INTER-OFFICE MEMORANDUM

SUBJECT: Review and Evaluation of TFD 55-7, Animas Property, Hidalgo Co., NM (5646A).

DATE: June 13, 1985

cc: H. D. Pilkington
J. E. Deymonaz

TO: H. J. Olson

FROM: Michael Connelly

GENERAL:

Animas TFD well 55-7 was spudded at 8 p.m. on December 29, 1984, fulfilling SRC's contractural obligation with Grace Geothermal Corporation to spud before January 1, 1985. The hole was bottomed in Precambrain/granite at a depth of 7001 feet at 11:30 p.m. on February 13, 1985 without encountering high temperatures or large fluid entry zones. The drill rig was on site 47 days from spud-in to TD (Fig. 1). Actual drilling time was 742.75 hours. This represents a total of 28.57 days of drilling. The time difference represents trips to change bits, deviation surveys, fishing, logging and setting casing. This averages to a penetration rate of approximately 10 ft/hr, not counting 41 hours opening the hole. Penetration rate below the intermediate casing varied from 3-35 ft/hr, and averaged 8-10 ft/hr.

The drilling was completed within budget at a cost of approximately $1,448,119. Minor adjustments in these costs may still be necessary.

A percentage breakdown of costs are shown on Figure 2. The well is currently "in suspension" and well costs do not include any abandonment charges.

Generalized Lithology (ft)

0- 145	Alluvium - Light brown to tan, very poorly sorted, subangular to subrounded, predominantly volcanic clasts (tuffs, ash and andesite), contains a soft weathered clay matrix, locally drusy quartz, some hematitie and possibly manganese oxide.

Generalized Lithology (ft)

145-1460	Rhyolitic lithic tuff - Light brown to tan to orange to red, subangular tuff and welded tuff clasts, often brick red due to iron staining, certain horizons are extremely silicified, often contains abundant calcite and clay, commonly contains a trace of magnetite and/or pyrite.
1460-1990	Interbedded lithic tuffs and solution deposits - White to light gray to dark gray, solution deposits are predominantly calcium carbonate, highly fractured with abundant clear to white calcite veining and locally abundant pyrite veining. The tuffs are red to light greenish-brown, often silicified with feldspars and micas altering to clay. This marks the base of the Tertiary section and the top of the Paleozoic section.
1990-2960	Interbedded limestones and siltstones - Light to dark-brown to black, sucrosic texture, hard to very hard, locally silty in places, locally highly fractured with abundant calcite veining, often contains abundant bioclasts and microfossils, pyritic in places.
2960-3200	Intrusive dike - White to light red, mottled green and white, hard with aphanitic groundmass, with freshly altered plagioclase and biotite and muscovite, abundant subeuhedral magnetite, with white to clear calcite veining. Biotite and hornblende commonly altered to chlorite, locally contains a trace of pyrite.
3200-4060	Limestone and small intrusive dikes - Light to medium brown, dark gray, hard to very hard with sucrosic texture commonly recrystallized, interbedded with siltstone, locally abundant microfossils, commonly abundant white calcite veining with a trace of pyrite. 3400 to 3480' section has been silicified into chert. From 3480' to 3560' there is an intrusive dike that has been chloritized.

4060-4760	Intrusive dike and limestone - White to pink, very hard, silicified, aplitic predominantly quartz and feldspar, dissiminated pyrite, propylitically altered, common to abundant chlorite and magnetite, locally minor biotite, trace of pyrite and kaolin, minor calcite veining. Small bed of limestone occurs at 4470' to 4550'; it is light to medium brown, light to dark gray, locally silty, commonly recrystallized, contains fossils, abundant calcite veining with a trace of pyrite.
4760-5780	Limestone - White to light gray to dark gray, hard, brittle, very fine to fine grain matrix with abundant intraclasts, locally soft and friable, minor light brown chert, minor calcite veining, locally dolomite rhombs are visible.
5780-5960	Siltstone and Shale - Siltstone is medium gray brown, moderately hard, well laminated with a fissile appearance, slightly to highly calcic, trace of calcite microveining, rare, very fine grained pyrite. Shale is dark gray to black, very fine grained with calcite cement, dark gray to black organic matter, predominantly blocky with a trace of calcite veining and rare disseminated pyrite.
5960-6530	Limestone and dolomite - Medium to dark gray, white, tan, hard brittle, locally granular in appearance, cherty with interbedded silica, trace of disseminated pyrite, trace of microfossils, minor calcite veining. At 6470' to 6490' solution deposit, tan to white cryptocrystalline highly fractured.
6530-6630	Intrusive - Light to medium green, hard, fine grained, altered appearance common to abundant disseminated magnetite, common chlorite, trace epidote, minor calcite, microveining, trace of disseminated pyrite.
6630-6800	Dolomite and shale - Light gray to gray moderately hard, recrystallized granular texture fractured with trace of disseminated pyrite. Shale is black, soft to moderately hard and slightly fissile.

6800-6860	Sandstone - Clear to white with a minor gray green cast, fine to medium grained quartz subangular to round, moderately well sorted, minor chlorite, trace vein calcite, trace of disseminated pyrite. Probably the Bliss sandstone.
6860-7001	Granite - Light pink, white to light green, hard, hypidiomorphic texture, moderately fractured with minor kaolin and chlorite fracture fill, trace of calcite and hematite, rare pyrite. PRECAMBRIAN BASEMENT.

RESULTS OF DRILLING AND LOGGING:

Drilling

The target area for this hole was a Basin and Range westward dipping fault located to the east of the drill hole. This fault is located approximately .5 miles to the west of the drill site, and is a subsidiary to the major range front fault forming the Animas Valley. No major faulting was intersected while drilling. There were, however, minor drilling breaks at 220', 270', 345', 550', 680', 880', 920', 940', 1020', 1190', 1430', 1580', 1690', 1880', 3075', 4095', 4470', 5970', 6650', and 6680'. Hole deviation does not correlate with these drilling breaks. A plan map and vertical cross-section of the well is shown in Figure 3. The last survey was taken at 6956'. The vertical depth of the well is approximately 6,972 feet. The vertical drift angle was fairly constant between 1031' and 5536', varying between 0.5° and 3.75°. From 5536 feet to TD, the drift angle increases from 3.75° to 16.24°. The angle increases because the bottomhole assembly was made more flexible rather than due to structural or lithologic effects.

Temperature logs

Figure 4 shows the results of the temperature surveys including mud in and mud out temperatures. The highest temperature recorded is 326°F at 6919' feet on the April 3, Kuster time-temperature survey. Bottom hole temperatures for the Schlumberger survey are 238°F. The April 3, Kuster survey temperature gradient projects to 350°F at 8700-9600 feet. However, if this temperature is corrected to the Spafford probe measurements taken on the same date the thermal gradient projects to 350°F at 9400-10650 feet. The highest geothermal gradient below the

13 3/8" casing is between 1030' and 1300', where it averages between 100°-110°C/km. The thermal gradient turns isothermal from 1300' to 2400'. Below 2400' it averages between 15° and 30°C/km. The difference between the March 4, Spafford probe survey and the April 3rd survey is due to the probes not being equillibrated with each other and/or the hole recovering from the thermal shock of drilling. The gradient maximum and roll over at about 1250' relates to three small fracture zones between 1200' and 1250' which are probably water bearing.

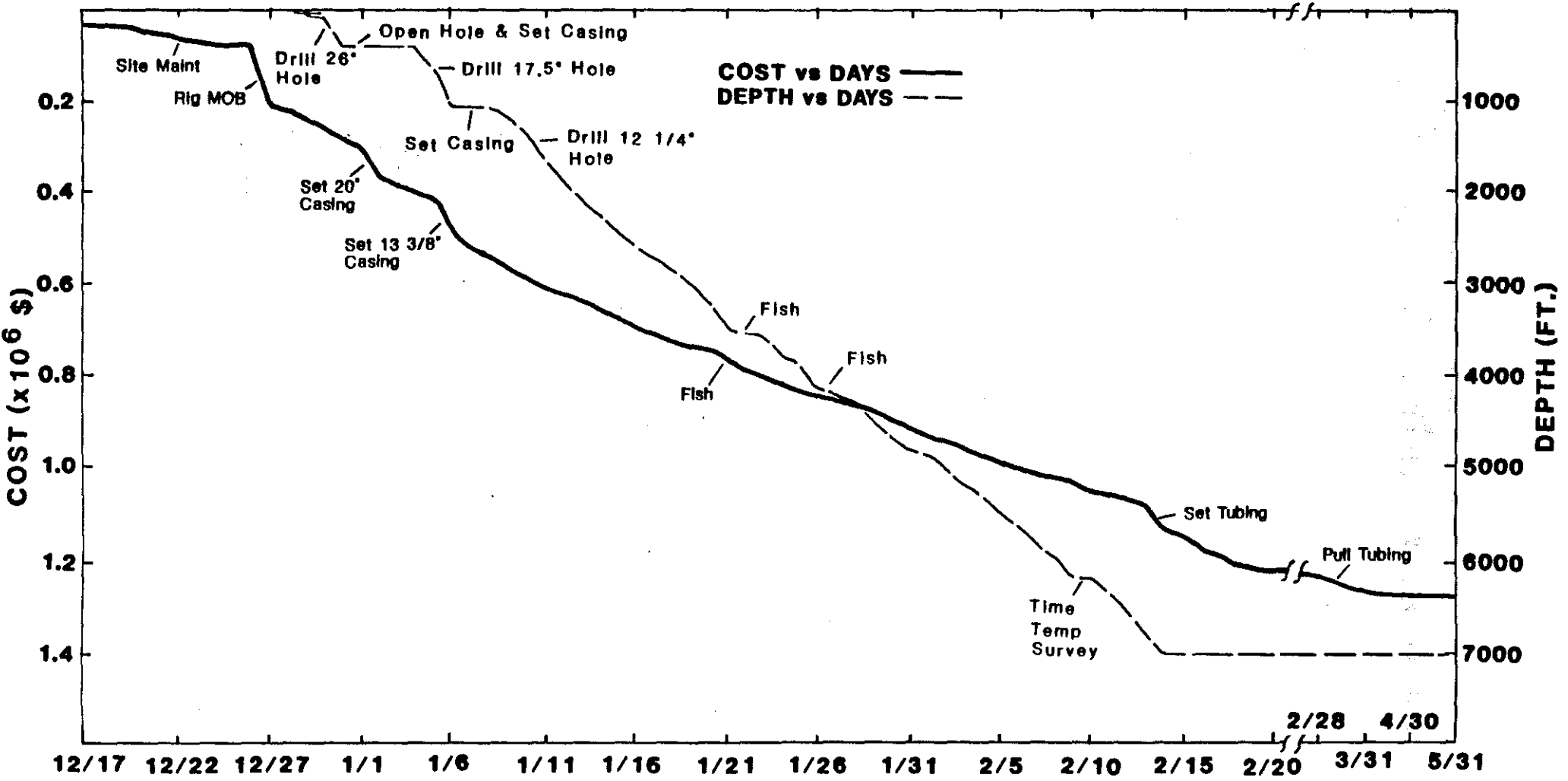

Figure 1. Animas TFD 55-7 Cost-Depth-Time Diagram

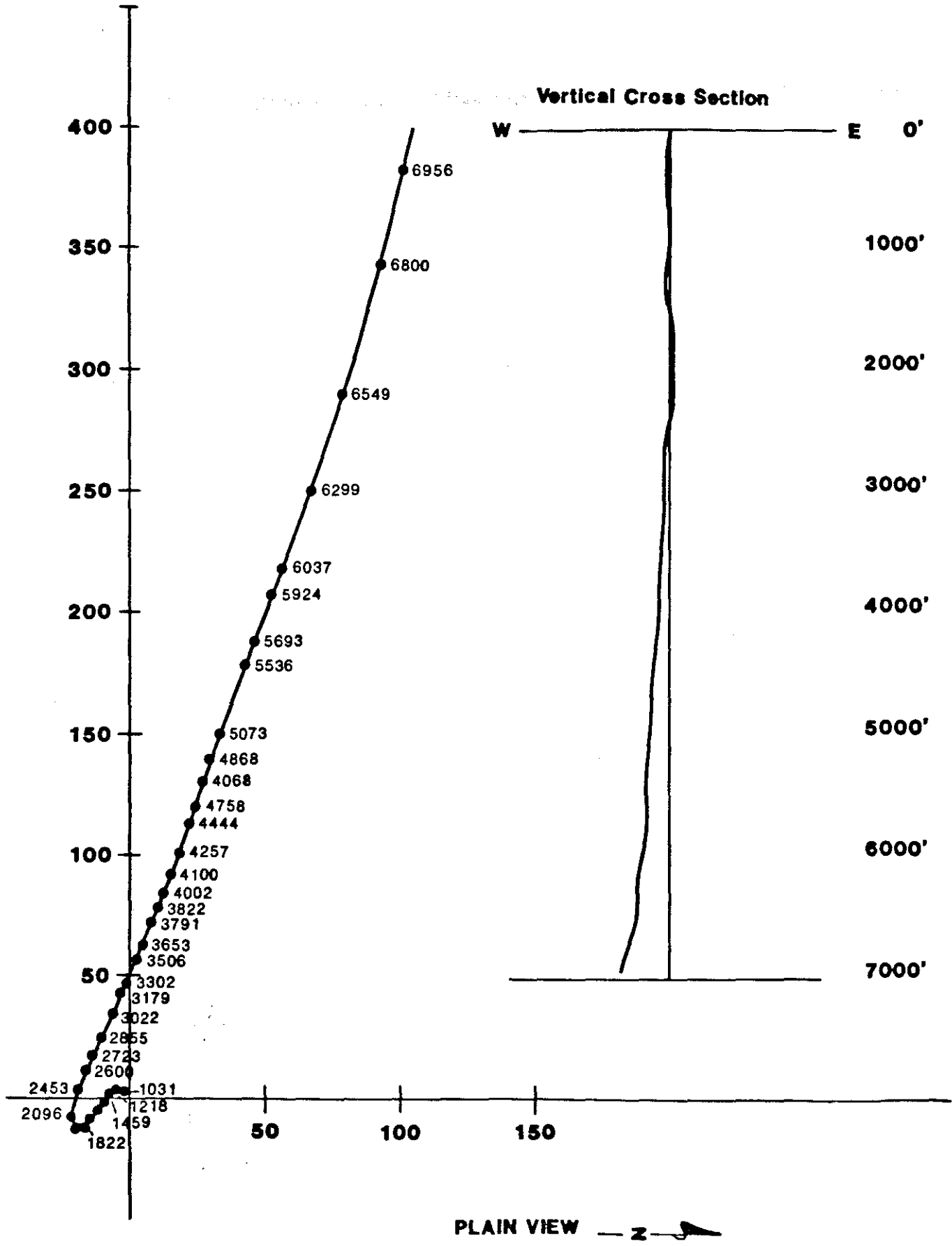

Figure 3. Animas TFD 55-7 Plan View and Vertical Cross Section

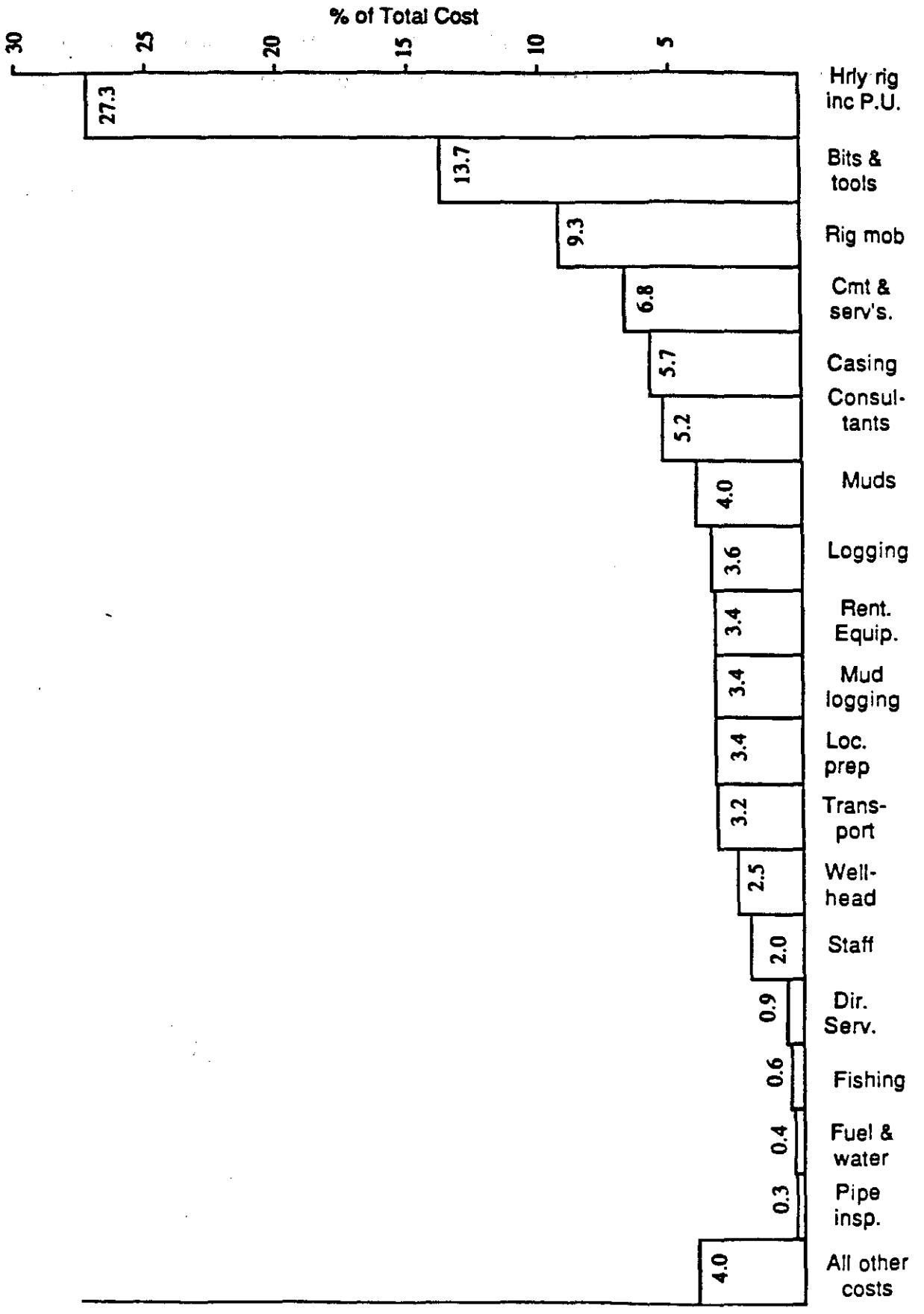

Figure 2. Animas TFD 55-7 Activity Percent Cost

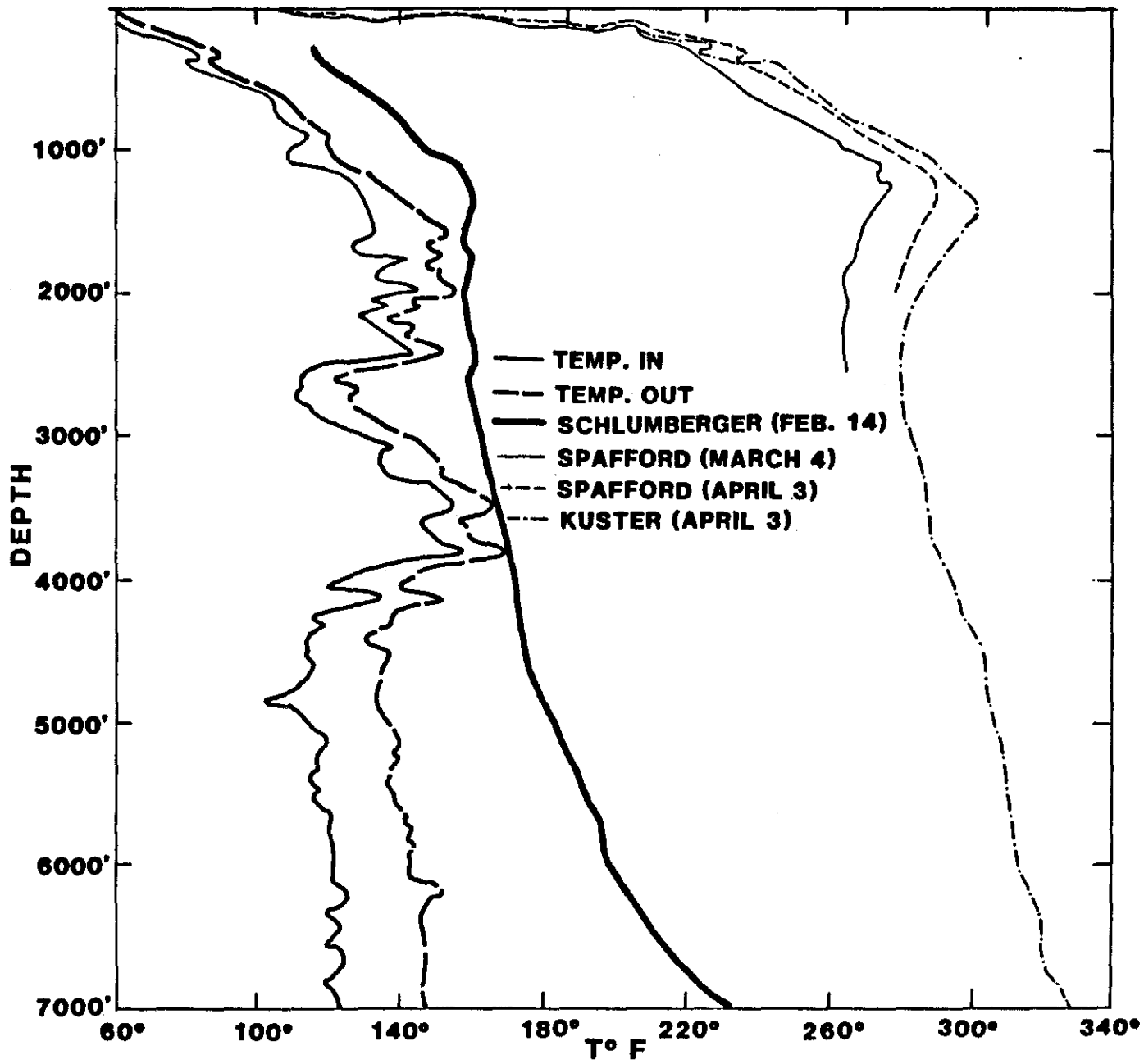

Figure 4. Animas TFD 55-7 Temperature Surveys