



CITY OF SOUTH PASADENA

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Mr. Abdi Saghafi
Project Manager
SR-710 Tunnel Geotechnical Study
State of California Department of Transportation – District 7
Suite 100 – MS #2
100 S. Main St.
Los Angeles, CA 90012-3606

Dear Mr. Saghafi,

Materials, including a “Geotechnical Exploration Program” were distributed at the Technical Advisory Committee meeting for the SR-710 Tunnel Geotechnical Study on Thursday, August 21, 2008, for review and comment.

The City’s geotechnical consultants have had an opportunity to review the documents, including the improved versions of the Geological Map and Exploration Plan that you sent us, and would like to submit the following comments:

1. The scope of proposed exploration within any corridor zone is consistent with the variety or complexity of the geological formations to be encountered. For example: Corridor Zone 3 explorations are greater in number per area than the other corridors in that this corridor involves more different geological formations than the others including earthquake fault zones. However, there is no written scope of work that describes the objectives of the field work indicated on the map.
2. The proposed geophysical lines, for the most part look reasonable. However, we suggest that the orientation of several of the lines should be adjusted such that they are perpendicular to structural trends apparently intended to be investigated, rather than oblique to the faults and folds.
3. There is a lot of literature on the Elysian Park and Raymond faults. Do the Technical Consultants plan to contact the authors of those various papers on an individual basis to ask for additional information?
4. Growth folding above the Elysian Park Blind Thrust should be factored into evaluations. This could be very important for Zone 1. A major disadvantage of Zone 1 is that it appears to be right on top of an active fault and associated growth fold. There are currently no seismic lines proposed across this active anticline. This area should be

revisited before the seismic surveys. The provided information indicates that the Caltrans Technical Consultants believe the Elysian Park Fault to be inactive, whereas we believe other practitioners may consider it to be potentially active or active.

5. Some proposed geophysical survey locations do not appear to be targeting specific geologic structures (faults or folds) and rationale for these investigations should be obtained.
6. **Zone 1 Borings** – Zone 1 appears to be sited in fairly uniform stratigraphy comprised of Puente Formation, siltstone, shale and sandstone. The potential exists for alternating soft/weak and hard/strong rock layers. At least four faults including the Elysian Park Thrust Fault offset these strata. They are mapped as inactive faults, but there may be active growth folding associated with the Elysian Park Thrust Fault. Active fault crossings will require special considerations and design. The eight (8) borings for Zone 1 appear to provide good geographic coverage of the zone.
7. **Zone 2 Borings** – Zone 2 appears to be sited to transect not only the Puente Formation, but also siltstone, sandstone and conglomerate of the older Topanga Formation and conglomerate of the younger Fernando Formation. At least seven inactive fault crossings, including the Highland Park Fault, offset these formations and strata. The five (5) proposed borings seem few compared to eight for Zone 1 (and twelve for Zone 3), especially in light of the more complex possible stratigraphy in Zone 2 relative to Zone 1. The potential for cobbles and boulders in any conglomerate beds should be evaluated. Consideration should be given to an angled boring to investigate the nature of one of the major fault crossings.
8. **Zone 3 Borings** – Zone 3 appears to be sited in Puente and Topanga Formation siltstones for more than half its length. The alignment also transects granitic (quartz diorite) intrusive rocks, and has a considerable reach of soil tunnel at the north end. At least four fault zones cut across and offset the rock types described, including two active faults, the Raymond Hill and Eagle Rock faults. The twelve (12) proposed borings appear to provide good geographic and formation coverage. Borings should include investigation of the granitic/sedimentary rock contacts, particularly the fault contacts between these drastically different rock types at the two active fault locations. Consideration should be given to an angled boring to investigate the nature of one of the major active fault crossings.
9. **Zone 4 Borings** – Zone 4 appears to be sited entirely as a soil tunnel in Old Alluvium, largely skimming just above the contact between the alluvium and the underlying sedimentary and granitic rocks (which are similar to Zone 3). The Old Alluvium is noted to contain cobbles and boulders, particularly near the base of the formation in the coarse-grained basal alluvium that accumulated in topographic lows in the pre-existing bedrock surface. There is one active fault, the Raymond Hill Fault that appears to impact the soil strata at tunnel horizon. The total of four borings seems few to provide good geographic coverage and to investigate variability in the alluvium/bedrock interface. Test borings should include contingencies for investigating bouldery ground including rock coring techniques. Boring should extend at least two tunnel diameters below proposed tunnel invert and/or be drilled deep enough to confirm the location of underlying bedrock.
10. **Zone 5 Borings** – Zone 5, like Zone 4, is sited in Old Alluvium and the conceptual tunnel alignment appears to maintain at least one tunnel diameter between the Old

Alluvium and overlying younger alluvium. One active fault (East Montbello) crosses the alignment shown in the Typical Section, but is not shown to extend up into the Old Alluvium, which seems inconsistent with it being active. The same comments about the Old Alluvium for Zone 4 apply also to Zone 5.

11. The most geotechnical test boring work is proposed for Zone 3 and the least for Zone 5. In terms of linear feet of test boring per linear feet of Zone route, Zone 3 ranks highest, followed by Zones 1, 2, 4 and then 5. Topography and tunnel depth generally require more “access drilling” to get to the tunnel envelope for Zones 1 through 3.

Geotechnical Evaluation Criteria

There are ten proposed evaluation criteria for this proposed geotechnical study, only three of which are geotechnical in nature. Fault crossings, geologic/geotechnical conditions and ground water considerations are included as geotechnical evaluation criteria. Based on the proposed outcome of the proposed exploration program, geotechnical evaluations will include faulting, geologic characterization, geotechnical property evaluation, ground water condition and impact evaluation, and a hazardous materials study (contaminated soil and water, and hazardous gases).

The other seven evaluation criteria include mostly system and traffic considerations. These seem to represent scope drift from the Caltrans RFP for this project, the purpose of which was “to better characterize the physical and environmental nature of the study area so that a more informed decision can be made when selecting potential alignment alternatives”. The RFP project area included only a 6.2 mile corridor along what is Zone 3 under current consideration, but we understand that the project area was since expanded to include other zones (corridors) because of funding, community input, and an expansion of the study area to remain “route neutral”..

With respect to the proposed geotechnical evaluation criteria, we offer the following initial comments:

1. Consider adding *geologic hazards* evaluations at the proposed portal locations
2. Suggest adding tunneling *ground behavior* evaluations to geologic characterization and geotechnical property evaluation to define viable tunneling technologies for each Zone.
3. Evaluations of liquefaction potential should be included for reaches of soil tunnel to evaluate the potential for soils to liquefy in response to a seismic event.
4. In addition to the consideration of active fault zones, the seismic impact due to liquefaction seismic hazards should be considered for those areas indicated by the California DMG seismic hazard maps.
5. Rationale for use of the geophysical surveys should be provided and their purpose when considering deep tunneling. In general, the geophysical surveys crossing fault zones may not clearly define the nature of the zone.
6. Along with the plan of exploration, methods to be used for evaluating the quality of rock and overburden for the purposed tunneling should also be given.

Tunnel Zones (Corridors)

Other general comments relative to the five current "route neutral" zones include:

1. The location of the borehole sites and geophysical survey lines do not appear to be in conflict with the "route neutral" concept. For the current level of feasibility studies, geotechnical data obtained from these exploration locations would be applicable to nearby route alternatives within the same formation and crossing the same fault zone.
2. Tunnel Zones 1 through 3 are considerably shorter than Zones 4 and 5. Given the potential size of the proposed tunnel(s), the shorter routes will be more attractive with respect to tunnel cost and tunnel ventilation.
3. Tunnel Zones 1 through 3 are considerably more complex than Zones 4 and 5 with respect to geology and seismicity/faulting.
4. All zones coincide at the south end of the project area at the north terminus of existing I-710 and considerable effort should be allocated to the geotechnical issues and viability of this south portal location common to all five zones.
5. Despite being the most obvious "direct link" to connect I-710 to the south to the area north of South Pasadena, Zone 3 is probably the most challenging in terms of variable subsurface conditions requiring soft and hard rock as well as soil tunneling technologies as well as active and inactive fault crossings.

Finally, we would like to request the following:

1. Caltrans to provide all Committee members with the written scope of work document that accompanies the exploration program map in order to evaluate the goals and objectives of the geophysical survey program, and to obtain more detail about the proposed drilling and testing programs that accompany the borings.
2. Consider adding a geophysical line(s) across the Elysian Park Anticline.
3. Caltrans to provide a copy of CH2MHill's proposal to Caltrans and compare current scope of work to previously proposed scope of work

Thank you for this opportunity to submit comments and requests, and we look forward to your responses to them.

Regards,



Philip C. Putnam
Mayor

cc: City Council, City Manager Lilian Myers, District 7 Director Doug Failing