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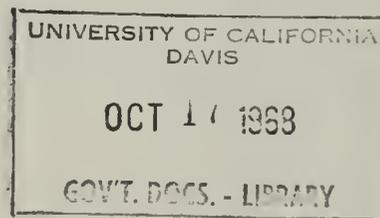
Department of Water Resources

BULLETIN No. 74-4

Water Well Standards

CENTRAL, HOLLYWOOD,
SANTA MONICA BASINS
LOS ANGELES COUNTY

Final Supplement



AUGUST 1968

RONALD REAGAN
Governor
State of California

WILLIAM R. GIANELLI
Director
Department of Water Resources

FOREWORD

Bulletin No. 74-4, "Water Well Standards: Central, Hollywood, and Santa Monica Basins, Los Angeles County", was published in a preliminary edition in October 1965 and was given wide distribution at that time. On August 22, 1966, a departmental public hearing was held, but no changes in the Bulletin resulted from it.

Because the preliminary edition offered extensive and comprehensive data about geology, hydrology, water quality, and minimum water well standards, only the revised supplemental water well standards for the Central, Hollywood, and Santa Monica Basins are being published as a supplement to the preliminary edition of Bulletin No. 74-4, to make the information it contains concise and readily accessible, as well as for reasons of fiscal economy. The boundaries of the "Areas of Recommended Sealing Standards" have been revised in accordance with the minimum standards established for the entire State by Bulletin No. 74.

The investigation that led to this publication was authorized by Section 231 of the California Water Code. Sections 13800 through 13806 of the Code set up a procedure for adoption of local ordinances to establish water well standards:

13800. The department, after such studies and investigations pursuant to Section 231 as it finds necessary, on determining that water well construction, maintenance, abandonment, and destruction standards are needed in an area to protect the quality of water used or which may be used for any beneficial use, shall so report to the appropriate regional water quality control board and to the State Department of Public Health. The report shall contain such recommended standards for water well construction, maintenance, abandonment, and destruction as, in the department's opinion, are necessary to protect the quality of any affected water.

This supplement provides specific recommendations to form the basis of such local ordinances for protecting the quality of the State's water resources in compliance with the provisions of the California Water Code.

Valuable data and other assistance were contributed by agencies of the Federal Government and of the State of California, by cities, counties, public districts, and private companies and individuals. Special mention is accorded to the Los Angeles County Flood Control District, Roscoe Moss Company, and Water Wells Supply Company.

William R. Gianelli
 William R. Gianelli, Director
 Department of Water Resources
 The Resources Agency
 State of California
 June 17, 1968

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ABSTRACT

The bulletin reports on areas of Central, Hollywood, and Santa Monica Basins, Los Angeles County, which require supplemental sealing standards for water wells to protect the quality of the ground water.

Five different areas--with specific differences in degree of need for water well standards--can be established for these basins on the basis of the quality of the water.

It is recommended that local agencies adopt the standards that the Los Angeles Regional Water Quality Control Board (No. 4) and the State Department of Public Health may establish, as set forth in this bulletin.

This report supplements the preliminary edition of the same bulletin published in October 1965.

WATER WELL STANDARDS

In compliance with the California Water Code, it has been necessary to establish supplemental water well standards for those localities where minimum statewide standards are inadequate to protect ground water quality from impairment by improperly constructed or sealed wells.

Persons involved in any phase of water well construction or destruction in the Central, Hollywood, and Santa Monica Basins should have, in addition to this report on supplemental standards, a copy of the statewide Standards (Chapter II) from Department of Water Resources Bulletin No. 74, "Water Well Standards: State of California". Application of the recommended statewide and supplemental water well standards to the construction and destruction of water wells is intended to prevent quality impairment caused by improperly constructed, defective, or inadequately destroyed wells. The standards apply not only to wells in the planning stage, but also to those now in use that require modification and those scheduled for destruction.

Supplemental Water Well Construction Standards

Water quality problems and conditions of ground water occurrence require that, in some parts of the study area, the statewide water well standards be supplemented to protect quality from impairment. Typically, the deeper aquifers contain better water than the shallower. Where the quality is so poor that it presents a threat, necessary measures must be taken to seal off the shallower aquifers in wells to keep the impaired water from moving into the deeper aquifers. Accordingly, additional standards have been devised to meet those needs.

Based on the characteristics of ground water occurrence and quality conditions, as determined by this study, the Central, Hollywood, and Santa Monica Basins have been separated into 5 zones (Figure 1).

Central, Hollywood, and Santa Monica Basins Recharge Areas (Zone I)

Those parts of the study area requiring minimum water well standards are in Zone I (Figure 1). This embraces portions of the Santa Monica and Hollywood Basins, and most of the Los Angeles and Montebello Forebays, as well as the Whittier area in the Central Basin.

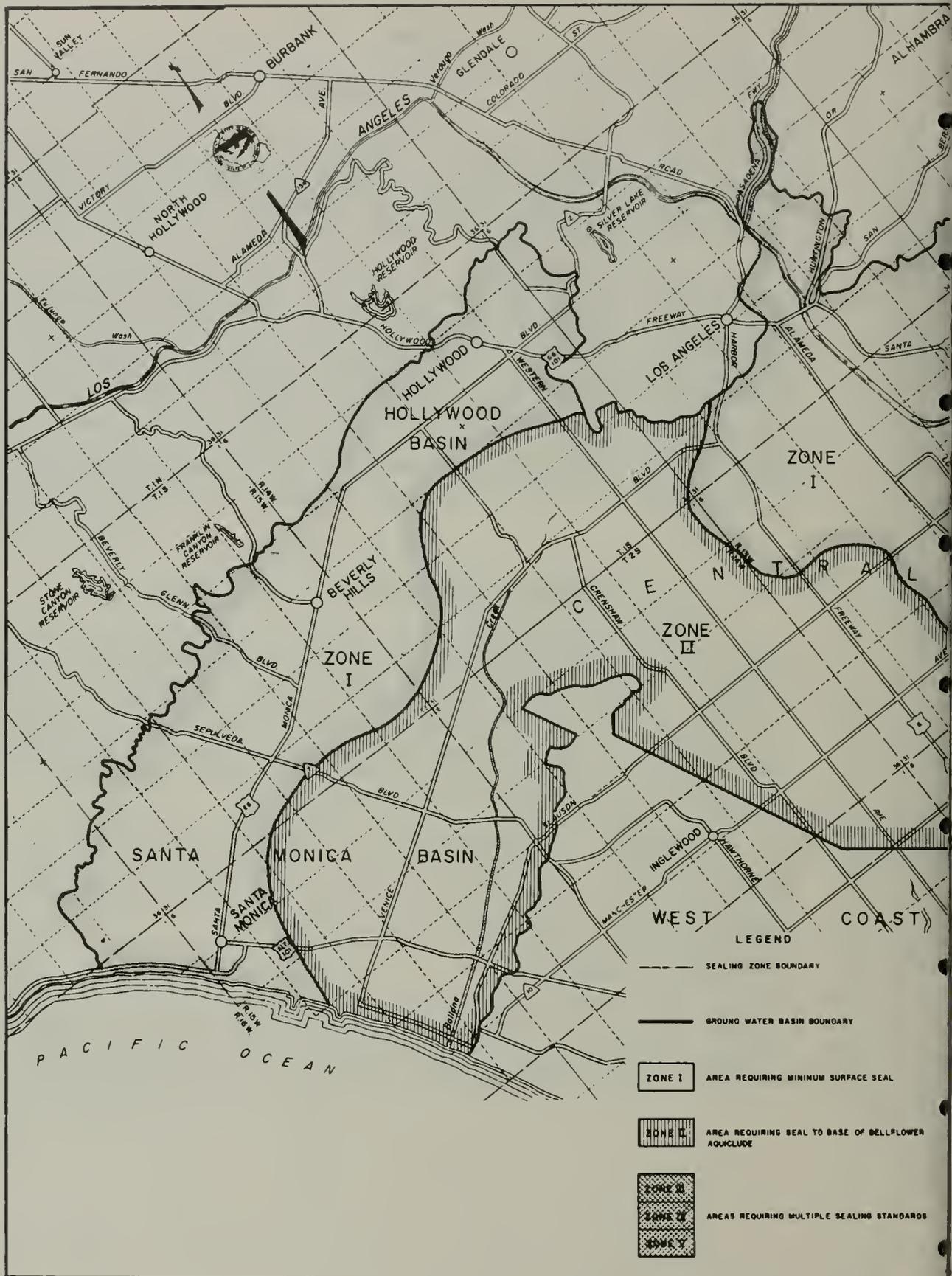
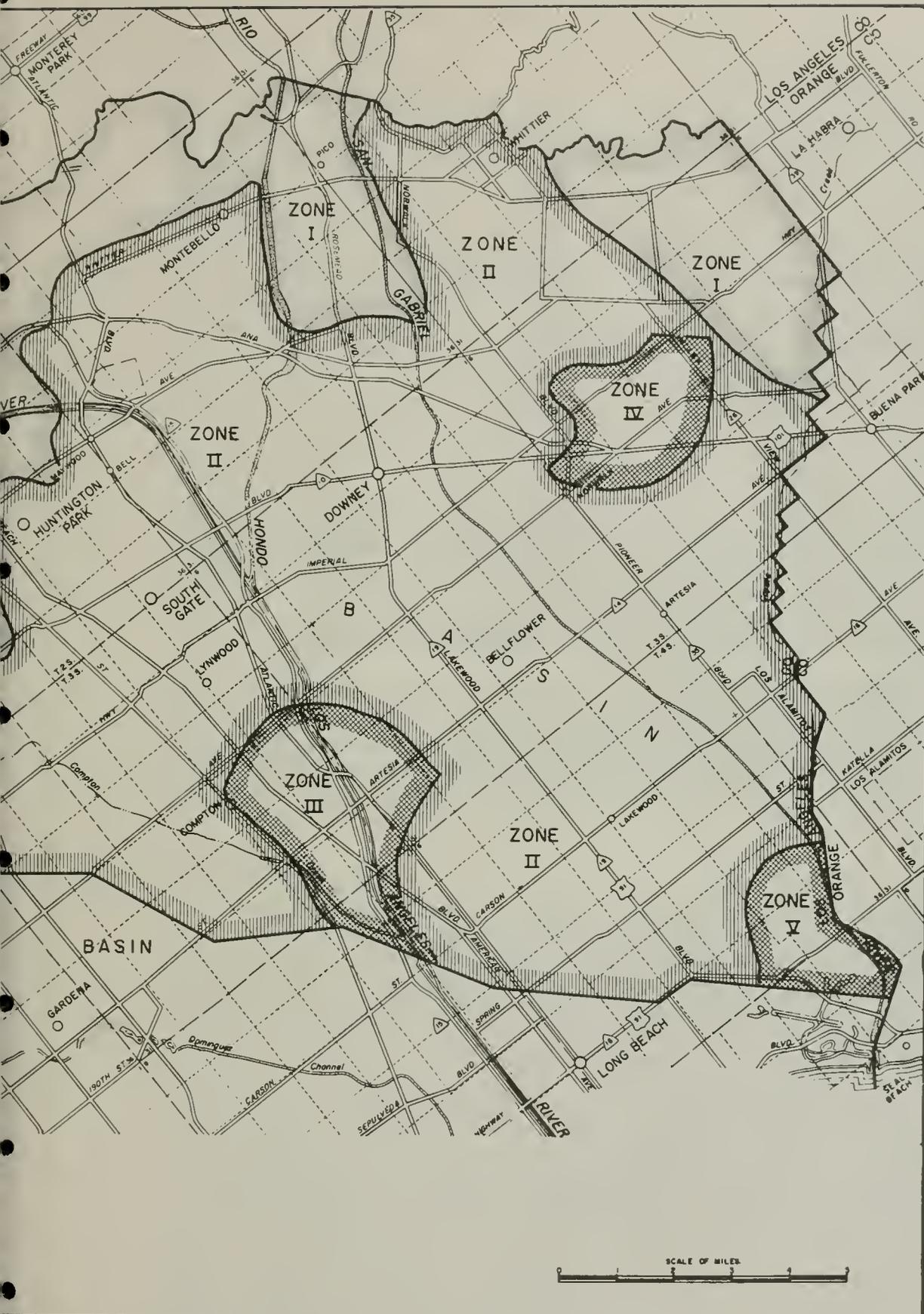


Figure 1. AREAS OF RECOMMENDED

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1968



SEALING STANDARDS

Bellflower Aquiclude--Zone II

Maintaining the protection provided by the Bellflower aquiclude is the only special factor to be considered in constructing and sealing wells.

Water Quality Conditions. In this area (Figure 1), semiperched water-bearing zones contain waters that have been degraded. Concentrations of total dissolved solids (TDS) range from 400 ppm to 34,000 ppm.

Recommended Standards. In addition to the minimum standards, it is recommended that the seal extend to the base of the Bellflower aquiclude. The elevation of the base for a specific well location in Zone II may be determined from Figure 2.

Dominguez Gap--Zone III

The aquifers underlying the Gaspar aquifer in the Dominguez Gap area contain ground water of good to excellent quality, averaging about 350 ppm TDS, but could be impaired by the downward movement of poor quality water from the Gaspar aquifer through inadequately sealed wells. Consequently, wells penetrating aquifers underlying the Gaspar aquifer in this area should be constructed so they do not facilitate this movement.

Water Quality Conditions. Within the inland segment of Dominguez Gap, ground water quality in the Gaspar aquifer deteriorates southwesterly, with water from wells near the Gap's Basin boundary containing more than 900 ppm TDS. Disposed oil brine wastes reaching the Gaspar aquifer are suspected as the chief source of this impairment. The estimated areal extent of degraded ground water in excess of 700 ppm TDS in the aquifer is shown in Figure 3.

Under present conditions, a slight inland ground water gradient exists, which may allow the impaired water at Dominguez Gap to move further inland. Although its rate of travel would be slow, it must be recognized that as long as the prevailing situation persists the impaired water could affect a larger area. To anticipate this, a one-mile-wide peripheral area has been included in Zone III inland from that containing water in excess of 700 ppm TDS. It is believed that the impaired water will not reach further inland than one mile.

Recommended Standards. Wells that extend only to the Gaspar aquifer in Zone III shall comply with the requirements for Zone II. In addition to the requirements for Zone II, in all wells that penetrate aquifers below the Gaspar aquifer, the annular space seal shall extend at least 20 feet below the base of the Gaspar aquifer. Elevations on the base of the Gaspar near Dominguez Gap are shown in Figure 3.

Norwalk Area--Zone IV

In this zone, well construction and sealing requirements should protect the Artesia aquifer from further deterioration and the underlying aquifers from the downward movement of polluted water in the Artesia aquifer.

Water Quality Conditions. The quality of the water in the Artesia aquifer near Norwalk has been adversely affected by hydrocarbon pollution. The estimated boundaries of the region (900 acres) in which ground water has been affected by pollution are shown in Figure 4.

The portion of Zone IV outside the suspected area of polluted water is based on the anticipated future lateral movement of the polluted water. The variability of the factors affecting this movement, however, makes it difficult to predict the amount and direction of movement, which depends primarily on the amount and direction of the hydraulic gradient. Until 1963, the gradient from the polluted area was westward because of a pumping depression immediately west of the area; now, ground water movement is southward. Estimates of the potential rate of movement vary widely: as low as 600 feet per year and as high as 4,000 feet per year.

Recommended Standards. Wells that extend only to the Artesia aquifer in Zone IV shall comply with the requirements for Zone II.

Wells penetrating aquifers beneath the Artesia aquifer require sealing off that aquifer to prevent polluted water from moving down into those aquifers. To accomplish this, the seal should extend to at least 20 feet below the base of the Artesia aquifer. The elevation of the base of the Artesia aquifer beneath Zone IV is shown in Figure 4.

Alamitos Gap--Zone V

The areal extent of Zone V, for which these supplementary standards are recommended, was determined from a review of the Alamitos Gap Project and an evaluation of its effect on saline water in the Gap. This is a cooperative project by the Los Angeles County Flood Control District and the Orange County Water District to develop a pressure ridge across the Alamitos Gap as a barrier to prevent further sea-water intrusion, consisting of a series of aligned injection wells (Figure 5). Imported fresh water is now used in the injection wells to build up the pressure ridge. However, the barrier will be seaward of the inland penetration of the saline water. As a result, a wedge of saline water will be pinched off inland from the barrier and will probably move still further inland. Although the future behavior and final disposition of this wedge cannot be predicted accurately, estimates can be made, based on the results of the West Coast Basin Barrier Project at Manhattan Beach, California, and on experiments conducted at the University of California at Berkeley. Eventually, the wedge may be dissipated by commingling with the injected fresh water, but until that happens, the wedge could cause some temporary degradation of water quality in the Silverado and underlying aquifers.

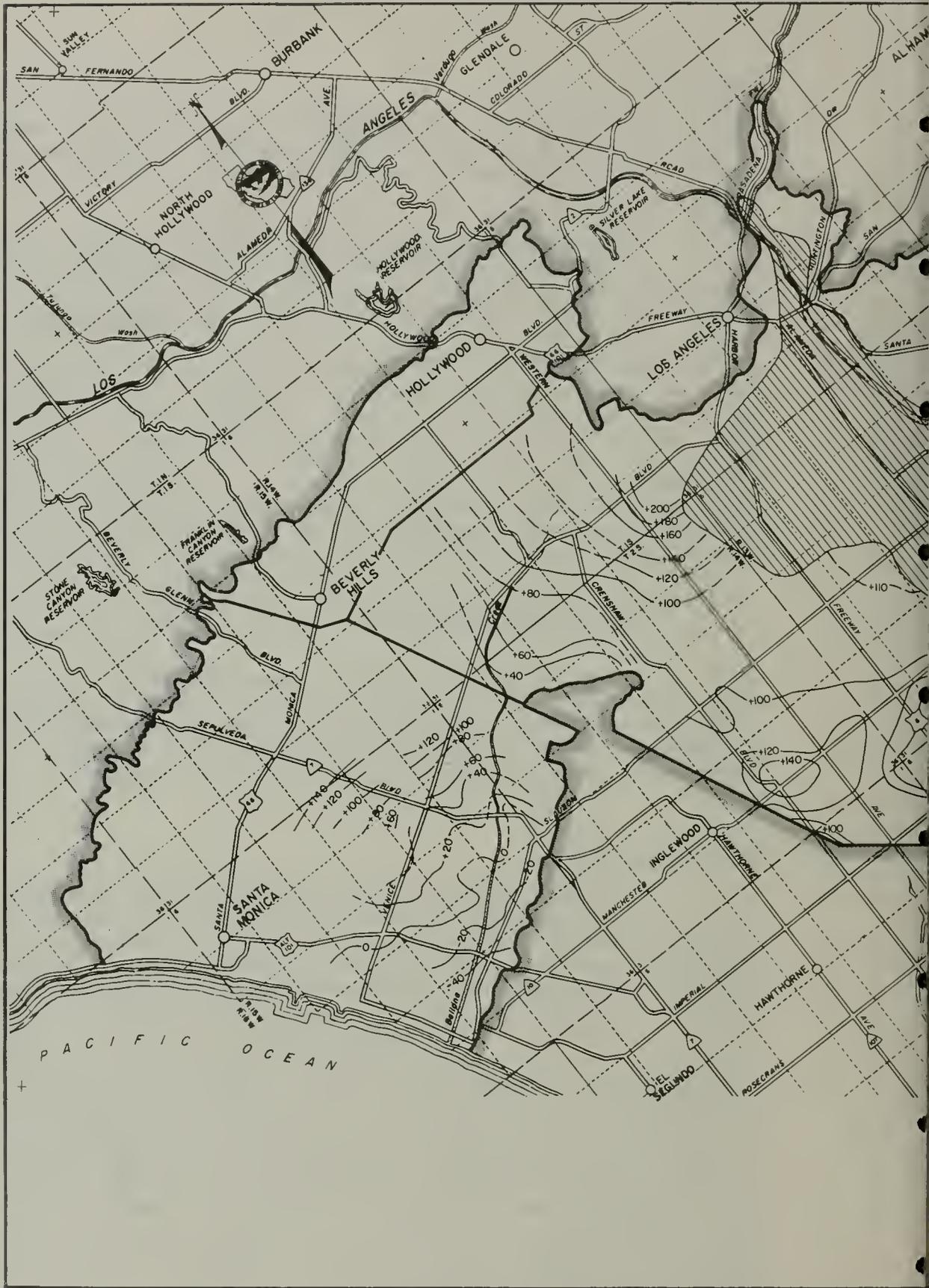
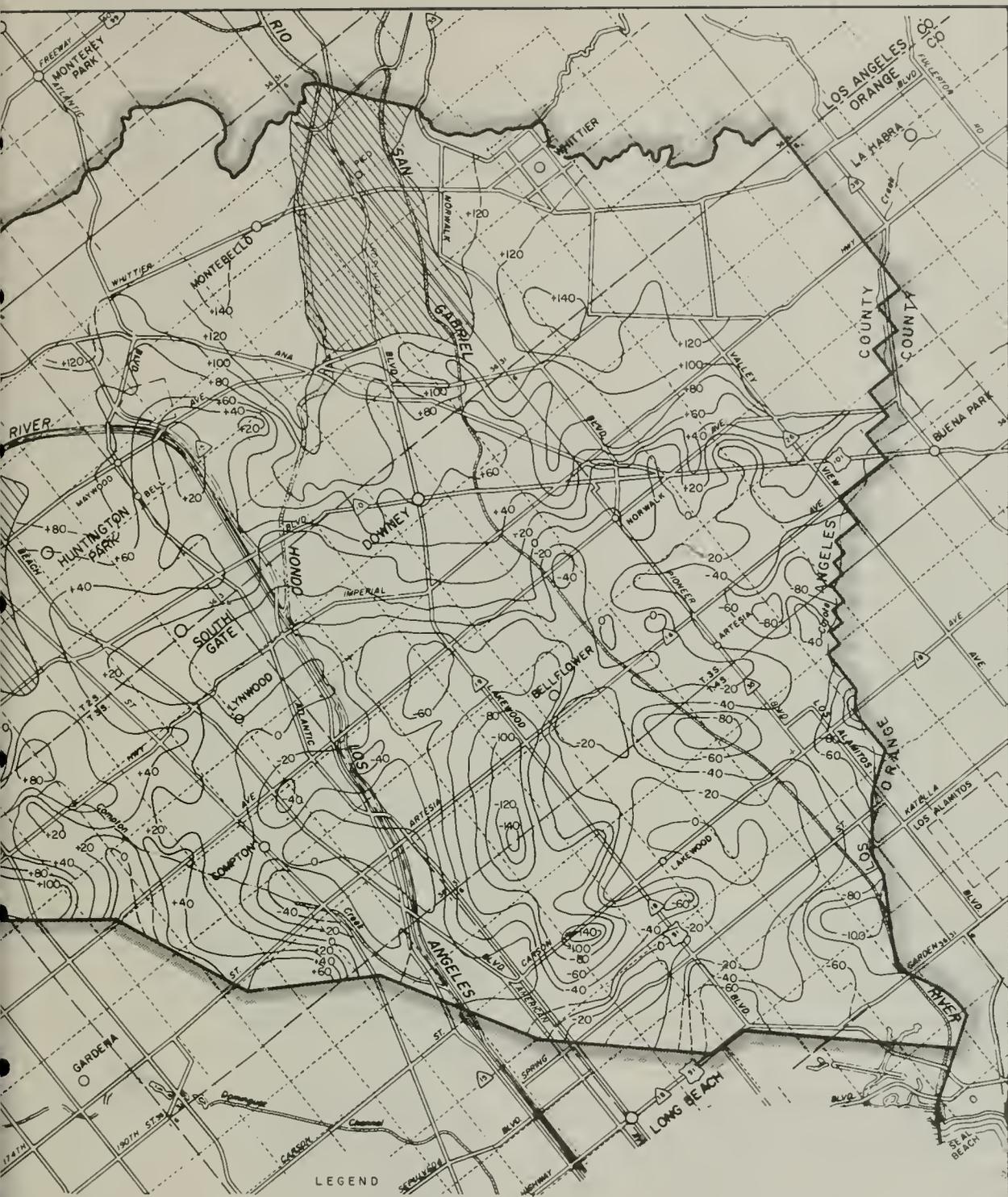
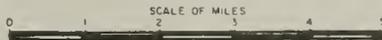


Figure 2. LINES OF EQUAL ELEVATION ON



LEGEND

- GROUND WATER BASIN BOUNDARY
- LIMITS OF THE STUDY AREA
-  KNOWN AREAS WHERE THE BELLFLOWER AQUICLUDE IS ABSENT
- +80— LINES OF EQUAL ELEVATION ON THE BASE OF THE BELLFLOWER AQUICLUDE (DASHED WHERE CONTROL IS POOR)



THE BASE OF THE BELLFLOWER AQUICLUDE

Data from the Barrier Project at Manhattan Beach indicate the pinched-off saline wedge in that area began to dissipate 7,000 to 8,000 feet inland from the line of injection wells. The general geologic and hydraulic characteristics of the Manhattan Beach and Alamitos Gap areas are enough alike to expect the wedges to behave similarly.

If the wedge does not dissipate, but instead moves inland at a rate of 500 feet per year (a maximum rate probably), it will take 8 years to reach the boundary of Zone V. This should provide sufficient time, after the barrier in Alamitos Gap is in operation, to review the adequacy of the supplemental sealing standards and the zone delineation.

Water Quality Conditions. Water levels in the Central Basin have dropped below sea level, thereby allowing sea water to move inland through the Alamitos Gap. Salt water reached the Central Basin chiefly through the unlined Los Cerritos Tidal Channel and the coarse basal Recent deposits in the Gap. The Seal Beach Fault in the Alamitos Gap acts as a barrier preventing sea water from moving directly into the Pleistocene aquifers of the Central Basin. However, the Lynwood, Gage, and Artesia aquifers are exposed to the coarse basal gravels of the Recent deposits in the Central Basin, or inland, side of the fault. Because of this hydraulic continuity, sea water that has intruded the Recent materials of the Alamitos Gap has also been able to move into these Pleistocene aquifers. The inland extent of sea-water impairment in these aquifers, based on water containing chlorides in concentration in excess of 500 ppm, is shown as of the spring of 1963 (Figure 5).

Although the Silverado and Sunnyside aquifers are separated from this saline water by relatively impermeable sediments, ground water quality impairment could occur by the downward movement of the saline water in the overlying aquifers through improperly constructed wells.

Recommended Standards. The ground water in aquifers from wells in Zone V that penetrate no deeper than the base of the Lynwood aquifer has been impaired by sea-water intrusion to some degree. Hence, supplemental well construction standards would not protect it from this impairment. However, protection from further deterioration by percolating surface water warrants a surface seal, as presented for Zone II.

In addition to requirements for Zone II, the construction of Zone V wells that penetrate deeper than the Lynwood aquifer (the deepest aquifer susceptible to sea-water intrusion) should provide an annular seal, extending at least 20 feet below the base of the Lynwood aquifer. The elevation of the base of the Lynwood aquifer underlying Zone V is shown in Figure 5. This annular seal would safeguard water quality in the Silverado and underlying aquifers from impairment by the downward movement of saline water in the overlying aquifers.

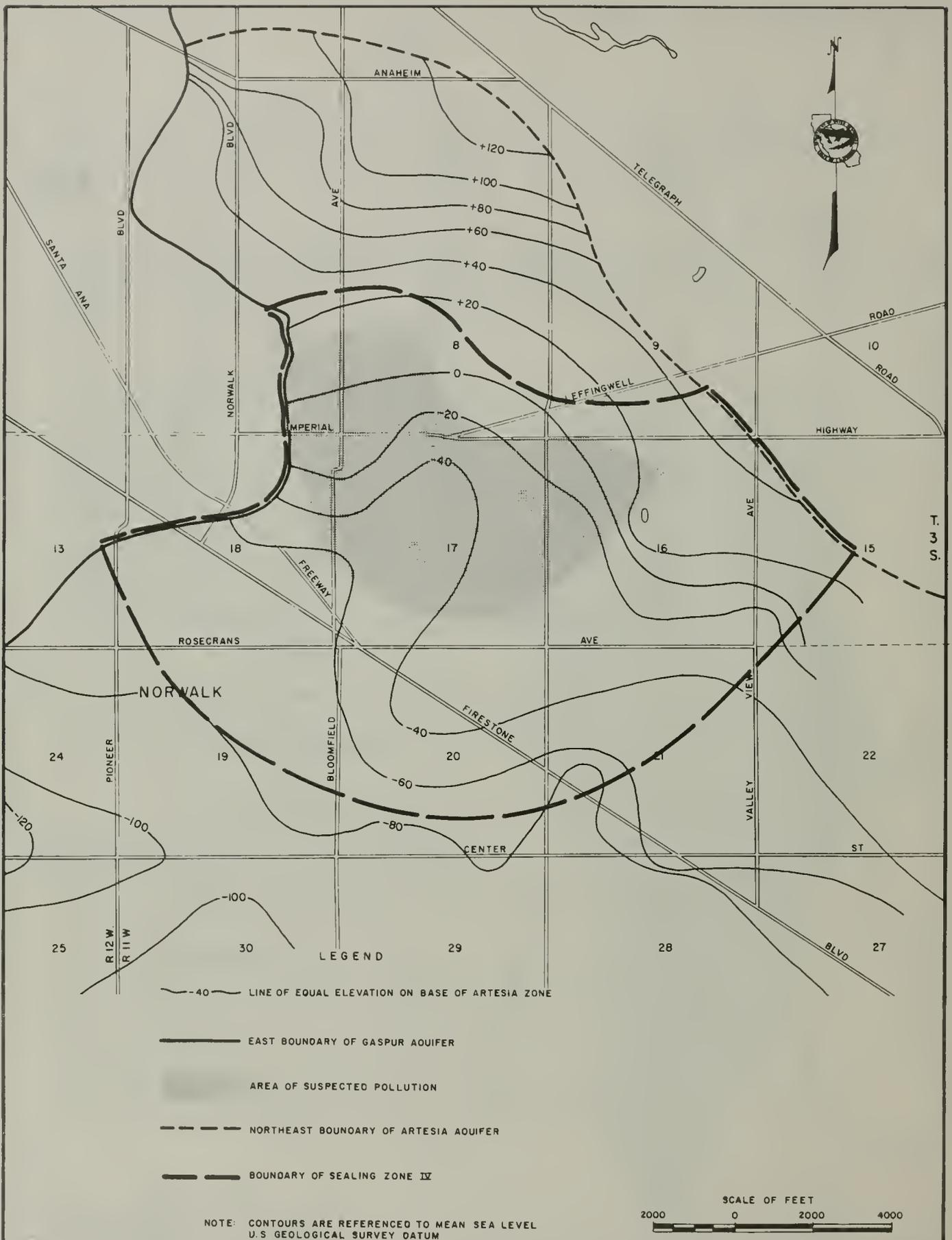


Figure 4. WATER WELL SEALING ZONE IV NORWALK AREA

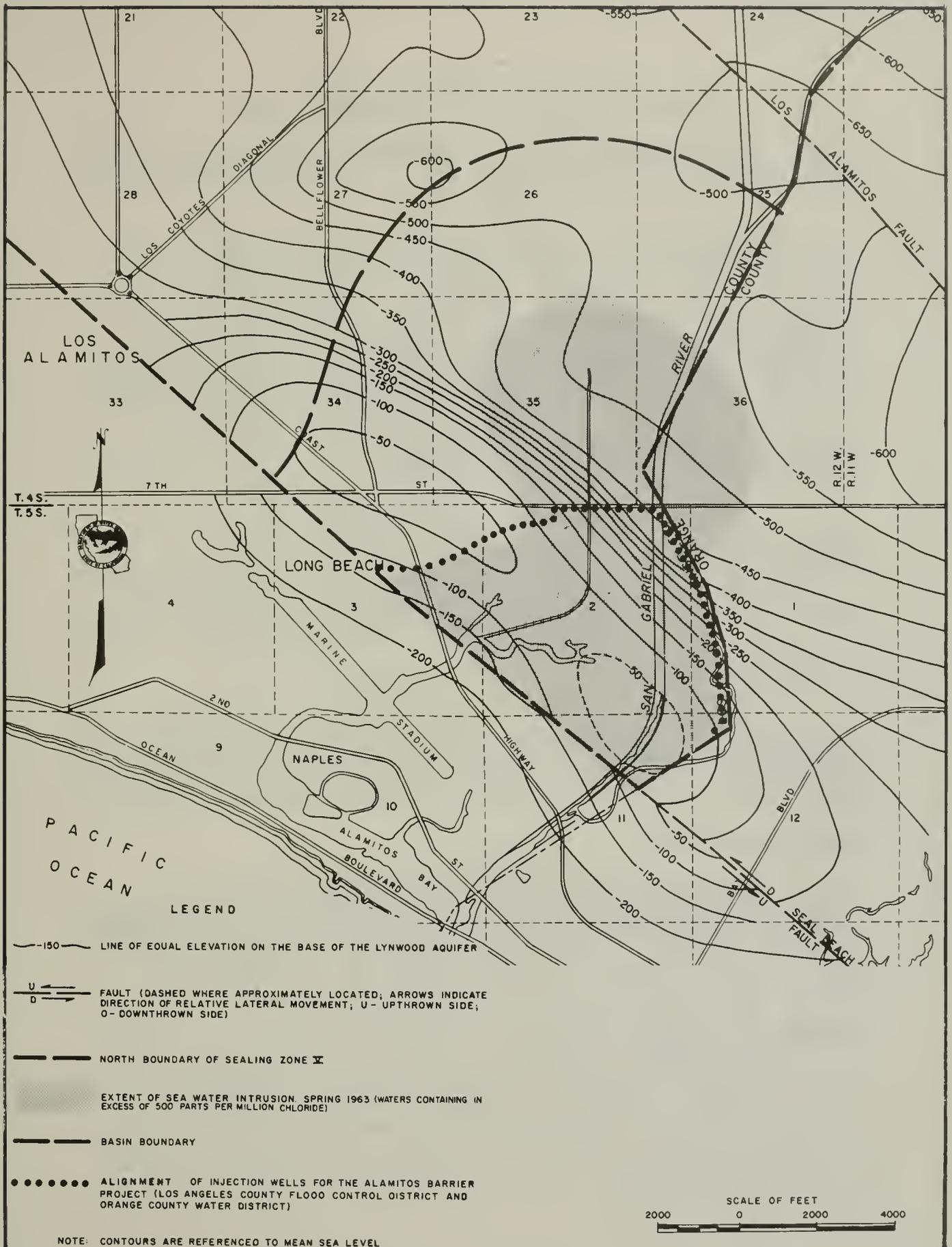


Figure 5. WATER WELL SEALING ZONE V ALAMITOS GAP

Supplemental Water Well Destruction Standards

A well that has fallen into such a state of disuse or disrepair that it may become a source of impairment to ground water quality should be destroyed to prevent such impairment.

In parts of the Central, Hollywood, and Santa Monica Basins, supplemental standards, in addition to those in Bulletin No. 74, are needed to ensure the protection of ground water quality when destroying a well. These supplemental standards are concerned with sealing off the aquifers in each zone that contain ground water of impaired quality and with restoring, as much as possible, the imperviousness provided by the Bellflower aquiclude. In Zones III, IV, and V, inert filler material may be placed opposite the water-bearing zones and above the zones to be sealed. The recommended supplemental standards are:

Central, Hollywood and Santa Monica Basins Recharge Areas - Zone I

No additional requirements needed in this area.

Bellflower Aquiclude - Zone II

All wells shall be sealed and filled with impervious material to the base of the Bellflower Aquiclude. (See Figure 2.)

Dominguez Gap - Zone III

In addition to the requirements for Zone II, wells which penetrate aquifers below the Gaspur aquifer shall be sealed and filled with impervious material from the base of the Gaspur aquifer (Figure 3) to a depth of 20 feet. Wells that penetrate only the Gaspur aquifer shall be sealed (filled) in accordance with the requirements for Zone II.

Norwalk Area - Zone IV

In addition to the requirements for Zone II, wells which penetrate aquifers below the Artesia aquifer (Figure 4) shall be sealed and filled with impervious material from the base of the Artesia aquifer to a depth of 20 feet. Wells that penetrate only the Artesia aquifer shall be sealed and filled in accordance with the requirements for Zone II.

Alamitos Gap - Zone V

In addition to the requirements for Zone II, wells which penetrate aquifers below the Lynwood aquifer (Figure 5) shall be sealed and filled with impervious material from the base of the Lynwood to a depth of 20 feet. Wells that penetrate no deeper than the base of the Lynwood aquifer shall be sealed and filled in accordance with the requirements for Zone II.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations have resulted from this investigation:

Conclusions

1. The water that occurs in the shallowest aquifers is generally unacceptable for beneficial use.
2. In 3 areas, the quality of ground water in the shallow aquifers has been impaired by intrusion of sea water and/or the indiscriminate disposal of industrial wastes: Dominguez Gap, where the quality of the Gaspur aquifer has been impaired by disposal of oil brine wastes; Alamitos Gap, where sea water has moved inland to impair the Lynwood and overlying aquifers; and Norwalk, where uncontrolled disposal of oil brine wastes has allowed hydrocarbons to commingle with ground waters in the Artesia aquifer.
3. There are 5 areas where conditions of ground water occurrence call for specific water well standards to protect quality: Zone I, which includes much of the Hollywood and Santa Monica Basins, as well as the Central Basin recharge areas, where the minimum standards are sufficient; and Zones II through V, which are all areas in which shallow aquifers contain ground waters of impaired quality.
4. The boundaries of each zone define the present or potential lateral extent of impaired ground waters in that zone.
5. Compliance with the water well standards in Bulletin No. 74 and in this report will deter impairment to ground water quality by improperly constructed or destroyed wells.

Recommendations

1. The Los Angeles Regional Water Quality Control Board and the California Department of Public Health should establish water well standards for the Central, Hollywood, and Santa Monica Basins of Los Angeles County.
2. The standards in Chapter II of Department of Water Resources Bulletin No. 74, February 1968, together with the supplementary standards in this report on pages 1 through 12 should form the basis for standards to be established in Central, Hollywood, and Santa Monica Basins, Los Angeles County.

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

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The Resources Agency
DEPARTMENT OF WATER RESOURCES

ENGINEERING CERTIFICATION

This report has been prepared under my direction as the professional
engineer in direct responsible charge of the work, in accordance with the pro-
visions of the Civil and Professional Engineers' Act of the State of California.

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Date May 20, 1968

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