THE GEOLOGY AND HYDROGEOLOGY OF THE ALBION BASIN, CASSIA COUNTY, IDAHO

A Thesis

in the

University of Idaho Graduate School

by

DAVID ARTHUR MYERS

May, 1967

THE GEOLOGY AND HYDROGEOLOGY
OF THE
ALBION BASIN, CASSIA COUNTY, IDAHO

A Thesis

Presented in Partial Fulfillment of the Requirements for the

DEGREE OF MASTER OF SCIENCE

Major in Geology

in the

UNIVERSITY OF IDAHO GRADUATE SCHOOL

by

DAVID ARTHUR MYERS

May, 1967

This thesis of David Arthur Myers for the M.S. degree "The Geology and Hydrogeology of the Albion Basin, Cassia County, Idaho",

A. has been reviewed in rough draft form and preparation of the final draft is recommended; permission is granted to proceed with the final examination upon submission of two final draft copies to the graduate school:

Major Professor________________ Date____________

Committee Members________________ Date____________

________________ Date____________

B. is approved in final draft form:

Head of Dept.________________ Date____________

Dean of College________________ Date____________

C. has been granted final acceptance after review by the Graduate Council and after successful completion of the final oral examination:

Dean of the
Graduate School________________ Date____________

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

BIOGRAPHICAL SKETCH

David Arthur Myers was born February 28, 1943, in Puyallup, Washington. He attended public schools in Tacoma, Washington, graduating from Stadium High School in June, 1961. In the fall of 1961 he entered the University of Puget Sound, Tacoma, Washington. In May, 1965 he received the degree of B.S. in Geology. He entered the Graduate School at the University of Idaho in September, 1965 and graduated with the degree of M.S. in Geology in June, 1967.

ACKNOWLEDGEMENTS

Dr. R. W. Jones, University of Idaho, supervised the field work and the preparation of the thesis; Dr. R. E. Williams, University of Idaho, assisted in supervision of the section on hydrogeology. I wish to express my appreciation to Glenn Logan, U. S. Soil Conservation Service, Burley, Idaho, for his assistance in delineating soil types and origins; to Bernace Brewerton, Riley Gray, and Vard Chatburn, for help in locating wells and springs; to the Idaho Department of Highways for use of their air photos; and to the staff of Magic Valley Christian College, who offered their facilities to me.

ABSTRACT

Albion basin is an alluvium-filled basin in eastern Cassia County, Idaho, about 18 miles southeast of Burley.

The study area is in the Basin and Range province of the western United States. The eastern boundary of the basin is formed by the Malta Range, a rotated fault block which apparently is bounded by high-angle normal faults on the east and west. A line of hot springs marks the probable position of the fault on the west side of the Malta Range. East Hills bounds the basin on the north and the main mass of Albion Range forms the south and west boundaries.

The Malta Range and part of the East Hills are made up of a thick flow of quartz latite. The flow consists of three zones: lower and upper vitrophyre zones, and a central lithoidal zone. No mineralogical differences and no physical breaks were noted between the zones. Capping the Malta Range in the north is a body of Snake River basalt about one square mile in area. The Albion Range is underlain by metamorphic rocks.

Marsh Creek is the principal stream in the basin, but the ground water is the main source of irrigation and domestic water. Wells range in depth from 11 feet to more than 700 feet and yields range from a few gallons per minute to 540 gallons per minute. Wells must be cased the entire depth of penetration. Several clay lenses in the alluvium create local artesian aquifers. The water,

mostly of the calcium-bicarbonate type, is suitable for domestic and irrigation use: the total dissolved solids content ranges from 202 ppm. to 2294 ppm; temperatures of the waters in the deep wells are generally 62° to 74°F., and in the shallow wells, 57°F. Hot springs in Marsh Canyon are used only for irrigation, although the possibility exists that they could be developed for domestic heating or for recreation.

Quantitative data on water resources could not be obtained from the present study, but available data suggest that the basin is not yet fully developed.

INTRODUCTION

Purpose and Scope

The study of the Albion basin was undertaken to provide background data for future investigations of the role of geology in the movement of water within a small alluvium-filled ground-water basin.

The alluvium-filled area of the basin covers approximately 60 square miles, whereas the area within the drainage divides is about 130 square miles. The surface and subsurface geology were mapped in some detail and the geology of the volcanic rocks in the Malta Range east of Albion basin was mapped in reconnaissance, but the metamorphic rocks of the Albion Range were not studied. Data were collected on wells, water levels and on the chemical quality, temperature and electrical conductivity of the water.

Method of Investigation

During the summer of 1966, sixty days were spent collecting field data on geology and hydrogeology. Geology of the Malta Range was mapped by a series of traverses across the range and by one traverse along the crest of the range. In addition, several traverses were made across the terrane bordering the northern end of the basin.

Air photos furnished by the Idaho Department of Highways were used to locate the traverse positions. Two base maps were used: geology was mapped on Idaho Department of Highways Cassia County Sheets 1 and 2; and well positions were plotted on U.S. Forest Service Map, Basin 1, Idaho, Boise Project. The county road map has a scale of one inch to the mile and the Forest Service map, a scale of two inches to the mile.

A well inventory was made in the field and augmented by data from the files in the Boise Office of the U.S. Geological Survey, Water Resources Division. Logs of the wells within the basin were obtained from the U.S. Geological Survey, the Idaho State Reclamation Engineer, and local farmers.

Previous Investigations

The area was mapped in 1929 and 1930 by A. L. Anderson (1931) as part of a much larger project that covered the entire eastern portion of Cassia County in reconnaissance. Anderson's report and maps were used as a starting point for this more detailed study. Glenn Logan of the Soil Conservation Service in Burley provided data on the soils of the basin (unpublished report, 1962). Armstrong (1966) has entirely revised the stratigraphy of the metamorphic rocks of the Albion Range.

Location and Access

The Albion basin is in eastern Cassia County, Idaho approximately 18 miles southeast of Burley, the county seat (Fig. 1). The basin has one major access road, Idaho State Highway 77, which crosses the basin in a north-south direction. Numerous gravel roads serve the ranches and farms of the area. A U.S. Forest Service Road provides access to the highest point in the area, 10,000 foot Mount Harrison. A road maintained jointly by the Rural Electrification Administration and the Federal Aeronautics Administration provides access to the Malta Range. A small private road provides access to a portion of the eastern edge of the Malta Range.

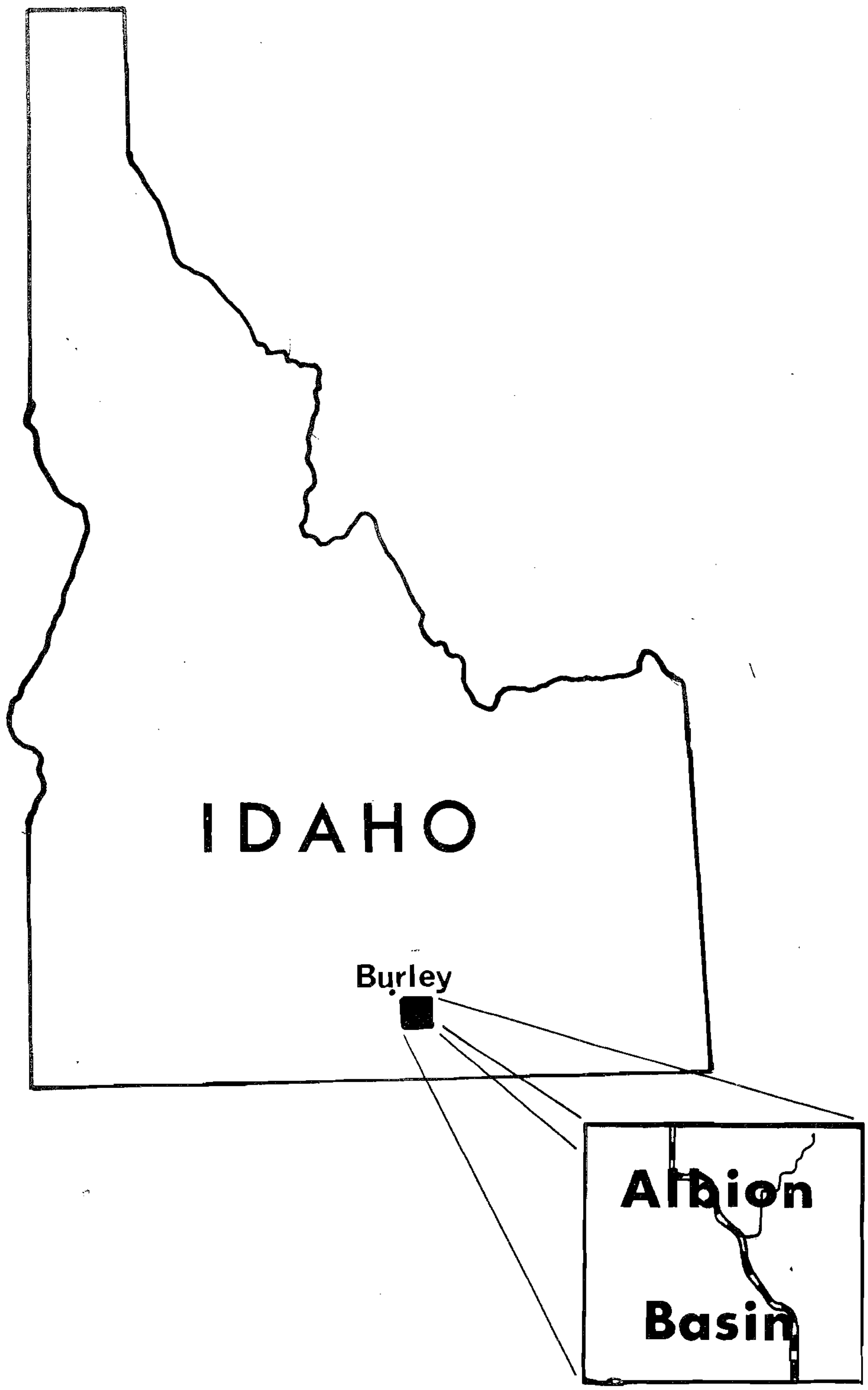


Figure 1: Index Map of Albion Basin, Idaho

GEOLOGY

General Statement

The study area can be subdivided into four distinct topographic units, the Albion Range, the Malta Range, the East Hills, and the Albion basin. Albion basin is bounded in the west and south by the Albion Range, on the east by the Malta Range and on the north by the East Hills.

Albion Range

The Albion Range is made up of metamorphic rocks that were mapped as "Harrison Series" by Anderson (1931). Armstrong (1966) has dated these rocks by rubidium-strontium methods at 550 million years.

Malta Range

The Malta Range is composed of volcanic rocks of three distinct lithologies: a tuffaceous unit, a quartz latite unit, and a thin cap of Snake River basalt.

The thickness of the volcanic ash unit is not known. The base of the unit is not exposed; the uppermost 20 feet is all that crops out.

The quartz latite is a single flow that has a very complex system of joints. The unit is well exposed along the eastern edge of the Malta Range, where it stands in high cliffs. The flow ranges in thickness from 400 to 1500 feet within the area mapped. The quartz latite is divided into three distinct mapping subunits: a lower vitrophyre zone; a central non-glassy zone; and an upper vitrophyre zone. Anderson (1931) stated that three flows were present, separated by soil zones; during the present study the soil zones could not be identified.

A small body of Snake River basalt overlies the northernmost section of the area. The basalt forms a capping ridge about 40 feet thick and a square mile in area (Pl. 1).

East Hills

In the East Hills the quartz latite of the Malta Range is underlain by metamorphic rocks of the "Harrison Series".

Albion Basin

The lower third of the Albion basin is filled with alluvial deposits. The stratigraphy of the basin was worked out by interpretation of driller's logs. The thickness of the sediments in the central portions of the valley is in excess of 700 feet. The valley alluvium is believed to be glacially-derived from the Albion and Malta Ranges (Logan, oral communication, 1966). Most of the available well logs show four lenses of clay; one well, for which the log is not available, was reported to have penetrated six lenses of clay. These lenses suggest a periodic damming of Marsh Creek during glaciation, causing deposition of glacial lake sediments.

Structure

The Albion basin is within the Basin and Range province of the western United States. The structure of the area exemplifies this type of regional block faulting. The largest single element studied was the Malta Range.

Malta Range

The Malta Range is a rotated fault block of typical Basin and Range type (Pl. 1 and 2). Strikes are nearly constant and dips vary only slightly. A prominent scarp is present along the entire eastern edge of the range. Other evidence of presence of faults includes a line of hot springs in the north, and discordant rock relations along the western edge.

Differential uplift of the range is suggested by elevation differences of several hundred feet in outcrops of the tuff unit. The tuff crops out several hundred feet higher in the southern portions of the Malta Range than in the north.

The quartz latite unit in the range gradually thickens from 400 feet in the north to 1500 feet in the south. The vitrophyre zones within the unit remain about the same thickness throughout the range.

Joint patterns within the quartz latite unit are diverse. The joint patterns, where present, range from platy to well-developed columns. Platy joints are most evident in the central and northern portions of the range, where total thickness of the unit is small. The platy joints form large swirls, with diverse orientations. These joints suggest remnants of large heat-flow cells within the unit that solidified as the main mass cooled. Columnar joints are present in the southern portions of the Malta Range. The columns are oriented at all attitudes but most are vertical. The vitrophyre zones have no consistent joints. No mineralogical differences were seen between the rock types for each joint type.

East Hills

The quartz latite of the East Hills is in fault contact with the metamorphic rocks of the Albion Range. The fault is marked by quartzite and quartz latite in vertical contact across a brecciated zone of quartzite and quartz latite. In the western portion of the East Hills the fault trace is marked by a topographic low.

The quartz latite crops out in cliffs facing south, towards the Albion basin. The tuff crops out in only one place (Pl. 1), about one mile northwest of Albion. Elsewhere the tuff is not exposed.

The attitude of the quartz latite unit is about the same as in the Malta Range. Dips are 4° to 6° to the west, except near the fault where they are around 7°.

Joints in the quartz latite are mostly columnar, with platy joints occurring only in scattered locations.

Petrography

Tuff

The lowermost unit cropping out in the area is a light gray tuff that is friable when wet.

In thin section, the tuff has a composition of:

Glass shards	95%
K-spar	2%
Mafics	3%

The groundmass is partially devitrified. Phenocrysts are up to 0.5 mm. in diameter and show incomplete crystal development. Glass shards are up to 1.0 mm. in length.

Quartz latite

The quartz latite of the Malta Range and East Hills consists of two vitrophyre zones and a lithoidal zone which can be distinguished in hand specimen. The vitrophyre zones are present at the top and bottom of the unit. The zones are recognized by a granular, glassy matrix containing well-defined phenocrysts, 0.5 to 3.0 mm. in diameter. The lithoidal zone in the middle of the unit consists of a yellow-brown devitrified matrix containing phenocrysts of plagioclase and quartz. The matrix gives a positive potassium test when treated with sodium cobaltinitrite, suggesting that potassium feldspar is present.

In thin section the specimens show a phenocryst composition of:

Plagioclase An_{15}	70%
Quartz	20%
Hornblende	6%

Small microlites of potassium feldspar are dispersed throughout the groundmass. The central zone and vitrophyre zones have the same phenocryst composition, but the potassium feldspar microlites are more abundant in the central zone.

Near the contact of the quartz latite and the tuff, phenocrysts show poor crystal development. In this zone, the potassium feldspar microlites show flow structure by bending around the phenocrysts in a banded pattern.

Snake River Basalt

In hand specimen, the basalt is a dense, dark rock with few vesicles. The texture is dictytaxitic with large open spaces between plagioclase laths.

In thin section the basalt shows a composition of:

Plagioclase An_{57}	70%
Olivine	20%
Iddingsite	5%

The most striking feature of this rock in thin section is the alteration of olivine to iddingsite.

HYDROGEOLOGY

Climate

The Albion basin is in an area that normally receives from 10 to 16 inches of precipitation annually (U.S. Environmental Services Administration, 1967). Most of the precipitation falls as snow during the months of January and February. The summers are warm and the winters are moderately cold. Soil Conservation Service records (Nelson and Wilson, Snow Course Data, 1942-1967) show an average depth of 23.34 inches throughout the winter, at the Howell Canyon snow station during the 25-year period of record.

Since 1959, the basin has been experiencing near-drought conditions, with snow depth averaging 14 inches below normal. During the 1966 irrigation season, the flow of both Marsh and Howell Creeks became so low that several farmers with low-order water rights on the two streams were forced to cease irrigation.

Wells and Well Numbering System

The Village of Albion and most of the farms within the basin depend upon ground water for domestic supplies. Ground water is used for irrigation by a few of the farms. Of the 30 wells inventoried, only six operating wells were more than 100 feet deep. The wells were plotted on the base map and assigned numbers using the system of the Idaho Bureau of Mines and Geology (Fig. 2); data on the wells appear in Table 1, and their

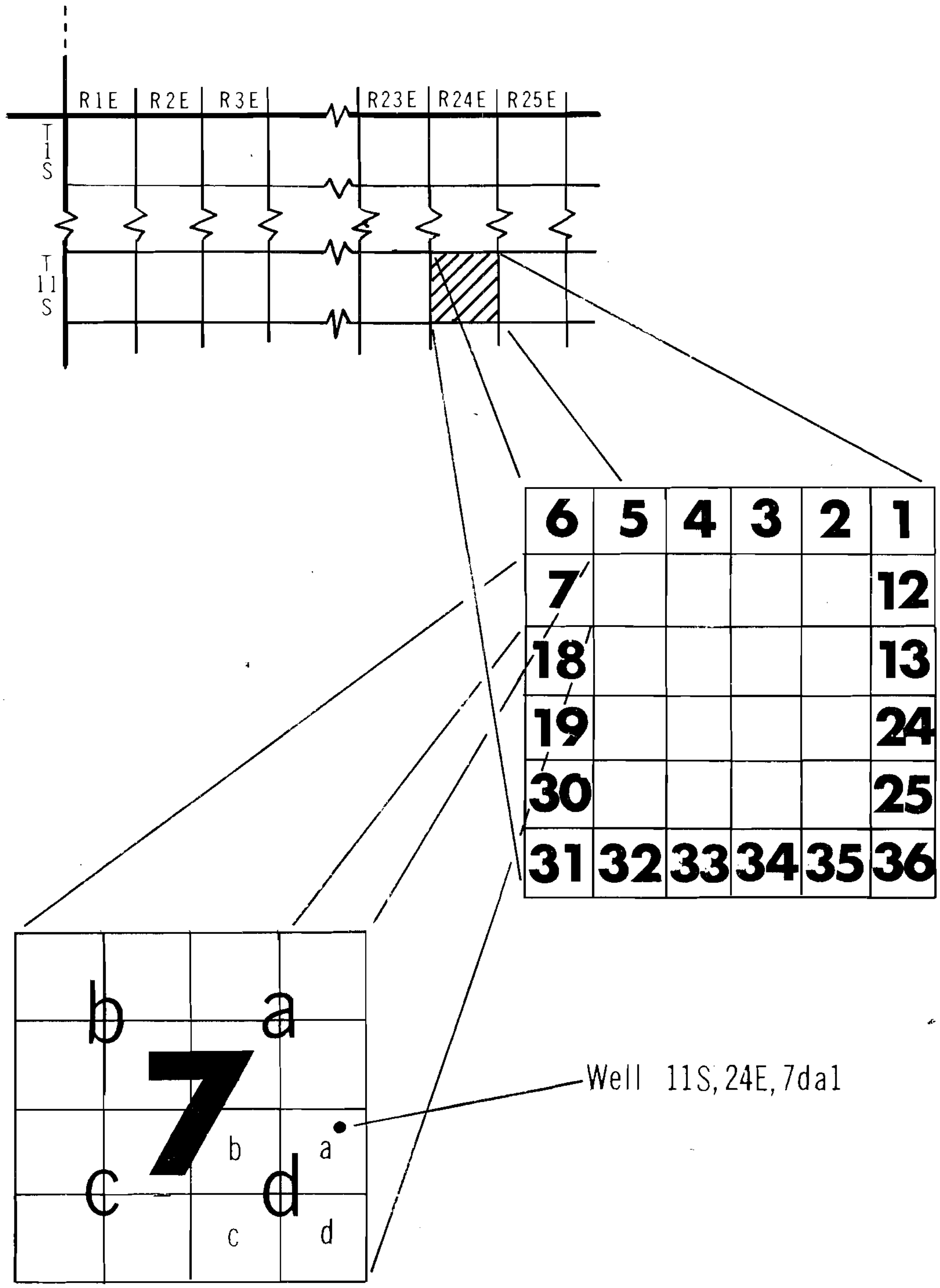


Figure 2: Well Location System used by the Idaho Bureau of Mines and Geology

TABLE 1.

Well Inventory, Albion Basin,
see Plate 3 for locations

Well	Diameter (in.)	Depth (ft.)	Temp. (°C.)	E.C. (micromhos)
T11S R24E				
25ac1	6	222	----	---
24cd1	6	240	----	---
35aa1	6	---	----	---
35aa2	6	203	----	---
T11S R25E				
11cb1	16	456	25°C	450
11dc1	8	460	rept. hot	---
14ab1	6	266	----	---
31ba1	8	150	16°C	625
31ca1	6	68	----	hard
31cd1	6	150	22°C	2200
32dd1	16	365	----	---
33db1	12	319	----	---
35ca1	6	68	16°C	365
T12S R24E				
1ab1	6	170	----	---
1ba1	8	170	17°C	---
12cb1	-	45	----	---
12cd1	6	25	13°C	380
13ab1	-	11	14°C	625
13ab2	-	18	16°C	260
13bc1	-	12	11°C	220

Table I, Con't.

Well	Diameter (in.)	Depth (ft.)	Temp. (°C.)	E.C. (micromhos)
T12S R25E				
4bdl	-	20	12°C	420
4bd2	12	627	24°C	300
6abl	15	220	15°C	380
6bal	16	550	21°C	535
6bdl	16	710	----	---
6dcl	-	90	17°C	510
7abl	-	105	16°C	480
7cbl	24	13	12°C	420
18dal	8	280	----	---
35adl	6	250	----	---

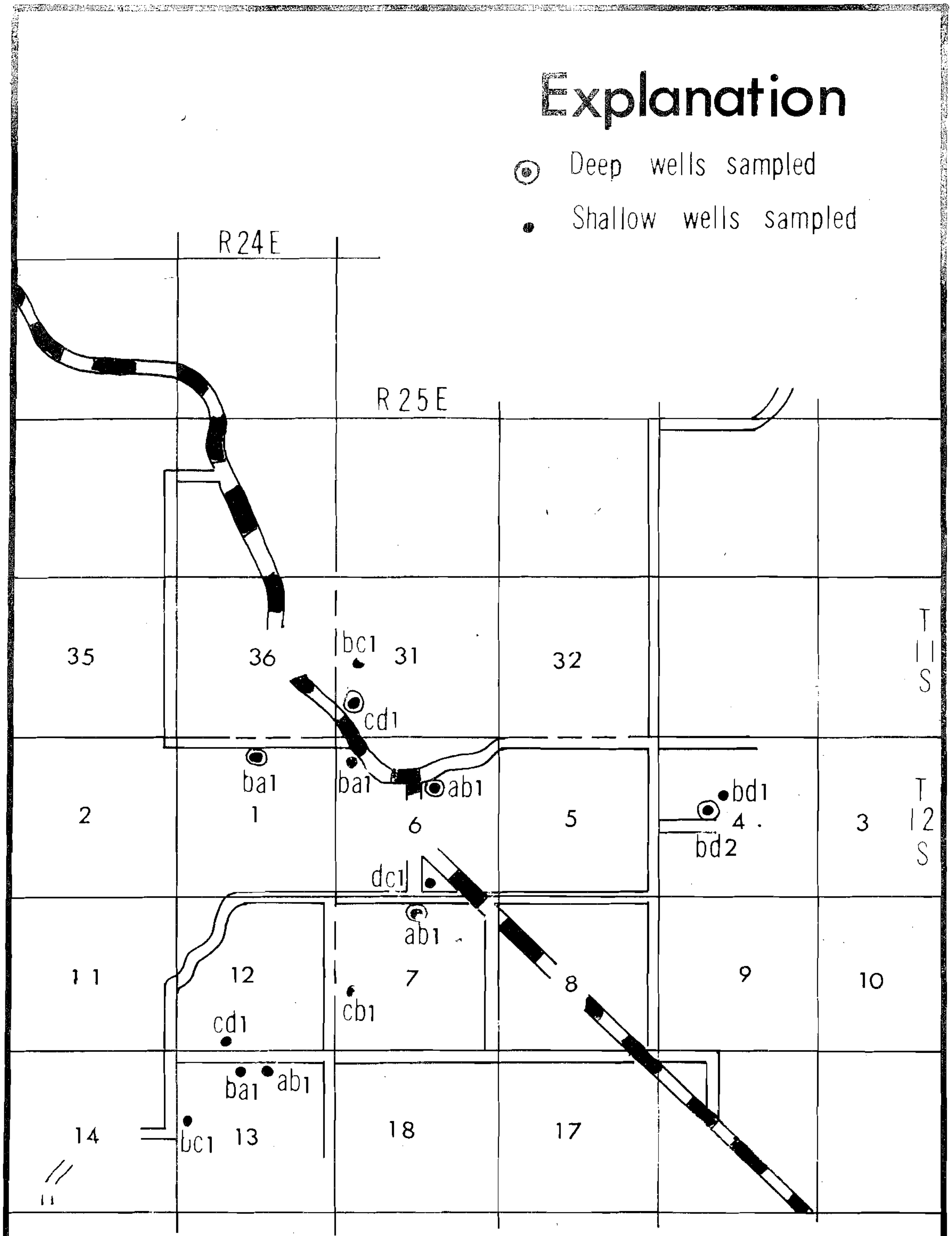


Figure 3: Chemical analysis location map, Albion Basin, Idaho

locations are shown on Plate III. In the text, wells are referred to only by their section location numbers.

The wells in the basin are either dug or drilled. Dug wells were mostly constructed by hand; cable tool rigs were used for drilled wells. Drilled wells which yield large quantities of water generally are 16 inches in diameter; for lesser amounts of water, well casings down to four inches in diameter are used.

Water Quality

Measurements of some of the chemical and physical properties of the water were taken in the field. Temperature and electrical conductivity (E.C.) were measured on most operating wells. Field E.C. measurements ranged from less than 50 micromhos at Howell Springs to more that 2200 micromhos in well 31cdl.

Most of the farmers in the basin periodically send samples of their well water to the Idaho State Public Health Department for bacteria counts. All of the wells tested have been safe and free from colliform bacteria.

Chemical analyses were conducted on 14 selected water samples (Fig. 3). The analyses were performed by the Department of Agricultural Chemistry at the University of Idaho. The samples were collected from locations within the basin from wells of different depths. The results of the analyses are shown in Table 2.

Table 2

Chemical Analyses of Selected Samples

Well	E.C. 10^{-3}	pH	Cations								Anions						Total
			Ca		Mg		Na		K		HCO_3		Cl		SO_4		
			epm	ppm	epm	ppm	epm	ppm	epm	ppm	epm	ppm	epm	ppm	epm	ppm	ppm
31ba1	0.76	7.95	3.95	80.5	1.97	23.9	1.50	34.5	0.18	7.3	2.99	143.5	3.49	123.8	1.12	53.7	467.2
31cd1	3.70	7.95	16.63	339.2	8.32	101.1	11.83	272.	0.22	8.6	4.72	226.5	24.24	860.1	8.0	386.5	2293.9
1ba1	0.52	8.00	3.03	61.8	1.51	18.3	0.5	11.5	0.13	5.0	2.99	143.5	1.75	62.1	0.43	20.6	322.8
12cd1	0.47	8.00	3.02	61.8	1.52	18.5	0.5	11.5	0.11	6.6	4.95	237.6	0.19	6.7	0.06	2.8	345.1
13ab1	0.72	7.80	4.38	87.6	2.19	26.6	1.57	36.1	0.17	6.6	7.48	359.0	0.76	26.0	0.07	3.3	545.3
13ab2	0.39	7.95	2.71	55.2	1.35	16.4	0.03	0.7	0.01	0.4	3.91	187.6	0.17	6.3	0.08	3.8	270.3
13bc1	0.25	7.90	1.64	33.4	0.82	9.9	0.55	12.6	0.12	4.7	2.65	127.2	0.39	13.8	0.09	4.3	202.9
4bd1	0.60	7.90	3.08	62.8	1.54	18.7	1.20	27.6	0.16	6.3	4.95	236.7	0.99	35.1	0.04	1.9	390.0
4bd2	0.37	7.70	1.79	35.8	0.89	8.2	0.94	21.6	0.08	3.1	2.07	99.3	0.99	35.1	0.64	30.7	230.8
6ab1	0.50	7.85	2.42	49.3	1.21	14.7	1.23	28.3	0.14	5.5	3.22	154.5	1.18	41.9	0.60	28.8	323.0
6dc1	0.70	8.10	3.14	64.0	1.57	19.0	2.97	68.3	0.19	7.4	7.02	336.9	0.76	26.9	0.09	4.3	519.4
7ab1	0.85	8.00	3.95	80.5	1.97	23.9	2.45	56.3	0.21	8.2	7.02	336.9	0.97	34.4	0.59	28.3	568.5
7cb1	0.65	7.80	3.80	77.5	1.90	23.1	1.25	28.7	0.14	5.5	6.67	320.1	0.39	13.8	0.03	1.4	470.1
6ba1	0.70	8.00	3.66	74.6	1.83	22.2	1.23	28.3	0.18	7.0	3.57	171.3	2.35	83.4	0.98	47.0	391.5

Interpretation of Water Quality Data

The analyses were converted to parts per million (ppm) and calculated into ion percentages. The percentages were plotted on a Piper Water Analysis Diagram (Fig. 4) to determine the type of water. Most of the analyses plot in the secondary carbonate alkalinity section of the diagram. These are calcium bicarbonate waters. The water is very consistent in percentage composition; only two samples plot outside the main group. The two samples with unusual compositions are in the secondary salinity section of the diagram (Piper, 1953). These are calcium sulfate-chloride waters.

Flow Pattern

Most of the recharge in the basin is from precipitation which falls on the Albion Range, in the vicinity of Mount Harrison. Numerous springs issue from joints and fractures in quartzites that crop out on the flanks of the Albion Range. Three of these springs form the source of Howell Creek, one of the major streams in the basin.

The Malta Range makes little contribution to the hydrologic system of the basin. Because of the blocking effect of the Albion Range, only minor amounts of snow fall on the Malta Range during the winter months. Because of the lower elevation of the Malta Range, the snow melts rapidly and flows down numerous small gullies

Explanation

1	4bd2
2	13ab1
3	31ba1
4	13bc1
5	7cb1
6	4bd1
7	13ab2
8	1ba1
9	12cd1
10	7ab1
11	6ba1
12	31cd1
13	6ab1
14	6dc1

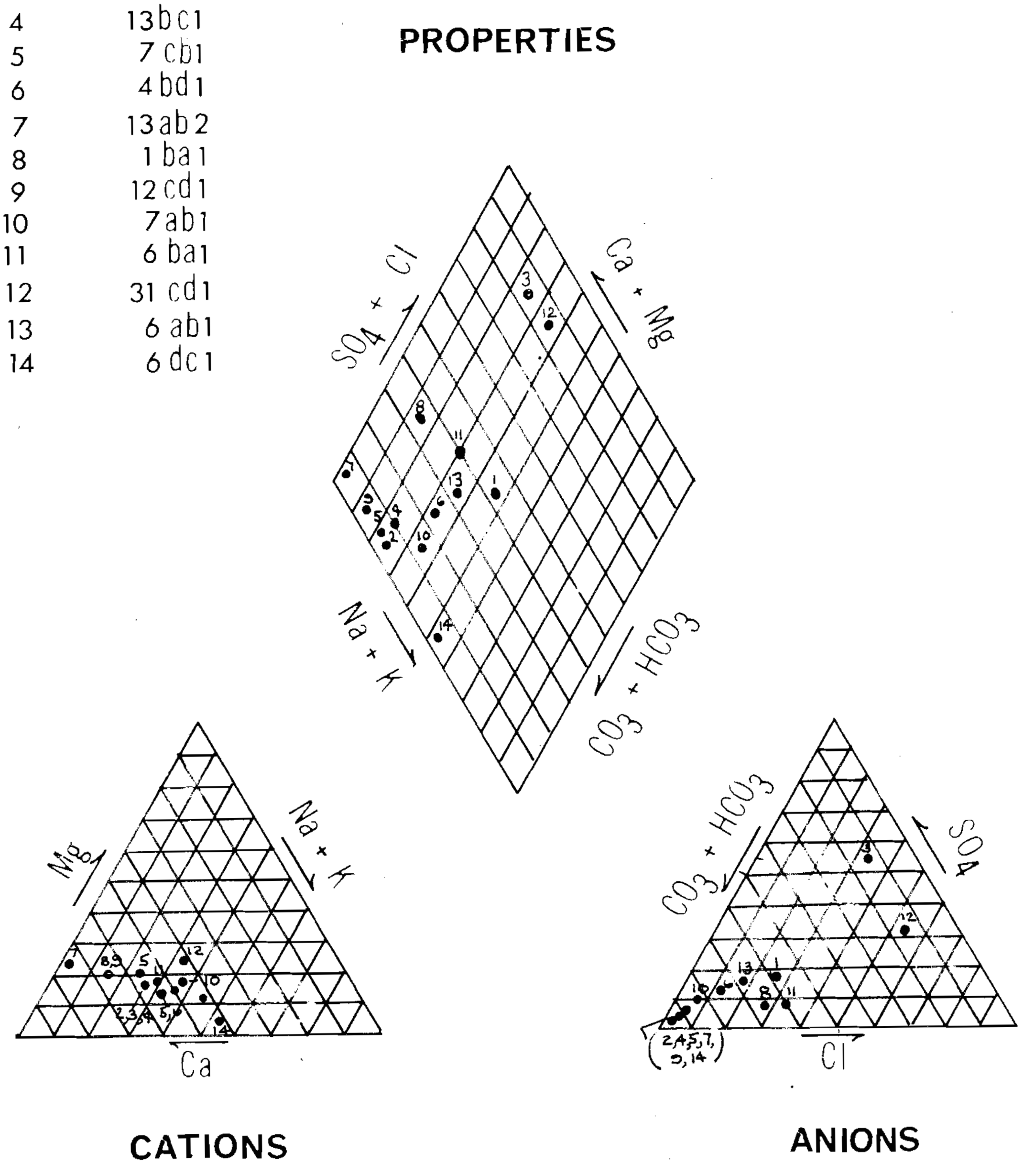


Figure 4: Water analysis diagram, Albion Basin, Idaho

in the range and enters the basin primarily as surface water, but may recharge ground water sometimes.

Local residents state that Marsh and Howell Creeks show some fluctuation in total flow throughout the year. This variation has little reported effect on the unconfined water table. This lack of reaction to spring high-water and summer low-flow conditions suggests that the streams have poor hydrologic connection with the free water table. However, in the vicinity of the Village of Albion, the flow of Marsh Creek is notably reduced. In this area numerous shallow wells penetrate the shallow aquifer and possibly induce recharge from the stream. Farther downstream, at the point where Marsh Creek enters Marsh Canyon, the total flow of the stream is increased to about its former level. The lack of good hydrologic connection through most of the basin suggests that Marsh Creek contributes little to ground-water recharge in the basin.

Aquifers

The alluvial area of the basin contains a number of local ground-water zones. The only zone of wide extent is a shallow water table aquifer. Most of the wells utilize this aquifer. Deeper wells within the basin penetrate different local artesian aquifers. The number of wells penetrating the confined aquifers is slowly increasing, but the confined aquifers seem to be capable of further development.

As an isolated basin with definite hydrologic boundaries, the Albion basin provides an excellant model for the study of ground-water flow. A lack of observation wells during the period of study greatly limited the collection of data concerning aquifer characteristics. With the installation of observation wells required by the Idaho State Reclamation Engineer, data should become available to provide the basis for a more accurate quantification of the ground-water resources of the Albion basin.

Unconfined Aquifer

The water table aquifer is present in much of the alluvium in the lower part of the basin. The shape of a water table is commonly assumed to be a subdued replica of the land surface.

In portions of the Albion basin, few wells are present to indicate the depth to water in the unconfined aquifer. Toth (1963), by use of a mathematical model, showed that, under certain boundary conditions, the location of the free water table in a basin may approximate a sine curve. Portions of the Albion basin meet the requirements of isotropy, homogeneity, and hydrogeologic boundaries prerequisite to the application of the model set forth by Toth. He postulates that a basin will be divided into recharge and discharge areas by a line approximately half way down the slope of the basin. This condition is indicated in the Albion basin by a line of springs about one third of the way down slope. A prediction of the approximate position of the water table, based on Toth's work and available water levels, for the basin is shown in Figure 5. The applicability of Toth's model is probably limited in the lower reaches of the basin. By adjusting Toth's assumption of a horizontal, impermeable, lower boundary for a sloping and for anisotropic conditions, these limitations could be overcome.

Water from the unconfined aquifer is generally of good quality. Temperatures are 57 ± 1°F. and E.C. is 360 ± 50 micromhos throughout the aquifer.

The unconfined aquifer is tapped by dug wells that rarely exceed a depth of twenty feet below land surface. These wells have proved adequate for domestic use. Under prolonged pumping they do go dry, but after pumping ceases they refill to their former levels within a few hours.

Aquifer characteristics could not be determined due to a lack of data and lack of opportunity to conduct pumping tests. Certain properties can be inferred from the available information. The high rate of drawdown and recovery in wells utilizing the shallow aquifer suggests a low coefficient of transmissibility. This is also indicated by the absence of interaction between adjacent wells.

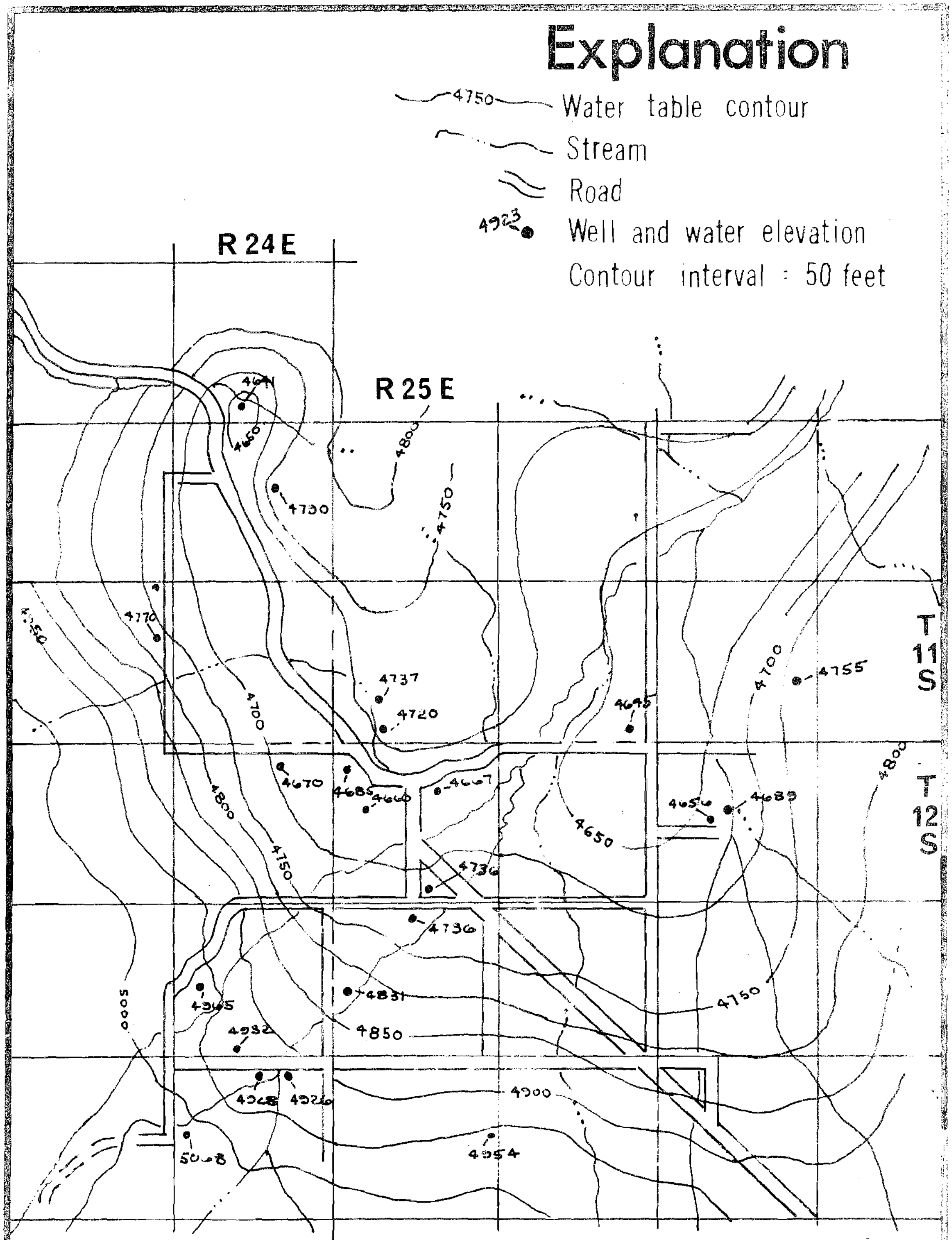


Figure 5: Water table contour map, Albion Basin, Idaho

Confined Aquifers

Several local confined aquifers are present in the alluvial deposits of Albion basin. The presence of these aquifers is deduced from drillers' reports of head differentials across several impermeable clay lenses. Most drillers' logs report from one to four impermeable layers in the first 200 feet of penetration. Well 18da1 penetrated six layers in 280 feet (reported by owner). The clays are presumed to be lenses and may not extend between wells. Drillers did not report the actual head differences in feet, but noted only a rise or fall of the water level in the wells after passing through a clay layer.

Water from the confined aquifers is of poorer quality than that of the unconfined aquifers. The temperatures range from 62° to 74°F. Electrical conductivity ranges from 425 to 2200 micromhos. According to the hypothesis of Chebotarev (1955) and Back (1960) the well with the highest total dissolved solids (TDS) content in a given basin should be the well farthest from the area of recharge. In the Albion basin, if Toth's model is in fact applicable, this is found to be the case, the bottom of the well having the highest TDS (31cd1) is the lowest in elevation and farthest from the area of recharge.

Yields from the confined aquifers differ from well to well. Most of the wells seem to draw down about 120 feet--regardless of pumping rate--and establish a relatively stable pumping level at 120 feet. The three large irrigation wells in operation in the basin produce up to 1.2 cubic feet per second (cfs). Recovery times in these wells are very short and can be measured in minutes. Two of the deep wells supply water for public supply for the Village of Albion and for Magic Valley Christian College. Figure 6 shows the location of the deep wells. Data on the deep wells include:

Well	Depth (feet)	Yield (cfs)	Use
4bd2	627	1.2	Irrigation
6ba1	550	0.6	Public Supply
6ab1	220	0.5	Public Supply
31cd1	150	0.2	Stock
7ab1	105	---	Domestic
1ab1	158	---	Irrigation

The supply from well 6ab1 was found to be insufficient to meet the needs of the Village of Albion and another well was drilled in early 1967. This well is reported to yield 0.6 cfs with 150 feet of drawdown.

Well 7ab1 was deepened from 58 feet to 105 feet in order to eliminate the interference of well 6cd1, 400 feet away, which tapped the same aquifer. After 7ab1 was deepened, it was necessary to deepen 6cd1 to maintain sufficient water supply. These two wells are in the region where the flow of Marsh Creek is noticeably lower, and probably help in inducing recharge to the shallower aquifers in this region.

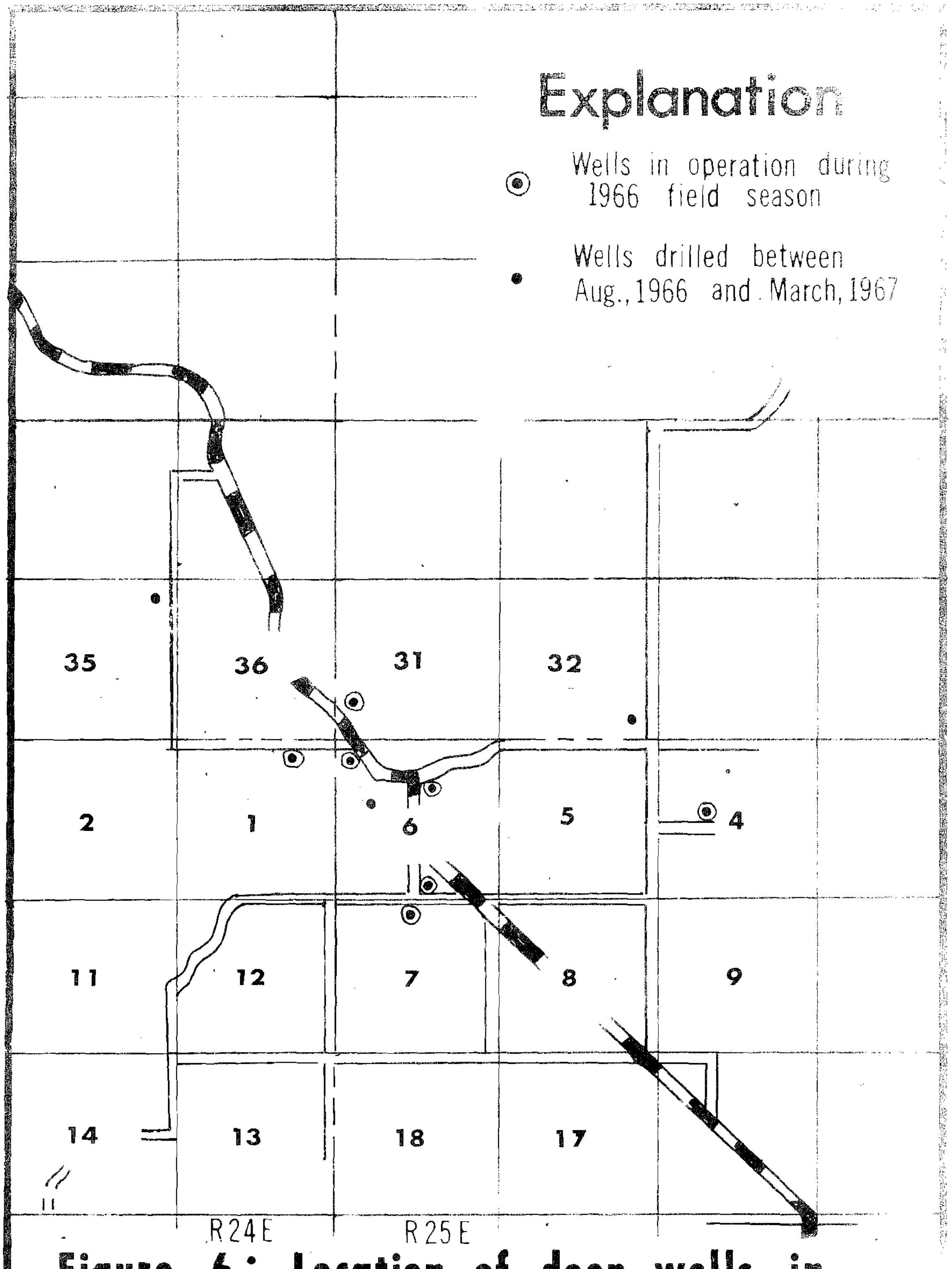


Figure 6: Location of deep wells in Albion basin, Idaho

Hot springs are present along the western edge of the Malta Range, near the point where Marsh Creek flows out of the basin in sec. 14, T 11 S., R. 25 E. The water from these springs has about the same E.C. as water from the confined aquifers, but the temperature is 87°F. The proximity of the hot springs to the Malta Range fault block indicates that water rising along faults might be responsible for the higher temperature. The hot springs in the Albion basin have not been exploited but the possibility for future development exists and should not be overlooked.

In the 1940's, an organization known as the Marsh Creek Oil and Gas Company drilled a well in the Albion basin. The well was drilled to a depth of 625 feet. The well log reports a show of oil at 587 feet, but this cannot be confirmed. The well was filled with cement after the company went out of operation and could not be located in 1966.

The Albion basin ground-water system lies between two ground-water regions that have been declared "critical" by the Idaho State Reclamation Engineer. In 1962, the Albion basin was closed to further ground-water development for any purpose other than domestic supply. In the summer of 1966, the Village of Albion applied for a drilling permit to obtain additional water to meet its demands and for possible emergencies. Because the area was considered to be within the boundaries of a water-critical area, the request for a permit was denied. After consultation with the residents of the basin in a formal hearing, the Idaho State Reclamation Engineer removed the Albion basin from the "critical" classification. This action was taken on the condition that observation wells and a stream gaging station were to be installed to monitor the basin. If any "significant and substantial" lowering of water levels occurs, then the basin will be reinstated as a water critical area.

CONCLUSIONS

Owing to lack of quantitative data, the ground-water resources of the Albion basin could not be determined accurately in the present study. Available data, however, suggest that the basin is not yet exploited to its maximum safe level. Data to be compiled from the observation program required by the Idaho State Reclamation Engineer should provide a basis for quantitative studies in the future.

The hot springs in Albion basin are available for future economic development. Water from these springs could be piped a few miles, at relatively low cost, to provide low cost heating to the Village of Albion, or to supply a swimming pool.

The Albion basin will provide an excellent field laboratory for future studies of ground-water flow in a small basin.

SELECTED REFERENCES

Anderson, A. L., 1931, Geology and mineral resources of eastern Cassia County, Idaho: Idaho Bur. Mines and Geology Bull. 14.

Armstrong, R. L., 1966, Pre-Tertiary stratigraphy of the Albion Range, Southern Idaho (abs): Geol. Soc. Amer. Special Paper (in press).

Back, W., 1960, Origin of hydrothermal facies of ground-water in the Atlantic Coastal Plain: Report of the 21st session, Int. Geol. Congress, pt. I, Copenhagen, p. 87-95.

Chebotarev, I. I., 1955, Metamorphism of natural waters in the crust of weathering: Geochim. et Cosmochim. Acta, v. 8, p. 22-48, 137-170, 198-212.

Logan, G. H., 1962, Descriptive legend of the soil survey on east and west Cassia soil conservation districts Idaho: Burley, U.S. Soil Conservation Service, mimeographed.

Nelson, M. W., and Wilson, J. A., 1967, Water supply outlook and Federal-state-private cooperative snow surveys for Idaho for March, 1967: Boise, U.S. Soil Conservation Service.

Piper, A. M., 1953, A graphic procedure in the geochemical interpretation of water analyses: U.S. Geol. Survey, Ground water notes, (mimeographed).

Toth, J., 1963, A theoretical analysis of groundwater flow in small drainage basins: Jour. of Geophys. Res., v. 68, no. 16, p. 4795-4812.

U. S. Environmental Services Admin., 1967, Climatological Data, Idaho: U.S. Environmental Services Admin.

Plate 1

GEOLOGIC MAP

of the

ALBION BASIN, CASSIA CO., IDAHO

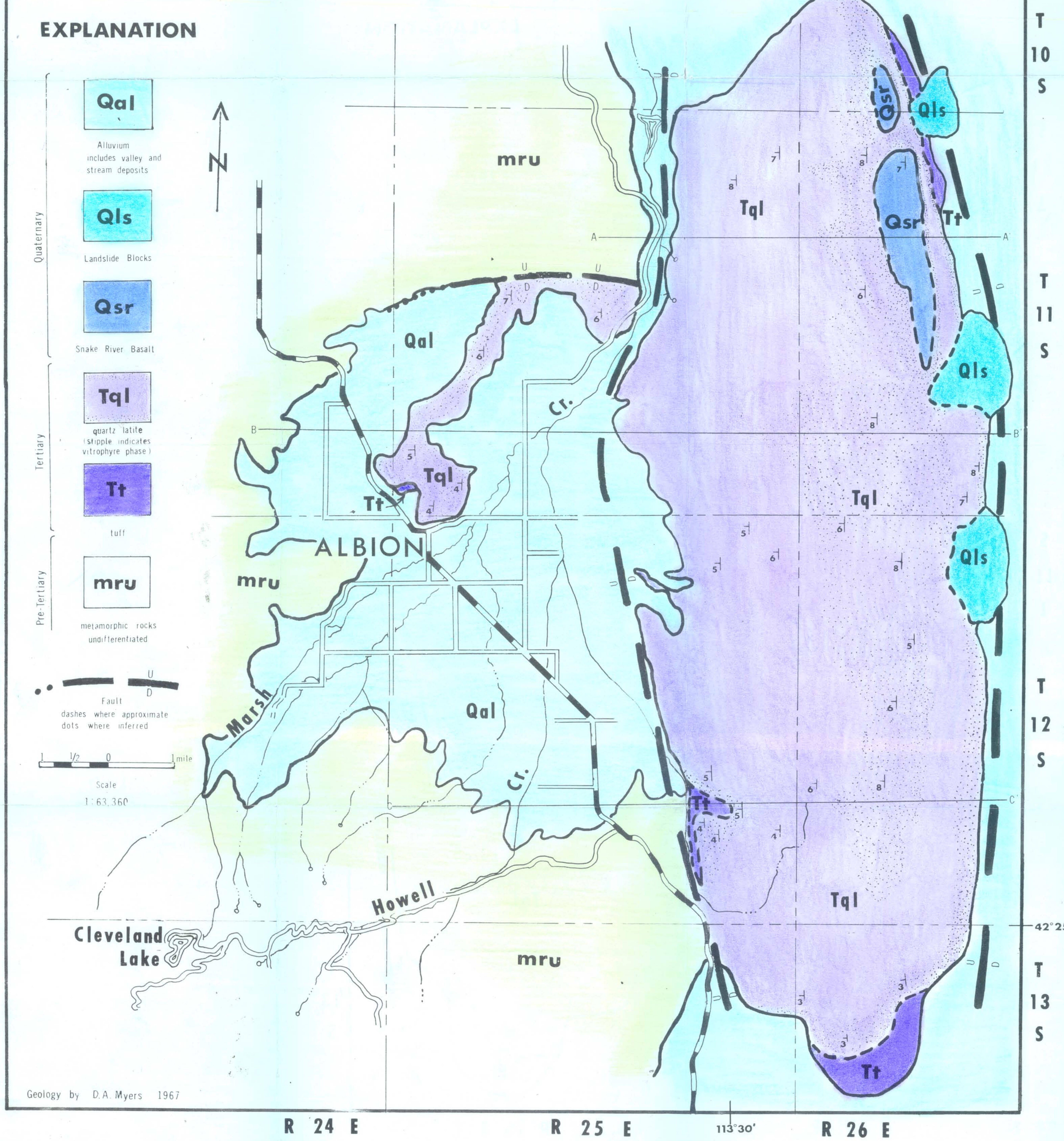
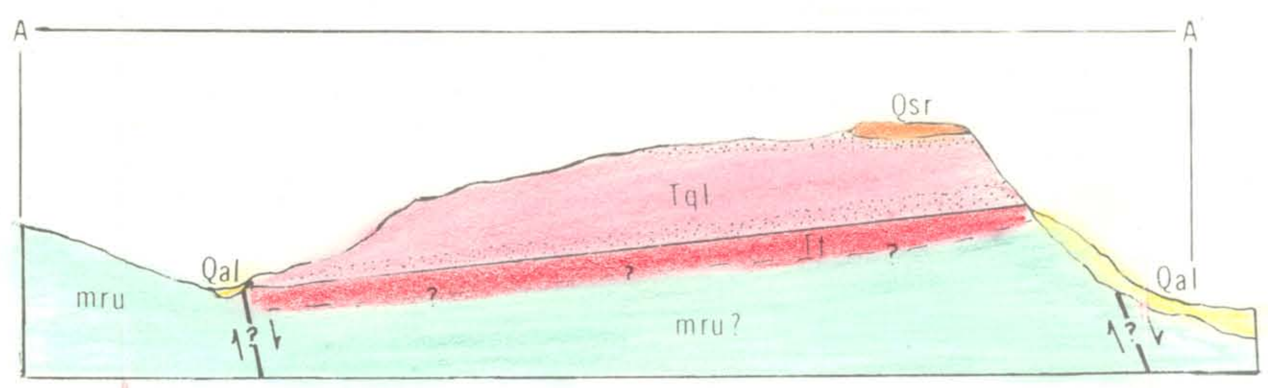
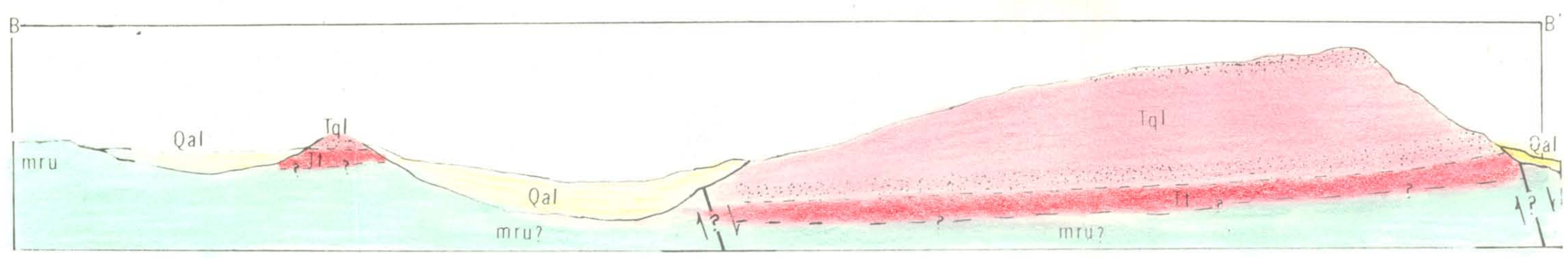
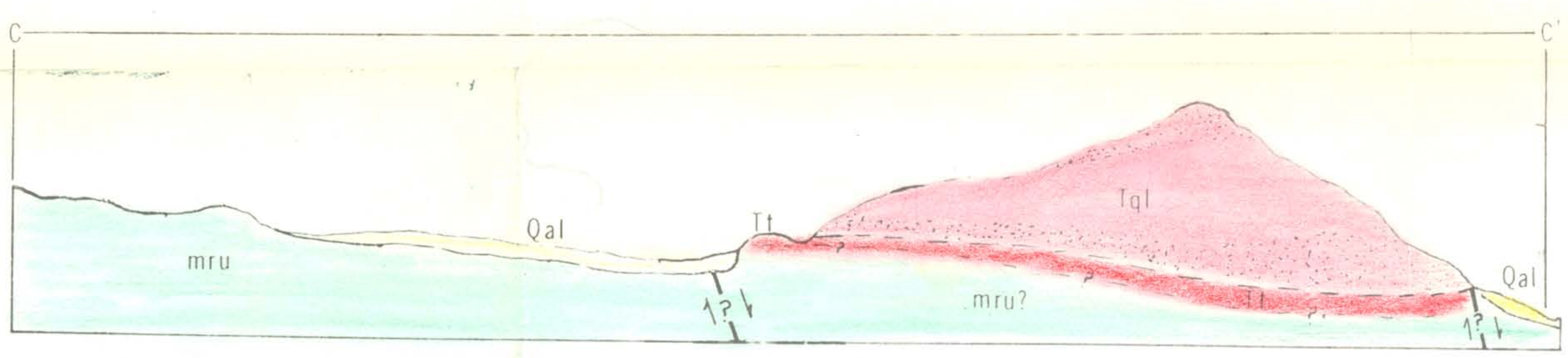


Plate 2

STRUCTURE SECTIONS
across the
ALBION BASIN, CASSIA CO., IDAHO







See plate I for explanation of geologic symbols and location of section lines

Horizontal Scale
0 1/2 1 2 miles
1: 63,360
Vertical Exaggeration = 3X

D.A. Myers 1967

Plate 3

Well Location Map
Albion Basin, Cassia County, Idaho