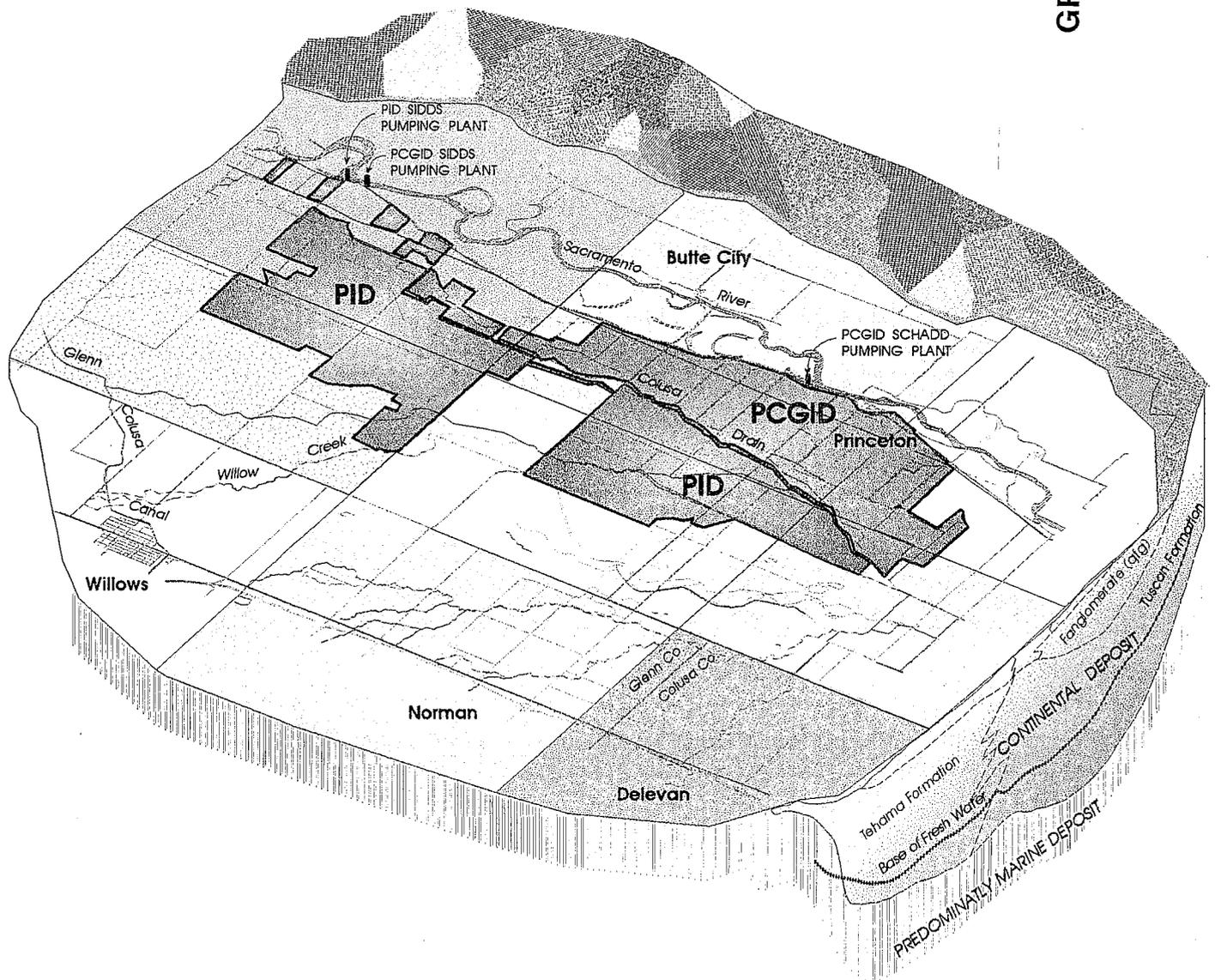


# PRINCETON-CODORA-GLENN IRRIGATION DISTRICT PROVIDENT IRRIGATION DISTRICT

## GROUNDWATER MANAGEMENT PLAN

GROUND WATER SECTION

LIBRARY COPY



REVIEW DRAFT

OCTOBER 19, 1995



BRANDT &  
ASSOCIATES, P.C.  
CONSULTING ENGINEERS

PROVIDENT IRRIGATION DISTRICT  
258 S. BUTTE ST.  
WILLOWS, CA 95988

916 934-4801  
916 934-3066-FAX

FACSIMILE COVER SHEET

DATE: Feb 8, 97

TO: <u>DAN McManus</u>	FROM: <u>Doug</u>
COMPANY: <u>DWR</u>	PROVIDENT IRRIGATION DISTRICT
PHONE:	PHONE: <u>916 934-4801</u>
FAX: <u>529 7322</u>	FAX: <u>916 934-3066</u>

MESSAGE: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PAGES TO FOLLOW 4

IF YOU DO NOT RECEIVE ALL OF THE PAGES, PLEASE TELEPHONE THE SENDER  
AT 916 934-4801.

**PROVIDENT IRRIGATION DISTRICT**  
**RULES AND REGULATIONS**  
**TO IMPLEMENT THE**  
**GROUNDWATER MANAGEMENT PLAN**

---

Pursuant to adoption of the joint Groundwater Management Plan of the Princeton-Codora-Glenn Irrigation District and the Provident Irrigation District, the following rules and regulations are hereby adopted in accordance with Water Code section 10753.8.

1. Groundwater Monitoring Wells. The Districts, at their expense, shall monitor a network of wells on a regular basis to create a database of the groundwater basin. Monitoring efforts shall include the following:

- a. The Districts shall jointly establish a network of groundwater monitoring wells. Existing wells that should be considered for inclusion into the network are identified on Map 3 of the Groundwater Management Plan.
- b. Coordination of monitoring efforts with the owners of wells, if provisions do not already exist, and implementing procedures to facilitate monitoring groundwater levels.
- c. Obtaining survey reference point elevations on each well to be used for groundwater monitoring.
- d. Obtaining groundwater level measurements in the Spring and Fall for all wells.

- a. Operating their wells as part of a planned conjunctive use program to assist in developing a better understanding of the basin and to increase the overall water supply available to each district.<sup>1</sup>
  - b. Measuring the groundwater pumped; and
  - c. Including their wells in a groundwater monitoring network.
4. Pump Efficiency. The Districts shall arrange a schedule with PG&E for performing pump efficiency tests and specific capacity estimates on all wells used by each district for supplemental irrigation water.
5. Conjunctive Use. The Districts, in working with landowners, shall design conjunctive use operations annually that will facilitate stressing the basin so as to document the basin performance and response. Such operations shall be coordinated with landowners based on existing agreements for use of wells to provide supplemental water to the Districts.
6. Water Conservation. The Districts shall jointly continue to promote policies and procedures that enhance water conservation.
7. Recharge. The District will attempt to monitor and evaluate recharge of the groundwater basin from natural and artificial channels.
8. Well Drilling and Abandonment. The Districts will work with the landowners within their respective jurisdictions to assess the impact of new and abandoned wells on the groundwater basin, and shall establish procedures as practical to monitor such activities.

---

<sup>1</sup> How will the water produced be used---on the well owner's land? For general district purposes? Who will pay for it?

- e. Obtaining groundwater level measurements on a monthly basis for four wells spaced uniformly along the central portion of PCGID and PID from the north to south boundaries.
  - f. Obtaining water quality samples in the Fall of each year from the four wells to be monitored monthly, and testing for total dissolved solids, nitrates, boron, iron, and manganese.
  - g. Compilation of the water level data into a database to facilitate producing hydrographs for the individual wells, and groundwater contour maps.
  - h. Compilation of the water quality data into a database to facilitate the statistical analysis and determination of temporal trends.
2. DWR Well. The Districts shall review the results and observations from the monitoring well which DWR plans to construct near PID's Sidde Pumping Plant, and select two other locations, spaced uniformly to the south boundary of the PCGID, to construct monitoring wells to determine the relative hydraulic connectivity with the Sacramento River.
3. Existing Well Usage. The Districts shall jointly inventory wells used for irrigation water supplies and work with the owners to obtain information on groundwater extraction on an annual basis. In addition, the owner's interest and willingness to participate shall be obtained by:

9. Groundwater Banking. The Districts shall endeavor to promote advantageous groundwater banking projects, when feasible.

10. Pumping Restrictions. Only under special circumstances would pumping restrictions be imposed. The District shall not impose such restrictions until after consulting with landowners and other affected agencies and holding a mandatory public hearing at least 60 days prior to the effective date of such restrictions.

**TABLE OF CONTENTS**

	<u>PAGE</u>
I. INTRODUCTION . . . . .	1
A. General . . . . .	1
B. Assembly Bill 3030 . . . . .	1
C. Schedule for AB3030 Process . . . . .	3
II. THE DISTRICTS . . . . .	5
A. Princeton-Codora-Glenn Irrigation District . . . . .	5
B. Provident Irrigation District . . . . .	8
III. GOALS AND OBJECTIVES . . . . .	11
A. Goals . . . . .	11
B. Objectives . . . . .	11
IV. THE GROUNDWATER BASIN . . . . .	12
A. General . . . . .	12
B. Geology . . . . .	12
C. Groundwater Levels and Movement . . . . .	14
D. Groundwater Quality . . . . .	22
E. Recharge . . . . .	22
F. Well Yields and Specific Capacity . . . . .	23
G. Land Subsidence . . . . .	23
H. Summary . . . . .	24
V. THE GROUNDWATER MANAGEMENT PROGRAM . . . . .	25
A. General . . . . .	25
B. Initial Phase . . . . .	25
C. Later Phase(s) . . . . .	27
VI. IMPLEMENTATION . . . . .	34
A. Schedule for Adoption . . . . .	34
B. Funding . . . . .	35
VII. REFERENCES . . . . .	36

**TABLE OF CONTENTS  
(Continued)**

**TABLES**

<u>No.</u>	<u>Title</u>	<u>Page</u>
1	PCGID and PID Schedule for AB3030 Process . . . . .	4
2	Groundwater Management Program -- Task Oriented Element . . . . .	28
3	Groundwater Management Program -- Management Oriented Element . . . . .	31

**FIGURES**

<u>No.</u>	<u>Title</u>	
1	Generalized Geologic Section . . . . .	13
2	Geologic Section 1 . . . . .	15
3	Geologic Section 2 . . . . .	16
4	Geologic Section 3 . . . . .	17
5	Geologic Section 4 . . . . .	18
6	Geologic Section 5 . . . . .	19
7	Geologic Section 6 . . . . .	20

**MAPS**

<u>No.</u>	<u>Title</u>	
1	Districts Boundaries . . . . .	6
2	Generalized Geologic Section Locations . . . . .	21
3	Proposed Well Monitoring Network . . . . .	30

**TABLE OF CONTENTS  
(Continued)**

**APPENDICES**

**A Well Hydrographs**

Well No. 18N/1W-17G01  
Well No. 18N/1W-32L02  
Well No. 18N/2W-15N01  
Well No. 18N/2W-18K01  
Well No. 18N/2W-36B01  
Well No. 19N/2W-09A01  
Well No. 19N/2W-13J01  
Well No. 19N/2W-23Q01  
Well No. 19N/2W-29Q01  
Well No. 19N/2W-34F01  
Well No. 19N/2W-36H01  
Well No. 20N/1W-31E01  
Well No. 20N/2W-27J01  
Well No. 20N/2W-29G01

***I. INTRODUCTION***

---

**A. GENERAL**

Efficient use of the water resources available in the Sacramento Valley and the State of California generally requires the conjunctive use and management of both surface water and groundwater. The management of surface water resources has, however, outpaced the management of groundwater with some notable exceptions.

As the demand and competition for water grows, a greater emphasis will be placed upon use of the groundwater basins within California. The unmanaged use of the groundwater basin can initiate a deterioration in water quality and land subsidence. Thus, it is imperative to have a good understanding of the underlying groundwater basin in an area. Equally important, is to know what influence certain activities within and outside an area exert on the underlying groundwater basin.

The enactment of the Groundwater Management Act (AB3030) was the impetus of the Princeton-Codora-Glenn Irrigation District (PCGID) and the Provident Irrigation District (PID) to work together to manage the underlying groundwater basin more effectively. The districts agreed to jointly prepare this groundwater management plan under the authority of AB3030.

**B. ASSEMBLY BILL 3030**

In 1992, legislative action was taken by the California State Assembly to address the lack of groundwater management in the state. Assembly Bill 3030 (Water Code Sections 10750-10755) provides the legislative authority for local water agencies to establish and implement programs to manage groundwater resources within their respective service

# REVIEW DRAFT

areas. The process by which a groundwater management plan can be prepared and implemented is very specific.

The components of a groundwater management plan, as outlined in AB3030 (Water Code Section 10753.7), may include the following:

- Control saline water intrusion.
- Identify and manage wellhead protection areas and recharge areas.
- Regulate the migration of contaminated groundwater.
- Administer a well abandonment and well destruction program.
- Mitigate conditions of overdraft.
- Replenish groundwater extracted by water producers.
- Monitor groundwater levels and storage.
- Facilitate conjunctive use operations.
- Identify well construction policies.
- Construct and operate the contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
- Develop relationships with federal and state regulatory agencies.

# REVIEW DRAFT

- Review land use plans and coordinate with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

## C. SCHEDULE FOR AB3030 PROCESS

The schedule for PCGID and PID to execute the AB3030 process is presented in Table 1.

**TABLE 1**

**PCGID AND PID SCHEDULE FOR AB3030 PROCESS**

Step No.	Description	Date or Period of Execution
1	Conduct a Noticed Public Hearing on Resolution of Intention to Draft a Groundwater Management Plan	April 13, 1994
2	Draft and Publish Resolution of Intention to Prepare a Groundwater Management Plan	May 16, 1994 (PID) June 8, 1994 (PCGID)
3	Prepare a Groundwater Management Plan Within Two Years of Publishing the Resolution of Intention	March 1995 - September 1995
4	Present the Groundwater Management Plan to Landowners	November 1995
5	Conduct a Second Noticed Public Hearing on Resolution of Intention to Adopt the Groundwater Management Plan	January 1996
6	Receive Written Protests From Landowners Affected by the Groundwater Management Plan for a Period of 35 Days Following the Second Hearing	Not Scheduled
7	Adopt the Groundwater Management Plan if a Majority Protest (More Than 50 Percent of the Assessed Value of the Land Within the Agency) Has Not Been Filed Within 35 Days Following the Second Hearing	Not Scheduled
8	Formulate and Adopt Rules and Regulations to Implement the Groundwater Management Plan	Not Scheduled

## ***II. THE DISTRICTS***

---

The boundaries of PCGID and PID are delineated on Map 1. Presented below is a brief description of each district.

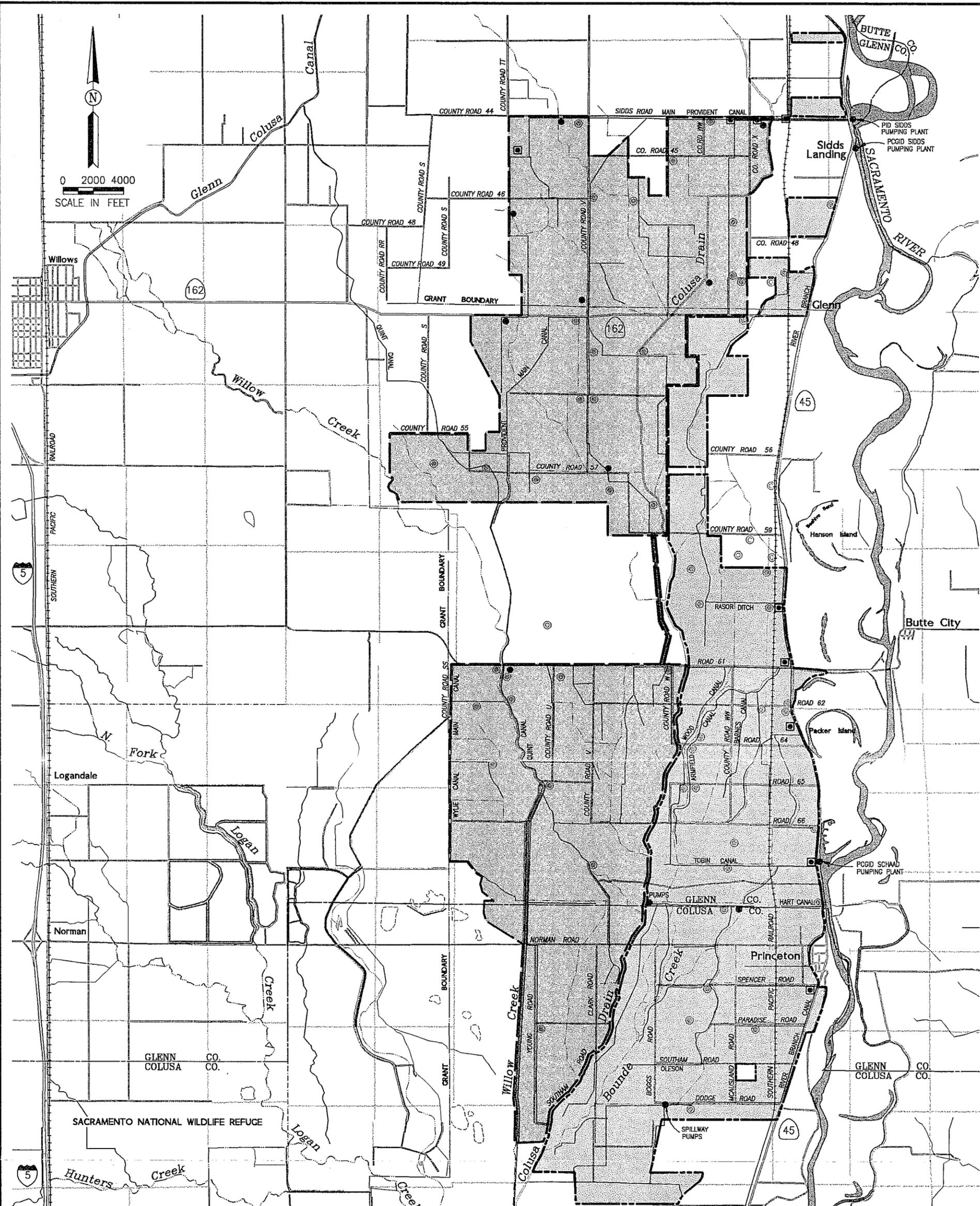
### **A. PRINCETON-CODORA-GLENN IRRIGATION DISTRICT**

#### **1. Creation of PCGID**

PCGID was organized in 1916 to take over from the receiver of the Sacramento Valley West Side Canal Company, a portion of the River Branch canal system. This canal was constructed in 1906 by the Central Canal and Irrigation Company. Although originally expecting to receive water from the Sacramento Valley Irrigation Company project, landowners subsequently learned that they would only be entitled to supplies after all demands of the Central Canal had been met. In order to avoid litigation and perhaps serious loss, the irrigators decided to purchase the facilities and water rights and transfer the point of diversion from the Central Canal diversion point north of Hamilton City to locations within the boundaries of the newly formed district. Two pumping plants were constructed, one north of the community of Glenn at Sidds Landing and a second, the Schaad plant, one mile north of the town of Princeton. Each pumping plant consisted of three horizontal centrifugal pump units with a total capacity of 120 cubic feet per second (cfs) for each plant. The pumping plants were completed in 1917 and began delivering water in 1918.

As the total irrigated acreage began to increase in the 1950's, PCGID added two incline pumps to the Sidds Landing plant to increase the plant capacity by 70 cfs. Later, construction began on recirculation pumping plants within PCGID in order to more fully use all waters within the system. There are now four recapture plants within PCGID.

PCGID's office is in the community of Princeton.



**Legend**

-  Provident Irrigation District Boundary
-  Princeton-Codora-Glenn Irrigation District Boundary
-  Canals
-  Drains
-  Wells Available to Districts for Water Supply
-  District Owned Well
-  Recirculation Pump

**PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
& PROVIDENT IRRIGATION DISTRICT  
GROUNDWATER MANAGEMENT PLAN  
DISTRICTS BOUNDARIES**

BORCALLI & ASSOCIATES, INC.  
SACRAMENTO, CALIFORNIA

REVIEW DRAFT

10-18-95

-6-

MAP 1

## 2. Size

PCGID lies near the west side of the Sacramento River with the Colusa Basin Trough along most of its west boundary common to PID. The community of Princeton is within PCGID's boundaries.

PCGID consists of approximately 11,700 acres. There are 10,500 acres of irrigable land within the district's boundaries.

## 3. Sources of Water

PCGID has two contracts to pump water from the Sacramento River. One contract, PCGID's base supply, entitles the district to pump 52,810 acre-feet of water annually. The second contract is PCGID's Central Valley Project water supply, which is 15,000 acre-feet. In addition to the river water supplies, PCGID pumps approximately 20,000 acre-feet each year through its four recirculation pumps on the district drains. There are approximately 20 privately owned wells and five district owned wells within the district's boundaries. These wells are used in conjunction with the river pumps primarily during times of short water supplies.

## 4. Crop Mix

Approximately 7,500 to 8,000 acres of rice are planted each year in the district. The balance of irrigable acreage consists of 1,500 acres of orchards and 1,500 acres of row crops.

## 5. Existing Monitoring

### a. Water Supplies

All water pumped from the Sacramento River is metered as it is pumped. These meters are read by the U. S. Bureau of Reclamation and PCGID. Records of all pumped water are kept by PCGID. All water pumped at the recirculation plants is measured by PCGID. All pumps are checked periodically for efficiency and pumping capability. District wells and some of the private wells are equipped with meters to measure the amount of water pumped.

### b. Groundwater Levels

PCGID has initiated a program of measuring water levels in selected wells on a monthly basis throughout the district to determine the effect that pumping has on the water table within the district and the surrounding area.

### c. Groundwater Quality

PCGID has initiated a program of testing water quality in selected wells.

## B. PROVIDENT IRRIGATION DISTRICT

### 1. Creation of PID

The history of PID and neighboring irrigation districts is related to the original organization of the old Central Irrigation District formed on November 22, 1887. About one-half of the lands of PID were included in the original boundaries of the Central Irrigation District. Due to litigation, opposition, and lacks of funds,

# REVIEW DRAFT

construction of the conveyance and distribution system to divert water from the Sacramento River was halted in 1891. In 1906, a portion of the canals were completed and the first water was delivered. In 1909, the entire system and lands were sold to the Sacramento Valley Irrigation Company. In 1914, the Sacramento Valley Irrigation Company went into receivership. Large tracts of land were in turn sold to the Provident Irrigation Syndicate. This Syndicate filed its own water rights from the Sacramento River and completed a canal system in 1917 to divert water from the Sacramento River at Sidds Landing. PID was formed in 1918, under the Irrigation District Act.

PID's office is in the City of Willows.

## 2. Size

PID lies to the west of the Sacramento River in the Colusa Basin Trough in the counties of Glenn and Colusa. It is approximately seven miles east of the town of Willows, being primarily an agricultural area, having very few residents within its boundaries. The total area is 15,165 acres of which 14,439 acres are irrigable.

## 3. Sources of Water

The primary water source is from the Sacramento River and drains from adjacent irrigation districts. The methods and quantities of diversions have varied in the past. A groundwater study was conducted in 1963, and during the drought years of 1976-1977, PID installed three agricultural groundwater wells to supplement its water supply. An additional well was installed in 1991. During the drought of 1986-1993, several private groundwater wells were installed.

## 4. Crop Mix

PID has historically been primarily a rice district. Rice has averaged 98 percent of the total planted acres within PID.

## 5. Existing Monitoring

### a. Water Supplies

All water pumped from the Sacramento River is metered as it is pumped. These meters are read by the U. S. Bureau of Reclamation and PID. Records of all pumped water are kept by PID. All water pumped at the recirculation plants is measured by PID. All pumps are checked periodically for efficiency and pumping capability. District wells and some of the private wells are equipped with meters to measure the amount of water pumped.

### b. Groundwater Levels

PID has initiated a program of measuring water levels in selected wells on a monthly basis throughout the district to determine the effect that pumping has on the water table within the district and the surrounding area.

### c. Groundwater Quality

PID has initiated a program of testing water quality in selected wells.

## *III. GOALS AND OBJECTIVES*

---

The goals and objectives of PCGID and PID, which guided the formulation of this groundwater management plan, are presented below.

### **A. Goals**

- Assure an adequate water supply, both quantity and quality, for the water users within the districts, in a manner that is efficient, economical, and environmentally sound.
- Manage the use of surface water and groundwater resources available to the districts for maximum benefit of the water users within the districts, without adversely affecting the groundwater basin underlying neighboring lands.

### **B. Objectives**

- Increase the understanding of the districts' underlying groundwater basin.
- Coordinate the acquisition, compilation, and evaluation of groundwater data and management of the groundwater basin with districts or agencies having jurisdiction over adjacent lands.

***IV. THE GROUNDWATER BASIN***

---

**A. GENERAL**

The land within the boundaries of PCGID and PID represent less than one percent of the Sacramento Valley aquifer system. The majority of this land occurs as floodplain deposits of the Colusa Basin and alluvium or floodplain deposits of the Sacramento River. PID is comprised primarily of floodplain deposits of the Colusa Basin, whereas PCGID is comprised primarily of alluvium or floodplain deposits of the Sacramento River.

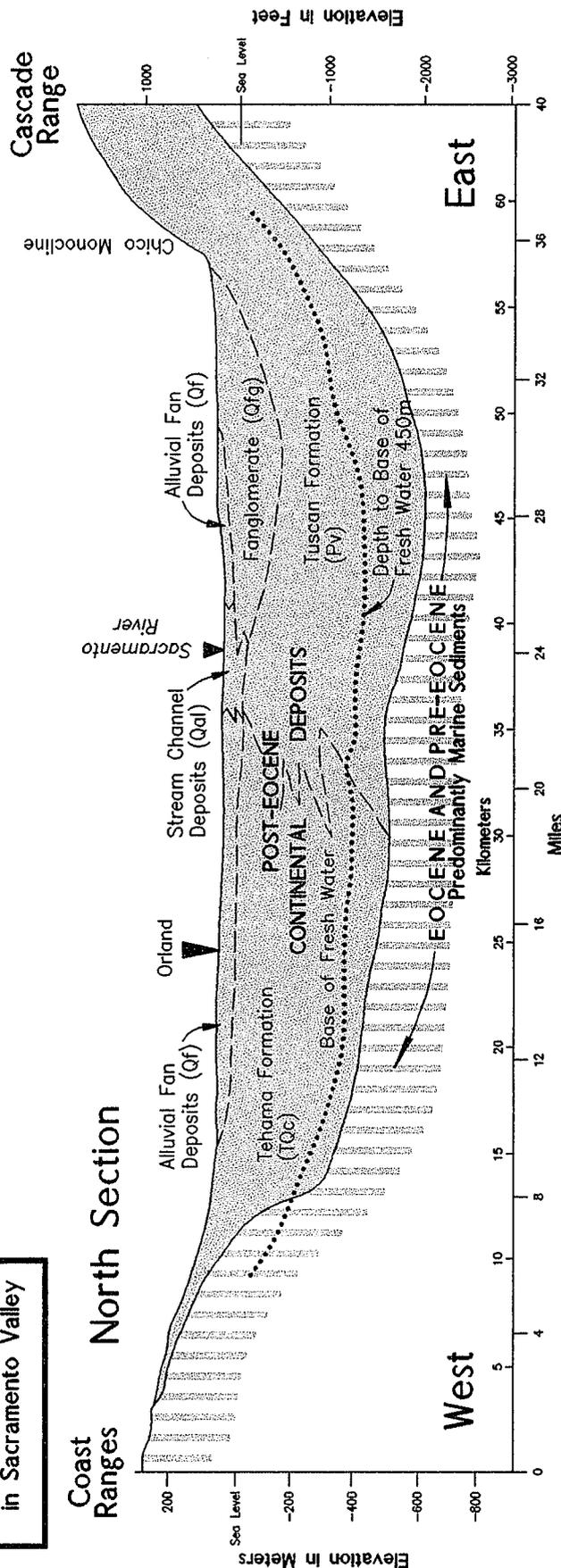
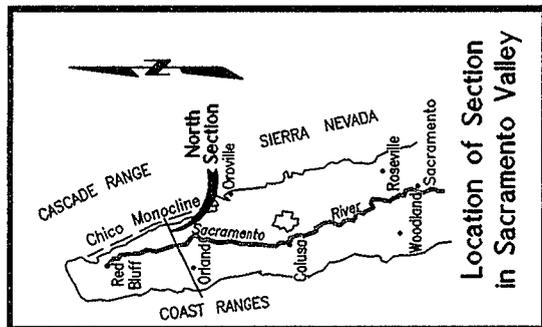
The flood basins are topographically low, nearly flat, and poorly drained. The alluvium or deposits from the Sacramento River are moderately to highly permeable.

**B. GEOLOGY**

Presented in Figure 1 is a Generalized Geologic Section of the Sacramento Valley in the vicinity of PCGID and PID. The principal geologic formations from which wells within each district extract groundwater are the alluvial or stream deposits, and the underlying Tehama Formation. The Tehama Formation interfingers with the Tuscan deposit near the axis of the Sacramento Valley.

The Tehama Formation is comprised of silt, sand, gravel, and clay of fluvial origin and is derived from the Coast Range, west of the valley. These sediments are locally cemented, and somewhat more compacted than the overlying alluvial deposits. The extent to which the sediments are capable of compaction is not known.

**PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
& PROVIDENT IRRIGATION DISTRICT  
GROUNDWATER MANAGEMENT PLAN  
GENERALIZED GEOLOGIC SECTION**



Source: State of California, The Resource Agency, Department of Water Resources, Evaluation of Ground Water Resources: Sacramento Valley. Prepared by the Department of Water Resources in cooperation with the U.S. Geological Survey, Bulletin 118-6, August 1978.

# REVIEW DRAFT

Geologic sections through PCGID and PID (Figure 2 through Figure 7) were developed using driller logs and differentiating between predominantly coarse-grained material and predominantly fine-grained material<sup>1/</sup>. From inspection of the generalized sections, the majority of the wells developed for irrigation appear to be in depth ranges of 300 feet to 450 feet.

## C. GROUNDWATER LEVELS AND MOVEMENT

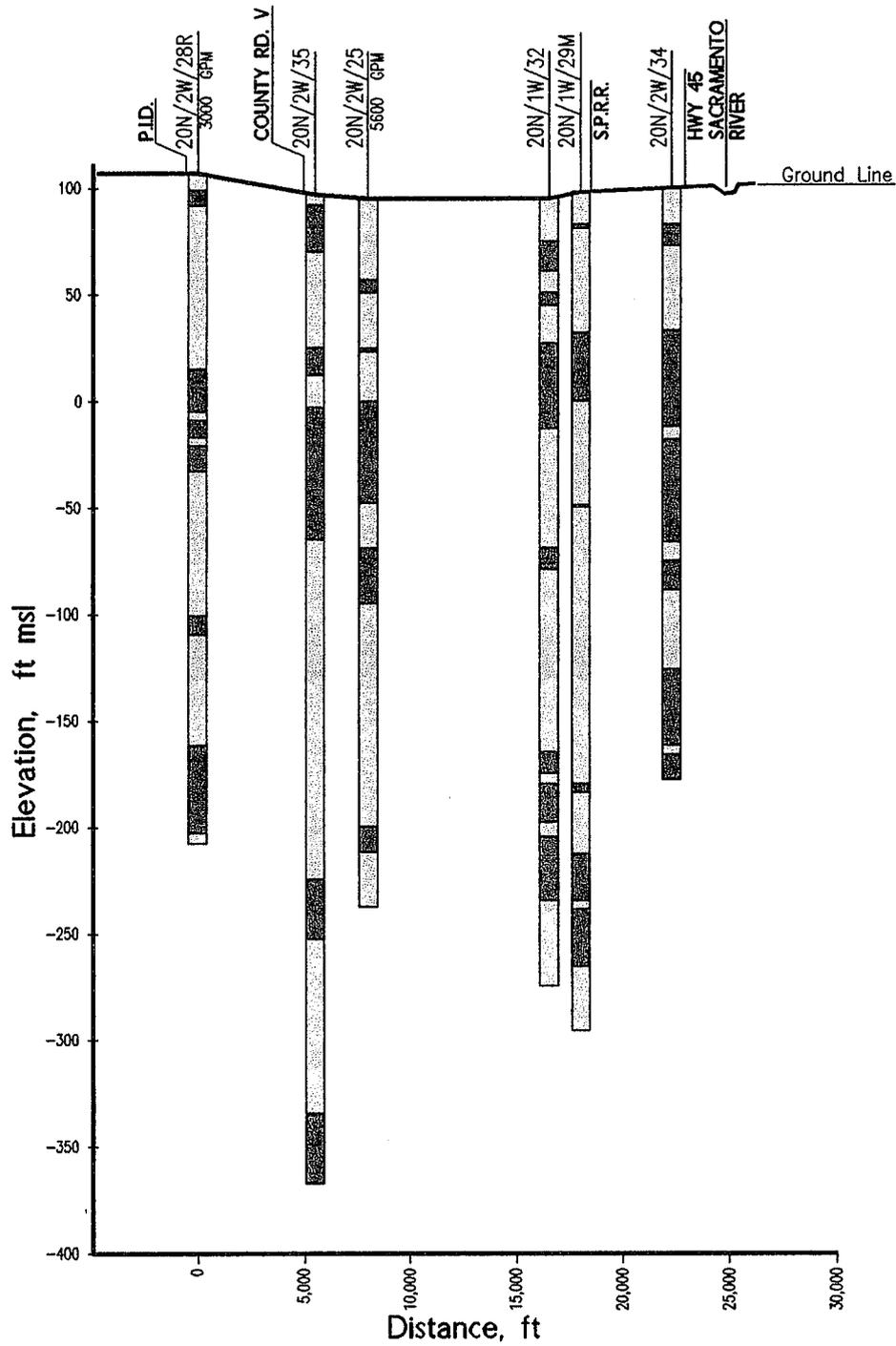
There are 14 wells in or near PCGID and PID that are included in the database of groundwater levels of the Department of Water Resources (DWR). The locations of the monitoring wells are shown on Map 2. From review of the data, it appears that three of the wells are no longer monitored.

Inspection of the groundwater level hydrographs shows that in the spring the groundwater level is within 10 feet from the ground surface throughout the area. Also, with the exception of one monitoring well, Well No. 18N/2W-18K01, the spring-to-fall drawdown does not exceed 10 feet. The hydrograph for Well No. 18N/2W-18K01 reflects a significant increase in groundwater extraction. The spring-to-fall drawdown of 10-12 feet prior to the 1987-1994 dry period increased to about 90 feet during the dry period. Although the drawdown was increased substantially, the groundwater levels at the well recovered fully. From the standpoint of basin management, it is worthy to note that to the extent the spring-to-fall drawdown is increased and the groundwater level recovers fully, the basin storage is being used more effectively. On the other hand, if the groundwater levels in the spring did not recover fully, the basin could be in an overdraft situation depending upon the hydrologic conditions.

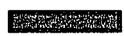
---

<sup>1/</sup> Coarse-grained material consists primarily of sand, clayey or silty sand; clayey, silty, or sandy gravel; and gravel. Fine-grained material consists of clay, silt, and sandy clay; or silt.

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
 & PROVIDENT IRRIGATION DISTRICT  
 GROUNDWATER MANAGEMENT PLAN  
 GEOLOGIC SECTION 1

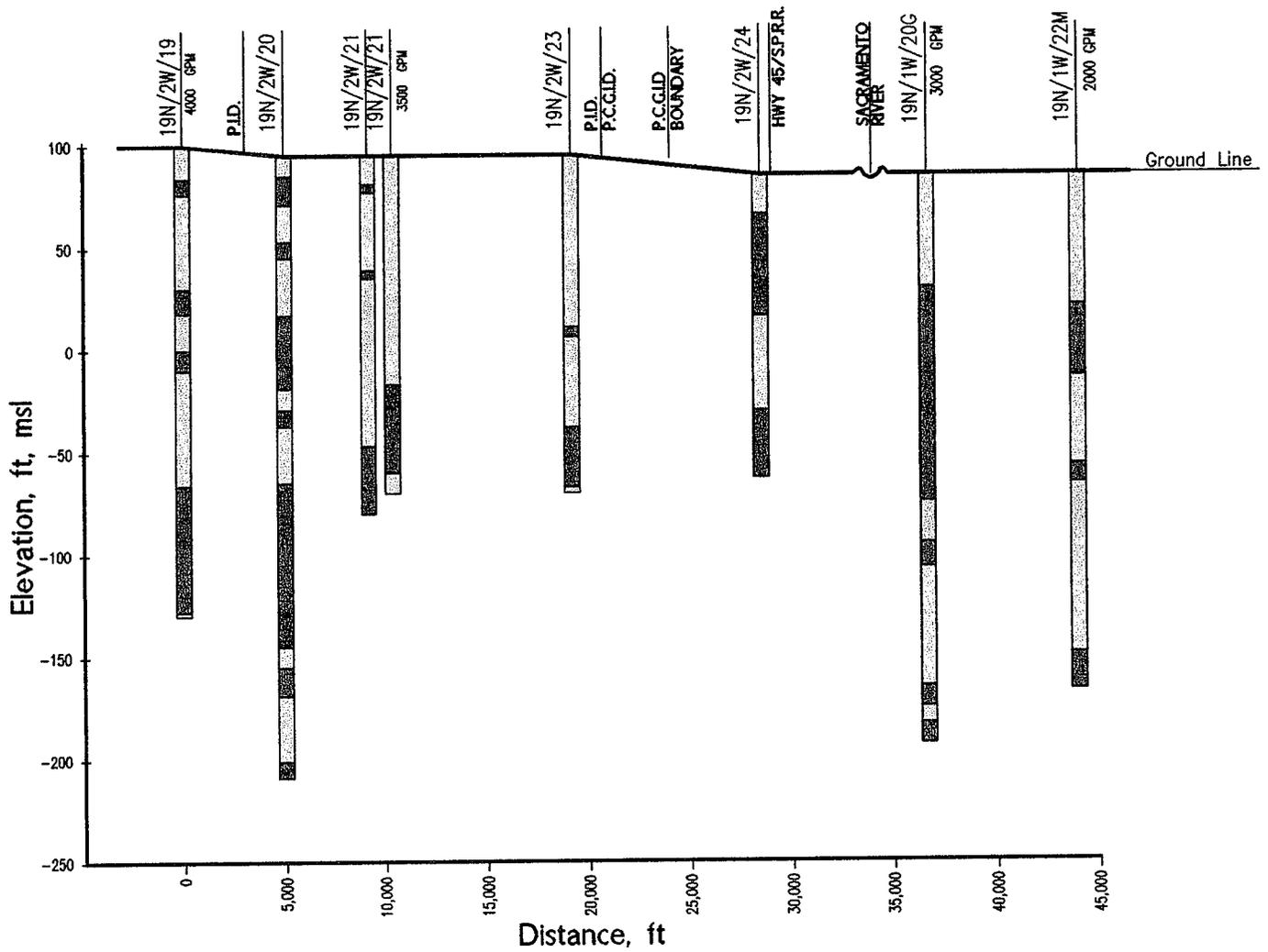


Legend

-  Predominantly Coarse-Grained Material
-  Predominantly Fine-Grained Material

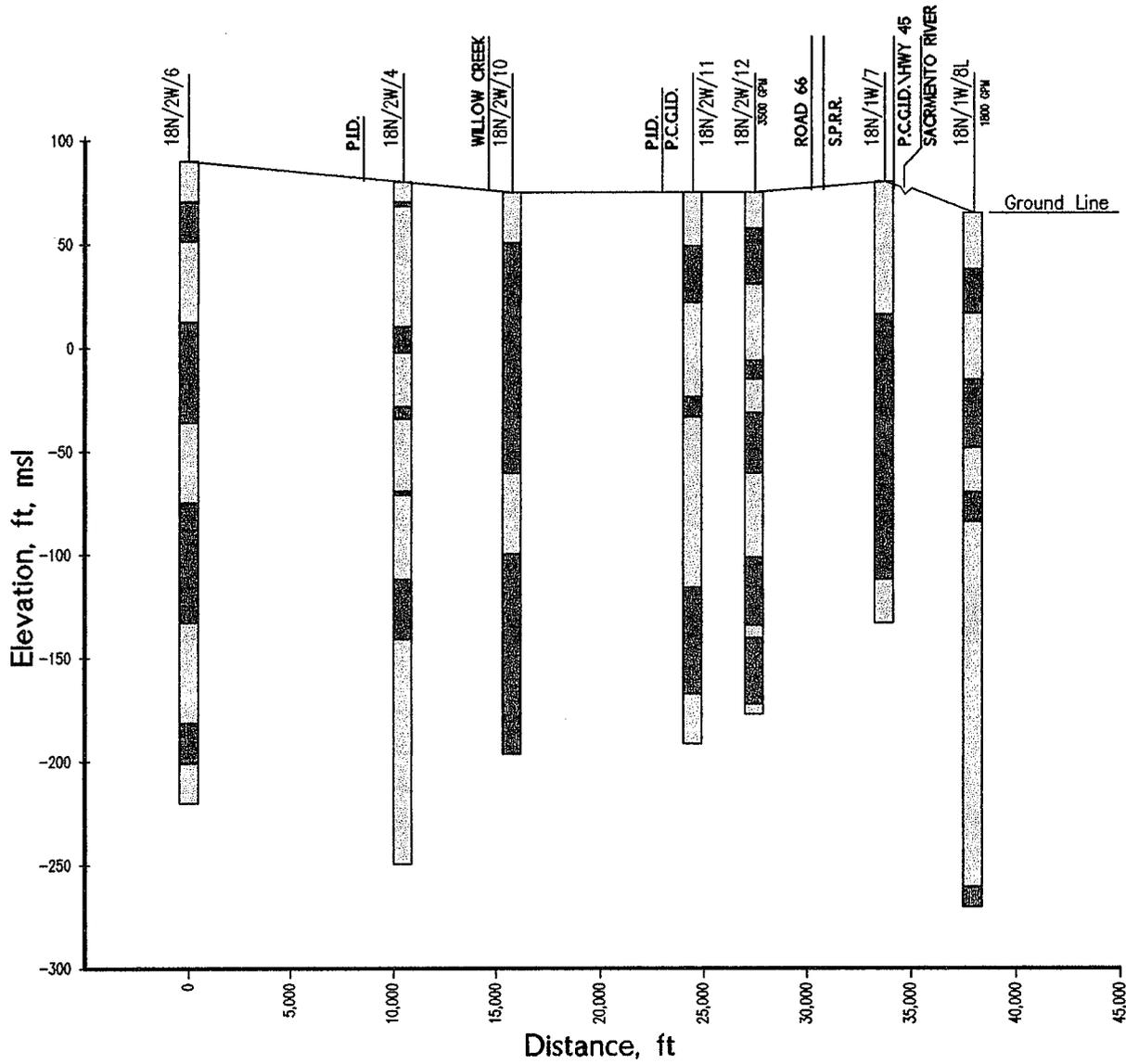
20N/2W/28R State Well Identification Number

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
 & PROVIDENT IRRIGATION DISTRICT  
 GROUNDWATER MANAGEMENT PLAN  
 GEOLOGIC SECTION 2



- Legend**
-  Predominantly Coarse-Grained Material
  -  Predominantly Fine-Grained Material
  - 20N/2W/28R State Well Identification Number

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
 & PROVIDENT IRRIGATION DISTRICT  
 GROUNDWATER MANAGEMENT PLAN  
 GEOLOGIC SECTION 3



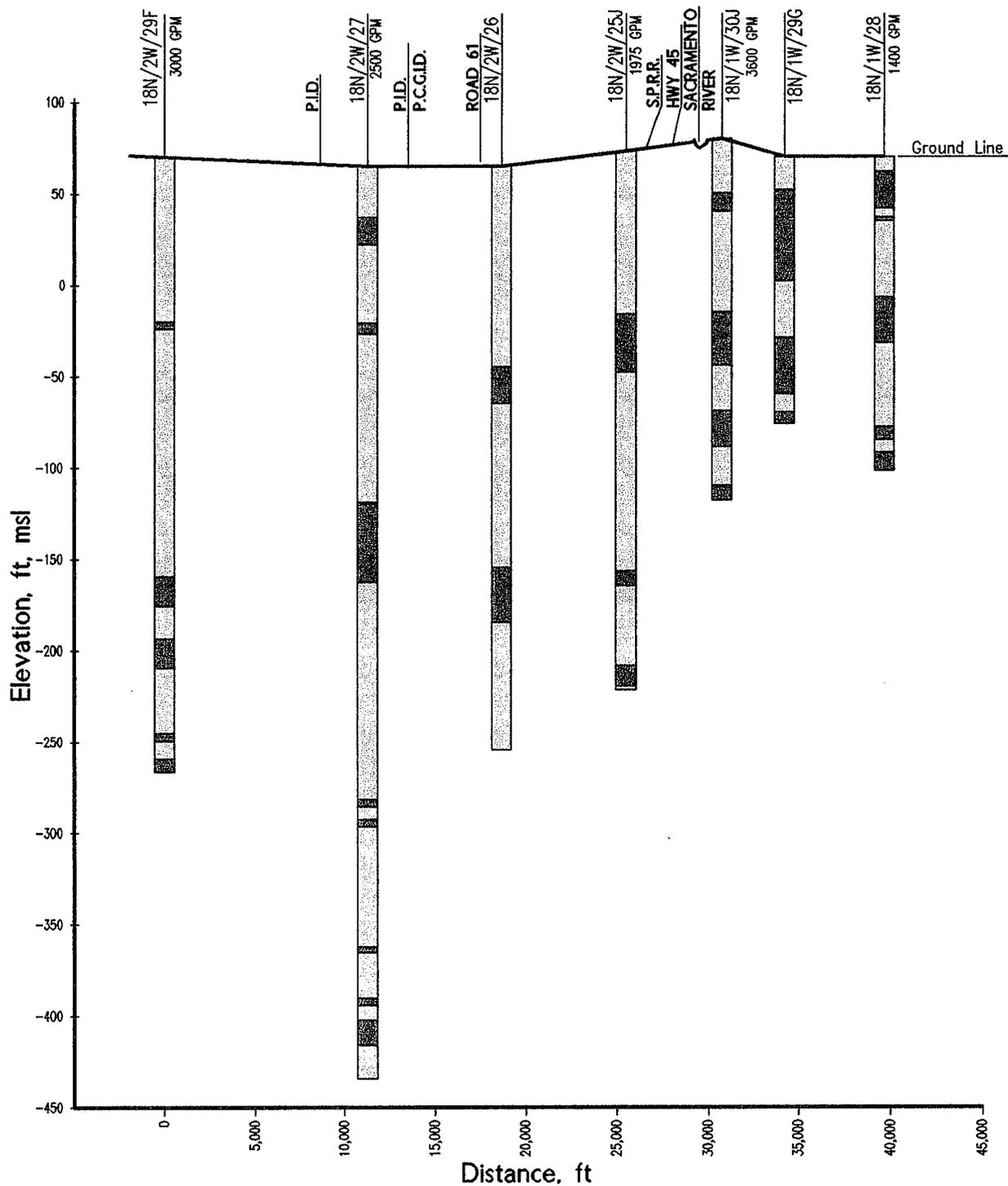
Legend

-  Predominantly Coarse-Grained Material
-  Predominantly Fine-Grained Material

20N/2W/28R State Well Identification Number

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
& PROVIDENT IRRIGATION DISTRICT  
GROUNDWATER MANAGEMENT PLAN

GEOLOGIC SECTION 4

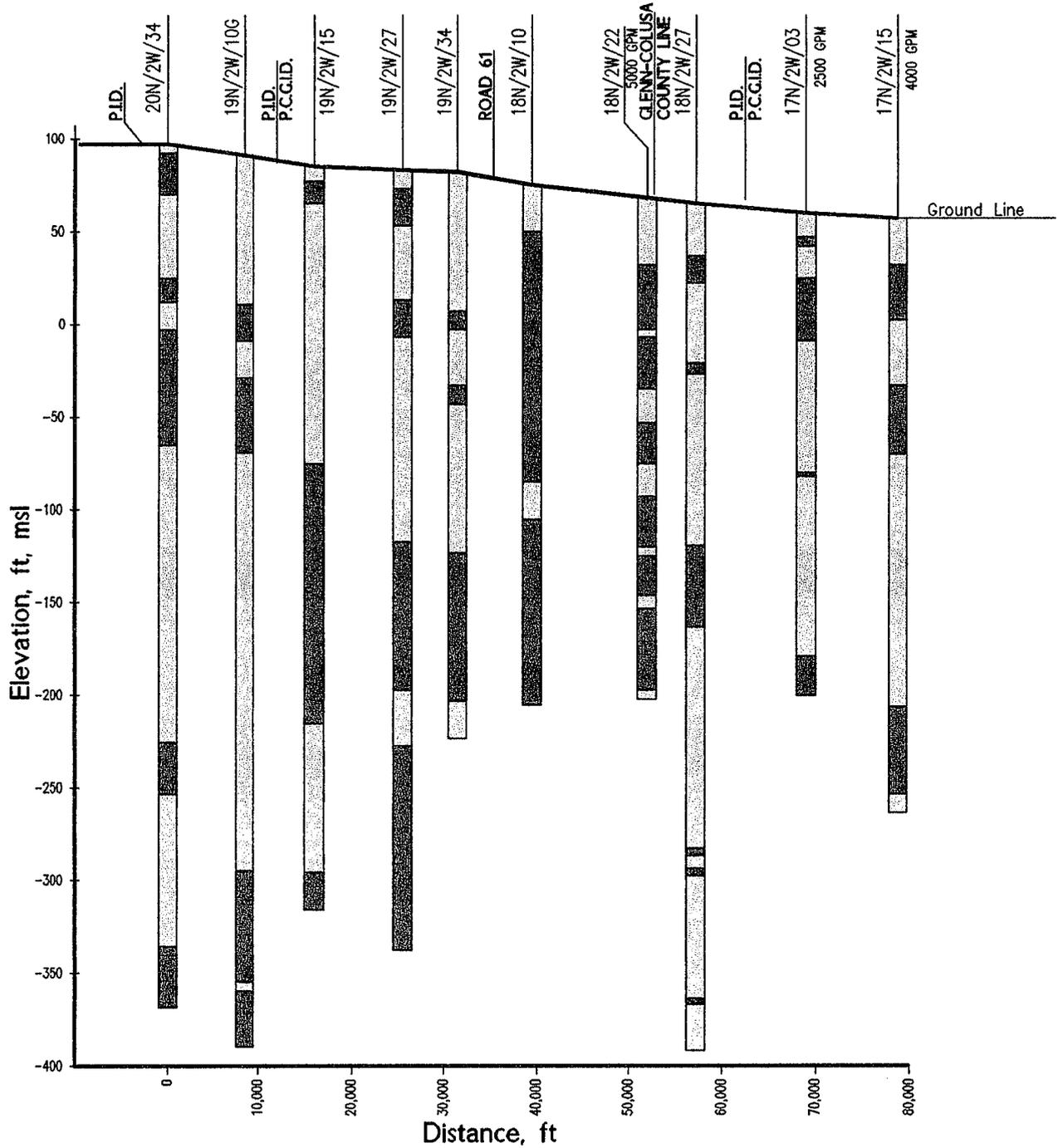


Legend

- Predominantly Coarse-Grained Material
- Predominantly Fine-Grained Material

20N/2W/28R State Well Identification Number

PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
 & PROVIDENT IRRIGATION DISTRICT  
 GROUNDWATER MANAGEMENT PLAN  
 GEOLOGIC SECTION 5



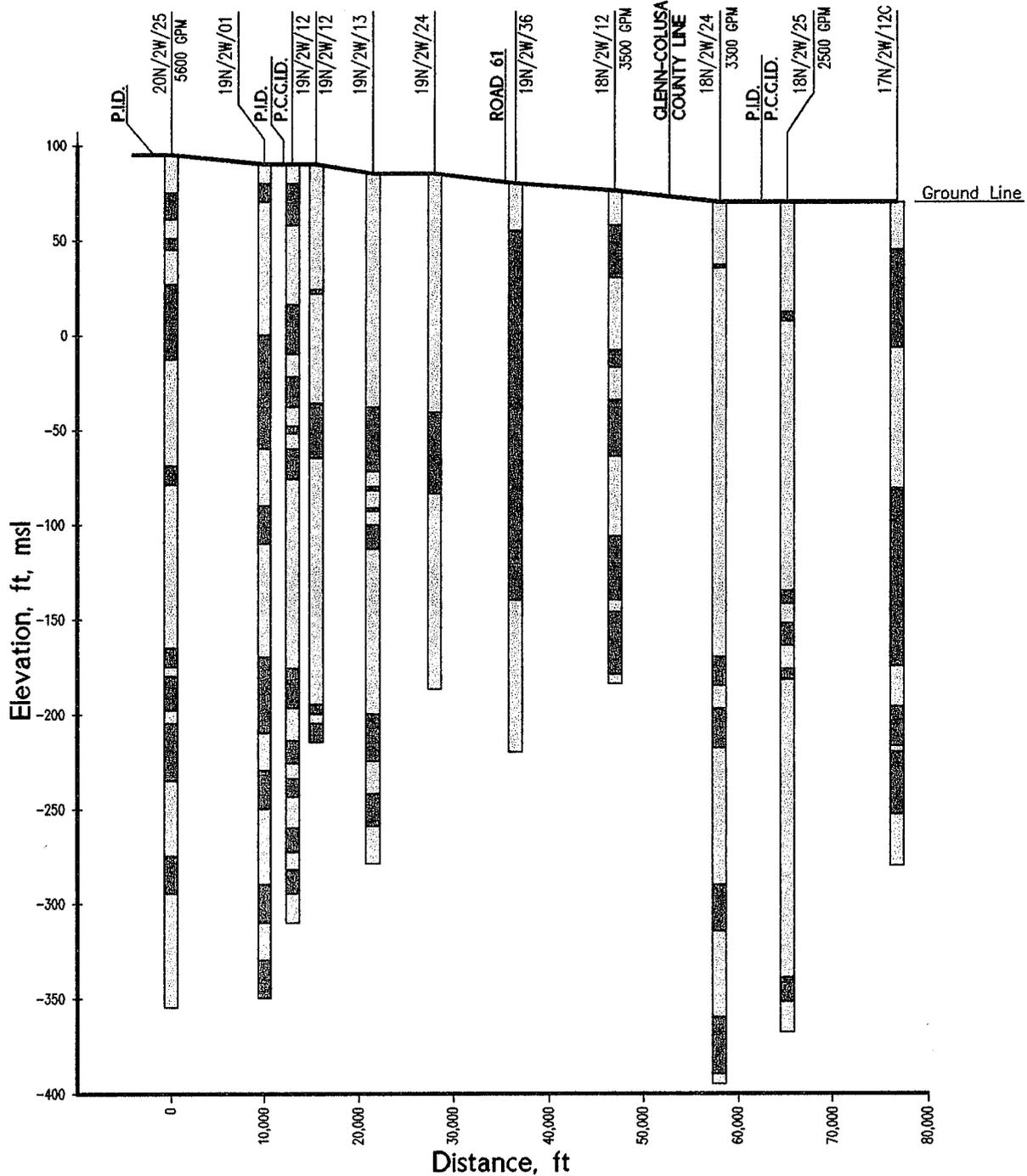
Legend

- Predominantly Coarse-Grained Material
- Predominantly Fine-Grained Material

20N/2W/28R State Well Identification Number

# PRINCETON-CODORA-GLENN IRRIGATION DISTRICT & PROVIDENT IRRIGATION DISTRICT GROUNDWATER MANAGEMENT PLAN

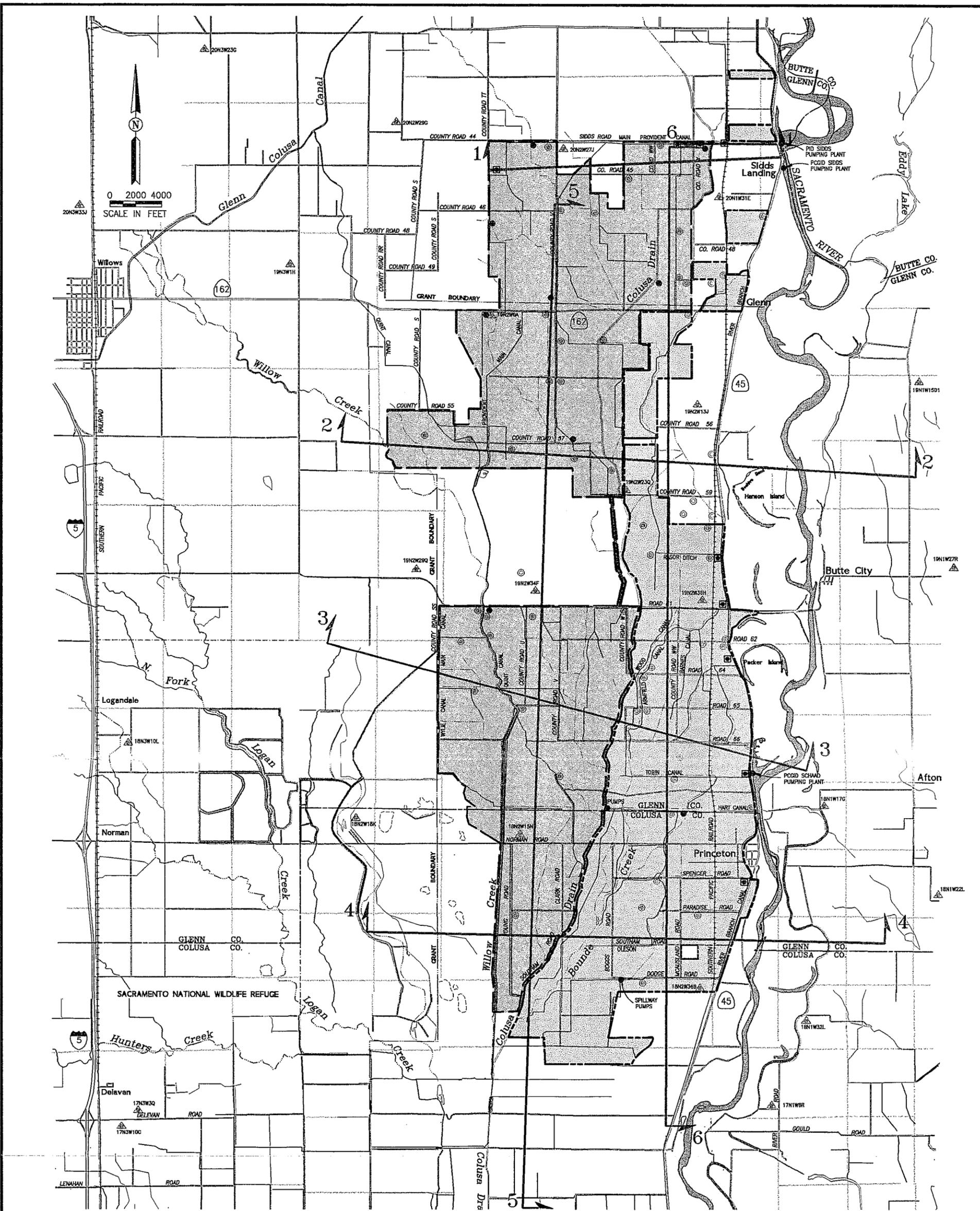
## GEOLOGIC SECTION 6



**Legend**

- Predominantly Coarse-Grained Material
- Predominantly Fine-Grained Material

20N/2W/28R State Well Identification Number



**Legend**

- Provident Irrigation District Boundary
- Princeton-Codora-Glenn Irrigation District Boundary
- Canals
- Drains
- Wells Available to Districts for Water Supply
- District Owned Well
- Recirculation Pump
- State DWR Monitoring Well
- Geologic Section (See Figures 2-7)

**PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
& PROVIDENT IRRIGATION DISTRICT  
GROUNDWATER MANAGEMENT PLAN  
GENERALIZED GEOLOGIC  
SECTION LOCATIONS**

BORCALLI & ASSOCIATES, INC.  
SACRAMENTO, CALIFORNIA

Based upon the groundwater level contours prepared by DWR, in the vicinity of PCGID and PID, in the spring the general direction of groundwater flow is in a southeasterly direction, toward the Sacramento River.

## D. GROUNDWATER QUALITY

Groundwater in the vicinity of PCGID and PID is characterized as a calcium-magnesium or magnesium-calcium-bicarbonate type water. Total dissolved solids in the area are in the range of 200 to 500 milligrams per liter (mg/l), with the concentration in isolated wells in the range of 500 to 1,500 mg/l. No problems with the quality of groundwater in the area are cited in the reference material.

The base of fresh water underlying each district is in the order of 1,300 to 1,400 feet below ground surface. Fresh water, as used to delineate this interface, has a total dissolved solids concentration of less than 2,000 mg/l. For agricultural use, adverse affects on many crops occur with the total dissolved solids in the range of 1,000 to 2,000 mg/l.

## E. RECHARGE

Recharge of the groundwater basin in the Sacramento Valley occurs from percolation of excess applied irrigation water, precipitation and streamflow, and subsurface inflow.

Recharge from percolation of precipitation and excess applied irrigation water will be influenced significantly by the permeability of the soils and the presence of a hardpan level or lack thereof.

Recharge from the Sacramento River will be influenced by the permeability of the streambed as well as the relative position of the groundwater levels as it can affect the flux

across the boundary of the streambed. The Geologic Sections (Figure 2 through Figure 4) show a significant amount of fine-grained material separating the Sacramento River from the groundwater basin underlying the districts.

The groundwater basin underlying PCGID and PID is largely confined or partially confined. The alluvium in PCGID is unconfined.

## F. WELL YIELDS AND SPECIFIC CAPACITY

The groundwater basin underlying PCGID and PID is designated by DWR to be an area of high well yields and high specific capacity. Well yields are generally expected to exceed 2,000 gallons per minute (gpm) and some existing wells yield in excess of 5,000 gpm. Specific capacities are indicated to be as high as 75 gpm/foot of drawdown.

## G. LAND SUBSIDENCE

Land subsidence or the compaction of the aquifer system caused by lowering the hydraulic head has occurred in the southwestern part of the Sacramento Valley, where the water demands of the area have been met almost entirely by pumping groundwater with little or no surface water use. Compaction of the aquifer system occurs mainly in the fine-grained sediments. When the hydraulic head in an aquifer system is reduced to a level below the preconsolidation stress, the fine-grained sediments compact and release water. Depending upon the composition of the sediments, such compaction could cause contaminants to be released also.

This phenomena is thought to be the source of selenium contamination of groundwater supplies in the south part of the Sacramento Valley in the vicinity of Davis. There is no indication of subsidence occurring within PCGID and PID, and the extent to which the fine-grained sediments underlying the districts may be susceptible to subsidence is not known.

## H. SUMMARY

The availability of site-specific data with some history is limited, thus the knowledge of the groundwater basin in the vicinity of each district is very general. The information that is available, however, suggests that the prospects exist for a more effective conjunctive use operation.

***V. THE GROUNDWATER MANAGEMENT PROGRAM***

---

**A. GENERAL**

In view of the current level of understanding of the groundwater basin underlying PCGID and PID, and the practical aspects of limited financial resources, the Initial Phase of the Groundwater Management Program (Program) will, of necessity, be one with a limited but focused effort, which over time will establish the foundation for more effective management of the groundwater basin to fulfill the goals and objectives of this plan.

Later, the Program, as it evolves over time, may embody all components addressed in Water Code Section 10753.7. Other components may be incorporated into the Program, as deemed appropriate by each district's Board of Directors, to fulfill the adopted goals and objectives.

In summary, the Program will be described below in two phases. The Initial Phase, covering approximately five years, and later phases, the timing and scope of which cannot be determined at this time.

**B. INITIAL PHASE**

1. Program Elements

The Initial Phase Program for PCGID and PID consists of two elements. A **Task** oriented element and a **Management** oriented element.

- The **Task** oriented element of the Program focuses on performing the work to carry out those components of Water Code 10753 that are determined to be a priority at this time.

- The **Management** oriented element of the Program focuses on managing the task; coordinating the task with other local agencies; and communicating the status of the task to the landowners and general public.

## 2. Priority Needs

Section 10753.7 of the Water Code identifies 12 components that may be included in a groundwater management plan adopted under the authority set forth in Section 10753. Although all components are important in varying degrees, the reality of the situation is that they cannot all be pursued at the onset of the Program. It is more important to allocate limited financial resources to performing a good job on a few components, rather than overextending them on several components. The needs of the Program must then be prioritized.

From a review of the 12 various components, in relation to the goals and objectives of the plan, those deemed to be most important are the following:

- Monitor groundwater levels and storage
- Facilitate conjunctive use operations
- Develop relationships with federal and state agencies

As noted above, the selection of the components noted above is not to imply that the others are not important. Rather significant progress towards improving the management of the groundwater basin will not be made unless the priority components are successfully implemented.

Presented in Table 2 and Table 3 are descriptions of the activities to be implemented under the **Task** and **Management** oriented elements, respectively.

## C. LATER PHASE(S)

The components of a groundwater management program (Water Code Section 10753.7) which are not deemed to be a priority may be implemented individually over time in combination with those components enumerated in Section I., or in combination with components not identified at this time.

A brief discussion is provided below of the respective components that are not a part of the Initial Phase Program.

### Control of Saline Water Intrusion (Section 10753.7(a))

The base of the freshwater is approximately 1,400 feet below ground surface. Lowering of the groundwater levels, thus the hydraulic heads, could initiate the upward migration or upwelling of saline water.

### Regulate the Migration of Contaminated Groundwater (Section 10753.7(c))

The contamination of groundwater can occur within or outside the boundaries of the districts. To the extent contamination does occur, and is detected with water quality monitoring, the districts could design a groundwater operations plan that would minimize adverse impacts to landowners.

**TABLE 2**

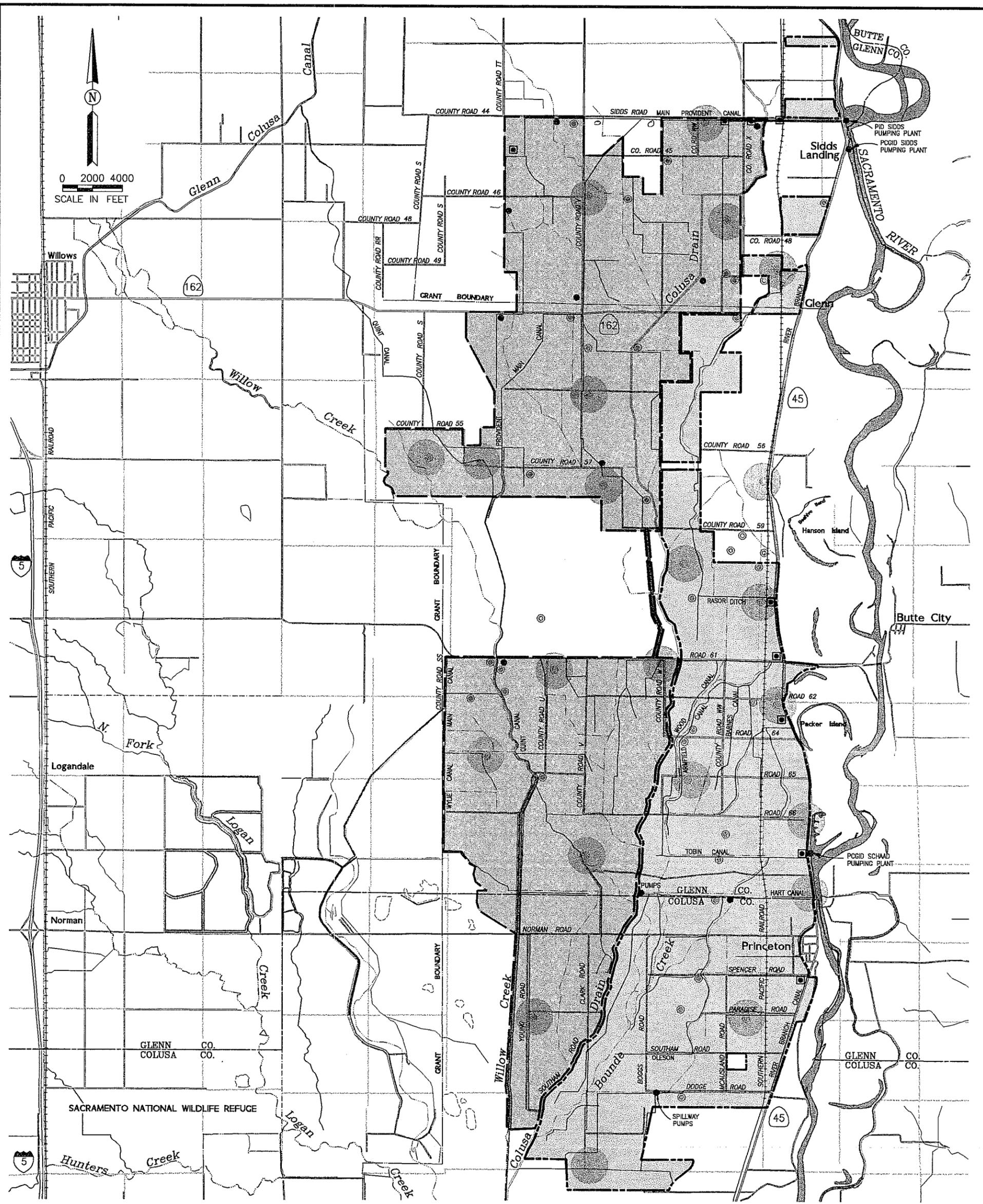
**GROUNDWATER MANAGEMENT PROGRAM  
TASK ORIENTED ELEMENT**

Activity	Description
<p>1. Monitoring of Groundwater Levels and Storage</p>	<p>A network of groundwater monitoring wells needs to be monitored on a regular basis to create a database from which a better understanding of the groundwater basin can be obtained. The history of data will also facilitate the detection of problems before they reach an acute stage. Understanding the groundwater basin can be improved by exerting the basin to different stress situations and monitoring the impacts.</p> <p>The work to be performed for this activity includes the following:</p> <ol style="list-style-type: none"> <li>a. Establish a network of groundwater monitoring wells building on the work that PCGID and PID have initiated. Existing wells that should be considered for inclusion into the network are identified on Map 3. <ul style="list-style-type: none"> <li>• Work with the owner of the well, if provisions do not already exist, install provisions to facilitate monitoring groundwater levels.</li> <li>• Obtain survey reference point elevations on each well to be used for groundwater monitoring.</li> <li>• Obtain groundwater level measurements in the spring and fall for all wells.</li> <li>• Obtain groundwater level measurements on a monthly basis for four wells spaced uniformly along the central portion of PCGID and PID from the north to south boundaries.</li> <li>• Obtain water quality samples in the fall of each year from the four wells to be monitored monthly, and test for total dissolved solids, nitrates, boron, iron, and manganese.</li> <li>• Compile the water level data into a database to facilitate producing hydrographs for the individual wells, and groundwater contour maps.</li> <li>• Compile the water quality data into a database to facilitate the statistical analysis and determination of temporal trends.</li> </ul> </li> <li>b. Review the results and observations from the monitoring well which DWR plans to construct near PID's Sidds Pumping Plant, and select two other locations, spaced uniformly to the south boundary of the PCGID, to construct monitoring wells to determine the relative hydraulic connectivity with the Sacramento River.</li> </ol>

**TABLE 2**

**TASK ORIENTED ELEMENT**

Activity	Description
<p>1. Monitoring of Groundwater Levels and Storage (Cont'd)</p>	<p>c. Inventory wells used for irrigation and municipal water supplies and work with the owners to obtain information on groundwater extraction on an annual basis. In addition, the owner's interest and willingness to participate in the following should be obtained by:</p> <ul style="list-style-type: none"> <li>• Operating their wells as part of a planned conjunctive use program to assist in developing a better understanding of the basin and to increase the overall water supply available to each district.</li> <li>• Measuring the groundwater pumped.</li> <li>• Including their wells in a groundwater monitoring network.</li> </ul> <p>d. Arrange a schedule with PG&amp;E for performing pump efficiency tests and specific capacity estimates on all wells used by each district for supplemental irrigation water.</p>
<p>2. Facilitating Conjunctive Use Operations</p>	<p>Carefully managed conjunctive use of each district's surface water and groundwater will maximize the total available water supply. The conjunctive use of surface and groundwater is an integral part of each district's existing operations. The districts, in working with landowners, should design conjunctive use operations annually that will facilitate stressing the basin so as to document the basin performance and response. Since the districts have arrangements with landowners to use selected wells for supplemental water this activity could be readily implemented. Based upon the information obtained in Activity 1.c., the planning for conjunctive use operations within each district may be expanded.</p>
<p>3. Develop Relationships With Federal and State Agencies</p>	<p>The DWR, U.S. Bureau of Reclamation, and U. S. Geological Survey, have established programs for monitoring surface and groundwater resources. DWR in particular can provide assistance in planning and implementing groundwater monitoring and investigative programs and facilitate incorporating each district's data into a regional database.</p>



**Legend**

-  Provident Irrigation District Boundary
-  Princeton-Codora-Glenn Irrigation District Boundary
-  Canals
-  Drains
-  Wells Available to Districts for Water Supply
-  District Owned Well
-  Recirculation Pump

General Location for Proposed Monitoring Well

**PRINCETON-CODORA-GLENN IRRIGATION DISTRICT  
& PROVIDENT IRRIGATION DISTRICT  
GROUNDWATER MANAGEMENT PLAN  
PROPOSED WELL  
MONITORING NETWORK**

**BORCALLI & ASSOCIATES, INC.**  
SACRAMENTO, CALIFORNIA

**REVIEW DRAFT**

**TABLE 3**

**MANAGEMENT ORIENTED ELEMENT**

Activity	Description
<p>1. Managing the Tasks</p>	<p>Management of the task oriented elements of the Program is a vital part of the Groundwater Management Plan. Only with a well managed effort can the Program be implemented effectively. Important aspects of this activity include the following:</p> <ul style="list-style-type: none"> <li>• Budgeting staff and financial resources for performing the work.</li> <li>• Ensuring the timely and orderly performance of the monitoring work.</li> <li>• Compiling and evaluating the data.</li> <li>• Evaluating the monitoring network and making modifications when deemed appropriate.</li> <li>• Periodically updating the task oriented element of the Program and making modifications as appropriate.</li> <li>• Preparing an annual report, which documents the data and evaluation of the data; identifies recommended modifications or additions to the work; and makes the information available to the landowners in the districts.</li> </ul>
<p>2. Coordinating With Other Local Agencies</p>	<p>The data and information obtained through each district's groundwater monitoring effort will be more useful if it is coordinated with similar efforts of other local agencies. The type of information and timing of measurements and tests should be coordinated with the monitoring programs of DWR and local agencies.</p> <p>The data should be compiled in a format common to other agencies and evaluated annually.</p>
<p>3. Communicating With Landowners</p>	<p>Each district has a policy of holding meetings with landowners to keep them apprised of activities and issues that may affect their district. This is an effective mechanism for informing landowners and should be continued.</p> <p>Keeping the landowners informed of the Program through meetings and periodic newsletters or mailings will be important for continued success.</p>

## Administer a Well Abandonment and Well Destruction Program (Section 10753.7(d))

Existing agencies have jurisdiction for implementing and enforcing provisions of the Water Code with respect to the abandonment and destruction of wells. PCGID and PID will assist the various agencies, as appropriate, to implement the respective provisions and as part of its inventory activities in the initial phase, will attempt to identify wells requiring such attention.

## Mitigate Conditions of Overdraft (Section 10753.7(e))

The well monitoring activity in the initial phase will facilitate the determination of overdraft conditions. PCGID and PID will implement such measures as deemed appropriate to mitigate the overdraft by working with landowners to manage the distribution and application of surface water supplies and groundwater extraction to effect direct and/or in-lieu recharge.

## Replenish Groundwater Extracted by Water Producers (Section 10753.7(f))

To the extent groundwater extracted by water producers is not replenished each year over a period of years, an overdraft condition could occur. PCGID and PID will exercise whatever means practical to manage the groundwater basin to maintain a water balance that does not adversely impact its landowners.

## Identify Well Construction Policies (Section 10753.7(i))

Existing agencies have jurisdiction for implementing and enforcing provisions of the water code with respect to the construction of wells. PCGID and PID will assist the various agencies as appropriate to implement the respective provisions.

## REVIEW DRAFT

To the extent PGCID and PID determine that special practices should be employed, from monitoring and evaluating data obtained in their initial phase activities, the appropriate agencies will be so advised.

### Construct and Operate Recharge, Storage, Conservation, Water Recycling, and Extraction Projects (Section 10753.7(j))

PCGID and PID currently operate an extensive surface water diversion, conveyance, and recovery system in conjunction with district and privately owned wells. Each district will continue to work with landowners and could design, construct, and operate project facilities to protect water quality and maximize supplies as deemed appropriate.

### Review Land Use Plans and Coordinate With Land Use Planning Agencies to Assess Activities Which Create a Reasonable Risk of Groundwater Contamination (Section 10753.7(l))

PCGID and PID will evaluate any proposed land use or zoning changes from the standpoint of the risk of initiating a deterioration in the quality of groundwater. Any risk or potential risk for contamination will be brought to the attention of the appropriate federal, state, or local agencies to ensure that the potential for adverse impacts is fully mitigated.

**V. IMPLEMENTATION**

---

---

**A. SCHEDULE FOR ADOPTION**

Implementation of the Groundwater Management Program under the authority of AB3030 (Water Code Section 10753) requires adoption by PCGID and PID. Adoption of the Program may be by resolution providing the specified process is followed. This process and a tentative schedule is presented below.

Activity	Completion Date
Present "Review" Draft Plan Report to Board of Directors	October 1995
Circulate "Review" Draft Plan Report to Landowners	October 1995
Conduct Meeting to Inform Landowners of Plan and Receive Comments	November 1995
Prepare "Final" Draft Plan	December 1995
Receive Approval of the "Final" Draft Plan by Districts Boards	January 1996
Notice and Conduct Public Hearing on a Resolution of Intent to Adopt Plan	February 1996
Adopt Plan	March 1996

## B. FUNDING

Adoption of the Plan by PCGID and PID, pursuant to Part 2.7 of the Water Code, provides the districts with the authority of a water replenishment district pursuant to Part 4 of Division 18 of the Water Code. Having this authority, each district may fix and collect fees and assessments for groundwater management in accordance with Part 6 of Division 18 of the Water Code.

***VII. REFERENCES***

---

Shepard's; "California Water Code 1994."

State of California, The Resources Agency, Department of Water Resources; "Evaluation of Ground Water Resources: Sacramento Valley," Bulletin 118-6, August 1978.

State of California, The Resources Agency, Department of Water Resources; "Ground Water Levels in the Sacramento Valley Ground Water Basin Colusa County," January 1994.

U. S. Geological Survey; "Chemical Quality of Ground Water in the Tehama-Colusa Canal Service Area, Sacramento Valley, California," Water Resources Investigations 76-92, November 1972.

U. S. Geological Survey; "Descriptions and Chemical Analyses for Selected Wells in the Tehama-Colusa Canal Service Area, Sacramento Valley, California," Open File Report, April 1975.

U. S. Geological Survey; "Geochemistry of Ground Water in the Sacramento Valley, California," Professional Paper 1257.

U. S. Geological Survey; "Geologic Features and Ground-Water Storage Capacity of the Sacramento Valley California," Water-Supply Paper 1497, 1961.

U. S. Geological Survey; "Geology of the Fresh Ground-Water Basin of the Central Valley, California, With Texture Maps and Sections," Professional Paper 1401-C.

U. S. Geological Survey; "Ground-Water Flow in the Central Valley, California," Open-File Report 85-345, 1985.

U. S. Geological Survey; "Ground-Water Flow in the Central Valley, California," Professional Paper 1401-D.

U. S. Geological Survey; "Miscellaneous Field Studies Map," MF-1790, 1985.

**APPENDIX A**

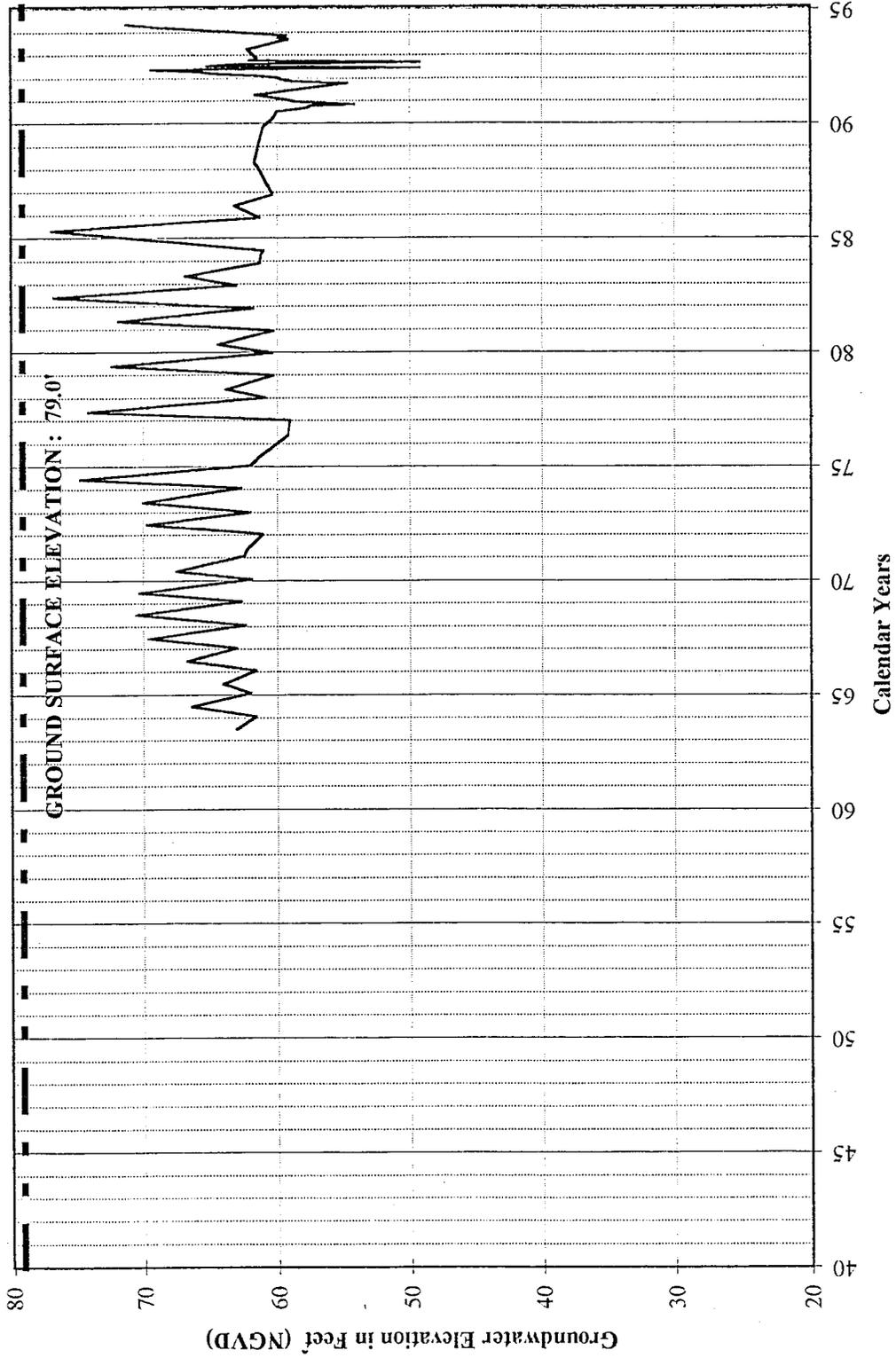
---

---

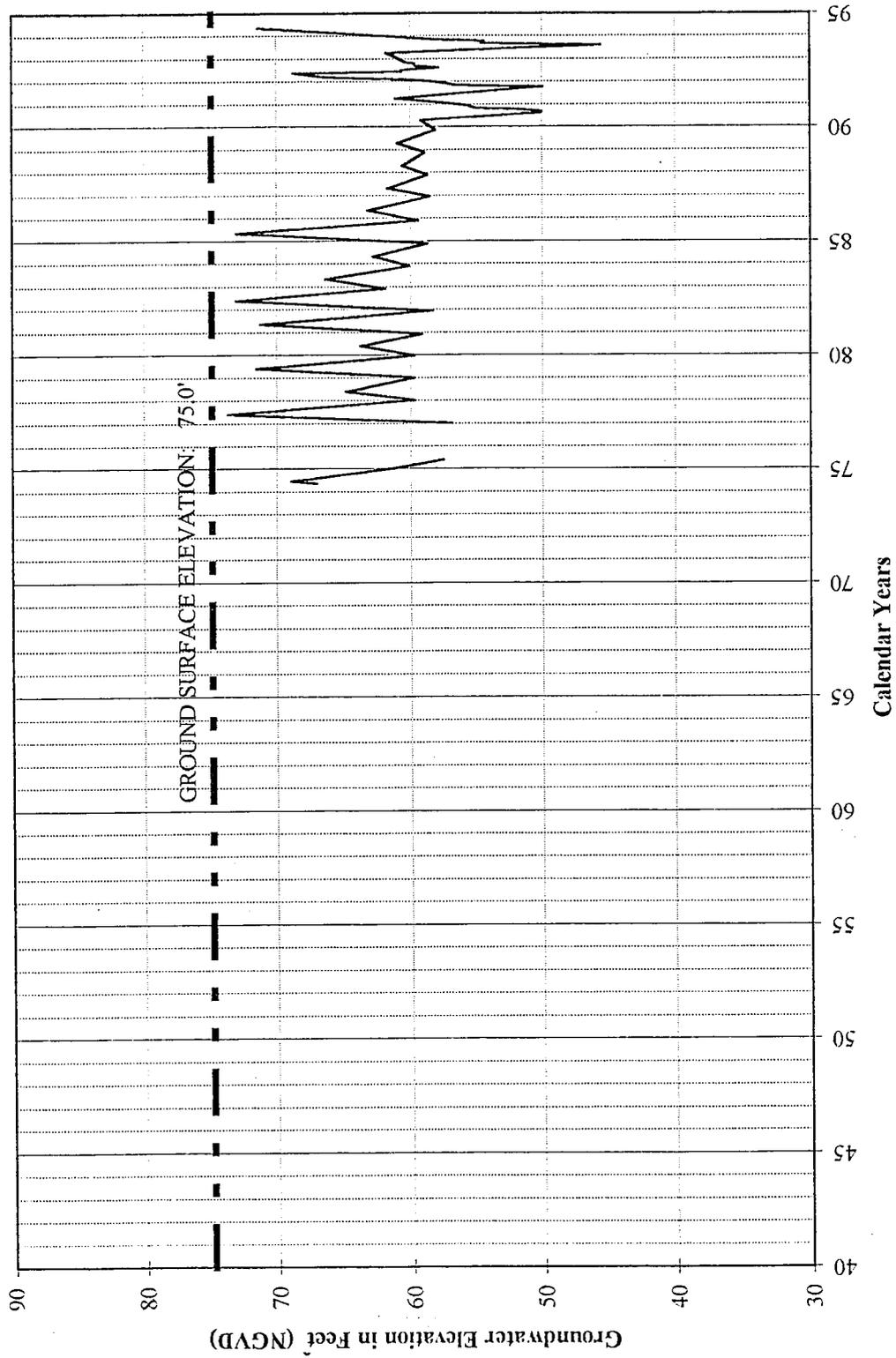
STATE WELL NUMBER 18N / 1W - 17G01

GLENN COUNTY

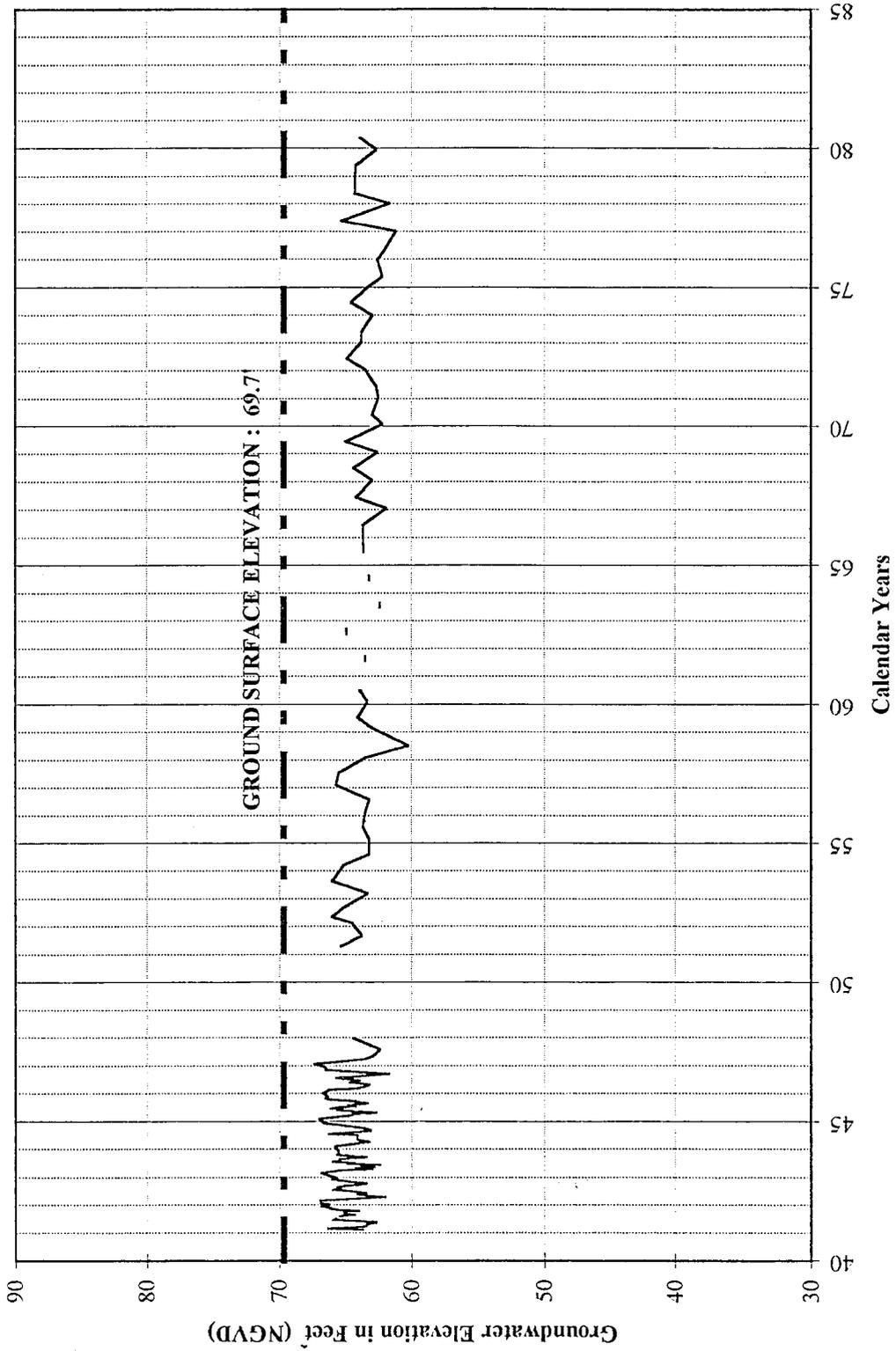
(NOT WITHIN DISTRICT BOUNDARIES)



STATE WELL NUMBER 18N / 1W - 32L02  
COLUSA COUNTY  
(NOT WITHIN DISTRICT BOUNDARIES)



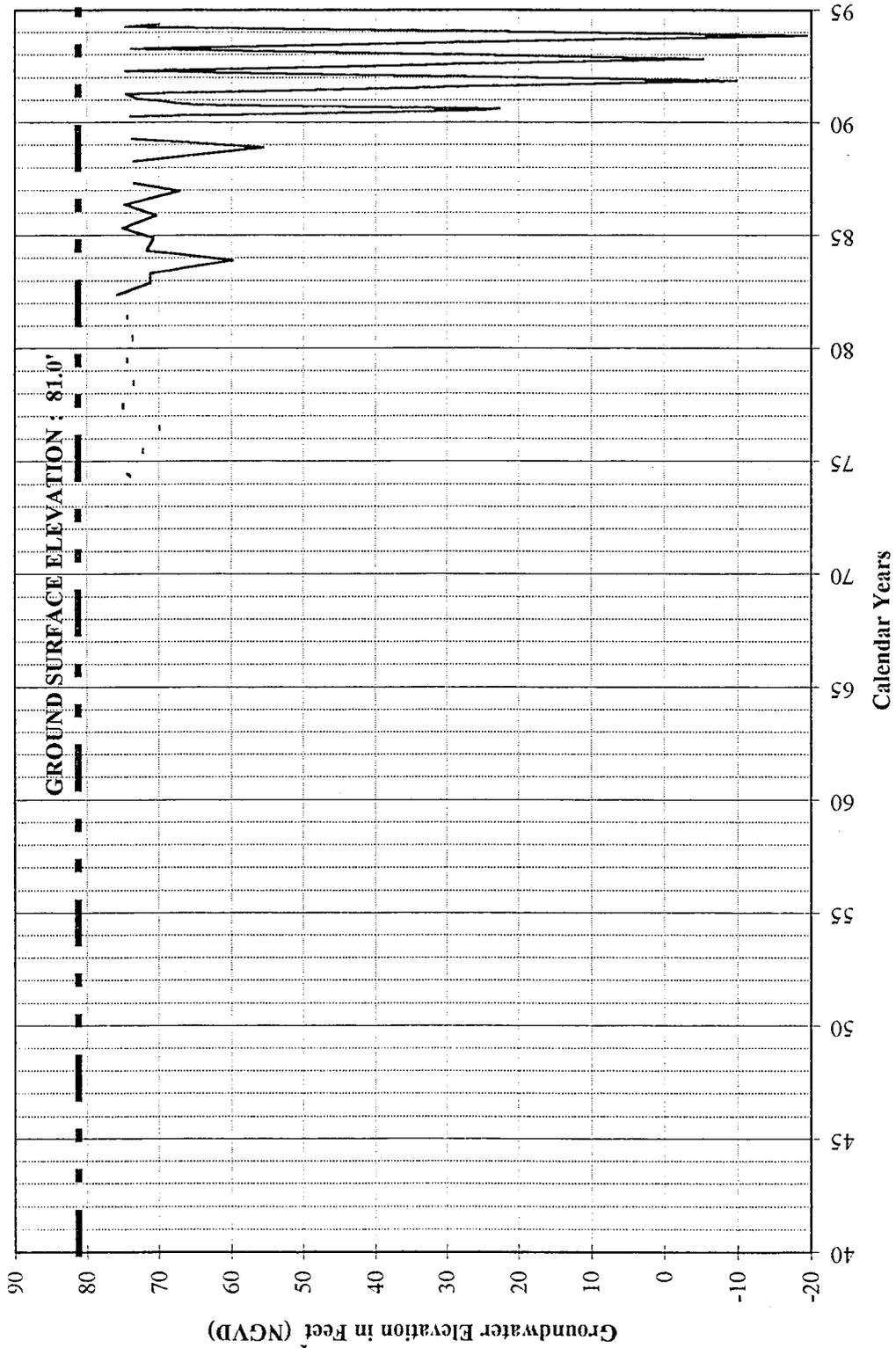
STATE WELL NUMBER 18N / 2W - 15N01  
COLUSA COUNTY



STATE WELL NUMBER 18N / 2W - 18K01

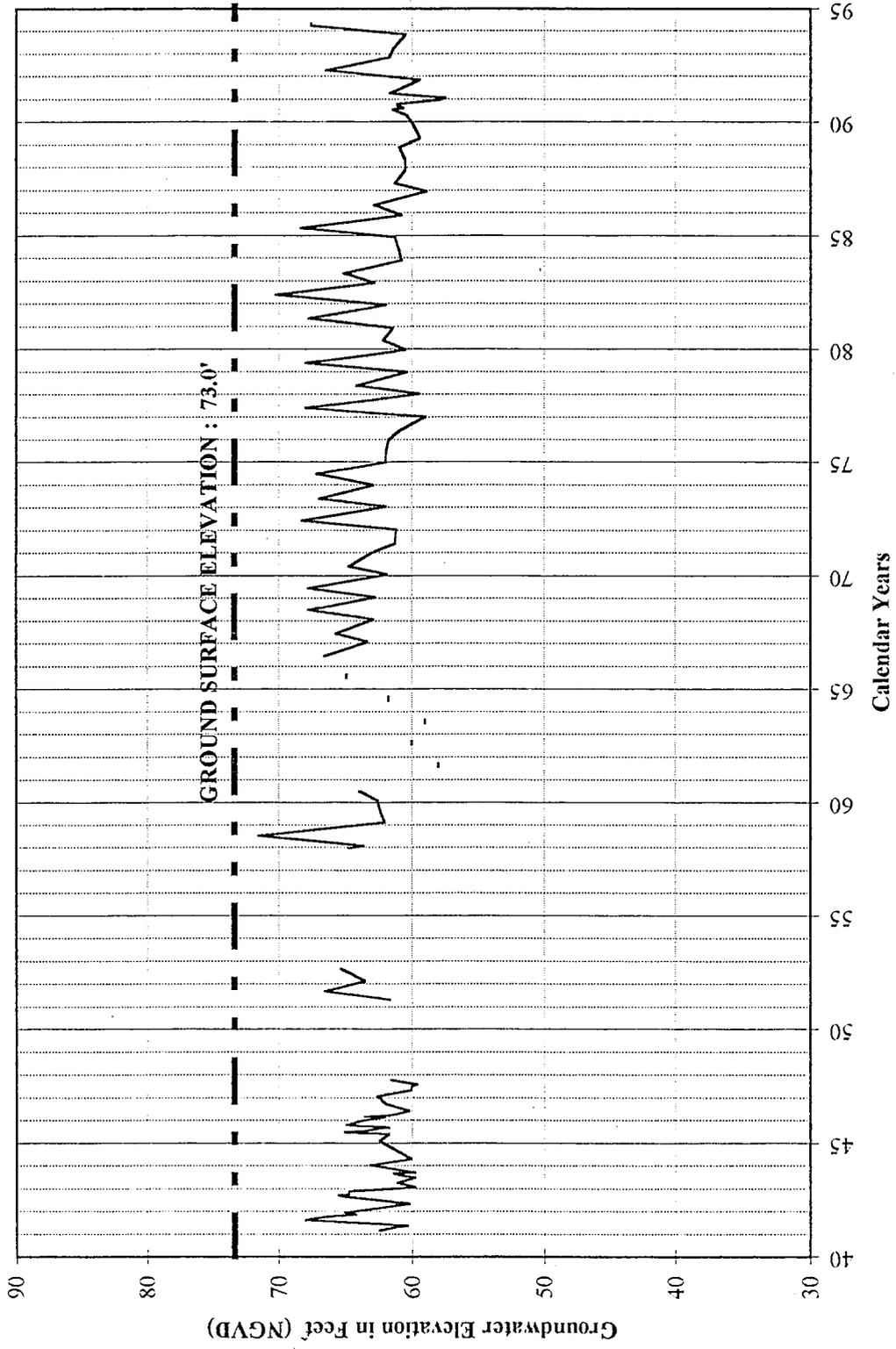
COLUSA COUNTY

(NOT WITHIN DISTRICT BOUNDARIES)



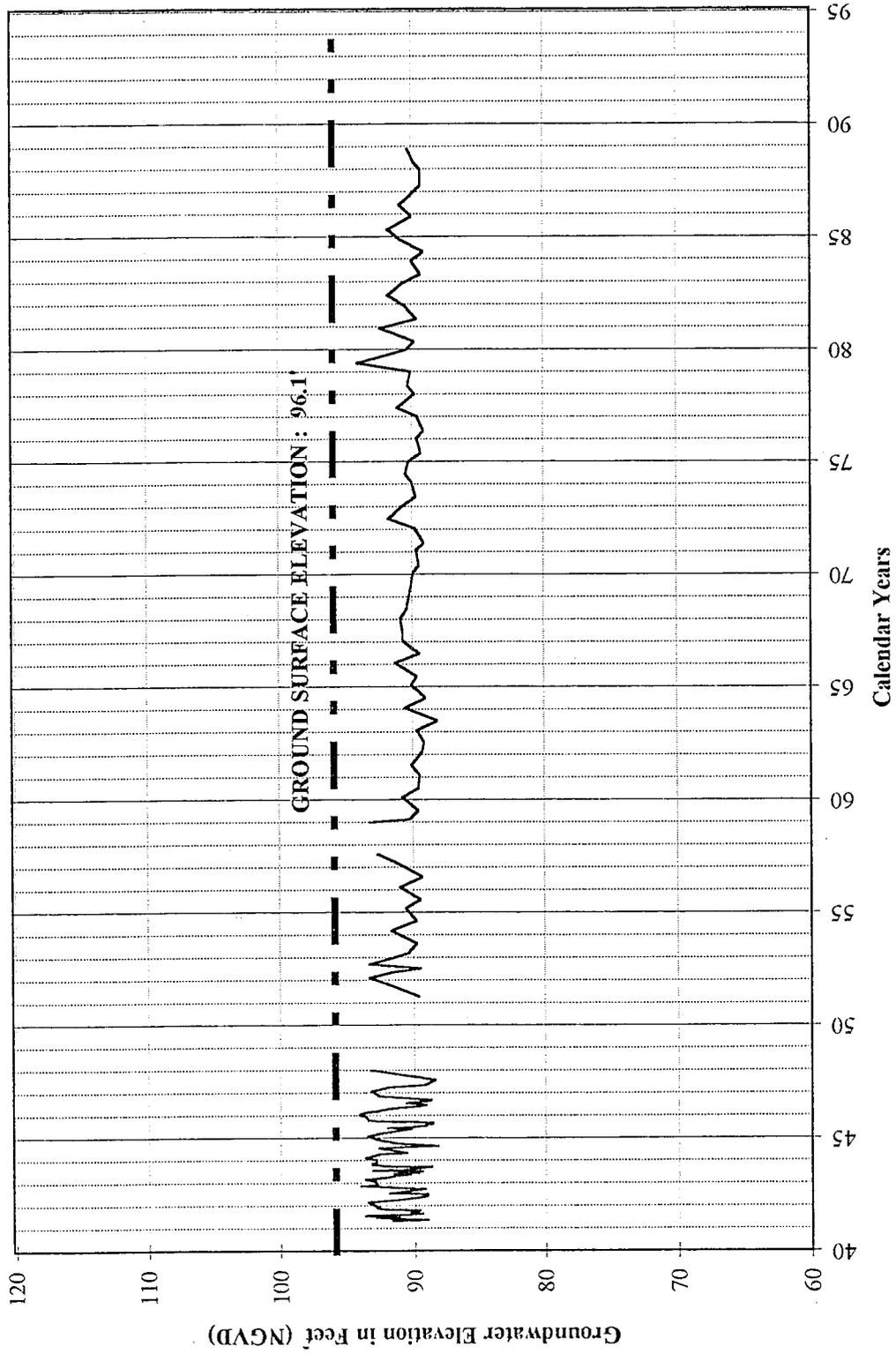
Source: DWR, Northern District groundwater database

STATE WELL NUMBER 18N / 2W - 36B01  
COLUSA COUNTY



Source: DWR, Northern District groundwater database

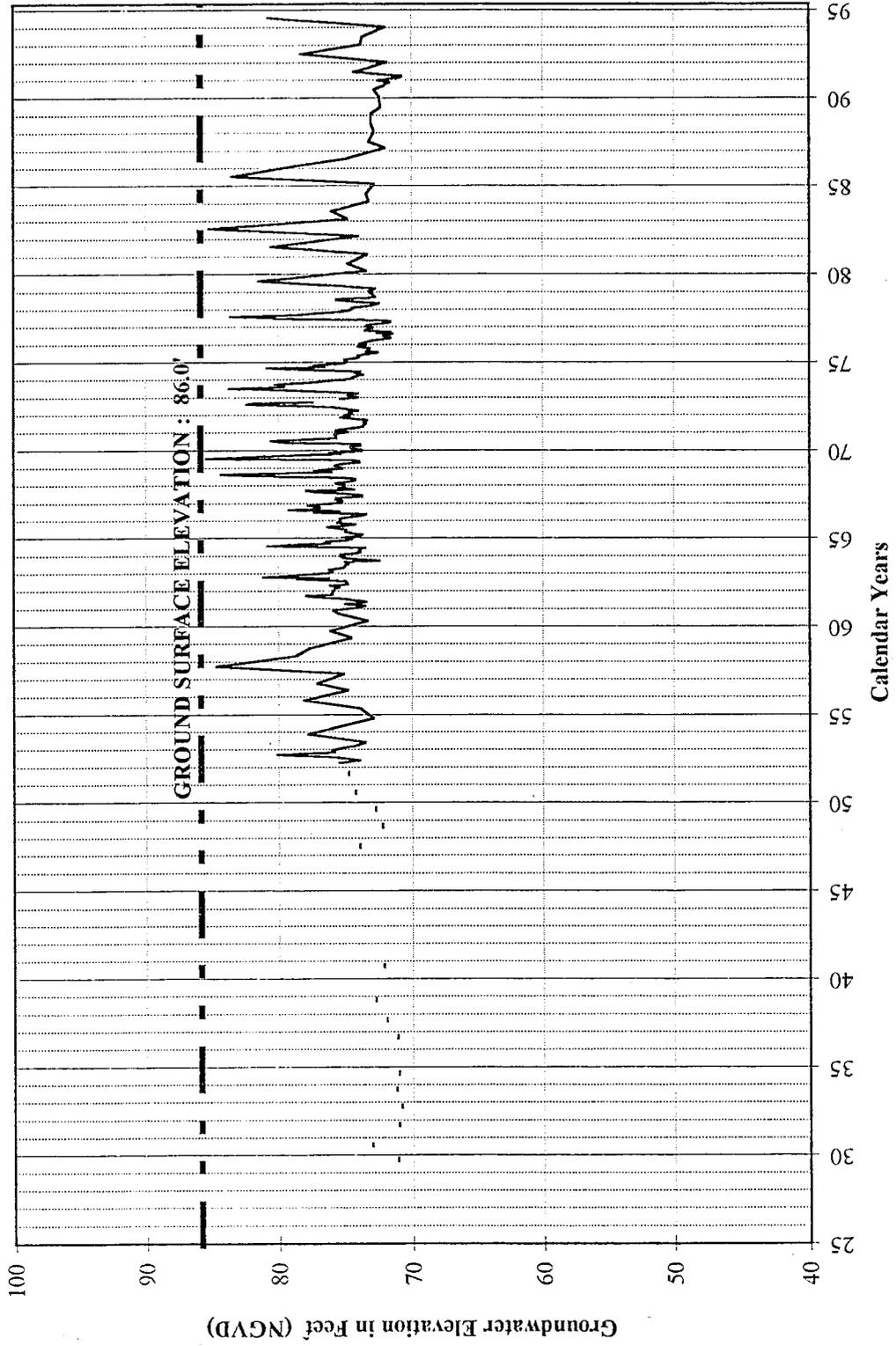
STATE WELL NUMBER 19N / 2W - 09A01  
GLENN COUNTY



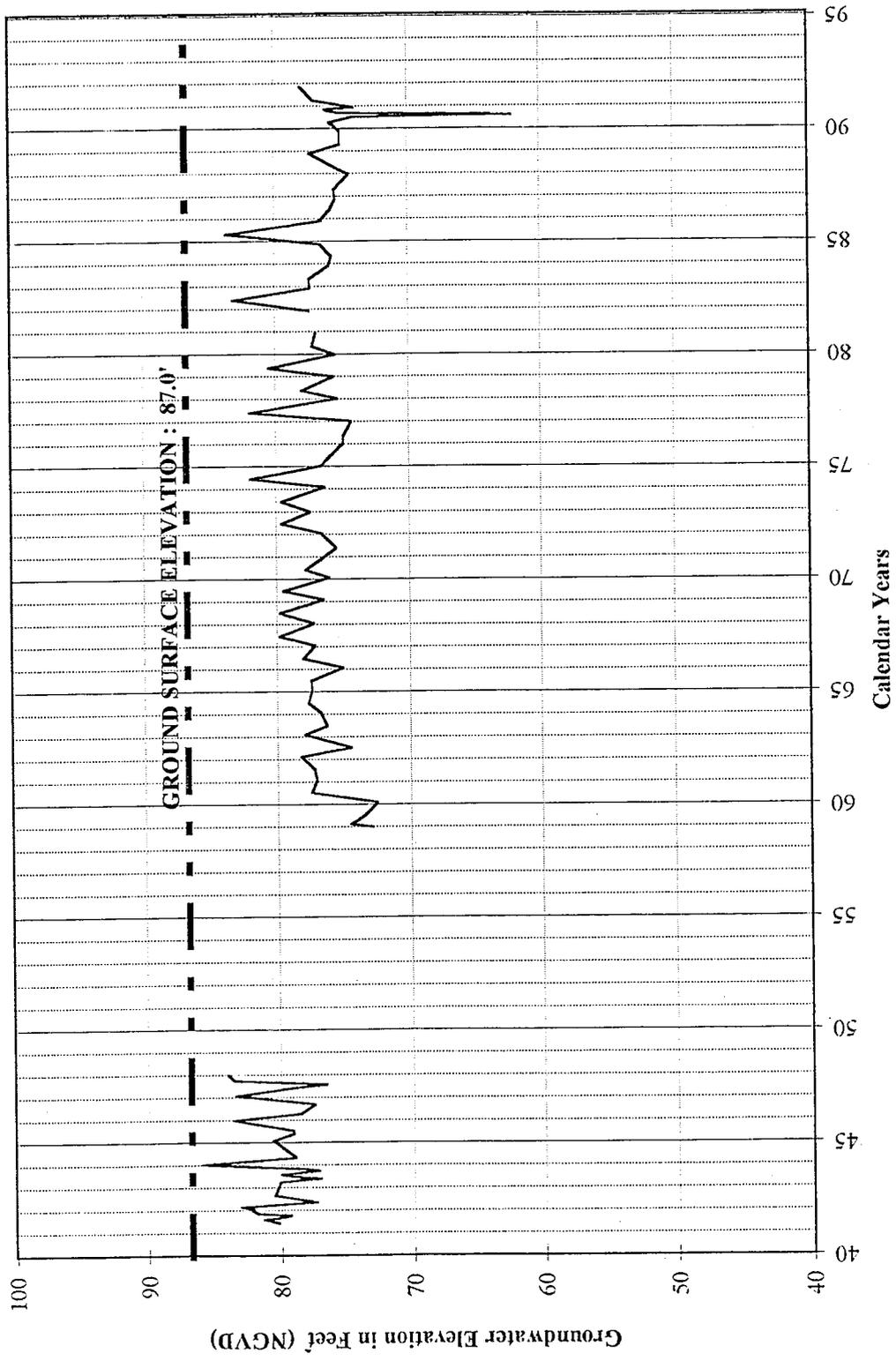
STATE WELL NUMBER 19N / 2W - 13J01

GLENN COUNTY

(NOT WITHIN DISTRICT BOUNDARIES)

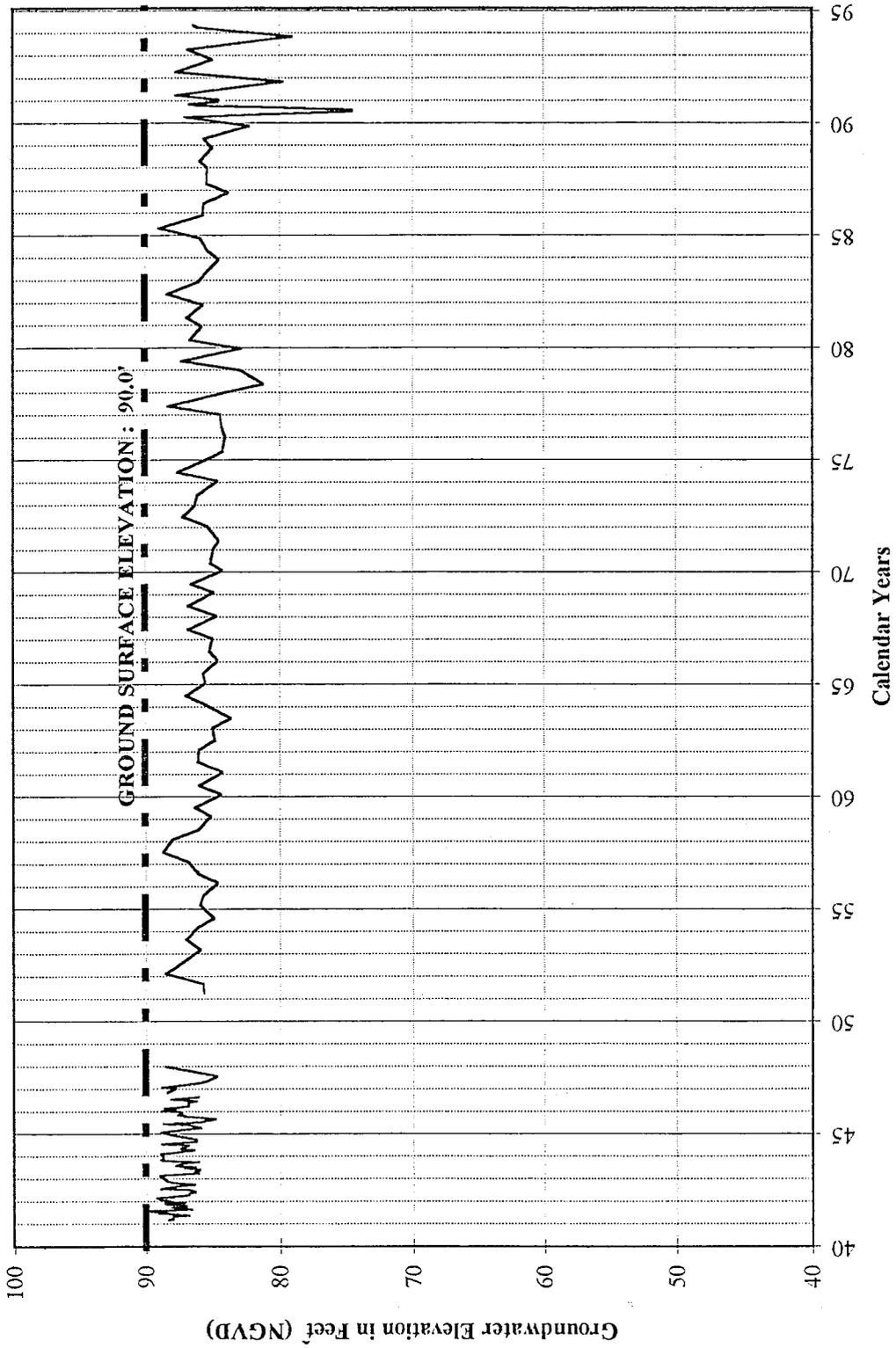


STATE WELL NUMBER 19N / 2W - 23Q01  
GLENN COUNTY

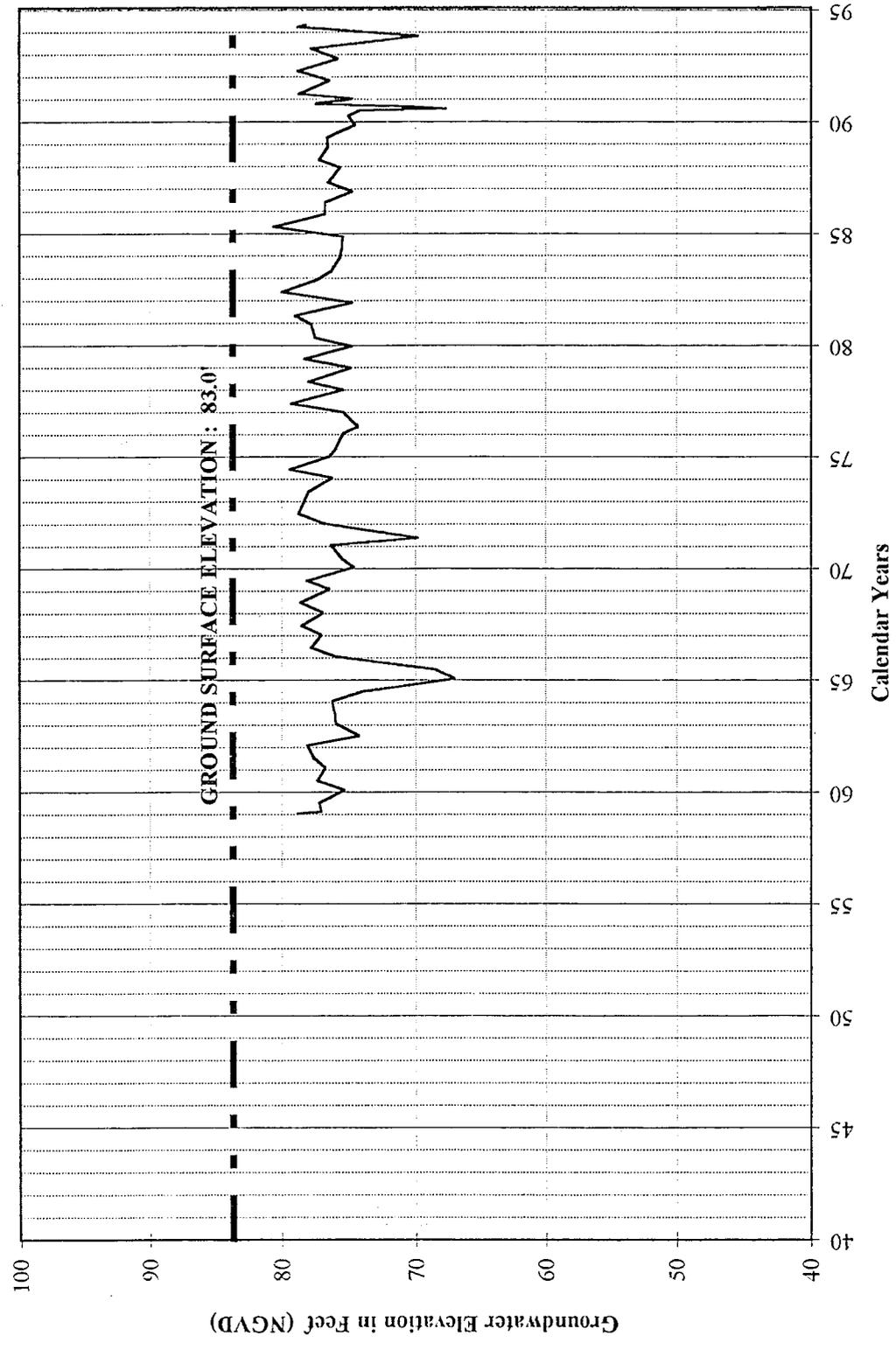


Source: DWR, Northern District groundwater database

STATE WELL NUMBER 19N / 2W - 29Q01  
GLENN COUNTY  
(NOT WITHIN DISTRICT BOUNDARIES)

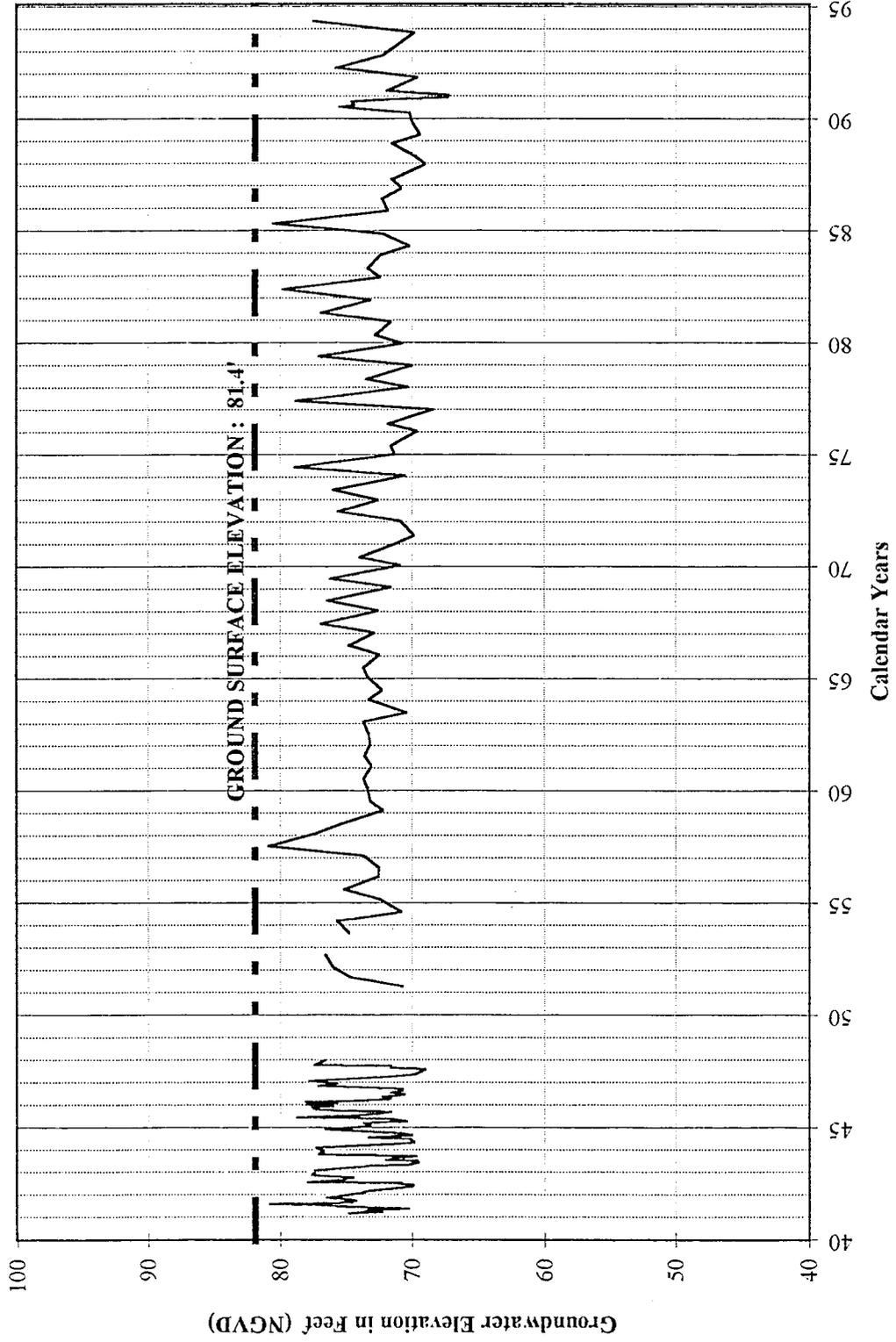


STATE WELL NUMBER 19N / 2W - 34F01  
GLENN COUNTY  
(NOT WITHIN DISTRICT BOUNDARIES)

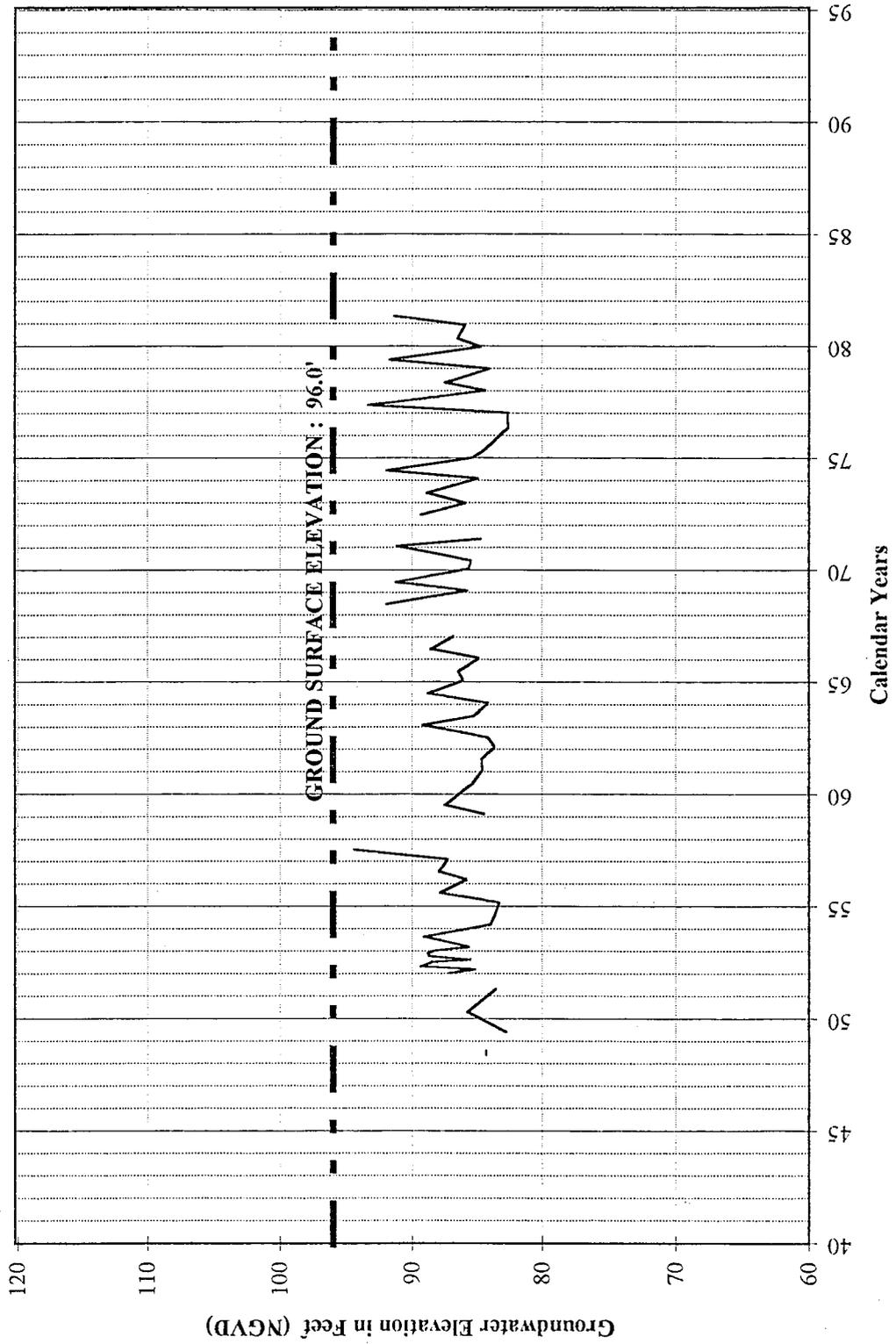


Source: DWR, Northern District groundwater database

STATE WELL NUMBER 19N / 2W - 36H01  
GLENN COUNTY

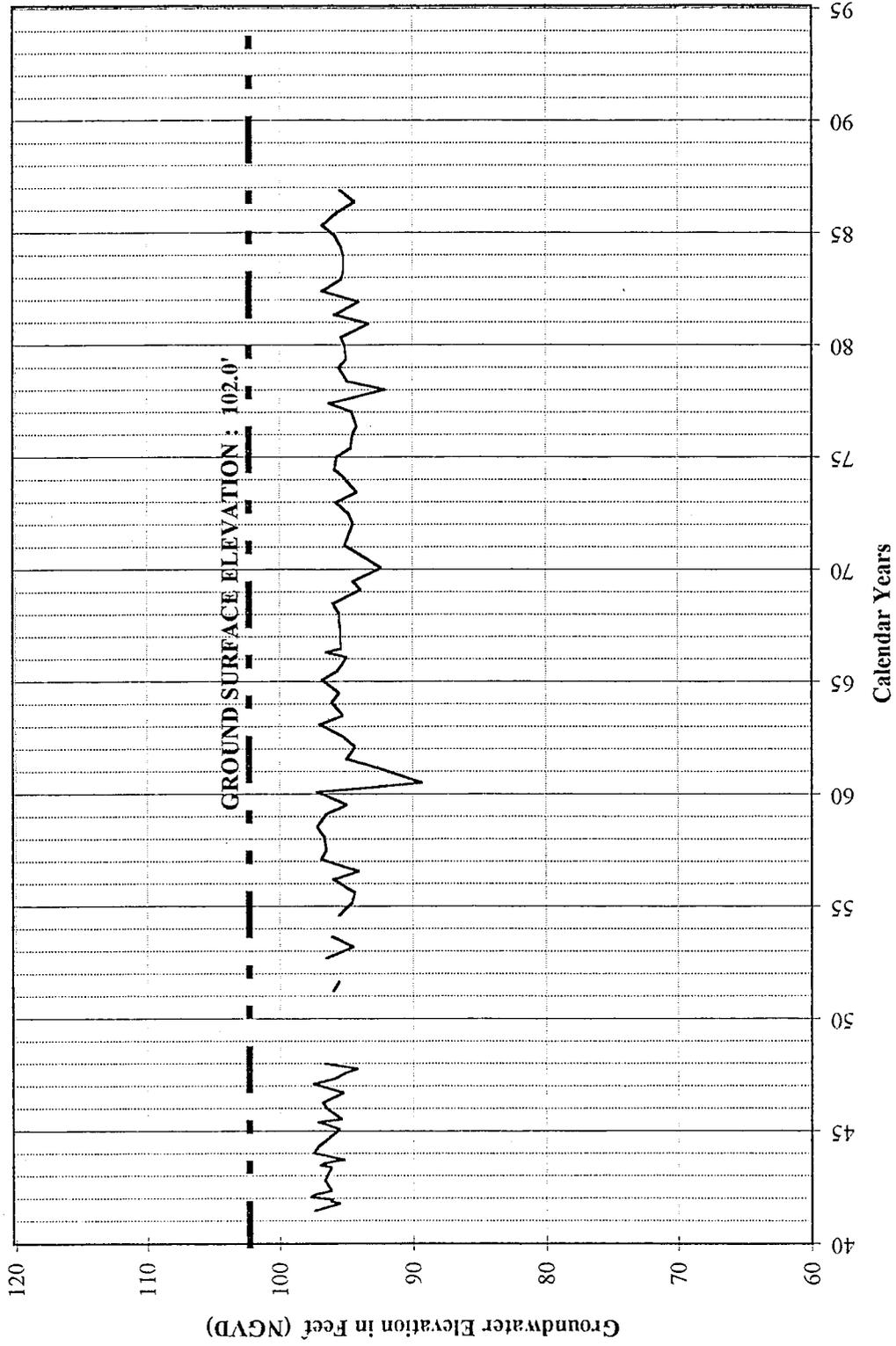


STATE WELL NUMBER 20N / 1W - 31E01  
GLENN COUNTY



Source: DWR, Northern District groundwater database

STATE WELL NUMBER 20N / 2W - 27J01  
GLENN COUNTY  
(NOT WITHIN DISTRICT BOUNDARIES)



STATE WELL NUMBER 20N / 2W - 29G01  
GLENN COUNTY  
(NOT WITHIN DISTRICT BOUNDARIES)

