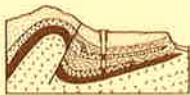


10-12

Delineation of Montecito Basin
Evaluation of Recharge to Basin from
Consolidated Rocks
Montecito Water District
April 18, 1979



MICHAEL F. HOOVER Consulting Geologist

800 GARDEN STREET, SUITE L • SANTA BARBARA, CALIFORNIA 93101 • (805) 965-3046

April 18, 1979

Montecito County Water District
583 San Ysidro Road
Santa Barbara, California 93108

Attention: Mr. Charles Evans, General Manager

Subject: Delineation of Montecito Basin
Evaluation of Recharge to Basin from Consolidated Rocks

Gentlemen:

INTRODUCTION

In accordance with our services agreement, I am providing geologic and hydrologic information which is intended to expand the data base in the Montecito area, and to aid you in your inhouse study of the private pumpage in the Montecito Basin.

DELINEATION OF SANDSTONE/BASIN BOUNDARY

The Montecito Basin is a complex, sediment-filled basin that is divided into three sub-units (storage units) by east-west trending faults (Plate 1). The Basin is open to the ocean on the south (where it is terminated by an offshore fault). On the north, the Basin gradually thins (Plate 2), and terminates in an irregular pattern, generally in the vicinity of Mountain Drive.

Above the northern terminus of the Basin, the topography rises rather steeply. Wells in this area (generally above Mountain Drive) withdraw water from sandstones of either the Sespe or Coldwater



Formations. Other wells are drilled in an area where the unconsolidated deposits comprising the Montecito Basin overlap the sandstone. These wells may withdraw water from either the sandstone or the overlying unconsolidated deposits, or both aquifers. This overlap area is delineated on Plate 1. Water wells located below the overlap area generally withdraw water from unconsolidated deposits that comprise the Montecito Basin.

There had been approximately 231 successful wells drilled in Montecito as of April 1, 1979. The wells range in yield from 2.5 to 250 gpm. Well locations and pertinent well information are also on Plate 1. Approximately 113 wells are drilled into, and withdraw water from the unconsolidated deposits which comprise the Montecito Groundwater Basin. Approximately 93 wells are located in and withdraw water from the consolidated rocks that outcrop adjacent to the Basin. Approximately 26 wells are in the marginal or overlap area. Wells located in the overlap or marginal area overlies the unconsolidated deposits (the "Basin"); however, they may be drilled into the underlying sandstone, or withdraw water from both the unconsolidated deposits and the sandstone aquifers. Wells in this area require a careful analysis of both formation logs and well construction information in order to determine their relationship to District wells.

SUBSURFACE SEEPAGE FROM CONSOLIDATED ROCKS

Given that both the consolidated rock or "sandstone aquifers" and unconsolidated or "Basin aquifers" co-exist in Montecito, it is important to ascertain the relationship between the two. The U.S. Geological Survey (Muir, 1968) estimated (on the basis of data acquired in Goleta) that the consolidated rocks contribute approximately 300 acre-feet per year to the basin in the form of subsurface inflow.

I have recalculated subsurface inflow using data developed in



Montecito and the following relationship:

$$Q = TIW$$

where:

Q = flow in gallons per day

T = aquifer transmissibility in gallons per day per foot

I = hydraulic gradient between the sandstone and the basin
in feet per foot

W = width of the aquifer in feet

Data from pumping tests in water wells in the consolidated rocks in Montecito suggest the following values:

T = 178 gallons per day per foot

I = .0625

W = 20,000 feet

therefore, Q = 222500 gpd, or 250 acre feet per year

Applying these values, the seepage from the consolidated rocks is estimated to be a maximum of 250 acre feet per year. The actual subsurface seepage is probably less than 250 af/yr, since the transmissibility value of 178gpd/ft does not take into consideration the numerous dry holes drilled in the Sespe Formation.

Since the subsurface seepage depends upon the hydraulic gradient between the sandstone and the basin, then it follows that if that gradient were lowered by heavy pumping of the sandstone aquifers, the subsurface seepage would be lowered.

Assuming that the sandstone wells lower the water table overall by 25 feet (maximum estimated utilization) the gradient would be lowered to .05 feet per foot, resulting in a subsurface seepage of approximately 200 af/yr. Thus, the maximum anticipated effect that wells drilled into the Sespe and Coldwater Formations will have upon the subsurface seepage is approximately 50 acre feet per year. In light of the fact that the "Basin" water table will probably be lowered commensurately with the sandstone water table (piezometric



surface), the effect of the Sespe wells on the Montecito Basin is essentially negligible.

RECHARGE FROM LOW-FLOW OF STREAMS

The majority of the recharge to the Montecito Basin results from direct infiltration of rainfall, and from stream seepage.

The majority of the recharge from stream seepage occurs in the winter months. However, a significant amount of recharge occurs after the rains, during the spring and early summer months when base flow from the consolidated rocks (principally the Coldwater sandstone) discharges water to the creeks. This water eventually flows into the basin and recharges.

The amount of low flow (resulting from base flow) in the major streams in Montecito can be estimated using data developed during extensive USGS investigations that were conducted during the construction of the Tecolote tunnel.^{1,2}

Using this methodology, the low flow from springs and streams in Montecito is estimated to be 436 to 585 acre feet per year (Table I).

Surface water diversions on creeks in Montecito are estimated on Table II. Most figures on Table II are based on consumptive use, and are therefore estimated (surface water diversions are not metered).

- 1 U.S. Geological Survey, 1960. Flow of Springs and Small Streams in the Tecolote Tunnel Area of Santa Barbara County. Open File Report.
- 2 U.S. Geological Survey, 1968. Reconnaissance of the Ground-Water Resources of the Ellwood-Gaviota Area. Open File Report.

MICHAEL F. HOOVER
Consulting Geologist



Subtracting the amount of estimated surface water diversions from the maximum estimated low flow yields a net recharge to the Basin from low flow of streams of 27 to 216 acre feet per year. The net low flow recharge of 27 to 216 acre feet is the maximum amount of recharge water that can be diverted away from the Basin due to additional surface water diversions or Coldwater sandstone wells.

It is important to note that a large quantity of water (approximately 444 acre feet per year) was being diverted during the 1950's when the perennial yield estimate was made. These diversions have therefore been integrated into the estimate of safe yield, and should not be subtracted from the safe yield as "pumpage" as some investigators have done.

In summary, wells withdrawing water from the "Basin" affect the District's wells directly. Wells drilled into the sandstone aquifers and stream diversions affect the District wells indirectly. Wells drilled into the Sespe Sandstone affect the District wells by a maximum of 50 acre feet. Wells drilled into the Coldwater sandstone and stream diversions affect the recharge to the Basin by a maximum of 216 acre feet per year, less evaporation, or approximately 175 acre feet per year. These estimates assume full utilization of the sandstone aquifers, and are not representative of present conditions.

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I trust that this letter is of benefit in your inhouse analysis of private pumpage, and your forthcoming safe yield analysis. If you have any questions, please contact me.

Sincerely,


Michael F. Hoover



TABLE I

ESTIMATE OF LOW FLOW FROM
CREEKS AND SPRINGS IN MONTECITO

Acreage of Watershed above Consolidated Rocks-Basin Sediments contact

Picay	626 acres
Romero	1303
East Fork Buena Vista	424
Buena Vista	424
San Ysidro	2118
Oak	300
Hot Springs	550
East Fork Cold Springs	957
Cold Springs	<u>1272</u>
	7974 total acres above basin sediments
	7974 acres = 12.46 sq. mi.

Assuming that the annual low-flow is 35 to 47 acre feet per square mile, then the low-flow recharge to basin per year by streams (minus evaporative loss and consumptive use by riparian vegetation) equals approximately 436 to 585 acre-feet.

* Miller and Rapp, 1968



TABLE II

STREAM DIVERSIONS IN MONTECITO

<u>Stream/User</u>	<u>Low Estimate</u>	<u>High Estimate</u>	<u>1950's Estimate</u>
Hot Springs Creek			
Montecito Creek			
Water Co.	62	126	62
Cold Springs Creek	75	150	150
Romero/Picay Creeks			
Cynthia Wood	8.5	8.5	8.5
Petan Company	122	172	122 (?)
Jesuit Novitiate	102	102	102
San Ysidro Creek	<u>0</u>	<u>?</u>	<u>0 ?</u>
	369.5 af/yr	558.5 af/yr	444.5 af/yr

Map of Montecito Groundwater Basin - 61" x 36" - cannot scan
Plate 1-2, Basin Boundaries - oversized, cannot scan

