R. Longenbaugh

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Artificial Ground-Water Recharge in the Prospect Valley Area, Colorado

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ARTIFICIAL GROUND-WATER RECHARGE IN THE PROSPECT VALLEY AREA, COLORADO

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CORRECTIONS FOR PUBLICATION

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Description of Study Area

(3) Ground Water is on page 6 instead of page 7

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"A pumping test was performed at well B1-63-9ddc to determine the aquifer properties at that location." should be included under the heading of PROCEDURE, column 2, page 12.

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Acknowledgments

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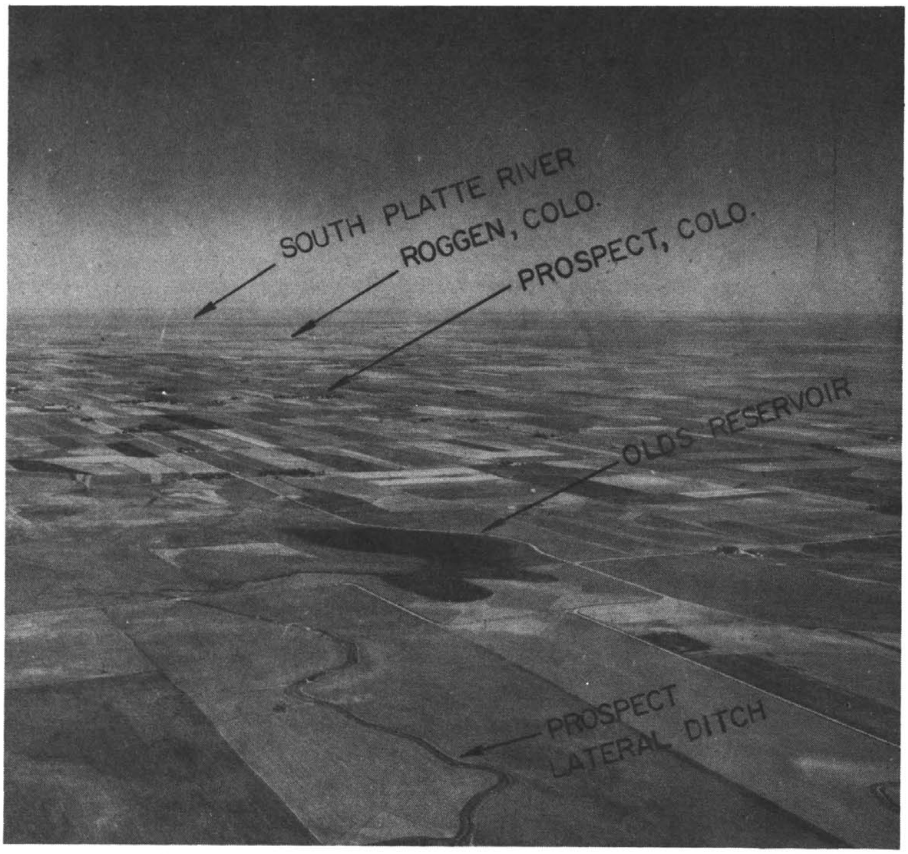
ABSTRACT

ARTIFICIAL GROUND-WATER RECHARGE IN THE PROSPECT VALLEY AREA, COLORADO

A general description of the Prospect Valley area is presented, including the physiography, geology, and hydrology with special emphasis on the surface and ground-water for irrigation. The procedure and results of a quantitative ground-water recharge investigation at Olds Reservoir are discussed and an equation evaluated for describing the dissipation of a mound of recharge water beneath a spreading basin. A ground-water inventory for Prospect Valley is itemized for the period 1942 to 1962 and the "current, permissive, sustained ground-water yield" discussed. Based on historical water supply deliveries, some water resource management aspects are proposed involving conjunctive use of surface and ground-water supplies.



An aerial view to the northeast across Prospect Valley

ARTIFICIAL GROUND-WATER RECHARGE IN THE PROSPECT VALLEY AREA, COLORADO

by

M. M. Skinner[1]

INTRODUCTION

A study of artificial and natural recharge of ground-water reservoirs in Colorado was initiated July 1, 1959 at Colorado State University. This research project, Colorado Agricultural Experiment Station Project 112, was funded by an appropriation of the Forty-second Colorado General Assembly under Senate Bill No. 336. Studies were not intended to be limited to only the physical processes of introducing recharge water into a ground-water reservoir, but ground-water geology, hydrology, and hydraulics as well as legal, social, and economic aspects were also to be considered. This information could in turn be utilized in formulating *criteria* for the proper *management* and *operation* of Colorado's ground-water reservoirs as components of the total water supply in each basin (1).[2] Colorado Agricultural Experiment Station Project 105, a continuing project for measuring and recording long-term ground-water level fluctuations in the pump-irrigated areas of Colorado, provided valuable historical data necessary in the preparation of portions of this report.

The Prospect Valley area, in the South Platte River Basin, was one of the first areas considered for study under research Project 112 since: (a) the area is typical of several alluvial-filled valleys tributary to the South Platte River which depend to a great extent on ground-water supplies to perpetuate an irrigated economy; (b) ground-water level hydrographs dating back to the beginning of pumping in the area depict a depletion of the ground-water supply and the consequent need for replenishment (8); (c) information concerning the geology and hydrology of the area was already fairly complete (3) (6) (7) (9); and (d) an operable ground-water recharge site (Old Reservoir) existed from which some information on limited recharge-operations was available.

The purpose of this report is to (a) review the historical development and use of irrigation-water supplies for Prospect Valley; (b) to evaluate the use of theoretical equations for describing the effect of artificial ground-water recharge operations through an areal spreading basin; (c) to better understand the operating characteristics of ground-water reservoirs in alluvial-filled valleys; and (d) to promote management techniques for maximizing the efficiency of use of limited irrigation-water supplies.

DESCRIPTION OF THE STUDY AREA

Physiography

The Prospect Valley area, located approximately 40 miles northeast of Denver, Colo., includes about 12,500 acres[3] of irrigated land. Irrigation-water supplies are derived from canal deliveries and/or wells. The major portion of the irrigated area in the valley is supplied by both canal deliveries and pumps; the remaining irrigated area is supplied by either pumps or canals. Principal crops grown in the area include sugar beets, corn, beans, alfalfa, and small grains. Cattle feeding operations, which utilize the locally grown feeds, are becoming quite common. The prosperity of the valley was further enhanced during 1962 with the development of several additional producing oil and gas wells near the north end of the irrigated area.

The small community of Prospect is located centrally in Prospect Valley with the towns of Roggen lying to the north and Keenesburg to the northwest. The area is served by a branch line of the Chicago, Burlington, and Quincy Railroad, primarily for the transportation of sugar beets to processing plants. State Highways 52 and 79, east-west and north-south roads respectively, intersect at Prospect (figure 1).

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[1]Assistant research engineer, civil engineering section, Colorado State University, Fort Collins, Colo.

[2]Number in parentheses refers to the number of a reference in the bibliography.

[3]Information furnished by R. V. Rouse, manager, Henrylyn Irrigation District, Hudson, Colo.

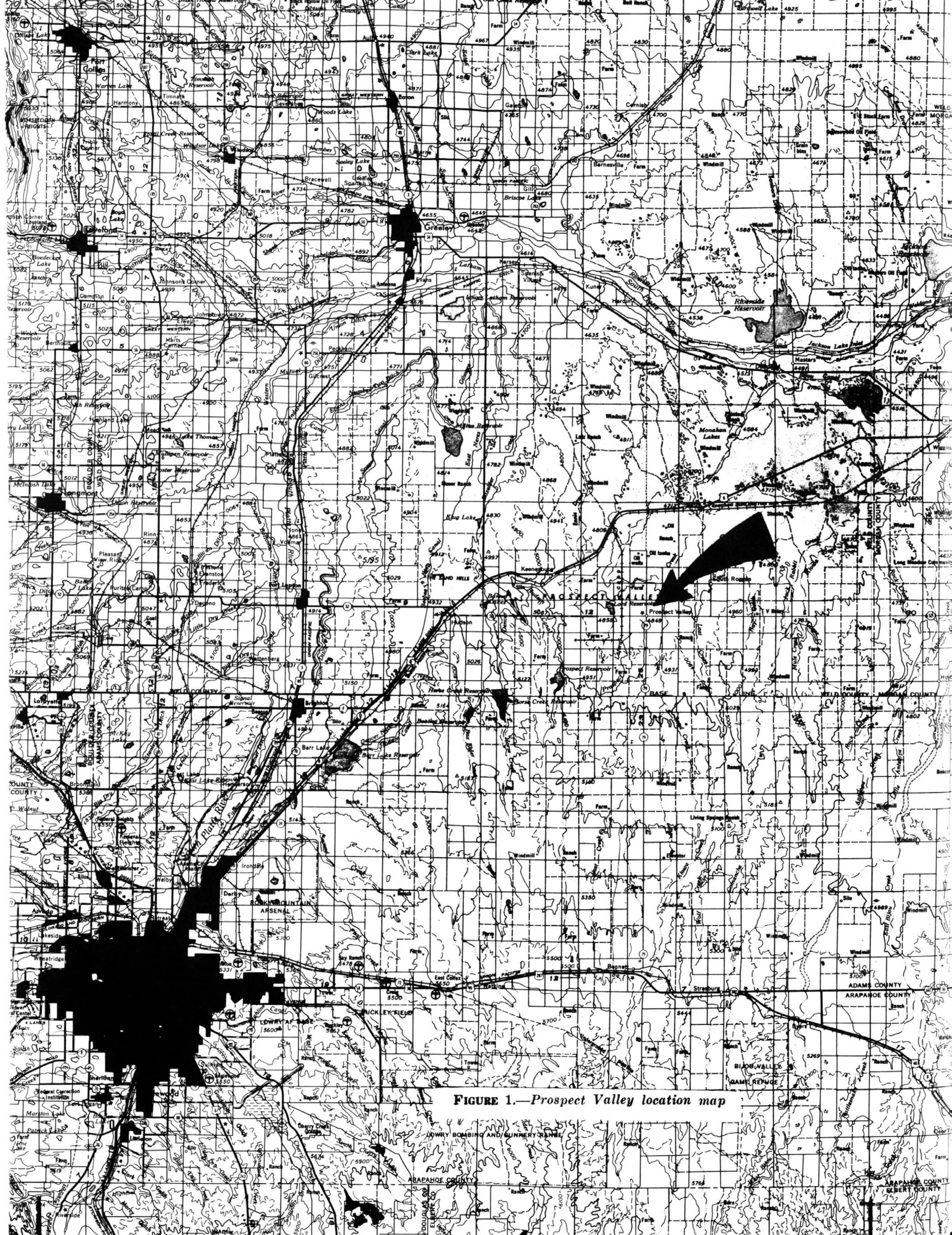


FIGURE 1.—*Prospect Valley location map*

The climate of the area is characterized by a large amount of sunshine, light rainfall, low relative humidity, and moderate temperatures. The average normal annual precipitation is about 12.7 inches (1941-1961). The average normal monthly precipitation for the period 1941-1961 for the Prospect Valley area is listed below in table 1. (18)

TABLE 1.—*Average normal monthly precipitation (inches) - Prospect Valley (1941-1961)*

Jan.	0.4	Apr.	1.7	July	1.4	Oct.	0.8
Feb.	0.4	May	2.5	Aug.	1.2	Nov.	0.5
Mar.	0.8	June	1.6	Sept.	1.0	Dec.	0.4

The average annual growing season is around 150 days with the last killing spring frost occurring about April 30 and the first killing fall frost occurring about September 30. The average annual temperature is near 49°F.; average January temperature near 25°F.; and average July temperature near 74°F. The limited amount of evaporation data indicate that the average annual evaporation from a free water surface is on the order of about 4 to 5 feet in Prospect Valley. Data collected from an evaporation pan located 2 miles south of Roggen, Colo., indicated approximately 32 inches of evaporation for the period May 1, 1960 to October 1, 1960. An evaporation station located 7 miles southwest of Wiggins, Colo., indicated about 43 inches of evaporation during the period of April 1, 1961 to October 1, 1961. (5)

A description of the major soil types in the Prospect Valley area was furnished by John Sampson, soil scientist, Soil Conservation Service, Keenesburg, Colo.:

> "**Weld loam and very fine sandy loam** - This is a deep soil developing in calcareous loess. The B horizon is a heavy clay loam to clay with moderate to strong structure. Depth to lime varies from 10" to 18". There is a relatively high percent of silt and very fine sand in these soils.
>
> **Adena loam and very fine sandy loam** - This is a thin phase counterpart of the Weld Series. Similar to Weld but has a thinner B horizon and is calcareous within 10 inches of the surface.
>
> **Colby loam and very fine sandy loam** - This is a deep soil with a medium textured surface, no developed B horizon or subsoil and medium textured loess parent materials. Normally it is calcareous to the surface.
>
> **Havre loam and very fine sandy loam** - This is a deep, well-drained soil having a medium textured surface, no developed B horizon or subsoil, and medium textured, stratified parent materials. Usually is calcareous to the surface. This soil is commonly medium textured throughout, but may be found occasionally with sand substratums."

The reported estimates of normal annual consumptive use of irrigation water by crops in the area amount to 18 inches for alfalfa, 15 inches for grass, hay, and pasture, 13 inches for corn and other annuals, and 9 inches for small grain.[4] The percentage of irrigation water delivered to the farm headgate that is available for consumptive use by crops has been estimated to be about 60 percent for the Prospect Valley area. The 40 percent loss includes 10 percent for farm ditch loss, 15 percent loss due to surface runoff, and 15 percent loss due to deep percolation. (4)

The topography of Prospect Valley is relatively smooth with an average ground-surface slope of about 20 feet per mile to the north-northeast. Elevation of the upper end of the irrigated area is about 5,000 feet; the elevation of the lower part of the irrigated area is about 4,700 feet. The valley floor with an average width of about 5 miles is bordered on the east and west by approximately parallel ridges of moderate relief.

The length of the irrigated valley is about 15 miles, bounded on the upper end by slightly rolling, summer-fallow, dry-land wheat acreages, and on the lower end by a considerable aeolian deposit with characteristic sand hill topography.

The dryland farming area of the upper end of the valley, although underlain by considerable deposits of sand and gravel, lacks ground-water supplies due to the meager amount of saturated thickness. Wells located along the extreme upper end of the irrigated area often experience surging resulting from pumping in 10 to 15 feet of saturated aquifer.

The sandhill area at the lower end of the valley is underlain by a considerable thickness of saturated sand and gravel. The sand hill area provides for relatively high precipitation infiltration resulting in good quality recharge water reaching the underlying ground-water reservoir. The ground-water table is close to the land surface in this area as evidenced by a series of small ponds and sections of ground-water fed intermittent stream flow. (15)

[4] Normal annual consumptive use amounts do not include the proportion furnished by precipitation.

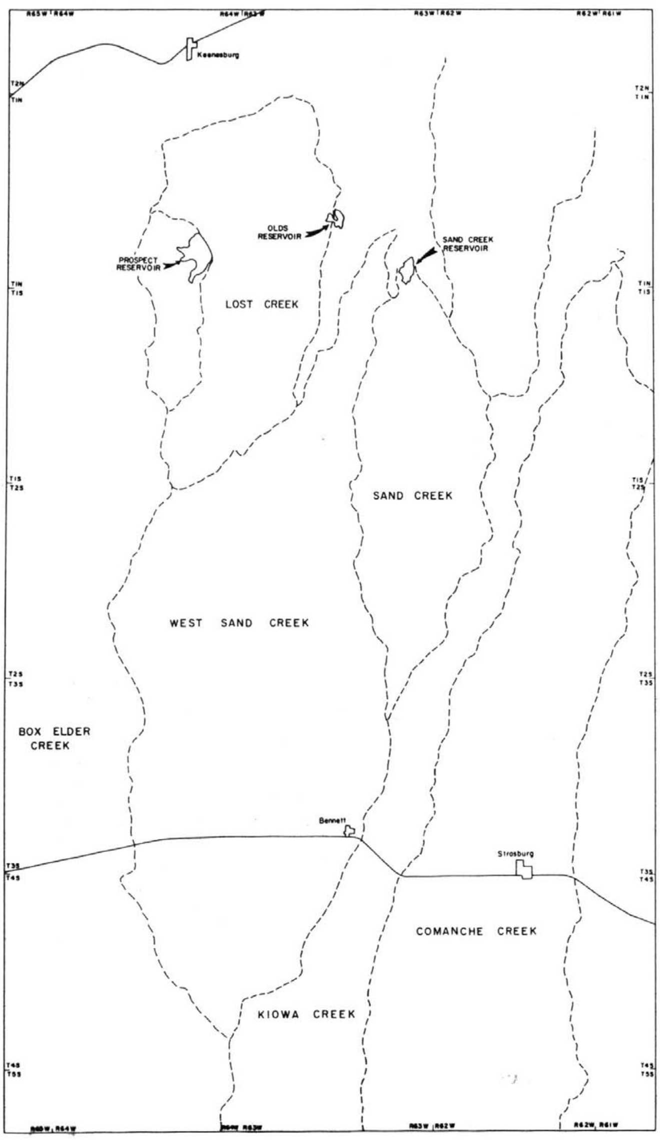
Water Supply

Water for crops in Prospect Valley is obtained from ground water, canal deliveries, and precipitation. Ground-water supplies are necessary, especially during the latter part of the growing season, to supplement normally deficient canal deliveries and/or precipitation. Soil moisture content and precipitation, during the beginning of the growing season, have a definite affect on the pump-irrigation requirements.

Ephemeral Stream Flow

Precipitation amounts in connection with the characteristics of the drainage areas produce a limited amount of runoff in the Lost Creek and Sand Creek drainages. Lost Creek and Sand Creek are ephemeral streams aligned approximately parallel along the west and east side of the valley, respectively. Lost Creek has a drainage area of about 55 square miles (above Lord Reservoir), and Sand Creek (including Sand Creek and West Sand Creek) has a drainage area of about 150 square miles (above the abandoned Sand Creek Reservoir) (figure 2). Runoff from the Lost Creek drainage is terminated in Lord Reservoir, whereas runoff in Sand Creek either infiltrates into the stream bed or spreads out over an area along the east side of the valley and evaporates or is absorbed into the cultivated fields. Although the runoff is seldom of any immediate use as a direct irrigation supply, the flows undoubtedly aid to some extent in replenishing the underlying ground-water reservoir.

FIGURE 2.—*Map of Lost Creek and Sand Creek drainage areas.*



According to interviews with residents of the area, the normal frequency of flood flows is around two per year of a magnitude of 50 to 100 cubic feet per second in the Sand Creek drainage, and one every 2 years of 50 to 100 cubic feet per second in the Lost Creek drainage. Duration of the runoff is generally less than a day in the case of rainfall or less than a week in the case of snowmelt. The flood flows often damage croplands and roadways.

A study of measured, historical flood flows for areas in the South Platte River Basin similar to the Sand Creek and Lost Creek drainage has been made to estimate the probable annual runoff amounts for unmeasured areas: (17)

TABLE 2.—*Estimated probability of annual runoff volume (acre-feet) in Lost Creek and Sand Creek*

Stream	Recurrence interval (years)				
	2	3	5	10	20
Lost Creek (above Lord Reservoir)	850	1350	2250	3450	4600
Sand Creek (above Sand Creek Reservoir)	1610	2510	3780	6000	8140

Canals and Surface Reservoirs

The Henrylyn Irrigation District was organized in 1907 to supply irrigation water to an area of 32,870 acres lying east from Hudson, Colo. Prospect Valley, approximately 12 miles east of Hudson is included at the east edge of the district. The first water was delivered to the area in 1912. (7)

Water for the district is diverted from the South Platte River near the north edge of Denver, Colo., and carried in the Burlington Canal (figure 3). Approximately 5 miles below the diversion point the flow is divided into the Burlington Ditch and the O'Brian Canal. The flow in the O'Brian is again divided at Barr Lake with the Denver-Hudson Canal carrying the flow to Horsecreek Reservoir. The Denver-Hudson Canal carries the flow from Horsecreek and Bootleg Reservoirs on to Prospect Reservoir. Water may be carried from Prospect Reservoir through a 7-mile stretch of the Prospect Lateral to supply Olds Reservoir or the upper part of Prospect Valley. Two small ditches,

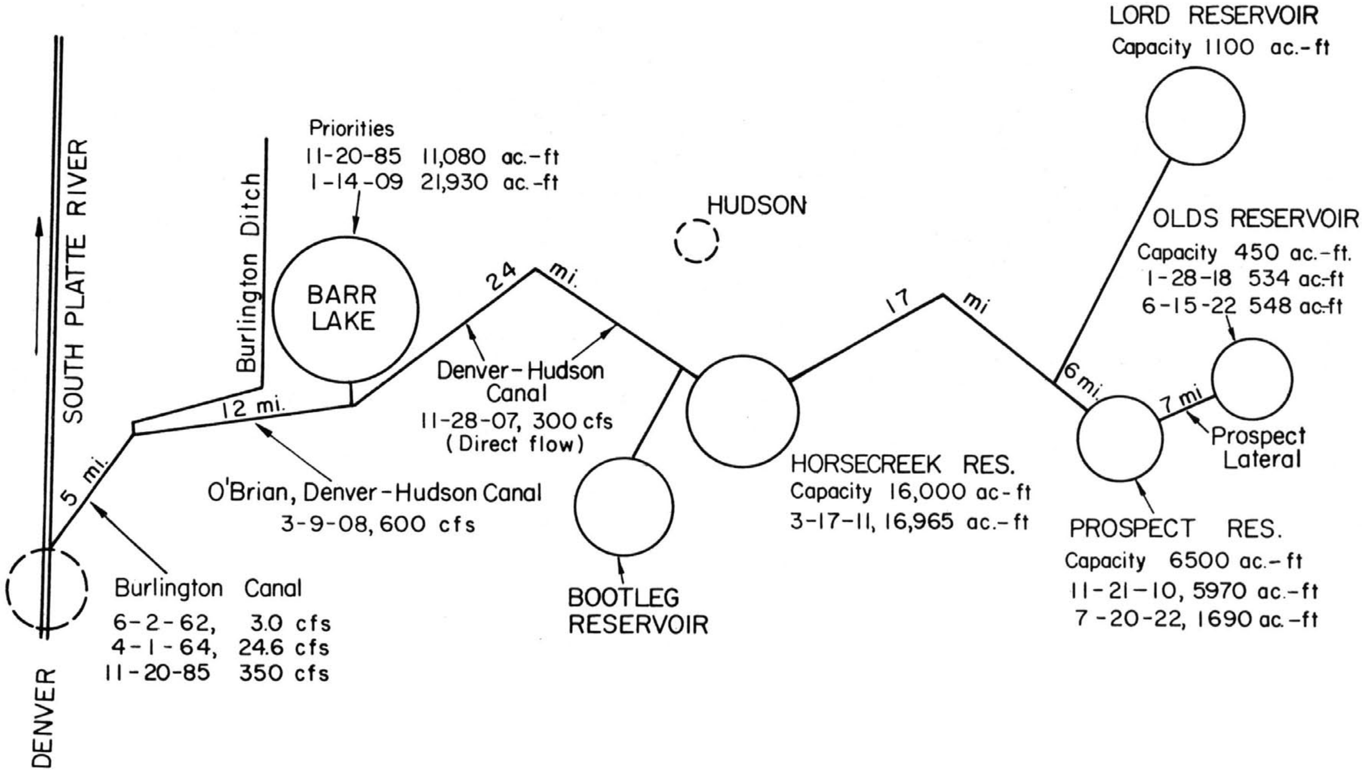


FIGURE 3.—*Schematic diagram of the diverted surface-water distribution system.*

the Low-Line Canal and the "1053" Ditch, divert flow from the Denver-Hudson Canal above Prospect Reservoir and supply Lord Reservoir and the lower part of Prospect Valley. Capacities of the conveyance and storage system as well as the direct flow and storage rights for the surface-water facilities are illustrated (figure 3).

An additional surface storage reservoir, Sand Creek Reservoir, located on the Sand Creek drainage at the east side of the valley, was abandoned after failing on the first filling in the spring of 1915. The breach in the earth-fill dam was never repaired and the feeder canal, the Henrylyn Canal, was also abandoned. (7) An aerial view of Olds Reservoir and Sand Creek is shown (figure 4).

The water supply was apparently greatly overestimated at the inception of the district and consequently a considerable reduction had to eventually be made in the size of the anticipated irrigated area. In addition, the water rights held by the Henrylyn Irrigation District are of a relatively late priority date and are primarily for storage. During the irrigation season, opportunities for storage exist only after the direct flow rights have been satisfied; flow for storage, however, is generally available to the area in late fall and winter. According to diversion-delivery records a conveyance loss of about 60 percent exists between the diversion point below Denver and Prospect Valley.[5] The majority of this conveyance loss is probably due to seepage from the canals and reservoirs of the system.

Since the diversion point on the South Platte River is located a short distance downstream from the Denver area sewage plant outfalls, the quality of water diverted to Prospect Valley depends to a high degree on the extent of the sewage treatment process. Some dilution of the sewage effluent occurs during periods of increased flow in the South Platte River, usually during the spring and early summer months. During the fall and winter months, however, a larger percentage of the total flow in the river at the diversion point is made up of sewage effluent. The presence of detergents in the surface-diverted irrigation supplies is evidenced by considerable foaming at drop structures and other points of turbulent mixing (figure 5). According to R. V. Rouse, manager of the Henrylyn Irrigation District, the foaming became noticeable in about 1955.

[5] R. V. Rouse

FIGURE 4.—*An aerial view, looking east, with Olds Reservoir in the foreground and Sand Creek in the background.*

FIGURE 5.—*Photo of "sudsing action" at a drop structure at the intake to Olds Reservoir (Dec. 1959).*

Ground Water

The use of ground water for a supplemental irrigation supply began in Prospect Valley in 1932. (7) Electricity became available for use by irrigation pumps in Prospect Valley in 1940. As of the spring of 1962 there were approximately 200 irrigation wells in Prospect Valley with about 95 percent being powered by electricity. The increased use of ground water for irrigation supplies and power consumed by electrically powered pumps are illustrated in table 3.

TABLE 3.—*Summary of irrigation well development and electrical power consumption by pumps in Prospect Valley*

Year	Est. total No. of pumps (operating)	Total* No. on electricity (operating)	Power* Consumed (KWH)	Est. volume of ground water pumped (acre-feet)
1938	......	......	......	9,000(6)
1939	......	......	......	10,000
1940	67(6)	......	......	12,700(6)
1941	......	......	......	12,000
1942	68(7)	......	......	6,500(7)
1943	76(7)	......	......	14,580(7)
1944	87(7)	......	......	13,100(7)
1945	......	......	......	18,000
1946	111(3)	......	......	23,790(3)
1947	115(3)	......	......	17,674(3)
1948	118(3)	......	......	27,436(3)
1949	120(3)	......	......	18,178(3)
1950	121(3)	102	3,808,663	33,305(3)
1951	140	124	4,032,124	29,791
1952	150	137	4,784,249	32,839
1953	165	150	5,330,231	37,403
1954	175	166	7,562,871	49,842
1955	189	179	6,221,471	39,933
1956	194	188	8,151,376	49,712
1957	192	184	3,485,253	20,712
1958	193	185	4,709,718	28,357
1959	195	187	5,654,423	36,720
1960	198	192	5,921,513	37,541
1961	200	190	4,181,346	27,628
1962	202	192		

* Reported by Morgan County Rural Electric Association, Fort Morgan, Colo.
---- Data not available.

Consumption of electrical power and average overall pumping plant efficiencies for Prospect Valley during 1949 were reported by the U. S. Geological Survey: (3)

Average kilowatt-hours consumed per acre-foot of water pumped = 151.6
(88 pumping plants tested)
Average kilowatt-hours consumed per acre-foot per foot of lift = 2.15
(60 pumping plants tested)
Average overall efficiency of pumping plants = 47.5%
(60 pumping plants tested)

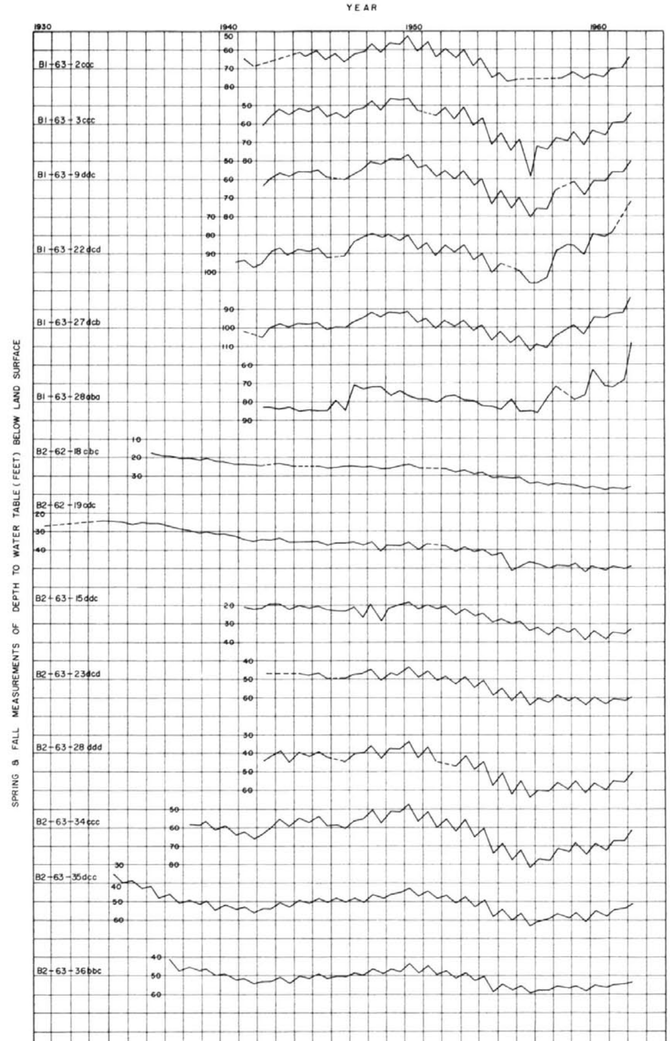
A ground-water observation well network established by W. E. Code indicated that during the period 1933 to 1942 a decline in the ground-water table of some 21 feet occurred in the center of the pumped area. Water supply conditions were exceptionally good in the 1942-1949 period, however, and a rise in the water table resulted. The trend of the water table, as illustrated by the ground-water level hydrographs (figure 6), has been generally down with brief periods of recovery due to above normal canal supplies.[6] Limited artificial ground-water recharge through Olds Reservoir since 1939, with increased amounts being recharged in recent years, has sustained the ground-water level fairly well in the upper part of the valley.

It will be noted that ground-water storage depletion ordinarily occurs during the summer and recovery occurs during the winter (figure 6). In contrast, the water table in some areas of Colorado, where considerable diverted surface water is utilized in conjunction with ground-water pumping, may rise during the summer and fall during the winter months. The decline in the water-table level during a period of nonpumping may be the result of natural drainage to a surface stream or an adjacent ground-water reservoir or merely a leveling off of the water table in the same aquifer.

The Prospect Valley Ground-Water Aquifer

The principal water-bearing formation of Prospect Valley is the alluvium deposited in an underlying, ancestral erosion channel. The pleistocene erosion channel with an average width of 5 to 6 miles is cut into the Laramie formation near

FIGURE 6.—*Selected ground-water level hydrographs for Prospect Valley*



[6]See Appendix A for definition of well location description.

the upper part of the valley; into the Fox Hills formation near the central part of the valley; and into the Pierre Shale at the lower end near the junction with the main stem of the South Platte River. (3)

The Laramie formation, composed of sandy clay and sandstone, is carbonaceous and contains some lignite. The Laramie formation is relatively impervious, but will yield moderate quantities of water to domestic and stock wells. The Fox Hills formation consists of fine-grained sandstone and sandy shale and yields some water under artesian pressure to domestic and stock wells. The Pierre Shale consists of marine shale and silt with some discontinuous lenses of sand. The Pierre is considered to be quite impermeable and offers little chance of obtaining enough water for either domestic or stock wells. (3)

The alluvium of Pleistocene and recent geologic age deposited in the confining erosion channel, consists of a heterogeneous mixture of cobbles, gravel, sand, silt, and clay. The aquifer is generally quite permeable and characteristically yields large flows to irrigation wells. The thickness of the alluvium varies from a few feet near the edges of the valley to about 150 feet near the central part of the valley. The surface of contact between the erosion channel and the alluvium slopes generally toward the north-northeast at about 20 feet per mile. (3)

The saturated thickness of the aquifer generally fluctuates in response to recharge and withdrawals of the ground water. Minor water-level fluctuations are also due to atmospheric pressure changes and will be described later. The greater saturated thicknesses are located near the central and lower portion of the valley and the lesser saturated thicknesses are near the edges and upper part of the valley. The surface of the ground-water table slopes generally to the north-northeast at about 18 feet per mile. In the vicinity of Prospect, Colo., the magnitude of the subsurface flow moving through the alluvium in response to the hydraulic gradient has been estimated to be about 11 cubic feet per second with the average rate of movement of the ground water estimated at about 1/4 mile per year. (3) Part of the underflow is probably consumed by evapo-transpiration near the lower part of the valley where the water table is close to the ground surface; the majority of the remainder of the underflow probably contributes to the total flow in the South Platte River.

The total amount of ground water stored in the Prospect Valley ground-water aquifer and the quantity of ground water represented by a 1-foot rise or decline of the water table has been estimated by the U. S. Geological Survey (1949) to be 940,000 acre-feet and 16,400 acre-feet, respectively. (3) The amount of ground water in storage immediately below the irrigated area during the 1942-1944 period was estimated to be about 170,000 acre-feet. (7) Obviously, complete removal by pumping of the total amount of ground water in storage beneath the area is not feasible.

Major discharge from the Prospect Valley ground-water reservoir includes:

(a) Withdrawals by irrigation wells.
(b) Subsurface outflow to the South Platte River alluvium.
(c) Evapo-transpiration near the lower end of the valley.

Major recharge to the Prospect Valley ground-water reservoir includes:

(a) Incidental recharge from canals, and applied irrigation water.
(b) Subsurface inflow from the upper end of the valley.
(c) Artificial recharge through Olds Reservoir.
(d) Natural influent seepage from the intermittent streams of Sand Creek and Lost Creek.
(e) Deep percolation of precipitation to the water table.

In Prospect Valley, the principal withdrawal of ground water has been by irrigation wells. The principal recharge to the ground-water storage has been due to the deep percolation of part of the irrigation water applied to the land.

QUANTITATIVE RECHARGE OPERATIONS AT OLDS RESERVOIR

Reasons for Study

Ground-water storage through an artificial recharge facility or facilities appears to be a logical answer for providing a dependable, long-term irrigation water supply for Prospect Valley. In addition, continuing artificial ground-water recharge operations with good quality water helps maintain tolerable water quality in the ground-water reservoir. The natural storage reservoir provided by the extensive aquifer below Prospect Valley offers several advantages over a surface storage system:

(a) A large water-storage capacity with no land loss, construction, or maintenance costs except for recharge facilities.
(b) Negligible evaporation and seepage losses.
(c) High water use efficiency due to part of the irrigation application returning directly to the ground-water reservoir.

As stated in the introduction to this report an operable recharge site (Olds Reservoir) exists in the Prospect Valley area. Olds Reservoir, with a storage capacity of approximately 450 acre-feet, was originally constructed in 1918 as a portion of the Henrylyn irrigation system. Due to excessive seepage losses the reservoir was soon abandoned. Water was purposely diverted into Olds Reservoir, however, in 1939 for replenishing the diminishing ground-water supply. The beneficial effect of this recharge operation was noted by the rise of the water levels in nearby irrigation wells. Since that time surplus water has generally been put into Olds Reservoir whenever available. A limited amount of artificial ground-water recharge has been accomplished through Olds Reservoir since 1939; records indicate that during the period from 1939 to 1959 a total of approximately 30,000 acre-feet had been recharged. Olds Reservoir is located near the upper end of the irrigated area and consequently the recharge water becomes immediately available to many of the pumps (figure 7). Lord Reservoir at full stage sustains a seepage loss of about 25 acre-feet per day, but is not generally operated for the sole purpose of artificial ground-water recharge.[7]

Since a comprehensive management plan needs to include the ability to predict the physical effect of recharge activities, a quantitative study of recharge through Olds Reservoir was initiated in 1959. The intention of the recharge study was to compare actual field measurements of water-level changes with theoretically predicted water-level changes.

Physical Arrangement of the Investigation

The initial step of the investigation was to establish an extensive observation-well network that would give a representative indication of the effect of recharge from Olds Reservoir. Considerations involved in selection of the observation wells were based on the geology and the accessibility and location of each well with respect to the recharge site—Olds Reservoir. A total of 32 observation wells were selected (figure 7).

In all but *one* instance, existing or abandoned wells were utilized for observation wells. For the singular case, a well (B1-63-21 daa) was drilled to accommodate a continuous recorder and furnish a log of the material below a point at the north edge of Olds Reservoir—the log and sample descriptions are described in appendix C.

Three continuous recorders were incorporated in the observation-well network: a recorder located near the community of Prospect (Bl-63-2ccc); a recorder located in the southeast corner of Section 9 about 2 miles down-valley (north) from Olds Reservoir (Bl-63-9 ddc); and a recorder located at the north edge of Olds Reservoir (Bl-63-21 daa) (figure 8).

[7] R. V. Rouse

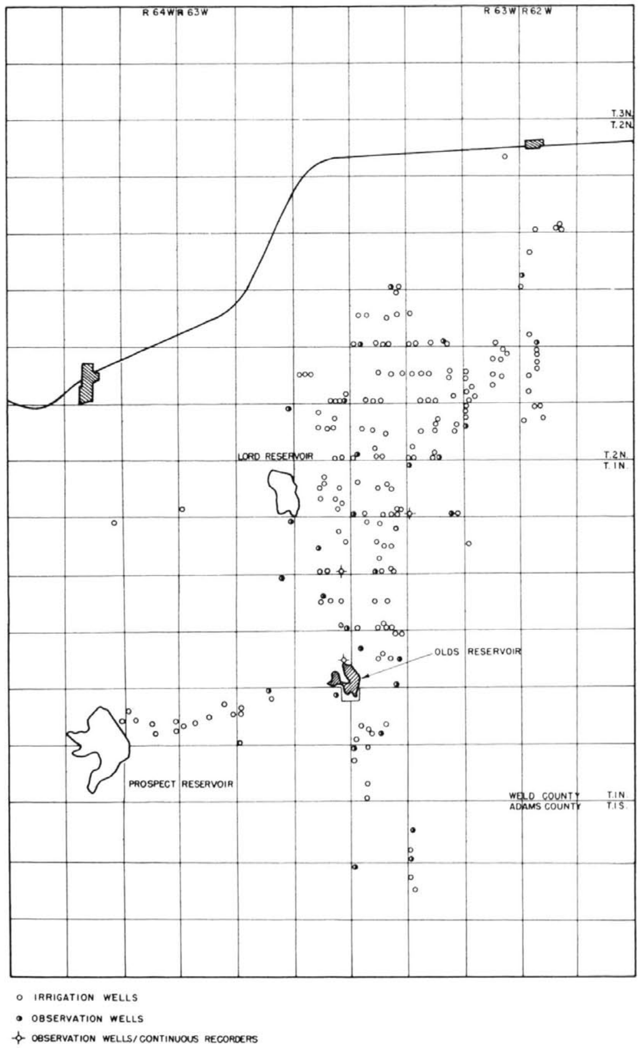


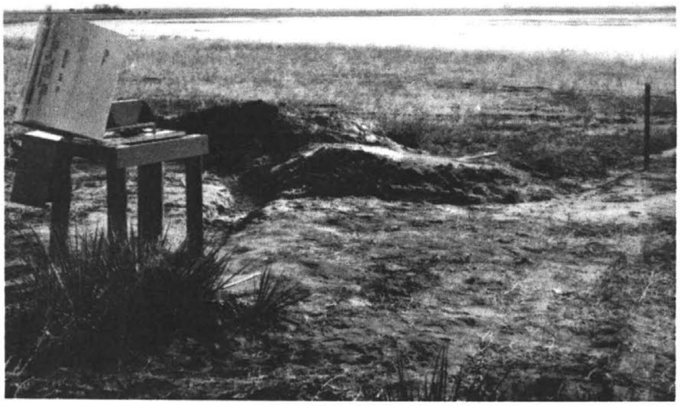
FIGURE 7.—*Location map of irrigation wells, observation wells, and reservoirs in Prospect Valley (1962).*

The recorder Bl-63-2ccc was established by W. E. Code in 1954 in connection with Colorado State University's long-term, ground-water table fluctuation studies—Project 105. The recorder Bl-63-9ddc was placed on an abandoned irrigation well. The recorder Bl-63-21daa was placed on a 5-inch cased well drilled especially for the study as previously mentioned. A small 1 1/4-inch well was installed near Bl-63-21daa (fig. 8) and checked periodically during the recharge operation to detect the effect of a clay layer encountered at about 18 feet (see log of well Bl-63-21daa, appendix C).

For determining the inflow to the recharge site, a drop structure in the inlet canal to Olds Reservoir was calibrated by current metering. A stage recorder was utilized to provide a continuous inflow record (figure 5).

A plane-table survey provided a volume-stage relationship for Olds Reservoir (figure 9). A contour map of Olds Reservoir is shown (figure 10). A staff gage was located near the northeast bank of Olds Reservoir to indicate the reservoir stage (figure 11).

Figure 8.—*Photo of the observation well B1-63-21 daa and the 1 1/4-inch well near Olds Reservoir.*



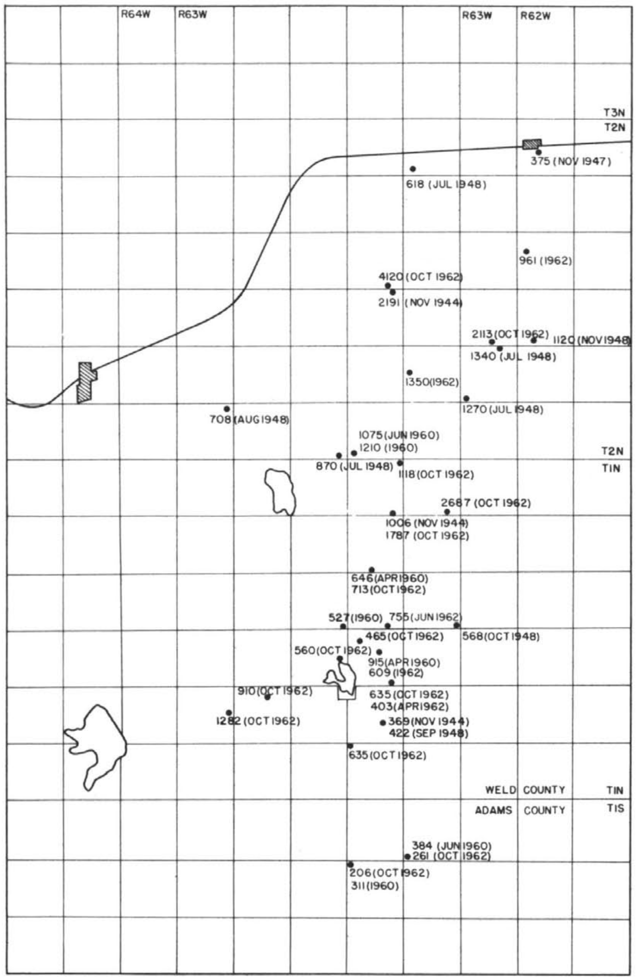


Figure 9.—*Volume-stage curve for Olds Reservoir.*

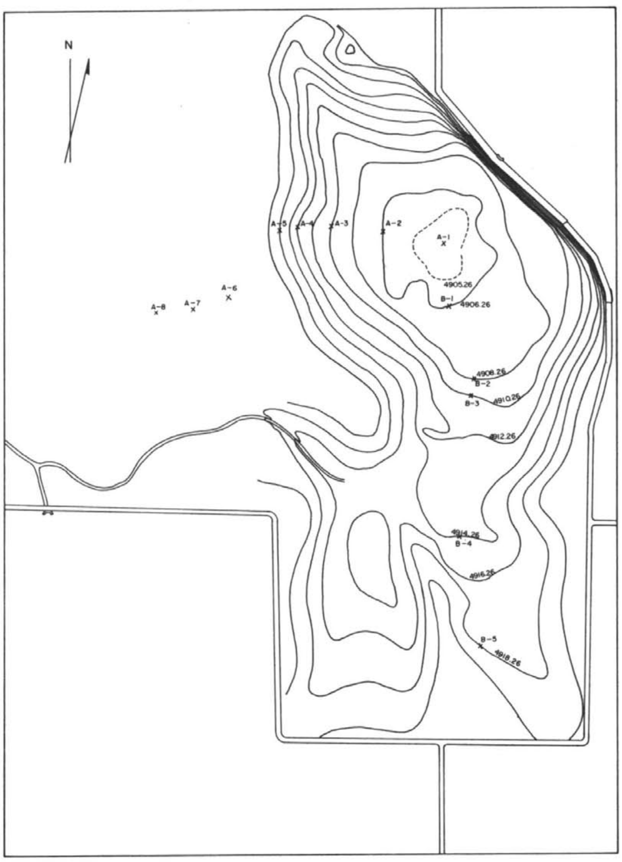


Figure 10.—*Contour map of Olds Reservoir.*

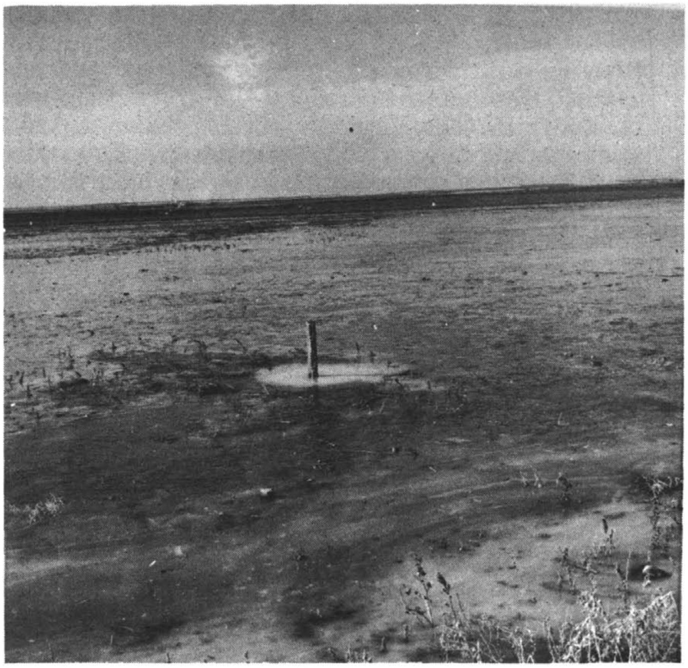


FIGURE 11.—*Photo of Olds Reservoir staff gage.*

The location of the inflow recording station, the Olds Reservoir staff gage, and the observation well (B1-63-21daa) are illustrated (figure 12).

FIGURE 12.—*Aerial view of the Olds Reservoir area illustrating the location of the inflow station[1], the Olds Reservoir staff gage[2], and the observation well B1-63-21daa[3].*

A limited soils survey was made of the bed surface of Olds Reservoir. A summary of the soils analysis for the specified sample locations (figure 10) is shown in table 4.

TABLE 4.—*Summary of soil analysis—Olds Reservoir*

Sample location	Effective size (mm)	Uniformity coefficient	Median size d_{50} (mm)
A - 1	0.0467	9.6	0.37
A - 2	0.0023	92.0	0.16
A - 3	0.0015	153.0	0.17
A - 4	0.0225	11.9	0.22
A - 5	0.0290	9.7	0.24
A - 6	0.0024	91.6	0.17
A - 7	0.0078	29.3	0.18
A - 8	0.0012	100.0	0.06
B - 1	0.0005	158.0	0.04
B - 2	0.0015	130.0	0.14
B - 3	0.0015	107.0	0.08
B - 4	0.0020	55.6	0.07
B - 5	0.0005	120.0	0.04

Location of irrigation wells in the valley including the selected observation wells were determined by measuring with an automobile speedometer from the nearest section corner or other prominent landmark. Elevations of respective measuring points at some observation wells were established by running levels from USC & GS bench marks or, in some cases, estimated from topographic maps.[8]

A pumping test was performed at well B1-63-9ddc to determine the aquifer properties at that location.

Procedure

Water, diverted from Prospect Reservoir and carried through the Prospect Lateral Ditch, was started into Olds Reservoir on December 3, 1959, and continued with only one interruption until April 20, 1960 (appendix D). Periodic checks were made on the inflow recorder above Olds Reservoir; Henrylyn Irrigation District personnel made regular readings of the staff gage in the reservoir for establishing storage volume.

Water-table measurements were made in the observation wells with either a steel tape or an electrical sounder. Water-level measurements in the observation-well network were begun on October 14, 1959, and continued on approximate monthly intervals until the latter part of April 1960. Supplemental ground-water-level data were available for the area dating back to 1933, thanks to the efforts of W. E. Code (Project 105).

A limited number of water samples for quality analyses were obtained from both the canal inflow to Olds Reservoir and from the discharge pipes of selected irrigation wells in the valley. The water-quality analyses were performed by either the State of Colorado, Department of Public Health; the U. S. Department of the Interior, Geological Survey, Denver, Colo.; or by the chemistry or bacteriology department, Colorado State University, Fort Collins, Colo.

RESULTS OF THE QUANTITATIVE RECHARGE STUDY AT OLDS RESERVOIR

Recharge Calculations

During the period of December 3, 1959 to April 20, 1960, a total of about 9,400 acre-feet of water (neglecting reservoir evaporation) were recharged through Olds Reservoir to the underlying ground-water aquifer of Prospect Valley. The average daily infiltration rate amounted to approximately 68 acre-feet per day or about 1.2 feet of depth per day over the total areal surface of the reservoir (≈58 acres). The average depth in Olds Reservoir during the recharge study (storage volume÷areal surface ≈ $\frac{\text{287 acre-feet}}{\text{58 acres}}$) was about 5 feet.

The measured inflow to Olds Reservoir during the recharge period averaged about 70 acre-feet per day after the first few days of operation. The inflow canal was shut off 1 day on March 10, 1960. Inflow was somewhat less than 70 acre-feet per day during the latter part of the period April 8 to April 20, 1960 (appendix D).

Stage readings from the staff gage in Olds Reservoir during the majority of the recharge period were in the range of 7 to 9 feet. A plot of selected stages given in table 5 and corresponding infiltration rates are shown (figure 13). Stage-infiltration rate data for stages less than 7 feet were not considered reliable due to the nonequilibrium conditions present during the initial filling period and after the inflow was shut off. An apparently semilogarithmic stage-infiltration rate relationship for the limited staff-gage stage range of 7 to 9 feet is indicated. Average depth (storage volume ÷surface area) for the corresponding staff gage limits is 4.91 feet to 5.35 feet.

TABLE 5.—*Selected stage-infiltration data for Olds Reservoir (1959-1960)*

Staff-gage stage (feet)	Reservoir storage volume (V)	Reservoir surface area (A)	Average depth ($\frac{V}{A}$)	Infiltration rate
				Acre-feet per day
7.0 (4915.26)*	270 acre-feet	55 acres	4.91 feet	67
8.0 (4916.26)*	330 acre-feet	64 acres	5.16 feet	71
9.0 (4917.26)*	390 acre-feet	73 acres	5.35 feet	74

*Elevation in feet above mean sea level.

No appreciable change in the stage-infiltration rate relationship was noted throughout the study period. As the recharge mound was developing beneath Olds Reservoir, there were instances (with

[8] U. S. Department of the Interior Geological Survey—7.5 minute series (topographic).

the inflow rate remaining steady) of a rapid drop in reservoir stage for only brief periods.[9] This phenomenon was probably the result of removal of entrapped air in the voids of the aquifer as it was becoming saturated. Code reported an infiltration rate of 17 acre-feet per day at a reservoir storage volume of 75 acre-feet and 50 acre-feet per day at a reservoir storage volume of 250 acre-feet during the 1940-1944 period. (7) The obvious increased detergent content as well as a probable increase in other contaminants in the supply water during recent years may have some effect on the increased recharge rate.

Ground-Water Level Measurements in the Observation-Well Network

The maximum rise in ground-water levels was noted in the recorder well at the north edge of Olds Reservoir (well Bl-63-21daa). During the recharge period the ground-water level at the north side of Olds Reservoir rose approximately 45 feet (to elevation ≈ 4,876 feet). Near the end of the recharge period, the top of the recharge mound was approaching the bottom of Olds Reservoir and some flow was apparently beginning to flow out onto the clay layer encountered at about 18 feet below ground surface. Some water was detected in the 1 1/4-inch well near the Olds observation well B1-63-21daa (table 6).

TABLE 6.—*Tape readings in the 1 1/4-inch pipe well (near Olds obs. well). (Depth in feet to water table from ground surface)*

Date	Tape readings	Remarks
12-22-59	......	No water in pipe
12-23-59	......	No water in pipe
12-29-59	......	No water in pipe
1- 5-60	......	No water in pipe
1-11-60	......	No water in pipe
4-11-60	13.3	3.8 feet of water in pipe
4-27-60	16.8	0.3 feet of water in pipe
11-10-61	......	No water in pipe

The ground-water-level measurements in the observation well network for the period before recharge started until after inflow to the recharge facility had ceased (October 14, 1959 - April 27, 1960) are included in appendix A. The contour map of the ground-water mound generated in the major part by recharge through Olds Reservoir indicates the effect of the recharge on the surrounding ground-water levels (figure 14). Normally some recovery of ground-water levels occur in Prospect Valley during the period from fall to spring, but as shown by the historical ground-water-level hydrographs, this winter recovery seldom exceeds 5 feet (figure 6). The contour map illustrating the approximate gross changes in ground-water levels between October 14, 1959 and April 27, 1960 does not differentiate the normal winter recovery. After the recharge water had been shut off, the ground-water mound gradually spread in areal extent and dissipated or "melted" with ground-water levels near the central portion of the mound lowering and levels at the fringe areas of the mound rising.

Comparison of Theory with Field Measurements

The ability to predict the effect of a recharge operation on ground-water levels at various distances from the recharge source is desirable for establishing design and operation criteria for a recharge site. For an areal recharge site such as Olds Reservoir, a modification of heat flow equations was found to be reliable in predicting the recharge effect on surrounding ground-water levels (Bittinger and Trelease). (2) The following equation describes the variation, with time, of the shape of the ground-water mound which forms beneath a circular spreading basin:

$$\frac{h_n}{H} = \frac{1}{2\alpha t_n} \cdot e^{\frac{-r^2}{4\alpha t_n}} \int_0^a e^{\frac{-r'^2}{4\alpha t_n}} I_0 \frac{rr'}{2\alpha t_n} r'dr'$$

Figure 15 illustrates the physical situation with the terms defined as follows: (2)

- a = Radius of spreading basin and of ground-water disk
- r = Radial distance from center of spreading basin
- Q = Rate of seepage from spreading basin
- K = Aquifer permeability
- D = Original saturated thickness of acquifer
- V = Specific yield of aquifer
- α = Aquifer constant = $\frac{KD}{V}$
- t_n = Time since instantaneous release of disk No. n
- t_p = Time between releases of ground-water
- h_n = Water table rise due to release of disk No. n
- H = Height of ground-water disk due to inflow Q over time, t_p, = $Qt_p/\pi a^2V$

The following assumptions were made relative to the spreading basin and underlying aquifer:

(a) Isotropic and homogeneous aquifer.
(b) Aquifer is infinite in extent, bounded on the bottom by a horizontal, impervious layer.
(c) Ground-water flow is horizontal only.
(d) Circular spreading basin with uniform infiltration rate over the entire area.
(e) The ground-water mound is formed by periodic, instantaneous releases of disks of recharge water, each having a height H and radius a (figure 16).
(f) The top of the ground-water mound does not come in contact with the bottom of the spreading basin.

Results of the use of the above equation in predicting the effect of the recharge through Olds Reservoir on surrounding ground-water levels

[9] R. V. Rouse

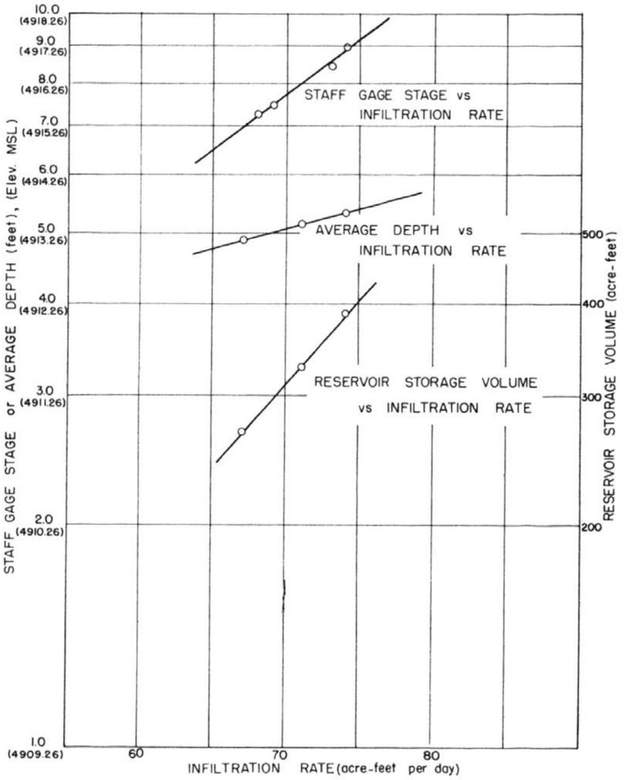
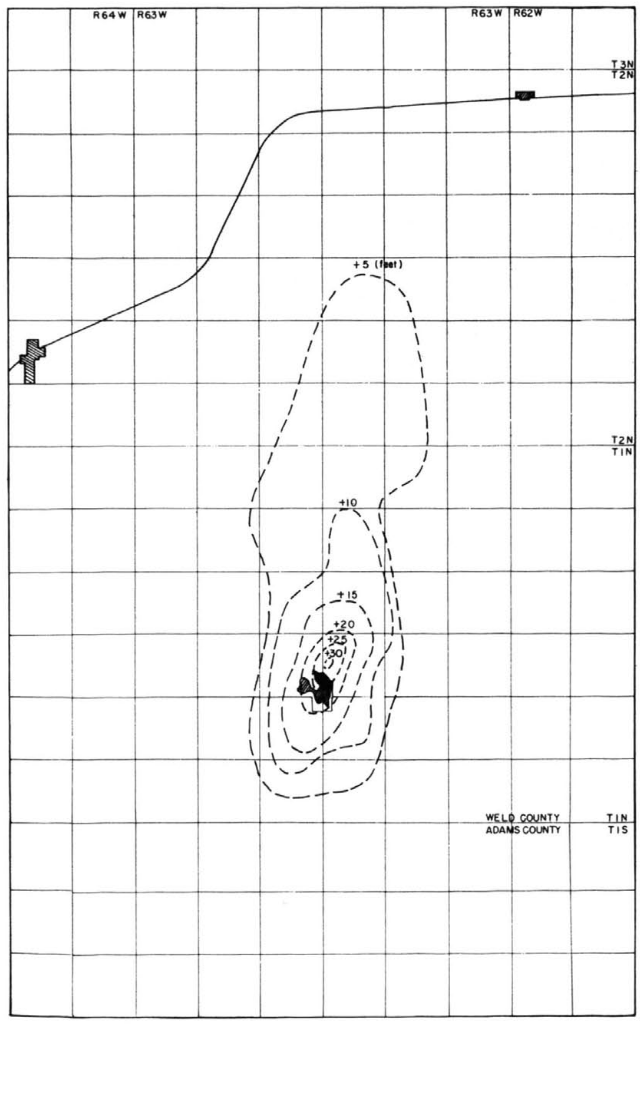


FIGURE 13.—*Plots of staff-gage stage, average depth, and reservoir storage vs infiltration rate for Olds Reservoir (1959-1960).*

FIGURE 14.—*Contour map of the gross changes in ground-water levels in the vicinity of Olds Reservoir (October 14, 1959 - April 27, 1960).*



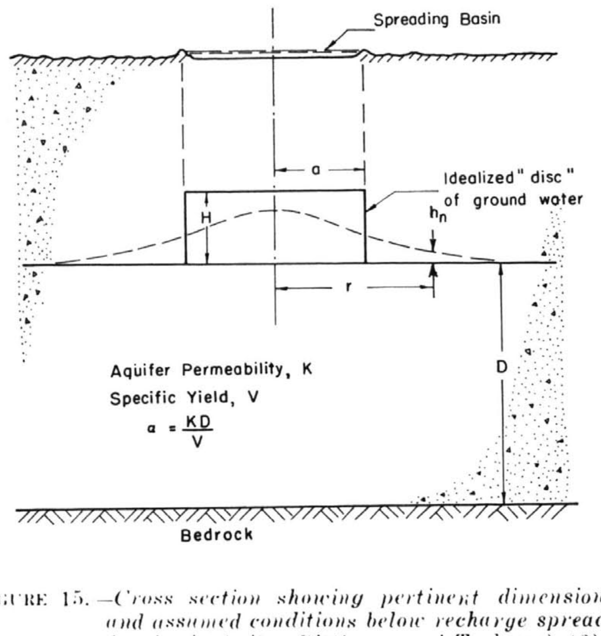


FIGURE 15.—*Cross section showing pertinent dimensions and assumed conditions below recharge spreading basin (after Bittinger and Trelease).(2)*

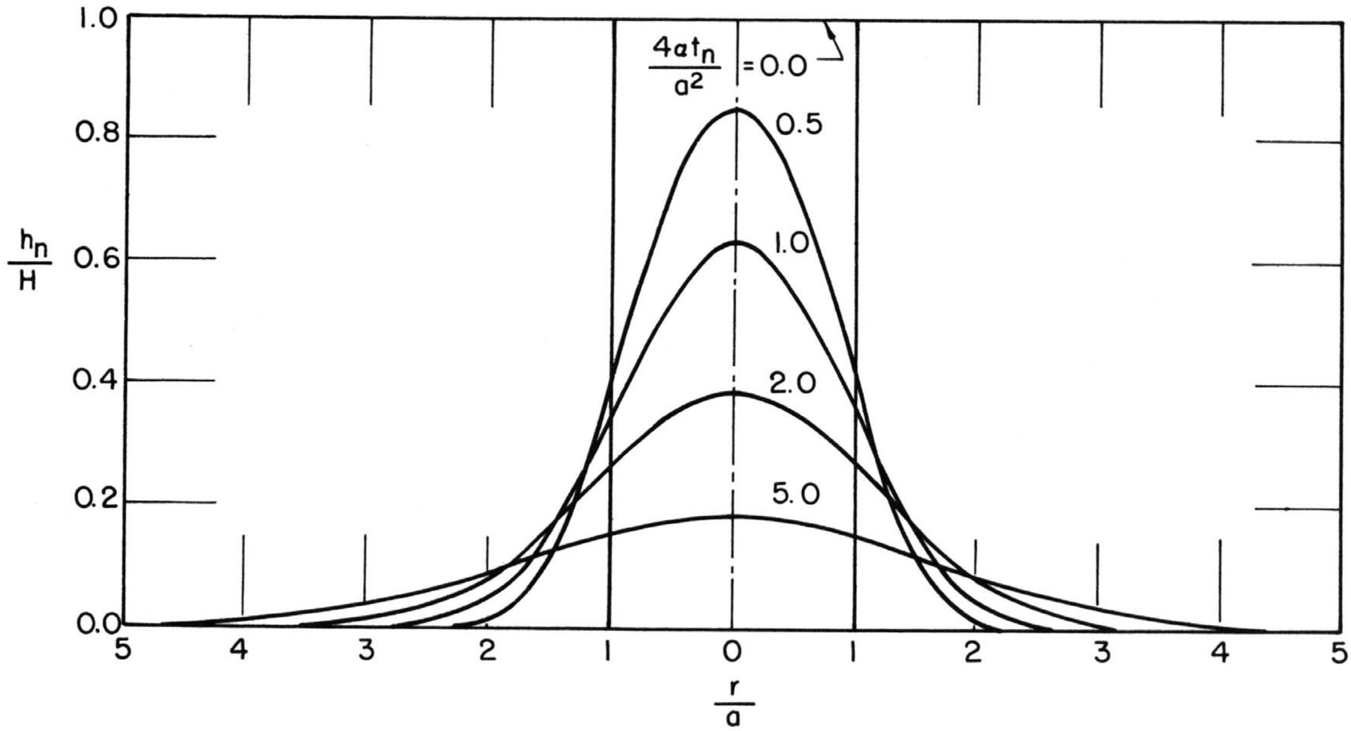


FIGURE 16.—*Cross-sectional shape of a ground-water mound initially of radius* a *and height* H. *Family of curves computed from: (after Bittinger and Trelease)* (2).

$$\frac{h_n}{H} = \frac{1}{2\alpha t_n} \cdot e^{\frac{-r^2}{4\alpha t_n}} \int_0^a e^{\frac{-r'^2}{4\alpha t_n}} I_o \frac{rr'}{2\alpha t_n} r'dr'$$

agreed quite well with the field measurements. (2) Bittinger and Trelease found that for distances of observation from the center of the recharge site greater than 2½ times the radius of the spreading basin, the source of recharge may be considered as a recharge well rather than a disk and that the Theis, nonequilibrium equation (20) may be used to predict the effect of recharge.

OPERATING CHARACTERISTICS OF THE PROSPECT VALLEY GROUND-WATER RESERVOIR

Introduction

Before water resource management aspects were proposed for Prospect Valley, an investigation of the *characteristics of the aquifer* and the historical response of the ground-water system to various *hydrologic elements* was made. Characteristics of the aquifer considered included the shape, size, composition, specific yield, and permeability. Hydrologic elements considered included canal deliveries to the area, precipitaion, surface and subsurface inflow and outflow, ground-water pumpage, articificial and incidental ground-water recharge, return flow to the ground-water reservoir from applied irrigation water, and changes in ground-water storage. The surface-water and ground-water quality aspects were also considered.

Characteristics of the Aquifer

A heterogeneous mixture of cobbles, gravel, sand, silt, and clay, deposited in a trough-shaped ercsion channel forms the ground-water aquifer beneath Prospect Valley. Sediments range in thickness from a few feet near the edges of the valley to about 150 feet near the central part. An inspection of drillers logs (appendix B) indicated that alternating layers of clay, often times of considerable thickness with no apparent continuity over any sizable area, are common in the valley. The layers of clay overlying the ground-water reservoir in some areas apparently produce a confining or semi-artesian effect. Water-table fluctuations at the observation well B1-63-9ddc illustrated a time-related response to atmospheric pressure fluctua-

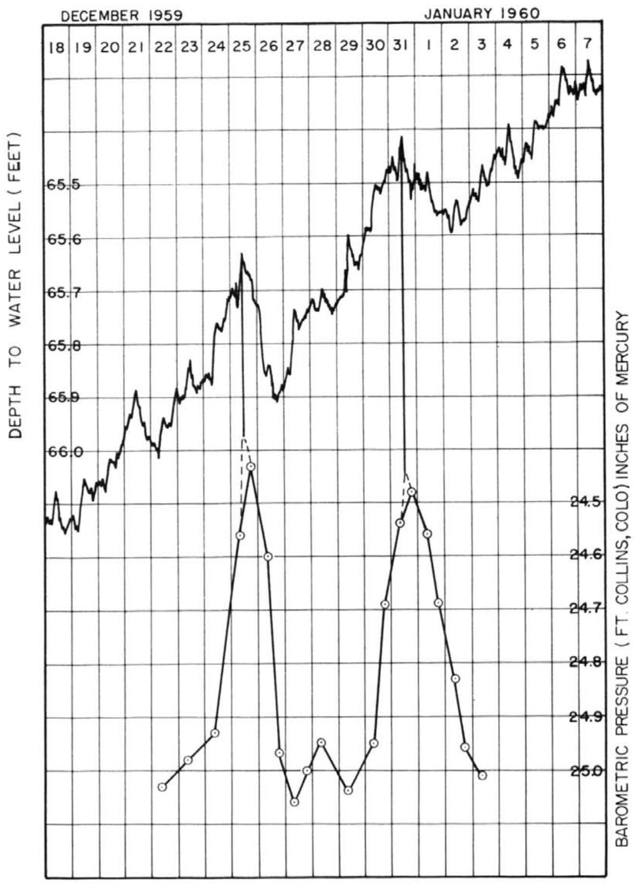


FIGURE 17.—*Relation of water level changes in well B1-63-9ddc to atmospheric pressure changes at Fort Collins, Colo.*

tions (figure 17). The "barometric efficiency" of a confined aquifer is defined as follows: (20)

$$\text{Barometric efficiency} = \frac{\text{Atmospheric pressure change}}{\text{Water level change in well (expressed in terms of a column of water)}}$$

The "barometric efficiency" generally is in the range of 20 to 75 percent. (20) The "barometric efficiency" of the well Bl-63-9ddc appeared to be about 60 percent. It is interesting to note that no atmospheric pressure effects were indicated at the recorder wells Bl-63-2ccc or Bl-63-21daa.

The average specific yield[10] for the aquifer, including the clay lenses, was determined by Code to be about 17 percent. (7) Limited pumping test data collected for Prospect Valley are listed in table 7. Due to the nonhomogeneity of the Prospect Valley aquifer, the results of the pumping tests are only indicative of the aquifer characteristics at the location of the respective test wells.

The wells in the area are generally drilled to the underlying bedrock with the wells near the central part of the valley producing the greater flows. Irrigation well flows were reported to be in the range of 500 to 1700 gallons per minute. (3) (7)

> "Well Bl-63-4dd, near the center of the channel, has a specific capacity of 167 gpm per foot of drawdown, whereas B2-63-28bc1, which is reported to be near the edge of the channel, has a specific capacity of only 13 gpm per foot of drawdown. The average specific capacity of 73 wells tested in 1947-1949 was 63 gpm per foot of drawdown." (3)

The distribution of approximately 200 irrigation wells in Prospect Valley is confined to an area about 4 miles wide and 12 miles long (spring 1962) (figure 7).

Hydrologic Elements

The quantitative evaluation of the items of supply and disposal involved in a ground-water inventory for a given aquifer of necessity (due to the physical impossibility of accurate measurement) involves estimates of some of the items. The following discussion attempted to categorize the various items of supply and disposal and to evaluate the respective items as to their relative quantitative importance on ground-water volume changes in the Prospect Valley aquifer for the arbitrarily selected period 1942-1962. That section of the aquifer extending from 2 miles south of the Weld-Adams County line to Roggen, Colo., was considered in the inventory (figure 7). The data on canal deliveries to Prospect Valley were furnished by the Henrylyn Irrigation District, R. V. Rouse, manager, Hudson, Colo.

Items of Supply

Artificial ground-water recharge through Olds Reservoir is a direct contribution to the volume of storage in the aquifer. Records indicate that an average of approximately 2,500 acre-feet annually have been recharged through Olds Reservoir during the period of 1942-1962. Seepage from Lord Reservoir also contributes to the ground-water storage volume, but sufficient records are not available to evaluate the quantity. A seepage rate of about 25 acre-feet per day for Lord Reservoir at full stage has been estimated. Lord Reservoir is generally not maintained at full stage for any length of time and is used only occasionally for storage.[11]

Canal seepage losses along the distribution system between the Denver-Hudson Canal or the Prospect Reservoir and the farmers' field headgate represent a considerable source of recharge. Code (7) reported a delivery loss of 33 percent of which a good portion probably reaches the water table. Where the canal system is traversing areas of shallow depth to bedrock, near the west edge of the valley for example, some of the seepage may be forced to the surface of the ground to evaporate or be transpired by vegetation. Based on the 33

[10]A ratio, expressed as a percentage of the amount of water that can be drained out of a saturated aquifer sample by gravity to the gross volume of the sediments.
[11]R. V. Rouse

TABLE 7.—*Results of selected pumping tests in Prospect Valley**

Well number	B1-63-9ddc	B1-63-22acc	B2-62-18bca	B2-62-19cd	B2-63-26bcc
Date of test	1960	1962	1962	1948	1962
Duration of test (hours)	6	98	11	77.5	14
Pump discharge (gallons per minute)	1060	1150	680	896	870
Drawdown at pumped well (feet)	21.0	17.0	10.2	22.0	24.1
Specific capacity of pumped well (gallons per minute per foot of drawdown)	51	68	67	41	36
Saturated thickness of formation (feet)	65	91	55	48	59
Coefficient of transmissibility (gallons per day per foot)	435,000	250,000	100,000	92,000	120,000
Average coefficient of permeability (gallons per day per square foot)	6700	2700	1800	1915	2000

* The pumping test on wells B1-63-22acc, B2-62-18bca, B2-62-19cd, and B2-63-26bcc were performed by the U. S. Geological Survey; the pumping test on well B1-63-9ddc was performed by Colorado State University.

percent loss determination mentioned above, an average annual recharge to the ground-water reservoir of approximately 3,000 acre-feet per year (1942-1962) is furnished by canal seepage.

Deep percolation of field-applied water represents one of the major sources of recharge to the underlying ground-water reservoir in Prospect Valley. Based on the determinations by Blaney and Criddle (4) about 25 percent of the water delivered to the farm might be expected to percolate downward to the water table in the Prospect Valley area. The recharge contributed by field-applied canal supplies is estimated to be approximately 2,200 acre-feet per year (1942-1962). Often canal supplies contain some sediment load which may tend to reduce infiltration losses of the canal water. In the case of Prospect Valley, however, the canal deliveries are generally quite sediment free.

That portion of the irrigation water furnished by pumps is characteristically sediment free and is estimated to provide an average annual return flow to the ground-water reservoir of about 7,000 acre-feet per year (1942-1962).

Precipitation penetration to the water table undoubtedly contributes some recharge to the ground-water reservoir in the valley. A good portion of the precipitation, however, is consumed before it percolates beyond the root zone. Based on an infiltration area of 5 by 15 miles the recharge to the underlying reservoir may approach an average supply of 2,500 acre-feet per year (1942-1962).

Deep percolation of runoff from Lost Creek and Sand Creek is difficult to estimate, but based on the information in table 2, the average annual recharge to the ground-water reservoir from this source may be around 2,500 acre-feet per year (1942-1962). Both the Lost Creek and Sand Creek drainages are at the edges of the pumped area where the opportunity for high infiltration capacity and direct recharge to the ground-water reservoir are reduced. If flows from both Sand Creek and Lost Creek could be diverted into the central part of the upper valley, a greater recharge benefit could probably be realized.

Ground-water underflow into the area is also difficult to estimate due to lack of information. A limited number of drillers' logs indicate the continuation of a sizable alluvial-filled erosion channel at the upper (southern) end of Prospect Valley. The logs of wells along the southern extremity of the pumped area, however, indicate small saturated thicknesses which would limit the amount of ground-water underflow into the area. Based on limited information of the aquifer, saturated thickness, and water table slope in the upper part of the valley, the underflow may be on the order of 6,000 acre-feet per year.

Items of Disposal

Ground-water pumpage is the major item that tends to reduce the volume of water stored in the Prospect Valley aquifer. The average annual extraction of ground water by pumping is estimated to be about 28,000 acre-feet per year (1942-1962). As mentioned previously, a portion of the pumped water returns to the reservoir through deep percolation and is available for re-use. The net effect of the pumping, therefore, is a depletion of the ground-water storage of something less than 28,000 acre-feet annually, depending on the consumptive use of the water.

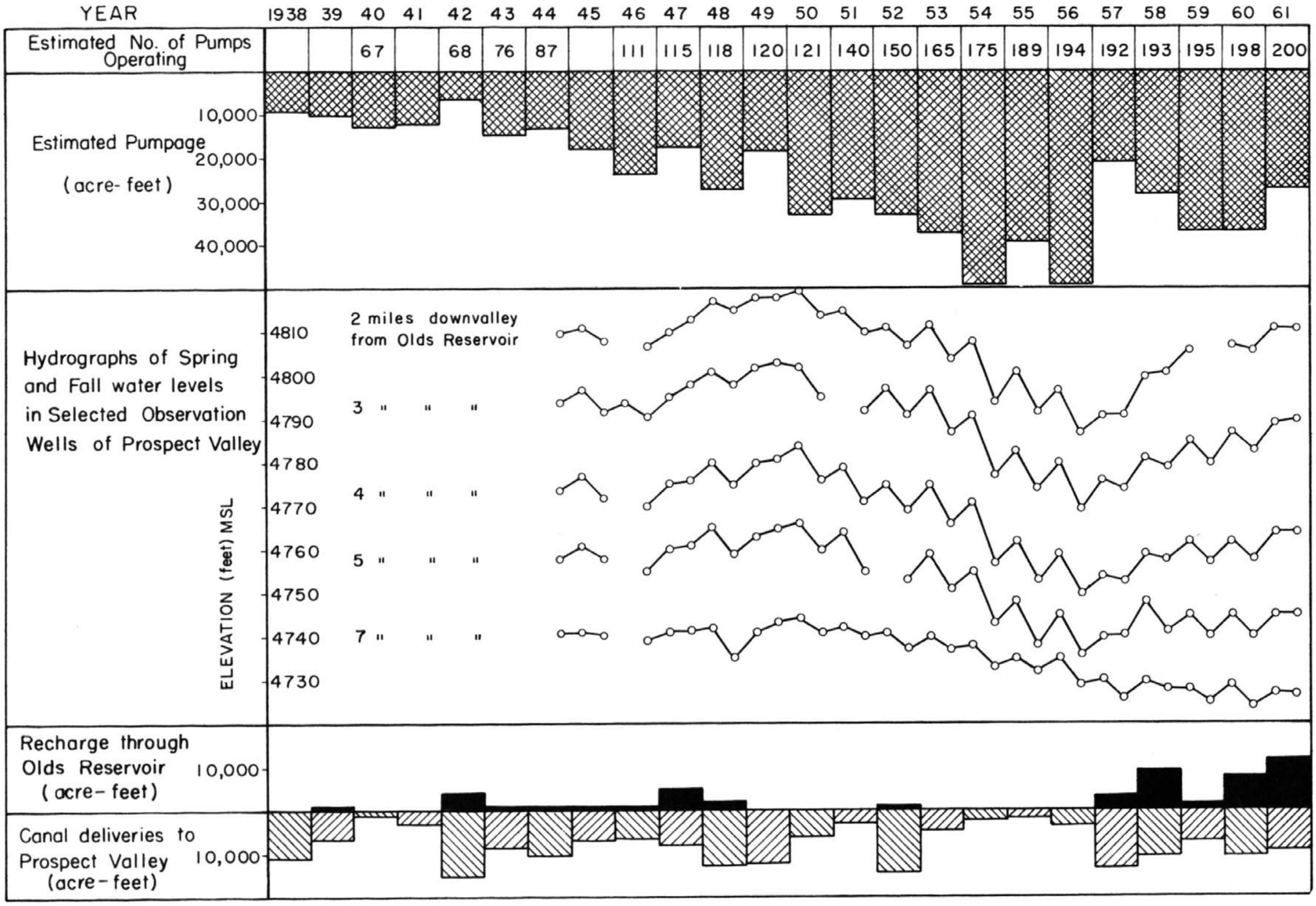


FIGURE 18.—*Historical relationship of ground-water levels with pumping and recharge - Prospect Valley aquifer.*

The volume of pumped water was estimated generally from reported pump discharges and electrical power consumption data:

$$A = 1.207 \frac{KWH}{BHP} \frac{D}{5430}$$

A = volume of pumpage, in acre feet

KWH = kilowatt-hours consumed[12]

BHP = billed horsepower, which is 10% less than input horsepower[12]

D = pump discharge, in gallons per minute (estimated in most cases from data published in references (3) and (7) and change in pumping lifts)

Ground-water underflow out of the area amounts to a relatively large item. The U. S. Geological Survey estimated the underflow to be about 11 cubic feet per second (3) which would remove approximately 8,000 acre-feet of ground water per year from the reservoir. The magnitude of the underflow depends upon the slope of the water table, the permeability of the aquifer and the area of the cross-section of aquifer through which flow is occurring.

Change in Ground-Water Storage

The net effect of the quantitative items of supply and disposal is represented in the change in ground water storage. The change in ground-water storage is indicated by the ground-water table fluctuations and may be evaluated by considering the specific yield. An investigation of the ground-water level fluctuations (appendix A) illustrates that the increase or decrease in water levels since 1942 has not been general for the entire aquifer. The ground-water levels in a relatively small area around Olds Reservoir have risen while those in the remainder of the valley have lowered. The net effect has been an annual depletion of ground-water storage volume.

The effect of the combination of the major hydrologic elements of ground-water pumpage, recharge through Olds Reservoir, and canal deliveries to the area on the water-level fluctuations in selected observation wells is pictorially illustrated (figure 18). Above normal recharge amounts through Olds Reservoir and above normal amounts of canal water since about 1957, illustrate a beneficial effect on water levels, especially in the upper part of the valley.

[12]Morgan County REA, Fort Morgan, Colo.

Storage Efficiency of the Aquifer

The storage efficiency of a ground-water reservoir is quite high in comparison to a surface reservoir in an area like Prospect Valley. As pointed out previously, evaporation losses for a surface reservoir in this area normally amount to about 4 to 5 feet per year. According to mathematical calculations by R. E. Glover, water recharged at Olds Reservoir may be recovered by pumping at some later date with relatively small loss, table 8. (10)

TABLE 8.—*The precentage of the artificial recharge at Olds Reservoir that is lost as ground-water underflow to the South Platte River (after Glover).* (10)

Years since recharge	Percent lost
1	....
2	....
3	....
4	....
5	....
6	2.4
7	3.2
8	4.0
9	6.6
10	7.8

The loss of recharge water is the amount that drains out the lower end of the valley into the South Platte River alluvium. Some drainage, however, occurs naturally (about 11 cfs) out of the valley and into the South Platte River alluvium due to the normal slope of the water-table surface. Artificial recharge operations create a mound in the water table and consequently increase the downvalley gradient with a resultant increase in subsurface flow from the area. The calculations in table 8 represent only the loss due to the added effect of the recharge.

Unusually high water-use efficiency also exists where the irrigated area overlies the ground-water reservoir. Part of the water applied to the land returns to the ground-water reservoir as deep percolation. A given amount of water stored in a surface reservoir is generally applied only once by an individual surface-water user; in the case of ground-water storage in Prospect Valley, part of the applied pumped water returns to the ground-water reservoir for re-use.

The following development by R. E. Glover relates the total irrigation use to the original recharge. (11) Suppose a recharge amount R is stored in the ground-water reservoir and is subsequently pumped to the surface and used for irrigation where the fractional part n is lost by deep percolation. The part lost can again be pumped and applied. As this process is continued the sum S of all of these pumpages will be

$$S = R\,(1 + n + n^2 + n^3 \ldots\ldots)$$

If both sides of this equation are multiplied by n the result is:

$$nS = R\,(n + n^2 + n^3 + n^4 \ldots\ldots)$$

A subtraction yields the relation

$$S - nS = R$$

or

$$S = \frac{R}{1 - n}$$

The above expression indicates the total amount pumped when all the original recharge has finally been consumed. The ratio of the total pumpage S to the original recharge amount R is indicated in the following table:

TABLE 9.—*Ratios of pumpage to recharge (after Glover).* (11)

Part lost n	$\frac{S}{R}$
0.1	1.111
0.2	1.250
0.3	1.428
0.4	1.667
0.5	2.000

An examination of the above development will show that the practice of ground-water storage beneath the area of use does not create additional water, but may allow some re-use of the original recharge.

Water Quality Aspects

Each time irrigation water is applied to the land an increase in dissolved solids content of the deep percolating water generally occurs. The re-use concept of the ground water is evidenced in Prospect Valley by the increase in total dissolved solids content of the ground water in the downvalley direction (figure 19). The normal ground-water underflow helps to maintain a tolerable salt content (total dissolved solids) in the Prospect Valley ground-water reservoir. Artificial, incidental, or natural ground-water recharge with water of relatively low salt concentration near the upper end of the valley tends to reduce the gross salt concentration by dilution and induce more underflow of higher salt concentration water out the lower end of the valley.

Only a limited number of water quality analyses have been made for the Prospect Valley area.[13] Code (7) reported the results of chemical analyses on ground-water samples taken from three wells in the area during the latter part of 1944 (appendix E).

During the period of 1947-1948, the U. S. Geological Survey obtained several samples of ground-water supplies from the Prospect Valley area. Analyses of these samples were included in a comprehensive report of the geology and water resources of the lower South Platte River Valley (3) (appendix F).

In connection with the recent quantitative recharge investigation at Olds Reservoir, some water quality analyses were performed on surface-water samples. Surface-water samples were collected at various points along the conveyance system during the first three months in 1960. The sampling location, date of sampling, and results of the limited anaylses are presented in appendix G.

Several ground-water samples were obtained from selected irrigation wells during 1960 and 1962. The results of these analyses are presented in appendix H.

[13]The concentration of the various chemical constituents, listed in Appendices E, F, G, H, I, and J, are given in parts per million.

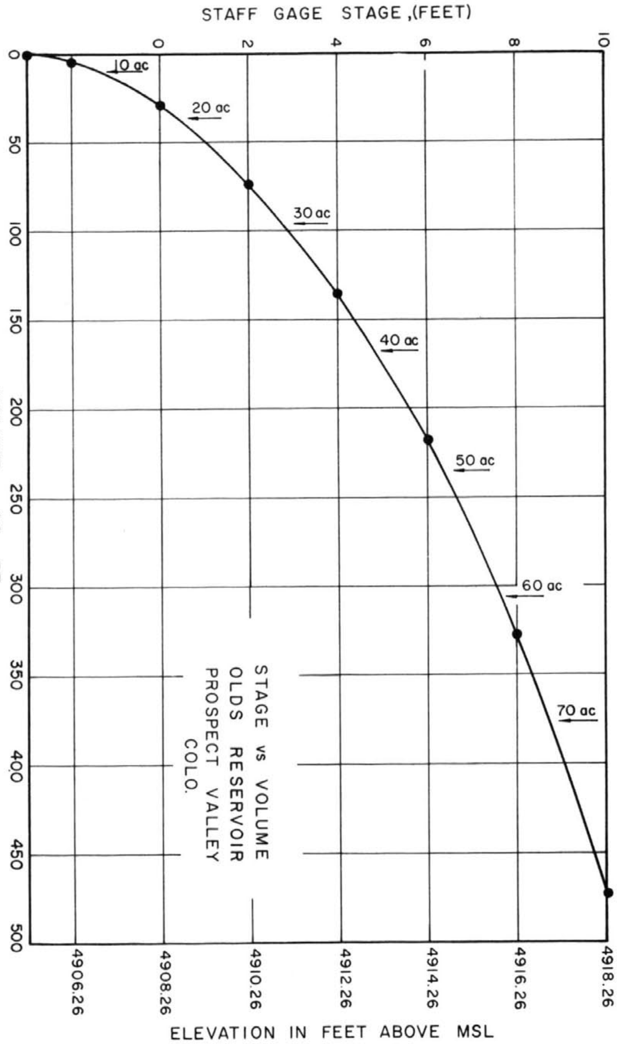


FIGURE 19.—*Total dissolved solids content (parts per million) in the ground water at selected locations in Prospect Valley.*

A limited quality anaylsis of four ground-water samples was performed by the U. S. Geological Survey during the latter part of 1962 (appendix I).

Eight ground-water samples were collected from selected irrigation wells in Prospect Valley on October 3, 1962. Quality analyses of the samples were performed by W. M. Allison, water analyst, department of chemistry, Colorado State University (appendix J).

Limited sampling of ground-water temperatures during 1960 indicated an average of about 55° Fahrenheit.

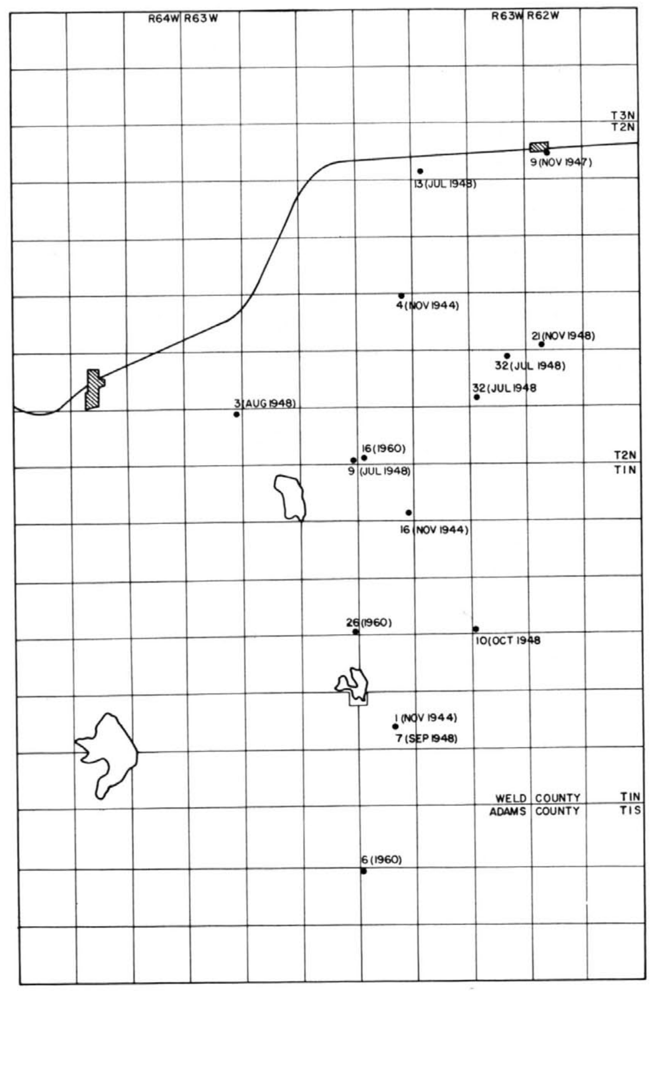
For comparison of the results of the limited water quality analyses, the "U. S. Public Health Service Drinking Water Standards - 1962," are listed in table 10:

TABLE 10.—*U. S. Public Health Service Drinking Water Standards—1962.* (16)

Substance	Recommended maximum concentration in parts per million
Alkyl Benzene Sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.
Copper (Cu)	1.
Carbon Chloroform Extract (CCE)	0.2
Cyanide (CN)	0.01
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate* (NO_3)	45.
Phenols	0.001
Sulfate (SO_4)	250.
Total dissolved solids	500.
Zinc (Zn)	5.

* In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

FIGURE 20.—*Nitrate content (parts per million) in the ground water at selected locations in Prospect Valley.*



Probably the most important water quality parameter, as far as crops are concerned, is the Sodium Adsorption Ratio (SAR):

$$\text{Sodium Adsorption Ratio}^{14} = \frac{\text{Na}}{\sqrt{\frac{\text{Ca} + \text{mg}}{2}}}$$

Recommended water classifications for SAR values are given by Todd (20):

SAR	Water class
< 10	Excellent
10-18	Good
18-26	Fair
> 26	Poor

Sodium adsorption ratios, computed from quality analyses of water samples at 15 locations in Prospect Valley, ranged from 1.2 to 6.5 with the exception of two samples in the poor water class (SAR = 26.2 and 28.7 at B1-62-5aa and B2-63-31aa respectively).

Artificial ground-water recharge through Olds Reservoir and incidental recharge resulting from field application of canal supplies has induced some nitrate and "detergent" content into the ground water during recent years. Results of limited quality analyses of nitrate content and detergent content are plotted in figures 20 and 21 respectively. The extent of the ABS[15] (detergent) concentration in the ground water appears to be centered around Olds Reservoir at the present time. Concentrations of both detergent and nitrates in the ground water in Prospect Valley are approaching the limits of suggested concentrations for domestic use, however.

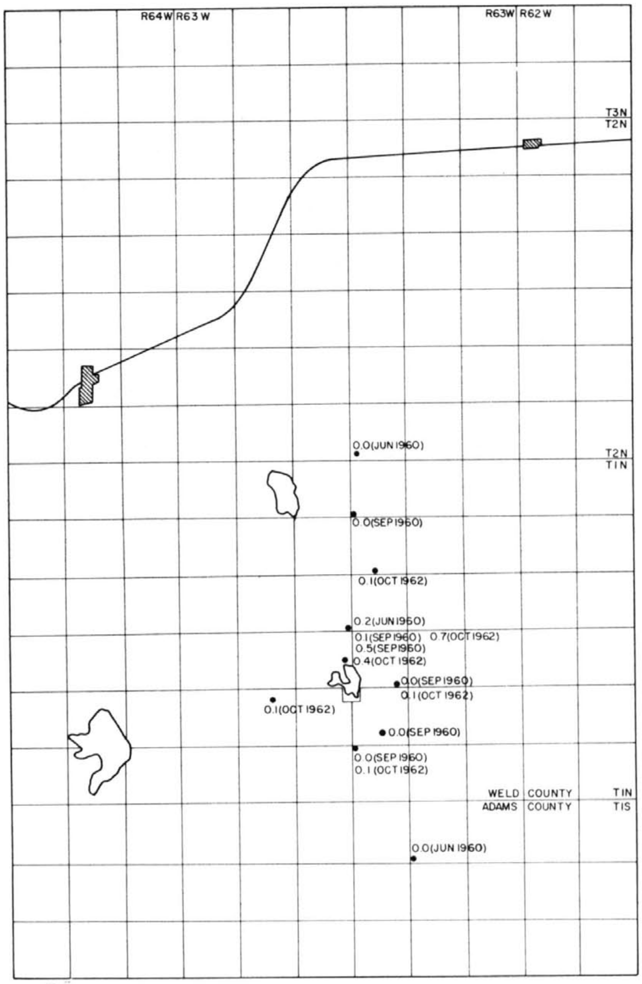


FIGURE 21.—*ABS content (parts per million) in the ground water at selected locations in Prospect Valley.*

PROPOSED WATER RESOURCE MANAGEMENT ASPECTS FOR THE PROSPECT VALLEY AREA

Irrigation Water Requirements

The 20-year (1942-1962) average annual gross application rate (surface- and ground-water supplies) for irrigation in Prospect Valley has amounted to approximately 3.12 acre-feet per acre per year. The gross application rate presented in table 11 is calculated from the total irrigation water application (sum of canal deliveries to farmers' field headgate plus pump-discharges) divided by total irrigated acreage (includes land irrigated by both canal deliveries and pumped ground water plus land irrigated by canal deliveries only plus land irrigated by pumped ground water only). The practiced application rate may vary depending on whether the applied irrigation water is a combination of canal and ground water or exclusively either canal or ground water; no distinction has been made in this study of what the variation in application rate might be. For purposes of calculation in this report, the practiced application rates for canal supplies and/or ground-water supplies are assumed to be equal.

The average annual irrigation application for the 20-year period (1942-1962) has amounted to approximately 36,930 acre-feet per year; an average of 8,778 acre-feet per year and 28,152 acre-feet per year for canal supplies and pumps respectively. With no increase in irrigated acreage it would seem reasonable to assume that the future average annual requirements for irrigation water would be about what the past requirements have been.

Irrigation supply deficiencies during years of low precipitation and/or canal deliveries are met by local ground-water supplies. Ground-water use has exceeded surface-water use every year since 1938, except for 1942. During the period of 1942 to 1962 ground-water supplies have furnished about 76 percent of the total irrigation water used in the valley. Historical ground-water level hydrographs (figure 6) illustrate periods of increased pumping

[14]Concentrations of the constituents are expressed in milliequivalents per liter.
[15]Alkyl benzene sulfonate

TABLE 11.—*Precipitation, canal deliveries and estimated pumpage in Prospect Valley During the Period (1938-1962)*

Year	Estimated annual precipitation* (inches)	Estimated precipitation* (inches) May 1 - Oct. 1	Net canal deliveries to users (acre-feet)	Recharge at Olds Reservoir (acre-feet)	Estimated pumpage (acre-feet)	Estimated total irrigation water application on field (acre-feet)	Estimated** irrigated acreage	Gross application rate (acre-feet)/acre
1938	14.0	9.76	10932	0	9000(6)	19932	11000	1.81
1939	5.9	2.64	6660	1050 (7)	10000	16660		1.51
1940	11.7	7.19	1097	0	12700(6)	13797		1.25
1941	16.1	9.86	2804	0	12000	14804		1.35
1942	17.4	8.19	15300	4029	6500(7)	21800		1.98
1943	10.0	6.52	8370	624	14580(7)	22950		2.09
1944	12.1	4.62	10285	597	13100(7)	23385		2.13
1945	17.2	10.68	6884	1200	18000	24884		2.26
1946	14.4***	9.75	6359	1286	23790(3)	30149		2.74
1947	14.0***	8.43	17589	4486	17674(3)	35263		3.21
1948	6.6***	5.11	12698	2378	27436(3)	40134		3.65
1949	13.6***	10.81	12235	0	18178(3)	30413		2.77
1950	9.4***	4.87	6111	0	33305(3)	39416		3.58
1951	14.4	8.76	3085	0	29791	32876	11000	2.99
1952	9.4	5.28	14312	1020	32839	47151	12500	3.77
1953	10.7	6.17	4130	0	37403	41533		3.32
1954	8.1	6.12	2088	0	49842	51930		4.15
1955	12.7	10.11	1806	0	39933	41739		3.34
1956	11.4	7.58	3860	0	49712	53572		4.29
1957	14.5***	7.97	13648	3402	20712	34360		2.75
1958	15.0	9.55	10143	8459	28357	38500		3.08
1959	12.6	6.46	7427	1637	36720	44147		3.53
1960	10.8	5.20	10161	7758	37541	47702		3.82
1961	17.1	12.73	9067	11630	27628	36695	12500	2.94
1962				3330[1]				

[1] Jan. 1 - Mar. 1
* Average of Fort Lupton, Greeley, and Fort Morgan precipitation station values (when available).
** Prior to 1952 the total irrigated acreage was assumed to be 11,000 acres; since 1952, the estimate is 12,500 acres.
*** Fort Lupton precipitation data missing.

lifts as the ground-water reservoir was drawn upon especially heavy during the dry periods around 1940 and mid-1950. As of the spring of 1962 the ground-water levels in Prospect Valley were recovering quite well in the upper part of the Valley, but were continuing to decline at a fairly steady rate in the lower part of the irrigated area—the beneficial effect of past recharge activities through Olds Reservoir was evident. The past 20 years have shown that with the aid of even a limited ground-water recharge program, the ground-water reservoir underlying Prospect Valley may be utilized conjunctively with the surface irrigation system to provide a dependable long-term irrigation supply for the area.

Code reported (7) in his study of Prospect Valley during the 1942-1944 period:

> "Analysis of the data indicated that with the average surface-water supply of 5,500 acre-feet, the safe yield of water from underground sources was about 9,860 acre-feet. With the indicated field duty of 1.8 acre-feet per acre, the irrigated area would thus be limited to about 8,300 acres. This would necessitate a reduction of about 4,000 acres from the present irrigated area. Should water conditions prevail as in average years and the present area be maintained, indications are that economic exhaustion would occur in from 14 to 18 years. Before that time exhaustion symptoms would be severely felt in some portions of the valley."

As mentioned previously, the average annual surface-water supply, calculated from the data in table 11, for the 20-year period (1942-1962) amounts to approximately 8,778 acre-feet per year. Apparently the artificial ground-water recharge of approximately 2,500 acre-feet per year (average) through Olds Reservoir during the past 20 years has not only maintained the 1942-1944 irrigated acreage level, but has increased the safe yield of the underground reservoir well beyond the 9,860 acre-feet per year.

The ground-water reservoir will probably continue to be the primary source of irrigation water in the future. To get maximum use of this storage facility, the reservoir should be operated similarly to a surface reservoir—drawn upon during dry periods and replenished during wet periods. Due to the immense storage capacity of the reservior below Prospect Valley, the reservoir could provide supply during an extended drought period. During years of above normal surface supplies, however, every effort should be made to replenish the storage volume of the ground-water reservoir with good quality water. For this reason, the enlargement of the conveyance system and the construction of additional recharge sites for utilization during the uncommonly wet years, may be the only hope for maintaining a future in irrigation in an area like Prospect Valley. Every effort should be made to insure that the long-term average annual replenishment approximates the average annual withdrawal.

Discussion of the Estimated Safe Yield of the Prospect Valley Ground-Water Reservoir

The safe yield of a ground-water reservoir has been defined as the amount of water that can be pumped from it annually without producing an undesired result. (20) The terms "sustained yield" or "perennial yield" have been suggested as more appropriate (14), but at any rate some value representing the allowable average annual draft on a given ground-water reservoir for specific conditions needs to be determined.

Safe yield is governed by several factors which may change as conditions change. Generally the following are considered as the governing factors: (12) (13) (20)

a. Water supply to the ground-water reservoir.
b. Economics of pumping.
c. Quality of the ground water.
d. Water rights for the basin.

Withdrawals from the ground-water reservoir in excess of the long-term annual average supply to the ground-water reservoir must come from ground-water storage and constitute an overdraft. To make efficient use of a ground-water reservoir, however, pumping amounts during below-normal water-supply years may exceed the long-term annual safe yield. Average long-term withdrawal amounts from the ground-water reservoir in excess of the average annual supply will undoubtedly lead to serious consequences. The average annual supply to the Prospect Valley ground-water reservoir, for conditions existing over the 20-year period (1942-1962), amounts to about 25,700 acre-feet per year.

The average annual supply (acre-feet) to the Prospect Valley ground-water reservoir for the selected period of 1942 to 1962 as discussed earlier is itemized:

Recharge through Olds Reservoir	2,500
Canal seepage losses	3,000
Deep percolation of field applied water	9,200
Precipitation penetration to water table	2,500
Deep percolation of runoff from Lost Creek and Sand Creek	2,500
Ground-water underflow into the area	6,000
Total	25,700

The average annual discharge (acre-feet) from the Prospect Valley ground-water reservoir for the selected period of 1942 to 1962 as discussed earlier is itemized:

Ground-water pumpage	28,000
Ground-water underflow out of the area	8,000
Total	36,000

Since only about 25,700 acre-feet annually is supplied to the reservoir, the withdrawals (including underflow and pumpage) in excess of this amount must come from storage. In order to maintain long-term water-table level equilibrium under the present irrigation demands, an average annual increase of about 10,300 acre-feet in the supply to the ground-water reservoir must be affected.

If the above ground-water supply-discharge entities are assumed to be representative of average annual conditions in the Valley, the following relation may be established to arrive at a theoretical safe yield:

$$2500 + 3000 + 2200 + 1/4 \text{ pumpage} + 2500 + 2500 + 6000 = \text{pumpage} + 8000$$

$$18{,}700 + 1/4 \text{ pumpage} = \text{pumpage} + 8000$$

$$\text{or } 10{,}700 = 3/4 \text{ pumpage}$$

$$\text{or pumpage} \approx 14{,}300$$

Equating average annual supply (acre feet) to average annual discharge (acre feet) indicates a safe yield or average annual allowed pumping of about 14,000 acre feet. This amount of pumping represents about one-half of the present average annual pumping. To exist under this limited pumping situation, a considerable increase in irrigation efficiency would have to be realized or a reduction in the pump-irrigated acreage to $\frac{14{,}000}{3.12} \approx 4500$ acres would have to be accomplished.

Economic considerations may govern safe yield if pumping costs become excessive. With declining water levels, the increased pumping lifts reduce the well discharges and the size of the pump motors need to be increased to maintain flows. The increased cost of the pumped water may make irrigation economically unfeasible. Since the saturated thickness of the alluvium is limited, and deepening individual wells by drilling in most cases is not possible, declining water levels may reduce well discharges in some areas to uneconomical amounts.

Deterioration of ground-water quality as the result of pumping may limit the safe yield of an aquifer. Excessive pumping may lower the water table and induce water of undesirable quality into the area. Excessive pumping may also cause an intolerable salt-concentration buildup, due to the leaching action of the recycling water. Poor quality water presently exists in sections of the lower part of the valley where safe yield has already consequently been reduced.

Importation of poor quality water for artificial ground-water recharge purposes may limit the safe yield of the ground-water reservoir by contaminating a portion or the entire volume of the aquifer. Extreme caution should be exercised in the future to insure that optimum quality imported water is used in the area.

Water rights may limit the safe yield of an aquifer by restricting the supply of "new water" to an area. In the instance of Prospect Valley, with rights for diversion of surface water to the area being of a limited nature, the aspect of water rights may be an important consideration in obtaining future "new water" supplies.

Safe yield of the Prospect Valley ground-water reservoir may certainly be affected by any or all factors of supply, economics, quality, and water rights. The supply and quality factors, however, are probably the predominant considerations in maintaining the current level of safe yield of the Prospect Valley aquifer.

Suggested Practices for Meeting Future Water Demands in Prospect Valley

With available water supplies becoming more and more heavily encumbered, suitable water amounts in the future may be deficient for satisfying the current water-supply demand in Prospect Valley—the deficiency may be incurred by quantity and/or quality aspects. Sufficient future water supplies undoubtedly will depend upon the degree of maximizing the efficiency of use of available water. The following are suggested practices that might be included in an overall management program to insure the required annual supply to irrigated lands of Prospect Valley:

A. Artificial ground-water recharge is a vitally important tool for fully utilizing the Prospect Valley ground-water reservoir as an efficient storage and distribution system. Selection of the type, location, and size of artificial recharge facilities may be established in view of the results of the quantitative investigation of the recharge operations through Olds Reservoir described earlier in this report. Some of the various type recharge methods that might be feasible for Prospect Valley include:

1. Flooding or spreading of shallow depths of water over large areas of land.
2. Controlled flows into closed basins such as natural ponds, reservoirs, or impoundments formed by excavation, dikes, or dams.
3. Controlled flows through specially constructed ditches or furrows.
4. Water spreading in natural stream beds or drainageways, induced by constructing small ,broad dams or revetments.
5. Spreading excess water over croplands during nonirrigation periods.
6. Controlled flows into specially constructed pits, shafts, or wells—may be used where an overlying, impermeable strata restricts the normal downward movement of water from the surface of the ground to the ground-water reservoir.

The basin method of water spreading (Olds Reservoir operations) has proved quite satisfactory for recharge purposes and probably should be the primary type to be considered for Prospect Valley. The location, number, and size of specific recharge facilities for the valley would depend upon such factors as the magnitude and delivery schedule of available water supplies for recharge, availability of economically feasible recharge sites, infiltration rates of the respective recharge sites and the benefits of recharge operations to ground-water users as a whole.

The availability of water for recharge purposes in Prospect Valley is dependent on the amount of water available for diversion from the South Platte River and the capacity of the conveyance system. The amount of diversion from the South Platte River depends on the amount actually available in the river at the diversion point and the legal right for the diversion. From both the quality and quantity standpoint, the enlargement of portions of the conveyance system may be worthwhile to take advantage of limited periods of flow of unusually good quality water occurring during spring runoff or flood periods. Similarly, high capacity recharge facilities for handling large flows of better quality water, that cannot be temporarily stored in the surface conveyance system, may be advantageous. If flow is available during the normal irrigation season and can be beneficially applied, the water may be used directly on the irrigated land without the added cost of pumping. Obviously, the number of unnecessary cycles of the flow from the ground-water reservoir to the ground surface and back again to the ground-water reservoir should be kept to a minimum from the standpoint of economy, quality, and consumptive use. If necessary, special recharge facilities should be constructed to rapidly recharge runoff from the drainages of Lost Creek and Sand Creek. Runoff in these streams would probably be of relatively good quality. In addition, proper distribution of the runoff flows in recharge sites would reduce the flood damage.

The location of specific recharge facilities in Prospect Valley generally should be near the upper part of the irrigated area to take advantage of the re-use concept as the ground-water flow gradually moves downvalley. Due to the nonuniformity of the aquifer, a drilling program should be utilized in selecting an area of good permeability for each recharge site. In addition, various methods might be used or experimented with (such as graded gravel filters in the bottom of the spreading basin) for increasing or sustaining respective infiltration rates for each recharge site.

To achieve an additional average annual recharge of 10,300 acre-feet, at least two more recharge sites of about the size of Olds Reservoir, should be constructed:

1. A spreading area to recharge flow from Sand Creek.
2. A spreading area just below Lord Reservoir to recharge runoff flow from Lost Creek and surplus water brought in through the Denver-Hudson Canal.

The following recharge facility operation procedures are suggested:

1. Make every effort to recharge all of the runoff flows from the Sand Creek and Lost Creek drainages.
2. Immediately recharge available flows (in excess of surface-water demands in the area) of the more desirable quality water accompanying larger flows in the South Platte River.

The effective recharge at a point located a given distance from the recharge source may not always be evidenced by a rise in the ground-water level; in some cases recharge has effectively reached a certain area even if the ground-water levels in the area are maintained at a steady level, or if the rate of the normally declining water levels in the area is reduced. In addition, through displacement or pressure processes, a ground-water user may be obtaining the benefits of a recharge operation before the actual recharge water reaches the cone of influence of his well. Any amount of recharge water placed in the ground-water reservoir in Prospect Valley should eventually, either directly or indirectly be effective in all parts of the reservoir. Under established ground-water pumping conditions in the valley, any recharge water reduces the amount of pumping lift at each well location that is hydraulically connected to the recharge source.

B. Reduction of water loss that may be considered as nonbeneficial consumptive use is very important. Sealing or lining of leaky portions of the surface-water conveyance system would seem appropriate in view of the losses apparently existing along the system. Sealing or lining of canals often offers a dual return for the investment in an increase in water delivery and reduction in land loss. Figure 22 illustrates a typical seepage situation that could be remedied, probably quite economically, through the employment of some seepage reduction method. Several alternatives for sealing or lining canals are presently available, depending upon the extent of seepage reduction that is economically feasible.

FIGURE 22.—*View of canal seepage damage in Prospect Valley (below the Denver-Hudson Canal in the N½ S11, T 1N, R64W).*

According to diversion-delivery records a conveyance loss of about 60 percent exists between the diversion point below Denver and Prospect Valley. Based on canal deliveries to the valley during the period 1942-1962, the average annual conveyance loss approaches 13,000 acre-feet. A sizable portion of the 13,000 acre-feet could undoubtedly be salvaged through appropriate seepage reduction methods.

Removal or eradication of phreatophytes along ditch banks and reservoirs may help decrease part of the water conveyance loss. However, value of the increased available water may not exceed the value of the vegetation as canal-bank stabilizers, shade and cover for birds and animals, and possible esthetic values.

Possible use of evaporation retardent chemicals along the canal system and on the surface reservoirs may be worth considering.

C. Improved irrigation efficiency is a tremendous potential source of increased available water supply. Considerable effort should be made by individual water users to obtain the greatest benefit from the least amount of water application. The optimum water application rate is the result of a careful balance of the aspects of method, time, and amount of irrigation. Water conservation practices, such as recirculating tail water for example, help to maintain high irrigation efficiency.

D. History has shown that a comprehensive water quality and quantity surveillance network is very necessary to properly manage water-resource operations. A quantity network should include sufficient measuring devices of suitable accuracy at key locations to equitably distribute the water and establish valuable records of water application. An extensive ground-water observation-well network would indicate areas of critical ground-water level changes and provide general knowledge on the behavoir of the ground-water reservoir. Periodic quality sampling of the surface and ground-water supplies and analysis of the results are becoming increasingly important. Other hydrologic data, including evaporation, rainfall, and soil moisture would be valuable.

E. Water quality from the standpoint of domestic use is certainly worth considering in an area like Prospect Valley. Irrigation return flows and poor quality imported water may deteriorate the domestic water supply in the area to the point of nonusability.

F. The formation of a local governing organization of water users with powers to raise operational supporting funds, police water use, and bargain for improved water-resource development is desirable. (19)

G. Finally, one of the more important aspects is to maintain a sufficient number of personnel to coordinate, supervise, administer, and record the elements necessary to insure success of the water management operation.

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APPENDIX A

Depth to ground-water level in selected wells in the Prospect Valley area, Colorado

* Well location description follows method adopted by U.S.G.S.

EXAMPLE:

BI-63-2 bbb

B — Townships North of Weld-Adams County Line

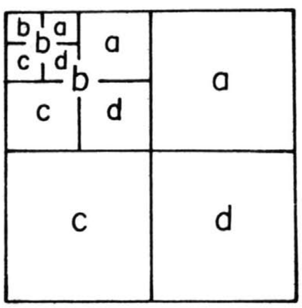
or

C — Townships South of Weld-Adams County Line

63 — Range

2 — Section

bbb — Subdivision of Section



Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado.

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-2bbb			
Oct. 14, 1959	78.02	Dec. 16, 1959	73.78	Apr. 11, 1960	70.10
Nov. 6	76.15	Dec. 29	73.15	Nov. 10, 1961	68.49
Nov. 25	74.82	Feb. 12, 1960	71.78	Mar. 29, 1962	63.92
Dec. 4	74.56	Mar. 9	70.78		
		B1-63-2ccc (recorder) (lowest daily water levels)			
May 5, 1941	64.54	Jun. 4, 1947	60.43	Dec. 3, 1950	57.56
Nov. 4	68.30	Jul. 1	59.66	Dec. 31	56.82
Apr. 27, 1944	60.71	Aug. 11	62.5	May 1, 1951	54.88
May 4	60.72	Sep. 5	62.54	Aug. 7	61.52
Jun. 2	60.18	Oct. 3	60.98	Aug. 30	63.94
Jul. 7	61.57	Oct. 29	59.84	Oct. 5	63.00
Aug. 4	63.13	Nov. 5	59.67	Nov. 3	60.53
Sep. 1	63.23	Dec. 3	58.83	Dec. 31	59.58
Oct. 6	63.32	Jan. 7, 1948	57.90	Apr. 17, 1952	58.20
Nov. 3	62.45	Feb. 15	57.14	Jul. 5	60.34
Dec. 1	61.79	Mar. 7	56.80	Sep. 4	65.63
Dec. 22	61.36	Apr. 8	56.31	Nov. 6	63.47
Jan. 5, 1945	61.07	Apr. 23	56.15	Jan. 19, 1953	60.70
Feb. 2	60.61	May 7	56.10	Mar. 26	59.32
Mar. 2	60.21	Jun. 4	56.04	May 22	59.21
Apr. 6	60.00	Jul. 3	56.40	Jun. 9	60.08
May 3	59.64	Aug. 2	58.75	Jul. 3	62.71
May 4	59.86	Sep. 5	60.62	Aug. 11	66.43
Jun. 1	60.53	Oct. 4	60.60	Oct. 9	67.61
Jul. 17	63.34	Nov. 10	59.05	Nov. 18	66.47
Aug. 7	64.98	Dec. 17	57.87	Jan. 7, 1954	65.10
Sep. 6	66.42	Jan. 7, 1949	57.34	Jan. 14	64.90
Oct. 5	64.70	Feb. 4	56.67	Jan. 21	64.72
Oct. 31	63.48	Mar. 4	56.10	Jan. 28	64.51
Nov. 2	63.50	Apr. 1	55.61	Feb. 4	64.33
Dec. 7	62.51	May 6	55.22	Feb. 11	64.14
Jan. 4, 1946	61.94	Jun. 3	55.61	Feb. 18	63.92
Feb. 7	61.50	Jul. 1	54.86	Feb. 25	63.76
Mar. 7	61.19	Aug. 5	56.75	Mar. 2	63.65
Apr. 5	61.65	Sep. 4	56.90	Mar. 9	63.43
Apr. 24	62.23	Oct. 2	56.40	Mar. 16	63.30
May 3	62.69	Nov. 6	55.23	Mar. 23	63.15
Jun. 2	63.56	Nov. 25	54.52	Mar. 30	63.09
Jul. 8,	65.47	Dec. 4	54.31	Apr. 6	62.92
Aug. 5	66.61	Jan. 1, 1950	53.51	Apr. 13	63.37
Sep. 2	67.17	Feb. 5	52.74	Apr. 20	64.12
Oct. 8	66.01	Mar. 5	52.25	Apr. 27	64.37
Oct. 30	65.25	Apr. 2	51.83	May 4	64.53
Nov. 5	65.08	Apr. 12	51.89	May 11	65.47
Dec. 4	64.23	May 7	52.06	May 18	66.07
Jan. 10, 1947	63.20	Jun. 4	53.09	May 25	66.25
Feb. 5	62.64	Jul. 2	54.61	Jun. 1	66.47
Mar. 5	62.22	Aug. 6	58.36	Jun. 8	66.46
Apr. 5	61.75	Sep. 3	61.43	Jun. 15	67.28
Apr. 30	61.41	Oct. 1	59.87	Jun. 22	68.05
May 1	61.67	Nov. 5	58.43	Jun. 27	68.36

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B1-63-2ccc (recorder) (continued)
(lowest daily water levels)

Date	Water level	Date	Water level	Date	Water level
Aug. 16, 1954	71.8	Aug. 6, 1958	73.51	Aug. 5, 1960	70.82
Sep. 13	73.34	Aug. 13	73.60	Aug. 12	71.25
Sep. 20	73.67	Aug. 20	73.87	Aug. 19	71.64
Sep. 27	73.93	Aug. 27	74.04	Aug. 26	72.10
Oct. 4	74.10	Aug. 29	74.17	Sep. 2	72.54
Oct. 11	73.98	Jan. 13, 1959	73.85	Sep. 9	72.92
Oct. 18	73.95	Jan. 20	73.69	Sep. 16	73.28
Oct. 25	73.94	Jan. 27	73.49	Sep. 19	73.30
Nov. 1	73.90	Feb. 2, 1959	73.32	Sep. 29	73.30
Nov. 8	73.84	Apr. 23	71.23	Oct. 7	73.26
Nov. 15	73.74	Apr. 30	71.05	Oct. 14	73.20
Nov. 22	73.65	May 26	70.37	Oct. 21	73.14
Nov. 28	73.52	Jun. 2	70.21	Oct. 28	73.04
Jan. 12, 1955	72.48	Jun. 5	70.12	Nov. 4	72.91
Mar. 3	71.28	Jun. 12	70.11	Nov. 8	72.83
Mar. 21	70.95	Jun. 19	70.28	Dec. 24	70.61
Apr. 6	70.58	Jun. 26	70.46	Dec. 20	70.40
May 10	71.69	Jul. 3	70.78	Feb. 21, 1961	69.62
Jun. 29	72.87	Jul. 10	71.22	Feb. 28	69.37
Aug. 18	> 75	Jul. 17	71.36	Mar. 6	69.10
(observation well dry)		Jul. 23	71.25	Mar. 13	68.88
Jan. 5, 1956	> 75	Aug. 28	73.54	Mar. 20	68.58
(observation well dry)		Oct. 14	74.84	Mar. 27	68.32
Mar. 16, 1956	74.60	Oct. 21	75.13	Apr. 3	68.05
Mar. 23	74.38	Nov. 6	75.31	Apr. 6	68.13
Mar. 30	74.21	Nov. 13	75.90	Jun. 8	66.09
Apr. 6	74.08	Dec. 16	74.27	Jun. 15	65.84
Apr. 13	73.95	Dec. 23	74.09	Jun. 22	65.56
Apr. 20	74.01	Dec. 29	73.93	Jun. 29	65.77
Apr. 27	74.34	Jan. 13, 1960	73.52	Jul. 5	66.03
May 3	74.57	Jan. 20	73.34	Jul. 25	67.63
May 9	> 75	Jan. 27	73.15	Sep. 27	68 81
(observation well dry)		Feb. 3	72.91	Oct. 4	68.36
Feb. 7, 1958	75.26	Feb. 10	72.69	Oct. 11	67.90
Feb. 14	74.98	Feb. 17	72.48	Oct. 18	67.64
Feb. 21	74.92	Feb. 24	72.25	Oct. 25	67.29
Feb. 28	74.67	Mar. 2	72.03	Nov. 1	67.04
Mar. 6	74.50	Mar. 9	71.82	Nov. 8	66.86
Mar. 13	74.35	Mar. 16	71.62	Nov. 15	66.60
Mar. 20	74.19	Mar. 23	71.44	Nov. 22	66.26
Mar. 27	74.04	Mar. 30	71.22	Nov. 29	66.06
Apr. 3	73.86	Apr. 6	71.02	Dec. 6	65.82
Apr. 10	73.74	Apr. 8	70.98	Dec. 13	65.63
Apr. 17	73.62	Apr. 27	70.68	Dec. 20	65.34
Apr. 24	73.51	May 4	70.54	Dec. 27	65.06
May 1	73.37	May 11	70.38	Dec. 31	64.93
May 8	73.20	May 18	70.03	Jan. 3, 1962	64.64
May 12	73.15	May 24	69.80	Jan. 23	63.88
Jun. 1	72.47	Jun. 10	69.02	Jan. 31	63.57
Jun. 7	72.17	Jun. 17	68.87	Feb. 12	63.13
Jun. 25	72.28	Jun. 24	68.76	Mar. 1	62.51
Jul. 2	72.46	Jul. 1	68.82	Mar. 14	62.08
Jul. 9	72.61	Jul. 8	69.18	Mar. 29	61.66
Jul. 16	72.79	Jul. 15	69.51	Apr. 6	61.50
Jul. 23	72.98	Jul. 22	69.96	Jun. 15	60.85
Jul. 30	73.28	Jul. 29	70.36		

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued)

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-2dd			
Oct. 30, 1946	45.20	Nov. 8, 1948	41.78	Apr. 5, 1950	39.70
Apr. 30, 1947	46.41	Apr. 15, 1949	42.62	Dec. 10	39.29
Oct. 29	44.20	Dec. 9	39.46	Apr. 18, 1951	40.72
Apr. 23, 1948	44.03				
		B1-63-2ddc			
May 15, 1942	50.27	Apr. 24, 1946	46.15	Dec. 7, 1948	41.34
Jun. 8	49.76	Oct. 30	44.20	Jan. 15, 1949	41.43
Jul. 7	49.35	Apr. 30, 1947	45.81	Feb. 15	41.56
Aug. 4	49.05	Sep. 19	43.67	Mar. 14	41.74
Sep. 4	48.86	Oct. 8	43.60	Apr. 15	42.02
Oct. 6	48.79	Oct. 29	43.20	May 9	41.83
Nov. 19	48.71	Nov. 5	43.17	Jun. 16	41.35
Apr. 1, 1943	48.75	Dec. 8	43.56	Jul. 12	41.11
May 5	48.73	Jan. 9,1948	43.64	Aug. 2	40.70
Jun. 1	48.69	Feb. 2	43.60	Oct. 18	38.97
Jul. 9	48.53	Mar. 11	43.59	Dec. 9	38.86
Aug. 4	48.00	Apr. 12	43.38	Feb. 1, 1950	39.10
Sep. 2	47.51	Apr. 23	43.43	Apr. 5	39.70
Oct. 6	47.00	Jun. 4	43.18	May 23	39.30
Nov. 16	47.02	Jul. 1	42.64	Aug. 3	38.64
Apr. 25, 1944	47.42	Aug. 13	41.95	Oct. 13	38.15
Nov. 8	45.79	Sep. 13	41.41	Dec. 10	39.29
May 3, 1945	46.32	Oct. 5	41.02	Mar. 29, 1962	44.82
Oct. 31	45.03	Nov. 8	41.18		
		B1-63-3ac			
May 15, 1942	58.81	Oct. 6, 1942	56.35	Jun. 1, 1943	51.32
Jun. 8	58.40	Nov. 18	54.80	Oct. 5	55.65
Jul. 7	57.30	Apr. 1, 1943	52.10	Nov. 17	55.32
Aug. 6	56.93	May 3	51.70	Nov. 9, 1944	53.89
		B1-63-3bc			
May 16, 1942	68.31	Oct. 6, 1942	64.42	Aug. 4, 1943	61.18
Jun. 8	67.69	Nov. 18	62.92	Oct. 6	63.39
Jul. 7	66.51	Mar. 31, 1943	59.98	Nov. 17	61.86
Aug. 5	65.34	May 3	59.27	Apr. 27, 1944	59.64
Sep. 2	65.33	Jun. 1	59.01	Nov. 8	61.70

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-3ccc			
May 14, 1942	60.36	Mar. 11, 1948	46.22	Apr. 1, 1955	63.92
May 22	60.10	Apr. 12	46.82	Oct. 26	73.32
Jun. 8	59.47	Apr. 23	45.70	Apr. 5, 1956	67.10
Jul. 7	58.22	Jun. 5	46.74	Nov. 13	87.87
Aug. 5	58.07	Jul. 1	45.33	Mar. 14, 1957	71.15
Sep. 2	57.19	Sep. 13	52.11	Oct. 11	72.9
Oct. 5	55.70	Oct. 5	51.62	Dec. 18	69.05
Nov. 18	54.25	Nov. 8	49.15	Jan. 7, 1958	68.00
Mar. 31, 1943	51.62	Dec. 7	48.14	Feb. 19	67.24
May 5	51.57	Jan. 15, 1949	47.47	Mar. 31	66.42
Jun. 1	50.60	Feb. 15	47.02	Apr. 28	65.53
Sep. 2	54.10	Mar. 14	45.80	Jun. 2	64.95
Oct. 6	54.54	Apr. 15	45.57	Nov. 10	68.38
Nov. 17	53.18	May 9	45.85	Mar. 23, 1959	63.12
Apr. 25, 1944	51.11	Jun. 16	45.34	Oct. 14	70.33
Nov. 8	52.90	Jul. 12	46.69	Nov. 5	67.75
May 3, 1945	50.25	Oct. 18	46.08	Nov. 25	66.54
Oct. 31	55.42	Dec. 9	43.98	Dec. 4	66.09
May 16, 1946	53.41	Feb. 1, 1950	43.97	Dec. 14	65.63
Oct. 30	56.41	Apr. 5	45.04	Dec. 29	64.88
Apr. 30, 1947	52.00	Oct. 13	51.88	Jan. 11, 1960	64.31
Sep. 19	52.32	Oct. 24, 1951	54.69	Feb. 12	63.08
Oct. 8	51.03	Apr. 3, 1952	50.20	Mar. 9	62.08
Oct. 29	49.53	Oct. 16	56.15	Apr. 11	61.15
Nov. 5	49.33	Apr. 20, 1953	49.96	Nov. 8	64.97
Dec. 8	48.37	Oct. 26	59.77	Apr. 3, 1961	58.21
Jan. 9, 1948	47.30	Apr. 7, 1954	55.75	Nov. 10	57.72
Feb. 2	46.92	Oct. 18	70.12	Mar. 29, 1962	52.27
		B1-63-3d			
Apr. 25, 1934	46.72	Apr. 29, 1937	56.55	Apr. 26, 1939	60.07
Apr. 16, 1935	50.90	Jun. 11,	57.81	Oct. 26	65.01
Oct. 16	54.50	Oct. 29	62.28	Apr. 25, 1940	62.07
Apr. 24, 1936	53.20	May 11, 1938	60.06	Nov. 30	66.50
Nov. 13	58.25	Dec. 9	61.78		
		B1-63-3ddd			
Apr. 16, 1942	66.63	Sep. 3, 1942	63.60	Jul. 6, 1943	59.34
May 14	66.32	Oct. 8	63.06	Sep. 1	65.36
May 21	66.20	Nov. 18	62.19	Oct. 4	64.22
Jun. 8	65.53	Apr. 1, 1943	59.77	Nov. 16	62.75
Jul. 8	64.38	May 5	59.55	Apr. 27, 1944	58.55
Aug. 5	63.94	Jun. 1	59.22	Jan. 26, 1945	58.63
		B1-63-4ca			
May 15, 1942	66.55	Aug. 5, 1942	60.84	Nov. 18, 1942	60.80
Jun. 8	64.10	Sep. 2	61.00	Mar. 30, 1943	57.16
Jul. 6	61.75	Oct. 5	60.89	May 3	55.52

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-4ca (continued)			
Jun. 3, 1943	55.10	Sep. 2, 1943	58.34	Apr. 25, 1944	60.20
Jul. 7	55.49	Oct. 5	59.66	Nov. 8	59.50
Aug. 4	56.82	Nov. 17	59.65		
		B1-63-8aaa			
Oct. 14, 1959	36.18	Dec. 14, 1959	38.94	Apr. 11, 1960	30.89*
Nov. 5	37.94	Dec. 29	39.03	*(Water in Lord Reservoir)	
Nov. 25	38.58	Feb. 12, 1960	39.47	Nov. 10, 1961	29.76
Dec. 4	38.84	Mar. 9	39.70	Mar. 29, 1962	32.35
		B1-63-9aac			
May 19, 1942	63.99	Mar. 30, 1943	55.33	Oct. 6, 1943	56.85
Jun. 8	63.12	May 3	54.68	Nov. 17	56.35
Jul. 6	61.96	Jun. 3	54.23	Apr. 25, 1944	55.17
Oct. 5	59.11	Jul. 5	55.12	Nov. 8	56.23
Nov. 18	57.90				
		B1-63-9ad (Measuring point elevation unknown)			
May 19, 1942	62.55	Nov. 17, 1942	56.95	Jul. 6, 1943	54.18
Jun. 8	61.80	Mar. 31, 1943	54.58	Oct. 5	56.00
Jul. 7	60.71	May 4	54.06	Nov. 17	55.48
Sep. 3	59.60	Jun. 3	53.65	Apr. 25, 1944	53.95
Oct. 5	58.20				
		B1-63-9bdd			
Dec. 19, 1957	74.41	Oct. 14, 1959	70.68	Dec. 29, 1959	66.21
Jan. 7, 1958	73.56	Nov. 5	68.92	Feb. 12, 1960	65.12
Feb. 19	71.80	Nov. 25	67.46	Apr. 11	63.63
Apr. 3	69.52	Dec. 4	67.20	Nov. 10, 1961	58.80
Apr. 28	68.49	Dec. 14	66.89	Mar. 29, 1962	54.41
Jun. 2	68.74				
		B1-63-9ddc (recorder 10-21-59 to 6-10-60) (lowest daily water levels)			
May 14, 1942	63.08	Oct. 5, 1943	57.75	Sep. 19, 1947	54.04
May 22	63.19	Nov. 18	56.90	Oct. 8	53.37
Jun. 9	62.29	Apr. 25, 1944	55.23	Oct. 29	52.70
Aug. 5	60.17	Nov. 8	56.37	Nov. 5	51.81
Oct. 6	58.92	May 3, 1945	54.54	Dec. 8	51.54
Nov. 18	57.90	Oct. 31	58.24	Jan. 9, 1948	51.31
Mar. 31, 1943	55.88	Oct. 30, 1946	59.31	Feb. 2	50.30
Jun. 3	55.39	Apr. 30, 1947	56.15	Mar. 11	49.66

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B1-63-9ddc (recorder 10-21-59 to 6-10-60) (continued)
(lowest daily water levels)

Date	Water level	Date	Water level	Date	Water level
Apr. 12, 1948	49.05	Nov. 5, 1959	65.61	Dec. 29, 1959	62.62
Apr. 22	48.98	Nov. 6	65.46	Dec. 30	62.50
Jun. 4	48.64	Nov. 7	65.35	Dec. 31	62.43
Oct. 5	51.03	Nov. 8	65.22	Jan. 1, 1960	62.46
Nov. 8	50.57	Nov. 9	65.16	Jan. 2	62.50
Dec. 7	50.06	Nov. 10	65.09	Jan. 3	62.44
Feb. 15, 1949	49.68	Nov. 11	65.08	Jan. 4	62.39
Mar. 14	48.55	Nov. 12	64.92	Jan. 5	62.36
Apr. 15	48.14	Nov. 13	64.92	Jan. 6	62.28
May 9	48.50	Nov. 14	64.92	Jan. 7	62.24
Jun. 16	48.13	Nov. 15	64.69	Jan. 8	62.23
Oct. 18	48.44	Nov. 16	64.88	Jan. 9	62.20
Dec. 9	47.65	Nov. 17	64.80	Jan. 10	62.17
Feb. 1, 1950	46.44	Nov. 18	64.57	Jan. 11	62.06
Apr. 5	45.85	Nov. 19	64.46	Jan. 12	62.09
Oct. 13	52.53	Nov. 20	64.48	Jan. 13	62.10
Dec. 10	52.34	Nov. 21	64.38	Jan. 14	62.07
Apr. 18, 1951	51.70	Nov. 22	64.37	Jan. 15	62.02
Oct. 24	57.22	Nov. 23	64.26	Jan. 16	61.97
Apr. 3, 1952	54.51	Nov. 24	64.36	Jan. 17	61.96
Oct. 16	58.66	Nov. 25	64.09	Jan. 18	62.00
Apr. 20, 1953	54.26	Nov. 26	64.16	Jan. 19	61.91
Oct. 26	62.05	Nov. 27	64.09	Jan. 20	61.88
Apr. 7, 1954	58.40	Nov. 28	64.04	Jan. 21	61.88
Oct. 18	72.00	Nov. 29	63.91	Jan. 22	61.80
Apr. 1, 1955	64.8	Nov. 30	63.86	Jan. 23	61.77
Oct. 26,	74.25	Dec. 1	63.88	Jan. 24	61.68
Apr. 5, 1956	68.85	Dec. 2	63.80	Jan. 25	61.62
Nov. 13	79.14	Dec. 3	63.68	Jan. 26	61.64
Mar. 14, 1957	74.68	Dec. 4	63.69	Jan. 27	61.61
Oct. 11	74.95	Dec. 5	63.74	Jan. 28	61.71
Dec. 18	71.26	Dec. 6	63.56	Jan. 29	61.62
Jan. 7, 1958	70.36	Dec. 7	63.51	Jan. 30	61.48
Feb. 19	67.24	Dec. 8	63.52	Jan. 31	61.46
Mar. 10	64.55	Dec. 9	63.42	Feb. 1	61.40
Apr. 28	64.67	Dec. 10	63.36	Feb. 2	61.33
Jun. 2	63.20	Dec. 11	63.34	Feb. 3	62.41
Mar. 23, 1959	60.00	Dec. 12	63.33	Feb. 4	61.39
Oct. 14	67.01	Dec. 13	63.23	Feb. 5	61.32
Oct. 21,	66.64	Dec. 14	63.23	Feb. 6	61.32
Oct. 22	66.60	Dec. 15	63.18	Feb. 7	61.17
Oct. 23	66.62	Dec. 16	63.13	Feb. 8	61.12
Oct. 24	66.48	Dec. 17	63.13	Feb. 9	61.12
Oct. 25	66.34	Dec. 18	63.05	Feb. 10	61.15
Oct. 26	66.31	Dec. 19	63.05	Feb. 11	61.25
Oct. 27	66.14	Dec. 20	62.98	Feb. 12	61.20
Oct. 28	66.05	Dec. 21	62.89	Feb. 13	60.95
Oct. 29	65.98	Dec. 22	62.91	Feb. 14	61.03
Oct. 30	65.98	Dec. 23	62.81	Feb. 15	60.90
Oct. 31	65.86	Dec. 24	62.78	Feb. 16	60.90
Nov. 1	65.76	Dec. 25	62.63	Feb. 17	60.89
Nov. 2	65.66	Dec. 26	62.81	Feb. 18	60.78
Nov. 3	65.46	Dec. 27	62.78	Feb. 19	60.77
Nov. 4	65.64	Dec. 28	62.64	Feb. 20	60.78

Deptn to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum

Date	Water level	Date	Water level	Date	Water level
		B1-63-9ddc (recorder 10-21-59 to 6-10-60) (continued) (lowest daily water levels)			
Feb. 21, 1960	60.66	Mar. 20, 1960	59.76	Apr. 17	58.70
Feb. 22	60.72	Mar. 21	59.75	Apr. 18	58.50
Feb. 23	60.68	Mar. 22	59.70	Apr. 19	58.56
Feb. 24	60.60	Mar. 23	59.60	Apr. 20	58.58
Feb. 25	60.56	Mar. 24	59.53	Apr. 21	58.56
Feb. 26	60.51	Mar. 25	59.49	Apr. 22 *	
Feb. 27	60.52	Mar. 26	59.46	Apr. 27	58.46
Feb. 28	60.50	Mar. 27	59.40	Apr. 28	58.41
Feb. 29	60.46	Mar. 28	59.30	Apr. 29	58.42
Mar. 1	60.37	Mar. 29	59.38	Apr. 30	58.38
Mar. 2	60.38	Mar. 30	59.34	May 1	58.29
Mar. 3	60.40	Mar. 31	59.26	May 2, 1960	58.19
Mar. 4	60.27	Apr. 1	59.23	May 3	58.35
Mar. 5	60.29	Apr. 2	59.24	May 4	58.34
Mar. 6	60.23	Apr. 3	59.17	May 5	58.34
Mar. 7	60.18	Apr. 4	59.15	May 6	58.19
Mar. 8	60.10	Apr. 5	59.08	May 7	58.08
Mar. 9	60.04	Apr. 6	59.00	May 8	58.03
Mar. 10	60.15	Apr. 7	59.07	May 9	58.02
Mar. 11	60.08	Apr. 8	58.97	May 10	57.96
Mar. 12	60.08	Apr. 9	58.90	May 11	57.91
Mar. 13	60.07	Apr. 10	58.84	May 12	57.80
Mar. 14	60.01	Apr. 11	58.88	May 13 *	
Mar. 15	59.92	Apr. 12	58.84	Jun. 10	56.79
Mar. 16	59.90	Apr. 13	58.78	Nov. 8	59.48
Mar. 17	59.89	Apr. 14	58.70	Apr. 3, 1961	54.80
Mar. 18	59.81	Apr. 15	56.68	Nov. 10	54.81
Mar. 19	59.81	Apr. 16	58.71	Mar. 29, 1962	48.61
		B1-63-10bdd			
May 19, 1942	67.40	Mar. 31, 1943	60.52	Oct. 5, 1943	64.86
Jun. 8	66.83	Jun. 3	59.99	Nov. 17	62.58
Jul. 7	65.95	Jul. 6	62.30	Apr. 27, 1944	59.56
Oct. 6	64.80	Sep. 1	66.11	Nov. 8	61.68
Nov. 18	62.96				

* Nearby well pumping

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-10cdd			
Apr. 25, 1934	51.3	May 5, 1943	60.22	Mar. 14, 1949	53.19
Oct. 7	61.	Jun. 2,	60.05	Apr. 15	53.62
Oct. 21	59.	Jul. 5	62.22	May 9	52.81
Nov. 11	57.	Oct. 5	65.00	Jun. 16	52.90
Nov. 22	56.5	Nov. 18	62.42	Oct. 18	53.57
Dec. 1	56.	Apr. 25, 1944	59.80	Dec. 9	51.08
Apr. 16, 1935	55.2	Nov. 8	61.59	Apr. 5, 1950	50.95
Oct. 16	59.7	May 3, 1945	59.03	May 23	52.85
Feb. 15, 1936	55.3	Oct. 31	63.55	Oct. 13	58.98
Nov. 13	61.7	Apr. 24, 1946	62.08	Dec. 10	56.28
Apr. 29, 1937	60.1	Oct. 30	64.40	Apr. 18, 1951	54.33
Oct. 30	65.2	Apr. 30, 1947	60.62	Oct. 24	62.51
May 11, 1938	63.10	Sep. 19	59.70	Dec. 18, 1957	75.14
Dec. 9	64.12	Oct. 8	58.53	Jan. 7, 1958	74.20
Apr. 26, 1939	62.89	Oct. 29	57.42	Feb. 19	72.15
Oct. 26	67.25	Nov. 5	57.08	Apr. 3	70.38
Apr. 25, 1940	63.75	Dec. 8	56.17	Apr. 28	69.30
Nov. 30	67.55	Jan. 9, 1948	55.28	Jun. 2	68.43
May 5, 1941	65.61	Feb. 2	54.70	Oct. 14, 1959	74.31
Nov. 4	70.35	Mar. 11	54.07	Nov. 5	71.90
Apr. 16, 1942	67.41	Apr. 12	53.70	Nov. 25	70.06
May 14	67.10	Apr. 23	53.34	Dec. 4	69.28
May 22	66.91	Jun. 4	54.31	Dec. 14	68.43
Jun. 9	66.48	Jul. 1	54.38	Dec. 29	67.38
Jul. 6	65.60	Sep. 13	59.43	Feb. 12, 1960	65.20
Aug. 5	65.36	Oct. 5	58.65	Mar. 9	63.86
Sep. 2	65.47	Nov. 8	56.34	Apr. 11	62.18
Oct. 5	64.42	Dec. 7	55.16	Nov. 10, 1961	58.85
Nov. 18	62.58	Jan. 15, 1949	54.10	Mar. 29, 1962	52.00
Mar. 31, 1943	60.52	Feb. 15	53.55		
		B1-63-14cdd			
May 15, 1942	61.46	Sep. 2, 1942	58.20	May 5 1943	59.43
May 22	61.30	Oct. 6	57.84	Jun. 3	59.39
Jun. 9	60.64	Nov. 18	58.17	Jul. 6	59.77
Jul. 8	59.63	Mar. 30, 1943	59.17	Aug. 3	59.48
Aug. 3	58.85				
		B1-63-14d			
Nov. 8, 1944	58.07	May 3, 1945	59.21	Oct. 31, 1945	57.82
		B1-63-15ac			
May 14, 1942	76.46	Oct. 5, 1942	72.75	Oct. 5, 1943	72.83
Jun. 9	75.84	Nov. 18	71.18	Nov. 18	71.05
Jul. 6	74.63	Mar. 30, 1943	68.90	Apr. 25, 1944	68.85
Sep. 2	74.47	Jun. 3	68.75	Nov. 9	71.11

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-15dc			
May 5, 1943	84.88	Oct. 29, 1947	79.54	Jun. 2, 1958	88.25
Jun. 3	84.23	Nov. 5	79.02	Oct. 14, 1959	93.48
Sep. 1	89.70	Jan. 9, 1948	77.90	Nov. 5	91.92
Oct. 4	88.60	Feb. 2	77.45	Nov. 25	90.56
Nov. 18,	86.81	Mar. 11	77.30	Dec. 4	90.17
Apr. 25, 1944	84.56	Apr. 12	76.75	Dec. 14	89.69
Nov. 8	86.98	Jul. 1	76.98	Dec. 29	88.90
May 3, 1945	84.14	Dec. 18, 1957	100.20	Jan. 11, 1960	88.20
Oct. 31	90.65	Jan. 7, 1958	98.16	Feb. 12	86.00
Oct. 30,1946	90.48	Feb. 19,	94.78	Mar. 9	81.10
Apr. 30, 1947	82.62	Apr. 3	92.10	Apr. 11	75.80
Oct. 8	81.75	Apr. 28	90.40	Apr. 27	76.30
		B1-63-16ad			
May 15, 1942	78.97	Oct. 5, 1942	74.73	Oct. 5, 1943	75.45
Jun. 8	78.25	Nov. 18	73.75	Nov. 18	73.70
Jul. 6	76.02	Mar. 31, 1943	72.17	Apr. 25, 1944	71.92
Aug. 5	75.26	Jun. 3	72.00	Nov. 8	73.26
Sep. 2	75.88				
		B1-63-16bdd			
May 14, 1942	73.19	Apr. 25, 1944	66.16	Dec. 4, 1959	70.47
Jun. 9	71.53	Nov. 8	67.22	Dec. 14	70.11
Jul. 6	69.48	Dec. 18, 1957	80.60	Dec. 29	69.50
Sep. 3	68.52	Jan. 7, 1958	79.28	Jan. 11, 1960	68.77
Oct. 6	68.16	Feb. 19,	75.74	Feb. 12	67.49
Mar. 31, 1943	66.60	Apr. 3	72.36	Mar. 9	65.92
Jun. 3	66.37	Apr. 28	70.75	Apr. 11	64.31
Aug. 3	68.89	Jun. 2	68.58	Apr. 27	63.58
Sep. 1	70.35	Oct. 14, 1959	74.20	Nov. 10, 1961	60.83
Oct. 5	68.57	Nov. 5	72.40	Mar. 29, 1962	53.58
Nov. 18	67.60	Nov. 25	71.17		
		B1-63-16ddd			
Dec. 18, 1957	87.54	Nov. 5, 1959	81.79	Feb. 12, 1960	73.96
Jan. 7, 1958	85.49	Nov. 25	80.95	Mar. 9	70.36
Feb. 19	82.16	Dec. 4	80.74	Apr. 11	65.96
Apr. 3	78.32	Dec. 14	80.42	Apr. 27	64.36
Apr. 28	76.23	Dec. 29	79.52	Nov. 10, 1961	68.14
Jun. 2	72.88	Jan. 11, 1960	78.13	Mar. 29, 1962	56.07
Oct. 14, 1959	82.84				

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-17aab			
May 15, 1942	32.44	Jul. 6, 1943	31.55	Oct. 14, 1959	27.11
May 22	32.26	Aug. 3	31.61	Nov. 5	27.55
Jun. 9	31.29	Sep. 2	31.62	Dec. 4	27.48
Jul. 6	31.67	Oct. 5	31.52	Dec. 14	27.55
Aug. 5	31.68	Nov. 18	31.64	Dec. 29	27.64
Sep. 2	31.69	Apr. 25, 1944	31.66	Jan. 11, 1960	27.66
Oct. 6	31.51	Nov. 8	31.17	Feb. 12	27.78
Nov. 18	31.95	Dec. 18, 1957	28.49	Apr. 11	27.72
Mar. 31, 1943	32.44	Jan. 7, 1958	28.62	Nov. 10, 1961	21.96
May 5	32.66	Feb. 19	28.84	Mar. 29, 1962	23.95

B1-63-21daa (recorder)
(lowest daily water levels - Olds Well)

Nov. 3, 1959	90.11	Dec. 14 , 1959	88.10	Jan. 23, 1960	61.06
5	90.45	15	87.56	24	60.72
6	90.45	16	87.00	25	60.43
7	90.45	17	86.40	26	60.12
8	90.45	18	85.44	27	59.96
9	90.45	19	84.32	28	59.90
10	90.42	20	83.08	29	59.60
11	90.42	21	81.62	30	59.10
12	90.42	22	80.20	31	58.85
13	90.50	23	78.84	Feb. 1, 1960	58.64
14	90.50	24	77.22	2	58.20
15	90.50	25	75.95	3	58.16
16	90.56	26	75.16	4	57.95
17	90.56	27	74.22	5	57.66
18	90.56	28	73.37	6	57.37
19	90.47	29	72.44	7	57.07
20	90.47	30	71.60	8	56.75
21	90.47	31	70.84	9	56.48
22	90.48	Jan 1, 1960	70.21	10	56.48
23	90.54	2	69.62	11	56.35
24	90.54	3	68.94	12	56.16
25	90.54	4	68.28	13	55.64
26	90.54	5	67.60	14	55.44
27	90.70	6	67.60	15	55.24
28	90.64	7	67.12	16	54.87
29	90.56	8	66.68	17	54.78
30	90.62	9	66.21	18	54.57
Dec. 1, 1959	90.63	10	65.80	19	54.11
2	90.60	11	65.30	20	53.98
3	90.51	12	64.93	21	53.66
4	90.69	13	64.63	22	53.44
5	90.69	14	64.10	23	53.38
6	90.54	15	63.84	24	52.97
7	90.53	16	63.41	25	52.61
8	90.53	17	63.12	26	52.57
9	89.33	18	62.85	27	52.25
10	89.92	19	62.50	28	52.20
11	89.52	20	62.10	29	52.05
12	89.00	21	61.83	Mar. 1, 1960	51.59
13	88.40	22	61.43	2	51.44

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued)

(Measurements in feet below local land surface datum)

B1-63-21daa (recorder) (continued)
(lowest daily water levels - Olds Well)

Date	Water level	Date	Water level	Date	Water level
Mar. 3, 1959	51.20	Mar. 30, 1959	47.14	May 5, 1960	54.55
4	51.08	31	47.10	6	54.50
5	50.89	Apr. 1, 1960	46.75	7	54.12
6	50.75	2	46.67	8	54.07
8	50.08	3	46.40	9	54.24
9	50.16	4	46.18	10	54.50
10	50.44	5	46.10	11	54.78
11	50.36	6	45.95	12	55.12
12	50.17	7	45.96	13	55.54
13	50.17	8	45.86	14	55.70
14	50.05	12	46.05	15	55.84
15	49.96	13	46.17	16	55.75
16	49.81	14	46.10	17	55.60
17	49.72	15	45.95	18	55.34
18	49.64	16	46.18	19	55.01
19	49.46	17	46.18	20	54.32
20	49.26	18	45.96	21	53.86
21	48.98	19	46.00	22	53.24
22	48.77	27	50.44	23	52.57
23	48.55	28	51.52	24	52.08
24	48.42	29	52.53	25	51.73
25	48.20	30	53.36	26	51.12
26	47.87	May 1, 1960	54.06	27	50.76
27	47.62	2	54.24	28	50.60
28	47.48	3	54.37	Nov. 10, 1961	57.88
29	47.23	4	54.32		

B1-63-22adc

Date	Water level	Date	Water level	Date	Water level
Dec. 18, 1957	83.74	Oct. 14, 1959	84.01	Jan. 11, 1960	83.50
Jan. 7, 1958	91.55	Nov. 6	85.80	Feb. 12	80.18
Feb. 19	88.77	Nov. 25	85.16	Mar. 9	74.55
Apr. 3	85.73	Dec. 4	85.01	Apr. 11	68.07
Apr. 28	83.94	Dec. 14	84.80	Nov. 10, 1961	71.08
Jun. 2	80.68	Dec. 29	84.29	Mar. 29, 1962	58.55

B1-63-22bca

Date	Water level	Date	Water level	Date	Water level
Dec. 18, 1957	89.00	Oct. 14, 1959	90.38	Feb. 12, 1960	73.31
Jan. 7, 1958	88.25	Nov. 5	89.69	Apr. 11	62.39
Feb. 19	83.85	Nov. 25	89.22	Apr. 27	61.47
Apr. 3	79.16	Dec. 4	88.93	Nov. 11, 1961	69.41
Apr. 28	76.45	Dec. 29	85.76	Mar. 29, 1962	55.81
Jun. 2	71.63	Jan. 11, 1960	82.02		

B1-63-22da

Date	Water level	Date	Water level	Date	Water level
May 20, 1942	91.00	Sep. 3, 1942	89.20	Oct. 4, 1943	86.95
Jun. 9	89.75	Oct. 6	87.31	Dec. 21	85.80
Jun. 20	89.00	Mar. 30, 1943	83.87	Apr. 25, 1944	84.73
Jul. 6	88.11	Jun. 3	84.61	Nov. 8	86.60

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-22dcd			
Nov. 30, 1940	94.54	Mar. 11, 1948	79.14	Apr. 7, 1954	89.04
May 5, 1941	93.53	Apr. 12	78.49	Oct. 18	99.10
Nov. 4	97.22	Apr. 23	78.11	Apr. 1, 1955	94.49
Apr. 16, 1942	95.03	June 4	75.41	Apr. 5, 1956	98.14
May 14	92.86	Jul. 1	75.84	Nov. 13	105.4
May 22	93.24	Nov. 8	80.63	Mar. 14, 1957	104.9
June 9,	90.74	Dec. 7	80.05	Oct. 11	102.0
June 20	91.12	Jan. 15, 1949	79.23	Dec. 18	96.95
Jul. 6	89.25	Feb. 15	79.08	Jan. 7, 1958	94.94
Nov. 18	88.24	Mar. 14	78.97	Feb. 19	91.94
Mar. 30, 1943	86.68	Apr. 15	78.84	Mar. 31	87.4
May 5	86.34	May 9	78.69	Apr. 3	88.70
June 3	86.62	June 16	79.39	Apr. 28	86.09
Sep. 1	90.25	Jul. 12	79.80	Jun. 2	82.12
Nov. 18	88.41	Oct. 18	82.39	Nov. 10	84.3
Apr. 25, 1944	87.20	Dec. 9	80.93	Mar. 23, 1959	84.60
Nov. 8	88.49	Feb. 1, 1950	79.37	Oct. 14	89.45
May 3, 1945	86.85	Apr. 5	79.03	Dec. 4	89.10
Oct. 31	91.80	May 23	79.98	Dec. 14	88.98
Oct. 30, 1946	90.95	Oct. 13	86.99	Dec. 29	88.42
Apr. 30, 1947	83.01	Dec. 10	84.89	Jan. 11, 1960	87.31
Sep. 19	85.05	Apr. 18, 1951	83.52	Feb. 12	83.00
Oct. 8	81.66	Oct. 24	90.37	Mar. 9	77.98
Oct. 29	80.60	Apr. 20, 1952	84.71	Nov. 8	79.80
Nov. 5	80.40	Oct. 16	88.10	Apr. 3, 1961	77.45
Dec. 8	79.47	Apr. 20, 1953	84.71	Mar. 29, 1962	60.79
Feb. 2, 1948	79.07	Oct. 26	92.66		
		B1-63-27cb			
May 14, 1942	107.5	Aug. 5, 1942	103.1	Nov. 18, 1942	103.1
Jun. 9	105.8	Sep. 3	103.1	Mar. 30, 1943	102.50
Jul. 6	104.34	Oct. 6	102.6		
		B1-63-27db			
Apr. 16, 1942	104.4	Jun. 9, 1942	102.8	Jul. 6, 1942	101.3
May 15	103.5				
		B1-63-27dcb			
May 5, 1941	102.3	Nov. 8, 1944	97.63	Jun. 4, 1948	90.74
May 15, 1942	105.10	May 3, 1945	96.88	Jul. 1	90.42
Jul. 6	100.76	Oct. 31	100.53	Sep. 13	97.66
Sep. 3	101.20	Apr. 24, 1946	99.22	Oct. 5	93.67
Oct. 6	99.80	Oct. 30	99.50	Nov. 8	91.75
Nov. 18	98.67	Apr. 30, 1947	96.10	Dec. 7	91.45
Apr. 30, 1943	97.58	Oct. 8	94.23	Jan. 15, 1949	90.99
May 5	97.42	Oct. 29	92.45	Feb. 15	92.25
Jun. 3	97.13	Nov. 5	92.23	Mar. 14	91.10
Jul. 5	98.53	Dec. 8	91.87	Apr. 15	90.72
Oct. 4	99.34	Jan. 9, 1948	91.67	May 9	90.56
Nov. 18	98.13	Apr. 12	91.20	Jun. 16	90.39
Apr. 25, 1944	97.26	Apr. 23	90.98	Oct. 18	91.72

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-27dcb (continued)			
Dec. 9, 1949	90.91	Apr. 1, 1955	101.2	Oct. 14, 1959	102.34
Feb. 1, 1950	90.58	Oct. 26	107.2	Nov. 5	100.72
Apr. 5	90.50	Apr. 5, 1956	103.5	Dec. 14	99.36
May 23	91.03	Nov. 13,	111.7	Dec. 29	98.94
Oct. 13	96.39	Mar. 14, 1957	107.9	Jan. 11, 1960	98.61
Dec. 10	94.50	Oct. 11	109.9	Feb. 12	97.29
Apr. 18, 1951	94.48	Dec. 18	106.82	Mar. 9	95.57
Oct. 24	99.81	Jan. 7, 1958	106.14	Apr. 11	93.17
Apr. 3, 1952	95.44	Feb. 19	104.37	Apr. 27	92.08
Oct. 16	98.37	Mar. 31	103.1	Nov. 8	93.74
Apr. 20, 1953	95.02	Apr. 3	102.44	Apr. 3, 1961	91.29
Oct. 26	100.50	Apr. 28	101.20	Nov. 10	90.75
Apr. 7, 1954	97.90	Nov. 10	99.7	Mar. 28, 1962	82.84
Oct. 18	105.7	Mar. 23, 1959	97.20		
		B1-63-28aba			
May 15, 1942	82.90	Mar. 11, 1948	75.60	Apr. 7, 1954	81.50
May 22	81.32	Apr. 12	71.72	Oct. 18	81.93
Jun. 9	80.42	Apr. 23	69.20	Apr. 1, 1955	83.28
Jul. 6	81.25	Jun. 4	67.19	Oct. 26	77.97
Aug. 5	81.10	Jul. 1	68.62	Apr. 5, 1956	84.6
Sep. 3	82.05	Aug. 13	69.33	Nov. 13	84.2
Oct. 6	82.94	Sep. 13	70.33	Mar. 14, 1957	85.23
Nov. 18	83.57	Oct. 5	71.60	Oct. 11	76.9
Mar. 30, 1943	83.65	Nov. 8	75.18	Dec. 18	76.38
May 5	81.17	Dec. 7	75.00	Jan. 7, 1958	75.67
Jun. 3	81.40	Jan 15, 1949	75.30	Feb. 19	74.66
Jul. 5	81.34	Apr. 15	76.20	Mar. 31	70.90
Aug. 3	81.03	May 9	76.45	Apr. 28	67.60
Sep. 1	81.60	Jul. 12	75.55	Jun. 2	62.75
Oct. 4	82.52	Aug. 2	73.33	Mar. 23, 1959	77.90
Nov. 18	83.86	Oct. 18	73.72	Apr. 23	77.66
Apr. 25, 1944	84.81	Dec. 9	75.25	Oct. 14	75.59
Nov. 8	84.05	Feb. 1, 1950	76.04	Nov. 5	76.38
May 3, 1945	84.61	Apr. 5	76.59	Nov. 25	76.89
Oct. 31	84.44	May 23	76.69	Dec. 4	77.08
Apr. 24, 1946	78.82	Aug. 3	76.83	Dec. 14	77.22
Oct. 30	84.41	Oct. 13	77.95	Dec. 29	76.68
Apr. 30, 1947	70.36	Dec. 10	77.62	Jan. 11, 1960	75.71
Sep. 22	72.79	Feb. 7, 1951	77.87	Feb. 12	67.13
Oct. 8	72.70	Apr. 18	78.04	Mar. 9	61.60
Oct. 29	73.22	Oct. 24	79.90	Apr. 27	55.22
Nov. 5	72.20	Apr. 3, 1952	76.40	Nov. 8	70.69
Dec. 8	73.54	Oct. 16	75.95	Apr. 3, 1961	71.42
Jan. 9, 1948	74.60	Apr. 20, 1953	78.30	Nov. 10	67.57
Feb. 2	76.85	Oct. 26	78.8	Mar. 28, 1962	47.06
		B1-63-29abb			
Oct. 14, 1959	50.94	Dec. 14, 1959	50.07	Mar. 9, 1960	48.58
Nov. 5	50.60	Dec. 29	49.89	Apr. 11	48.05
Nov. 25	50.19	Jan. 11, 1960	49.69	Nov. 10, 1961	45.05
Dec. 4	50.18	Feb. 12	49.34		

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued)

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B1-63-34bbb			
Oct. 14, 1959	113.84	Jan. 11, 1960	111.69	Apr. 27, 1960	105.53
Nov. 5	113.07	Feb. 12,	110.66	Nov. 10	102.90
Dec. 14	112.29	Mar. 9	108.96	Mar. 28, 1962	97.50
Dec. 29	112.05	Apr. 11,	106.57		
		B2-62-6bc			
1937	"10' to ground-water level."	Oct. 9, 1942	6.90	Nov. 16, 1943	7.22
		Nov. 17	6.41	Apr. 26, 1944	5.78
May 21, 1942	4.78	May 4, 1943	5.79	Nov. 10	7.80
Jun. 10	4.98	Sep. 2	7.06		
		B2-62-6cb			
Nov. 6, 1947	11.98	Oct. 5, 1948	13.12	Jul. 12, 1949	8.94
Dec. 8	11.95	Nov. 4	12.90	Oct. 18	11.09
Jan. 9, 1948	11.80	Dec. 7	12.44	Dec. 9	10.48
Feb. 2	11.80	Jan. 15, 1949	12.37	Feb. 1, 1950	10.68
Mar. 11	11.96	Feb. 15	12.73	Apr. 5	10.72
Apr. 12	11.92	Mar. 14	12.19	May 23	10.48
Jun. 5	11.79	Apr. 15	11.99	Aug. 3	11.94
Jul. 1	12.29	May 9	11.94	Oct. 13	12.04
Aug. 5	12.97	Jun. 6	10.92	Dec. 10	12.02
Sep. 13	13.08				
		B2-62-6cd			
Apr. 3, 1952	11.77	Apr. 1, 1955	14.22	Oct. 11, 1957	15.38
Oct. 16	13.25	Oct. 26	14.36	Mar. 31, 1958	15.02
Apr. 20, 1953	12.37	Spring 1956	14.0	Nov. 10	15.73
Oct. 26	14.05	Fall 1956	15.6	Mar. 23, 1959	15.32
Apr. 7, 1954	13.46	Mar. 14, 1957	15.20	Nov. 13	15.88
Oct. 18	15.03	Oct. 11	15.38		
		B2-62-7cc			
Sep. 23, 1947	19.50	Nov. 4	20.17	Aug. 2, 1949	17.48
Oct. 9	19.00	Dec. 7	20.07	Oct. 18	18.23
Nov. 5	19.12	Jan. 15, 1949	19.57	Dec. 9	18.30
Dec. 8	19.20	Feb. 15	20.10	Feb. 1, 1950	18.36
Apr. 12, 1948	18.98	Mar. 15	19.99	Apr. 5	18.36
Jun. 5	19.08	Apr. 15	19.99	May 23	18.09
Aug. 5	20.01	May 9	19.82	Oct. 13	19.72
Sep. 13	20.27	Jun. 13	18.97	Dec. 10	19.59
Oct. 5, 1948	20.07	Jul. 12	17.25		

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B2-62-18cbc

Date	Water level	Date	Water level	Date	Water level
Apr. 23, 1936	17.9	Nov. 5, 1947	24.75	Apr. 3, 1952	25.65
Sep. 9	19.0	Dec. 8	24.60	Oct. 16	27.32
Nov. 12	19.1	Jan. 9, 1948	24.74	Apr. 20, 1953	26.50
Apr. 29, 1937	19.4	Feb. 2	24.63	Oct. 26	28.41
Jun. 11	19.6	Mar. 11	24.48	Apr. 7, 1954	27.74
Oct. 29	20.6	Apr. 23	24.15	Oct. 18	30.70
May 11, 1938	20.6	Jul. 1	24.94	Apr. 1, 1955	30.06
Dec. 9	21.8	Aug. 5	25.63	Oct. 26	30.65
Apr. 26, 1939	20.9	Sep. 13	25.53	Spring 1956	30.2
Oct. 26	22.1	Oct. 14	25.65	Fall 1956	33.4
Apr. 25, 1940	22.4	Nov. 4	25.67	Mar. 14, 1957	32.95
Oct. 30	23.4	Dec. 7	25.68	Oct. 11	34.35
Nov. 30	23.27	Jan. 15, 1949	25.78	Mar. 31, 1958	33.20
May 5, 1941	23.6	Feb. 15	25.75	Nov. 10	34.10
Nov. 4	24.1	Mar. 15	25.52	Mar. 23, 1959	34.19
Apr. 15, 1942	24.3	Apr. 15	25.49	Oct. 14	36.32
Mar. 31, 1943	23.1	May 9	25.48	Nov. 6	35.84
Nov. 16	24.3	Jun. 13	24.86	Nov. 11	35.84
May 3, 1945	24.7	Jul. 12	23.47	Nov. 25	35.69
Oct. 10	25.4	Oct. 18	24.04	Dec. 4	35.57
Apr. 23, 1946	25.06	Dec. 9	23.87	Dec. 16	35.48
Oct. 31	24.40	Feb. 1, 1950	23.78	Mar. 9, 1960	35.05
Apr. 29, 1947	24.30	Apr. 5	23.54	Nov. 8	36.80
Sep. 23	25.08	May 23	23.38	Apr. 3, 1961	35.79
Oct. 9	24.94	Oct. 13	25.29	Nov. 10	36.41
Oct. 29	24.43	Dec. 10	25.15	Mar. 29, 1962	35.46

B2-62-18ccc
(Measuring point elevation unknown)

Date	Water level	Date	Water level	Date	Water level
May 21, 1942	34.42	Jul. 7, 1942	34.02	Oct. 9, 1942	34.64
Jun. 11	34.38	Sep. 4	34.97	Nov. 17	34.41

B2-62-19cdc

Date	Water level	Date	Water level	Date	Water level
Jul. 30, 1930	27.7	Jul. 2, 1936	26.2	Apr. 25, 1940	31.95
Jun. 3, 1933	25.01	Sep. 9	26.2	Nov. 30	33.00
Oct. 11	24.96	Nov. 12	27.17	May 2, 1941	34.57
Apr. 24, 1934	24.92	Apr. 29, 1937	27.44	Nov. 4	35.42
Aug. 7	25.80	Oct. 29	28.90	Apr. 15, 1942	34.65
Oct. 2	25.3	May 11, 1938	29.75	May 21, 1942	34.51
Apr. 16, 1935	26.50	Dec. 9	31.05	Jun. 9	34.95
Oct. 16	25.7	Apr. 26, 1939	30.72	Jun. 12	35.20
Apr. 23, 1936	25.90	Oct. 26	31.55	Jul. 7	35.02

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B2-62-19cdc (continued)

Date	Water level	Date	Water level	Date	Water level
Aug. 4	35.41	Mar. 11, 1948	35.92	Oct. 26, 1953	40.57
Sep. 4	35.47	Apr. 12	35.38	Apr. 7, 1954	39.10
Oct. 9	34.61	Apr. 23	35.21	Oct. 18	42.51
Nov. 17	34.29	Jun. 5	38.28	Apr. 1, 1955	41.04
Mar. 31, 1943	33.88	Jul. 1	37.56	Oct. 26	50.72
May 4	33.82	Oct. 5	40.11	Mar. 14, 1957	47.00
Jun. 1	33.82	Nov. 1	38.15	Oct. 11	49.13
Aug. 5	37.00	Dec. 7	35.63	Mar. 31, 1958	47.93
Sep. 2	37.03	Jan. 15, 1949	37.25	Nov. 10	48.10
Oct. 6	35.95	Feb. 15	37.06	Mar. 23, 1959	46.65
Nov. 16	35.69	Jun. 16	35.58	Oct. 14	51.53
Apr. 26, 1944	35.98	Aug. 2	38.35	Nov. 6	49.90
Nov. 9	35.93	Oct. 18	37.35	Nov. 11	49.90
May 3, 1945	35.38	Dec. 9	35.55	Nov. 25	49.30
Oct. 30	37.17	Feb. 1, 1950	35.56	Dec. 4	49.00
Apr. 23, 1946	36.08	Apr. 5	35.47	Dec. 16	48.70
Oct. 31	36.21	Oct. 13	39.23	Dec. 29	48.47
Apr. 29, 1947	35.32	Dec. 10	37.97	Feb. 12, 1960	48.09
Sep. 23	38.65	Apr. 18, 1951	36.19	Apr. 11	47.65
Oct. 29	36.98	Apr. 24	38.52	Nov. 8	50.53
Nov. 5, 1947	37.15	Apr. 3, 1952	37.20	Apr. 3, 1961	48.43
Dec. 8	36.57	Oct. 16	40.62	Nov. 10	49.70
Jan. 9, 1948	36.30	Apr. 20, 1953	37.88	Mar. 29, 1962	48.29
Feb. 2	36.12				

B2-62-30cb

Date	Water level	Date	Water level	Date	Water level
May 21, 1942	44.77	Nov. 17, 1942	44.40	Sep. 2, 1943	45.54
Jun. 9	45.07	Apr. 1, 1943	44.50	Oct. 6	45.73
Jul. 7	44.88	May 4	44.43	Nov. 16	45.52
Aug. 4	45.00	Jun. 1	44.41	Apr. 26, 1944	45.41
Sep. 3	45.16	Jul. 9	45.35	Nov. 9	46.23
Oct. 9	45.04	Aug. 5	45.25		

B2-62-30dcc

Date	Water level	Date	Water level	Date	Water level
May 21, 1942	37.40	Nov. 17, 1942	37.41	Sep. 2, 1943	37.81
Jun. 9	37.39	Apr. 1, 1943	37.62	Oct. 6	37.90
Jul. 7	37.41	May 4	37.56	Nov. 16	38.00
Aug. 4	37.42	Jun. 1	37.61	Apr. 26, 1944	38.33
Sep 3	37.46	Jul. 9	37.71	Nov. 9	38.72
Oct. 9	37.48	Aug. 5	37.75		

B2-62-31ba

Date	Water level
Mar. 29, 1962	51.42

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B2-63-1dbd			
Mar. 29, 1962	13.20				
		B2-63-11aa			
May 21, 1942	4.15	Mar. 31, 1943	5.13	Oct. 6, 1943	6.16
Jun. 10	4.17	May 4	4.96	Nov. 16	6.18
Aug. 4	4.75	Aug. 5	5.62	Apr. 26, 1944	5.31
Nov. 17	5.04				
		B2-63-13acd			
May 21, 1942	21.78	Apr. 1, 1943	22.42	Sep. 2, 1943	23.75
Jul. 7	20.19	May 4	22.48	Oct. 6	24.03
Aug. 4	20.39	Jun. 3	22.49	Nov. 16	23.77
Sep. 4	21.08	Jul. 9	22.88	Apr. 26, 1944	23.78
Oct. 9	20.71	Aug. 5	23.25	Nov. 10	24.15
Nov. 17	20.50				
		B2-63-15-cb			
May 22, 1942	11.18	Nov. 17, 1942	12.48	Aug. 4, 1943	12.89
Jul. 7	11.77	Mar. 31, 1943	12.76	Sep. 2	12.73
Aug. 4	10.94	May 4	12.70	Oct. 5	13.42
Sep. 4	11.39	Jun. 3	12.53	Nov. 17	13.90
Oct. 8	12.24	Jul. 8	12.97	Apr. 27, 1944	13.74
		B2-63-15ddc			
May 5, 1941	21.05	Nov. 5, 1947	21.03	May 23, 1950	22.95
Nov. 4	22.30	Dec. 8	20.55	Oct. 13	21.80
Apr. 15, 1942	21.82	Jan. 9, 1948	20.36	Dec. 10	20.83
May 21	19.30	Feb. 2	20.19	Apr. 18, 1951	19.79
Aug. 4	19.96	Mar. 11	19.92	Oct. 24	21.72
Oct. 8	19.03	Apr. 12	19.70	Apr. 3, 1952	20.90
Nov. 17	18.80	Apr. 23	22.76	Oct. 16	24.93
Mar. 31, 1943	19.10	Oct. 5	28.48	Apr. 20, 1953	21.96
Jun. 2	19.66	Nov. 4	27.08	Oct. 26	25.34
Jul. 8	22.49	Dec. 7	22.59	Apr. 7, 1954	24.09
Oct. 5	22.24	Jan. 15, 1949	21.47	Oct. 18	28.89
Nov. 17	21.47	Feb. 15	21.49	Apr. 1, 1955	27.16
Apr. 27, 1944	20.21	Mar. 15	21.40	Oct. 26	29.55
Nov. 10	21.45	Apr. 15	21.13	Spring 1956	28.4
May 3, 1945	20.68	May 9	20.66	Fall	33.3
Oct. 30	22.38	Jun. 16	16.48	Mar. 14, 1957	31.85
Apr. 23, 1946	22.80	Jul. 12	23.48	Oct. 11	35.65
Oct. 31	23.00	Oct. 18	19.20	Mar. 31, 1958	31.62
Apr. 29, 1947	21.02	Dec. 9	18.98	Nov. 10	34.15
Oct. 9	26.32	Feb. 1, 1950	18.56	Mar. 23, 1959	32.40
Oct. 29	21.30	Apr. 5	18.08	Oct. 14	38.25

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B2-63-15ddc (continued)			
Nov. 6, 1959	36.77	Dec. 29, 1959	35.04	Apr. 3, 1961	34.66
Nov. 25	35.98	Feb. 12, 1960	34.42	Nov. 10	35.40
Dec. 4	35.80	Apr. 11	33.53	Mar. 29, 1962	32.92
Dec. 16	35.37	Nov. 8	38.00		
		B2-63-21ab			
May 22, 1942	19.67	Nov. 17, 1942	17.82	Sep. 2, 1943	18.68
Jun. 10	19.01	Mar. 31, 1943	17.95	Oct. 5	19.22
Jul. 9	18.31	May 4	17.95	Nov. 17	19.59
Aug. 4	17.72	Jun. 3	18.13	Apr. 28, 1944	12.59
Sep. 4	17.38	Jul. 8	18.36	Nov. 10	20.20
Oct. 8	17.74	Aug. 4	18.32		
		B2-63-22 ac (Measuring point elevation unknown)			
May 21, 1942	28.73	Nov. 17, 1942	27.10	Nov. 17, 1943	30.11
Jun. 10	28.01	Apr. 1, 1943	27.90	Nov. 10, 1944	29.77
Oct. 8	27.89	May 4	27.08		
		B2-63-22ad			
May 21, 1942	29.90	Mar. 31, 1943	28.54	Oct. 5, 1943	34.31
Jun. 10	29.11	Apr. 1	28.22	Nov. 17	30.95
Jul. 9	29.30	May 4	27.96	Apr. 27, 1944	29.31
Oct. 8	29.10	Jun. 2	28.99	Nov. 10	30.54
Nov. 17	27.95				
		B2-63-22ccd			
May 22, 1942	34.38	Sep. 23, 1947	35.40	Jun. 16, 1949	30.38
Jun. 10	32.86	Oct. 8	34.36	Oct. 18	32.82
Jul. 7	30.96	Oct. 29	33.02	Dec. 9	29.69
Aug. 5	32.77	Nov. 5	32.70	Feb. 1, 1950	28.87
Sep. 4	33.87	Dec. 8	31.80	Apr. 5	28.56
Oct. 8	33.08	Jan. 9, 1948	31.40	May 23	30.20
Nov. 17	32.11	Feb. 2	30.97	Oct. 13	35.65
Mar. 31, 1943	31.48	Mar. 11	30.75	Dec. 10	33.39
May 4	31.37	Apr. 12	30.35	Apr. 18, 1951	30.81
Jul. 8	34.45	Jul. 1	32.79	Oct. 24	36.75
Aug. 4	36.13	Sep. 13	38.38	Apr. 3, 1952	32.78
Sep. 2	37.33	Oct. 5	37.57	Oct. 16	39.43
Nov. 17	35.30	Nov. 4	34.96	Apr. 20, 1953	33.96
Apr. 26, 1944	32.98	Dec. 7	33.72	Oct. 26	42.08
Nov. 10	34.66	Jan. 15, 1949	32.92	Apr. 7, 1954	37.03
May 3, 1945	32.30	Feb. 15	32.28	Oct. 18	45.40
Oct. 30	35.96	Mar. 15	31.73	Apr. 1, 1955	41.94
Oct. 31, 1946	37.51	Apr. 15	31.65	Oct. 26	52.42
Apr. 29, 1947	33.47	May 9	31.70	Spring 1956	46.1

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B2-63-22ccd (continued)			
Fall 1956	53.2	Nov. 6, 1959	53.99	Mar. 9, 1960	49.10
Mar. 14, 1957	51.54	Nov. 25	52.92	Apr. 11	48.28
Oct. 11	60.0	Dec. 4	52.46	Nov. 8	54.58
Mar. 31, 1958	47.35	Dec. 16	51.91	Apr. 3, 1961	49.08
Mar. 23, 1959	50.00	Dec. 29	52.35	Nov. 10	51.42
Oct. 14	55.39	Feb. 12, 1960	49.85	Mar. 29, 1962	46.07

B2-63-22dc

Date	Water level	Date	Water level	Date	Water level
Jun. 2, 1933	22.84	Nov. 17, 1943	38.65	Apr. 23, 1948	34.58
Oct. 11	25.03	Apr. 26, 1944	36.00	Jul. 1	37.55
Apr. 24, 1934	24.0	Nov. 10	37.96	Oct. 5	43.53
Apr. 24, 1936	29.0	May 3, 1945	35.50	Nov. 4	39.11
Oct. 26, 1939	36.2	Oct. 30	39.43	Dec. 7	37.77
Dec. 4, 1940	38.7	Apr. 23, 1946	39.65	Jan. 15, 1949	36.58
May 1, 1941	37.40	Oct. 31	41.16	Feb. 15	36.02
Nov. 10	40.59	Apr. 29, 1947	36.30	Mar. 15	35.58
Apr. 15, 1942	38.7	Sep. 23	41.54	Apr. 15	35.59
May 22	37.5	Oct. 9	39.00	May 9	35.54
Jun. 10	36.15	Oct. 29	36.60	Jun. 16	34.11
Jul. 7	34.69	Nov. 5	36.20	Oct. 18	35.39
Oct. 8	36.62	Dec. 8	35.09	Dec. 9	33.07
Nov. 17	35.10	Jan. 9, 1948	34.67	Feb. 1, 1950	32.32
Mar. 31, 1943	34.68	Feb. 2	34.38	Apr. 5	32.50
May 4	34.57	Mar. 11	33.91	Dec. 10	36.96
Oct. 5	42.43	Apr. 12	33.66	Apr. 18, 1951	34.15

B2-63-23 ccc

Date	Water level	Date	Water level	Date	Water level
May 22, 1942	38.10	Oct. 8, 1942	37.72	Jun. 2, 1943	36.45
Jun. 10	37.50	Nov. 17	36.06	Nov. 17	39.62
Jul. 7	35.86	Mar. 31, 1943	35.24	Apr. 26, 1944	36.90
Aug. 4	37.78	May 4	35.70	Nov. 10	38.82
Sep. 3	39.38				

B2-63-23dcd

Date	Water level	Date	Water level	Date	Water level
Jul. 15, 1942	46.97	Nov. 5, 1947	46.63	Mar. 15, 1949	46.75
Aug. 8	45.60	Dec. 8,	45.52	Apr. 15	46.29
Sept. 3	45.81	Jan. 9, 1948	45.31	May 9	45.99
Oct. 8	46.61	Feb. 2	44.95	Jun. 16	45.57
Nov. 17	46.20	Mar. 11	44.60	Aug. 2	47.55
Apr. 26, 1944	46.89	Jun. 5	44.28	Dec. 9	43.78
Nov. 10	47.85	Jul. 1	45.46	Feb. 1, 1950	43.80
May 3, 1945	46.65	Aug. 23	48.04	Apr. 5	43.28
Oct. 30	49.32	Sep. 13	48.60	May 23	44.40
Oct. 31, 1946	49.72	Oct. 5	50.15	Oct. 13	48.72
Apr. 29, 1947	47.16	Nov. 4	49.43	Dec. 10	47.39
Sep. 22	47.60	Dec. 7	48.51	Apr. 18, 1951	45.45
Oct. 9	46.61	Jan. 15, 1949	47.66	Oct. 24	50.50
Oct. 29	46.73	Feb. 15	48.18	Apr. 3, 1952	48.30

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
B2-63-23dcd (continued)					
Oct. 16, 1952	52.23	Mar. 14, 1957	60.24	Dec. 16, 1959	61.98
Apr. 20, 1953	48.30	Oct. 12	62.40	Dec. 29	61.67
Oct. 26	54.18	Mar. 31, 1958	58.50	Feb. 12, 1960	60.78
Apr. 7, 1954	50.56	Nov. 10	61.54	Apr. 11	59.77
Oct. 18	58.16	Mar. 23, 1959	59.90	Nov. 8	63.32
Apr. 1, 1955	54.47	Oct. 14	63.90	Apr. 3, 1961	60.59
Oct. 26	61.72	Nov. 6	63.03	Nov. 10	61.41
Spring 1956	56.6	Nov. 25	62.53	Mar. 29, 1962	59.64
Fall	63.6	Dec. 4	62.30		
B2-63-25cc (Measuring point elevation unknown)					
May 21, 1942	50.45	Nov. 17, 1942	49.67	Oct. 6, 1943	51.41
Jun. 9	50.43	Apr. 1, 1943	48.17	Nov. 6	50.46
Aug. 4	51.71	May 4	47.90	Apr. 26, 1944	48.52
Sep. 3	52.00	Jun. 1	48.22	Nov. 9	49.76
Oct. 7	50.43	Sep. 3	52.14		
B2-63-25dbb					
May 21, 1942	40.39	Nov. 17, 1942	39.67	Sep. 3, 1943	43.81
Jun. 9	40.25	Apr. 1, 1943	41.87	Oct. 6	43.92
Jul. 7	40.06	Jun. 1	41.57	Nov. 16	43.71
Sep. 3	40.99	Jul. 9	42.36	Apr. 28, 1944	42.75
Oct. 8	40.06	Aug. 5	43.45	Nov. 9	43.57
B2-63-25dcc					
Dec. 4, 1940	40.81	Sep. 3, 1942	42.04	Sep. 3, 1943	41.69
May 5, 1941	40.60	Oct. 8	41.83	Oct. 6	42.03
Nov. 4	42.70	Nov. 17	41.52	Nov. 16	42.00
Apr. 16, 1942	42.51	Apr. 1, 1943	40.52	Apr. 26, 1944	40.87
May 21	42.36	May 4	40.12	Nov. 9	41.32
Jun. 9	42.16	Jun. 1	40.07	May 3, 1945	39.78
Jul. 7	41.87	Jul. 9	40.44	Oct. 30	41.89
Aug. 4	41.83	Aug. 5	41.12		
B2-63-26acd (Measuring point elevation unknown)					
May 21, 1942	49.01	Nov. 17, 1942	48.08	Oct. 6, 1943	51.57
Jun. 9	48.15	Apr. 1, 1943	46.41	Nov. 17	50.23
Jul. 7	47.66	May 4	46.10	Apr. 27, 1944	47.47
Oct. 8	48.94	Jun. 1	46.55		

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B2-63-26bc			
May 22, 1942	51.02	Nov. 17, 1942	50.23	Oct. 6, 1943	56.70
Jun. 9	50.49	Mar. 31, 1943	48.20	Nov. 17	53.48
Jul. 7	49.44	May 4	47.71	Apr. 27, 1944	49.66
Oct. 8	52.15	Jun. 2	47.85	Nov. 10	52.59
		B2-63-26dd (Measuring point elevation unknown)			
May 20, 1942	51.31	Nov. 17, 1942	51.42	Oct. 6, 1943	54.70
Jun. 9	50.73	Apr. 1, 1943	48.62	Nov. 17	52.60
Jul. 7	50.19	May 4	48.22	Apr. 27, 1944	49.50
Sep. 3	53.31	Jun. 1	48.62	Nov. 9	52.46
Oct. 7	52.08	Jul. 9	49.78		
		B2-63-27ad			
May 22, 1942	43.92	Apr. 1, 1943	40.06	Nov. 17, 1943	45.60
Aug. 5	43.18	Jun. 1	40.26	Apr. 27, 1944	41.43
Oct. 8	43.26	Oct. 5	47.64	Nov. 10	44.82
Nov. 17	41.73				
		B2-63-27bc			
May 22, 1942	38.29	Nov. 17, 1942	36.05	Sep. 2, 1943	40.52
Jun. 10	37.52	Mar. 31, 1943	35.06	Oct. 5	41.16
Jul. 7	35.35	May 4	34.83	Nov. 17	39.05
Sep. 4	37.20	Jun. 3	35.71	Apr. 28, 1944	36.28
Oct. 8	36.90				
		B2-63-27cd			
May 20, 1942	53.15	Oct. 7, 1942	50.96	Oct. 5, 1943	53.90
Jun. 9	52.40	Nov. 17	50.04	Nov. 17	52.22
Jul. 7	50.95	Mar. 31, 1943	48.13	Apr. 27, 1944	48.90
Aug. 5	50.65	May 4	47.68	Nov. 9	51.63
Sep. 4	52.03	Jun. 1	47.83		
		B2-63-28bc			
May 22, 1942	31.08	Nov. 17, 1942	28.62	Aug. 4, 1943	28.06
Jun. 10	30.87	Mar. 31, 1943	28.33	Sep. 2	28.86
Jul. 9	30.49	May 4	28.21	Nov. 17	27.84
Aug. 5	29.89	Jun. 3	27.94	Apr. 28, 1944	28.00
Sep. 4	29.22	Jul. 8	27.61	Nov. 10	26.45
Oct. 8	28.83				

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date		Water level	Date		Water level	Date		Water level
				B2-63-28dcd				
May	19, 1942	49.55	Mar.	31, 1943	43.78	Dec.	21, 1943	46.22
Sep.	2	48.73	May	3	43.34	Apr.	27, 1944	44.17
Oct.	7	46.72	May	31	43.97	Nov.	9	46.11
Nov.	17	45.62	Oct.	5	48.70			
				B2-63-28ddd				
May	19, 1942	44.29	Apr.	11, 1948	35.47	Oct.	26, 1953	48.57
Sep.	2	44.77	Apr.	23	35.27	Apr.	7, 1954	44.63
Oct.	7	41.78	Jun.	5	38.27	Oct.	18	57.18
Nov.	17	40.69	Oct.	5	42.92	Apr.	1, 1955	50.79
Apr.	30, 1943	38.83	Nov.	8	40.55	Oct.	26	62.37
May	3	38.35	Dec.	7	39.33	Spring	1956	54.8
June	3	38.61	Jan.	15, 1949	38.25	Fall		63.9
Oct.	5	44.92	Feb.	15	37.55	Mar.	14, 1957	59.88
Nov.	17	42.63	Mar.	15	37.14	Oct.	11	60.2
Dec.	21	41.68	Apr.	15	36.61	Mar.	31, 1958	55.22
Apr.	27, 1944	39.44	May	9	36.35	Nov.	10	59.10
Nov.	9	41.83	Jun.	16	35.29	Mar.	23, 1959	54.87
May	3, 1945	39.25	Aug.	2	39.72	Oct.	14	61.18
Oct.	31	42.24	Oct.	18	37.68	Nov.	6	59.95
Oct.	31, 1946	44.73	Dec.	9	34.95	Dec.	4	58.94
Apr.	29, 1947	40.18	Feb.	1, 1950	33.68	Dec.	16	58.53
Sep.	22	40.92	Apr.	5	33.68	Dec.	29	58.10
Oct.	9	39.97	Aug.	3	43.61	Feb.	12, 1960	56.74
Oct.	29	38.72	Oct.	13	42.79	Mar.	9	55.97
Nov.	5	38.40	Dec.	10	39.78	Apr.	11	54.99
Dec.	8	37.54	Apr.	18, 1951	36.21	Nov.	8	59.77
Jan.	9, 1948	36.91	Oct.	24	44.56	Apr.	3, 1961	54.82
Feb.	2	36.44	Oct.	16, 1952	46.71	Nov.	10	55.47
Mar.	11	35.92	Apr.	20, 1953	41.36	Mar.	29, 1962	50.17
				B2-63-32aaa				
Apr.	25, 1934	22.71	Oct.	9, 1940	35.20	Aug.	5, 1943	33.53
Jun.	19	23.05	Nov.	30	35.73	Sep.	2	33.04
Oct.	3	24.04	May	5, 1941	36.20	Oct.	5	32.69
Apr.	16, 1935	24.83	Nov.	4	36.80	Nov.	17	32.57
Oct.	16	25.68	Apr.	16, 1942	37.43	Apr.	27, 1944	32.85
Apr.	23, 1936	26.91	May	16	37.35	Nov.	8	31.18
July	2	27.28	May	22	37.29	May	3, 1945	31.25
Sep.	9	27.70	Jun.	9	37.17	Oct.	31	30.89
Nov.	13	27.90	Jul.	6	36.85	Apr.	24, 1946	31.38
Apr.	29, 1937	28.88	Aug.	3	36.52	Oct.	31	31.84
Jun.	11	29.08	Sep.	2	36.09	Apr.	29, 1947	32.06
Oct.	30	30.41	Oct.	8	35.46	Sep.	22	30.92
May	11, 1938	32.02	Nov.	17	34.90	Oct.	9	30.45
Dec.	9	33.36	Apr.	31, 1943	34.23	Oct.	29	29.79
Apr.	26, 1939	33.03	May	3	34.08	Nov.	5	30.13
Oct.	26	33.65	May	31	34.05	Dec.	8	29.78
Apr.	25, 1940	34.65	Jul.	7	33.75	Jan.	9, 1948	29.78

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date	Water level	Date	Water level	Date	Water level
		B2-63-32aaa (continued)			
Feb. 2, 1948	29.60	Aug. 2, 1949	27.37	Oct. 18, 1954	32.97
Mar. 11	29.70	Oct. 18, 1949	25.97	Apr. 1, 1955	34.77
Apr. 12	29.60	Dec. 9	25.79	Oct. 26, 1955	36.38
Apr. 23	29.09	Feb. 1, 1950	26.06	Spring 1956	37.3
Jun. 5	29.51	Apr. 5	26.19	Fall 1956	38.3
Jul. 1	29.26	May 23	26.23	Oct. 14, 1959	35.37
Sep. 13	28.57	Aug. 3	26.45	Nov. 5	35.34
Oct. 5	28.32	Oct. 13	26.49	Nov. 25	35.33
Nov. 8	28.17	Dec. 10	26.80	Dec. 4, 1959	35.36
Dec. 7	28.03	Apr. 18, 1951	27.56	Dec. 16	35.35
Jan. 15, 1949	28.19	Oct. 24	28.97	Dec. 29	35.40
Feb. 15	28.14	Apr. 3, 1952	30.31	Mar. 9, 1960	35.78
Mar. 15	28.69	Oct. 16	29.47	Nov. 8	33.99
Apr. 15	28.67	Apr. 20, 1953	30.76	Apr. 3, 1961	34.44
May 9	28.80	Oct. 26	30.91	Nov. 10	31.69
Jun. 16	28.51	Apr. 7, 1954	32.07	Mar. 29, 1962	31.86
Jul. 12	27.63				
		B2-63-33aa			
Apr. 16, 1942	59.66	Nov. 18, 1942	54.93	Oct. 6, 1943	56.88
May 15	59.19	Mar. 31, 1943	52.30	Nov. 17	55.22
Jun. 9	58.01	May 3	51.83	Apr. 27, 1944	52.40
Oct. 8	56.30	Jun. 3	51.95	Nov. 9	54.73
		B2-63-33ba			
May 19, 1942	49.05	Nov. 17, 1942	44.52	Sep. 2, 1943	43.52
Jun. 9	47.82	Mar. 31, 1943	42.92	Oct. 5	44.80
Jul. 7	46.57	May 3	42.20	Nov. 17	44.56
Aug. 5	45.13	May 31	42.00	Apr. 27, 1944	42.70
Sep. 2	45.34	Jul. 7	41.18	Nov. 9	43.11
Oct. 8	44.95	Aug. 4	42.37		
		B2-63-33dcd			
May 15, 1942	59.07	Nov. 17, 1942	52.71	Oct. 5, 1943	52.53
Jun. 8	58.34	Mar. 31, 1943	49.69	Nov. 17	50.80
Jul. 6	56.98	May 3	48.87	Apr. 27, 1944	49.71
Aug. 5	55.31	May 31	48.57	Nov. 9	50.64
Oct. 8	54.09				
		B2-63-34ad			
May 20, 1942	59.83	Oct. 7, 1942	58.35	Jul. 7, 1943	54.40
Jun. 9	59.39	Nov. 17	57.43	Sep. 2	57.94
Jul. 7	58.60	Apr. 1, 1943	54.51	Oct. 5	58.85
Aug. 5	58.33	May 4	53.95	Nov. 17	57.30
Sep. 3	58.58	Jun. 1	53.84	Apr. 27, 1944	54.46

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

Date		Water level	Date		Water level	Date		Water level
				B2-63-34bc				
Jun.	2, 1933	32.79	May	11, 1938	48.85	Sep.	4, 1942	47.12
Oct.	11	35.79	Dec.	9	51.4	Oct.	8	46.30
Apr.	25, 1934	34.45	Apr.	26, 1939	48.45	Nov.	18	45.04
Oct.	3	41.81	Apr.	25, 1940	50.82	Mar.	31, 1943	42.66
Apr.	16, 1935	38.40	Nov.	30	55.42	May	3	42.15
Oct.	16	44.36	May	5, 1941	53.50	Jun.	3	42.00
Apr.	23, 1936	40.60	May	20, 1942	48.93	Oct.	6	47.22
Nov.	12	46.30	Jun.	9	49.04	Nov.	17	45.55
Apr.	29, 1937	45.20	Jul.	7	46.80	Apr.	27, 1944	42.62
Jun.	11	46.40	Aug.	5	46.76	Nov.	9	45.11
Oct.	29	52.71						
				B2-63-34ccc				
May	11, 1938	58.54	Oct.	29, 1947	54.65	Oct.	24, 1951	59.99
Dec.	9	58.99	Nov.	5	54.32	Apr.	3, 1952	55.57
Apr.	26, 1939	57.31	Dec.	8	53.19	Oct.	16	62.00
Oct.	26	61.95	Jan.	9, 1948	52.97	Apr.	20, 1953	55.63
Apr.	25, 1940	59.30	Feb.	2	52.39	Oct.	20	65.43
Nov.	30	64.11	Mar.	11	51.81	Apr.	7, 1954	60.49
May	5, 1941	62.61	Apr.	12	50.87	Oct.	18	74.17
Nov.	4	66.14	Apr.	23	50.66	Apr.	1, 1955	68.84
Apr.	16, 1942	64.05	Jun.	5	51.72	Oct.	26	77.66
May	15	63.64	Jul.	1	53.20	Spring	1956	72.4
May	22	53.51	Aug.	13	57.70	Fall	1956	81.5
June	8	63.02	Sep.	13	70.49	Mar.	14, 1957	76.98
Jul.	7	65.67	Oct.	5	57.70	Oct.	11	77.66
Aug.	5	60.55	Nov.	8	55.59	Mar.	31, 1958	71.72
Sep.	2	61.81	Dec.	7	54.28	Nov.	10	73.52
Oct.	8	60.17	Jan.	15, 1949	53.12	Mar.	23, 1959	68.57
Nov.	18	58.62	Feb.	15	52.33	Oct.	14	74.87
Mar.	31, 1943	55.80	Mar.	15	51.93	Nov.	6	73.85
Jun.	3	55.01	Apr.	15	51.36	Nov.	25	73.06
Aug.	5	58.65	May	9	51.19	Dec.	4	72.70
Oct.	5	59.41	Jun.	16	51.17	Dec.	16	72.20
Dec.	21	56.88	Jul.	12	51.23	Dec.	29	71.73
Apr.	27, 1944	55.42	Oct.	18	51.85	Feb.	12, 1960	70.30
Nov.	9	57.52	Dec.	9	49.82	Mar.	9	69.50
May	3, 1945	54.48	Feb.	1, 1950	48.69	Apr.	11	68.59
Oct.	31	59.22	Apr.	5	47.29	Nov.	8	72.73
May	16, 1946	58.30	May	23	50.48	Apr.	3, 1961	67.28
Oct.	30	60.75	Oct.	13	56.82	Nov.	10	67.23
Apr.	29, 1947	56.46	Dec.	10	54.60	Mar.	29, 1962	61.72
Oct.	9	55.74	Apr.	18, 1951	51.72			
				B2-63-35ac				
May	20, 1942	56.68	Apr.	1, 1943	53.82	Oct.	6, 1943	60.20
Jun.	9	56.99	May	4	53.37	Nov.	17	57.59
Jul.	7	56.81	Jun.	1	53.45	Apr.	27, 1944	53.94
Oct.	7	58.65	Jul.	6	55.05	Nov.	9	57.09
Nov.	17	56.64	Sep.	3	61.00			

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B2-63-35bc

Date	Water level	Date	Water level	Date	Water level
May 20, 1942	61.71	Nov. 17, 1942	61.02	Oct. 1, 1943	63.6
Jun. 9	61.69	Apr. 1, 1943	58.20	Nov. 17	61.5
Jul. 7	61.27	May 4	57.80	Apr. 27, 1944	58.12
Aug. 5	62.18	Jun. 1	57.74	Nov. 9	60.88
Oct. 7	63.10				

B2-63-35cc

Date	Water level	Date	Water level	Date	Water level
Oct. 16, 1935	54.25	Oct. 26, 1939	65.21	Jul. 7, 1942	64.20
Sep. 9, 1936	62.4	Apr. 25, 1940	61.09	Oct. 6	64.75
Nov. 12	57.53	Nov. 30	65.47	Nov. 18	62.45
Apr. 29, 1937	55.32	May 5, 1941	63.08	Apr. 1, 1943	59.75
Jun. 11	57.64	Nov. 4	67.12	Jun. 1	60.40
Oct. 29	62.21	Apr. 16, 1942	64.60	Oct. 6	62.8
May 11, 1938	59.20	May 15	64.26	Nov. 17	61.8
Dec. 9	60.80	May 21	64.27	Apr. 26, 1944	59.07
Apr. 26, 1939	59.11	Jun. 8	63.88	Nov. 9, 1944	61.48

B2-63-35dcc

Date	Water level	Date	Water level	Date	Water level
Apr. 25, 1934	35.76	Oct. 31,	50.80	Apr. 18, 1951	44.64
Oct. 3	40.77	Apr. 23 1946	48.94	Oct. 24	48.83
Apr. 16, 1935	39.81	Oct. 31	50.74	Apr. 3, 1952	47.09
Oct. 16	43.20	Apr. 29, 1947	48.83	Oct. 16	51.34
Apr. 24, 1936	42.55	Oct. 9	50.75	Apr. 20, 1953	47.65
Sep. 9	48.25	Oct. 28	48.95	Oct. 26	53.02
Nov. 12	47.39	Nov. 5	48.76	Apr. 7, 1954	49.99
Apr. 29, 1937	46.22	Dec. 8	48.02	Oct. 18	58.84
Jun. 11	48.03	Jan. 9, 1948	47.65	Apr. 1, 1955	54.79
Oct. 29	51.70	Feb. 2	47.29	Oct. 26	60.65
May 11, 1938	50.02	Mar. 11	47.03	Spring 1956	56.95
Dec. 9	52.00	Apr. 12	46.40	Fall 1956	63.75
Apr. 26, 1939	50.54	Apr. 23	46.20	Mar. 14, 1957	61.16
Oct. 26	55.40	Jul. 1	46.49	Oct. 11	59.85
Apr. 25, 1940	52.40	Nov. 8	48.69	Mar. 31, 1958	57.30
Nov. 30	54.75	Dec. 7	47.94	Nov. 10	59.39
May 5, 1941	53.60	Jan. 15, 1949	47.15	Mar. 23, 1959	56.75
Nov. 4	56.73	Feb. 15	46.85	Oct. 14	61.30
May 16, 1942	54.37	Mar. 15	46.50	Nov. 6	59.39
Oct. 6	54.75	Apr. 15	46.32	Nov. 25	58.56
Nov. 17	53.41	May 9	45.93	Dec. 4	58.37
Apr. 1 1943	51.10	Jun. 16	45.31	Dec. 16	57.92
May 4	50.68	Jul. 12	45.06	Dec. 29	57.56
Jun. 1	50.76	Oct. 18	45.16	Feb. 12, 1960	56.83
Oct. 6	53.48	Dec. 9	44.28	Apr. 11	55.97
Nov. 17	52.31	Feb. 1, 1950	43.55	Nov. 8	58.81
Apr. 26, 1944	50.21	Apr. 5	43.25	Apr. 3, 1961	55.56
Nov. 9	51.33	Oct. 13	47.05	Nov. 10	54.59
May 3, 1945	48.95	Dec. 10	45.98	Mar. 29, 1962	52.15

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

B2-63-36bbc

Date	Water level	Date	Water level	Date	Water level
Apr. 29, 1937	41.27	Apr. 29, 1947	48.55	Oct. 24, 1951	49.58
Jun. 11	45.37	Sep. 22	50.88	Apr. 3, 1952	47.10
Oct. 29	47.98	Oct. 9	49.94	Oct. 16	51.47
May 11, 1938	45.78	Oct. 29	49.10	Apr. 20, 1953	48.28
Dec. 9	47.81	Nov. 5	49.02	Oct. 26	52.28
Apr. 26, 1939	46.76	Dec. 8	48.49	Apr. 7, 1954	50.32
Oct. 26	50.57	Jan. 9, 1948	47.85	Oct. 18	58.85
Apr. 25, 1940	49.28	Feb. 2	47.42	Apr. 1, 1955	54.30
Nov. 30	52.93	Mar. 11	47.00	Oct. 26	57.65
May 5, 1941	52.06	Apr. 12	46.30	Spring 1956	55.32
Nov. 4	54.65	Apr. 23	45.92	Fall 1956	59.56
Apr. 16, 1942	53.60	Jun. 5	46.60	Mar. 17, 1957	57.97
May 20	53.35	Jul. 1	46.74	Oct. 11	57.68
Jun. 9	53.22	Oct. 5	50.14	Mar. 31, 1958	55.80
Jul. 7	52.93	Nov. 8	48.98	Nov. 10	56.85
Oct. 7	53.48	Dec. 7	48.46	Mar. 23, 1959	55.60
Nov. 17	52.65	Jan. 15, 1949	47.75	Oct. 14	58.04
Apr. 1, 1943	50.95	Feb. 15	47.36	Nov. 6	56.96
May 4	51.20	Mar. 15	47.07	Nov. 25	56.42
Jun. 1	51.00	Apr. 15	46.62	Dec. 4	56.22
Sep. 3	56.01	May 9	46.37	Dec. 16	55.99
Oct. 6	54.17	Jun. 16	45.79	Dec. 29	55.79
Nov. 16	52.65	Oct. 18	47.32	Feb. 12, 1960	55.42
Apr. 26, 1944	50.75	Dec. 9	45.45	Apr. 11	55.12
Nov. 9	51.63	Feb. 1. 1950	44.34	Nov. 8	56.65
May 3, 1945	49.40	Apr. 5	43.36	Apr. 3, 1961	55.14
Oct. 30	51.45	Oct. 13	48.45	Nov. 10	54.52
Apr. 23, 1946	50.50	Dec. 10	46.85	Mar. 29, 1962	53.46
Oct. 31	50.50	Apr. 18, 1951	44.68		

B2-63-36bcc

Date	Water level	Date	Water level	Date	Water level
Apr. 16, 1935	35.44	Jul. 2, 1936	40.0	Nov. 12, 1936	41.84
Apr. 24, 1936	37.22	Sep. 9	43.22		

B3-62-30ddd

Date	Water level
Mar. 29, 1962	3.67

C1-63-2bcc

Date	Water level	Date	Water level	Date	Water level
Oct. 14, 1959	123.38	Dec. 29, 1959	122.84	Apr. 27, 1960	123.21
Nov. 5	123.34	Feb. 12, 1960	122.67	Nov. 10, 1961	124.00
Dec. 4	123.10	Mar. 9	122.40	Mar. 28, 1962	122.04
Dec. 14	123.01	Apr. 11	122.24		

Depth to ground-water level in selected wells in the Prospect Valley Area, Colorado (continued).

(Measurements in feet below local land surface datum)

C1-63-2ccc

Date		Water level	Date		Water level	Date		Water level
Oct.	14, 1959	117.95	Dec.	14, 1959	117.53	Apr.	11, 1960	116.94
Nov.	14	117.85	Dec.	29	117.38	Nov.	10, 1961	119.62
Nov.	25	117.66	Feb.	12, 1960	117.23	Mar.	28, 1962	117.53
Dec.	4	117.59	Mar.	9	117.06			

C1-63-10bbb

Oct.	14, 1959	122.85	Dec.	14, 1959	122.48	Apr.	11, 1960	122.12
Nov.	5	122.70	Dec.	29	122.38	Nov.	11, 1961	121.45
Nov.	25	122.53	Feb.	12, 1960	122.29	Mar.	28, 1962	121.15
Dec.	4	122.51	Mar.	7	122.05			

APPENDIX B

Selected logs of test holes and irrigation and domestic wells in the Prospect Valley area, Colorado*

* Additional logs listed in reference (3)

Logs of test holes, irrigation, and domestic wells in the Prospect Valley Area, Colorado

Depth (feet)

B1-62-17cbb

Driller's log of test well drilled by Holden and Holden, October 25, 1956. Surface altitude, 4,830 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 18
Gravel	18- 25
Clay	25- 26
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	26- 64
Rock	64- 66
Shale	66- 74

B1-62-18ada

Driller's log of domestic well drilled by Holden and Holden, September 22, 1953. Surface altitude, 4,824 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 16
Sandy clay	16- 22
Clay	22- 24
Sandy clay	24- 35
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	35- 37

B1-62-18adc

Driller's log of test well drilled by Holden and Holden, February 11, 1954. Surface altitude, 4,830 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 8
Sand	8- 16
Clay	16- 25
Rock	25- 26
Clay	26- 28
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	28- 30
Shale	30- 43

B1-62-18daa

Driller's log of test well drilled by Holden and Holden, October 25, 1956. Surface altitude, 4,832 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 20
Gravel	20- 26
Clay	26- 29
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	29- 42

B1-62-18dac

Driller's log of test well drilled by Holden and Holden, October 25, 1956. Surface altitude, 4,848 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 18
Gravel	18- 21
Clay	21- 28
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	28- 32

B1-62-18dad

Driller's log of test well drilled by Holden and Holden, October 25, 1956. Surface altitude, 4,837 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 20
Gravel	20- 23
Clay	23- 44
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, hard, black	44- 53
Rock	53- 56
Shale, hard, blue	56- 74

B1-63-2bab

Drillers' log of domestic well drilled by Holden and Holden, September 24, 1956. Surface altitude, 4,822 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 11
Clay, sandy	11- 47
Gravel	47- 60
Clay	60- 66
Gravel	66- 83
Clay, sandy	83-126

Logs of test holes, irrigation, and domestic wells in the Prospect Valley Area, Colorado (continued)

B1-63-2bbb

Driller's log of irrigation well drilled by Holden and Holden, February 25, 1954. Surface altitude, 4,827 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 20
Gravel	20- 24
Clay	24- 37
Clay	37- 68
Clay, sandy	68- 82
Gravel	82- 85
Clay	85- 90
Gravel	90-110
Sand, fine	110-116

B1-63-2bcc

Driller's log of test well drilled by Holden and Holden, January 3, 1955. Surface altitude, 4,830 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 3
Sand, dirty	3- 19
Clay	19- 32
Gravel	32- 44
Clay	44- 50
Gravel	50- 68
Clay, sandy	68- 80
Gravel	80- 86
Clay	86- 94
Gravel	94-107
Clay	107-116
Gravel	116-143
Clay, soft	143-165
Gravel	165-184
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	184-189

B1-63-2ddc

Driller's log of test well drilled by Holden and Holden, January 15, 1946. Surface altitude, 4,834 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 22
Sand	22- 52
Gravel	52- 64
Clay, soft	64- 70
Quicksand	70- 79
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Clay to shale	79- 80

B1-63-3ddc

Driller's log of irrigation well drilled by Holden and Holden, May 26, 1955. Surface altitude, 4,845 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 15
Gravel, dirty	15- 18
Clay, sandy	18- 38
Gravel	38- 49
Clay	49- 55
Gravel	55- 60
Sand, dirty	60- 70
Gravel	70- 83
Clay	83- 85
Gravel	85-102
Clay	102-116
Sand, fine	116-122
Clay	122-124
Gravel	124-130
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	130-137

B1-63-3ddd

Driller's log of domestic well drilled by Holden and Holden, July 23, 1954. Surface altitude, 4,846 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 40
Sand	40- 46
Gravel	46- 58
Clay	58- 62
Gravel	62-103
Sand, fine	103-108
Clay	108-109
Sand, fine	109-120
Clay	120-125
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	125-128

B1-63-4abb

Driller's log of test well drilled by Holden and Holden, January 11, 1952. Surface altitude, 4,828 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 22
Gravel, dry	22- 45
Gravel	45- 47
Clay	47- 49
Gravel	49- 55
Clay	55- 61
Gravel	61- 63
Clay	63- 70
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	70- 72

B1-63-4-acc

Driller's log of test well drilled by Holden and Holden, January 11, 1952. Surface altitude, 4,840 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 45
Gravel, dry	45- 54
Gravel	54- 56
Clay	56- 62
Sand, fine	62- 65
Gravel	65- 84
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	84- 85

B1-63-4-ada

Driller's log of domestic well drilled by Holden and Holden, July 16, 1954. Surface altitude, 4,842 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 45
Gravel	45- 56
Clay	56- 59
Gravel	59- 62
Clay	62- 65
Gravel	65- 82
Clay	82- 84
Gravel	84-120
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	120-125

B1-63-4c

Driller's log of test well drilled by Oliver Well Works, August 18, 1954.

Pleistocene and Recent deposits, undifferentiated:	
Soil	0- 4
Clay	4- 15
Gravel, fine	15- 18
Clay	18- 37
Gravel, with streaks of clay	37- 50
Clay	50- 52
Gravel, hard	52- 56
Clay	56- 65
Gravel	65- 71
Clay	71- 72
Gravel, hard with streaks of clay	72- 97
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, blue	97-117

B1-63-4cdd

Driller's log of irrigation well drilled by Holden and Holden, April 3, 1954. Surface altitude, 4,841 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 30
Gravel	30- 41
Clay	41- 43
Gravel	43- 51
Clay	51- 52
Sand, fine	52- 60
Clay and gravel	60- 65
Clay	65- 70
Gravel, fine, hard	70- 89
Clay	89- 94
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	94- 95

B1-63-5ccc

Driller's log of test well drilled by Holden and Holden, January 10, 1952. Surface altitude, 4,855 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 31
Rock, solid	31

B1-63-7cdd

Driller's log of domestic well drilled by Holden and Holden, December 23, 1953. Surface altitude, 4,896 feet

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 25
Gravel, fine	25- 27
Clay, blue	27- 30
Clay, yellow	30- 47
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	47- 54

B1-63-9aaa

Driller's log of domestic well drilled by Holden and Holden, August 11, 1954. Surface altitude, 4,848 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 27
Gravel	27- 30
Clay	30- 51
Gravel	51- 89
Clay	89- 93
Gravel	93-125
Clay	125-126
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	126-127

B1-63-10aaa

Driller's log of domestic well drilled by Holden and Holden, June 7, 1955. Surface altitude, 4,847 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 36
Gravel	36- 62
Clay	62- 70
Gravel	70- 94
Clay	94- 98
Gravel	98-110
Sand, fine	110-116
Clay	116-120
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	120-122

B1-63-10bab

Driller's log of domestic well drilled by Holden and Holden, September 9, 1954. Surface altitude, 4,860 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 19
Gravel	19- 23
Clay	23- 53
Gravel	53- 66
Clay	66- 68
Gravel	68-121
Clay	121-130
Gravel	130-155
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	155-161

B1-63-10ccc

Driller's log of domestic well drilled by Holden and Holden, August 25, 1959. Surface altitude, 4,864 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 44
Gravel	44- 46
Clay	46- 54
Gravel	54- 68
Clay	68- 81
Gravel	81- 93
Clay	93- 97
Gravel	97-110
Clay	110-114
Sand	114-118
Clay, blue	118-121
Sand	121-127
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	127-131
Coal	131-133
Shale	133-136

B1-63-10dab

Driller's log of test well drilled by Holden and Holden, March 8, 1957. Surface altitude, 4,854 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 22
Sand	22- 30
Gravel	30- 43
Clay	43- 47
Clay, sandy	47- 62
Gravel	62-100
Sand, fine	100-124
Gravel	124-138
Clay	138-140
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	140-147

B1-63-10dc

Driller's log of irrigation well drilled by Oliver Well Works, July 26, 1956. Surface altitude, 4,865 feet.

Pleistocene and Recent deposits, undifferentiated:	
Soil	0- 4
Clay	4- 33
Gravel	33- 42
Clay	42- 50
Gravel	50- 61
Gravel with streaks of clay	61- 82
Gravel, hard, coarse	82-116
Gravel, hard, fine	116-141
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, blue	141-152

B1-63-10dda

Driller's log of domestic well drilled by Holden and Holden, October 3, 1953. Surface altitude, 4,863 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 50
Sand, fine	50- 62
Gravel	62- 68
Clay, gravel layers	68- 87
Clay, hard	87- 92
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	92- 98

B1-63-11a

Driller's log of domestic well drilled by Holden and Holden, December 6, 1954.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 18
Sand	18- 24

B1-63-11a (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay	24- 48
Gravel	48- 87
Clay	87- 93
Sand and gravel	93-104
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	104-106

B1-63-11-bbc

Driller's log of test well drilled by Holden and Holden, April 1, 1955. Surface altitude, 4,851 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 7
Sand	7- 14
Clay	14- 27
Gravel	27- 82
Clay	82- 88
Gravel	88- 97
Clay	97-100
Gravel	100-105
Clay	105-107
Gravel	107-123
Clay	123-127
Gravel	127-145
Sand, fine	145-164
Sand and gravel	164-175
Clay	175-176
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	176-189

B1-63-11bcc

Driller's log of test well drilled by Holden and Holden, April 1, 1955. Surface altitude, 4,858 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 7
Sand	7- 11
Clay	11- 18
Sand	18- 23
Gravel	23- 42
Sand	42- 56
Gravel	56- 68
Clay	68- 74
Gravel	74- 96
Clay	96- 98
Gravel	98-102
Clay	102-110
Gravel	110-122
Clay	122-128
Sand, fine	128-165
Gravel	165-167

B1-63-11 (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay, soft	167-176
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	176-186

B1-63-11bcd

Driller's log of irrigation well drilled by Holden and Holden, April 18, 1958. Surface altitude, 4,854 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 11
Clay	11- 18
Gravel	18- 75
Clay	75- 80
Gravel	80-138
Sand	138-143
Clay	143-146
Gravel	146-148
Soft clay	148-156
Gravel	156-183
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	183-187

B1-63-11bdd

Driller's log of test well drilled by Holden and Holden, April 18, 1958. Surface altitude, 4,855 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 18
Gravel	18- 50
Clay	50- 63
Gravel	63- 68
Clay	68- 76
Gravel	76- 92
Clay	92- 96
Gravel	96-123
Clay	123-128
Sand, fine	128-133
Clay, soft	133-149
Gravel	149-171
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	171-177

B1-63-11c

Driller's log of domestic well drilled by Oliver Well Works, October 15, 1954.

Pleistocene and Recent deposits, undifferentiated:	
Soil	0- 5
Clay	5- 51

B1-63-11c (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Sand	51- 54
Clay	54- 63
Gravel	63- 69
Clay	69- 78
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, yellow	78-100
Shale, blue	100-139
Coal	139-141
Shale, blue	141-148
Rock	148-150
Shale, blue	150-185
Rock	185-186
Shale, blue	186-225
Coal	225-229
Shale, blue	229-239
Sandrock, gray	239-251
Rock, hard	251-253
Sandrock, gray, dry	253-267
Shale, blue with streaks of sandrock	267-274
Shale, blue	274-290
Coal	290-292
Shale, blue	292-304
Coal	304-307
Shale, blue	307-311
Rock, hard	311-313
Shale, black	313-317
Sandrock, gray	317-323
Shale, blue	323-332
Sandrock, gray	332-338
Shale, blue	338-357
Rock, hard	357-359
Shale, blue	359-361
Sandrock, gray	361-366
Shale, blue	366-369
Sandrock, gray	369-373
Rock, hard	373-374
Shale, blue	374-376
Coal	376-378
Shale, blue	378-395
Rock, hard	395-399
Shale, blue	399-411
Sandrock, gray	411-419
Shale, blue	419-421
Rock, hard	421-422
Shale, blue	422-428
Sandrock, gray	428-432
Shale, blue	432-449
Sandrock, gray	449-457
Shale, blue	457-475
Sandrock, gray, coarse	475-494
Shale, blue	494-504

B1-63-11d

Driller's log of domestic well drilled by Holden and Holden, October 21, 1953.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 18
Gravel	18- 22
Clay	22- 24
Gravel	24- 45
Clay	45- 57
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	57- 59

B1-63-11dcc

Driller's log of test well drilled by Holden and Holden, September 29, 1953. Surface altitude, 4,865 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 32
Sand	32- 36
Clay	36- 42
Sand and gravel	42- 63
Clay	63- 64
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	64- 68

B1-63-11ddd

Driller's log of test well drilled by Holden and Holden, September 29, 1953. Surface altitude, 4,828 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 16
Gravel	16- 21
Clay	21- 23
Gravel, good	23- 27
Clay	27- 30
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	30- 43

B1-63-12-bcb

Driller's log of test well drilled by Holden and Holden, September 14, 1953. Surface altitude, 4,837 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 7
Sand	7- 14
Clay	14- 21
Gravel	21- 30
Clay	30- 63
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	63- 64

B1-63-14-bbb

Driller's log of domestic well drilled by Holden and Holden, September 17, 1957. Surface altitude, 4,872 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 9
Fine sand	9- 13
Clay	13- 21
Gravel	21- 38
Clay	38- 49
Gravel	49- 59
Clay	59- 65
Sand	65- 79
Clay	79- 80
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, gray	80- 89

B1-63-15-bdd

Drillers' log of test and irrigation wells drilled by Holden and Holden, July 25, 1953. Surface altitude, 4,732 feet.

Pleistocene and Recent deposits, undifferentiated:	
Soil	0- 20
Sand	20- 24
Clay	24- 30
Sand	30- 55
Clay	55- 83
Sand, hard	83- 94
Sand, fair	94-110
Sand and clay layers	110-116
Sand	116-146
Clay	146-148
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	148-159

B1-63-15daa

Driller's log of domestic well drilled by Holden and Holden, October 31, 1955. Surface altitude, 4,767 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 3
Clay, sandy	3- 8
Clay, hard	8- 21
Gravel	21- 28
Clay	28- 34
Gravel, dirty	34- 60
Clay	60- 66
Sand and gravel, fine	66-110
Clay, sandy	110-122
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	122-126

B1-63-16caa

Driller's log of test well drilled by Holden and Holden, August 20, 1954. Surface altitude, 4,785 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 28
Gravel	28- 30
Clay	30- 38
Gravel	38- 62
Clay	62- 74
Gravel	74- 95
Clay	95- 97
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	97-106

B1-63-16ddd

Driller's log of test well drilled by Holden and Holden, June 17, 1957. Surface altitude, 4,752 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 5
Clay, sandy	5- 23
Clay	23- 60
Gravel	60- 96
Clay	96- 98
Gravel	98-147
Clay	147-148
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	148-158

B1-63-17ddd

Driller's log of test well drilled by Holden and Holden, September 8, 1954. Surface altitude, 4,890 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 22
Gravel	22- 42
Clay	42- 48
Gravel	48- 56
Clay	56- 76
Gravel	76- 80
Clay	80- 93
Rock, brown	93- 96
Clay	96- 98
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	98-104

B1-63-19bbc

Driller's log of test well drilled by Holden and Holden, September 8, 1955. Surface altitude, 4,928 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 8

B1-63-19bbc (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Sand, fine	8- 18
Clay	18- 27
Gravel and clay layers	27- 40
Clay	40- 49
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	49- 64

B1-63-22aab

Driller's log of test well drilled by Holden and Holden, August 26, 1946. Surface altitude, 4,901 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 26
Sand	26- 36
Clay, sandy	36- 60
Sand, dirty	60- 85
Gravel, good	85- 90
Clay, soft	90- 91
Gravel, good	91-108
Clay, hard	108-110
Clay and dirty sand	110-130
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	130

B1-63-26ccc

Driller's log of irrigation well drilled by Holden and Holden, May 25, 1954. Surface altitude, 4,933 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 7
Gravel, dirty	7- 23
Clay	23- 32
Gravel	32- 53
Clay	53- 75
Gravel	75- 80
Clay	80- 83
Gravel	83- 90
Clay	90- 98
Gravel	98-105
Clay	105-114
Clay, hard, blue	114-120
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	120-128

B1-63-30acc

Driller's log of irrigation well drilled by Holden and Holden, January 26, 1955. Surface altitude, 4,936 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 25
Gravel	25- 31
Clay	31- 34
Sand, fine	34- 43
Clay, soft and sandy	43- 55
Gravel and clay	55- 74
Gravel	74- 83
Clay	83- 87
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	87- 88

B1-63-34bbb

Driller's log of irrigation well drilled by Holden and Holden, May 7, 1954. Surface altitude, 4,800 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 32
Sand	32- 40
Clay	40- 42
Sand	42- 65
Clay	65- 71
Sand	71- 86
Clay	86- 89
Gravel	89- 95
Clay	95-112
Gravel	112-117
Clay	117-120
Gravel	120-126
Clay	126-132
Gravel	132-161
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	161

B1-63-34ddd

Driller's log of irrigation well drilled by Holden and Holden, April 24, 1959. Surface altitude, 4,788 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 9
Sand and clay	9- 21
Sand, fine	21- 24
Sand	24- 45
Clay	45- 57
Sand, coarse	57- 62
Clay	62- 63
Sand, coarse	63- 70
Clay	70- 87
Clay, white	87- 95
Sand, coarse	95-107

B1-63-34ddd (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay	107-108
Sand, coarse	108-117
Clay	117-119
Sand, coarse	119-126
Clay	126-129
Sand, coarse	129-137
Clay	137-139
Sand, coarse	139-141
Clay	141-147
Sand, fine	147-155
Clay	155-170
Sand, coarse	170-176
Clay	176-178
Sand, blue	178-182
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	182-183

B1-64-14acc

Driller's log of domestic well drilled by Holden and Holden, June 29, 1959. Surface altitude, 5,012 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 9
Sandy clay	9- 14
Clay	14- 28
Clay, blue	28- 37
Sand	37- 50
Shale	50-108
Sand	108-114
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	114-178

B1-64-24bcc

Driller's log of domestic well drilled by Holden and Holden, June 10, 1949. Surface altitude, 4,990 feet.

Pleistocene and Recent deposits, undifferentiated:	
Soil	0- 3
Sand, brown	3- 40
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale, gray	40- 55

B2-62-6bdd

Driller's log of domestic well drilled by Holden and Holden, August 27, 1959. Surface altitude, 4,704 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 6
Clay, sandy	6- 33

B2-62-6bdd (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay, hard	33- 50
Sand	50- 63
Gravel	63- 67
Clay, sandy	67- 75
Gravel	75- 85
Clay	85- 94
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	94- 96

B2-62-24cdc

Driller's log of test well drilled by Holden and Holden, August 11, 1961. Surface altitude, 4,821 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 19
Clay	19- 56
Sand	56- 59
Clay	59- 68
Sand	68- 70
Clay	70- 73
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	73- 86

B2-62-30bab

Driller's log of domestic well drilled by Holden and Holden, August 27, 1955. Surface altitude, 4,768 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 30
Gravel	30- 65
Clay	65- 68
Gravel	68- 85
Clay	85- 87
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	87- 93

B2-62-32aad

Driller's log of domestic well drilled by Holden and Holden, January 14, 1954. Surface altitude, 4,705 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 45
Clay, sandy	45- 63
Clay, blue, hard	63- 66
Clay, sandy	66- 71
Sand, fine	71- 95
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	95-105

Logs of test holes, irrigation, and domestic wells in the Prospect Valley Area, Colorado (continued)

B2-62-35ccb

Driller's log of test well drilled by Holden and Holden, January 7, 1957. Surface altitude, 4,880 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 38
Gravel	38- 50
Clay	50- 58
Gravel	58- 71
Clay	71- 80
Gravel	80-106
Clay	106-111
Clay, blue	111-121
Gravel	121-129
Clay, blue	129-134
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	134-137

B2-63-2add

Driller's log of test well drilled by Holden and Holden, March 8, 1957. Surface altitude, 4,720 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 38
Gravel	38- 52
Clay	52- 56
Gravel	56- 70
Gravel, dirty	70- 80
Gravel	80- 89
Clay	89- 93
Sand, fine	93-108
Gravel	108-122
Clay	122-124
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	124-126

B2-63-4ccc

Driller's log of domestic well drilled by Holden and Holden, May 7, 1955. Surface altitude, 4,785 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 34
Gravel	34- 60
Clay	60- 63
Gravel	63- 65
Clay	65- 67
Gravel	67- 91
Clay, soft	91- 94
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	94- 95

Logs of test holes, irrigation, and domestic wells in the Prospect Valley Area, Colorado (continued)

B2-63-10dcd

Driller's log of domestic well drilled by Holden and Holden, September 28, 1956. Surface altitude, 4,750 feet.

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 9
Sand, fine	9- 17
Clay	17- 31
Sand, fine	21- 50
Clay	50- 58
Gravel	58- 63
Clay	63- 68
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	68- 75

B2-63-22cdc

Driller's log of test well drilled by Holden and Holden, April 18, 1957. Surface altitude, 4,776 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 6
Clay, sandy	6- 11
Clay	11- 29
Gravel	29- 74
Clay	74- 77
Gravel	77- 79
Clay	79- 80
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	80- 82

B2-63-23bcc

Driller's log of irrigation well drilled by Holden and Holden, December 30, 1954. Surface altitude, 4,770 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 57
Gravel	57- 69
Clay	69- 73
Gravel	73-112
Clay, sandy	112-115
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	115-118

B2-63-26ddb

Driller's log of test well drilled by Holden and Holden, August 21, 1940. Surface altitude, 4,791 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 27
Gravel	27- 35
Clay	35- 46
Gravel	46- 54

B2-63-26ddb (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay	54- 55
Sand, fine, dirty	55- 64
Clay	64- 65
Gravel, fair	65- 72
Clay	72- 73
Gravel, good	73- 85
Clay and gravel	85- 90
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	90- 91

B2-63-28bdd

Driller's log of domestic well drilled by Holden and Holden, April 20, 1955. Surface altitude, 4,793 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 28
Clay, sandy	28- 32
Clay, hard	32- 50
Gravel	50- 53
Clay	53- 56
Sand	56- 64
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	64- 66

B2-63-33baa

Driller's log of domestic well drilled by Holden and Holden, May 25, 1955. Surface altitude, 4,805 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 3
Sand	3- 18
Clay	18- 20
Sand	20- 25
Clay	25- 30
Sand	30- 34
Clay	34- 60
Gravel	60- 64
Clay, sandy	64- 76
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	76- 81

B2-63-34aaa

Driller's log of domestic well drilled by Holden and Holden, August 5, 1954. Surface altitude, 4,802 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, hard	0- 18
Clay, sandy	18- 46
Gravel	46- 48

B2-63-34aaa (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Clay, sandy	48- 50
Gravel	50- 59
Clay	59- 63
Gravel	63- 67
Clay	67- 76
Gravel, fine sand	76- 98
Clay, fine sand	98-103
Sand, fine	103-125
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	125-127

B2-63-35-abc

Driller's log of test well drilled by Holden and Holden, March 28, 1960. Surface altitude, 4,803 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 32
Gravel	32- 62
Clay	62- 68
Gravel	68- 83
Clay	83- 86
Gravel	86- 92
Clay, sandy	92-103
Sand, fine	103-119
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	119-129

B3-62-19bab

Driller's log of stock well drilled by Holden and Holden, April 16, 1958. Surface altitude, 4,700 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 9
Clay	9- 22
Clay, sandy	22- 34
Sand, dirty, fine	34- 52
Sandstone	52- 53
Coal, soft	53- 55
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale formation	55- 60

B3-62-25ccc

Driller's log of stock well drilled by Holden and Holden, February 15, 1958. Surface altitude, 4,715 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 9
Clay	9- 26
Clay, sandy	26- 48

B3-62-25ccc (continued)

	Depth (feet)
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	48- 55
Shale, sandy	55- 59

B3-63-15ccc

Driller's log of stock well drilled by Holden and Holden, October 29, 1959. Surface altitude, 4,780 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 23
Clay	23- 36
Sand	36- 40
Clay	40- 46
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	46- 50

C1-63-2bcc

Driller's log of test well drilled by Holden and Holden, January 3, 1955. Surface altitude, 4,995 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 3
Sand, dirty	3- 19
Clay	19- 32
Gravel	32- 44
Clay	44- 50
Gravel	50- 68
Clay, sandy	68- 80
Gravel	80- 86
Clay	86- 94
Gravel	94-107
Clay	107-116
Gravel	116-143
Clay, soft	143-165
Gravel	165-184
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	184-189

C1-63-3ada

Driller's log of test well drilled by Holden and Holden, October 6, 1955. Surface altitude, 4,991 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay, sandy	0- 9
Gravel	9- 26
Clay	26- 32
Clay, sandy	32- 41
Gravel, dirty	41- 54
Clay	54- 75
Gravel	75- 82
Clay	82- 94

C1-63-3ada (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Gravel	94-140
Sand, fine	140-157
Gravel	157-164
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	164-169

C1-63-10aaa

Driller's log of irrigation well drilled by Holden and Holden, May 25, 1954. Surface altitude, 5,010 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 8
Sand	8- 12
Clay	12- 21
Gravel	21- 38
Clay	38- 47
Gravel	47- 53
Clay	53- 57
Gravel	57- 76
Clay	76- 79
Sand, fine	79- 89
Gravel	89-112
Clay	112-116
Gravel, fine	116-124
Clay	124-130
Gravel	130-142
Sand, fine	142-168
Gravel	168-178
Clay	178-181
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	181-191

C1-63-14ccc

Driller's log of test well drilled by Holden and Holden, September 30, 1960, Surface altitude, 5,058 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 21
Sand	21- 33
Clay	33- 41
Gravel	41- 48
Clay	48- 50
Gravel	50- 54
Clay	54- 75
Gravel	75- 80
Clay	80- 88
Gravel	88-102
Clay	102-106
Gravel	106-120
Clay	120-122

C1-63-14ccc (continued)

	Depth (feet)
Pleistocene and Recent deposits, undifferentiated--continued	
Gravel	122-127
Clay	127-130
Gravel	130-158
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	158-160

C1-63-34cdb

Driller's log of irrigation well drilled by Holden and Holden, May 5, 1956. Surface altitude, 5,139 feet.

Pleistocene and Recent deposits, undifferentiated:	
Clay	0- 46
Sand	46- 65
Clay	65- 74
Gravel	74- 94
Clay	94- 97
Gravel	97-121
Clay, sandy	121-127
Gravel	127-159
Clay	159-160
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	160-167

C2-63-7caa

Driller's log of supply well drilled by Holden and Holden, November 24, 1953. Surface altitude, 5,210 feet.

Pleistocene and Recent deposits, undifferentiated:	
Sand	0- 74
Clay, sandy	74- 90
Upper Cretaceous (Laramie, Fox Hills, or Pierre shale), undifferentiated:	
Shale	90-118

APPENDIX C

Drillers Log and Description of Column Samples from Test Hole B1-63-21daa

In NE¼., SE¼., Sec. 21, T 1N., R 63W.
Hole intended also to be an observation well.
Drilled by rotary method Nov. 3, 1959
M. W. Bittinger and W. E. Code observers.
Holden & Holden - contractors

Depth below land surface (feet)		
0 - 5	brown sandy soil.	
5 - 18	medium sand	sample
18 - 22	clay, soft	
22 - 24	sandy, clay	
24 - 42	hard clay	
42 - 60	clay less hard, sand streaks	sample
60 - 63	clay	
63 - 75	sand, fine to coarse	
75 - 131	coarse sand to fine gravel - clay streak at about 91 samples at 75, 80 and 95	
131-132	clay	
132-134	blue shale	

Cased with 5-inch plastic pipe. 40 feet perforated with 1/8-inch saw kerfs and 80 feet of plain. Top of casing about 2.0 ft. above ground surface.

"Mugel" used as drilling mud. Hole bailed for about 1/2 hour to remove mud. Clear water run in at finish.

Well No.: B1-63-21daa
Location: Prospect Valley, Colorado
Samples described by L. J. McGreevy, U.S.G.S., Denver, Colo. - For Colorado State University - Recharge project.

Sample No.	Sample Des.	Thickness (feet)	Depth (feet)
59 Col 77	Sand, medium to coarse, yellowish-gray (5Y7/2), subangular, well sorted; contains some grayish-black (N-2) accessory minerals	13	18
59 Col 78	Sand, very fine to very coarse, silty, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals	25	43

59 Col 79	Silty sand, very fine to very coarse, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals, some mica, some calcareous particles, and a small amount of very fine gravel	13	56
59 Col 80	Silty sand, very fine to very coarse, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals, some mica, some calcareous particles, and a small amount of very fine gravel	2	58
59 Col 81	Sand,medium to very coarse, silty, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals and a small amount of very fine gravel	17	75
59 Col 82	Sand and gravel, very fine sand to very fine gravel, silty, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals and some calcareous particles	5	80
59 Col 83	Sand and gravel, very fine sand to very fine gravel, silty, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals	15	95
59 Col 84	Sand and gravel, coarse sand to very fine gravel, silty, yellowish-gray (5Y7/2), subangular, fair sorting	15	110
59 Col 85	Sandy gravel, very fine sand to fine gravel, silty, yellowish-gray (5Y7/2), subangular, poorly sorted; contains some grayish-black (N-2) accessory minerals	19	129

APPENDIX D

Ground-Water Recharge Calculations for Olds Reservoir (Dec. 3, 1959 - April 20, 1960)

Date	Daily Inflow volume (acre-feet)	Storage volume (acre-feet)	Increase in storage (acre-feet)	Daily seepage (acre-feet) (recharge)	Accumulated seepage (acre-feet) (recharge)
Dec. 3, 1959	18				
4	18				
	46				
5	23				
	47	74	74	78 - 3 days	78
6	70	123	49	21	99
7	71	163	40	31	130
8	71	213	50	21	151
9	71	243	30	41	192
10	71	270	27	44	236
11	71	293	23	48	284
12	70				
13	70	328	35	105 - 2 days	389
14	70	340	12	58	447
15	71	346	6	65	512
16	71	360	14	57	569
17	71	362	2	69	638
18	71				
19	72	362	0	143 - 2 days	781
20	72				
21	72	360	-2	146 - 2 days	927
22	48				
	10	357	-3	61	988
23	15				
	33	328	-29	77	1065
24	66				
25	66	311	-17	149 - 2 days	1214
26	66	306	-5	71	1285
27	66				
28	66	300	-6	138 - 2 days	1423
29	67	300	0	67	1490

Date	Daily Inflow volume (acre-feet)	Storage volume (acre-feet)	Increase in storage (acre-feet)	Daily seepage (acre-feet) (recharge)	Accumulated seepage (acre-feet) (recharge)
Dec. 30, 1959	67	296	-4	71	1561
31	67	287	-9	76	1637
Jan. 1, 1960	68	287	0	68	1705
2	68				
3	68	287	0	136 - 2 days	1841
4	68	287	0	68	1909
5	68	287	0	68	1977
6	68	287	0	68	2045
7	68	287	0	68	2113
8	68	287	0	68	2181
9	68	287	0	68	2249
10	68	287	0	68	2317
11	68	287	0	68	2385
12	68	296	3	65	2450
13	68	290	0	68	2518
14	69				
15	69	300	10	128 - 2 days	2646
16	69				
17	70				
18	70	300	0	209 - 3 days	2855
19	69	300	0	69	2924
20	69	300	0	69	2993
21	70	300	0	70	3063
22	69	302	2	67	3130
23	69				
24	68	317	15	122 - 2 days	3252
25	68	320	3	65	3317
26	68	325	5	63	3380

Date	Daily Inflow volume (acre-feet)	Storage volume (acre-feet)	Increase in storage (acre-feet)	Daily seepage (acre-feet) (recharge)	Accumulated seepage (acre-feet) (recharge)
Jan. 27	68				
28	68	328	3	133 - 2 days	3513
29	68				
30	67				
31	66				
Feb. 1	66				
2	66				
3	67				
4	67				
5	67				
6	67				
7	67				
8	67				
9	69				
10	70				
11	70				
12	70	340	12	1002 - 15 days	4515
13	70				
14	71	360	20	121 - 2 days	4636
15	71	360	0	71	4707
16	72	360	0	72	4779
17	72	360	0	72	4851
18	73	360	0	73	4924
19	73	360	0	73	4997
20	73	360	0	73	5070
21	73	360	0	73	5143
22	74	360	0	74	5217
23	74	395	35	39	5256
24	74	395	0	74	5330
25	74	395	0	74	5404

Date	Daily Inflow volume (acre-feet)	Storage volume (acre-feet)	Increase in storage (acre-feet)	Daily seepage (acre-feet) (recharge)	Accumulated seepage (acre-feet) (recharge)
Feb. 26	74	395	0	74	5478
27	74	395	0	74	5552
28	74	400	5	69	5621
29	74	400	0	74	5695
Mar. 1	73	400	0	73	5768
2	73	400	0	73	5841
3	73	400	0	73	5914
4	73	400	0	73	5987
5	73	400	0	73	6060
6	73	400	0	73	6133
7	74	400	0	74	6207
8	75	418	18	57	6264
9	74	418	0	74	6338
10					
11	10				
12	59				
13	59	300	-118	246 - 4 days	6584
14	60				
15	60	316	16	104 - 2 days	6688
16	60	328	12	48	6736
17	60	328	0	60	6796
18	61	328	0	61	6857
19	61	328	0	61	6918
20	61	328	0	61	6979
21	61				
22	81				

Date	Daily Inflow volume (acre-feet)	Storage volume (acre-feet)	Increase in storage (acre-feet)	Daily seepage (acre-feet) (recharge)	Accumulated seepage (acre-feet) (recharge)
Mar. 23	34				
	39				
24	34				
	36	360	32	253 - 4 days	7232
25	73				
26	73	366	6	140 - 2 days	7372
27	73	377	11	62	7434
28	73	380	3	70	7504
29	73	385	5	68	7572
30	73	395	10	63	7635
31	73	395	0	73	7708
Apr. 1	73	399	4	69	7777
2	73	395	-4	77	7854
3	73	410	15	58	7912
4	73	414	4	69	7981
5	73	418	4	69	8050
6	73	422	4	69	8119
7	73	422	0	73	8192
8	62				
9	62	360	-62	186 - 2 days	8378
10	62	362	2	60	8438
11	62	373	11	51	8489
12	62				
13	62				
14	62				
15	62				
16	60				
17	57	392	19	346 - 6 days	8835
18	56				
19	56				
20	56				
		0	-392	560	9395

APPENDIX E

	Summary of ground-water Well B1-63-27db(1)	Quality analyses (Code) Well B1-63-3dd(2)	Well B2-63-22aa(3)
Total solids	369	1006	2191
Volatile solids	25	58	366
Silica (SiO_2)	22	19	27
Nitrate (NO_3)	1	16	4
Chloride (Cl)	20	68	160
Carbonates (CO_2)	53	79	62
Sulfates (SO_3)	88	402	832
Lime (CaO)	88	229	461
Magnesia (MgO)	17	67	100
Soda (Na_2O)	50	44	3
Reaction (ph)	7.7	7.9	7.3

(1) Irrigation well; 171 feet deep; 92 feet to water; sampled November, 1944.
(2) Domestic well; 80 feet deep; 62 feet to water; sampled November, 1944.
(3) Irrigation well; 84 feet deep; 20 feet to water; sampled November, 1944.

"These samples were analyzed by J. W. Tobiska, Chemist, Colorado Agricultural Experiment Station, and indicate an increasing hardness from south to north, showing the influence of seepage water from irrigation. Trial scattered observations of ground-water temperatures were made in September 1944 which ranged from 53.5° to 55.7° Fahrenheit."(7)

APPENDIX F

Summary of ground-water quality analyses (after Bjorklund & Brown)

Well No.	B1-62-5aa	B1-63-13cc	B1-63-27db	B2-62-6ca	B2-62-6cb2	B2-62-19cd	B2-63-2cc	B2-63-25ab2	B2-63-25cc1	B2-63-31aa	B2-63-33dd2	B3-62-15ba
Date of collection	10/20/47	10/26/48	9/13/48	8/31/48	11/6/47	11/5/48	7/27/48	7/26/48	7/26/48	8/31/48	7/30/48	8/30/48
Depth of well (feet)	190	40.5	172	104+	......	87	81	80	74	650	87	87
Geologic Source*	L(?)	A	A	F	A	A	A	A	A	P	A	A
pH	8.6	7.9	7.6	8.5	7.6	7.8	7.6	7.4	7.6	8.0	7.9	7.5
Specif. cond. (mmho/cm at 25°C)	3780	806	548	737	544	1510	882	1760	1690	1020	1200	462
Silica (SiO_2)	9.3	17	26	12	25	17	25	28	26	12	24	21
Iron (Fe)	0.95	2.1	.02	.02	.02	.16	.02	.03	.05	.10	.05	.02
Calcium (Ca)	49	76	76	5.0	.66	200	83	260	231	3.5	137	60
Magnesium (Mg)	11	16	13	3.9	15	31	22	39	38	2.6	28	13
Sodium (Na)	764	74	42	196	40	113	82	103	135	290	107	31
Potassium (K)	6.0	8.0	4.4	0.0	0.0	9.2	2.0	4.0	6.0	3.2	3.2	4.0
Bicarbonate (HCO_3)	c360	262	216	c510	183	234	219	307	326	673	297	182
Sulfate (SO_4)	56	136	135	0.0	126	516	252	612	548	6.0	300	99
Chloride (Cl)	1060	38	17	25	7.0	90	20	108	90	0.00	70	6.0
Flouride (F)	0.7	1.6	0.4	1.4	0.6	1.6	0.8	0.2	0.50	1.6	0.4	0.6
Nitrate (NO_3)	13	10	6.9	1.9	9.4	21	13	32	32	2.5	9.1	10
Boron (B)	0.20	0.8	0.16	0.41	0.15	0.12	0.12	0.30	0.2	.00	0.42	0.00
Dissolved solids	2150	568	422	510	375	1120	618	1340	1270	708	870	382
Hardness as $CaCO_3$ Total	168	256	243	29	226	626	298	809	733	19	457	203
Noncarbonate	0	41	66	0	76	434	118	557	466	0	213	54
Percent sodium	90	38	27	94	28	28	37	22	28	96	34	24

* A - Alluvium; F - Fox Hills sandstone; L - Laramie formation; P - Pierre shale

c - includes equivalent of 20 ppm of carbonate (CO_3)

APPENDIX G

Summary of surface-water quality analyses (CSU-1960)

Location	Date	Total dissolved solids, ppm	BOD* ppm	ABS** ppm	Temperature (field)
Burlington ditch at HWY 85 bridge-Adams City, Colo.	1-28-60	717	......	1.3	52.0°F
Denver-Hudson Canal at inlet to Horsecreek Reservoir	1-28-60	736	......	2.1	41.8°F
Denver-Hudson Canal at outlet of Horsecreek Reservoir	1-28-60	723	......	1.9	37.2°F
	2-17-60	......	118	1.7	39.2°F
	3- 7-60	703	36	1.3	39.2°F
Denver-Hudson Canal at inlet to Prospect Reservoir	2-17-60	......	......	1.9	35.6°F
	3- 7-60	441	20	2.5	39.6°F
Prospect lateral ditch at outlet of Prospect Reservoir	1-28-60	703	......	1.9	38.5°F
	2-17-60	......	......	2.0	37.4°F
	3- 7-60	703	10	1.8	38.8°F
Prospect lateral ditch at inlet to Olds Reservoir	1-28-60	703	......	1.9	37.0°F
	2-17-60	......	......	2.0	39.2°F
	3- 7-60	703	14	2.3	39.6°F
Olds Reservoir - north side	3- 7-60	640	22	1.5	......
Olds Reservoir - east side	2-17-60	......	......	1.7	35.6°F
	3- 7-60	570	8	1.2	37.4°F
Olds Reservoir - southwest side	1-28-60	723	......	2.2	36.5°F

* Biochemical oxygen demand
** Alkyl-benzene-sulfonate (detergent)

APPENDIX H

Summary of ground-water-quality analyses (CSU - 1960 and 1962)

	Well B1-63-16dd	Well B2-63-34cc	Well C1-63-10bb
Total dissolved solids	527	1210	311
Hardness as $CaCO_3$	225	780	166
Hardness, non-carbonate	96	698	20
ph	7.7	7.6	8.2
Calcium	59	237	52
Magnesium	19	46	8.8
Sodium	70	96	36
Potassium	4.4	4.6	2.6
Bicarbonate (HCO_3)	158	100	178
Sulfate (SO_4)	108	632	67
Chloride (Cl)	76	94	7.0
Fluoride (F)	0.4	0.4	0.5
Nitrate (NO_3)	26	16	5.8

Analyses performed by Water Quality Laboratory of the U. S. Geological Survey, Denver, Colo. (1960).

Location	Date	Total dissolved solids, ppm	ABS, ppm
B1-63-2ddc	10- 3-62	2687	
B1-63-3aaa	10- 3-62	1118	
B1-63-3ccc	9-14-60		0.0*
B1-63-3dcd	10- 3-62	1787	
B1-63-10cdd	4-27-60	646	
B1-63-10cdd	10- 3-62	713*	0.1*
B1-63-16ddd	6-10-60	755	0.2*
B1-63-16ddd	9-14-60		0.1*
B1-63-21daa	10- 3-62	560*	0.4*
B1-63-22adc	4-27-60	915	
B1-63-22bca	9-14-60		0.5*
B1-63-22bca	10- 3-62	465*	0.7*
B1-63-22dcd	9-14-60		0.0*
B1-63-22dcd	10- 3-62	635*	0.1*
B1-63-22ddc	4-27-60	403	
B1-63-27dcb	9-14-60		0. *
B1-63-29abc	10- 3-62	910*	0.1*
B1-63-30add	10- 3-62	1282	
B1-63-34bbb	9-14-60		0.03*
B1-63-34bbb	10- 3-62	635*	0.1 *
B2-63-15ddc	10- 3-62	4120	
B2-63-24dcc	10- 3-62	2113	
B2-63-34ccc	6-10-60	1075	0.0*
C1-63-2ccc	6-10-60	384	0.0*
C1-63-2ccc	10- 3-62	261	
C1-63-3cc	6-10-60	268	
C1-63-10bbb	10- 3-62	206	

* Analyses performed by the Colorado State Department of Public Health.

APPENDIX I

Summary of ground-water quality analyses (USGS - 1962)

	Quality (field determinations)			
Location	Water temper- ature (°F)	Total dis- solved solids, ppm	Hardness (ppm)	pH
B1-63-22acc*	50	609	275	8.0
B2-62-18bca	54	961	600	7.5
B2-63-26bcc	54	1350	940	8.0

* Laboratory test for detergents
pH 7.4, 660 ppm total dissolved solids
Bacteria count 10,000 per ml., Coliform 3,500 per ml.
Alkyl-benzene-sulfonate (detergent) 0.4 ppm; Sample tested 4 days after collection.

APPENDIX J

Summary of ground-water quality analyses (CSU - 1962)

	B1-63-2ddc	B1-63-3aaa	B1-63-3dcd	B1-63-30add	B2-63-15ddc	B2-63-24dcc	C1-63-2ccc	C1-63-10bbb
Total alkalinity	326	280	236	246	364	252	160	132
Total solids	2687	1118	1787	1282	4120	2113	261	206
Volatile matter (org.)	423	378	401	236	499	339	86	83
Organic matter	mod.	trace	trace	trace	trace	none	none	none
Reaction (acid-alkal.)	7.3	7.5	7.4	7.6	7.4	7.4	7.7	7.3
Total hardness	over 1000	over 1000	998	596	over 1000	over 1000	176	148
Sodium	light to mod.	light	light to mod.	moderate	light	light	heavy	heavy
Calcium	heavy	heavy	heavy	mod. to heavy	heavy	heavy	light	light
Magnesium	light	light	light	moderate	very heavy	moderate	present	present
Iron	light	light to mod.	trace	present	none	present	none	moderate
Nitrates	very heavy	heavy	heavy	heavy	heavy	very heavy	trace	trace
Chlorides	moderate	moderate	moderate	light to mod.	moderate	moderate	light to mod.	light to mod.
Sulfates	mod. to heavy	mod. to heavy	mod. to heavy	light	mod. to heavy	mod. to heavy	trace	trace
Carbonates	none	none	none	none	none	none	none	none
Sulfides	none	none	none	none	none	none	none	none
Comments	(1)	(2)	(3)	(4)	(5)	(6)	....	....

[1] A very hard water. Solids too high. Nitrates too high for either livestock or household use.
[2] Because of the high nitrates, not recommended for either livestock or household use. Solids too high for household use.
[3] A hard water. Solids and nitrates too high for household use. Nitrates too high for livestock use.
[4] Solids too high for household use. Nitrates too high for either livestock or household use.
[5] A very hard water. Magnesium and sulfates (epsom salts) too high for livestock or household use.
[6] A very hard water. Nitrates too high for either household or livestock use.