

PART III
ENGINEERING SURVEY

CHAPTER 3

DATA COLLECTION, ANALYSIS AND REVIEW OF THE FEASIBILITY STUDY

3.1 Data Collection and Analysis

Following data were collected and analyzed:

- Updated land use map of concerned Cities and Municipalities
- Subdivision development plans from the Housing and Land use Regulatory Board (HLURB) and concerned LGUs
- Any other development plans such as agro-industry estates, commercial establishments, fish ponds, etc.
- Barangay names which are traversed by the proposed bypasses
- Latest socio-economic data
- Supplemental hydrological data
- Existing irrigation system
- DPWH Department Orders
- Latest bid prices of highway projects
- DPWH's latest policies on seismic design
- Latest EMB's policies on the environmental impact assessment
- Latest requirements on Resettlement Action Plan
- Construction material test results particularly for subbase and base course materials and aggregate for concrete
- History of Sicsican Bridge damages and Reinforcement

3.2 Review of the Feasibility Study

The feasibility study was reviewed focusing on the following:

- New development along the proposed bypass routes
- Design criteria
- Possible ways to reduce construction costs
- Traffic demand forecast (particularly number of buses and trucks for pavement design and directional traffic volume at proposed intersections for the intersection design)
- Hydraulic analysis of three major rivers (Angat, Pampanga and Talavera Rivers)
- Possible ways to avoid squatters within the road right-of-way to be acquired.

3.3 Field Reconnaissance Survey along the Proposed Bypass Corridors

The field survey of present condition of the bypass route proposed during the Feasibility Study was undertaken in order to identify new developments along the corridor, verify and check control points and identify flooded areas. The survey was conducted by ocular inspection and interview with local residents.

3.3.1 Plaridel Bypass Route

The F/S alignment is shown in Figure 3.3-1.

- a) Construction of an 18-hectare subdivision at approx. Sta. 01+550 was on-going. This new development was directly traversed by the proposed alignment.
- b) Flood sections were identified as shown in Figure 3.3-2.
- c) At the intersection of proposed alignment with Bustos-Angat Road at approximately Sta. 13+980, around twenty (20) houses will be affected by the bypass corridor. Based on visual observation, less number of houses will be affected by shifting the F/S Route by about 60 meters towards west.
- d) At the intersection of proposed alignment with Baliuag-San Rafael Road at approx. Sta. 16+050, a newly built church (Iglesia ni Cristo) will be affected by the bypass corridor. A minor shift of the F/S Route will avoid to hit the concerned structure.
- e) There were no changes in the condition of the proposed alignment at the beginning point at the Buroi Interchange and at the end point along the existing Pan-Philippine Highway.

Access Roads

There are seven proposed access roads considered for either new construction or improvement / rehabilitation. (Refer to Figure 3.3-1).

- 1) *Balagtas Agricultural School Road* - This was an existing 1.97 km long with 4.80m wide travelway in good condition. There was no shoulder although shoulders were provided on sections along rice paddies. On residential section, the existing road could be improved by widening along the south side.
- 2) *New Access Road* - Still non-existent, this 2.48 km long proposed road with 6.70m wide travelway and 1.50m shoulder on both sides will directly connect the Sta. Rita Bypass with the proposed Bypass. The road corridor which traverses on rice paddies and agro-industrial zone area was confirmed to be clear of obstruction.
- 3) *Balagtas-Bustos Road* - This 2.45 km long provincial road with 4.85m wide travelway and 0.50m shoulders consisted of PCCP and PCCP with Ac overlay in good to fair conditions. No occurrence of flooding along the entire stretch had been confirmed during interview with local residents. Widening to 6.10m while maintaining a shoulder width of 0.50m could be

accommodated since the existing corridor width varies from 7.10 to 7.50 meters.

- 4) *San Jose-Camachilhan Road* - This 1.05km long provincial road with 5.00m wide and 1.0m shoulders consist of PCCP in fair condition. The whole section however, was identified as flooded section. This was observed from the elevation of the existing bridge located along the section. According to the local residents 1.3m deep flood have occurred during heavy rains.
- 5) *Bustos-Angat Road* - This 2.45km long national road with 6.10m width and 0.50m shoulders consisted of PCCP and PCCP with AC overlay in good to fair condition. Widening is not possible as the section traverses through densely residential area. Traffic condition could be improved with proper mitigation measures such as pavement marking/stripping, road maintenance, etc.. No occurrence of flooding throughout the section was confirmed with the local residents.
- 6) *Baliuag-San Rafael Road* - This 2.65km long provincial road with 5.00m width and 1.0m shoulders consisted of PCCP and AC overlay in fair condition. Distresses such as potholes and crackings were present throughout the section. Maintenance is needed in order to stop further deterioration of the existing pavement. No flooding was identified.
- 7) *Sampaloc-San Rafael Road* - The section of 1.80 km provincial road consisted of fairly new PCCP with 6.10m travelway. However, some sections already showed distresses such as wide cracking and depressions, a clear indication of failed subgrade. Shoulder ranged in width from 0.50 to 1.0m. There was no flood occurrence throughout the section.

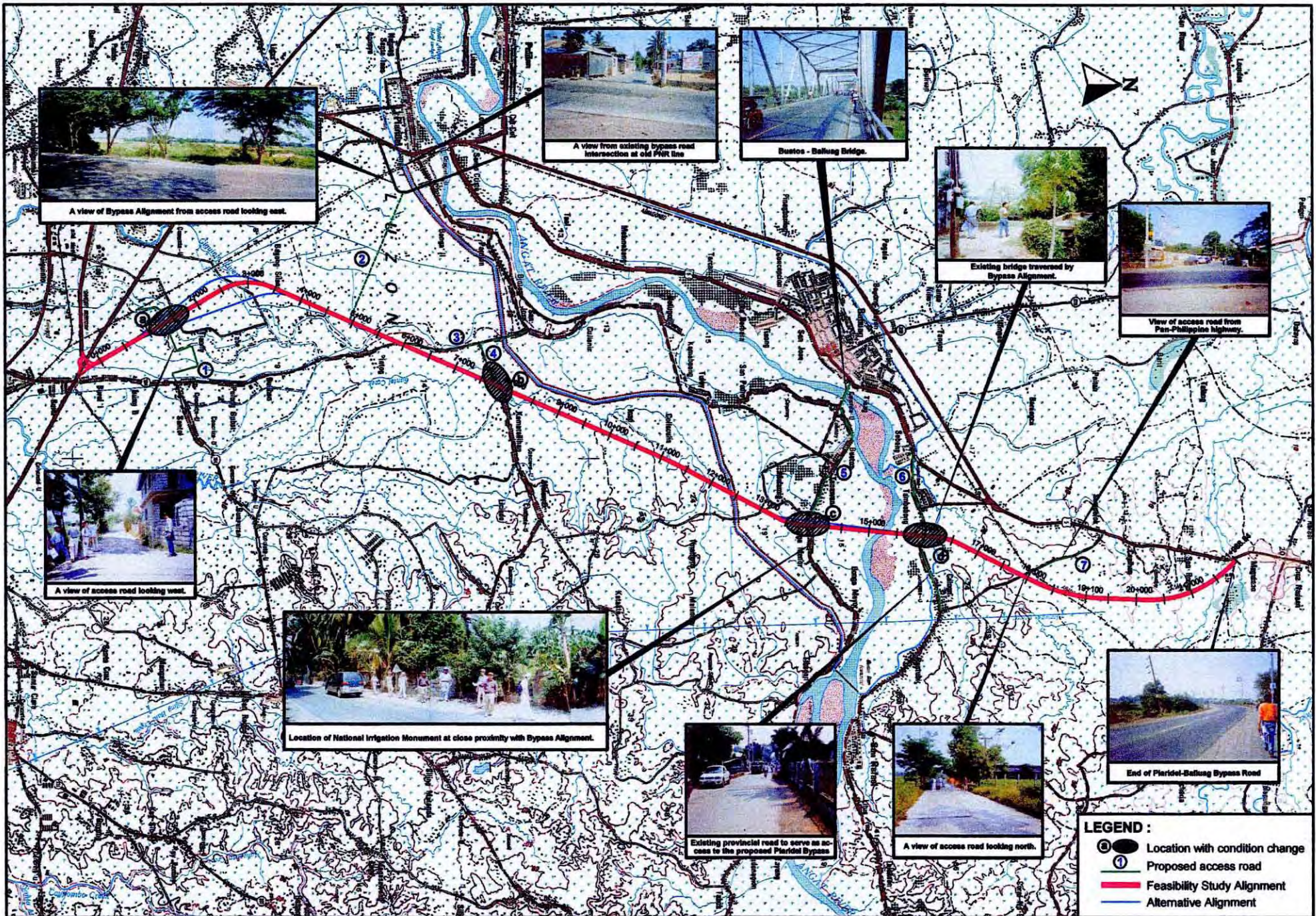
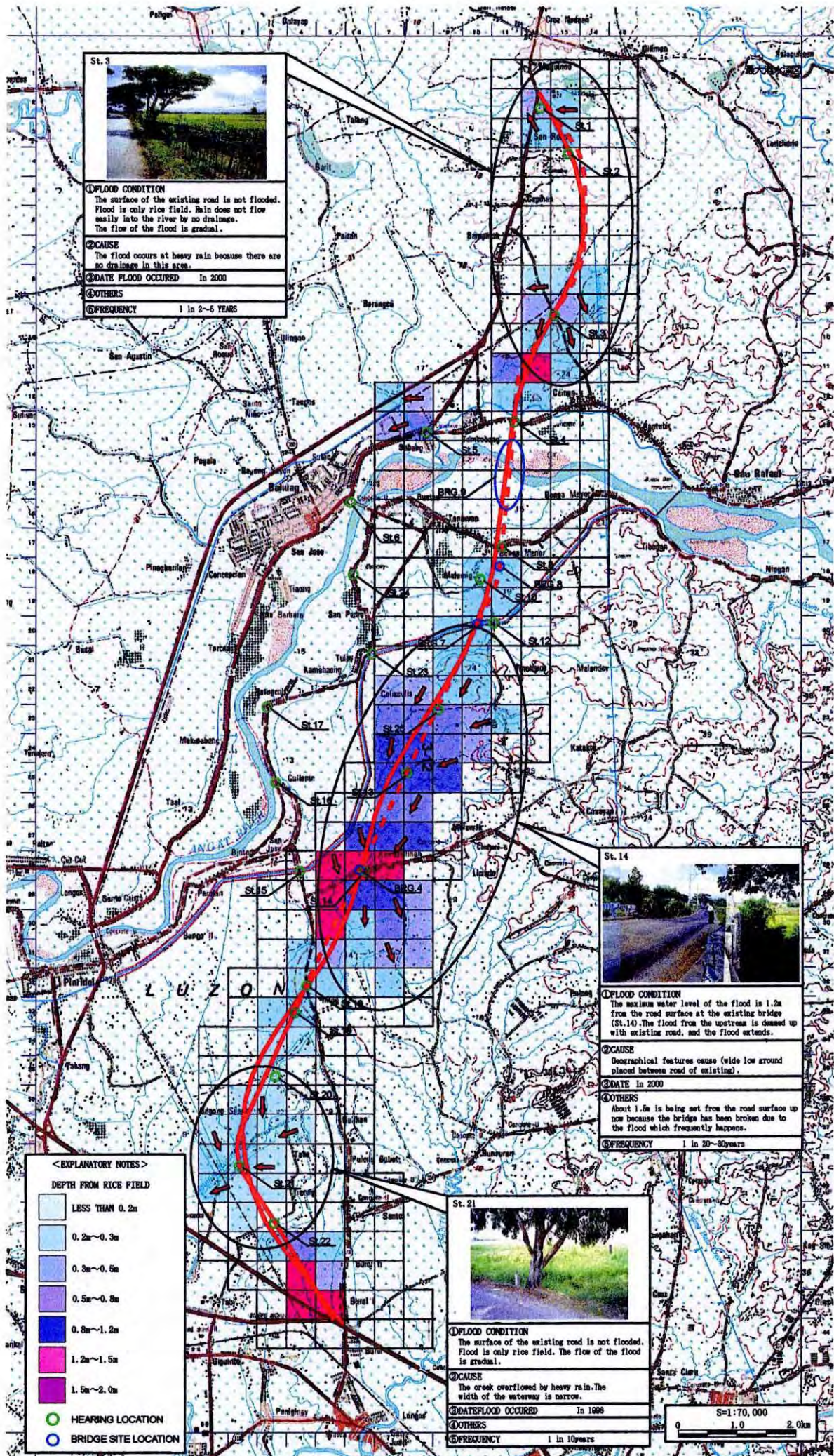


FIGURE 3.3-1 PRESENT CONDITION OF PLARIDEL BYPASS CORRIDOR



St. 3

FLOOD CONDITION
The surface of the existing road is not flooded. Flood is only rice field. Rain does not flow easily into the river by no drainage. The flow of the flood is gradual.

CAUSE
The flood occurs at heavy rain because there are no drainage in this area.

DATE FLOOD OCCURED In 2000

OTHERS

FREQUENCY 1 in 2-5 YEARS

St. 14

FLOOD CONDITION
The maximum water level of the flood is 1.2m from the road surface at the existing bridge (St.14). The flood from the upstream is dammed up with existing road, and the flood extends.

CAUSE
Geographical features cause (wide low ground placed between road of existing).

DATE In 2000

OTHERS
About 1.5m is being set from the road surface up now because the bridge has been broken due to the flood which frequently happens.

FREQUENCY 1 in 20-30years

St. 21

FLOOD CONDITION
The surface of the existing road is not flooded. Flood is only rice field. The flow of the flood is gradual.

CAUSE
The creek overflowed by heavy rain. The width of the waterway is narrow.

DATE FLOOD OCCURED In 1998

OTHERS

FREQUENCY 1 in 10years

<EXPLANATORY NOTES>

DEPTH FROM RICE FIELD

- LESS THAN 0.2m
- 0.2m~0.3m
- 0.3m~0.5m
- 0.5m~0.8m
- 0.8m~1.2m
- 1.2m~1.5m
- 1.5m~2.0m

HEARING LOCATION

BRIDGE SITE LOCATION

FIGURE 3.3-2 FLOOD AREA MAP (PLARIDEL BYPASS)

3.3.2 Cabanatuan Bypass Route

The F/S alignment is shown in Figure 3.3-3.

- a) At the intersection of proposed alignment with Nueva Ecija-Aurora Road at about Sta. 13+170, a permanent concrete house will be affected by the bypass corridor. The concerned structure can be avoided by shifting the alignment by about 30 meters towards east.
- b) At the intersection of the proposed alignment with a minor road just north of Valde Fuente-Fortaleza Road at about Sta. 15+970, six concrete houses will be affected by the bypass alignment. An alternative alignment needs to be studied to minimize structures to be affected.
- c) At the intersection of proposed alignment with a road at approximately Sta. 18+570, a small barangay chapel will be affected. An alternative alignment to avoid the chapel is not feasible because of the existing learning center located at the east and permanent concrete houses at the west side of the F/S alignment. The barangay chapel will be proposed for relocation.
- d) Flood sections were identified as shown in Figure 3.3-4.
 - The beginning point of the alignment along Pan-Philippine Highway (km Post 102+650) up to Sta. 03+700 was identified as the flood section. This was confirmed during interview with local residents, that water from Pampanga River flows across Pan-Philippine Highway (Km Post 102 to Km Post 104) towards the direction of the bypass alignment.
 - Half meter flooding has occurred at the intersection of the proposed alignment with Cabanatuan-Papaya Road during heavy rains. Different kinds of pavement distresses such as wide cracking and depression was evident at this location.
- e) There were no changes to the condition of the proposed alignment at the beginning and end points as these locations were selected outside high density residential areas along the Pan-Philippine Highway. At the end section, the F/S alignment requires a long bridge to span over Talavera River, therefore, alternative alignments needs to be studied to select a more economical alignment.

Access Roads

There are five proposed access routes considered for either new construction or improvement / rehabilitation. (Refer to Figure 3.3-3).

- 1) *Magsaysay Road* - This 3.10km long provincial road consisted of 6.10m wide travelway with no identified shoulder, although 0.50m and 1.50m shoulders on both sides will be provided at built-up sections and at rice paddies, respectively. The existing PCCP pavement was fairly new but cracking and depression at several locations were rampant. This condition was seemed to be a clear indication of subgrade failure. No flooding was identified throughout the section.
- 2) *Cabanatuan-Papaya Road* - This 1.80km portion of a provincial road consisted of 6.10m wide travelway with 2.00m wide unmaintained shoulders. The existing pavement was in good condition but flooding to 0.30m deep at proposed intersection with the bypass alignment occurred during heavy rains.
- 3) *New Access Road* - This new road will directly connect the bypass road to the Circumferential Road in Cabanatuan City. The portion of the road from the bypass alignment to Cabanatuan-Papaya Road intersection which will traverse through rice paddies was still non-existent. From this intersection to the Circumferential Road, the existing road was 6.50m wide paved with gravel. Per interview with local residents, a knee deep flooding usually occurred during heavy rains.
- 4) *Nueva Ecija-Aurora Road* - This 2.05km portion of a national road consisted of 6.10m travelway with 1.80meter shoulders. Distresses such as potholes and crackings were observed in the section. No occurrence of flooding was recorded.
- 5) *Valde Fuerte-Fortaleza Road* - From Pan-Philippine Highway to approximately 2 km towards east, the road consisted of newly constructed pavement with sections still under construction. The new pavement was 6.10m PCC with 0.50m shoulder. The remaining 1.50km was still gravel paved.

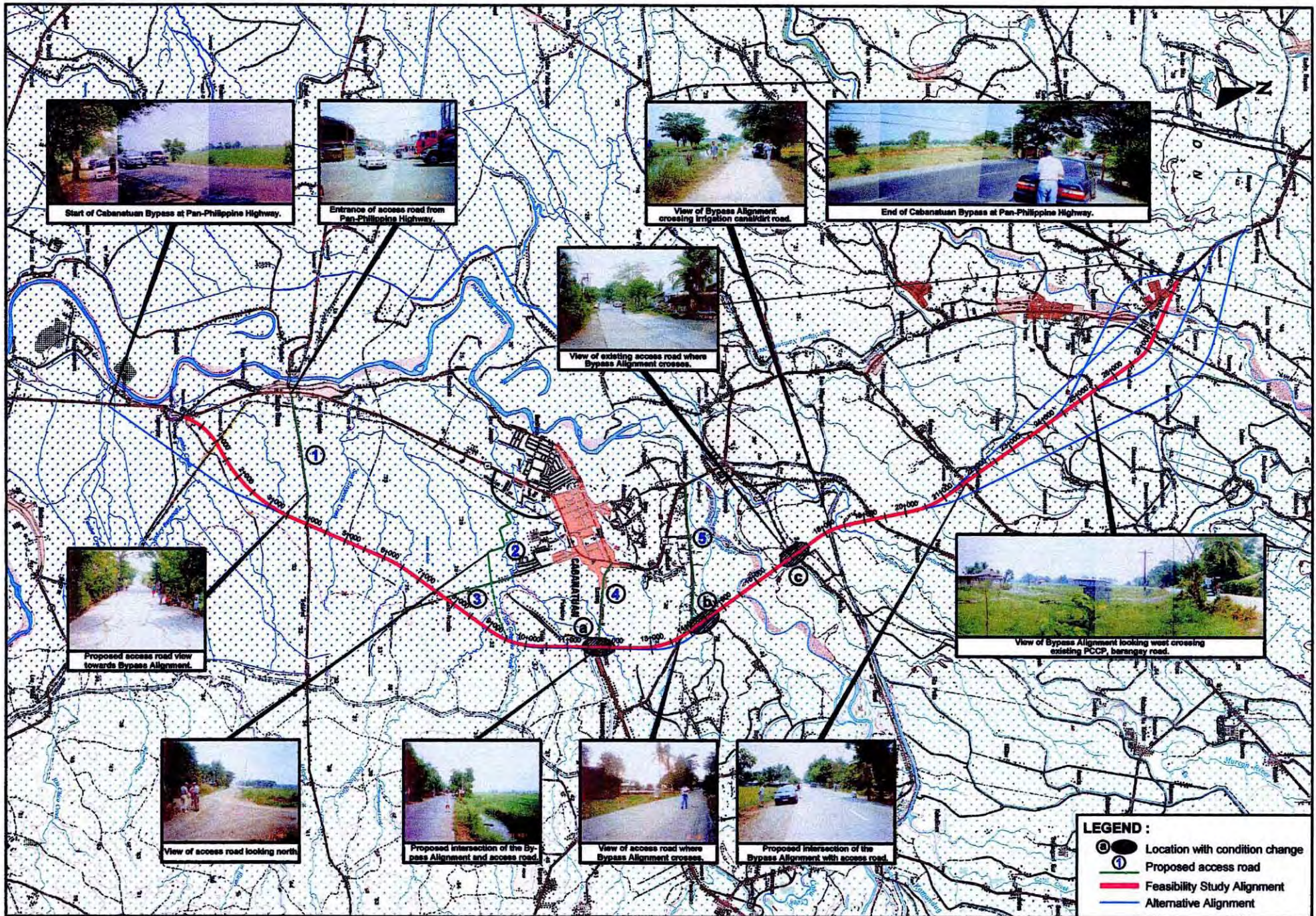


FIGURE 3.3-3 PRESENT CONDITION OF CABANATUAN BYPASS CORRIDOR

LEGEND :

- A Location with condition change
- 1 Proposed access road
- Feasibility Study Alignment
- Alternative Alignment

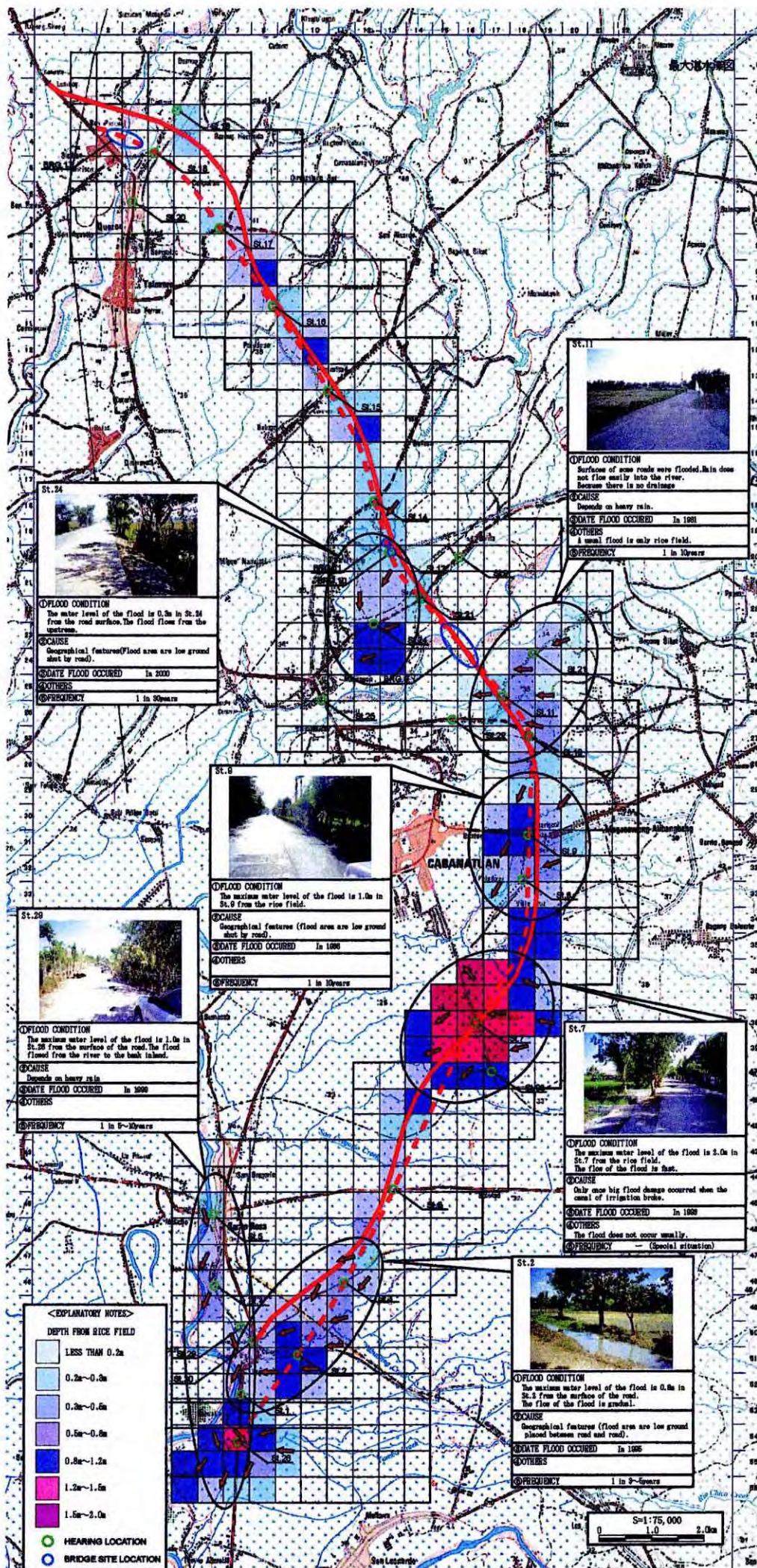


FIGURE 3.3-4 FLOOD AREA MAP (CABANATUAN BYPASS)

3.3.3 San Jose Bypass Route

The F/S alignment is shown in Figure 3.3-5.

- a) At the intersection of proposed alignment with Nueva Ecija-Pangasinan Road at about Sta. 2+850, on-going construction and newly built concrete houses will be directly traversed by the bypass alignment.
- b) At about Sta. 05+100 to Sta. 05+400, the proposed alignment traverses on swampy area. An alternative alignment west of the F/S alignment needs to be studied to avoid this area.
- c) There were no changes to the condition of the proposed alignment at the beginning and end points as these locations were selected outside the high density residential areas along the Pan-Philippine Highway.
- d) Identified flood sections are shown in Figure 3.3-6.

Access Roads

There are two access roads proposed for new construction or improvement/rehabilitation for the San Jose Bypass. (Refer to Figure 3.3-5).

- 1) *Nueva Ecija-Pangasinan Road* - This 2.25km long national road consisted of 6.10m wide travelway with 1.80m shoulders. The present PCCP and PCCP with AC overlay was in good to fair condition. No flooding occurred in the area.
- 2) *New Access Road* - The 1.67km of roadway was still non-existent but would be traversing through rice paddies. The proposed road will directly connect the proposed Bypass with the existing Pan-Philippine Highway. No flooding occurred in the end points of the access road.

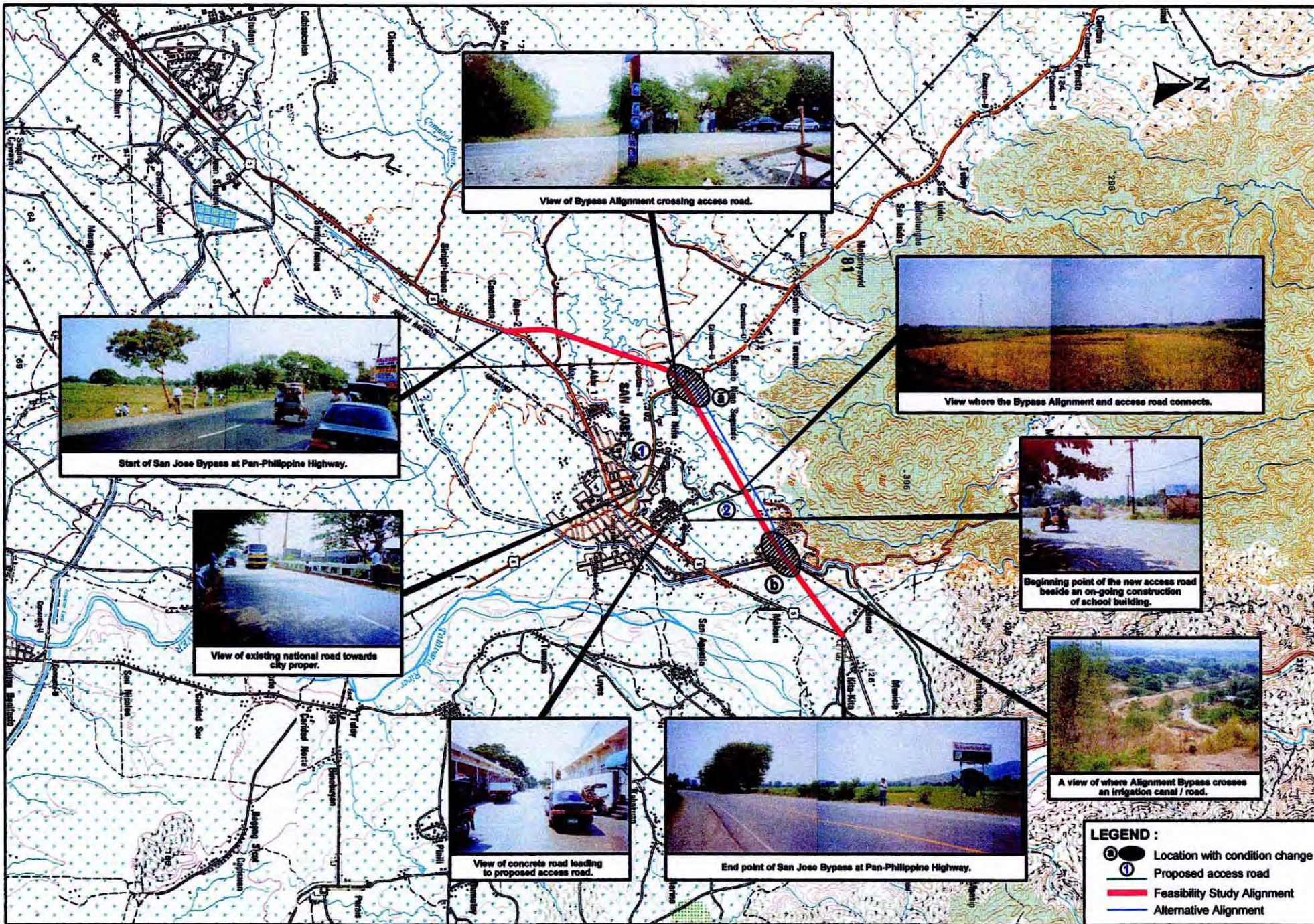


FIGURE 3.3-5 PRESENT CONDITION OF SAN JOSE BYPASS CORRIDOR

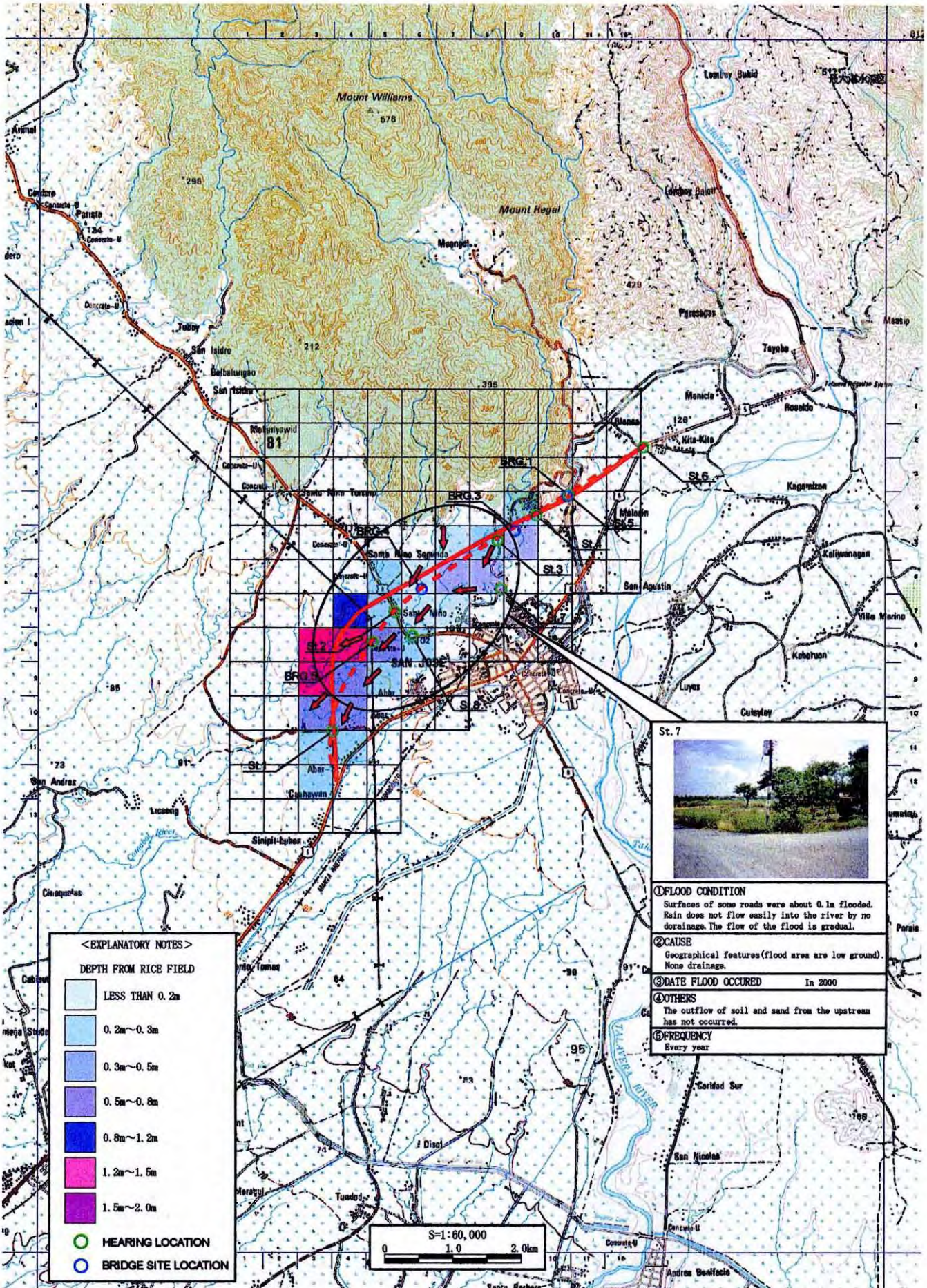


FIGURE 3.3-6 FLOOD AREA MAP (SAN JOSE BYPASS)

3.3-4 Interchange Site (Plaridel Bypass)

The Interchange location is shown in Figure 3.3-7

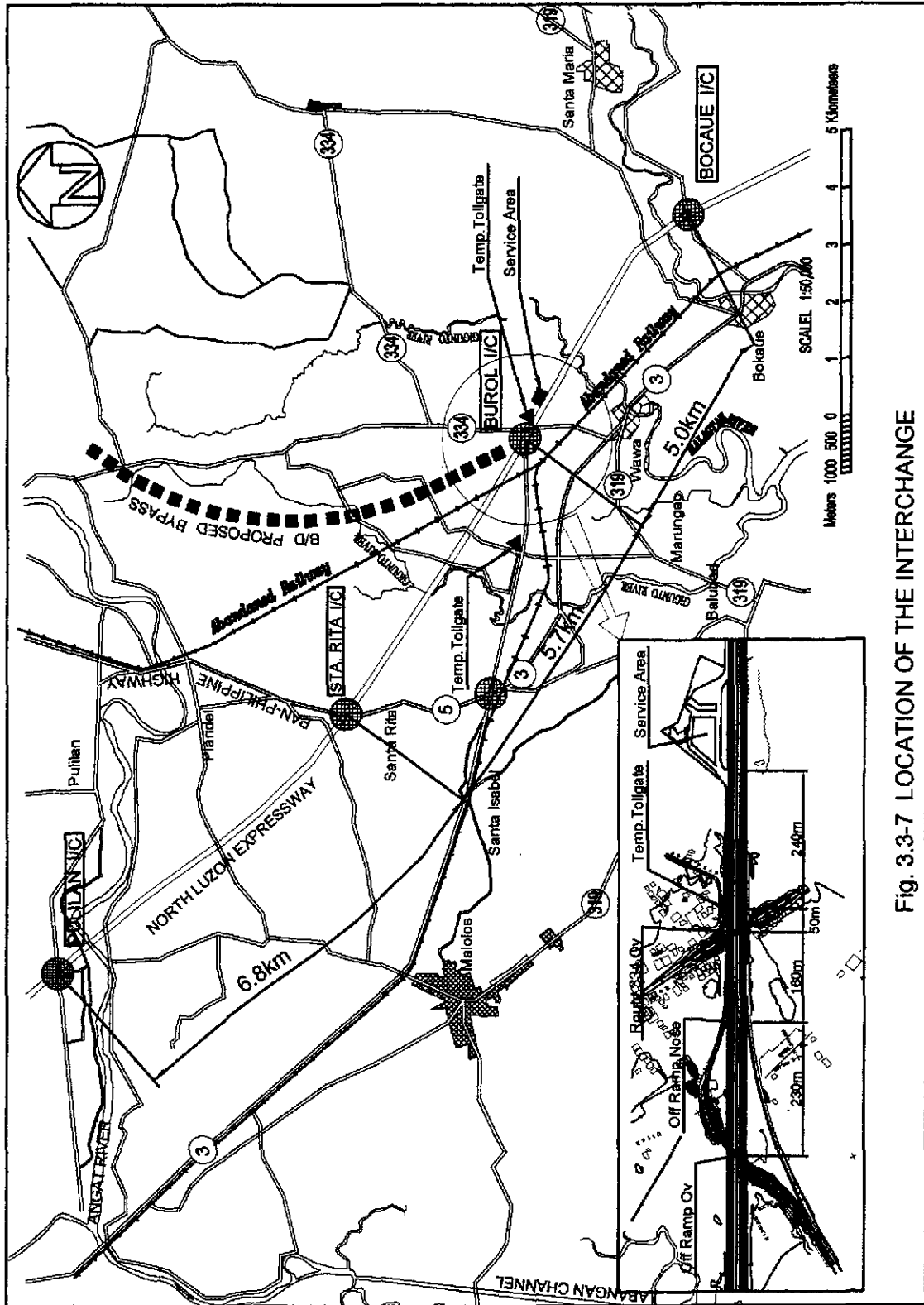


Fig. 3.3-7 LOCATION OF THE INTERCHANGE

FIGURE 3.3-7 LOCATION INTERCHANGE

Conditions of North Luzon Expressway and its related roads are as follows:

Number of Lane

(a) Plaridel Bypass		
Ultimate Stage		4-lane
Initial Stage		2-lane
(b) North Luzon Expressway		
Future Plan		8 to 6-lane (Under Planning)
Existing carriageway		4-lane
© Divided Highway (from Burol interchange on NLE)		
Existing Thruway		4-lane
Existing On and Off Ramp		each 1-lane
(d) Provincial Road Route No.334		
Existing carriageway		2-lane

Design Speed

(a) Plaridel Bypass		
Ultimate Stage		80 km/h
Initial Stage		80 km/h
(b) North Luzon Expressway		
Future Plan		100 km/h (Under Planning)
Existing carriageway		100 km/h
© Divided Highway (from Wawa interchange on NLE)		
Existing Thruway		80 km/h
Existing On and Off Ramp		50 km/h
(d) Provincial Road Route No.334		
Existing carriageway		50 km/h

Vertical Clearance

Existing Over Bridge		4.27 m
New Design Standard		5.12 m (included overlay t=13cm)

3.4 Supplemental Traffic Survey

3.4.1 Traffic Survey Undertaken

Roadside and intersection traffic count surveys were performed at eight (8) stations respectively as shown in Figure 3.4-1 in order to update the traffic data.

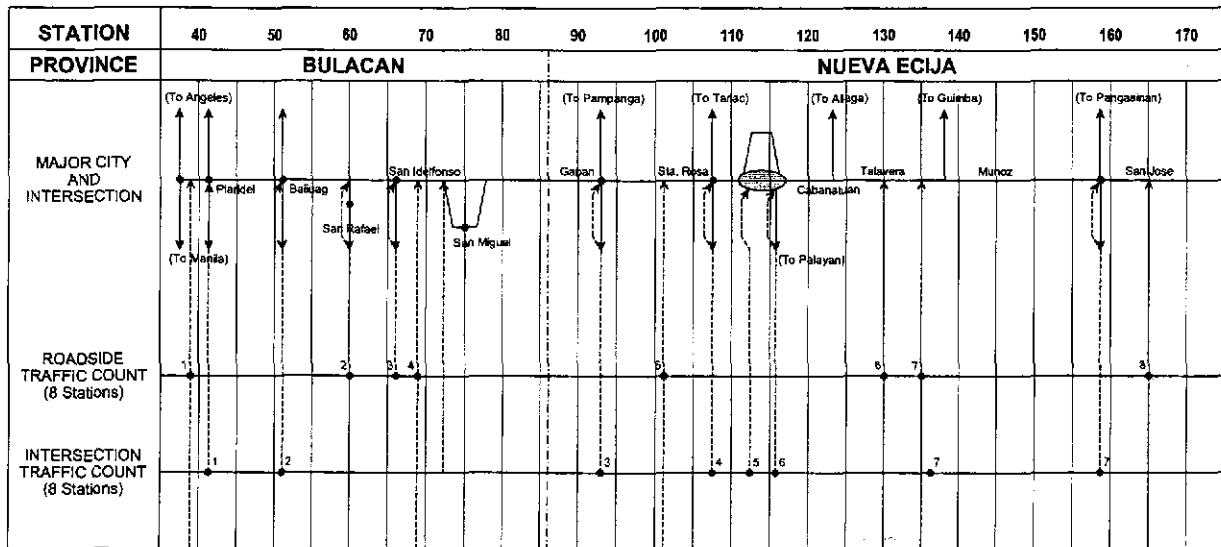


FIGURE 3.4-1 TRAFFIC SURVEY STATIONS

3.4.2 Traffic Survey Results

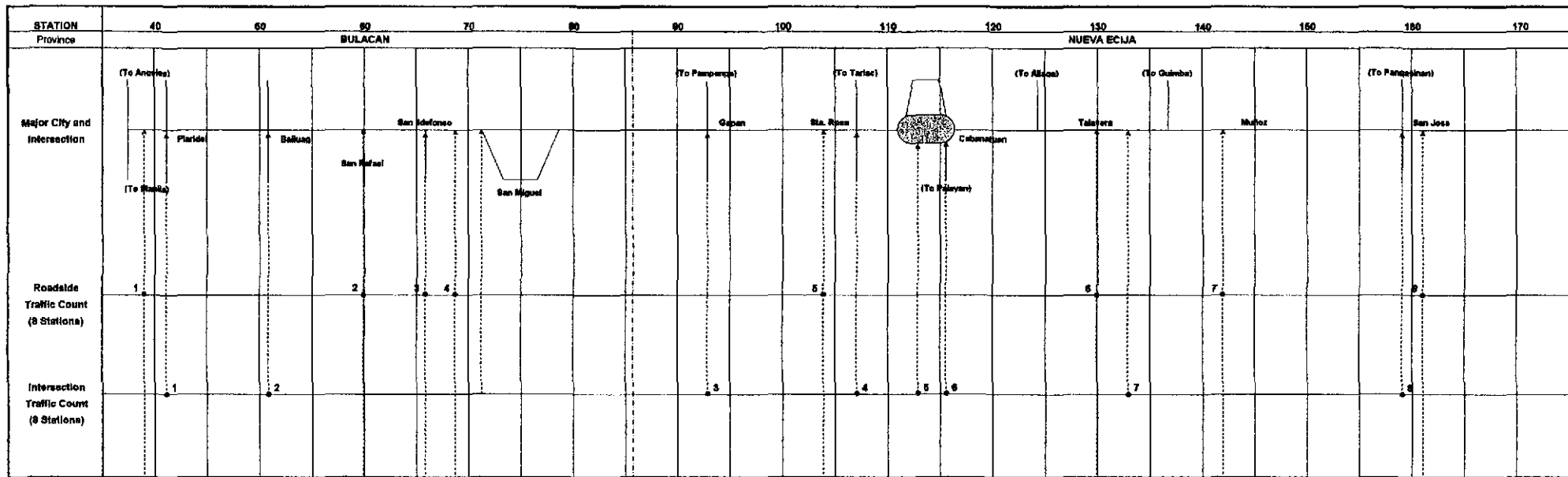
The following traffic counts were undertaken in April 2001:

- Roadside traffic count (RTC) at 8 stations
- Intersection traffic count (ITC) at 8 stations

The location of the traffic survey station is shown in Figure 3.4-1. The 12-hour count from 6:00 A.M. to 6:00 P.M. for two consecutive week days was undertaken at each survey station.

The 12-hour survey results were converted to AADT and compared with the results of 1998 traffic survey as shown in Figure 3.4-2 and Table 3.4-1.

The existing Pan-Philippine Highway carries heavy traffic ranging from 11,100 to 56,300 veh./day in 2001. At most traffic survey stations, traffic increased from 1998 to 2001 at the rate of 1.6 to 20.7% per annum, except at the Talavera section (RTC-06) where traffic remained the same and at the San Jose intersection (ITC-08) where traffic decreased slightly.



3-16

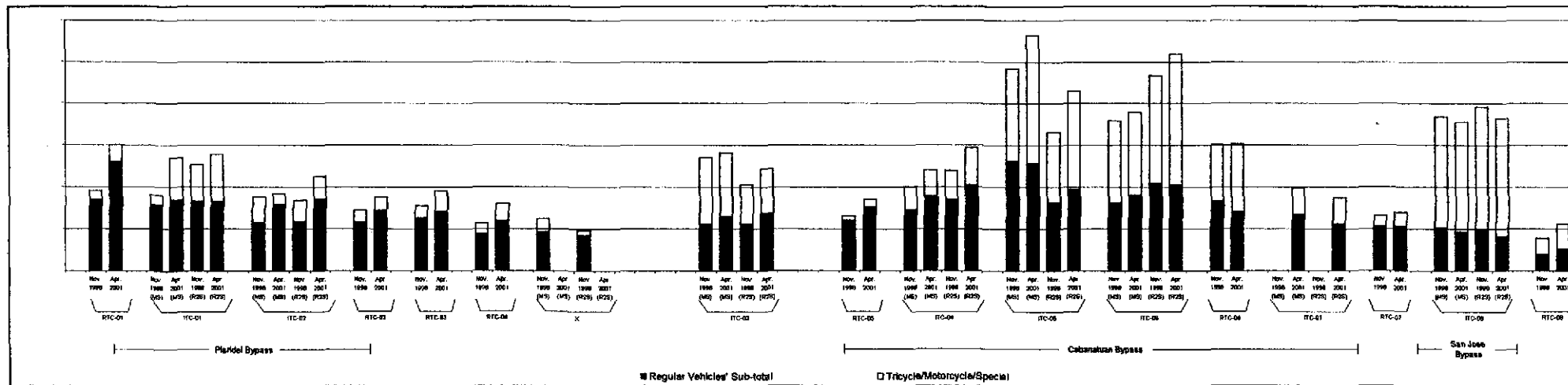


FIGURE 3.4-2 TRAFFIC COUNT SURVEY STATIONS AND RESULTS

TABLE 3.4-1 (1) AADT ALONG THE STUDY ROAD (1998 and 2001)
Detailed Design Study on Upgrading Inter-Urban Highway System along the Pan-Philippine Highway (Plaridel, Cabanatuan and San Jose Bypasses)

Survey Station No.	Location	Km.	Survey Conducted	AADT by Vehicle Type					Average Growth Rate (% per annum)	Tricycle/Motor-cycle/Special	Total	Average Growth Rate (% per annum)
				Car/Taxi/Jeep/ Pick-up/Van	Jeepney	Bus	Truck	Sub-total				
RTC-01	Sta. Rita, Plaridel	Km. 39	Nov. 1998	10,322	2,383	1,128	2,978	16,811	19.57%	2,213	19,024	20.72%
			Apr. 2001	15,930	3,541	1,808	4,616	25,895				
ITC-01	Plaridel Intersection (Manila Side)	Km. 41+400	Nov. 1998	11,446	184	772	3,196	15,598	3.24%	2,484	18,082	17.92%
			Apr. 2001	9,718	4,592	1,146	1,393	16,849				
ITC-01	Plaridel Intersection (Region II Side)	Km. 41+450	Nov. 1998	12,177	350	773	3,218	16,518	-0.16%	8,792	25,310	3.97%
			Apr. 2001	10,380	3,616	1,131	1,326	16,453				
ITC-02	Baliuag Intersection (Manila Side)	Km. 50+810	Nov. 1998	6,867	2,591	1,111	776	11,345	14.75%	6,312	17,657	1.62%
			Apr. 2001	9,986	440	1,369	4,025	15,820				
ITC-02	Baliuag Intersection (Region II Side)	Km. 50+860	Nov. 1998	5,617	3,688	1,112	1,243	11,660	16.98%	5,124	16,784	12.79%
			Apr. 2001	11,166	545	1,351	3,972	17,034				
RTC-02	San Rafael	Km. 60	Nov. 1998	7,156	1,345	765	2,190	11,456	9.46%	2,920	14,376	8.59%
			Apr. 2001	8,581	1,607	1,182	2,882	14,252				
RTC-03	San Ildefonso	Km. 66	Nov. 1998	7,884	1,811	898	1,881	12,474	5.11%	3,079	15,553	8.73%
			Apr. 2001	8,671	1,786	1,210	2,405	14,072				
RTC-04	San Ildefonso-San Miguel	Km. 68	Nov. 1998	5,689	461	844	1,594	8,588	13.92%	2,716	11,304	15.45%
			Apr. 2001	7,598	475	907	2,787	11,767				
X	San Miguel Intersection (Manila Side)	Km. 72+800	Nov. 1998	6,341	479	874	1,569	9,263	-	3,108	12,371	-
			Apr. 2001									
ITC-03	Gapan Intersection (Manila Side)	Km. 93+450	Nov. 1998	7,472	847	827	1,941	11,087	6.18%	15,838	26,925	1.85%
			Apr. 2001	7,766	898	860	3,292	12,816				
ITC-03	Gapan Intersection (Region II Side)	Km. 93+500	Nov. 1998	6,829	1,602	928	1,661	11,020	9.04%	9,535	20,555	7.13%
			Apr. 2001	7,681	1,922	942	3,040	13,585				
RTC-05	Gapan-Sta. Rosa	Km. 104	Nov. 1998	7,618	1,704	772	1,876	11,970	10.45%	1,054	13,024	11.98%
			Apr. 2001	9,568	1,689	888	3,074	15,219				
ITC-04	Sta. Rosa Intersection (Manila Side)	Km. 107+020	Nov. 1998	8,414	3,162	877	2,067	14,520	8.42%	5,559	20,079	7.77%
			Apr. 2001	10,381	3,027	911	3,336	17,655				
ITC-04	Sta. Rosa Intersection (Region II Side)	Km. 107+070	Nov. 1998	10,011	3,647	948	2,214	16,820	8.23%	7,011	23,831	8.97%
			Apr. 2001	11,974	3,746	992	3,652	20,364				

TABLE 3.4-1 (2) AADT ALONG THE STUDY ROAD (1998 and 2001)
Detailed Design Study on Upgrading Inter-Urban Highway System along the Pan-Philippine Highway (Plaridel, Cabanatuan and San Jose Bypasses)

Survey Station No.	Location	Km.	Survey Conducted	AADT by Vehicle Type					Average Growth Rate (% per annum)	Tricycle/Motor-cycle/Special	Total	Growth Rate (% per annum)
				Car/Taxi/Jeep/Pick-up/Van	Jeepney	Bus	Truck	Sub-total				
ITC-05	Cabanatuan 1 Intersection (Manila Side)	Km. 113+700	Nov. 1998	18,966	4,479	504	2,188	26,137	-0.88%	22,205	48,342	6.52%
			Apr. 2001	18,190	3,155	370	3,867	25,582				
	Cabanatuan 1 Intersection (Reg. II Side)	Km. 113+800	Nov. 1998	13,409	520	432	1,832	16,193	7.64%	16,871	33,064	11.35%
			Apr. 2001	14,011	1,090	463	3,784	19,348				
ITC-06	Cabanatuan 2 Intersection (Manila Side)	Km. 115+950	Nov. 1998	9,878	3,298	666	2,169	16,011	4.90%	19,758	35,769	2.29%
			Apr. 2001	9,738	4,501	831	2,903	17,973				
	Cabanatuan 2 Intersection (Reg. II Side)	Km. 116+000	Nov. 1998	12,380	5,488	652	2,210	20,730	-0.67%	26,016	46,746	4.42%
			Apr. 2001	12,314	4,509	638	2,933	20,394				
RTC-06	Talavera	Km. 130	Nov. 1998	10,070	3,460	344	2,629	16,503	-6.68%	13,630	30,133	0.04%
			Apr. 2001	7,272	3,322	483	2,887	13,964				
ITC-07	Calipahan Intersection (Manila Side)	Km. 132+950	Nov. 1998						-	6,291	19,618	-
			Apr. 2001	6,493	3,768	438	2,628	13,327				
	Calipahan Intersection (Reg. II Side)	Km. 133+000	Nov. 1998						-	6,251	17,326	-
			Apr. 2001	5,079	3,183	436	2,377	11,075				
RTC-07	Talavera - Munoz	Km. 142	Nov. 1998	5,420	2,600	265	2,223	10,508	0.26%	2,569	13,077	2.80%
			Apr. 2001	5,188	2,844	500	2,044	10,576				
ITC-08	San Jose Intersection (Manila Side)	Km. 159+050	Nov. 1998	6,101	1,651	214	2,229	10,195	-3.87%	26,615	36,810	-1.47%
			Apr. 2001	5,459	1,330	339	2,140	9,268				
	San Jose Intersection (Region II Side)	Km. 159+100	Nov. 1998	6,443	779	253	2,374	9,849	-8.03%	29,294	39,143	-3.05%
			Apr. 2001	5,043	703	495	1,803	8,044				
RTC-08	San Jose (Outside Urban Center)	Km. 161	Nov. 1998	2,064	278	244	1,168	3,754	12.80%	3,951	7,705	16.54%
			Apr. 2001	2,451	652	527	1,394	5,024				