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Possibility of excessive rise of the water table at the site of Birmingham General Hospital, San Fernando Valley, California

By
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This memorandum was prepared at the request of the Veterans Administration. It relates to the possibility of flooding of basements at the Birmingham General Hospital as a result of future rises of the water table.

In the central part of the San Fernando Valley water-bearing materials extend to a depth of several hundred feet below the land surface and are overlain by a few tens of feet of deposits consisting largely of clay and silty to sandy clay. These shallow deposits are tight enough locally to confine water under artesian pressure within the main water-bearing zones. At some other places in the valley where local recharge from nearby sources can occur, these shallow deposits of low permeability support a semiperched water body above the main zone of saturation. At still other places (see p. 4) the shallow materials are fairly permeable. For the main part of the valley, ground-water movement is, in general, to the east and southeast, resulting in rising water southeast of Van Nuys where the boundaries of the basin converge.

The Los Angeles County Flood Control District has considered this area critical with respect to excessively high water levels and has made an investigation of ground-water conditions. About 7 miles southeast of the Birmingham Hospital site, water levels as little as 5 to 10 feet below the land surface were observed by the District in April 1944. Ground-water

contours were not, however, extended north or northwest of Van Nuys. No work on shallow ground-water levels has been done by the Flood Control District in the vicinity of the Birmingham Hospital area.

All wells near the hospital site are shown on the attached map. Of the 12 shown, only 2 are shallow: no. 4769 (60 feet deep), too far away to yield pertinent information, and no. 3691A (33 feet deep) along the Los Angeles River. The latter well may show abnormally high levels because of possible recharge from the river.

Data obtained from a graph on file at the Los Angeles County Flood Control District may be pertinent. Six test wells, each 10 feet deep, apparently existed at some time in the past at half-mile intervals from Corbin Avenue east to White Oak Avenue, along Van Owen Street. Profiles of the water table were drawn for April 1930 and April 1945. A table showing scaled depths to water is as follows:

Station	Depth to water below land surface, in feet	
	April 1930	April 1945
Corbin Avenue (just west of map)	1	4
Tampa Avenue	4½	1½
Wilbur Avenue	Below bottom, estimated 14	5½
Reseda Avenue	do., estimated 17½	8
Lindley Avenue	do., estimated 24	Below bottom, est. 10½
White Oak Avenue	do., estimated 32	do., estimated 15½

The estimated values seem to be on rough straight-line extrapolations and hence are probably subject to question. Extrapolating still farther west to Balboa Avenue (a distance of 1 mile), the depth to water would be 60 feet in April 1930 and 38 feet in April 1945. However, inasmuch as the land-surface gradient changes east of White Oak Avenue, the validity of such added extrapolation should be open to extreme question. Furthermore, with the existence of appreciable flow in Bull Canyon Wash during wet years, the water table should rise east of Balboa Boulevard and might have been as

shallow as 15 feet below the land surface in April 1945. The above is all that seems to be available with respect to an attempt to determine the depth to shallow water directly. Following are a few observations made after assembling all pertinent information.

For the area in question, flooding of subsurface construction at the hospital can occur from two sources--(1) surface inflow from abnormally high accretions of water in the flood-control reservoir to the south, and (2) direct seepage of shallow ground water into structures extending below the water table. These will be considered separately.

Surface-water inflow from adjacent flood-control reservoir.- Assuming the worst case, a 14-foot basement constructed below altitude 715 would be in danger only when flood stage reached 715 feet. The U. S. Corps of Engineers reports that the design stage is 712 feet (based on a 100-year frequency), which would be too low for surface inflow. The highest recorded stage was 699.3 feet on January 23, 1943. Although the Flood Control District reported a momentary inundation to 712 feet during the 1938 flood in the vicinity of Balboa Street, owing to the inability of the channel downstream to carry the load, it is likely that channel improvements made in connection with construction of the flood-control reservoir would prevent a recurrence of such inundation except in some very extreme instance. Apparently, flooding from this source is most unlikely.

Direct seepage of shallow ground water into porous substructures.- Water-level rise in the shallow body can occur from at least three possible sources --(1) absorption of water directly applied to the land surface in the vicinity of the site, (2) leakage from wells tapping deeper zones, and (3) development

of a hydraulic gradient away from the reservoir.

With respect to absorption of water directly applied to the land surface nearby, such application could result in a serious threat to subsurface construction, particularly if the shallow deposits at the hospital site are fairly tight, resulting in the development of a semiperched level that would remain high for a considerable period of time. For instance, artificial-recharge operations up gradient from the hospital site could raise the water levels in the shallow aquifers sufficiently high to cause trouble if the shallow and deep aquifers proved to be interconnected in the higher parts of the valley.

A rise of the shallow water level due to leakage from deeper wells is known to have occurred, presumably late in the forties, at three places west of the hospital area. These are, respectively, at Van Owen Street and Wilbur Avenue, where the shallow level rose to within 8 feet of the land surface; at Sherman Way and De Soto Avenue, within 5 feet; and at Vandalen Avenue and Chase Street, within 4 feet. The nearest of these places is about 2 miles west of the hospital site. Reference to the attached sketch will show that, if such leakage had occurred at the site, the highest altitude of record (702 feet) would have resulted in a minimum depth of 23 feet to shallow water at well 3691C and possible, but not necessarily, in a somewhat lesser depth at the lower part of the area. It should be noted that the highest level reached at well 3691B, south of the Los Angeles River, was 703 feet, only 12 feet below the land surface.

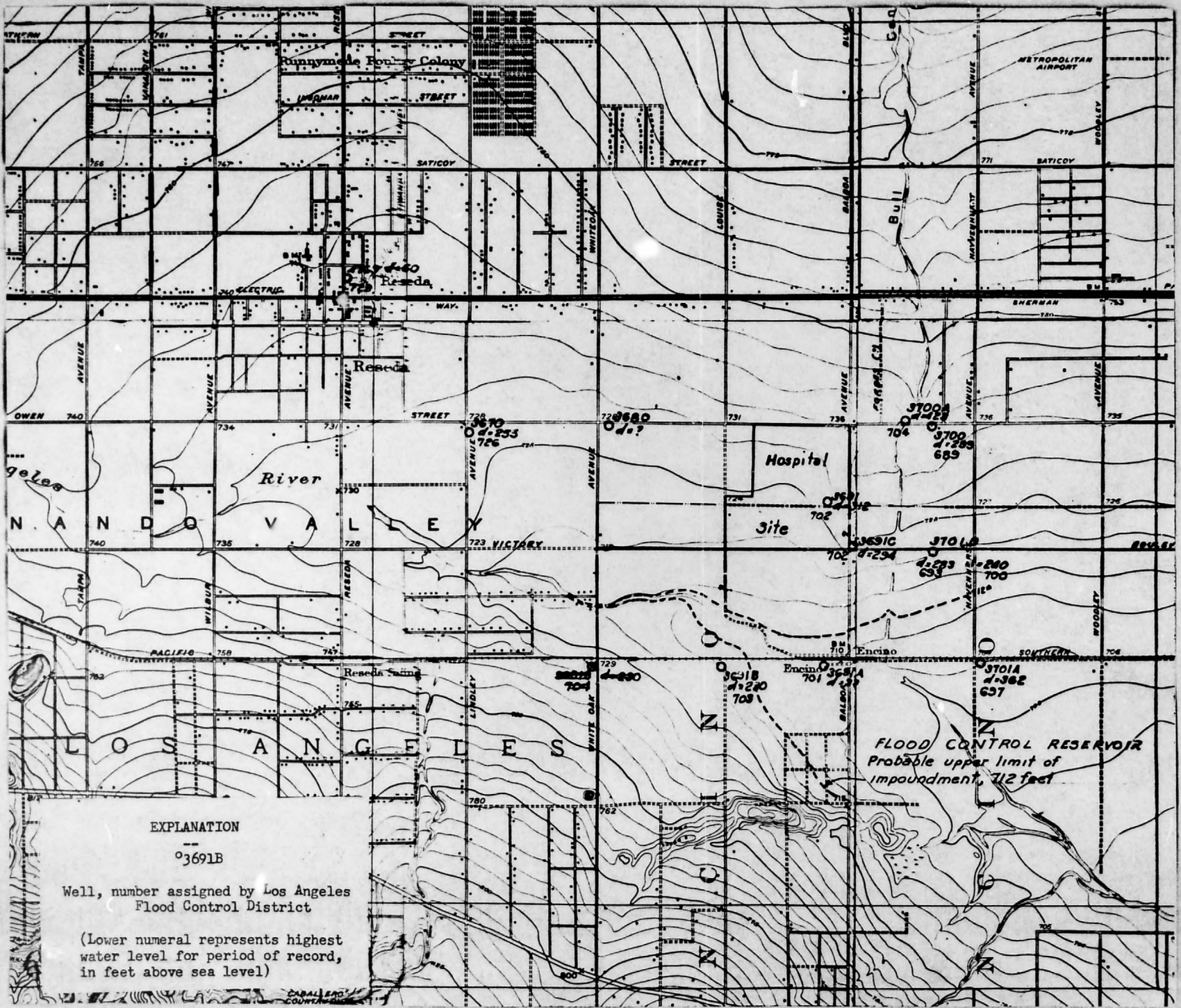
Apart from leakage due to imperfect casings of wells penetrating deeper zones, the level in these zones can influence shallow levels to some extent if their overlying confining materials are not completely impervious. According to Harry F. Blaney of the Division of Irrigation, Department of

Agriculture, materials overlying the main aquifers in San Fernando Valley are relatively pervious locally; at such places water levels in the shallow and deeper zones are about the same. Regardless of which of the two physical conditions exists at the site, a minimum level depth to water would be at least 20 feet. On the basis of long-term changes of stage of the deeper body, it might be expected that the water surface would recede to as much as 35 to 40 feet below land surface. Rise of water by leakage from deep zones probably would not cause trouble at the higher parts of the hospital site.

Finally, the development of a northward gradient from the reservoir can be considered a pertinent factor when the level in the reservoir nears its design stage of 712 feet. No routing schedule apparently is available for this stage, but it is estimated that it would hold for not more than 1 hour. For the maximum height actually recorded (699.3 feet above sea level on January 23, 1943) the level in the reservoir rose to this height from 676 feet in 18 hours, and declined to 674 feet in 66 hours. Presumably there would be insufficient time for appreciable infiltration except in relatively coarse materials. The possibility of the development of a groundwater mound of sufficient height to endanger a nearby basement at the cited altitude can be considered remote.

In summarizing, it is believed on the basis of available records that a minimum depth to water on the hospital site on the order of 15 feet is a fair guess, and that for normal years the water level may recede to as much as 35 feet below land surface. However, if artificial recharge operations were attempted in the vicinity of the site, such additions to the deeper zones could conceivably boost the head in these to levels above the historic natural highs. Unless the shallow deposits are virtually impervious, such

increases in head ultimately would be transmitted to these overlying materials, resulting in levels only a few feet below the land surface. In view of this possibility, it should be emphasized that subsurface construction anywhere on the site may be in danger of flooding if carried below an altitude of 712 to 715 feet, and that the southern, lower part of the site is the most likely to be flooded. Construction in the southern part, or in any part below 712 to 715 feet, therefore, should be undertaken with this in mind.


Sunnymede Poultry Colony
Reseda
Reseda
Hospital
Site
River
N A N D O V A L L E Y
L O S A N G E L E S
Encino
Reseda Farms
FLOOD CONTROL RESERVOIR
Probable upper limit of
impoundment, 712 feet
EXPLANATION
3691B
Well, number assigned by Los Angeles
Flood Control District
(Lower numeral represents highest
water level for period of record,
in feet above sea level)

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