Contractor shall ensure that the stoplogs shall fit the concrete guides with the maximum tolerances as shown on the Drawings. Stoplogs panels shall be fabricated to conform closely with the dimensions and sizes shown on the Drawings.

## **25.05 TESTING AND INSPECTION**

Standard for acceptance of welded joints and the procedure for radiographic examination shall be that of the ASME Code for Unfired Pressure Vessels unless otherwise specified the Project Engineer. The Project Engineer will select the location at which circumferential welds shall be inspected and tested. All radiographs of welds shall become the property of BSWM. Instead of radiography, the Contractor may substitute ultrasonic inspections only upon prior approval by the Project Engineer. In cases where both tests are done by the Contractor, radiographic evaluation shall prevail over ultrasonic evaluation. Before conducting actual ultrasonic test of welded connections, the test equipment shall be calibrated and approved by the Project Engineer. Cost of testing shall be borne by the Contractor who will have on its staff a qualified weld inspector trained in operating test equipment.

All circumferential field welds shall be spot radiographed. Three spots per circumferential field joints shall be examined with each spot to at least 20 centimeters in length. Should any of the spots radiographed along the same joints. Should any of the second set of spots still prove defective, then the entire circumferential joint shall be radiographed. Defects in weld disclosed by the test shall be repaired in accordance with the standards and radiographed again by and at the Contractor's expense until such welds are found satisfactory.

#### **25.06. TEST PROCEDURES, TEST RUNS AND ADJUSTMENTS**

Cast-iron pipe, steel-pipe, wye-branch, reducers, and gate valve shall meet the following requirements:

- a. Pressure Head. The system shall be able to operate at a full hydrostatic pressure of 125 psi.
- b. Hydrostatic Test Pressure. The system must be able to withstand a test pressure equivalent to 1.5 times operating pressure.

After complete installation and adjustment is done for operation, the Contractor shall conduct test runs for the pipes and valves. The cost of performing the test shall be considered included in the contract unit price for furnishing and/or installing these items.

All tests shall be performed in the presence of an authorized representative of the BSWM. All data shall be certified correct and be submitted to the BSWM. All defects found during the test as the result of the installation work shall be corrected accordingly to the satisfaction of the BSWM.

#### **25.07 PROTECTIVE COATING**

- a. Immersed Steel. Except where otherwise specified, all steel surfaces and all parts of the structures that have surfaces which are normally immersed in water, shall be painted with two coats of coal tar epoxy paint in accordance with SSPC No. 11.01 Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint System.
- b. Embedded Steel Work. Where not otherwise specified, all steel surfaces which will be embedded or against which concrete shall be placed, shall be cleaned in accordance with SSPC-SP 93 then painted with one coat of cement latex consisting of 10 parts of Portland cement (by weight), five parts of water and one part of modified latex emulsion.

#### **25.08 METHOD OF MEASUREMENT**

The quantity of steel pipe installed shall be measured by linear meters of pipe actually installed. Steel gate, trashrack, stoplog, gate valve and dresser coupling shall be

measured by the number of set acceptably installed. Wye-branch flanges and reducers shall be measured by weight in kilograms of material acceptably placed.

**25.09 BASIS OF PAYMENT**

Payment of works under this Section shall be based upon unit price per linear meter, per kg, per unit, per set of assembly of works installed as shown in the Bid Proposal of the Contractor which price shall constitute the cost of labor, equipment and all other incidentals incurred by the Contractor in the fabrication, delivery and installation of these items of works.

## SECTION 26 PAINTING

### METAL WORKS

#### 26.01 GENERAL

Contractor shall clean all surfaces of metalworks and apply paint and protective coatings as hereinafter provided and shall furnish all the required materials. Surfaces not required to be painted and coated, but which are adjacent to the surfaces to be cleaned and painted, shall be protected against contamination and damage during the cleaning and painting operations. Before proceeding with cleaning or painting operations, Contractor shall clean and repair all shop applied paint which is defective or damaged. Materials which have been painted shall be handled with care and protected as necessary to preserve the coating in good condition. Temporary or permanent welding will not be permitted on areas where the welding will damage paint or other protective coatings unless the areas of coating which could be damaged thereby are accessible for repairing and inspection. Except where specified, Contractor will not be required to disassemble any machinery, equipment or other metal work for the purpose of painting the interiors. Tinting where required for color contrast, shall be done by using not more than three (3) ounces of tinting color per U.S. gallon of paint.

Items being delivered shop-coated with priming paint or standard shop coat will have coatings compatible with the types of paint indicated in the following schedule. Certain items will be furnished with a gasoline-soluble rust-preventive compound.

Contractor shall take care to procure the painting materials according to a schedule which will ensure that paint will not be stored longer than the limits recommended by the manufactures.

#### 26.02 CLEANING AND PAINTING SCHEDULE

No.	Item	Method of Surface Preparation *	Paint or Coating Material	No. of Coating
1	Operating mechanism; non-water bearing metal pipe and standard valves and fittings; pipe hangers and supports; handrails, stairs, walkways gratings unless galvanized, ladders; structural steel; hatch covers, hatch frames, base plates and miscellaneous non-water bearing metalwork to be subjected to ordinary atmospheric exposure and to public view but not including items otherwise tabulated	Damaged areas of shop-applied prime coats and any unpainted surfaces that require painting.	Red-lead priming paint Type II	1
		A Undamaged areas of shop applied prime coats and areas of field- applied prime coats that cleaning except that clean surfaces of field-applied prime coats will require no further surface preparation	Machinery paint or regular aluminum paint whichever is directed	2



No.	Item	Method of Surface Preparation *	Paint or Coating Material	No. of Coating
		B Damaged areas of items furnished completely painted	Damaged areas shall be repaired to match existing surfaces	
2	Trashracks, guide frames, stem gates and other metalworks not otherwise specifically tabulated, all of which will be intermittently submerged, or otherwise subjected to excessive spray or condensation applied prime	C Damaged areas of shop applied prime coat	Self-curing inorganic zinc prime coating (Equal to Dimetcote No. 4 Amercoat Corporation, Brea, California) Coal, tar epoxy coating	1
		Undamaged areas of shop-applied prime coats and areas of filed coats that require cleaning except that clean surfaces of field applied prime coats will require no further surface preparation		2 or more to produce a minimum dry-fill thickness of 16 mils
3	Upstream face of Steel Gates	C See paragraph 33.03 for letter identification	VR-6 vinyl-resin paint	6
4	Exterior surfaces of: all ferrous non-galvanized surface of water-bearing valves; steel gates and any other metal work which will be intermittently submerged subjected to spray or condensation and which subject also to sunlight exposure or to public view.	C For unpainted surfaces	Red-lead priming paint Type IV	1
		B For areas of Type IV red-lead shop coat	Phenolic-resin aluminum paint	2
5	Galvanized surfaces exposed to public view which are required to be painted for decorative purposes	A For galvanized surfaces enamel interior oil paint, or	Zinc dust-zinc oxide priming paint, machinery enamel semi-gloss regular aluminum paint whichever is directed	1
		Semi-gloss regular aluminum paint whichever is directed		2

No.	Item	Method of Surface Preparation *	Paint or Coating Material	No. of Coating
6	Machined surfaces, steel cables and finished surfaces which will be in rolling or sliding contact and which are not required to be painted or lubricated	A	One heavy coat of gasoline soluble rust preventive compound	1
7	Surfaces of metalwork which will be inaccessible after installation or assembly	B or C As specified for the metalwork if furnished unpainted or	Priming paint specified for other surfaces of the same metalwork	3
		A If furnished painted	None	
8	Stainless steel; nonferrous metalwork, galvanized metalwork which will be exposed outdoors; and surfaces of cast-iron which are to be buried or continuously subjected to moisture and not exposed to public view	Painting is not required unless otherwise tabulated	None	
9	Interior surfaces of cast-iron pipe, valves, fittings	Painting is not required unless specifically listed elsewhere in this tabulation	None	
10	Metal surfaces to be encased in concrete and which concrete is to be placed	Painting is not required	None	

### **26.03 PREPARATION OF SURFACES**

Surface preparation shall be in accordance with one of the following methods. The method to be used for each item is indicated in the painting tabulation. Weld spatter, burrs, or other objectionable surface irregularities shall be removed or repaired before cleaning. Any dirt or dust remaining from the cleaning operation shall be removed before the surfaces are painted. Cleaning solvent shall be mineral spirits or xylol except the xylol shall be used for surfaces which require coal tar coatings. In the event that rust forms or the surface becomes otherwise contaminated in the interval between cleaning and painting, or between coats of paints, recleaning will be required.

Method A. All oil, grease and dirt shall be removed by the use of clean solvent and clean wiping materials.

Method B. All oil, grease and dirt shall be removed by the use of clean solvent and clean wiping materials. Following the solvent cleaning, the surfaces to be painted shall be cleaned of all defective or damage areas of existing paint, and of all loose rust, loose mill scale, and other foreign substances by scrapping, chipping, blasting, power wire brushing or other effective means.

Method C. All oil, grease and dirt shall be removed by the use of clean solvent and clean wiping materials. Following the solvent cleaning, the surfaces to be painted shall be blast cleaned to base metal, using dry, hard, sharp sand or still grit, to produce a grey-etched surface. The blasting material shall pass a No. 16 U. S. standard screen and at least 85 percent shall be retained on a No. 50 U. S. standard screen.

#### **26.04 APPLICATION**

Materials shall be thoroughly mixed and surfaces shall be clean and free from moisture at the time of application. Effective means shall be provided for removing all spraying equipment. Nozzle pressure consistent with acceptable finish results shall be employed when spray painting. Each coat shall be free from runs, pinholes and sags. Each coat shall be allowed to dry or to harden before succeeding coating is applied. Thicknesses specified in millimeters shall be measured by an approved dry- film thickness gage. Red-lead priming paint, regular or phenolic resin aluminum paint and machinery paint may be thinned if necessary to permit satisfactory application, in which event mineral spirits shall be used and the amount of thinner shall be kept to a minimum and in no event shall it exceed 15 percent of the paint. Thinning of other materials will be permitted only if approved by the Project Engineer. If necessary to improve application properties, cold-applied paints may be heated by means of a hot-water to temperature not exceeding 38 °C.

Application of specific materials shall be as follows:

- a. Red-lead priming paint shall be applied at a maximum coverage of 12.5 square meters per liter per coat for Type II and a maximum coverage of between 11 and 12.5 square meters per liter coat for Type IV. The first coat shall be applied by either brush or spray. Following the first coat, an additional tinted brush coat shall be applied over all rivets, welds, bolts, seams, sharp corners and edges before subsequent painting. Alternate coats shall be tinted for color contrast using IB black. If necessary, each additional pass shall be by strokes of right angles to the previous pass.

Specific color matches will not be required except that all paint used for the last coat shall be uniform in color.

- b. Cold-applied coal-tar paint, CA-59, shall be applied at a coverage of approximately 3 square meters per liter per coat. It shall be applied by brushing. Thinning will not be permitted.
- c. Coal-tar epoxy coating shall be applied at a maximum coverage of 2.7 square meters per liter per coat. Alternate coat shall be of different colors and the final coat shall be a color other than black, the color being subject to approval by the Project Engineer. Surface preparation, coating preparation, application and thinning shall be done in accordance with the manufacturer's instructions.

## **26.05 MATERIALS**

All pigmented paints and primers shall be purchased in sealed containers packaged by the manufacturer and shall be delivered with the seals unbroken. Colors of finish paints shall match color samples, furnished by the BSWM unless color requirements are specifically stated otherwise. Materials shall be in accordance with the following specifications:

a. U. S. Federal Specifications:

- 1) Red-lead priming paint, TT-P-8c, Type II and Type IV.
- 2) Zinc-dust zinc oxide primer, TT-P-641b, Type II.
- 3) Mixing varnish for regular aluminum paint, TT-V-81b, Type II, class B.
- 4) Mixing varnish for phenolic-resin aluminum paint, TT-V-119.
- 5) Aluminum paste, TT-A320a, Type II, Class B
- 6) Machinery enamel, TT-E-489b, Class A.
- 7) Pigment-in-oil (tinting colors) TT-P-381b.
- 8) Mineral spirits, TT-T-291a, Grade I.

b. U. S. Bureau of Reclamation Specification:

- 1) Cold-applied, coal tar paint CA-50.
- 2) Vinyl-resign paint, VR-6, aluminum paste and thinner.

c. United States Maritime Administration Specification:

Rust preventive compound, 52 MA-602a, Type B, medium except that equally effective inhibitors, in suitable quantities, may be used in lieu of the specified percentage of chromates.

d. U. S. Military Specifications:

Coal tar epoxy, MCL-P23236, Type I, and II, Class A.

e. Certification, Sampling and Testing of Materials:

Contractor shall furnish manufacturer's certificates in compliance with specifications for all paint materials being furnished.

Contractor shall conduct film thickness measurements and electrical inspection of the coated surfaces and shall record and repair defective work as necessary for compliance with the specifications. All test equipment shall be furnished by the Contractor.

Contractor shall provide magnetic type dry film thickness gage for measuring paint thickness and a high voltage type detector for electrical inspection of coal tar epoxy resin coatings. All coats to be done shall be under the direction of BSWM and testing equipment to be used shall be subjected to approval by the BSWM.

**26.06 BASIS OF PAYMENT**

No separate measurement and payment will be made for the above painting requirements and the cost for the painting test shall be included in the metalworks in the Bill of Quantities for which painting is required.

## SECTION 27

### CHANNEL EXCAVATION

#### 27.01 SCOPE

The work under this Section shall consist of excavating and removal of all classes of materials in the approach channels for the spillway and diversion intake, main canal and the wasteway channel including disposal of unsuitable or surplus materials to designated waste disposal areas, stockpiling of excavated materials suitable for embankment and backfilling, and trimming of side slopes inside the channel prism and channel beds except for portion where concrete lining is required all in accordance with the Drawings and these Specifications and as directed by the DA/BSWM Project Engineer.

All channel/canal excavations shall be true to lines, grades, slopes and profile shown on the Drawings or as required by the Project Engineer.

#### 27.02 CLASSIFICATION

All excavated materials under this Section will be classified as follows:

- a. Rock- Any sound massive formation of hard material which cannot be excavated either by manual or mechanical means unless first blasted shall fall under this classification.
- b. Indurated Materials- A massive formation of inorganic materials not falling under the classification of “Rock “ such as Adobe, Hardpan and the like, shall be classified as “ Indurated Materials “.
- c. Common- All other materials not falling under the above classifications will be classified as “ Common Materials “.

#### 27.03 CONSTRUCTION REQUIREMENTS

##### 27.03.1 Sections and Slopes

Excavation sections, profiles and slopes shall be cut true and straight in conformity with the lines and grades shown on the Drawings within the following tolerances, measured normal to the excavated surfaces:

Item	Tolerances
1. Side slopes above minimum elevation of operating roads	+ 30 cms
2. Profile of operating roads, access roads and protection dikes	+ 9 cms
3. Profile of invert channels	+ 3 cms
4. Side slopes inside channel prism	+ 15 cms

The extreme of the above tolerances shall not be continuous over a distance of 40 meters measured at any place, in any direction, parallel to the excavated surface.

#### 27.03.2 Excavation Beyond Established Lines

Precautions shall be taken to preserve, in an undisturbed condition, materials beyond the designated limits of excavations as shown on the Drawings except unsuitable materials ordered removed by the Project Engineer. Materials loosened beyond the excavation limits as a result of excavation operations shall be considered defective work and shall be compacted or removed and replaced with compacted embankment at the Contractor's expense, as directed by the DA/BSWM Project Engineer.

### **27.04 METHOD OF CONSTRUCTION**

Channel/canal excavation shall include all excavation works in the channel/canal prism whether common, indurated or rock materials, except additional excavations at structure sites which is specified to be done and measured for payment under Section 5.

The Contractor shall also excavate after the area of operation is acceptably cleared and grubbed in accordance with Section 4, Clearing and Grubbing. Excavation shall be in accordance with the cross-section, lines and grades shown on the Drawings. On portion where concrete lining is required, excavation shall not extend beyond the neat lines of the underside face of lining as shown on the Drawings. Excavation operations shall be such that all materials suitable for embankment or backfilling and filling shall be separated for objectionable materials which are to be wasted. All surfaces from the excavation shall be trimmed to the required slopes and grades within the specified tolerances under paragraph 27.03 (2).

The method of construction or excavation shall be at the option of the Contractor whether by the use of manual labor or by the use of equipment. For cut above 1.00 meter but less than 1.50 meters, if there is sufficient manual labor such that the timetable for completion of the project will not be adversely affected, and the work can be done with manual labor at a price not exceeding the price for mechanized work, excavation shall be done by manual labor. These limits refer only to workable soil. If the soil is wet and sticky, the above limits may be reduced. If the soil is hard as to require picks for loosening, thereby impairing the efficiency of manual labor considerably, the cut section shall be plowed mechanically with the use of disc plows towed by TD-9 tractor until the soft layer is reached.

In case no manual labor is available to meet project deadline, the Contractor shall be required to secure a certification from the Mayor of the locality concerned to support his request for extension. On the other hand, if the availability of manual labor is

more than enough to meet project deadline the Contractor may be required to undertake manual excavation more than what can be mechanically done.

In the absence of manual labor, the channels, canal should preferably excavate with the use bulldozers (D7 or D8) and motorized scrapers, excavating in excessive layers of about 30 centimeters followed subsequently by trimming of the side lobes using a Grader or a Backhoe. Should the Contractor propose to do excavation works by some other means, prior approval of the Project Engineer must be secured.

If slides occur on excavated slopes or if run-off flows deposit additional materials in excavations before the acceptance of the works, the removal of the said slopes and /or deposit shall be at the expense of the Contractor.

#### **27.05 FINISHING CHANNELS/CANALS**

Upon completion of all construction operations, the slopes of all canal/channel sections shall be finished as specified and shown in the Drawings. Channel beds, embankment and side slopes shall be trimmed and shape to the finished cross- sections to produce smooth surfaces and slopes, and uniform cross-sections, as shown on the Drawings.

Stockpiling of materials on finished sections, roadways and embankments shall not be permitted. All finished works and surfaces shall be cleaned of dirt and foreign materials.

The Contractor should also be required to clear all right-of-way for all excess or objectionable materials, if all excess or objectionable materials are the result of the Contractor's operation as determined by the DA/BSWM Project Engineer.

All weeds and other objectionable growth, roots, excess earth, debris, loosened rock larger than 7.5 centimeters shall be removed and disposed off in approved sites outside the right-of-way as specified or directed by the Project Engineer.

Entire channel section, side slope and structure approaches shall be left in neat and presentable conditions.

#### **27.06 METHOD OF MEASUREMENT**

Channel excavation will be measured for every cubic meter of material excavated from the channel prism. Measurement shall be made in its original position after undertaking clearing and grubbing including stripping operations and computed by the Average-End-Area Method for every 20- meter section of finished channel within the pay lines or neat lines shown on the Drawings, acceptably excavated and formed into embankments of used for structure backfill, or wasted as directed.

Hauling of excavated materials within the free haul distance either for embankment or disposal to waste areas and trimming of side slopes in channel prism and beds except



for portion where concrete lining is required, are considered subsidiary works and thus, shall be paid under this Section and the cost thereof shall be considered included in the contract unit price for channel excavation. Hauling or overhauling for disposal of excavated materials into embankments is a subsidiary work for impervious fill core trench backfill, coffer dam of dam embankment or structure backfill as the case maybe. Thus, it will not be measured for payment and the cost thereof is included in the contract unit price for impervious fill, core trench backfill, and coffer dam for dam embankment or structure backfill as the case maybe.

**27.07 BASIS OF PAYMENT**

The volume measured as provided above shall be paid at the contract unit price per cubic meter for the different classes of Channel/Canal excavation, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, equipment, tolls and all incidentals necessary for the successful completion of the work described under this Section, and for all subsidiary works except for hauling of excavated materials beyond the free haul distance for disposal to waste areas which shall be paid under Section 8, Borrow Haul.

# CONSTRUCTION OF MATAMPAY SWIP






## Brgy. Matampay, Munai, Lanao del Norte

### Region - 10

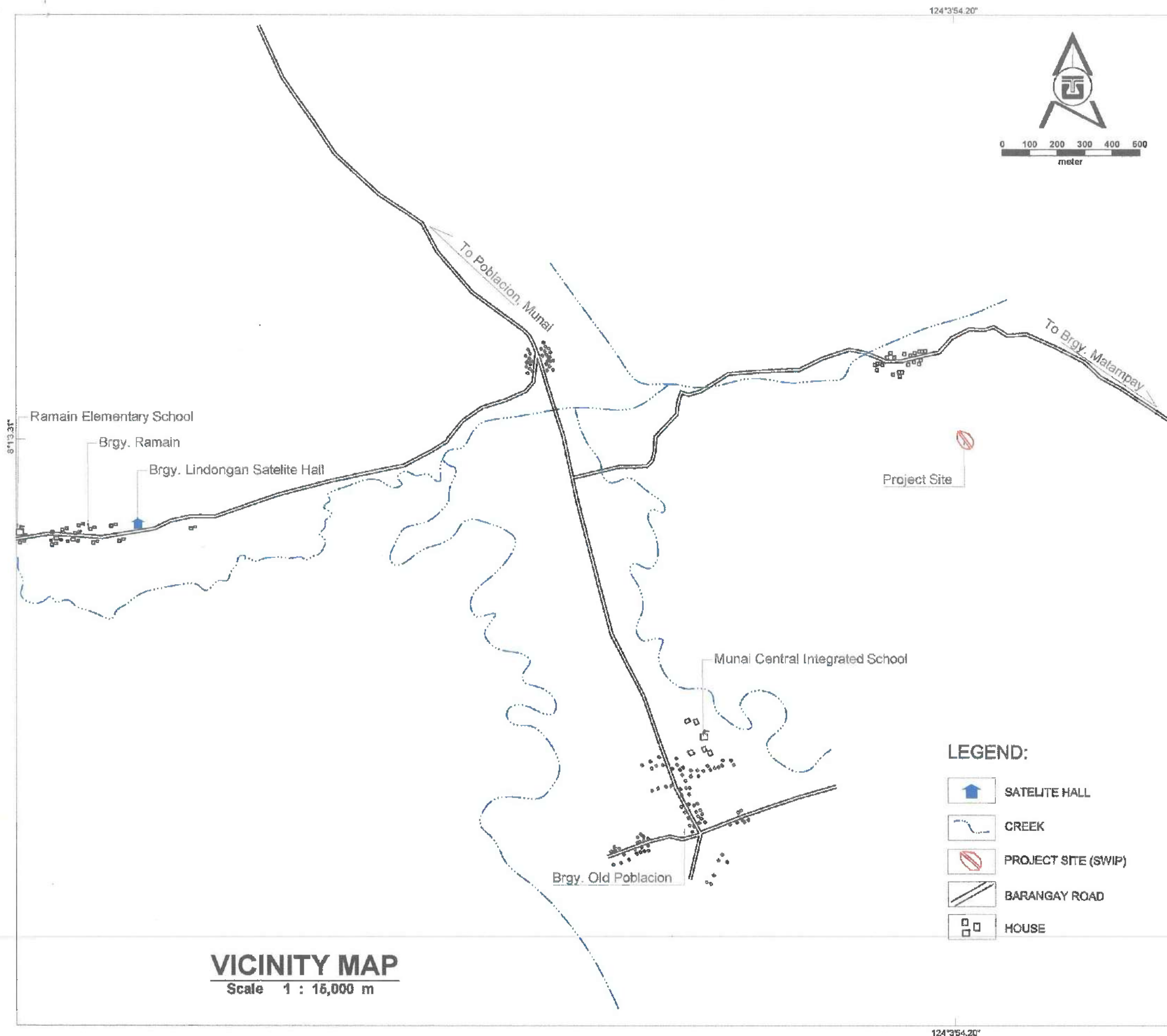


**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**

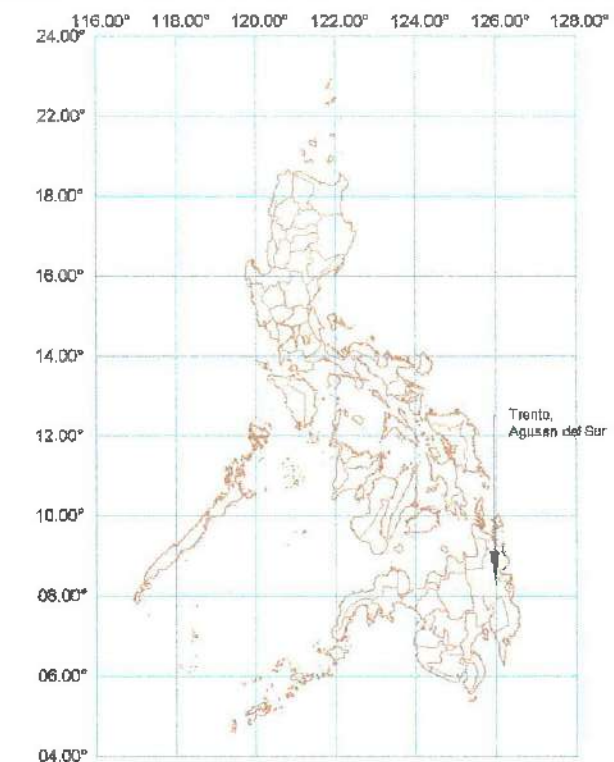
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 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: <b>BSWM-WD-IF-008</b> Control Number: <b>2024-54-WD-RAS-P0004</b> Effective Date: November 8, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: <b>02/16/24</b>	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: _____	 <b>GINA P. NIÑO, Ph.D.</b> Director Date: _____	<b>LIST OF DRAWINGS</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	<b>R. Samson</b> Sheet No.: <b>1 / 26</b>





**VICINITY MAP**  
Scale 1 : 15,000 m



## MAIN PROJECT FEATURES

NAME OF PROJECT: MATAMPAY SWIP  
LOCATION: Brgy. Matampay, Munai, Lanao del Norte  
DESIGNER: Engr. Rogelio B. Cuime Jr.

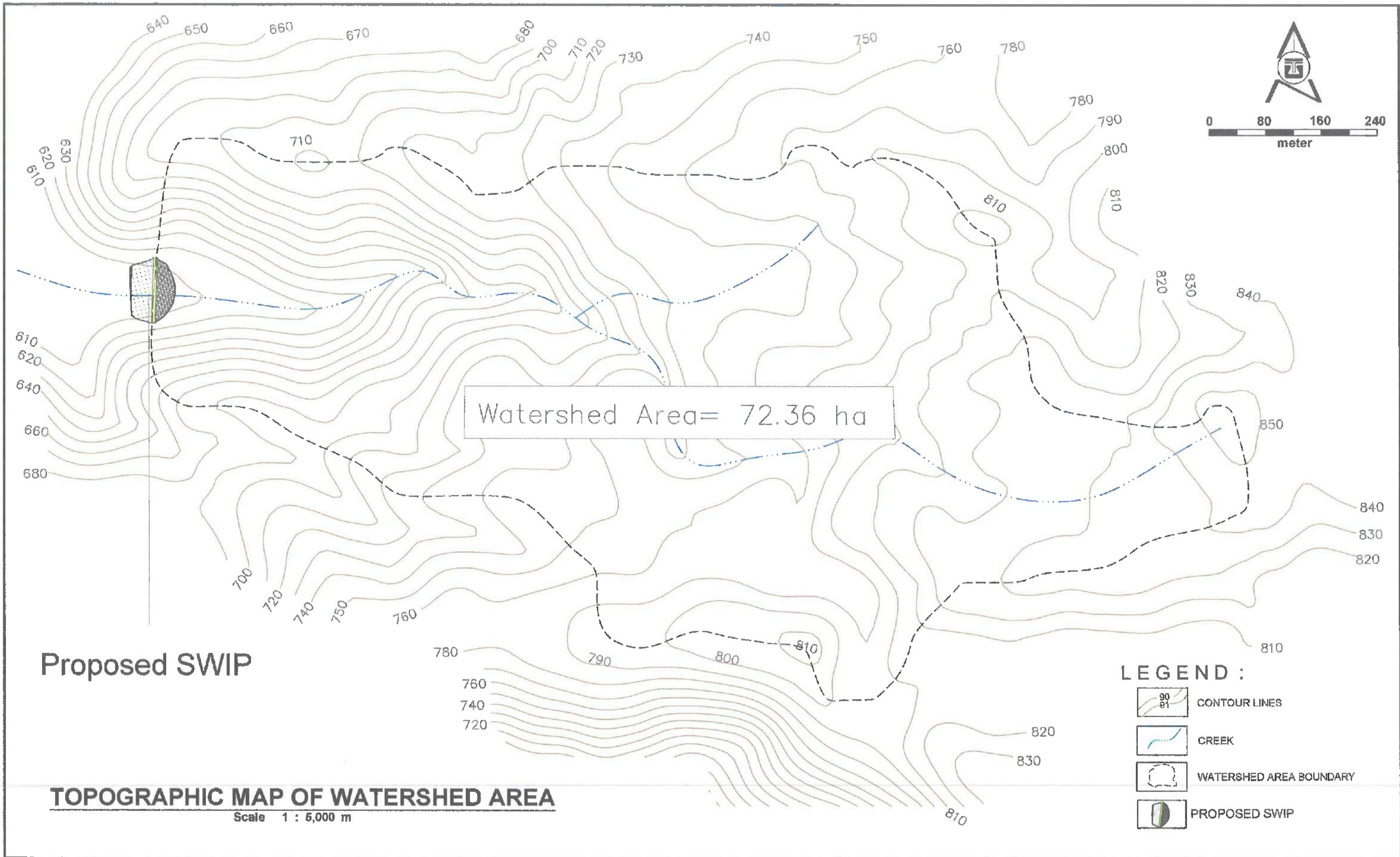
1. WATERSHED	
AREA (ha)	72.36
PRESENT LAND-USE(Compant)	FOREST
SOIL TYPE	SILTY CLAY LOAM
2. HYDROLOGY	
MEAN ANNUAL RAINFALL (mm)	2080.00
ANNUAL RESERVOIR INFLOW (mm)	2675.17
3. RESERVOIR	
AREA (ha)	1.07
MINIMUM ELEV. (m)/STORAGE (cu. m.)	608.00/6,702
NWS ELEV. (m.)/STORAGE (cu. m.)	613.00/44,903
EFFECTIVE STORAGE VOLUME (cu. m.)	36,201
4. PROJECT FACILITIES	
a. DAM	
TYPE	SWIP
CREST ELEV. (m.)	819.00
HEIGHT (m.)	14.00
CREST WIDTH (m.)	6.00
CREST LENGTH (m.)	100.00
UPSTREAM SLOPE (H:V)	2.76:1
DOWNSTREAM SLOPE (H:V)	2.50:1
b. SPILLWAY	
b.1 APPROACH CHANNEL	
LENGTH (m.)	12.00
WIDTH (m.)	7.00
BURCHARGE HEIGHT (m.)	0.98
b.2 DISCHARGE CHANNEL	
LENGTH (m.)	48.00
WIDTH (m.)	7.00
SLOPE % AVERAGE	30.00
b.3 STILLING BASIN	
TYPE	Type III USBR
LENGTH (m.)	7.00
WIDTH (m.)	7.00
SLOPE % AVERAGE	0% BASIN / 0.2% RIPRAP
b.4 DESIGN FLOOD	
Q in 50 yr. (cu.m)	12.29
Q out 50 yr. (cu.m)	11.62
c. OUTLET WORKS	
TYPE	Steel Pressure Pipe
PIPE DIAMETER (m.)	0.25
PIPE LENGTH (m.)	68
MAXIMUM DISCHARGE (cu. m/sec.)	0.126
d. IRRIGATION WORKS	
d.1 CANAL LENGTH (m.)	1,045
d.2 STRUCTURES	
END CHECK (No.)	3
DIVISION BOX RIGHT/LEFT (No.)	4/2
FLUME/LENGTH(m.)	2 / 15 & 8
OTHERS (Specify) (m.)	
e. ACCESS ROAD	
TYPE	GRAVELLED
LENGTH (m.)	400
5. DESIGN SERVICE AREA AND CROPPING PATTERN	
CROPPING PATTERN	Rice Rice Onion
SEASONAL SYSTEM WATER REQUIREMENT (mm)	113 190 107
SERVICE AREA (ha)	39 37 18
6. PROJECT COST (P)	15,360,000.00



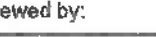
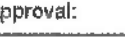

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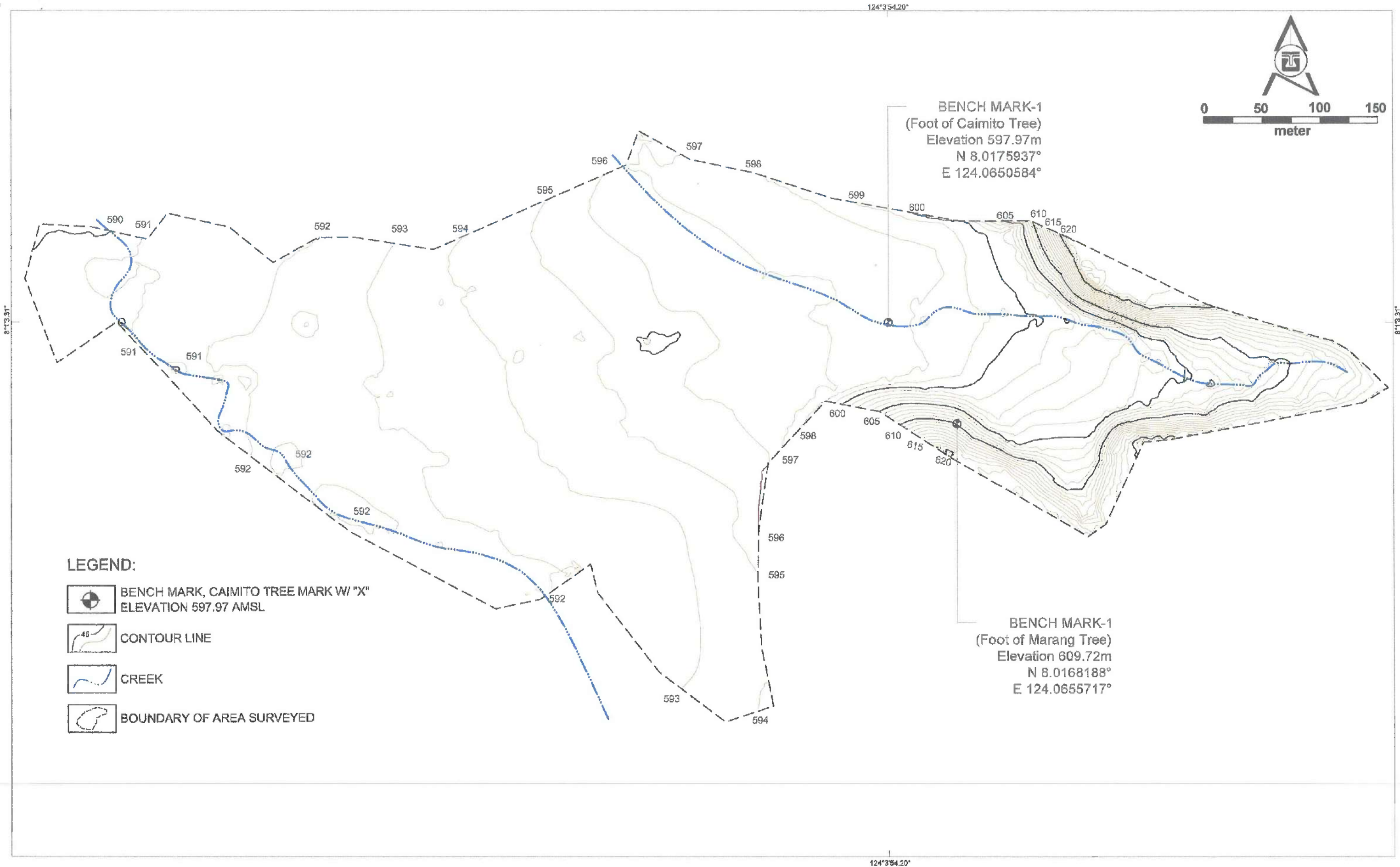
- SATELLITE HALL
- CREEK
- PROJECT SITE (SWIP)
- BARANGAY ROAD
- HOUSE

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Content:	CAD / Drawn by:
	Reference Code: BSWM-WD-IF-008 Control Number: 202404-WD-RS-00004 Effective Date: November 6, 2023	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 02/16/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. MACO, Ph.D.</b> Director Date:	<b>VICINITY MAP / LOCATION MAP / MAIN PROJECT FEATURES</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	<b>R. Samson</b> Sheet No.: <b>2 / 26</b>



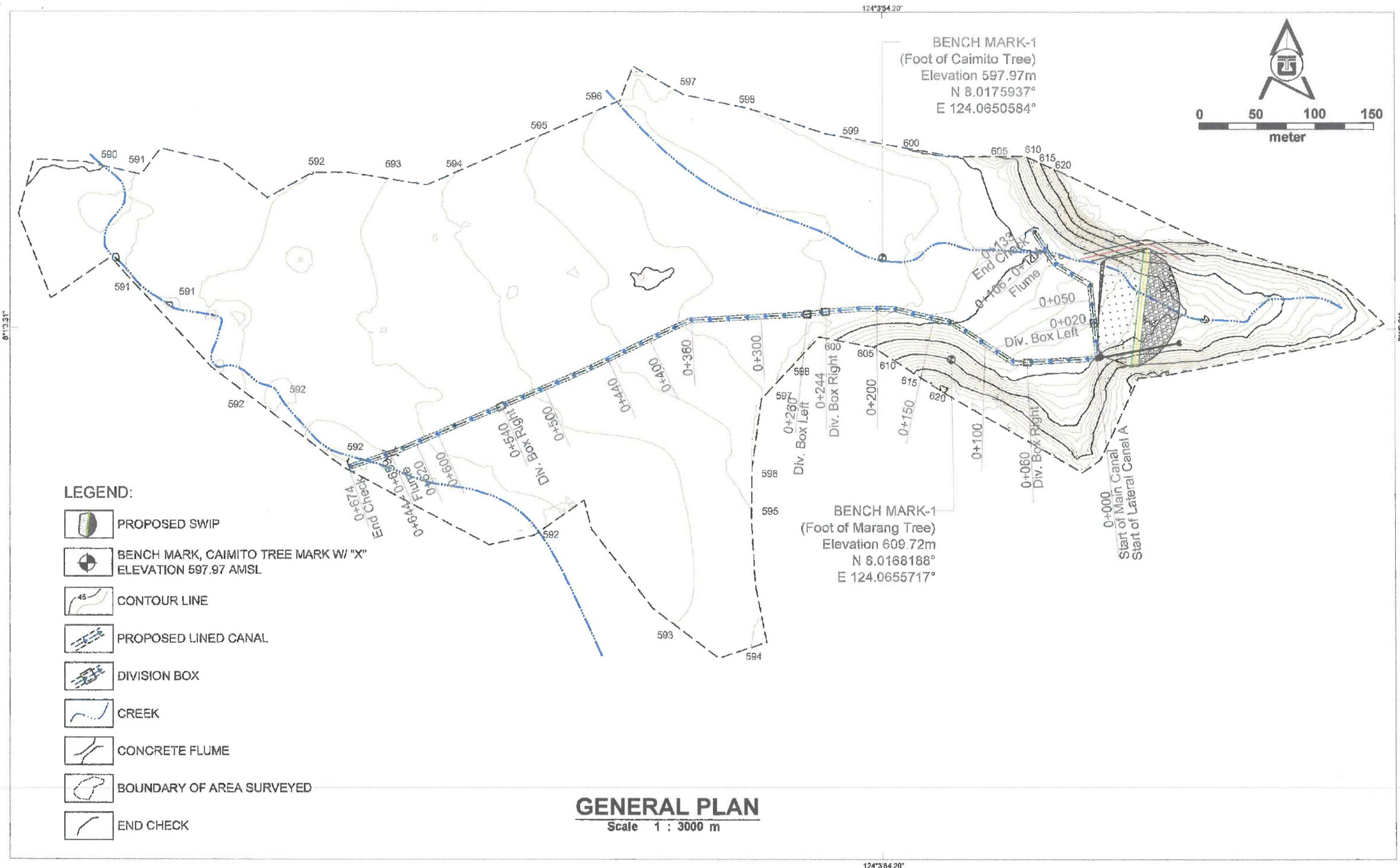



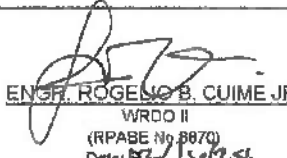



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	WATER RESOURCES MANAGEMENT DIVISION						Name of Project:	Sheet No.:	
	Reference Code: BSWM_WD_JF_006						Construction of Matampay SWIP		3 / 26
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	Effective Date: November 6, 2023						Brgy. Matampay, Munai, Lanao Del Norte		



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	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_IP_008 Control Number: 2024-04-WD-235-00004 Effective Date: November 6, 2023					<b>Construction of Matampay SWIP</b>	4 / 26
						Location:	
	<b>Brgy. Matampay, Munai, Lanao Del Norte</b>						





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	<b>Bureau of Soils and Water Management</b>					<b>GENERAL PLAN</b>	R. Sameon
	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_JF_008 Control Number: 202404WD-RES-00004 Effective Date: November 6, 2023	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 02/14/24	 <b>ENGR. ALBERTO DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA B. MULO, Ph.D.</b> Director Date:	<b>Construction of Matampay SWIP</b>	<b>5 / 26</b>
						Location:	
					<b>Brgy. Matampay, Munai, Lanao Del Norte</b>		



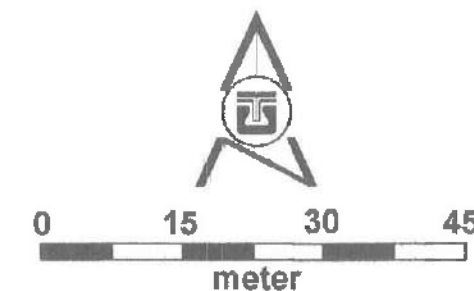


**SITE DEVELOPMENT PLAN OF DAM**  
Scale 1 : 600 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_008 Control Number: 202404_WD_003-0004 Effective Date: November 6, 2023	Prepared by:  <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 04/16/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINA P. WLO, Ph.D.</b> Director Date:	Sheet Contents: <b>SITE DEVELOPMENT PLAN</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munal, Lanao Del Norte</b>	CAD / Drawn by: R. Samson Sheet No.: <b>6 / 26</b>
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BENCH MARK-1  
(Foot of Caimito Tree)  
Elevation 597.97m  
N 8.0175937°  
E 124.0650584°



Distance=105.600m  
N 34°06'47.98" W



BENCH MARK-1  
(Foot of Marang Tree)  
Elevation 609.72m  
N 8.0168188°  
E 124.0655717°

## REFERENCE LINES OF DAM

Scale 1 : 600 m

Distance=141.604m  
N 52°07'48.95" E

Distance=183.134m  
N 60°18'57.69" E

Distance=214.004m  
N 66°19'41.49" E

Distance=194.190m  
N 85°54'19.44" E

Distance=127.009m  
N 69°10'58.33" E

Distance=156.800m  
S 87°54'31.33" E

0+058 End of Riprap  
0+057 End of Basin  
0+050 Start of Basin

0+040

0+030

0+020

0+010

0+006 End of Curve

0+005.25 End of Curve

0-000

0-005.25 Start of Curve

0-006 Start of Approach

0-010

0-020

0-030

0-032

0+020

0+040

0+060

0+080

0+100

0-000

0-010

0-020

0-030

0-035

0-036



DEPARTMENT OF AGRICULTURE  
Bureau of Soils and  
Water Management  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSIWM\_WD\_JF\_006  
Control Number: 202404 WD-RMS-00064  
Effective Date: November 8, 2023

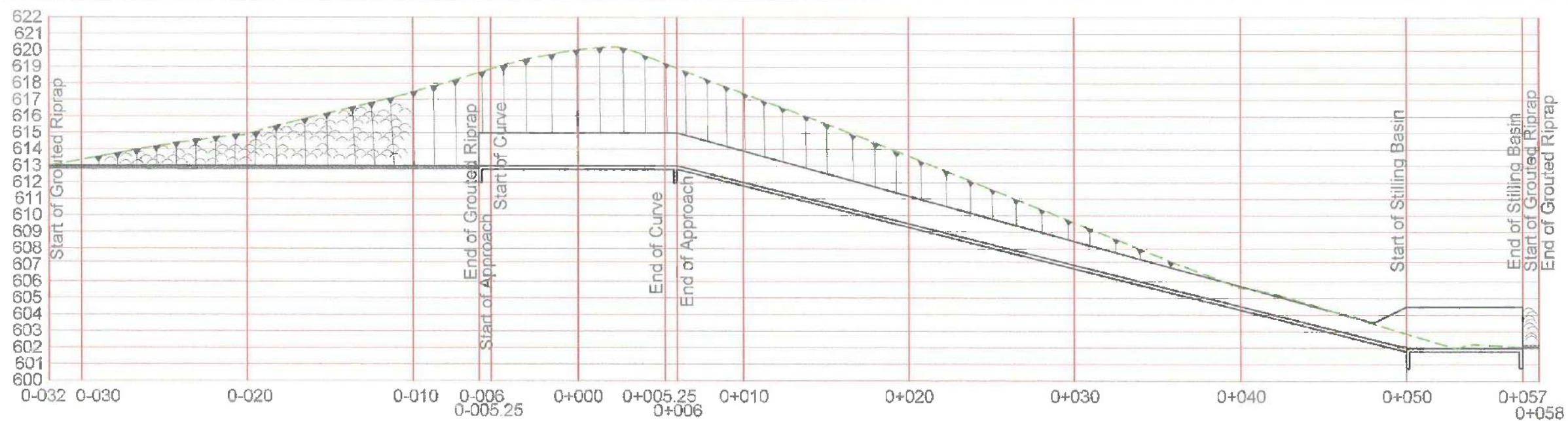
Prepared by:  
ENGR. ROGELIO B. CUIME JR.  
WRDO II  
(RPABE No. 8870)  
Date: 07/10/24

Checked / Reviewed by:  
ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: 07/10/24

Recommending Approval:  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: 07/10/24

Approved by:  
GINA P. NILO Ph.D.  
Director  
Date: 07/10/24

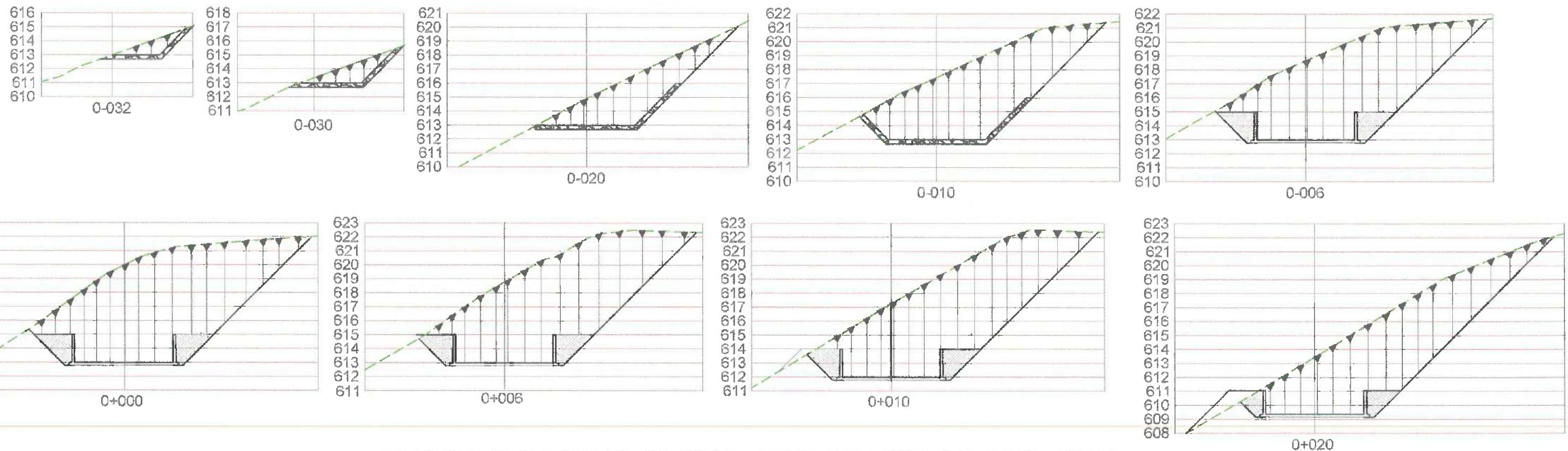
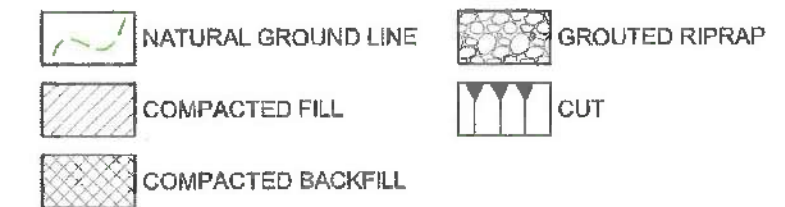
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REFERENCE LINES OF DAM	R. Samson
Name of Project:	Sheet No.:
Construction of Matampay SWIP	7 / 26
Location:	
Brgy. Matampay, Munai, Lanao Del Norte	



## ELEVATION PROFILE ALONG CENTERLINE OF SPILLWAY

Scale 1 : 300 m

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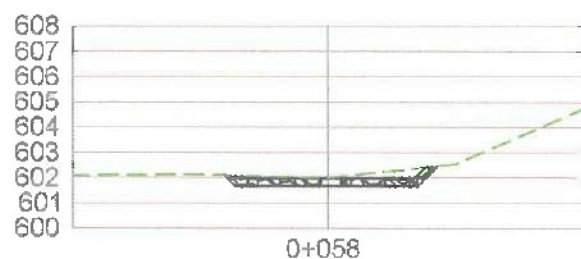
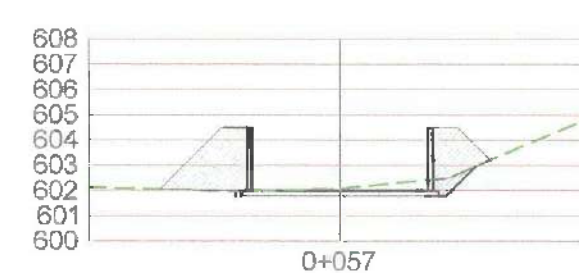
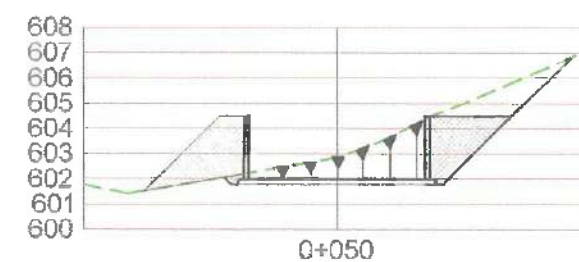
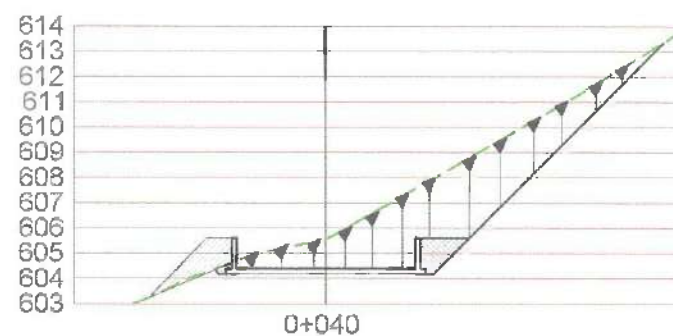
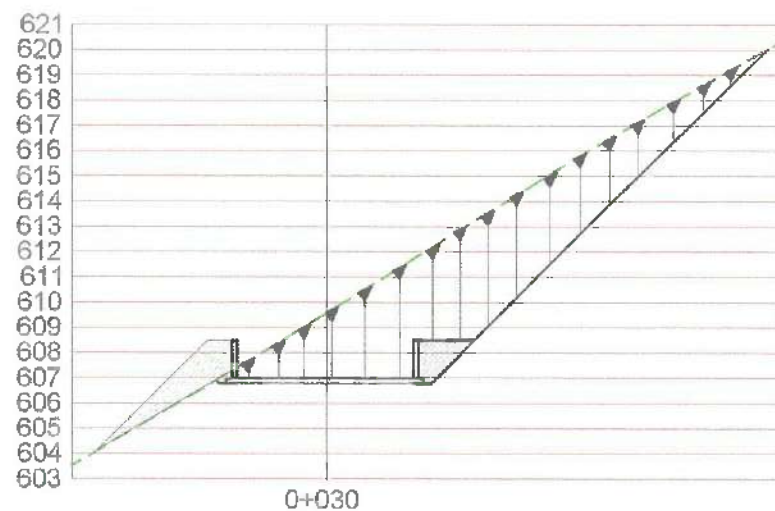


## CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY

Scale 1 : 300 m

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	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_JF_008 Control Number: 702404_WD_63-00004 Effective Date: November 6, 2023					Construction of Matampay SWIP	8 / 26
						Location:	
						Brgy. Matampay, Munai, Lanao Del Norte	








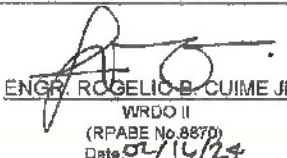
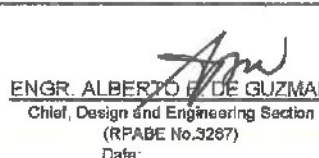
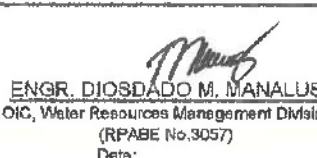
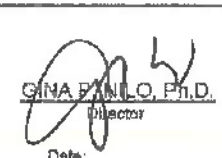


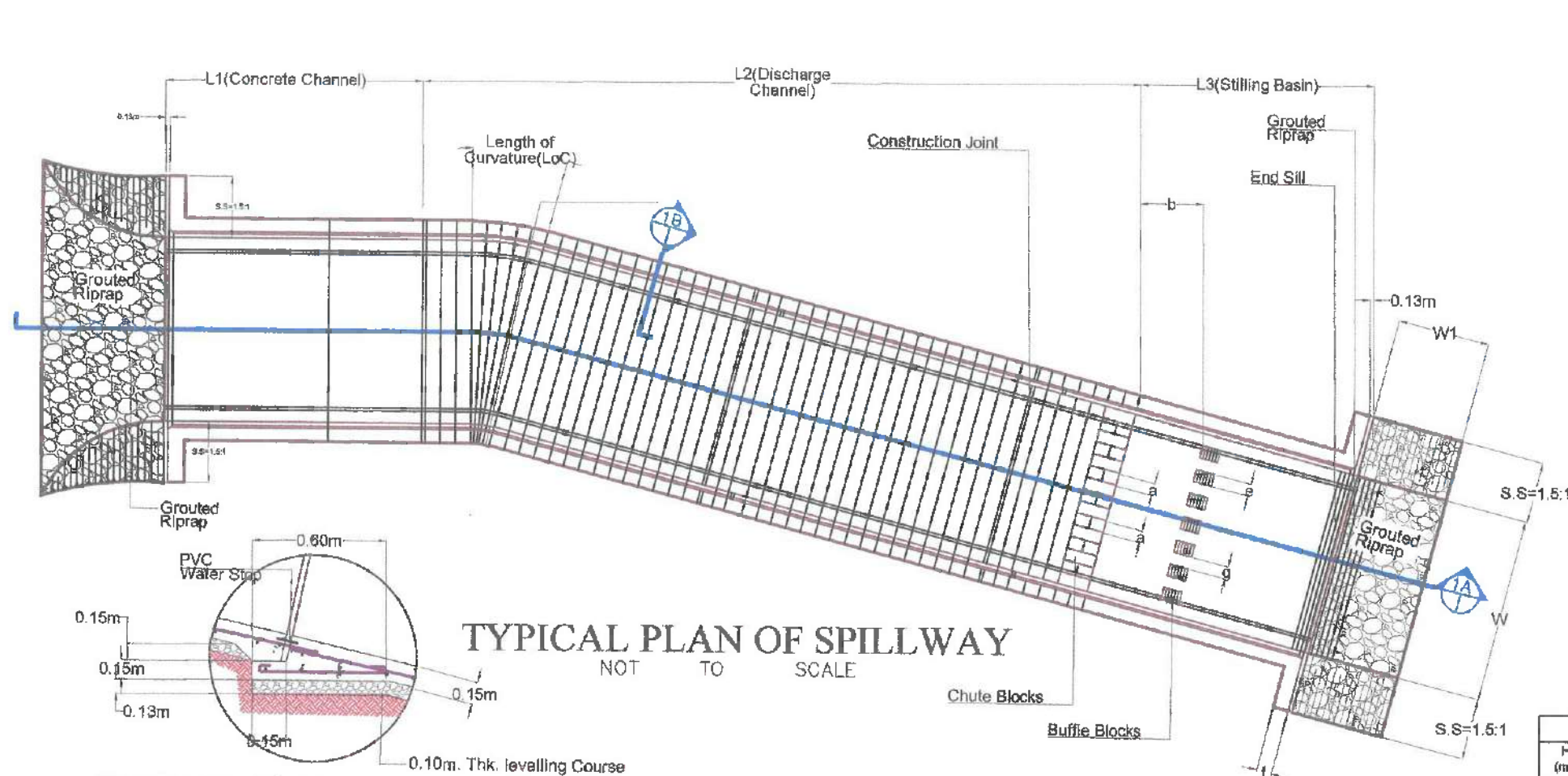
## CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY

Scale 1 : 300 m

### LEGEND:

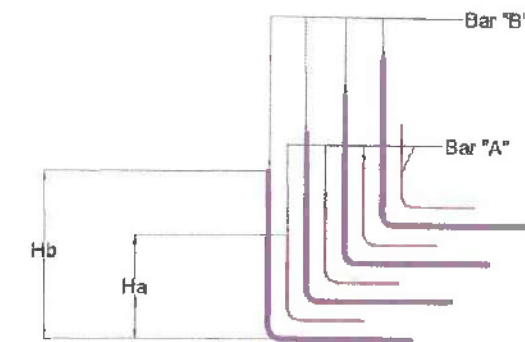
-  NATURAL GROUND LINE
-  COMPACTED FILL
-  COMPACTED BACKFILL
-  CUT

	DEPARTMENT OF AGRICULTURE	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Bureau of Soils and Water Management	 ENGR. ROGELIO B. CUIME JR. WRDO II (RPABE No. 8870) Date: 04/14/24	 ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3267) Date:	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date:	 GINA F. NILO, P.E. Director Date:	CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY	R. Samson
	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_IF_006 Control Number: 700404_WD_IF_0004 Effective Date: November 6, 2023					Construction of Matampay SWIP	9 / 26
						Location:	
	Brgy. Matampay, Munai, Lanao Del Norte						



TYPICAL PLAN OF SPILLWAY

NOT TO SCALE

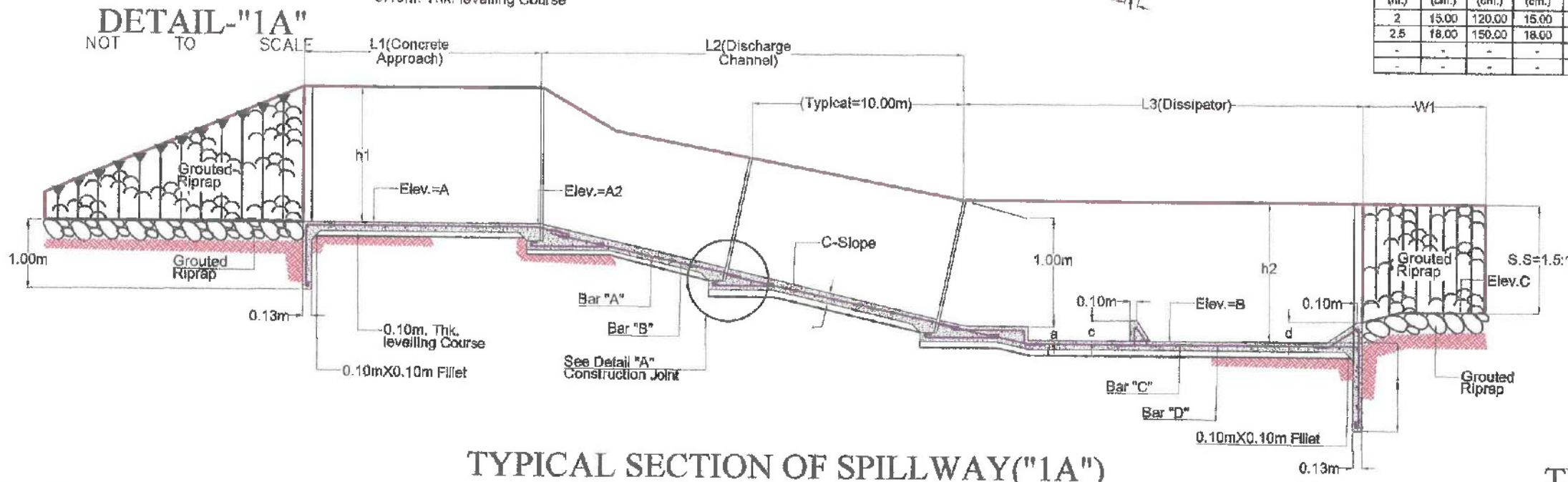


For height, H=3.00m and Lesser

NOT TO SCALE

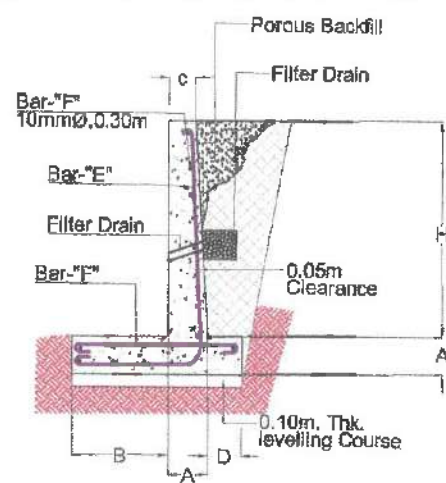
SCHEDULE OF ELEVATIONS AND DIMENSIONS			
ELEV. A =	613.00 m	h1 =	2.00 m
ELEV. B =	602.00 m	h2 =	2.50 m
ELEV. C =	601.80 m	i =	1.20 m
a =	0.10 m	j =	n/a
b =	1.90 m	L1 =	12.00 m
c =	0.30 m	L2 =	44.00 m
d =	0.19 m	W =	7.00 m
e =	0.20 m	W1 =	1.00 m
g =	0.20 m	C-slope =	4.5:1 m
L3 =	7.00 m	S-slope =	1.5:1 m
LoC =	10.50 m	RoC =	7.80 m

SCHEDULE OF DIMENSIONS AND REINFORCEMENTS (FOR "1C")									
H (m.)	A (cm.)	B (cm.)	D (cm.)	C (cm.)	Toe pressure (kg./sq.m.)	E BARS		F BARS	
						size (mm.)	spacing (cm.)	size (mm.)	spacing (cm.)
2	15.00	120.00	15.00	15.00	-	12.00	25.00	10.00	30.00
2.5	18.00	150.00	18.00	15.00	-	12.00	25.00	10.00	30.00
-	-	-	-	-	-	-	-	-	-



TYPICAL SECTION OF SPILLWAY ("1A")

NOT TO SCALE

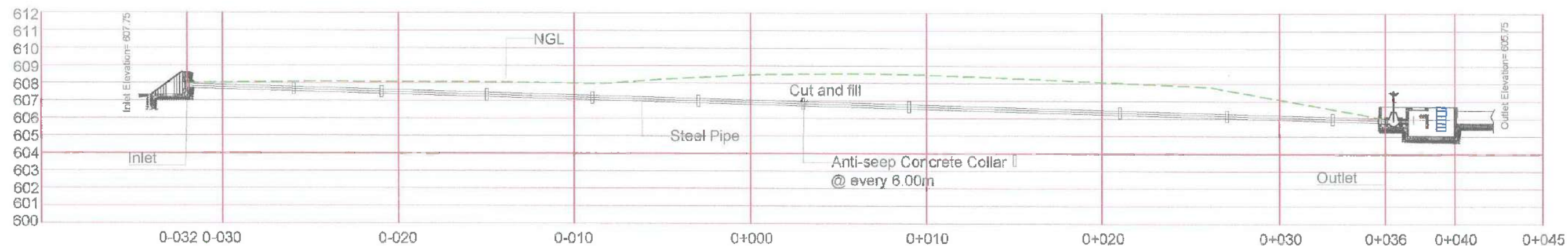


TYPICAL SECTION-"1B"

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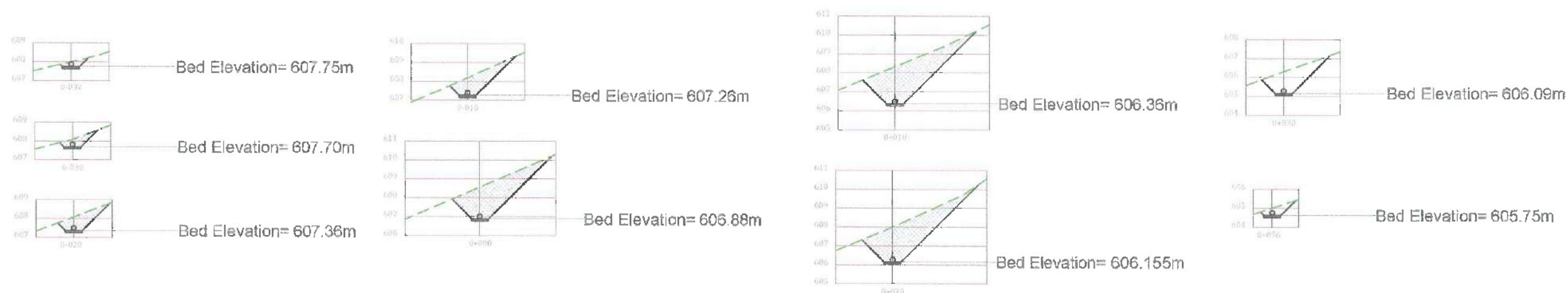
<p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-IF-008 Control Number: 202404-WD-RS-00004 Effective Date: November 8, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROSELIO B. CUIME JR.</b> WRDD II (RPABE No. 8870) Date: 02/16/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA F. MILO, Ph.D.</b> Director Date:	<b>TYPICAL PLAN AND DETAILED SECTIONS OF SPILLWAY</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	<b>R. Sameon</b> Sheet No.: <b>10 / 26</b>





## ELEVATION PROFILE ALONG CENTERLINE OF OUTLET WORKS

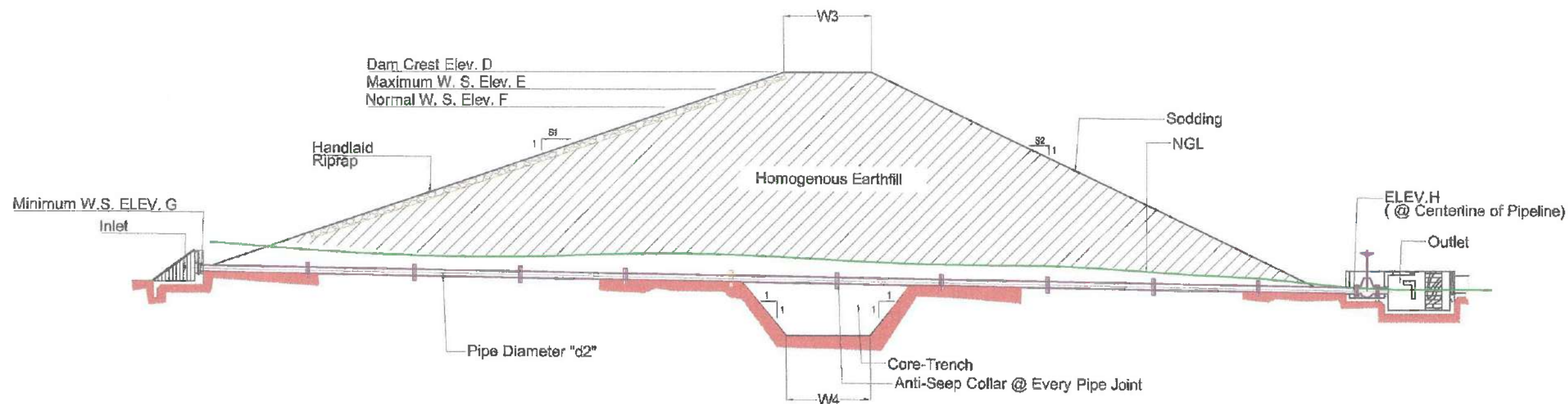
Scale 1 : 250 m



## CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS

Scale 1 : 150 m

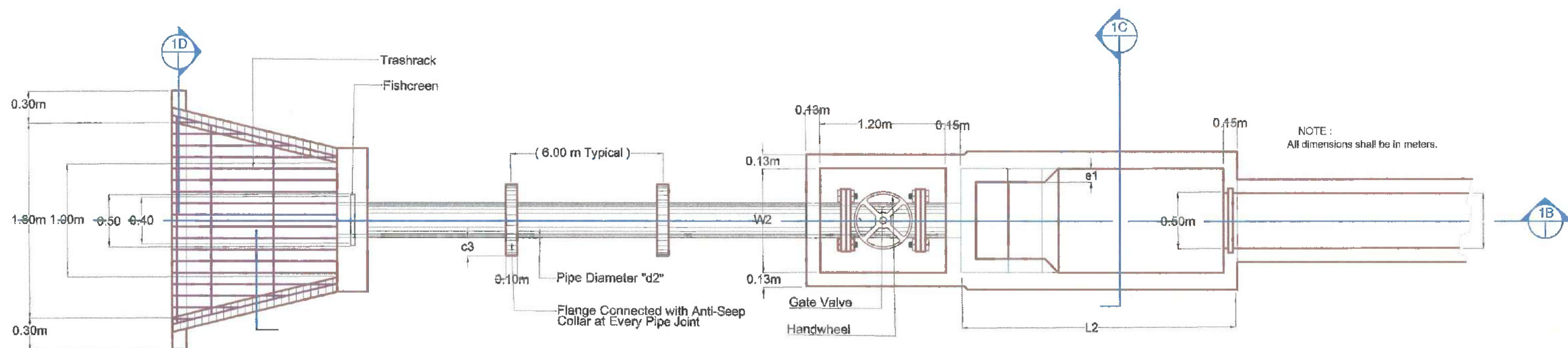
	DEPARTMENT OF AGRICULTURE	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Bureau of Soils and Water Management	 ENGR. ROGELIO B. CUIME JR. WRDO II (RPABE No. 8870) Date: 02/14/24	 ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date:	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date:	 GINA P. NILO, Ph.D. Director Date:	ELEVATION PROFILE / CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS	R. Samson
	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_JF_008					Construction of Matampay SWIP	
	Control Number: 202464 WD-RAS-00004					Location:	
Effective Date: November 6, 2023	Brgy. Matampay, Munai, Lanao Del Norte	11 / 26					



SCHEDULE OF ELEVATIONS AND DIMENSIONS	
ELEV. D =	616.00m
ELEV. E =	613.98m
ELEV. F =	613.00m
ELEV. G =	607.75m
ELEV. H =	605.75m
W3 =	7.00m
W4 =	7.00m
b3 =	0.60m
c3 =	0.40m
e1 =	0.13m
W2 =	1.80m
L2 =	2.70m
PIPE DIA. "d2" =	0.25m

## PROFILE ALONG CENTERLINE OF OUTLET WORKS

NOT TO SCALE



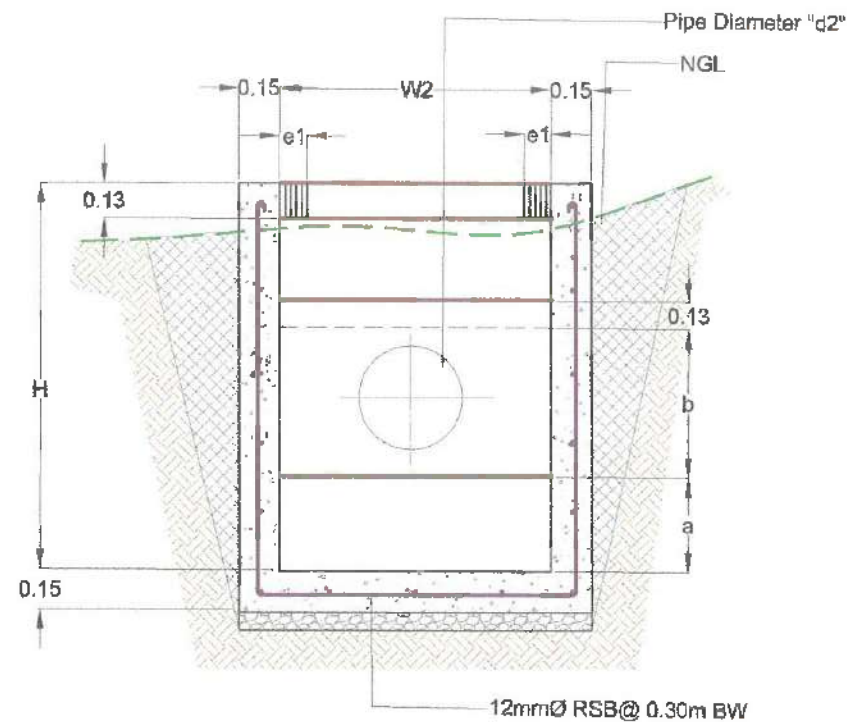
NOTE:  
All dimensions shall be in meters.

## PLAN OF OUTLET WORKS

NOT TO SCALE

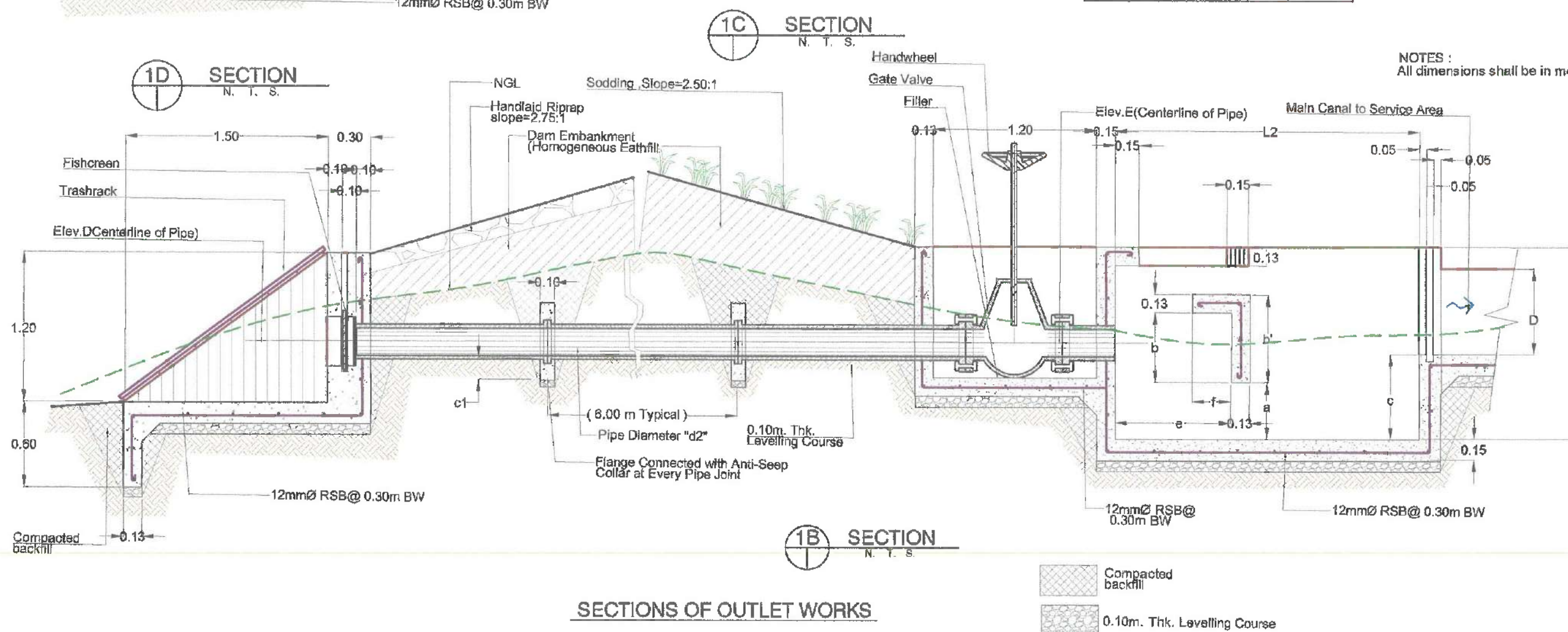
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b>	Prepared by:  <b>ENGR. ROGELIO B. CUIME JR.</b> WRDC II (RPAB No. 3870) Date: 02/16/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPAB No. 3057) Date:	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date:	Sheet Contents: <b>TYPICAL PROFILE/PLAN ALONG CENTERLINE OF OUTLET WORKS</b>	CAD / Drawn by: R. Samson	
	Reference Code: BSWM_WD_IF_008 Control Number: 202404_WDIF-00004 Effective Date: November 6, 2023						Name of Project: <b>Construction of Matampay SWIP</b>	Sheet No.: <b>12 / 26</b>
						Location: <b>Brgy. Matampay, Muna, Lanao Del Norte</b>		



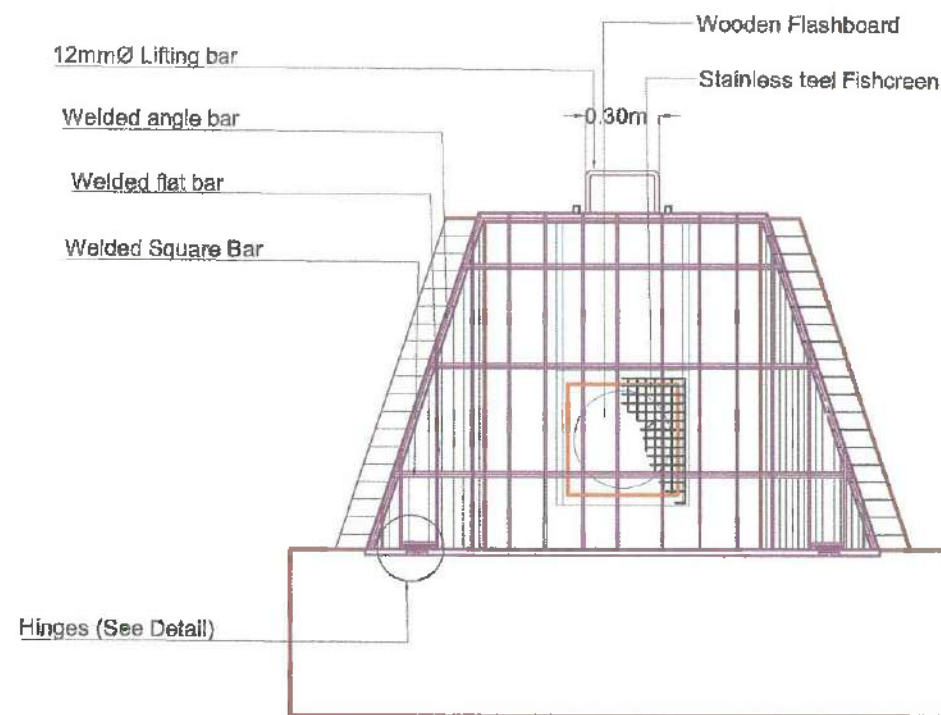


SCHEDULE OF ELEVATIONS AND DIMESIONS	
ELEV. D =	607.75m
ELEV. E =	605.75m
a =	0.95m
b =	0.71m
c =	0.32m
e1 =	0.13m
e =	0.95m
D =	0.50m
H =	1.36m
W =	1.90m
L1 =	2.85m
L2 =	2.70m
Lp =	68.00m
c3 =	0.40m
c1 =	0.40m
PIPE DIA. -"d2" =	0.25m
PIPE DIA. -"d1" =	0.25m

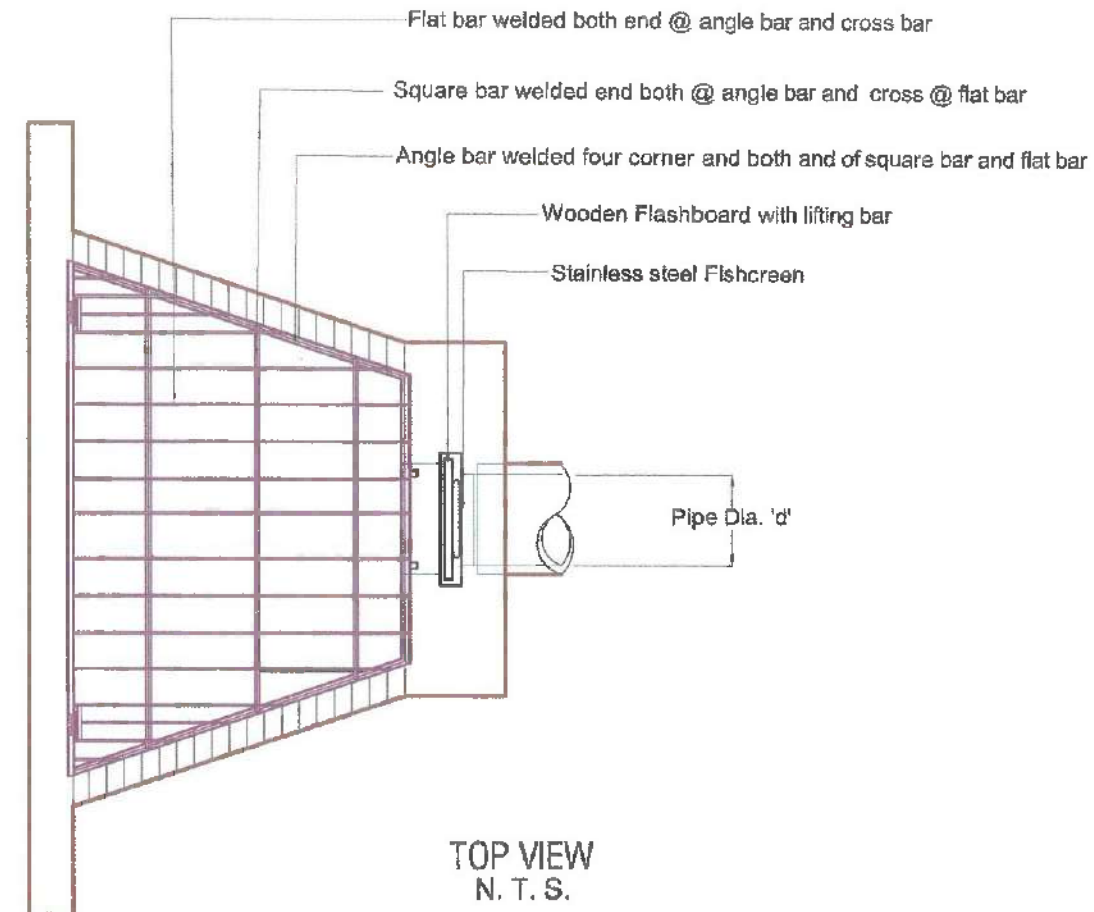
NOTES :  
All dimensions shall be in meters.



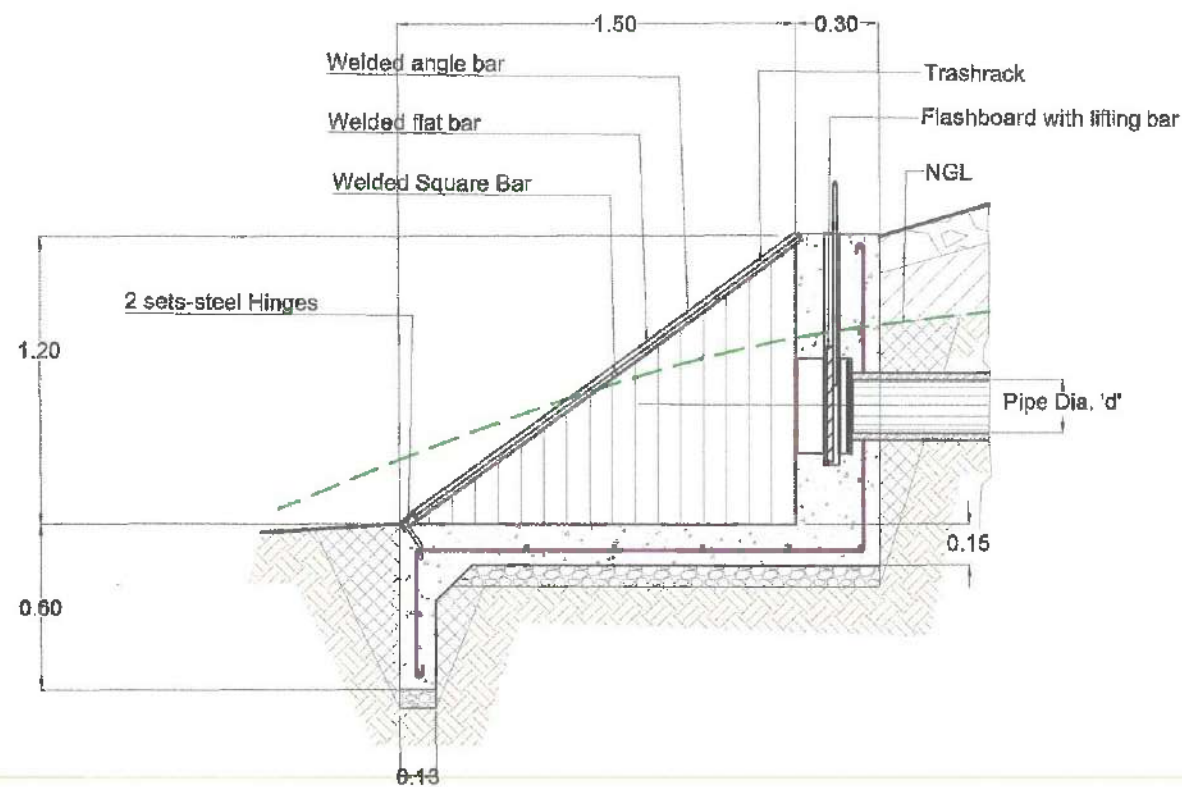




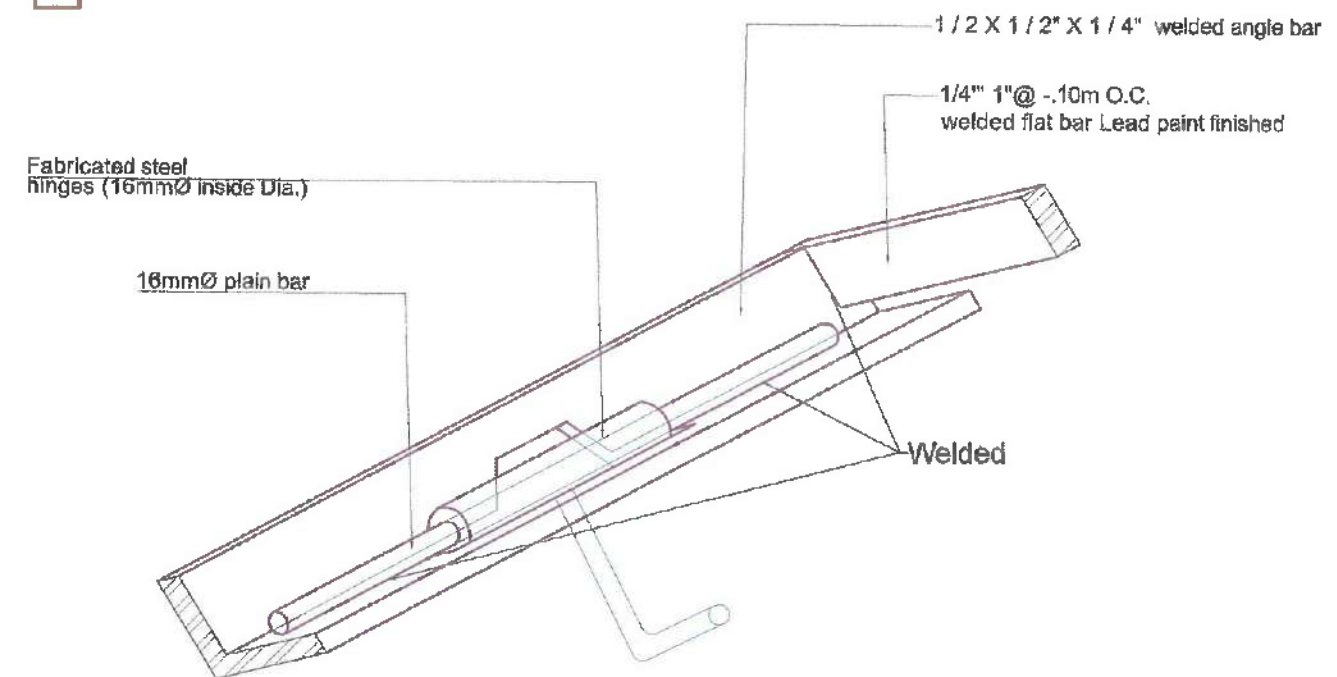
FRONT VIEW  
N. T. S.



TOP VIEW  
N. T. S.








SIDE VIEW  
N. T. S.

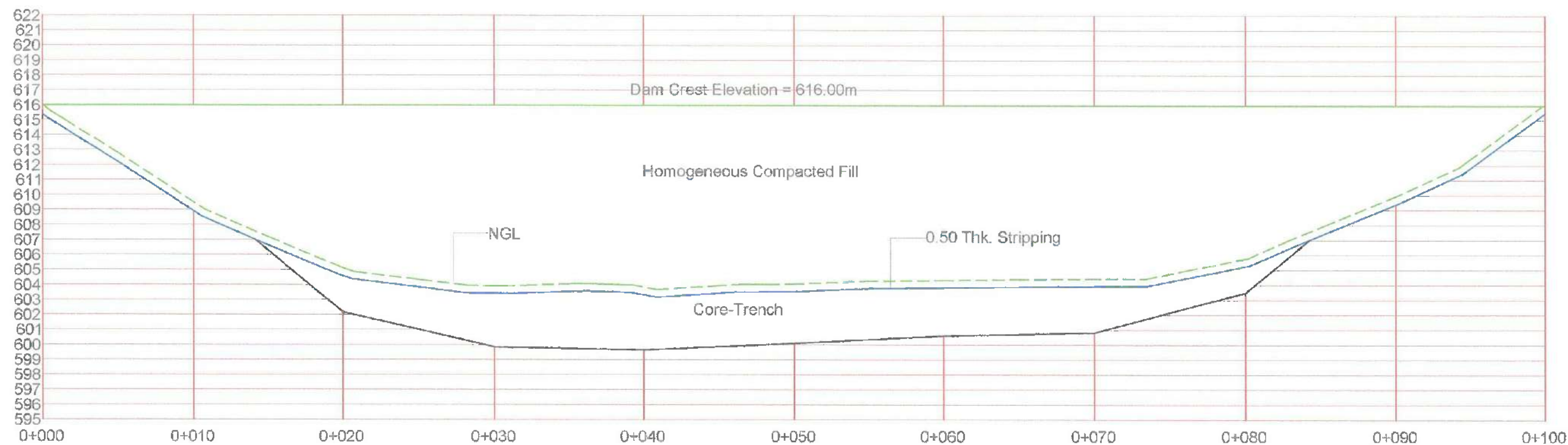


DETAIL OF HINGES  
N. T. S.

## STEEL TRASHRACK INLET

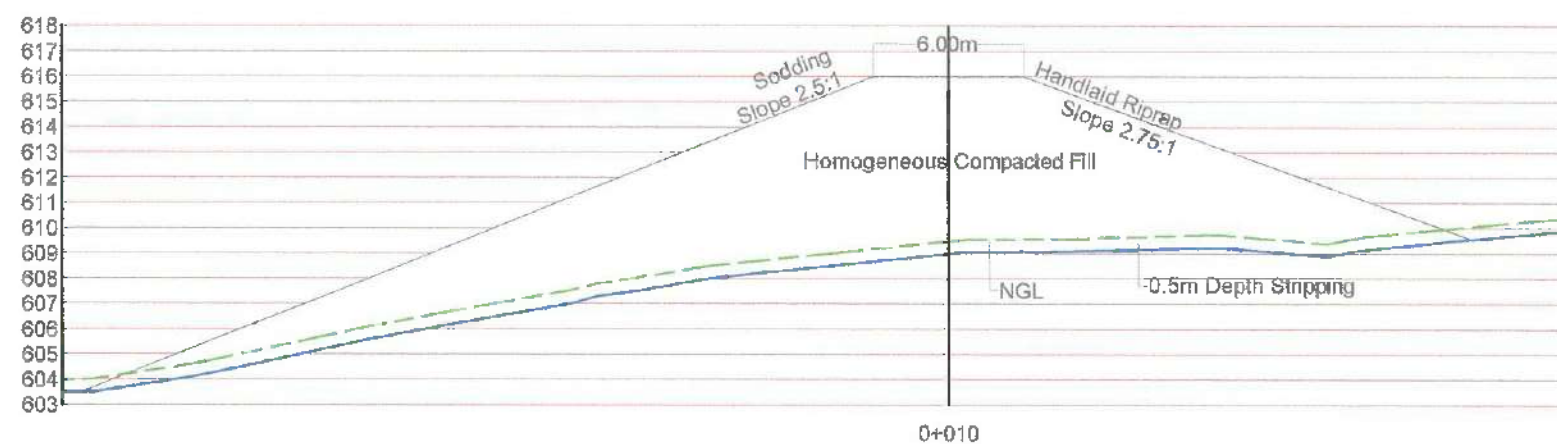
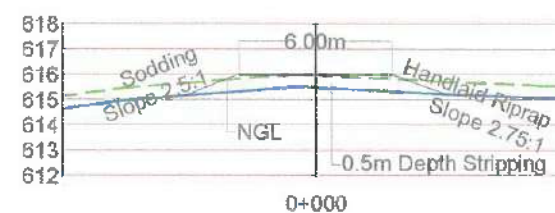
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 2/16/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINAP P. NILO, Ph.D.</b> Director Date:	Sheet Contents: <b>DETAILS OF TRASHRACK INLET</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munal, Lanao Del Norte</b>	CAD / Drawn by: R. Sameon Sheet No.: <b>14 / 26</b>
	Reference Code: BSWM_WD_IF_006 Control Number: 2024-04 WD-ES-00004 Effective Date: November 6, 2023						





**ELEVATION PROFILE ALONG CENTERLINE OF DAM EMBANKMENT**

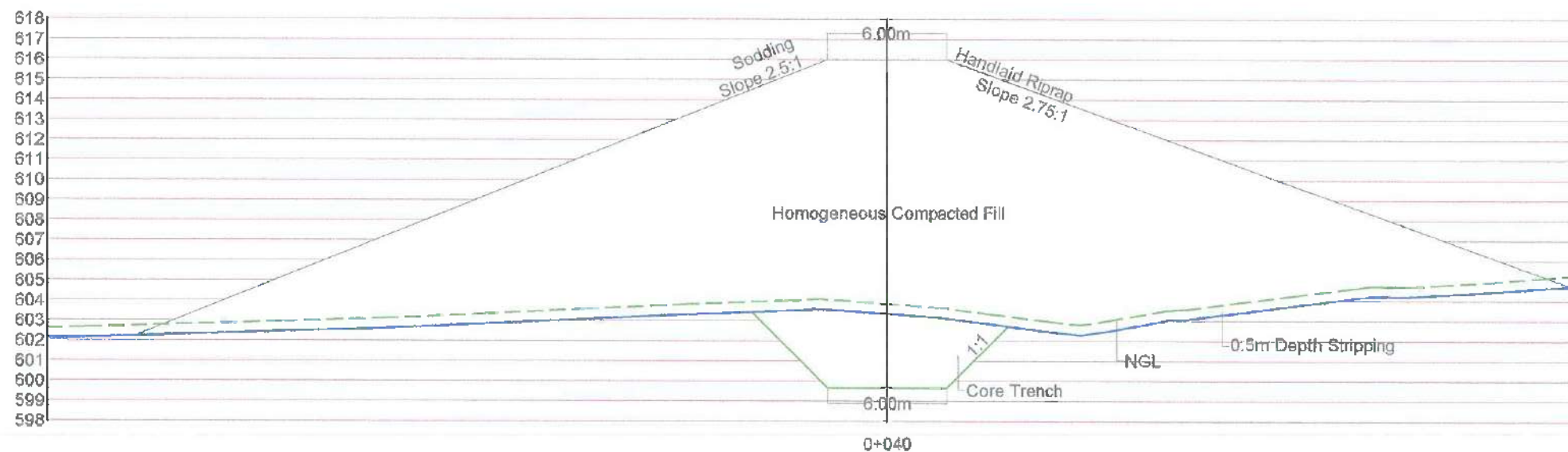
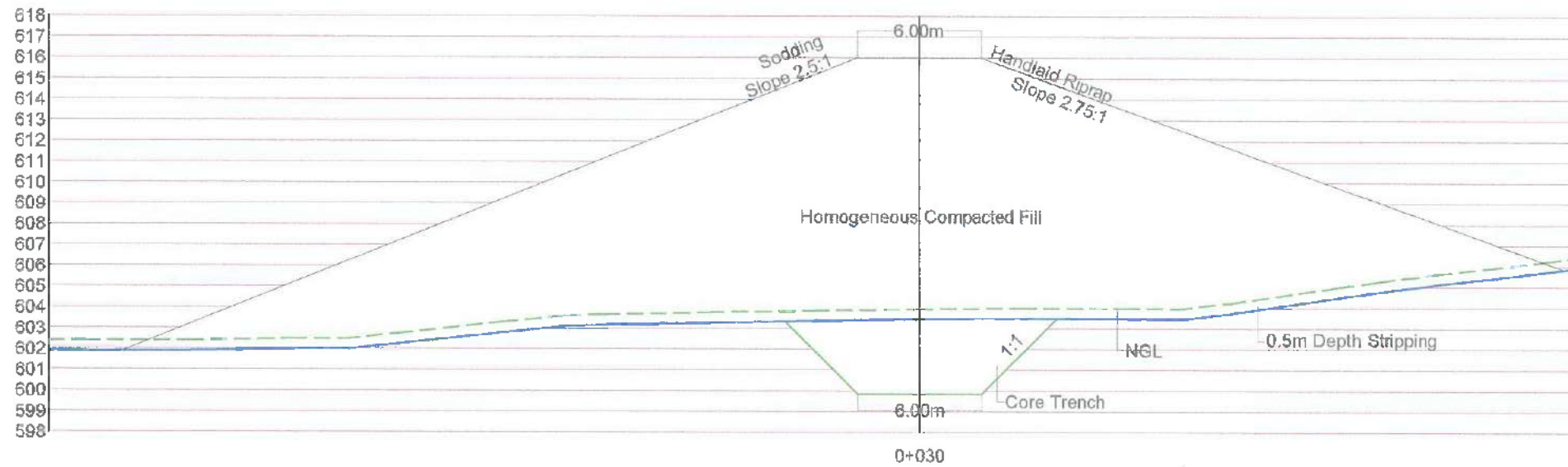
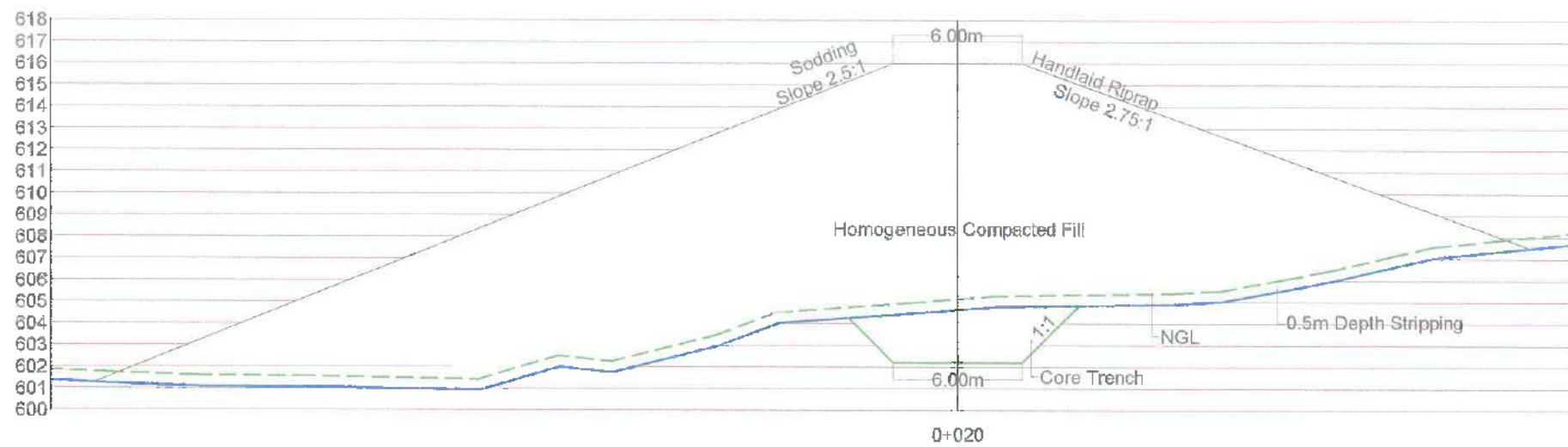
Scale 1 : 300 m



**CROSS-SECTIONS ALONG DAM EMBANKMENT**


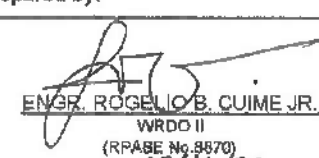
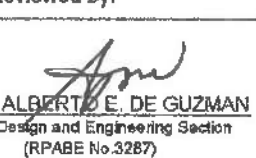
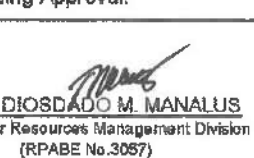
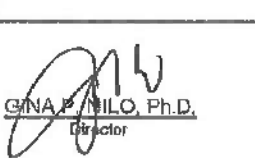
Scale 1 : 300 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b>	Prepared by:  <b>ENGR. ROGELIO B. GUIME JR.</b> WRDO II (RPABE No. 8870) Date: 07/14/24	Checked / Reviewed by:  <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date:	Sheet Contents: <b>ELEVATION PROFILE/CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munal, Lanao Del Norte</b>	CAD / Drawn by: R. Samson Sheet No.: <b>15 / 26</b>
	Reference Code: BSWM_WD_IF_008 Control Number: 202404_WD_153-00004 Effective Date: November 5, 2023						

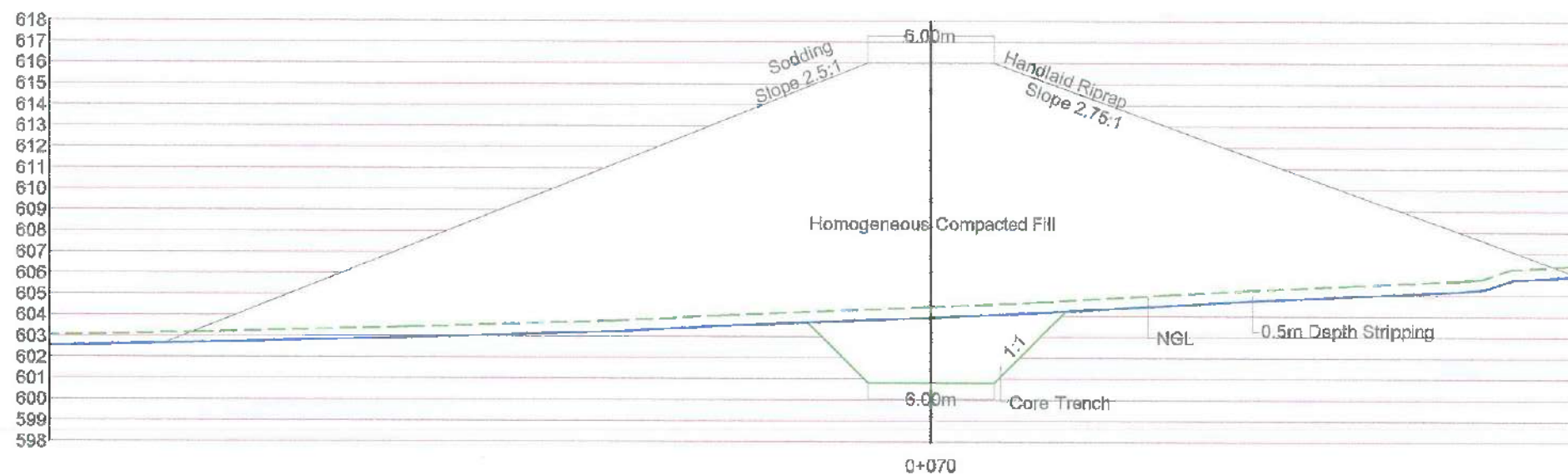
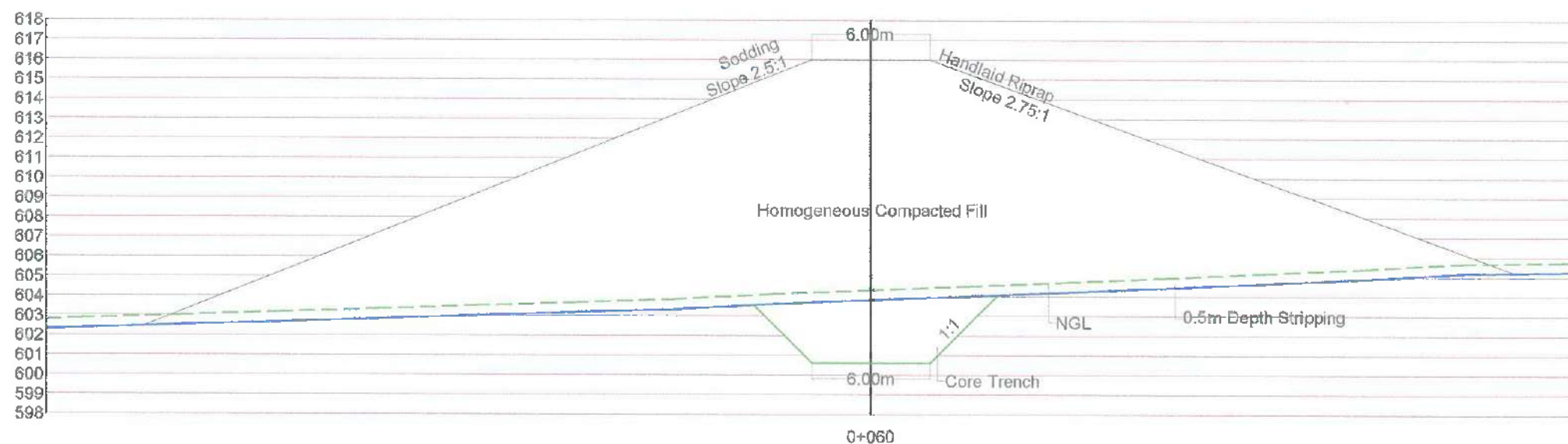
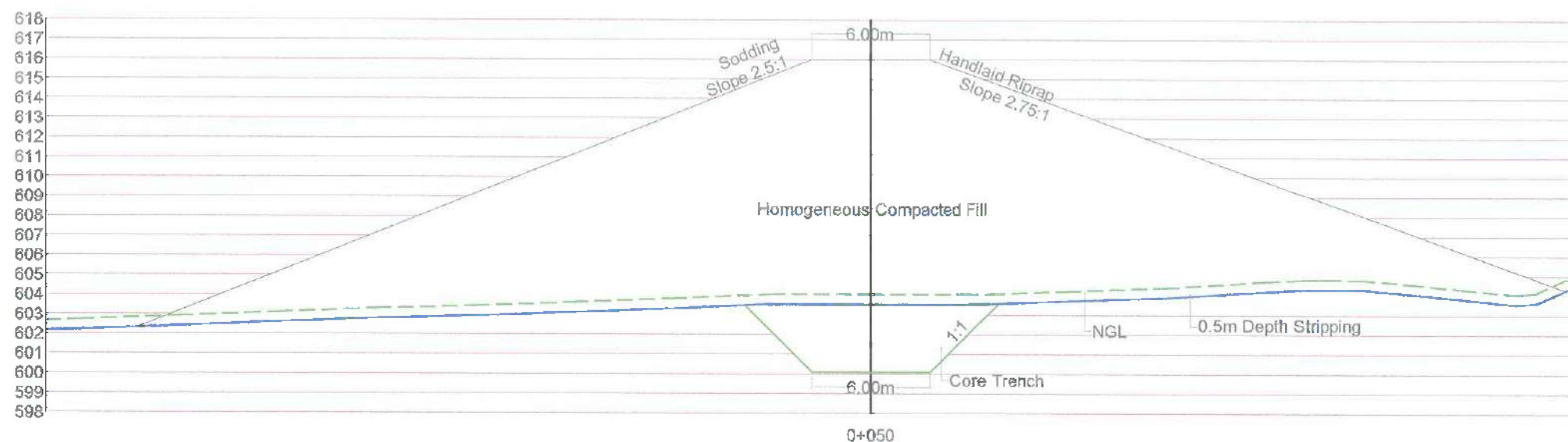


## CROSS-SECTIONS ALONG DAM EMBANKMENT

Scale 1 : 300 m






 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_JF_006 Control Number: 2024-04_WD-RMS-00004 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 3870) Date: 02/16/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. MILO, Ph.D.</b> Director Date:	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	R. Gamson Sheet No.: <b>16 / 26</b>

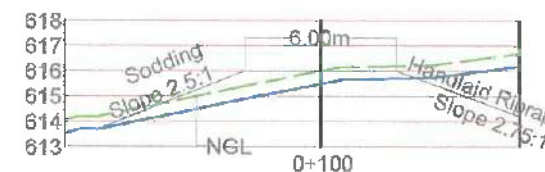
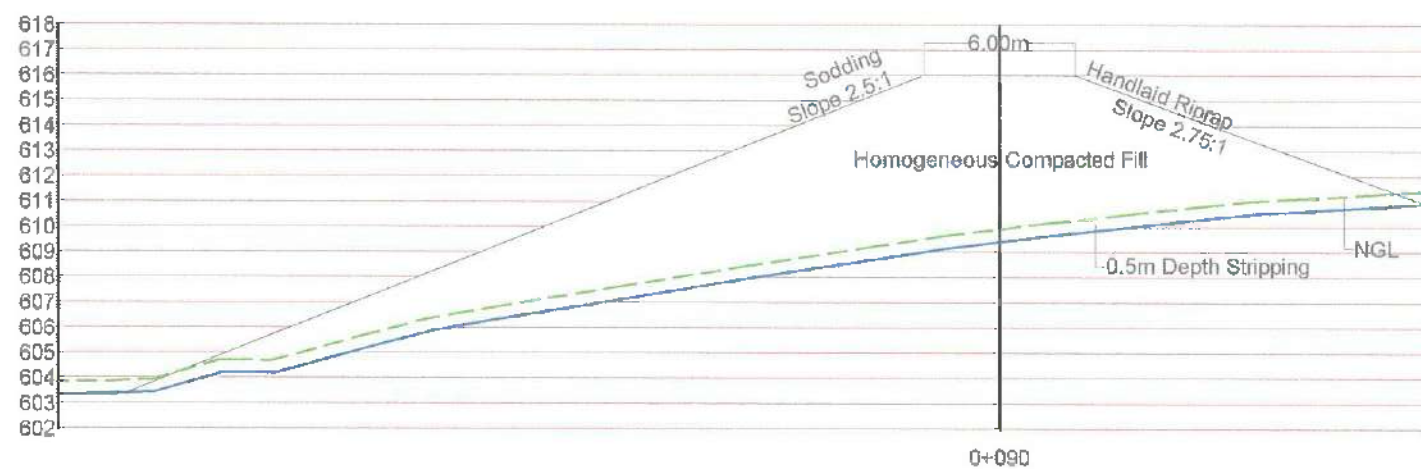
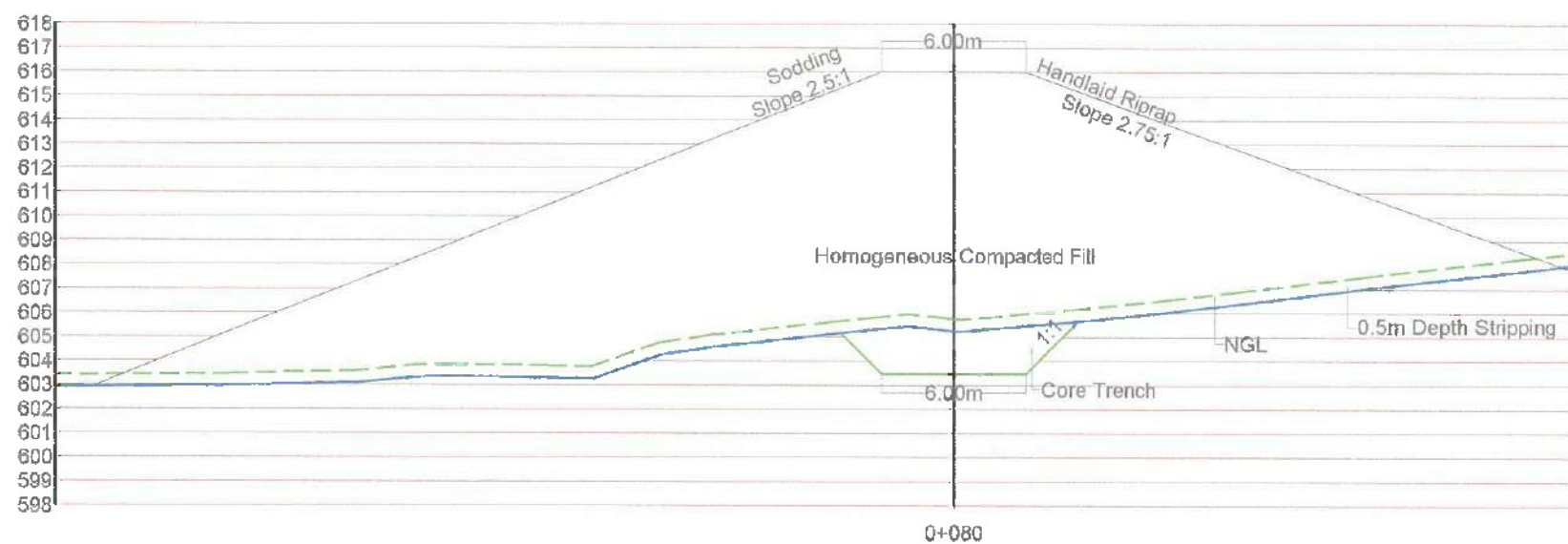




## CROSS-SECTIONS ALONG DAM EMBANKMENT




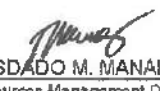

Scale 1 : 300 m

 <p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_IF_008 Control Number: 202404 WD RES-00004 Effective Date: November 8, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 3570) Date: 03/14/24	 <b>ENGR. ALBERTO DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. NILO, Ph.D.</b> Director Date:	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	R. Samson Sheet No.: <b>17 / 26</b>

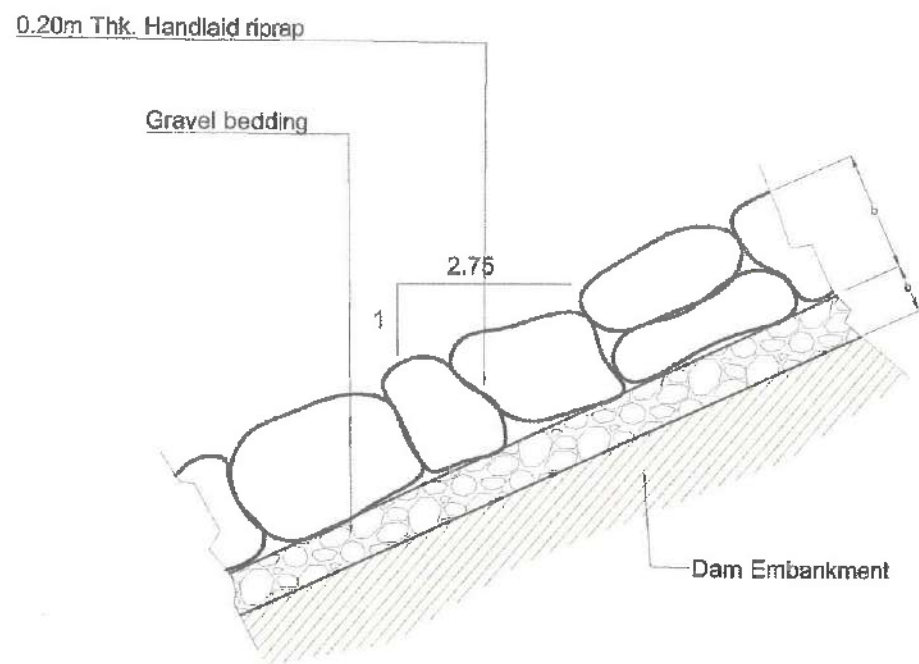


## CROSS-SECTIONS ALONG DAM EMBANKMENT

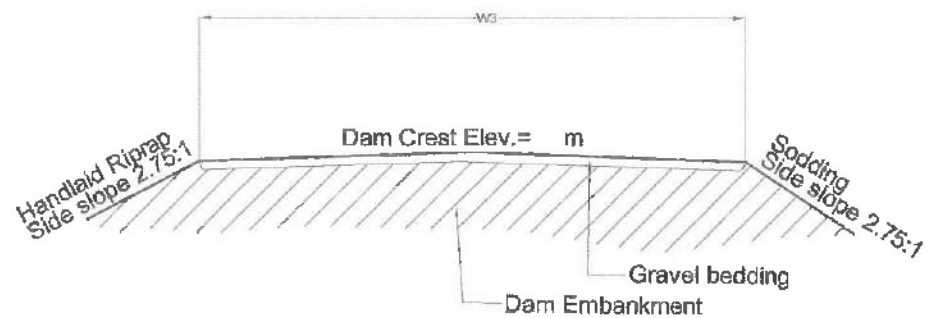
Scale 1 : 300 m

 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_006 Control Number: 2024-WD-RES-00004 Effective Date: November 8, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8670) Date: 07/16/24	 <b>ENGR. ALBERTO C. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. NIOL, Ph.D.</b> Director Date:	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munal, Lanao Del Norte</b>	R. Samson Sheet No.: <b>18 / 26</b>



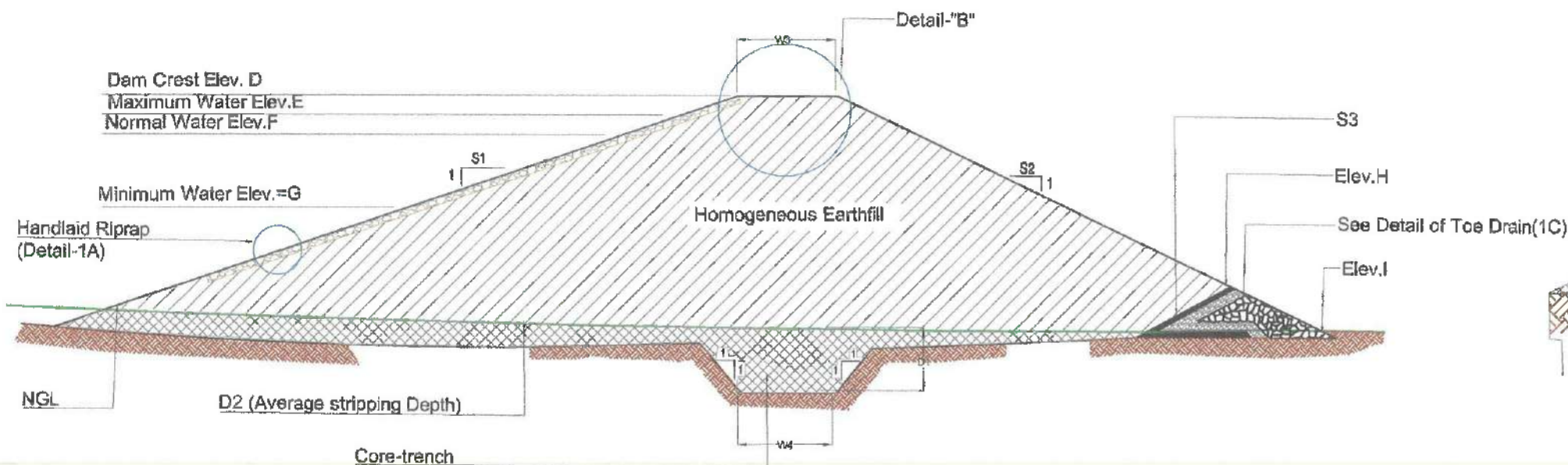


Detail -"1A"(Handlaid Riprap)  
NOT TO SCALE

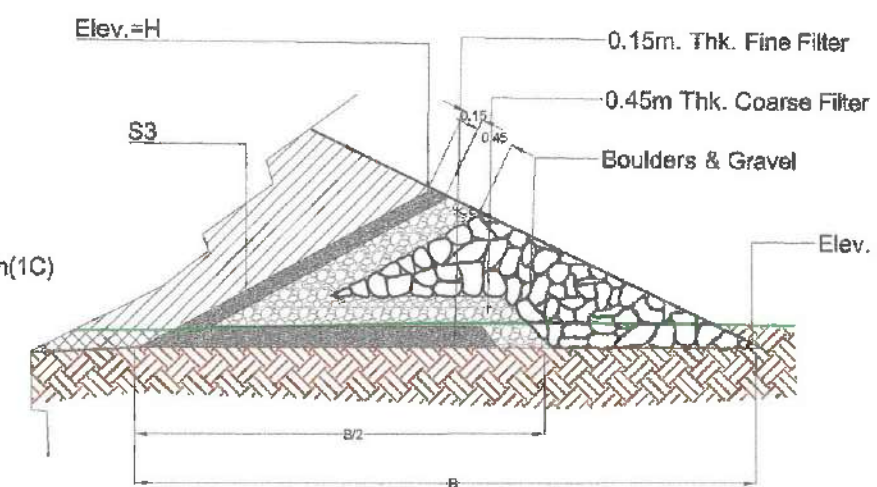


Detail-"B"  
NOT TO SCALE

SCHEDULE OF ELEVATIONS AND DIMENSIONS	
ELEV. D =	616.00m
ELEV. E =	613.98m
ELEV. F =	613.00m
ELEV. G =	608.00m
ELEV. H =	603.00m
ELEV. I =	602.00m
D1 =	4.00m
D2 =	0.50m
B =	3.50m
S1 =	2.75
S2 =	2.50
S3 =	1
W3 =	6.00m
W4 =	6.00m
B / 2 =	1.30m



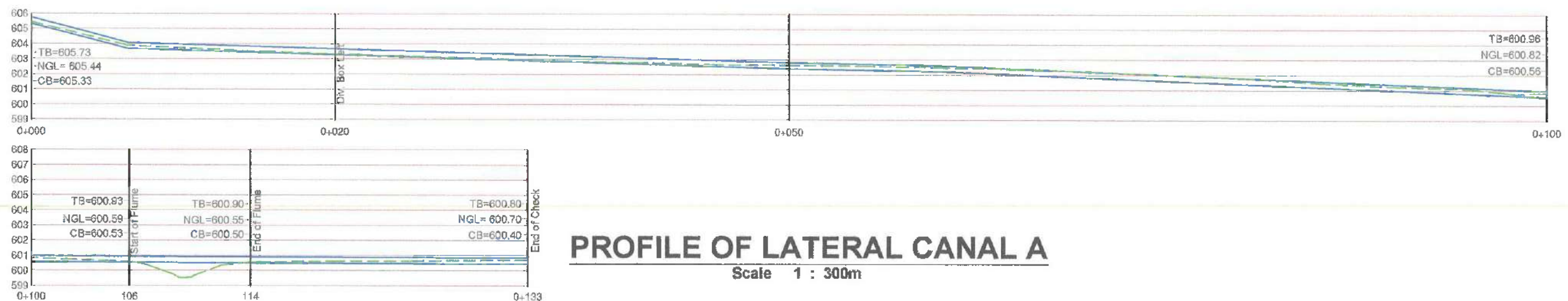
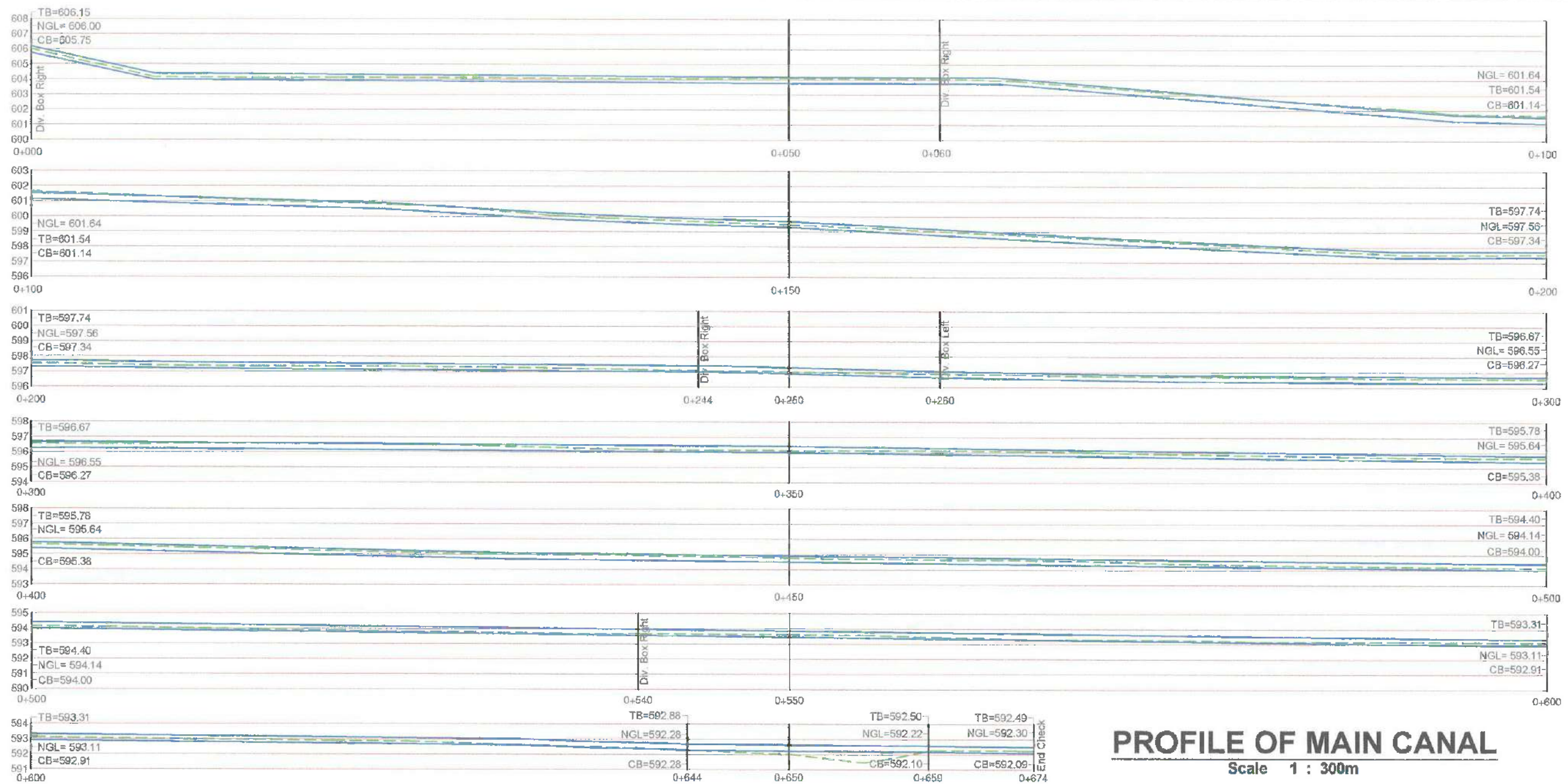
TYPICAL DAM SECTION  
NOT TO SCALE



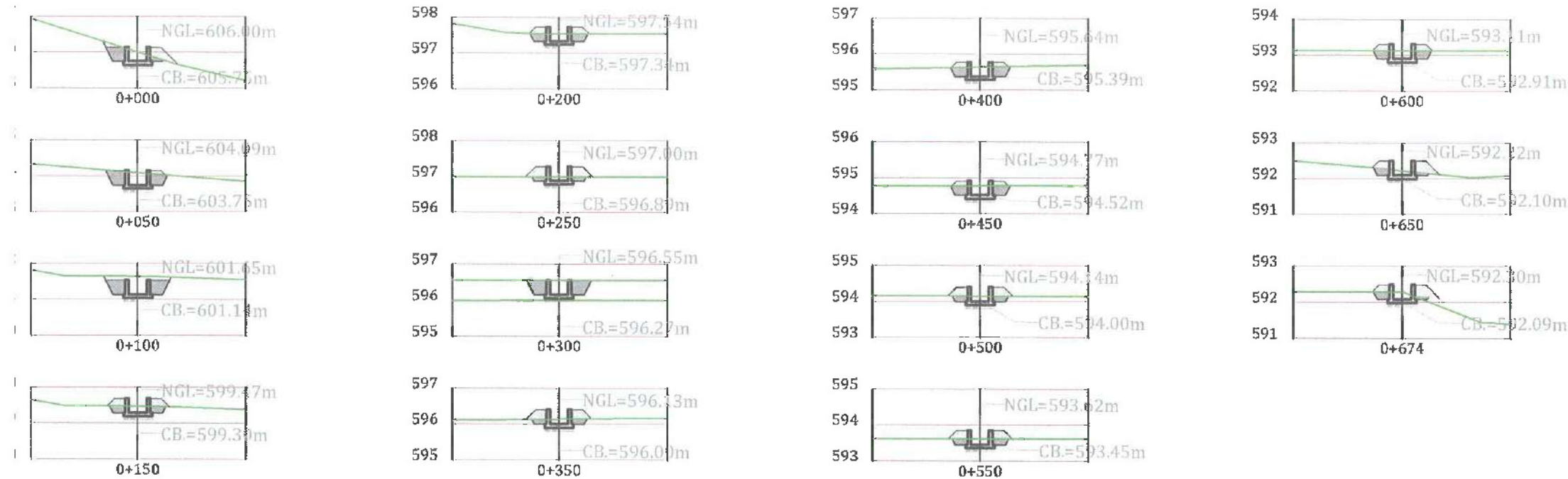
TOE-DRAIN DETAIL-"1C"  
NOT TO SCALE

<p>DEPARTMENT OF AGRICULTURE Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-IF-006 Control Number: 202404-WD-BG-00004 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 02/16/24	 <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. NILO, Ph.D.</b> Director Date:	TYPICAL DAM SECTION / TOE DRAIN Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	R. Samson Sheet No.: <b>19 / 26</b>



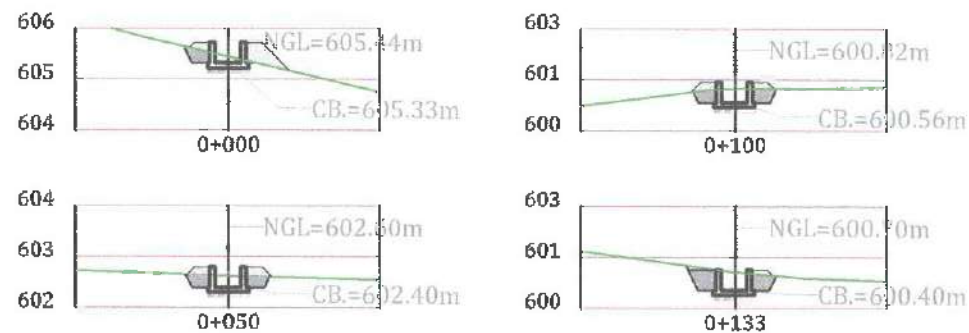


<p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-IF-006 Control Number: 2024-04-WD-RBS-00004 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME JR.</b> WRDQ II (RPAB No. 8870) Date: 22/11/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPAB No. 3057) Date:	 <b>GINA PANILO, Ph.D.</b> Director Date:	<b>CANAL PROFILE</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>	<b>R. Samson</b> Sheet No.: <b>20 / 26</b>



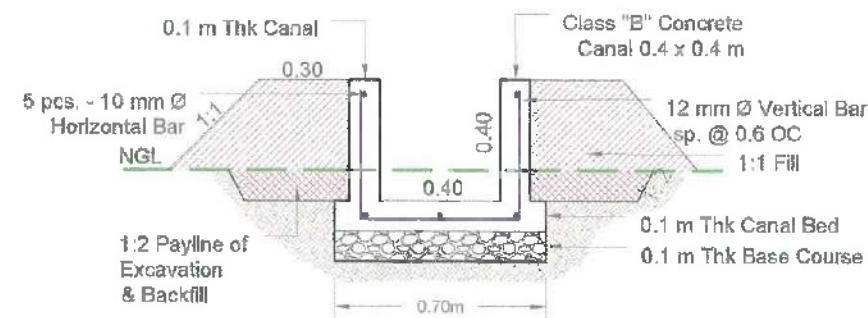
### CROSS-SECTIONS OF MAIN CANAL

Scale 1 : 150 m



### CROSS-SECTIONS OF LATERAL CANAL A

Scale 1 : 150 m



### TYPICAL CROSS-SECTION OF MAIN AND LATERAL CANAL

Scale 1 : 25 m



STATION		Q	A	V	b	d	D	n	s
FROM	TO	(cms.)	(sq. m)	(m/sec)	(m)	(m)	(m)		(%)
Main									
0+000	0+150	0.071	0.032	2.05	0.40	0.08	0.40	0.015	4.30
0+150	0+300	0.045	0.032	1.41	0.40	0.08	0.40	0.015	2.02
0+300	0+450	0.034	0.032	1.07	0.40	0.08	0.40	0.015	1.17
0+450	0+674	0.033	0.032	1.17	0.40	0.08	0.40	0.015	0.14
Lateral A									
0+000	0+133	0.056	0.024	2.02	0.40	0.06	0.40	0.015	3.71



DEPARTMENT OF AGRICULTURE  
Bureau of Soils and Water Management  
WATER RESOURCES MANAGEMENT DIVISION

Reference Code: BSWM\_WD\_IF\_006  
Control Number: 802404\_WD-RS-00004  
Effective Date: November 8, 2023

Prepared by:  
ENGR. ROGELIO B. CUIME JR.  
WRDO II  
(RPAB No. 8970)  
Date: 02/16/24

Checked / Reviewed by:  
ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPAB No. 3287)  
Date: \_\_\_\_\_

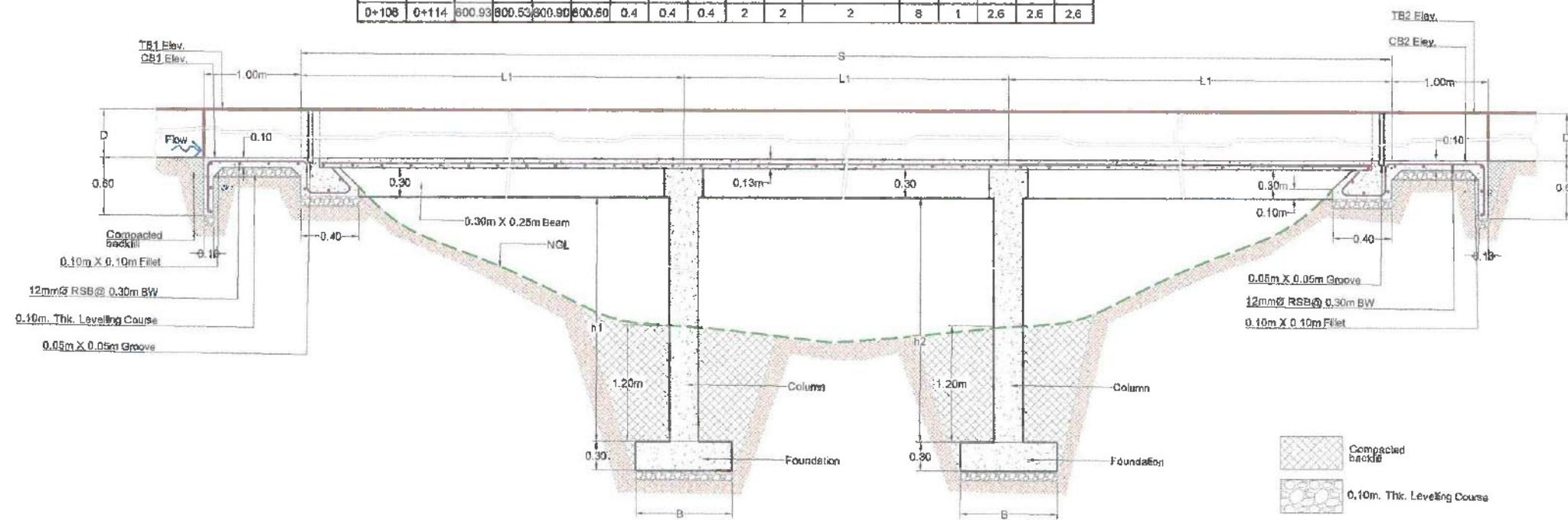
Recommending Approval:  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPAB No. 3057)  
Date: \_\_\_\_\_

Approved by:  
GINA P. NILO, Ph.D.  
Director  
Date: \_\_\_\_\_

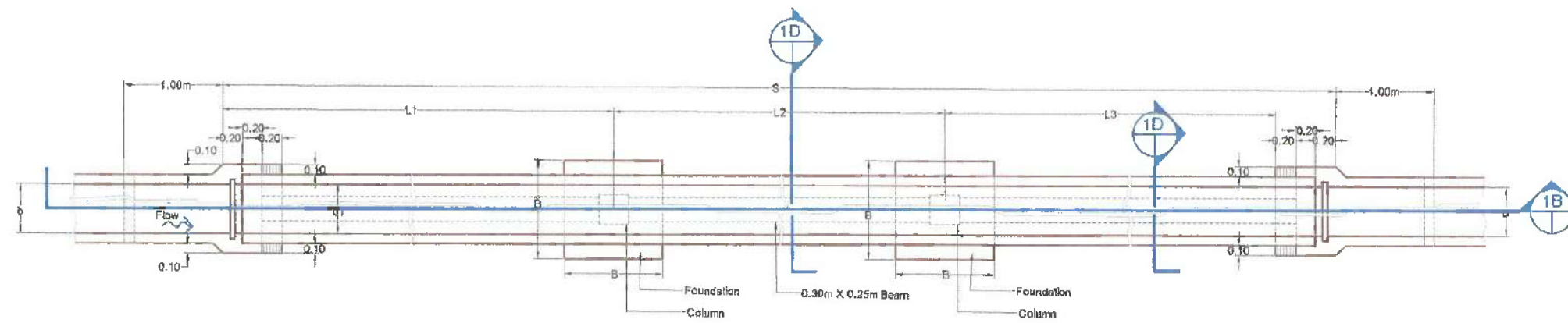
Sheet Contents:  
CANAL DETAILS  
Name of Project: Construction of Matampay SWIP  
Location: Brgy. Matampay, Munal, Lanao Del Norte  
CAD / Drawn by: R. Samson  
Sheet No.: 21 / 26



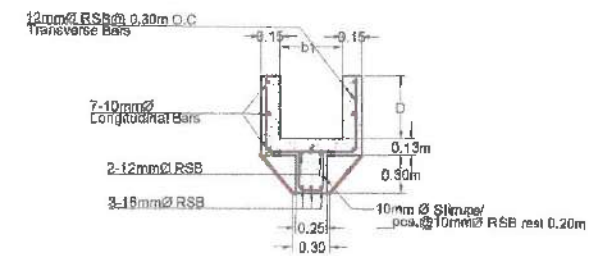
SCHEDULE OF ELEVATIONS AND DIMENSIONS																
Station		Elevation (m.)				Dimension (m.)										
From	To	TB1	CB1	TB2	CB2	b	b1	D	h1	h2	No. of Column	S	B	L1	L2	L3
Main																
0+644	0+659	592.88	592.28	592.50	592.10	0.4	0.4	0.4	2	2	2	16	1	6	5	5
Lateral A																
0+108	0+114	600.93	600.53	600.90	600.50	0.4	0.4	0.4	2	2	2	8	1	2.6	2.6	2.6



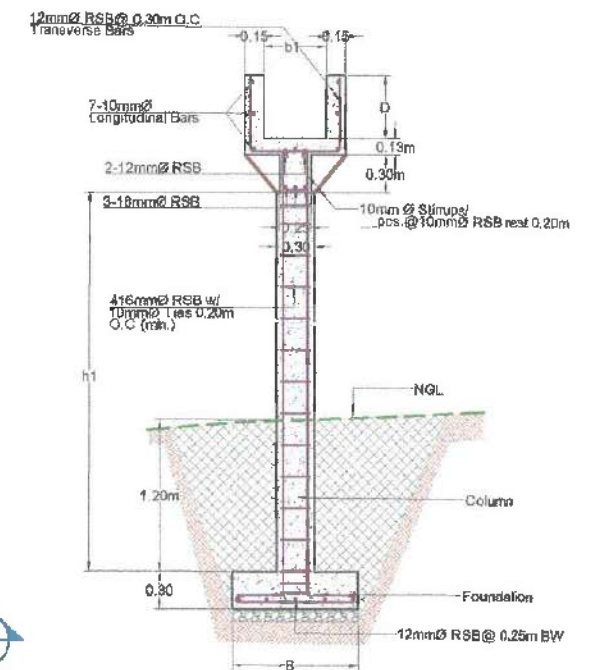
SECTIONS -"1B"  
SCALE: 1:60 M.




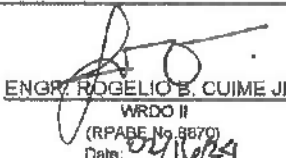


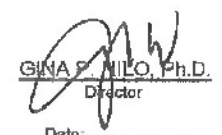
PLAN OF CONCRETE FLUME  
SCALE: 1:60 M.



SECTIONS -"1C"  
SCALE: 1:60 M.



SECTIONS -"1D"  
SCALE: 1:60 M.

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 3670) Date: 04/10/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3267) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINA P. MILO, Ph.D.</b> Director Date:	Sheet Contents: <b>CONCRETE FLUME</b>	CAD / Drawn by: R. Samson	
	Reference Code: BS/W/M_WD_JF_006 Control Number: 202404_WD_R&S-00004 Effective Date: November 8, 2023						Name of Project: <b>Construction of Matampay SWIP</b>	Sheet No.: <b>22 / 26</b>
						Location: <b>Brgy. Matampay, Munai, Lanao Del Norte</b>		



## SECTION-"1B"

SCALE: 1:20 M

## TYPICAL PLAN

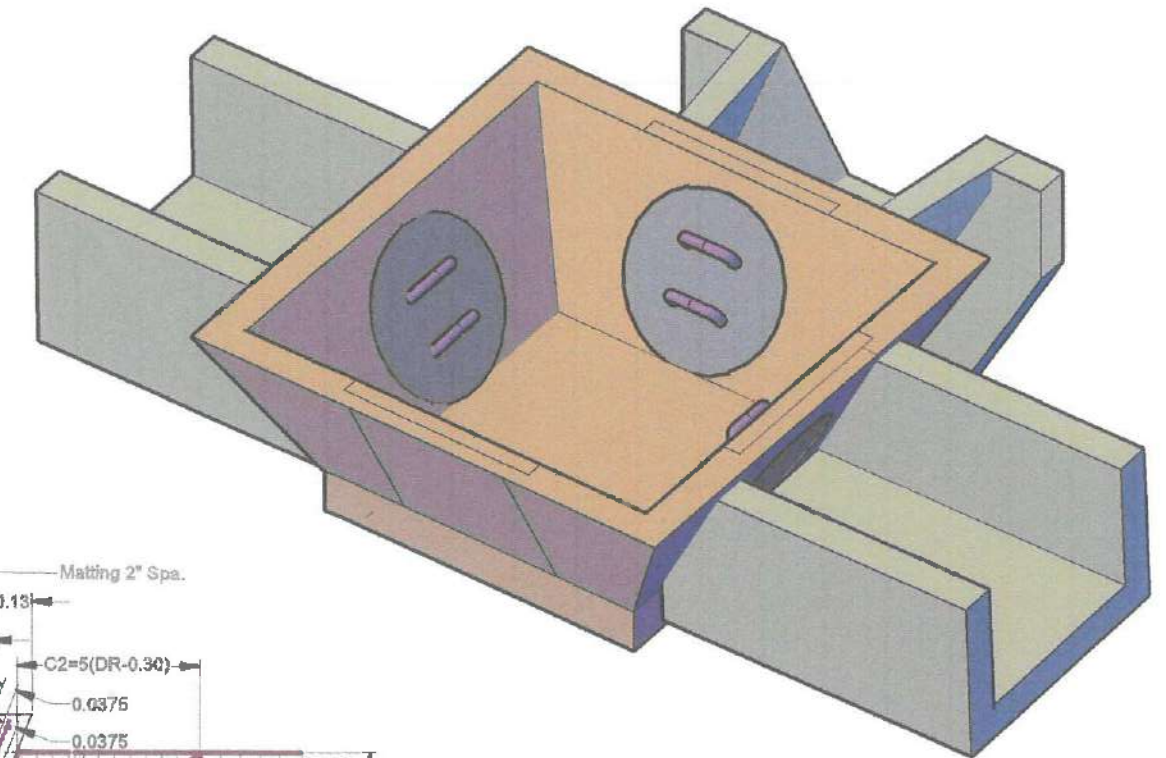
SCALE: 1:20 M

SCHEDULE OF DIMENSIONS DIVISION BOX-LEFT										
Station	b	ba	ba1	bb	bb1	bR	G2	DR	Da	Db
Main Canal 0+000	0.40	0.50	1.00	0.50	1.0	0.30	1.00	0.50	0.40	0.60
Main Canal 0+080	0.40	0.50	1.00	0.50	1.0	0.30	1.00	0.50	0.40	0.60
Main Canal 0+244	0.40	0.50	1.00	0.50	1.0	0.30	1.00	0.50	0.40	0.60
Main Canal 0+540	0.40	0.50	1.00	0.50	1.0	0.30	1.00	0.50	0.40	0.60



## SECTION-"1A"

SCALE: 1:20 M









### ISOMETRIC VIEW

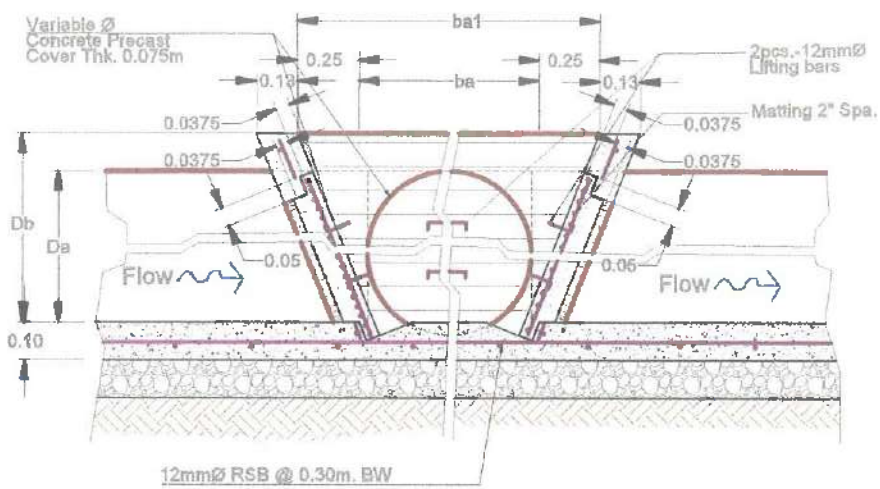
SCALE: 1:20 M

### TYPICAL PLAN/SECTIONS OF DIVISION BOX RIGHT

SCALE AS SHOWN

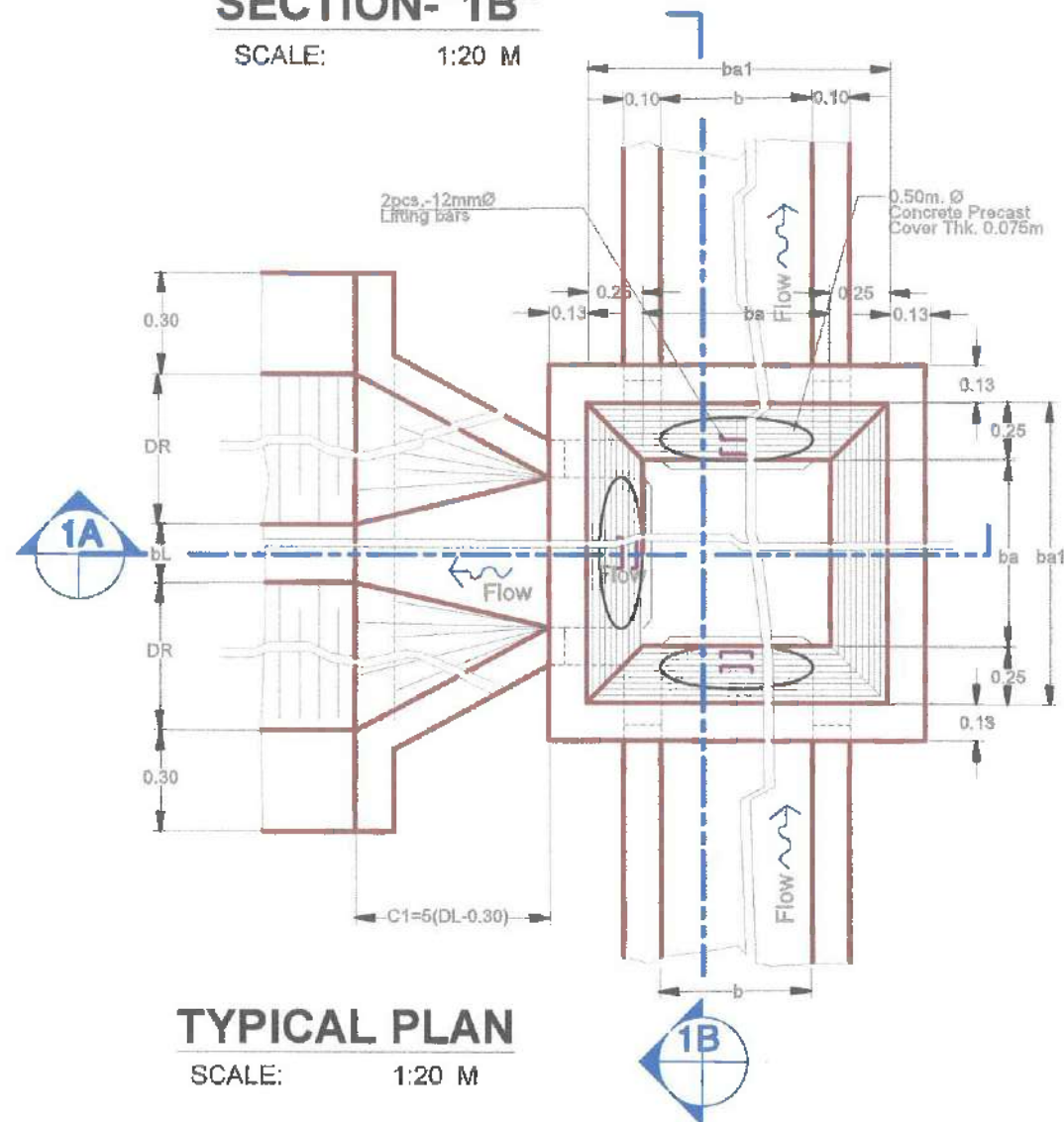
 	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b>	Prepared by:  <b>ENGR. ROGELIO B. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: <u>07/14/24</u>	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: _____	Approved by:  <b>GINA F. NILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>DIVISION BOX-RIGHT</b> Name of Project: <b>Construction of Matampay SWIP</b> Location: <b>Brgy. Matampay, Munal, Lanao Del Norte</b>	CAD / Drawn by: R. Samson Sheet No.: <b>23 / 26</b>
	Reference Code: <b>BSWM_WD_IF_006</b> Control Number: <b>002404 WD-RFS-0004</b> Effective Date: November 6, 2023						





**SECTION-'1B'**

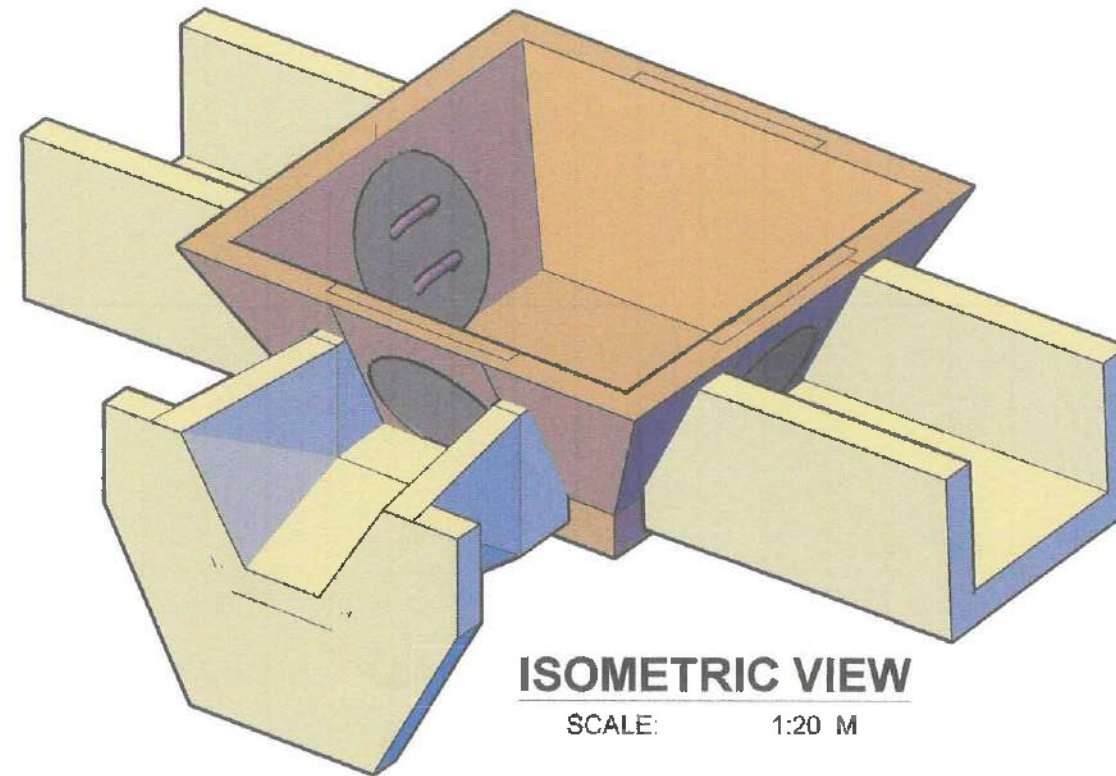
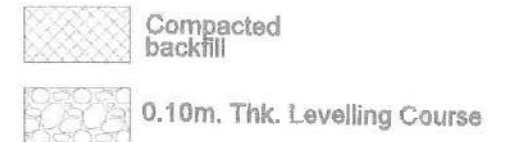
SCALE: 1:20 M



**TYPICAL PLAN**

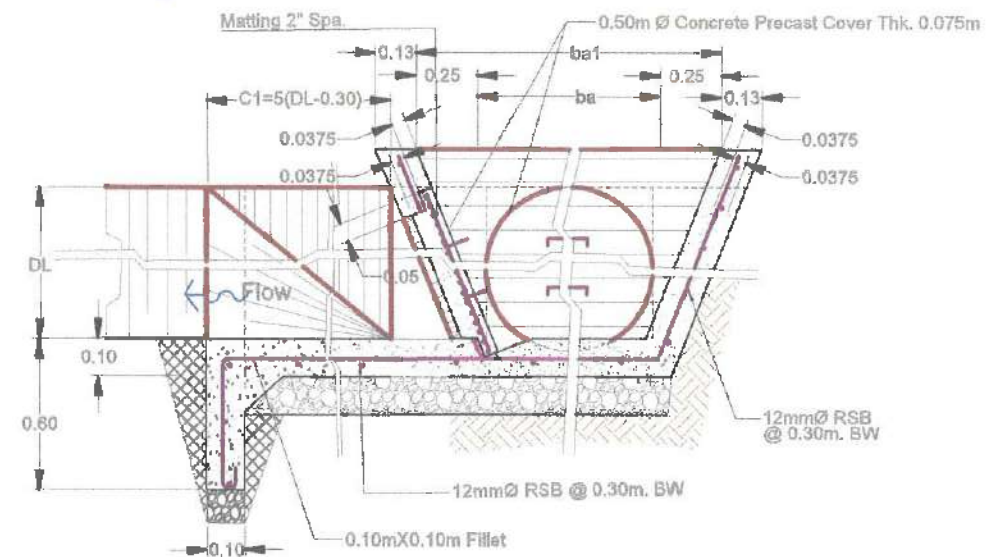
SCALE: 1:20 M

SCHEDULE OF DIMENSIONS DIVISION BOX-LEFT										
Station	b	ba	ba1	bb	bb1	bR	C2	DR	Da	Db
Main Canal 0+280	0.40	0.50	1.00	0.50	1.00	0.30	1.00	0.50	0.40	0.80
Lateral Canal A 0+020	0.40	0.50	1.00	0.50	1.00	0.30	1.00	0.50	0.40	0.80



**ISOMETRIC VIEW**

SCALE: 1:20 M



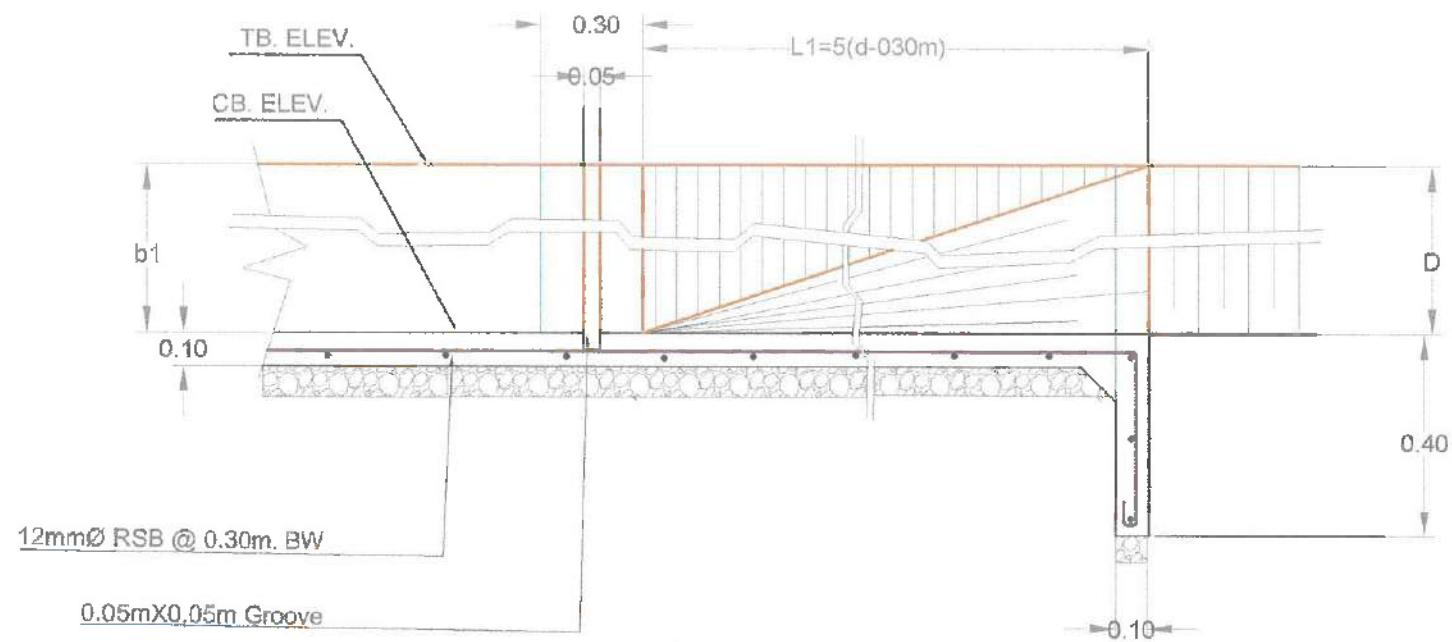
**SECTION-'1A'**

SCALE: 1:20 M

## TYPICAL PLAN/SECTIONS OF DIVISION BOX LEFT

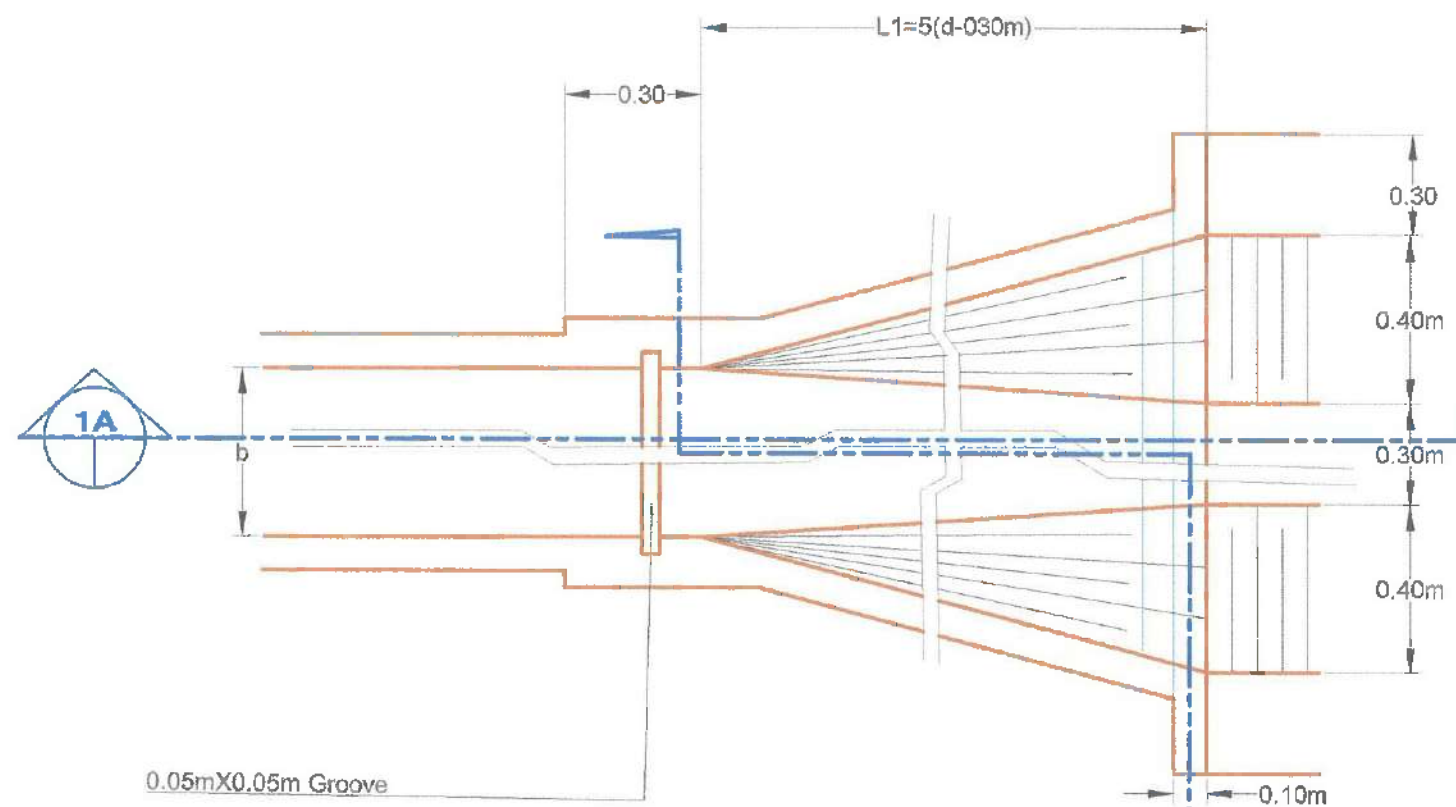
SCALE AS SHOWN

	DEPARTMENT OF AGRICULTURE	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Bureau of Soils and Water Management	 <b>ENGR. ROGELIO S. CUIME JR.</b> WRDO II (RPABE No. 8870) Date: 02/16/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA PANILO, Ph.D.</b> Director Date:	<b>DIVISION BOX-LEFT</b>	R. Samson
	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_IP_008 Control Number: 202404_WD_IP-00004 Effective Date: November 8, 2023					<b>Construction of Matampay SWIP</b>	24 / 26
						Location:	
	<b>Brgy. Matampay, Muna, Lanao Del Norte</b>						

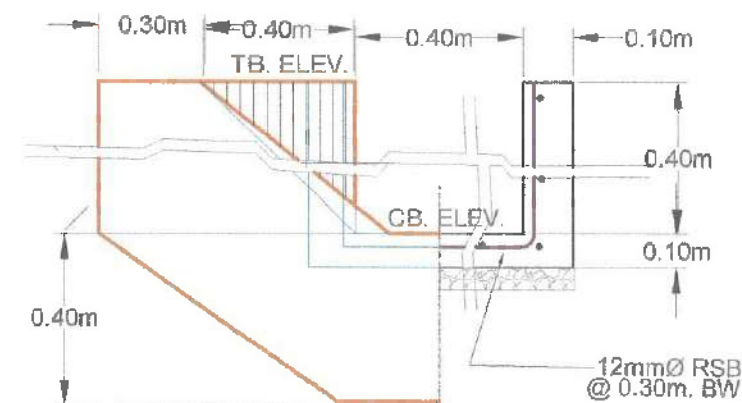


**SECTION-1A**  
SCALE: 1:20 M

SCHEDULE OF DIMENSIONS OF END CHECK						
Station	Elev.		DIMENSIONS			
	TB	CB	b	b1	D	L1
Main Canal 0+674	592.49	592.09	0.40	0.40	0.40	1.00
Lateral A 0+133	600.80	600.40	0.40	0.40	0.40	1.00


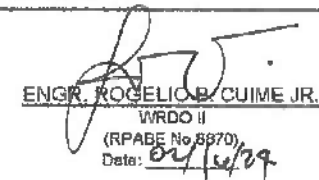
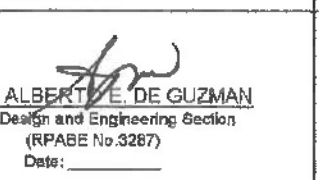
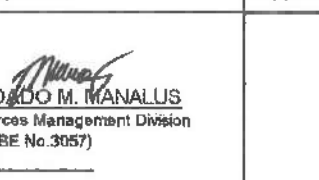
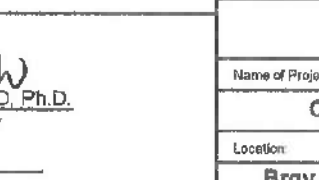


**PLAN**  
SCALE: 1:15 M



**SECTION-1B**  
SCALE: 1:20 M

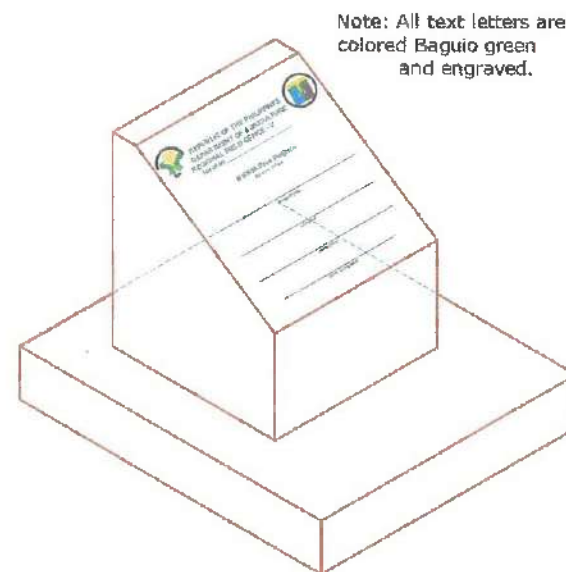
 0.10m. Thk. Levelling Course

	DEPARTMENT OF AGRICULTURE	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Bureau of Soils and Water Management	 ENGR. ROGELIO B. CUIME JR. WRDO II (RPABE No. 8970) Date: 02/16/29	 ENGR. ALBERT V. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date:	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date:	 GINA RAMILO, Ph.D. Director Date:	END CHECK	R. Samson
	WATER RESOURCES MANAGEMENT DIVISION					Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_JF_006					Construction of Matampay SWIP	25 / 26
	Control Number: 202404_WD-RWS-00004					Location:	
Effective Date: November 6, 2023	Brgy. Matampay, Muna, Lanao Del Norte						

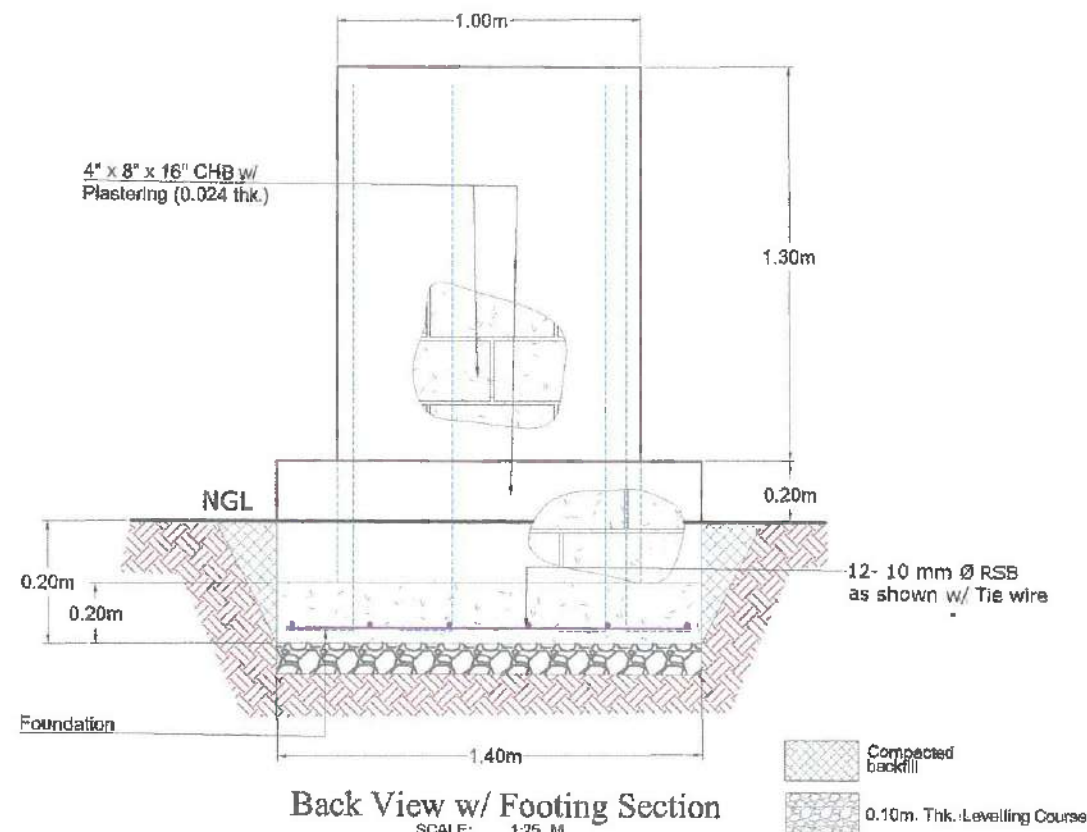




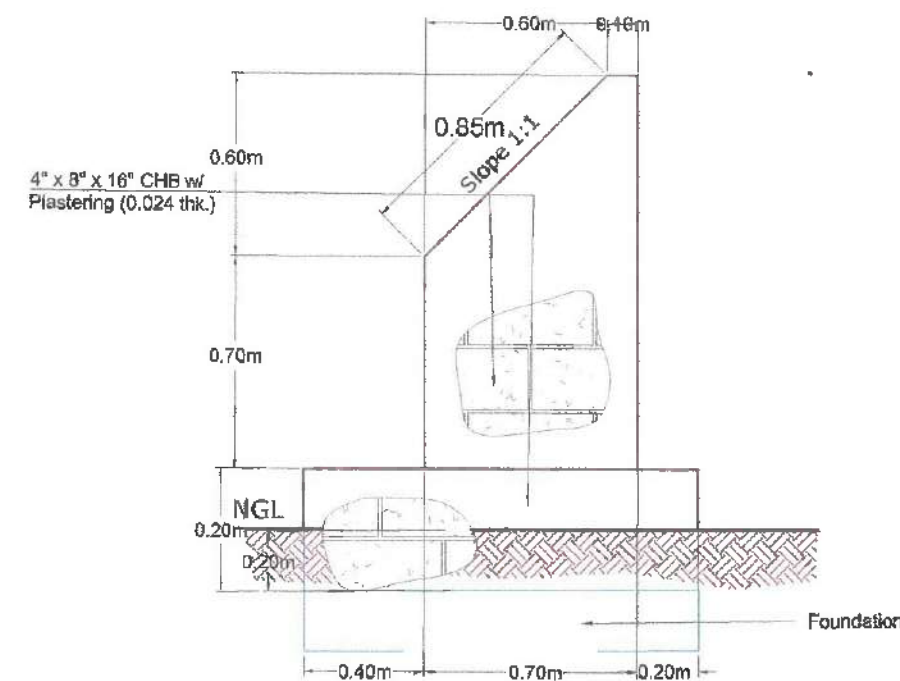
### Matting Plan



**Isometric View**  
Not to Scale





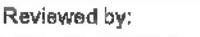


Back View w/ Footing Section  
SCALE: 1/25 M.



Right Side View  
SCALE: 1/25 M.

## PLAN AND ISOMETRIC VIEWS OF CONCRETE SIGNAGE

SCALE AS SHOWN

 <b>DEPARTMENT OF AGRICULTURE</b>  <b>Bureau of Soils and Water Management</b>  WATER RESOURCES MANAGEMENT DIVISION  Reference Code: BSWM_WD_IF_006 Control Number: 202404 WD_ECS-00004 Effective Date: November 8, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <u>ENGR. ROGELIO B. CUIME JR.</u> WRDO II (RPABE No. 8870) Date: 04/12/24	 <u>ENGR. ALBERTO E. DE GUZMAN</u> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	 <u>ENGR. DIOSDADO M. MANALUS</u> OIC, Water Resources Management Division (RPABE No. 3067) Date: _____	 <u>GINA P. NINO Ph.D.</u> Director Date: _____	<b>PLAN AND VIEW OF CONCRETE SIGNAGE</b>	R. Samson
	Name of Project:					Sheet No.:
	<b>Construction of Matampay SWIP</b>					<b>26 / 26</b>
	Location:					
<b>Brgy. Matampay, Munai, Lanao Del Norte</b>						

# CONSTRUCTION OF NALILIMPIYAAN SWIP





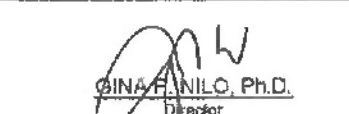
Brgy. Baloy, Cuyapo, Nueva Ecija  
Region - 3

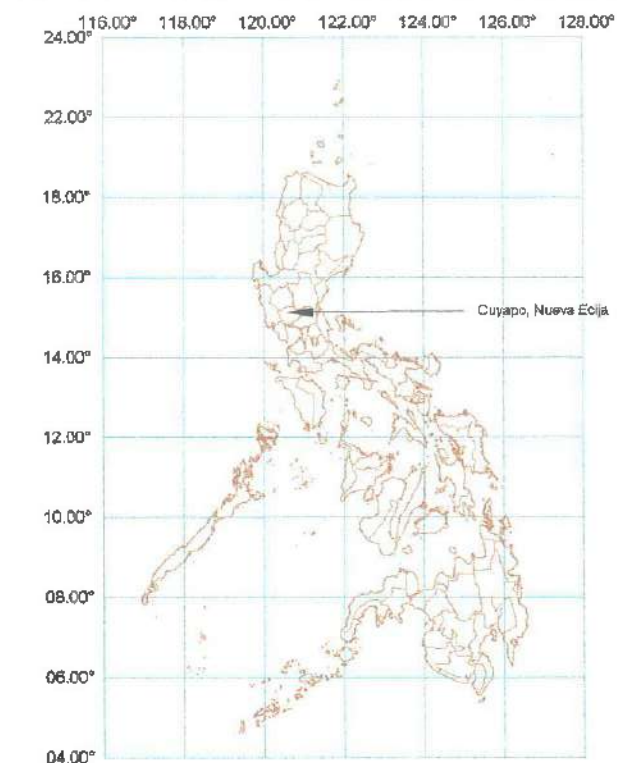
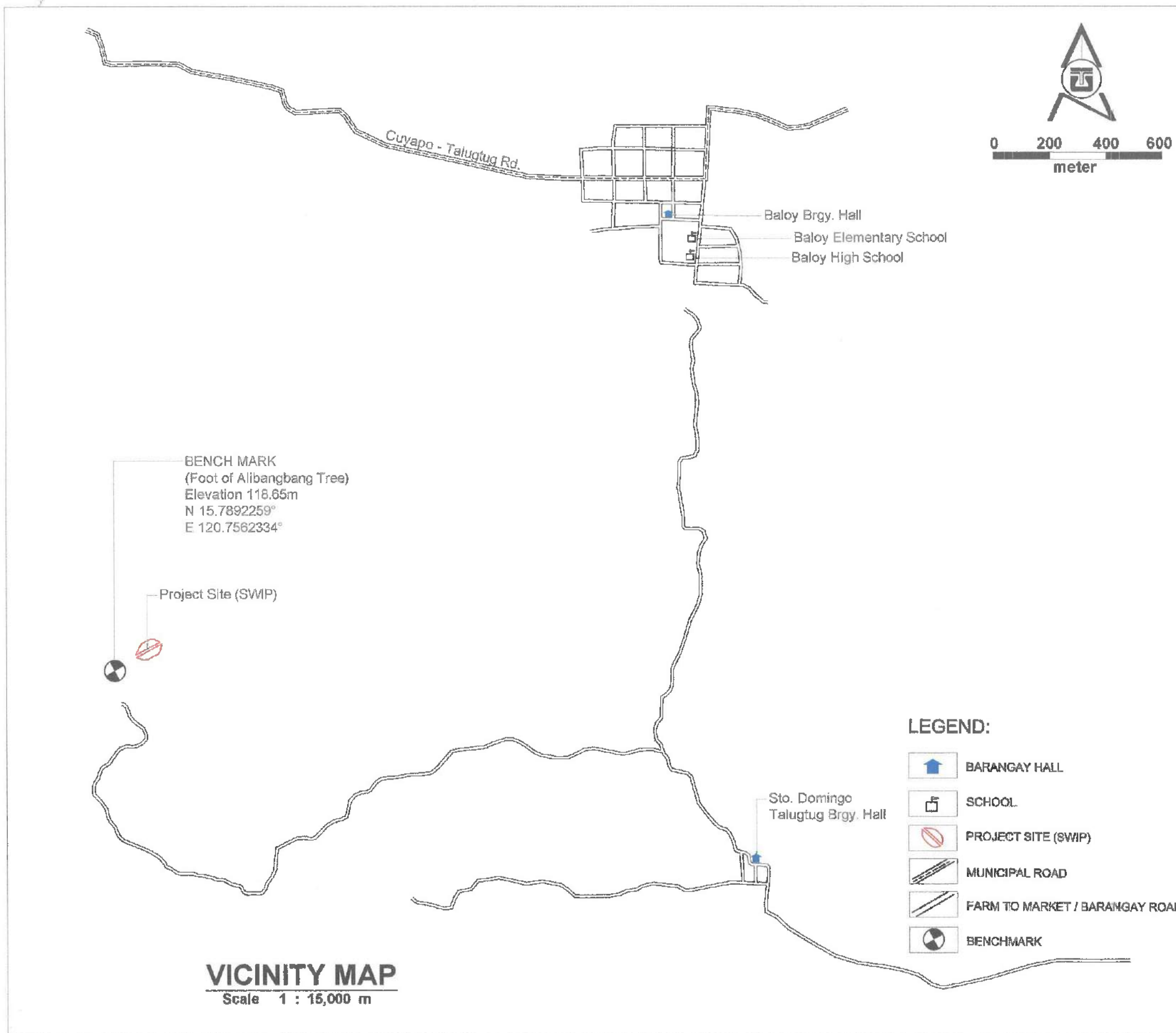


**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**



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PLAN AND ISOMETRIC VIEW OF CONCRETE SIGNAGE	30 OF 30



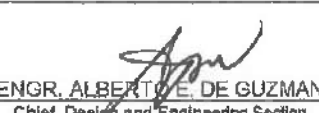

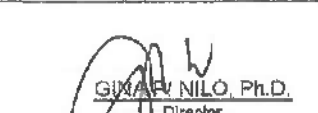
 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_008 Control Number: 2021-04-WD-RES-00004 Effective Date: November 5, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 6870) Date: 02/16/2024	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/23/2024	 <b>GINA F. NILO, Ph.D.</b> Director Date: _____	<b>LIST OF DRAWINGS / MAIN PROJECT FEATURES</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>1 / 30</b>



## MAIN PROJECT FEATURES

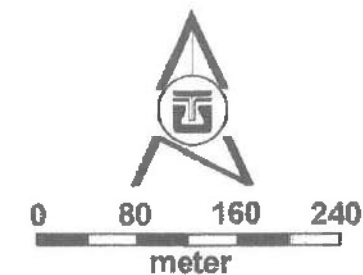
NAME OF PROJECT: NAGLILIMPIYAAN SWIP  
LOCATION: Brgy. Baloy, Cuyapo, Nueva Ecija  
DESIGNER: Engr. Rogelio B. Guime Jr.

1. WATERSHED			
AREA (ha)			47.09
PRESENT LAND-USE(Dominant)			FOREST
SOIL TYPE			CLAY LOAM
2. HYDROLOGY			
MEAN ANNUAL RAINFALL (mm)			811.50
ANNUAL RESERVOIR INFLOW (mm)			533.67
3. RESERVOIR			
AREA (ha)			5.52
MINIMUM ELEV. (m)/ STORAGE (cu. m.)			105.30/5,055
NWS ELEV. (m.)/STORAGE (cu. m.)			115.00/253,649
EFFECTIVE STORAGE VOLUME (cu. m.)			249,894
4. PROJECT FACILITIES			
a. DAM			
TYPE			SWIP
CREST ELEV. (m.)			117.00
HEIGHT (m.)			16.00
CREST WIDTH (m.)			8.00
CREST LENGTH (m.)			144.00
UPSTREAM SLOPE (H:V)			2.75:1
DOWNSTREAM SLOPE (H:V)			2.50:1
b. SPILLWAY			
b.1 APPROACH CHANNEL			
LENGTH (m.)			6.00
WIDTH (m.)			4.00
SURCHARGE HEIGHT (m.)			0.54
b.2 DISCHARGE CHANNEL			
LENGTH (m.)			18.00
WIDTH (m.)			4.00
SLOPE % AVERAGE			25.00
b.3 STILLING BASIN			
TYPE			Type III USBR
LENGTH (m.)			7.00
WIDTH (m.)			7.00
SLOPE % AVERAGE			0% BASIN / 3.0% RIPRAP
b.4 DESIGN FLOOD			
Q in 50 yr. (cu.m)			5.85
Q out 50 yr. (cu.m)			2.76
c. OUTLET WORKS			
TYPE			Steel Pressure Pipe
PIPE DIAMETER (m.)			0.25
PIPE LENGTH (m.)			102
MAXIMUM DISCHARGE (cu.m/sec.)			0.148
d. IRRIGATION WORKS			
d.1 CANAL LENGTH (m.)			1,500
d.2 STRUCTURES			
END CHECK (No.)			1
DIVISION BOX RIGHT/LEFT (No.)			4/1
FLUME LENGTH (m.)			1 / 16
REINFORCED CONCRETE CULVERT & TRACTOR CROSSING (No.)			1 & 1
e. ACCESS ROAD			
TYPE			GRAVELLED
LENGTH (m.)			1500.00
6. DESIGN SERVICE AREA AND CROPPING PATTERN			
CROPPING PATTERN	Rice	Rice	Fallow
SEASONAL SYSTEM WATER REQUIREMENT (mm)	80	215	
SERVICE AREA (ha)	80	21	
6. PROJECT COST (P)			24,000,000.00

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM-WD-IF-006 Control Number: 2024-04-WD-RES-00004 Effective Date: November 6, 2023	Prepared by:  ENGR. ROGELIO B. GUIME, JR. WRDO II (RPABE No. 8870) Date: 02/16/2024	Checked / Reviewed by:  ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/17/2024	Recommending Approval:  ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/27/24	Approved by:  GEN. NILO, Ph.D. Director Date: _____	Sheet Contents: <b>VICINITY MAP / LOCATION MAP . MAIN PROJECT FEATURES</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	CAD / Drawn by: <b>R. Samson</b> Sheet No.: <b>2 / 30</b>
--	--	---	--	--	--	---	--


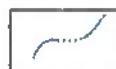




Watershed Area= 47.09 ha





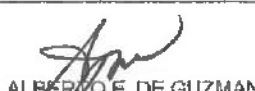


Proposed SWIP

# LEGEND :

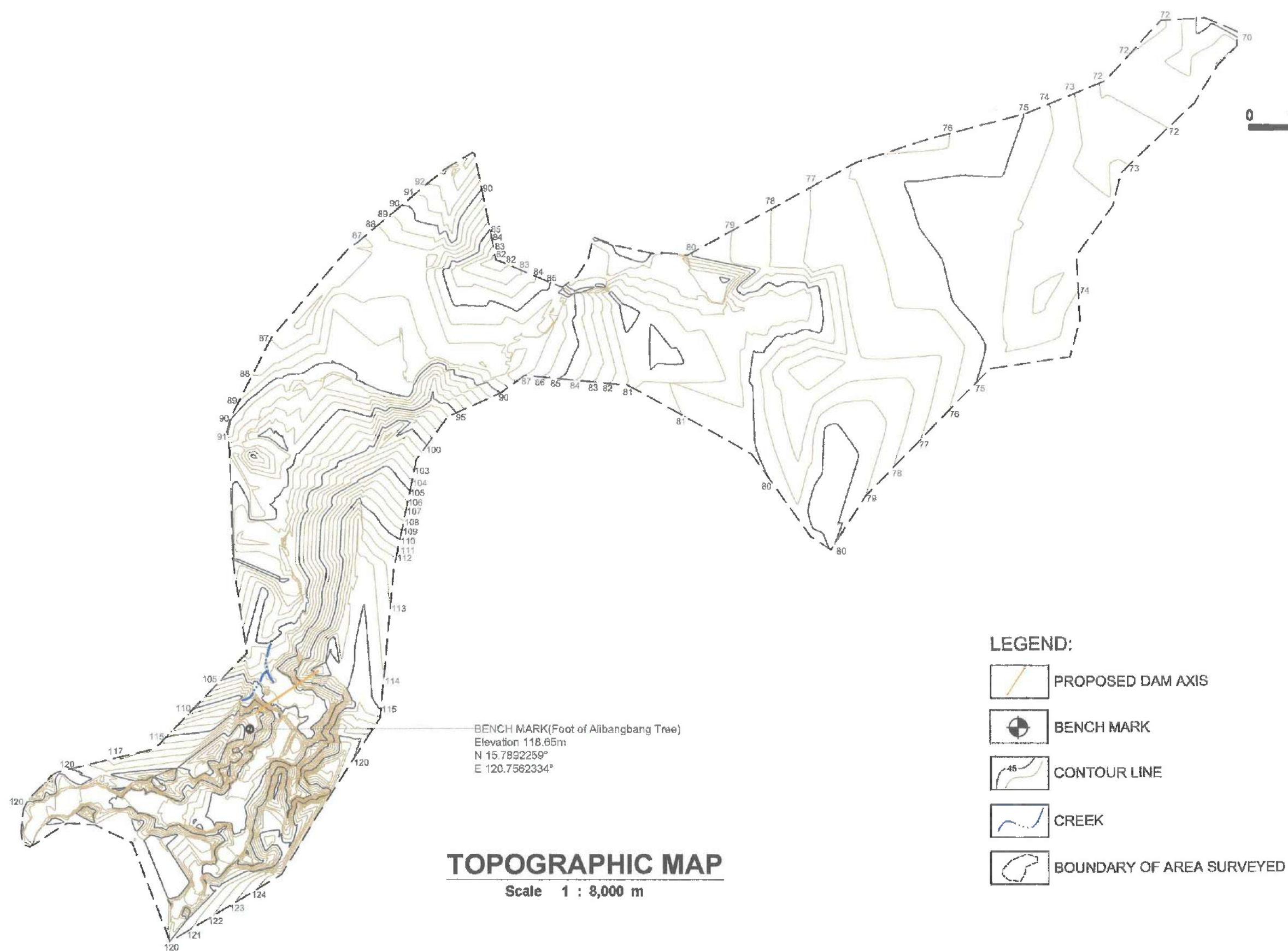
-  90 91 CONTOUR LINES
-  CREEK
-  WATERSHED AREA BOUNDARY
-  PROJECT SITE (SWIP)

## TOPOGRAPHIC MAP OF WATERSHED AREA




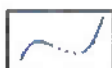

Scale 1 : 6,000 m



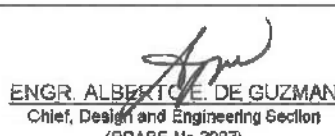
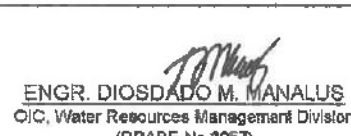
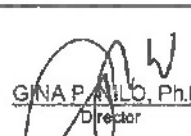
 <p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_IF_008 Control Number: 302404 WD - R63-00006 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents	CAD / Drawn by:
	 <b>ENGR. ROMEO B. CUIME, JR.</b> WRDO II (RPABE No.8870) Date: 07/16/2024	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No.3287) Date: 07/16/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No.3057) Date: 07/22/2024	 <b>GINA F. ANILLO, Ph.D.</b> Director Date: _____	<b>TOPOGRAPHIC MAP OF WATERSHED AREA</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Sameon Sheet No.: <b>3 / 30</b>

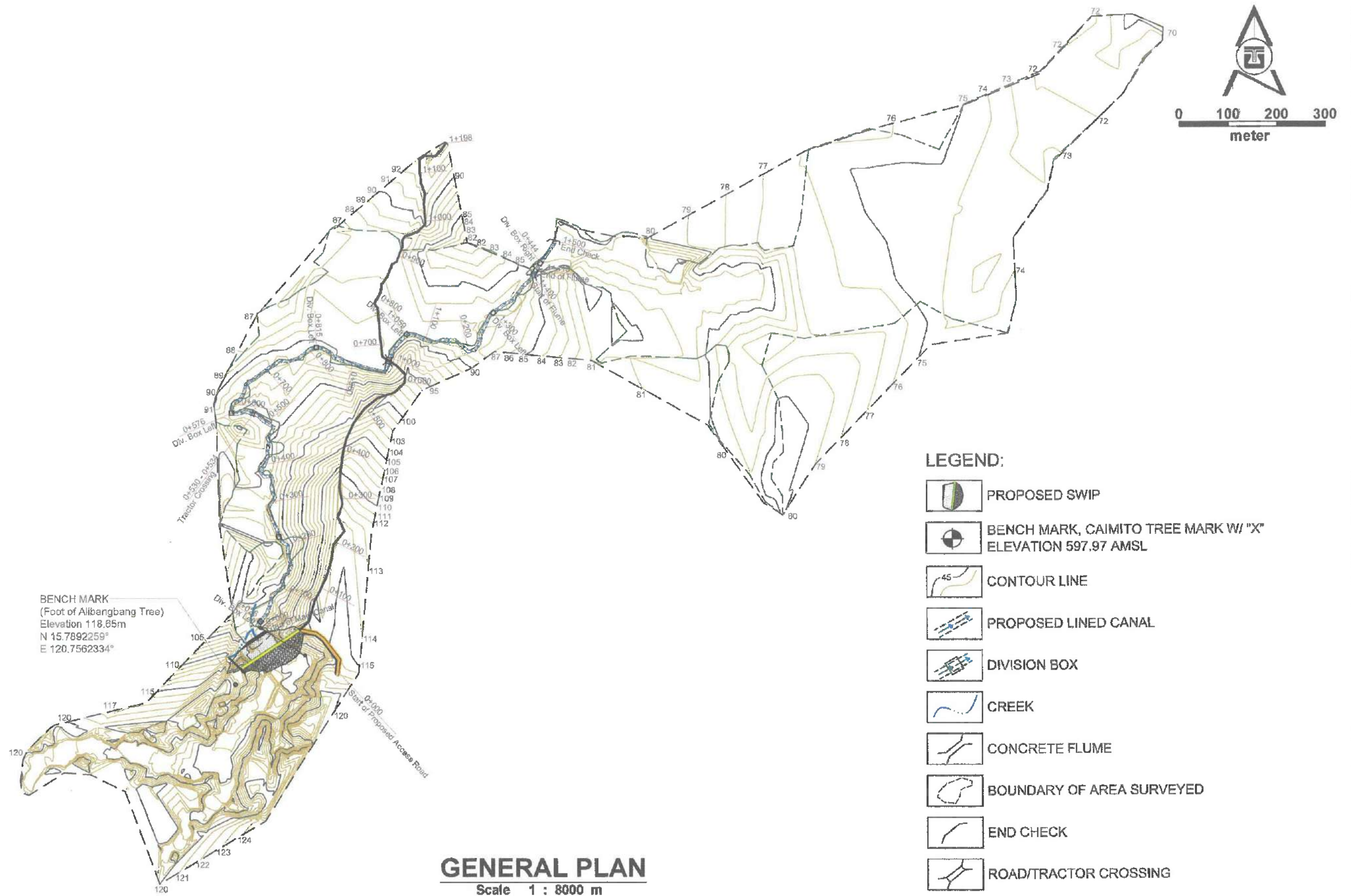




#### LEGEND:

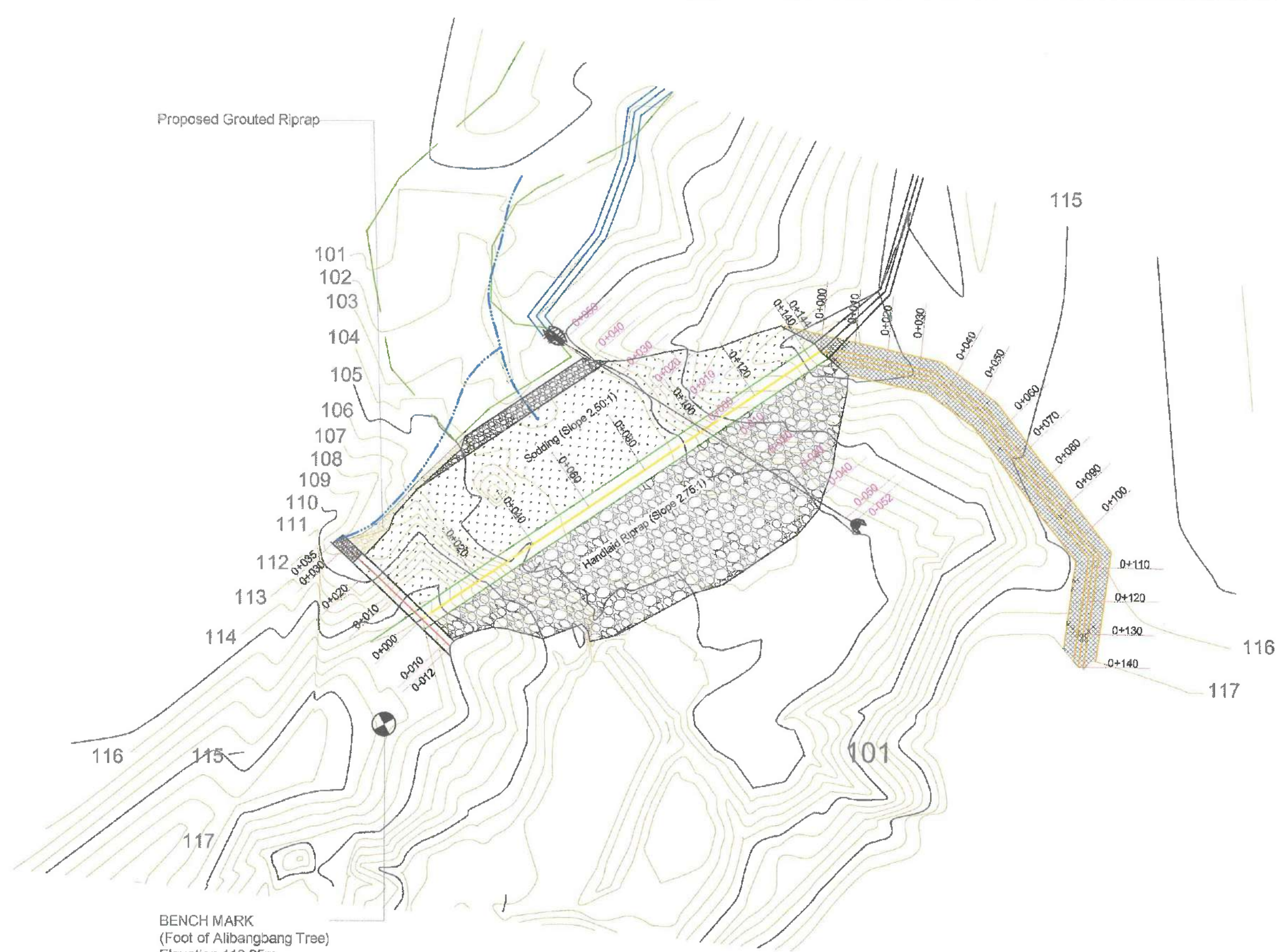
-  PROPOSED DAM AXIS
-  BENCH MARK
-  CONTOUR LINE
-  CREEK
-  BOUNDARY OF AREA SURVEYED

 <p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-JF-008 Control Number: 702404-WD-R65-00006 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 6870) Date: <u>11/1/24</u>	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: <u>11/1/24</u>	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: <u>11/1/24</u>	 <b>GINA P. ANILLO, Ph.D.</b> Director Date: _____	<b>TOPOGRAPHIC MAP</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>4 / 30</b>








	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 2/14/2014	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 2/22/2014	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 2/22/2014	Approved by:  <b>GINA F. NIÑO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>GENERAL PLAN</b>	CAD / Drawn by: R. Samson
	Reference Code: BSWM_WD_JF_006 Control Number: 201404_WD-RMS-00004 Effective Date: November 6, 2023					Name of Project: <b>Construction of Naglilimpiyaan SWIP</b>	Sheet No.: <b>5 / 30</b>
					Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>		

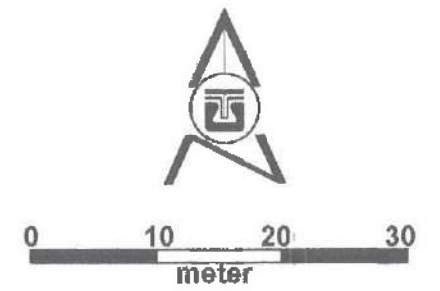
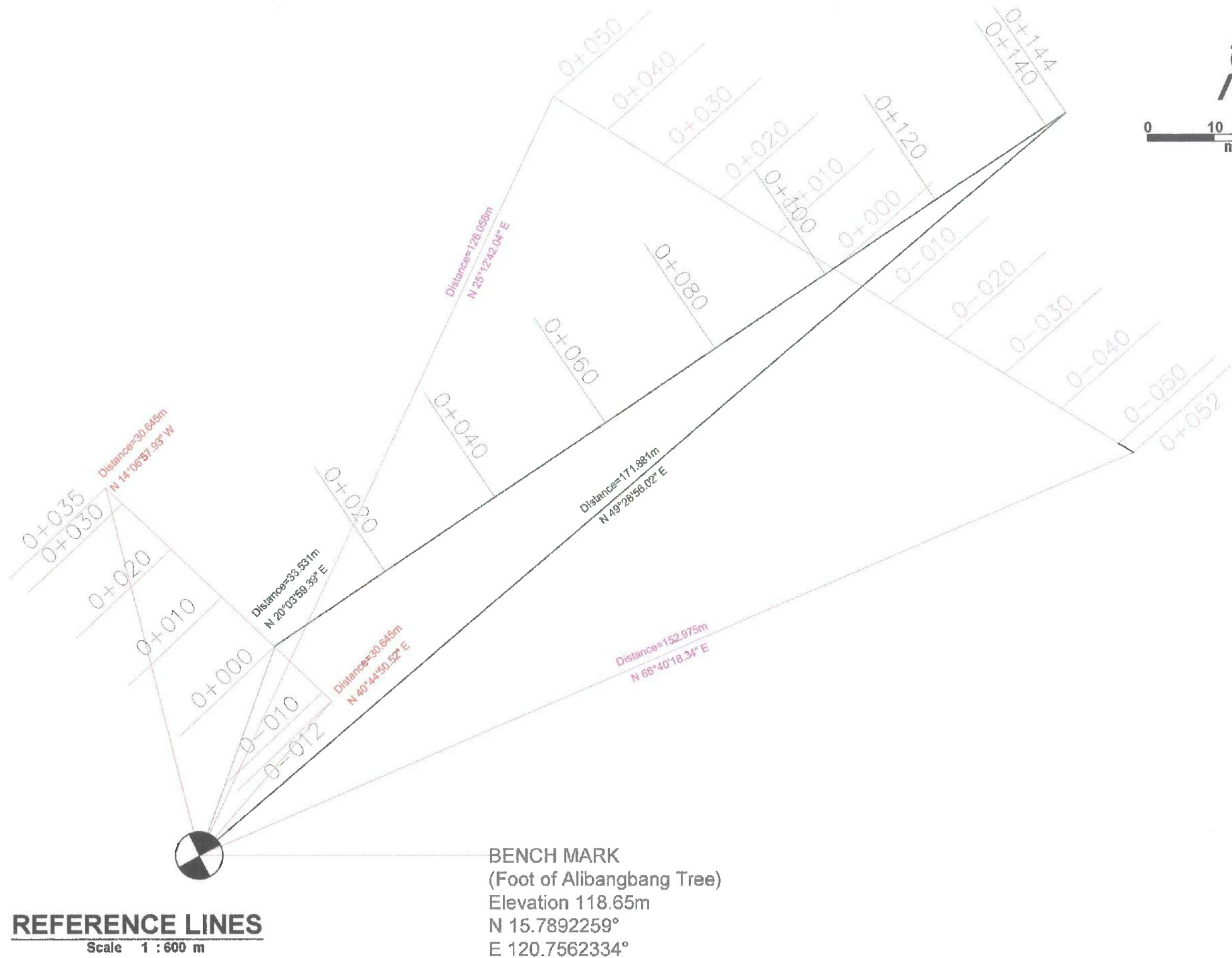





BENCH MARK  
(Foot of Alibang Tree)  
Elevation 118.65m  
N 15.7892259°  
E 120.7562334°

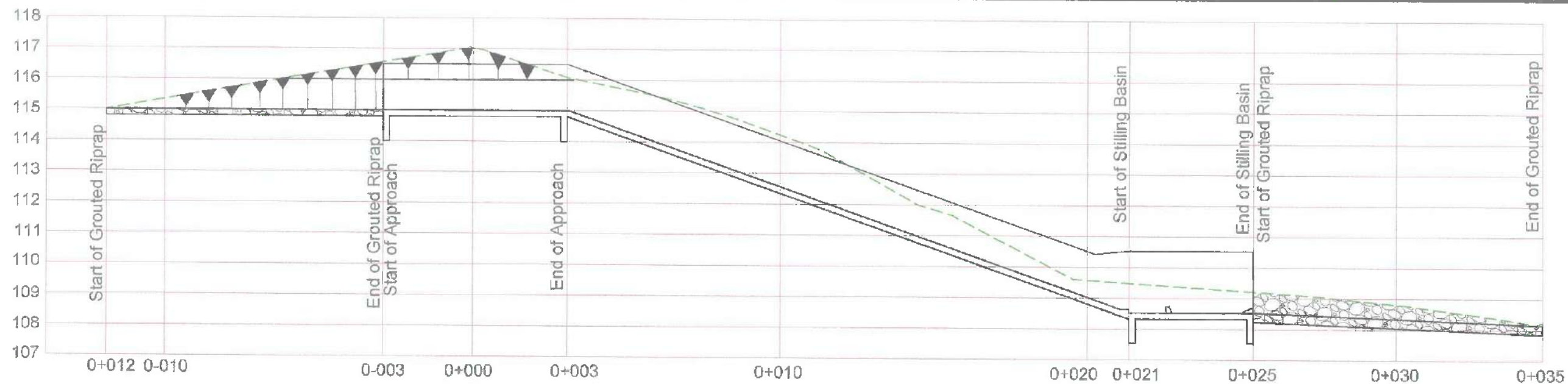
# **SITE DEVELOPMENT PLAN OF DAM** Scale 1 : 1000 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_006 Control Number: 202404_WD-RES-00001 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		 ENGR. ROGELIO B. CUIME, JR. WRDO II (RPABE No. 8870) Date: 02/16/2024	 ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/22/2024	 GINA P. MICO, Ph.D. Director Date: _____	<b>SITE DEVELOPMENT PLAN</b>	R. Samson
						Name of Project:	Sheet No.:
						<b>Construction of Naglilimpiyaan SWIP</b>	
						Location:	<b>6 / 30</b>
						<b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	



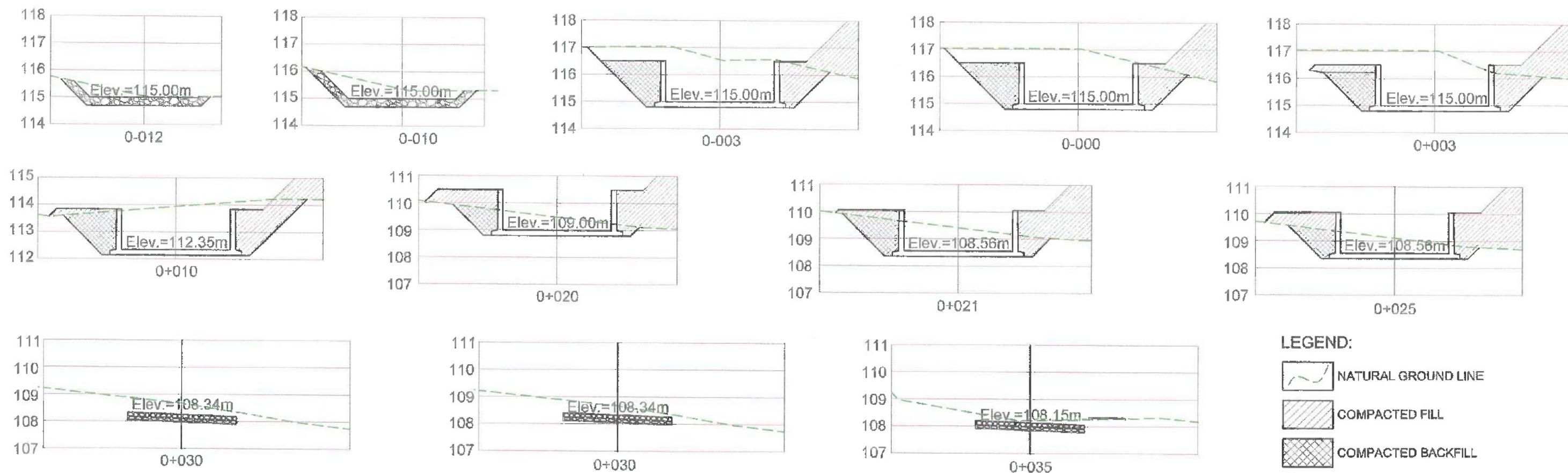
	<b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_F_008 Control Number: 202409 WD-RS-00000 Effective Date: November 8, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		ENGR. ROGELIO B. CUIME, JR. WRDO II (RPABE No.8870) Date: 04/16/2024	ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No.3287) Date: 02/21/2024	ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No.3057) Date: 02/22/2024	GINA P. NILLO, Ph.D. Director Date: _____	<b>REFERENCE LINES</b>	R. Samson
						Name of Project:	Sheet No.:
						<b>Construction of Naglilimpiyaan SWIP</b>	7 / 30
						Location:	
						<b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	





## ELEVATION PROFILE ALONG CENTERLINE OF SPILLWAY

Scale 1 : 300 m



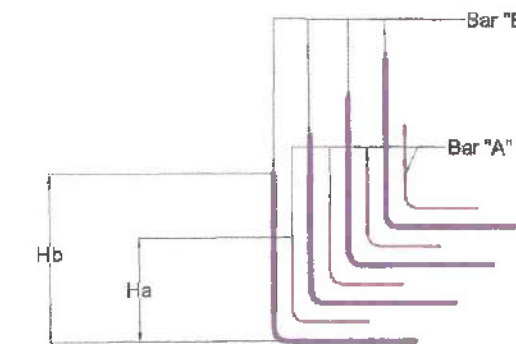
### LEGEND:

- NATURAL GROUND LINE
- COMPACTED FILL
- COMPACTED BACKFILL
- GROUTED RIPRAP
- CUT

## CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY

Scale 1 : 150 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  ENGR. ROGELIO S. CUAME, JR. WRDO II (RPABE No. 8870) Date: 02/16/2024	Checked / Reviewed by:  ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	Recommending Approval:  ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/21/2024	Approved by:  GINA P. NILO, Ph.D. Director Date:	Sheet Contents: <b>PROFILE / CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY</b>	CAD / Drawn by: R. Samson
	Reference Code: BSWM-WD-JF-006 Control Number: 202404-WD-RES-00006 Effective Date: November 6, 2023					Name of Project: <b>Construction of Naglilimpyaan SWIP</b>	Sheet No.: <b>8 / 30</b>
					Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>		

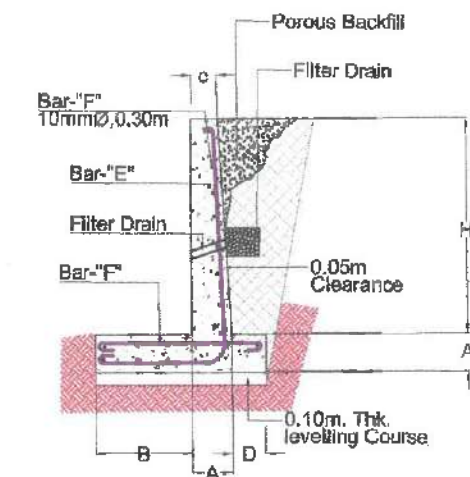


NOT TO SCALE

SCHEDULE OF ELEVATIONS AND DIMENSIONS			
ELEV. A =	115.00 m	h1 =	1.50 m
ELEV. B =	109.50 m	h2 =	2.00 m
ELEV. C =	103.10 m	j =	1.00 m
a =	0.10 m	j =	n/a
b =	1.20 m	L1 =	6.00 m
c =	0.20 m	L2 =	18.00 m
d =	0.15 m	W =	2.00 m
e =	0.20 m	W1 =	10.00 m
g =	0.20 m	C-slope =	4.5:1
L3 =	4.00 m	S-slope =	1.5:1
LoC =	-	RoC =	-

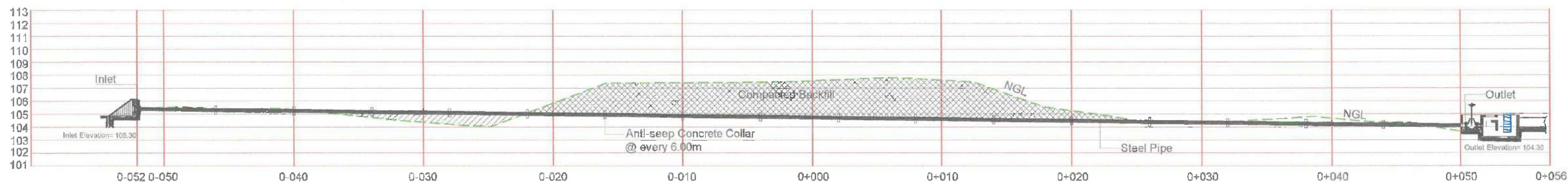


SCHEDULE OF DIMENSIONS AND REINFORCEMENTS (FOR "1C")									
H (m.)	A (cm.)	B (cm.)	D (cm.)	C (cm.)	Toe pressure (kg./sq.m.)	E BARS		F BARS	
						size (mm.)	spacing (cm.)	size (mm.)	spacing (cm.)
1.5	15.00	120.00	15.00	15.00	-	12.00	25.00	10.00	30.00
2	15.00	120.00	15.00	15.00	-	12.00	25.00	10.00	30.00



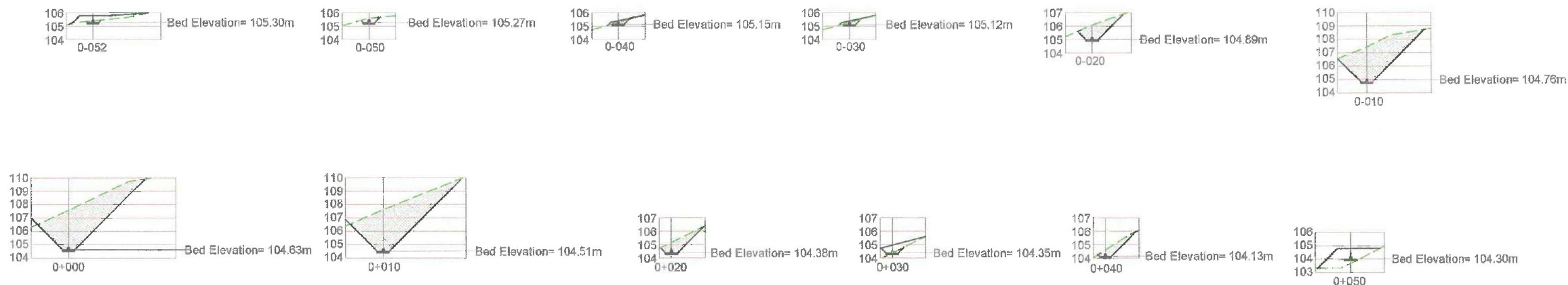
**TYPICAL SECTION-"1B"**  
NOT TO SCALE





## ELEVATION PROFILE ALONG CENTERLINE OF OUTLET WORKS

Scale 1 : 300 m



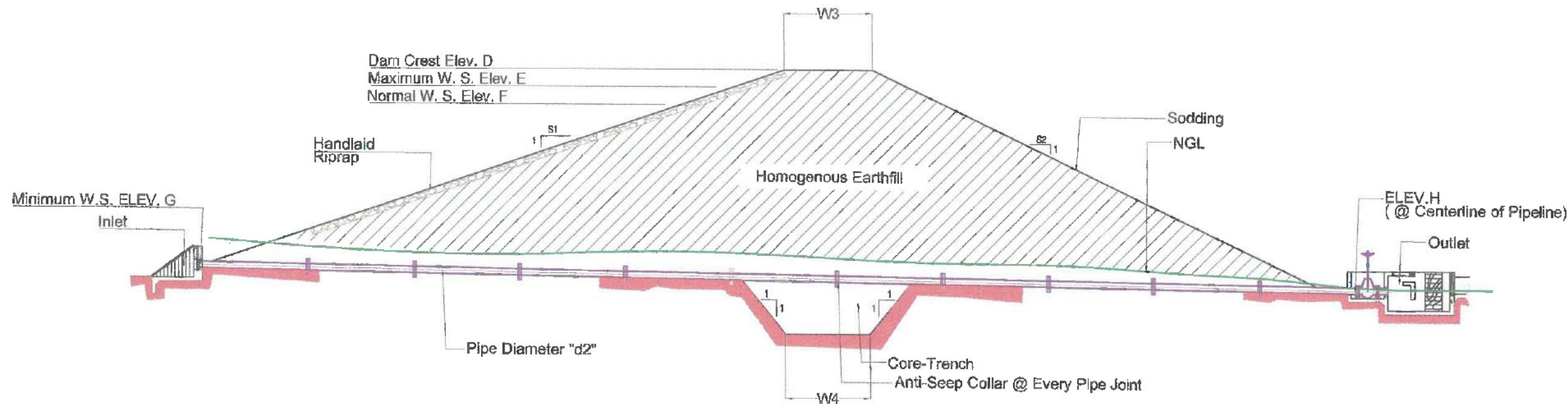
### LEGEND:

- NATURAL GROUND LINE
- COMPACTED FILL
- COMPACTED BACKFILL

## CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS

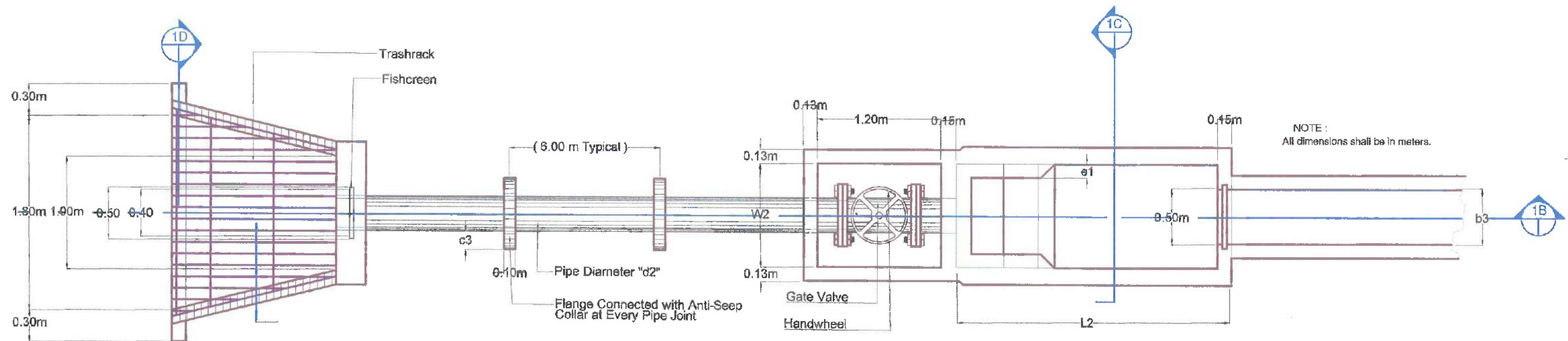
Scale 1 : 300 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 01/10/2024	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 01/21/2024	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 01/22/2024	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>PROFILE ALONG AND CROSS-SECTIONS ACROSS THE CENTERLINE OF OUTLET WORKS</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	CAD / Drawn by: <b>R. Samson</b> Sheet No.: <b>10 / 30</b>
	Reference Code: <b>BSWM_WD_JF_008</b> Control Number: <b>202404 WD-R&amp;S-00006</b> Effective Date: November 6, 2023						



SCHEDULE OF ELEVATIONS AND DIMENSIONS	
ELEV. D =	117.00m
ELEV. E =	115.54m
ELEV. F =	115.00m
ELEV. G =	105.30m
ELEV. H =	104.30m
W3 =	8.00m
W4 =	0.00m
b3 =	0.50m
c3 =	0.40m
e1 =	0.13m
W2 =	2.00m
L2 =	2.70m
PIPE DIA. "d2" =	0.25m

**PROFILE ALONG CENTERLINE OF OUTLET WORKS**  
NOT TO SCALE

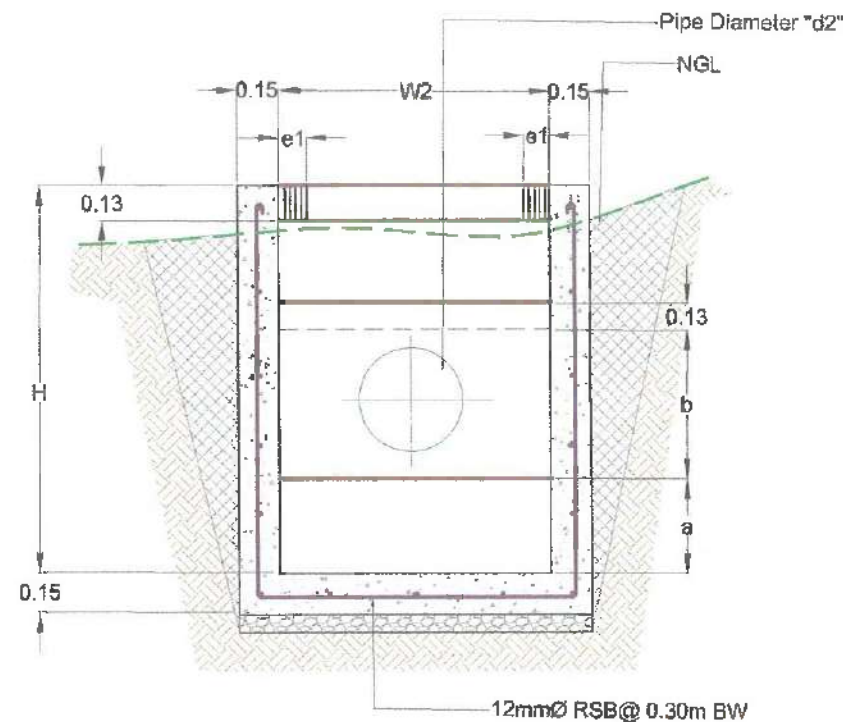


NOTE:  
All dimensions shall be in meters.

**PLAN OF OUTLET WORKS**  
NOT TO SCALE

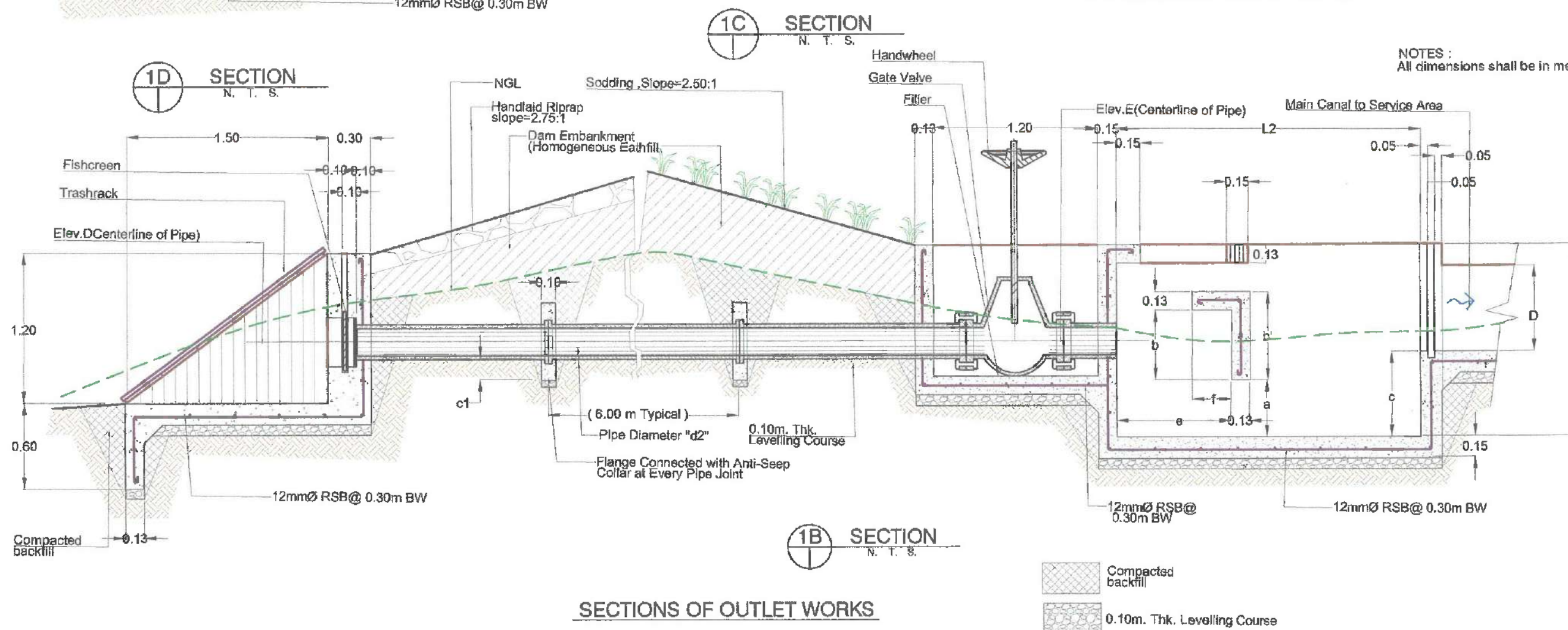
<p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_IF_008 Control Number: 202404WD-RES-00002 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	ENGR. ROGELIO B. CUIME, JR. WDO II (RPABE No. 8870) Date: 02/10/2024	ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/10/2024	ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/10/2024	GINA P. NILO, Ph.D. Director Date: _____	PLAN / PROFILE ALONG CENTERLINE OF OUTLET WORKS	R. Samson
					Name of Project:	Sheet No.:
					Construction of Naglilimpiyaan SWP	11 / 30
					Location:	Brgy. Baloy, Cuyapo, Nueva Ecija





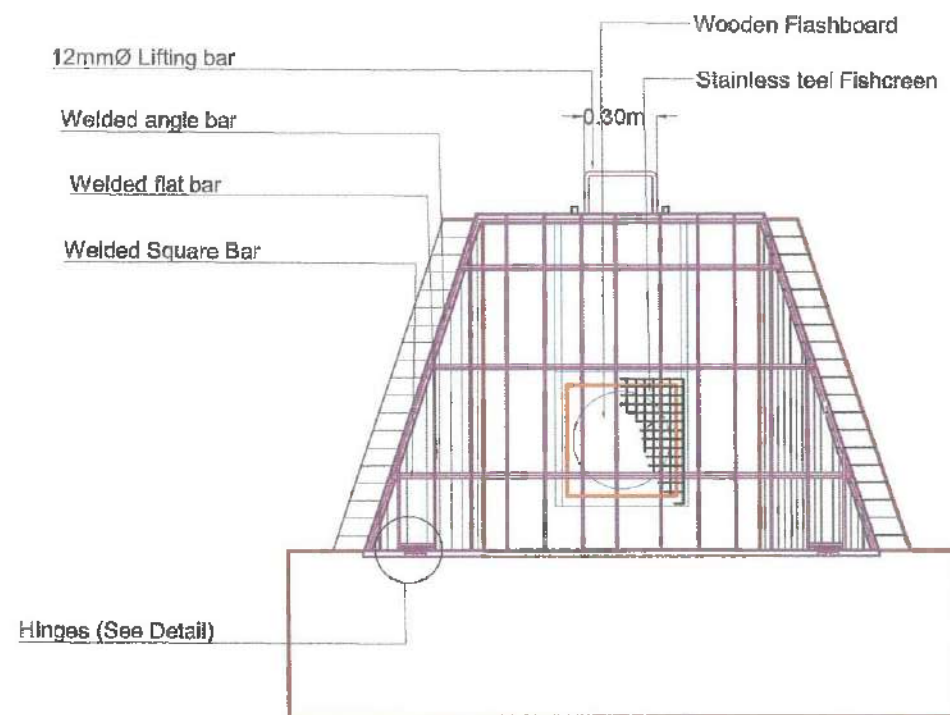
<b>ELEV. D =</b>	<b>105.30m</b>
<b>ELEV. E =</b>	<b>104.30m</b>
<b>a =</b>	<b>0.38m</b>
<b>b =</b>	<b>0.86m</b>
<b>c =</b>	<b>0.80m</b>
<b>e1 =</b>	<b>0.13m</b>
<b>e =</b>	<b>1.00m</b>
<b>D =</b>	<b>0.50m</b>
<b>H =</b>	<b>1.58m</b>
<b>W =</b>	<b>2.30m</b>
<b>L1 =</b>	<b>1.50m</b>
<b>L2 =</b>	<b>2.90m</b>
<b>Lp =</b>	<b>102.00m</b>
<b>c3 =</b>	<b>0.40m</b>
<b>c1 =</b>	<b>0.40m</b>
<b>PIPE DIA. -"d2" =</b>	<b>0.25m</b>
<b>PIPE DIA. -"d" =</b>	<b>0.25m</b>

NOTES :  
All dimensions shall be in meters.

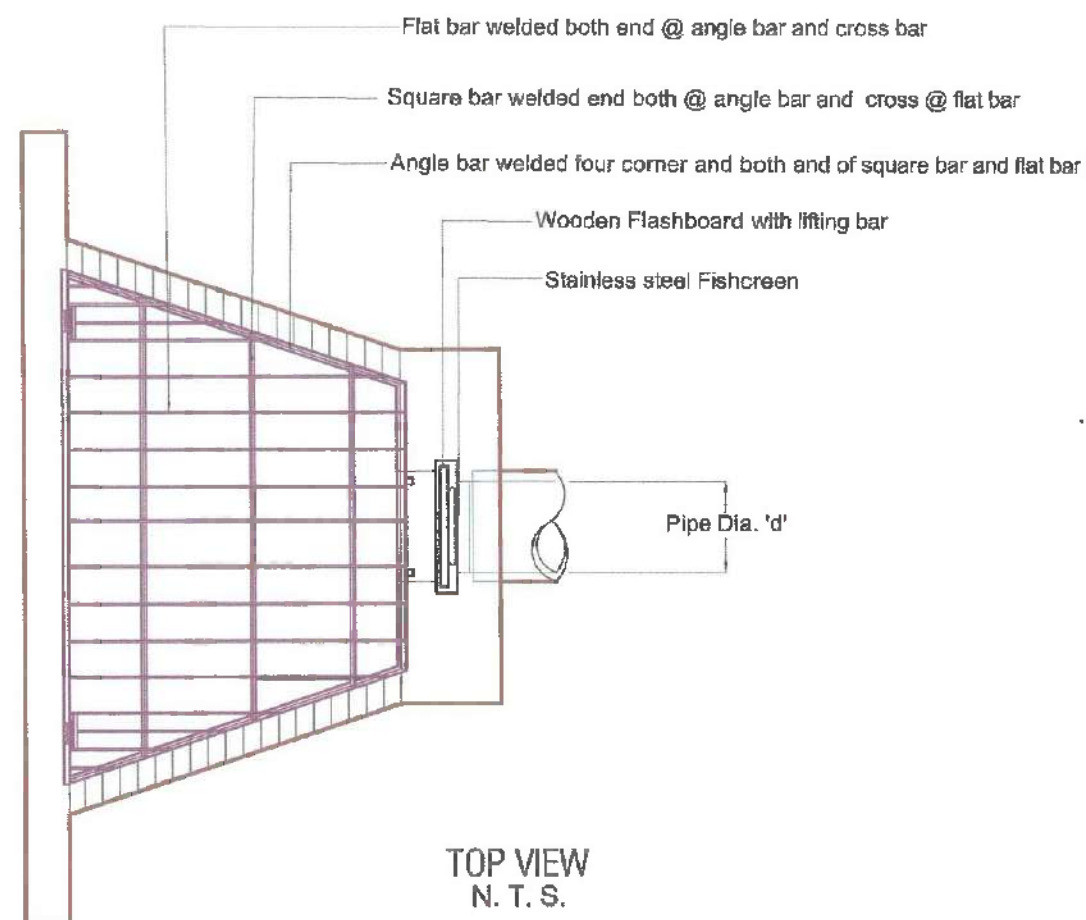


## SECTIONS OF OUTLET WORKS

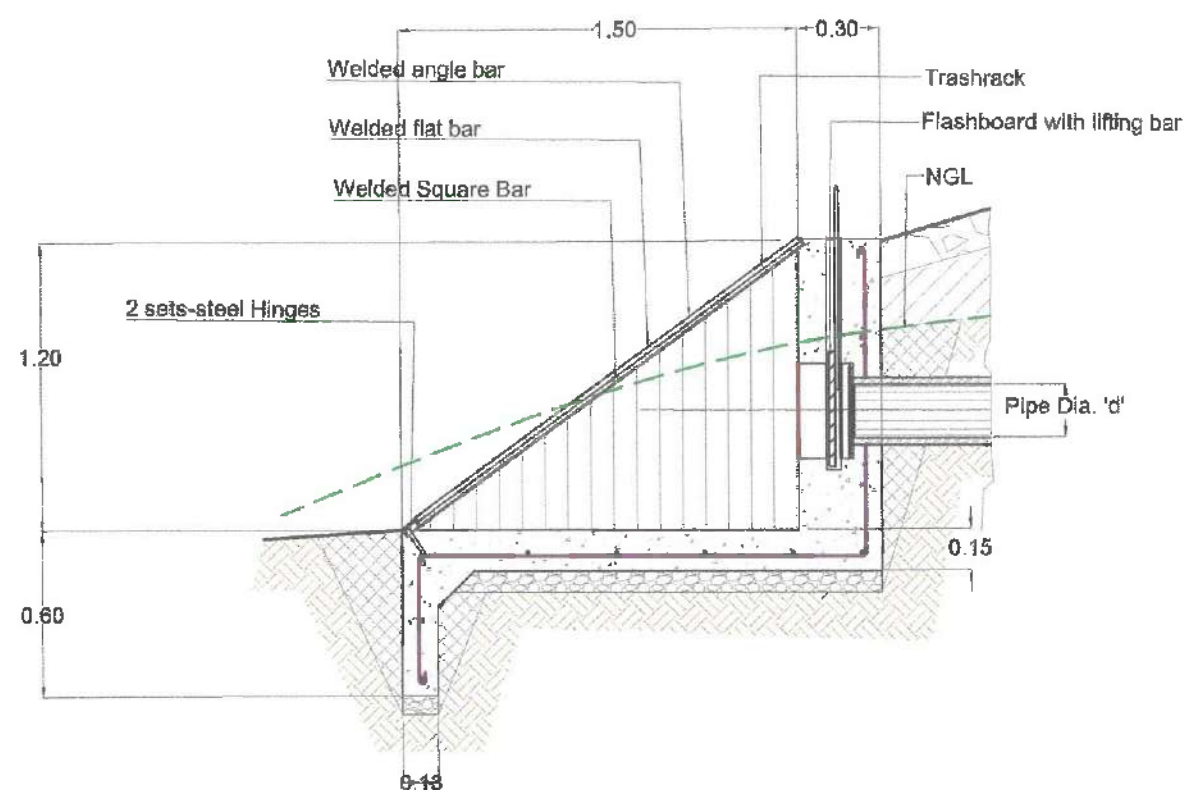




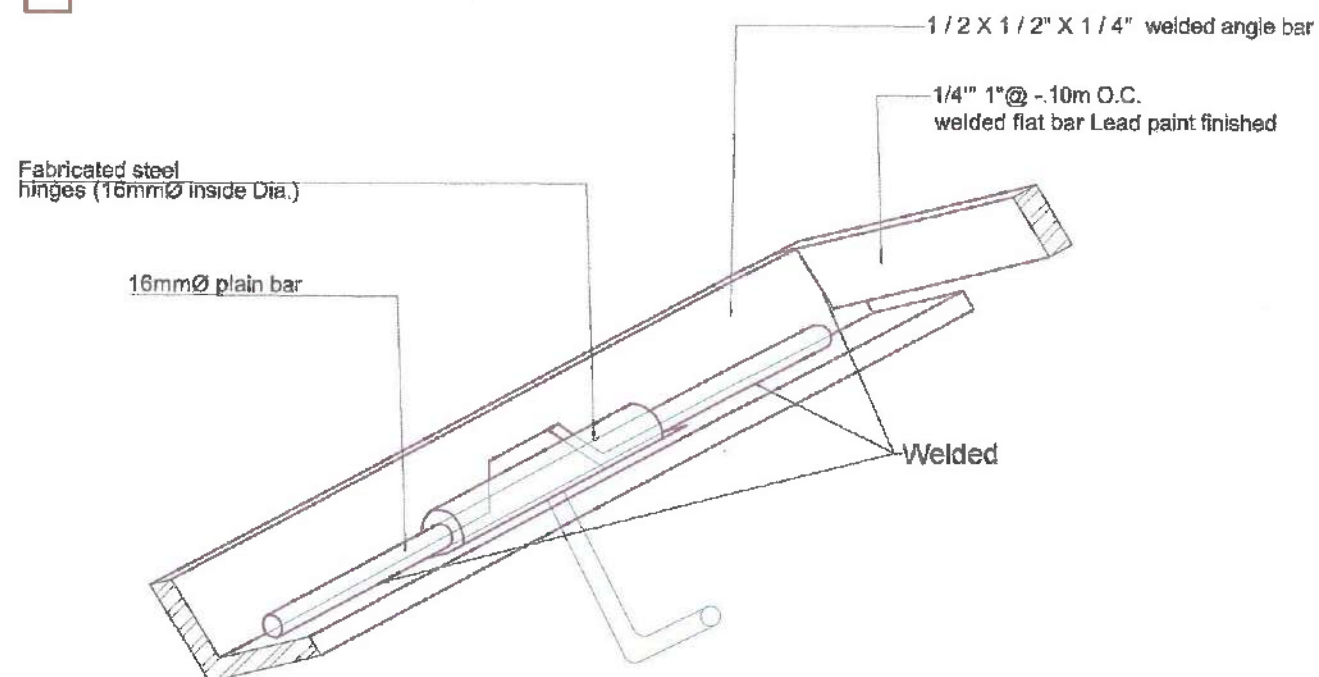
FRONT VIEW  
N. T. S.



TOP VIEW  
N. T. S.



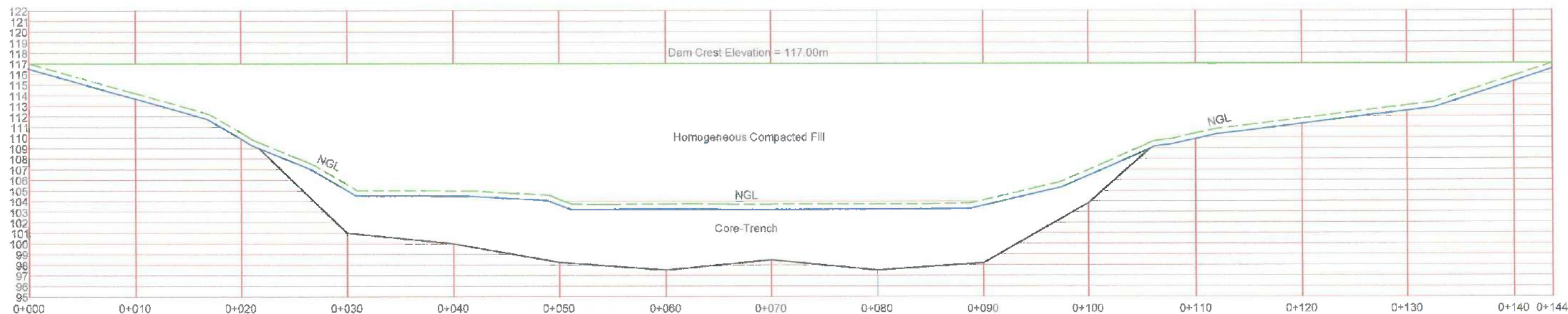
SIDE VIEW  
N. T. S.



DETAIL OF HINGES  
N. T. S.

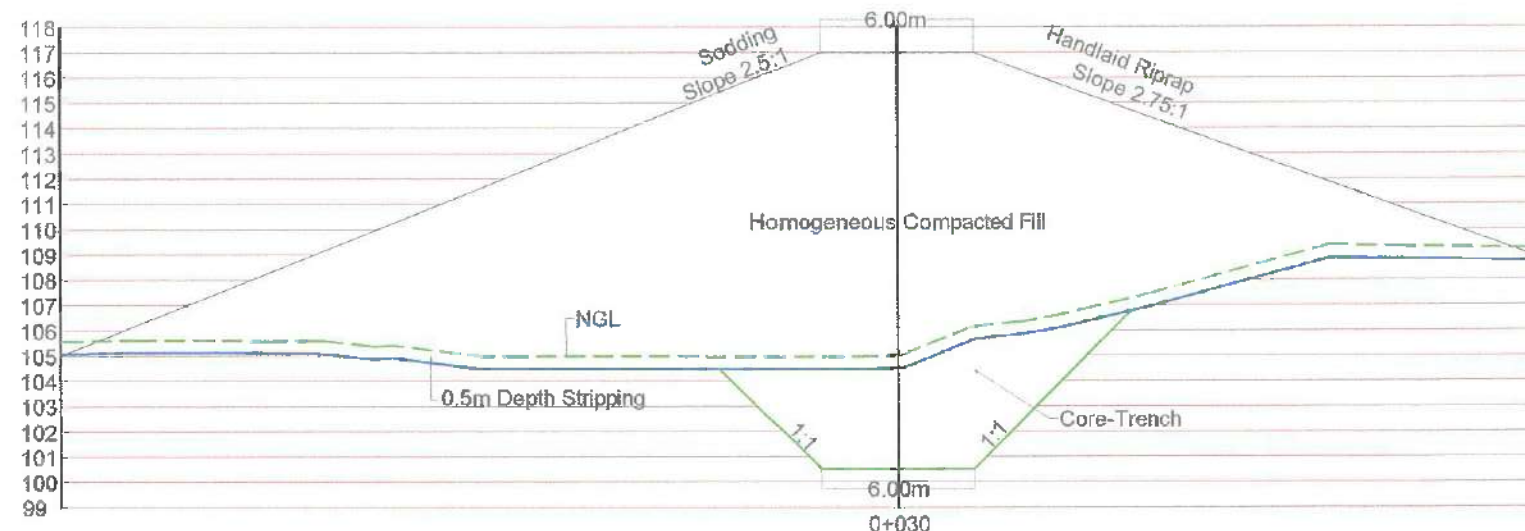
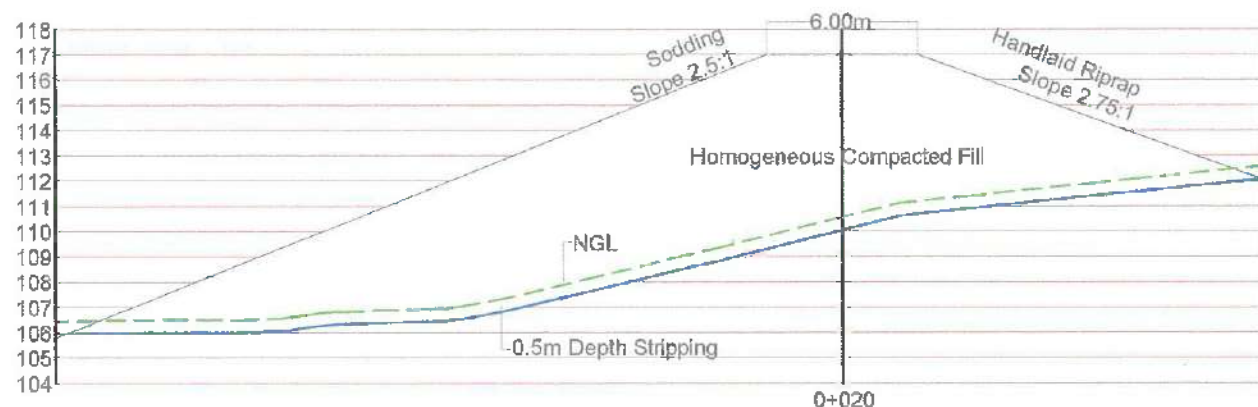
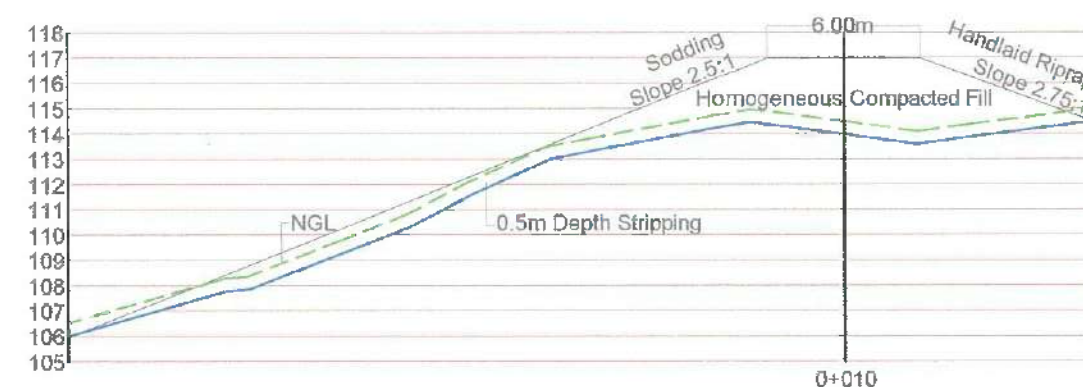
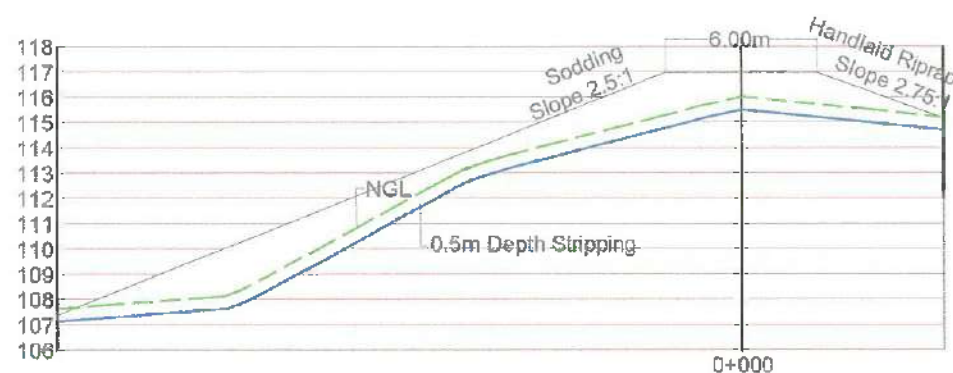
### STEEL TRASHRACK INLET

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  ENGR. ROGELIO B. CUIME, JR. WRDO II (RPABE No. 8870) Date: 02/14/2024	Checked / Reviewed by:  ENGR. ALBERT E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/14/2024	Recommending Approval:  ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/14/2024	Approved by:  GINA PANILO, Ph.D. Director Date:	Sheet Contents: <b>DETAILS OF STEEL TRASHRACK INLET</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	CAD / Drawn by: R. Samson Sheet No.: <b>13 / 30</b>
	Reference Code: BSWM_WD_IF_008 Control Number: 202404 WD-RES-00004 Effective Date: November 6, 2023						



## ELEVATION PROFILE ALONG CENTERLINE OF DAM EMBANKMENT

Scale 1 : 400 m

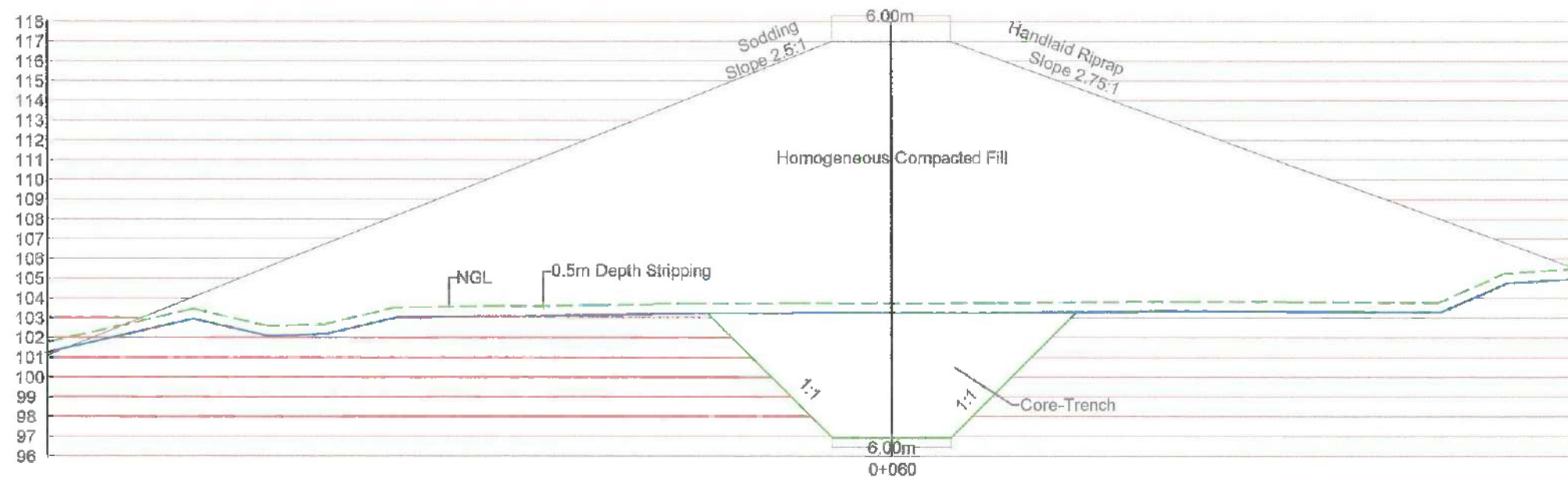
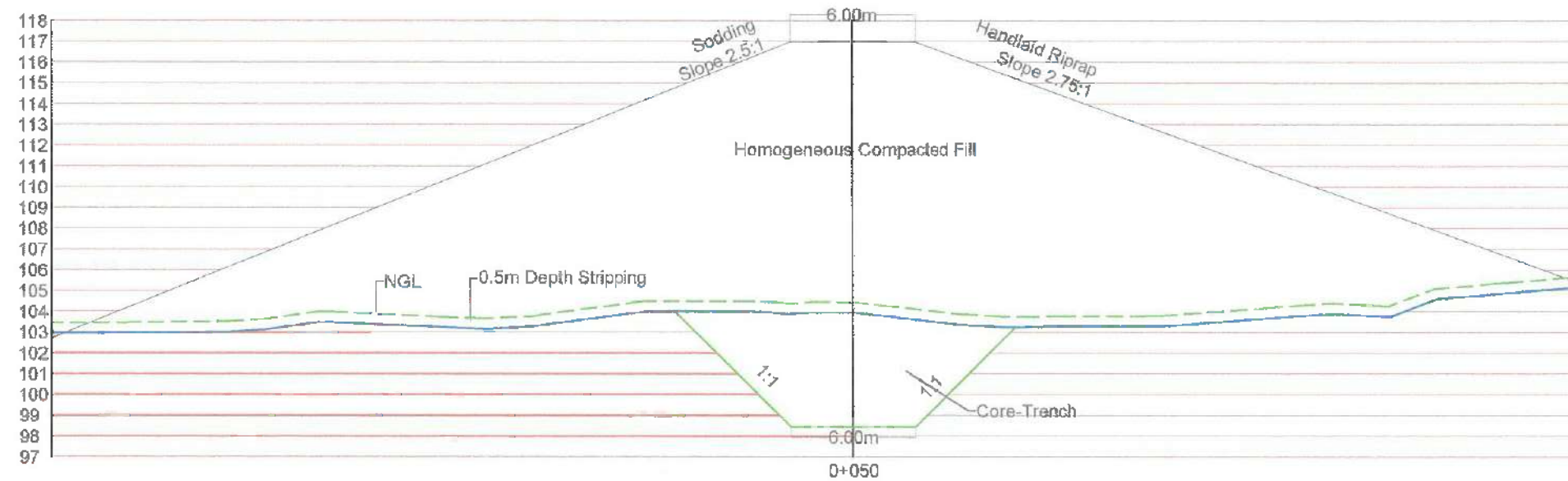
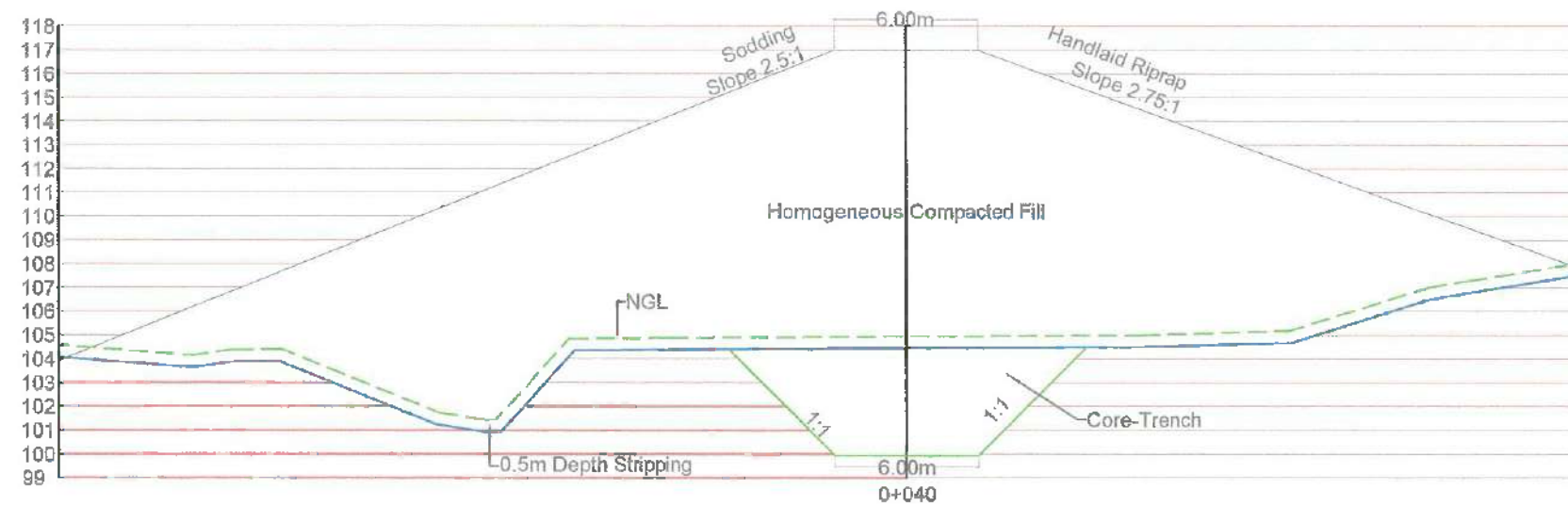


## CROSS-SECTIONS ALONG DAM EMBANKMENT

Scale 1 : 300 m






<p>DEPARTMENT OF AGRICULTURE</p> <p><b>Bureau of Soils and Water Management</b></p> <p>WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-IF-008</p> <p>Control Number: 202404 WD-RES-00006</p> <p>Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	<p>ENGR. ROGELIO B. CUIME JR.</p> <p>WRDO II</p> <p>(RPABE No.8870)</p> <p>Date: 02/16/2024</p>	<p>ENGR. ALBERTO E. DE GUZMAN</p> <p>Chief, Design and Engineering Section</p> <p>(RPABE No.3287)</p> <p>Date: 02/16/2024</p>	<p>ENGR. DIOSDADO M. MANALUS</p> <p>OIC, Water Resources Management Division</p> <p>(RPABE No.3057)</p> <p>Date: 02/22/2024</p>	<p>GNA P. NILO, Ph.D.</p> <p>Director</p> <p>Date: _____</p>	<p><b>PROFILE / CROSS-SECTIONS ALONG DAM EMBANKMENT</b></p> <p>Name of Project:</p> <p><b>Construction of Naglimpiyaan SWIP</b></p> <p>Location:</p> <p><b>Brgy. Baloy, Cuyapo, Nueva Ecija</b></p>	<p>R. Samson</p> <p>Sheet No.:</p> <p><b>14 / 30</b></p>

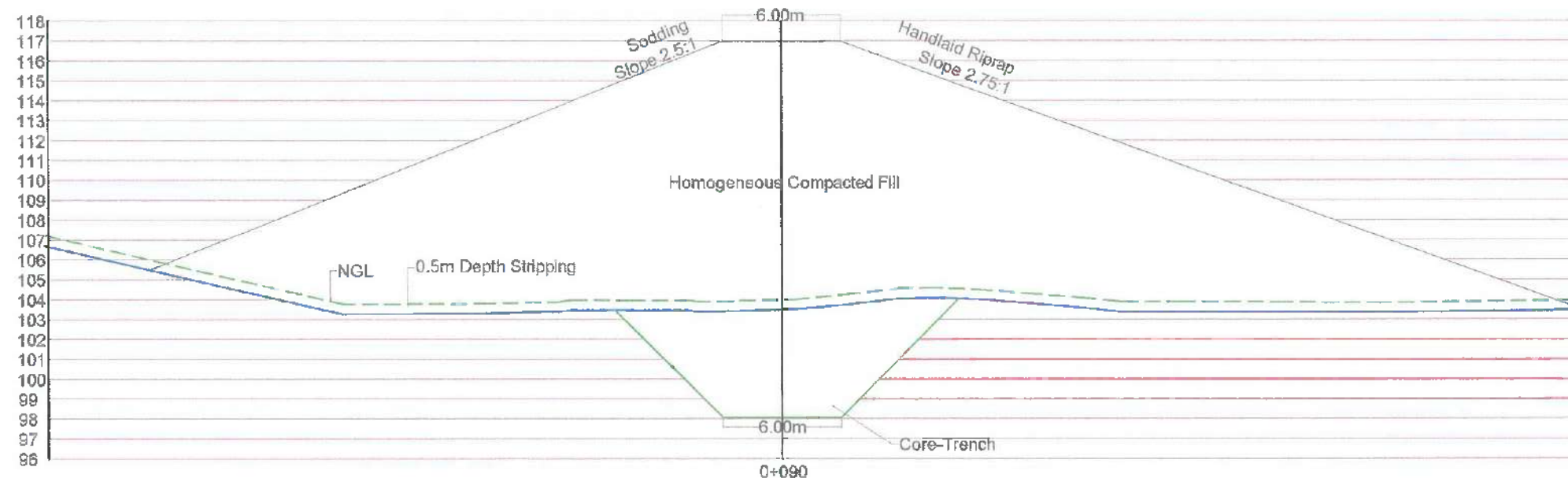
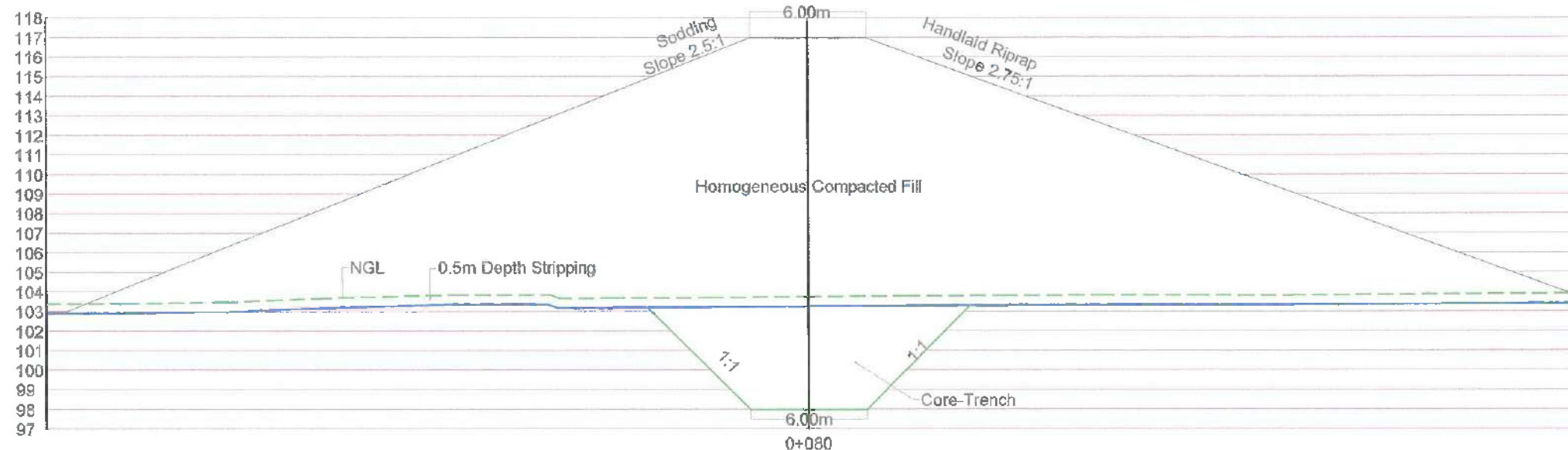
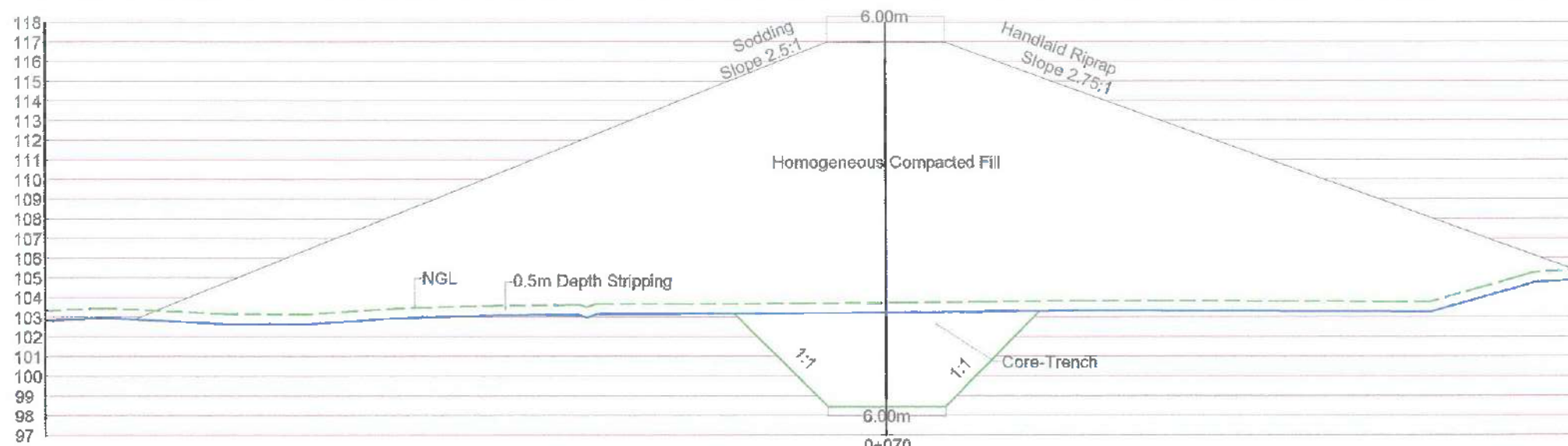




## CROSS-SECTIONS ALONG DAM EMBANKMENT

Scale 1 : 300 m

 <p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-JF-008 Control Number: 201404-WD-RES-00004 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO S. CUIME, JR.</b> WRDO II (RPABE No. 8370) Date: 5/2/2024	 <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 5/2/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 5/2/2024	 <b>GINA P. ALO, Ph.D.</b> Director Date:	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Naglilimpiyan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>15 / 30</b>

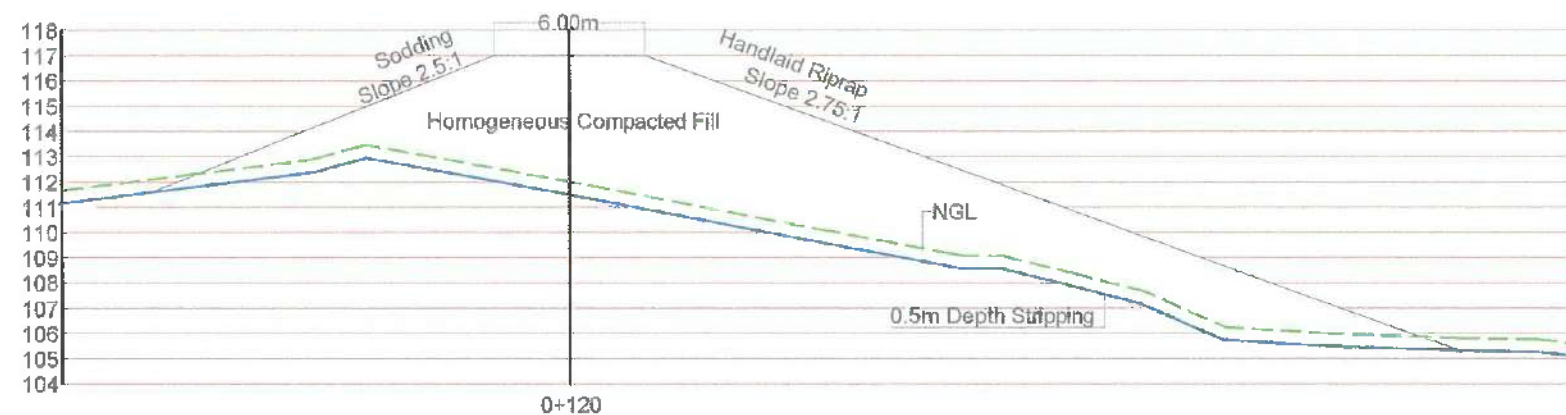
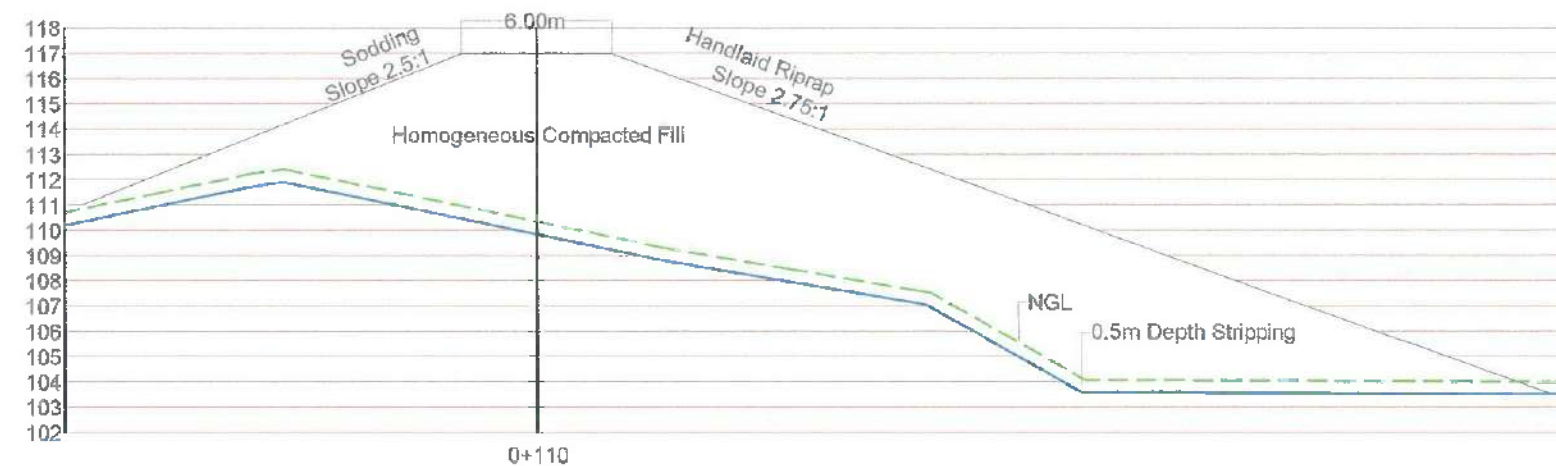
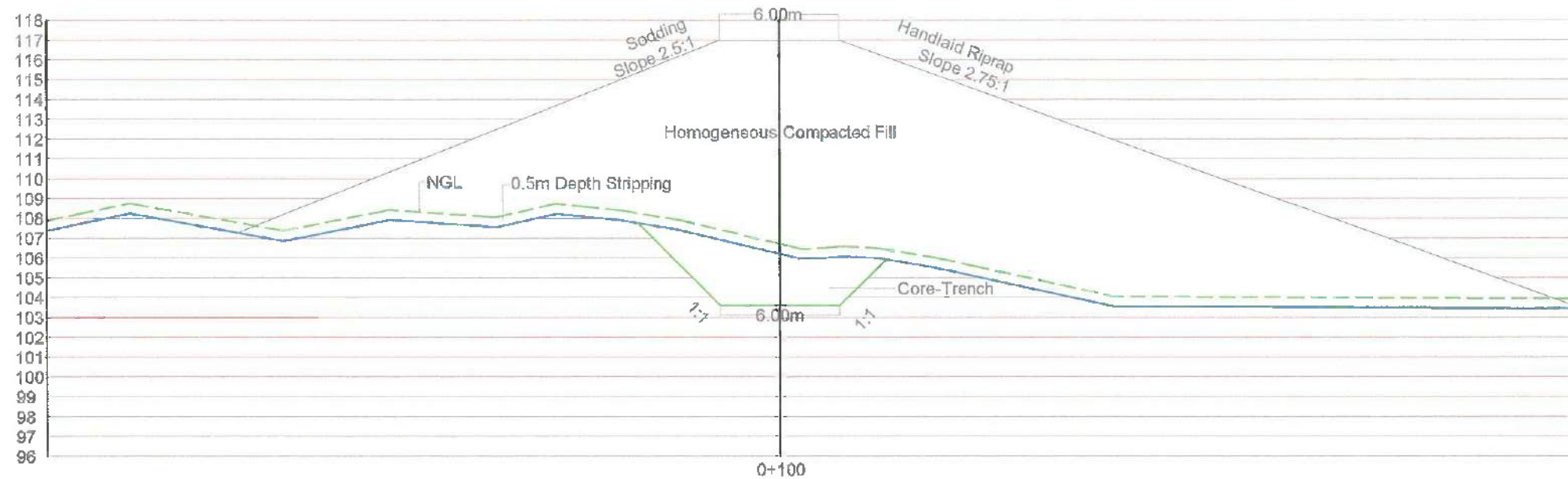


## CROSS-SECTIONS ALONG DAM EMBANKMENT






Scale 1 : 300 m

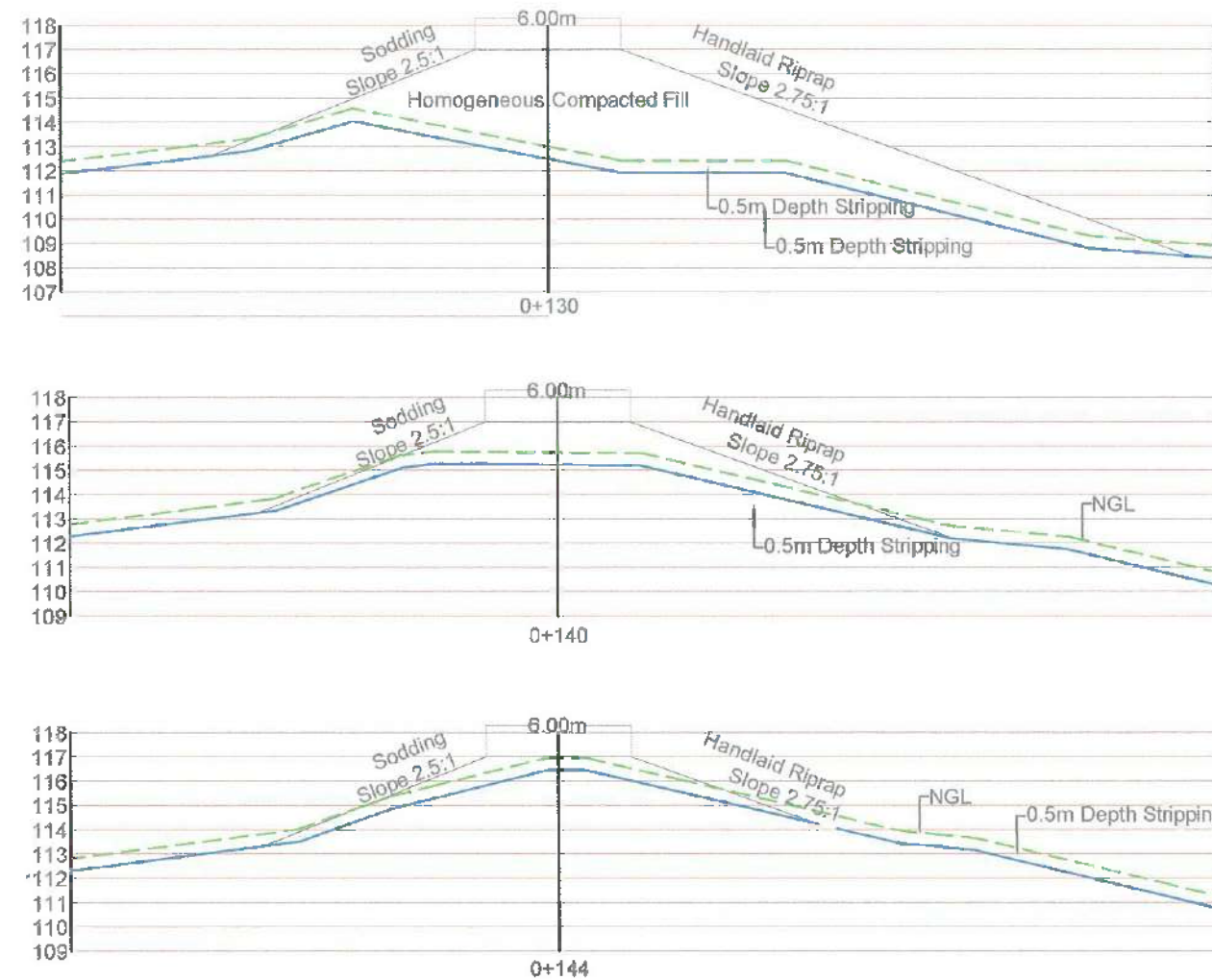
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_JF_008 Control Number: 2024-WD-RFS-00004 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		ENGR. ROGELIO B. CUIME, JR.	ENGR. ALBERTO E. DE GUZMAN	ENGR. DIOSDADO M. MANALUS	GINA P. NILO, Ph.D.	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b>	R. Samson
		WRDO II (RPABE No. 8870) Date: 02/21/2024	Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/21/2024	Director	Name of Project:	Sheet No.:
						Construction of Naglilimpiyaan SWP	16 / 30
						Location:	
						Brgy. Baloy, Cuyapo, Nueva Ecija	






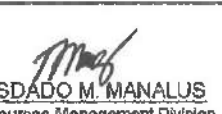



**CROSS-SECTIONS ALONG DAM EMBANKMENT**  
Scale 1 : 300 m

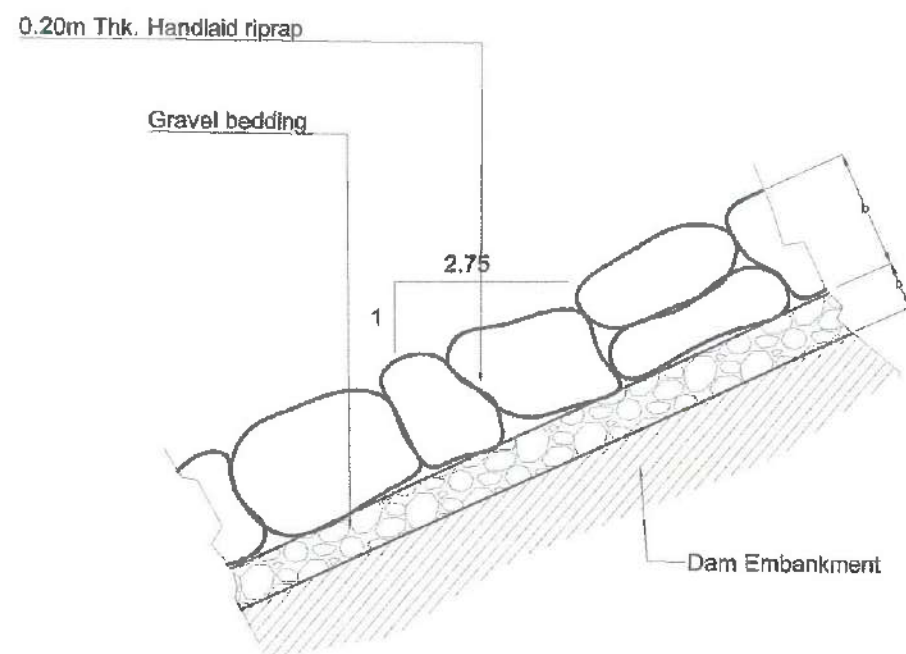
 <p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_IP_006 Control Number: 20464 WD-RES-00006 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 02/16/2024	 <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/22/2024	 <b>GINA P. NILO, Ph.D.</b> Director Date: _____	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Nagtilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>17 / 30</b>



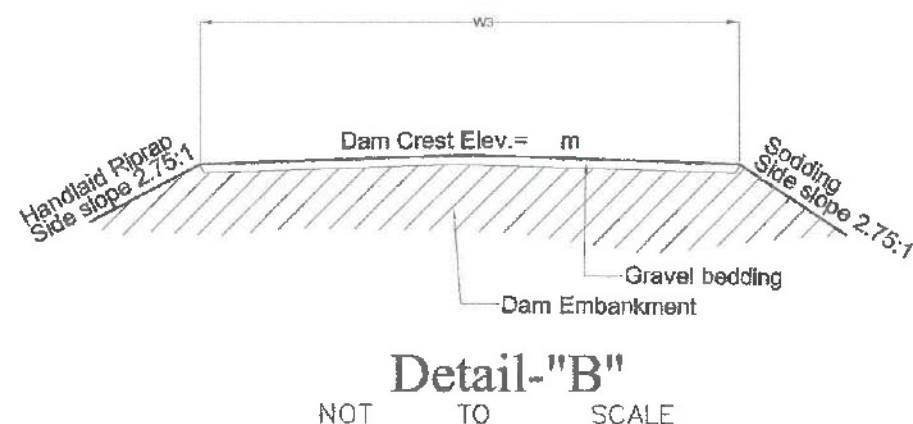
**CROSS-SECTIONS ALONG DAM EMBANKMENT**  
Scale 1 : 300 m

 <p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_JF_006 Control Number: 2024-WD-RS-00004 Effective Date: November 8, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No.8870) Date: 02/22/2024	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No.3287) Date: 02/22/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No.3057) Date: 02/22/2024	 <b>GINA PANILO, Ph.D.</b> Director Date:	<b>CROSS-SECTIONS ALONG DAM EMBANKMENT</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>18 / 30</b>





**Detail -1A (Handlaid Riprap)**  
NOT TO SCALE

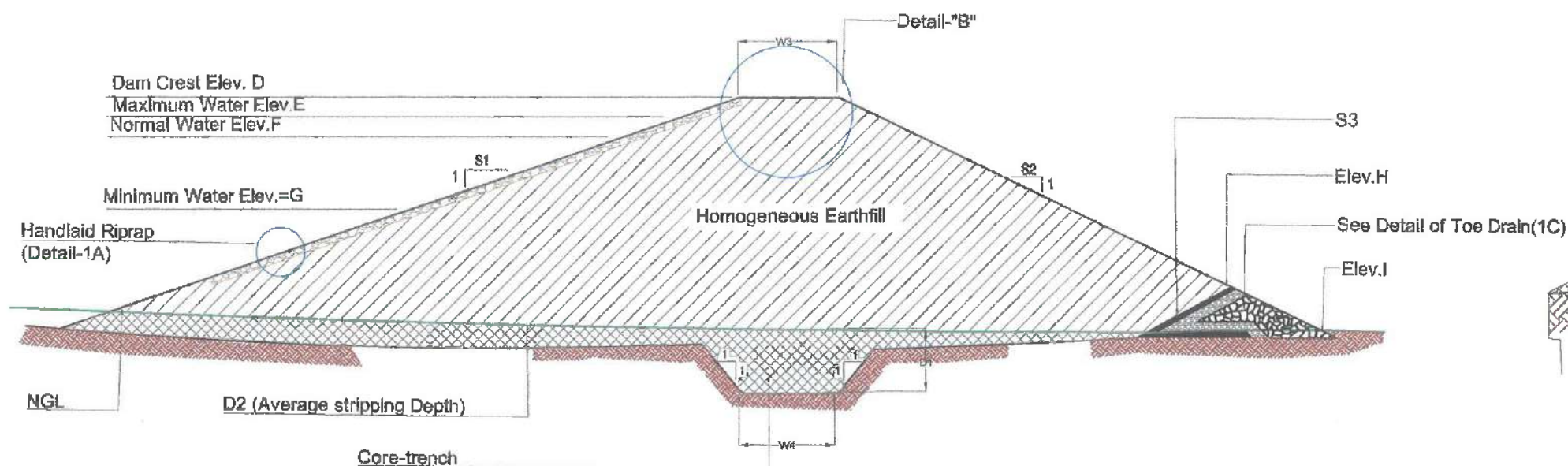


**Detail -B**

NOT TO SCALE

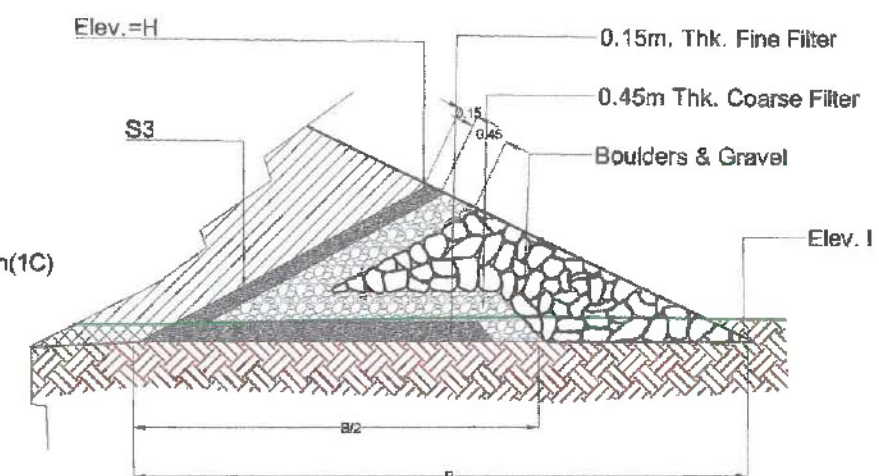
**SCHEDULE OF ELEVATIONS AND DIMENSIONS**

ELEV. D =	117.00m
ELEV. E =	115.54m
ELEV. F =	115.00m
ELEV. G =	105.30m
ELEV. H =	105.00m
ELEV. I =	103.00m
D1 =	6.00m
D2 =	0.50m
B =	5.00m
S1 =	2.75
S2 =	2.50
S3 =	1
W3 =	6.00m
W4 =	6.00m
B / 2 =	2.50m



**TYPICAL DAM SECTION**

NOT TO SCALE



**TOE-DRAIN DETAIL -1C**

NOT TO SCALE



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_IF\_006  
Control Number: 202404 WD 245-00004  
Effective Date: November 6, 2023

Prepared by:  
**ENGR. ROGELIO B. CUIME, JR.**  
WRDO II  
(RPABE No. 6970)  
Date: 02/14/2024

Checked / Reviewed by:  
**ENGR. ALBERTO E. DE GUZMAN**  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: 02/21/2024

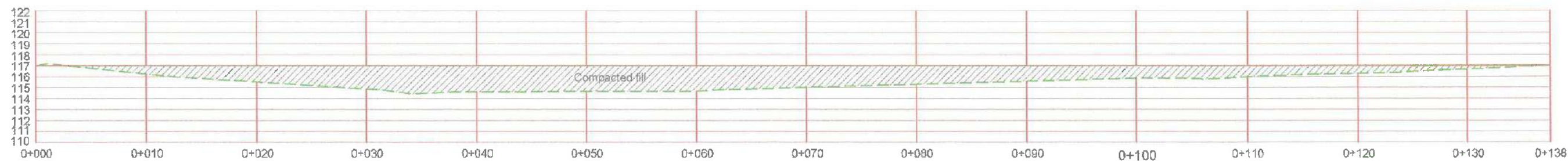
Recommending Approval:  
**ENGR. DIOSDADO M. MANALUS**  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: 2/22/2024

Approved by:  
**GWAF NINO, Ph.D.**  
Director  
Date: \_\_\_\_\_

Sheet Contents:  
**TYPICAL DAM SECTION / TOE DRAIN**  
Name of Project:  
**Construction of Naglilimpiyaan SWIP**  
Location:  
**Brgy. Baloy, Cuyapo, Nueva Ecija**

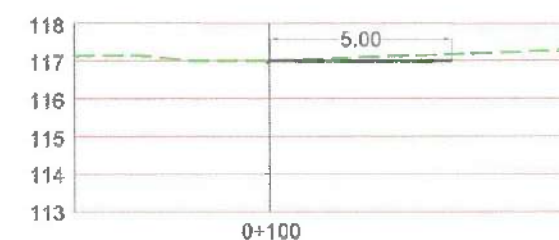
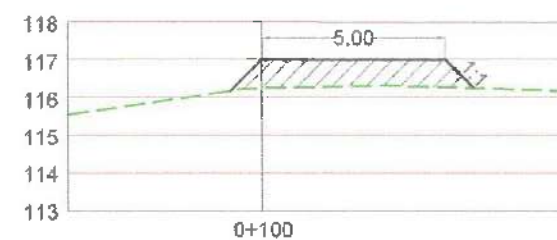
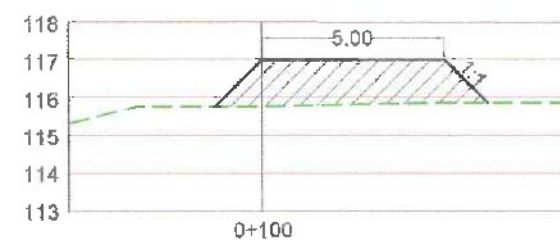
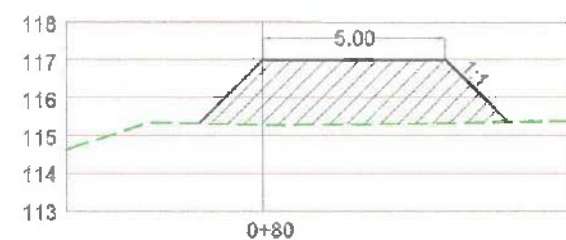
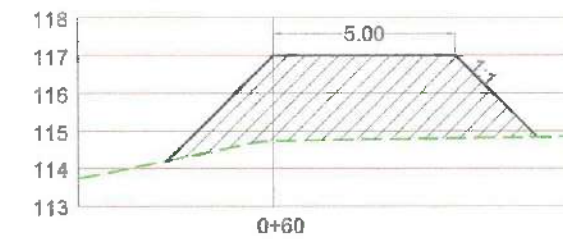
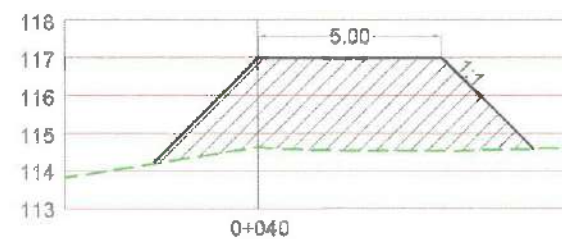
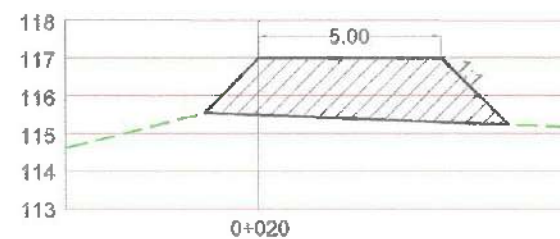
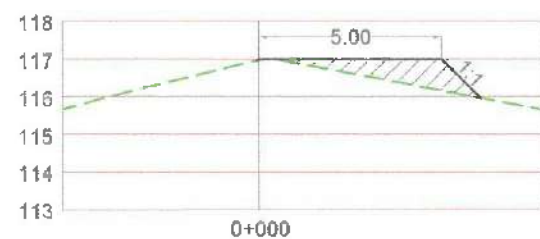
CAD / Drawn by:  
**R. Samson**  
Sheet No.:  
**19 / 30**





## PROFILE OF COMPACTED FILL



Scale 1 : 400m








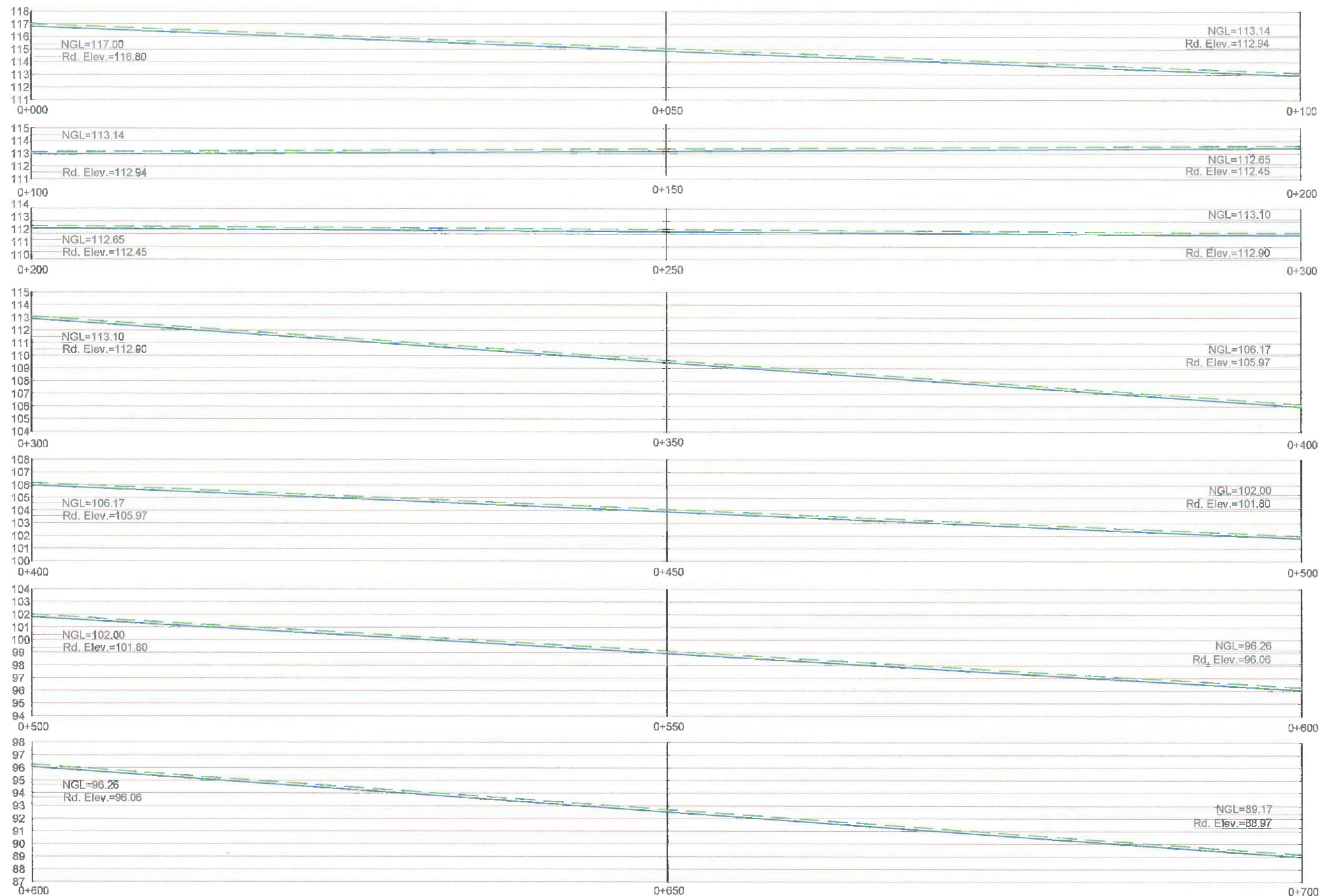
## CROSS-SECTIONS OF COMPACTED FILL

Scale 1 : 200m

### LEGEND:






-  NATURAL GROUND LINE
-  COMPACTED FILL

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents: <b>PROFILE AND CROSS-SECTIONS OF COMPACTED FILL</b>	CAD / Drawn by:
	Reference Code: BSWM-WD-IF-008 Control Number: 2024-04 WD-RES-00004 Effective Date: November 6, 2023	 <b>ENGR. ROGELIO S. CUIME, JR.</b> WRDO II (RPAB No. 8870) Date: 01/14/2024	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date: 01/14/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPAB No. 3087) Date: 02/24/2024	 <b>GINA F. NILO, Ph.D.</b> Director Date:	Name of Project: <b>Construction of Nagilimpiyaan SWP</b>	R. Samson
						Location:	Sheet No.:
						<b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	<b>20 / 30</b>

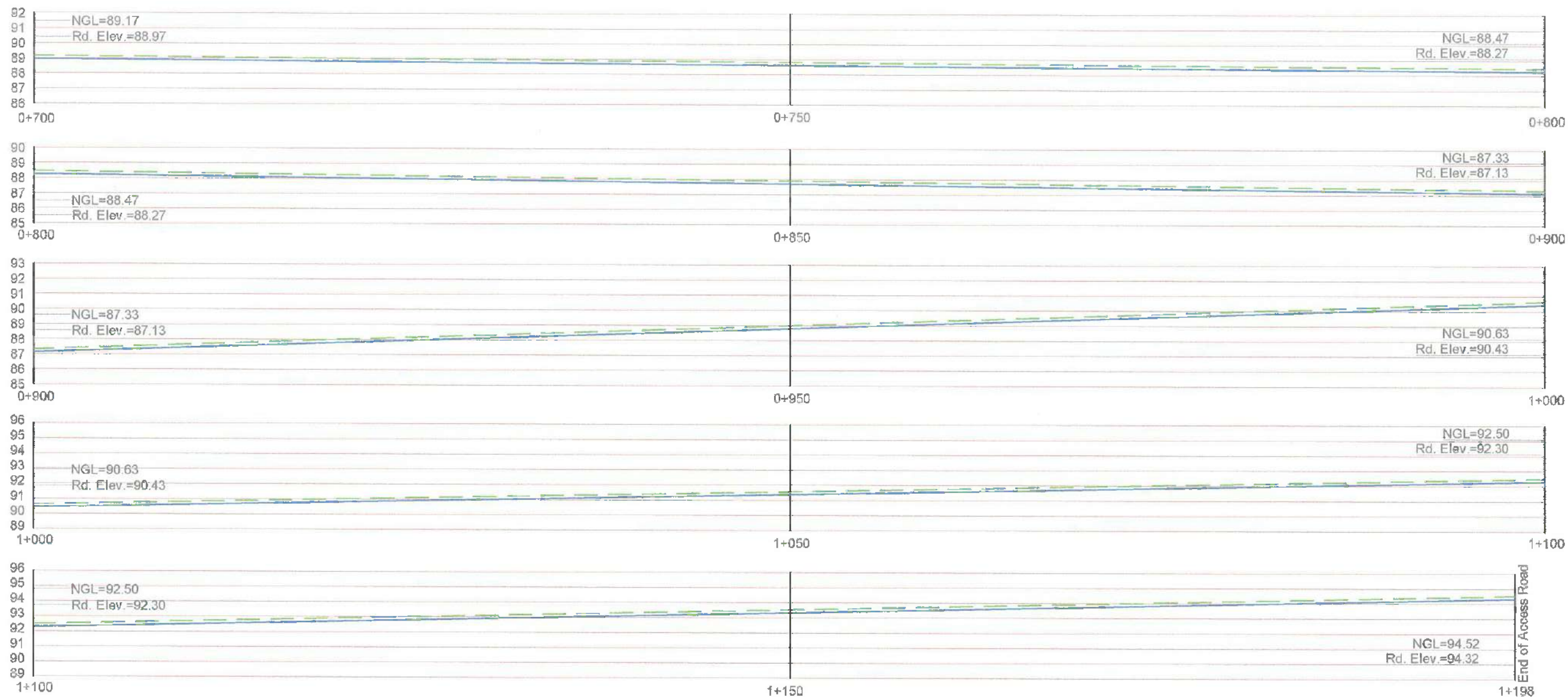


## PROFILE OF ACCESS ROAD

Scale 1 : 300m

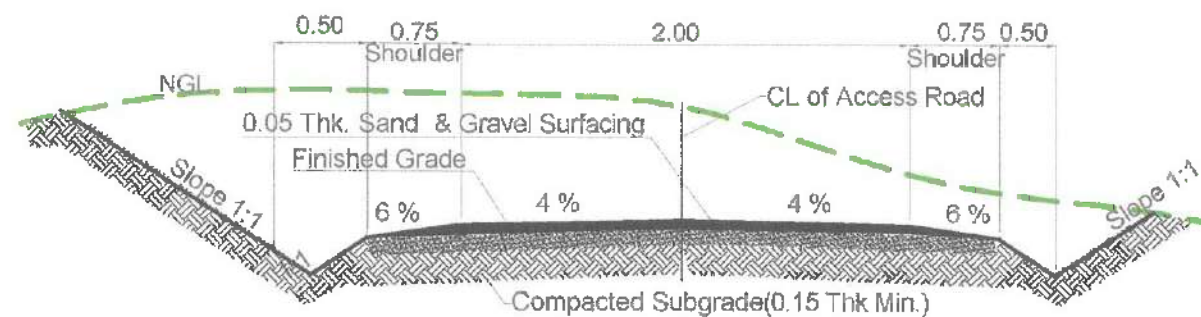
 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_006 Control Number: 46464_WD_RS-00004 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 02/16/2024	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/16/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/16/2024	 <b>GINA P. WILO, Ph.D.</b> Director Date:	<b>PROFILE OF ACCESS ROAD</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	R. Samson Sheet No.: <b>21 / 30</b>











## PROFILE OF ACCESS ROAD

Scale 1 : 300m

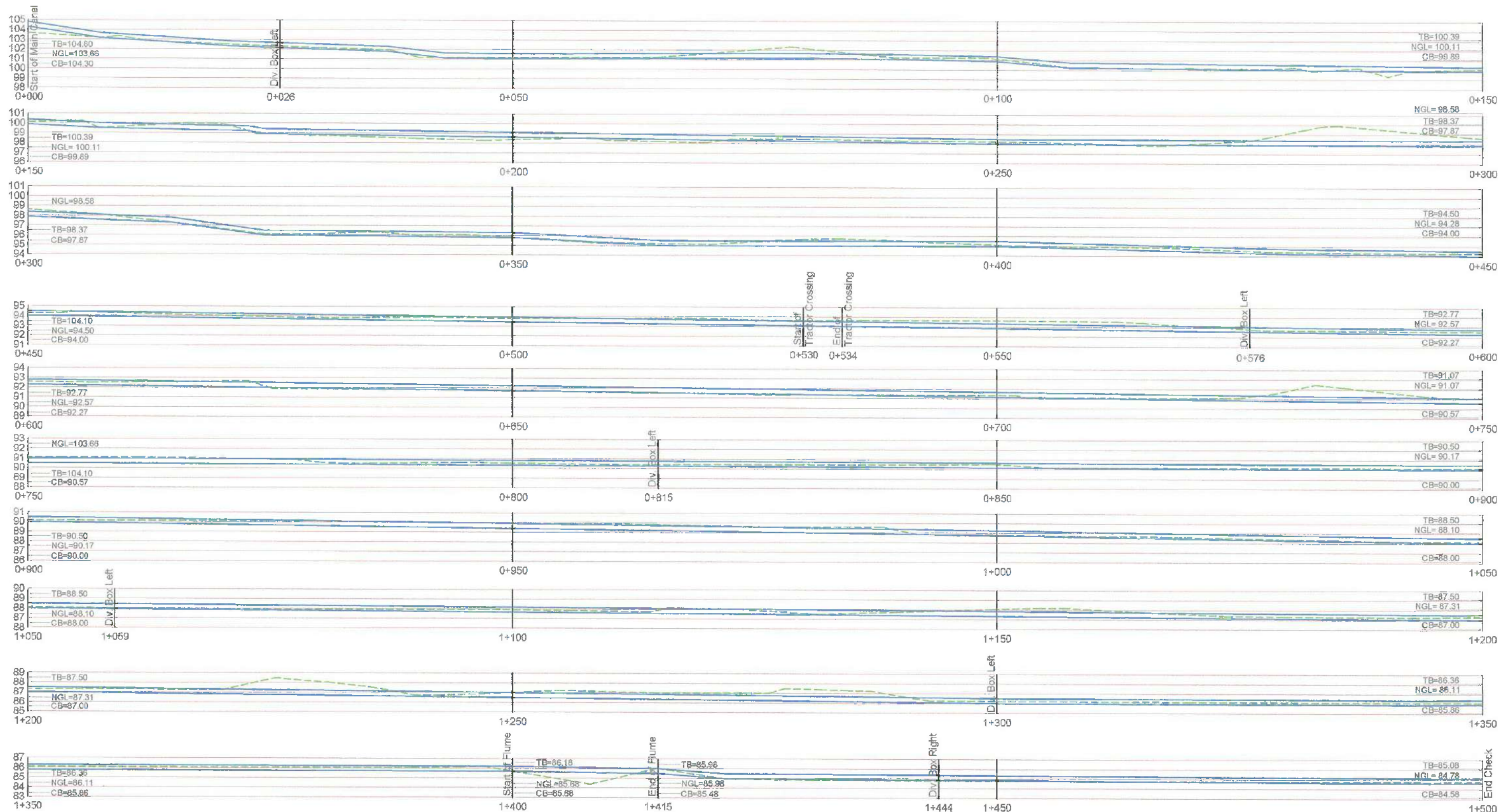


## TYPICAL CROSS-SECTION OF ACCESS ROAD

Scale Not To Scale

 	<b>DEPARTMENT OF AGRICULTURE</b>  <b>Bureau of Soils and Water Management</b>  WATER RESOURCES MANAGEMENT DIVISION	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Reference Code: <u>BSWM-WD-IP-006</u> Control Number: <u>2014-WD-RS-00006</u> Effective Date: November 6, 2023	 <u>ENGR. ROGELIO B. CUIME, JR.</u> WRDO II (RPAB No. 8870) Date: <u>02/01/2014</u>	 <u>ENGR. ALBERTO L. DE GUZMAN</u> Chief, Design and Engineering Section (RPAB No. 3287) Date: <u>02/01/2014</u>	 <u>ENGR. DIOSDADO M. MANALUS</u> OIC, Water Resources Management Division (RPAB No. 2057) Date: <u>02/01/2014</u>	 <u>GINA P. WLO, Ph.D.</u> Director Date: _____	<b>PROFILE OF ACCESS ROAD</b>	R. Samson
						Name of Project:	Sheet No.:
						<b>Construction of Naglilimpiyaan SWIP</b>	
						Location:	<b>22 / 30</b>
						<b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	



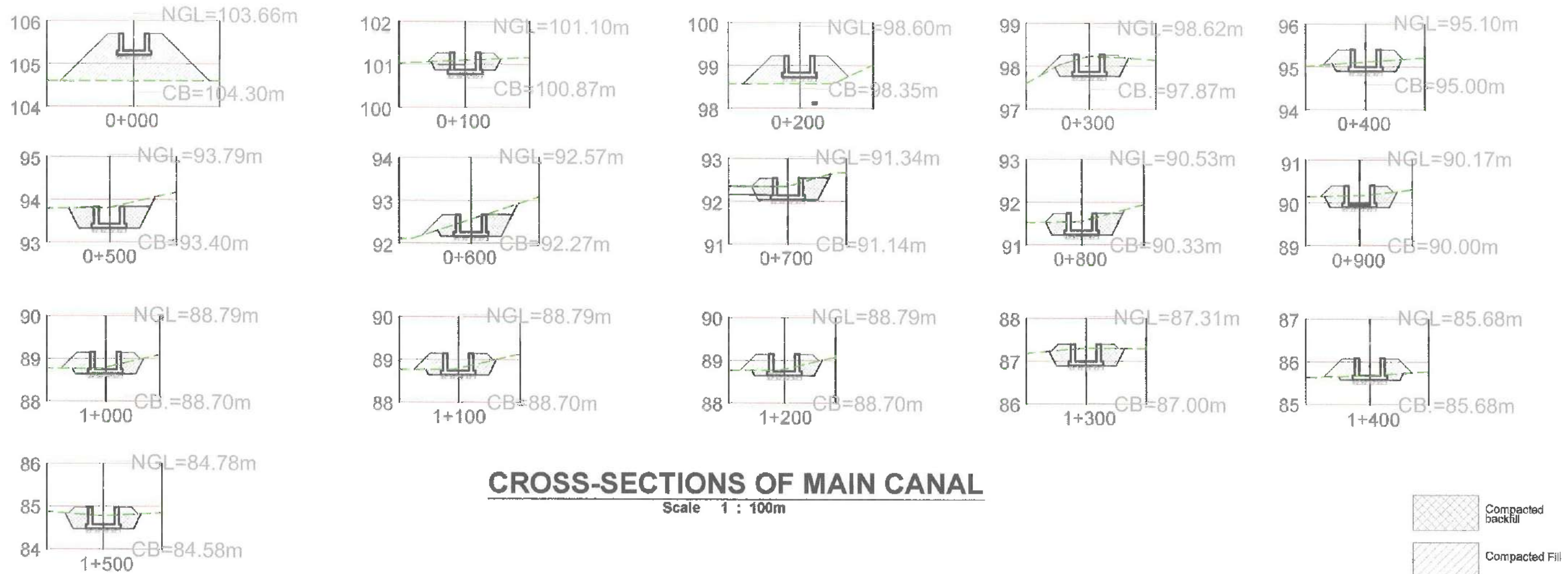


## PROFILE OF MAIN CANAL

Scale 1 : 400m

<p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-JF-008 Control Number: 2024-WD-RES-00006 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8970) Date: 02/11/2024	 <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/11/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/12/2024	 <b>GINA M. NILO, Ph.D.</b> Director Date:	<b>PROFILE OF MAIN CANAL</b> Name of Project: <b>Construction of Naglimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	<b>R. Samson</b> Sheet No.: <b>23 / 30</b>

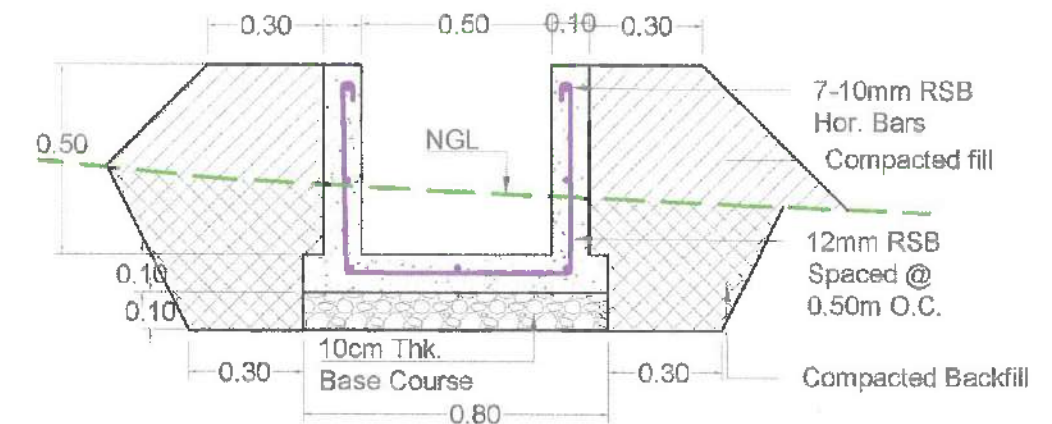




### CROSS-SECTIONS OF MAIN CANAL

Scale 1 : 100m

CANAL HYDRAULIC ELEMENTS											
Station		Q	b	n	S	d	P	A	R	D	V
From	To	cms	m			m	m	sqm.	m	m	m/sec
<b>Main</b>											
0+000	0+150	0.0902474	0.50	0.015	2.47%	0.1	0.7	0.05	0.0714	0.4	1.8049
0+150	0+300	0.0976155	0.50	0.015	1.35%	0.13	0.76	0.065	0.0855	0.43	1.5018
0+300	0+450	0.0921729	0.50	0.015	2.58%	0.1	0.7	0.05	0.0714	0.4	1.8435
0+450	0+600	0.0903371	0.50	0.015	1.15%	0.13	0.76	0.065	0.0855	0.43	1.3898
0+600	0+750	0.0895504	0.50	0.015	1.13%	0.13	0.76	0.065	0.0855	0.43	1.3777
0+750	0+900	0.0949815	0.50	0.015	0.38%	0.2	0.9	0.1	0.1111	0.5	0.9498
0+900	1+050	0.097131	0.50	0.015	1.33%	0.13	0.76	0.065	0.0855	0.43	1.4943
1+050	1+200	0.0922863	0.50	0.015	0.67%	0.16	0.82	0.08	0.0976	0.46	1.1536
1+200	1+350	0.0981017	0.50	0.015	0.75%	0.16	0.82	0.08	0.0976	0.46	1.2263
1+350	1+500	0.09569	0.50	0.015	0.86%	0.15	0.8	0.075	0.0938	0.45	1.2759



### TYPICAL CROSS-SECTION OF MAIN CANAL

Scale 1 : 20m

**DEPARTMENT OF AGRICULTURE**  
Bureau of Soils and  
Water Management  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_IF\_008  
Control Number: 2024-04\_WD-RES-00004  
Effective Date: November 6, 2023

Prepared by:  
  
ENGR. ROGELIO S. CUIME, JR.  
WRDO II  
(RPABE No. 8870)  
Date: 02/16/2024

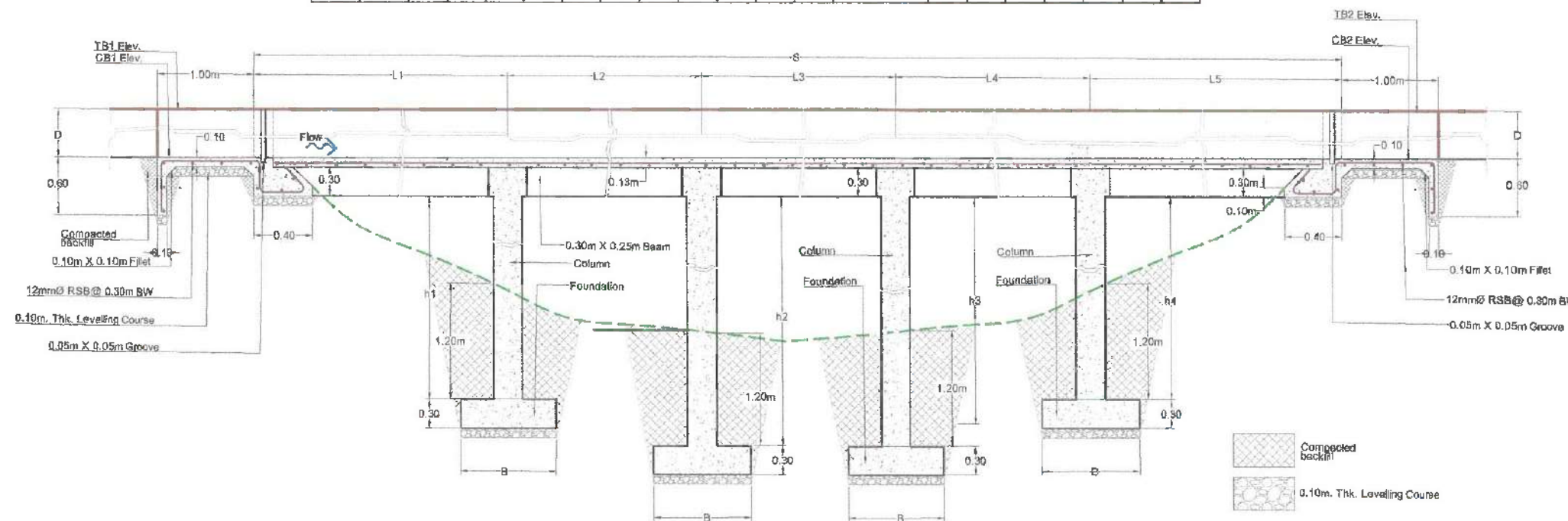
Checked / Reviewed by:  
  
ENGR. ALBERTO C. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: 02/24/2024

Recommending Approval:  
  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: 02/22/2024

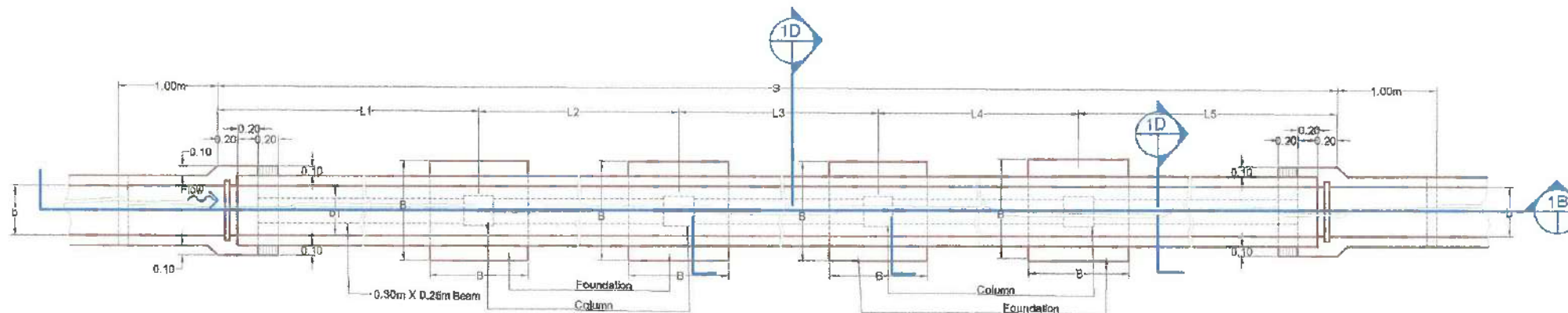
Approved by:  
  
GINA F. NINO, Ph.D.  
Director  
Date: \_\_\_\_\_

Sheet Contents:  
**CANAL DETAILS**  
Name of Project:  
**Construction of Naglilimpiyaan SWIP**  
Location:  
**Brgy. Baloy, Cuyapo, Nueva Ecija**  
CAD / Drawn by:  
R. Samson  
Sheet No.:  
**24 / 30**

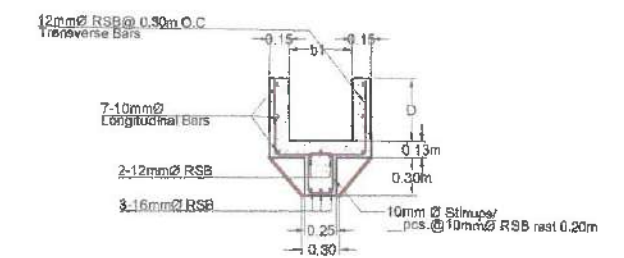
SCHEDULE OF ELEVATIONS AND DIMENSIONS																	
Station		Elevation (m.)				Dimension (m.)											
From	To	TB1	CB1	TB2	CB2	b	b1	D	h1	h2	h3	h4	No. of Column	S	B	L1	L2
1+400	1+415	86.18	85.68	85.98	85.48	0.50	0.50	0.50	2	2	2	2	4	15	5	3	3



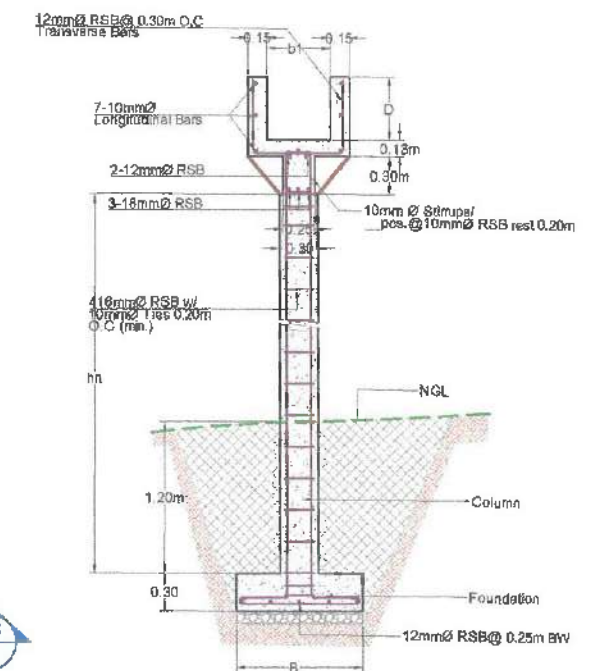
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SCALE: 1:50 M.



PLAN OF CONCRETE FLUME  
SCALE: 1:50 M.



SECTIONS -"1C"  
SCALE: 1:50 M.



SECTIONS -"1D"  
SCALE: 1:50 M.

**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_JF\_006  
Control Number: 202404\_WD-JF-000016  
Effective Date: November 6, 2023

Prepared by:  
  
ENGR. ROGELIO B. CUIME, JR.  
WRDO II  
(RPABE No. 8870)  
Date: 02/16/2024

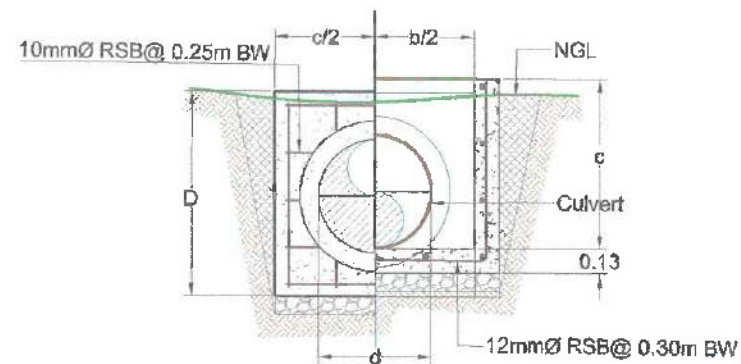
Checked / Reviewed by:  
  
ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: 02/21/2024

Recommending Approval:  
  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: 02/21/2024

Approved by:  
  
GINA F. NILO, Ph.D.  
Director  
Date: \_\_\_\_\_

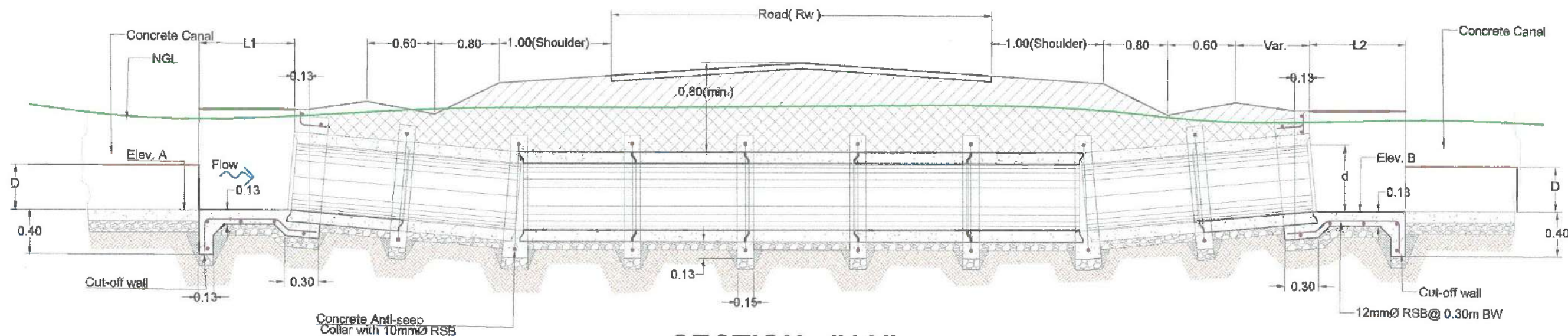
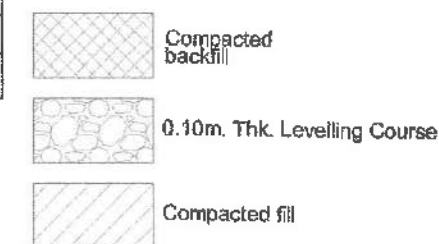
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**CONCRETE FLUME**  
Name of Project:  
**Construction of Naglimpiyaan SWIP**  
Location:  
**Brgy. Baloy, Cuyapo, Nueva Ecija**  
CAD / Drawn by:  
R. Samson  
Sheet No.:  
**25 / 30**



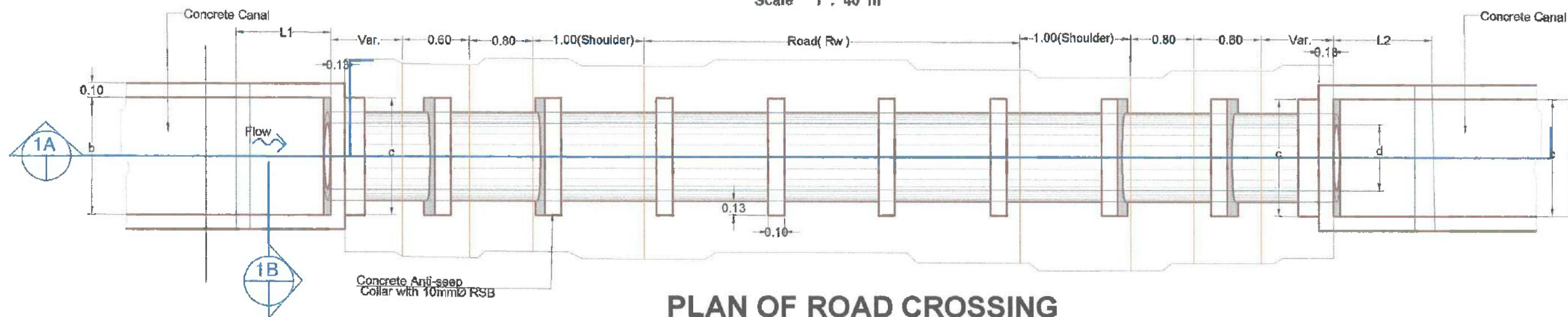


**SECTION - "1B"**  
Scale 1 : 40 m

SCHEDULE OF ELEVATIONS AND DIMENSIONS										
Main Canal A Station		Elevation (m.)		Dimension (m.)						
From	To	A	B	b	c	D	d	L1	L2	No. of Culvert
0+475	0+478	131.7	131.7	0.40	0.91	0.40	0.61	1.00	1.00	3



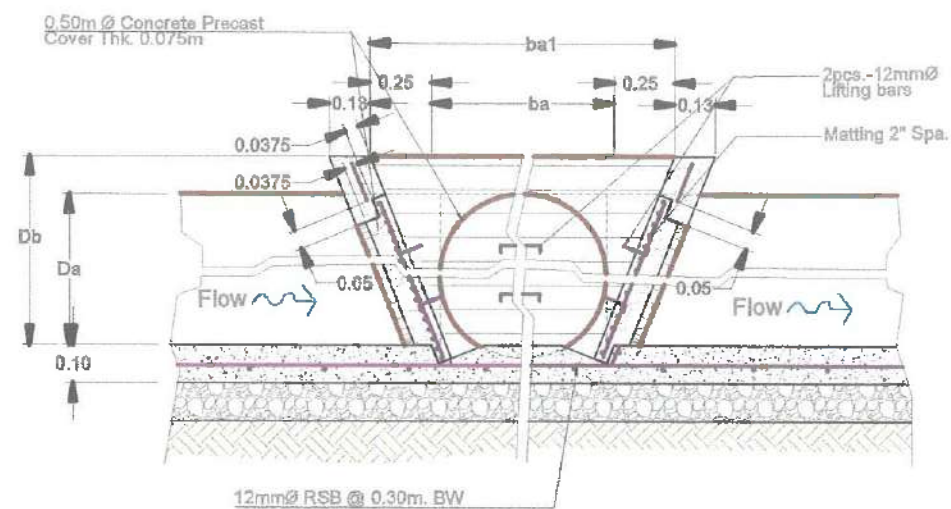
**SECTION - "1A"**  
Scale 1 : 40 m



**PLAN OF ROAD CROSSING**  
Scale 1 : 40 m

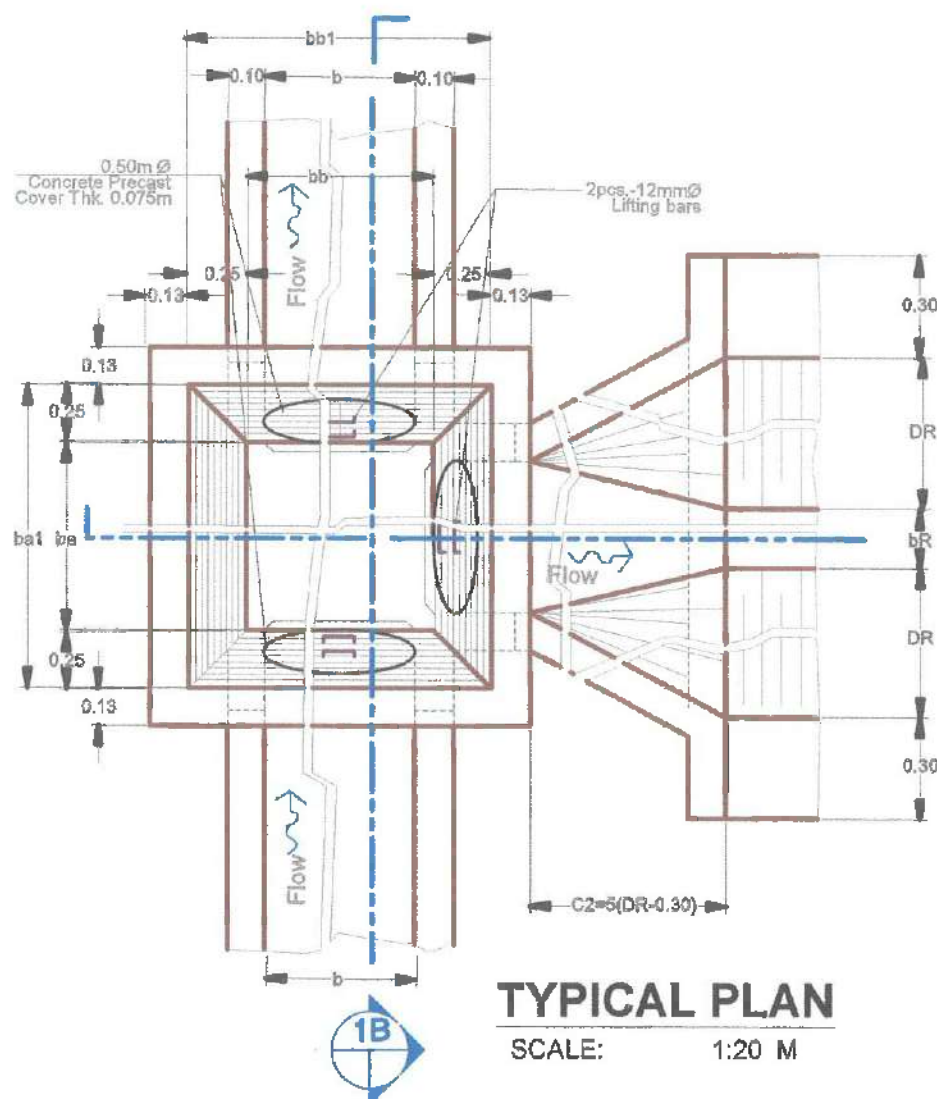
<p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-JF-008 Control Number: 2024-WD-RES-00006 Effective Date: November 8, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. ROGEL B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 04/16/2024	 <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 04/21/2024	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/24/2024	 <b>GINA PANILO, Ph.D.</b> Director Date:	<b>TYPICAL PLAN/SECTIONS OF ROAD CROSSING</b> Name of Project: <b>Construction of Naglilimpiyaan SWIP</b> Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	<b>R. Samson</b> Sheet No.: <b>26 / 30</b>





**SECTION-"1B"**

SCALE: 1:20 M



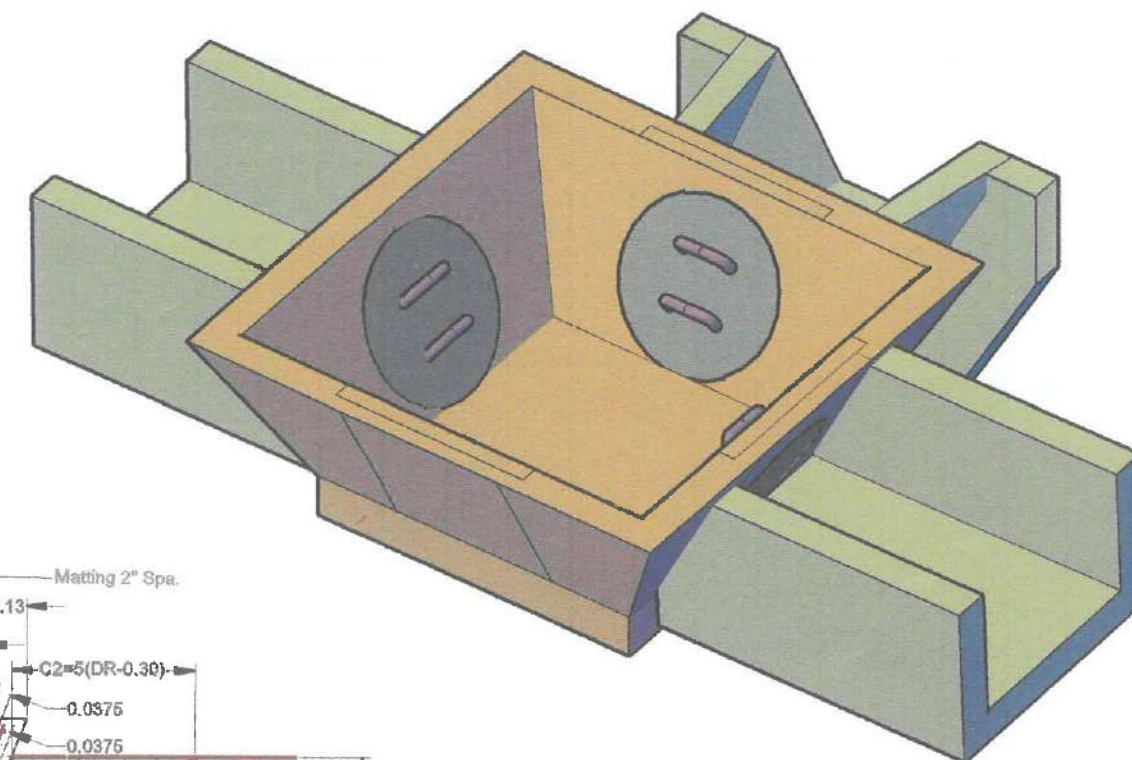
**TYPICAL PLAN**

SCALE: 1:20 M

**TYPICAL PLAN/SECTIONS OF DIVISION BOX RIGHT**

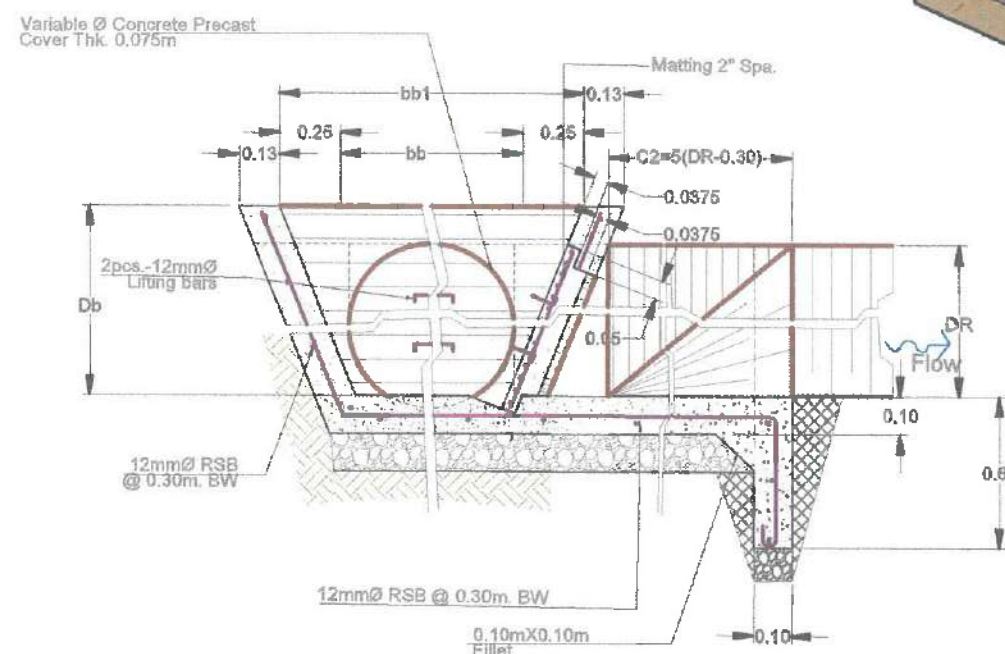
SCALE AS SHOWN

SCHEDULE OF DIMENSIONS DIVISION BOX-LEFT										
Station	b	ba	ba1	bb	bb1	bR	C2	DR	Da	Db
1+444	0.50	0.50	1.00	0.50	1.00	0.30	1.00	0.50	0.50	0.70



**ISOMETRIC VIEW**

SCALE: 1:20 M



**SECTION-"1A"**

SCALE: 1:20 M



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**  
 Reference Code: BSWM\_WD\_IF\_008  
 Control Number: 202404 WD-PES-00006  
 Effective Date: November 6, 2023

Prepared by:  
**ENGR. ROGELIO B. CUIME, JR.**  
 WRDO II  
 (RPABE No.8870)  
 Date: 04/16/2024

Checked / Reviewed by:  
**ENGR. ALBERTO E. DE GUZMAN**  
 Chief, Design and Engineering Section  
 (RPABE No.3287)  
 Date: 04/21/2024

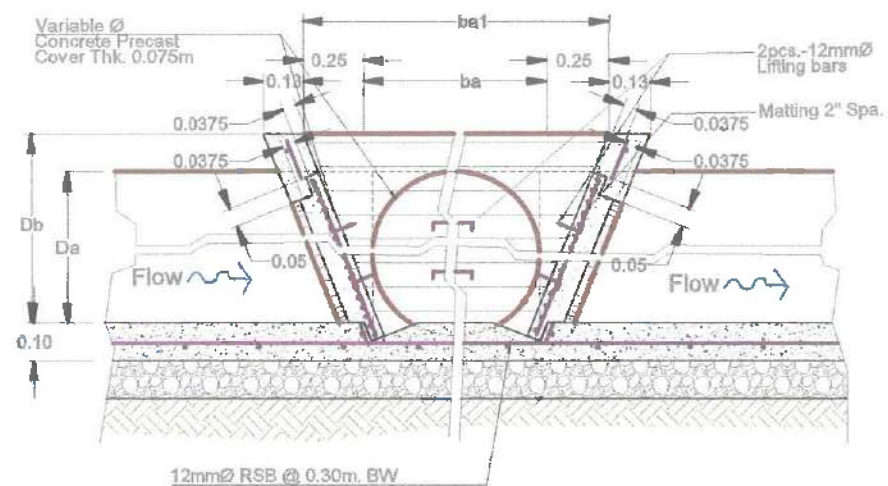
Recommending Approval:  
**ENGR. DIOSDADO M. MANALUS**  
 OIC, Water Resources Management Division  
 (RPABE No.3057)  
 Date: 04/24/2024

Approved by:  
**GINA PANILO, Ph.D.**  
 Director  
 Date: 04/24/2024

Sheet Contents:  
**TYPICAL PLAN/SECTIONS OF DIVISION BOX RIGHT**  
 Name of Project:  
**Construction of Naglilimpiyaan SWIP**  
 Location:  
**Brgy. Baloy, Cuyapo, Nueva Ecija**

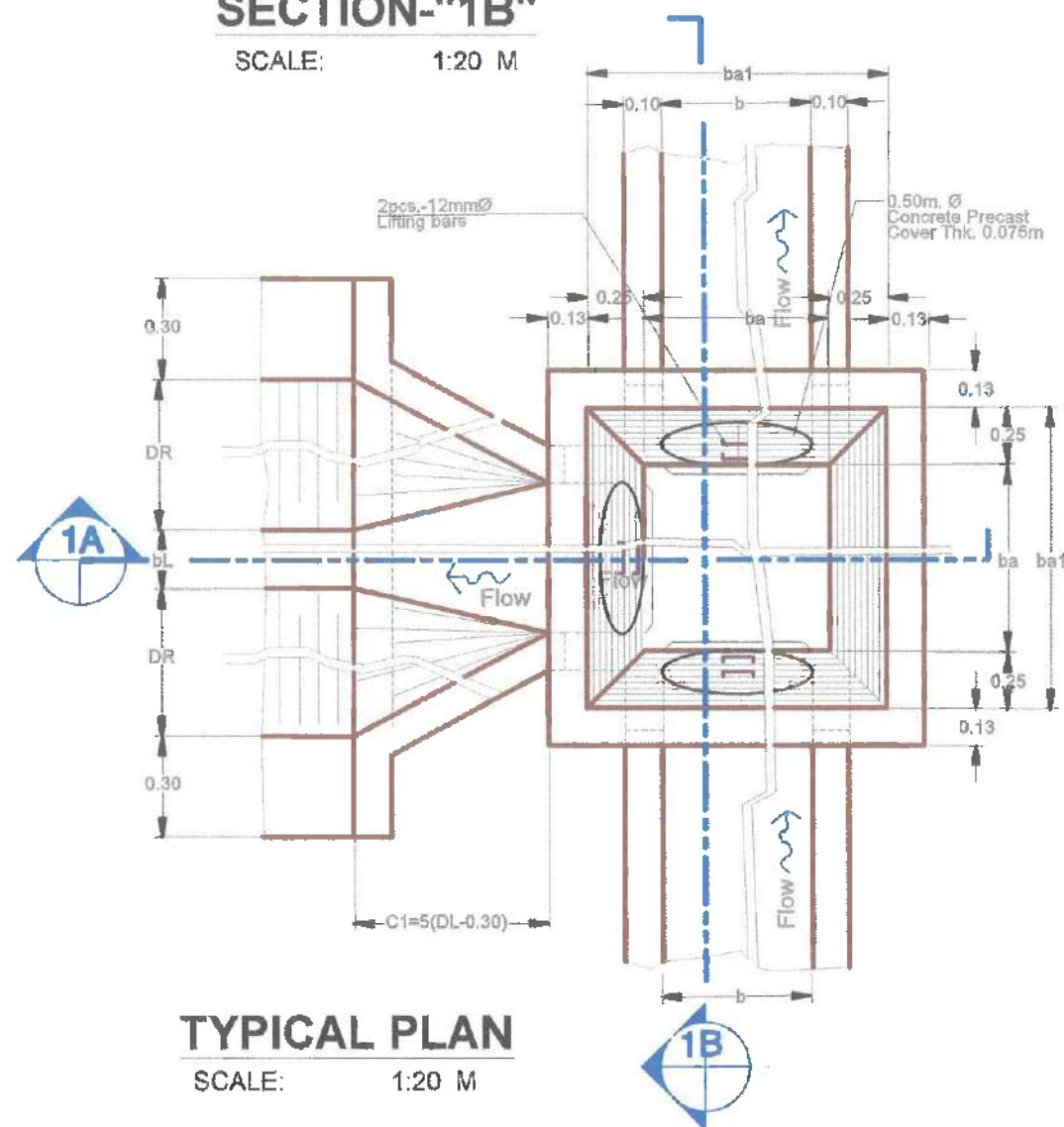
CAD / Drawn by:  
**R. Samson**  
 Sheet No.:  
**27 / 30**





**SECTION-"1B"**

SCALE: 1:20 M



**TYPICAL PLAN**

SCALE: 1:20 M

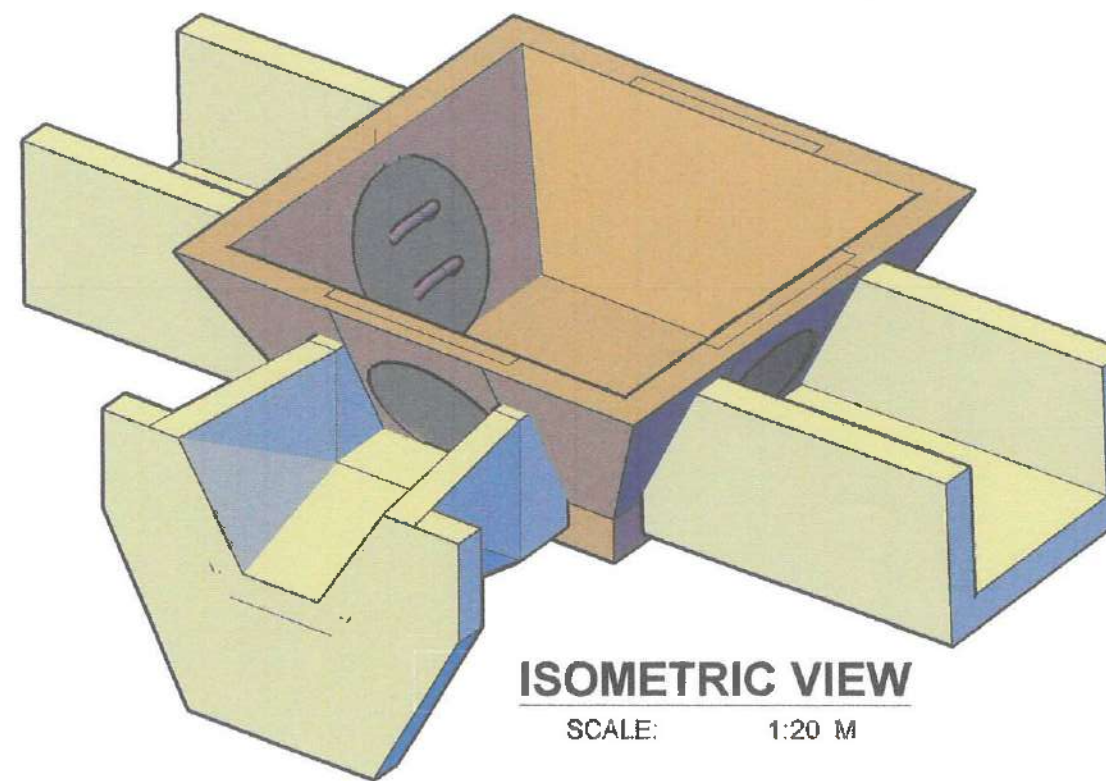
**TYPICAL PLAN/SECTIONS OF DIVISION BOX LEFT**

SCALE AS SHOWN

SCHEDULE OF DIMENSIONS DIVISION BOX-LEFT									
Station	b	ba	ba1	bb1	bR	C2	DR	Da	Db
0+026	0.50	0.50	1.00	1.00	0.30	1.00	0.50	0.50	0.70
0+576	0.50	0.50	1.00	1.00	0.30	1.00	0.50	0.50	0.70
0+815	0.50	0.50	1.00	1.00	0.30	1.00	0.50	0.50	0.70
1+059	0.50	0.50	1.00	1.00	0.30	1.00	0.50	0.50	0.70
1+900	0.50	0.50	1.00	1.00	0.30	1.00	0.50	0.50	0.70

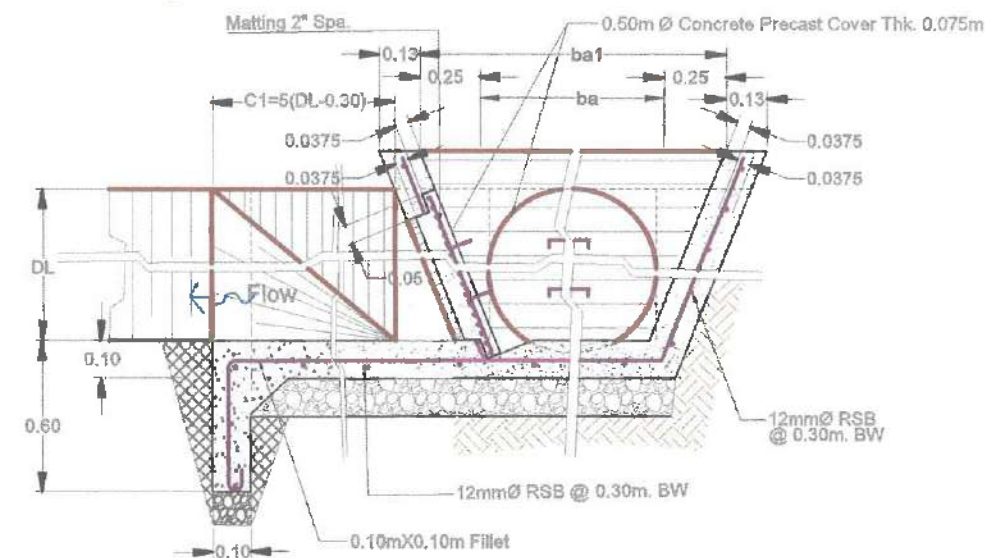
Compacted backfill

0.10m. Thk. Levelling Course



**ISOMETRIC VIEW**

SCALE: 1:20 M



**SECTION-"1A"**

SCALE: 1:20 M



**DEPARTMENT OF AGRICULTURE**  
Bureau of Soils and Water Management  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_IF\_008  
Control Number: 202404 WD-RES-00006  
Effective Date: November 6, 2023

Prepared by:  
  
ENGR. ROGELIO B. CUIME, JR.  
WRDO II  
(RPABE No. 8870)  
Date: 02/21/2024

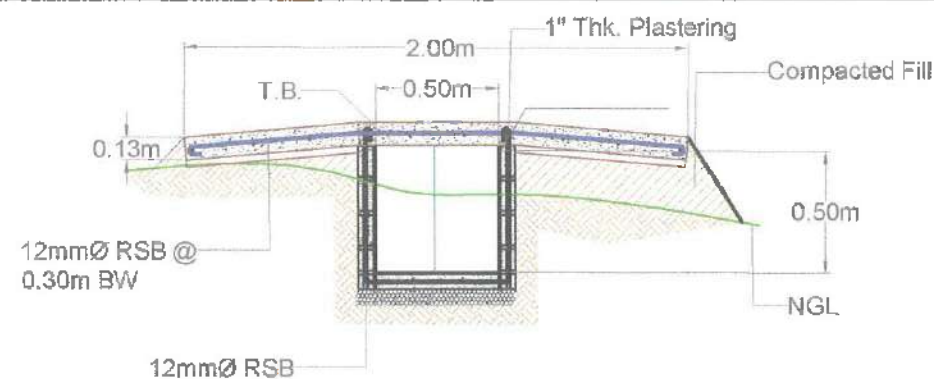
Checked / Reviewed by:  
  
ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: 02/21/2024

Recommending Approval:  
  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: 02/21/2024

Approved by:  
  
GINA A. NIOL, Ph.D.  
Director  
Date: 02/21/2024

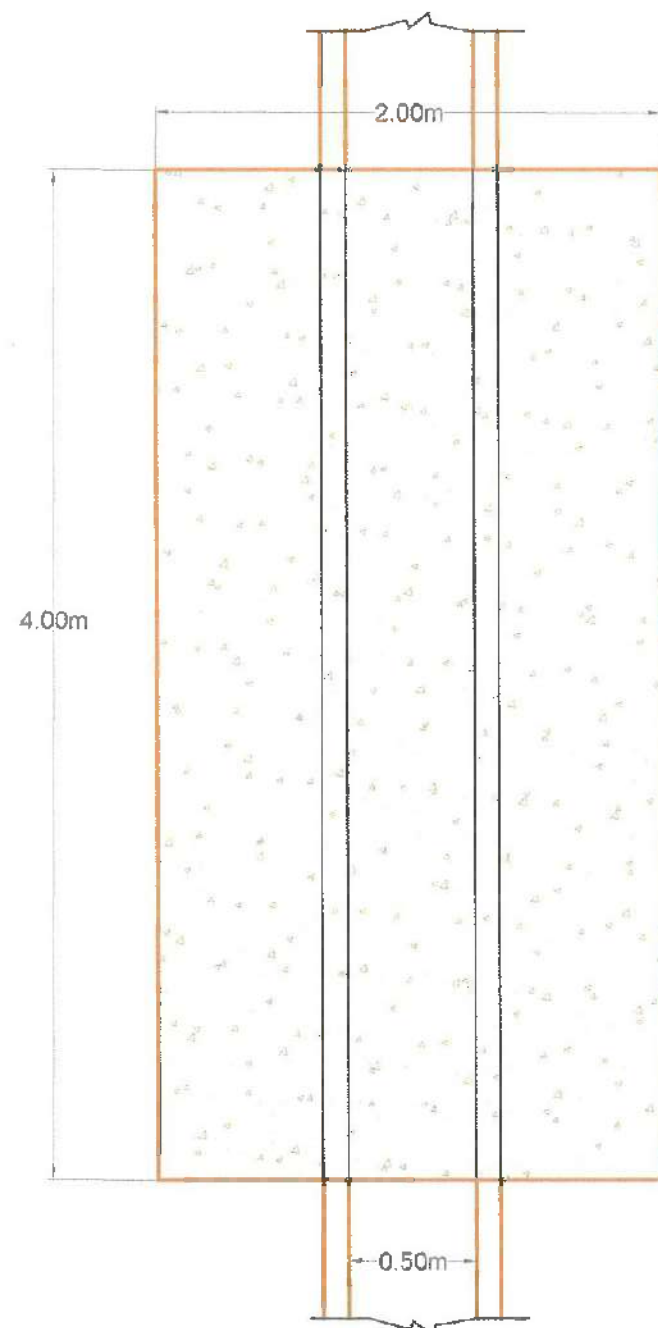
Sheet Contents:  
**TYPICAL PLAN/SECTIONS OF DIVISION BOX LEFT**  
Name of Project:  
**Construction of Naglimpiyaan SWIP**  
Location:  
**Brgy. Baloy, Cuyapo, Nueva Ecija**  
CAD / Drawn by:  
R. Samson  
Sheet No.:  
**28 / 30**





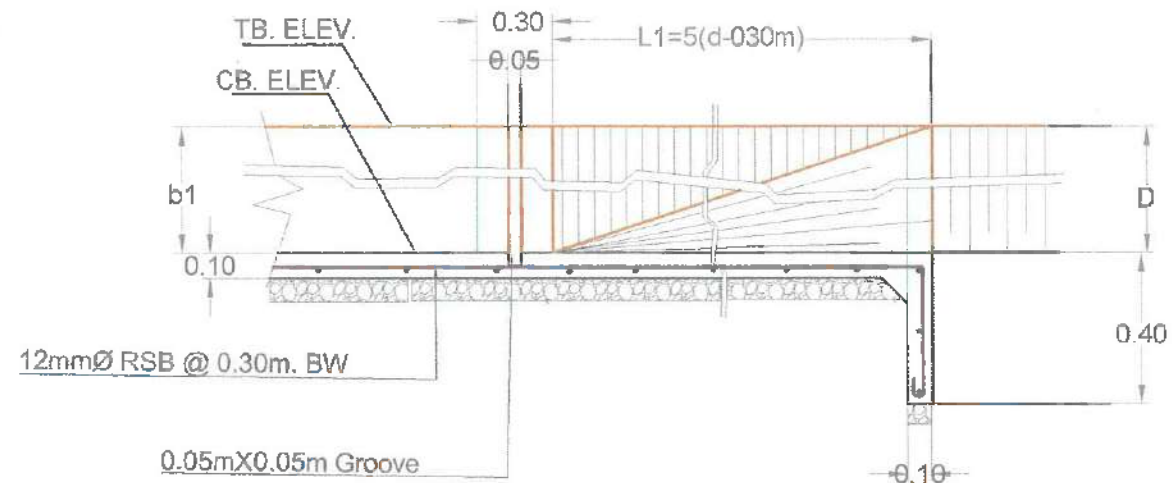
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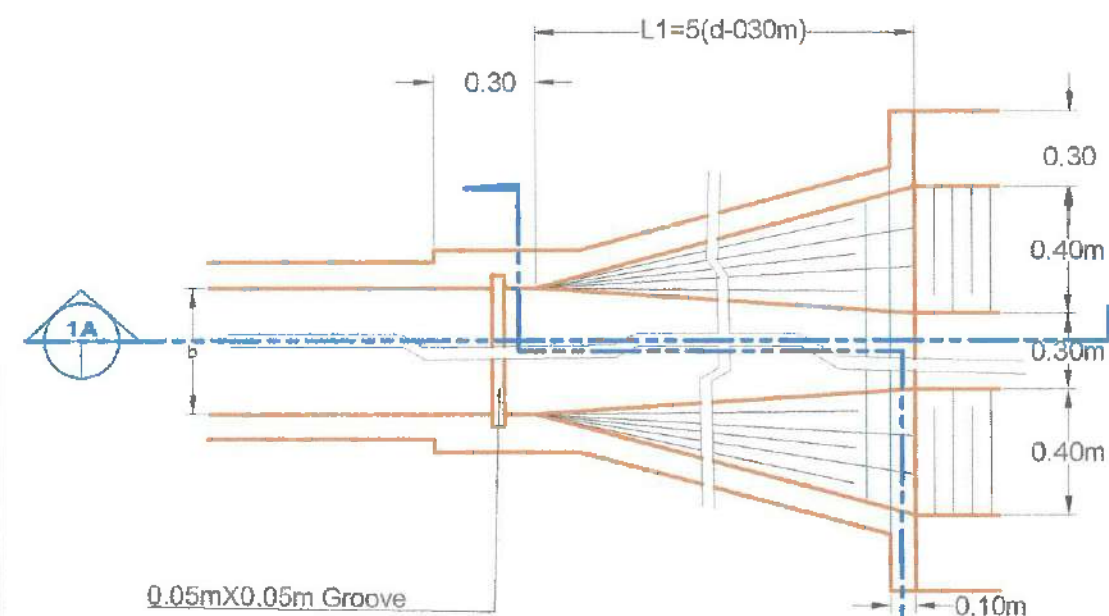
### PLAN

Scale 1 : 30 m



### SECTION-1A

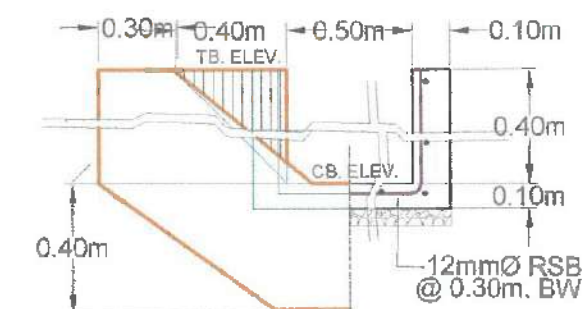
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### PLAN

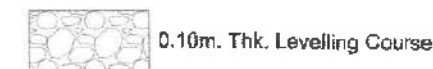
SCALE: 1:20 M

SCHEDULE OF DIMENSIONS OF END CHECK						
Station	Elev.		DIMENSIONS			
	TB	CB	b	b1	D	L1
1+500	85.08	84.58	0.50	0.50	0.50	1.00

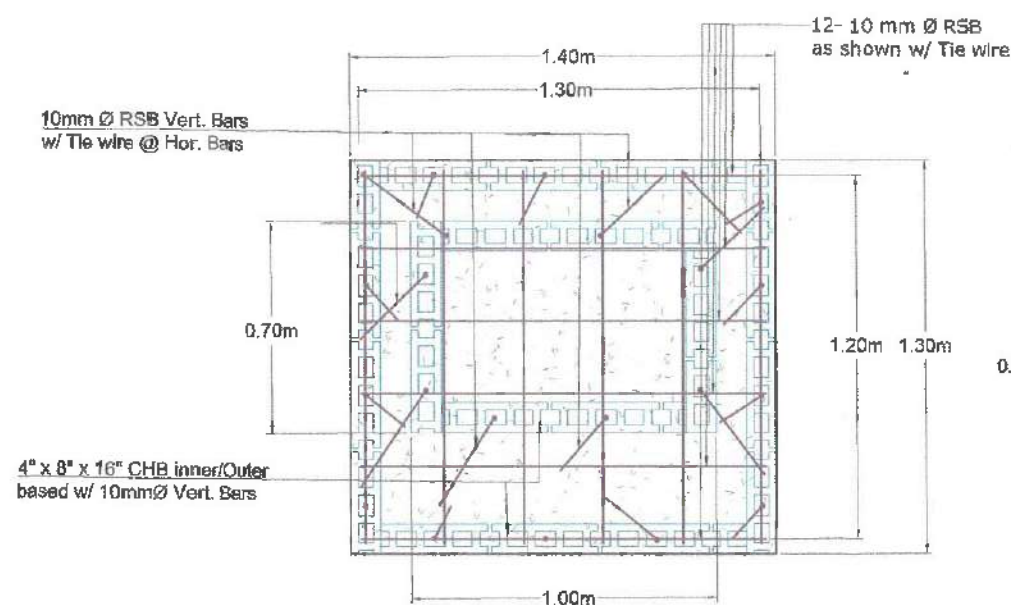


### SECTION-1B

SCALE: 1:20 M



	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. ROGELIO B. CUIME, JR.</b> WRDO II (RPABE No. 8870) Date: 02/21/2024	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/21/2024	Approved by:  <b>GINA P. NIÑO, Ph.D.</b> Director Date:	Sheet Contents: <b>TYPICAL PLAN/SECTIONS OF TRACTOR CROSSING AND END CHECK</b>	CAD / Drawn by: R. Samson	
	Reference Code: BSWM_WD_IF_006 Control Number: 202401 WD-KES-00001q Effective Date: November 6, 2023						Name of Project: <b>Construction of Naglilimpiyaan SWP</b>	Sheet No.: <b>29 / 30</b>
							Location: <b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	



**Matting Plan**  
SCALE: 1:25 M.

REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF AGRICULTURE  
REGIONAL FIELD OFFICE - V

BSWM-Rec Program

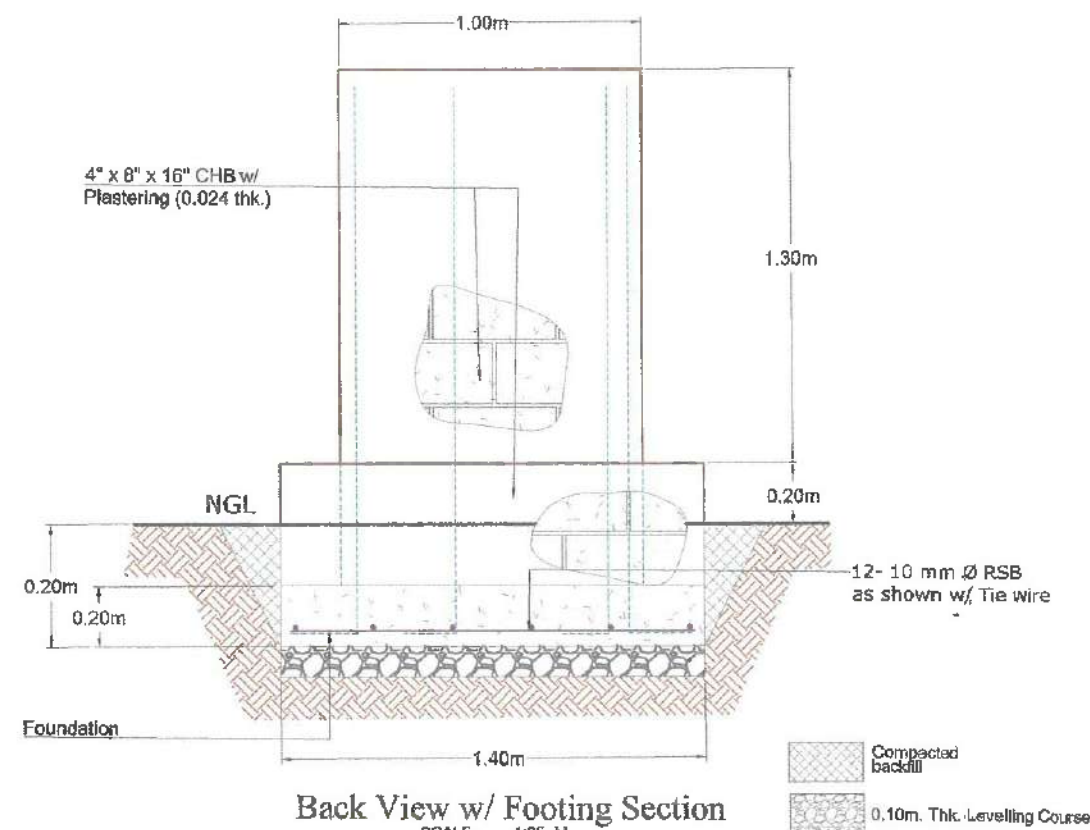
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Location: \_\_\_\_\_

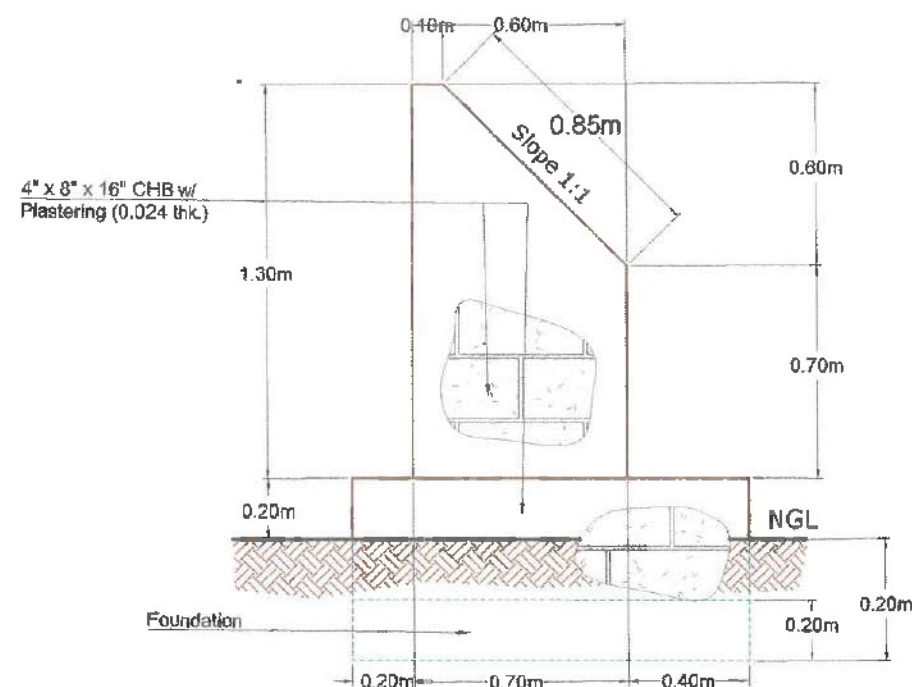
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Date Completed: \_\_\_\_\_

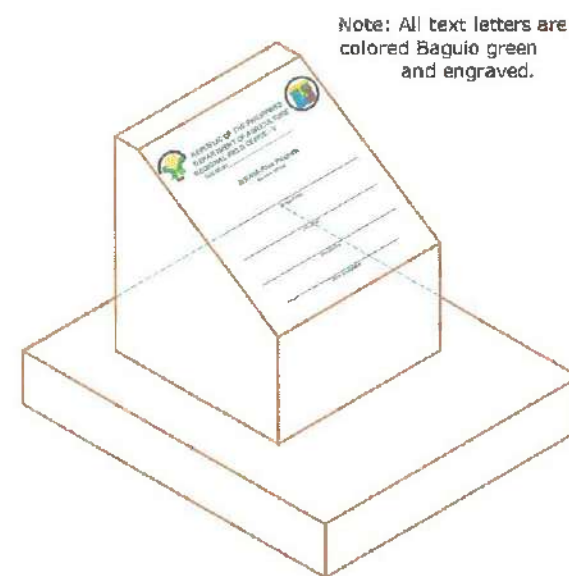
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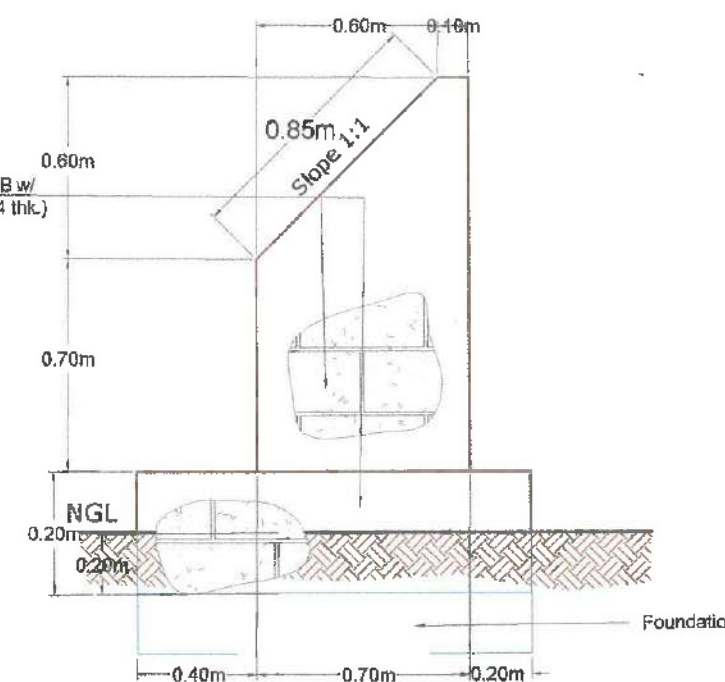
**Back View w/ Footing Section**  
SCALE: 1:25 M.



**Left Side View**  
SCALE: 1:25 M.



**Isometric View**  
Not to Scale



**Right Side View**  
SCALE: 1:25 M.

## PLAN AND ISOMETRIC VIEWS OF CONCRETE SIGNAGE

SCALE AS SHOWN

	<b>DEPARTMENT OF AGRICULTURE</b>  <b>Bureau of Soils and Water Management</b>  WATER RESOURCES MANAGEMENT DIVISION  Reference Code: BSWM_WD_JF_006 Control Number: 2024SL-WD-RES-00006 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		ENGR. ROGELIO S. CUIME, JR. WRDO II (RPABE No. 3870) Date: 02/16/2024	ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 02/21/2024	ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date: 02/22/2024	GINA P. NILO, Ph.D. Director Date: _____	<b>PLAN AND ISOMETRIC VIEW OF CONCRETE SIGNAGE</b>	R. Samson
						Name of Project:	Sheet No.:
						<b>Construction of Naglilimpiyaan SWIP</b>	
						Location:	<b>30 / 30</b>
						<b>Brgy. Baloy, Cuyapo, Nueva Ecija</b>	



# CONSTRUCTION OF MABALBALANAY-BANGCAG SMALL WATER IMPOUNDING PROJECT (SWIP)

Brgy. Agbannawag, Tabuk City, Kalinga



*Republic of the Philippines*  
**DEPARTMENT OF AGRICULTURE**  
Regional Field Office-Cordillera Administrative Region  
**REGIONAL AGRICULTURAL ENGINEERING DIVISION**  
*BPI Compound, Guisad, Baguio City*  
*Telefax No. (074) 445-3771*

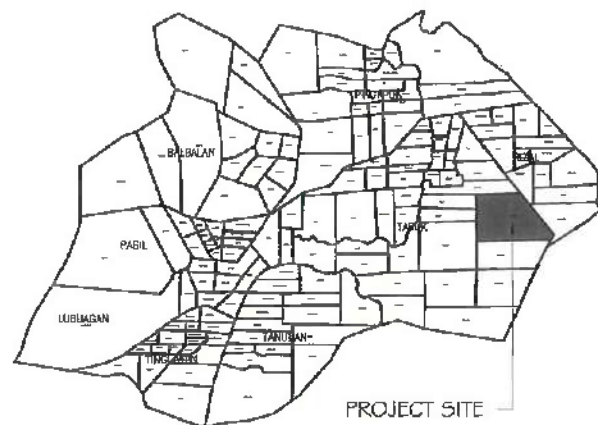
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Farm Plan	2 of 17
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Profile Along Centerline of Outletworks; Outletworks Section Details	10 of 17
Typical Dam Section; Detail "B"; Detail "A"; Detail "C"	11 of 17
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Typical Road Section Details; Main Canal Typical Section; Lateral Canal Typical Section	14 of 17
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COA Billboard Details; DA Billboard Details	16 of 17
General Contrsuction Notes	17 of 17





1  
1 17  
MAP OF CORDILLERA ADMINISTRATIVE REGION  
SCALE NTS



2  
1 17  
MAP OF KALINGA PROVINCE  
SCALE NTS



3  
1 17  
VICINITY MAP  
SCALE NTS

DA-RFO CAR SAED-0P009 OCT 19 2022 REV 001



Republic of the Philippines  
DEPARTMENT OF AGRICULTURE  
Regional Field Office-  
Cordillera Administrative Region  
REGIONAL AGRICULTURAL  
ENGINEERING DIVISION  
BPI Compound, Guisad, Baguio City  
Telefax No. (074) 445-3771

Prepared by:

JORAM B. MAYAO  
Engineer I, RAED

Checked by:

JUN O. ALEJO  
Engineer III, EPDS Sect. Chief, RAED

Recommending Approval:

FILEMON A. SALVADOR  
Engineer V/Division Chief, RAED

Approved:

ATTY. JENNILYN M. DAWAYAN, CESO IV  
Regional Executive Director

Name of Project:

Construction of Mabalbalanay-Bangcag  
Small Water Impounding Project (SWIP)

Location:

Agbannawag, Tabuk City, Kalinga

Sheet Contents:

- Vicinity Map
- Map of Kalinga Province

Sheet no.:

1/17

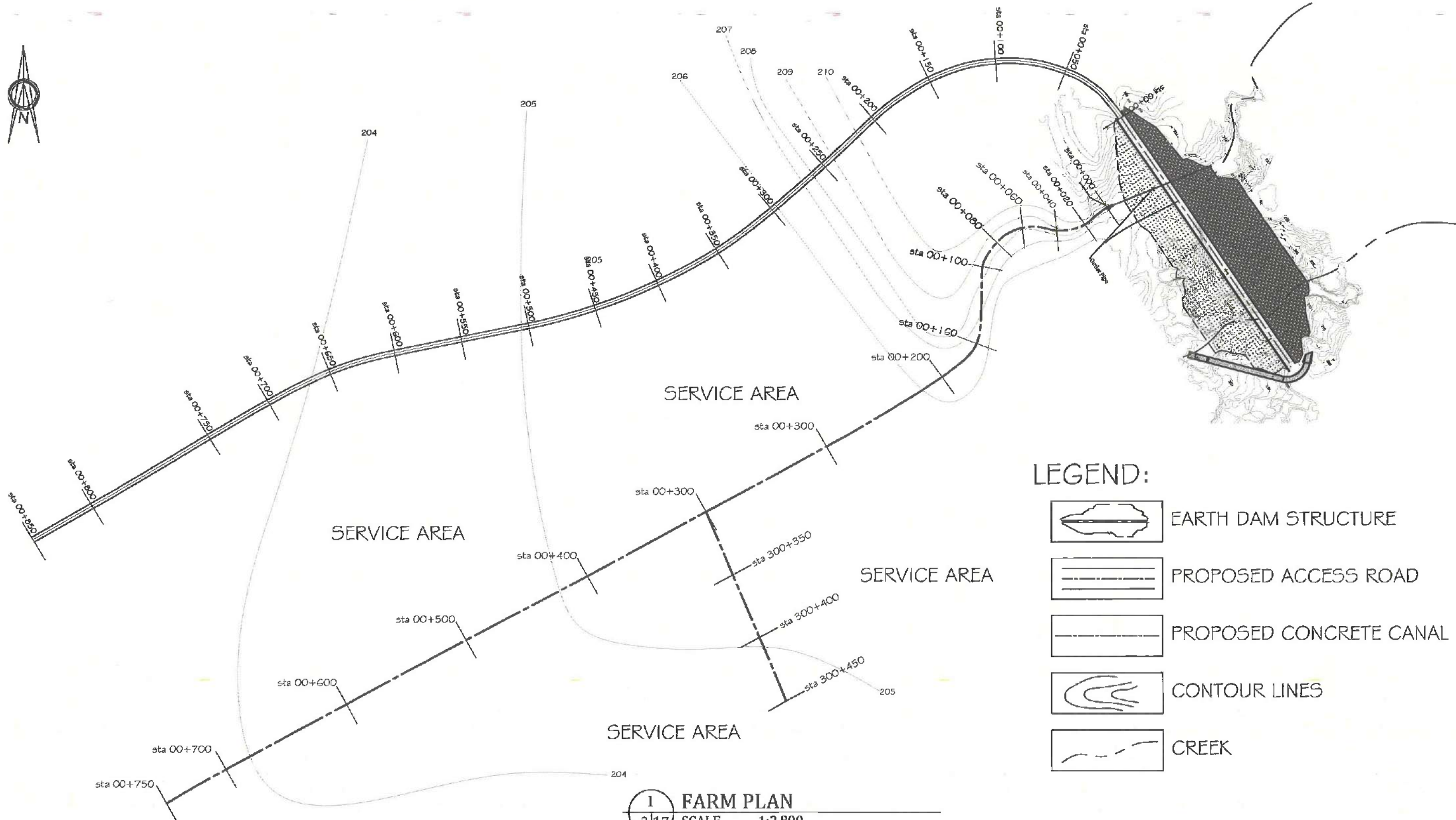
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CAD by:

jbmayao

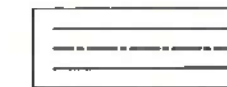




### LEGEND:



EARTH DAM STRUCTURE



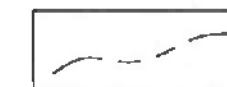
PROPOSED ACCESS ROAD



PROPOSED CONCRETE CANAL



CONTOUR LINES



CREEK

1 FARM PLAN  
2/17 SCALE 1:2,800

DA-RFO CAR RAED-QP009 OCT 10 2022 REV 001



Republic of the Philippines  
**DEPARTMENT OF AGRICULTURE**  
Regional Field Office-  
Cordillera Administrative Region  
**REGIONAL AGRICULTURAL  
ENGINEERING DIVISION**  
BPI Compound, Guisad, Baguio City  
Telefax No. (074) 445-3771

Prepared by:

**JORAM B. MAYAO**  
Engineer I, RAED

Checked by:

**JUN O. ALEJO**  
Engineer III/ EPDS Sect. Chief, RAED

Recommending Approval:

**FILEMON A. SALVADOR**  
Engineer IV/ Division Chief, RAED

Approved:

**ATTY. JENNILYN M. DAWAYAN, CESO IV**  
Regional Executive Director

Name of Project:

Construction of Mabalalanay-Bangcag  
Small Water Impounding Project (SWIP)

Location:

Agbannawag, Tabuk City, Kalinga

Sheet Contents:

- Farm Plan

Sheet no.:

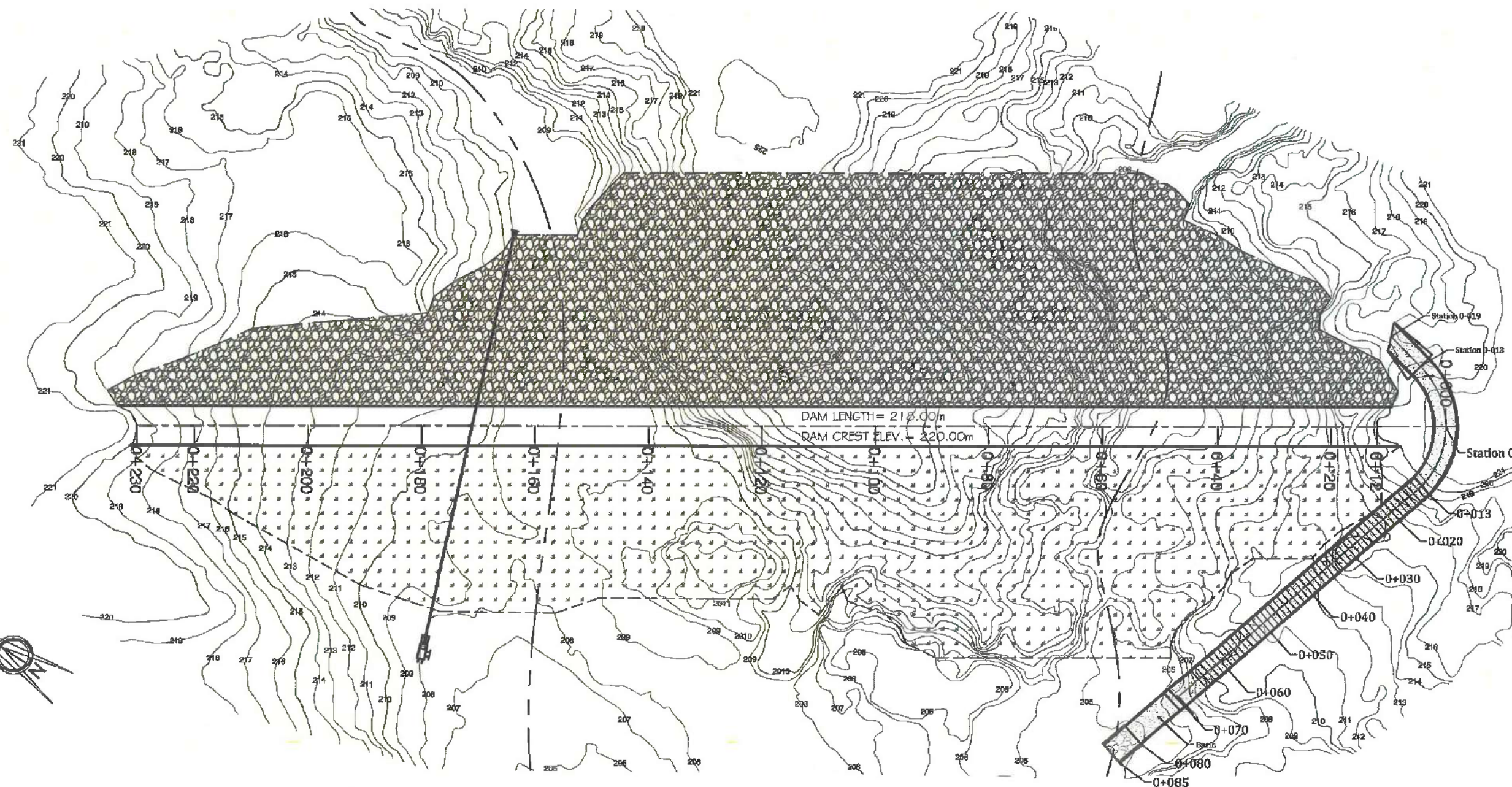
2/17

Size:

A3

CAD by:





1 SITE DEVELOPMENT PLAN  
3/17 SCALE 1:800

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Republic of the Philippines  
DEPARTMENT OF AGRICULTURE  
Regional Field Office-  
Cordillera Administrative Region  
REGIONAL AGRICULTURAL  
ENGINEERING DIVISION  
BPI Compound, Guisad, Baguio City  
Telefax No. (074) 445-3771

Prepared by:

JORAM H. MAYAO  
Engineer I, RAED

Checked by:

JUN O. ALEJO  
Engineer III/ EPDS Sect. Chief, RAED

Recommending Approval:

FILEMON A. SALVADOR  
Engineer V/Division Chief, RAED

Approved:

ATTY. JENNILYN M. DAWAYAN, CESO IV  
Regional Executive Director

Name of Project:

Construction of Mabalalanay-Bangcag  
Small Water Impounding Project (SWIP)

Location:

Agbannawag, Tabuk City, Kalinga

Sheet Contents:

- Site Development Plan

Sheet no.:

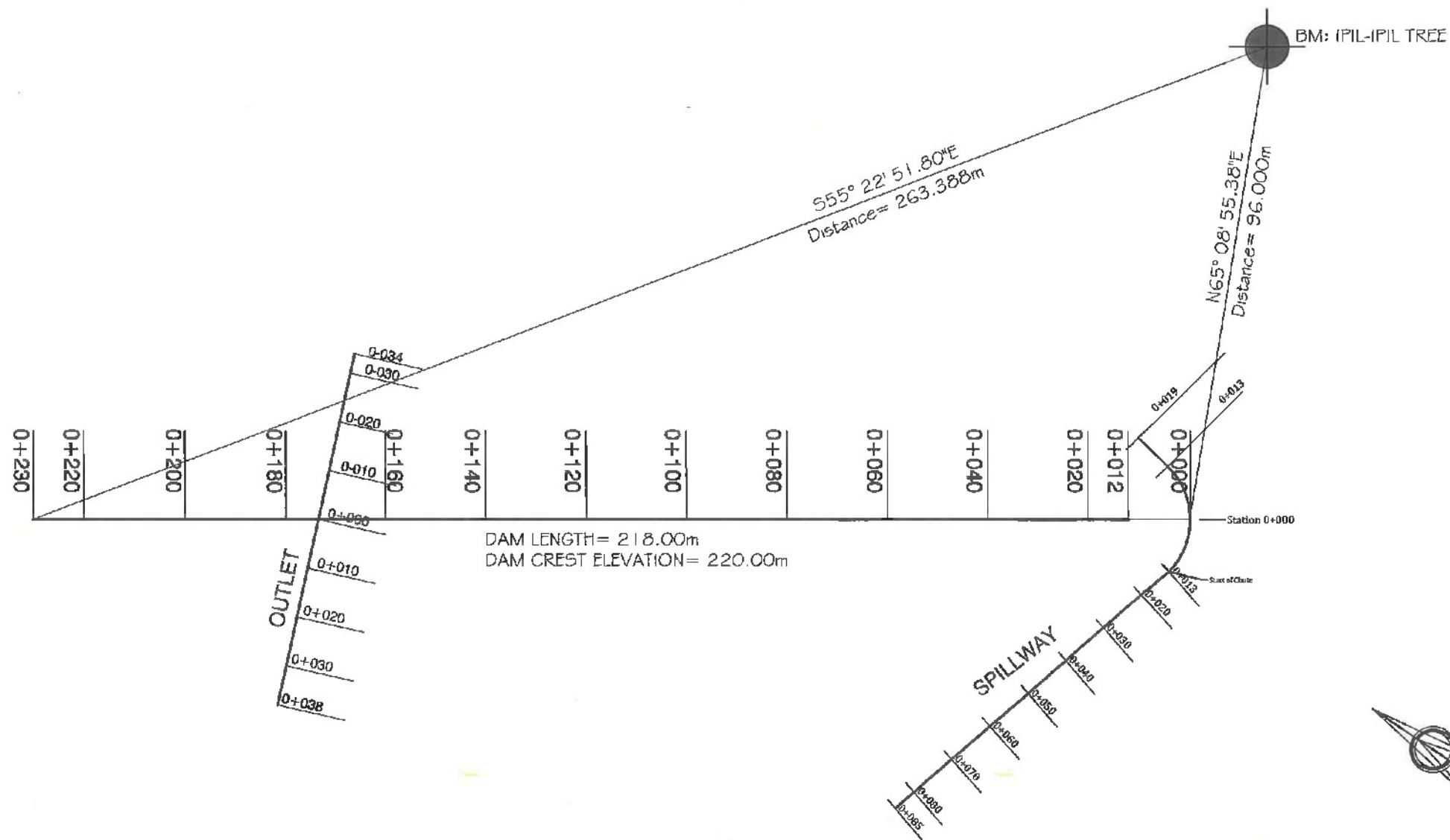
3/17

Size:

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CAD by:

jlmayao

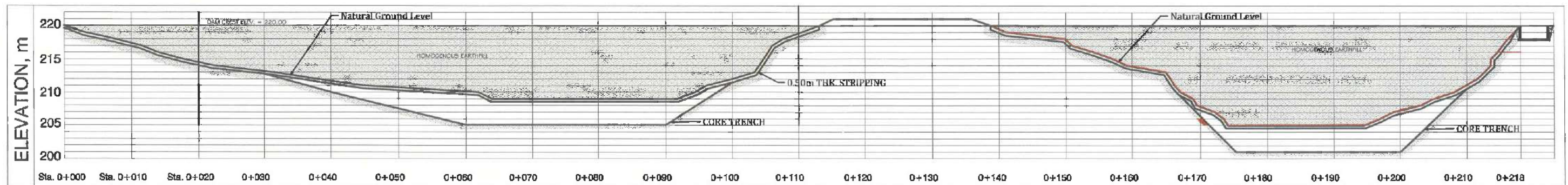


1 REFERENCE LINE  
4/17 SCALE 1:100

DA-RPO-CAR-RAED-QP009 OCT 10 2022 REV 001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p> JUN O. ALEJO Engineer III/ EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p> FILEMON A. SALVADOR Engineer V/ Division Chief, RAED</p>	<p>Approved:</p> <p> ATTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabaibalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location:</p> <p>Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Reference Line</li> </ul>	<p>Sheet no.:</p> <p>4/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p>jbmayaoo</p>
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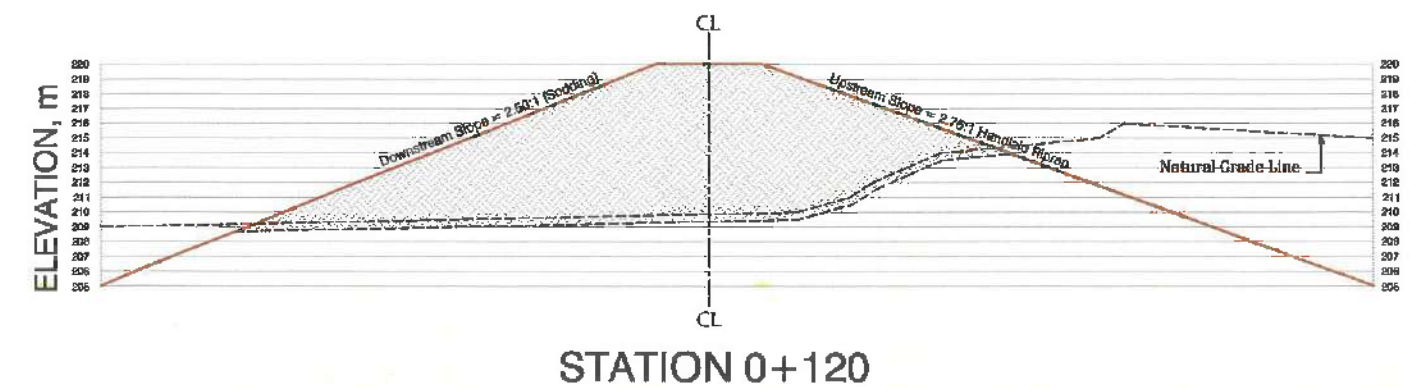
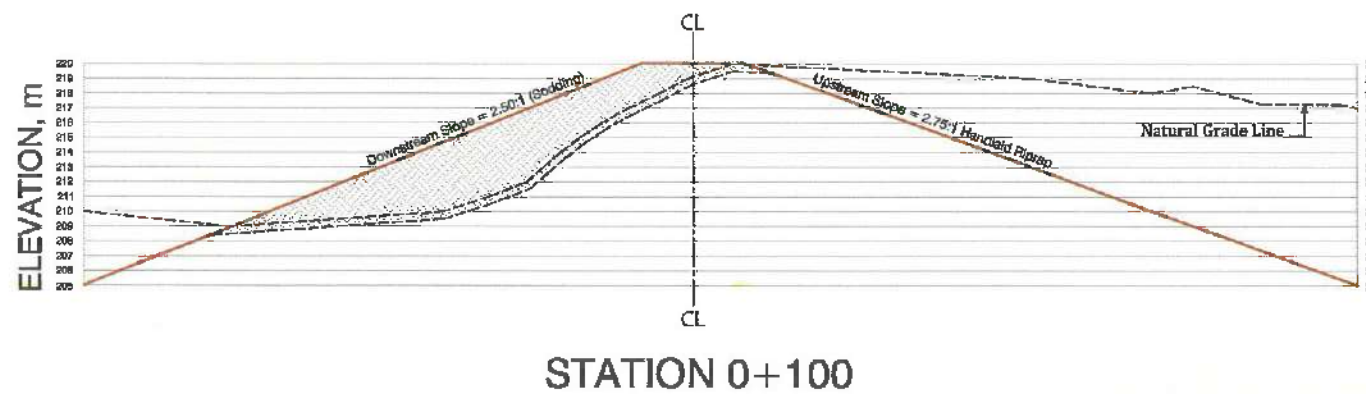
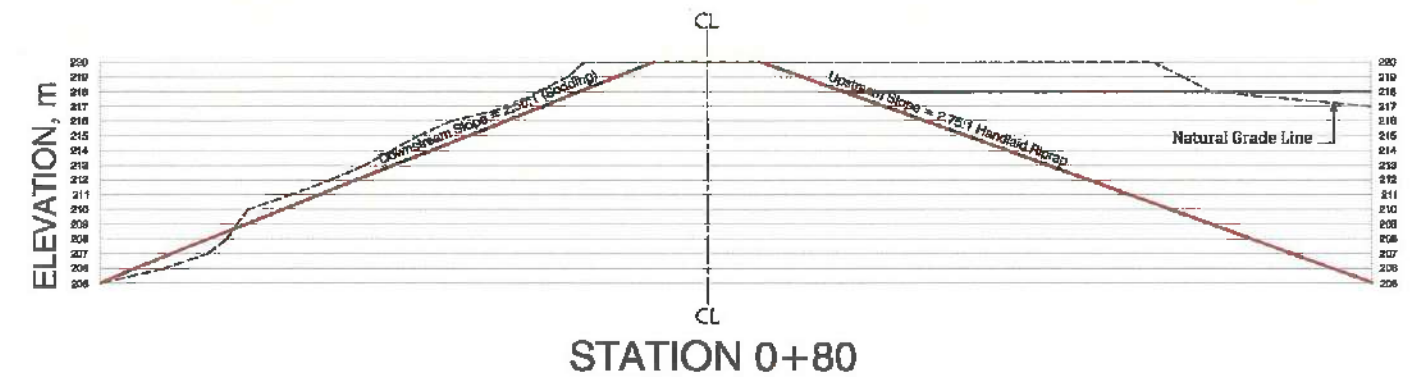
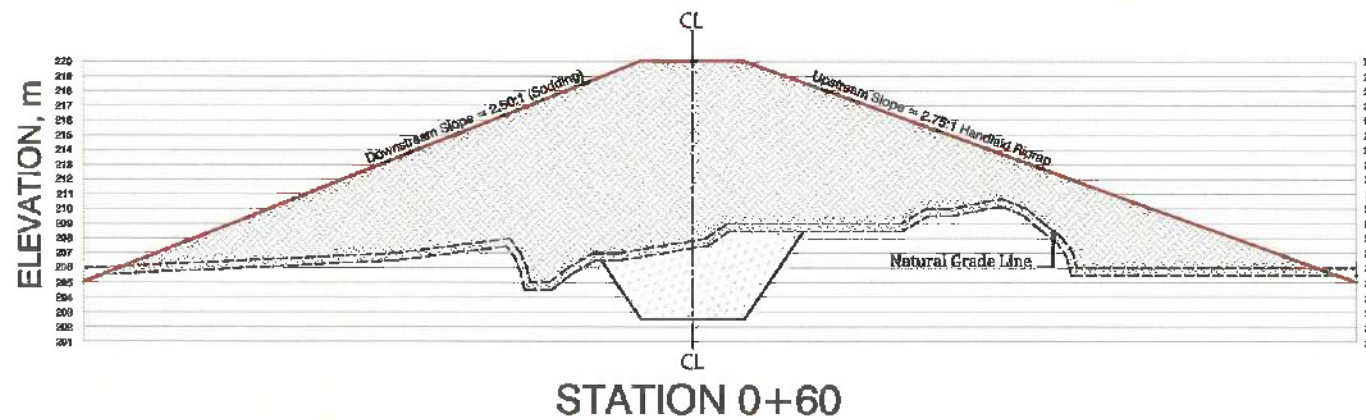
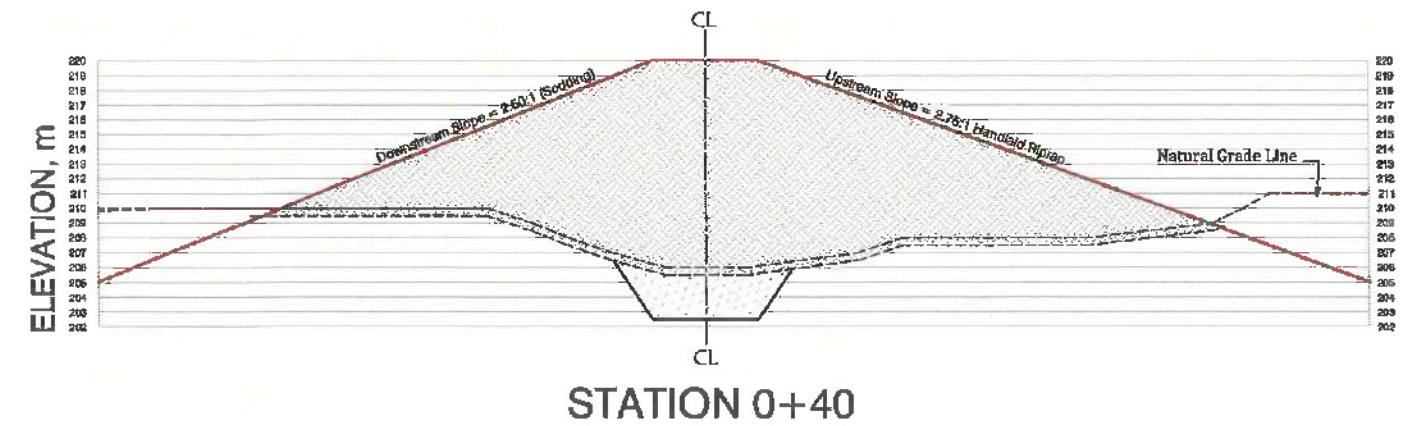
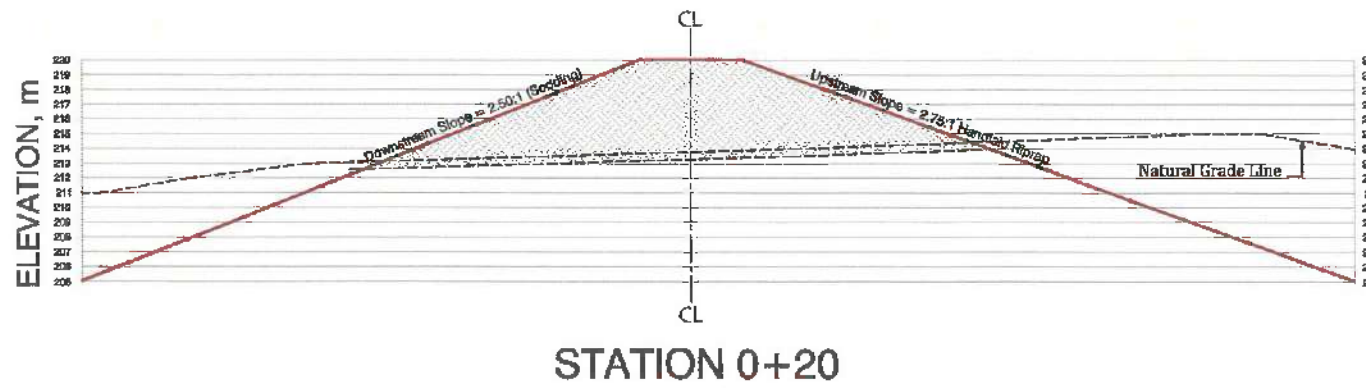




1  
5/17 PROFILE ALONG CENTERLINE OF DAM AXIS  
SCALE 1:600

DA-RFO CAR RAED-QF009 OCT 10 2022 REV 001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p> JUN O. ALEJO Engineer III/ EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p> FILEMON A. SALVADOR Engineer V, Division Chief, RAED</p>	<p>Approved:</p> <p> ATTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location:</p> <p>Aghannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Profile Along Centerline of Dam Axis</li> </ul>	<p>Sheet no.:</p> <p>5/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p></p>
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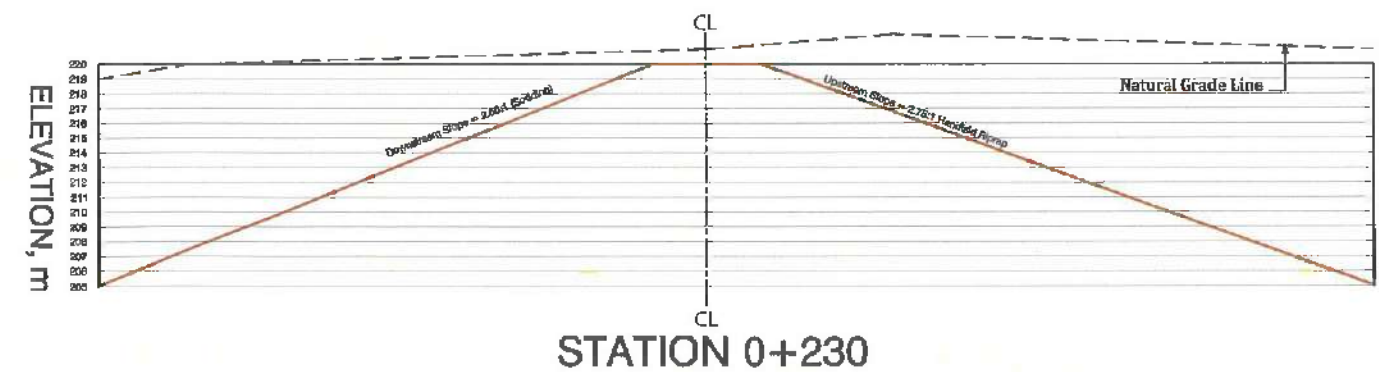
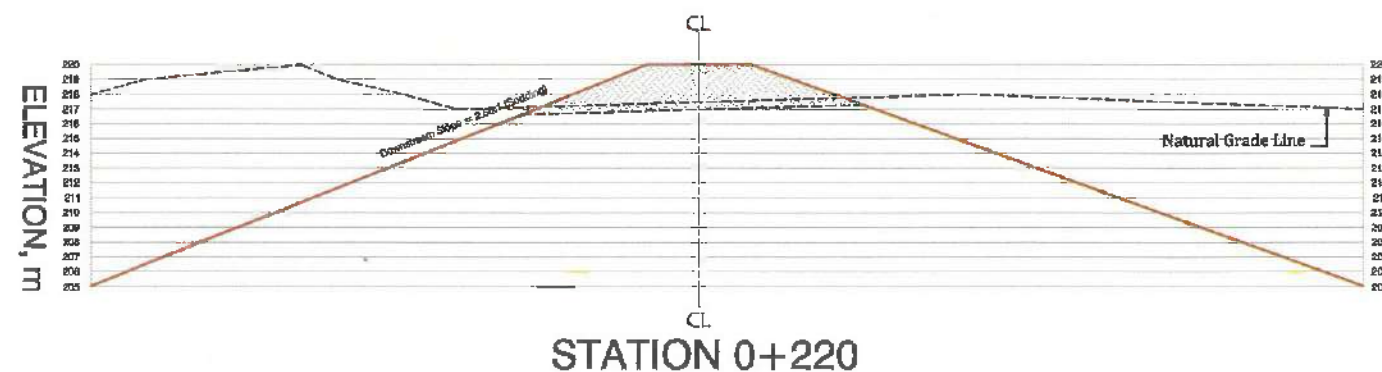
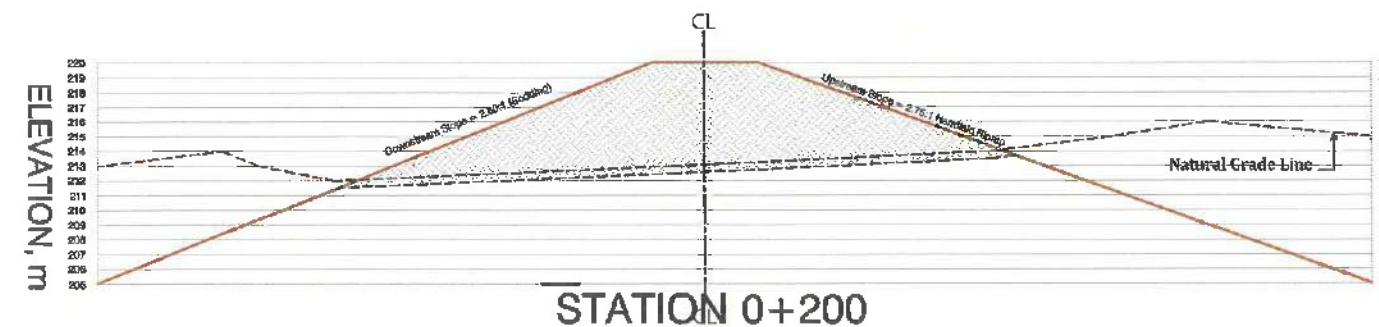
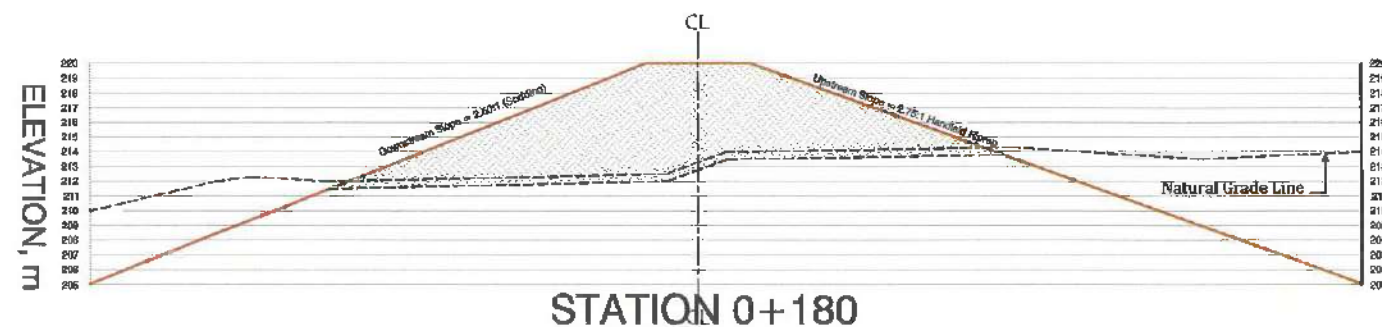
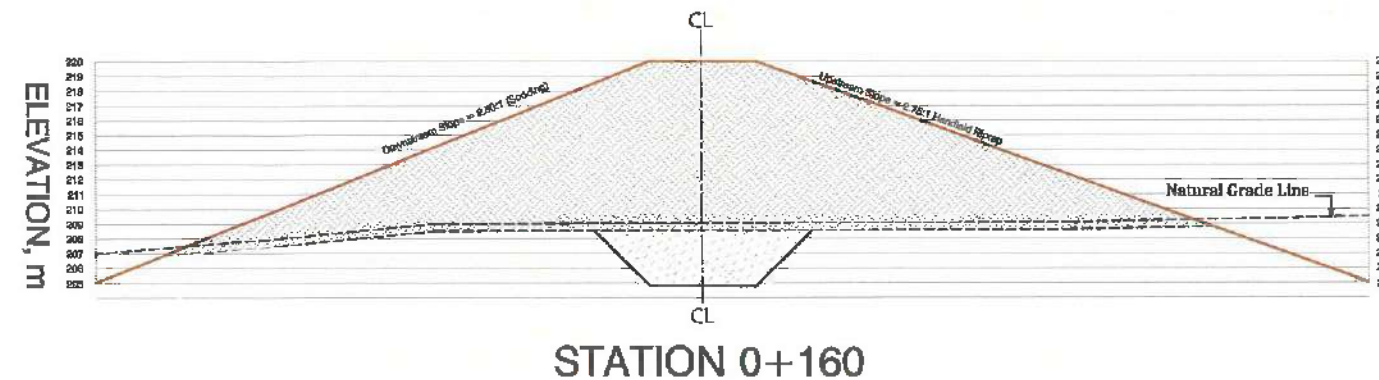
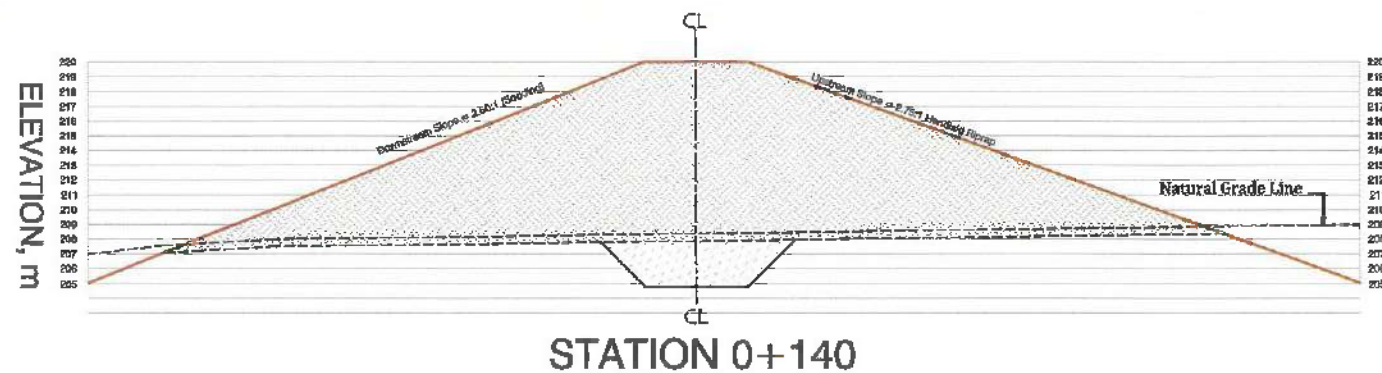


1  
6/17 DAM EMBANKMENT SECTION DETAILS  
SCALE 1:500

DA-RFO CAR RAED-QF009 OCT'18 2022 REV-001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Gulsad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p> JUN O. ALEJO Engineer III/ EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p> FILEMON A. SALVADOR Engineer V, Division Chief, RAED</p>	<p>Approved:</p> <p> ATTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location:</p> <p>Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Dam Embankment Section Details</li> </ul>	<p>Sheet no.:</p> <p>6/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p>jbmayao</p>
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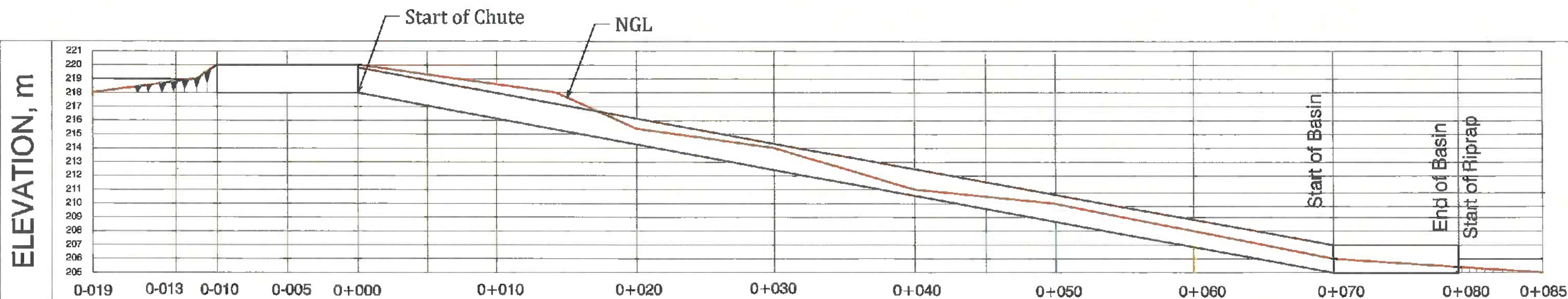




1  
7/17 DAM EMBANKMENT SECTION DETAILS  
SCALE 1:500

DA-RFO-AR-RAED-QF009 OCT 10 2022 REV 001

	<p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p> JUN A. ALEJO Engineer III/ EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p> FILEMON A. SALVADOR Engineer IV/ Division Chief, RAED</p>	<p>Approved:</p> <p> ATTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location: Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Site Development Plan</li> </ul>	<p>Sheet no.:</p> <p>7/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p></p>
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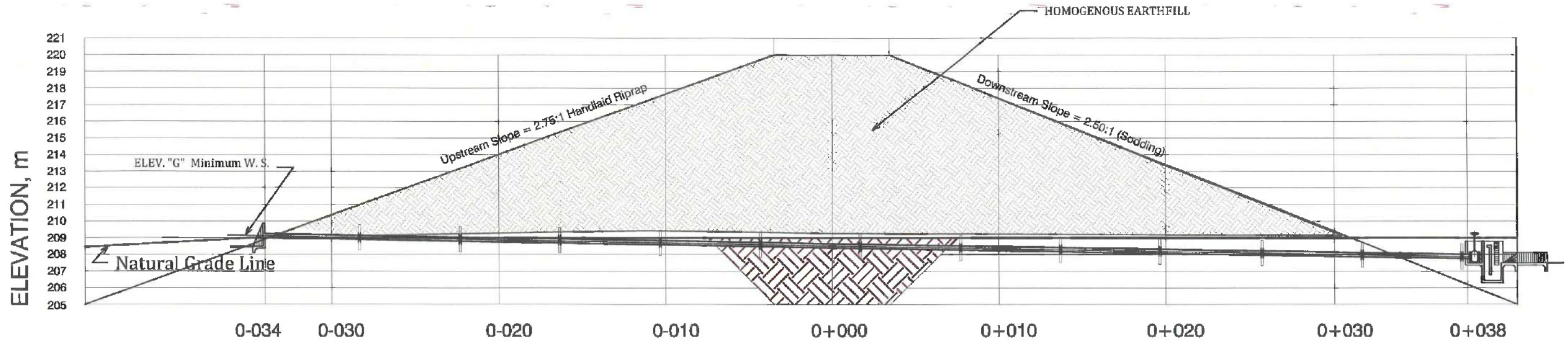


1  
8/17 PROFILE ALONG CENTERLINE OF SPILLWAY  
SCALE NTS

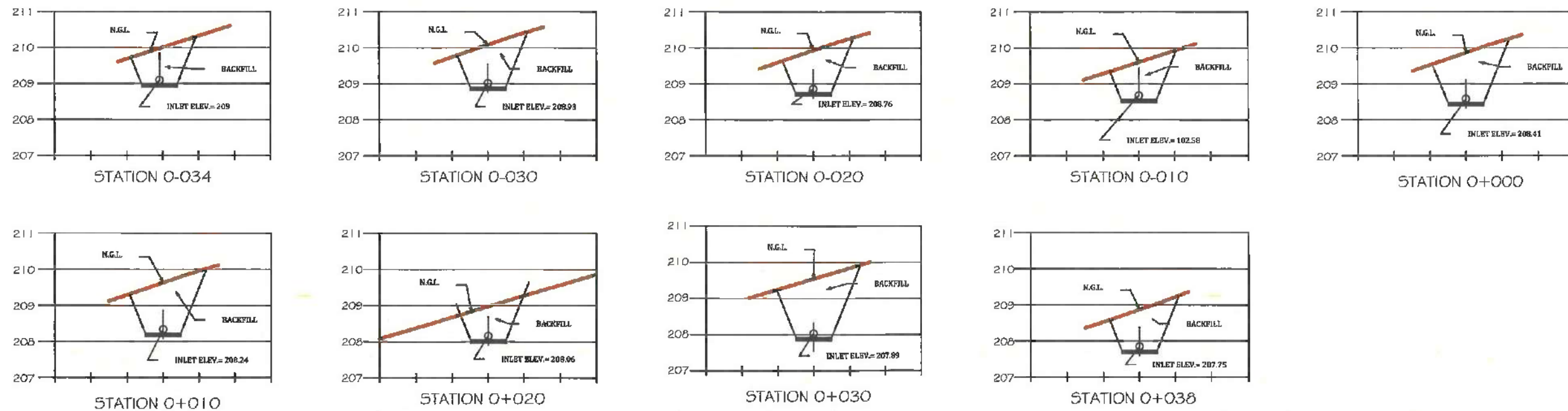
DA-RFO CAR RAED-QF009 OCT 10 2022 REV 001

	Republic of the Philippines <b>DEPARTMENT OF AGRICULTURE</b> Regional Field Office- Cordillera Administrative Region <b>REGIONAL AGRICULTURAL ENGINEERING DIVISION</b> BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771	<b>Prepared by:</b>  <b>JORAM B. MAYAO</b> Engineer I, RAED	<b>Checked by:</b>  <b>JUNO A. ALAJO</b> Engineer III/EPDS Secy. Chief, RAED	<b>Recommending Approval:</b>  <b>FILEMON A. SALVADOR</b> Engineer V/Division Chief, RAED	<b>Approved:</b>  <b>ATTY. JENNILYN M. DAWAYAN, CESO IV</b> Regional Executive Director	<b>Name of Project:</b> Construction of Mabalbalanay-Bangcag Small Water Impounding Project (SWIP) <b>Location:</b> Agbannawag, Tabuk City, Kalinga <b>Sheet Contents:</b> • Profile Along Centerline of Spillway	<b>Sheet no.:</b> 8/17 <b>Size:</b> A3 <b>CAD by:</b> jlmayao
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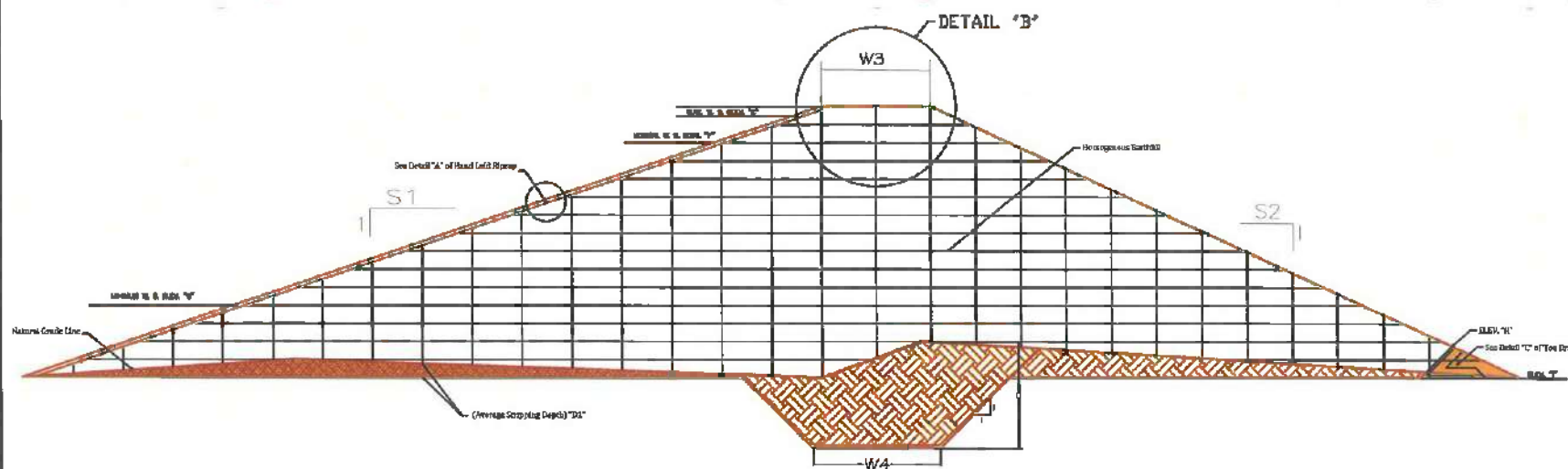
1 PROFILE ALONG CENTERLINE OF OUTLET WORKS  
10/17 SCALE 1:250



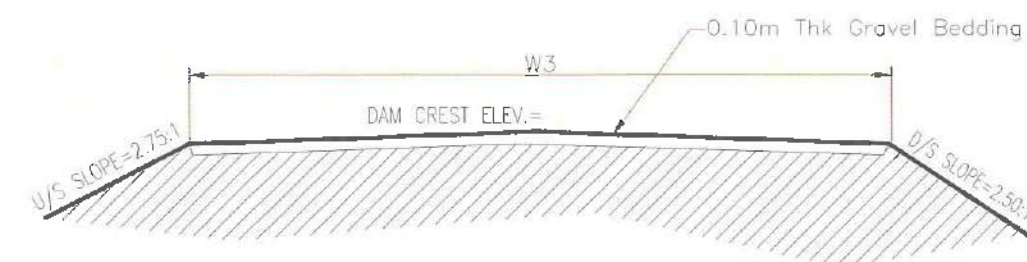
2 OUTLETWORKS SECTION DETAILS  
10/17 SCALE NTS

DA-RFO CARTRAED-QP009-OC1 10 2022 REV 001

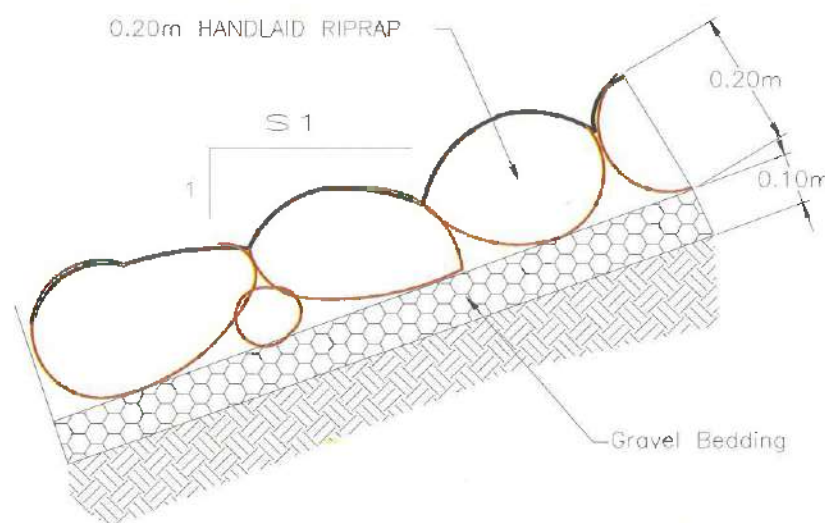
 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p> JUN O. ALEJO Engineer III/ EPTIS Sec. Chief, RAED</p>	<p>Recommending Approval:</p> <p> FILEMON A. SALVADOR Engineer V, Division Chief, RAED</p>	<p>Approved:</p> <p> ATTY. JENNILYN M. DAWAYAN, CESO-IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalbalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location:</p> <p>Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Profile Along Centerline of Outlet Works</li> <li>Outlet Works Section Details</li> </ul>	<p>Sheet no.:</p> <p>10/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p>ifmangro</p>
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1  
11/17  
TYPICAL DAM SECTION  
SCALE NTS



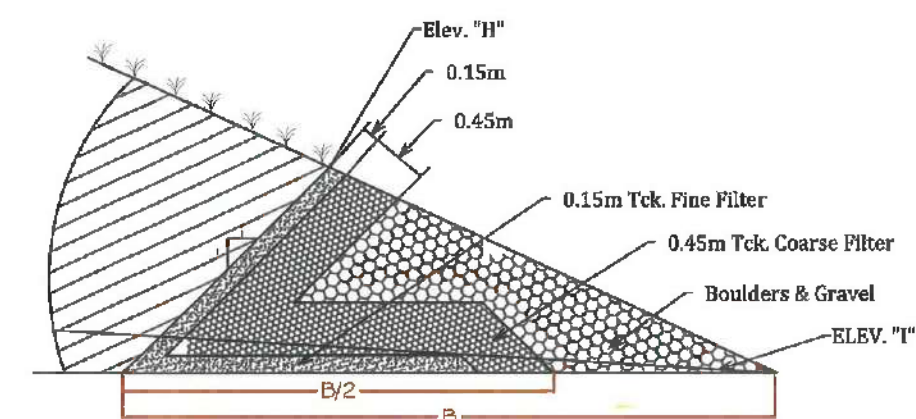
2  
11/17  
DETAIL "B"  
SCALE NTS



3  
11/17  
DETAIL "A"  
SCALE NTS

#### SCHEDULE OF ELEVATION AND DIMENSIONS

ELEV. D =	220.00
ELEV. E =	219.50
ELEV. F =	218.00
ELEV. G =	209.00
ELEV. H =	206.75
ELEV. I =	205.00
D1 =	0.50
D =	6.00
S1 =	1:2.75
S2 =	1:2.50
W3 =	7.00
W4 =	7.00
B/2 =	3.60

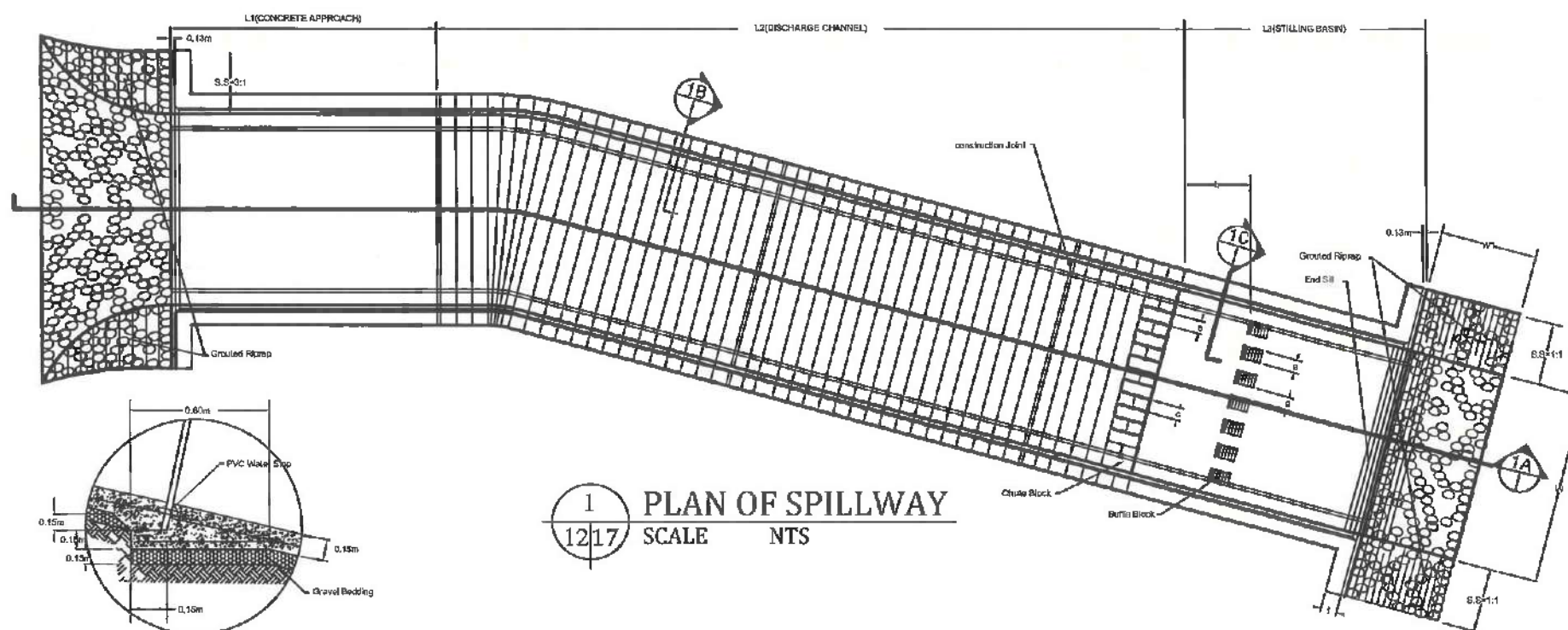


4  
11/17  
DETAIL "C" (Toe Drain)  
SCALE NTS

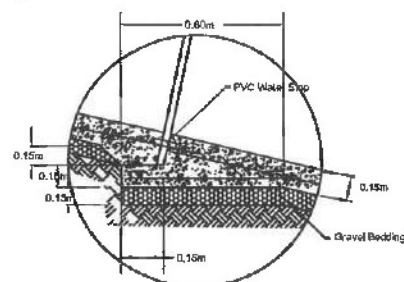
DA-RFO CAR RAED-QF009 OCT 10 2022 REV 001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	Prepared by:	Checked by:	Recommending Approval:	Approved:	Name of Project:	Sheet no.:
	JORAM B. MAYAO Engineer I, RAED	JUN. C. AREJO Engineer III/ EPDS Sect. Chief, RAED	FILEMON A. SALVADOR Engineer I/ Division Chief, RAED	ATTY. JENNILYN M. BAWAYAN, CESO IV Regional Executive Director	Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)	11/17
					Location:	Size:
					Agbannawag, Tabuk City, Kalinga	A3
				Sheet Contents:	CAD by:	
				<ul style="list-style-type: none"> <li>Typical Dam Section</li> <li>Detail "A"</li> <li>Detail "B"</li> <li>Detail "C"</li> </ul>	jbmayao	

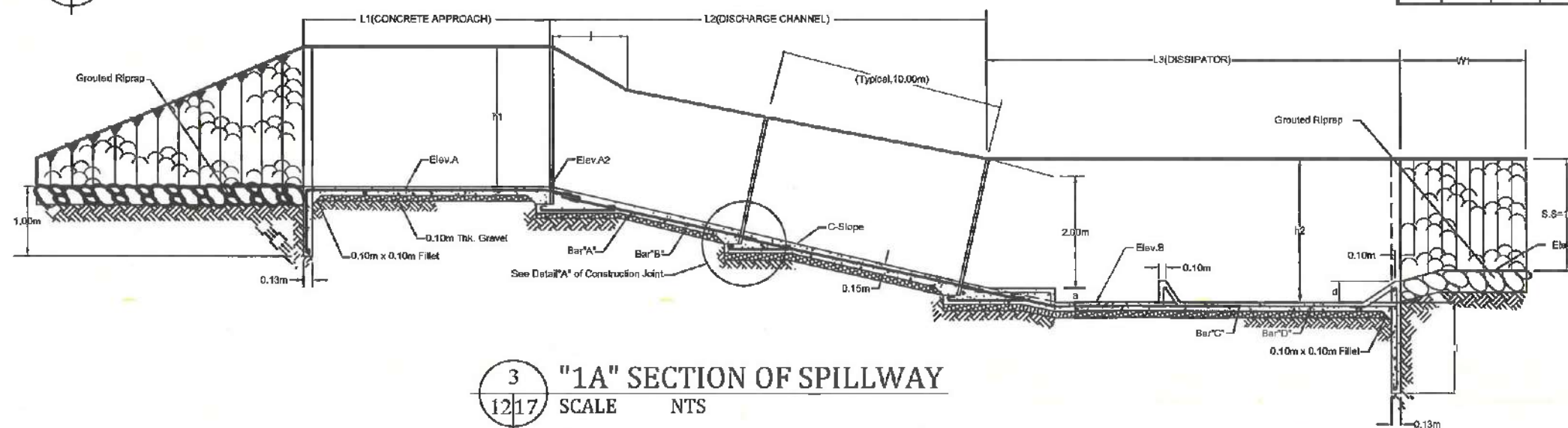




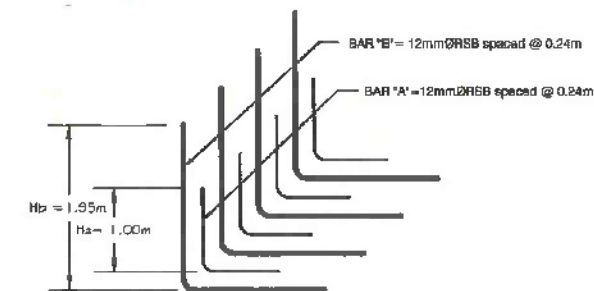
1 PLAN OF SPILLWAY  
SCALE NTS



2 DETAIL - "1A"  
SCALE NTS



3 "1A" SECTION OF SPILLWAY  
SCALE NTS



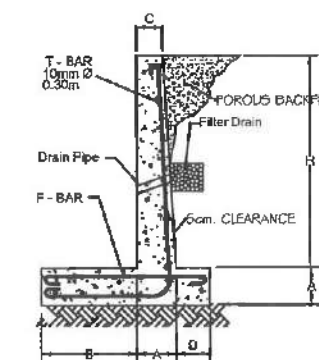
FOR HEIGHT, H, 2.50m  
AND LESSER  
N. T. S.

SCHEDULE OF ELEVATIONS AND  
DIMENSIONS

ELEV. A =	219.00m	h1 =	2.00m
ELEV. B =	205.00m	h2 =	2.00m
ELEV. C =	205.25m	h =	-
a =	0.20 m.	j =	-
b =	1.00 m.	L1 =	10.00m
c =	0.25 m.	L2 =	70.00m
d =	0.20 m.	W =	4.00m
e =	-	W1 =	8.00m
f =	-	C-SLOPE =	1:5.38
L3 =	09.00m	S-SLOPE =	1:1

SCHEDULE OF DIMENSIONS AND REINFORCEMENTS (FOR - "1C")

H (m.)	A (cm.)	B (cm.)	D (cm.)	C (cm.)	Toe pressure (kg./sq. cm.)	E BARS		F BARS	
						size (mm.)	spacing (cm.)	size (mm.)	spacing (cm.)
2.00 m.	0.20 m.	1.20 m.	0.15 m.	0.15 m.	0.219	-	-	-	-



4 SECTION - "1C"  
SCALE NTS

DA-RFO CAR RAEL-QP009 DCT 10 2022 REV 001



Republic of the Philippines  
DEPARTMENT OF AGRICULTURE  
Regional Field Office-  
Cordillera Administrative Region  
REGIONAL AGRICULTURAL  
ENGINEERING DIVISION  
BPI Compound, Guisad, Baguio City  
Telefax No. (074) 445-3771

Prepared by:

JORAM E. MAYAO  
Engineer I, RAED

Checked by:

JUNO D. ALEJO  
Engineer III/ EPDS Sect. Chief, RAED

Recommending Approval:

FILEMON A. SALVADOR  
Engineer V/ Division Chief, RAED

Approved:

ATTY. JENNILYN M. DAWAYAN, CESO IV  
Regional Executive Director

Name of Project:

Construction of Mabalalanay-Bangcag  
Small Water Impounding Project (SWIP)

Location:

Agbannawag, Tabuk City, Kalinga

Sheet Contents:

- Plan of Spillway
- Detail - "1A"
- "1A" Section of Spillway
- Section - "1C"

Sheet no.:

12/17

Size:

A3

CAD by:

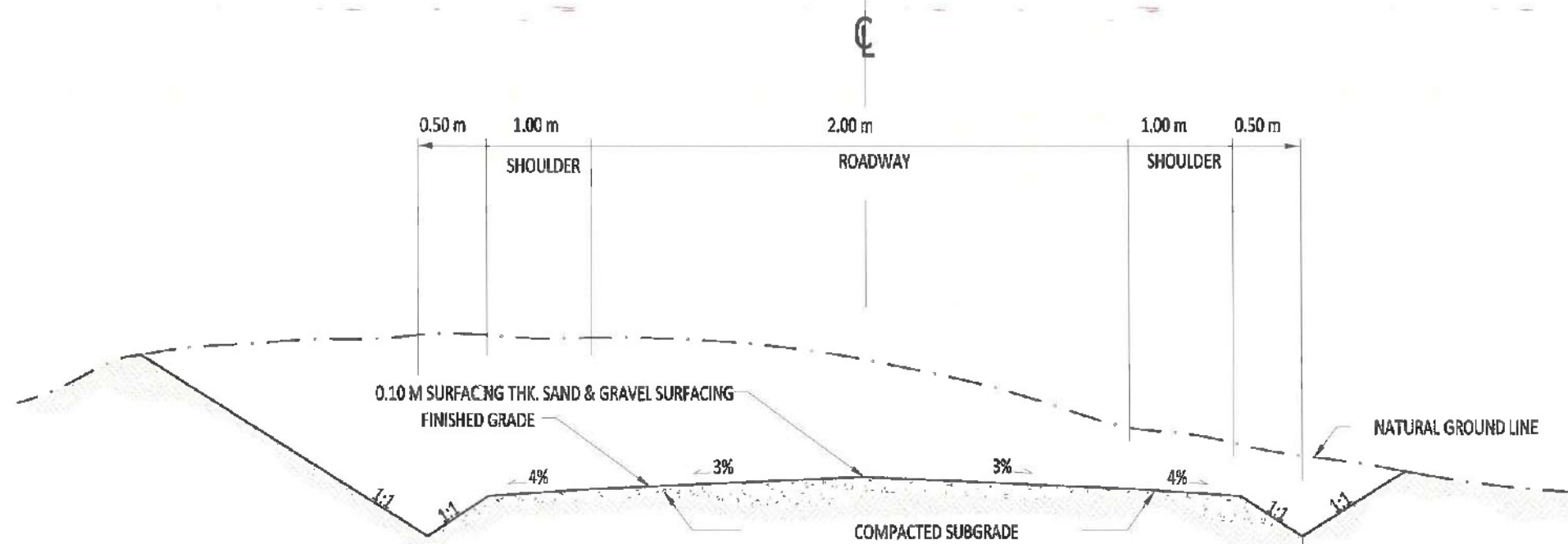
jbmayao



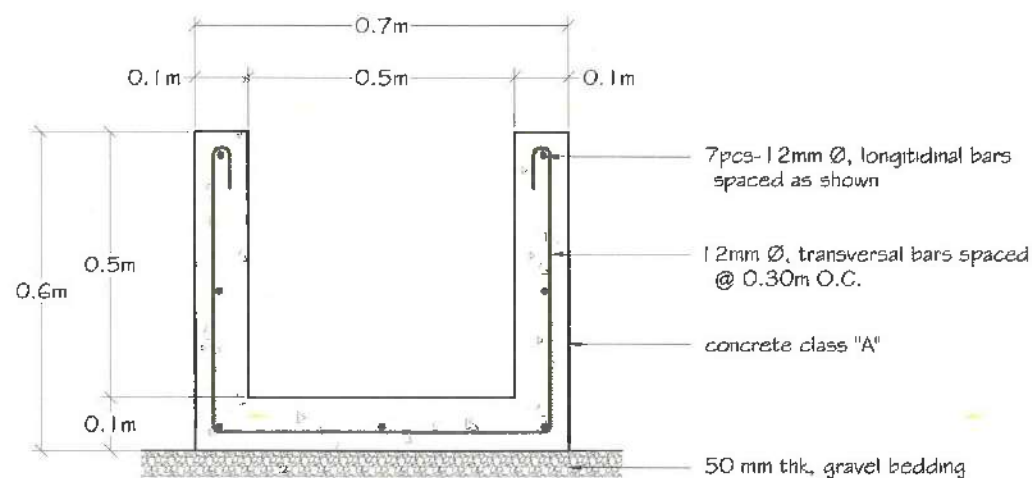
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d <sub>2N</sub>	0.20
b <sub>2N</sub>	0.40m
d <sub>2D</sub>	0.20m
d <sub>2C</sub>	0.70m
r <sub>2</sub>	0.25m
D <sub>2D</sub>	0.40m
H <sub>2D</sub>	1.50m
CT <sub>2</sub>	0.50m
L <sub>2</sub>	1.70m
b <sub>1N</sub>	0.55m
W <sub>2N</sub>	1.50m



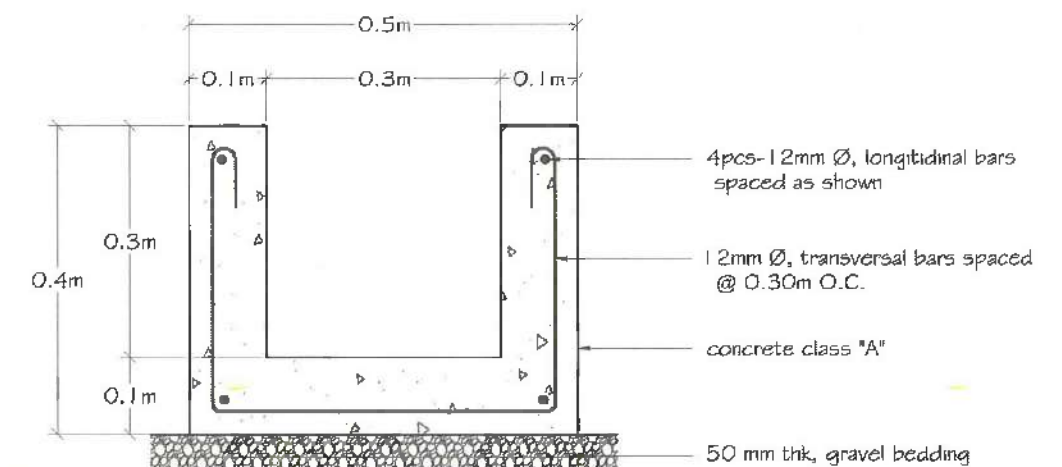




1  
14/17  
TYPICAL ROAD SECTION DETAILS  
SCALE NTS



2  
14/17  
MAIN CANAL TYPICAL SECTION  
SCALE NTS

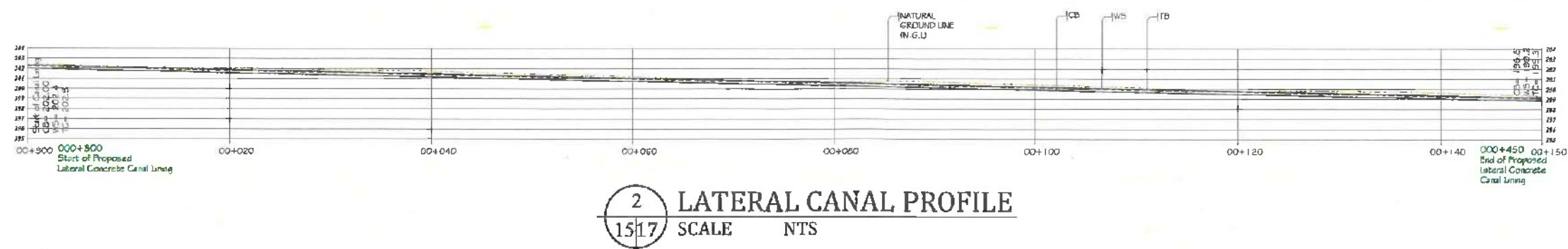
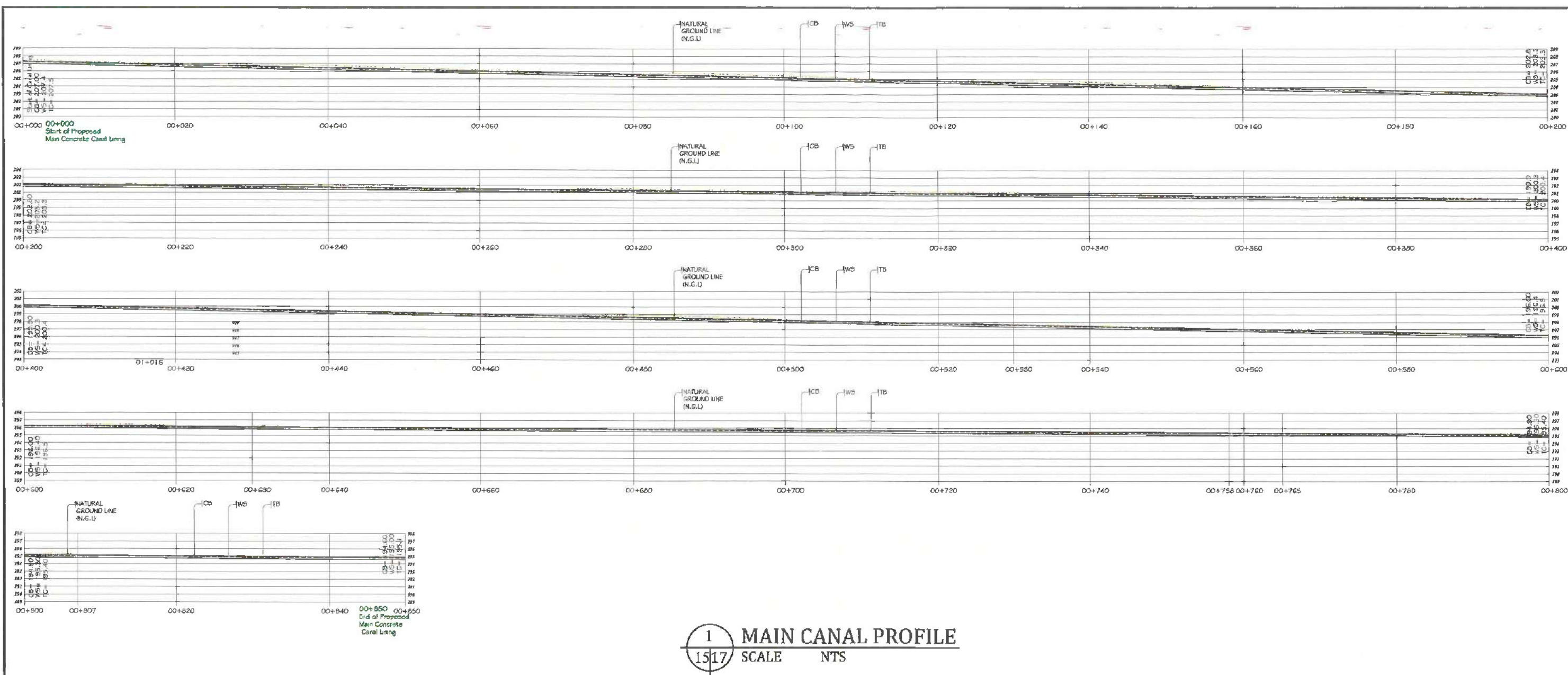


3  
14/17  
LATERAL CANAL TYPICAL SECTION  
SCALE NTS

DA-RFO GAR RAED-QF009 GCT 10 2022 MEY GDL

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p><i>Joram B. Mayao</i> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p><i>Jun O. Alejo</i> JUN O. ALEJO Engineer III/EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p><i>Filemon A. Salvador</i> FILEMON A. SALVADOR Engineer V, Division Chief, RAED</p>	<p>Approved:</p> <p><i>Apty. Jennilyn M. Dawayan</i> APTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location: Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>• Typical Road Section Details</li> <li>• Main Canal Typical Section</li> <li>• Lateral Canal Typical Section</li> </ul>	<p>Sheet no.:</p> <p>14/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p><i>Joram B. Mayao</i></p>
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DA-RFO CAR-RAED-00109-01-10-2022 REV 001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	<p>Prepared by:</p> <p><i>Joram B. Mayao</i> JORAM B. MAYAO Engineer I, RAED</p>	<p>Checked by:</p> <p><i>Jun O. Albio</i> JUN O. ALBIO Engineer III/EPDS Sect. Chief, RAED</p>	<p>Recommending Approval:</p> <p><i>Filemon A. Salvador</i> FILEMON A. SALVADOR Engineer IV/Division Chief, RAED</p>	<p>Approved:</p> <p><i>Athy Jennilyn M. Dawayan</i> ATHY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director</p>	<p>Name of Project:</p> <p>Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP)</p> <p>Location:</p> <p>Agbannawag, Tabuk City, Kalinga</p> <p>Sheet Contents:</p> <ul style="list-style-type: none"> <li>Main Canal Profile</li> <li>Lateral Canal Profile</li> </ul>	<p>Sheet no.:</p> <p>15/17</p> <p>Size:</p> <p>A3</p> <p>CAD by:</p> <p><i>J. Mayao</i></p>
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**COMMISSION ON AUDIT**  
Cordillera Administrative Region  
City of Baguio

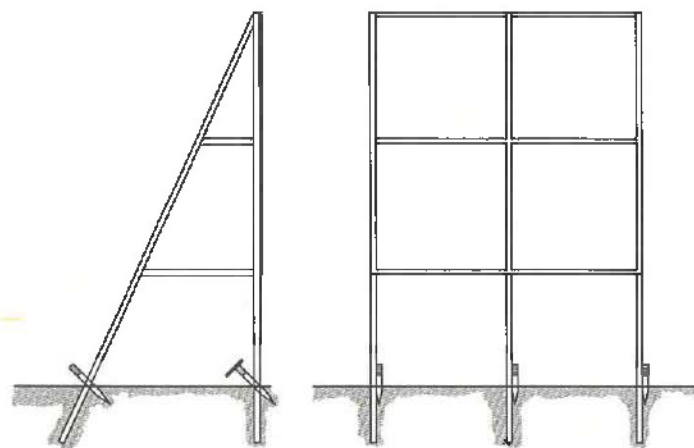
Project: \_\_\_\_\_ Cost: \_\_\_\_\_  
Location: \_\_\_\_\_ Fund Source: \_\_\_\_\_

Implementing Agency: DA-RFO-CAR  
Development Partner/s: \_\_\_\_\_  
Contractor/Supplier: \_\_\_\_\_  
Brief Description of the Project: \_\_\_\_\_  
Project Details:

Project Data			Project Status				Remarks
Duration	Start Date	Target Date of Completion	Percentage of Completion	As of (Date)	Next Interval to Date	Date Completed	

For performers or complaints about the project, please contact the Regional Office or Chapter which has jurisdiction on the project.  
COA Regional Office No./Chapter: \_\_\_\_\_  
Address: \_\_\_\_\_  
Contact Number: \_\_\_\_\_ or text COA Citizen's Desk @ 0915-529-1257

2.4m



1  
16/17  
**COA BILLBOARD DETAILS**  
SCALE NTS

NOTE:  
COA Billboard shall have the following specifications:  
Font: Helvetica/Geneva  
Font Size: Main Format = 3"  
Font Size: Sub Information = 1"  
Font Color: Black with white background

\*\*\*Signboard must already be put up at a strategic location at the project site upon receipt of Notice to Proceed.

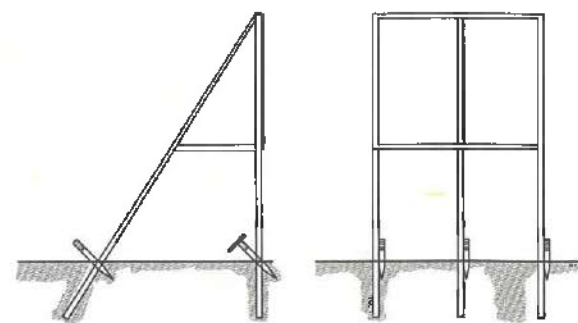
1 m

**CONSTRUCTION OF MABALBALANAY BANGCAG SMALL WATER IMPOUNDING PROJECT**  
Namburan, Tabuk City, Kalinga

CONTRACTOR: \_\_\_\_\_  
CONTRACT COST (P/P): \_\_\_\_\_  
DATE OF NOTICE TO PROCEED: \_\_\_\_\_  
PROJECT DURATION: \_\_\_\_\_  
IMPLEMENTING AGENCY: \_\_\_\_\_  
SOURCE OF FUND: \_\_\_\_\_

DEPARTMENT OF AGRICULTURE  
REGIONAL FIELD OFFICE  
CORDILLERA ADMINISTRATIVE REGION

1.5m



2  
16/17  
**DA BILLBOARD DETAILS**  
SCALE NTS

1.0m  
0.60m

0.40m 0.15m

0.40m

1.0m 0.60m

0.2m 0.2m

**DEPARTMENT OF AGRICULTURE  
Regional Field Office -  
Cordillera Administrative Region**

Source of Fund

**CONSTRUCTION OF MABALBALANAY BANGCAG SMALL WATER IMPOUNDING PROJECT (SWIP)**  
Project Title

Namburan, Tabuk City, Kalinga  
Location

Date Completed

3  
16/17  
**PROJECT MARKER DETAILS**  
SCALE NTS

DA-RFO-CAR-RAED-QP009 DCY 10 2022 REV 001

 <p>Republic of the Philippines <b>DEPARTMENT OF AGRICULTURE</b> Regional Field Office - Cordillera Administrative Region <b>REGIONAL AGRICULTURAL ENGINEERING DIVISION</b> BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	Prepared by:	Checked by:	Recommending Approval:	Approved:	Name of Project:	Sheet no.:
					Construction of Mabalbalanay-Bangcag Small Water Impounding Project (SWIP)	16/17
	JORAM B. MAYAO Engineer I, RAED	JUN D. ALEJO Engineer III/ EPDS Sect. Chief, RAED	FILEMON A. SALVADOR Engineer V/ Division Chief, RAED	ATTY. JENNILYN M. DAWAYAN, CESO IV Regional Executive Director	Location: Agbannawag, Tabuk City, Kalinga	Size: A3
					Sheet Contents:	CAD by: jbmayao

- COA Billboard Details
- DA Billboard Details
- Center Post Details
- Sliding Door Details



## GENERAL

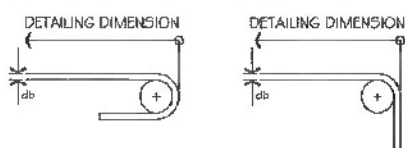
1. ALL WORK AND MATERIALS SHALL CONFORM TO THE DA SPECIFICATIONS. A COPY OF THESE DOCUMENTS SHALL BE ON THE PROJECTS SITE DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL VERIFY ALL STATIONS, DIMENSIONS AND CONDITIONS AT THE PROJECT SITE BEFORE PROCEEDING WITH THE WORK. ANY DISCREPANCIES BETWEEN THE ACTUAL CONDITIONS AND INFORMATION SHOWN ON THE DRAWINGS SHALL BE NOTIFIED TO THE PROJECT-IN-CHARGE.
3. THE DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURES. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION UNLESS SO STATED. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY MEASURES TO PROTECT THE STRUCTURES, ADJACENT PROPERTIES AND WORKMEN DURING CONSTRUCTION.
4. GENERAL NOTES AND TYPICAL DETAILS APPLY TO ALL DRAWINGS UNLESS OTHERWISE SHOWN OR NOTED.
5. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.
6. PRIOR TO ANY CONSTRUCTION ACTIVITY, THE CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION MEETING TO BE CONDUCTED BY DA PERSONNEL WITH THE FARMER BENEFICIARIES TO THOROUGHLY REVIEW & DISCUSS THE APPROVED DRAWINGS AND DOCUMENTS TO AVOID OR REDUCE POSSIBLE CONFLICTS AND DELAYS IN COMPLETING THE PROJECT.
7. A COPY OF THE APPROVED CONSTRUCTION PLANS MUST BE ON THE PROJECT SITE WHEN CONSTRUCTION IS IN PROGRESS.
8. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY DA REPRESENTATIVES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE REMOVAL AND REPLACEMENT OF ITEMS THAT DO NOT MEET CITY STANDARDS OR WERE CONSTRUCTED WITHOUT INSPECTION OF THE PROJECT-IN-CHARGE.
9. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN TEST REPORT OF PURCHASED MATERIALS AND CONSTRUCTED STRUCTURES AS SPECIFIED ON THE SPECIFICATIONS OF DA.

## NORMAL WEIGHT CONCRETE

1. CONCRETE USED IN THIS STRUCTURAL WORK SHALL HAVE COMPRESSIVE STRENGTH AT 28 DAYS OF  $21 \text{ kg/cm}^2$  (3,000 PSI) EXCEPT FOR LOAD BEARING CHB FILLERS WHICH ARE  $140 \text{ kg/cm}^2$  (2,000 PSI).
2. MINIMUM CLEAR CONCRETE COVER SHALL BE AS FOLLOWS:
  - A. BEAMS.....40mm
  - B. FOOTING (CAST AGAINST EARTH).....75mm
  - C. SLABS AND WALLS (NOT EXPOSED TO WEATHER).....20mm
  - D. CONCRETE EXPOSED TO EARTH OR WEATHER.....40mm
  - E. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED EARTH TO EARTH.....75mm
  - F. ALL CONCRETE SHALL BE KEPT MOIST FOR A MINIMUM OF 7 CONSECUTIVE DAYS IMMEDIATELY AFTER POURING BY FOG SPRAYING OR OTHER APPROVED METHODS.

## REINFORCING BARS

1. UNLESS OTHERWISE SPECIFIED ON PLANS, ALL REINFORCING BARS SHALL BE DEFORMED WITH A MINIMUM YIELD STRENGTH,  $f_y = 230 \text{ MPa}$  (30,000 PSI) GRADE 33 FOR 10mm  $\phi$  AND BELOW;  $f_y = 275 \text{ MPa}$  (40,000 PSI) GRADE 40 FOR 12mm  $\phi$ , 16mm  $\phi$  AND 20mm  $\phi$ .
2. ALL REINFORCING BARS SHALL BE ACCURATELY AND SECURELY PLACED BEFORE POURING CONCRETE.
3. REINFORCING BARS SHALL BE FREE OF RUST, GREASE OR OTHER MATERIALS
4. STANDARD HOOKS SHALL BE AS FOLLOWS:



BAR DIAMETER, $d_b$ (mm)	D (mm)	180° HOOK L (mm)	90° HOOK L (mm)
10	60	65	120
12	72	65	145
16	96	65	196
20	120	80	240

5. STANDARD SPLICES SHALL BE AS FOLLOWS:



BAR DIAMETER, $d_b$ (mm)	LAP SPICE L (mm)
10	514
12	611
16	819

## GROUTED RIPRAP

1. BOULDERS SHALL BE PLACED ON THE SURFACE TO THE DEPTH SPECIFIED. IT SHALL BE SECURELY BEDDED WITH THE LARGER ROCKS FIRMLY IN CONTACT ONE TO ANOTHER WITHOUT BRIDGING.
2. STONES FOR RIPRAP SHALL BE AS FOLLOWS:
 

CLASS A :	STONES RANGING FROM A MINIMUM OF 15kg TO A MAXIMUM OF 25kg WITH AT LEAST 50% OF THE STONES WEIGHING MORE THAN 20kg
CLASS B :	STONES RANGING FROM A MINIMUM OF 30kg TO A MAXIMUM OF 70kg WITH AT LEAST 50% OF THE STONES WEIGHING MORE THAN 50kgs
3. MORTAR FOR GROUTED RIPRAP SHALL CONSIST OF SAND, CEMENT AND WATER CONFORMING TO THE REQUIREMENTS, MIXED IN THE PROPORTION OF ONE PART CEMENT TO THREE PARTS SAND BY VOLUME, AND SUFFICIENT WATER TO OBTAIN THE REQUIRED CONSISTENCY.

## ABBREVIATIONS

HOR.	HORIZONTAL
MAX,max	MAXIMUM
MIN	MINIMUM
MPa	MEGAPASCAL
RSB	REINFORCED STEEL BAR
kg	KILOGRAM
kN	KILONEWTON
kN/m <sup>3</sup>	KILONEWTON PER CUBIC
	METER
kPa	KILOPASCAL
psf	POUNDS PER SQUARE
	FOOT
psi	POUNDS PER SQUARE
	INCH
OCBW	ON CENTER BOTHWAYS
OCEW	ON CENTER EACH
	WAY
BW	BOTH WAYS
OC	ON CENTER
M,m	METER
BOTT	BOTTOM
CONC	CONCRETE
DEG,°	DEGREE
DET	DETAIL
ELEV	ELEVATION
GA	GAGE
@	AT
&	AND
$\phi$	DIAMETER
No, NO.	NUMBER
SCHED	SCHEDULE
thk	THICK
NTS	NOT TO SCALE

## 1 GENERAL CONSTRUCTION NOTES

1717 SCALE NTS

DA-RFO CAR RAED-QP009 OCT 10 2022 REV 001

 <p>Republic of the Philippines DEPARTMENT OF AGRICULTURE Regional Field Office- Cordillera Administrative Region REGIONAL AGRICULTURAL ENGINEERING DIVISION BPI Compound, Guisad, Baguio City Telefax No. (074) 445-3771</p>	Prepared by:	Checked by:	Recommending Approval:	Approved:	Name of Project:	Sheet no.:
	 <b>JORAM B. MAYAO</b> Engineer I, RAED	 <b>JUN O. ALEJO</b> Engineer III/ ERDS Sect. Chief, RAED	 <b>FILEMON A. SALVADOR</b> Engineer V, Division Chief, RAED	 <b>ATTY. JENNILYN M. DAWAYAN, CESO IV</b> Regional Executive Director	Construction of Mabalalanay-Bangcag Small Water Impounding Project (SWIP) Location: Agbannawag, Tabuk City, Kalinga Sheet Contents: • General Construction Notes	<b>17/17</b> Size: A3 CAD by: 

# REHABILITATION OF LIBASAN SWIP

## Brgy. Libasan, Nabunturan, Davao de Oro

### Region - 11



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**

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**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and**  
**Water Management**  
WATER RESOURCES MANAGEMENT DIVISION

Reference Code: BSWM-WD-IF-006  
Control Number: 2024-07 WD-RES-0001  
Effective Date: November 6, 2023

Prepared by:

ENGR. JEANETTE M. MORALES  
WRDO II  
(RPABE No. 8533)  
Date: \_\_\_\_\_

Checked / Reviewed by:

ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: \_\_\_\_\_

Recommending Approval:

ENGR. DIOSDADO M. MANALUS  
CIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: \_\_\_\_\_

Approved by:

GINA P. NILO, Ph.D.  
Director  
Date: \_\_\_\_\_

Sheet Contents:

LIST OF DRAWINGS

Name of Project:

Rehabilitation of Libasan SWIP

Location:

Brgy. Libasan, Nabunturan, Davao de Oro

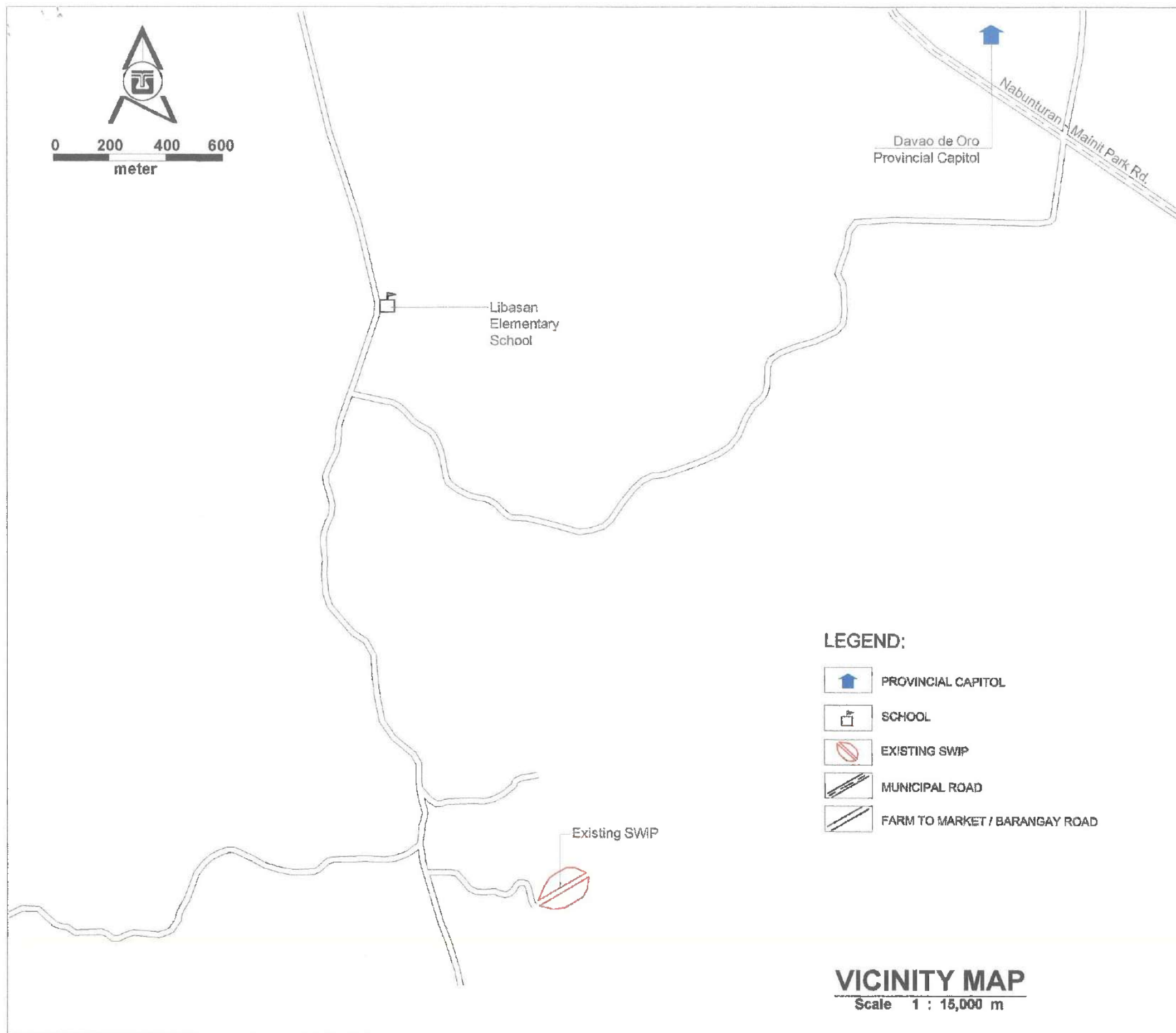
CAD / Drawn by:

R. Samson

Sheet No.:

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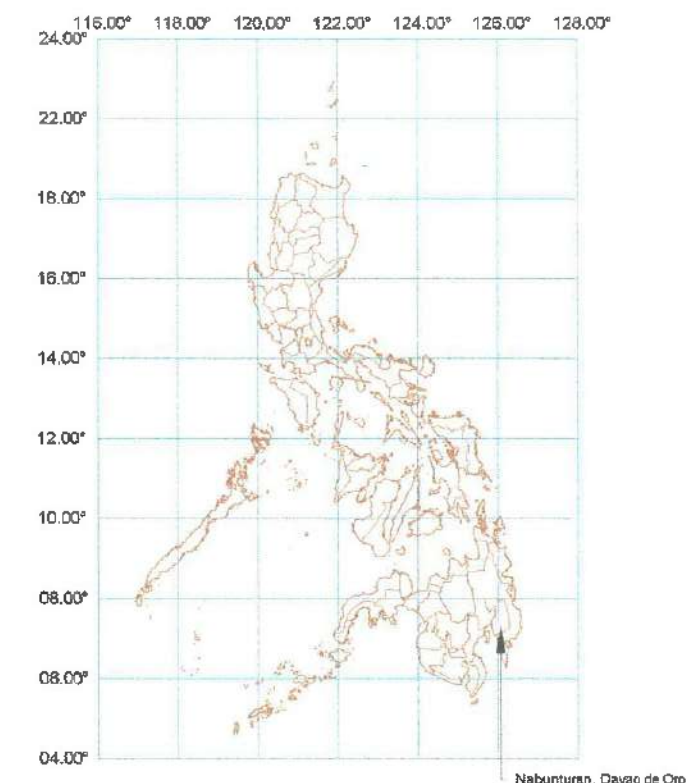


#### LEGEND:

- PROVINCIAL CAPITOL
- SCHOOL
- EXISTING SWIP
- MUNICIPAL ROAD
- FARM TO MARKET / BARANGAY ROAD

#### VICINITY MAP

Scale 1 : 15,000 m



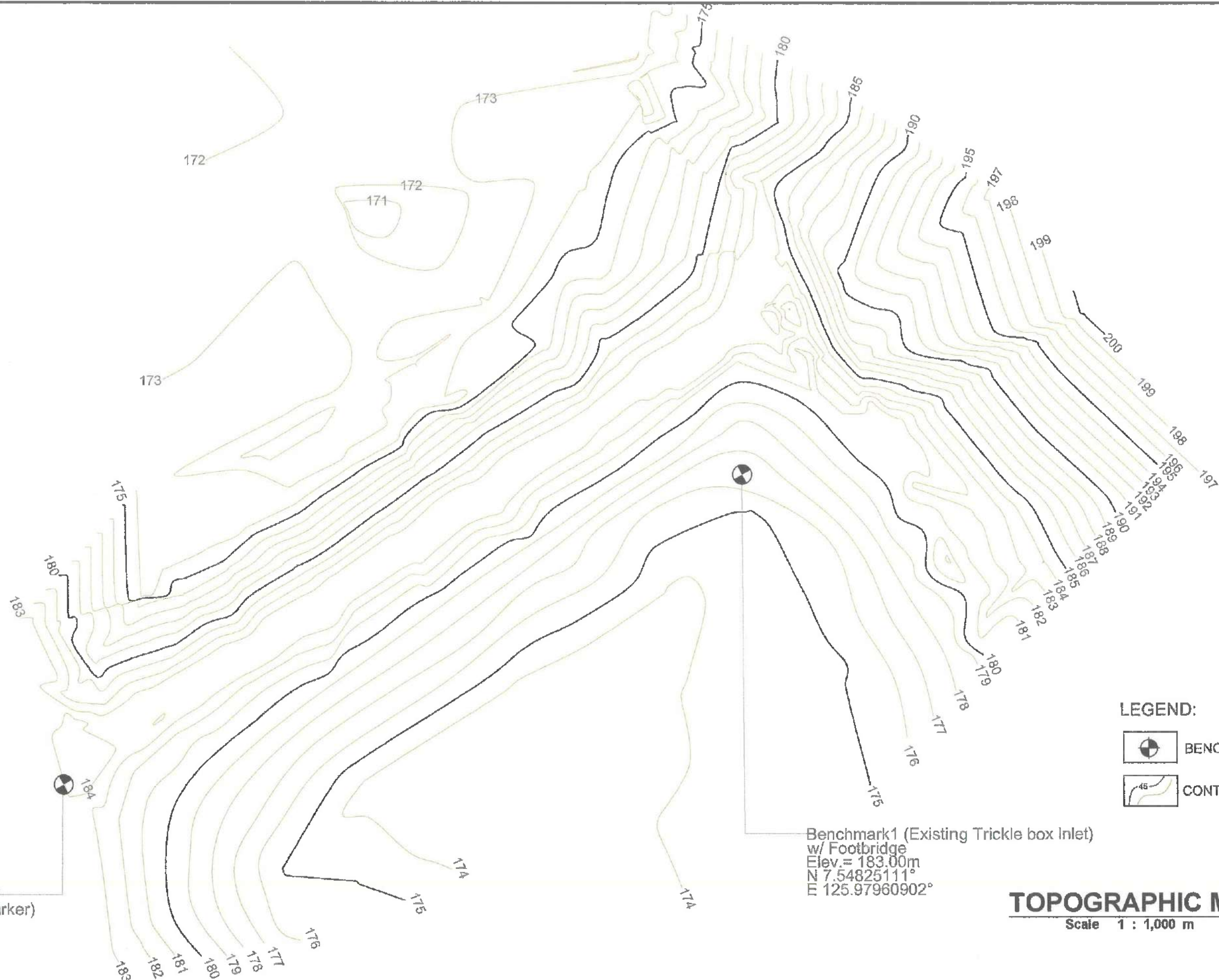
#### MAIN PROJECT FEATURES

NAME OF PROJECT: REHABILITATION OF LIBASAN SWIP  
LOCATION: Brgy. Libasan, Nabunturan, Davao de Oro  
DESIGNER: Engr. Jeancelle M. Morales

1. WATERSHED	
AREA (ha.)	242.00
PRESENT LAND-USE(Dominant)	FOREST
SOIL TYPE	SANDY CLAY LOAM
4. PROJECT FACILITIES	
a. DAM	
TYPE	SWIP
CREST ELEV. (m.)	184.50
HEIGHT (m.)	11.50
CREST WIDTH (m.)	6
CREST LENGTH (m.)	210
UPSTREAM SLOPE (H:V)	2.75:1
DOWNSTREAM SLOPE (H:V)	2.50:1
b. SPILLWAY (PROPOSED)	
b.1 APPROACH CHANNEL	
LENGTH (m.)	18
WIDTH (m.)	3
SURCHARGE HEIGHT (m.)	0.96
b.2 DISCHARGE CHANNEL (PROPOSED)	
LENGTH (m.)	60
WIDTH (m.)	3
c. OUTLET WORKS	
TYPE	Gate Valve
PIPE DIAMETER (m.)	0.20
5. DESIGN SERVICE AREA AND CROPPING PATTERN	
CROPPING PATTERN	Rice      Rice      Fallow
SERVICE AREA (ha.)	160      160      160
6. PROJECT COST (P)	4,500,000.00

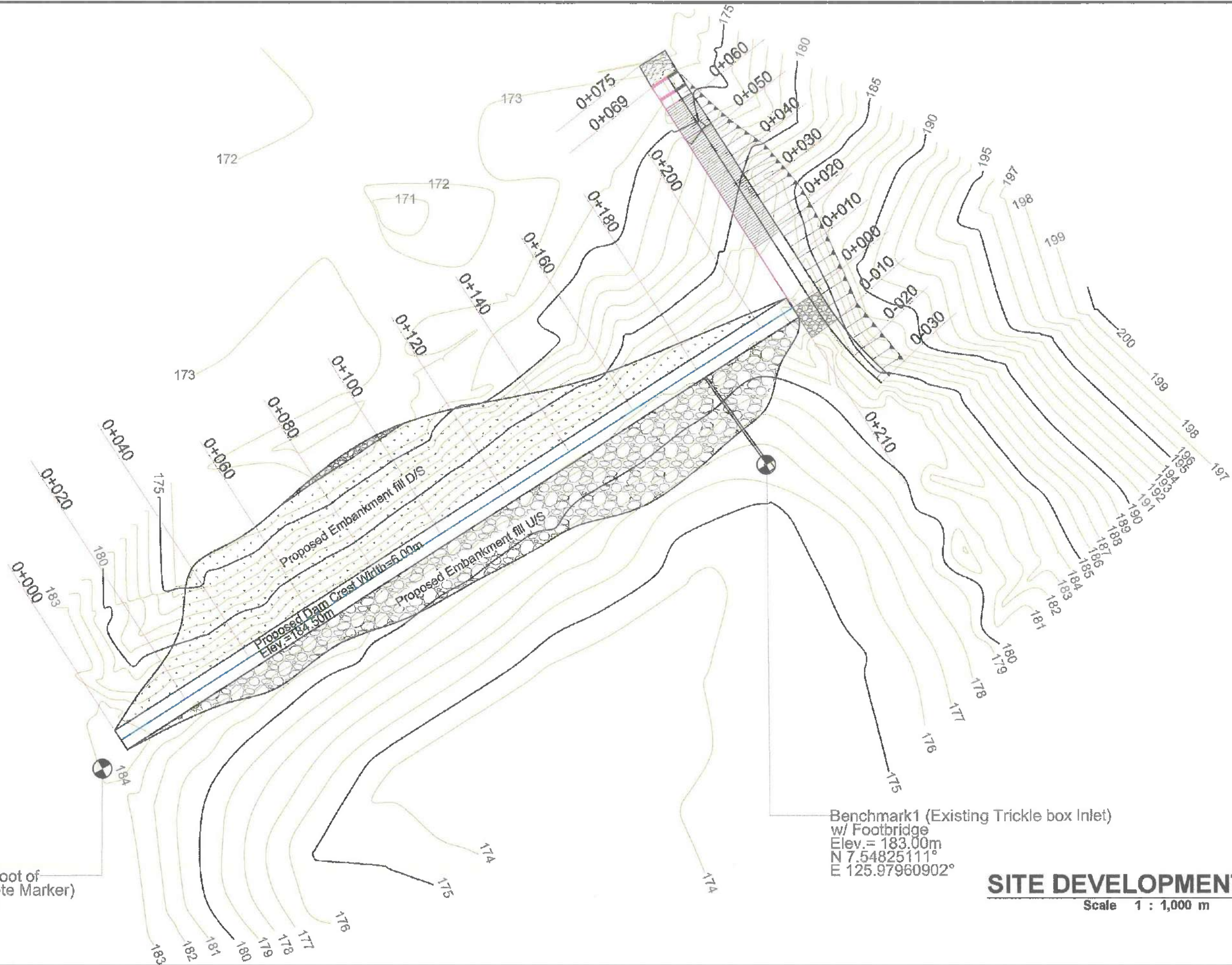
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	Reference Code: BSWM_WD_IF_006 Control Number: 202402_WD_RTS-00001 Effective Date: November 6, 2023	 ENGR. JEANCILLE M. MORALES WDO II (RPABE No.8533) Date: _____	 ENGR. ALBERT E. DE GUZMAN Chief, Design and Engineering Section (RPABE No.3287) Date: _____	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No.3057) Date: _____	 GINA F. NIÑO, Ph.D. Director Date: _____	VICINITY MAP / LOCATION MAP / MAIN PROJECT FEATURES	R. Samson
						Name of Project:	Sheet No.:
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Brgy. Libasan, Nabunturan, Davao de Oro



	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_IF_006 Control Number: 2024-08-WD-BES-00001 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		 ENGR. JEANELLE M. MORALES WRDO II (RPABE No. 8533) Date:	 ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date:	 ENGR. DIOSDADO M. MANALUS OIC, Water Resources Management Division (RPABE No. 3057) Date:	 GINA A. NILO, Ph.D. Director Date:	<b>TOPOGRAPHIC MAP</b> Name of Project:	R. Samson
						Rehabilitation of Libasan SWIP	Sheet No.:
						Location:	3 / 13
						Brgy. Libasan, Nabunturan, Davao de Oro	





Benchmark2 (Foot of  
Existing Concrete Marker)  
Elev. = 184.00m  
N 7.547578°  
E 125.978000°

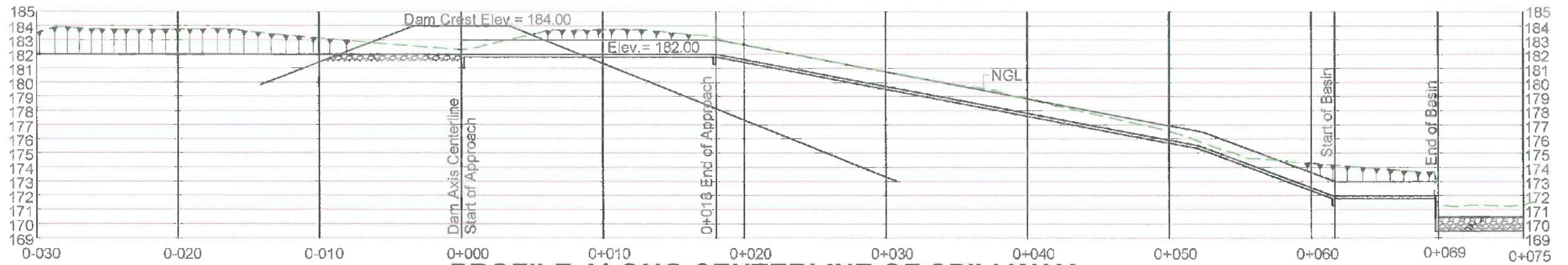
Benchmark1 (Existing Trickle box Inlet)  
w/ Footbridge  
Elev. = 183.00m  
N 7.54825111°  
E 125.97960902°

## SITE DEVELOPMENT PLAN

Scale 1 : 1,000 m

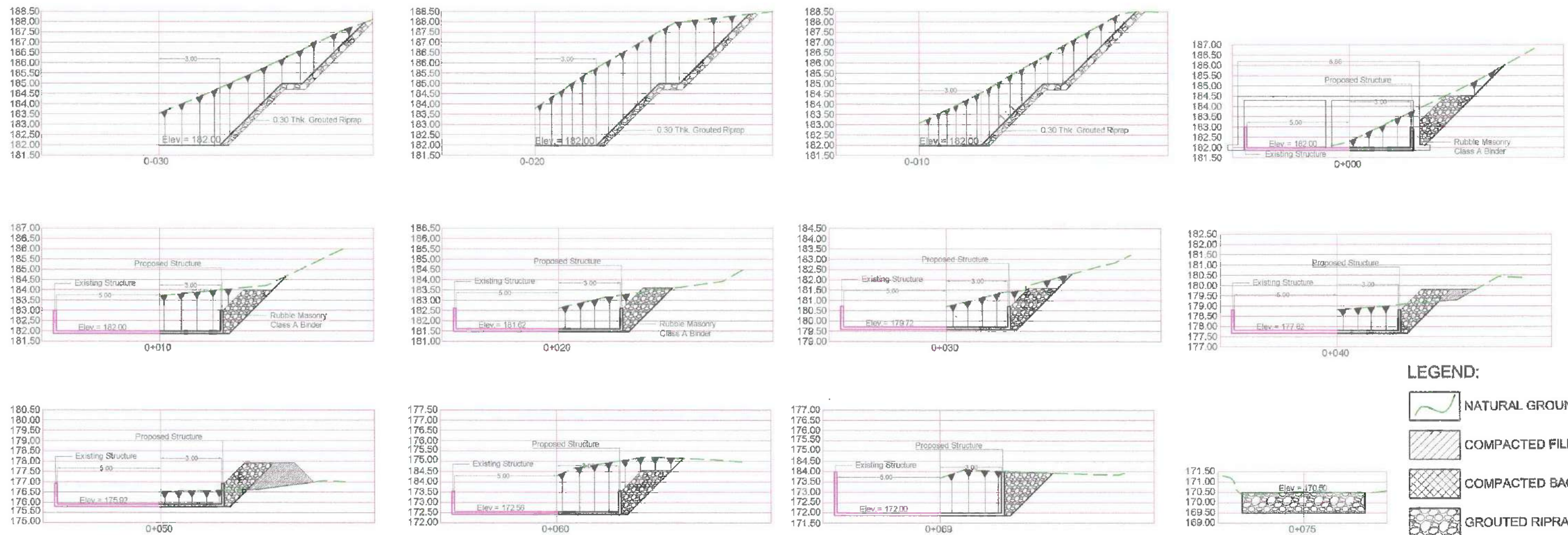
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**PROFILE ALONG CENTERLINE OF SPILLWAY**

Scale 1 : 300 m



**CROSS-SECTIONS ALONG CENTERLINE OF SPILLWAY**

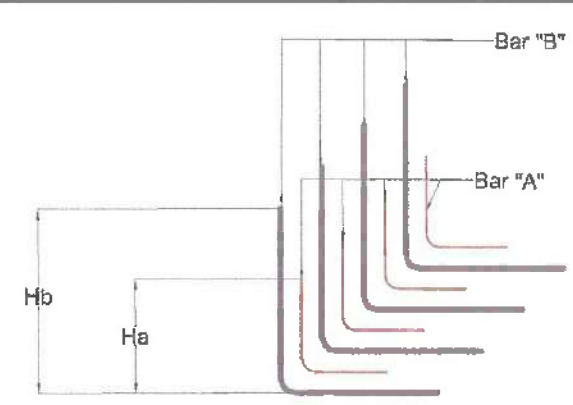
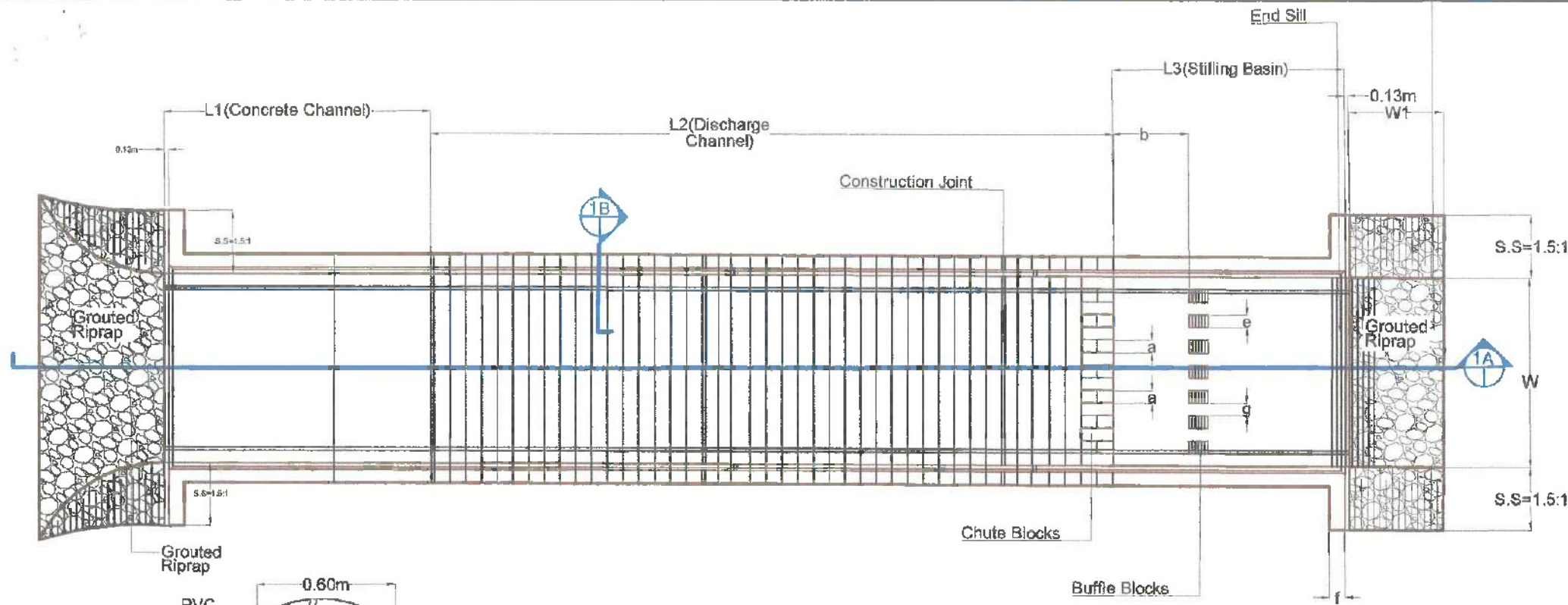
Scale 1 : 200 m

**LEGEND:**

- NATURAL GROUND LINE
- COMPACTED FILL
- COMPACTED BACKFILL
- GROUTED RIPRAP
- CUT
- EXISTING STRUCTURE
- PROPOSED STRUCTURE

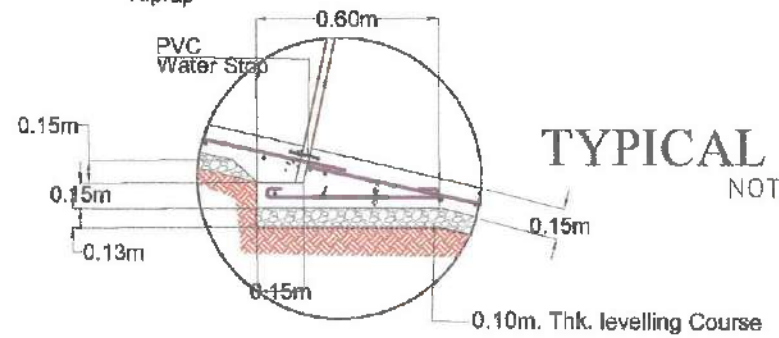
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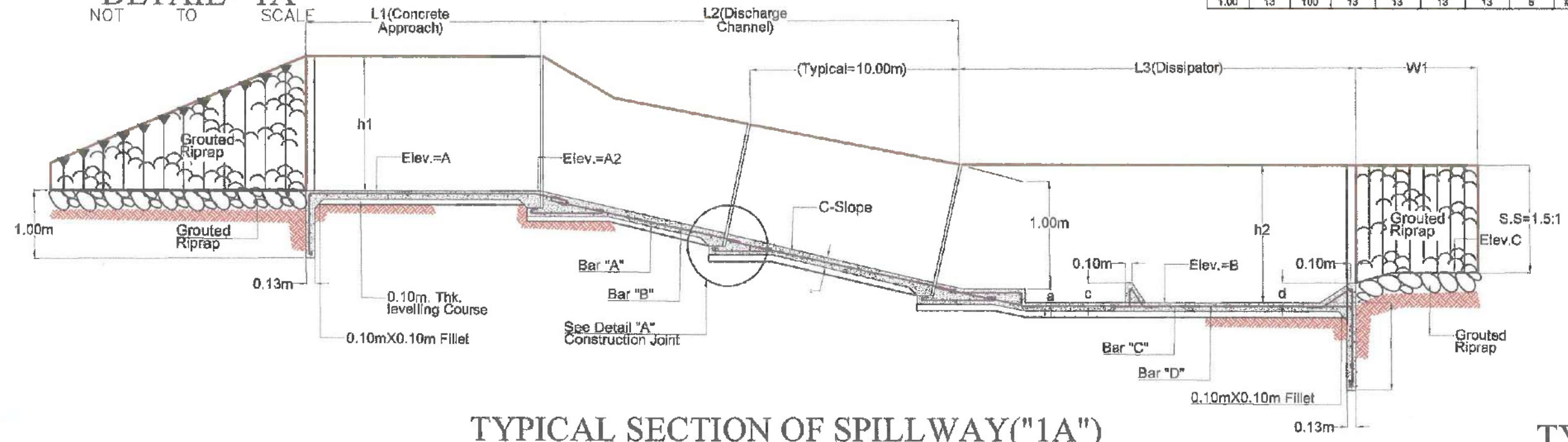
For height,  $H=3.00\text{m}$   
and Lesser  
NOT TO SCALE

SCHEDULE OF ELEVATIONS AND DIMENSIONS					
ELEV. A =	182.00 m	h1 =	1.00 m		
ELEV. B =	171.00 m	h2 =	2.00 m		
ELEV. C =	169.50 m	i =	n/a		
a =	0.30 m	j =	n/a		
b =	3.40 m	L1 =	10.00 m		
c =	0.20 m	L2 =	39.00 m		
d =	0.20 m	W =	3.00 m		
e =	0.30 m	W1 =	6.00 m		
g =	0.35 m	C-slope =	4.5:1 m		
L3 =	4.00 m	S-slope =	1.5:1 m		
LoC =	-	RoC =	-		

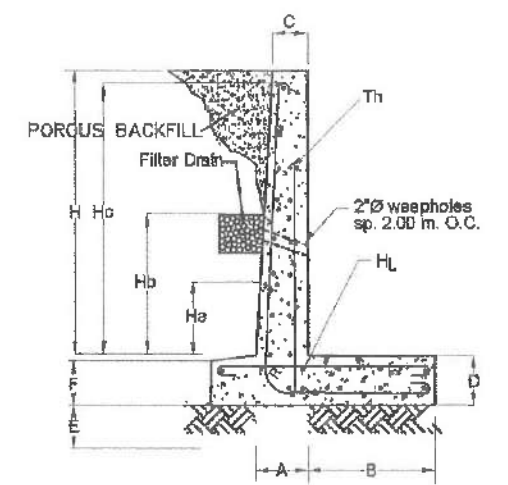


TYPICAL PLAN OF SPILLWAY  
NOT TO SCALE

SCHEDULE OF DIMENSIONS AND REINFORCEMENTS (FOR "1B")																			
H (m.)	A (cm.)	B (cm.)	C (cm.)	D (cm.)	E (cm.)	F (cm.)	R (cm.)	BAR "A"			BAR "B"		BAR "C"		Th		HL		Toe pressure (kg./sq.cm.)
								size	Ho	SPA	Hb	SPA	Hc	SPA	Size	SPA	Size	SPA	
1.00	13	100	13	13	13	13	6	#3	75	24	146	24	-	-	-	-	-	-	308



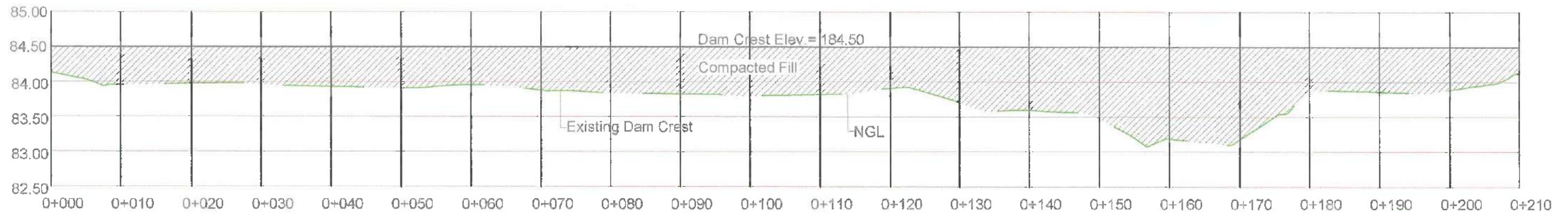
TYPICAL SECTION OF SPILLWAY ("1A")  
NOT TO SCALE



TYPICAL SECTION-"1B"  
NOT TO SCALE

<p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM-WD-IF-006 Control Number: 202402-WD-RES-00001 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
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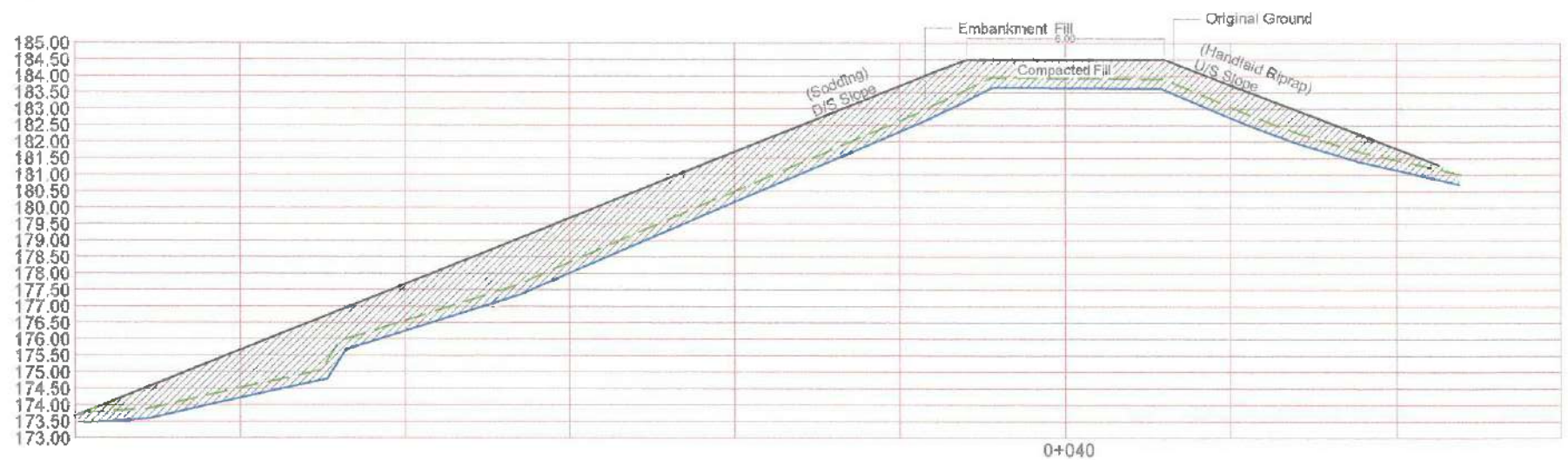
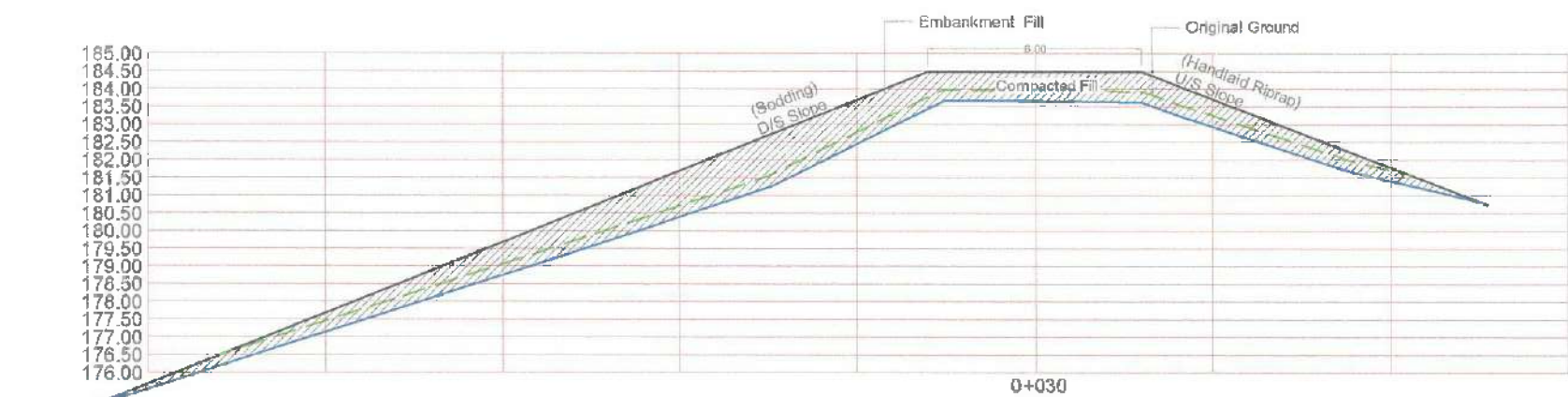
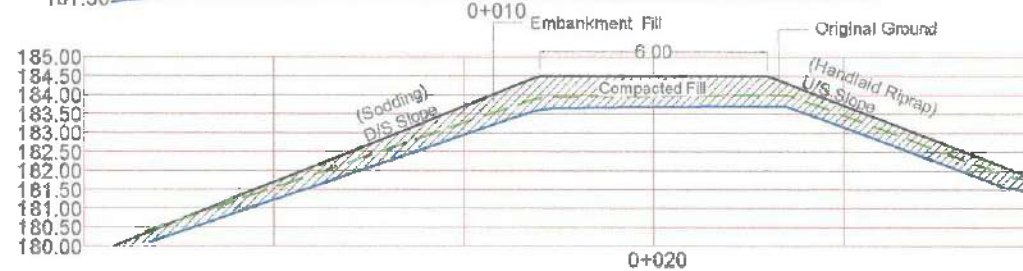
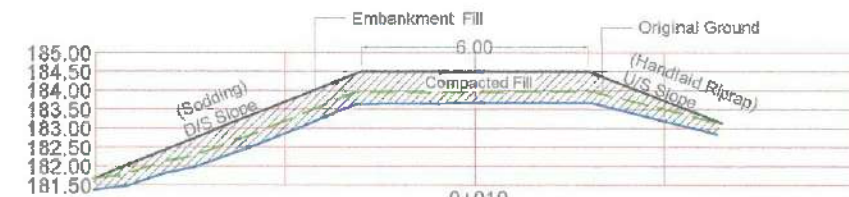
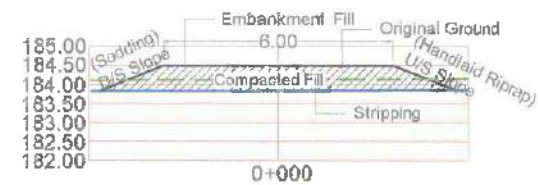
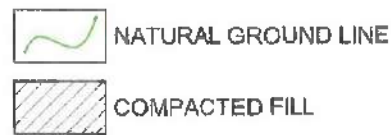




## PROFILE ALONG CENTERLINE OF DAM EMBANKMENT

Scale Horizontal : 1 : 600 m  
Vertical : 1 : 6,000m

### LEGEND:

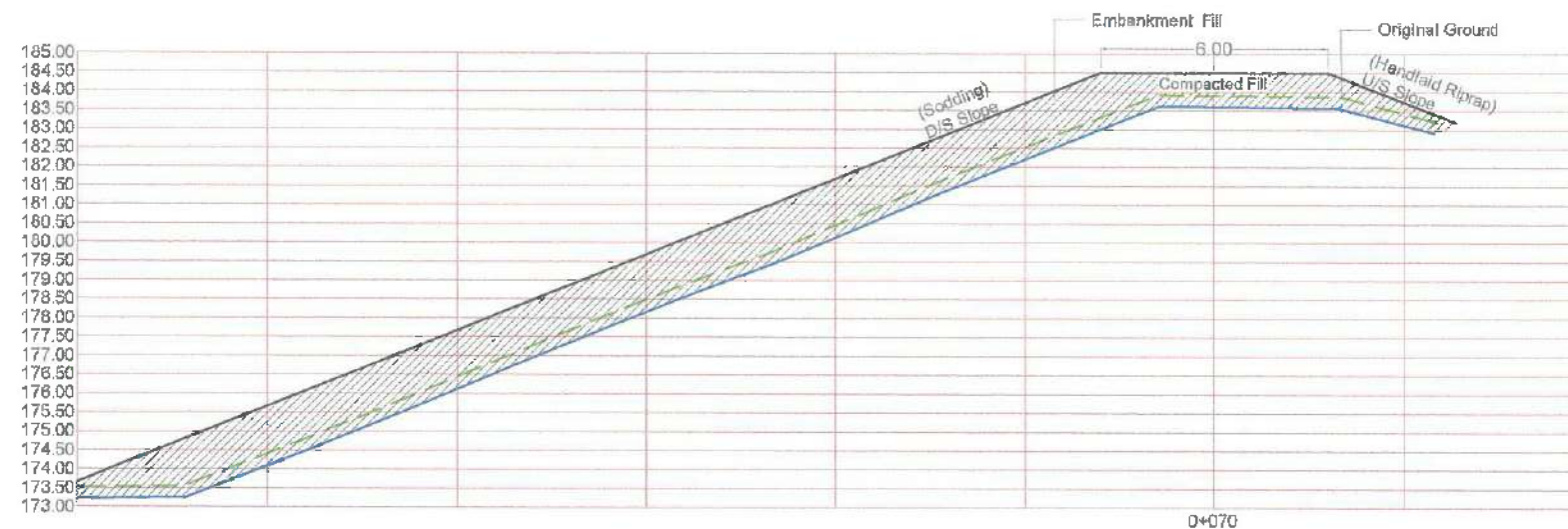
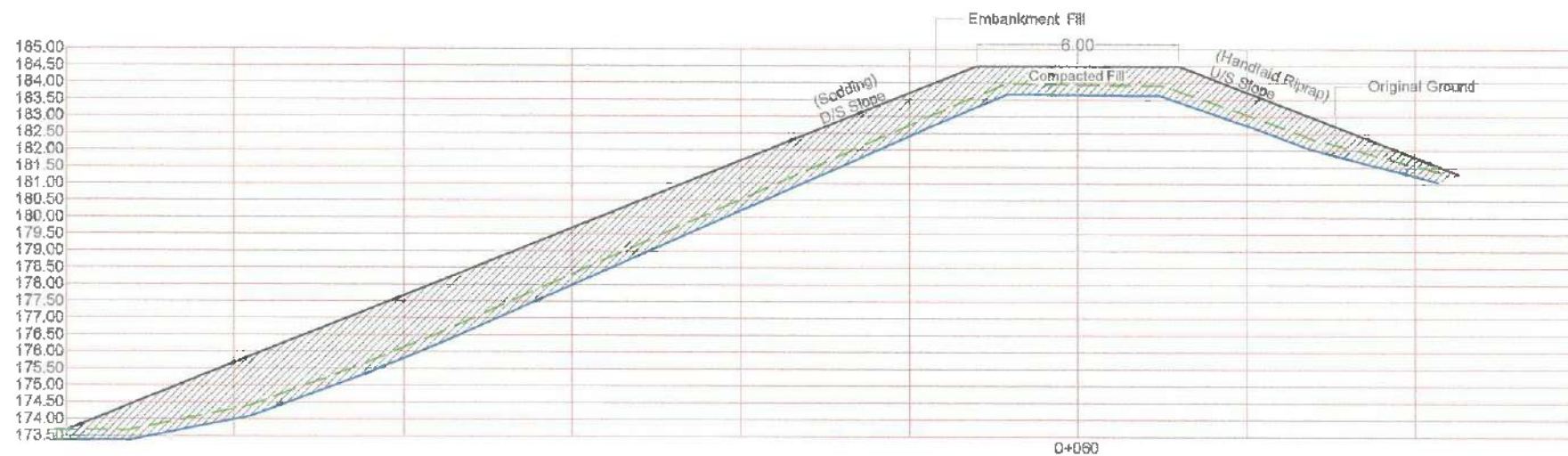
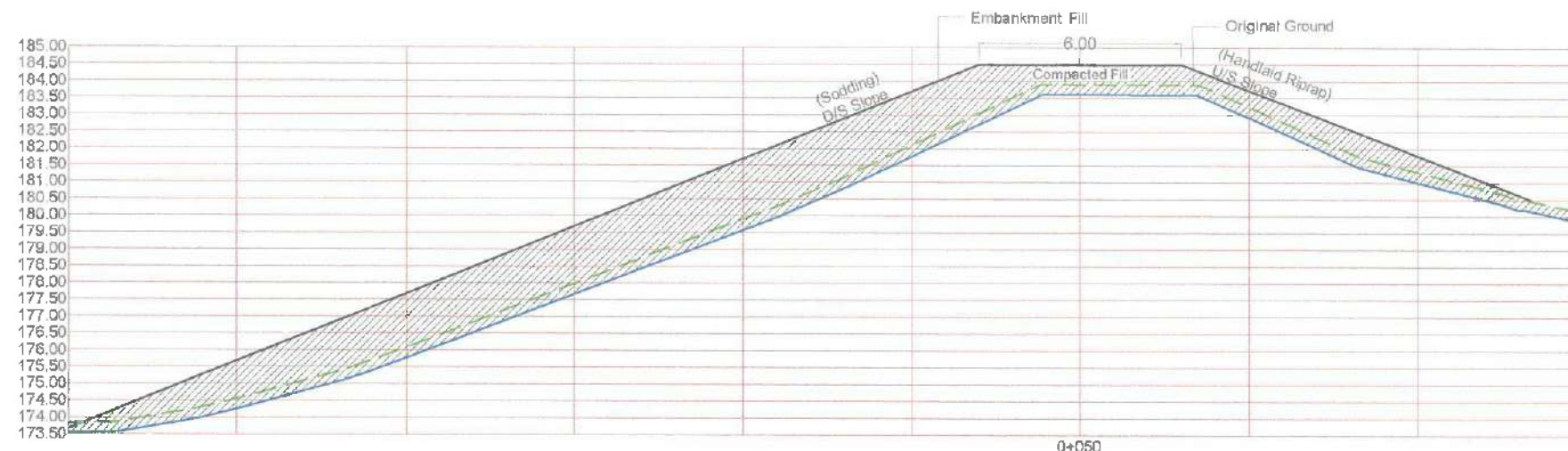


## CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT



Scale 1 : 200 m

<p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM-WD-IF-006 Control Number: 201002-WD-RES-00001 Effective Date: November 8, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
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**LEGEND:**

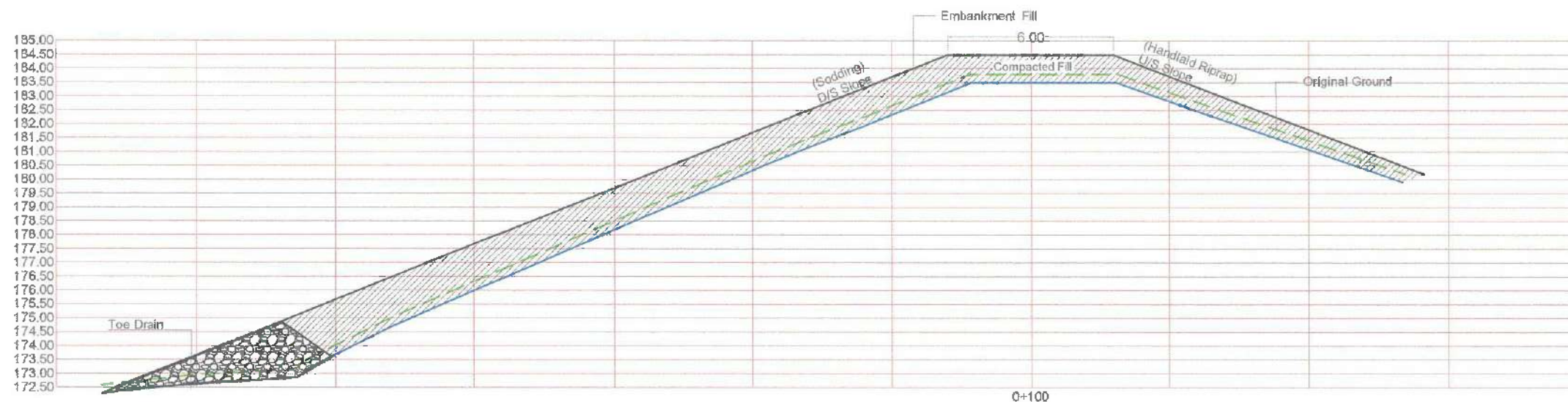
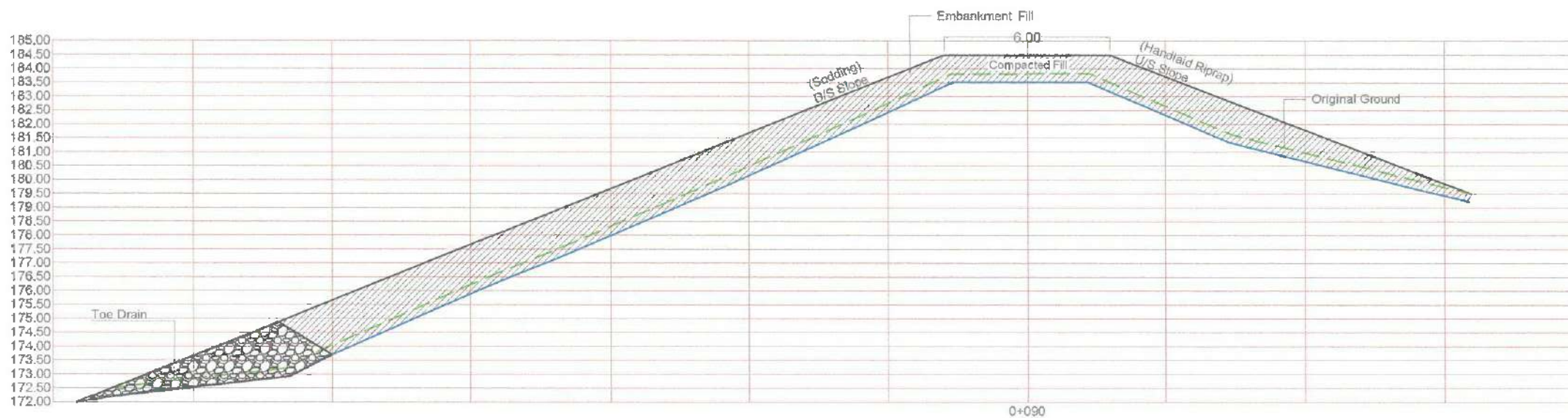
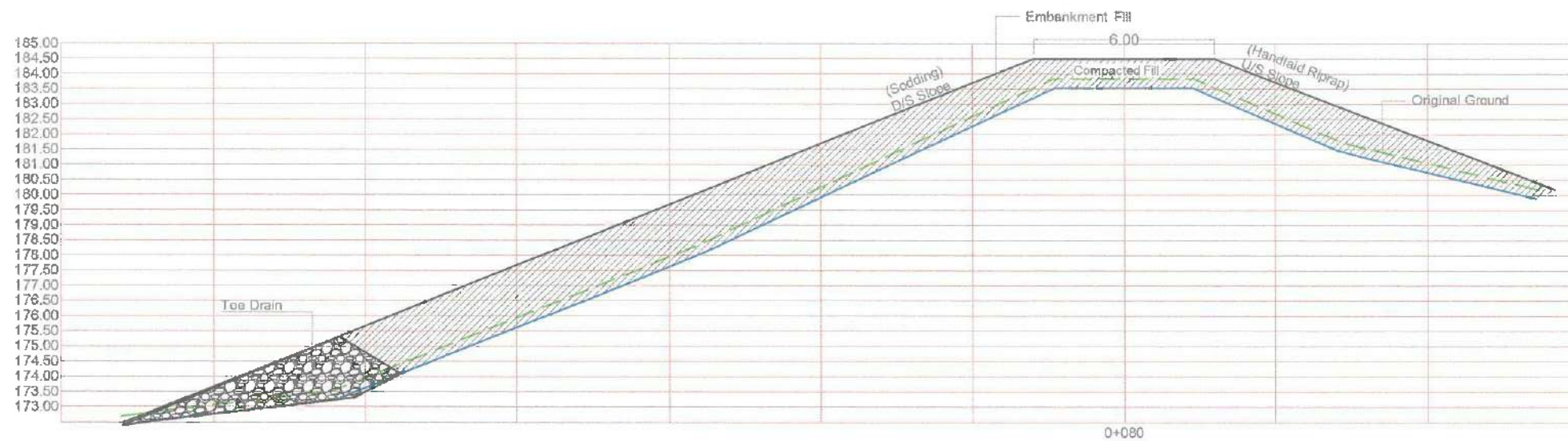
-  NATURAL GROUND LINE
-  COMPACTED FILL

## CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT


Scale 1 : 200 m


 <p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM_WD_IF_006 Control Number: 202402_WD_RES-00001 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
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	Name of Project:				Sheet No.:	
	Location:				8 / 13	
	Brgy. Libasan, Nabunturan, Davao de Oro					










**LEGEND:**

 NATURAL GROUND LINE

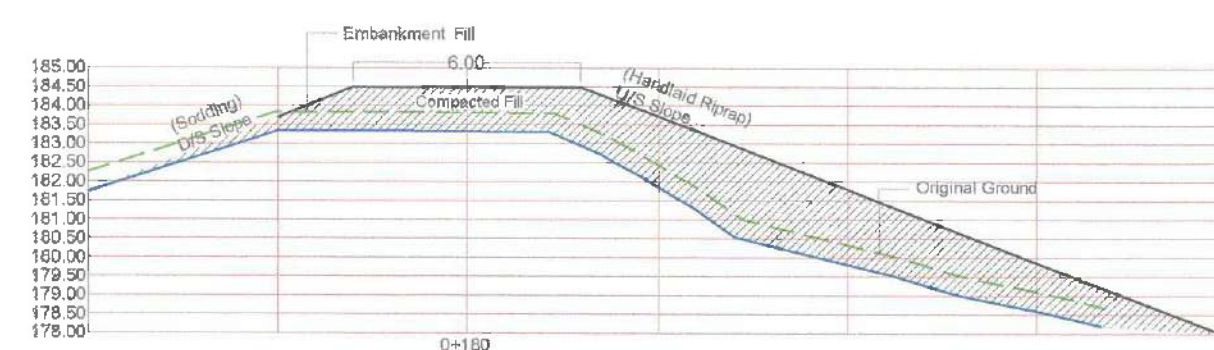
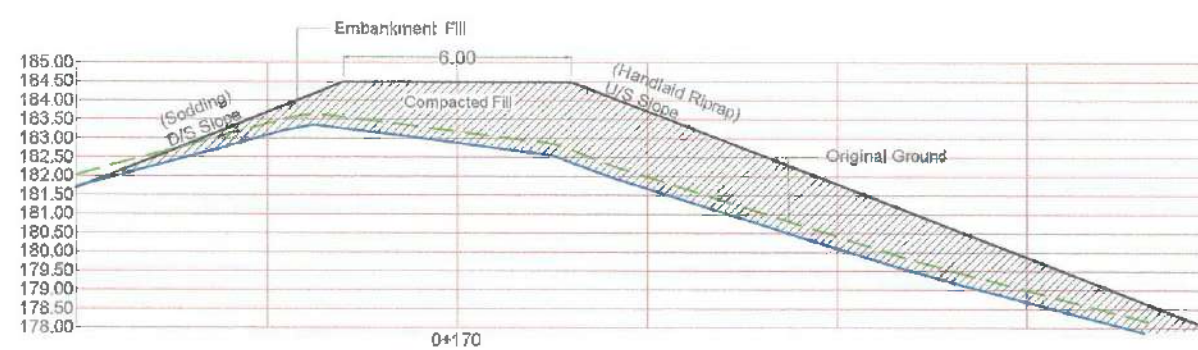
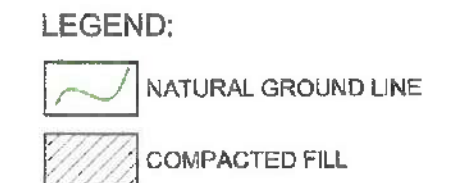
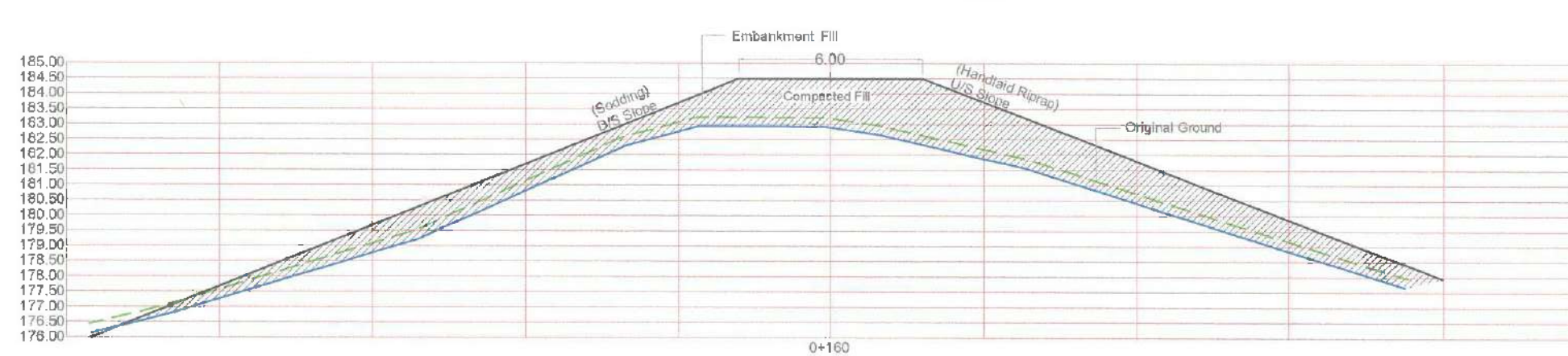
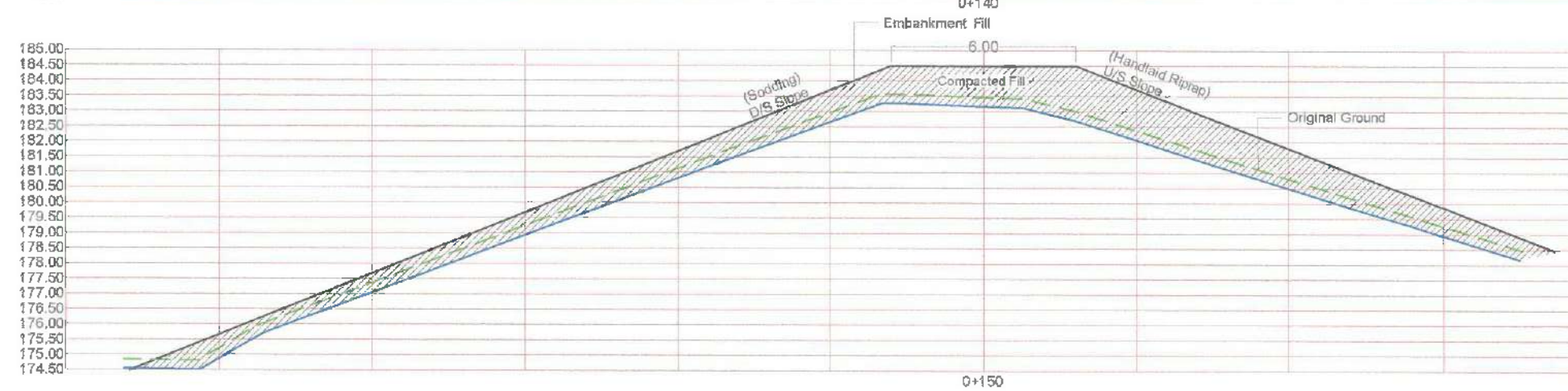
 COMPACTED FILL

## CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT

Scale 1 : 200 m






	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. JEANETTE M. MORALES</b> WRMO II (RPABE No. 8539) Date: _____	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: _____	Approved by:  <b>GNA BENILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT</b> Name of Project: <b>Rehabilitation of Libasan SWIP</b> Location: <b>Brgy. Libasan, Nabunturan, Davao de Oro</b>	CAD / Drawn by: R. Samson Sheet No.: <b>9 / 13</b>
	Reference Code: BSWM-WD-JF-006 Control Number: 202402-WD-RFS-00001 Effective Date: November 5, 2023						



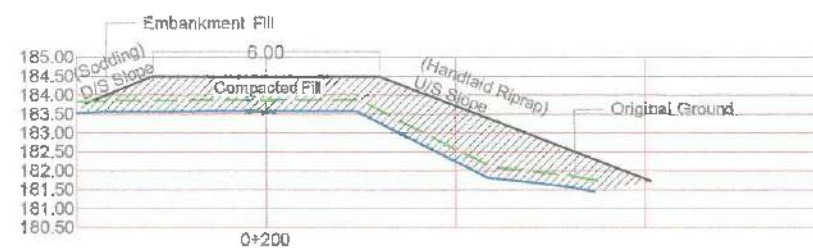
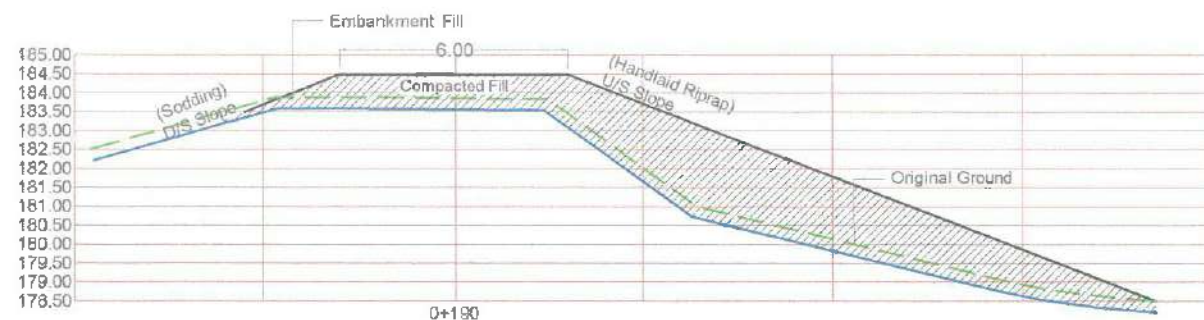


## CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT



Scale 1 : 200 m

 <p><b>DEPARTMENT OF AGRICULTURE</b> Bureau of Soils and Water Management WATER RESOURCES MANAGEMENT DIVISION</p> <p>Reference Code: BSWM WD JF_006 Control Number: 202403 WD RES-0001 Effective Date: November 6, 2023</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. JEANEZLE M. MORALES</b> WRD II (RPABE No.8533) Date: _____	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No.3267) Date: _____	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No.3057) Date: _____	 <b>GINA H. NILO, Ph.D.</b> Director Date: _____	<b>CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT</b> Name of Project: <b>Rehabilitation of Libasan SWIP</b> Location: <b>Brgy. Libasan, Nabunturan, Davao de Oro</b>	<b>R. Samson</b> Sheet No.: <b>11 / 13</b>



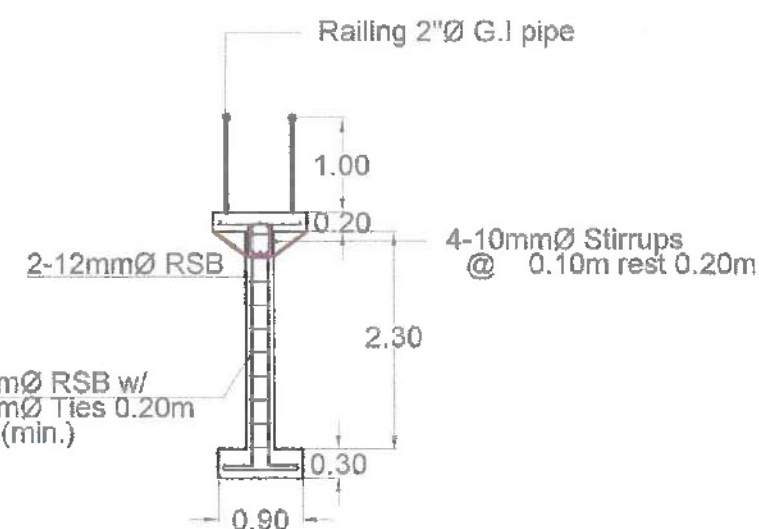
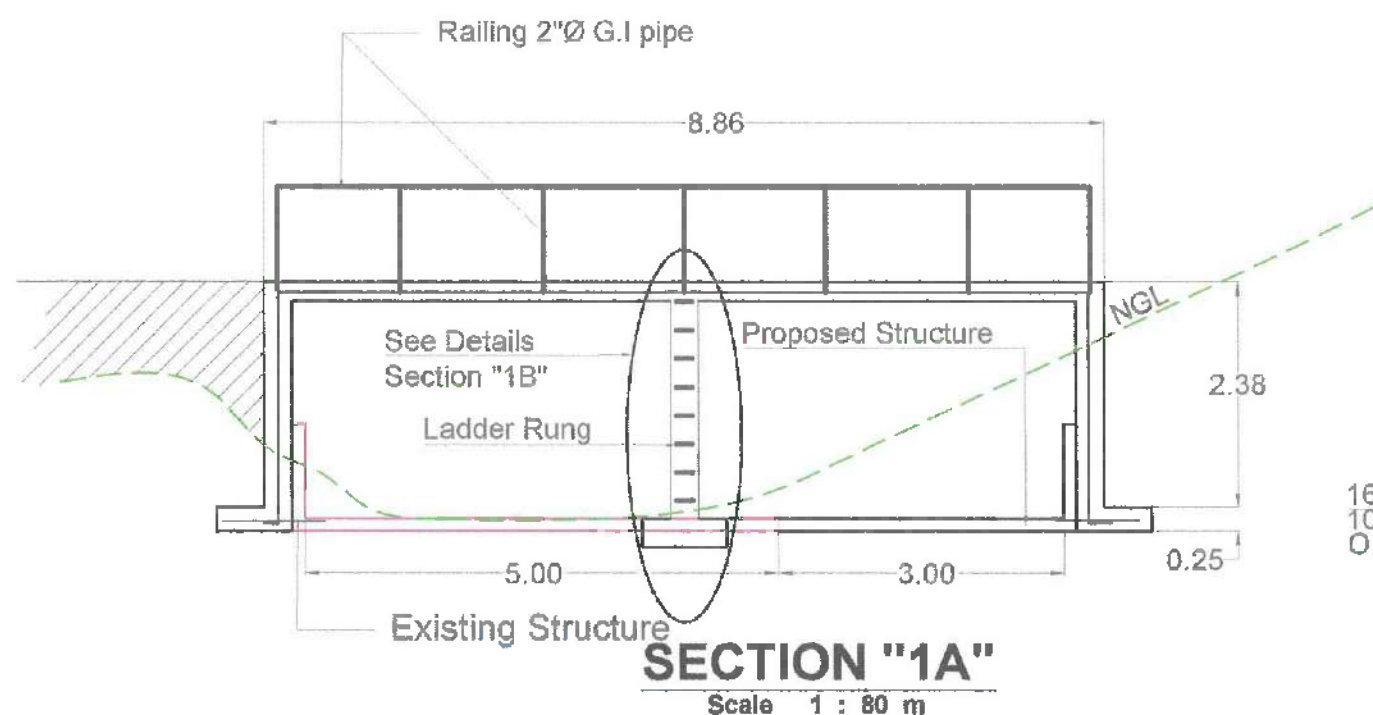


#### LEGEND:

-  NATURAL GROUND LINE
-  COMPACTED FILL

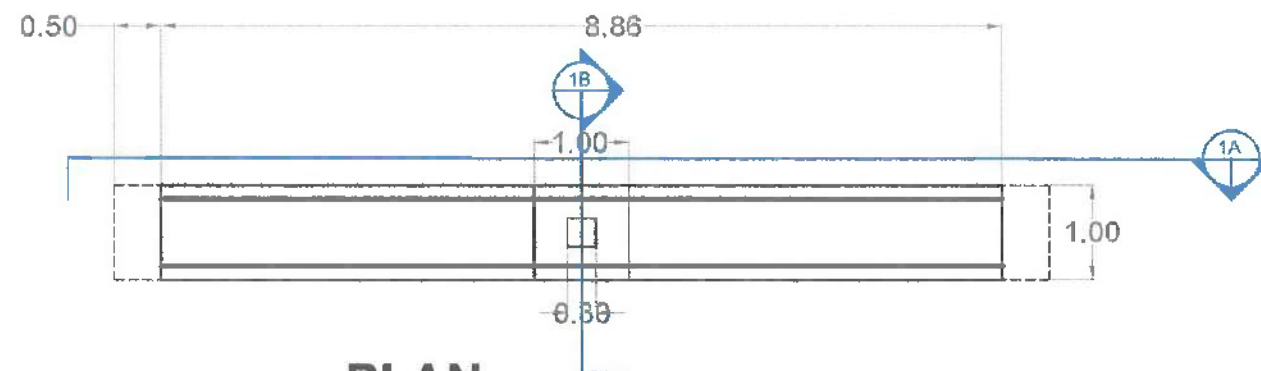
### CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT

Scale 1 : 200 m



#### SECTION "1B"

Scale 1 : 80 m





#### PLAN

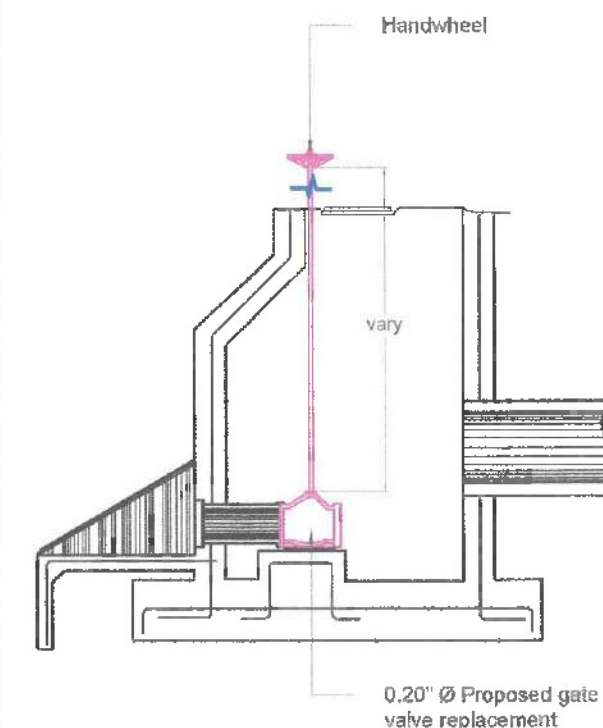
Scale 1 : 80 m

#### DETAILS OF CATWALK

Scale 1 : 80 m






#### LEGEND:

-  EXISTING SPILLWAY
-  PROPOSED ADDITIONAL SPILLWAY



#### PLAN OF GATE VALVE

Scale 1 : 50 m

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM-WD-JF-006 Control Number: 102402-WD-RS-0006 Effective Date: November 6, 2023	Prepared by:  <b>ENGR. JEANELLE M. MORALES</b> WRDO II (RPABE No.8533) Date:	Checked / Reviewed by:  <b>ENGR. ALBERTO M. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No.3287) Date:	Recommending Approval:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No.3057) Date:	Approved by:  <b>GINA F. NIÑO, Ph.D.</b> Director Date:	Sheet Contents: <b>CROSS-SECTIONS ALONG CENTERLINE OF DAM EMBANKMENT / DETAILS OF CATWALK / PLAN OF GATE VALVE</b> Name of Project: <b>Rehabilitation of Libasan SWIP</b> Location: <b>Brgy. Libasan, Nabunturan, Davao de Oro</b>	CAD / Drawn by: R. Samson Sheet No.: <b>12 / 13</b>
--	---	--	---	---	--	---	--





SCHEDULE OF ELEVATIONS AND DIMENSIONS	
ELEV. D =	184.50m
ELEV. E =	183.00m
ELEV. F =	182.00m
ELEV. G =	175.00m
ELEV. H =	174.00m
ELEV. I =	172.00m
D1 =	6.00m
D2 =	0.50m
B =	3.50m
S1 =	2.75
S2 =	2.50
S3 =	1
W3 =	6.00m
B/2 =	1.75m



# **REHABILITATION OF BUSSAOIT SWIP**

**Brgy. Bussaoit, Bacnotan, La Union**  
**Region - 1**



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**

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## MAIN PROJECT FEATURES






NAME OF PROJECT: Rehabilitation of BUSSAOIT SWIP  
 LOCATION: Brgy. BUSSAOIT, BACNOTAN, LA UNION  
 DESIGNER: Engr. Melody D. Zabala

COORDINATES:  
 N 16.711635°  
 E 120.374733°

4. PROJECT FACILITIES	
a. DAM	
TYPE	Homogenous Earthfill
CREST ELEV. (m.)	51
HEIGHT (m.)	15
CREST WIDTH (m.)	8
UPSTREAM SLOPE (H:V)	2.75:1
DOWNSTREAM SLOPE (H:V)	2.50:1
c. OUTLET WORKS	
TYPE	Steel pressure pipe
PIPE INNER DIAMETER (m.)	0.30
PIPE LENGTH (m.)	141
MAXIMUM DISCHARGE (cu.m. / sec.)	-
5. PROJECT COST (Php.)	16,000,000.00

## LIST OF DRAWINGS


E 120.374733°

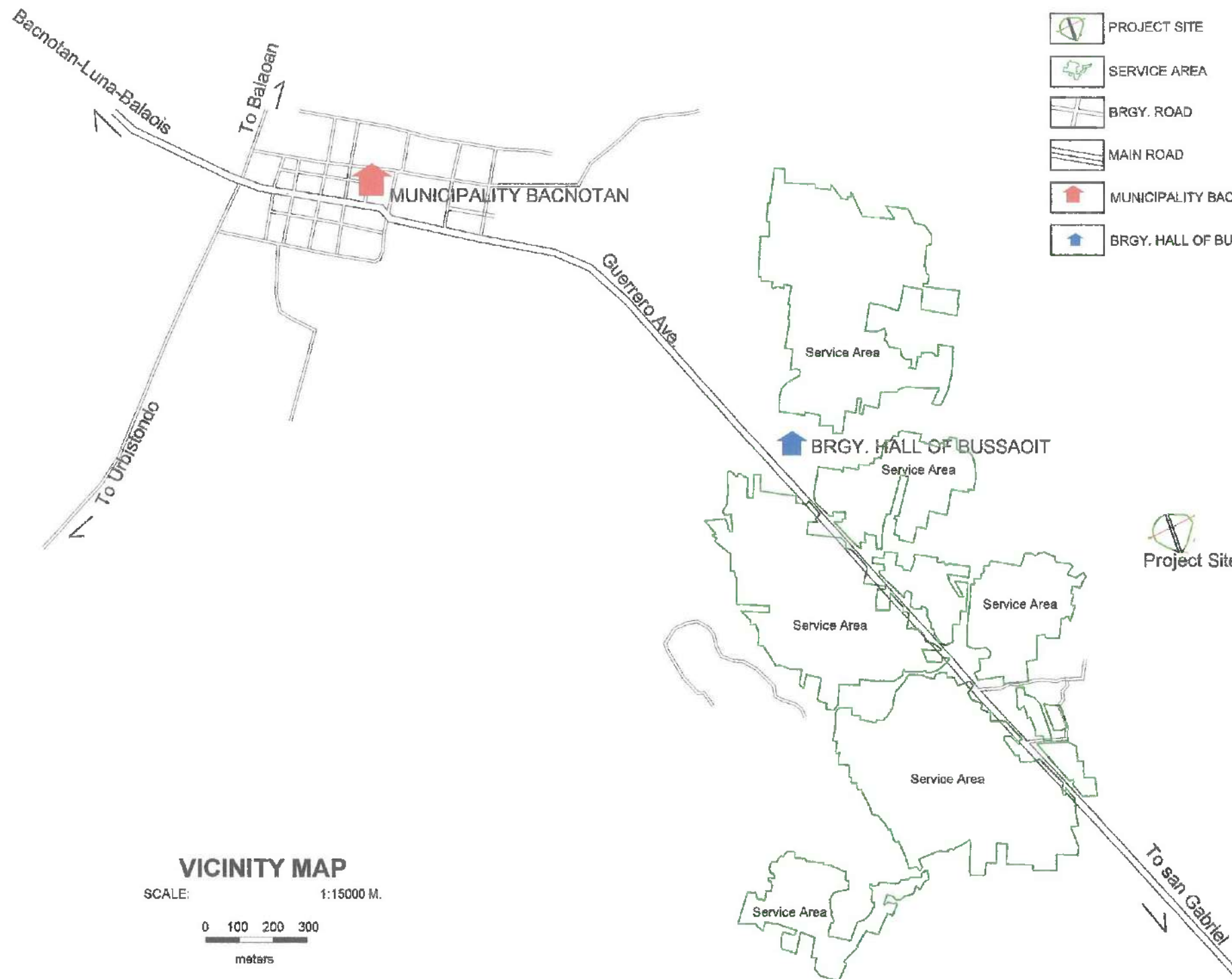
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPABE No. 8386) Date: <u>02/10/24</u>	Checked / Reviewed by:  <b>ENGR. ALBERT E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC Water Resources Management Division (RPABE No. 3057) Date: _____	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>LIST OF DRAWINGS/MAIN PROJECT FEATURES</b> Name of Project: <b>Rehabilitation of Bussaoit SWIP</b> Location: <b>Brgy. Bussaoit, Bacnotan, La Union</b>	CAD / Drawn by: <b>E. P. Bustillo</b> Sheet No.: <b>1 / 11</b>
	Reference Code: <u>BSWM_WD_IF_006</u> Control Number: <u>202404_WD_IF-00003</u> Effective Date: November 6, 2023						



E 120.374733°

LEGEND:

-  PROJECT SITE
-  SERVICE AREA
-  BRGY. ROAD
-  MAIN ROAD
-  MUNICIPALITY BACNOTAN
-  BRGY. HALL OF BUSSAOIT



VICINITY MAP

SCALE: 1:15000 M.

0 100 200 300  
meters

116.00° 118.00° 120.00° 122.00° 124.00° 126.00° 128.00°

24.00°

22.00°

18.00°

16.00°

14.00°

12.00°

10.00°

08.00°

06.00°






04.00°

LOCATION MAP

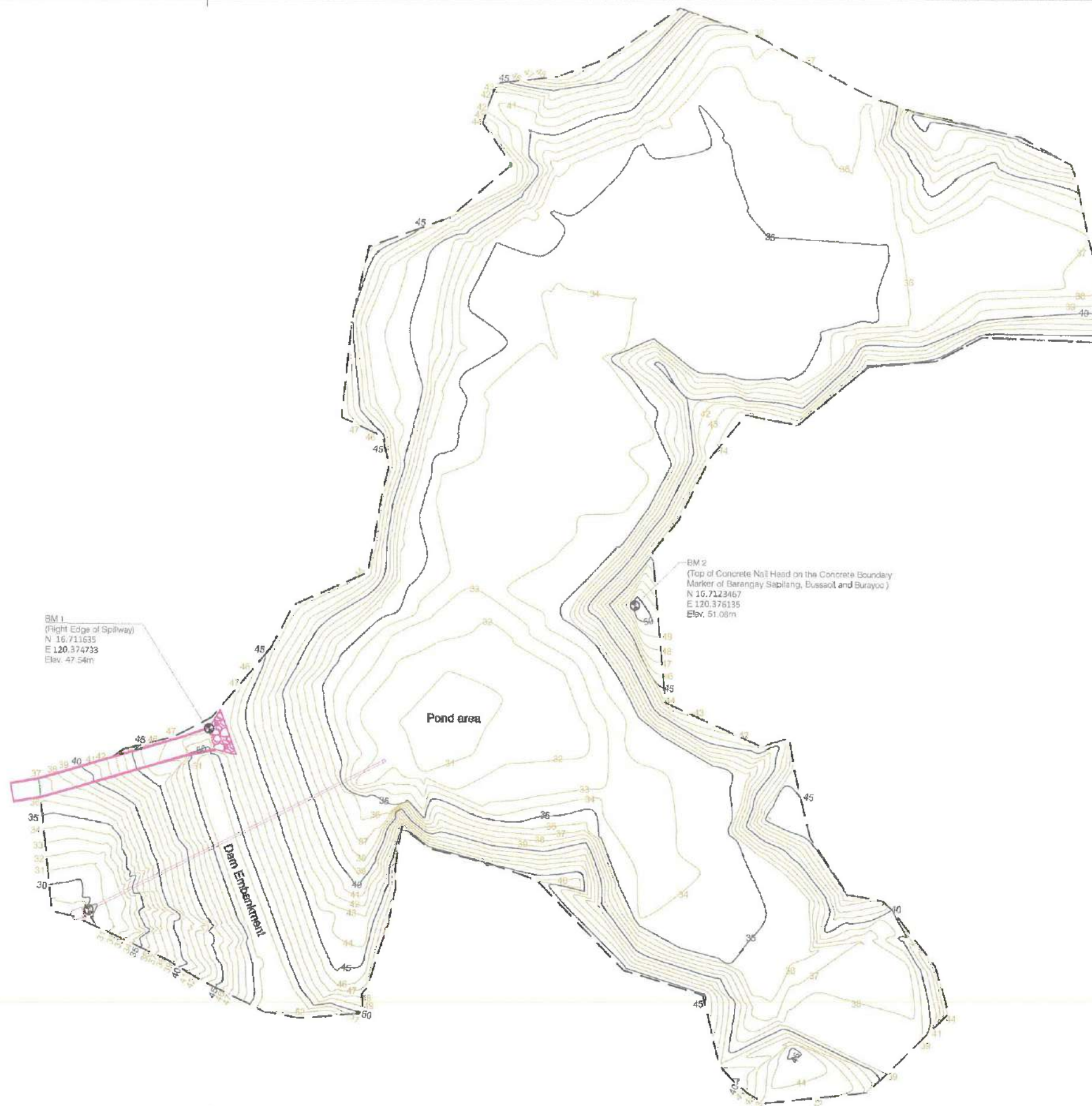
NOT TO SCALE

BACNOTAN, LA UNION  
N 16.711635°  
E 120.374733°

E 120.374733°

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPABE No. 9388) Date: <u>02-20-24</u>	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date: _____	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date: _____	Approved by:  <b>GINA PANILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>VICINITY MAP/ LOCATION MAP</b>	CAD / Drawn by: <b>E. P. Bustillo</b>	
	Reference Code: BSWM_WD_IF_008 Control Number: <u>202404_WD_PES-00003</u> Effective Date: November 8, 2023						Name of Project: <b>Rehabilitation of Bussaoit SWIP</b>	Sheet No.: <b>2 / 11</b>
							Location: <b>Brgy. Bussaoit, Bacnotan, La Union</b>	

E 120.374733°



E 120.374733°

**DEPARTMENT OF AGRICULTURE****Bureau of Soils and  
Water Management**  
WATER RESOURCES MANAGEMENT DIVISIONReference Code: BSWM\_WD\_JF\_008  
Control Number: 2024DM-WD-RES-00063  
Effective Date: November 6, 2023

Prepared by:

  
ENGR. MELODY D. ZABALA  
WRDO II  
(RPABE No. 9388)  
Date: 11-30-23

Checked / Reviewed by:

  
ENGR. ALBERTONE DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: \_\_\_\_\_

Recommending Approval:

  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: \_\_\_\_\_

Approved by:

  
GINA P. NILO, Ph.D.  
Director  
Date: \_\_\_\_\_

Sheet Contents:

**TOPOGRAPHIC MAP**

Name of Project:

**Rehabilitation of Bussait SWIP**

Location:

Brgy. Bussait, Bacnotan, La Union

CAD / Drawn by:

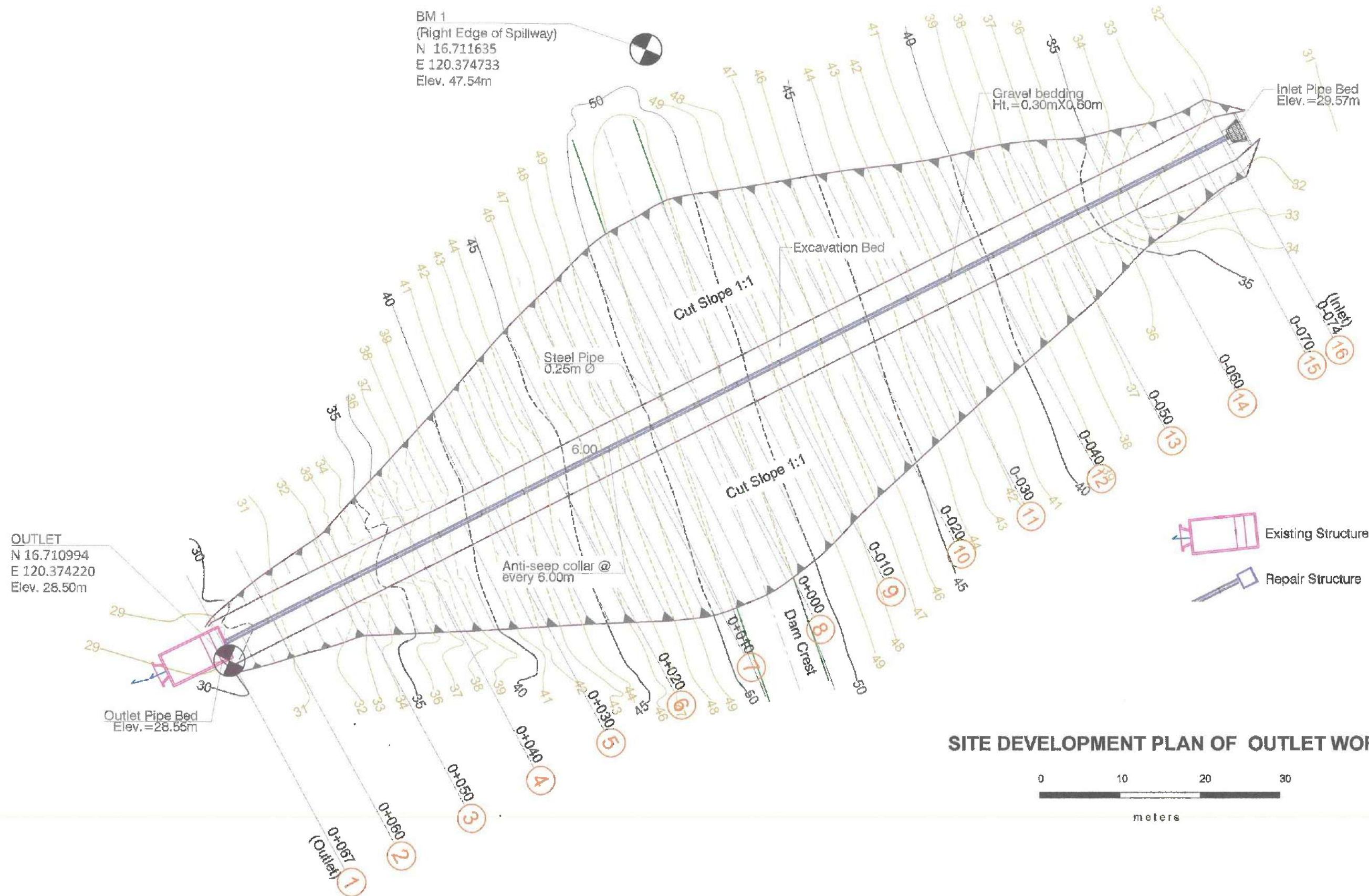
E. P. Bustillo

Sheet No.:

**3 / 11**




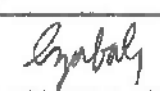
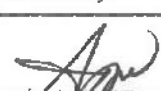


E 120.374733°

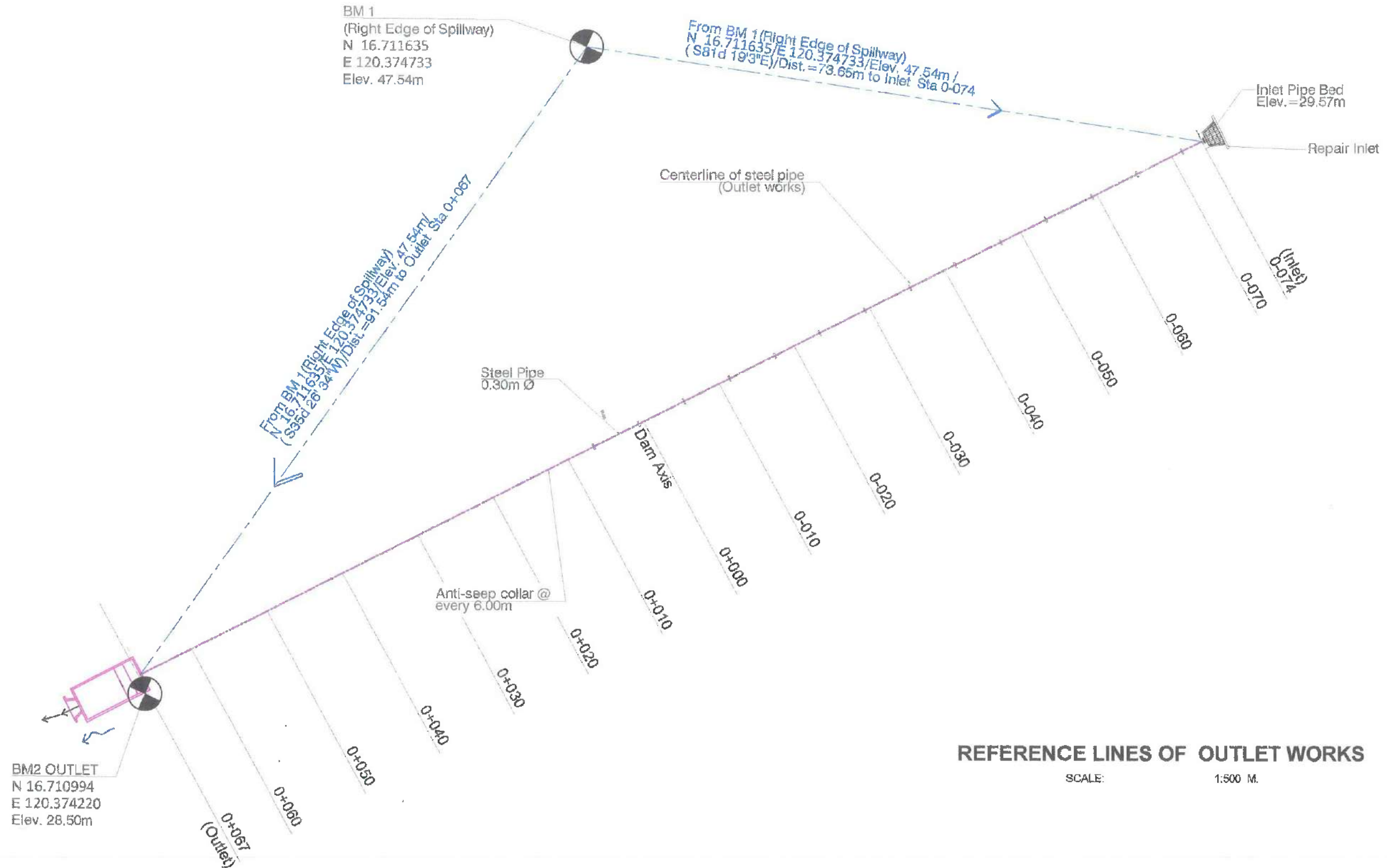


## SITE DEVELOPMENT PLAN OF OUTLET WORKS

E 120.374733°

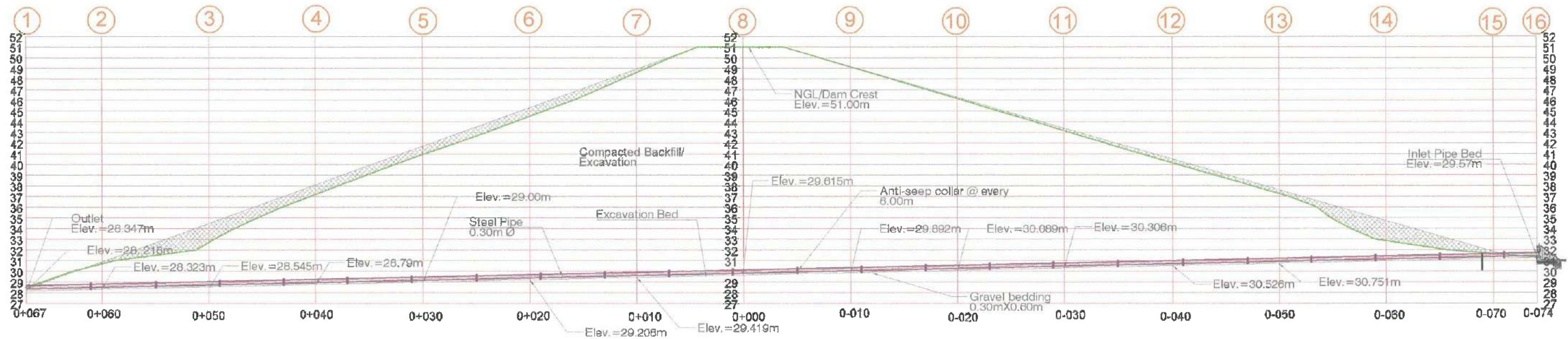
E 16.711635°

 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM-WD-IF-006 Control Number: 4-074-01-WD-215-00003 Effective Date: November 6, 2023	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPABE No. 9388) Date: 11/20/24	 <b>ENGR. ALBERTO DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3267) Date:	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	 <b>GINA P. NILO, Ph.D.</b> Director Date:	<b>SITE REHABILITATION PLAN OF OUTLET WORKS</b> Name of Project: <b>Rehabilitation of Bussaoit SWIP</b> Location: <b>Brgy. Bussaoit, Bacnotan, La Union</b>	E. P. Bustillo
						Sheet No.:
						4 / 11



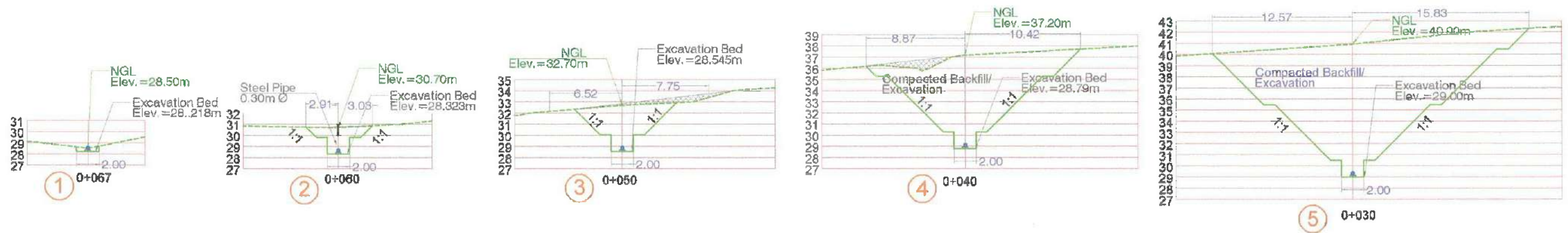
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPABE No. 9388) Date: 02-20-24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINA P. MULO, Ph.D.</b> Director Date:	Sheet Contents: <b>REFERENCE LINES OF OUTLET WORKS</b> Name of Project: <b>Rehabilitation of Bussaoit SWIP</b> Location: <b>Brgy. Bussaoit, Bacnotan, La Union</b>	CAD / Drawn by: <b>E. P. Bustillo</b> Sheet No.: <b>5 / 11</b>
	Reference Code: BSWM_WD_IF_006 Control Number: 202404_WD_00000003 Effective Date: November 6, 2023						





ELEVATION PROFILE ALONG CENTERLINE OF OUTLET WORKS

SCALE: 1:40 M.

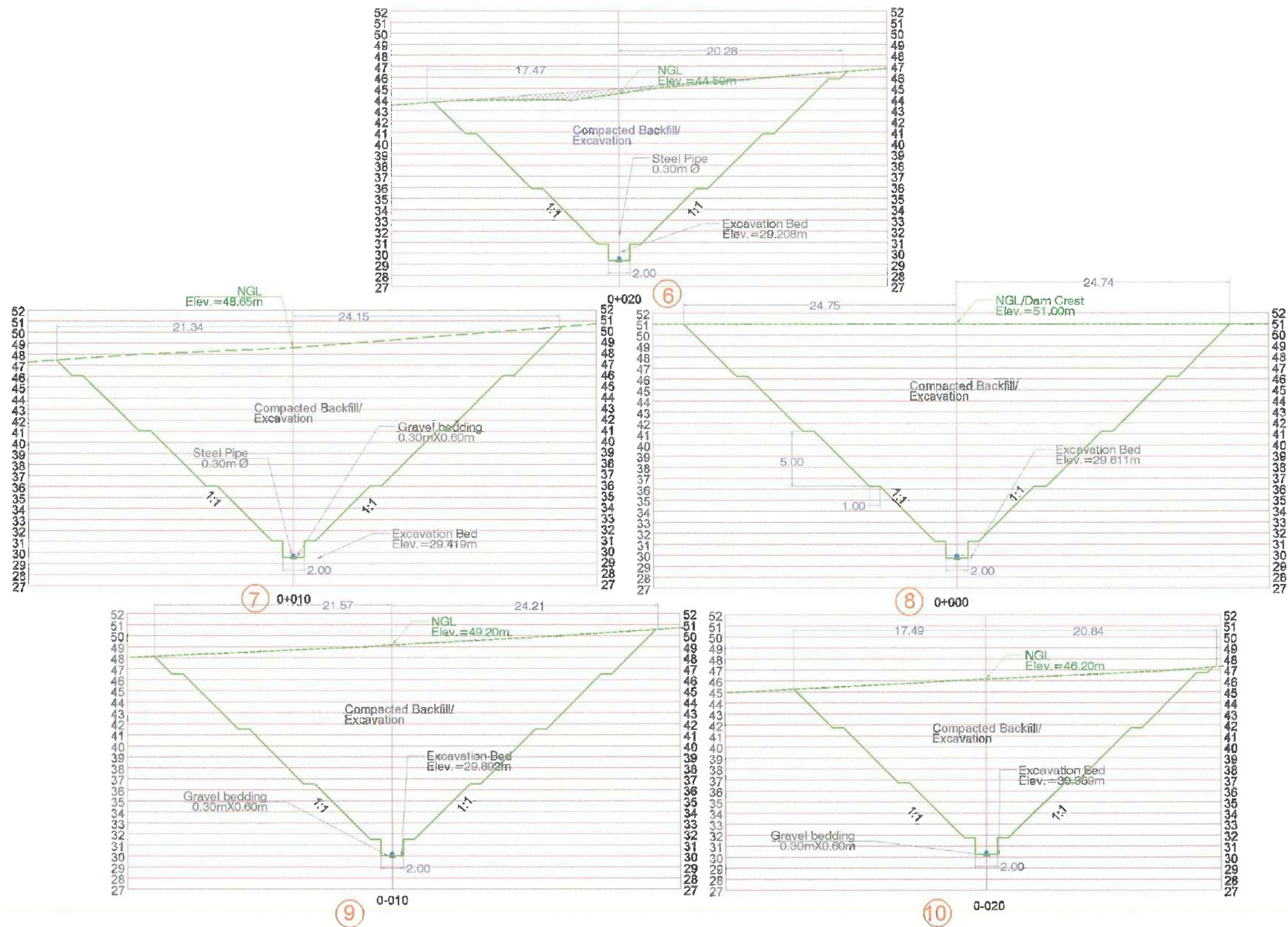


CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS

SCALE: 1:40 M.






	DEPARTMENT OF AGRICULTURE	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents	CAD / Drawn by:
	Bureau of Soils and Water Management	ENGR. MELODY D. ZABALA	ENGR. ALBERTO E. DE GUZMAN	ENGR. DIOSDADO M. MANALUS	GINA P. NILO, Ph.D.	ELEVATION PROFILE/CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS	E. P. Bustillo
	WATER RESOURCES MANAGEMENT DIVISION	WRDO II	Chief, Design and Engineering Section	Chief, Water Resources Management Division	Director	Name of Project:	Sheet No.:
	Reference Code: BSWM_WD_IF_006	(RPAB No. 9388)	(RPAB No. 3287)	(RPAB No. 3057)		Rehabilitation of Bussaoit SWIP	
	Control Number: 202404_WD-RES-00003	Date: 02-20-24	Date:	Date:		Location:	
	Effective Date: November 6, 2023					Brgy. Bussaoit, Bacnotan, La Union	6 / 11



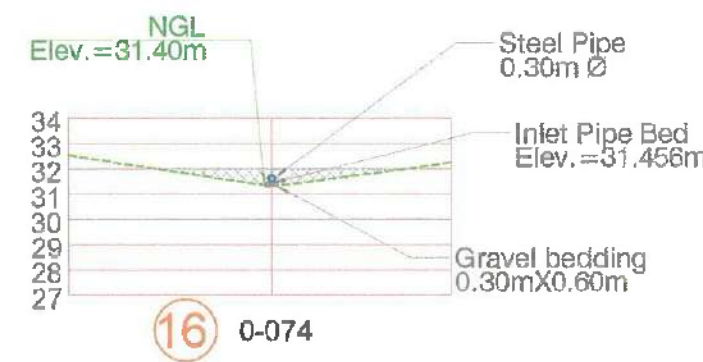
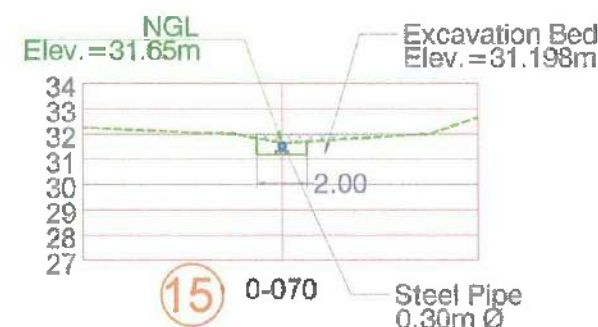
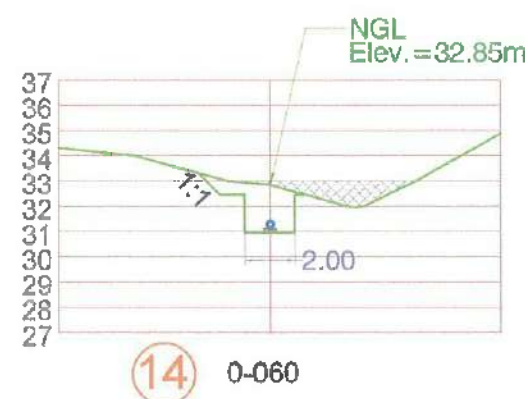
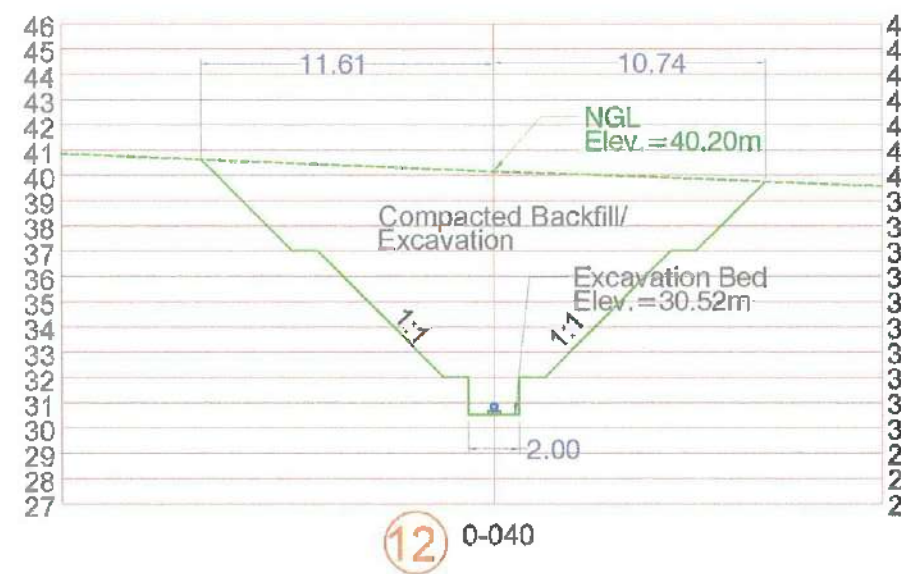
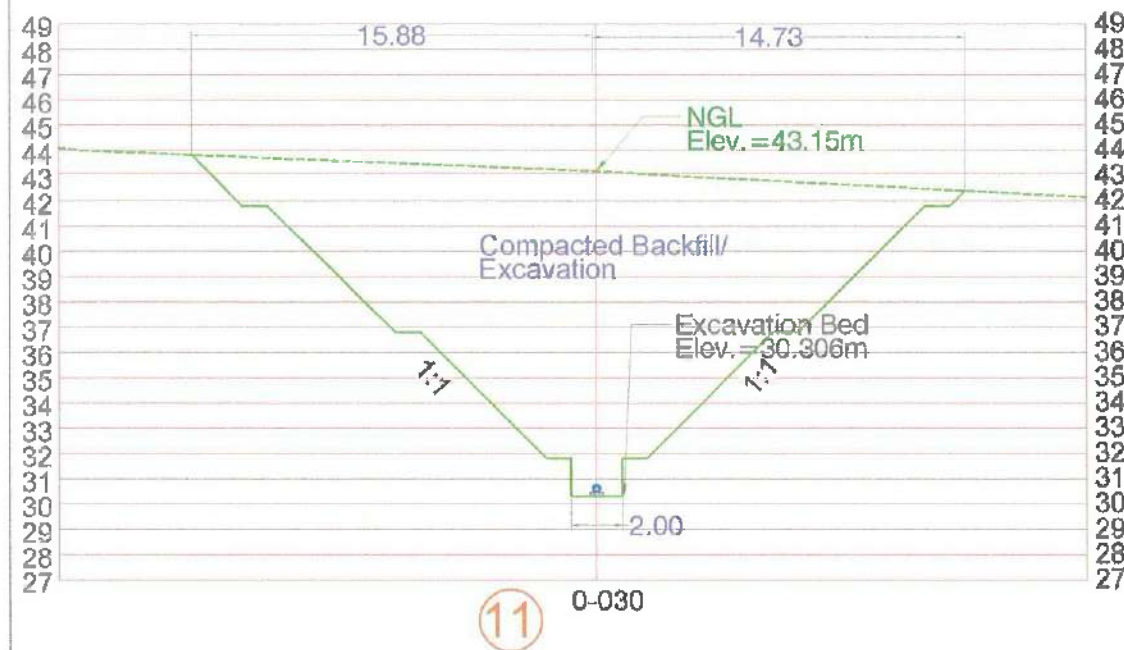


### CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS

SCALE: 1:40 M.

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPABE No. 9388) Date: 02-20-24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPABE No. 3287) Date:	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC, Water Resources Management Division (RPABE No. 3057) Date:	Approved by:  <b>GINA P. MICO, Ph.D.</b> Director Date:	Sheet Contents: <b>CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS</b> Name of Project: <b>Rehabilitation of Bussaoit SWIP</b> Location: <b>Brgy. Bussaoit, Bacnotan, La Union</b>	CAD / Drawn by: <b>E. P. Bustillo</b> Sheet No.: <b>7 / 11</b>
	Reference Code: BSWM_WD_IF_006 Control Number: 202404_WD-IB-00003 Effective Date: November 6, 2023						





### CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS

SCALE: 1:30 M.



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**  
 Reference Code: BSWM\_WD\_IF\_006  
 Control Number: 2024-04-WD-003-00003  
 Effective Date: November 6, 2023

Prepared by:  
 ENGR. MELODY D. ZABALA  
 WRDO II  
 (RPABE No. 9388)  
 Date: 07-10-24

Checked / Reviewed by:  
 ENGR. ALBERTO E. DE GUZMAN  
 Chief, Design and Engineering Section  
 (RPABE No. 3287)  
 Date: \_\_\_\_\_

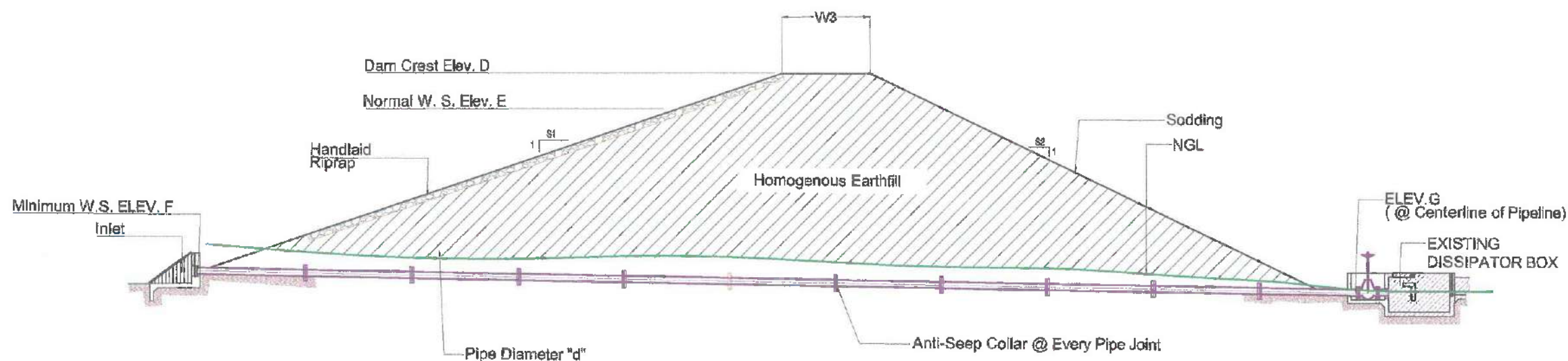
Recommending Approval:  
 By the Authority of the Director:  
 ENGR. DIOSDADO M. MANALUS  
 OIC, Water Resource Management Division  
 (RPABE No. 3057)  
 Date: \_\_\_\_\_

Approved by:  
 GINA P. NILO, Ph.D.  
 Director  
 Date: \_\_\_\_\_

Sheet Contents:  
**CROSS-SECTIONS ALONG CENTERLINE OF OUTLET WORKS**  
 Name of Project:  
**Rehabilitation of Bussaoit SWIP**  
 Location:  
 Brgy. Bussaoit, Bacnotan, La Union

CAD / Drawn by:  
 E. P. Bustillo  
 Sheet No.:  
**8 / 11**

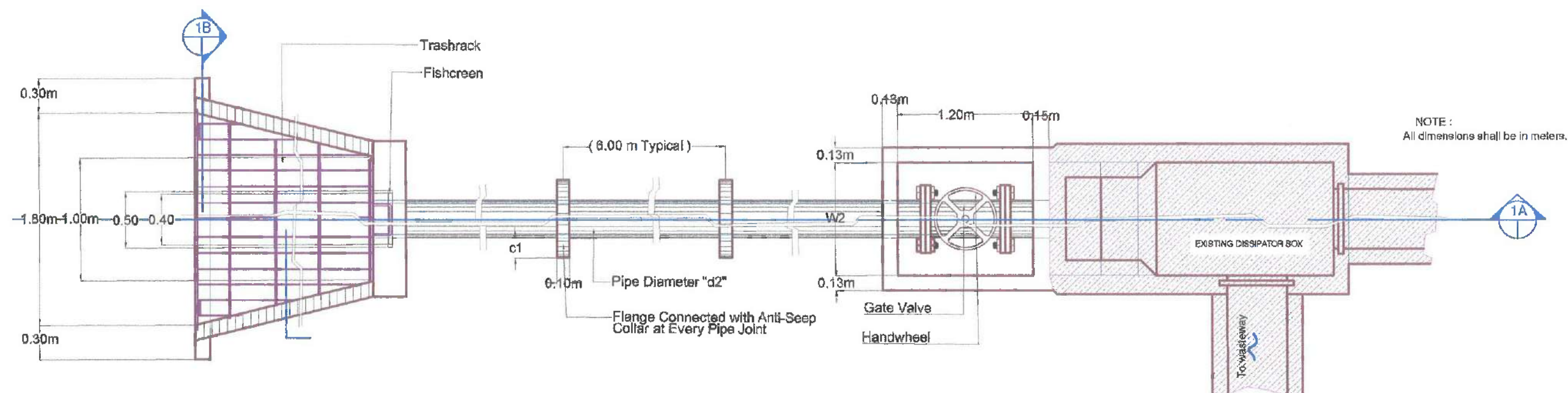
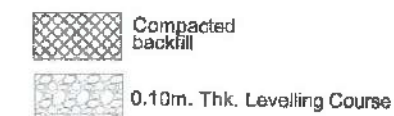




SCHEDULE OF ELEVATIONS AND DIMENSIONS (m)	
ELEV. D =	51.00
ELEV. E =	47.50
ELEV. F =	29.65
ELEV. G =	28.65
W3 =	8.00
b3 =	0.40
c3 =	0.40
PIPE DIA. - "d" =	0.30

## TYPICAL PROFILE ALONG CENTERLINE OF OUTLET WORKS

NOT TO SCALE



NOTE:  
All dimensions shall be in meters.

## TYPICAL PLAN OF OUTLET WORKS

NOT TO SCALE



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**  
Reference Code: BSWM\_WD\_IF\_006  
Control Number: 202404\_WD-R3-00003  
Effective Date: November 8, 2023

Prepared by:  
  
ENGR. MELODY D. ZABALA  
WRDO II  
(RPABE No. 9388)  
Date: 02-20-24

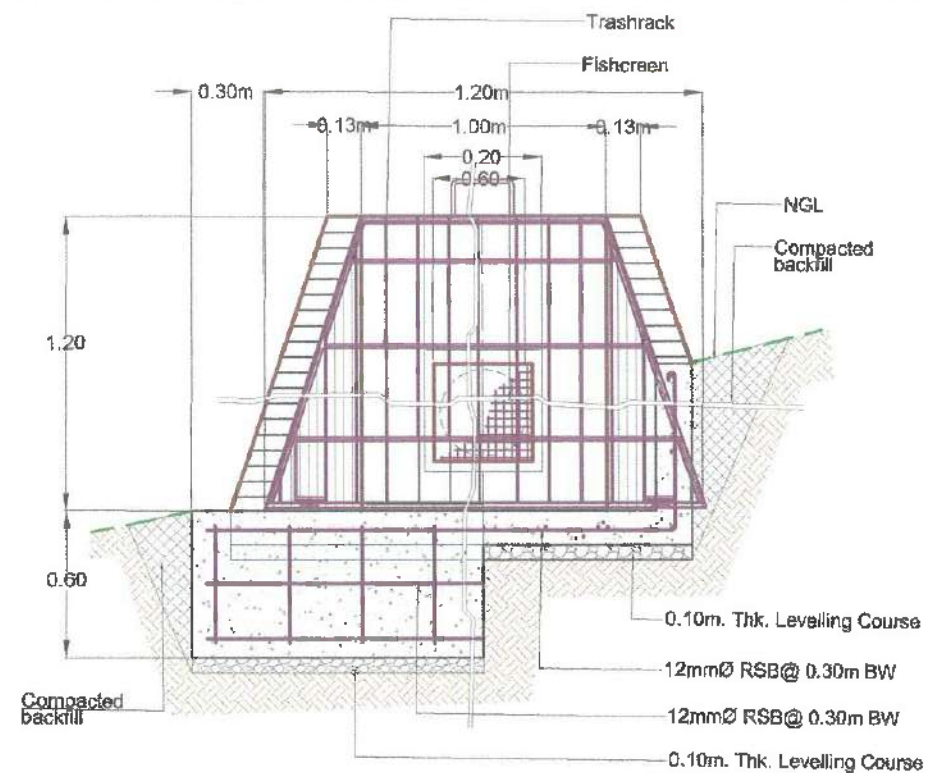
Checked / Reviewed by:  
  
ENGR. ALBERTO E. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: \_\_\_\_\_

Recommending Approval:  
By the Authority of the Director:  
  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: \_\_\_\_\_

Approved by:  
  
GINA P. NIOL, Ph.D.  
Director  
Date: \_\_\_\_\_

Sheet Contents:  
**TYPICAL PLAN/PROFILE ALONG CENTERLINE OF OUTLET WORKS**  
Name of Project:  
**Rehabilitation of Bussaoit SWIP**  
Location:  
**Brgy. Bussaoit, Bacnotan, La Union**  
CAD / Drawn by:  
E. P. Bustillo  
Sheet No.:  
**9 / 11**

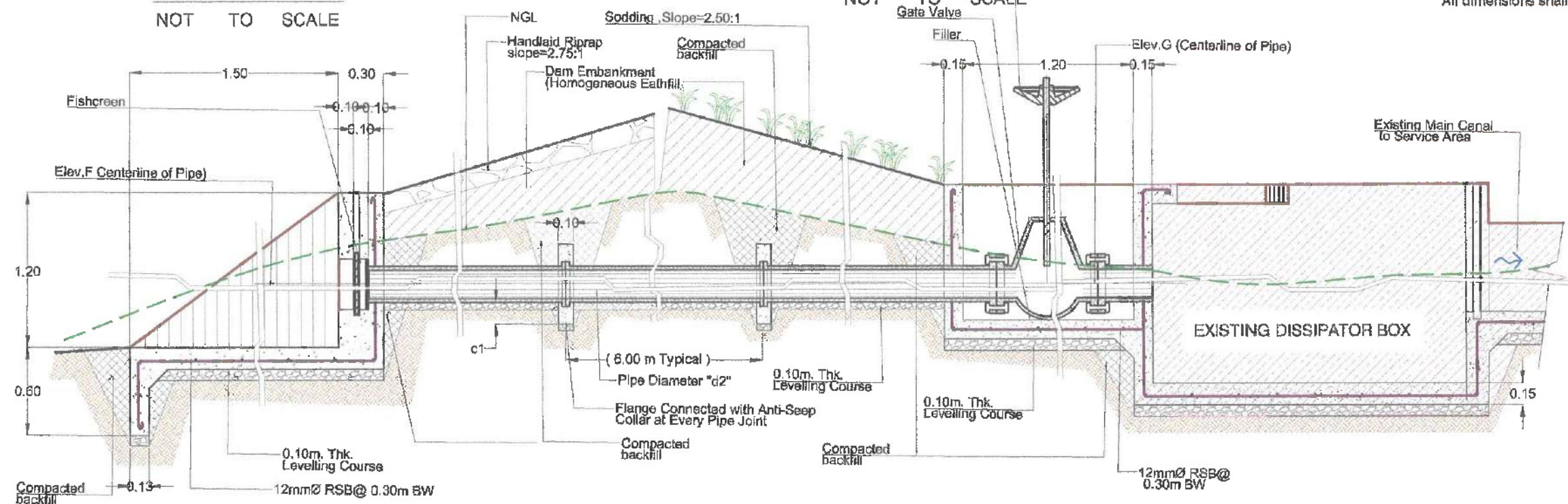
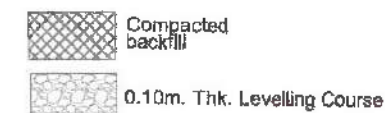




**SECTION-1B**  
NOT TO SCALE

LOOKING DOWNSTREAM

SCHEDULE OF ELEVATIONS AND DIMENSIONS (m)	
ELEV. F =	29.65
ELEV. G =	28.65
c1 =	0.13
D =	0.50
Lp =	141
c3 =	0.40m
W2 =	1.90
PIPE DIA. "d" =	0.30



**SECTION-1C**  
NOT TO SCALE

NOTES:  
All dimensions shall be in meters.

**SECTION -1A**  
NOT TO SCALE

**TYPICAL SECTION OF OUTLET WORKS**  
NOT TO SCALE



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_JF\_008  
Control Number: 202404\_WD-RS-10003  
Effective Date: November 8, 2023

Prepared by:  
*Engr. Melody D. Zabala*  
ENGR. MELODY D. ZABALA  
WRDO II  
(RPABE No. 8388)  
Date: 2/10/24

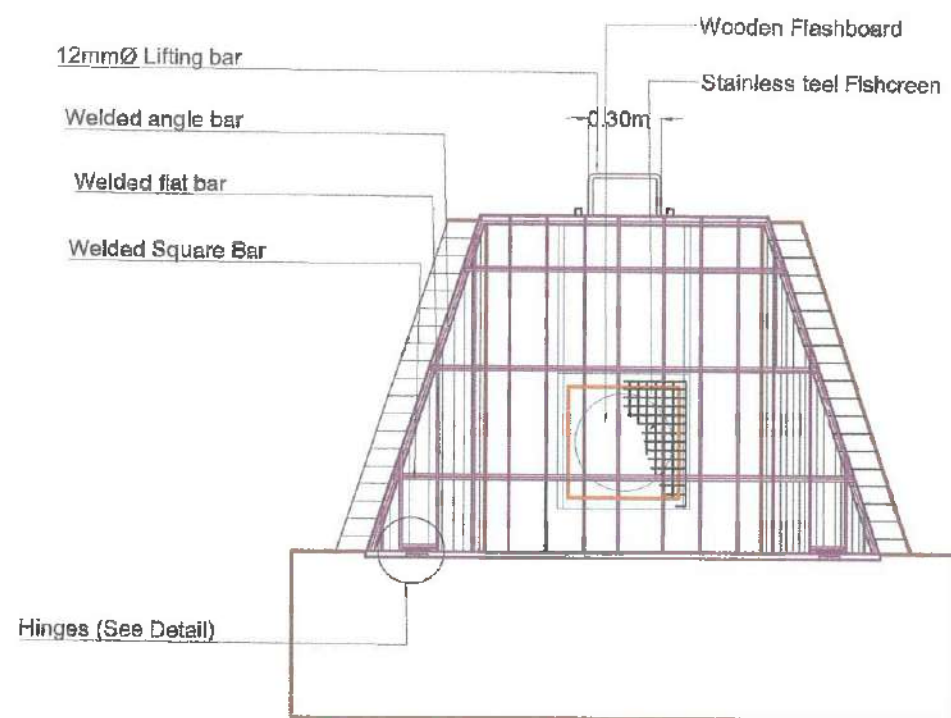
Checked / Reviewed by:  
*Engr. Alberto Z. de Guzman*  
ENGR. ALBERTO Z. DE GUZMAN  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date: \_\_\_\_\_

Recommending Approval:  
By the Authority of the Director:  
*Engr. Diosdado M. Manalus*  
ENGR. DIOSDADO M. MANALUS  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date: \_\_\_\_\_

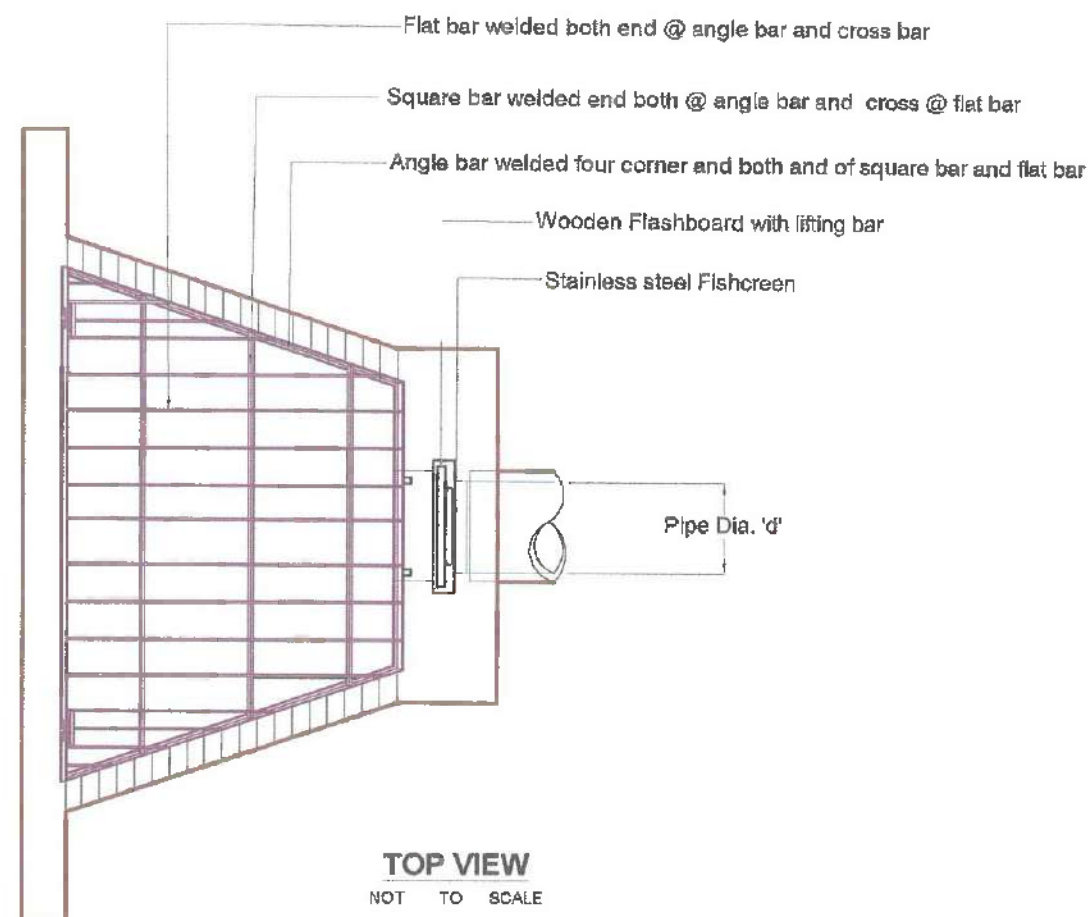
Approved by:  
*Gina P. Nilo, Ph.D.*  
GINA P. NILLO, Ph.D.  
Director  
Date: \_\_\_\_\_

Sheet Contents:  
**TYPICAL SECTIONS OF OUTLET WORKS**  
Name of Project:  
**Rehabilitation of Bussaoit SWIP**  
Location:  
**Brgy. Bussaoit, Bacnotan, La Union**

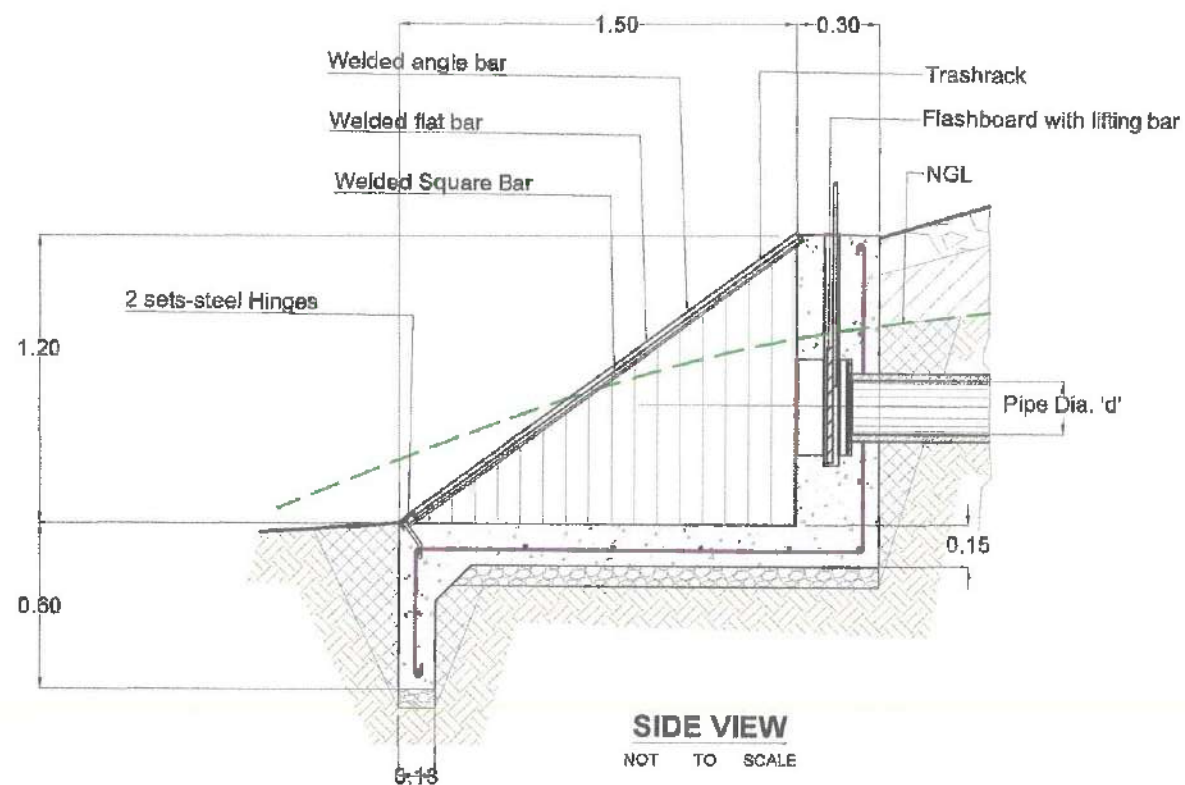
CAD / Drawn by:  
**E. P. Bustillo**  
Sheet No.:  
**10 / 11**



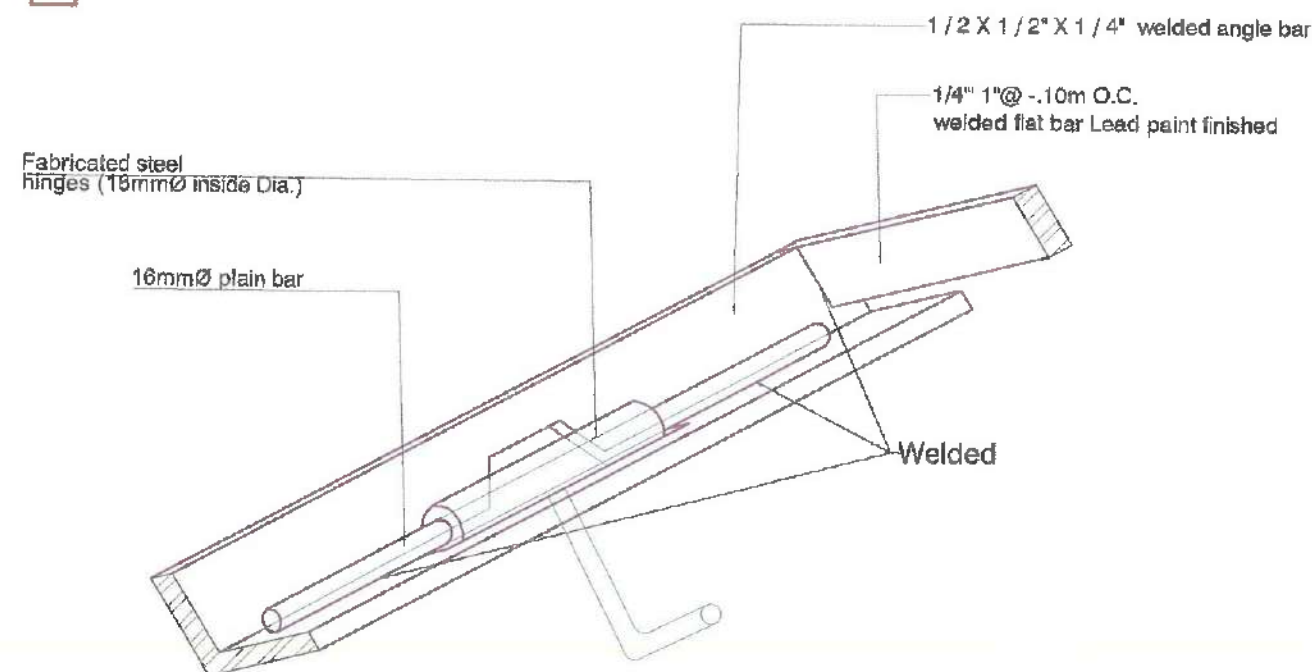
**FRONT VIEW**  
NOT TO SCALE



**TOP VIEW**  
NOT TO SCALE



**SIDE VIEW**  
NOT TO SCALE



**DETAIL OF HINGES**  
NOT TO SCALE

**TYPICAL STEEL TRASHRACK INLET**  
NOT TO SCALE



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
WATER RESOURCES MANAGEMENT DIVISION  
Reference Code: BSWM\_WD\_JF\_006  
Control Number: 2004-04-WD-RFS-00003  
Effective Date: November 6, 2023

Prepared by:  
**ENGR. MELCODY D. ZABALA**  
WRDO II  
(RPABE No. 9388)  
Date: 07-10-21

Checked / Reviewed by:  
**ENGR. ALBERTO E. DE GUZMAN**  
Chief, Design and Engineering Section  
(RPABE No. 3287)  
Date:

Recommending Approval:  
By the Authority of the Director:  
**ENGR. DIOSDADO M. MANALUS**  
OIC, Water Resources Management Division  
(RPABE No. 3057)  
Date:

Approved by:  
**GINA B. NLO, Ph.D.**  
Director  
Date:

Sheet Contents:  
**TYPICAL STEEL TRASHRACK INLET**  
Name of Project:  
**Rehabilitation of Bussaoit SWIP**  
Location:  
**Brgy. Bussaoit, Bacnotan, La Union**  
CAD / Drawn by:  
**E. P. Busto**  
Sheet No.:  
**11 / 11**



# **Rehabilitation of PLACIDO SWIP**

## **Brgy. San Andres, Balungao, Pangasinan**

### **Region - 1**



**DEPARTMENT OF AGRICULTURE**  
**Bureau of Soils and Water Management**  
**WATER RESOURCES MANAGEMENT DIVISION**








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CROSS-SECTIONS OF DESILTATION OF POND AREA	6 OF 8
CROSS-SECTIONS OF DESILTATION OF POND AREA	7 OF 8
TYPICAL PLAN/SECTIONS/ISOMETRIC VIEW OF CONCRETE SIGNAGE	8 OF 8

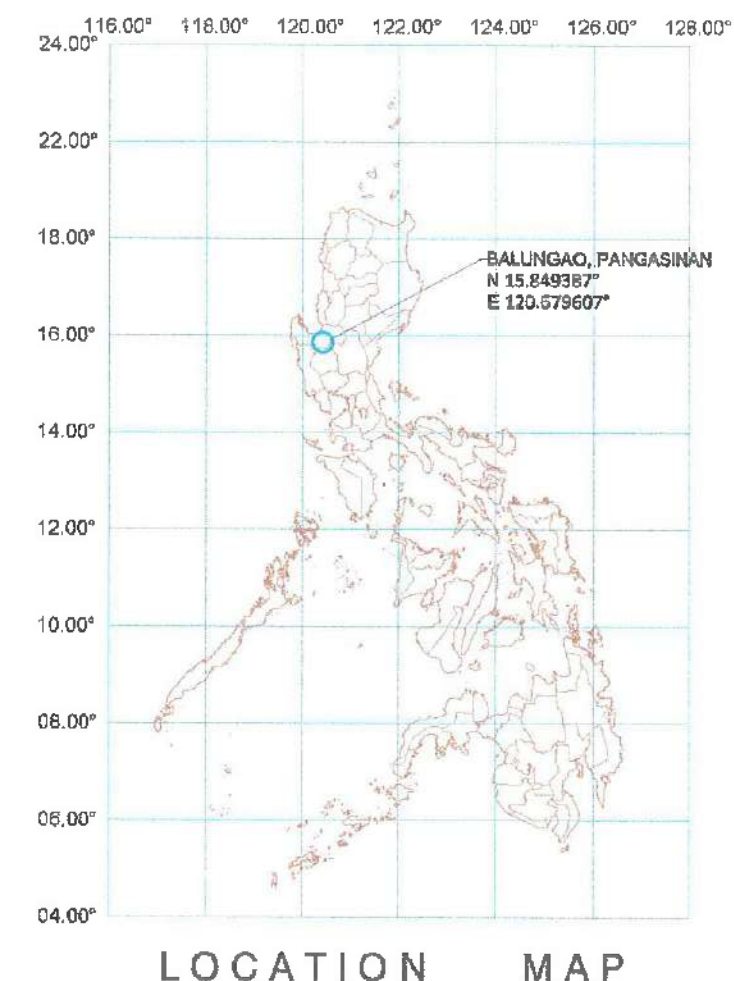
**MAIN PROJECT FEATURES**  
NAME OF PROJECT: Rehabilitation of PLACIDO SWP  
LOCATION: Brgy. SAN ANDRES, BALUNGAO, PANGASINAN  
DESIGNER: Engr. MELODY L. ZABALA

COORDINATES:  
N 15.849387°  
E 120.679607°

1. PROJECT FACILITIES	
a. IRRIGATION FACILITIES	
a.1 DREDGING OF POND AREA (cum.)	13,490
b. SERVICE AREA (ha.)	28
6. PROJECT COST (Php.)	4,000,000.00

## LIST OF DRAWINGS

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM-WD-RE-0005 Control Number: <u>2024-WD-RE-0002</u> Effective Date: Nov. 6, 2023 Rev. No. 3	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
		 ENGR. MELODY D. ZABALA WRDO II (RPAB No. 9889) Date: <u>3/19/24</u>	 ENGR. ALBERT C. DE GUZMAN Chief, Design and Engineering Section (RPAB No. 3247) Date: <u>3/19/24</u>	 ENGR. DIOSDADO M. MANALUS OC Water Resources Management Division (RPAB No. 3057) Date: <u>3/19/24</u>	 ENGR. NILO, Ph.D. Director Date: _____	LIST OF DRAWINGS / MAIN PROJECT FEATURES Name of Project: Rehabilitation of PLACIDO SWIP Location: Brgy San Andres, Balungao, Pangasinan	E. P. Bustillo Sheet No.: 1 / 8








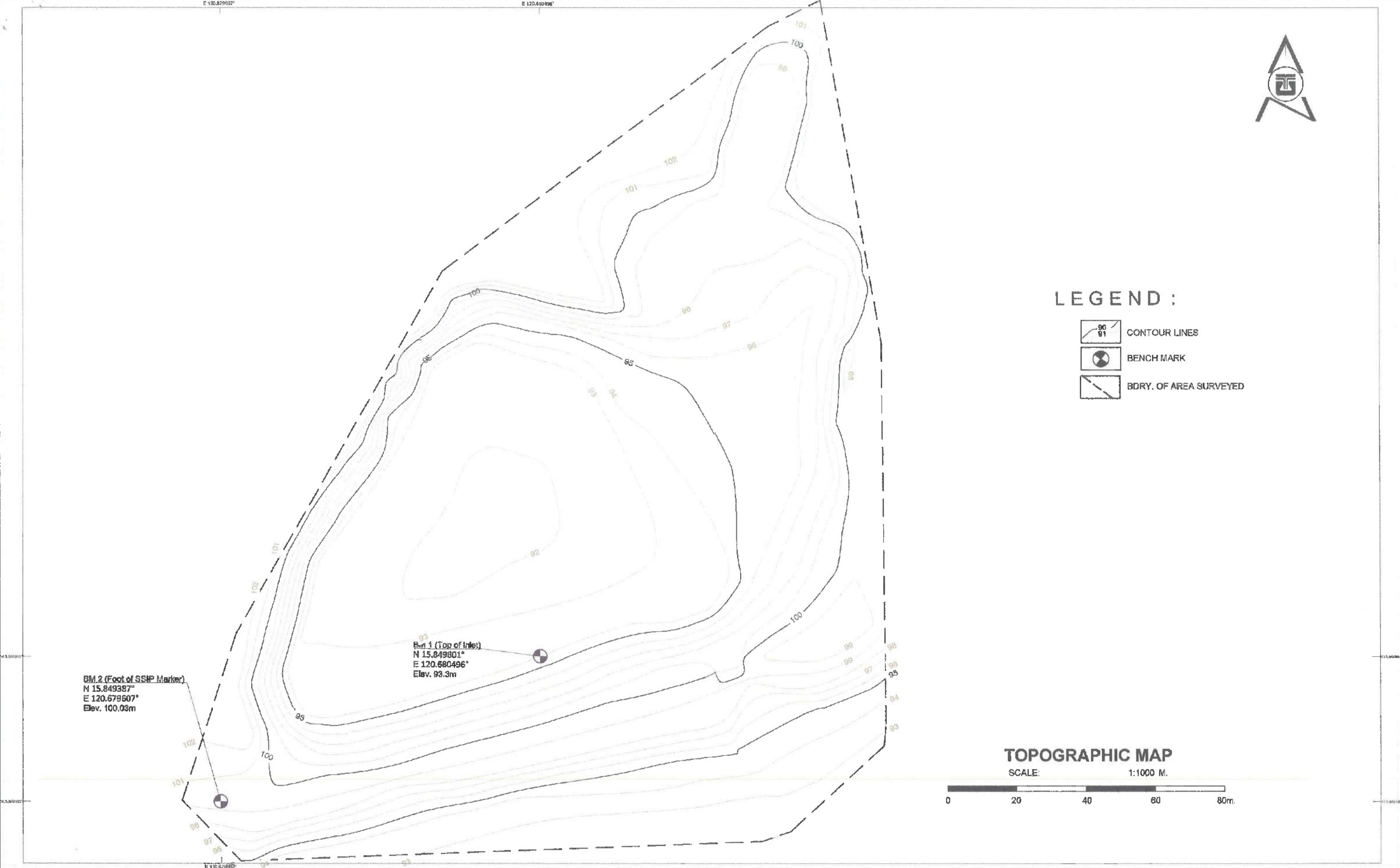
# LEGEND:

- PROJECT SITE
- MUNICIPAL HALL
- BRGY. HALL
- MAIN ROAD
- BRGY. ROAD




## VICINITY MAP

SCALE: 1:50,000 M.

 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b> Reference Code: BSWM_WD_RE_0005 Control Number: 2122/001 WD-RE-00001 Effective Date: Nov. 6, 2023 Rev. No. 3	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	 <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPAB No. 8268) Date: 5/19/24	 <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date: 3/19/24	 <b>ENGR. DIOSDADO M. MANALUS</b> OIC Water Resources Management Division (RPAB No. 3057) Date: 3/20/24	 <b>GINA P. NILO, Ph.D.</b> Director Date:	VICINITY MAP / LOCATION MAP Name of Project: <b>Rehabilitation of PLACIDO SWIP</b> Location: Brgy San Andres, Balungao, Pangasinan	E. P. Bustillo Sheet No.: <b>2 / 8</b>








**LEGEND :**

-  CONTOUR LINES
-  BENCH MARK
-  BDRY. OF AREA SURVEYED

**TOPOGRAPHIC MAP**





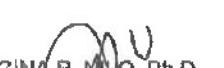
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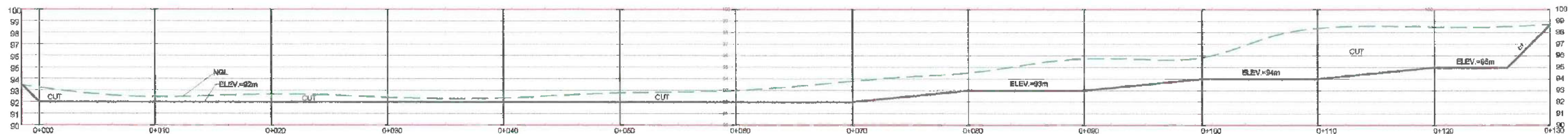
	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION	Prepared by:  <b>ENGR. MEODY D. ZABALA</b> WRDO II (RPAB No. 9395) Date: <u>2/19/24</u>	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date: <u>2/19/24</u>	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> CIC Water Resources Management Division (RPAB No. 3057) Date: <u>3/20/24</u>	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date: _____	Sheet Contents: <b>TOPOGRAPHIC MAP</b>	CAD / Drawn by: <b>E. P. Bustillo</b>
	Reference Code: <b>BSWM_WD_RE_0005</b>					Name of Project: <b>Rehabilitation of PLACIDO SWIP</b>	Sheet No.: <b>3 / 8</b>
	Control Number: <b>102404 WD-RES-00002</b>					Location: <b>Brgy San Andres, Balungao, Pangasinan</b>	
	Effective Date: <b>Nov. 8, 2023</b>						
	Rev. No. <b>3</b>						





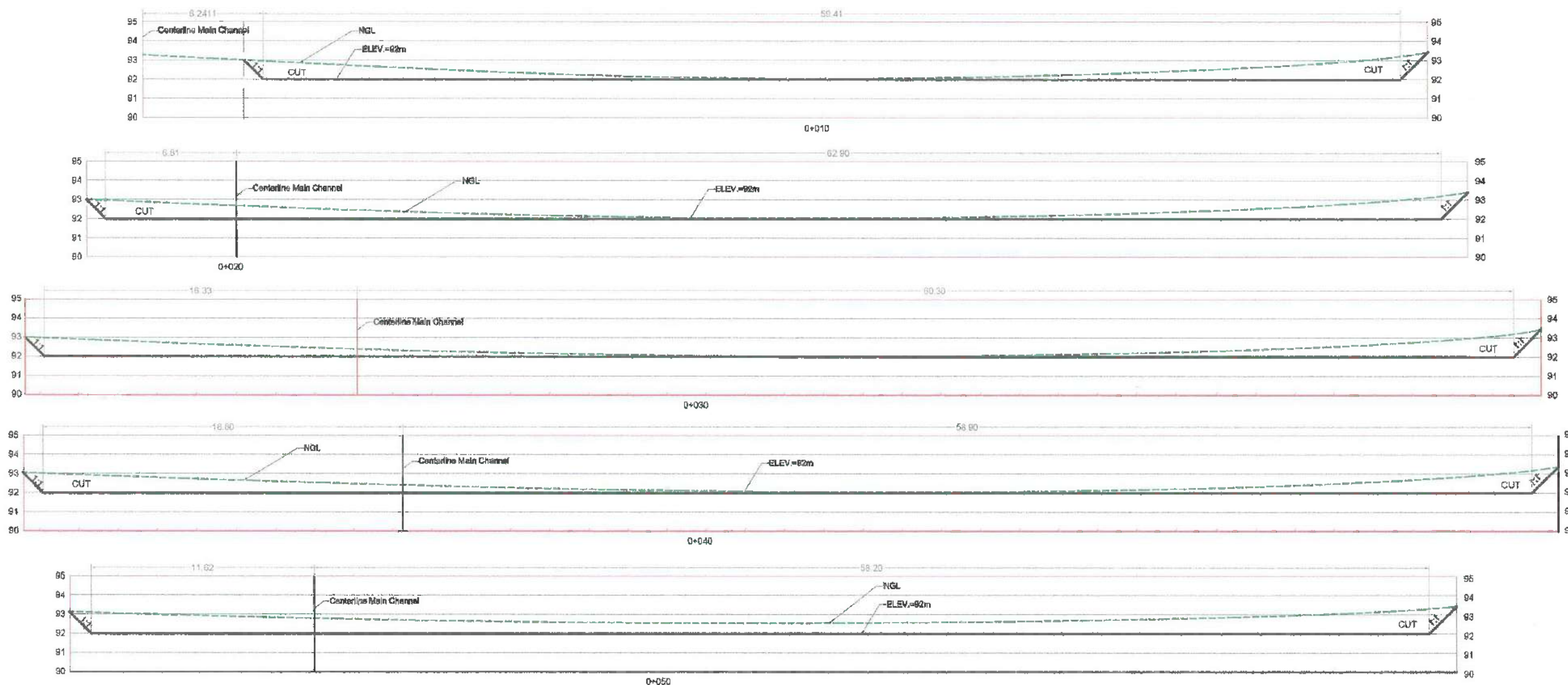
 <b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_RE_0005 Control Number: 2024-WD-265-00002 Effective Date: Nov. 8, 2023 Rev. No. 3	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:		
	 ENGR. MELODY D. ZABALA WRDO II (RPAE No. 9388) Date: 3/19/24	 ENGR. ALBERTO DE GUZMAN Chief, Design and Engineering Section (RPABE No. 3287) Date: 3/19/24	 ENGR. DIOSDADO M. MANALUS OIC Water Resources Management Division (RPABE No. 3057) Date: 3/20/24	 GINA P. MOLO, Ph.D. Director Date: _____	REHABILITATION PLAN		CAD / Drawn by:
					Name of Project:		E. P. Bustillo
					Rehabilitation of PLACIDO SWIP		Sheet No.:
					Location:		4 / 8
				Brgy San Andres, Balungao, Pangasinan			





## PROFILE ELEVATION OF DESILTATION ALONG CENTERLINE OF POND AREA

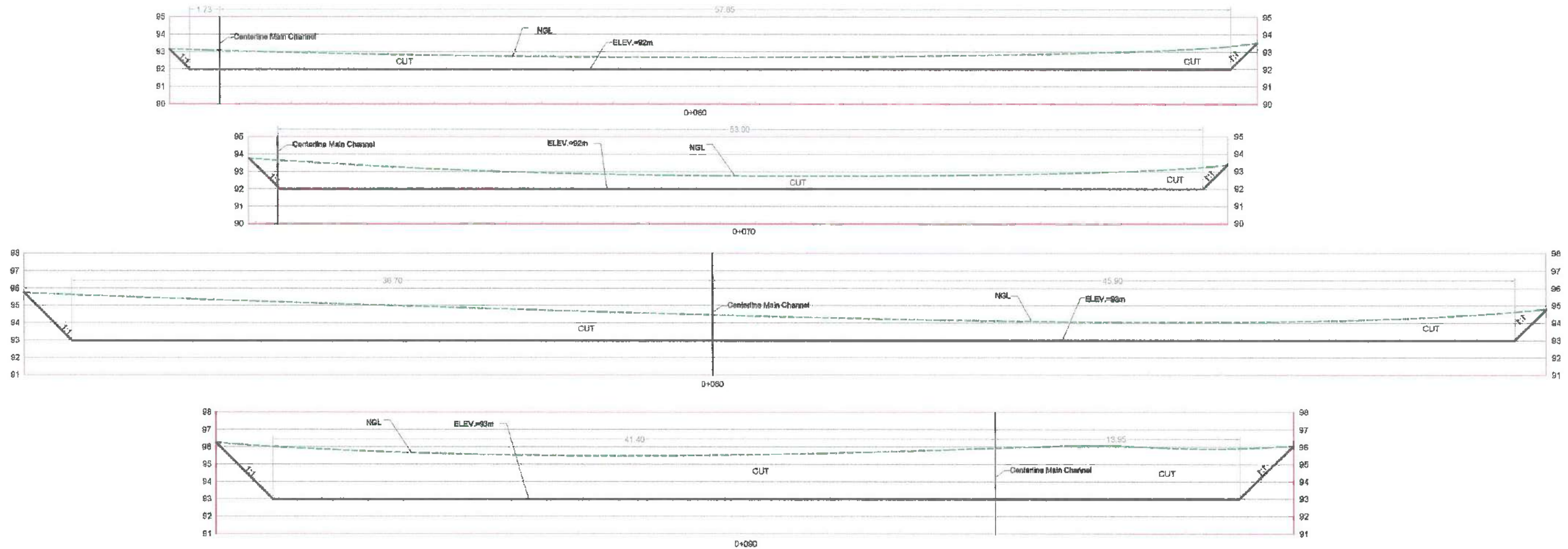
SCALE: 1:350 M.



## CROSS-SECTIONS OF DESILTATION OF POND AREA

SCALE: 1:250 M.

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION		Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPAS No. 9318) Date: 3/19/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAS No. 3257) Date: 3/19/24	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC Water Resources Management Division (RPAS No. 3057) Date: 3/20/24	Approved by:  <b>GINA P. MILO, Ph.D.</b> Director Date:	Sheet Contents: PROFILE ELEVATIONS AND CROSS-SECTIONS ALONG CENTERLINE OF POND AREA / CROSS-SECTIONS OF DESILTATION OF POND AREA Name of Project: <b>Rehabilitation of PLACIDO SWIP</b> Location: Brgy San Andres, Balungao, Pangasinan	CAD / Drawn by: E. P. Bustillo Sheet No.: <b>5 / 8</b>
	Reference Code: BSWM_WD_RE_0005 Control Number: 202404-WD-255-00002 Effective Date: Nov. 8, 2023 Rev. No. 3							

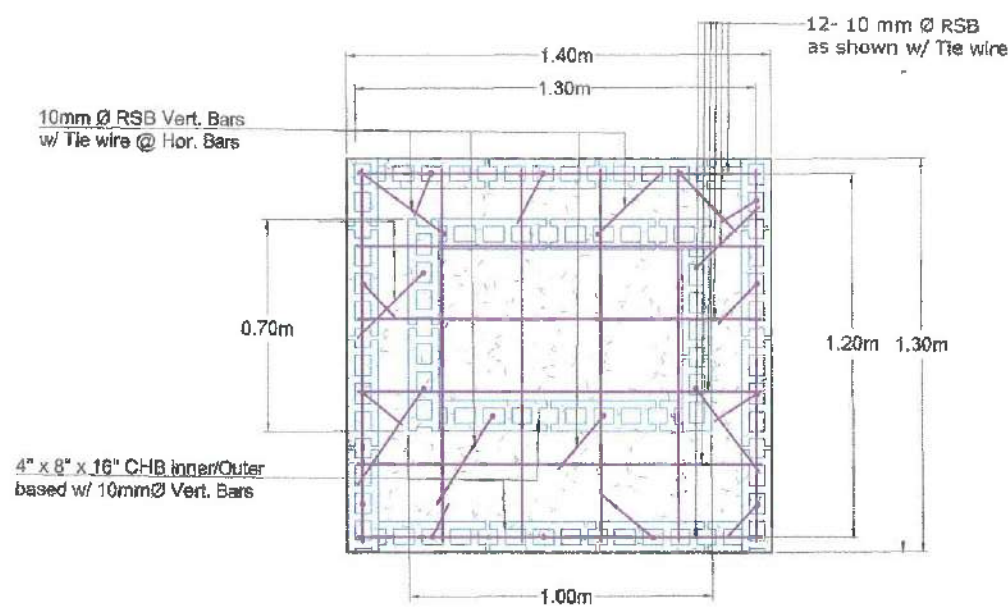


# CROSS-SECTIONS OF DESILTATION OF POND AREA

SCALE: 1:250 M.

	<b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> <b>WATER RESOURCES MANAGEMENT DIVISION</b>		Prepared by:  <b>ENGR. MELODY D. ZABALA</b> WRDO II (RPAB No. 8388) Date: 2/19/24	Checked / Reviewed by:  <b>ENGR. ALBERTO E. DE GUZMAN</b> Chief, Design and Engineering Section (RPAB No. 3287) Date: 2/19/24	Recommending Approval: By the Authority of the Director:  <b>ENGR. DIOSDADO M. MANALUS</b> OIC Water Resources Management Division (RPAB No. 3057) Date: 2/20/24	Approved by:  <b>GINA P. NILO, Ph.D.</b> Director Date:	Sheet Contents: <b>CROSS-SECTIONS OF DESILTATION OF POND AREA</b> Name of Project: <b>Rehabilitation of PLACIDO SWIP</b> Location: <b>Brgy San Andres, Bakungao, Pangasinan</b>	CAD / Drawn by: <b>E. P. Suebllo</b> Sheet No.: <b>6 / 8</b>
	Reference Code: BSWM_WD_RE_0005 Control Number: 250404_WD-RES-00002 Effective Date: Nov. 6, 2023 Rev. No. 3							





**TYPICAL MATTING PLAN**

SCALE: 1:25 M

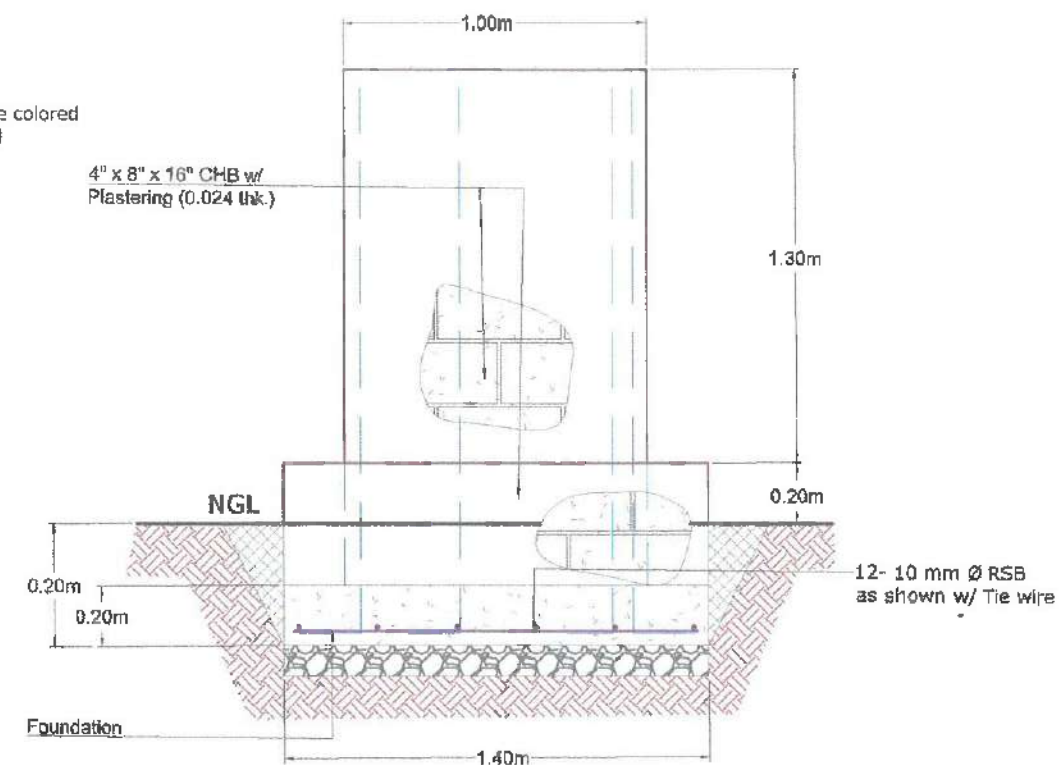
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1.00m

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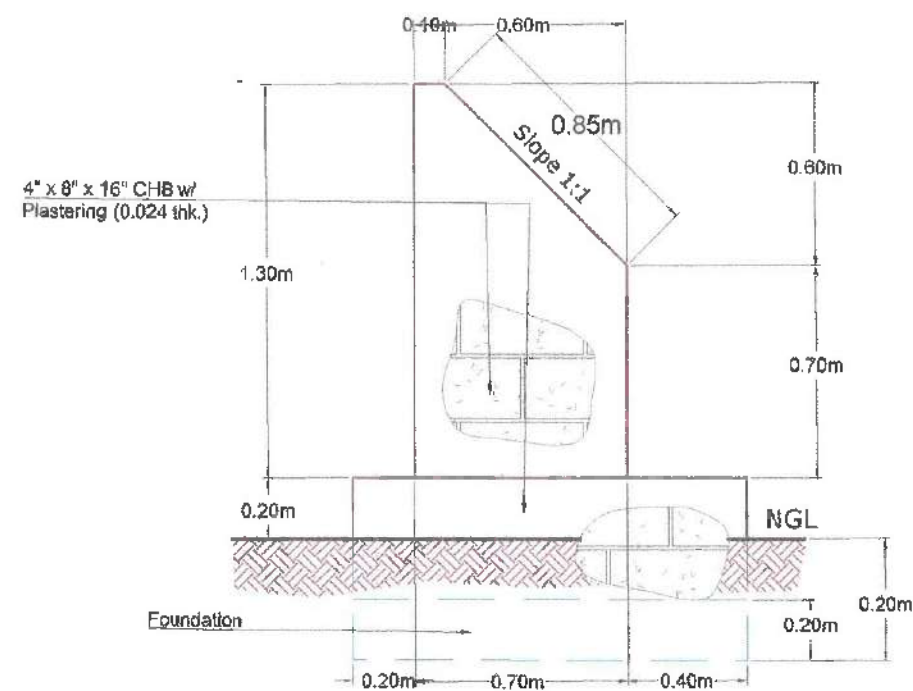
REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF AGRICULTURE  
REGIONAL FIELD OFFICE  
Location: \_\_\_\_\_  
DR-Locally Funded Project 2024  
Source of Fund: \_\_\_\_\_  
Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
Beneficiary: \_\_\_\_\_  
Sub-Component: \_\_\_\_\_

Note: All text letters are colored Baguio green and engraved.



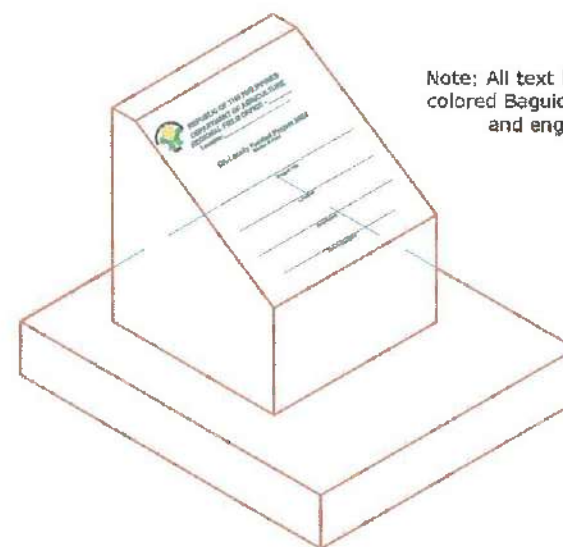
**BACK VIEW OF FOOTING SECTION**

SCALE: 1:25 M



**LEFT SIDE VIEW**

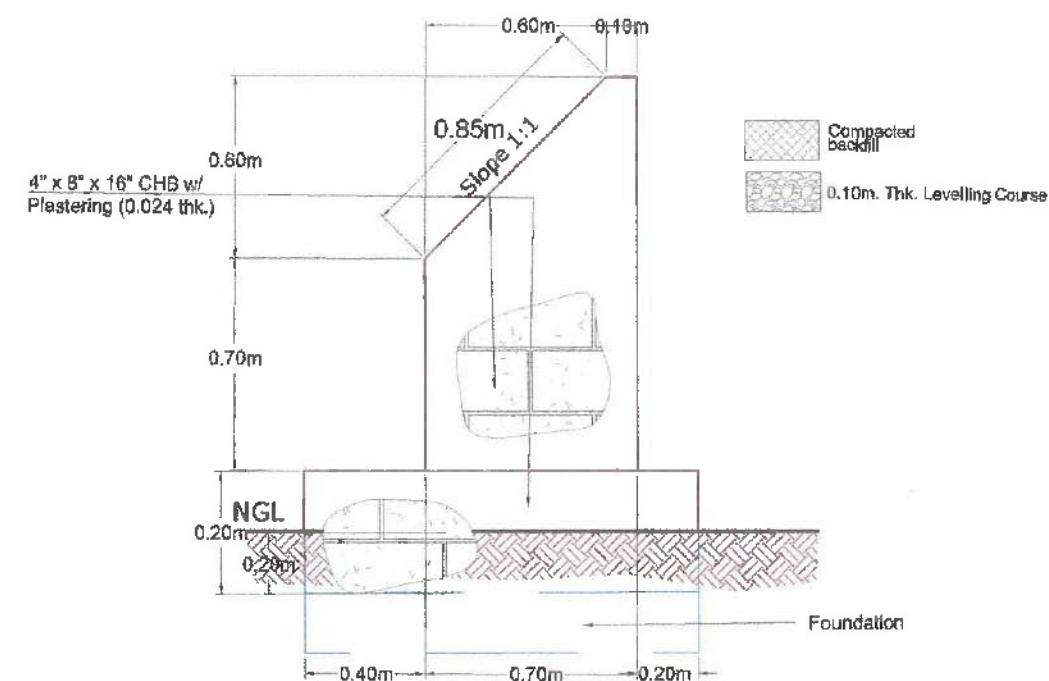
SCALE: 1:25 M



**ISOMETRIC VIEW**

SCALE: 1:25 M

Note: All text letters are colored Baguio green and engraved.




**RIGHT SIDE VIEW**

SCALE: 1:25 M

**TYPICAL PLAN/SECTIONS/ISOMETRIC VIEW OF CONCRETE SIGNAGE**

SCALE AS SHOWN

 <p><b>DEPARTMENT OF AGRICULTURE</b> <b>Bureau of Soils and Water Management</b> WATER RESOURCES MANAGEMENT DIVISION Reference Code: BSWM_WD_RE_0005 Control Number: 202404 WD-REC-0002 Effective Date: Nov. 6, 2023 Rev. No. 3</p>	Prepared by:	Checked / Reviewed by:	Recommending Approval:	Approved by:	Sheet Contents:	CAD / Drawn by:
	ENGR. MILODY D. ZABALA WRDO II (RPAB No. 9399) Date: 7/19/24	ENGR. ALBERTO E. DE GUZMAN Chief, Design and Engineering Section (RPAB No. 3287) Date: 7/19/24	ENGR. DIOSDADO M. MANALUS OIC Water Resources Management Division (RPAB No. 3057) Date: 7/20/24	GINA P. NILO, Ph.D. Director Date: _____	TYPICAL PLAN/SECTIONS/ISOMETRIC VIEW OF CONCRETE SIGNAGE	E. P. Bueltito
					Name of Project:	Sheet No.:
					Location:	8 / 8
					Brgy San Andres, Balungao, Pangasinan	

## BILL OF QUANTITIES

e of Project: Construction of Matampay SWIP

Location: Brgy. Matampay, Munai, Lanao del Norte

Item No.	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
<b>1</b>	<b>Construction of Camp, other temporary facilities, and movement of equipment</b>	L.S	<b>1</b>		
<b>2</b>	<b>Diversion of water and care of creek</b>	L.S.	<b>1</b>		
<b>3</b>	<b>Clearing and Grubbing</b>	sq. m.	<b>5,000</b>		
<b>4</b>	<b>Dam</b>				
4.1	Excavation (Stripping)	cu. m.	2,991		
4.2	Excavation (Core Trench)	cu. m.	1,765		
4.3	Embankment Fill (Side Borrow)	cu. m.	31,289		
4.4	Embankment Fill (From Core Trench & Spillway Excavation)	cu. m.	4,918		
4.5	Levelling Course (Gravel Blanket)	cu. m.	240		
4.6	Handlaid Riprap	cu. m.	479		
4.7	Sprigging and sodding	sq. m.	3,307		
4.8	Gravel Surfacing	cu. m.	60		
<b>5.0</b>	<b>Toe Drain</b>				
5.1	Rock Toe (Boulders)	cu. m.	80		
5.2	Gravel and Sand Transition	cu. m.	30		
5.3	Fine Sand Transition	cu. m.	19		
<b>6.0</b>	<b>Spillway</b>				
6.1	Excavation	cu. m.	5,021		
6.2	Structural Backfill	cu. m.	638		
6.3	Concrete Class "A" w/ forms	cu. m.	55		
6.4	Concrete Class "A" w/o forms	cu. m.	102		
6.5	Reinforcing Steel	kg.	9,783		
6.6	Levelling Course	cu. m.	56		
6.7	Grouted Riprap	cu. m.	63		
6.8	PVC Pipe	m.	144		
<b>7</b>	<b>Outlet Works</b>				
7.1	Common Excavation	cu. m.	252		
7.2	Structural Backfill	cu. m.	237		
7.3	Concrete Class "A" w/ forms	cu. m.	6		
7.4	Concrete Class "A" w/o forms	cu. m.	2		
7.5	Reinforcing Steel	kg.	160		
7.6	Levelling Course	cu. m.	8		
7.7	Steel Pipe 0.25 x 6 m	Pcs	12		
7.8	Gate Valve 0.25 m. Diam.	assem	1		
7.9	Trashrack, fishscreen and flashboard	L.S.	<b>1</b>		
<b>8</b>	<b>Irrigation Works (674 lm Lined Canal, 5 Division Boxes, 15 m &amp; 8 m Flume &amp; 1 End check)</b>				
8.1	Common Excavation	cu. m.	348		
8.2	Structural Backfill	cu. m.	<b>95</b>		
8.3	Concrete Class "A" w/ forms	cu. m.	11		
8.4	Concrete Class "A" w/o forms	cu. m.	2		
8.5	Concrete Class "B" w/ forms	cu. m.	83		
8.6	Concrete Class "B" w/o forms	cu. m.	68		
8.7	Reinforcing Steel	kg.	<b>6,747</b>		
8.8	Levelling Course	cu. m.	66		
<b>9</b>	<b>Provision of Permanent Marker &amp; Billboard</b>	Lot	<b>1</b>		
	<b>TOTAL PROJECT COST</b>				

Signed by:

Name: \_\_\_\_\_

Bidder Authorized Representative



## BILL OF QUANTITIES

**Name of Project: Construction of Naglilimpiyaan SWIP**

**Location: Brgy. Baloy, Cuyapo, Nueva Ecija**

Item No.	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
<b>1</b>	<b>Construction of Camp, other temporary facilities, and movement of equipment</b>	L.S	<i>1</i>		
<b>2</b>	<b>Access Road</b>	m.	<i>1,100</i>		
<b>3</b>	<b>Diversion of water and care of creek</b>	L.S.	<i>1</i>		
<b>4</b>	<b>Clearing and Grubbing</b>	sq. m.	<i>63,300</i>		
<b>5.0</b>	<b>Dam</b>				
5.1	Excavation (Stripping)	cu. m.	<i>4,226</i>		
5.2	Excavation (Core Trench)	cu. m.	<i>4,350</i>		
5.3	Embankment Fill (Side Borrow)	cu. m.	<i>46,242</i>		
5.4	Embankment Fill (From Core Trench & Spillway Excavation)	cu. m.	<i>3,670</i>		
5.5	Levelling Course (Gravel Blanket)	cu. m.	<i>409</i>		
5.6	Handlaid Riprap	cu. m.	<i>831</i>		
5.6	Sprigging and sodding	sq. m.	<i>4,039</i>		
5.6	Gravel Surfacing	cu. m.	<i>173</i>		
<b>6.0</b>	<b>Toe Drain</b>				
6.1	Rock Toe (Boulders)	cu. m.	<i>116</i>		
6.2	Gravel and Sand Transition	cu. m.	<i>84</i>		
6.3	Fine Sand Transition	cu. m.	<i>33</i>		
<b>7.0</b>	<b>Spillway</b>				
7.1	Excavation	cu. m.	<i>411</i>		
7.2	Structural Backfill	cu. m.	<i>173</i>		
7.3	Concrete Class "A" w/ forms	cu. m.	<i>26</i>		
7.4	Concrete Class "A" w/o forms	cu. m.	<i>23</i>		
7.5	Reinforcing Steel	kg.	<i>4,555</i>		
7.6	Levelling Course	cu. m.	<i>14</i>		
7.7	Grouted Riprap	cu. m.	<i>71</i>		
7.8	PVC Pipe	m.	<i>60</i>		
<b>8</b>	<b>Outlet Works</b>				
8.1	Common Excavation	cu. m.	<i>425</i>		
8.2	Structural Backfill	cu. m.	<i>446</i>		
8.3	Concrete Class "A" w/ forms	cu. m.	<i>6</i>		
8.4	Concrete Class "A" w/o forms	cu. m.	<i>2</i>		
8.5	Reinforcing Steel	kg.	<i>87</i>		
8.6	Levelling Course	cu. m.	<i>11</i>		
8.7	Steel Pipe 0.25 x 6 m	Pcs	<i>17</i>		
8.8	Gate Valve 0.25 m. Diam.	assem	<i>1</i>		
8.9	Trashrack, fishscreen and flashboard	L.S.	<i>1</i>		
<b>9</b>	<b>Irrigation Works (1500 lm Lined Canal, 6 Division Boxes, 15 Flume &amp; 1 End Check)</b>				
9.1	Common Excavation	cu. m.	<i>863</i>		
9.2	Structural Backfill	cu. m.	<i>741</i>		
9.3	Concrete Class "A" w/ forms	cu. m.	<i>7</i>		
9.4	Concrete Class "A" w/o forms	cu. m.	<i>1</i>		
9.5	Concrete Class "B" w/ forms	cu. m.	<i>152</i>		
9.6	Concrete Class "B" w/o forms	cu. m.	<i>123</i>		
9.7	Reinforcing Steel	kg.	<i>16,364</i>		
9.8	Levelling Course	cu. m.	<i>106</i>		
9.9	RCP (0.61 m. Diam.)	m.	<i>3</i>		
<b>10</b>	<b>Provision of Permanent Marker &amp; Billboard</b>	Lot	<i>1</i>		
	<b>TOTAL PROJECT COST</b>				

Signed by:

Name:

Bidder Authorized Representative

## BILL OF QUANTITIES

Name of Project: Construction of Mabalbalanay SWIP

Location: Brgy. Agbannawag, Tabuk City Kalinga

Item No.	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
1	Mobilization and Demobilization of Equipment	lot	1.00		
2	Diversion of Water and care of Creek	lot	1.00		
3	Gravel Surface course (uncrushed) for access road	cu.m	330.00		
4	Clearing and grubbing (w/ stripping)	sq.m.	7,179.00		
5	Structure Excavation (common soil)	cu. m.	18,119.52		
6	Embankment including spreading and compaction	cu. m.	26,729.48		
7	Handlaid Riprap	cu. m.	1301.84		
8	Sprigging	sq.m.	5720.00		
9	Bed course granular material	cu. m.	186.10		
10	Rock toe drain filter	cu. m.	81.60		
11	Gravel transition filter	cu. m.	73.80		
12	Sand Transition filter	cu. m.	28.20		
13	Reinforcing steel bar	kg	16940.97		
14	Structural concrete Class A with forms	cu. m.	330.54		
15	Grouted riprap Class A	cu. m.	29.10		
16	Installation of 10" diameter uPVC pipe class 150	l.m.	72.00		
17	Installation of 10" diameter Gate Valve	lot	1.00		
18	Installation of trash rack	lot	1.00		
19	Manual Excavation for canal (common soil)	cu. m.	161.00		
20	Permits and clearances	lot	1.00		
21	Occupational safety and health program	Days	238.00		
22	Provision and installation of project billboard and permanent marker	lot	1.00		
<b>TOTAL PROJECT COST</b>					

Signed by:

Name: \_\_\_\_\_  
 Bidder Authorized Representative

## BILL OF QUANTITIES

**Name of Project:** Rehabilitation of Libasan SWIP

**Location:** Brgy. Libasan, Nabunturan, Davao de Oro

Item No.	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
<b>1</b>	<b>Construction of Camp, other temporary facilities, and movement of equipment</b>	L.S	<i>1</i>		
<b>2</b>	<b>Diversion of water and care of creek</b>	L.S.	<i>1</i>		
<b>3</b>	<b>Clearing and Grubbing</b>	sq. m.	<i>6,000</i>		
<b>4</b>	<b>Dam</b>				
4.1	Excavation (Stripping)	cu. m.	<i>3,225</i>		
4.2	Embankment Fill (Borrow Haul)	cu. m.	<i>530</i>		
4.3	Spillway Excavation)	cu. m.	<i>1,500</i>		
4.4	Levelling Course (Gravel Blanket)	cu. m.	<i>83</i>		
4.5	Handlaid Riprap	cu. m.	<i>249</i>		
4.6	Sprigging and sodding	sq. m.	<i>2,810</i>		
4.7	Gravel Surfacing	cu. m.	<i>84</i>		
<b>5.0</b>	<b>Toe Drain</b>				
5.1	Rock Toe (Boulders)	cu. m.	<i>35</i>		
5.2	Gravel and Sand Transition	cu. m.	<i>30</i>		
5.3	Fine Sand Transition	cu. m.	<i>6</i>		
<b>6.0</b>	<b>Spillway</b>				
6.1	Excavation	cu. m.	<i>670</i>		
6.2	Structural Backfill	cu. m.	<i>700</i>		
6.3	Concrete Class "A" w/ forms	cu. m.	<i>16</i>		
6.4	Concrete Class "A" w/o forms	cu. m.	<i>18</i>		
6.5	Reinforcing Steel	kg.	<i>2,350</i>		
6.6	Levelling Course	cu. m.	<i>22</i>		
6.7	Grouted Riprap	cu. m.	<i>375</i>		
6.8	Handlaid Riprap	cu. m.	<i>133</i>		
6.9	G.I. Pipe (2" diameter x 6m)	pcs	<i>3</i>		
6.10	Demolition of Concrete	cu. m.	<i>40</i>		
6.11	<b>Outlet Works</b>				
<b>7</b>	<b>Gate Valve 0.20 diam.</b>	assem	<i>1</i>		
7.1	<b>Provision of Permanent Marker &amp; Billboard</b>	Lot	<i>1</i>		
	<b>TOTAL PROJECT COST</b>				

Signed by:

Name: \_\_\_\_\_

Bidder Authorized Representative

# **BILL OF QUANTITIES**

**Name of Project: Rehabilitation of Bussaoit SWIP**

**Location: Brgy. Bussaoit, Bacnotan, La Union**

Item No.	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
<b>1.0</b>	<b>Construction of Camp, other temporary facilities, and movement of equipment</b>	L.S	<i>1</i>		
<b>2.0</b>	<b>Diversion of water and care of creek</b>	L.S.	<i>1</i>		
<b>3.0</b>	<b>Dam</b>				
3.1	Excavation	cu. m.	<i>34,336</i>		
3.2	Embankment Fill (Side Borrow)	cu. m.	<i>35,700</i>		
3.3	Levelling Course (Gravel Blanket)	cu. m.	<i>203</i>		
3.4	Handlaid Riprap	cu. m.	<i>608</i>		
3.5	Sprigging and sodding	sq. m.	<i>1,614</i>		
3.6	Gravel Surfacing	cu. m.	<i>405</i>		
3.7	Demolition of Concrete	cu. m.	<i>40</i>		
<b>4.0</b>	<b>Outlet Works</b>				
4.1	Common Excavation	<i>cu. m.</i>	<i>15.00</i>		
4.2	Concrete Class "A" w/ forms	<i>cu. m.</i>	<i>1.00</i>		
4.3	Concrete Class "A" w/o forms	<i>cu. m.</i>	<i>1.00</i>		
4.4	Reinforcing Steel	<i>kg.</i>	<i>35.00</i>		
4.5	Levelling Course	<i>cu. m.</i>	<i>8.00</i>		
4.6	Steel Pipe 0.30 x 6 m	<i>Pcs</i>	<i>24.00</i>		
4.7	Gate Valve 0.30 m. Diam.	<i>assem</i>	<i>1.00</i>		
4.8	Trashrack, fishscreen and flashboard	L.S.	<i>1</i>		
<b>5.0</b>	<b>Provision of Permanent Marker &amp; Billboard</b>	Lot	<i>1</i>		
	<b>TOTAL PROJECT COST</b>				

Signed by:

Name:

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Bidder Authorized Representative



## BILL OF QUANTITIES

Name of Project: Rehabilitation of San Andres SWIP

Location: Brgy. San Andres, Balungao, Pangasinan

Item	Description	Unit	Quantity	Unit Cost (P)	Total Amount (P)
No.					
<b>1.0</b>	<b>Construction of Camp, other temporary facilities, and movement of equipment</b>	L.S	1.00		
2.0	Diversion of water and care of creek	L.S.	1		
3.0	Clearing and Grubbing	sq. m.	944		
4.0	Dam				
4.1	Excavation (Dredging of Pond Area)	cu. m.	13,490		
5.0	Provision of Permanent Marker & Billboard	Lot	1		
	TOTAL PROJECT COST				

Signed by:

Name: \_\_\_\_\_  
Bidder Authorized Representative