

## MEMORANDUM

**Date:** August 22, 2005  
**To:** Sam Gennawey  
**From:** Robert Olsen – P&D Consultants  
**Subject:** Yucaipa Geological Constraints

### GEOLOGICAL CONSTRAINTS

The Project area is located south of central Yucaipa, in the southern part of the Yucaipa Plain. The Project area is divided into two unequal areas by Interstate 10, which runs in a general east-west direction in this area. The part of the Project area north of Interstate 10 consists of rolling hills with relatively steep southerly slopes. The part of the Project area south of Interstate 10 consists of strongly dissected alluvial deposits with a general east-west drainage pattern.

Geological formations within the Project area, based on the *Geological Map of the Yucaipa Quadrangle* (2003), include the San Timoteo beds (Pleistocene to Pliocene sandstone and gravel), older and younger axial valley deposits (late to middle Pleistocene and latest Quaternary to Holocene respectively) and very young alluvial-fan deposits (latest Holocene). The basement complex underlying these formations likely consists of metamorphic or igneous rocks of Mesozoic or older age.

The only named body of water in the Project area is Yucaipa Creek, which flows through Oak Creek Canyon in the western section of the southern part of the Project area. Interstate 10 generally runs along the eastward extension of Yucaipa Creek and obscures the former configuration of the channel. Thus, the former trace of Yucaipa Creek generally ran along the division between the northern and southern part of the Project area.

### *Seismicity*

The project area is located in a seismically active region, and is traversed by two active faults. The project area is located approximately four miles south of the San Andreas fault zone, a major strike-slip rupture that is capable of producing earthquakes of Richter magnitude greater than 7.5.

## MEMORANDUM

The Banning fault runs roughly from the center of the southern border of the south part of the Project area, west-northwest to Live Oak Canyon at the west edge of the Project area. The position of the Banning fault is inferred throughout its length as it traverses the Project area, since it is obscured by relatively young alluvial sediments. The eastern and central sections of the Banning fault are active (an earthquake occurred along the fault in July 2005) with a maximum probable earthquake magnitude of 7.2, or possibly more if caused by an earthquake along the San Andreas fault zone to the north. The western part of the Banning fault, including that section within the Project area, is not regarded as active.

The Chicken Hill fault runs along the east side of Live Oak Canyon, roughly along the western edge of the northern part of the study area, and across the western section of the southern part of the study area. The Chicken Hill fault is shown (though not named) on the *Fault Map of California* as having been active in the late Quaternary or Holocene (700,000 or 10,000 years before present respectively). The trace of the Chicken Hill fault is shown as approximate north of Interstate 10, and inferred south of Interstate 10.

Seismically active areas in California are subject to special requirements under the Alquist-Priolo Act. A series of Special Studies Zones maps based on the corresponding topographic maps have been prepared by the California Division of Mines and Geology (now California Geological Survey) showing the traces of faults that are regarded as posing significant seismic hazards. Development within the defined areas of the Special studies Zones requires site-specific investigations of fault traces, movements and hazards. In the Project area, the only fault mapped as a Special Studies Zone is the segment of the Chicken Hill fault north of Interstate 10. However, the inferred traces of the Chicken Hill fault south of Interstate 10, and the Banning fault, should be regarded as potentially subject to direct seismic hazard (ground rupture) as well, and any development in the area should take these faults into account.

*Constraint: Seismic studies in the immediate vicinities of the Chicken Hill fault and the Banning fault will be required. Development should avoid the traces of these faults.*

### **Drainage**

The construction of Interstate 10 has profoundly changed the drainage pattern in the Project area. Formerly, runoff from the higher areas north of Yucaipa

Creek (beyond the northern part of the Project area) drained to Yucaipa Creek, which ran westerly to Live Oak Canyon and then southwest. The area south of Yucaipa Creek generally also had a westerly drainage pattern, with a south branch of Yucaipa Creek being the most important feature. The area south of Yucaipa Creek is heavily dissected since the alluvium in the area is readily eroded.

Construction of Interstate 10 has impacted drainage in the area, preventing normal runoff from the north into Yucaipa Creek and thence west to Live Oak Canyon. Culverts and drains under the freeway may be inadequate to handle runoff during rainy periods, resulting in diversion of drainage patterns, local erosion or local flooding in the area north of the freeway. The current drainage system, or any proposed modification to the system that would change the discharge of runoff to the area south of the freeway, could result in other disturbances to the runoff patterns throughout the Project area.

*Constraint: Hydrologic studies will be required for development on either side of the freeway. Mitigation measures for the current disruption of natural drainage, particularly in the area north of the freeway, will be needed. The impacts of any improved drainage under the freeway on the drainage system south of the freeway will need to be determined.*

### ***Landslides and Liquefaction***

Landslides may occur in certain soil or rock types on steep or moderately steep slopes where water seepage or other factors result in failure of the cohesion of the material. Landslide deposits typically have an irregular, hummocky appearance, often with a visible break (scarp) on the slope above the deposit. Landslide-prone deposits could fail due to ground shaking during an earthquake, though landslides can also occur without seismic activity. A small and very local landslide was noted on the hill southeast of the rest stop along Interstate 10, apparently due to erosion of the bank of a local stream. No landslides are indicated on the geologic map of the area.

Liquefaction typically occurs in water-saturated, fine-grained sediments in areas of very low slope. Ground shaking during an earthquake can cause such sediments to fail (liquefy), damaging existing structures. Such sediments and conditions are unlikely to be present in the Project area since the site is located in an area of relatively steep topography.

## MEMORANDUM

Landslide and liquefaction hazards are mapped by the California Geological Survey on a series of Seismic Hazard Zones maps, based on the corresponding 7.5-minute topographic maps. No Seismic Hazard Zones map has been compiled or is proposed for the Yucaipa quadrangle.

*Constraints: None evident.*

### **Soils**

Potential constraints related to soils include possible high water tables, corrosion of steel or concrete, drainage and permeability, liquefaction and engineering factors such as rippability and load bearing capacity. Soils observed in the field consisted for the most part of medium- to coarse-grained sandy loam, often with gravel or cobbles. Such soils typically have high permeability and low potential for shallow groundwater or liquefaction. Other concerns such as corrosivity would need to be evaluated as part of geotechnical studies.

*Constraints: None known, but geotechnical soil studies will be needed for any development.*

