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To: MR. TOM OSTROM, CHIEF
OFFICE OF EARTHQUAKE ENGINEERING

Date: September 30, 2013

File: Anthony UC
Coachella Canal Bridges
0000001016 6SSCN
RIV-10-PM 60.4
Bridge No. 56-0618
Bridges No.56-0079L/R

Attention: Mark Yashinsky

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
Materials Engineering and Testing Services and Geotechnical Services
Office of Geotechnical Design South 2 Branch
Office of Geotechnical Support – Geotechnical Instrumentation Branch

Subject: Evaluation of Fault Rupture Potential, Anthony UC and Coachella Canal Bridges, Riverside County, CA

SUMMARY

These three bridges are located 200 ft (Anthony UC), 500 ft (right bridge), and 600 ft (left bridge) east of the San Andreas Fault (Coachella section), the nearest Caltrans-active fault. The fault is very well-located in this area, and the lack of off-fault deformation suggests that lateral movement is confined to a narrow zone. **No rupture is expected at these bridges**, however the bridges will be subject to high levels of ground motion which may cause offset. No further work is recommended.

INTRODUCTION

This evaluation was prepared as part of the statewide evaluation of fault rupture potential at Caltrans bridges. Caltrans' policies regarding fault rupture at bridges are described in Memo to Designers (MTD) 20-10. Caltrans requires a fault rupture evaluation if a bridge is located within an Alquist-Priolo Earthquake Fault Zone (EFZ) or within 1,000 feet of an un-zoned fault 15,000 years or younger in age. The bridges are situated within the EFZ established in 1974 for the San Andreas Fault (Coachella section) in the Indio 7-1/2' Quadrangle and are shown as near an eastern crossing of the fault; therefore a fault evaluation was required.

Anthony UC was built in 1972 and is 47 ft long and 15 ft wide. The UC is a corrugated metal riveted arch plate under 3-5 ft of fill. Coachella Canal Bridge (left) was built in 1972 and is 86 ft long and 41 ft wide. The bridge is a simple span bridge with PC/PS "I" girders on open and seated abutments, supported on spread footings. Coachella Canal Bridge (right) was built in 1947 and is 78 ft long and 41 ft wide. The bridge is a continuous four span bridge with 9-pile bents at 2 and 4 and 11-pile bent at 3 and open-end diaphragm abutments, all supported on spread footings.

No damage that could be associated with tectonic movement has been reported at Anthony UC. The decks of both Coachella Canal bridges are described as slightly to severely cracked in BIRIS Inspection Reports, however this damage is likely the result of processes unrelated to tectonic movement.

FAULT RUPTURE EVALUATION

This evaluation consisted of literature and air photo, discussions with other geologists, and field reconnaissance. The nearest Caltrans-active fault is the San Andreas Fault, Coachella segment. The San Andreas Fault is part of the boundary between the Pacific and North American plates and extends south from Shelter Cove in northern California to Bombay Beach located on the southeastern shore of the Salton Sea. The Coachella segment is the southernmost section and is a near-vertical right-lateral strike-slip fault (Figure 1).

The Indio EFZ Quad was completed in 1974, with a revision due out this year (2013) or next. We contacted CGS (Treiman, p.c.2012) because the fault location shown on the 1974 Quad (Figure 2) (i.e. east of the two bridges) was not in agreement with other sources we reviewed (Figures 3 and 4). CGS indicated that the map was in error and the eastern segment was not present at the latitude of the bridges. The SoSafe Scenario report (USGS, 2008) denotes the fault crossing west of the bridges as was observed in previous mapping and our field reconnaissance. This location was further confirmed through trenching by PETRA in 2011 (Figure 5).

Both modern Google Earth images (Figure 6) and 1956 Caltrans air photos (Figures 7) clearly reveal the fault a few hundred feet north of I10. Prehistoric Lake Cahuilla and recent agricultural activity obscure the fault, which last ruptured circa 1690 around the time of the last high stand of Lake Cahuilla (Philibosian et al, 2011).

A field reconnaissance in the vicinity of the ridges was conducted on 9/10/2013 by Douglas Cook and Martha Merriam. North of I10 (Figure 8), the fault appears as a linear trench extending into a wider zone cut by a small gully that reveals a sharp contact (fault?) between lake and alluvial deposits. This observation agrees with earlier mapping cited above. As shown in the figures, the fault is located approximately 200 ft west of Anthony UC, 500 ft west of Coachella Canal (right), and 600 ft west of Coachella Canal (left).

Based on the above information indicating the fault is very well-located and does not extend east to the bridge locations. We conclude that fault rupture hazard is low, and no further work is needed. If you have any questions, please contact K. Douglas Cook at (916) 227-7414, or Martha Merriam at 916-227-7135.

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Figure 1. Google Earth image showing the San Andreas Fault (red dashed; from 9/10/2013 field reconnaissance), SoSAFe (USGS, 2008) fault crossing locations (yellow pins), and locations of Anthony UC and the Coachella Canal bridges.

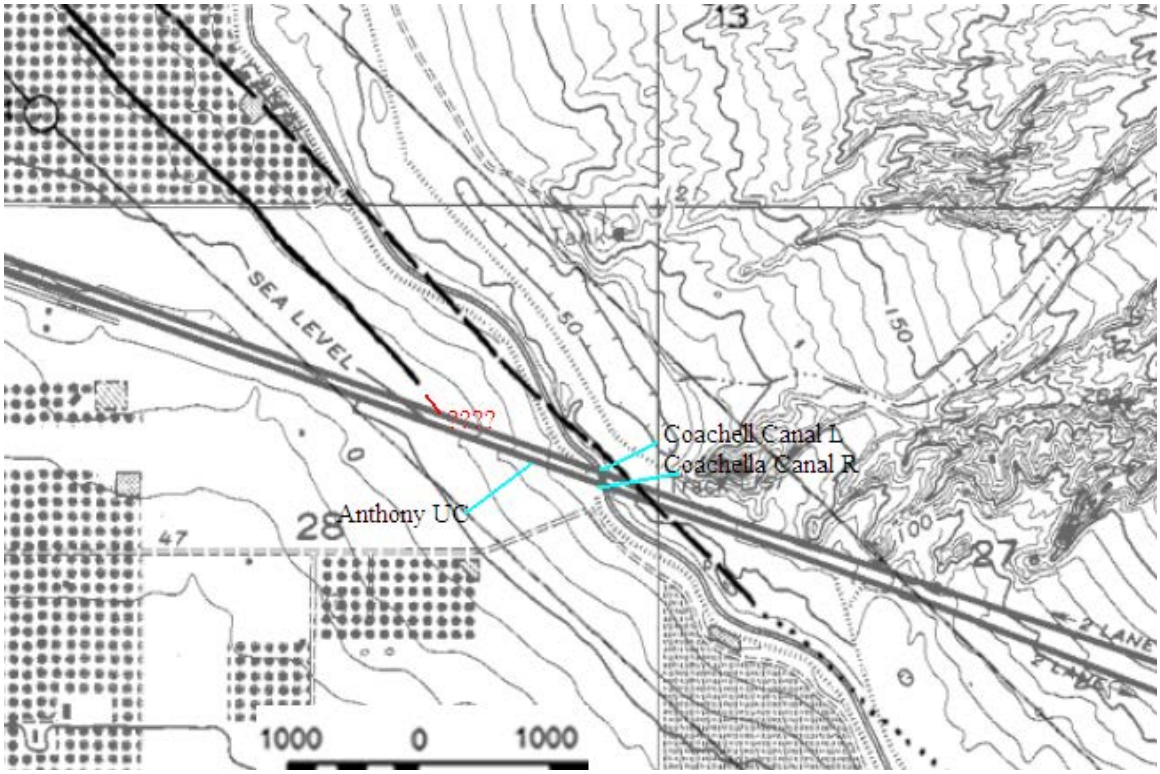

Figure 2. Indio AP EFZ Map (1974). Note incorrect location of San Andreas Fault east of bridges.

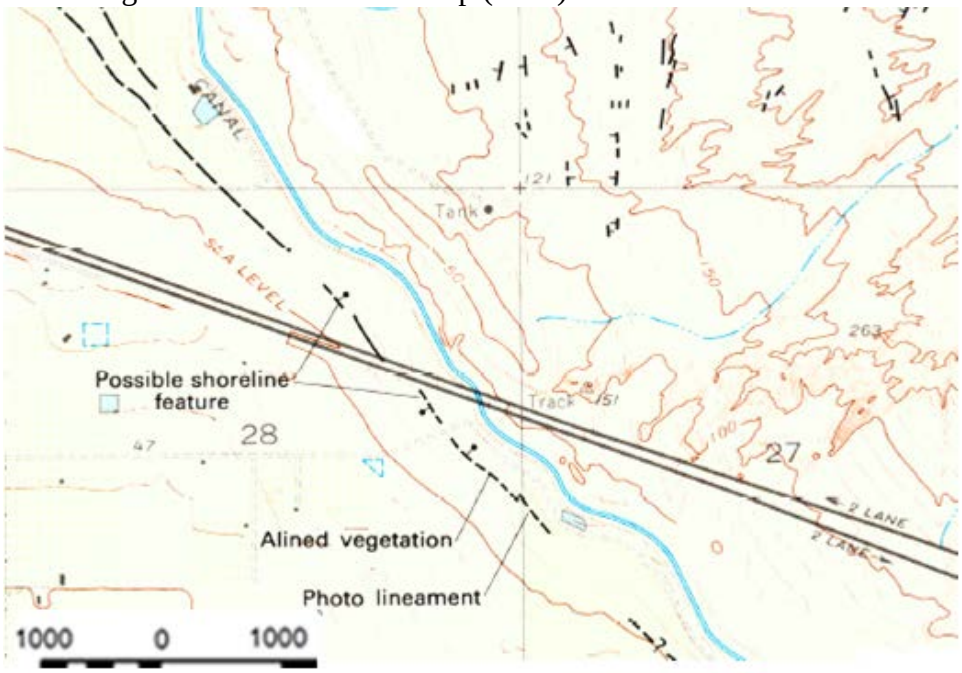

Figure 3. Clark (1984) 1:24,000 scale mapping. Fault in Figure 2 east of bridges is not shown here.

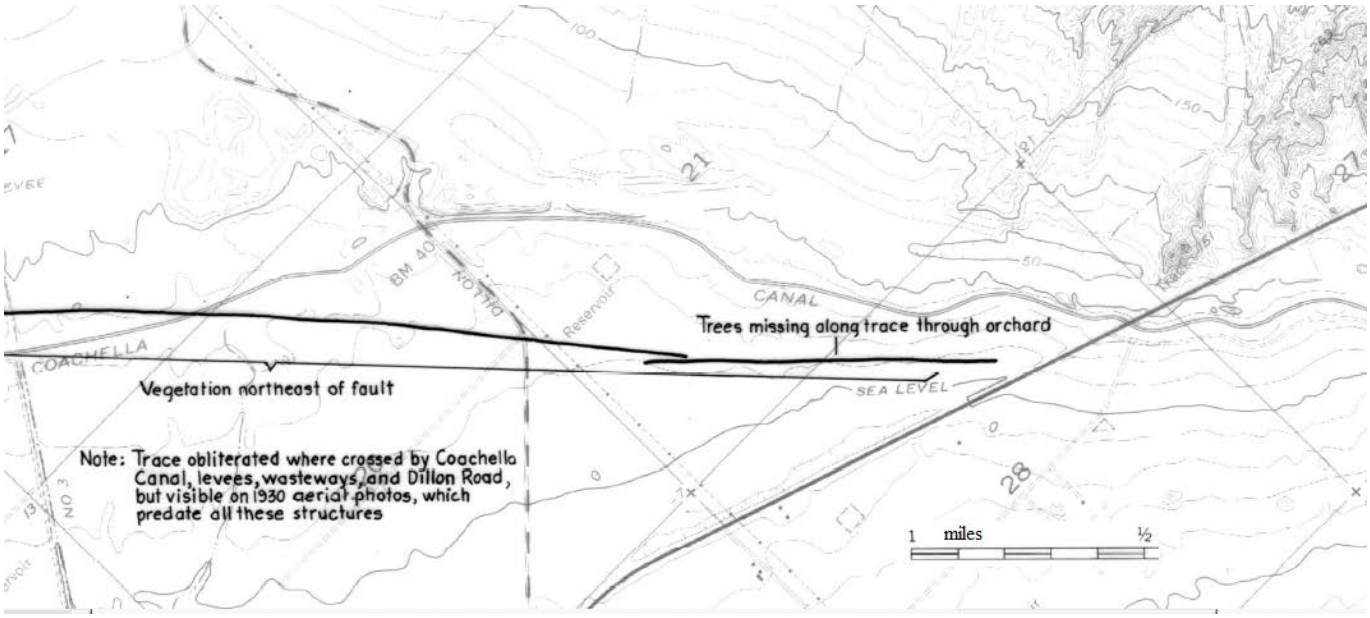

Figure 4. Hope (1969) indicates the 1930 photos predate structures. Unfortunately he does not reference the photos.

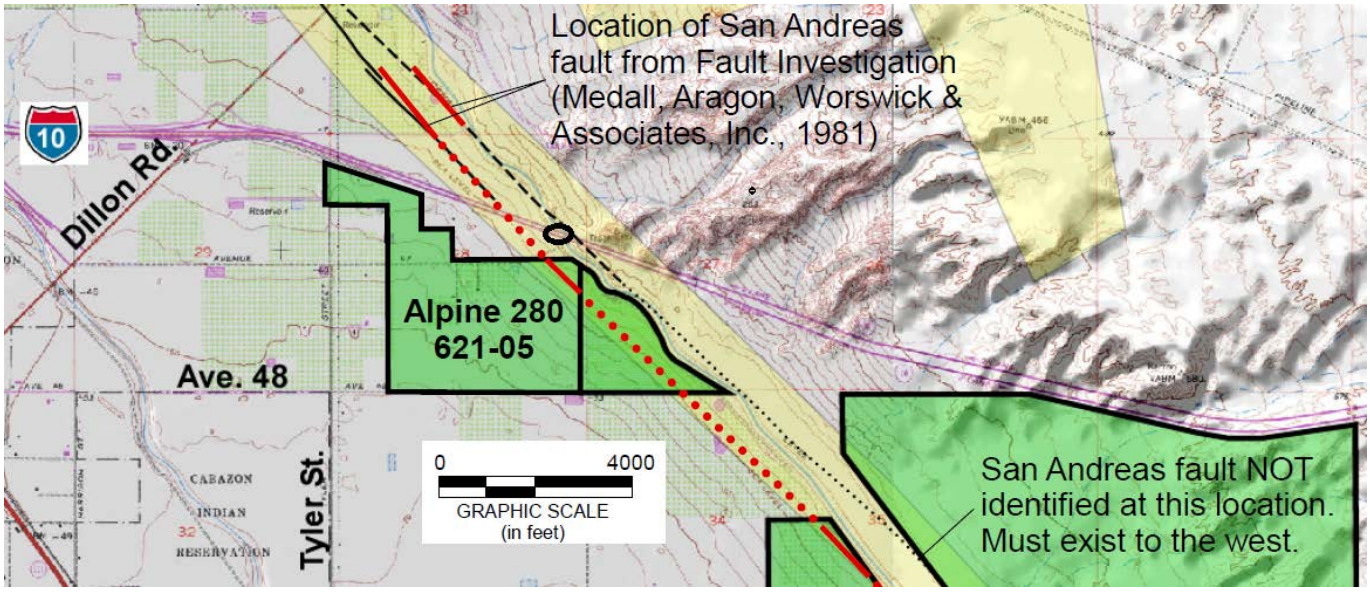

Figure 5. Bridges are shown as small black oval. Note comment in lower right. From Petra, pc (2013)

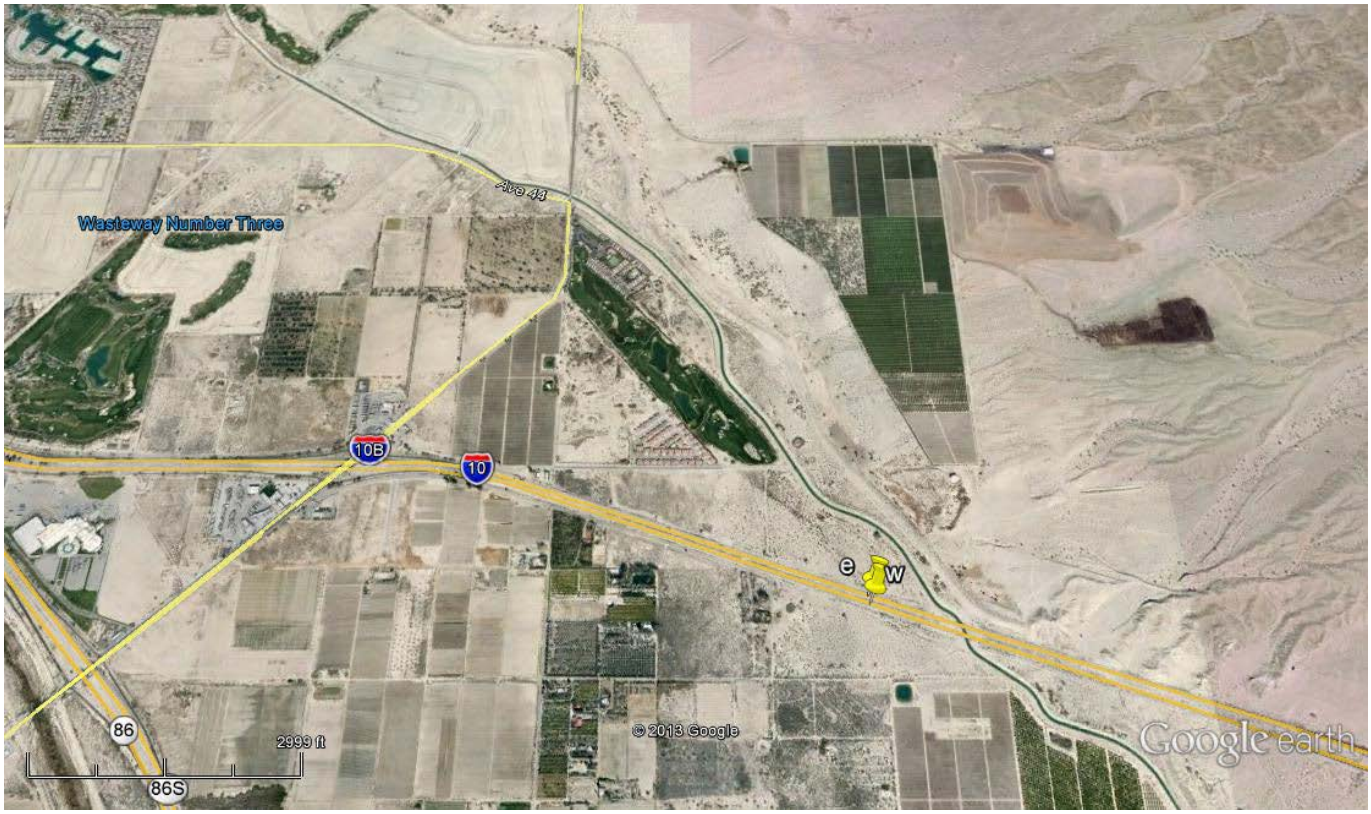

Figure 6. Regional view on Google Earth showing fault crossing per SoSAFe (USGS, 2008) (yellow pins).

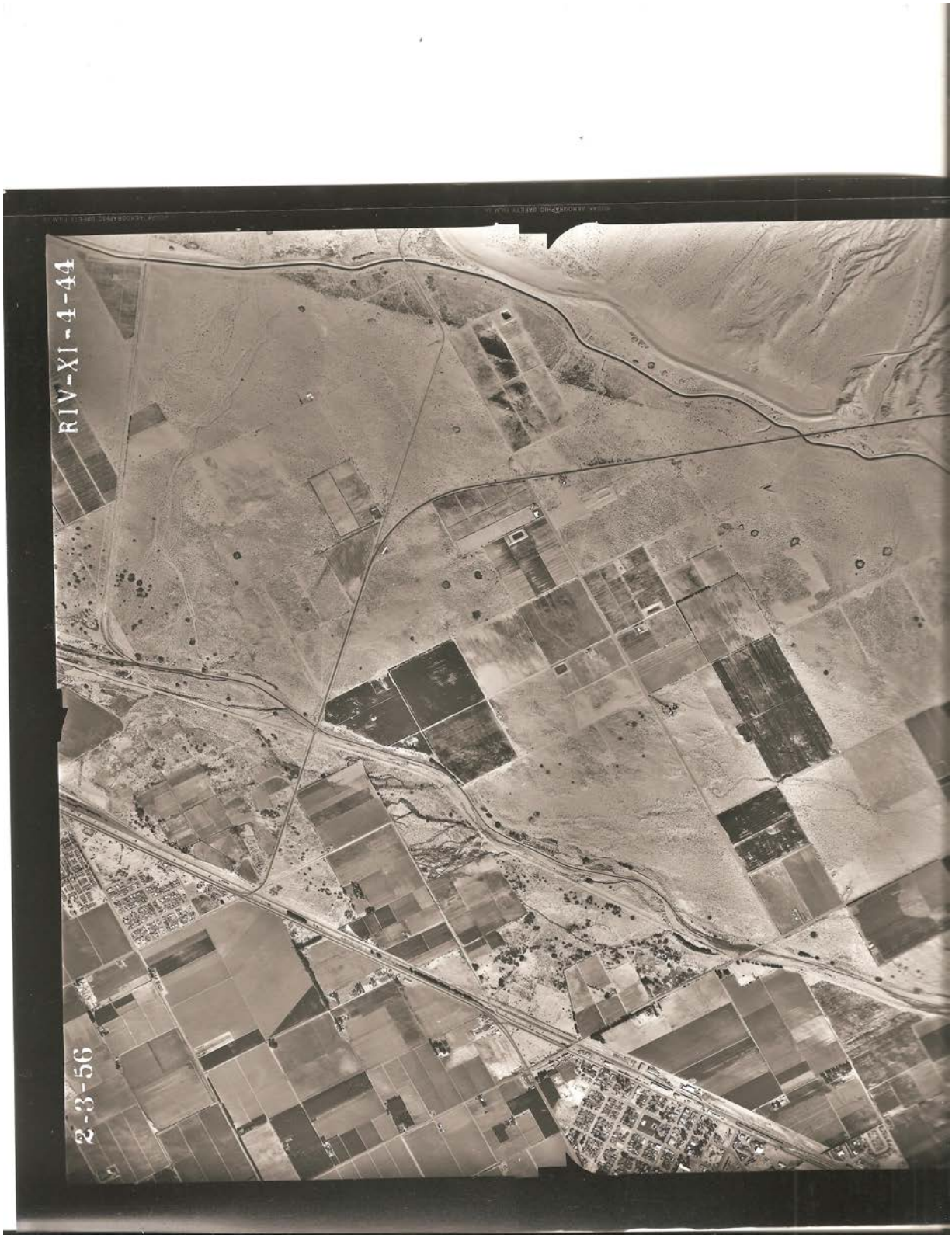

Figure 7. Caltrans 1956 air photo.

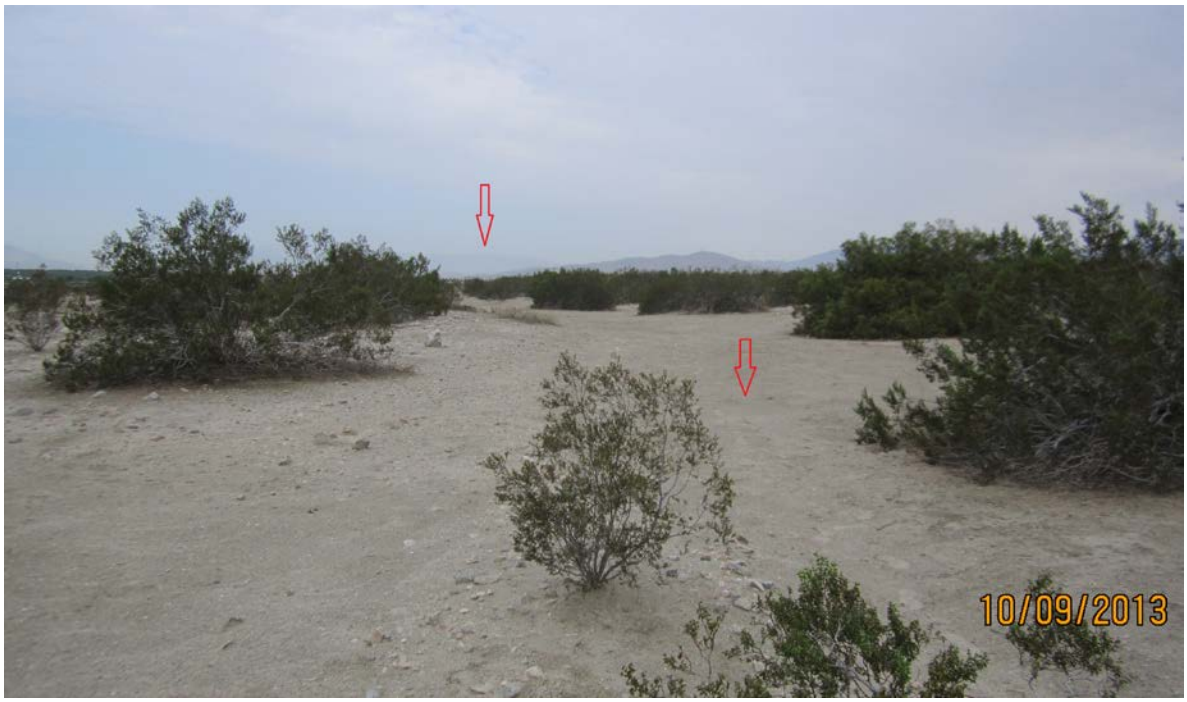

Figure 8. Looking northwest along the fault trend (indicated by red arrows).