

APPENDIX 9.4-1

Bridges – Plaridel Bypass (Initial & Ultimate Stage)

BRIDGE NO. 1 (PLARIDEL BYPASS--INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of clay with gravel & sand with its riverbank in stable condition.
- The upstream & downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding
- The river discharge at 50 year return period is 125.40 cum/sec
- The river velocity at 50 years return period is 2.699 m/sec.
- The top river width at design flood level is 29.0 m.

2. SOIL / GROUND CONDITION

- The site is covered by 1.00m to 3.00m grayish silty clay, followed by a very thick layer of very dense sand and gravel.
- N-value at the upper 1.00m to 7.50m depth ranges from 4 to 40 and after which N-values > 50 is consistent towards the end of borehole.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

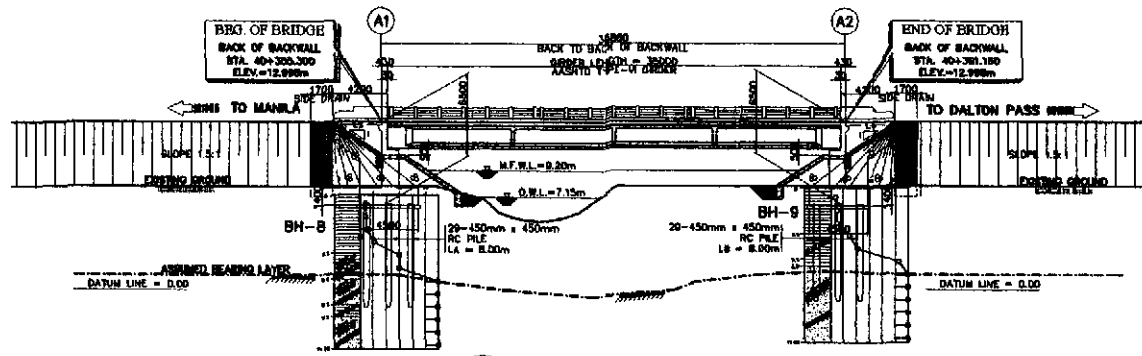
	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	35.86 m	35.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type VI (35m)	1-span, PCDG Type VI (35m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

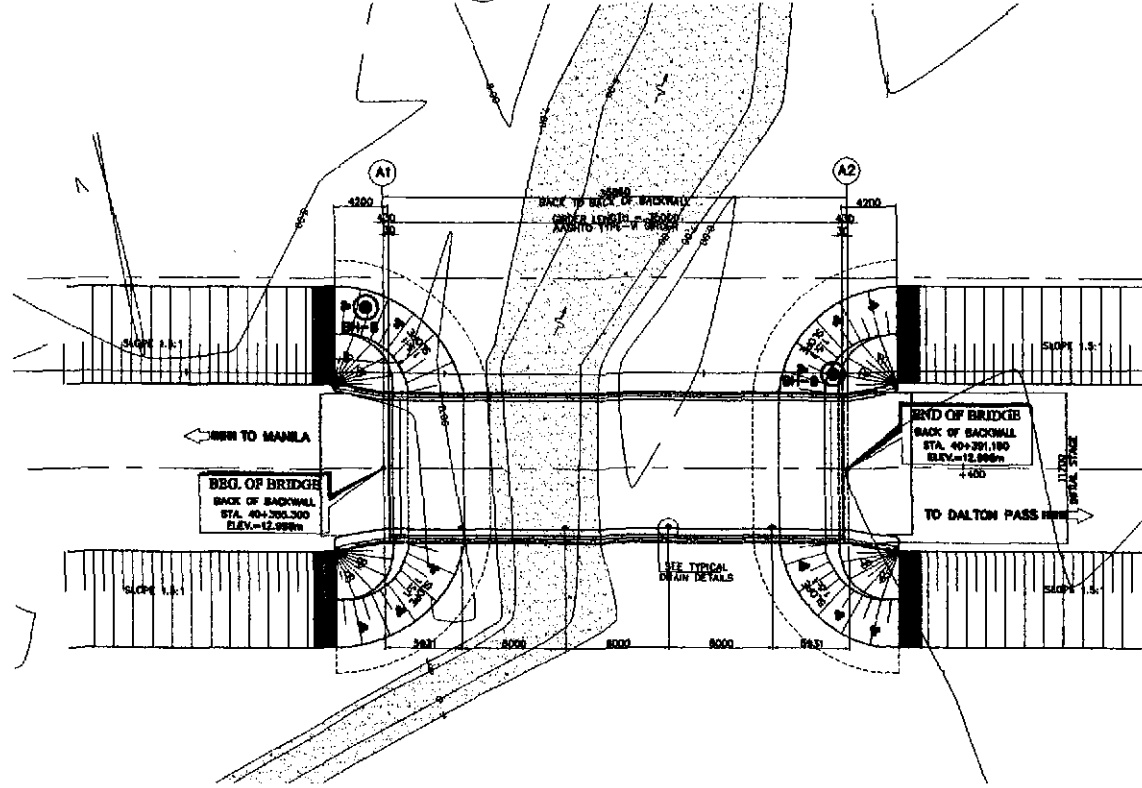
- The top width of river during the design flood is 29.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 35.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.
 - A three span bridge tends to be more expensive because of additional substructure cost.
- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

- Grouted Riprap Riverbank Protection with Loose Boulder Apron provided at toe.

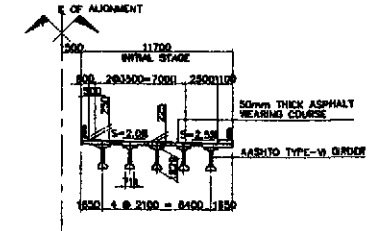


1 GENERAL ELEVATION
SCALE 1:200

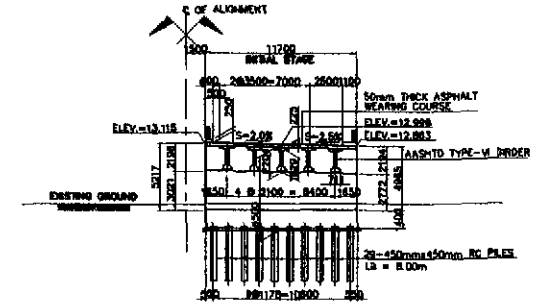


2 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO.1 (STA. 40+355.300)
SCALE AS SHOWN



3 SECTION @ MIDSPAN
SCALE 1:200



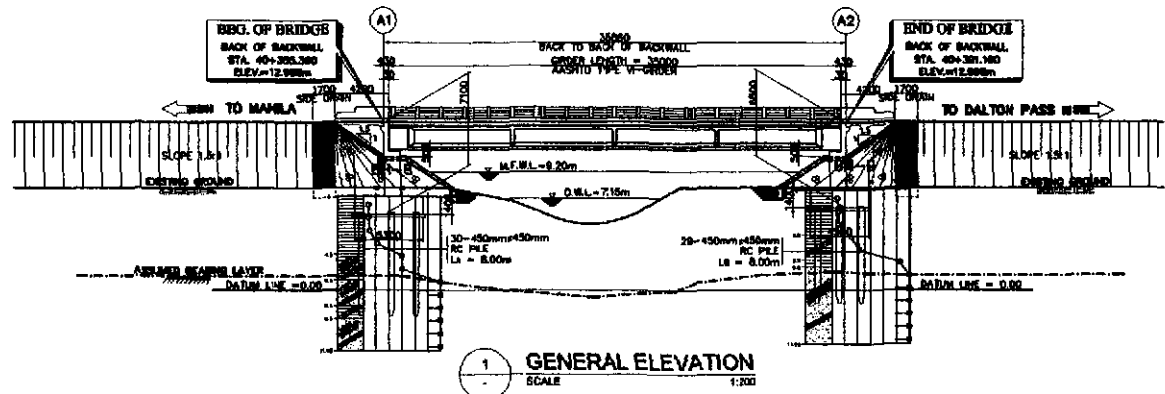
4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.699 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	125.400 cu.m/sec
CATCHMENT AREA, C_A	18.710 sq. km

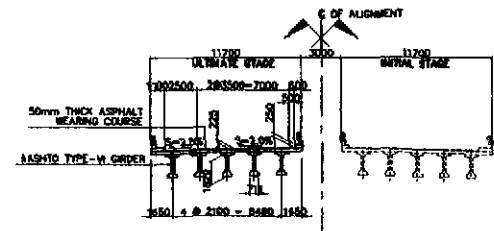
NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.

THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

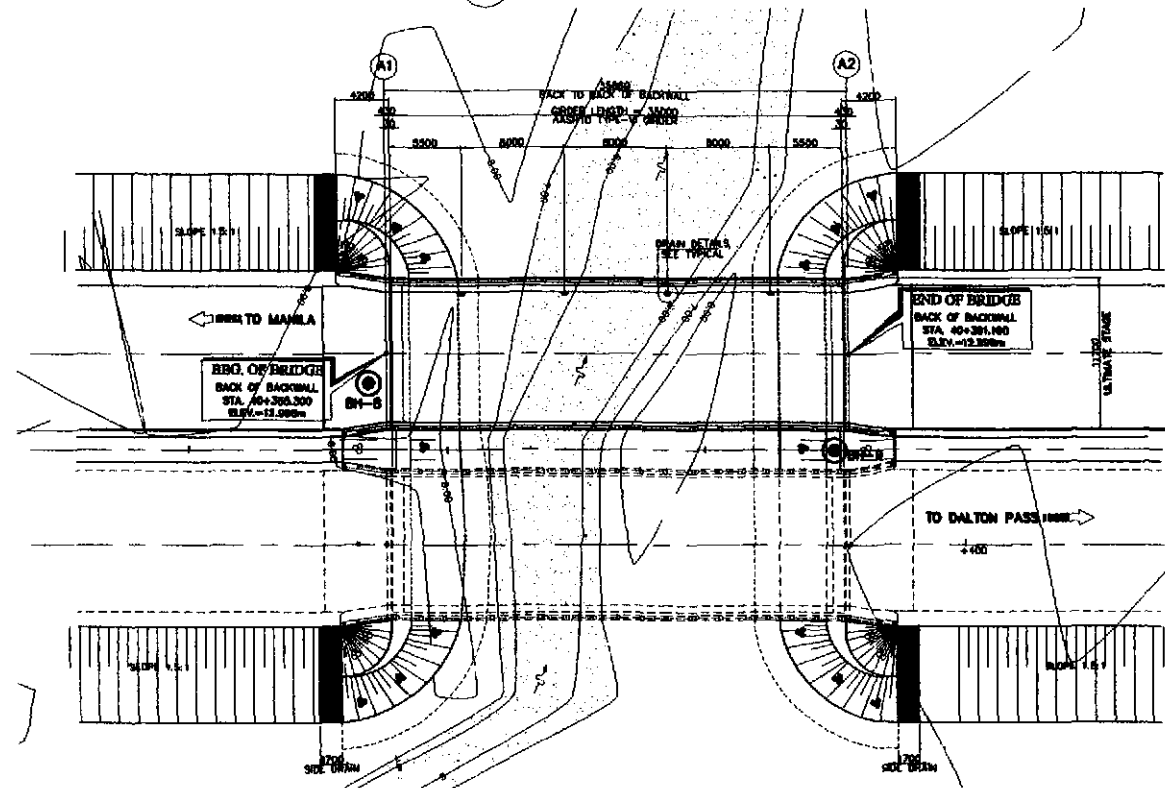
	DATE: _____ DRAWN BY: _____ CHECKED BY: _____ APPROVED BY: _____	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS OFFICE OF THE SECRETARY (See note above for Signature) (See note above for Signature) (See note above for Signature)	PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	SCALE : FULL SIZE A1	SHEET CONTENTS : PLARIDEL BYPASS BRIDGE NO.1 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	SHEET NO. : B-05
	DESIGNED BY: _____ CHECKED BY: _____ APPROVED BY: _____	PROJECT LEADER: _____	PROJECT MANAGER: _____ PROJECT ENGINEER: _____ PROJECT SUPERVISOR: _____ PROJECT ASSISTANT: _____	PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	SCALE : FULL SIZE A1	SHEET CONTENTS : PLARIDEL BYPASS BRIDGE NO.1 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS



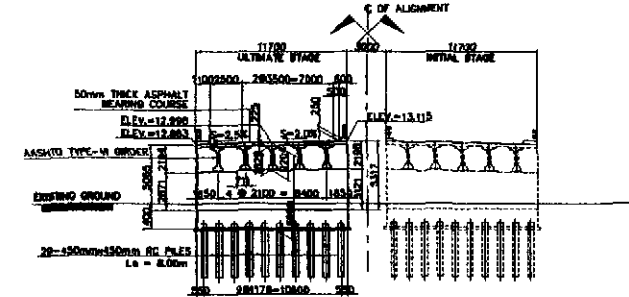
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MID SPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

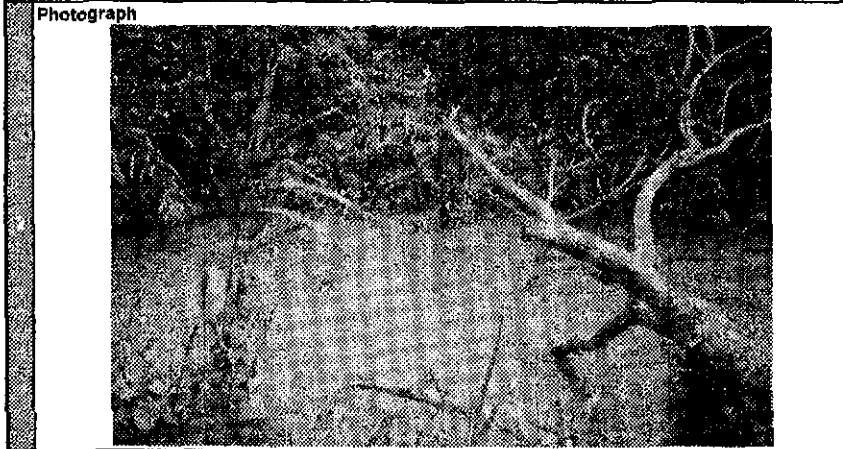
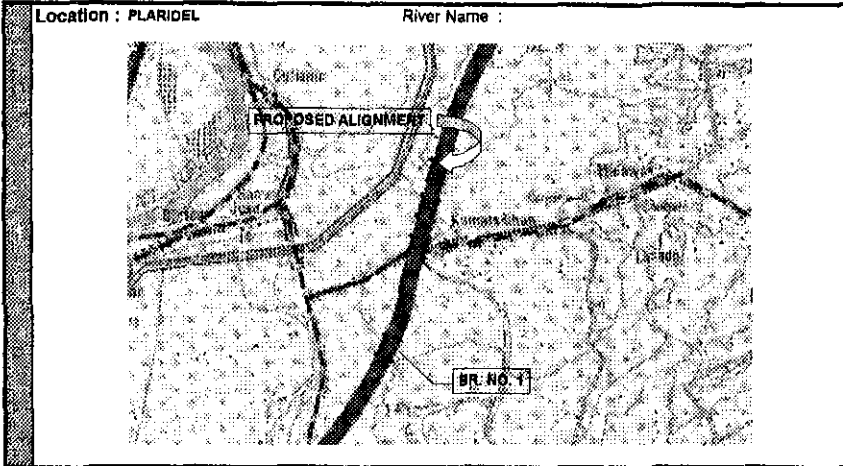
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.899 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	125.400 cu.m/sec
CATCHMENT AREA, CA	18.710 sq. km

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BRIDGE NO.1 (STA. 40+355.300)
SCALE AS SHOWN

	DESIGNED	DATE	SIGNATURE		PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :	
	CHECKED				DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	PLARIDEL BYPASS BRIDGE NO.1 (ULTIMATE STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	B-05
	SUBMITTED		TEAM LEADER		DIVISION OF DESIGN Checked by: [Signature] Approved by: [Signature] Date: [Date]	PROJECT NO. : Design by: [Signature] Checked by: [Signature] Date: [Date]			

PROPOSED BRIDGE SITE SURVEY



Land Use	<input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Others
Geographical Features / Terrain	<input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others
Stream / River Type	<input type="checkbox"/> Straight <input type="checkbox"/> Braided <input checked="" type="checkbox"/> Meandering
Nearby Structures	Upstream: Single span 12.0m long bridge at 450m from site. Downstream: Bridge at 4.8km from site.
Environmental Condition	<input checked="" type="checkbox"/> Trees/vegetation <input type="checkbox"/> Fish & Fish Habitat
Water Level (During survey)	<input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input type="checkbox"/> 1.0m - 1.5m <input checked="" type="checkbox"/> Others 2.5m

River Condition

River Width (m) : 8.0

Stream Velocity (m/s) :

Normal : 0.30

During Flood :

Channel Slope (%):

Upstream :

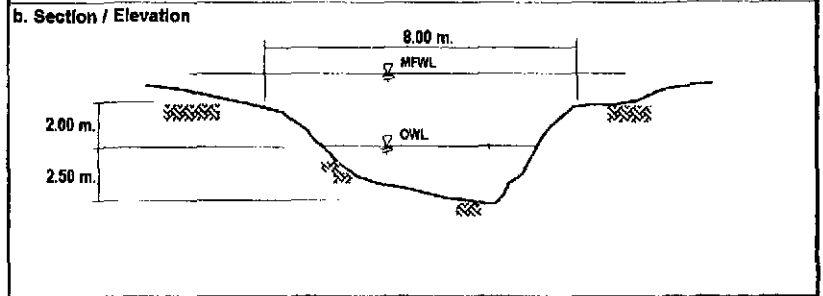
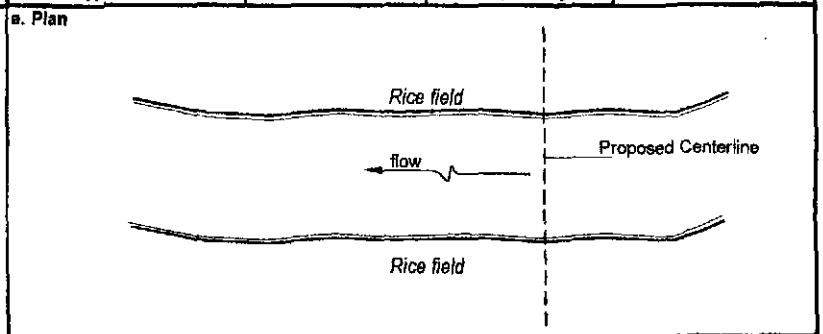
Downstream :

Site Access During Construction:

Possible Difficult

Comments:

Survey Date	18-Jun-01	Bridge No./Station	Bridge No. 1 / STA. 8+842.070
Bypass Name	PLARIDEL	Prepared by	ACP/ENS



Meander Situation	Upstream	<input type="checkbox"/> Existing <input checked="" type="checkbox"/> None
	Downstream	<input checked="" type="checkbox"/> Existing <input type="checkbox"/> None
Riverbed Material	<input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Others	
Riverside/Bank Condition	Upstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R
	Downstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R
Tendency to River Course and Riverbed Change	<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
Flood signs	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -	
Evidence of Drift & Debris	<input type="checkbox"/> None <input checked="" type="checkbox"/> Existing	Driftwoods, $\phi = 0.5 - 0.7$ Length = 3.0 - 3.5
	Others :	
Maximum Flood Water Level	Height above bank (m)	0.30
	Frequency (yrs)	
	Cause	
Recommendation for Bridge	Verify maximum flood water level. Provide 1.50m clearance from MFWL to soffit of superstructure.	
Recommendation for River Protection Works	Provide rubble concrete slope protection on road embankment.	
Comments / Others		

Table 3.4-6 Bridge No. 1 Site Condition

BRIDGE NO. 2 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of clayey silt underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding.
- Meandering river course.
- The river discharge at 50 year return period is 124.90 cum/sec.
- The river velocity at 50 year return period is 2.798 m/sec.
- The top river width at design flood level is 25.0 m.
- The bridge is skewed at 15°.

2. SOIL / GROUND CONDITION

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- The upper clay deposits (6 to 9m) in depth have N-values range of 4 to 10m.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	34.36 m	34.36 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type V (33.5m)	1-span, PCDG Type V (33.5m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

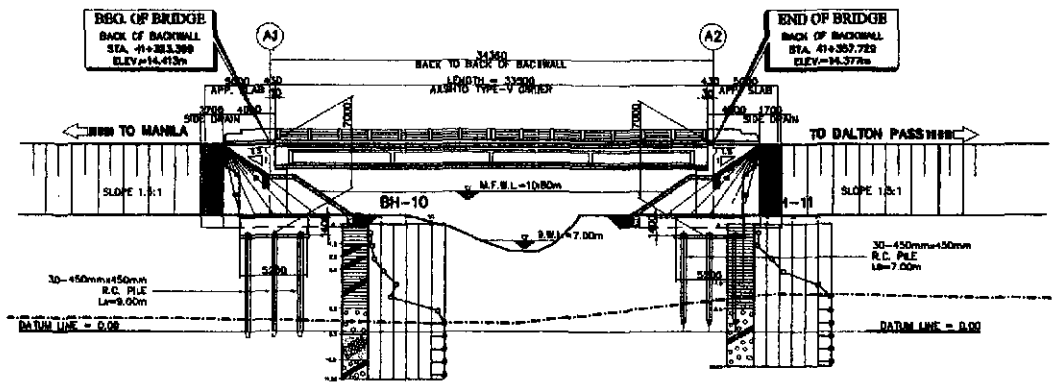
- The top width of river during the design flood is 25.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 34.36m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.

- A three span bridge tends to be more expensive because of additional substructure cost.

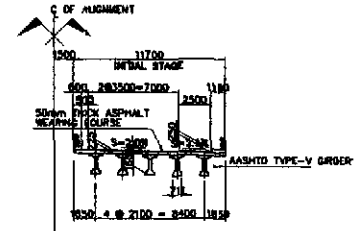
- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

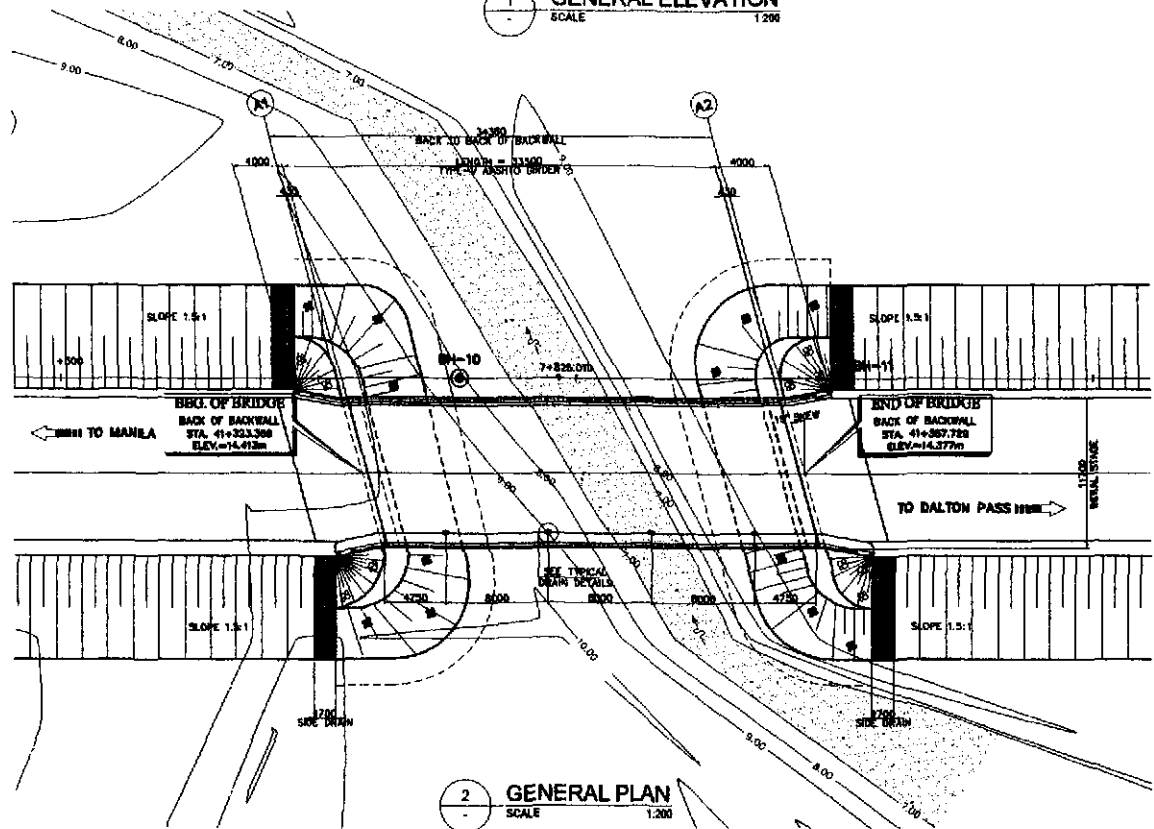
- Since river velocity during worst flooding is relatively slow (2.798 m/sec), the bridge utilizes Grouted Riprap Riverbank Protection.
- Grouted Riprap will be protected by Loose Boulder Apron at toe.



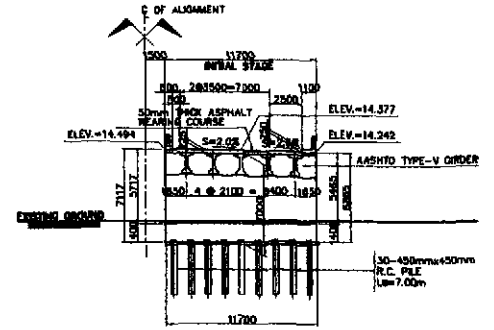
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MIDSPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

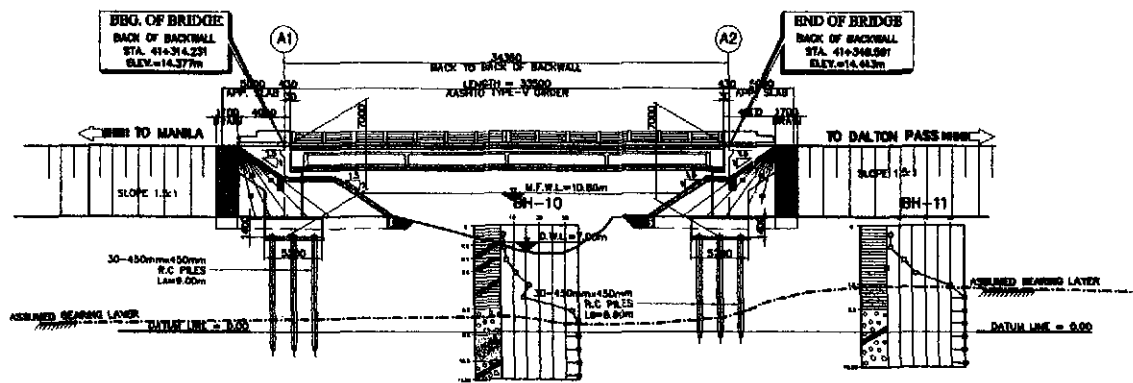
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.798 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	124,900 cu.m/sec
CATCHMENT AREA, CA	17.630 sq. km

NOTE:
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.

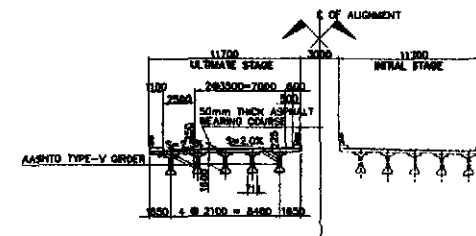
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO. 2 (STA. 41+323.369)
SCALE AB SHOW

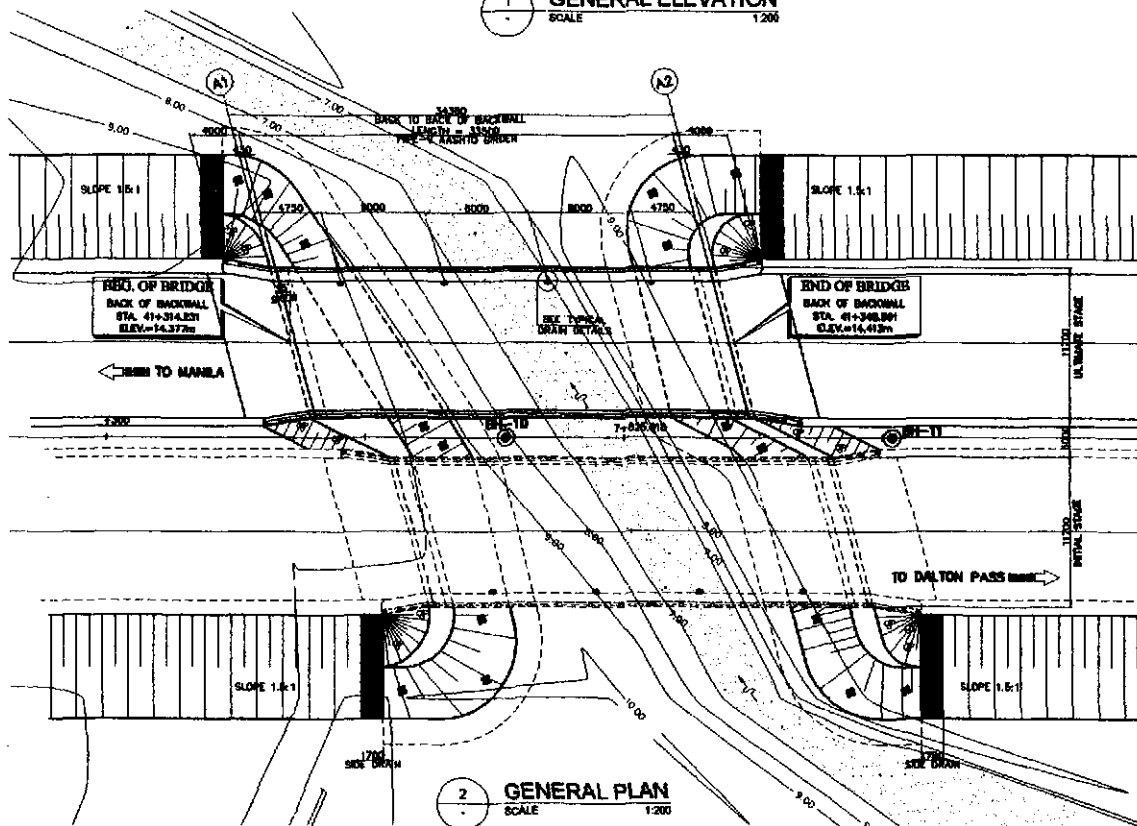
	DATE	REVISION	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED			DIVISION OF DESIGN Checked by: EDUARDO S. REYES Submitted by: DANILLO C. TRINIDAD	DIVISION OF THE SUPERVISOR Recommended by: EDUARDO V. LIRIO Approved by: STANLEY A. SUTANAMONG	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	PLARIDEL BYPASS BRIDGE NO.2 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	B-18	



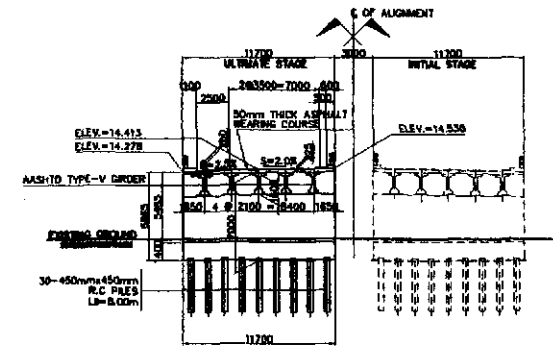
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MID SPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.798 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	124,900 cu.m/sec
CATCHMENT AREA, CA	17,630 sq. km

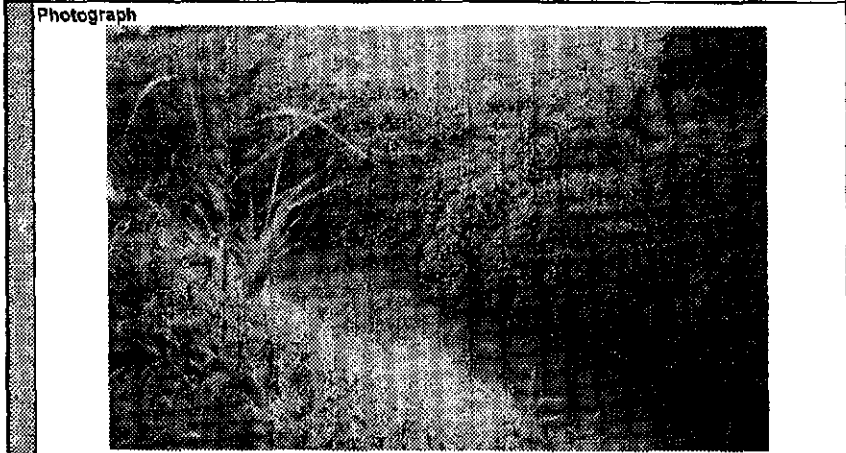
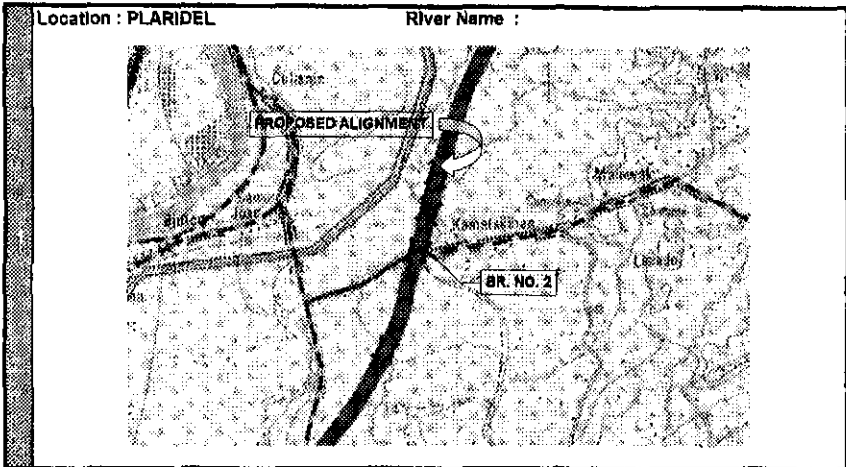
NOTE :
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THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO. 2 (STA. 41+314.231)
SCALE AS SHOWN

	DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED			DIVISION OF DESIGN Chief of Design				DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	PLARIDEL BYPASS BRIDGE NO. 2 (ULTIMATE STAGE) GENERAL PLAN, ELEVATION AND SECTIONS
APPROVED			OFFICE OF THE SECRETARY (For use only for Signature/Seal)							
SUBMITTED			DIVISION OF DESIGN Chief of Design							

PROPOSED BRIDGE SITE SURVEY



River Condition

River Width (m) : 8.0

Stream Velocity (m/s) :

Normal : 0.6

During Flood :

Channel Slope (%) :

Upstream :

Downstream :

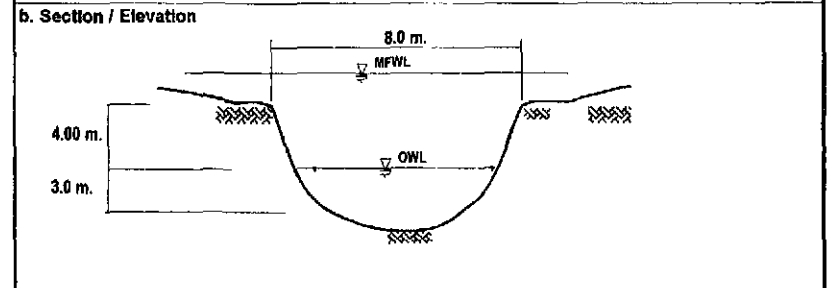
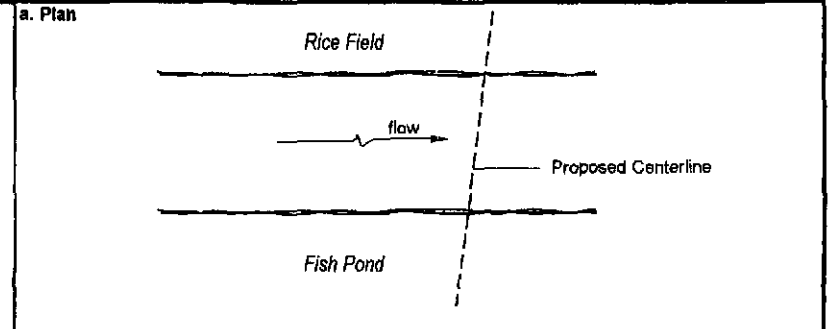
Site Access During Construction:

Possible

Difficult

Comments:

Survey Date	19-Jun-01	Bridge No./Station	Bridge No. 2 / STA 7+808.800
Bypass Name	PLARIDEL	Prepared by	ACP/ENS



Meander Situation

Upstream Existing None

Downstream Existing None

Riverbed Material

Large Gravel Gravel Sand Soil Others

Riverside/Bank Condition

Upstream Stable - Scouring/Eroding - L R With Protection/Ravement - L R

Downstream Stable - Scouring/Eroding - L R With Protection/Ravement - L R

Tendency to River Course and Riverbed Change

Stable Scouring Aggradation Degradation Sediment Transport Others

Flood signs

None Existing -

Evidence of Drift & Debris

None Existing

Driftwoods, $\phi =$ Length =

Others :

Maximum Flood Water Level

Interview Flood Data

Height above bank (m) 1.20

Frequency (yrs)

Cause

Recommendation for Bridge

Verify maximum flood water level. Provide 1.50m clearance from MFWL to soffit of superstructure.

Recommendation for River Protection Works

Comments / Others

Land Use

Commercial Industrial Residential Agricultural Others

Geographical Features / Terrain

Mountainous area Alluvial Plain Others

Stream / River Type

Straight Braided Meandering

Nearby Structures

Upstream Irrigation canal 500m from site.

Downstream Single span 12.0m long bridge at 470m from site.

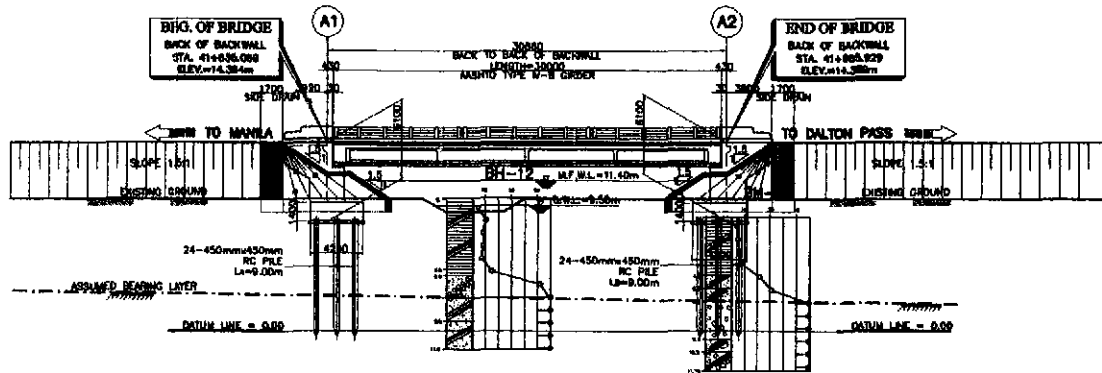
Environmental Condition

Trees/Vegetation Fish & Fish Habitat

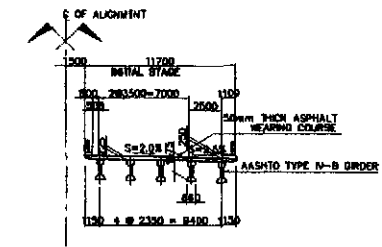
Water Level (During survey)

0 - 0.50m 0.50m - 1.0m 1.0m - 1.5m Others 3.0

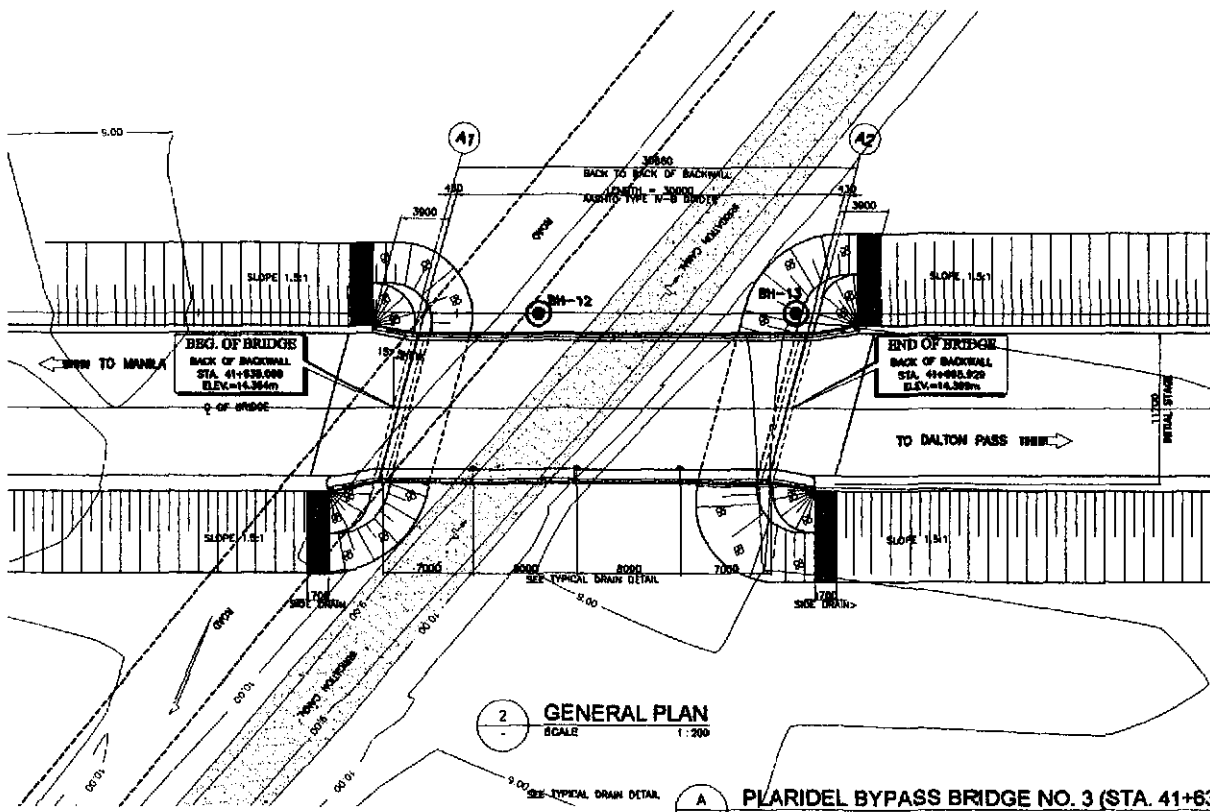
Table 3.4-7 Bridge No. 2 Site Condition



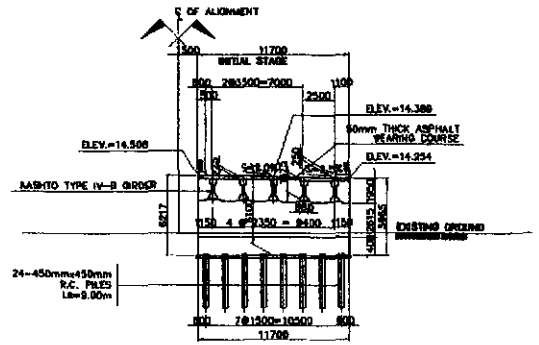
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MIDSPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
IRRIGATION CANAL	-

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A1 SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND TYPING ELEVATION.

THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

PLARIDEL BYPASS BRIDGE NO. 3 (STA. 41+635.069)
SCALE AS DRAWN

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY
KAI NISHIMURA & ENGINEERS
YEO YACHIRO ENGINEERING CO., LTD.

DESIGNED	CHECKED	APPROVED	DATE

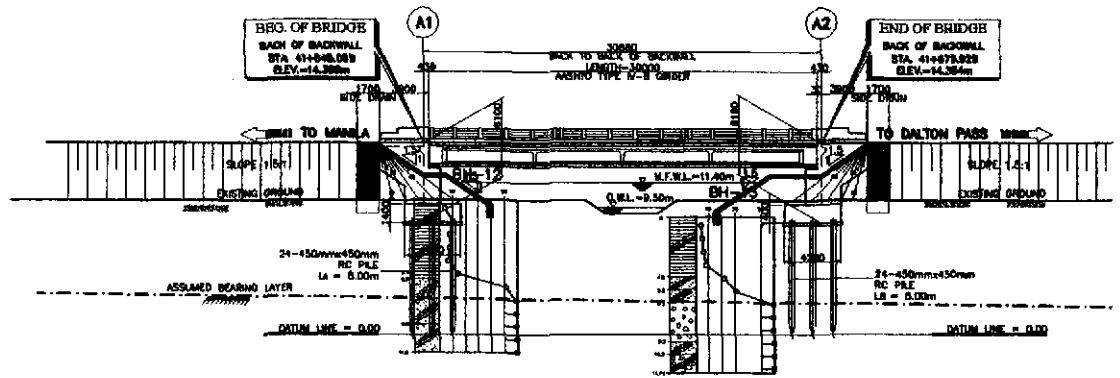
REPUBLIC OF THE PHILIPPINES		DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS	
BUREAU OF HIGHWAYS		OFFICE OF THE SUPERVISOR	
Checked by:	Approved by:	Checked by:	Approved by:
EDUARDO C. TRILANO	EDUARDO C. TRILANO	EDUARDO C. TRILANO	EDUARDO C. TRILANO

PROJECT AND LOCATION :
DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)

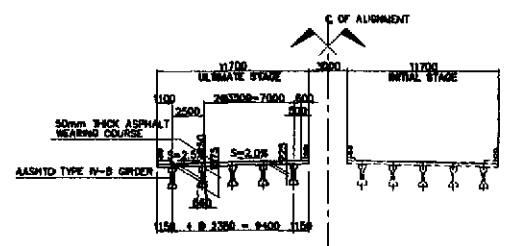
SCALE :
FULL SIZE A1

SHEET CONTENTS :
PLARIDEL BYPASS BRIDGE NO.3 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS

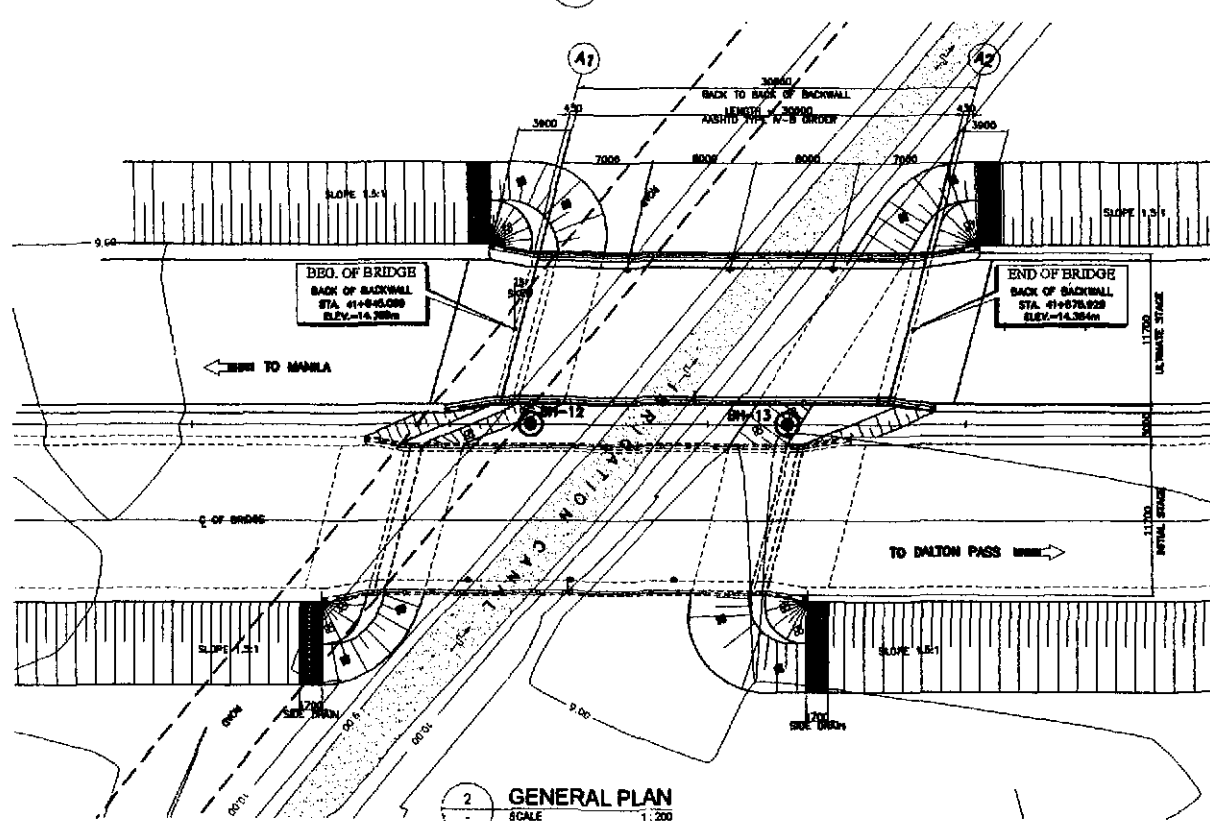
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B-31



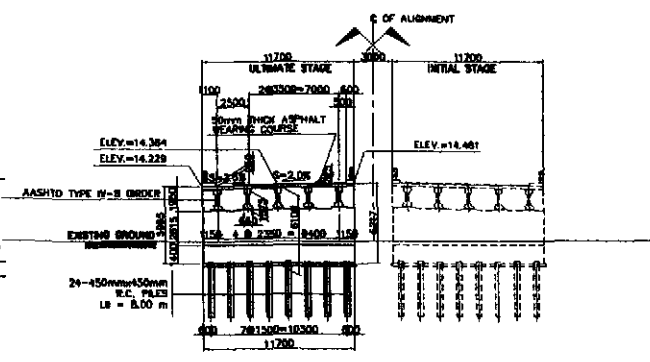
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MIDSPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
IRRIGATION CANAL	-

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A1 SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO. 3 (STA. 41+645.069)
SCALE 1:200

	DATE	SIGNATURE		PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED			REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	
CHECKED			OFFICE OF THE SECRETARY				B-33
SUBMITTED			Checked By: ARMANDO M. GORAY Recommended By: GERONIMO S. REYES Approved By: ENRIQUE V. DELA CRUZ (See cover sheet for Signatory Approval)				

PROPOSED BRIDGE SITE SURVEY

Location : PLARIDEL River Name : IRRIGATION CANAL

Photograph

3 Land Use	<input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Others
4 Geographical Features / Terrain	<input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others
5 Stream / River Type	<input checked="" type="checkbox"/> Straight <input type="checkbox"/> Braided <input type="checkbox"/> Meandering
6 Nearby Structures	Upstream: Irrigation canal running parallel. Downstream: Single span 12.0m long bridge at 900m from site.
7 Environmental Condition	<input checked="" type="checkbox"/> Trees/Vegetation <input checked="" type="checkbox"/> Fish & Fish Habitat
8 Water Level (During survey)	<input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input checked="" type="checkbox"/> 1.0m - 1.5m <input type="checkbox"/> Others

River Condition

River Width (m) : 7.2

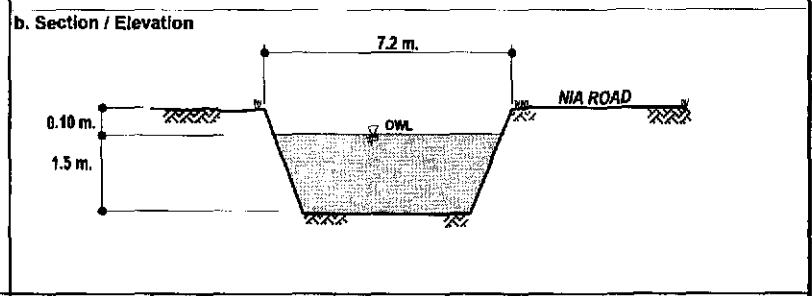
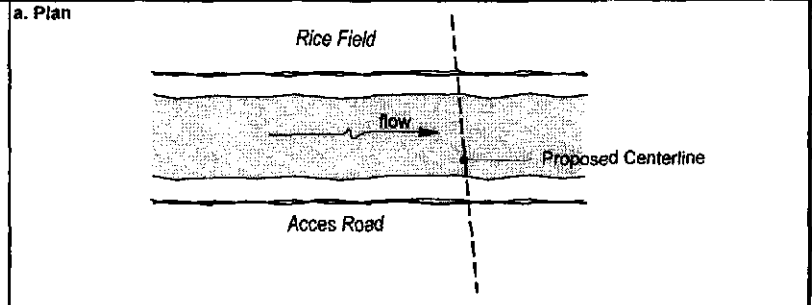
Stream Velocity (m/s) :
Normal : 0.30
During Flood :

Channel Slope (%) :
Upstream :
Downstream :

Site Access During Construction:
 Possible
 Difficult

Comments:

Survey Date	19-Jun-01	Bridge No./Station	Bridge No. 3 / STA 8+126.000
Bypass Name	PLARIDEL	Prepared by	GTR / ENS



10 Meander Situation	Upstream: <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None Downstream: <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None
11 Riverbed Material	<input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input type="checkbox"/> Soil <input checked="" type="checkbox"/> Others: CONCRETE
12 Riverside/Bank Condition	Upstream: <input type="checkbox"/> Stable - L R <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Rev. - L R Downstream: <input type="checkbox"/> Stable - L R <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Rev. - L R
13 Tendency to River Course and Riverbed Change	<input type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others
14 Flood signs	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -
15 Evidence of Drift & Debris	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing Driftwoods, Ø = Length = Others :
16 Maximum Flood Water Level	Height above bank (m) : <input checked="" type="checkbox"/> Interview <input type="checkbox"/> Flood Data <input type="checkbox"/> Flood Marks Cause :
17 Recommendation for Bridge	Verify maximum flood water level. Provide 1.0m clearance from MFWL and/or from bank.
18 Recommendation for River Protection Works	
19 Comments / Others	

Table 3.4-8 Bridge No. 3 Site Condition

BRIDGE NO. 3 (PLARIDEL BYPASS-INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION (IRRIGATION CANAL)

- The riverbed is composed of clayey silt underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding.
- Meandering river course.
- The top river width at design flood level is 25.0 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- Gravel and sand deposit is overlain uppermost plastic silt or clay with thickness ranging from 6.5 to 8.5 meters and after which N-values > 50 is consistent towards the end of borehole.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	30.86 m	30.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type IV-B (30m)	1-span, PCDG Type IV-B (30m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

- The top width of river during the design flood is 25.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 30.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.
 - A three span bridge tends to be more expensive because of additional substructure cost.

- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

- Grouted riprap will be provided for abutment protection.

BRIDGE NO. 4 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of clayey silt underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding.
- Meandering river course with riverbank heavily vegetated.
- The river discharge at 50 year return period is 109.20 cum/sec.
- The river velocity during 50 year flooding is 3.624 m/sec.
- The top river width at design flood level is 18.0 m.
- The bridge is skewed at 10°.

2. SOIL CONDITION

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- Gravel and sand deposit is overlain uppermost plastic silt or clay with thickness ranging from 7.5 to 9.5 meters and after which N-values > 50 is consistent towards the end of borehole.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	24.86 m	24.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type IV (24m)	1-span, PCDG Type IV (24m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

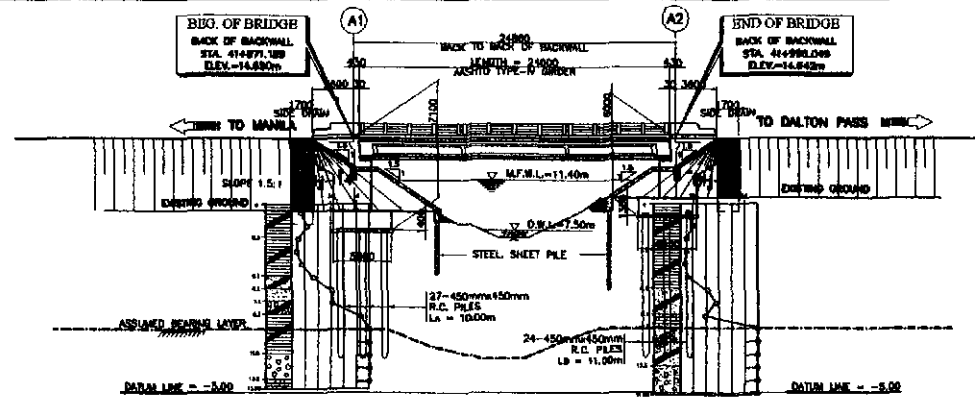
- The top width of river during the design flood is 18.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 24.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.

- A three span bridge tends to be more expensive because of additional substructure cost.

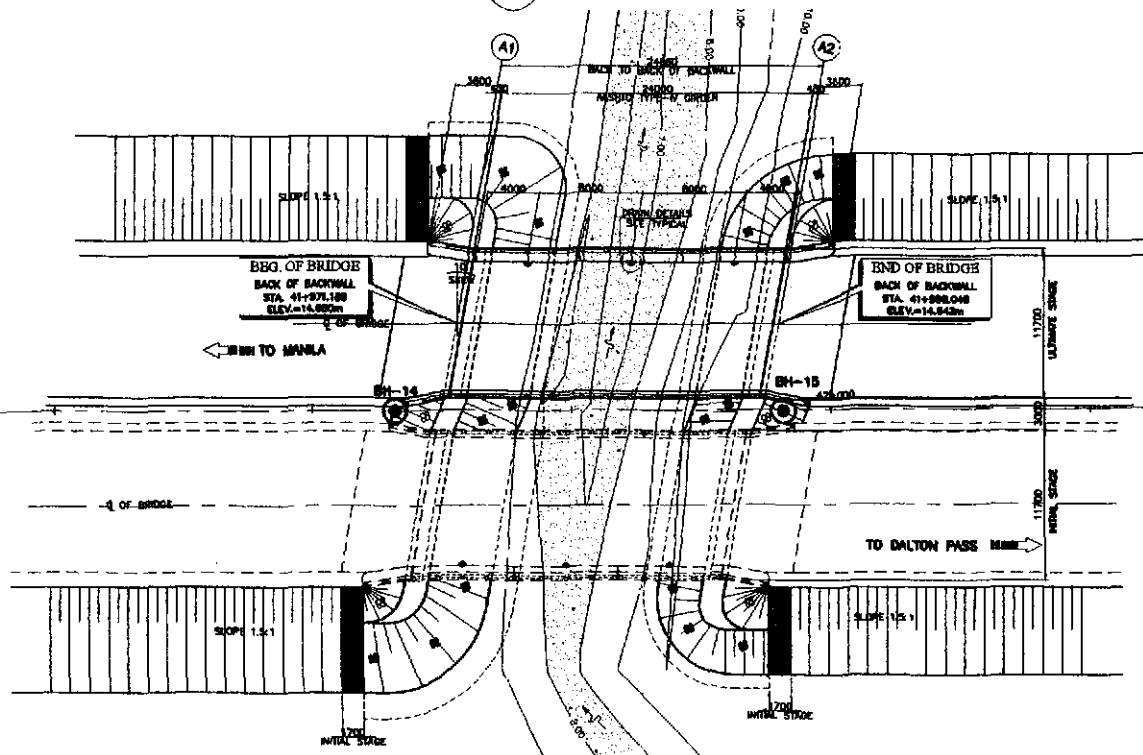
- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

- Since water velocity is relatively fast (3.624 m/sec), DPWH criteria requires Rubble Concrete River Bank Protection.
- River Bank Protection will be supported by steel sheet piles penetrating thru 5 meters of silty clay.

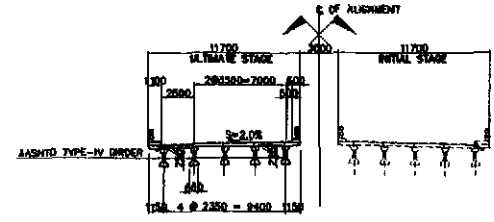


1 GENERAL ELEVATION
SCALE 1:200

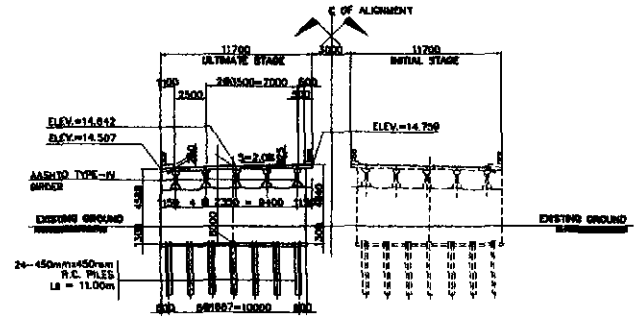


2 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO. 4 (STA. 41+971.189)
SCALE AS SHOWN



3 SECTION @ MIDSPAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

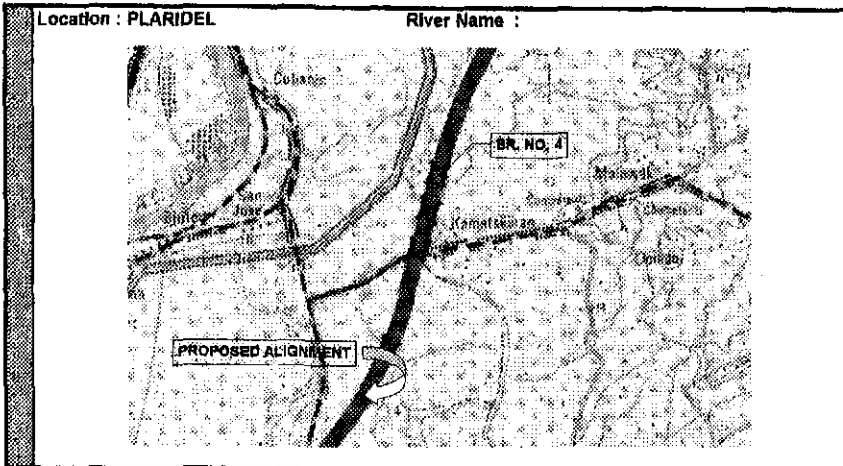
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	3.824 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	109.200 cu.m/sec
CATCHMENT AREA, CA	14,350 sq. km

NOTE:
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

19

	DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION:	SCALE:	SHEET CONTENTS:	SHEET NO.:
	DESIGNED			Div. - PWD Checked By: ENRICO C. TOLIANO Submitted:	Bureau of Highways Reviewed By: JORHANO M. BORDO Approved By: ENRIQUE S. DELA CRUZ Checked By: ENRIQUE S. DELA CRUZ	Office of the Secretary (Use space next to Signature/Approve) ENRIQUE S. DELA CRUZ Secretary	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	PLARIDEL BYPASS BRIDGE NO. 4 (ULTIMATE STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	B-46

PROPOSED BRIDGE SITE SURVEY



River Condition

River Width (m) : 15.0

Stream Velocity (m/s) :

Normal : 0.40

During Flood : _____

Channel Slope (%) :

Upstream : _____

Downstream : _____

Site Access During Construction:

Possible

Difficult

Comments:

Survey Date	19-Jun-01	Bridge No./Station	Bridge No. 4 / STA 8+452.800
Bypass Name	PLARIDEL	Prepared by	ACP / ENS

a. Plan

b. Section / Elevation

Meander Situation	Upstream	<input checked="" type="checkbox"/> Existing <input type="checkbox"/> None	
	Downstream	<input checked="" type="checkbox"/> Existing <input type="checkbox"/> None	
Riverbed Material		<input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Others	
Riverside/Bank Condition	Upstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R	
	Downstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R	
Tendency to River Course and Riverbed Change		<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
Flood signs		<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -	
Evidence of Drift & Debris	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing	Driftwoods, $\Phi =$	Length =
		Others :	
Maximum Flood Water Level	Height above bank (m)	0.50	Comments :
	<input checked="" type="checkbox"/> Interview <input type="checkbox"/> Flood Data		
	<input type="checkbox"/> Flood Marks		
Recommendation for Bridge	Verify maximum flood water level. Provide 1.50m clearance from MFWL to eoffit of superstructure.		
Recommendation for River Protection Works			
Comments / Others			

Land Use

Commercial Industrial Residential Agricultural Others

Geographical Features / Terrain

Mountainous area Alluvial Plain Others

Stream / River Type

Straight Braided Meandering

Nearby Structures

Upstream : Three-celled 12.0m box culvert at 5.0km from site.

Downstream : Irrigation canal running parallel.

Environmental Condition

Trees/Vegetation Fish & Fish Habitat

Water Level (During survey)

0 - 0.50m 0.50m - 1.0m 1.0m - 1.5m Others 2.0

Table 3.4-9 Bridge No. 4 Site Condition

BRIDGE NO. 5 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of clayey silt underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding.
- Meandering river course with riverbank heavily vegetated.
- The river discharge at 50 year return period is 85.60 cum/sec.
- The river velocity during 50 year flooding is 1.298 m/sec.
- The top river width at design flood level is 26.0 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- Bridge site is underlain by highly weathered bedrock.
- Bedrock layer is covered by thick, stiff residual clay and clayey silt, which probably derived from underlying parent rock.
- N-value at the upper 12 m thick is generally not more than 20 blows while the subsequent depths ranged between 30 to 50 blows.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	24.86 m	24.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type V (33.5m)	1-span, PCDG Type V (33.5m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

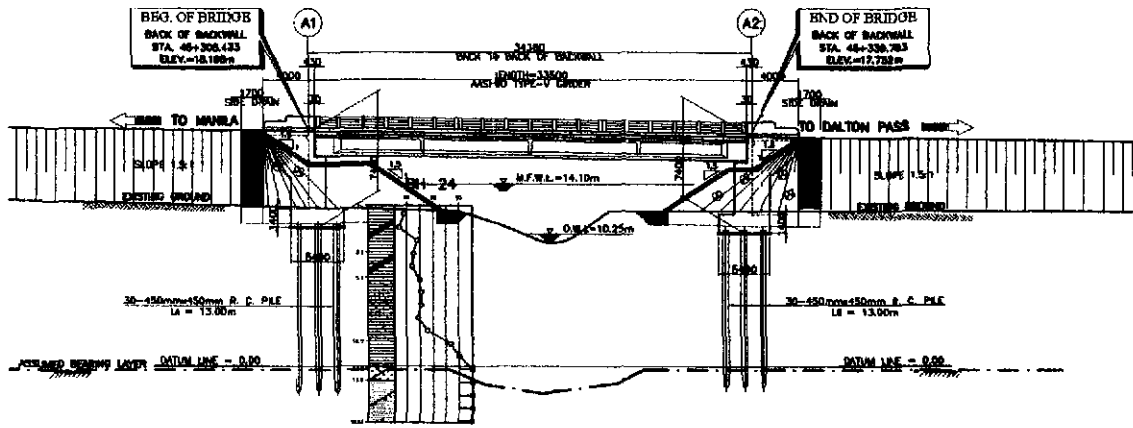
(2) DETERMINATION OF FINAL SCHEME

- The top width of river during the design flood is 26.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 24.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.

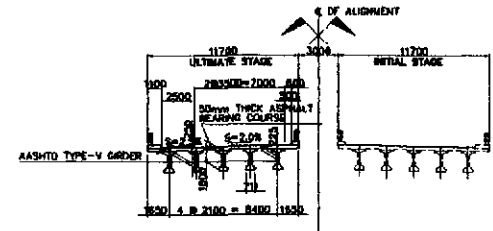
- A three span bridge tends to be more expensive because of additional substructure cost.
- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

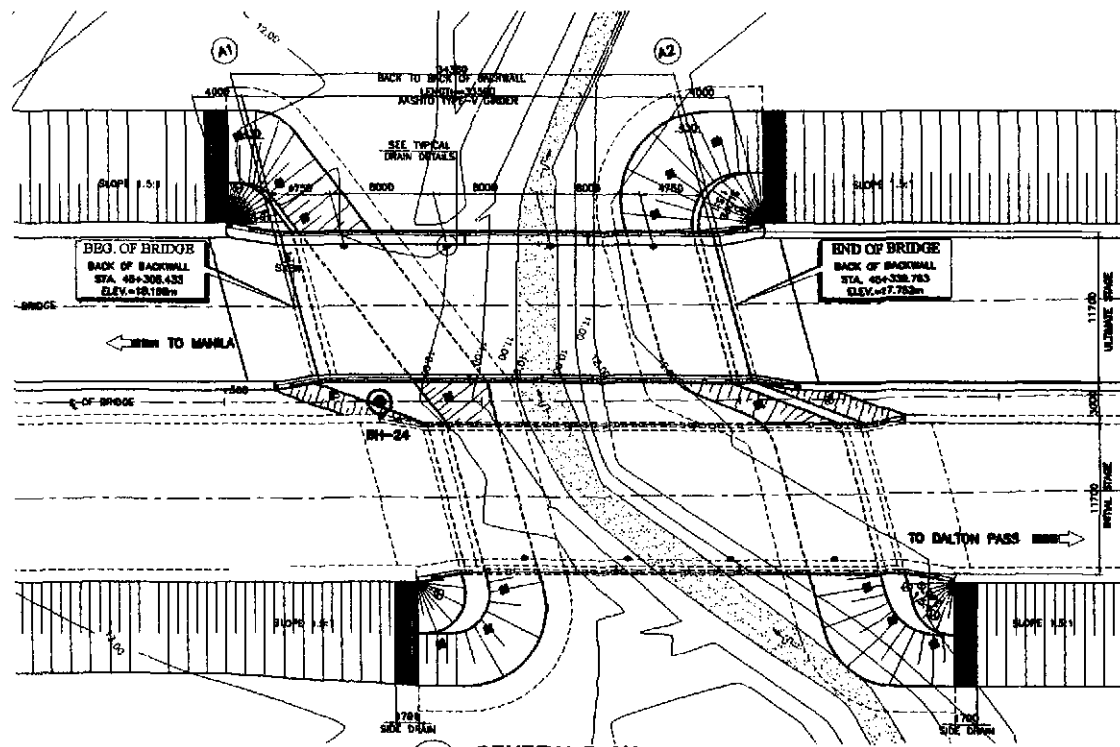
- Since river velocity during worst flooding is relatively slow (1.298m/sec), the bridge utilizes grouted riprap river bank protection.
- Grouted riprap protected by hand laid rocks at the toe.



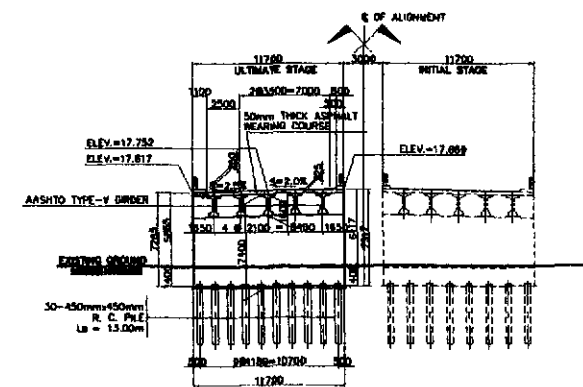
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MIDSPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	1.298 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	85.600 cu.m/sec
CATCHMENT AREA, CA	7.175 sq. km

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A2 SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.

THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R.C. PILE IS 1000mm WHILE FOR 450 x 450 R.C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO.5 (STA. 45+305.433)
SCALE AS SHOWN

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

RATAPRA & ENGINEERS INTERNATIONAL

YEO YACHTING ENGINEERING CO., LTD.

DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				
DESIGNED		BUREAU OF ROADS		OFFICE OF THE SUPERVISOR		
CHECKED		Supervised by:	Reviewed by:	Recommended by:	Approved by:	
SUBMITTED		FINANCIAL OFFICER	ADMINISTRATIVE OFFICER	ENGINEER IN CHARGE	SAFETY & QUALITY CONTROL	

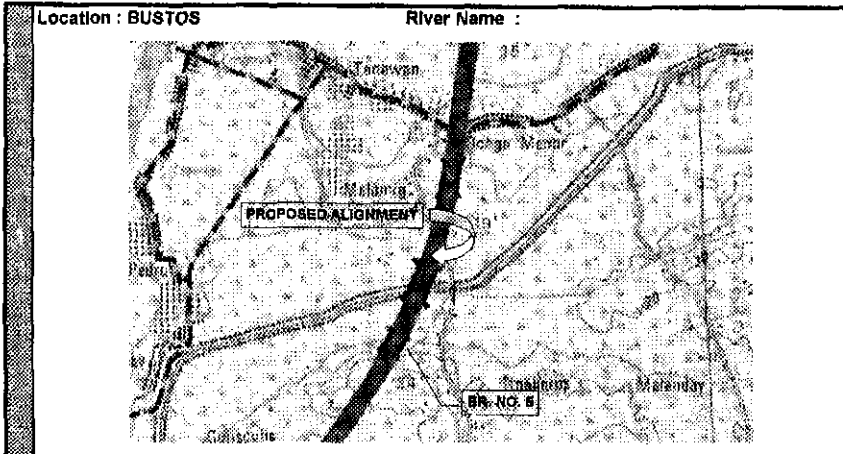
PROJECT AND LOCATION :
DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)

SCALE :
FULL SIZE A1

SHEET CONTENTS :
PLARIDEL BYPASS BRIDGE NO.5 (ULTIMATE STAGE) GENERAL PLAN, ELEVATION AND SECTIONS

SHEET NO. :
B-61

PROPOSED BRIDGE SITE SURVEY



Land Use	<input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Others
Geographical Features / Terrain	<input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others
Stream / River Type	<input type="checkbox"/> Straight <input type="checkbox"/> Braided <input checked="" type="checkbox"/> Meandering
Nearby Structures	Upstream: Abandoned timber bridge at 500m from site. Downstream: Irrigation canal running parallel.
Environmental Condition	<input checked="" type="checkbox"/> Trees/Vegetation <input type="checkbox"/> Fish & Fish Habitat
Water Level (During survey)	<input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input checked="" type="checkbox"/> 1.0m - 1.5m <input type="checkbox"/> Others

River Condition

River Width (m) : 10.0

Stream Velocity (m/s) :

Normal : 0.02

During Flood :

Channel Slope (%) :

Upstream :

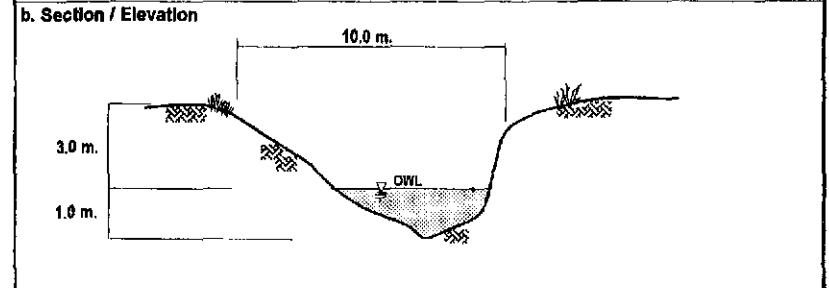
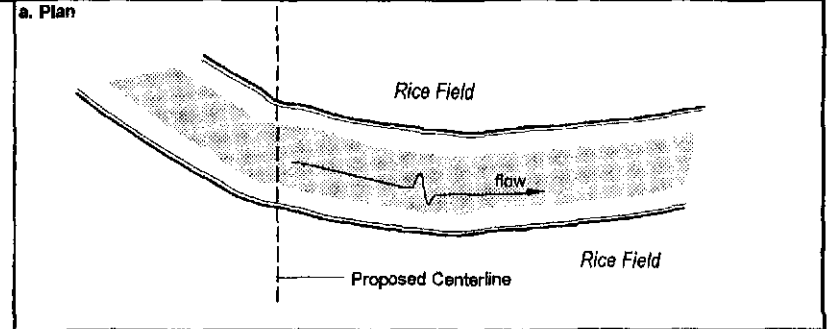
Downstream :

Site Access During Construction:

Possible Difficult

Comments :

Survey Date	19-Jun-01	Bridge No./Station	Bridge No. 5 / STA 11+800.200
Bypass Name	PLARIDEL	Prepared by	ACP / ENS



Meander Situation	Upstream	<input checked="" type="checkbox"/> Existing <input type="checkbox"/> None
	Downstream	<input checked="" type="checkbox"/> Existing <input type="checkbox"/> None
Riverbed Material	<input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Others	
Riverside/Bank Condition	Upstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R
	Downstream	<input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R
Tendency to River Course and Riverbed Change	<input type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
Flood signs	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -	
Evidence of Drift & Debris	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing	Driftwoods, $\Phi =$ Length =
	Others :	
Maximum Flood Water Level	Height above bank (m)	0.50
	<input checked="" type="checkbox"/> Intervi <input type="checkbox"/> Flood Data	Comments :
	<input type="checkbox"/> Flood Marks	Frequency (yrs) Cause
Recommendation for Bridge	Verify maximum flood water level. Provide 1.50m clearance from MPWL to soffit of superstructure.	
Recommendation for River Protection Works	Provide river bank slope protection.	
Comments / Others		

Table 3.4-10 Bridge No. 5 Site Condition

BRIDGE NO. 6 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION (IRRIGATION CANAL)

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- Evidence of drifts/debris during flooding.
- Meandering river course with heavily vegetated riverbank.
- The top river width at design flood level is 35.5 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- Bridge site is covered by 1.0 to 9.0 m of silty clay underlain by sand and gravel.
- Bedrock layer is covered by thick, stiff residual clay and clayey silt, which probably derived from underlying parent rock.
- N-value at the upper 12 m thick is generally not more than 20 blows while the subsequent depths ranged between 30 to 50 blows.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	40.86 m	40.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type VI-Modified (40m)	1-span, PCDG Type VI-Modified (40m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

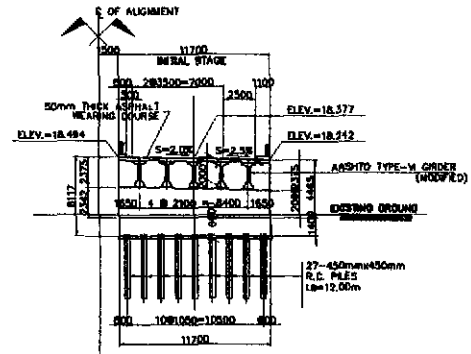
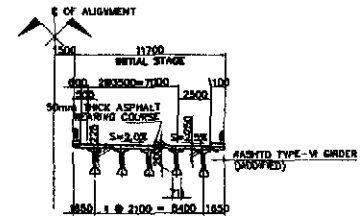
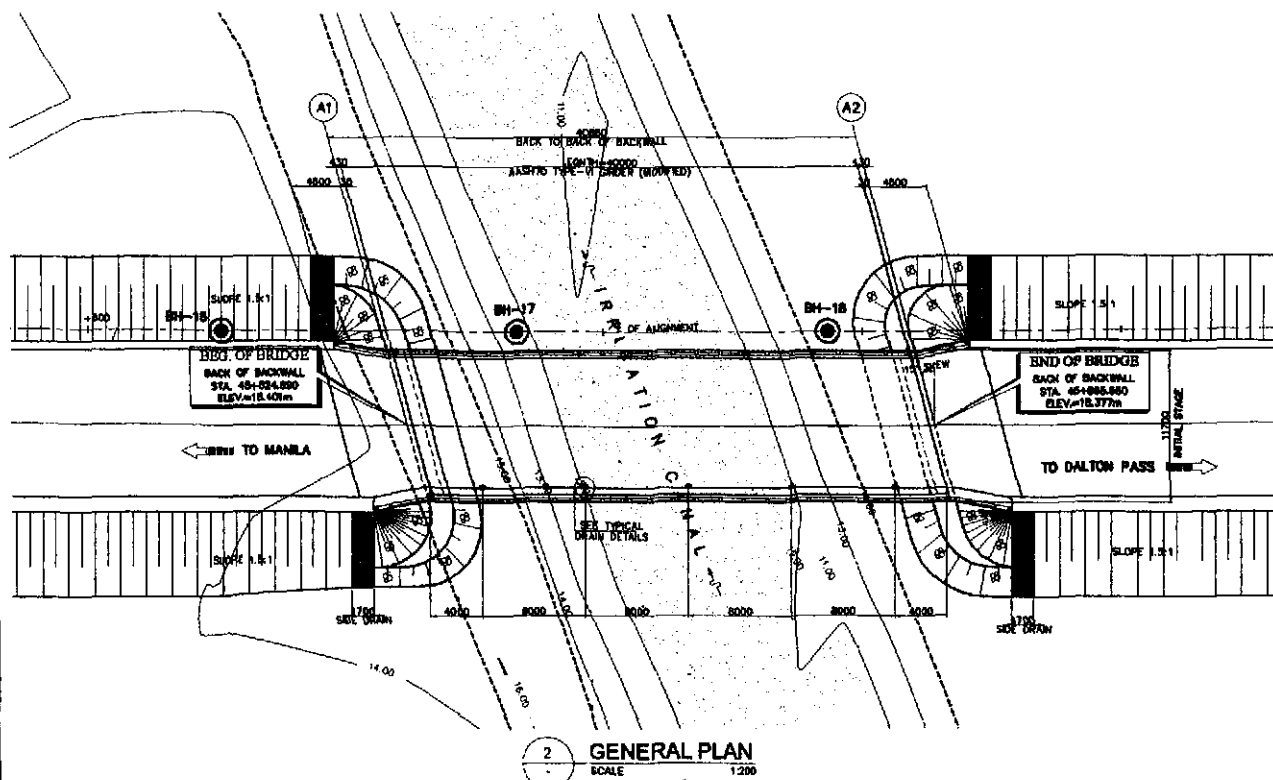
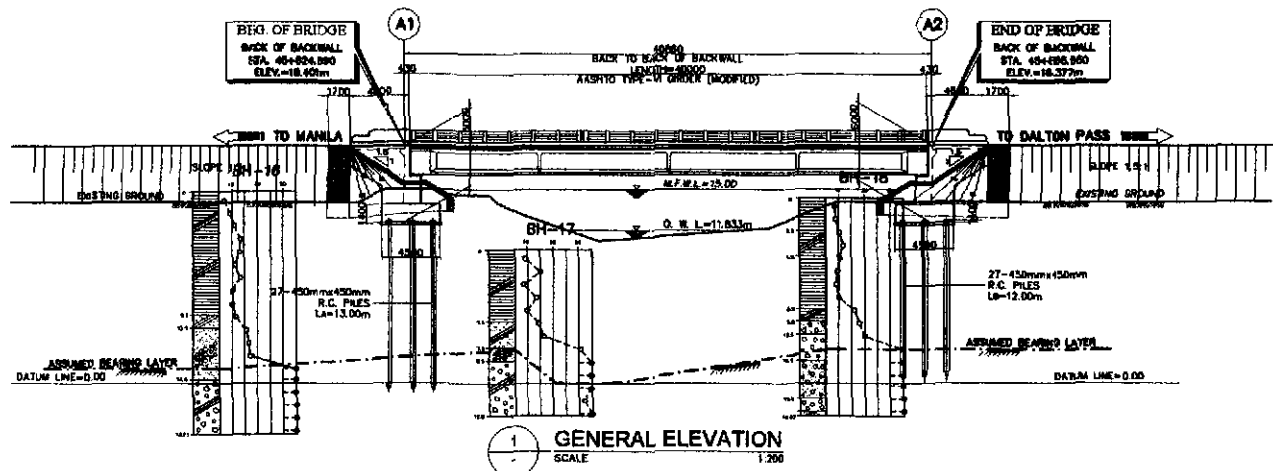
- The top width of river during the design flood is 35.5 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 40.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.

- A three span bridge tends to be more expensive because of additional substructure cost.

- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

- Grouted riprap will be provided for abutment protection.

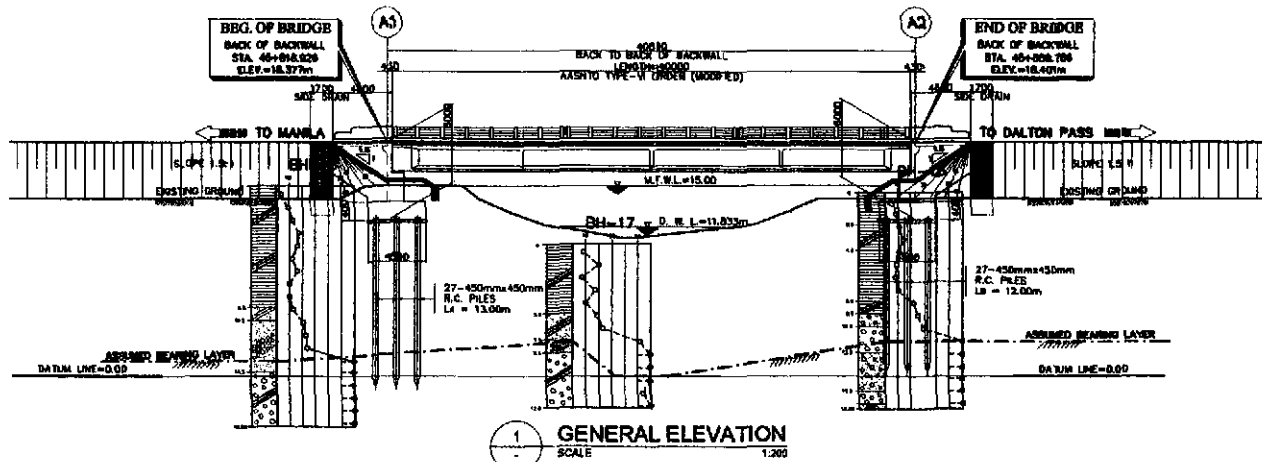


HYDRAULIC DATA	
IRRIGATION CANAL	-

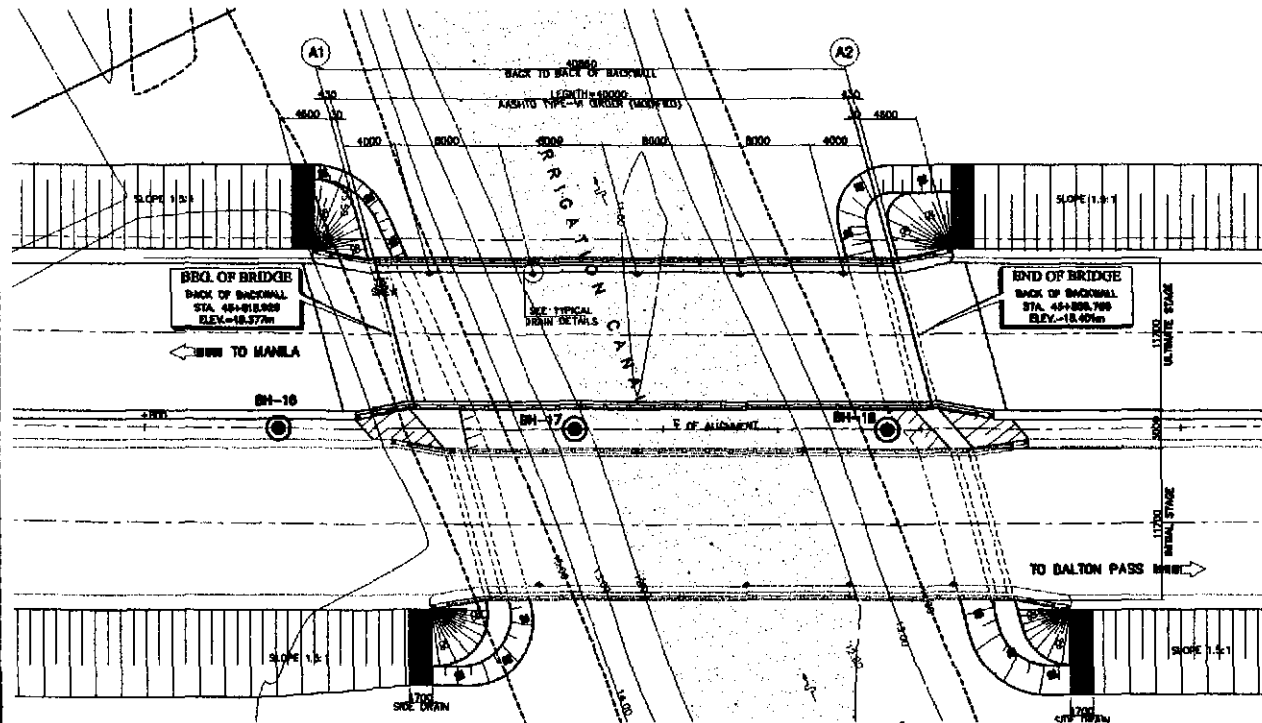
NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

PLARIDEL BYPASS BRIDGE NO.6 (STA. 45+824.890)
SCALE AS SHOWN

<p>JICA JAPAN INTERNATIONAL COOPERATION AGENCY</p>		<p>REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS</p>				<p>PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)</p>		<p>SCALE : FILE SIZE A1</p>	<p>SHEET CONTENTS : PLARIDEL BYPASS BRIDGE NO. 6 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS</p>	<p>SHEET NO. : B-72</p>
DESIGNED	BY	SIGNATURE	Checked By:	Approved By:	Supervised By:	Reviewed By:	Checked By:			
CHECKED			DANIEL C. TRINIDAD	ADRIANITA DORRIS	DEBORA E. REYES	EDUARDO V. IRR	SAMSON A. DUTAMARONG			
SUBMITTED			Project Manager	Chief, Design Section	Member, P. (D)	Undersecretary	Secretary			

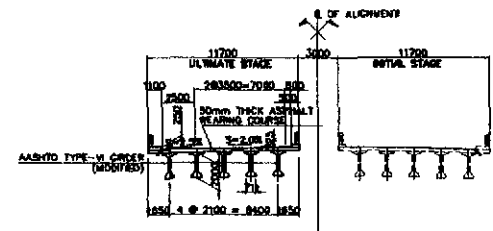


1 GENERAL ELEVATION
SCALE 1:200

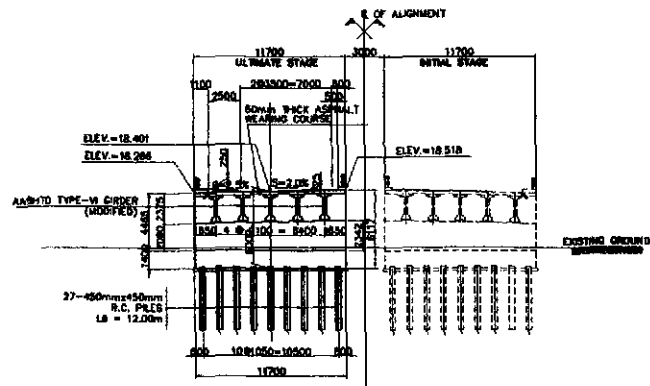


2 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO.6 (STA. 45+818.926)
SCALE AS SHOWN



3 SECTION @ MIDSPAN
SCALE 1:200



4 SECTION @ ABUTMENT A2
SCALE 1:200

HYDRAULIC DATA	
IRRIGATION CANAL	-

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOSTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE ADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

	DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS BUREAU OF BRIDGE				PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED		Checked By:	Reviewed By:	Approved By:	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	BRIDGE NO. 6 (ULTIMATE STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	FULL SIZE A1	B-74	
CHECKED		Project Director:	Checked By:	Approved By:						
SUBMITTED		Team Leader:	DAMILLO C. WALINDO	ARMANDO M. BORDO	OLIVERIO G. REYES					

PROPOSED BRIDGE SITE SURVEY

Location : BUSTOS		River Name : IRRIGATION CANAL	
		River Condition River Width (m) : 29.3 Stream Velocity (m/s) : Normal : 0.15 During Flood : Channel Slope (%) : Upstream : Downstream :	
		Site Access During Construction: <input checked="" type="checkbox"/> Possible <input type="checkbox"/> Difficult Comments:	
Photograph 		a. Plan 	
		b. Section / Elevation 	
		Meander Situation Upstream: <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None Downstream: <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None	
		Riverbed Material <input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Others	
		Riverside/Bank Condition Upstream: <input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Revetment - L R Downstream: <input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Revetment - L R	
		Tendency to River Course and Riverbed Change <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
		Flood signs <input checked="" type="checkbox"/> None <input type="checkbox"/> Existing	
		Evidence of Drift & Debris <input type="checkbox"/> None <input checked="" type="checkbox"/> Existing Driftwoods, $\phi =$ Length = Others : Water lilies, trees, and weeds.	
		Maximum Flood Water Level <input checked="" type="checkbox"/> Interview <input type="checkbox"/> Flood Data <input type="checkbox"/> Flood Marks Height above bank (m) : Frequency (yrs) : Cause :	
		Recommendation for Bridge Verify maximum flood water level. Provide 1.0m clearance from MPWL and/or from top of bank.	
		Recommendation for River Protection Works	
		Comments / Others	
Land Use <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Others			
Geographical Features / Terrain <input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others			
Stream / River Type <input checked="" type="checkbox"/> Straight <input type="checkbox"/> Braided <input checked="" type="checkbox"/> Meandering			
Nearby Structures Upstream: 26.0m long bridge at 450m from site. Downstream: Single span 22m long bridge at 1.70km from site.			
Environmental Condition <input checked="" type="checkbox"/> Trees/Vegetation <input type="checkbox"/> Fish & Fish Habitat			
Water Level (During survey) <input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input type="checkbox"/> 1.0m - 1.5m <input checked="" type="checkbox"/> Others 2.0			

Table 3.4-11 Bridge No. 6 Site Condition

BRIDGE NO. 7 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- Evidence of drifts/debris during flooding.
- River bank is heavily vegetated.
- Located nearby is a three-celled 24.5m long bridge structure with sluice gate.
- The river discharge at 50 year return period is 14.70 cum/sec.
- The river velocity during 50 year flooding is 1.16 m/sec.
- The top river width at design flood level is 37.5 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- Bridge site is covered by 1.0 to 8.0 m of silty clay underlain by sand and gravel.
- Bedrock layer is covered by thick, stiff residual clay and clayey silt, which probably derived from underlying parent rock.
- N-value at the upper 12 m thick is generally not more than 20 blows while the subsequent depths ranged between 30 to 50 blows.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

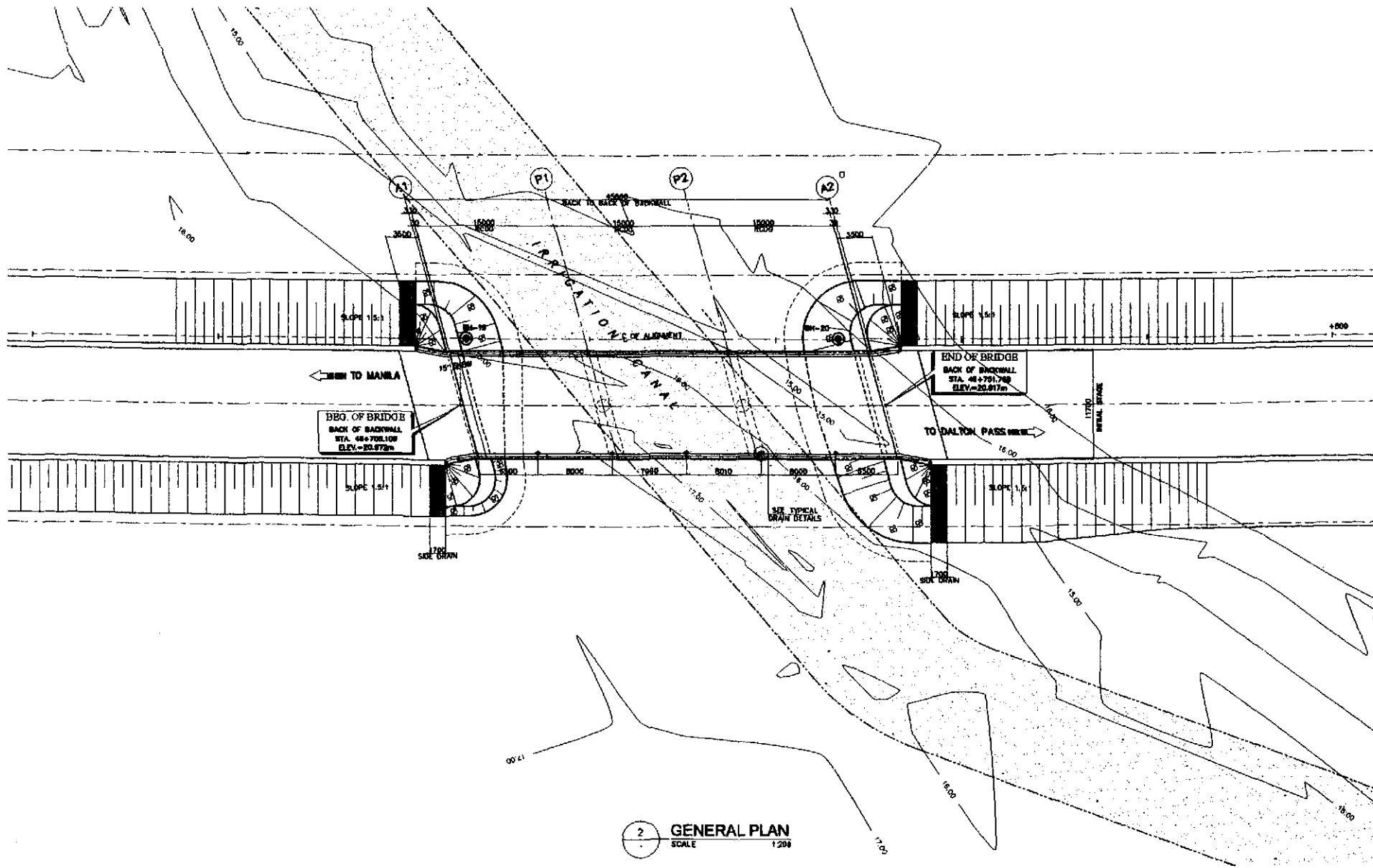
	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	45.66 m	45.66 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m
SHOULDER WIDTH	2.50 m	2.50 m
SIDEWALK WIDTH	1.10m + 0.60m	1.10m + 0.60m
SUPERSTRUCTURE TYPE	3-span, RCDG (15.00+15.00+15.00m = 45.0m)	3-span, RCDG (15.00+15.00+15.00m = 45.0m)
SUBSTRUCTURE TYPE	Closed-type Abutment / Single Column Pier	Closed-type Abutment / Single Column Pier
FOUNDATION TYPE	RC Piles (400 x 400mm)	RC Piles (400 x 400mm)

(2) DETERMINATION OF FINAL SCHEME

- A three span bridge was proposed being more economical than a 4-span bridge and more hydraulically advantageous than a 2-span bridge.
- Although more economical, a 2-span bridge with its pier located at center of river will have problems in case of debris collision to pier column and local scour at pier foundation.

(3) PROTECTION AGAINST SCOURING

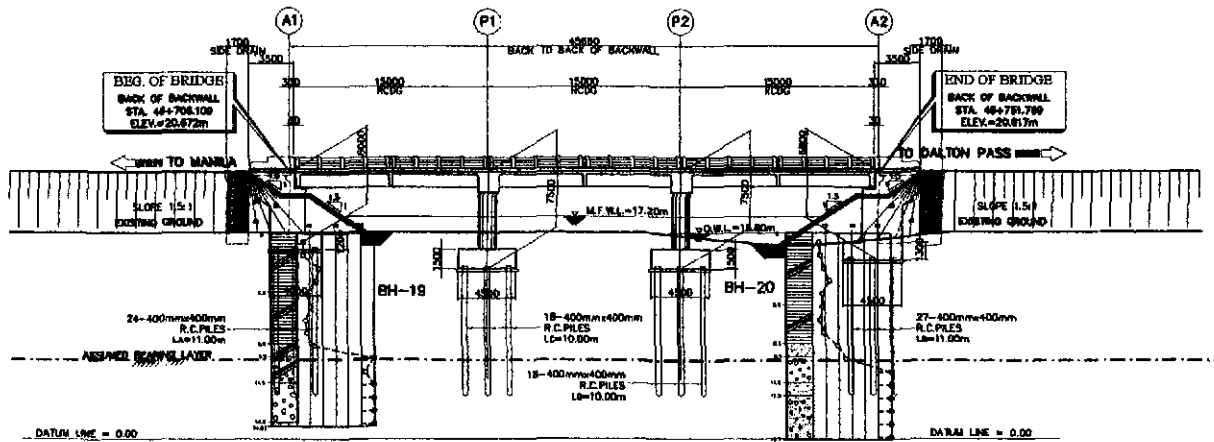
- Since river velocity during worst flooding is relatively slow (1.924m/sec), the bridge utilizes Grouted Riprap Riverbank Protection.
- Grouted Riprap protected by hand laid rocks at the toe.



2 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO. 7 (STA. 46+706.109)
SCALE AS SHOWN

	DESIGNED	DATE	SIGNATURE	<p>REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS</p>	<p>PROJECT AND LOCATION :</p> <p>DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)</p>	<p>SCALE :</p> <p>FULL SIZE A1</p>	<p>SHEET CONTENTS :</p> <p>PLARIDEL BYPASS BRIDGE NO. 7 (INITIAL STAGE) GENERAL PLAN</p>	<p>SHEET NO. :</p> <p>B-85</p>
	CHECKED							



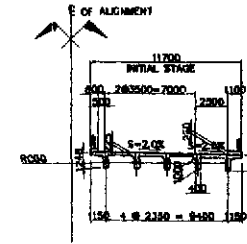
2 GENERAL ELEVATION
SCALE 1:200

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	1.16 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	14.70 cu.m./sec
CATCHMENT AREA, CA	1.350 sq. km

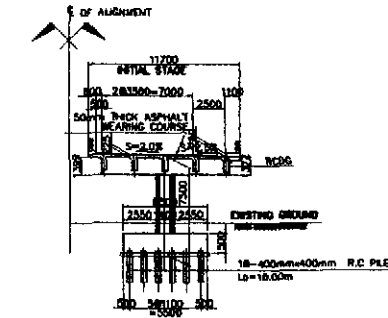
NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.

THE PILE LENGTH RECOMMENDED ARE MINIMUM SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

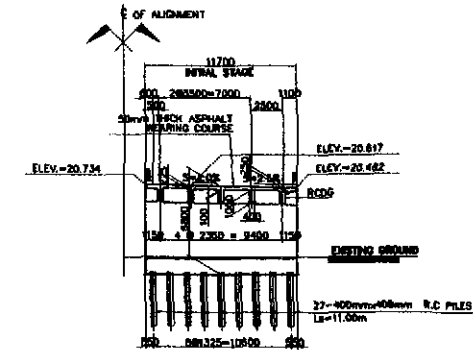
A PLARIDEL BYPASS BRIDGE NO.7 (STA. 46+706.109)
SCALE AS SHOWN



4 SECTION @ SUPERSTRUCTURE
SCALE 1:200

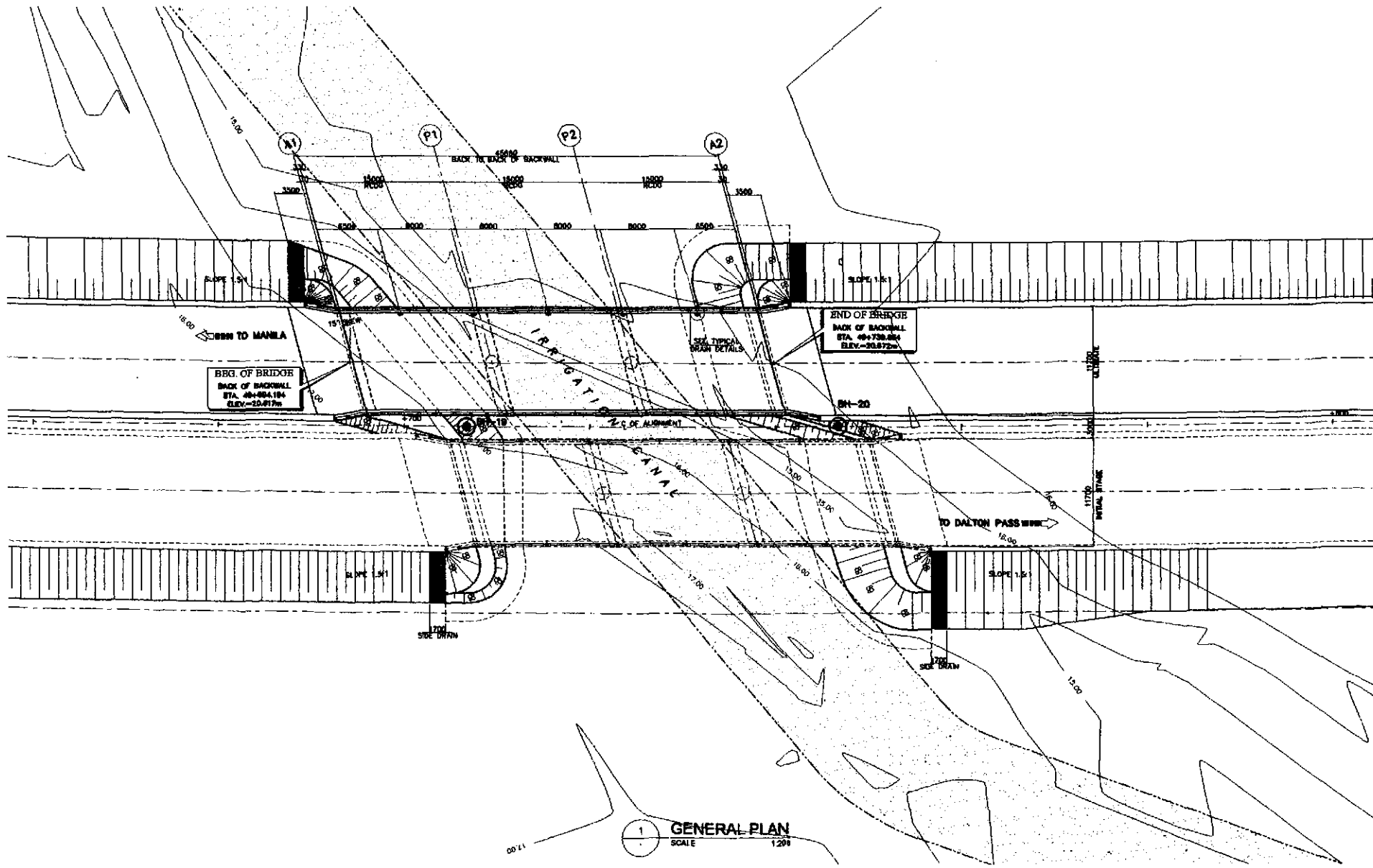


5 SECTION @ PIER P2
SCALE 1:200



6 SECTION @ ABUTMENT A2
SCALE 1:200

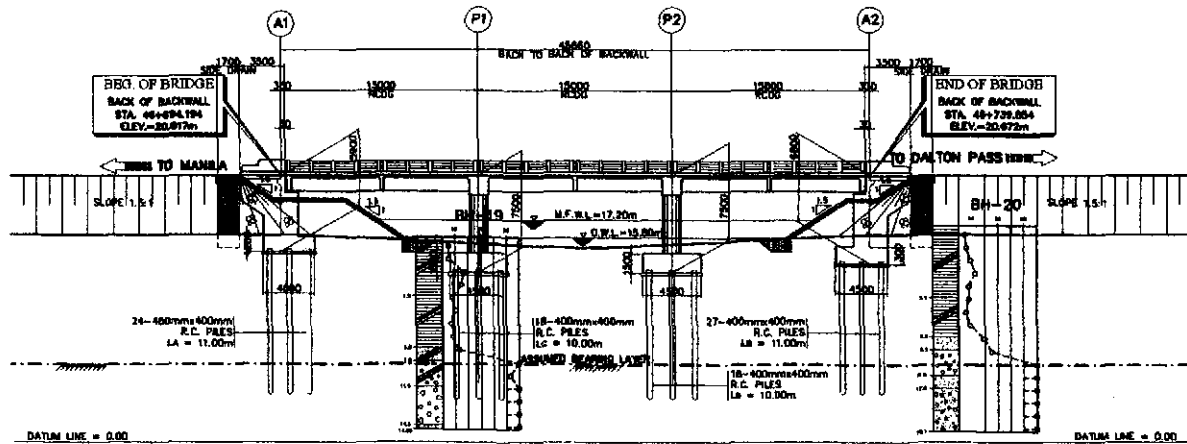
<p>JAPAN INTERNATIONAL COOPERATION AGENCY KAI KATAHARA & ENGINEERS INTERNATIONAL YEO YAKIYO ENGINEERING CO., LTD.</p>	DATE	SIGNATURE	<p>REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS</p>	PROJECT AND LOCATION :		SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED	CHECKED		SUBMITTED	DIVISION OF HIGHWAYS Checked by: DAVID C. TILANO Approved by: ADRIAN M. DOLY Checked by: MARICEL C. REYES Approved by: EDUARDO V. MIER	OFFICE OF THE SECRETARY Checked by: EDUARDO V. MIER Approved by: SIMON A. BATAHARRON	DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1



1 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO. 7 (STA. 48+694.194)
SCALE AS SHOWN

	DESIGNED	DATE	DESIGNER	<p>REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS</p>	PROJECT AND LOCATION :				SCALE :	SHEET COMMENTS :	SHEET NO. :
	DRAWN				DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)				FULL SIZE A1		
SUBMITTED TEAM LEADER				Bureau of Design Checked By: ADMARCO M. TORRES Project Designer:	Office of the Secretary Recommended By: ROBERTO S. REYES Director:	(See cover sheet for Signature/Date) ESTABAN V. JAR Chief Engineer:	Approved By: SAULON A. SOTANAYOC Director:				

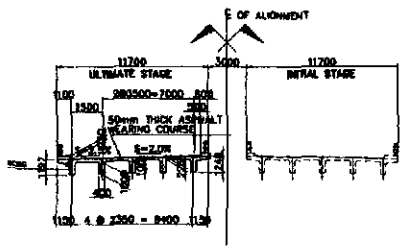


1 GENERAL ELEVATION
SCALE 1:200

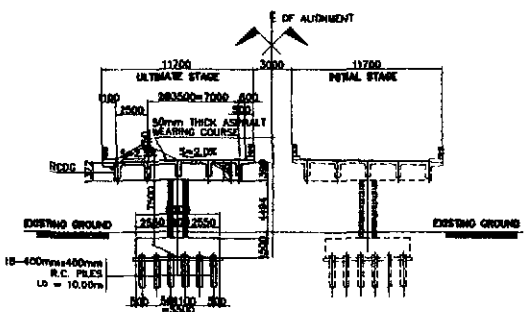
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	1.16 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	14.70 cu.m/sec
CATCHMENT AREA, CA	7.350 sq. km

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A1 AND A2 SHALL BE CONDUCTED FOR CONTINUATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

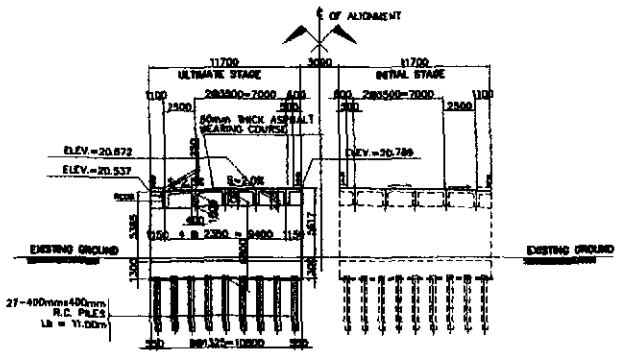
A PLARIDEL BYPASS BRIDGE NO.7 (STA. 46+694.194)
SCALE AS SHOWN



2 SECTION AT SUPERSTRUCTURE
SCALE 1:200



3 SECTION AT PIER P2
SCALE 1:200



4 SECTION AT ABUTMENT A2
SCALE 1:200

		REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)		SCALE : FULL SIZE A1	SHEET COMMENTS : PLARIDEL BYPASS BRIDGE NO. 7 (ULTIMATE STAGE) GENERAL ELEVATION AND SECTIONS	SHEET NO. : B-88
DESIGNED	BY	PROJECT	PILE - PWD Submitted by:	REVIEWED BY Approved by:	OFFICE OF THE SECRETARY Checked by:	Approved by:				
CHECKED			ENGINEER DANIEL C. TRILAND Project Engineer	ENGINEER ADRIAN C. DORAY Chief Engineer	ENGINEER DELBERTO S. REYES Member PE (CE)	ENGINEER EDUARDO V. WUI University	ENGINEER SAKION A. BATAWANG Secretary			
SUBMITTED			DATE: 12/15/2011							

PROPOSED BRIDGE SITE SURVEY

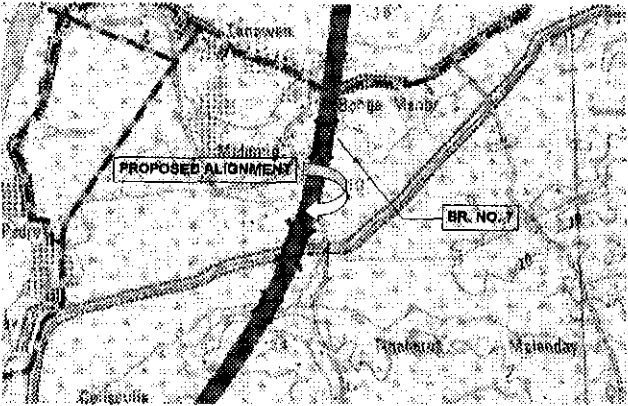

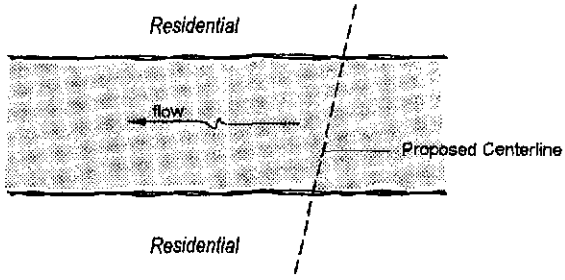
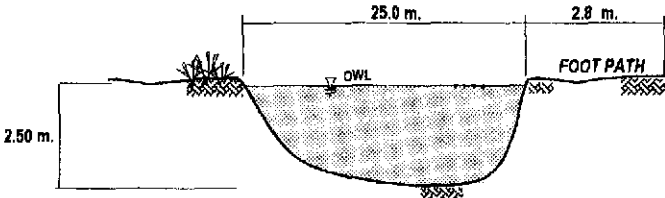
Location : BUSTOS		River Name :	
		River Condition River Width (m) : 25.0 Stream Velocity (m/s) Normal : 0.005 During Flood : Channel Slope (%) Upstream : Downstream : Site Access During Construction: <input checked="" type="checkbox"/> Possible <input type="checkbox"/> Difficult Comments:	
		a. Plan 	
		b. Section / Elevation 	
		Meander Situation Upstream <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None Downstream <input type="checkbox"/> Existing <input checked="" type="checkbox"/> None	
		Riverbed Material <input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Silt <input type="checkbox"/> Others	
		Riverside/Bank Condition Upstream <input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R Downstream <input checked="" type="checkbox"/> Stable - <input type="checkbox"/> Scouring/Eroding - L R <input type="checkbox"/> With Protection/Revetment - L R	
		Tendency to River Course and Riverbed Change <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
		Flood signs <input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -	
		Evidence of Drift & Debris <input type="checkbox"/> None <input checked="" type="checkbox"/> Existing Driftwoods, $\phi =$ Length = Others : Water lilies, trees, and weeds.	
Land Use <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Agricultural <input type="checkbox"/> Others		Maximum Flood Water Level <input checked="" type="checkbox"/> Interview <input type="checkbox"/> Flood Data <input type="checkbox"/> Flood Marks Height above bank (m) : Frequency (yrs) : Cause :	
Geographical Features / Terrain <input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others		Recommendation for Bridge Verify maximum flood water level. Provide 1.50m clearance from MFWL to soffit of superstructure.	
Stream / River Type <input checked="" type="checkbox"/> Straight <input type="checkbox"/> Braided <input type="checkbox"/> Meandering		Recommendation for River Protection Works Provide river bank slope protection.	
Nearby Structures Upstream : Downstream : Three-arched 24.50m long bridge w/ sluice gate at 300m from site.		Comments / Others	
Environmental Condition <input type="checkbox"/> Trees/vegetation <input type="checkbox"/> Fish & Fish Habitat			
Water Level (During survey) <input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input type="checkbox"/> 1.0m - 1.5m <input checked="" type="checkbox"/> Others 2.3			

Table 3.4-12 Bridge No. 7 Site Condition

BRIDGE NO. 9 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of silty clay underlain by the granular deposits consisting of gravel and sand.
- Evidence of drifts/debris during flooding.
- Meandering river course.
- The river discharge at 50 year return period is 119.80 cum/sec.
- The river velocity during 50 year flooding is 1.924 m/sec.
- The top river width at design flood level is 35.0 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- Bridge site is covered by 1.0 to 12.0 m of silty clay underlying tuffaceous siltstone and tuffaceous sandstone.
- Bedrock was encountered at a depth of 12.5 m and 13.5 m respectively.
- N-value at the upper 12 m thick is generally not more than 20 blows while the subsequent depths ranged between 30 to 50 blows.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	1
BRIDGE LENGTH	40.86 m	40.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	2 x 3.50m + 1.0m Median + 3.50m FRONTAGE
SHOULDER WIDTH	1.25 m	-
SIDEWALK WIDTH	1.50m + 0.60m	1.50m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type VI-Modified (40m)	1-span, PCDG Type VI-Modified (40m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

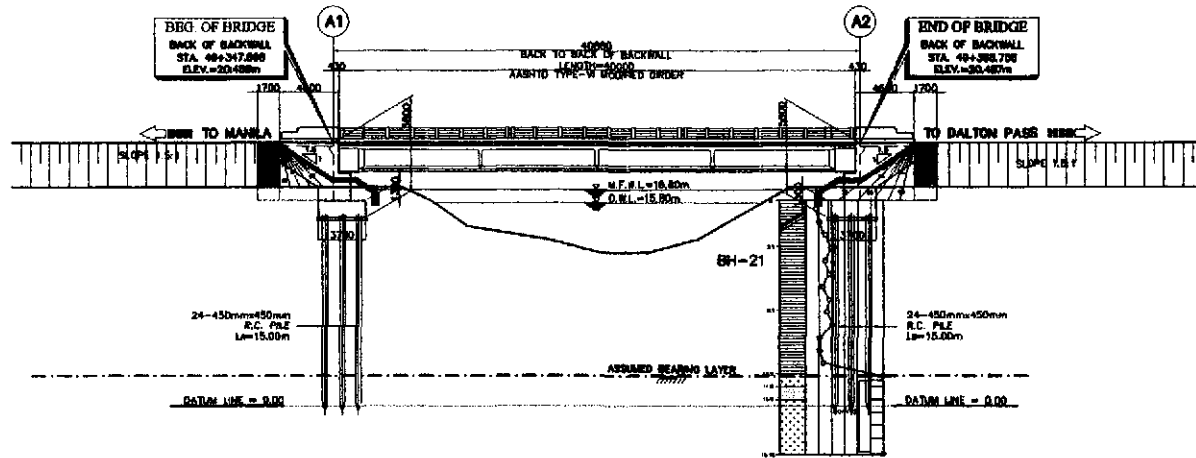
(2) DETERMINATION OF FINAL SCHEME

- The top width of river during the design flood is 35.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 40.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.
 - A three span bridge tends to be more expensive because of additional substructure cost.

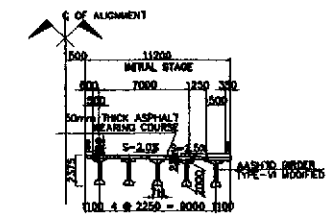
- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

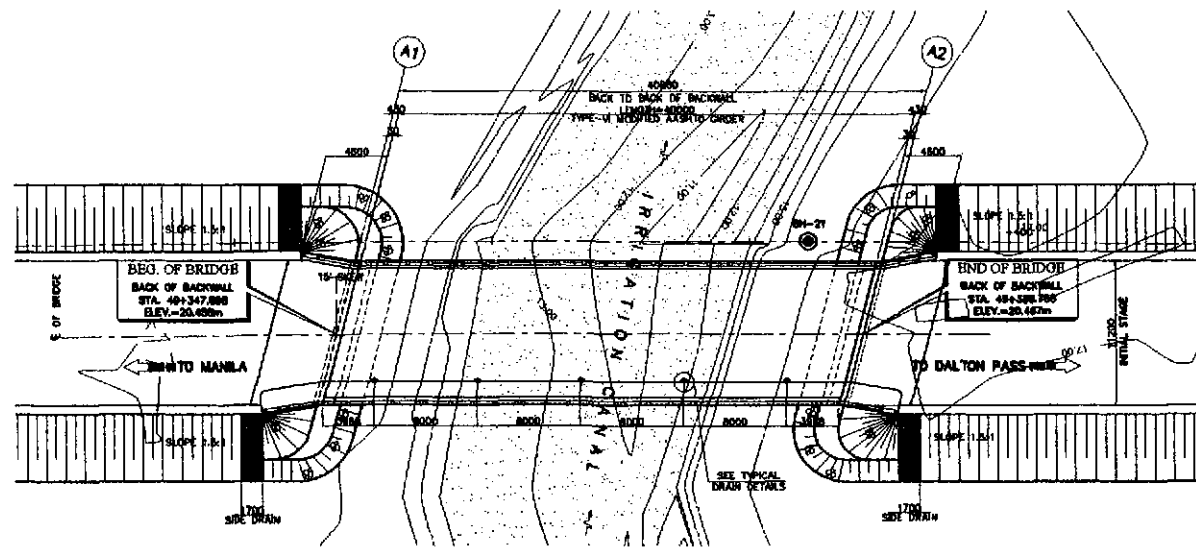
- Since river velocity during worst flooding is relatively slow (1.924m/sec), the bridge utilizes Grouted Riprap Riverbank Protection.



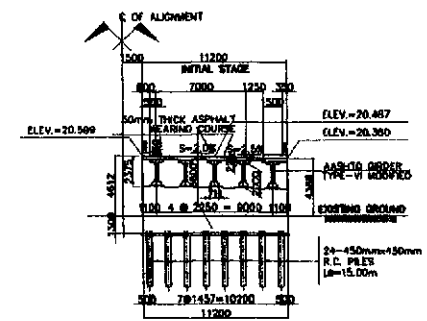
1 GENERAL ELEVATION
SCALE 1:200



3 SECTION @ MIDSPAN
SCALE 1:200



2 GENERAL PLAN
SCALE 1:200



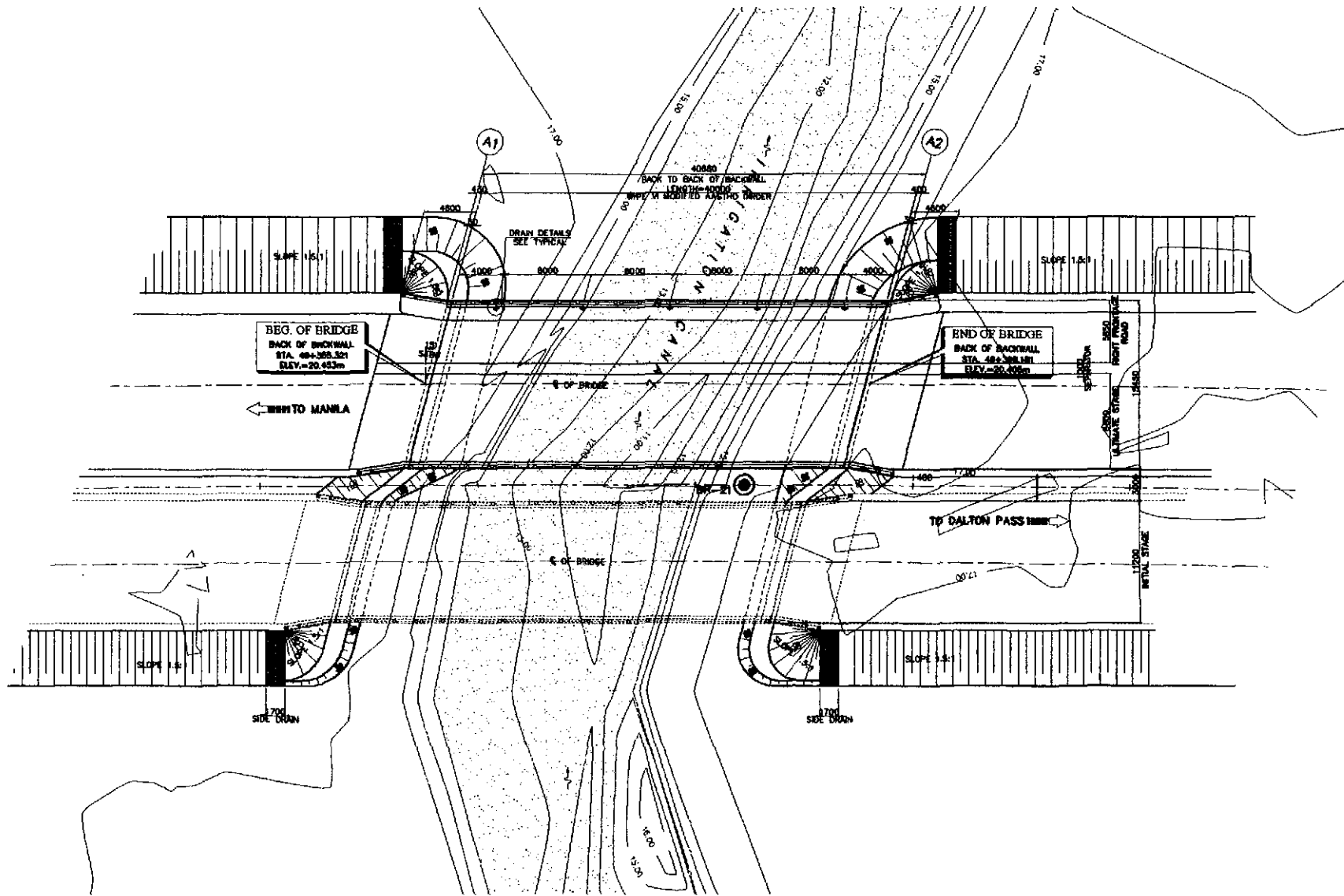
4 SECTION @ ABUTMENT
SCALE 1:200

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	1.024 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	119,600 cu.m./sec
CATCHMENT AREA, CA	11,850 sq. km

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A1 AND A2 SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH IS NOT ADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO. 9 (STA. 49+347.898)
SCALE AS SHOWN

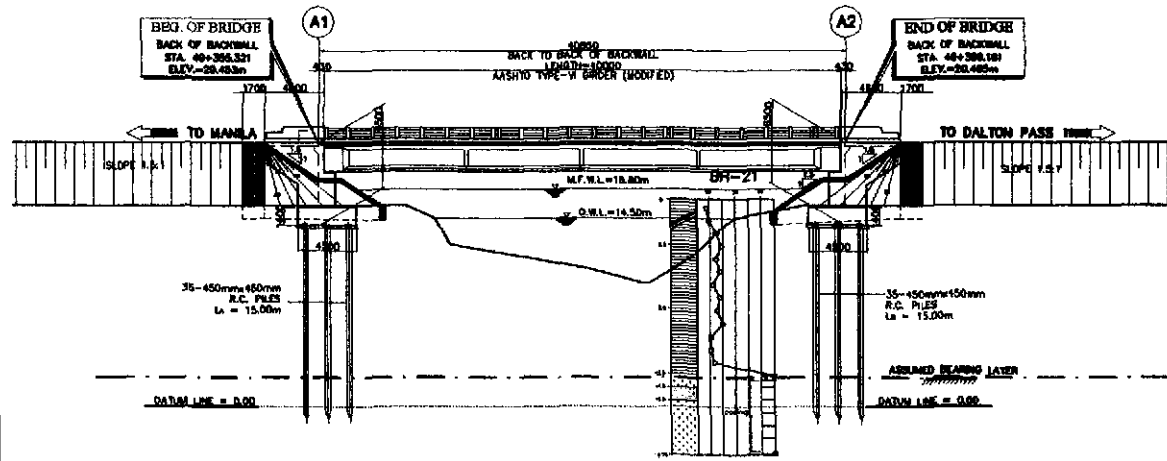
	DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	SCALE : FULL SIZE A1	SHEET COMMENTS : PLARIDEL BYPASS BRIDGE NO. 9 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTIONS	SHEET NO. : B-102
	DESIGNED		DIVISION OF REGION Submitted By:	OFFICE OF THE SECRETARY Reviewed By:	Checked By:	Approved By:				
	CHECKED		Project Director:	Chief, Bridge Section:	Director of (DES):	Undersecretary:	Secretary:			
	SUBMITTED	TEAM LEADER	DARLO C. TILGANO	ADRIANO M. DORON	EDUARDO S. REYES	EDUARDO V. WUI	SARON A. DATUMANGS			



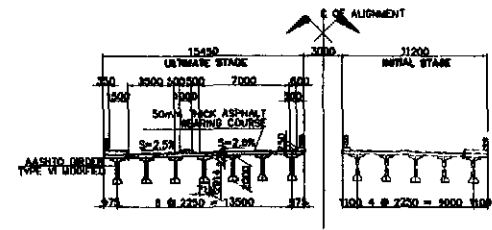
1 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO. 9 (STA. 49+355.321)
SCALE AS SHOWN

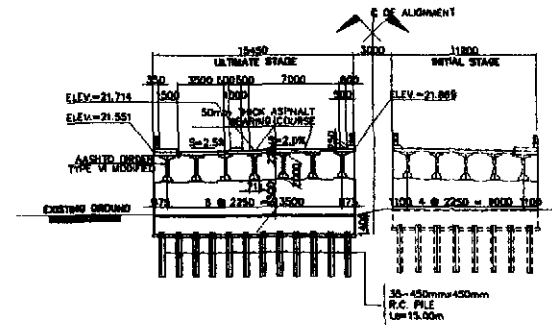
	DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				PROJECT AND LOCATION :	SCALE :	SHEET COMMENTS :	SHEET NO. :
	DESIGNED			OFFICE OF THE SECRETARY BUREAU OF BRIDGES				DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	FULL SIZE A1	PLARIDEL BYPASS BRIDGE NO. 9 (ULTIMATE STAGE) GENERAL PLAN
CHECKED			Submitted By: DANIEL C. TRAMANO Project Manager	Reviewed By: ADRIANO W. DORON Chief, Bridge Division	Recommended By: ROBERTO E. RIVERA Member (P.O.S.)	Authorized By: (See cover sheet for Signature) ENRIQUE M. SAN Director	Approved By: (See cover sheet for Signature/Stamp) SANDO A. SANTIAPANA Secretary			
RIGHTED			TEAM LEADER							



2 GENERAL ELEVATION (ULTIMATE)
SCALE 1:200



4A SECTION @ MIDSPAN
SCALE 1:200



4B SECTION @ ABUTMENT A2
SCALE 1:200

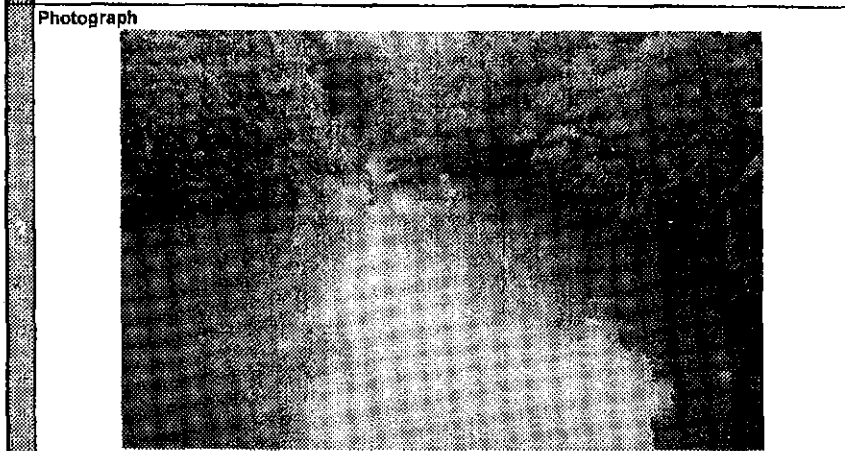
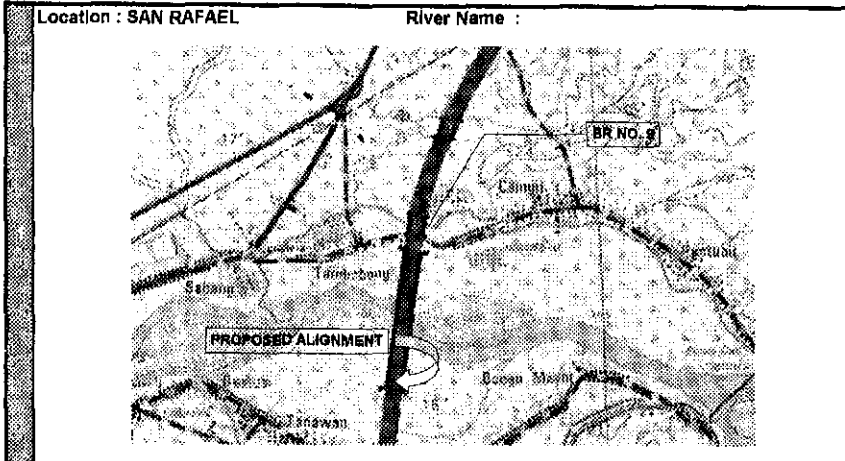
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	1.924 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	119.800 cu.m./sec
FLOODING AREA, C_A	11.850 sq. km

NOTE :
PRIOR TO CONSTRUCTION SOIL INVESTIGATION AT ABUTMENT A1 AND A2 SHALL BE CONDUCTED FOR CONFIRMATION OF ASSUMED BEARING CAPACITY AND FOOTING ELEVATION.
THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SDR, AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

A PLARIDEL BYPASS BRIDGE NO. 9 (STA. 49+355.321)
SCALE AS SHOWN

	JICA JAPAN INTERNATIONAL COOPERATION AGENCY Khatamra & Engineers International Yoo Yachiro Engineering Co., Ltd.	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS BUREAU OF HIGHWAYS				PROJECT AND LOCATION : DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	SCALE : FULL SIZE A1	SHEET CONTENTS : PLARIDEL BYPASS BRIDGE NO. 9 (ULTIMATE STAGE) GENERAL ELEVATION AND SECTIONS	SHEET NO. 1 B-105
	DESIGNED BY: CHECKED BY: SUPERVISOR:	DRAWN BY: PROJECT MANAGER:	REVIEWED BY: PROJECT MANAGER:	APPROVED BY: DIRECTOR:	APPROVED BY: ASSISTANT SECRETARY:	APPROVED BY: ASSISTANT SECRETARY:			

PROPOSED BRIDGE SITE SURVEY



Land Use	<input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Others
Geographical Features / Terrain	<input type="checkbox"/> Mountainous area <input type="checkbox"/> Alluvial <input checked="" type="checkbox"/> Plain <input type="checkbox"/> Others
Stream / River Type	<input checked="" type="checkbox"/> Straight <input type="checkbox"/> Braided <input type="checkbox"/> Meandering
Nearby Structures	Upstream: 11.50m long control bridge at 800m from site. Downstream:
Environmental Condition	<input checked="" type="checkbox"/> Trees/Vegetation <input type="checkbox"/> Fish & Fish Habitat
Water Level (During survey)	<input type="checkbox"/> 0 - 0.50m <input type="checkbox"/> 0.50m - 1.0m <input checked="" type="checkbox"/> 1.0m - 1.5m <input type="checkbox"/> Others

River Condition

River Width (m): 24.3

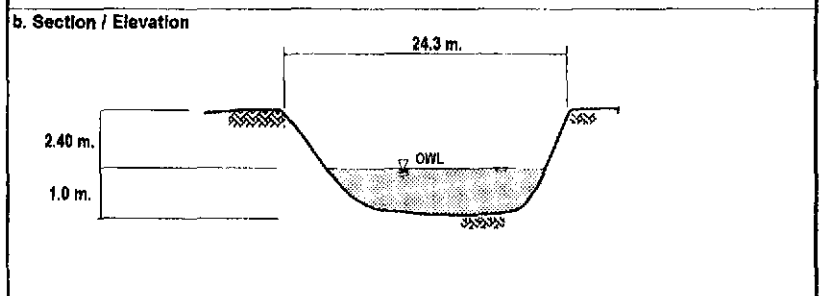
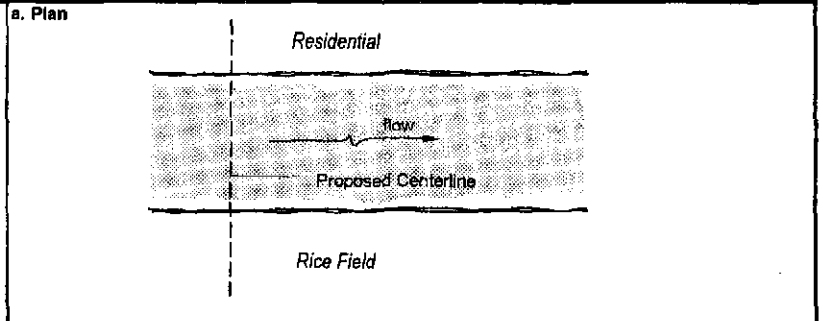
Stream Velocity (m/s):
 Normal: 0.5
 During Flood:

Channel Slope (%):
 Upstream:
 Downstream:

Site Access During Construction:
 Possible
 Difficult

Comments:

Survey Date	8/20/2001	Bridge No./Station	Bridge No. 9 / STA 15+852.130
Bypass Name	PLARIDEL	Prepared by	ACP/ENS



Meander Situation	Upstream	<input checked="" type="checkbox"/> Existing <input checked="" type="checkbox"/> None
	Downstream	<input checked="" type="checkbox"/> Existing <input checked="" type="checkbox"/> None
Riverbed Material	<input type="checkbox"/> Large Gravel <input type="checkbox"/> Gravel <input type="checkbox"/> Sand <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Others	
Riverside/Bank Condition	Upstream	<input type="checkbox"/> Stable - L R <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Revetment - L/R
	Downstream	<input type="checkbox"/> Stable - L R <input type="checkbox"/> Scouring/Eroding - L R <input checked="" type="checkbox"/> With Protection/Revetment - L/R
Tendency to River Course and Riverbed Change	<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Scouring <input type="checkbox"/> Aggradation <input type="checkbox"/> Degradation <input type="checkbox"/> Sediment Transport <input type="checkbox"/> Others	
Flood signs	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing -	
Evidence of Drift & Debris	<input checked="" type="checkbox"/> None <input type="checkbox"/> Existing	Driftwoods, $\phi =$ Length = Others: Weeds and trees.
	Maximum Flood Water Level	Height above bank (m): Frequency (yrs): Cause:
Recommendation for Bridge	Verify maximum flood water level. Provide 1.0m clearance from MFWL to soffit of superstructure.	
Recommendation for River Protection Works		
Comments / Others		

Table 3.4-14 Bridge No. 9 Site Condition

BRIDGE NO. 10 (PLARIDEL BYPASS–INITIAL AND ULTIMATE STAGE)

1. RIVER CONDITION

- The riverbed is composed of clay underlain by the granular deposits consisting of gravel and sand.
- The upstream and downstream conditions of riverbed & river banks are stable.
- No evidence of drifts/debris during flooding.
- No erosion at riverbank as it is heavily vegetated.
- Meandering river course.
- The river discharge at 50 year return period is 101.40 cum/sec.
- The river velocity during 50 year flooding is 2.133 m/sec.
- The top river width at design flood level is 29.0 m.
- The bridge is skewed at 15°.

2. SOIL CONDITION

- Bridge site is covered by 1.0 to 7.0 m of clay underlying hard siltstone.
- Bedrock was encountered below 20.0 m depth.
- N-value at the upper 4.0 m thick is generally not more than 10 blows while the subsequent depths ranged between 25 to 50 blows.

3. DESCRIPTION OF BRIDGE

(1) SELECTION OF SPAN COMPOSITION AND BRIDGE TYPE

	INITIAL STAGE	ULTIMATE STAGE
NO. OF BRIDGE	1	3
BRIDGE LENGTH	36.86 m	36.86 m
CARRIAGEWAY WIDTH	2 x 3.50m	6 x 3.50m
SHOULDER WIDTH	2.50 m	-
SIDEWALK WIDTH	0.60m	1.50m + 0.60m
SUPERSTRUCTURE TYPE	1-span, PCDG Type VI-Modified (40m)	1-span, PCDG Type VI-Modified (40m)
SUBSTRUCTURE TYPE	Closed-type Abutment	Closed-type Abutment
FOUNDATION TYPE	RC Piles (450 x 450mm)	RC Piles (450 x 450mm)

(2) DETERMINATION OF FINAL SCHEME

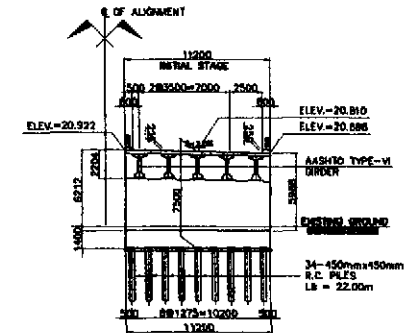
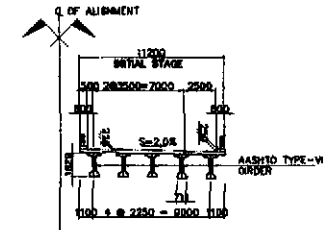
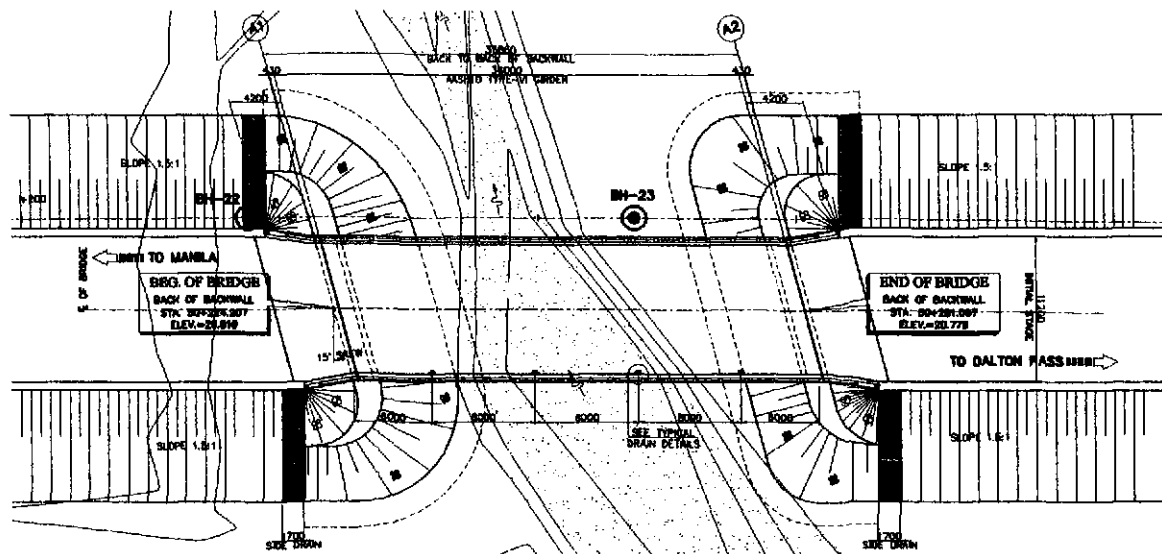
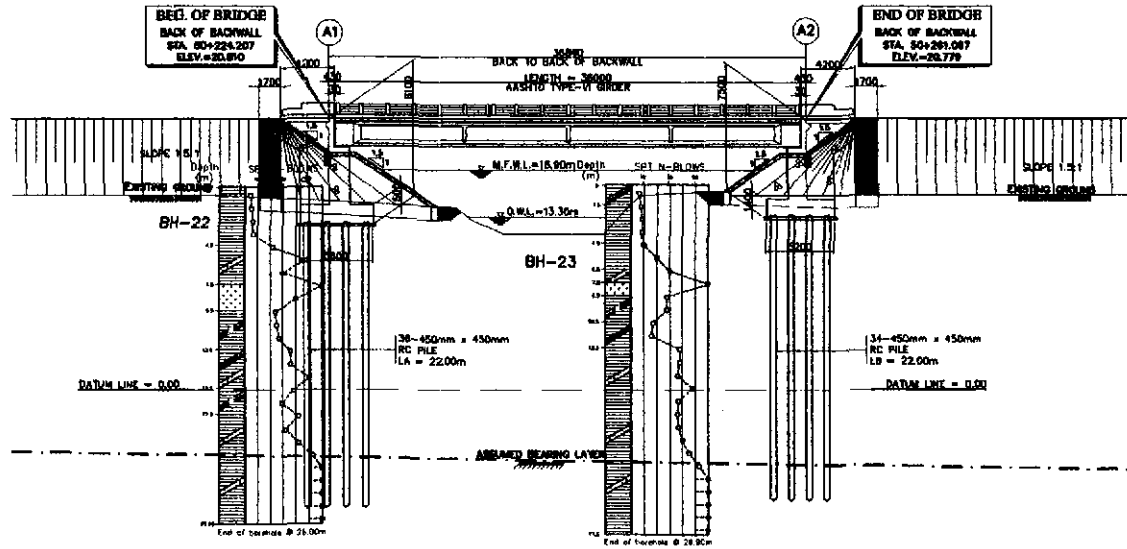
- The top width of river during the design flood is 29.0 m. To minimize river encroachment considering abutment slope protection, the bridge length becomes 36.86m for a single-span bridge.
- A single Span bridge is proposed due to :
 - Two-span bridge is not recommended since one pier will have to be located at the center of the river and may cause problems on river hydraulics.

- A three span bridge tends to be more expensive because of additional substructure cost.

- Pile foundation is proposed due to presence of soft soil layer.

(3) PROTECTION AGAINST SCOURING

- Since river velocity during worst flooding is relatively slow (2.133 m/sec), the bridge utilizes Grouted Riprap Riverbank Protection.
- Grouted Riprap shall be protected by Loose Boulder Apron at the toe.



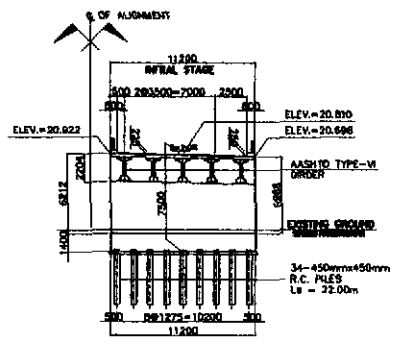
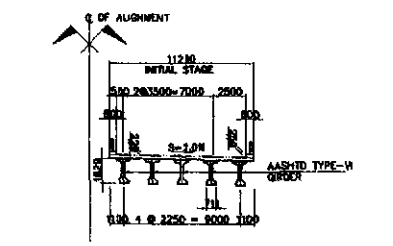
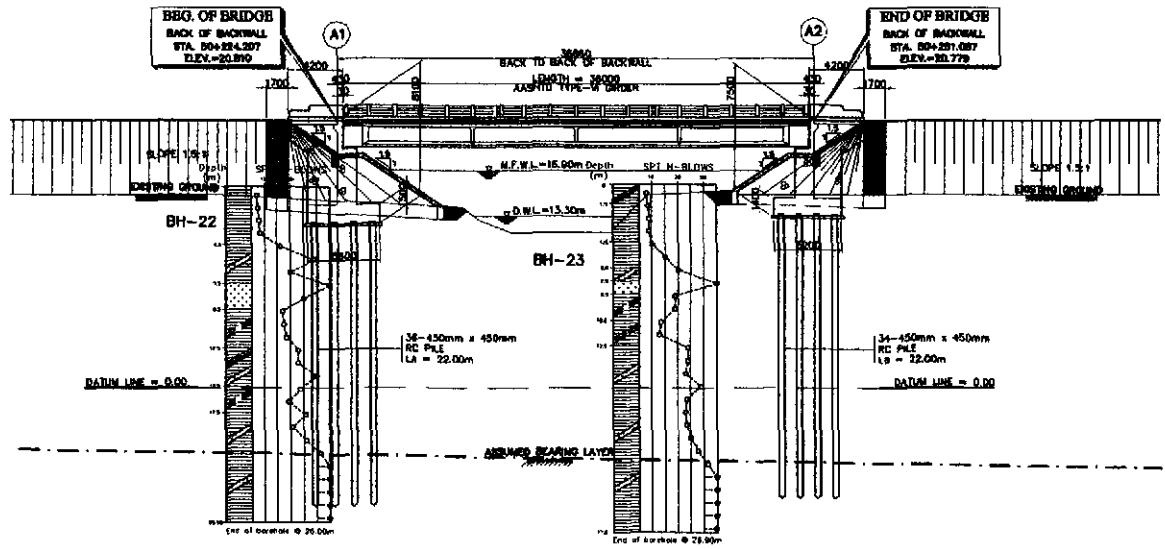
HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.133 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	101.400 cu.m/sec
CATCHMENT AREA, CA	12.300 sq. km

NOTE :
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A PLARIDEL BYPASS BRIDGE NO. 10 (STA. 50+224.207)
SCALE AS SHOWN

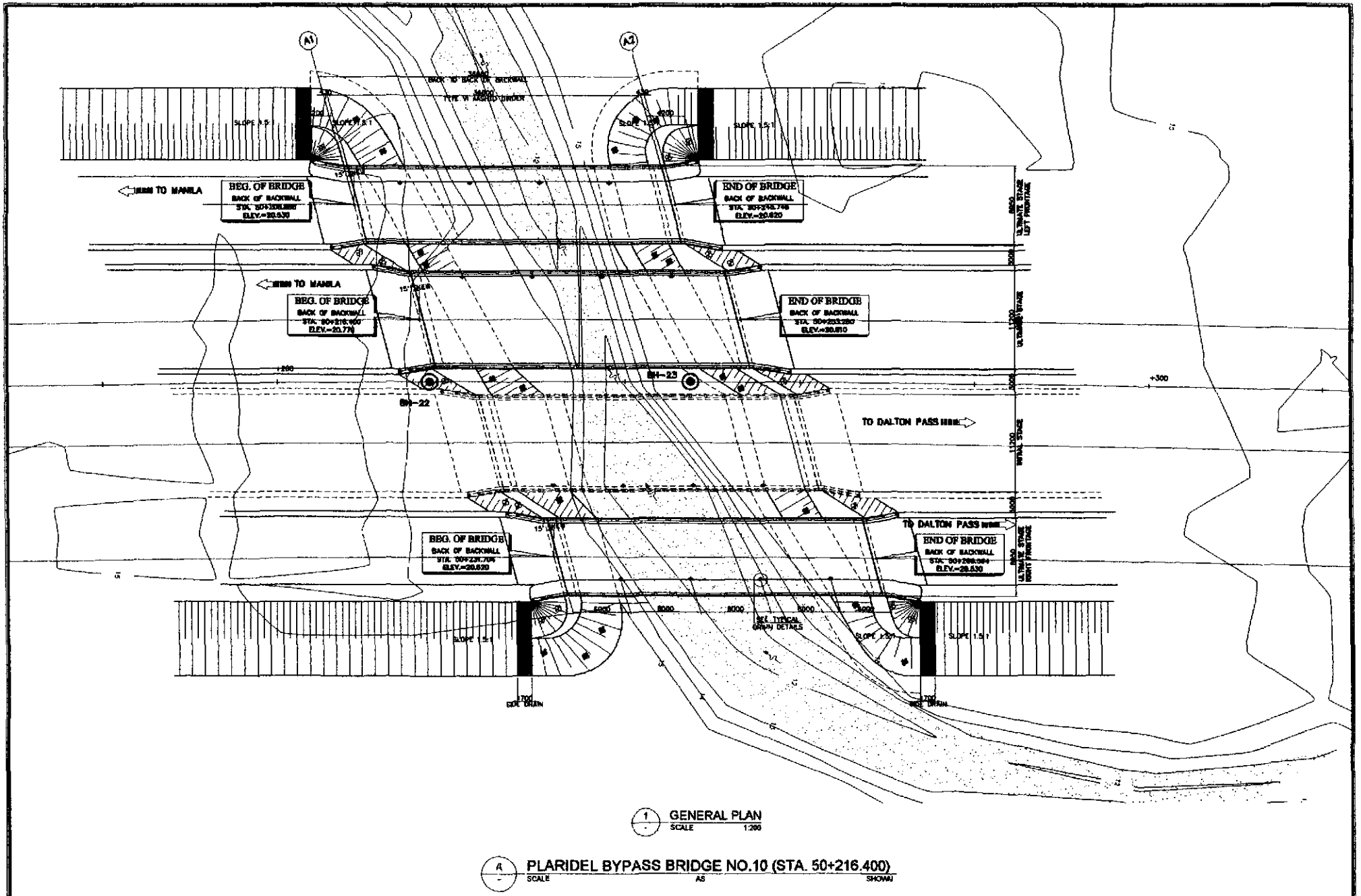
	DESIGNED	DATE	REVISION	<p>REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS</p>	<p>PROJECT AND LOCATION :</p> <p>DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)</p>	<p>SCALE :</p> <p>FULL SIZE A1</p>	<p>SHEET CONTENTS :</p> <p>PLARIDEL BYPASS BRIDGE NO. 10 (INITIAL STAGE) GENERAL PLAN, ELEVATION AND SECTION</p>	<p>SHEET NO. :</p> <p>B-115</p>
	CHECKED							



1 GENERAL ELEVATION
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO. 10 (STA. 50+224.207)
SCALE AS SHOWN

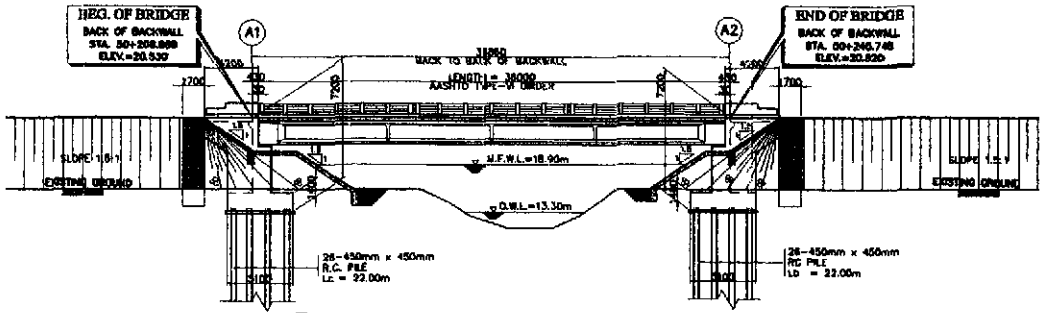
	DESIGNED	DATE	SCALE		REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS BUREAU OF HIGHWAYS				PROJECT AND LOCATION DETAILED ENGINEERING DESIGN ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	SCALE : FULL SIZE A1	SHEET CONTENTS : PLARIDEL BYPASS BRIDGE NO.10 (INITIAL STAGE) GENERAL ELEVATION AND SECTIONS	SHEET NO. 1 PB*
	CHECKED				OFFICE OF THE ASSISTANT SECRETARY (See cover sheet for Signature Appoint)							
APPROVED				DIVISION ENGINEER (See cover sheet for Signature Appoint)								



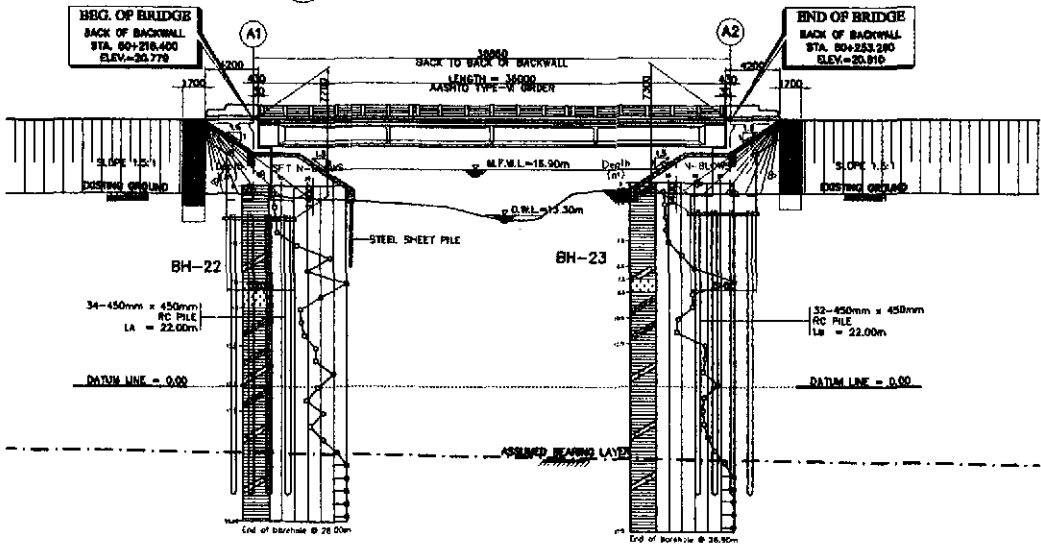
1 GENERAL PLAN
SCALE 1:200

A PLARIDEL BYPASS BRIDGE NO.10 (STA. 50+216.400)
SCALE AS SHOWN

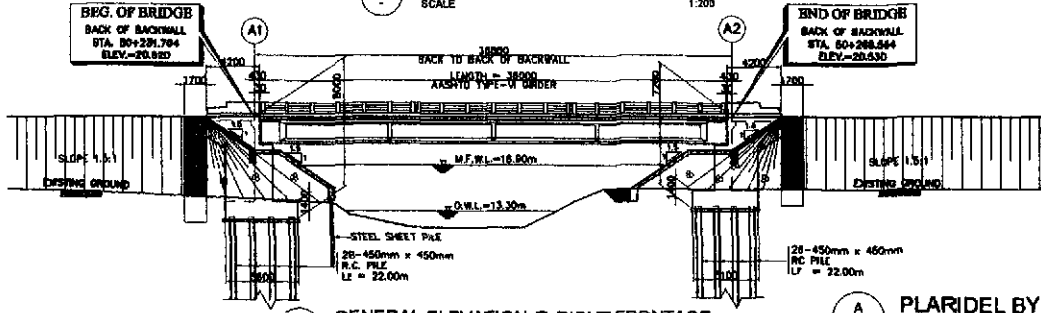
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	DESIGNED	CHECKED	SUBMITTED	DIV. - PWD Submitted by:	Reviewed by:	Recommended by: (See cover sheet for Signature/Approval)	Approved by: (See cover sheet for Signature/Approval)			
		TEAM LEADER	DERRIC C. TALANG Project Engineer	ANTHONY M. DORCY Chief P. Eng. Designer	ORLANDO S. REYES Manager (P. Eng.)	EDUARDO V. M.B. Sub-manager	SANDO A. BATAAN-ROSA Designer			



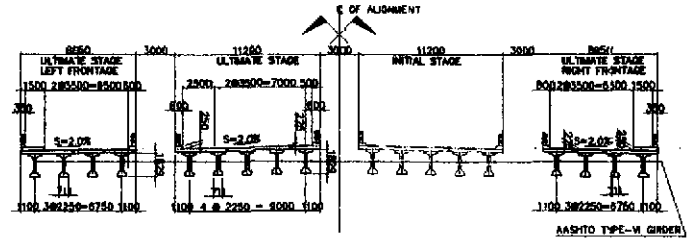
1 GENERAL ELEVATION @ LEFT FRONTAGE SCALE 1:200



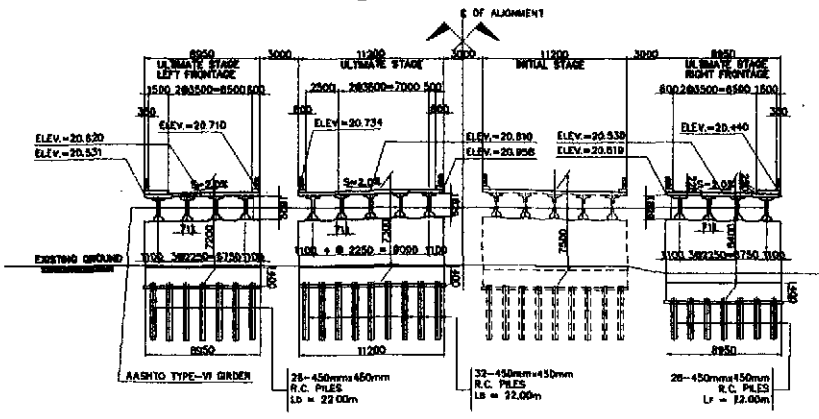
2 GENERAL ELEVATION (ULTIMATE) SCALE 1:200



3 GENERAL ELEVATION @ RIGHT FRONTAGE SCALE 1:200



3A SECTION @ MID-SPAN SCALE 1:400



3B SECTION @ ABUTMENT A2 SCALE 1:400

HYDRAULIC DATA	
VELOCITY @ 50 YEARS, V_{50}	2.133 m/sec
DISCHARGE @ 50 YEARS, Q_{50}	101.400 cu.m/sec
CATCHMENT AREA, CA	12 300 sq. km

NOTE :
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 THE PILE LENGTH RECOMMENDED ARE MINIMUM. SHOULD THE SOIL AT THE RECOMMENDED LENGTH BE INADEQUATE BEARING MATERIAL, LENGTH SHALL BE INCREASED. THE MINIMUM SOCKET LENGTH INTO ADEQUATE SOIL FOR 400 x 400 R. C. PILE IS 1000mm WHILE FOR 450 x 450 R. C. PILE IS 1200mm.

PLARIDEL BYPASS BRIDGE NO.10 (STA. 50+216.400)
 AS SHOWN

JICA
 JAPAN INTERNATIONAL COOPERATION AGENCY

YEBI
 YAMAGUCHI ENGINEERING CO., LTD.

DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
DESIGNED		OFFICE OF THE SECRETARY (See check sheet for Signature/Approval) SHERON A. DATARANONG Secretary
CHECKED		
SUBMITTED		
DATE		
PROJECT LEADER	SHILOD C. TRILANO Project Engineer	BUREAU OF HIGHWAYS Checked By: ASHLEY M. BOROY Checked By: OMBERTO S. REYES Checked By: EDUARDO V. MIR

PROJECT AND LOCATION :
 DETAILED ENGINEERING DESIGN ON
 UPGRADING INTER-URBAN HIGHWAY SYSTEM
 ALONG THE PAN-PHILIPPINE HIGHWAY
 (Plaridel, Cabanatuan and San Jose Bypasses)

SCALE :
 FULL SIZE A1

SHEET CONTENTS :
 PLARIDEL BYPASS
 BRIDGE NO.10 (ULTIMATE STAGE)
 GENERAL ELEVATION
 AND SECTIONS

SHEET NO. 1
B-119

APPENDIX 10.2-1

Hydrological Characteristics of Watersheds and Related Discharges (Cabanatuan Bypass)

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)	
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms		
1	100+794 101+519	1.440	8.0	2683.0	76.59	44.15	78.06	95.15	0.50	8.83	15.62	19.04	100+806	2-2.40 m x 2.40 m	22.40	Proposed Box Culvert	
													101+074	1-910 mm φ	1.05	Irrigation Structure	
													101+334	1-910 mm φ	1.05	Irrigation Structure	
													101+514	1-1520 mm φ	4.20	Irrigation Structure	
															28.70	Total	
2	101+519 102+114	0.853	10.0	1534.0	37.0	67.08	115.78	140.32	0.50	7.95	13.72	16.63	101+524	2-1220 mm φ	4.80	Irrigation Structure	
													101+774	2-1220 mm φ	4.80	Irrigation Structure	
													101+994	2-1220 mm φ	4.80	Irrigation Structure	
															14.40	Total	
3	102+114 102+654	0.304	3.0	990.0	35.5	68.36	117.83	142.76	0.50	2.89	4.99	6.04	102+184	1-1070 mm φ	1.55	Irrigation Structure	
													102+384	1-910 mm φ	1.05	Irrigation Structure	
													102+484	1-910 mm φ	1.05	Irrigation Structure	
													102+649	1-1220 mm φ	2.40	Irrigation Structure	
															6.05	Total	
4	102+654 103+554	26.130	See Hydrological Report											102+954		92.70	Proposed Bridge No 1
			103+194	1-910 mm φ	1.05	Irrigation Structure											
			103+304	1-910 mm φ	1.05	Irrigation Structure											
			103+685	1-910 mm φ	1.05	Irrigation Structure											
					95.85	Total											

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
5	103+554 104+044	0.739	6.0	1957.0	59.53	50.99	90.94	111.01	0.50	5.24	9.34	11.40	103+550	1-910 mm φ	1.05	Irrigation Structure
													103+644	1-910 mm φ	1.55	Irrigation Structure
													103+804	1-910 mm φ	1.55	Irrigation Structure
													103+904	1-3.0 m x 2.40 m	14.20	Proposed Box Culvert
													104+039	1-910 mm φ	1.05	Irrigation Structure
															19.40	Total
6	104+044 104+804	0.819	8.0	1336.0	34.35	69.37	119.45	144.69	0.50	7.90	13.60	16.48	104+049	1-1220 mm φ	2.40	Irrigation Structure
													104+194	2-1220 mm φ	4.80	Irrigation Structure
													104+294	2-1220 mm φ	4.80	Irrigation Structure
													104+334	2-1220 mm φ	4.80	Irrigation Structure
															16.80	Total
7	104+804 105+319	107.760	See Hydrological Report										104+809	1-1220 mm φ	2.70	Irrigation Structure
				105+034		512.80	Proposed Bridge No 2									
				105+314	1-910 mm φ	1.05										
					516.55	Total										
8	105+724 105+724	0.038	2.0	331.0	11.77	106.99	183.00	221.54	0.50	0.57	0.97	1.18	105+324	1-910 mm φ	1.05	
													105+654	1-910 mm φ	1.05	Irrigation Structure
															2.10	Total
9	104+724 106+204	0.034	2.0	191.0	6.26	137.04	238.08	288.75	0.50	0.65	1.12	1.36	105+724	1-910 mm φ	1.05	Irrigation Structure
													105+954	1-910 mm φ	1.05	Irrigation Structure
													106+199	1-910 mm φ	1.05	
															3.15	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
10	106+204 10659*4	0.126	5.0	705.0	19.74	86.35	146.20	176.71	0.50	1.51	2.55	3.09	106+209	1-1070 mm φ	1.55	Irrigation Structure
													106+364	1-910 mm φ	1.05	Irrigation Structure
													106+509	1-910 mm φ	1.05	Irrigation Structure
													106+589	1-910 mm φ	1.05	Irrigation Structure
															4.70	Total
11	106+594 107+159	0.221	6.0	897.0	24.27	80.42	136.83	165.47	0.50	2.47	4.21	5.09	106+599	1-1220 mm φ	2.40	Irrigation Structure
													106+834	2-1070 mm φ	3.10	
													107+154	1-1070 mm φ	1.55	Irrigation Structure
															7.05	Total
12	107+159 107+714	1.026	6.0	1794.0	53.86	54.51	96.19	117.17	0.50	7.77	13.72	16.71	107+234	1-910 mm φ	1.05	
													107+494	1-1070 mm φ	1.05	Irrigation Structure
													107+614	1-3.0m x 2.40 m	17.57	
													107+619	1-1070 mm φ	1.55	Irrigation Structure
													107+704	1-910 mm φ	1.05	Irrigation Structure
															22.27	Total
13	107+714 108+144	0.081	1.0	233.0	10.27	111.91	191.64	232.10	0.50	1.25	2.15	2.60	107+804	1-910 mm φ	1.05	Irrigation Structure
													108+139	1-1220 mm φ	2.70	Irrigation Structure
															3.75	Total
14	108+144 108+589	0.237	9.0	1336.0	32.83	70.71	121.60	147.25	0.50	2.33	4.01	4.86	108+154	1-910 mm φ	1.05	
													108+294	1-1070 mm φ	1.55	
													108+494	1-1070 mm φ	1.55	
													108+584	1-910 mm φ	1.05	Irrigation Structure
															5.20	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits		Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
							2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
15	108+589	108+854	3.945	11.0	3762.0	99.95	34.41	65.53	79.63	0.50	18.87	35.93	43.66	108+594	1-910 mm φ	1.05	Irrigation Structure
														108+704	3-3.00 x 2.70	46.80	Proposed Box Culvert
																47.85	Total
16	108+854	109+289	0.028	1.0	97.0	3.75	145.20	253.20	307.20	0.50	0.57	0.99	1.20	108+974	1-910 mm φ	1.05	
														109+174	1-910 mm φ	1.05	
														109+284	1-1220 mm φ	2.40	Irrigation Structure
																4.50	Total
17	109+289	109+554	0.206	2.0	438.0	16.25	93.75	159.60	192.98	0.50	2.68	4.56	5.52	109+294	1-910 mm φ	1.05	
														109+534	2-1220 mm φ	4.80	
																5.85	Total
18	109+554	109+954	0.045	1.0	149.0	6.14	137.81	239.52	290.51	0.50	0.86	1.50	1.81	109+574	2-1220 mm φ	4.80	
														109+909	1-910 mm φ	1.05	Irrigation Structure
																5.85	Total
19	109+954	110+294	0.758	6.0	1845.0	55.63	53.41	94.55	115.25	0.50	5.63	9.96	12.15	109+994	2-1070 mm φ	1.55	
														110+059	1-1070 mm φ	1.55	
														110+064	2-1220 mm φ	4.80	
														110+194	1-910 mm φ	1.05	
														110+284	1-910 mm φ	1.05	
																10.00	Total
20	110+294	110+604	0.092	2.0	408.0	14.97	96.50	164.57	199.01	0.50	1.23	2.10	2.54	110+374	1-910 mm φ	1.05	
														110+599	1-1070 mm φ	1.55	Irrigation Structure
																2.60	Total
21	110+604	110+834	11.175	See Hydrological Report									110+694		40.60	Proposed Bridge No 3	

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Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
22	110+834 111+204	0.033	1.0	186.0	7.92	126.28	218.16	264.45	0.50	0.57	0.99	1.20	110+934	1-910 mm φ	1.05	
													111+084	1-1070 mm φ	1.55	Irrigation Structure
													111+199	1-910 mm φ	1.05	
															3.65	Total
23	111+204 111+974	0.103	1.0	276.0	12.47	164.70	178.97	216.61	0.50	2.37	2.57	3.11	111+209	1-910 mm φ	1.05	Irrigation Structure
													111+304	1-910 mm φ	1.05	Irrigation Structure
													111+534	1-910 mm φ	1.05	Irrigation Structure
													111+919	1-910 mm φ	1.05	Irrigation Structure
													111+929	1-910 mm φ	1.05	
															5.25	Total
24	111+974 112+199	0.017	1.0	159.0	6.62	134.70	233.76	283.48	0.50	0.32	0.56	0.68	111+979	1-1070 mm φ	1.55	Irrigation Structure
													112+194	1-910 mm φ	1.05	Irrigation Structure
															2.60	Total
25	112+199 112+739	0.079	1.0	328.0	15.21	96.0	163.59	197.82	0.50	1.05	1.79	2.17	112+204	1-1220 mm φ	1.05	Irrigation Structure
													112+254	1-910 mm φ	1.05	Irrigation Structure
													112+734	1-910 mm φ	1.05	Irrigation Structure
															3.15	Total
26	112+739 112+864	0.120	3.0	875.0	30.80	72.50	124.47	150.66	0.50	1.21	2.07	2.51	112+754	1-910 mm φ	1.05	
													112+854	1-910 mm φ	1.05	
													112+859	1-1220 mm φ	2.70	Irrigation Structure
															4.80	Total
27	112+864 112+974	0.012	1.0	833.0	44.43	60.50	105.21	127.76	0.50	0.10	0.17	0.21	112+869	1-910 mm φ	1.05	
28	112+974 113+334	22.225	See Hydrological Report										113+204		99.70	Proposed Bridge No 4

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Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
29	113+334 113+454	0.146	3.0	755.00	26.00	78.24	133.44	161.40	0.50	1.59	2.71	3.27	113+304	1-910 mm φ	1.05	Irrigation Structure
													113+354	1-910 mm φ	1.05	Irrigation Structure
													113+449	1-910 mm φ	1.05	Irrigation Structure
															3.15	Total
30	113+454 113+994	0.188	2.0	557.00	21.42	84.01	142.42	172.16	0.50	2.19	3.71	4.49	113+464	1-910 mm φ	1.05	
													113+674	1-1070 mm φ	1.55	
													113+894	1-1070 mm φ	1.55	
															4.15	Total
31	113+994 114+234	17.650	See Hydrological Report									114+084		63.40	Proposed Bridge No 5	
32	114+234 114+614	0.093	2.00	390.00	14.22	98.96	168.89	204.29	0.50	1.28	2.19	2.65	114+364	1-910 mm φ	1.05	
													114+609	1-1070 mm φ	1.55	
															2.60	
33	114+614 115+274	0.074	2.00	404.00	14.81	97.02	165.49	200.14	0.50	0.99	1.69	2.05	114+619	1-910 mm φ	1.05	
													114+660	1-910 mm φ	1.05	Irrigation Structure
													115+269	1-910 mm φ	1.05	
															3.15	Total
34	115+274 115+474	10.425	See Hydrological Report									115+324		69.00	Proposed Bridge No 6	
35	115+474 115+794	0.113	2.0	454.00	16.93	90.07	153.28	185.21	0.50	1.41	2.40	2.90	115+494	1-910 mm φ	1.05	Irrigation Structure
													115+634	1-910 mm φ	1.05	
													115+794	1-910 mm φ	1.05	
															3.15	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
36	115+794 115+979	0.047	See Hydrological Report										115+804			Proposed Bridge No 7
			115+828	2-910 mm φ	2.10											
			115+974	1-910 mm φ	1.05											
					3.15	Total										
37	115+979 116+414	0.074	2.0	331.00	11.77	108.96	186.46	225.76	0.50	1.13	1.93	2.33	115+989	1-910 mm φ	1.05	
													116+034	1-910 mm φ	1.05	
													116+334	1-910 mm φ	1.05	
															3.15	Total
38	116+414 116+574		See Hydrological Report										116+464		32.30	Proposed Bridge No 8
39	116+574 116+829	0.019	1.0	149.00	6.14	137.81	239.52	290.51	0.50	0.37	0.64	0.77	116+574	1-910 mm φ	1.05	Irrigation Structure
													116+754	1-910 mm φ	1.05	
															2.10	Total
40	116+829 117+094	0.416	7.0	1439.00	39.39	64.94	112.33	136.22	0.50	3.75	6.49	7.87	116+834	1-1070 mm φ	1.55	Irrigation Structure
													117+094	2-1520 mm φ	8.00	
															9.55	Total
41	117+094 117+454	0.234	5.0	1004.00	29.64	73.65	126.33	152.85	0.50	2.39	4.10	4.96	117+204	1-1220 mm φ	2.70	Irrigation Structure
													117+454	1-1220 mm φ	2.70	
															5.40	Total
42	117+454 118+079	0.181	4.0	717.00	21.93	83.37	141.42	170.96	0.50	2.10	3.56	4.30	117+714	1-910 mm φ	1.05	
													117+958	2-910 mm φ	2.10	Irrigation Structure
													118+074	1-910 mm φ	1.05	
															4.20	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
43	118+079 118+454	0.102	4.0	726.00	22.25	82.97	140.79	170.21	0.50	1.18	2.00	2.42	118+084	1-910 mm φ	1.05	Irrigation Structure
													118+204	1-1070 mm φ	1.55	Irrigation Structure
															2.60	Total
44	118+454 118+704	11.950	See Hydrological Report										118+614		65.00	Proposed Bridge No 9
													118+664	1-910 mm φ	1.05	Irrigation Structure
													118+696	1-910 mm φ	1.05	
															67.10	Total
45	118+704 118+824	0.007	1.0	143.00	5.86	139.63	242.88	294.61	0.50	0.14	0.24	0.29	118+709	1-910 mm φ	1.05	
													118+814	1-910 mm φ	1.05	
															2.10	Total
46	118+824 119+554	0.407	2.0	737.00	29.56	73.75	126.46	153.03	0.50	4.18	7.16	8.67	118+894	1-910 mm φ	1.05	Irrigation Structure
													119+210	1-910 mm φ	1.05	Irrigation Structure
													119+044	1-910 mm φ	1.05	Irrigation Structure
													119+204	1-910 mm φ	1.05	Irrigation Structure
													119+240	1-1520 mm φ	4.00	
													119+414	1-910 mm φ	1.05	Irrigation Structure
													119+549	1-910 mm φ	1.05	Irrigation Structure
													119+614	1-910 mm φ	1.05	Irrigation Structure
		11.35	Total													
47	119+554 121+364		See Hydrological Report										120+574		6,990.00	Proposed Bridge No 10
													121+134	1-910 mm φ	1.05	Irrigation Structure
													121+284	1-910 mm φ	1.05	
															6,992.10	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
48	121+364 121+914	0.055	1.0	139.00	5.67	140.86	245.15	297.39	0.50	1.08	1.87	2.27	121+374	1-910 mm φ	1.05	
													121+406	1-1070 mm φ	1.05	Irrigation Structure
													121+914	1-910 mm φ	1.05	Irrigation Structure
															3.15	Total
49	121+914 122+374					See Hydrological Report							122+061	1-1070 mm φ	1.55	Irrigation Structure
						122+350	1-910 mm φ	1.05								
						122+374			Proposed Bridge No 11							
								2.60	Total							
50	122+374 122+459	0.007	1.0	147.00	6.04	138.46	240.72	291.97	0.50	0.13	0.23	0.28	122+460	1-1520 mm φ	4.00	Irrigation Structure
51	122+459 123+459	129.925				See Hydrological Report							122+466	1-910 mm φ	1.05	
						122+594		735.50	Proposed Bridge No 12							
						123+260	1-910 mm φ	1.05	Irrigation Structure							
						123+364	1-910 mm φ	1.05	Irrigation Structure							
						123+454	1-910 mm φ	1.05								
								739.70	Total							
52	123+459 123+569	0.010	1.0	219.00	9.56	115.65	198.48	240.44	0.50	0.16	0.28	0.34	123+464	1-910 mm φ	1.05	
													123+559	1-910 mm φ	1.05	
													123+564	1-1220 mm φ	1.55	Irrigation Structure
															3.65	Total
53	123+569 124+054	0.102	1.0	348.00	16.28	93.69	159.48	192.84	0.50	1.33	2.27	2.74	123+574	1-910 mm φ	1.05	
													123+654	1-910 mm φ	1.05	Irrigation Structure
													123+934	1-910 mm φ	1.05	
															3.15	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits		Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
							2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
54	124+054	124+359	0.127	2.0	501.00	18.96	88.00	149.19	180.35	0.50	1.55	2.63	3.18	124+134	2-910 mm φ	2.10	Irrigation Structure
														124+359	1-910 mm φ	1.05	
																3.15	
55	124+359	124+794	0.231	2.0	896.00	37.00	67.04	115.71	140.24	0.50	2.15	3.71	4.49	124+514	2-910 mm φ	2.10	Irrigation Structure
														124+654	2-910 mm φ	2.10	
																4.20	
56	124+794	124+994	1.572	4.0	1499.00	51.21	56.15	98.65	120.05	0.50	12.27	21.56	26.23	124+924	2-2.40 m x 2.40 m	28.10	Proposed Box Culvert
57	124+994	125+294	0.046	1.0	150.00	6.19	137.49	238.92	289.78	0.50	0.88	1.53	1.85	125+014	1-910 mm φ	1.05	
														125+134	1-910 mm φ	1.05	
																2.10	
58	125+294	125+639	0.040	See Hydrological Report										125+374	1-910 mm φ	1.05	
				125+614	1-910 mm φ	1.05											
				125+624			Proposed Bridge No 13										
						2.10		Total									
59	125+639	125+884	0.692	4.0	1779.00	62.36	49.77	88.73	108.32	0.50	4.79	8.53	10.42	125+644	2-1220 mm φ	4.80	
														125+874	2-1220 mm φ	4.80	
																9.60	
60	125+884	126+214	0.178	2.0	593.00	23.02	81.99	139.28	168.40	0.50	2.03	3.45	4.17	125+889	1-910 mm φ	1.05	Irrigation Structure
														126+214	2-1070 mm φ	3.10	
																4.15	

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits		Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
							2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
61	126+214	126+754	4.739	8.0	3963.00	119.95	33.01	57.52	69.82	0.50	21.74	37.89	45.99	126+434	1-910 mm φ	1.05	
														126+624	3-3.0 m x 3.0 m	73.62	Proposed Box Culvert
														126+679	1-910 mm φ	1.05	
																75.72	Total
62	126+754	127+004	0.017	1.0	77.00	2.87	145.20	253.20	307.20	0.50	0.34	0.59	0.72	126+874	1-910 mm φ	1.05	
														126+994	1-1220 mm φ	1.55	
																2.60	Total
63	127+004	127+434	0.035	1.0	91.00	3.48	145.20	253.20	307.20	0.50	0.70	1.23	1.49	127+012	1-1070 mm φ	1.05	Irrigation Structure
														127+034	1-910 mm φ	1.05	
														127+334	1-910 mm φ	1.05	Irrigation Structure
																2.10	Total
64	127+434	127+844	1.062	5.0	2152.00	71.23	145.20	253.20	307.20	0.50	21.43	37.37	45.34	127+480	3-3.0 m x 2.70 m	46.80	Proposed Box Culvert
														127+839	1-910 mm φ	1.05	Irrigation Structure
																47.85	Total
65	127+844	128+174	0.053	1.0	244.00	10.83	110.08	188.42	228.16	0.50	0.81	1.38	1.68	127+849	1-1070 mm φ	1.55	Irrigation Structure
														128+014	1-910 mm φ	1.05	
																2.60	Total
66	128+174	128+774	3.040	7.0	3314.00	102.80	36.78	64.38	78.23	0.50	15.54	27.20	33.06	128+300	2-3.0 m x 3.0 m	49.08	Proposed Box Culvert
														128+394	1-910 mm φ	1.05	Irrigation Structure
														128+559	1-910 mm φ	1.05	Irrigation Structure
														128+768	1-910 mm φ	1.05	Irrigation Structure
																52.23	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
67	128+774 129+054	0.023	1.0	167.00	7.00	132.24	229.25	277.92	0.50	0.42	0.74	0.89	128+784	1-1220 mm φ	2.70	Irrigation Structure
													128+814	1-910 mm φ	1.05	
													128+994	1-910 mm φ	1.05	
															4.80	Total
68	129+054 129+424	4.006	9.0	4498.00	132.60	31.03	53.85	65.31	0.50	17.28	29.98	36.36	129+112	3-3.0 m x 2.40 m	42.60	Proposed Box Culvert
													129+366	1-910 mm φ	1.05	Irrigation Structure
															43.65	Total
69	129+424 129+879	0.068	1.0	300.00	13.73	100.57	171.72	207.74	0.50	0.95	1.62	1.96	129+416	1-910 mm φ	1.05	Irrigation Structure
													129+436	1-910 mm φ	1.05	
													129+789	1-910 mm φ	1.05	Irrigation Structure
													129+862	1-1220 mm φ	2.70	Irrigation Structure
													129+874	1-910 mm φ	1.05	
															6.90	Total
70	129+879 130+359	0.060	1.0	354.00	16.61	92.99	158.22	191.30	0.50	0.77	1.32	1.59	129+884	1-910 mm φ	1.05	
													130+129	1-910 mm φ	1.05	Irrigation Structure
													130+359	1-910 mm φ	1.05	Irrigation Structure
															3.15	Total
71	130+359 130+654	0.098	1.0	376.00	17.80	90.46	153.65	185.75	0.50	1.23	2.10	2.53	130+509	1-1070 mm φ	1.55	Irrigation Structure
													130+654	1-1070 mm φ	1.55	Irrigation Structure
															3.10	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
72	130+654 131+144	0.606	2.0	731.00	29.28	74.11	127.01	153.69	0.50	6.24	10.70	12.94	130+934	2-1220 mm φ	4.80	
													131+088	2-1220 mm φ	4.80	
													131+144	1-1220 mm φ	2.40	Irrigation Structure
															12.00	Total
73	131+144 131+639	0.079	1.0	326.00	15.11	96.17	163.98	198.29	0.50	1.06	1.80	2.18	131+334	1-910 mm φ	1.05	
													131+594	1-910 mm φ	1.05	Irrigation Structure
															2.10	Total
74	131+639 131+904	5.267	10.0	4781.00	136.59	30.40	52.69	63.88	0.50	22.26	38.57	46.77	131+644	1-3.0 m x 2.40 m	17.57	Irrigation Canal
													131+734	2-3.0 m x 3.0 m	49.08	Proposed Box Culvert
															66.65	Total
75	131+904 132+124	0.040	1.0	318.00	14.68	97.45	166.24	201.05	0.50	0.55	0.93	1.13	131+904	1-910 mm φ	1.05	Irrigation Structure
													132+119	1-910 mm φ	1.05	
															2.10	Total
76	132+124 133+054					See Hydrological Report							132+274	3-3.0 m x 3.0 m	73.62	Proposed Box Culvert
						132+599	1-910 mm φ	1.05								
						132+964		1,570.00	Proposed Bridge No 14							
								1,644.67	Total							
77	133+054 133+249	0.039	1.0	226.00	9.91	113.38	194.28	235.32	0.50	0.62	1.06	1.28	133+064	1-910 mm φ	1.05	Irrigation Structure
													133+244	1-910 mm φ	1.05	Irrigation Structure
															2.10	Total

Appendix 10.2-1 HYDROLOGICAL CHARACTERISTICS OF WATERSHEDS AND RELATED DISCHARGES (CABANATUAN BYPASS)

Catchment Area No.	Station Limits	Catchment Area (km ²)	Diff. in Elev., Δh (m)	Length (m)	Tc (min)	RAINFALL INTENSITY			Coefficient C	DISCHARGE, Q			PROPOSED DRAINAGE STRUCTURES			REMARKS (General Recommendation)
						2 yrs	10 yrs	25 yrs		2 yrs	10 yrs	25 yrs	STATION	RCPC/RCBC	CAPACITY cms	
78	133+249 133+849	0.075	1.0	314.00	14.47	98.14	167.45	202.53	0.50	1.02	1.74	2.10	133+254	1-910 mm φ	1.05	
													133+574	1-910 mm φ	1.05	
													133+840	1-910 mm φ	1.05	
															3.15	Total
79	133+849 134+224	0.038	1.0	161.00	6.71	134.12	232.67	282.17	0.50	0.70	1.22	1.47	133+860	1-910 mm φ	1.05	
													133+920	1-910 mm φ	1.05	Irrigation Structure
													133+929	1-910 mm φ	1.05	Irrigation Structure
													134+129	1-910 mm φ	1.05	
													134+224	1-1220 mm φ	2.40	Irrigation Structure
															6.60	Total
80	134+224 134+644	0.015	1.0	137.00	5.57	141.51	246.36	298.86	0.50	0.29	0.50	0.60	134+229	1-910 mm φ	1.05	
													134+479	1-910 mm φ	1.05	
													134+634	1-910 mm φ	1.05	
															3.15	Total