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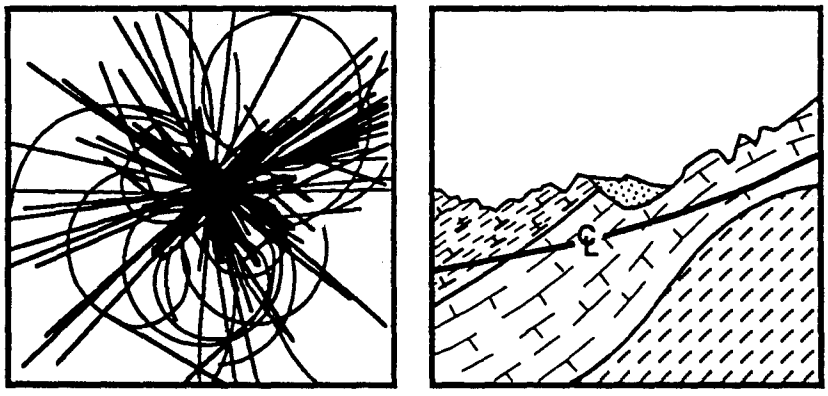
Discussion of Faulting in SSC Supplemental EIS



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MEMO

DATE: December 14, 1989

TO: Mack Riddle (RTK)

CC: Chris Laughton (SSC)
Dick Pearl (ANL)
Tim Toohig (SSC)
Phil Shelly (EG and G)

FROM: Matt Werner (TETC)

SUBJECT: Discussion of Faulting in SSC Supplemental EIS -- Data Acquired under DOE Contract DE-AC02-85ER40230

We would appreciate it if you would distribute this memo to the people listed (cc). The following is intended to bolster the discussion of faults in the SEIS.

The attached table, map, profile, and list of references summarize the current state of knowledge on faults at the SSC site. Recent mapping and drilling (for site geotechnical characterization) has doubled the number of known, mappable faults since the FEIS was published. However, the general character of faulting at the site is unchanged from what was described in the DEIS, i.e.;

1. The faults all trend north-northeast to northeast.
2. The faults are all normal faults or grabens.
3. The faults are ancient and inactive.
4. None of the new faults has an offset larger than the offsets already reported in the DEIS.

In light of this information, the most direct path to an SEIS section on faulting may be via revisions to the DEIS discussion of the subject (DEIS Vol. IV, Appendix 5, Section 6.5.7.1.3), as follows:

> The SSC site lies along the eastern margin of the Texas Craton in a thick sedimentary sequence with a shallow southeasterly dip. The sediments are exposed at the surface as broad, northeast-trending belts that are progressively older to the west. A geologic map of the vicinity of the site is presented in Figure ___ [revised map]; a cross section along the ring is presented in Figure ___ [revised profile].
>
> Rapid and abundant deposition of sediments in the Gulf of Mexico Basin and associated subsidence of the Gulf Region resulted in several arcuate zones of faults subparallel to the edge of the basin along the margin of the Texas Craton. These zones of faults in the Cenozoic and Mesozoic sediments generally comprise inactive, northeast-trending, steeply dipping, normal faults of moderate displacement. The closest of these zones to the site are the Mexia-Talco fault zone to the east of the site and the Balcones fault system to the southwest of the site. The majority of the mapped Balcones faults occur in a broad belt that stretches from Valverde County in southwestern Texas to Waco in McLennan County, south of the site. However, the northeastern limit of this fault belt appears to extend into the site area and coincides with the local northeast-trending faults and associated grabens (refs. 4, 5, and 18).

The characteristics of mappable faults in the vicinity of the site (shown in Figure ___ [revised map]) are summarized in Table ___ [revised Table]. The mappable faults commonly trend north-northeast to northeast (paralleling the Balcones trend) with steep dips and normal offsets (refs. 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,). These faults are mapped based on subtle photo lineaments and the occurrence of calcite (fault-healing mineralization) in float. Offsets on the faults (based on drilling or correlations of offset units at the surface) commonly range from 25 to 75 feet, and some appear to have offsets greater than 100 feet. Several of the mapped faults are grabens, which is consistent with the tectonics of the Balcones fault system.

In addition to mappable faults, small-scale faults are commonly observed in outcrops of Austin Chalk (refs. 1, 2, 3, 4, 5, 6, and 7). Displacements on the small-scale faults are commonly up to several feet. The reported abundance of small-scale faults throughout the chalk, as well as the extension of the Balcones system of larger-scale faults into the site area, suggests that additional faults not recognized to date may be identified in the future.

SUMMARY OF FAULT CHARACTERISTICS

ID No.	Fault	Location	Strike	Dip	Thickness	Displacement	References
1	Possible northern extension of Italy Graben	Crosses ring on south; 2.5 mi east of Interstate 35	N15°E	Steeply SW	–	~ 25 ft down to the west	4, 5, 17, 19
2	Unnamed Fault	Crosses ring on south; 4.5 mi east of Interstate 35	N15°E-N5°W	Steeply NW to SW	–	~ 15 ft down to the west	4, 5, 17, 19
3	Lake Waxahachie Graben	Center of ring; south shore of Lake Waxahachie	N70°E	north fault dips steeply SE; southern fault dips 50-70° NW	–	>60 ft	4, 6, 19
4	Unnamed Fault	1.2 mi east of ring; west side of Ennis	N15°-20°E	–	–	down to the west	18, 19
5	Unnamed Fault	1 mi inside west side of ring; 4 mi west of Waxahachie on Farm Route 1446	N45°E	Steeply SE	–	75-80 ft. down to the southeast	7, 19
6	Sardis Fault	1 mi inside northwest side of ring; 0.4 mi north of Sardis	N65°E	Steeply to the NW ~ 60°	–	~ 90 ft down to the northwest	4, 5, 6, 7, 19
7	Sterrett Fault	0.5-1 mi inside north end of ring; 2.5 mi south of Red Oak	N50°E	Steeply NW	–	>100 ft down to the northwest	1, 4, 19
8	Rockett Graben	1-2 mi inside north arc; near Rockett, Texas	N30°E	north fault steeply SE, south fault steeply NW	–	>100 ft of offset in the graben	1, 4, 5, 19
9	Bear Creek Fault	1 mi inside northeast side of ring; about 4 mi east of Red Oak	N40°E	~ 63°NW	–	> 90 ft of offset down to the northwest	2, 3, 4, 19
10	SE1.5 Fault	Crosses ring on northwest side; 1 mi south of State Route 875	N10°E	Moderately steep SE	~ 4 ft	4 ft down to east	8

SUMMARY OF FAULT CHARACTERISTICS

ID No.	Fault	Location	Strike	Dip	Thickness	Displacement	References
11	SE1 Graben	Crosses ring on west side; 1 mi north of Farm Route 1446	N10° to 30°E	northern fault ~ 44 SE; southern fault steep to the NW	northern fault is >2 ft but <19 ft	northwest fault 23 ft down to southeast; southeast fault 25 ft down to the northwest	9
12	SF10.6 Fault	Crosses ring on west side; 6 mi west of Waxahachie, near the corner of Hoyt Road and Farm Route 1446	N10°-20°E	Steep to the NW	>10 ft but <50 ft	10 ft down to the west	10
13	SF10.1 Graben	Crosses ring on southwest side; 0.3 mi north of State Route 66	N65°E	northern fault steeply SE; southern fault steeply NW	Graben is approxi-mately 350 ft wide; each fault <5 ft wide	25 ft on northern fault; 57 ft on southern fault	11
14	SE 10.9 Fault	Crosses ring on southwest side; 0.4 mi south of State Route 66	Average trend N28°E	Steep to SE	~ 300 ft	33-43 ft down to southeast	12
15	SE 10.7 Fault	Crosses ring on southwest side; trending north from Boz, Texas	Due north to N5°E	65o-90° west	<30 ft	30-35 ft down to west	13
16	SIR 3 Graben	Crosses ring on southwest side; 1 mi south of Boz, Texas	N10°E to N60°E	southern fault 70-75° NW	Graben is less than 430 ft wide; southern fault is <5 ft wide; northern fault not observed	Graben; southern fault has 73 ft down to north; northern fault has 64 ft down to south	14
17	SE 5.2 Fault	Crosses ring on east side; 0.1 mi north of State Route 879	E-W	–	–	Tenuous correlation suggests 5 ft down to the south	15
18	SF 5.8 Fault	Crosses ring on east side; 1.3 mi north of State Route 879	E-W	–	–	Tenuous correlation suggests 8 ft down to the south	16

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17. The Earth Technology Corporation, 1989j. Data Report for Structure Study Zone SE8.6 and Corehole SF8.6 and Rotary Wash Hole SF8.1, unpublished report prepared for RTK Joint Venture, Oakland, California.

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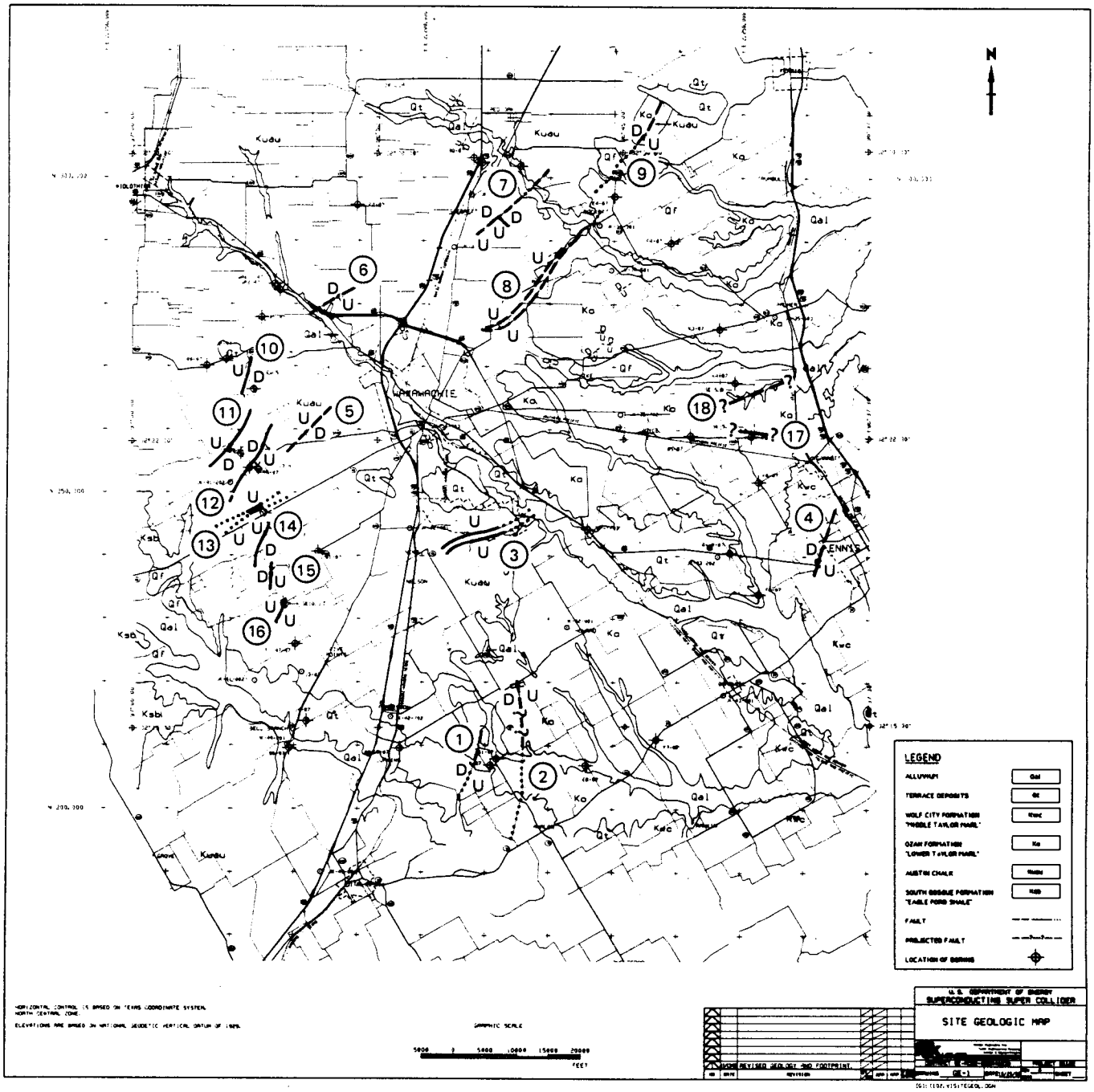
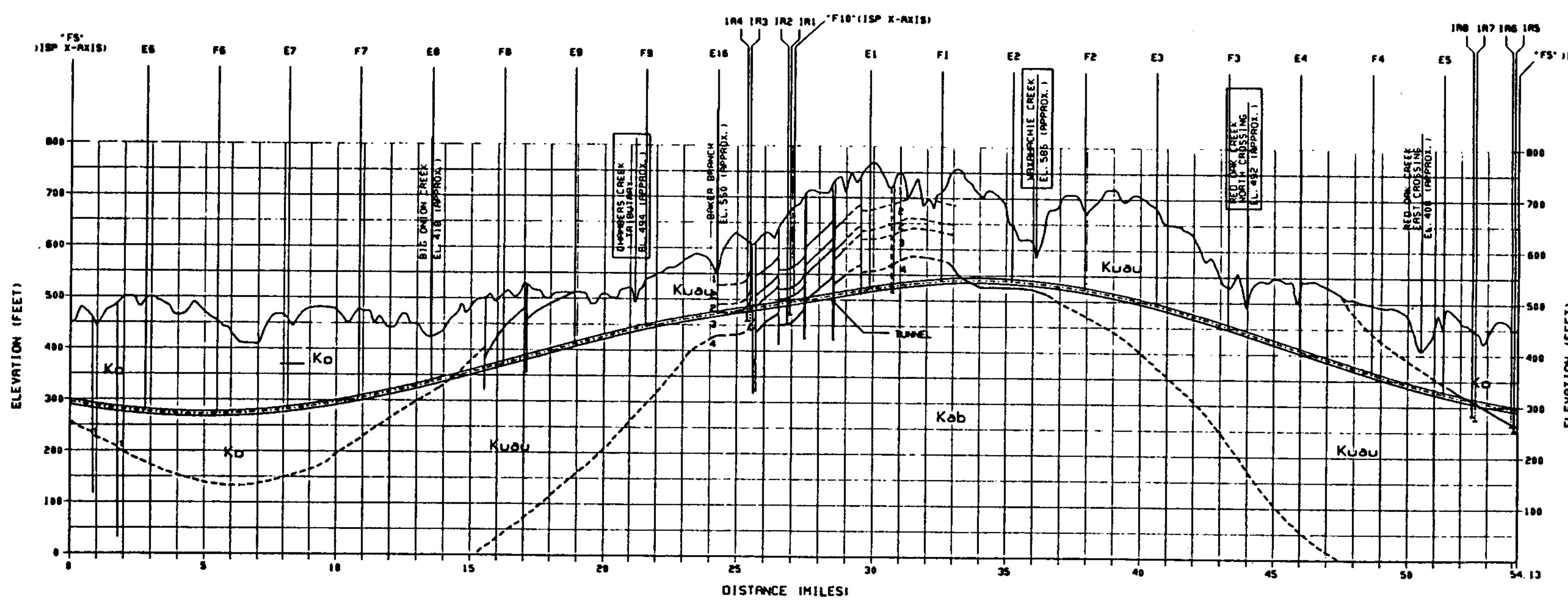
19. Texas National Research Laboratory Commission, 1987. Geologic map of proposed Dallas-Fort Worth SSC Site, in SSC Dallas - Fort Worth Site Proposal, Plate 1, Austin, Texas, scale 1:48,000.

MAP OF FAULTS IN VICINITY OF PROPOSED SITE





LEGEND

- TUNNEL PROFILE - SEE KEY PLAN FOR STRIKE, OBLIQUITY, AND CENTER LOCATION
- APPROXIMATE BASE OF EXPERIMENTAL HALL
- Qal/Qt — ALLUVIUM/TERRACE DEPOSITS
- Ko — TAYLOR MARL - OZAN FORMATION
- Kuau — AUSTIN CHALK
- Kab — SOUTH BOSQUE FORMATION - 'EAGLE FORD SHALE'
- CONTACT
- INFERRED CONTACT
- FAULT
- GROUND ELEVATION DETERMINED FROM USGS TOPOGRAPHIC MAPS
- CREEKS AT WHICH 50 FT. MINIMUM DISTANCE TO TUNNEL CENTERLINE OCCURS

Kuau	1	SLIGHTLY TO MODERATELY ARGILLACEOUS CHALK; ARGILLACEOUS LAYERS (0.2 TO 1.3 FT. THICK) COMPRISE LESS THAN 50% OF ROCK; WIRELINE UNITS A20 THROUGH A23.
Kuau	2	ARGILLACEOUS CHALK; ARGILLACEOUS LAYERS (0.5 TO 3.5 FT. THICK) COMPRISE OVER 50% OF ROCK; WIRELINE UNITS A24 THROUGH A26.
Kuau	3	SLIGHTLY TO MODERATELY ARGILLACEOUS CHALK; ARGILLACEOUS LAYERS (0.2 TO 2.0 FT. THICK) COMPRISE LESS THAN 50% OF ROCK; WIRELINE UNIT A27.
Kab	4	SOFT TO MEDIUM HARD SHALE WITH CALCITE NODULES, CONCRETIONS, AND THIN SEAMS; WIRELINE UNITS E20 AND E21.

SCALES (FEET)

VERTICAL: 100 0 100 200 300 400

HORIZONTAL: 10000 0 10000 20000 30000 40000

GROUND PROFILE BASED ON USGS TOPOGRAPHIC MAP ELEVATIONS.

GEOLOGY BASED ON DECEMBER 1989 GEOTECHNICAL INVESTIGATION.

U.S. DEPARTMENT OF ENERGY
SUPERCONDUCTING SUPER COLLIDER

TUNNEL PROFILE

RTK

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