DRAINAGE PROJECT TESTS TILE INSTALLATIONS CONTRA COUNTY

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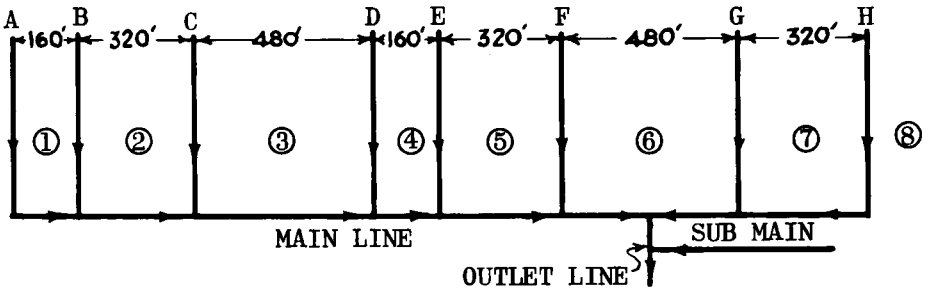
LINE LAYOUT, TILE TEST PLOT

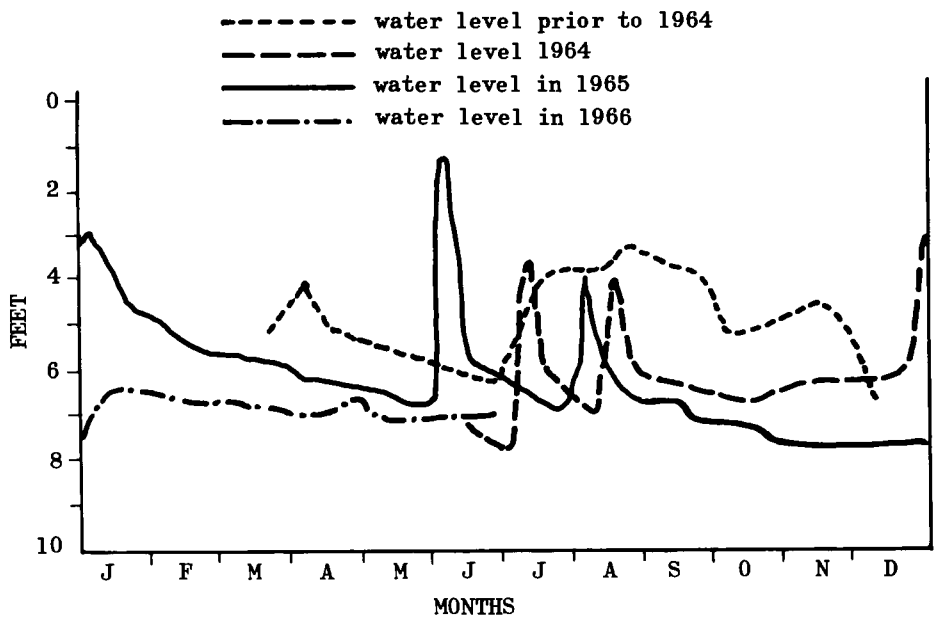


Stations (1), (2), and (3) in line layout sketch above were recorder wells. Stations (4) through (8) were observation wells only. Line details are specified in table below.

TILE MATERIALS AND SPECIFICATIONS

Line	Size	Length	Grade	Material
	Inches	Feet	Ft/Ft	
MAIN	6	1690	0.001	Bituminized Fiber
SUB MAIN	6	580	0.001	"
OUTLET	6	70	0.002	"
LATERALS:				
A	4	500	0.001	"
B	4	500	0.001	"
C	4	500	0.001	"
D	4	500	0.002	"
E	2	500	0.002	Plastic Experimental
F	6	500	0.002	Concrete
G	6	500	0.001	"
H	6	500	0.001	"

WATER TABLE FLUCTUATION AT RECORDER WELL NUMBER 2*



* Sharp rise in the water table represents an irrigation.

THE CONTRA COSTA COUNTY Drainage Project resulted from a request made of the Agricultural Extension Service at a county planning meeting held in 1964. The project involved the cooperation of the Extension Service, East Contra Costa Irrigation District, U. S. Soil Conservation Service, and USDA's Agricultural Stabilization Committee. The main objectives were: (1) to test spacing intervals for tile lines under soil conditions in the Brentwood and Byron areas of Contra Costa County as a basis for planning drainage projects for the two areas; (2) to test various tile materials with both gravel and glass fiber envelopes; and (3) to correct a serious drainage situation in a walnut orchard in Brentwood.

Hydraulic conductivity

The hydraulic conductivity of the Rincon clay and Rincon clay loam soils at the Brentwood site averaged 1.42 inches per hour. From auger-hole tests, it was estimated that the average tile spacing should be about 280 ft. Tile lines for the project were actually spaced at 160-, 320-, and 480-ft intervals, as shown in the diagram. The tile materials included bituminized fiber, concrete, and experimental plastic. The table gives general specifications for the tile project layout and materials used.

IN COSTA

CLYDE E. HOUSTON

Large, bulky machine seen above, moving through the orchard, was necessary to make tile installations at depths desired for these tests (6 to 7 ft).

Water table

Observation wells and permanent water-table recorders were established at the midpoint between tile lines. These recorders established data on water-table fluctuations during the irrigation season and throughout the winter rainfall season. Extreme ranges of water-table fluctuations at each recording station are listed below:

WATER TABLE FLUCTUATIONS

Station	1964–65	1965–66
	Range of extremes (depth in feet)	
1	5.0–7.8	5.0–7.7
2	3.3–6.7	2.7–7.5
3	5.6–7.6	4.3–7.5
4	6.5–7.4	5.5–7.0
5	6.5–7.5	5.8–7.4
6	6.5–7.5	6.0–7.5
7	6.4–7.2	5.8–7.0
8	5.7–7.0	5.8–7.0

Before installation (in 1964), the water table during most of the irrigation season was 3 to 4 ft below the soil surface. The graph shown of the water table at station 2 covers a period of time before the tile line was installed and also during the irrigation season for 1964, the complete year 1965, and the first part of 1966. These data are for extreme conditions. All other recorder and observation-well records indicate a stabilization in the water table at the 5½-ft depth midway between tile lines. The extreme fluctuations at station 2 indicated the need for additional drainage to correct the high water table caused by variations in soil structure in that area.

An analysis of samples of the soil and water resulted in this comparison of salinity and boron levels before the project started, and after two years of operation:

SOIL SALINITY 1964–1966

Soil depth	Range
inches	mmhos/cm
0—12	.76—.60
12—24	1.39—.95
24—48	1.76—.96

QUALITY OF DRAINAGE WATER

	Electrical conductivity	Boron
	mmhos/cm	ppm
1964	1.90	2.5
1965	1.95	3.1
1966	2.10	2.8

Tile installation

Installation of the tile line was complicated to some extent by the large bulky equipment necessary (see photo) to make the installations at the depths desired. Costs of the installation (listed here) may be used to estimate growers' costs for material plus installation—on a unit basis only. These costs represent expenditures that went into a project that was also designed to collect information that could be applied to other parts of the district.

COST OF TILE INSTALLATION

2000′ of 4″ bituminized fiber @ $1.10	$2200.00
2245′ of 6″ bituminized fiber @ $1.34	3008.30
1485′ of 6″ concrete @ $1.46	2168.10
500′ of 2″ plastic (experimental)	no charge
Eight 6′ bituminized fiber standpipes	96.00

Average cost for the 37½-acre installation was $199 per acre. In addition, the irrigation district provided an extensive outlet system for the project, costing $4,472, including pump.

After two years of operation, these preliminary conclusions were reached: (1) the water table was stabilized except at one location in the 40-acre walnut orchard; (2) the water table was stabilized at about 5½ ft during both the irrigation season and the winter rainfall season; and (3) tile lines spaced 480 ft apart functioned as well as lines spaced 160 ft apart in this soil type. The 2-inch plastic experimental line seemed to function as well as the 6-inch concrete and 4-inch bituminized fiber lines.

Paul W. Lamborn is County Director and Farm Advisor, Contra Costa County, and Clyde E. Houston is Extension Irrigation and Drainage Engineer, University of California, Davis. *Evo Baldocchi furnished the tile lines and field used for the project and engineering assistance was obtained from Jack E. Farmer, Superintendent of the East Contra Costa Irrigation District.*