THE GEOLOGY OF A PORTION OF HUMPHREYS

and

SAN FRANSISQUITO QUADRANGLES

by

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Presented as fulfillment of the requirement
for the degree of Bachelor of Science

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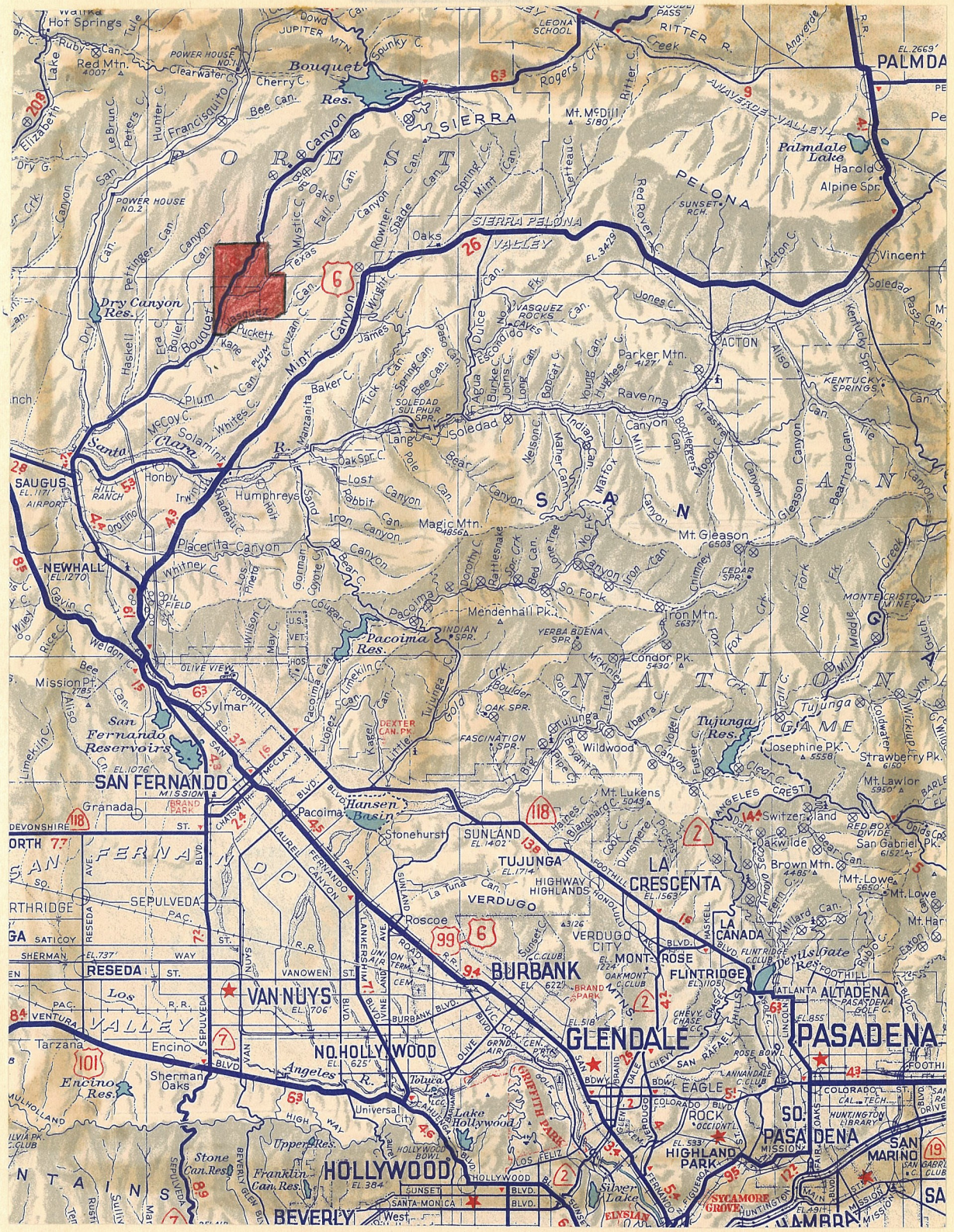
TABLE OF CONTENTS

ABSTRACT

The rocks of this area range in age from the pre-Cambrian Pelona schist to the Recent alluvium. This metamorphic formation is seperated from the two sedimentary formations by a formation of two igneous intrusives, which have been faulted into their position between the Pelona schist and the Sespe (Oligocene ?) formation. the igneous rock, granodiorite and leucomonzonite, caused the extreme tilting of the Sespe when they were faulted into their present position. These rocks are probably of Jura-Cretaceous age. The Sespe is a thick series (approx. 4000 ft.) of continental deposits, now in a more or less consolidated condition. The Lower Upper Miocene Mint Canyon formation is another continental series deposited unconformably upon the Sespe. It consists, in the lower section, of coarse conglomerates, sandstones and shales with some ash beds in the upper part which show some volcanic activity during Upper Miocene times. The region then underwent some folding and gentle tilting in post- Miocene times and a mature land surface was formed. There was a deposition of terrace material in probably Pleistocene time after which the region suffered continuous uplifting until the present time.

PLATE I



Index Map showing location of the area discussed in this report and the main routes by which it may be reached.

INTRODUCTION

Location and Extent of Area

The area described in this report is located in the north-central portion of Humphreys Quadrangle and the southernmost portion of the San Fransisquito Quadrangle. The Bouquet Canyon highway runs through the area near its western boundary. This highway is one of two main routes leading into Antelope Valley from the Los Angeles vicinity. The area is ten miles north and east of Saugus, which is approximately 40 miles from Los Angeles City. More precisely, the area lies between 118° 25' and 118° 28' West Longitude; between 34° 29' and 34° 31' North Latitude. See Plate I for map showing location and main routes of approach.

Size of the Area

The area is slightly larger than five square miles. It consists of a section a mile and a half wide along the Bouquet Canyon highway for a distance of about three miles. The eastern part consists of a section slightly over a mile square in the southern part of the area.

Purpose of the Investigation

The purpose of this investigation was the fulfillment of one of the requirements for the degree of Bachelor of Science in geology at the California Institute of Technology. Its purpose is further, to give the student the chance of doing a field problem on his own while still having the

opportunity of discussing perplexing problems with instructors, the ultimate intention being a development of self-reliance and independent interpretations.

Method of Field Work

A small area was taken to be mapped in detail with a Brunton Compass on a double photographic enlargement of a USGS topographic sheet. The contacts, faults, folds, dips and strikes, were mapped directly on the enlarged map in the field. The topographic sheet, on a scale of 1/24000, or approximately 2 and 5/8 inches per mile, was enlarged twice, so that 1/2 inch equalled exactly 500 feet. Interesting and unusual features, along with the ordinary data, were noted in the field book, their locations being given by a pair of coordinates, a system of which had been drawn on the the field map.

Acknowledgments

I wish to thank Dr. John H. Maxson for his helpful suggestions and for his advice on which sections of this locality to work.

Dr. Kew's report,in Bulletin 753, proved helpful as a source book for facts which could not possibly have been dtermined in such a small area and in such a limited length of time.

PHYSICAL CONDITIONS

Relief and Elevations

This small area lies in a belt of East-West striking mountain ridges which compose the San Gabriel Mountain Range. The smaller ridges and valleys of this area strike and gently slope to the Southwest from the Northeast. The topography is at once striking because of the very sharp contrast between its nature at the summits of the ridges and that of the new valley sides. Approximately 500 feet above the floor of Bouquet Canyon there exists an old land surface with typical, gently rolling topography of late maturity. The tops of some ridges are almost perfectly flat, forming a mesa or tableland. (See Plate II). In contrast, from the edge of these mesas there sometimes drop vertical cliffs of several hundred feet height. In general, the valley walls are steep sidéd and all of the younger canyons are of the V-shaped type, in the youthful stage of development. Bouquet Canyon, on the other hand, is older, has a wide valley floor and was probably one of the larger valleys of the old land surface period. The present day, anomalous type of relief, is due to a rejuvenation of the region by a relatively recent uplift. That this uplifting may still be going on, is reasonable to assume, for many of the broader valley floors contain deep cut gorges in the recent alluvium.

The lower part of this area is extremely rugged, due chiefly to the badlands type of erosion of the Mint Canyon

PLATE II

This is a view of Bouquet Canyon from the Sierra Pelona Ridge. It shows the terraces along the canyon at different levels as evidence of repeated uplifts. In the right foreground is the fault between the Sespe formation and the leucomonzonite igneous rock.

This is a view of the Sespe-Mint Canyon contact along the south face of Texas Canyon. It illustrates the fairly consolidated basal conglomerate of the Mint Canyon by the steep red cliffs alomg the top of the Canyon. In the background is a large flat mesa and typical MintCanyon badlands.

formation. The elevation also changes about 1200 feet in a space of little over two miles. The lowest point of the area is in the southwest corner with an elevation of 1525 feet and the highest point is in the eastern part with 2716 feet. The Sierra Pelona ridge is the highest mountain in the vicinity of the area with an elevation of 3600 feet.

Drainage

The drainage is generally southward. The smaller, consequent streams run south-westerly into the Bouquet Canyon stream which would normally drain a considerable sized area were it not for the Bouquet Reservoir Dam about 8 miles north of this locality. However, it contains water, which is released from the Dam, for the greater part of the year and is the largest stream in the area. The stream runs through it in a southernly direction and drains into the Santa Clara River, which runs westerly about 40 miles to the Pacific Ocean.

The regional pattern is dendritic and is very little controlled by the type of underlying formations, which are, for the most part, of rather gentle dip. In the specific area under consideration, the lower Mint Canyon formation has the typical badlands type of drainage. Dry streams are quickly changed to heavily laden, torrential currents by any fair sized downpour, and then dry up almost as rapidly. In the Sespe formation the drainage is somewhat controlled by the steeply dipping, resistant conglomerate beds. All of the streams, except Bouquet Canyon, are of the rapidly

degrading type, due to the recent or perhaps contemporaneous uplifting. Most of them are attaining the conventional concave profile of streams but some have hardly touched the old land surface and these are actually convex in profile. The drainage in these instances is quite anomalous for on top one has the gently graded streambeds of a mature land surface which gradually steepen into the cascading gorges of the badlands at slightly lower elevations and finally again become graded streams as they approach Bouquet Canyon.

Climate and Vegetation

This area lies in a region of typically semiarid climatic conditions. The average rainfall is in the vicinity of twenty inches or less. Most of this falls in a few torrential rains occurring generally between the months of November and April. The greater part of the year is dry except for occasional "sprinkles". The spring and fall is rather mild but the summers are often extremely hot, the temperature rising well over a hundred degrees on many days, especially in August.

The vegetation is also typically semiarid. The type of vegetation often varies quite sharply with the underlying formation. In loose rocky soil, typical of the lower Mint Canyon conglomerates, the surface is densely covered by a dry, scrubby brush, greasewood, manzanita and yucca. On sandier soils the surface usually abounds with sage brush of varying types, and the looser sandstone and shale soils are covered with a tall dry grass. The Pelona schist is

covered, largely, with greasewood. Some oaks and cottonwoods grow along the stream in Bouquet Canyon.

Exposures

The exposures, for the the most part of this area, are poor. The steep faces of the "badlands" Mint Canyon afford the only clear places to obtain a dip and strike and they are, in general, inaccessible, and if they are, the formation is usually such that an accurate dip and strike ~~are~~ *is* unobtainable. But this is not as difficult as the tracing of contacts, which are obscured by the top soil of the old land surface, which varies in thickness from next to nothing to several feet in most places. Add to this the areas covered by terraces and dense, impenetrable underbrush, and all that one has left is found in the side walls of canyons and occasionally on the floor, where the alluvium has recently been scoured out.

Culture

The culture consists of some small farms situated down on the alluvium of Bouquet Canyon and several of the larger tributary canyons. The bee-hive communities which are scattered throughout the area in unsuspecting locations are sometimes inconvenient and discouraging. A CCC camp is located at the northern extremity of the area.

PLATE III

The old land surface situated on the Sespe formation north of Texas Canyon and east of Bouquet Canyon. It is three to four hundred feet higher than floor of canyons. In the background are the mature Sierra Pelona Highlands. In the upper right hand corner can faintly be seen thru the haze, the Sespe Rocks, resistant knobs of conglomerate on the hillside.

STRATIGRAPHY

General Character and Correlation

The stratigraphy of this area consists of an igneous intrusive, a metamorphic rock formation and sedimentary formations of continental origin. The Pelona Schist is found in the northern extremity of the area and is reputed as one of the oldest formation in Southern California, being possibly Archeozoic in age. It is seperated from the sedimentary formations by an igneous intrusive of possible Jura-Cretaceous age and is faulted into its position. Two sedimentary formations were studied; the Sespe and the Lower Mint Canyon. Both are apparently of continental origin and are respectively Oligocene (?) and Lower Miocene in age.

METAMORPHIC

Pelona Schist

In the northern part of this area is found the Pelona Schist formation, one of the oldest and most extensive formations in Southern California. It is pre-Cambrian in age, if not possibly Archean, as some authors believe, and covers over 130 square miles. This extremely metamorphosed and resistant formation forms a steeply rising highlands in the north of the area. From above, this formation is rather anomalously expressed by rounded, gently rolling mountain

tops. The sides steepen gradually from the top downward, terminating in extremely steep walls of V-shaped canyons. Bouquet Canyon is a remarkable example of a V-shaped canyon with a low gradient, a result of the stream's downcutting keeping pace with the rate of uplifting. The smaller tributaries running off the mountain sides have consequenbly developed V-shaped troughs with a exceedingly steep gradient.

The Pelona schist in this locality is expressed by two of its lithological facies: true mica schist, which is predominant, and smaller quartzite units. Other facies have been described as making up the Pelona schist formation and they include limestone units and differemt kinds of true schist units. The mica schist of this area has the typical silverish-grey color largely due to the parallel orientation of the muscovite, biotite and other minerals. There are also darker colored types, varying from dark brown and dark green to a bluish-grey and black. These colors are characteristic of the fresher schist which is found in the walls at the bottom of Bouquet Canyon. The more weathered material found at the top on the mature land surface is characteristically reddish brown in color.

The quartzite is also typical, well banded, sub-crystalline, dark purplish colored quartzite. It is exceedinly fractured as is the rest of the formation but often breaks with a concoidal fracture when the fragment is small enough to be comparitively free of incipient fractures.

The formation is also intruded by quartz veins varying in size from minute stringers to large sill-like structures several feet in thickness. From even superficial observations, the lenticular nature of the veins is evident. Other writers, who have studied them in greater detail, claim this to be characteristic throughout the formation. The veins are intruded, for the most part, along the dip and strike planes of the schist. They are sill veins, thickening and thinning along their breadth as well as with depth. Traces of pyrite, chalcopyrite and manganese are found in these veins but very little or no gold.

Structurally, the schist is extremely faulted and folded. The dips and strikes vary so eratically over small distances that it is impossible to arrive at anything but a general average. Three master joints are are quickly seen, approximately at right angles, forming cube shaped fracture fragments. (See Structure)

IGNEOUS ROCK

Jura-Cretaceous (?)

Faulted up between the Pelona schist and the Sespe formation are two igneous rocks, a granodiorite and a leucomonzonite. The granodiorite is immediately south of the Pelona formation on the west side of Bouquet Canyon. It is a dark colored, greenish black rock which weathers to a dark black, stained with yellowish iron oxide. The leucomonzonite is seperated from the granodiorite by a fault. It is a whitish colored rock which weathers to a dark, rusty brown.

Granodiorite

Megascopic examination: Greenish black colored rock with quartz veinlets. Coarse grained and altered. Also white crystals of feldspar. Color index apparently about 25 %.

Microscopic:

Essential Minerals

Plagioclase - Andesine	45%
Orthoclase	30%
Quartz	5%

Varietal Minerals

Hornblende	15%

Accessory Minerals

Apatite	
Calcite	2%
Magnetite	

Alteration Products

Kaolin on feldspar
Chlorite on hornblende
Magnetite on hornblende

This rock was so extremely altered that it was almost

impossible to tell the orthoclase from the twinned plagioclase. Some of the orthoclase and the plagioclase were in large grains and subhedral. The hornblende was so completely altered to chlorite and magnetite that there was hardly any of the original mineral present. This rock is very close to the border between granodiorite and diorite. It was determined as granodiorite because there appeared to be 5% of quartz present. However, no very accurate measurements on the percent of minerals present were run.

Leucomonzonite

Megascopic examination: Medium grained, light colored rock with abundant white feldspars. Abundant chlorite tends to give parts of this rock a greenish tinge. There appears to be very little or no quartz and no dark minerals, but there is a reddish brown minerals in considerable amounts.

Microscopic:

Essential Minerals			
	Plagioclase	50%	
	Orthoclase	40%	
Varietal			
	Pyribole altered to chlorite		5%
	Hematite (ateration)		3%
Accessory			
	Apatite		
	Muscovite		2%
	Magnetite		
	Quartz	less than	1%
Alteration			
	Kaolin		
	Sericite		
	Calcite		

The large plagioclase crystals are so severely altered that the twinning is practically totally obscured. Much of the orthoclase occurs similar to vein quartz. This is unaltered. The prefix "leuco" is used because of the almost total lack of dark minerals.

SEDIMENTARY SERIES

Oligocene (?)

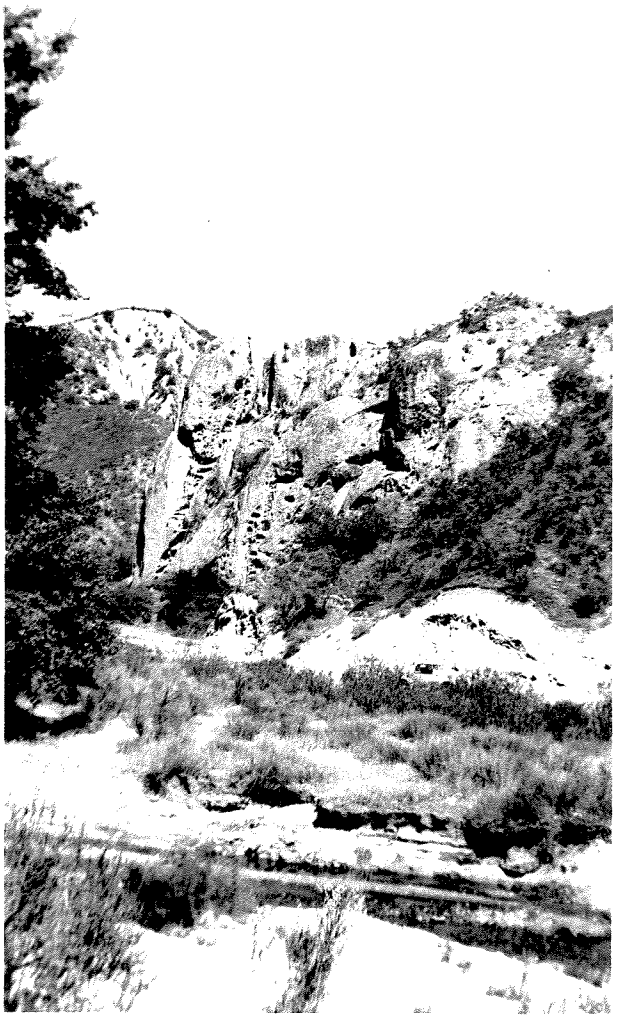
Sespe Formation

Faulted downward against the igneous rocks on the south lies the Sespe formation. It presents a striking topography due primarily to the resistant nature of some of its members and secondly, to the steeply inclined position of the entire formation. The well cemented, red brown conglomerate of the lowest part of the Sespe here exposed, weathers into steep, picturesque cliffs and resistant knobs on the hillsides. Other conglomeratic formations form steeply inclined cliffs very similar to the "Flatirons" of the Colorado Rockies, though on a much smaller scale. The Sespe is second only to the Mint Canyon formation in areal extent in this particular area. The thickness varies due to the faulting, but there seems to be over 4000 feet of Sespe present in this locality. Even some cross sections in this area would approach a figure of over 5000 feet. Since the type section described by Kew contains only 3500 feet, the apparent thickness at this locality is a rather peculiar circumstance.

Lithologically, from oldest to youngest, the section along the east side of the Bouquet Canyon highway consists of the following members :

1. A vertically inclined section of reddish brown conglomerate, downfaulted against igneous rock, is the oldest Sespe present. This is an extremely resistant formation due to its well cemented character. The cement consists

PLATE IV



Cliffs of well cemented Sespe conglomerate in a vertical attitude. Note the solution cavities in the formation. In the foreground is the Bouquet Canyon stream.

partly of iron oxides, which give the reddish color, and calcite, which often is leached out to form large, cave-like cavities (See PlateIV). The formation is roughly stratified but completly unsorted, and the anguclasts vary in size from a small gravel to boulders 14 inches in diameter and even larger. The boulders show no great variety as to kind of rock. The majority are a quartz-monzonite or pink granite of very coarse texture. There are smaller amounts of a fine grained, apparently dike forming rock and some chips of lava. The matrix is sand derived from the decomposition of granitic rock; it contains an abundance of quartz.

The above description coincides quite closely with Kew's description of a very large member in the middle of the type section of the Sespe that he described on Sespe Creek in the Camulos quadrangle. This formation, which decreases in thickness from 1500 to zero feet because it is cut out by the fault, may possibly be, then, this member of the type section, in which case, the Sespe in this locality would only consist of the upper part of the whole Sespe formation. Considering the total thickness at this point would tend to make one hesitate to make such an assumption.

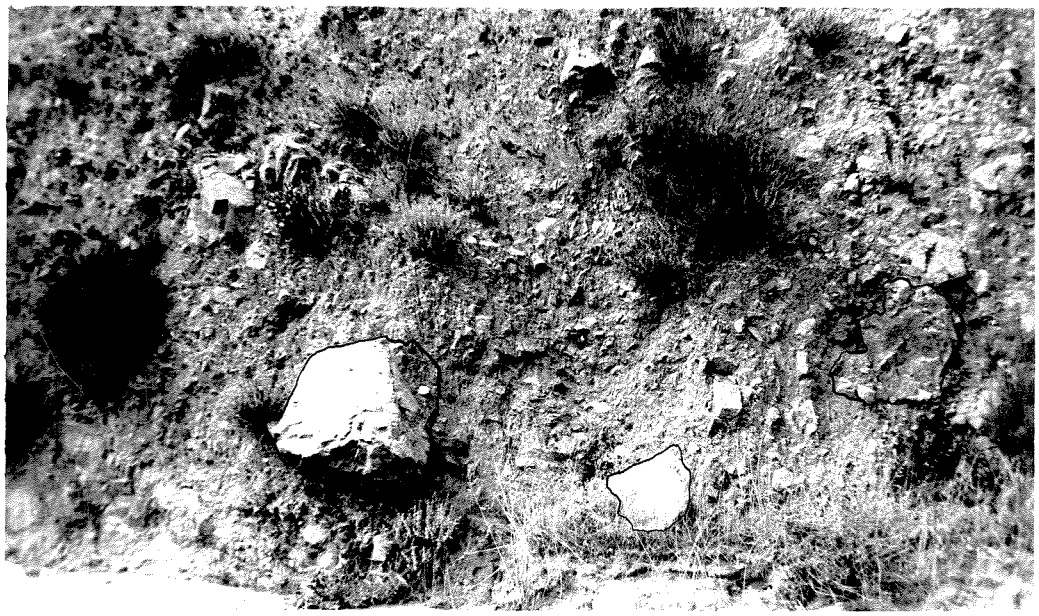
1a. Interbedded between large beds of the resistant conglomerate is a minor shale member. This consists of some finely laminated shales ranging in color from a brownish purple to brown, buff and light yellow. It is not resistant and is about 50 feet thick.

2. A conglomerate member approximately 200 feet thick is deposited conformably on the red beds. Huge, angular, granitic blocks, so little affected by the weathering processes as they are, force one to conclude that this must represent the accumulation of detritus on a talus slope. This member has been surprisingly consolidated and forms the "Flatiron"-like beds mentioned above. (Plate V gives a typical view of the appearance of this conglomerate).

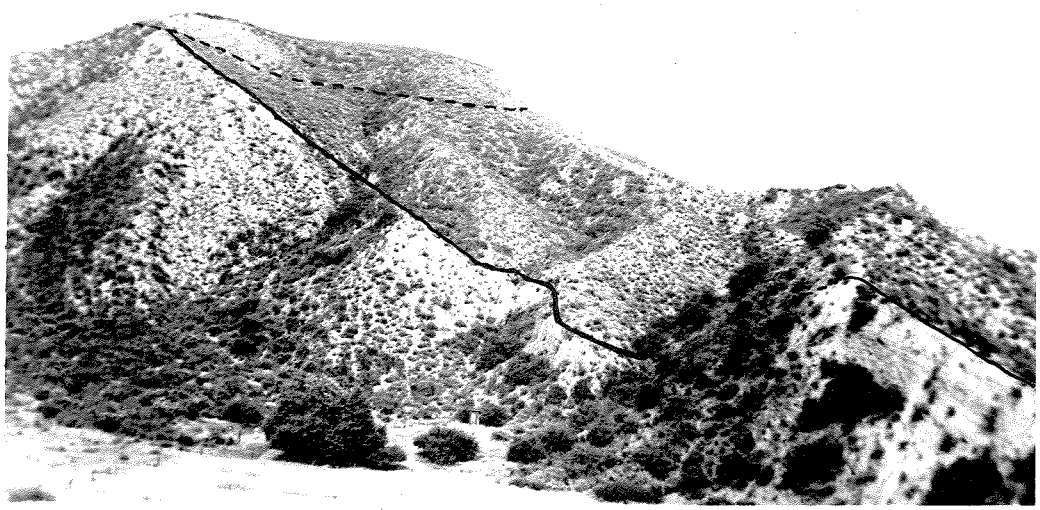
3. Next, in this section, is a considerable thickness of relatively unconsolidated shales, sandstones and conglomerates. This series is approximately 1500 feet thick along the section described. In the lower portion the dips are almost vertical or slightly inclined toward the south. The dip changes gradually, as far as can be determined, to about 45 degrees at the top of this particular series. In the center, approximately, there is a conglomerate very similar to that described in (2). It is close to 200 feet thick and is the best consolidated unit of this member. Below and above it are soft sandstones interbedded with thin beds of clay. These clays are brownish, unlaminated, quite thick shales which grade, often almost imperceptibly into fine sandstones. In general, the sandstones are very light, almost white in color and are rather poorly cemented with calcium carbonate.

The conglomerate is whitish, poorly cemented, and interbedded between the sandstones and shales. The conglomerate is well rounded and varies in size from small pebbles to large boulders. The maximum size of these boulders is

PLATE V



Typical, massive, well consolidated, Sespe conglomerate. This is similar to the formation described in (2) on page 14. This is the unknown formation in Texas Canyon.



This illustrates the unconformity between the Sespe on the left, and the Mint Canyon on the right, overlain unconformably by a Quaternary terrace. The Mint Canyon dips about 20 degrees south in this locality; the Sespe, about 45 degrees.

about 12 to 15 inches but the average is between 6 and 8 inches in diameter. The boulders are largely of coarse pink granite, of amphibolite with large feldspar phenocrysts, of gneiss and of schist. The schist is well banded but evidently is not the micaceous Pelona variety. Peculiarly, not one fragment of typical Pelona schist is in this unit. The gneiss is also well banded and extremely contorted. One large bed exists at the top of this member which is alone 700 feet thick. It is poorly sorted and roughly stratified as are the other beds and dips approximately 45 degrees to the south.

4. A well consolidated and cemented, dark colored conglomerate apparently forms the top of the Sespe in this section just east of the highway and in all the section west of it. Topographically, it stands out as a resistant reef, dipping 45 degrees toward the south. (See Plate V) It is approximately 100 feet thick and can be traced continuously from the western extremity of the area to a point about half a mile east of the Bouquet Canyon highway, where it disappears under terrace material and cannot be found elsewhere in the area in spite of its very characteristic appearance.

It consists almost exclusively of Pelona schist material. The fragments of schist are the typical micaceous schists of the Pelona formation. It also contains the quartzite in fair amounts as well as much of the quartz vein material. In addition to this material which is definitely derived from the Pelona formation, are small

amounts of granitic rock and gneiss, but in such small quantities as to be almost negligible. The cementing material could not be definitely determined but due to its reddish color and resistance, it is concluded that probably calcite and iron oxides are the chief binders.

Unknown Formation or a Part of the Sespe (?)

Just east of the section described above there is a massive conglomerate formation similar to that described in unit (2) above.(See Plate V). Owing to its massive charcter not dips could be taken but to all appearances it underlies the Mint Canyon formation conformably. It occupies the position of the fourth unit above described, which is curiously absent. From all appearances, this bed is at least several hundred feet thick. Dr. Maxson, of the Institute, suggested that this might possibly be another formation between the Sespe and the Mint Canyon. However, it was impossible to establish this fact due to the nature of the exposures and thus, for the present, it seems best to leave it as another member of the Sespe formation, even though its position involves some unanswered questions.

The age of the Sespe is rather undeterminable due to the lack of fossil evidence. Kew has concluded from its stratigraphic position in other localities and from some rather sparse vertebrate evidence, that this formation is in general older than Miocene and you ger than Eocene and so has placed it tentatively in the Oligocene.

Lower Upper Miocene

Mint Canyon Formation (Lower Section)

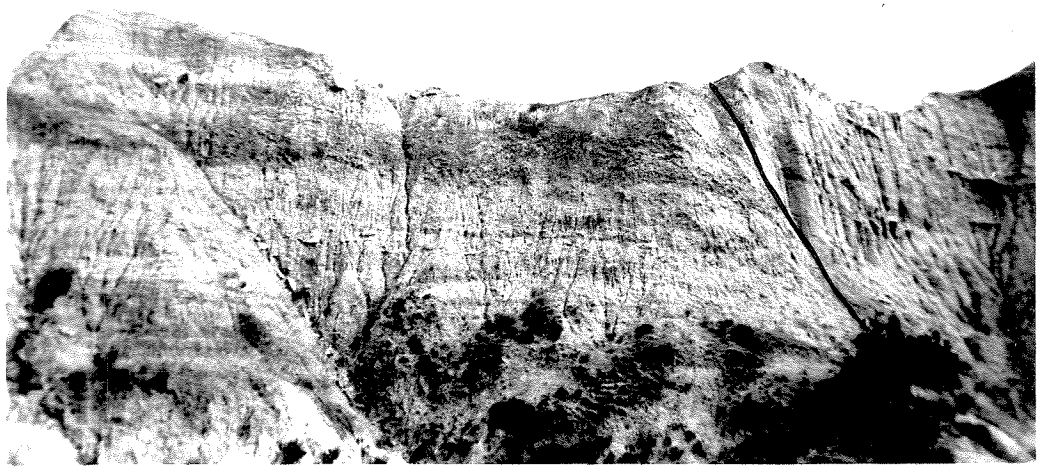
The Mint Canyon, in this area, is a series of flat dipping conglomerate, sandstone and a few shale beds. The series is, on the whole, poorly cemented and consolidated and weathers with the badlands type of erosion in many localities. (See Plate VI) Only the lower portion of the formation was studied and due to the limited extent investigated and the flat dip, estimates on the thickness of the various members could not be made.

The formation lies unconformably on the Sespe, the angle of unconformity being approximately 30 degrees. The lowest member is a basal conglomerate which is well consolidated in comparison with the rest of the formation. It forms a high, reddish colored cliff on the south wall of Texas Canyon immediately above the contact with the Sespe. (See Plate II) It consists of poorly sorted, angular and subangular rocks which are apparently derived from granitic and metamorphic sources. There is some schist which is similar to Pelona schist and some lava rock. The anguclasts vary from less than an inch to a foot or more in diameter.

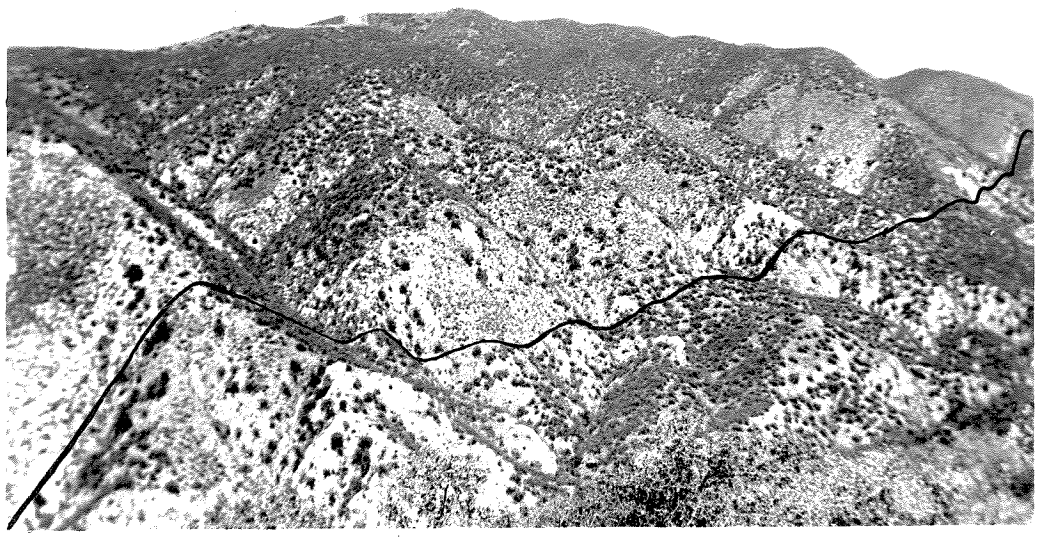
Lying on the basal conglomerate is a fairly thick, crossbedded sandstone member, poorly cemented and full of caliche dikes and sills, which emphasize its crossbedded nature.It is light buff in color as are nearly all the members of the lower Mint Canyon.

Following these two beds are a series of interbedded

PLATE VI



This picture illustrates typical badlands erosion in the Mint Canyon formation. It also shows how easily faults can be found found in this type of formation.



The fault between the Sespe and the igneous rock is less clearly shown here than it appears in the field since the sharp red-white contact does not show in black and white. The mature nature of the Pelona Highlands and the V-shaped canyons are better shown.

conglomerates, sandstones and shales, all poorly consolidated and of a dirty reddish color. Some conglomerates tend to be more rounded than others but on the whole, the origin seems to be all the same. These beds are quite lenticular and thicken and thin and often pinch out to a very remarkable degree. The shales are greyish and sometimes limey, which cause them to be considerably more resistant. These limey shales are often reddish colored and average about 4 inches in thickness.

In the southwestern portion of the area are several ash beds. These are only several feet thick but milky white in color so that they are easily seen and therefore illustrate the structure quite clearly. The two southernmost beds strike North-South and dip west. They are seperated by perhaps fifty feet of shales. A third ash bed is several hundred feet north of these; strikes just the opposite and dips south. These are seperated by a strike-slip fault, however, and thus are probably not the same beds.

The age of the Mint Canyon is determined by vertebrates and a few fresh water invertebrates. Fossil preservation is not favorable in the coarse formations found in the lower Mint Canyon. Some few vertebrate remains have been found in this lower section but on the whole, the real evidence of age for the entire formation is found largely in the upper section. Kew has determined this to be Upper Miocene. The break between these two formations is indistinct and at present, still quite arbitrary, but the detailed work of Mr. Jahns will fix this more definitely.

Quaternary

Old Age Land Surface and Terrace Alluvium

Lying unconformably on the Tertiary formations is a brick red formation of Quaternary age. (See Plate V) The remnants of the formation form terraces on the flat tops of the ridges and cover, to varying depths, parts of the old land surface. The thickness varies from place to place but its maximum is about 100 feet and this deminishes to next to nothing. The formation is rudely stratified but completely unsorted. It contains, chiefly, material derived from the Pelona formation, schist, quartzite and quartz vein material. This varies in size from gravel to large boulders up to two feet in diameter. Small amounts of granitic material are also found. The formation is flat dipping and was probably "laid down as flood plains of rivers ar alluvial fans" according to Kew. In the older streambed that were in this formation, there is a considerable accumulation of placer gold which is, at present, being taken out.

Recent Alluvium

On the floor of Bouquet Canyon and for some distances up Texas and Vasquez Canyons there is a greater or less thickness of new alluvium deposited by their respective streams. It consists of typical stream deposits, sand and gravel beds interbedded with clays plus some large conglomerate. In Bouquet Canyon, where the alluvium is more weathered, a fairly good soil exists.

GEOLOGIC STRUCTURE

Regional

The structural trend of this region is that of the San Gabriel Mountains and Ventura region, approximately east and west. The region is dominated by the San Andreas Rift, which passes through this region about 15 miles north of this area. The second major structural feature is the Sierra Madre thrust fault at the southern base of the San Gabriels. This lies about 10 miles south of the area. Some geologists believe this whole region of the San Gabriel Mountains is a huge thrust slice, caused, presumably, by the San Andreas. The major anticlines, synclines and faults seem all to be affected by this, since there is a definite tendency for a lining up of these features in an easterly-westerly direction in this region.

LOCAL STRUCTURE

Faulting

In the old formations of this area, the faulting is considerable. The Pelona schist is seperated from the igneous rock by a large fault which is actually a complex braided type of fracture. The zone of fracture is between 30 and 50 feet wide. It contains innumerable fracture surfaces and is a fairly consolidated, conglomerate breccia, containing large fragments of both the Pelona schist and the igneous rocks. A mine shaft through the fault zone clearly illustrates these facts. The zone is unmineralized,

as far as could be determined. The Pelona formation is further faulted, but these faults were not observed with any intent of studying them.

The igneous rocks are one mass of braided faults. The whole formation is practically one large brecciated zone. Most of the faults in this vicinity are steeply inclined, both to the north and the south. For all intents and purposes, the faults occurring with the igneous rock can be considered as vertical. The fault on the north side of these intrusive rocks, on the Pelona schist contact, falls into this category. The fault on the south side on the Sespe contact, however, is definitely inclined toward the south, but probably not less than 80 degrees. (SeePlates II & VI) These two faults are by far the largest and most important faults of the area. A steep fault also seperates the granodiorite from the leucomonzonite.and apparently joins the large fault on the Pelona contact at the top of the east side of Bouquet Canyon, since the granodiorite, at this point, has been pinched out.

Only minor faulting occurs in the Tertiary formations. In the Sespe, none are large enough to be traced over any considerable distance, and those that occurred are apparently related to the large fault on the igneous contact. In the Mint Canyon there are some normal faults of steep angle but they are practically untraceable, produced no marked affects and are, from all appearances, not very large. There is one strike slip fault in the southwestern corner of the area which very markedly displaces some ash beds just south

of the Vasquez Canyon road in Mr Flint's area. It displaces some ash beds in this area also. (See Page 18). The southwest side moves southwest approximately [illegible] feet. Faults are easily picked up in the steep cliff faces of this formation (See Plate VI), but are lost just as easily. Faulting, however, is a minor phenomenon in the sedimentary formations.

Age of the Faulting

Assuming that the ages assigned to the different formations are correct for the sake of brevity, the ages of the faults vary from probably pre-Cambrian to Recent. There are many old faults in the Pelona schist which could quite easily be pre-Cambrian. The Pelona schist was probably uplifted near the end of the Oligocene since this is when the first schist is found in the Sespe formation. At the end of the Oligocene the igneous formations were faulted up between the Pelona schist and the Sespe. This caused extreme tilting and even overturning of the lower part of the Sespe formation which could have set up consequent shear forces to produce the minor faulting in it. Minor faulting in the Mint Canyon is post Miocene in age.

Folding

The Pelona schist is extremely folded but it was not studied in much detail. The Sepe is gently folded in a north-south direction and very steeply inclined, on the whole. It has an overturned fold near the fault contact which is undoubtedly due to the uplifting of the igneous rock. The other folds of the Sespe are probably contemporaneous with

those of the Mint Canyon since they trend in the same general north-south direction. There are some miner folds which may or may not have been caused by the same forces. They lie crosswise on the larger folds and cause the development of structural saddles and domes along the anticlines and synclines which trend north and south. These larger folds are all plunging toward the south with the same degree of pitch as the dip of the formation, which is, on the average, about 15 to 20 degrees. These folds are post Miocene in age. Most of them are such broad and shallow structures that it is impossible to ever see them in the field but were picked up only after plotting the dips and strikes on a map.

GEOLOGIC HISTORY

I. Pre-Cambrian

A. Deposition of sediments which formed the Pelona schist

B. Sediments metamorphozed, folded and faulted(?)

II. Jura-Cretaceous

A. Intrusion of the igneous rocks into the substratum

B. Intrusion of quartz veins into the Pelona schist

III. Oligocene

A. Deposition of continental deposits to form part of the Sespe formation

B. Uplift of the Pelona schist against the Sespe and consequent tilting of the section

C. Deposition of Pelona schist conglomerate bed at top of the Sespe

D. Upfaulting of the igneous intrusives between the Pelona schist and the Sespe with consequent further tilting and partial overturning of the Sespe

IV. Miocene

A. Deposition of the continental deposits of the Mint Canyon unconformably on the Sespe

V. Post Miocene

A. Gentle tilting of the Mint Canyon formation, possibly contemporaneously with moderate folding and faulting

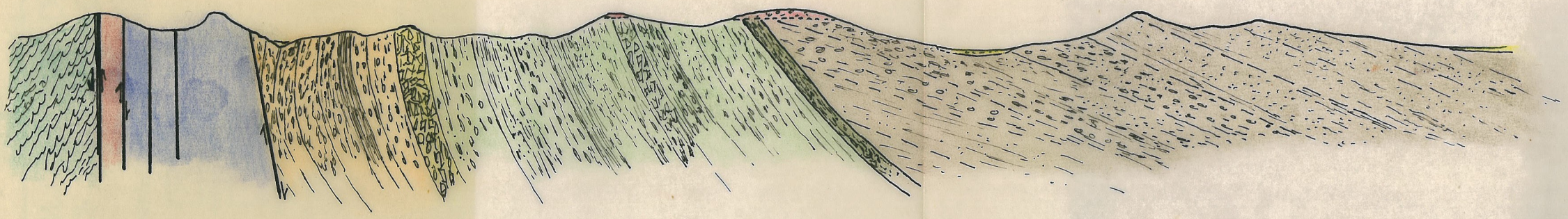
B. Development of consequent streams and erosion to a new land surface

VI. Quaternary

A. Deposition of terrace material largely derived from Pelona formation

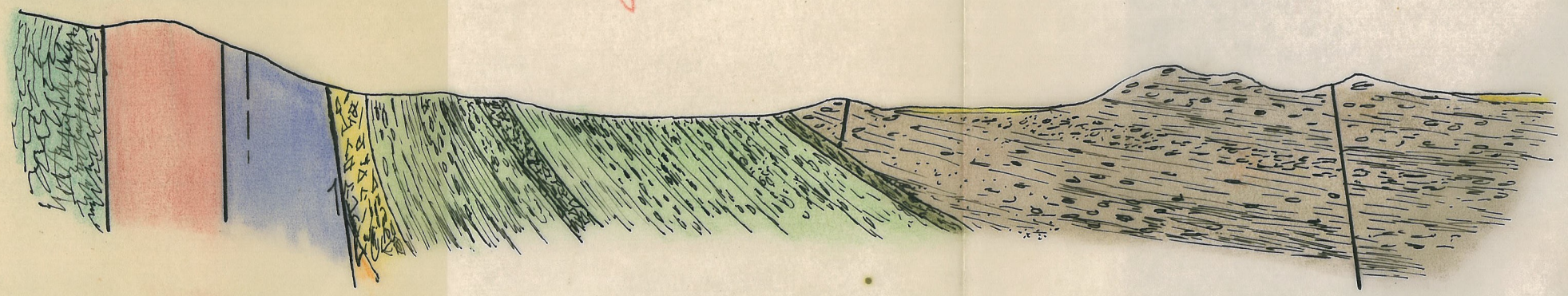
B. Repeated periods of uplifting and consequent formation of an old land surface approximately 500 feet above the floor of Bouquet Canyon

C. Deposition of the alluvium on the valley floors



SECTION A A'

Scale
Legend



SECTION B B'

GEOLOGIC MAP OF A PORTION OF BOUQUET CANYON, CALIF.

LEGEND

SEDIMENTARY ROCKS

QUATERNARY

- Qal — Recent Alluvium
- Qtal — Terrace Deposits

MINT CANYON FM.

- Tmc — ss, sh, cg.
- Tmca — Ash Beds

TERTIARY

SESPE FM.

- Tsp_1 — Red cemented cg.
- Tsp_2 — Talus Conglom.
- Tsp_3 — ss, sh, cg.
- Tsp_4 — schist cg.

IGNEOUS ROCKS

PRE-CAMBRIAN JURA-CRETACEOUS

- Jlm — Leucomonzonite
- Jgd — Granodiorite

METAMORPHIC ROCKS

- pCps — Pelona Schist

Contacts

U / D Faults

Anticlines

Synclines

N M.N. 16°

GEOLOGY BY
JOSEPH J GOMBOTZ

Bouquet Canyon

Texas Canyon

Vasquez Canyon

NATIONAL F

A

B

A'

B'