BRIDGE INSPECTION AND EVALUTION REPORT

RN-7E ROAD

RIO DULCE- EL ESTOR SECTION

Guatemala, May 2006 (Final)

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REFERENCE INDEX Page

1.0 INSPECTION AND EVALUATION REPORT

This report includes the results of the field visit to evaluate the bridges between Rio Dulce and El Estor along Road RN-7E. The field visit results were supplemented by the revision of design drawings which were gathered in DGC (General Road Directorate) and through private companies which were part of the design-construction process of some of the bridges.

Between Rio Dulce and El Estor, there are 15 bridges of different types and geometric and functional characteristics. A summary of them is presented in Annex 2.

The road/bridges construction administrator is DGC, but design drawings could be found completely at this institution. More over, some of the bridges were not totally built under DGC administration. For theses bridges, DGC was responsible mainly for the superstructure construction. That is probably the reason why some drawings of the substructures are missing at DGC. Because of the bridges' lack of information, assumptions were made regarding some of their elements based on site observations.

The design drawings found are as follows:

BRIDGE	DRAWINGS
ZARCO	Superstructure and Substructure
TUNICO	Superstructure
CICLON PRIETO	Superstructure
AGUA CALIENTE	Superstructure
MANACAS	Superstructure
LA MAQUINA	Superstructure
PEDERNALES	Superstructure

All bridges, besides of Sumach, were designed for AASHTO HS20-44 load. Even though some of the bridges lack plans, this structural configuration was assumed based on both; the DGC policy for the bridges constructed in the 90's, and the drawings of the similar bridges along the road section, which were built by the same contractor.

However, during the inspection it was found that not all AASHTO construction specifications were fulfilled. For example, we observed the lack of diaphragms (internals and externals), expansion joints as well as anti-seismic restraints.

Also, some differences between design drawings and what was finally built were observed. Regarding these differences we can mention the placement of Asphalt Concrete (AC) layers on some of the bridge decks, and there are no expansion

joints in many bridges (only observed in those bridges located on the paved section of the road).

All bridges, besides of Sumach, have elastomeric bearings. Sumach has balance beams bearings.

All bridges drawings, beside Zarco, contain information only of the superstructure. Because of this, the foundation types in most of the bridges are unknown, and could only be observed during the site visit.

Most of the bridges were built by REGA CONSULTORES in 1999. Sumach was built in 1998.
None of them have appear to have received any maintenance since then.

The defects observed in each bridge are described in the technical reports in Annex 3. Also, in these technical reports, a detailed description of all bridges is provided.

In Annex 4 an analysis of maximum moments and shear stresses on two spans were done, one for 15 meters and another for 22 meters length. For the load stress analysis, the assumption of a T3-S3 type vehicle with its maximum allowed weight of 41 ton was assumed. This assumption was made based on Guatemalan law regarding Weight and Dimensions of vehicles driving Guatemalan roads (see annex V). Furthermore, computation for the load configuration given by the client was also done, and results are present in Annex 4.

2.0 CONCLUSIONS

The study identifies multiple minor and major concerns, such as:

- Lack of available drawings and records.
- Incomplete construction such as omission of internal and end diaphragms even though some of the precast girders display recesses for that purpose. (Note: the trend for relatively short span bridges such as these is to omit internal diaphragms provided the deck slab is properly designed for this situation.)
- Deteriorated deck slabs.
- Damaged girders including exposed prestressed strands.
- Missing continuity connections in Bailey type Sumach Bridge and the excessive residual deflection.
- Lack of expansion joints.
- Scour and Erosion.
- Lack of design information and lack of site access concerning founding materials, piles and spread footing foundations.
- Lack of seismic restraints.
- Hydraulic concerns at La Quebrada.
- Limit stress capacity (moments) of bridges (with HS20-44 design load) to stand traffic loads with maximum weights need to be checked.
  The result of the analysis in Annex 4 shows that neither the 15 meter span nor the 22 meter span bridge can take the truck configuration with its maximum load of 40 tons. We can assume that a maximum load of an AASHTO HS20-44 truck load configuration of 32.7 ton can be taken. However, the bridge constructions show that some AASHTO design considerations were not taken. This means that deeper analysis of each bridge that takes into consideration the bridge present construction condition and its damages, can only tell the real load capacity of each of them.

Based on the above, the bridges that require major analysis and assessments to evaluate structural demands and capacities, and to produce concept designs of any required upgrades for the transit loads defined by the project are:

Sumach Bridge: This bridge has a superstructure for with an unknown load capacity, and has large midspan deflections.

Tunico Bridge: The bridge has scour in one of its piers, cracks in the riding deck (on top and bottom sides between two beams), and the fact that one of its long beams has no diaphragms at a location where the prestressed cables are exposed.

Agua Caliente Bridge: This bridge has some strucked beams with exposed prestressed cables, and also cracks in the main beams.

El Sauce or Boqueron Bridge: The bridge shows marked scour in its piers and exit abutment. Also, its beams are quite longspan for not having diaphragms.

Zarco Bridge: The bridge driving deck is in a considerable state of damage.

San Jorge Bridge: The bridge driving deck is in a considerable state of damage.

Puente Quebrada I: The bridge driving deck is in a considerable state of damage. The entry abutment fin is eroded and there is scouring at the exit abutment. A hydraulic study should be considered.

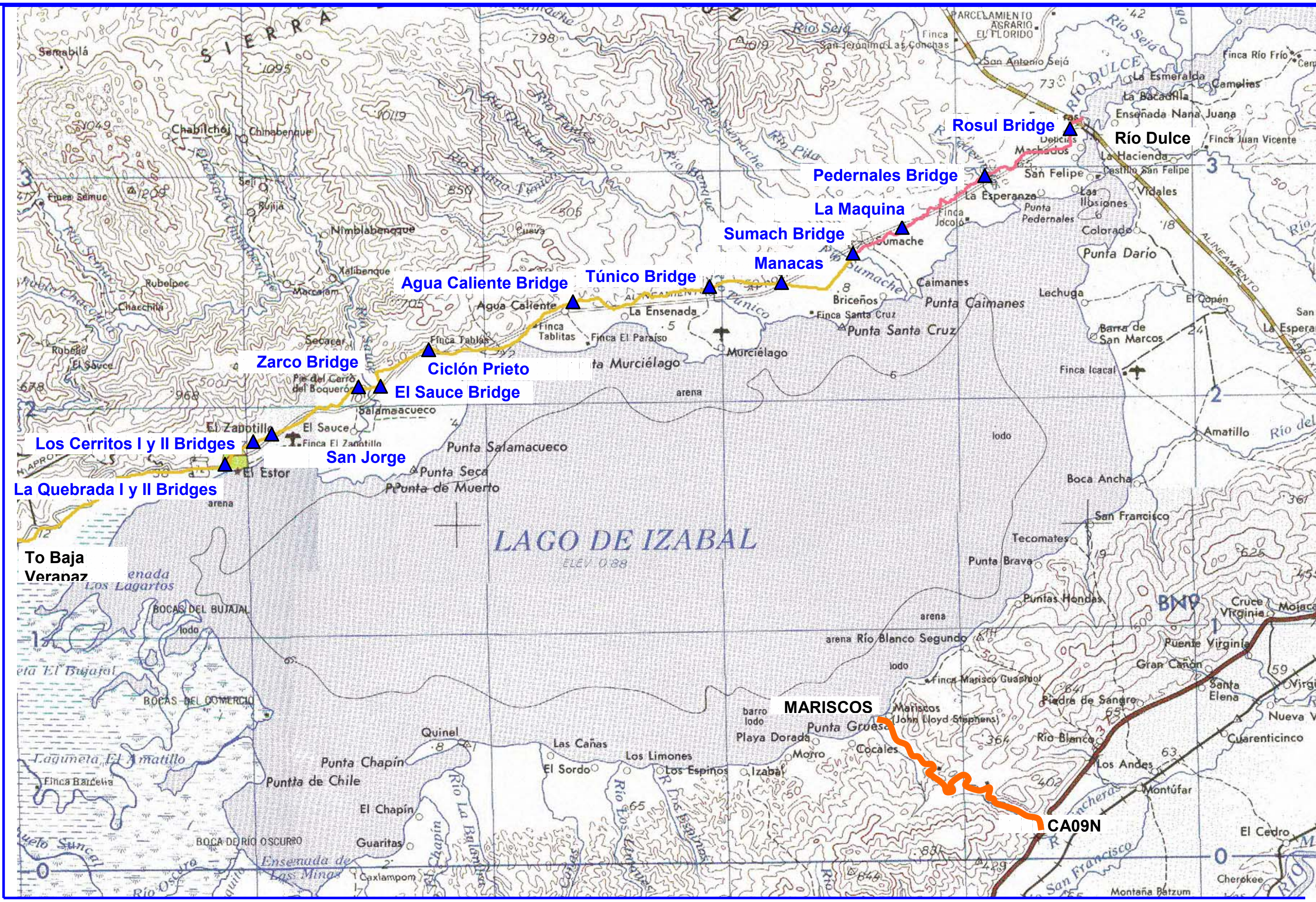
Puente Quebrada II: The bridge shows scour in the entry abutment.

Even that the above bridges require special attention, the rest of the bridges might need structural strengthening.

Note:
Entry side is Rio Dulce and exit side is the El Estor side of the bridge.
Design calculations of all bridge should be obtained to assure structural bridge structural capacity.

Annex 1

SITE MAP AND BRIDGE LOCATION


Rosul Bridge
Río Dulce
Pedernales Bridge
La Maquina
Sumach Bridge
Manacas
Túnico Bridge
Agua Caliente Bridge
Zarco Bridge
Ciclón Prieto
El Sauce Bridge
Los Cerritos I y II Bridges
San Jorge
La Quebrada I y II Bridges
To Baja Verapaz
LAGO DE IZABAL
MARISCOS
CA09N

Annex 2

SUMMARY OF BRIDGES CHARACTERISTICS

BRIDGES ON RN 7E ROAD: RIO DULCE - EL ESTOR SECTION							
Id	**BRIDGE**	**Km.**	**Type**	**Length and number of spans**	**LOAD CAPACITY**	**DRAWINGS**	**OBSERVATIONS**
1	ROSUL	00+900	CONCRETE	15 M. SINGLE SPAN	HS-20-44	NO	
2	PEDERNALES	05+000	CONCRETE	21 M. SINGLE SPAN	HS-20-44	SUPERSTRUCTURE	
3	LA MAQUINA	10+000	CONCRETE	15 M. SINGLE SPAN	HS-20-44	SUPERSTRUCTURE	
4	SUMACH	12+000	BAILEY	76.25 M. TWO SPANS 30.50 AND 45.75 M.	DESCONOCIDA	NO	SHOWS CONSIDERABLE DEFLECTIONS
5	MANACAS	16+000	CONCRETE	15 M. SINGLE SPAN	HS-20-44	SUPERSTRUCTURE	
6	TUNICO	18+000	CONCRETE	65.50 M. THREE SPANS 22, 21.50 AND 22 M.	HS-20-44	SUPERSTRUCTURE	SCOUR DECK CRACKS BETWEEN BEAMS STRUCKED BEAMS
7	AGUA CALIENTE	25+000	CONCRETE	21 M. SINGLE SPAN	HS-20-44	SUPERSTRUCTURE	CRACKED DECK STRUCKED BEAMS
8	CICLON PRIETO	31+000	CONCRETE	18 M. SINGLE SPAN	HS-20-44	SUPERSTRUCTURE	
9	EL SAUCE O BOQUERON	34+000	CONCRETE	60 M. THREE SPANS 22, 22 AND 16 M.	HS-20-44	NO	STRONG SCOUR IN PIERS AND ABUTMENT
10	ZARCO	35+000	CONCRETE	22 M. SINGLE SPAN	HS-20-44	COMPLETE	DAMAGED DECK
11	SAN JORGE	39+000	CONCRETE	14 M. SINGLE SPAN	HS-20-44	NO	DAMAGED DECK
12	LOS CERRITOS I	40+000 LD	CONCRETE	18 M. SINGLE SPAN	HS-20-44	NO	
13	LOS CERRITOS II	40+000 LI	CONCRETE	18 M. SINGLE SPAN	HS-20-44	NO	
14	LA QUEBRADA I	42+000 LD	CONCRETE	16 M. SINGLE SPAN	HS-20-44	NO	SCOUR DAMAGED DECK EROSION IN ABUTMENT FIN AND SIDEWALK
15	LA QUEBRADA II	42+000 LI	CONCRETE	16 M. SINGLE SPAN	HS-20-44	NO	EROSION IN ABUTMENT FIN AND SIDEWALK

Annex 3

BRIDGES' TECHNICAL REPORT

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Annex 4

MAXIMUM MOMENTS AND MAXIMUM SHEARS FOR AASHTO HS-20-44 BRIDGE CONFIGURATION (15 AND 22 METER SPANS)

Annex 5

ALLOWED WEIGHTS AND DIMENSIONS FOR GUATEMALA