

4.2 Cabanatuan Bypass

Alternative alignment study was required at the following two sections (see Figure 4.2-1):

- Beginning Section
- Talavera Section (end section)

The F/S alignment of the rest of the sections was judged appropriate except a short section where minor adjustment was made to avoid new permanent houses to be affected.

4.2.1 Beginning Section

The existing Pan-Philippine Highway suffers flooding at two sections between Gapan and Sta. Rosa. One is after Gapan and the other is at Tambo creek area before Sta. Rosa. Cabanatuan Bypass proposed to start before Sta. Rosa.

Flood conditions at Tambo Creek area before Sta. Rosa are as follows:

Cause of Flood	:	Spill-overed water from Pampanga River (from west to east) and flood water from Tambo Creek (from east to west) merges at this area.
Frequency	:	About once in 5 years
Flood depth	:	0.6 ~ 0.8m from the road surface
Traffic	:	Interrupted for 1~2 days

Based on the above conditions, two alternatives were studied (see Figure 4.2-2):

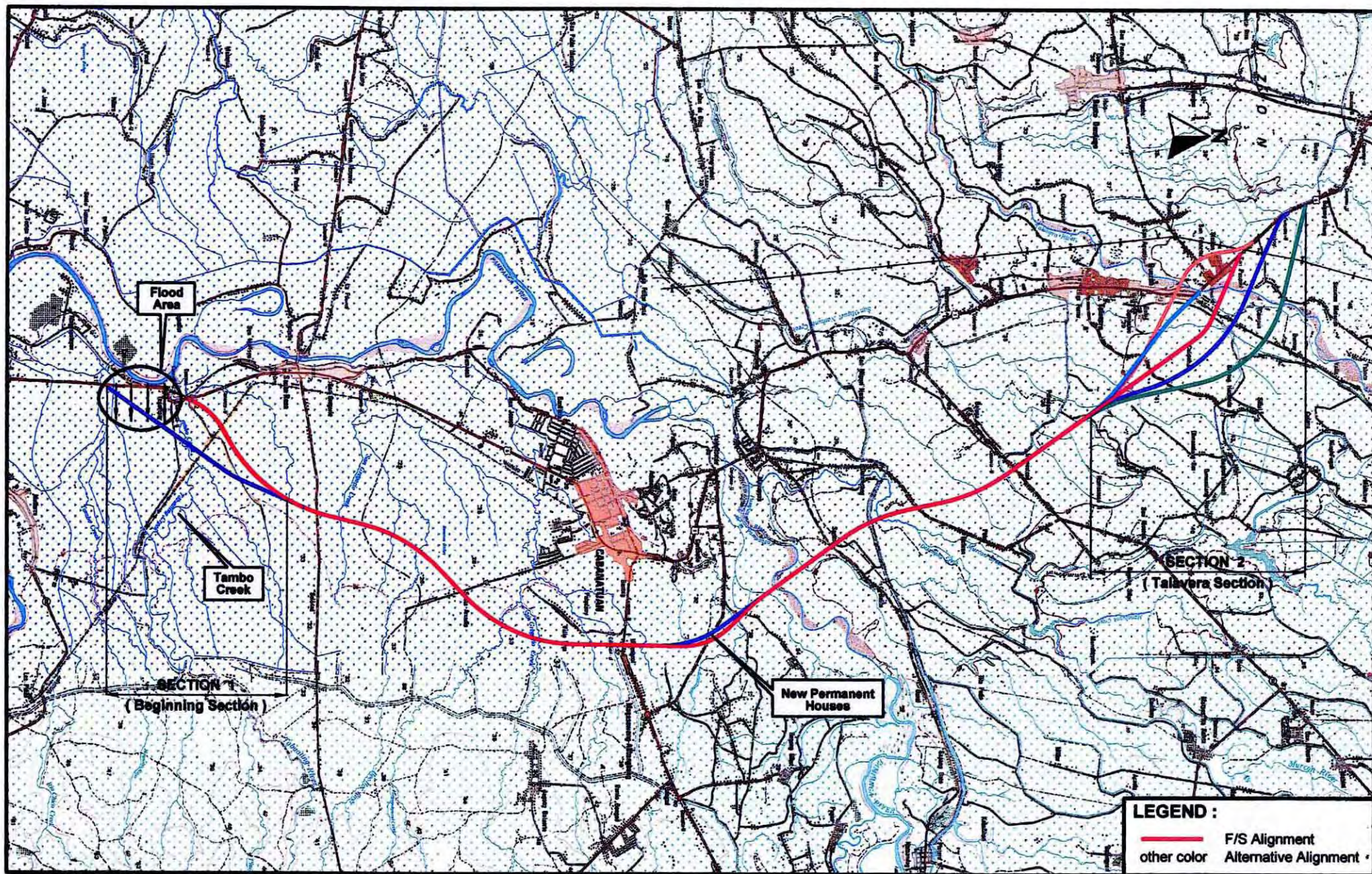


FIG. 4.2-1 ALTERNATIVE ALIGNMENTS FOR CABANATUAN BYPASS

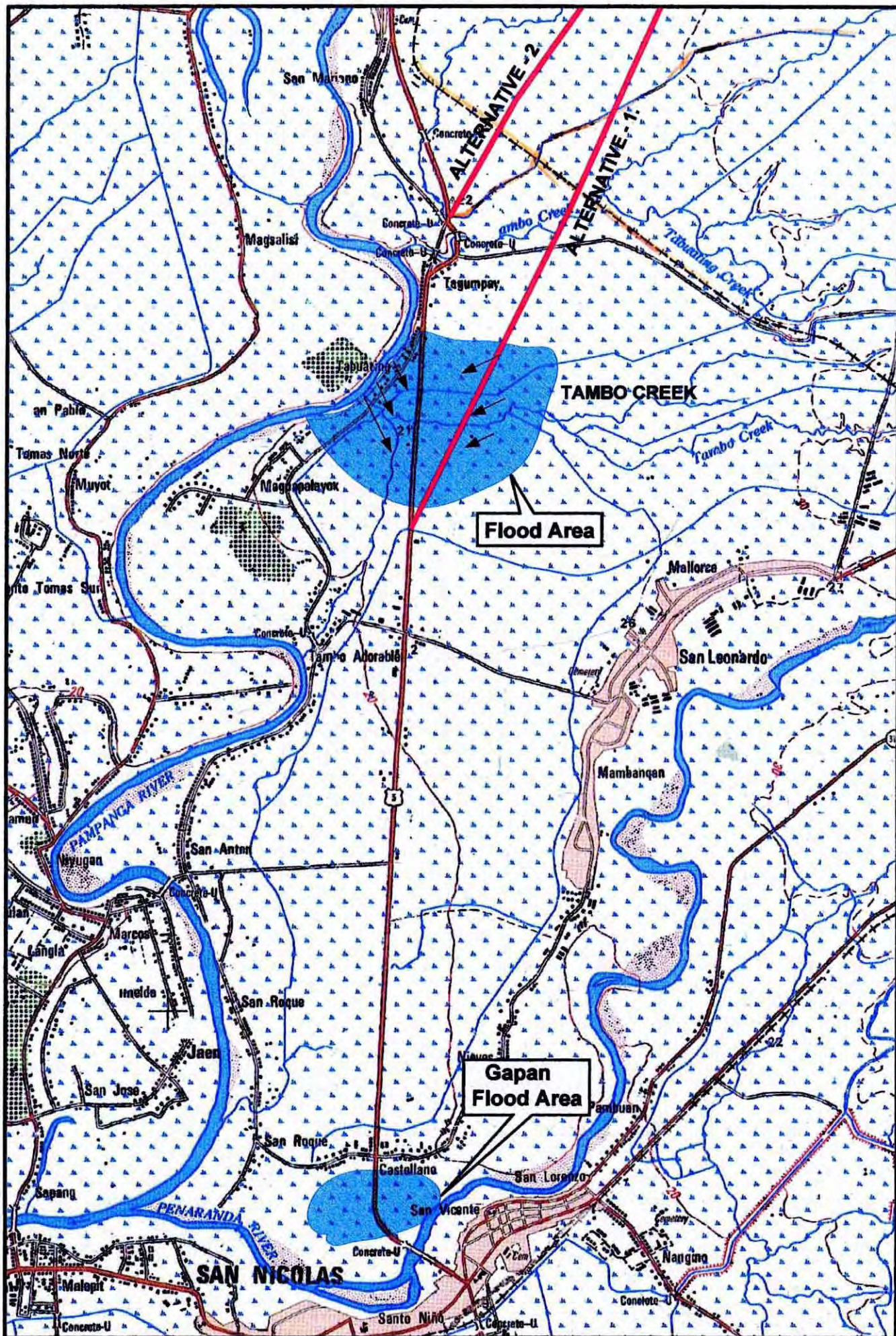


FIGURE 4.2-2 FLOOD AREAS

Alternative – 1 : Beginning point of the Bypass is to be located before Tambo creek flood area.

Alternative – 2 : This is the F/S alignment. Beginning point is to be located at Cabanatuan City side of the flood section.

Comparison of alternatives is shown in Table 4.2-1.

TABLE 4.2-1 COMPARISON OF ALTERNATIVES

	Alternative - 1	Alternative - 2
Bypass Length	The Bypass becomes longer by about 3km than Alternative-2.	-
Flood Condition	The Bypass can be so designed that it will not be flooded. Flooding at Gapan must be solved separately from this project.	The existing Pan-Philippine Highway suffers flooding at two locations. Flooding at Gapan and this area must be solved separately from this Project.
Traffic	Traffic will not be interrupted at Tambo creek flood area. However, traffic will be interrupted at Gapan flood area.	Traffic will be interrupted at two areas, Tambo creek and Gapan flood areas.

DPWH strongly requested to adopt Alternative-1, as it solves flood problem at this section by this Project and flood problem at Gapan area will be addressed by another project.

In line with strong recommendation of DPWH, Alternative-1 was selected.

4.2.2 Talavera Section

The alignment proposed by the F/S requires a 665m long bridge to cross Talavera River. The existing Pan-Philippine Highway crosses over the River by a 150m long Sicsican Bridge and passes through the urban area of Barangay San Pascual. The following three (3) issues were studied:

- Necessity to bypass Barangay San Pascual (or the bypass can be terminated before Sicsican bridge or not).
- The existing Sicsican Bridge can be utilized or not.
- If the Bypass needs to bypass Barangay San Pascual, where is the most appropriate location of a bridge to span over Talavera River.

(1) Necessity to Bypass Barangay San Pascual

Traffic Condition

The intersection traffic count undertaken at the central area of Barangay San Pascual in April 2001 shows the following traffic volume:

	Traffic Volume in AADT (April 2001)				LOS	V/C Ratio
	Regular	Tricycle / Motorcycle	Total	PCU		
Manila Side	13,327	6,291	19,618	21,298	E	0.97
San Jose Side	11,074	6,251	17,325	18,325	E	0.85

Future Traffic Volume Forecast by F/S

Year	Traffic Volume in PCU	LOS	V/C Ratio
2000	17,600	E	0.80
2005	21,200	E (Almost F)	0.96
2010	25,800	F	1.17
2020	39,700	F	1.80

The Study Team undertook the travel time survey along the subject section, of which result is shown in Figure 4.2-3 and summarized as follows:

Section	Travel Speed (Apr. 2001)
Section - 1 (Talavera Town Proper)	18.6 km/hr – 25.0 km/hr
Section - 2 (Barangay San Pascual)	25.4 km/hr – 36.9 km/hr
Section - 3 (San Jose Side Section)	34.2 km/hr – 51.8 km/hr

As shown above, the subject section will reach to its traffic capacity by about year 2005, widening to a 4-lane road or a bypass will be urgently needed.

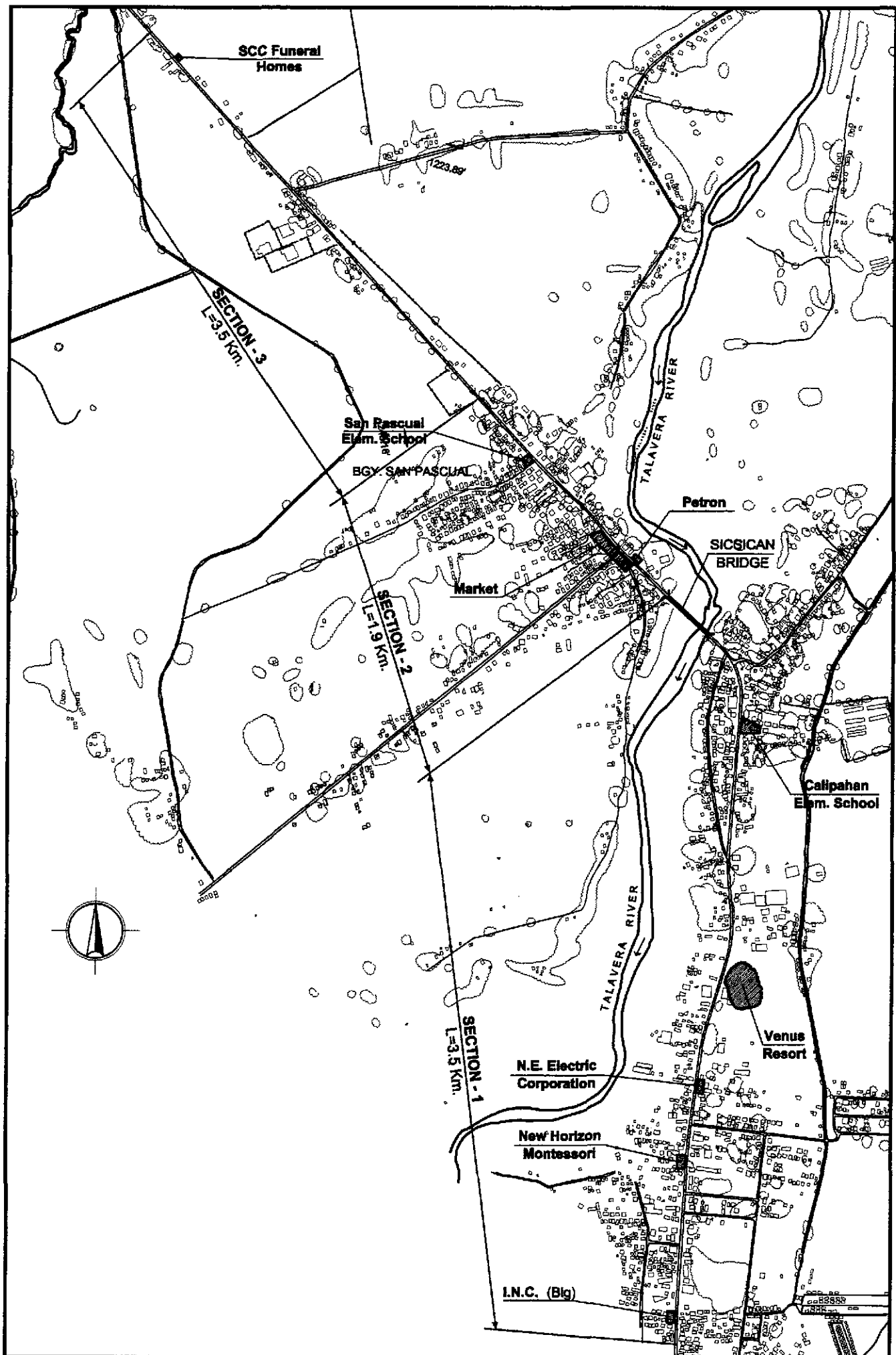


FIGURE 4.2-3 TRAVEL TIME SURVEY AND TRAVEL SPEED

(2) The existing Sicsican Bridge can be utilized or not

The conditions of existing Sicsican Bridge are as follows:

Bridge length	: L = 150m
Span composition	: 3-span truss bridge (3x50m)
Year constructed	: 1948 (52 years ago)
Design Live Load	: AASHO MS 13.5
Abutment Foundation	: Wooden pile (information from Talavera DPWH District Office)
Pier 1	: Tilted by the 1990 earthquake and totally reconstructed with two bored piles (diameter 2.25m pile length 18m)
Pier 2	: Once tilted and settled due to scouring by flood water before 1990 earthquake (information from Talavera DPWH District Office). Pier reconstructed with concrete piles.
Superstructure	: Still structurally sound.

Although superstructure was assessed still structurally sound, foundation of abutment may be problem when local scouring occurs around it.

Proper countermeasures against scouring needs to be provided.

It is a 2-lane bridge and its traffic capacity is limited. By about 2005, another 2-lane bridge will be required to accommodate expected traffic.

From the viewpoint of traffic capacity and abutment problem, an additional bridge was recommended.

(3) Appropriate location of a bridge to span over Talavera River

General condition of Talavera River is shown in Figure 4.2-4.

Past transition of waterway is shown in Figure 4.2-5. Three locations where the waterway remained the same in the past 23 to 25 years were found and selected for a bridge location. Preliminary hydraulic analysis was undertaken and the result is shown in Figure 4.2-6 and 7.

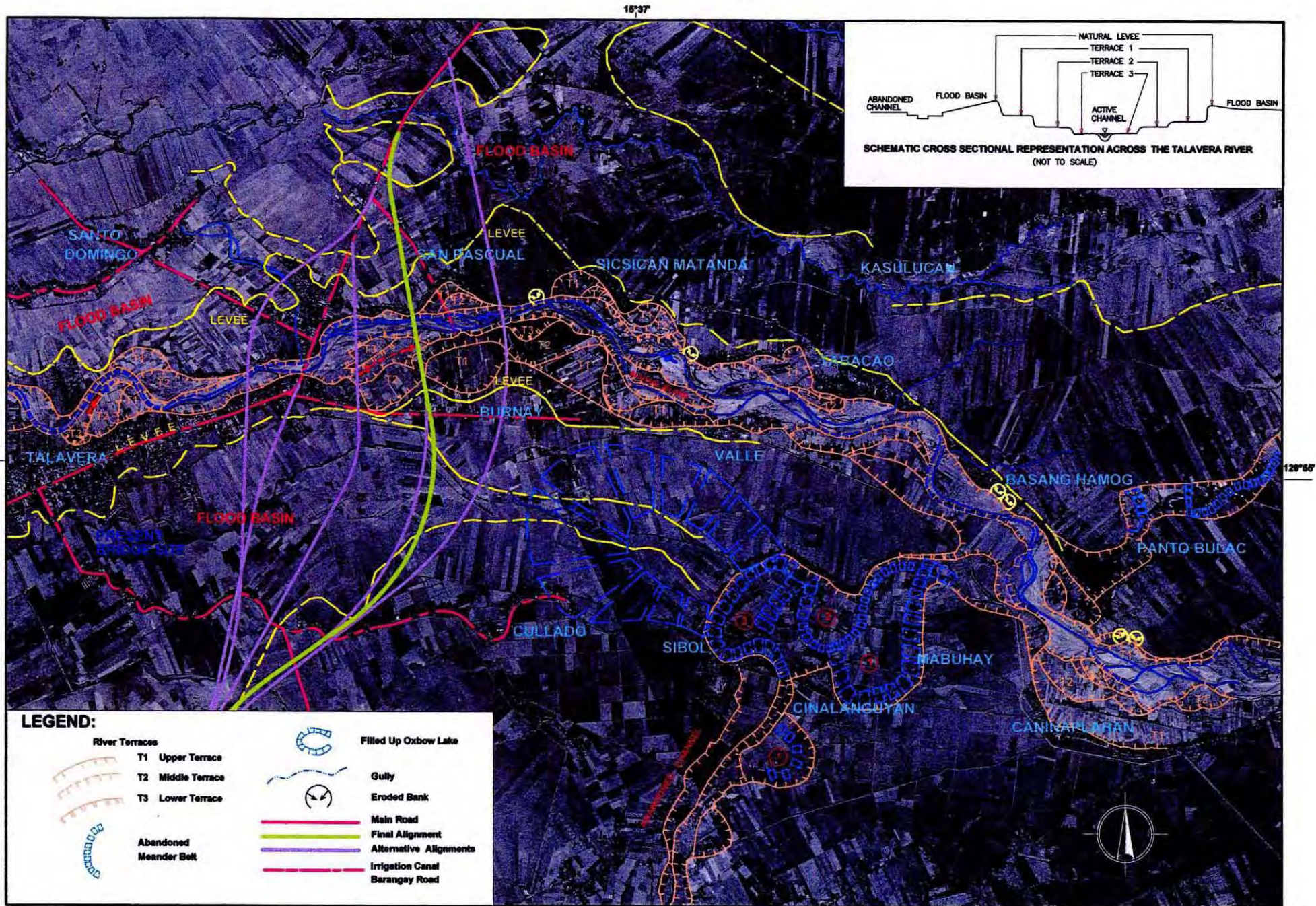
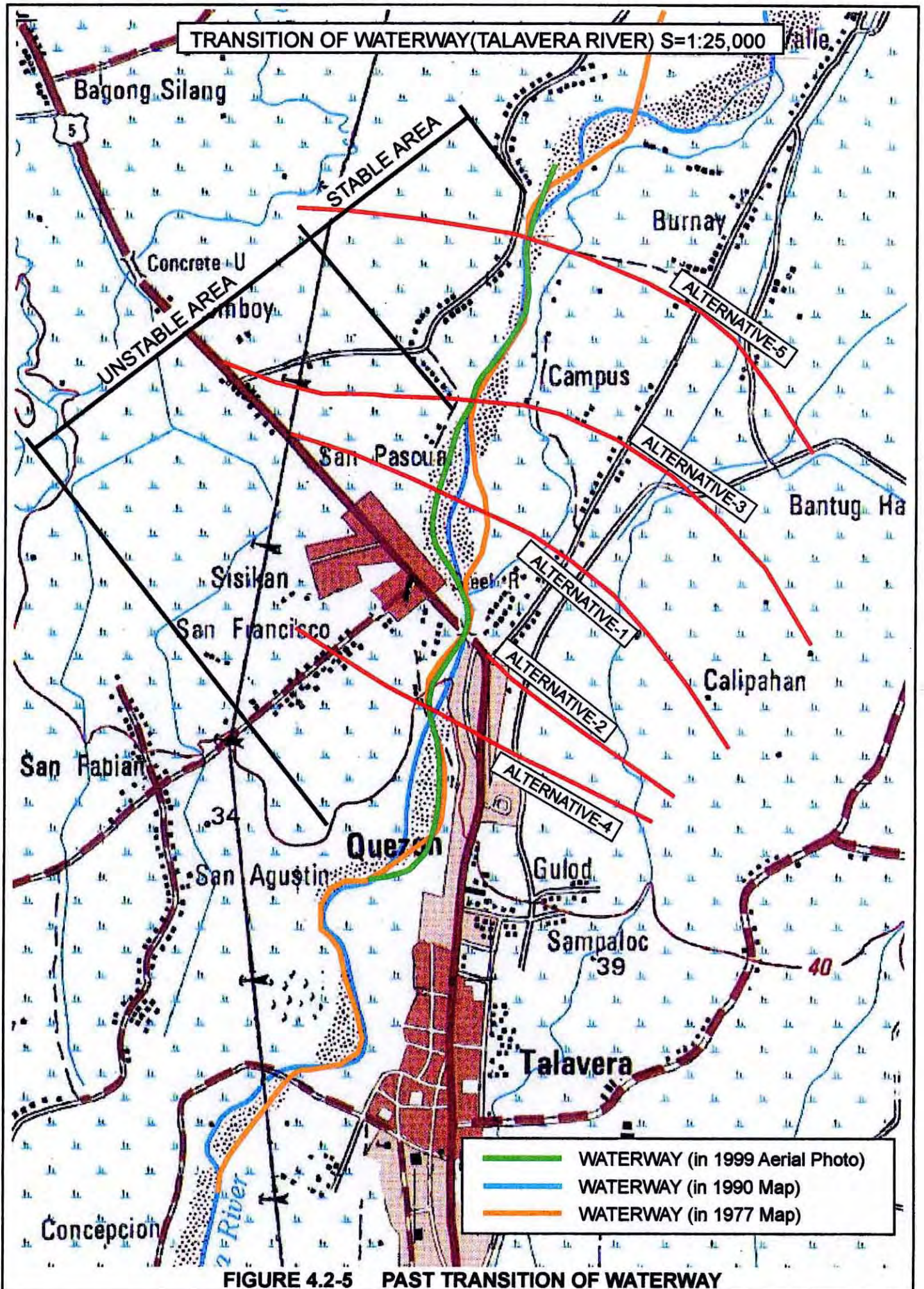


FIGURE 4.2-4 GENERAL CONDITION OF THE TALAVERA RIVER

SCALE : 1:30,000



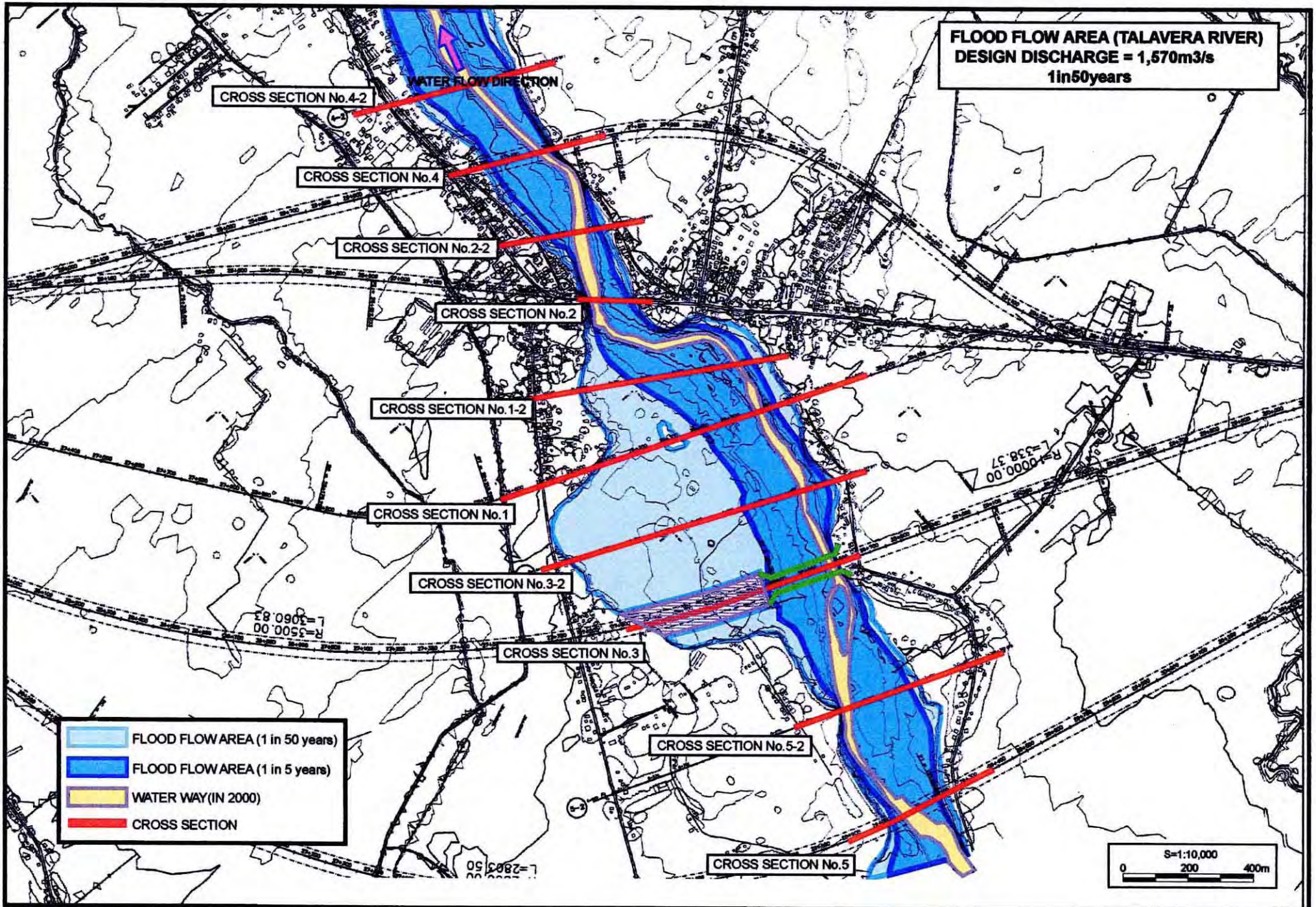


FIGURE 4.2-6(1) LOCATION OF RIVER CROSS SECTION

DESIGN FLOOD WATER LEVEL

H=15,000
V=1,500

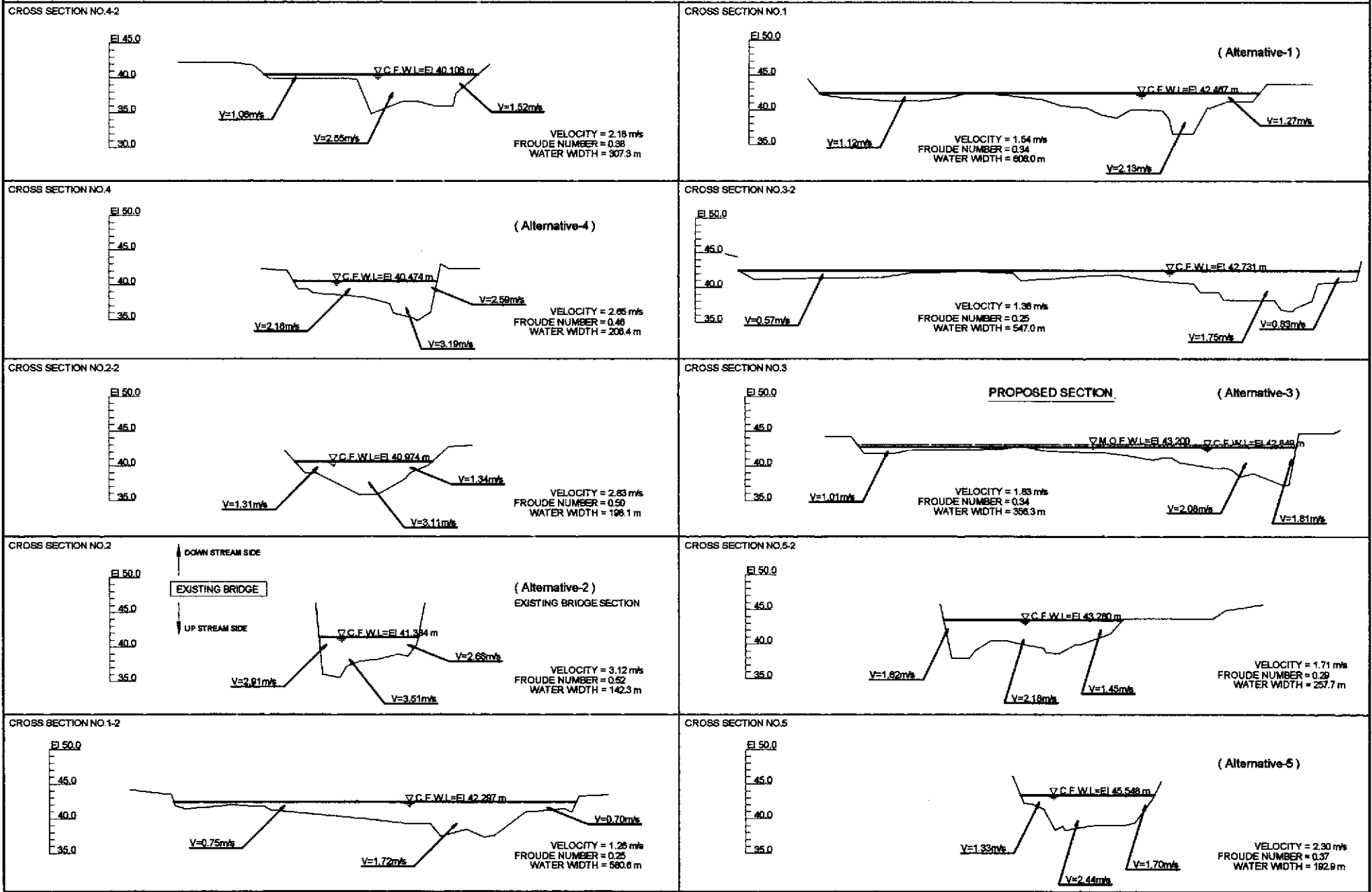


FIGURE 4.2-6(2) RESULT OF PRELIMINARY HYDRAULIC ANALYSIS

TALAVERA RIVER FLOOD WATER LEVEL (1 in 50YEARS)

RIVER NAME: TALAVERA

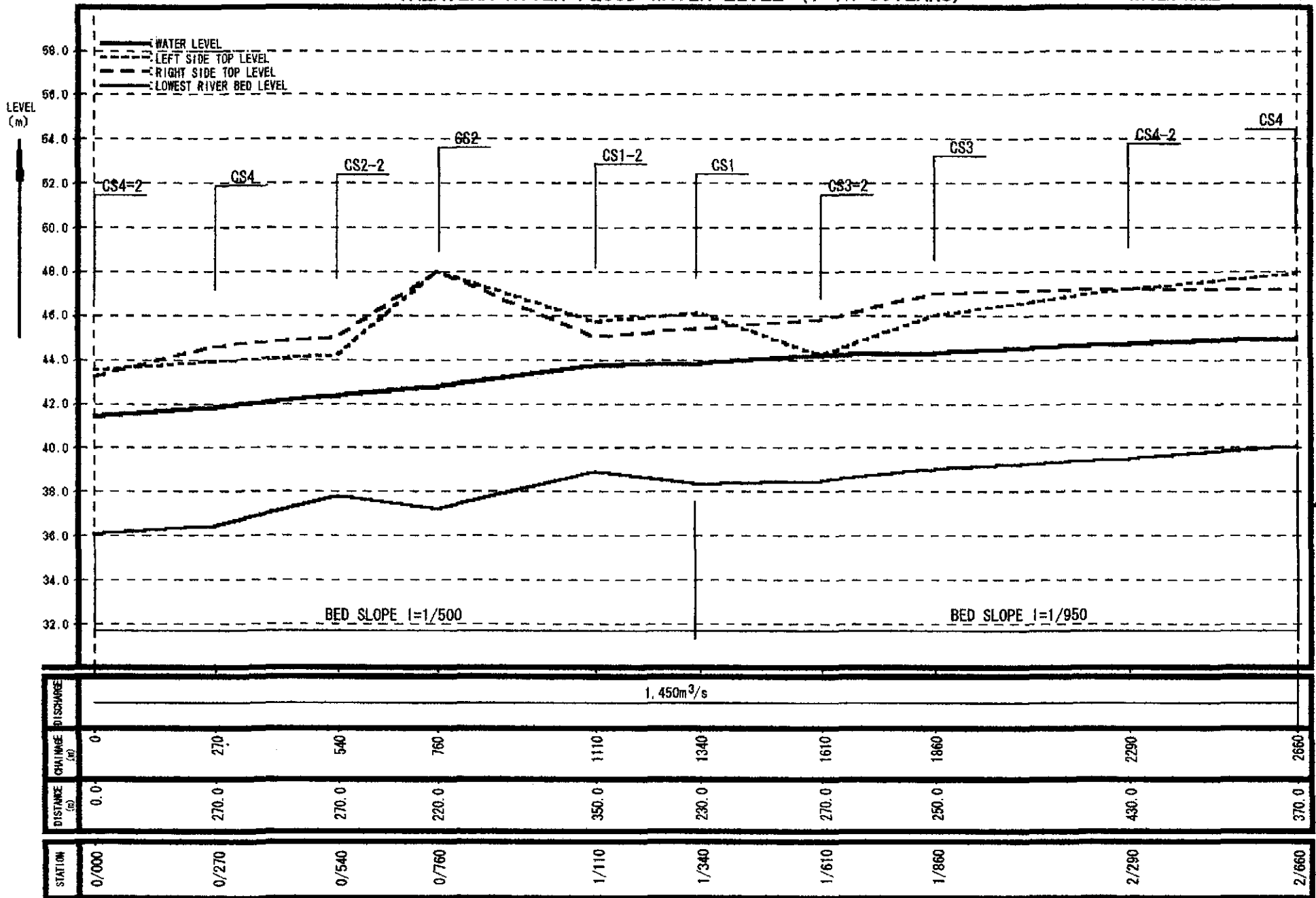


FIGURE 4.2-7 FLOOD WATER LEVEL

(4) Alternative Alignments

In due consideration of above, five alternative alignments were established as shown in Table 4.2-2 and Figure 4.2-8.

TABLE 4.2-2 ALTERNATIVE ALIGNMENTS FOR TALAVERA SECTION

	Alternative	Bgy. San Pascual bypassed or not	Bridge Location	Other Conditions
1	F/S Alignment	Yes	About 0.45km upstream side from the existing bridge.	
2	Terminated before the existing bridge	No (however, Barangay San Pascual Section to be widened to a 4-lane)	Stage 1: Utilize the existing bridge. Stage 2: An additional 2-lane bridge to be constructed.	
3		Yes	About 1 km upstream side from the existing bridge.	
4	4-A (Terminated at the Pan-Philippine Highway before the existing bridge).	No (however, the existing road to be widened from the bypass and Brgy. San Pascual Section)	Stage 1: Utilize the existing bridge. Stage 2: An additional 2-lane bridge to be constructed.	
	4-B (4-A alignment extended to bypass Barangay San Pascual).	Yes	About 0.7 km downstream side from the existing bridge	Intersection with the Pan-Philippine Highway - At-grade - Fly-over
5		Yes	About 1.8km upstream side from the existing bridge.	

Figure 4.2-9 shows a bridge scheme of each alternative.

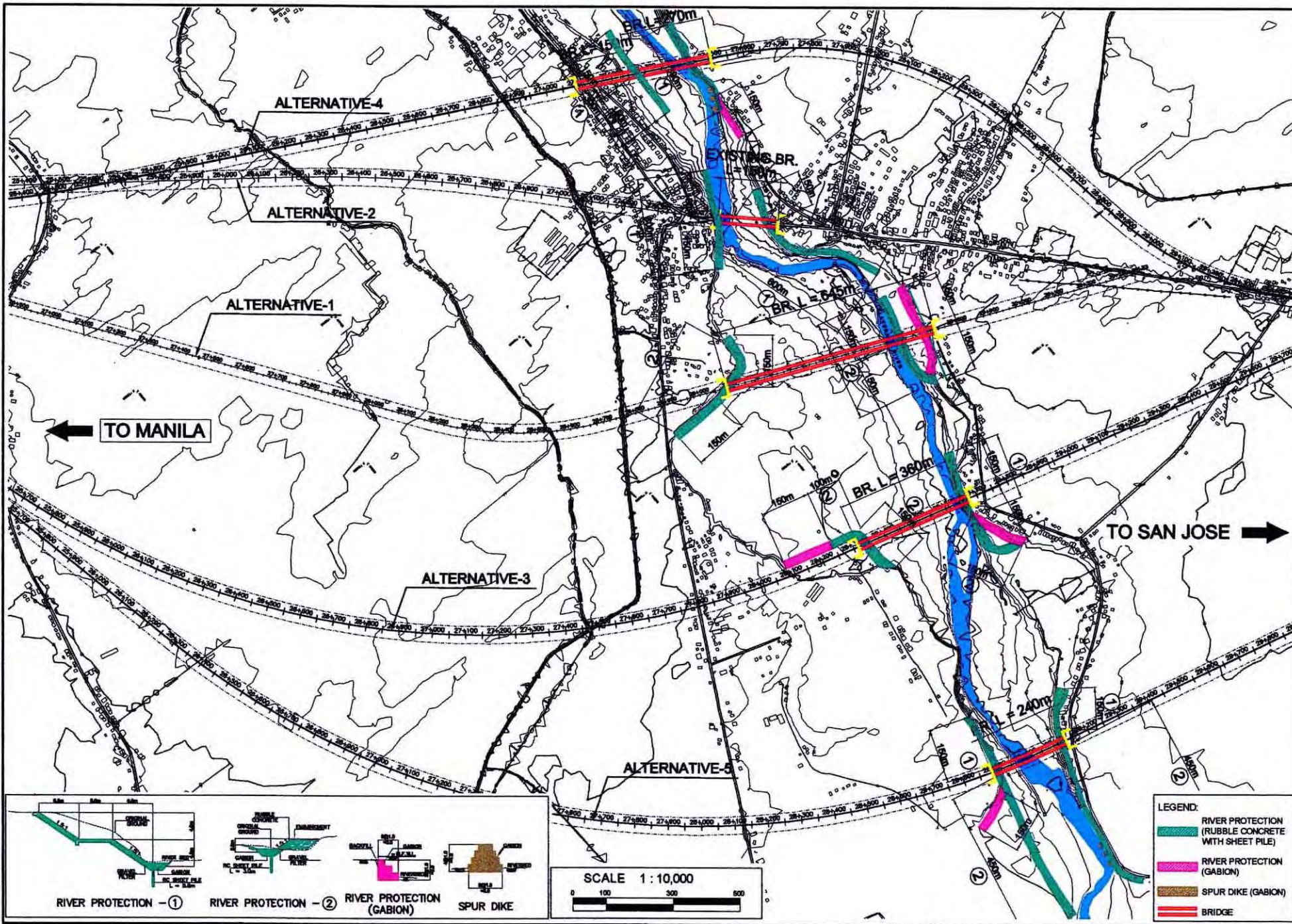


FIGURE 4.2-8 ALTERNATIVE ALIGNMENTS : TALAVERA SECTION

(5) Evaluation of Alternatives

All alternatives were evaluated based on the following criteria:

<u>Factors Adopted</u>	<u>Weight</u>
• Construction cost	12
• Social impact	7
• Environmental Impact	3
• Transport efficiency	5
• Opinion of Municipal Officials	3
	<hr/>
	30

Evaluation Criteria

- a) Construction Cost
Lowest cost : 12 points
Highest : 1 point

Intermediate cost : Interpolation

b) Social Impact

Evaluated by total number of houses affected and schools / markets affected. A school or a market was considered equivalent to 20 houses.

<u>No. of Houses/School/Market Affected</u>	<u>Point</u>
0 – 25	7
26 – 50	6
51 – 75	5
76 – 100	4
101 – 125	3
126 – 150	2
over 151	1

- c) Environmental Impact
Low : 3 points
High : 1 point

- d) Transport Efficiency
Evaluated by PCU-hour
Lowest : 5
Highest : 1
Intermediate by interpolation

- e) Opinion of Municipal Officials
Preferable : 3 points
Not preferable : 1 point

Evaluation result is shown in Table 4.2-3.

**TABLE 4.2-3 EVALUATION OF ALTERNATIVE ALIGNMENTS OF TALAVERA SECTION
CABANATUAN BYPASS**

Evaluation Criteria		Alternative 1	Alternative 2	Alternative 3	Alternative 4			Alternative 5
		(F.S. Alignment)	(Build parallel bridge & rehabilitate existing bridge/widen Pan-Philippine Highway.)	(Bridge located 1km upstream of existing Sicsican Bridge)	A (Alignment ends at Pan-Philippine Highway before crossing Talavera River.)	B1 (Alignment crosses Talavera River & grade separated at Pan-Phil Highway)	B2 (Alignment crosses Talavera River and intersect at grade with Pan-Phil Highway)	(Bridge located 2km upstream of existing Sicsican Bridge)
Bypass Features	Roadway Features							
	a) Alignment length, km	5.75	5.70	6.95	5.75	6.05	6.05	8.10
	b) No. of Intersections with major road	3 (1), 1 (U)	4 (1), 1 (U)	4 (1), 1 (U)	4 (1), 1 (U)	3 (1), 1 (U)	4 (1), 1 (U)	3 (1), 3 (U)
	Proposed Talavera River Bridge							
	a) Bridge length, m	645	150	360	150	420	270	240
b) River Protection, m								
- North Bank: Upstream + [Downstream]	150 + [150]	450 + [150]	300 + [150]	450 + [150]	300 + 600 + [150]	300 + 600 + [150]	450 + [150]	
- South Bank: Upstream + [Downstream]	150 + [150]	150 + [150]	150 + [250]	150 + [150]	150 + 300 + [150]	150 + 300 + [150]	600 + [150]	
c) Spur Dike, m	---	---	---	---	90	90	90	
d) Other structures	---	Upgrading of existing 150 m bridge.	---	Upgrading of existing 150 m bridge.	---	---	Additional Bridge - 25 m	
1	Construction Cost (Million PHP)							
	a) Bridge	580.5	215.0	324.0	215.0	420.0	318.0	216.0
	b) River Protection	37.5	58.5	44.8	58.5	80.5	80.5	82.5
	c) Highway	282.0	276.5	362.4	274.8	306.9	324.0	432.6
	Total Construction Cost =>	900.0	550.0	731.1	548.3	807.4	722.5	731.1
Relative Weight	12	1	11.9	6.3	12	3.9	6.6	6.3
2	Social Impact							
	a) Total no. of houses affected	10	95	22	150	105	115	17
	b) School		1		1			
	c) Market		1		1			
	d) Land Acquisition Cost (Million PHP)	20.77	45.94	28.33	74.06	28.08	28.08	22.93
e) Damage Compensation Cost (Million PHP)	1.91	13.78	4.02	20.85	17.99	19.77	3.30	
Total Acquisition Cost =>	22.67	59.72	32.36	94.71	46.07	47.85	26.24	
Relative Weight	7	7	2	7	1	3	3	7
3	Environmental Impact							
	a) Noise / Air Pollution	Low	High	Low	High	High	High	Low
Relative Weight	3	3	1	3	1	1	1	3
4	Transport Efficiency							
	a) Travel Time in minutes	9.35	13.21	8.35	14.68	10.46	13.46	8.10
	b) PCU-hrs/year (Million-Hrs, Year 2005)	1.42	2.00	1.26	2.22	1.58	2.04	1.23
Relative Weight	5	4.2	1.9	4.9	1	3.6	1.8	5
5	Opinion of Municipal Officials							
	a) Distance from Business Center	Preferable 0.60 km	Not preferable (Social Impact) Base	Preferable 1.10 km	Not preferable (Social Impact) Base	Not preferable (Social Impact) Base	Not preferable (Social Impact) Base	Not preferable (far from BD) 1.80 km
Relative Weight	3	3	1	3	1	1	1	1
TOTAL EVALUATION CRITERIA = 30		18.2	17.8	24.2	16.0	12.5	13.4	22.3
RANKING		3	4	1	5	7	6	2

Notes:
I - Intersections, U - Underpasses
BD - Business District

Alternatives 3 and 5 were evaluated to be superior to other alternatives. Alternative 3 is superior to Alternative 5 with regard to a bridge location. Upstream of Alternative 5 is devastating and waterway will be easily changed which will affect a bridge of Alternative 5.

Whereas, upstream of Alternative 3 has been stable for the past 23-25 years.

It was recommended that Alternative-3 be selected for Talavera Section.

4.2.3 Recommended Alignment of Cabanatuan Bypass

Recommended alignment of Cabanatuan Bypass is shown in Figure 4.2-10.

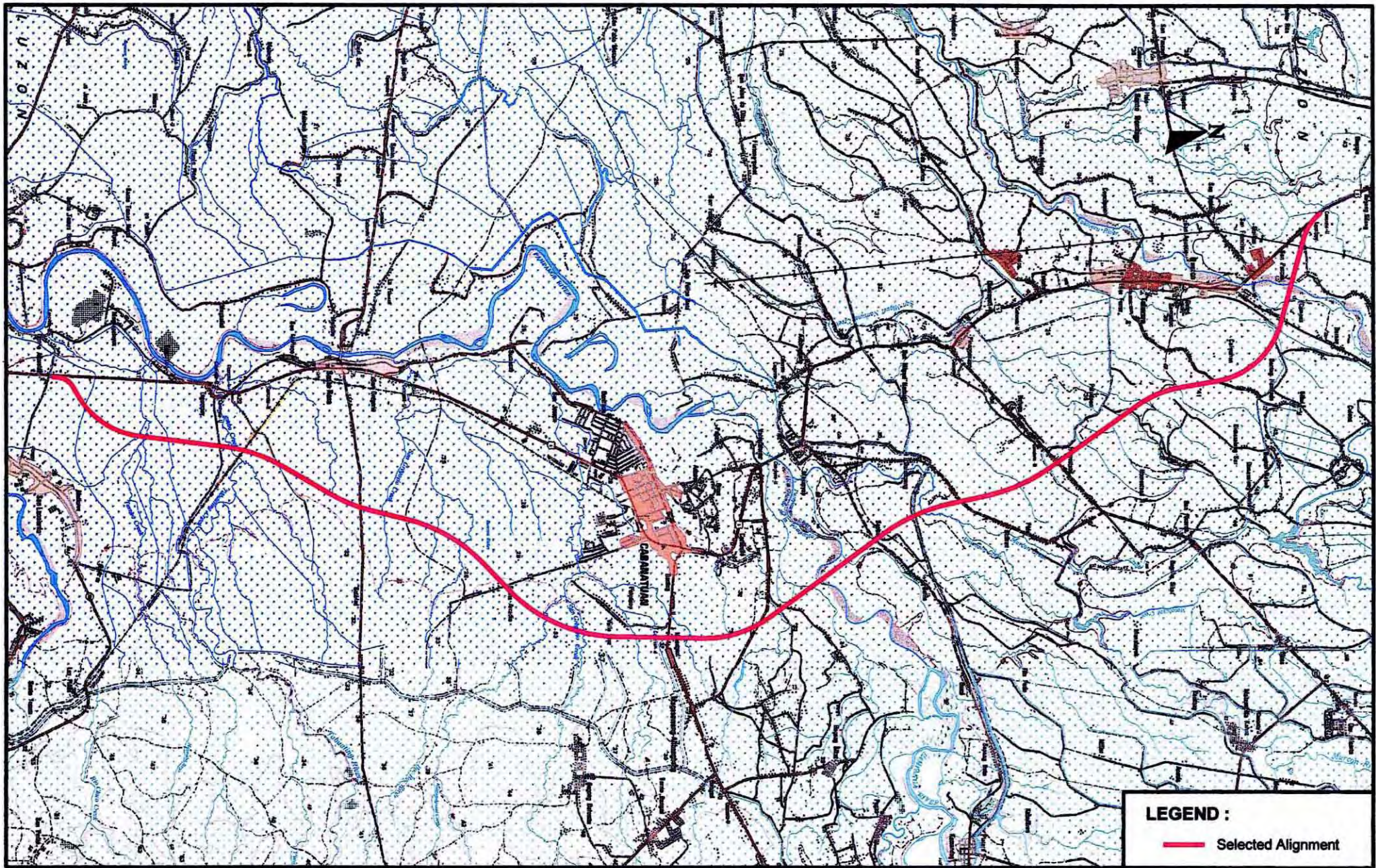


FIG. 4.2-10 SELECTED ALIGNMENT FOR CABANATUAN BYPASS