

March 13, 2008

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Attn: Mr. Leonard Fontes

**RE: Preliminary Geotechnical Engineering Services  
Preliminary DCR Preliminary Bridge Selection  
Palo Parado over Santa Cruz River  
Santa Cruz County, Arizona  
Terracon Project No. 63085039**

Terracon Consultants, Inc. (Terracon) has completed our preliminary review of expected geotechnical conditions and issues for this project. Our work was performed in general accordance with our proposal number D6308056, dated March 6, 2008.

#### **PROJECT DESCRIPTION**

The proposed bridge location will cross the Santa Cruz River on what is currently private property at Palo Parado. Currently the crossing is a dirt road across the perennial river bottom. The banks of the river are unprotected at this time. The proposed project consists of providing preliminary opinions on expected geotechnical conditions for this proposed bridge crossing that may span 360 to 400 feet. We expect the bridge would be multi-span, supported at the abutments on the river banks and also within the flow channel.

#### **WORK PERFORMED AND PRELIMINARY OPINIONS**

The preliminary opinions are based on our previous experience and knowledge of the conditions and what we expect may be encountered in the subsurface at this location. This evaluation did not include subsurface exploration by drilling and sampling, and any opinions are subject to re-evaluation following subsequent work.

From our experience in the area and with similar bridge crossings, we expect a bridge at this location to be supported on deep drilled shaft foundations extending below design scour elevations. We do not have any information on design scour depths, but we expect they would be on the order of 15 to 30 feet below the river bottom elevation.

We expect the subsurface soils within about five feet of the ground surface at the banks of the river to be silty or clayey sands with varied amounts of gravel. Below depths of about five feet at the banks, and below the surface of the river bottom, we expect the subsurface soils to consist of sands with gravel, having trace fines and numerous cobbles. We expect some of the subsurface layers to have significant amounts of gravel and cobbles, and could also contain higher percentages of clay within the sand-gravel-cobble matrix. We do not expect bedrock to be encountered within 100 feet of the ground surface.

These soils are expected to be moderately dense to very dense below depths of about 10 feet from the ground surface. Groundwater might be encountered, particularly at depths of 30 feet or more below the ground surface.

If a drilled shaft foundation system was used, contributions to the axial and lateral capacities of the shafts would not be considered at depths above the scour elevation. Shaft diameters between about three and eight feet, extending to depths between 60 and 80 feet below the river bottom elevation might be recommended.

Construction of drilled shafts might require casing if sloughing cohesionless soils, or running (saturated clean) sands are encountered. Shaft de-watering may be required due to groundwater prior to the placement of reinforcing steel and concrete.

## **GENERAL COMMENTS**

The preliminary opinions presented in this preliminary report are based upon our experience and knowledge of the area. This evaluation did not include subsurface exploration by drilling and sampling, and any opinions are subject to re-evaluation following subsequent work.

This preliminary report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this preliminary report, are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon

reviews the changes, and either verifies or modifies the conclusions of this preliminary report in writing.

If you have any questions regarding this preliminary report, please contact us.

Sincerely,

**TERRACON CONSULTANTS, INC.**



**Expires 03/31/2009**

Oleg B. Lysyj, P.E.  
Principal

Copies: Addressee (3)