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AGGREGATE RESOURCES OF JOSEPHINE COUNTY, OREGON

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

1975

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
1069 State Office Building, Portland, Oregon 97201

AGGREGATE RESOURCES

OF

JOSEPHINE COUNTY, OREGON

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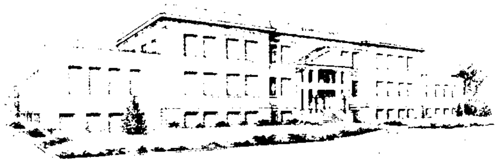
In cooperation with
Josephine County
Board of County Commissioners
Grants Pass, Oregon

1975



JOSEPHINE COUNTY OREGON

COUNTY COURTHOUSE
GRANTS PASS, OREGON 97526
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OFFICE OF
BOARD OF COUNTY COMMISSIONERS

Geo. A. Calvert
M. C. Loughridge
Anne G. Basker

April 4, 1975

F O R E W O R D

The sand and gravel resource of Josephine County is of great importance to the people of the County not only for today but for as long as there is a need for these materials for roads, driveways, foundations, building blocks, and the other varied uses of sand and gravel. It was with this consideration in mind that we entered into a contract with the Oregon Department of Geology and Mineral Industries to prepare a detailed inventory and analysis of the sand and gravel deposits in Josephine County. This work is now complete and the accompanying report will provide the foundation upon which plans for the future management of this major resource will be based.

We trust this report will be of interest to you and also provide you with an extensive source of information on the sand and gravel resource of Josephine County.

Yours sincerely,

BOARD OF COUNTY COMMISSIONERS

M. C. Loughridge
Chairman

Geo. A. Calvert
Commissioner

Anne G. Basker
Commissioner

DRB:k:lgb

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AGGREGATE RESOURCES OF JOSEPHINE COUNTY, OREGON

ABSTRACT

Sand, gravel, and crushed rock, termed "aggregates" in the construction industry, are necessary commodities in the building of highways, bridges, dams, streets, sidewalks, foundations, and all types of municipal structures.

A large part of the cost of aggregate is transportation; therefore, haul distances must be as short as possible and local sources utilized. Alluvial deposits of sand and gravel are preferred, but if not available, quarry rock can be used.

Alluvial deposits in Josephine County range from recently deposited channel gravel to older, partially weathered bench gravel. Gravel is present along the Rogue, Applegate, and Illinois Rivers and their tributaries. It occurs north of Grants Pass along Wolf Creek, Grave Creek, Jumpoff Joe Creek, and Louse Creek, all tributaries of the Rogue River.

South of Grants Pass, gravel is present along the Applegate River almost continuously from its mouth upstream to the County line at Provolt. Since the removal of gravel from most areas along the Rogue River is prohibited, aggregate for the Grants Pass area comes from the Applegate River.

Near Selma, gravel occurs in the alluvial deposits adjacent to Deer Creek. Near Cave Junction, gravel is present along the East and West Forks of the Illinois River and along Sucker Creek.

Where gravel is not available, quarry rock is used for select fill and for construction aggregate. Types of rock quarried for these purposes include metavolcanic, metasedimentary, basaltic, and granitic rocks.

Although the availability of aggregate may appear to be sufficient for present needs, the known resources must be protected by zoning to insure adequate reserves for the future.

AGGREGATE RESOURCES OF JOSEPHINE COUNTY, OREGON

INTRODUCTION

Purpose of the Report

This report was prepared at the request of the Josephine County Board of Commissioners to provide information on the aggregate resources of the County. The report will serve as a practical and useful reference for studies concerning future gravel and quarry needs. With this information, zoning requirements can be successfully outlined to assure the citizens of Josephine County a functional supply of gravel and quarry rock necessary for the continuing growth, development, and improvement of their communities, while at the same time providing for these future needs in a manner most compatible with the existing environmental status and present land uses.

The text is accompanied by a list of all known rock quarries, gravel pits, and prospects in the County (see Appendix). The location of these sites is shown on a map of Josephine County. A series of 26 photo maps shows the distribution of the alluvial deposits and adjacent bedrock units along the main streams and tributaries.

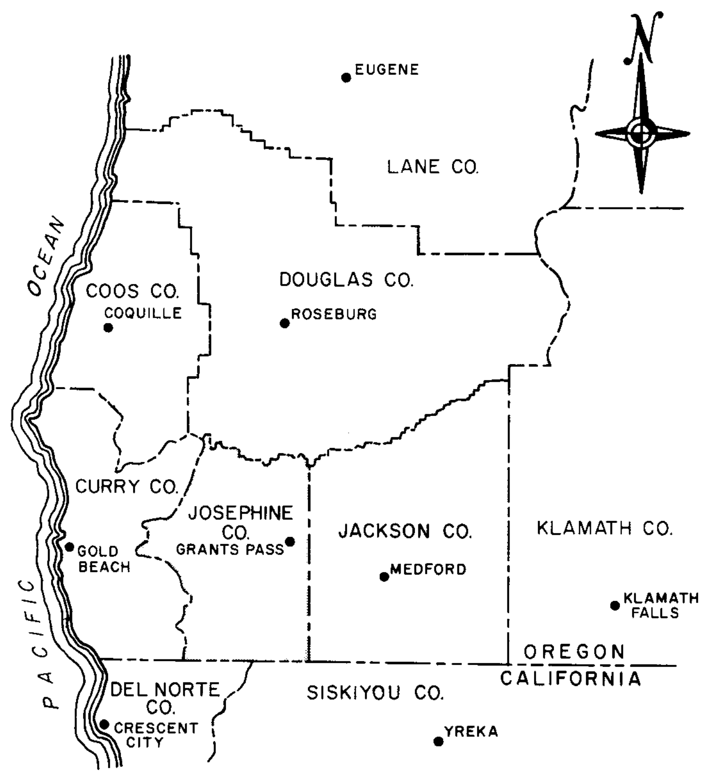

Figure 1. Index map showing location of Josephine County, Oregon.

Extent of Area

The area covered by this report includes all of Josephine County (Figure 1) (1,625 sq. mi.) with special emphasis on the major drainage systems and the more populated rural and urban localities. Of particular interest are the gravel deposits in the channels, floodplains, and terraces of the Rogue River westward from Grants Pass to the Robertson Bridge and those in the Applegate River system from its mouth at the Rogue southeastward to Provolt and Williams Creek. Other areas of special study include Wolf Creek, Grave Creek at Sunny Valley, and Louse and Jumpoff Joe Creeks at Merlin. The Deer Creek region around Selma and the Illinois River Valley between Kerby and O'Brien in southwest Josephine County are similarly examined.

Method of Study

Locations of rock quarries and gravel pits were obtained by inspection and by oral and written communication with local aggregate producers, County personnel, State Highway Division, U. S. Bureau of Public roads, U. S. Forest Service, and the U. S. Bureau of Reclamation.

Soil mapping by the U.S. Soils Conservation Service and by the County was used to distinguish gravel-bearing alluvium from deposits deficient in gravel. Water well logs in the State Engineer's office were examined to determine if gravel occurred below the surface in certain localities.

The quality of the rock from each source was determined by identifying the geologic formation and rock type, by examining the characteristics of the rock that are related to its use as an aggregate, and by evaluating the available laboratory data.

Previous Work

In the late 1800's, the first studies and reports on various minerals in Josephine County were made; some included sketch maps of localized areas. The first detailed mapping in the County was done by Francis Wells and published in 1940 (Wells, 1940). Between 1940 and 1955 published geologic maps completed the entire County (Wells 1940, 1955; Wells and others 1949; Wells and Walker, 1953).

The gravel resources of the Rogue and Applegate Rivers east of Josephine County were studied (Schlicker and Deacon, 1970a, 1970b) and their reports published by Jackson County.

Acknowledgments

We extend our gratitude to the many persons who provided information and assistance in the preparation of this report. For rock production and quarry data, we thank Elliott Parker, Oregon Highway Division; Wayne Hiatt and Donald Loetterle, Federal Highway Administration; Jerry Gray and Thomas Ehmett, Oregon Department of Geology and Mineral Industries; and personnel of the Rogue River National Forest, Bureau of Land Management, and Siskiyou National Forest. We thank David Brashears, Josephine County Planning Director, for field assistance and helpful suggestions, and Wally D. Owen for identifying aggregate sources and arranging a meeting with the aggregate industry in Josephine County. We appreciate the cooperation by the aggregate industry in furnishing data helpful in making this study. Our gratitude goes to Suzie Kozlik for typing the manuscript, to Ruthie Pavlat for typing the camera-copy, Len Ramp, Margaret Steere, and Carol Brookhyser for editing, and Steve Renoud for cartographic work.

POPULATION AND INDUSTRY

Population Growth Trends

The population of Josephine County has been increasing steadily, from 7,655 persons in 1920 to 35,746 in 1970. It is expected to reach 58,000 by 1985 (Figure 2).

The 1970 census indicated that the City of Grants Pass had a population of 12,455, or about one third of the County total (Table 1). The population by divisions is shown in Table 2.

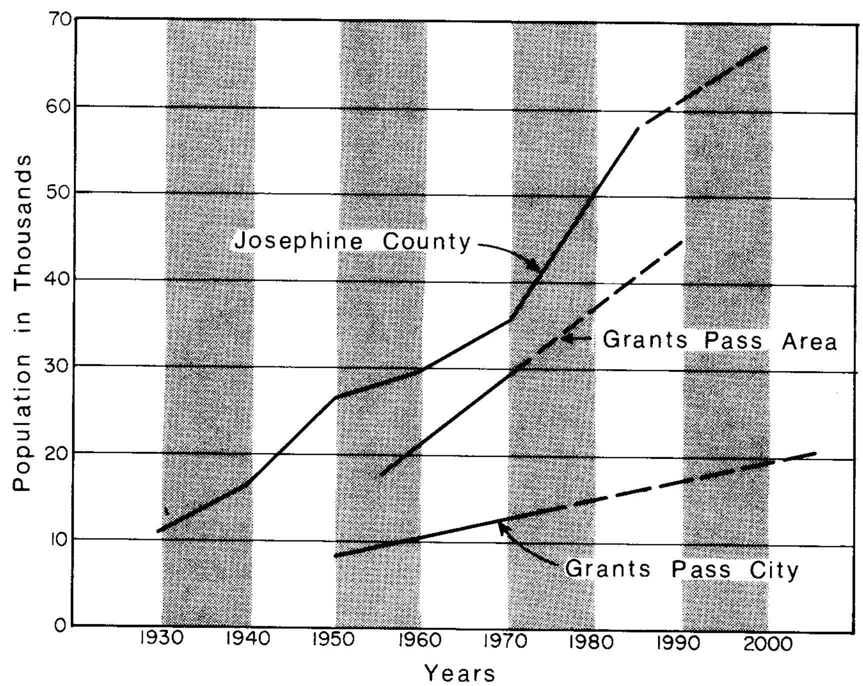

Figure 2. Population projections for Josephine County, Grants Pass area, and city of Grants Pass.

Table 1. Population for Josephine County, 1930 to 1974, and for Grants Pass, 1950 to 1974

	1930	1940	1950	1960	1970	1974*
Josephine County	11,498	16,301	26,542	29,917	35,746	45,100
Grants Pass			8,116	10,118	12,455	13,450

* July 1, 1974 estimate by Center for Population Research & Census, Portland State University

Table 2. Population statistics for Josephine County and its census divisions, showing percent of change between 1960 and 1970*

	1970	1960	Percent change
Josephine County	35,746	29,917	19.5
Cave Junction Div.	2,866	2,659	7.8
Cave Junction City	415	248	67.3
Fort Vannoy Div.	2,175	1,924	13.0
Fruitdale Div.	5,379	4,292	25.3
Fruitdale (U)	2,655	1,915	38.6
Grants Pass Southwest (U) part	211	------	----
Granite Hill Div.	2,119	2,133	-0.7
Grants Pass Div.	12,455	10,118	23.1
Grants Pass City	12,455	10,118	23.1
Jerome Prairie Div.	5,540	4,776	16.0
Grants Pass Southwest (U) part	3,220	------	----
Merlin Hill Div.	2,005	1,519	32.0
Wilderville Div.	1,893	1,486	29.0
Williams Div.	1,314	1,028	27.8

(U) Unincorporated

* From 1970 U.S. Census

The present trend indicates the greatest growth in housing and industry is in Grants Pass and the nearby communities of Murphy, Merlin, and Colonial Valley.

Industry

The economy of Josephine County has gone from gold mining in the 1850's to agriculture and, more recently, to the tourist and lumber industries. The 1970 net export income from the County amounted to about $47.5 million (Table 3).

The total economy is expected to increase to $112.92 million by 1980, or a gain of 47 percent. The increases are expected to come mainly from manufacturing and mining, 43 percent; tourism, 57 percent; and property and pensions, 64 percent.

Table 3. Net export income for Josephine County in 1970*

	Amount (in millions)	Percent of total
Agriculture	$ 4.30	5.6
Manufacturing & mining	21.35	28.
Tourism	26.20	34.3
Property & pensions	15.05	19.7
O & C National Forest & Federal payroll	5.68	7.4
State & Federal support	2.18	2.8
Other	1.70	2.2
Total	$76.46	100.0

* Stevens, Thompson, and Runyan, Inc., 1972

Relationship of Population to Aggregate Needs

Aggregate (sand, gravel, and crushed rock), is a basic requirement for any community, especially one that is growing. Roads, sidewalks, embankments, houses, public and commercial buildings, and larger construction projects such as freeways, bridges, dams, and airports require aggregate.

The illustration by Huntzicker (1970) of a growing community's need for aggregate is revealing. According to Huntzicker, the construction of the average housing unit requires about 41 cubic yards of concrete. Each new home generates a sizable secondary market in the expanding community. These communities require public buildings such as schools, libraries, churches, and municipal buildings with aggregate requirements equivalent to 28 cubic yards per house. Public works construction consisting of streets, sewers, water treatment plants, and sidewalks requires 73 cubic yards of concrete per house.

Every housing unit constructed generates a need for a total of 176 cubic yards of concrete. In addition to its use for concrete aggregate, rock is used for foundation pads, embankments, and select fill.

The growth rate of a community has considerable effect on the per-capita consumption of rock products. A rapidly growing community will use up to three times as much rock per-capita as one that is not expanding.

Josephine County is a rapidly developing area and therefore the need for aggregate is great. In order to have an adequate supply of aggregate at reasonable cost, local sources should be utilized. The delivered cost for aggregate will double if it is hauled about 10 miles to its place of use. About 30 miles is the maximum distance it can be truck hauled and still be competitive, and many feel that 15 miles may be a more reasonable haul limit.

In 1973, Josephine County used about 460,000 cubic yards of aggregate, which calculates to 12.3 cubic yards (almost 19 tons) per capita. By 1990, the annual consumption will be more than 700,000 cubic yards (Figure 3). Cumulative aggregate usage between 1970 and 1990 will total about 11.5 million cubic yards (Figure 4).

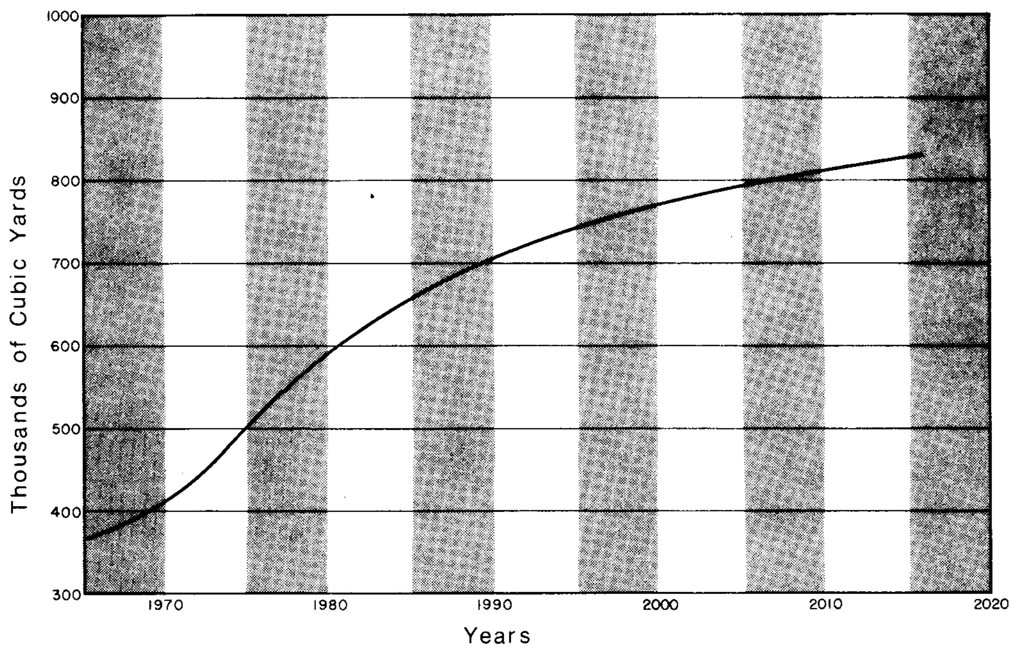

Figure 3. Projected annual aggregate requirement for Josephine County, based on 11.3 cubic yards per capita.

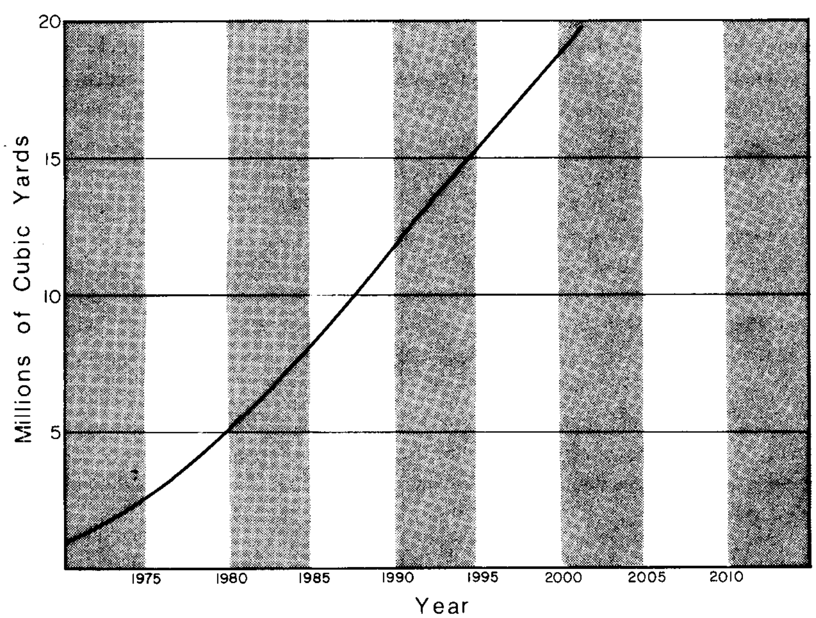

Figure 4. Projected cumulative aggregate requirement for Josephine County, based on 11.3 cubic yards per capita annually.

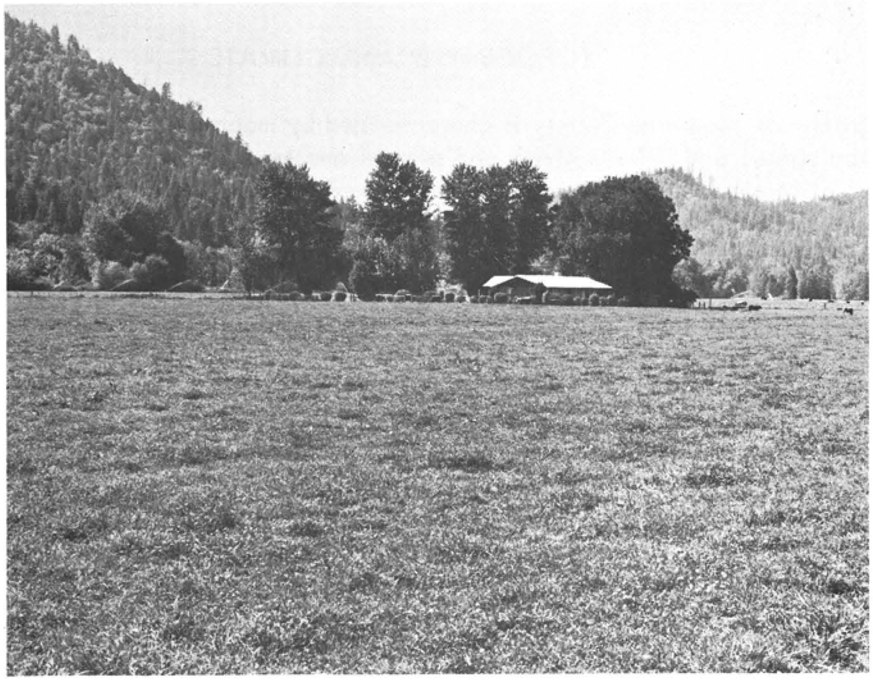

Photo 1. Terrace underlain by gravel (Ltg) west of Newhope on the Applegate River. Land is better suited for irrigated pasture or other agricultural crops than as a source for gravel.

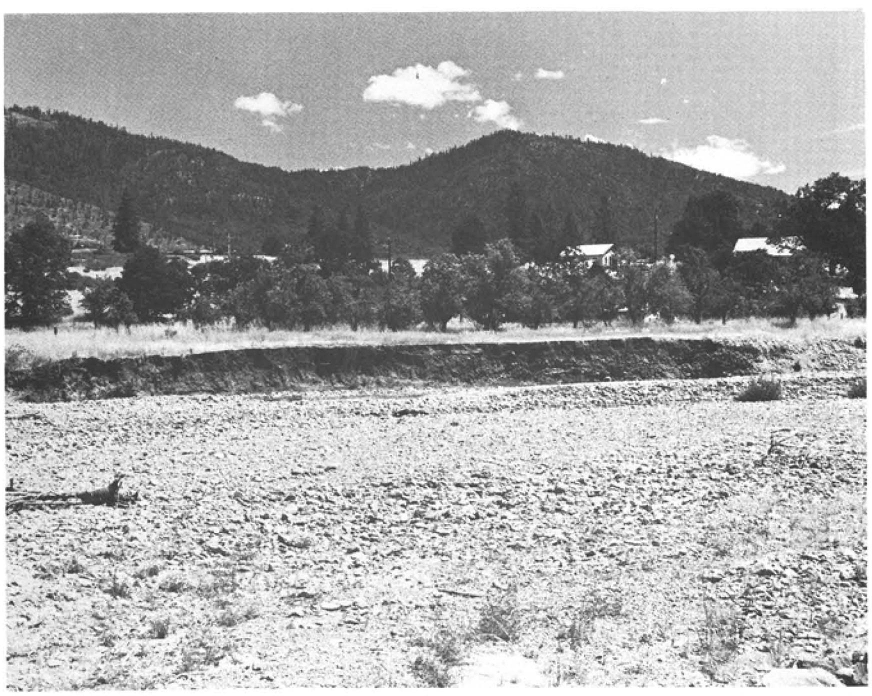

Photo 2. Riverwash (Rw) along Louse Creek west of Merlin. Gravel is suitable for local use in small amounts. Extensive excavation would have severe impact on stream channel.

TOPOGRAPHY AND CLIMATE

The topography of Josephine County is characterized by mountainous terrain separated by valleys of the Rogue, Applegate, and Illinois Rivers and several smaller streams. Most of the mountains rise to 3,000 to 4,000 feet in elevation msl, but a number of peaks in the Siskiyou Mountains south of Grants Pass are higher, for example Grayback Mountain, 7,055 feet; Kerby Peak, 5,554 feet; Bolan Mountain, 6,287 feet; and Lake Peak, 6,642 feet.

The valleys range in width from a fraction of a mile to several miles and have elevations averaging about 1,000 feet. Rural and urban settlements are situated in the valleys and are interconnected by a network of roads and highways that, in general, follow the river routes.

The climate in the valley areas is mild because of the westerly winds from the Pacific Ocean, only 30 miles from the western boundary of the County. The U. S. Weather Bureau at Medford, 25 miles southeast of Grants Pass, reports that the average daily low temperature for January is 28.4 degrees and the high is 42.4 degrees. For July, the average daily low temperature is 55.7 degrees and the high is 88.3 degrees. Temperatures below zero or higher than 100 degrees have been recorded only rarely in the Rogue River valley.

Precipitation ranges from about 0.27 inches in July to 6.04 inches in January, with an average total annual rainfall of 32.42 inches. Snow may be deep in the mountainous areas and persist there from November to mid-June, but it is seldom more than a few inches thick in the valleys and melts within a few days.

Photo 3. Agricultural development and encroaching housing characterize the Rogue River area from the mouth of the Applegate eastward to Grants Pass.

GEOLOGY*

General Summary

Geologic units ranging in age from Triassic to lower Tertiary comprise the bedrock of Josephine County (Figure 5). The oldest rocks are metasediments and metavolcanics of the Applegate Group of Upper Triassic age. These ancient rocks are overlain unconformably by the northeasterly trending bands of the Rogue, Galice, and Dothan Formations composed of marine sediments, volcanic flows, tuffs, and agglomerates of Jurassic age. The two older formations, the Rogue and the Galice, are complexly altered and deformed. Late Jurassic peridotite, associated serpentinite bodies, and coarse-grained granitic rocks intrude all of the formations older than the Dothan. Cretaceous marine sandstones of the Myrtle Group are present locally in the Illinois Valley. Lower Tertiary sediments and small Tertiary intrusive bodies are of minor occurrence.

Alluvial deposits in Josephine County are of Quaternary age. They consist of bench, terrace, and river gravels in the Rogue, Applegate, and Illinois River drainages. Since the alluvial deposits are of considerable importance to the County as sources of aggregate, they are treated in this report in more detail than are the bedrock units.

Bedrock Units

Applegate Group

The Applegate Group consists of an assemblage of Upper Triassic (?) metavolcanic and metasedimentary rocks that are exposed over approximately 400 square miles in the easternmost and southeastern parts of Josephine County.

Metavolcanic rocks (TRav) consist of greenish gray to pale green, coarse- to fine-grained, altered andesitic and basaltic lava flows, agglomerates, flow breccias, pyroclastics, and smaller bodies of intrusive rocks.

Metasedimentary rocks (TRas), lenticular in outcrop pattern and ranging from a few hundred feet to 10 miles in length, strike northeasterly and dip steeply to the southeast. Black, dense, fine-grained argillites predominate with variable occurrences of chert, quartzite, conglomerate, and marble. Thick sequences usually contain interbeds of volcanic material.

Both the metavolcanic and metasedimentary rocks of the Applegate Group are utilized as construction aggregate; however, the metasediments are generally too soft for use in concrete.

Contact aureole

Crystalline rocks with hornblende-rich bands occur along narrow zones adjacent to some of the major granitic stocks. They grade from gneiss and schist near the intrusive bodies to the normal metavolcanic or metasedimentary country rocks. The contact aureole rocks include hornblende gneiss, amphibolites, quartzite, and marble (Wells, 1940; Wells and others, 1949).

Rogue Formation

The Rogue Formation is a sequence of metamorphosed volcanic rocks that occupy a belt 2 to 8 miles wide, extending from the southeast to the north-central part of the County and covering approximately 140 square miles. Geographically the Rogue Formation lies between the Dothan Formation to the northwest and the Galice Formation to the southeast.

* See glossary for definitions of technical geologic terms.

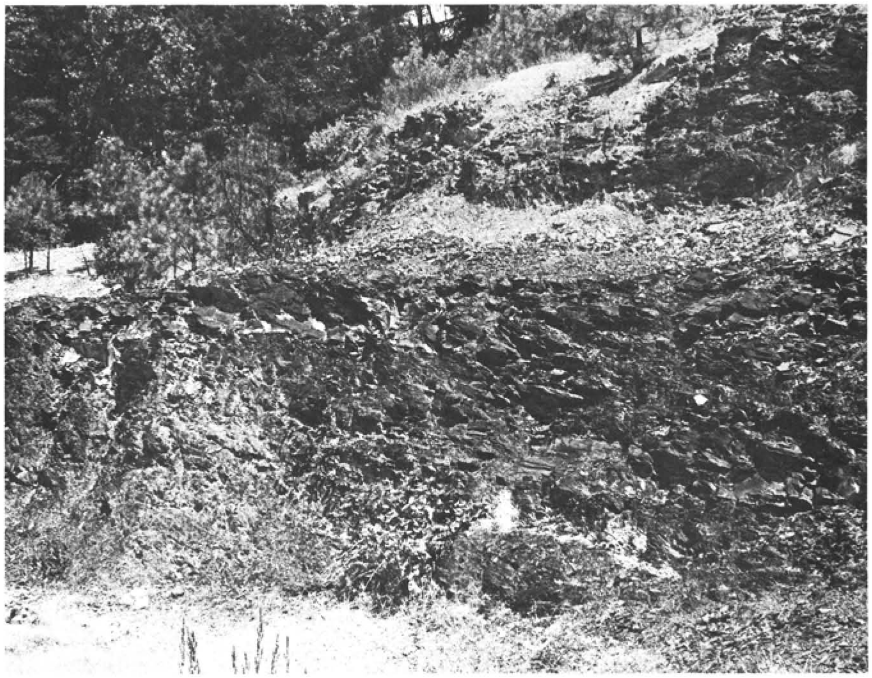

Photo 4. Small "shale" quarry (No. 124) in the Galice Formation metasediments 3 miles west of Merlin. Rock was used in road construction.

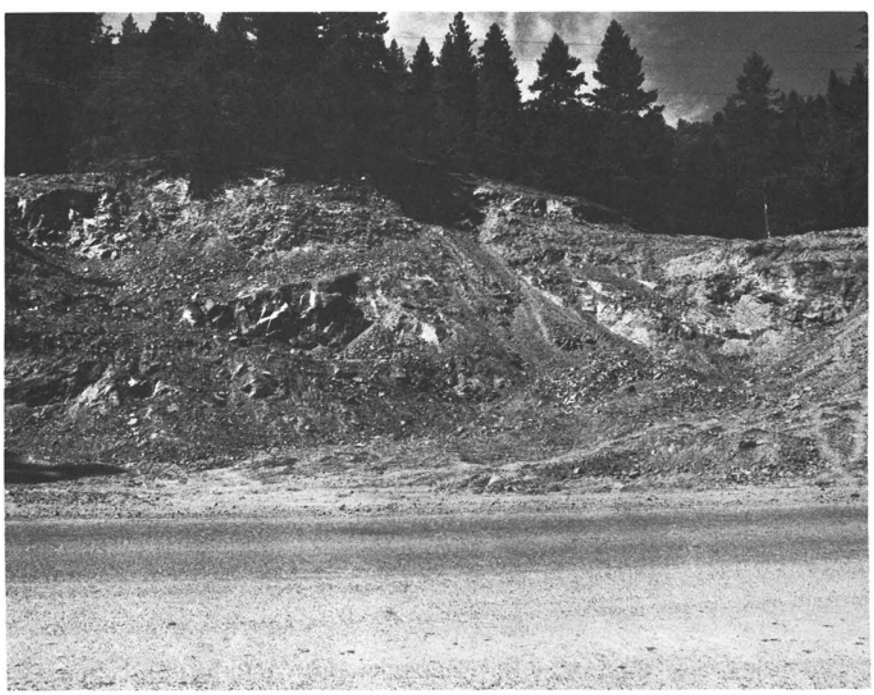

Photo 5. County quarry (No. 187) in Applegate Group metavolcanics half a mile west of Murphy.

ERA	PERIOD	FORMATION OF UNIT	DESCRIPTION	SYMBOL ON PHOTO MAP
CENOZOIC	Quaternary	Alluvial deposits	River sand, silt, gravel on benches, terraces, and at or near river level	Qal
		Riverwash	Channel and bar gravel in stream bed	Rw
		Floodway gravel	Fresh gravel in flood channels	Fg
		Low terrace gravel	Flood-plain gravel; silty sand overburden	Ltg
		High terrace gravel	Slightly weathered gravel on terraces	Htg
		Bench gravel	Weathered gravel with silt and clay on benches	Bg
		Quaternary sediments	Sandy, silty, clayey phases of alluvial units, chiefly bench gravel	Qs
		Dredge tailings	Boulders, cobbles, gravel from placer mines	Dt
	Tertiary	Old gravels	Weathered, cemented gravels at high elevations	--
		Intrusive rocks	Small bodies and dikes	--
MESOZOIC	Cretaceous	Myrtle Group	Marine sandstone and conglomerate	Km
	Jurassic	Dothan Formation	Massive graywacke, with mudstone, shale, siltstone, chert, and conglomerate	Jds
			Basaltic pillow lava	Jdv
		Intrusive rocks of Nevadan orogeny	Granitic rocks: quartz diorite	qd
			granodiorite	gd
			diorite	di
			gabbro	gb
			Ultramafic rocks: peridotite	pd
			serpentinite	sp
		Galice Formation	Sedimentary member: slaty shale, siltstone, sandstone	Jgs
			Volcanic member: flows, breccia, agglomerate, and tuff	Jgv
		Rogue Formation	Greenish altered lava; tuff, agglomerate, and breccia	Jrv
	Triassic	Applegate Group	Metamorphosed sedimentary rocks (argillite, chert, quartzite, conglomerate, marble)	TRas
			Metamorphosed volcanic rocks (basaltic lava, agglomerate, breccia)	TRav
			Contact aureoles of gneiss and schist adjacent to igneous bodies	Ca

Figure 5. Stratigraphic chart of alluvial and bedrock units in Josephine County.

Photo 6. County quarry (No. 186) NW¼ sec. 19, T.37S., R.5W. Rock, partly talus, is quarried from Applegate metavolcanics.

Photo 7. Marble Mountain quarry (No. 204), approximately 3 miles south of Wilderville, is a large source of limestone used for making cement. Occurs within sedimentary member of Applegate Group.

Photo 8. Weathered granite at Axtell quarry (No. 141) $1\frac{1}{2}$ miles northwest of Grants Pass is easily extracted and suitable for select fill. Properly treated, it can be used for road construction.

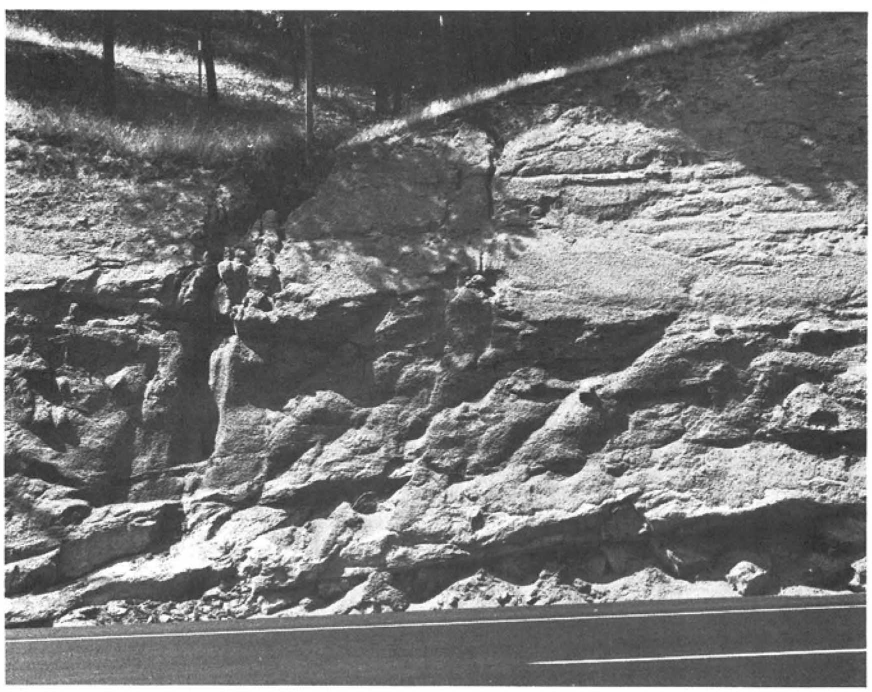

Photo 9. Roadcut in weathered quartz diorite ("granite") 3 miles west of Grants Pass on Upper River Road. Quartz diorite covers an area of more than 50 square miles just west of Grants Pass.

The Formation includes massive light- to dark-gray, greenish, altered lava flows of andesitic and basaltic composition. Locally, some of the lavas are amygdaloidal or porphyritic, and pillow structures are common. Small contemporaneous intrusive bodies of rhyolitic or dacitic composition are present. Lithic tuffs grade into agglomerates and are often associated with flow breccias. Other Jurassic volcanic rocks, similar to those of the Rogue Formation, occur in the northeast and southeast part of the County; however, their exact stratigraphic position is unknown.

Along the western edge of the unit, the rocks have been altered by metamorphism to schists and hornblende gneiss.

The Rogue Formation is probably one of the better sources of quarry rock in the southwest and north-central parts of the County. Basalts and andesites in this unit have been altered to greenstone. Although some parts of the Formation may be unusable as aggregate, much of it is of good quality.

Galice Formation

The Galice Formation forms a band 5 to 10 miles wide extending from the southwest to the northeast corner of Josephine County. A major thrust fault forms the contact between the Galice and Applegate Formations. The Rogue Formation bounds the Galice Formation on the west.

The volcanic member (Jgv) includes thick partly amygdaloidal, andesitic flows, flow breccias, and agglomerates. These rocks are covered by well-bedded tuffs and thin flows of dacitic and rhyolitic composition, which are in turn overlain by andesitic flows and agglomerates. Epidote and chlorite are present throughout the sequence as alteration minerals.

The sedimentary member (Jgs) is composed of dark-gray to black, fine-grained, thinly layered shales and siltstones having slaty cleavage interbedded with medium-grained, feldspathic graywacke sandstone layers. Chert, shale, and altered diabase and basaltic lavas are the most common lithic fragments. Carbonaceous material occurs in both the shale and sandstone.

The lavas of the Galice Formation generally produce good-quality aggregate; however, flow breccias and agglomerate contain undesirable fine-grained material which must be removed if the rock is to be used for base rock or concrete aggregate.

Slatey siltstone of the Galice Formation (commonly referred to as shale) is used throughout its outcrop area for subbase and embankment material on secondary and forest access roads. Where a better quality rock is not available, the "shale" is sometimes used for base rock and wearing surface; however, tests indicate that premature failure of the road is likely.

Dothan Formation

The Dothan Formation occupies a linear belt 2 to 7 miles by 30 miles along the northwest edge of the County and is bounded on the east by intrusive rocks and the Rogue Formation. It is characterized by a medium-grained, massive, poorly sorted graywacke (Jds), silicified in some areas. Interbeds of dark-gray to black mudstone, shale, and silstone with local slaty cleavage are common and are usually associated with chert lenses and basaltic lava. Lenses of conglomerate are rare. Chert lenses, red to light gray or cream colored, seldom exceed 30 feet in thickness and a quarter of a mile in length. Basaltic pillow lava altered to greenstone (Jdv) occurs locally as a stratigraphic horizon at the top of the Formation and as smaller lentils scattered throughout the graywacke. Fossils collected in the Dothan Formation suggest an uppermost Jurassic age (Ramp, 1969).

Because the area of Dothan outcrop is relatively remote and undeveloped, these rocks are used only for local construction and maintenance of County and forest access roads. The most satisfactory road metal in the Dothan Formation is quarried from indurated, fractured, quartz-veined graywacke and chert beds if they are at least 20 feet thick. (Chert has been called quartzite locally.)

Intrusive granitic rocks

Coarse- and medium-grained granitic rocks are exposed in three major bodies that intrude all rocks older than the Dothan Formation. Although quartz diorite (qd) and granodiorite (gd) predominate, gabbroic (gb), and dioritic (di) compositions are also present. In the northwest part of the County, the

Photo 10. Galice Formation metasediments ("shale") in roadcut near Wilderville. Rock of this type, although inferior, is sometimes quarried for base rock.

Photo 11. Fish Hatchery County Park on Applegate River. Because the channel is narrow where river cuts through resistant Applegate volcanics, stream velocity is high during floods and gravel is flushed downstream.

Illinois River gabbro-diorite complex extends northeasterly from the Curry County border for 25 miles between the Dothan and Rogue Formations. In the Grants Pass vicinity, quartz diorite of the Grants Pass pluton covers approximately 80 square miles from Hugo south to the Applegate River. Quartz diorite of the Grayback pluton is exposed over 50 square miles in the southeast corner of the County, and numerous smaller plugs and stocks, mostly 1 to 2 miles wide, intrude the Applegate Group. Contact aureoles (Ca), up to .2 mile wide, are frequently associated with the larger intrusive bodies.

Granitic rocks have been altered by mineral disintegration (weathering) of the individual grains in the rock to produce a coarse sand aggregate. The alteration products form a yellow to tan clay dispersed throughout the rock. Although the clay is not a problem if the rock is used for embankments, it must be removed or treated if the rock is used for base or topping in road construction.

Large bodies of granitic rock are located within the Grants Pass area and could supply this type of material for use in embankments into the future. Mines and quarries of large dimension could serve as sanitary landfill disposal sites such as the one used for this purpose at Merlin.

Peridotite and serpentinite

The largest body of peridotite (pd) covers approximately 100 square miles and extends from the southwest edge of the County to a point 3 miles northwest of Selma. Other localities up to 20 square miles in area occur northwest of Selma adjacent to the Rogue and Galice Formations. In general, the peridotites are medium-grained, intrusive rocks consisting of olivine with or without other mafic minerals. Weathered peridotite is usually a buff to rusty red (buckskin) whereas the fresh rock is a yellowish green to greenish black depending on the degree of alteration to serpentine minerals.

Where serpentinization is intense, the resultant sheared, green-black serpentinite is characteristic and easily distinguished from the less- deformed, fresh peridotites.

Serpentinite bodies (sp), 1 to 5 miles in diameter, occur throughout the Triassic Applegate Group, and larger masses up to 10 miles long, commonly localized along faults, are found within the volcanic member of the Galice Formation and adjacent to the Rogue Formation. Sheared bodies of serpentinite are also concentrated along the thrust fault between the Applegate Group and the Galice Formation.

There are a few quarries in rock mapped as peridotite-serpentinite. The rock from this unit is variable from poor to good depending upon the amount and type of alteration. Highly serpentinized rock or badly weathered rock is generally unsuitable for aggregate. Alteration may be localized, however, and better material could be present nearby or in other parts of the same outcrop.

Myrtle Group

Rocks of the Myrtle Group occur in Josephine County in only a small area (15 square miles) east of O'Brien and south of Cave Junction. These rocks consist chiefly of siltstone, sandstone, and conglomerate of Cretaceous age. One quarry (No. 276) is reported in the Myrtle Group. It lies northeast of O'Brien and was used as a source of riprap. Although the test for abrasion appeared satisfactory, the sodium sulfate test indicated that the rock would break down too rapidly to be suitable for base rock or concrete aggregate.

Alluvial Deposits

Classification of alluvial deposits

The alluvial deposits in Josephine County are classified here on the basis of age and geomorphic position. They consist of river sediment on benches, terraces, and flood plains, and in the stream channel.

The oldest alluvial unit is somewhat weathered bench gravel (Bg) occupying the highest ground in the valley. In places it underlies younger terrace and flood-plain gravel. Most of the bench gravel contains significant amounts of clay, and the thickness varys considerably from place to place.

Terrace gravel of moderate thickness overlies the eroded surface of bench gravel or rests directly on bedrock. The high terrace gravel (Htg) is generally flood free; however, the low flood-plain terrace (Ltg)

Photo 12. River-run gravels used for base rock in construction of Applegate Avenue near the mouth of the Applebate River.

Photo 13. Dredge tailings (Dt) at Leland Placer on south bank of Grave Creek 1 mile west of Sunny Valley near gravel pits No. 46 and No. 47 provide a major source of aggregate. Boulders will require crushing.

is occasionally inundated. Repeated flooding causes successive layers of silt and sand to be deposited on the gravel.

Floodway gravel (Fg) occurs in flood-plain areas adjacent to the streams where rapidly moving flood waters have stripped off silt and sand overburden.

Sand and gravel deposits within the stream channel or along the bank are termed Riverwash (Rw).

River sediment that is too low in gravel content to be suitable for aggregate is classified as Quaternary sediment (Qs).

Origin of alluvial deposits

Streams continually erode their banks where the current is swiftest and deposit sand and gravel where the current slackens. As the stream migrates back and forth across a valley, the gravel deposited during successive cycles forms sand and gravel beds which may extend across an entire valley. During floods, sand and silt are deposited on the flood-plain surface on top of the gravel and in places attain thicknesses as much as 5 or 6 feet.

After a stream has cut downward and has reached a new base level, it cuts laterally in new meanders and once again migrates back and forth across the valley, developing a new flood plain at a lower elevation. Since the river rarely cuts as far laterally as before, it leaves parts of the older flood-plain gravel as bench or terrace deposits.

Streams in mountainous areas have no flood plains; the gradient and stream velocity are high and a large volume of gravel is carried downstream. When such a stream enters a wide valley where the gradient and velocity are diminished, the load of gravel that was carried along the upper reaches is dumped, and the channel becomes clogged. When this occurs, part of the stream breaks out and flows in new channels and forms a braided stream.

Along rivers such as the Applegate, frequent severe floods greatly modify the stream channel and the gravel deposits. The amount of gravel deposited at the mouth of the Applegate, and for a short distance upstream, depends on the height of water in the Rogue River. When the Rogue is high, water in the lower Applegate is slowed, causing most of the gravel carried by the stream to be deposited. Should the Rogue be low when the Applegate is high, most of the gravel will be carried into the Rogue River channel and later flushed downstream during the Rogue River flooding.

Bench gravel (Bg)

Bench gravel occurs along the margins of the major stream valleys as remnants of a former higher valley floor. The upper surface of the bench gravel is 20 to 50 feet above the present stream level, but the gravel commonly extends beneath the younger terrace and flood-plain deposits since it originally spanned the entire valley before the stream cut down to lower elevations.

Bench gravel is as much as 50 feet thick and has a soil cover ranging from very thin to about 10 feet thick. The gravel contains silt or clay and, in places, large cobbles or boulders. It is partly weathered and stained a deep reddish brown.

The reddish clay and silt should be removed by washing if the gravel is to be used for concrete aggregate. Drilling or test pitting is necessary to determine the suitability of a gravel source. Since these older gravels require cleaning and are more costly to produce, other younger gravel deposits are preferred whenever they are available.

High terrace gravel (Htg)

High terrace gravel lies between the low terrace gravel subject to flooding and the higher bench gravel which never floods. The surface of the unit is nearly flat and has from 1 to 3 feet of silty-sandy overburden. It is extensive in all of the major valleys in the County, and because of proximity to water, much of the land composed of this unit is irrigated and used for crop or pasture.

High terrace gravel may occur as a thin veneer overlying the eroded surface of the bench gravel, or it may rest on bedrock and range in thickness from a few feet to about 30 feet.

Photo 14. Bench gravel (Bg) in roadcut southeast of Merlin. Such gravel usually requires washing to be suitable for aggregate.

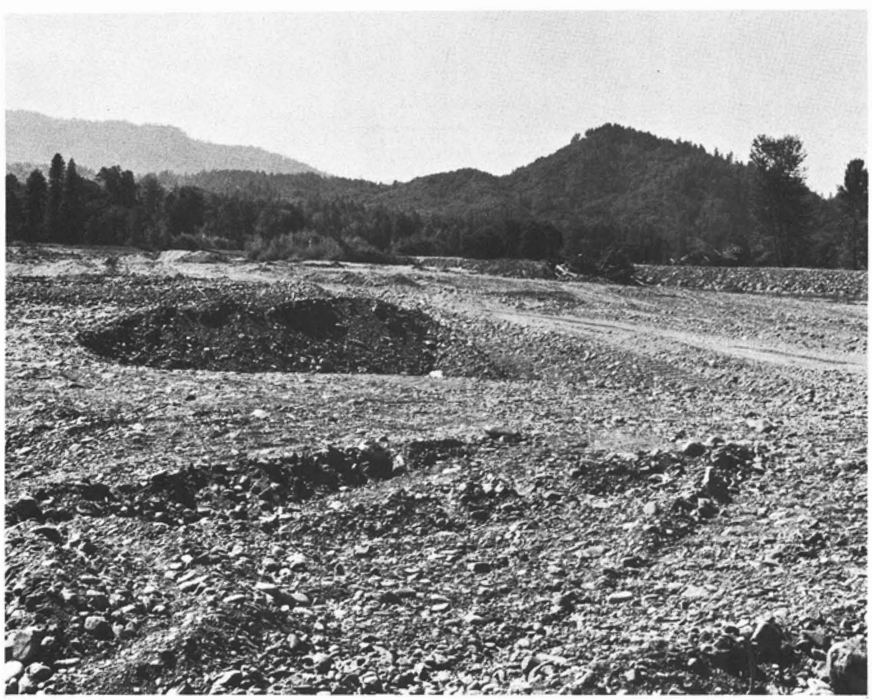

Photo 15. Kenneth Hyde Sand and Gravel (No. 196), about 3 miles northwest of Provolt, operates within the riverwash (Rw) of the Applegate River.

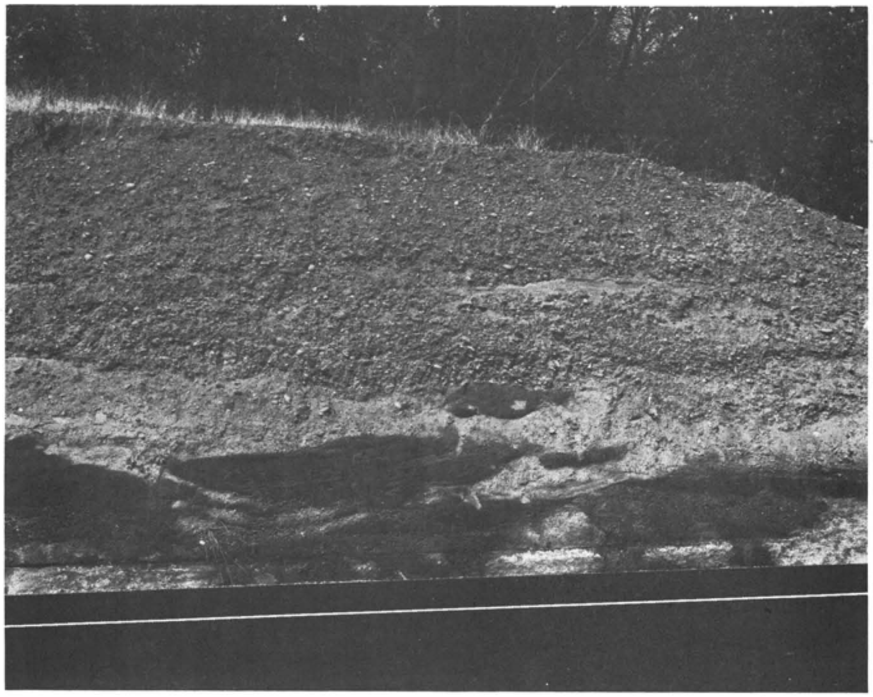

Photo 16. High terrace gravel and cross-bedded sand (Htg), exposed on the Upper River Road 1 mile west of Grants Pass, extend to depths of 30 feet and more.

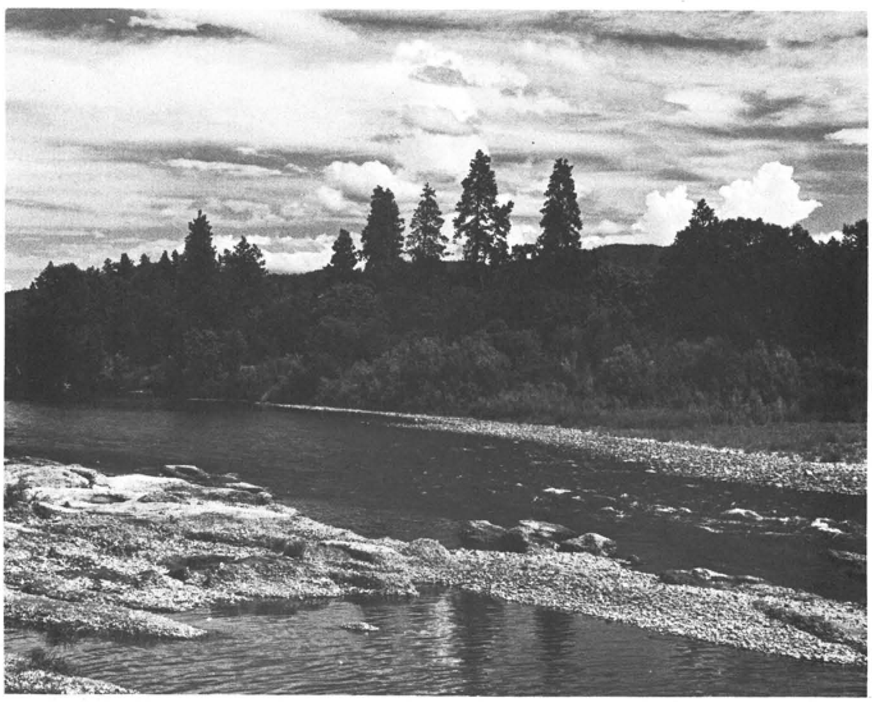

Photo 17. Cemented gravels are exposed in the Rogue River channel $2\frac{1}{2}$ miles west of Grants Pass. Recent laws preserving the Rogue River in its natural state preclude extraction from its channel in certain areas.

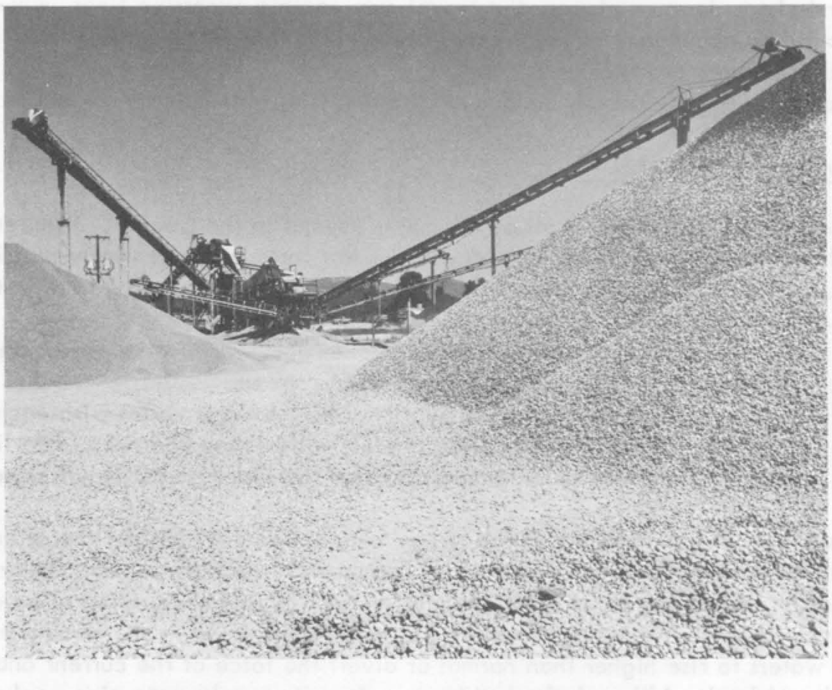

Photo 18. Copeland plant and stockpiles; various sizes of rock are separated and stockpiled for sale or used for ready-mix concrete manufactured in Grants Pass.

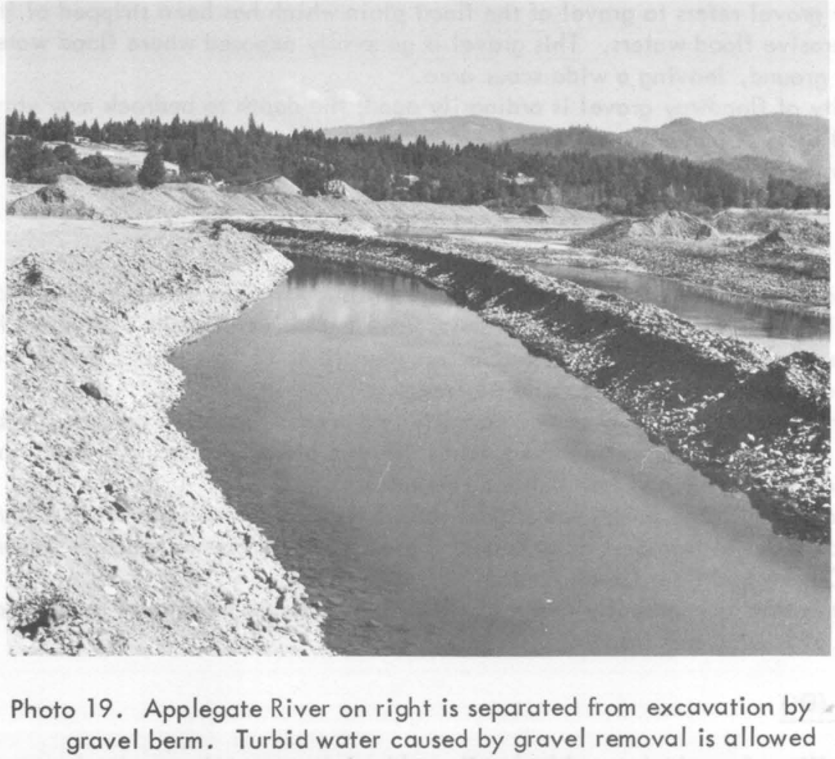

Photo 19. Applegate River on right is separated from excavation by gravel berm. Turbid water caused by gravel removal is allowed to clear before being released to the main stream.

The gravel is composed of fresh to slightly weathered, coarse material containing variable amounts of sand, silt, and clay. In some places, the gravel may contain excessive fines, whereas in others the deposit may contain an abundance of large cobbles and boulders. Areas having fines in excess of 45 percent are mapped as Quaternary sediment, "Qs".

High terrace gravel is relatively fresh and hard and is of good quality for use in concrete aggregate.

Low terrace (flood plain) gravel (Ltg)

Low terrace gravel occurs along all of the major streams in the County. It extends from the stream channel laterally to the edge of the high terrace. The low terrace is essentially the river flood plain. Since flooding usually occurs at least once annually, a mantle of silty sand 2 to 4 feet thick overlies the low terrace gravel in most places.

Adjacent to the stream, the gravel generally extends downward to the elevation of the stream channel, and bedrock, if exposed, slopes upward away from the stream.

Most of the low terrace gravel is of good quality. Its thickness varies with each stream valley, but averages from 8 to 20 feet. In many areas, older gravel, rather than bedrock, underlies low terrace gravel, and the depth of mining can be extended provided the older gravel is not cemented or severely weathered.

Operators of gravel pits adjacent to the stream channel should consider the effects the excavation will have on erosion during flooding. Streams running through thick gravel can easily develop new channels as a result of an improperly constructed berm or an unprotected excavation of an adjacent gravel pit. Dikes, roadways, and other structures associated with rock production in the flood path can act as dams and cause flood waters to rise higher than normal or divert the force of the current and cause erosion of valuable agricultural land. Although the low terrace deposits may be extensive, only a small part of the land in the County is available for gravel production because of higher land-use priority.

Floodway gravel (Fg)

Floodway gravel refers to gravel of the flood plain which has been stripped of its normal silt and sand cover by erosive flood waters. This gravel is generally exposed where flood water cuts across a meander or low ground, leaving a wide scour area.

The quality of floodway gravel is ordinarily good; the depth to bedrock may vary from a few feet to more than 20 feet. Channels made by mining floodway gravel could become the primary stream channel as a result of further erosion during subsequent flooding.

Riverwash (Rw)

Channel and point-bar gravels are termed Riverwash. Streams which have a wide variation in streamflow and carry large quantities of gravel normally have extensive deposits of riverwash gravel above the summer water level. In general, this gravel is less than 10 or 15 feet thick, but in places it rests on older gravel which may extend to total depths of 60 feet.

Riverwash gravel is generally of good quality and proper gradation can usually be obtained by selective extraction or crushing. If extraction extends into the older underlying gravel, some hard layers can be expected because of clay and iron oxide cementation.

Removal of fairly large quantities of gravel from these areas will have little adverse effect as long as the stream continues to transport an excess of gravel. Stream channels of the Applegate River, Illinois River, Sucker Creek, and Deer Creek contain abundant gravel.

The construction of improperly designed dikes and berms during gravel removal can have adverse effects in terms of erosion and flooding.

Dredge tailings (Dt)

Gravel tailings from dredge and hydraulic gold-mining operations occur in two areas north of Grants Pass. The tailings lie along Grave Creek east of Leland and in two areas on Coyote Creek east of Highway I-5.

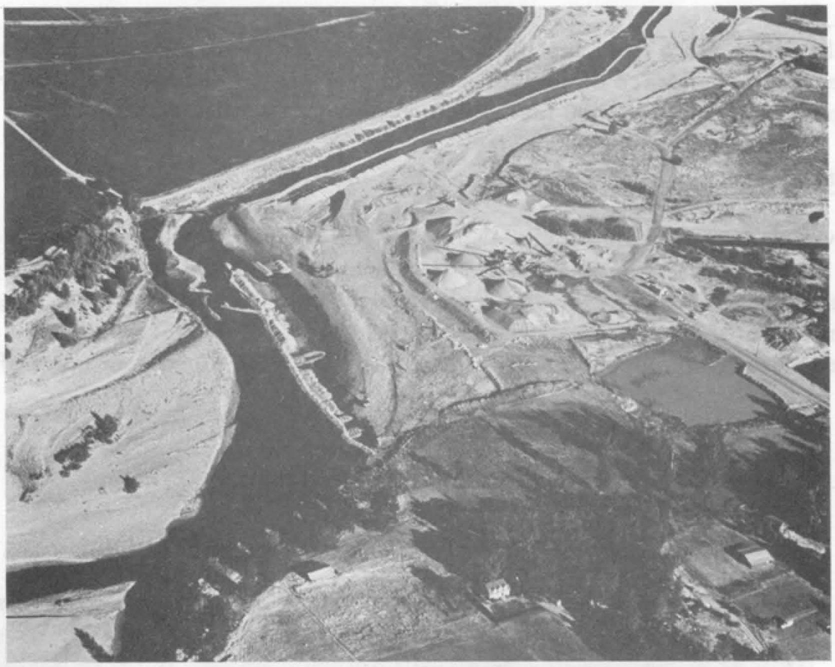

Photo 20. Copeland gravel at mouth of Applegate River. Note long berm at upper part of photo separating excavation area from main channel.

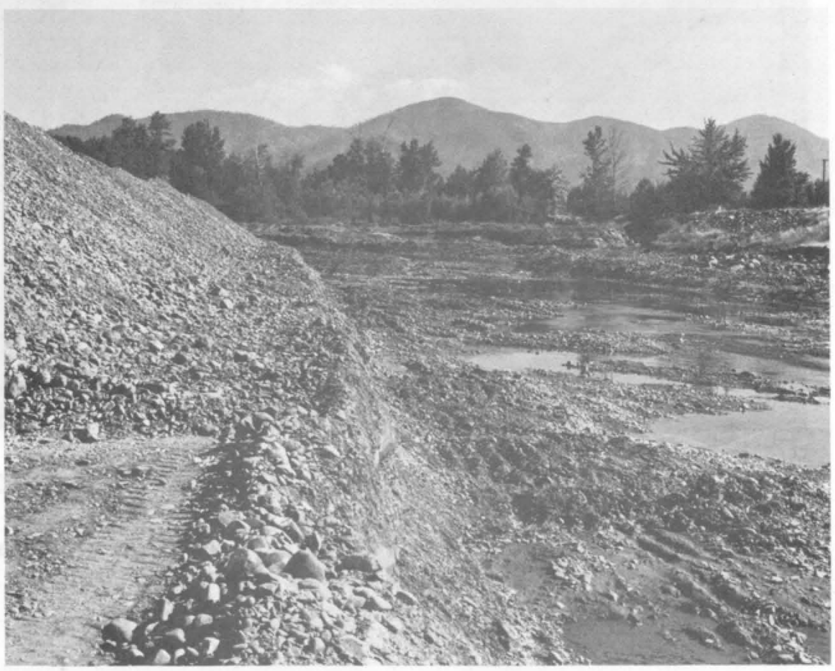

Photo 21. Dragline on Applegate River near mouth has excavated to layer of cemented gravels at about 8 foot depth. Older cemented gravels (No. 161) can be used if processed to remove excess fines.

Dredges operated on Grave Creek in the 1930's, and hydraulic mining on Coyote Creek was active until the early 1960's.

The gravel tailings are 6 to 12 feet thick. They are lacking in fines and require crushing for aggregate use because of the abundance of cobbles. The largest deposit of tailings is on Grave Creek, where the gravel occupies an area 300 to 400 feet wide and nearly two miles long.

Quaternary sediment (Qs)

Alluvium which does not contain gravel in commercial quantities is classed here as Quaternary sediment (Qs). Most areas mapped as Quaternary sediment (Qs) on the accompanying photo maps are equivalent to bench gravel (Bg). However, other alluvial units that are deficient in gravel, or contain excessive clay and silt, or have a thick overburden of soil, or are severely weathered are also mapped as Quaternary sediment (Qs). Good-quality gravel can usually be found near areas of Quaternary sediment.

Photo 22. Gilbert sand and gravel plant, on Middleton bar (No. 160) on Rogue River flood plain near mouth of Applegate River, is in floodway gravel (Fg). Unsuited for agriculture because of frequent floods, entire area is considered a prime gravel location.

REVIEW OF AGGREGATE RESOURCES

Quarry Rock

Quarry rock refers to hard bedrock quarried by drilling and blasting. In Josephine County, most quarry rock comes from metamorphosed sedimentary and volcanic rocks and from coarse-grained intrusives. Table 4 shows the number of aggregate sources in each geologic unit.

The quality of quarry rock varies with each geologic formation and within individual formations; therefore, the quality of rock in each quarry must be determined on an individual basis. In general, however, certain rock types such as basalt and gabbro tend to be of higher quality than the metasedimentary rocks or the weathered granitic rocks and serpentinites.

When rock is needed in remote areas for construction of forest access roads or other projects, a lower-quality local rock is often used in preference to a better rock transported over a greater distance. In construction of paved roads, the State or County generally utilizes a lower-quality rock that occurs locally for sub-base or base rock and a high-quality aggregate, often from a more distant source, for top course and paving.

Weathered granitic rock disintegrates into a coarse sand made up of the individual mineral particles. It can normally be quarried without blasting. Although it contains some clay from weathering, it makes good-quality embankment, or, if treated, it can be used for base rock in road construction. Quarries in weathered granite can produce large quantities of relatively inexpensive fill material.

The locations of the rock quarries in Josephine County are shown on the Aggregate Resources Location Map, and the pertinent information about each quarry is given in the Appendix.

Alluvial Deposits

The locations of 99 gravel pits are shown on the Aggregate Resources Location Map and the pertinent information about each is given in the Appendix. Good gravel sources are generally within the flood-plain areas of intermittent or perennial streams. Most sources above the annual flood plain need washing to remove excessive amounts of fines. Older material on higher terraces and benches requires extensive washing because of clayey fines. The type of alluvial material on most high terraces reflects the local bedrock formations; e.g., sandy alluvium is produced from granitic uplands.

Table 5 gives a brief summary of each alluvial unit and its map symbol. The distribution of the unit is shown by symbol on the accompanying 26 photo maps.

Table 4. Rock type and number of aggregate sources in each bedrock unit, Josephine County

Unit	Symbol	Rock type	Number of quarries
Myrtle Group	Km	Marine sandstone	1
Dothan Formation	Jds	Graywacke, shale, chert	28
Galice Formation	Jgs	Shale, siltstone, sandstone	24
	Jgv	Lava flows, breccia, agglomerate, and tuff	22
Rogue Formation	Jrv	Altered tuff, lava, agglomerate, and breccia	26
Applegate Group	ŦRav	Metavolcanics (lavas, breccias, and agglomerates)	59
	ŦRas	Metasediments (argillite, chert, conglomerate, and marble)	9
Contact aureole	Ca	Gneiss and schist	2
Granitic intrusive rocks	qd,gd,gb,di	Quartz diorite, granodiorite, gabbro, and diorite	35
Ultrabasic intrusive rocks	pd, sp	Peridotite and serpentinite	6
		Total number of quarries	212

Table 5. Summary of alluvial units in Josephine County

Unit	Map symbol	Brief description
Riverwash	Rw	Bar gravel in and adjacent to river channel. May contain excessive sand and silt locally. Depth to bedrock variable.
Floodway gravel	Fg	Part of terrace where flood waters either fail to deposit or have removed most of the silt and sand overburden.
Low terrace gravel	Ltg	Gravel as much as 20 feet thick, with sandy, silty overburden 2 to 4 feet thick.
High terrace gravel	Htg	Gravel as much as 30 feet thick, containing 30 to 45 percent fines; gravelly silt overburden 1 to 3 feet thick.
Bench gravel	Bg	Clayey gravel as much as 50 feet thick, with gravelly clay overburden 2 to 6 feet thick. Gravel generally dirty, more highly weathered than younger gravel, and requires washing.
Dredge tailings	Dt	Clean, coarse gravel and cobbles from gold placer operations. Deposits are 6 to 12 feet thick, deficient in natural fines, and require crushing because of abundance of cobbles.
Quaternary sediments	Qs	Sand, silt, clay, and non-commercial gravel on all levels of gravel units, mainly on bench gravel. Contains less than 40 percent gravel.

SUMMARY AND CONCLUSIONS

The Need for Aggregate

Aggregate (sand, gravel, and crushed rock) is an indispensable commodity that must be available for construction and development in populated areas and for building and maintaining freeways, County roads, and forest access roads. To be economic, aggregate resources need to be large, good quality, and within a short-haul distance from the place of use. In general, sand and gravel are preferable to rock because of their wide extent, ease of extraction, and nearness to population centers.

In 1973, Josephine County consumed about 460,000 cubic yards of aggregate or an equivalent of almost 12.7 cubic yards per person. By 1990 the annual demand will probably be more than 700,000 cubic yards, and between 1970 and 1990 total consumption will be about 11.5 million cubic yards.

Grants Pass and the surrounding communities use approximately 350,000 cubic yards of aggregate annually, or about three-quarters of the total County consumption, and trends in population growth suggest this will increase to about 493,000 cubic yards by the year 1990. The amount of gravel needed to supply Grants Pass alone, between 1960 and 1990, would be equivalent to an area of gravel covering 320 acres to a depth of 20 feet. By proper management of gravel deposited by the Applegate River, adequate supplies can be produced from the river bed, and the unsightly gravel pit normal to a dry-land operation can be avoided.

Available Resources

Rock quarries are scattered throughout Josephine County, particularly in the mountainous regions where river gravel is not available. Most of the quarries are small and are used intermittently for local road construction and maintenance. Igneous and metamorphic rocks usually produce higher quality aggregate than does sedimentary rock. Quality is also dependent upon degree of alteration and weathering. The highest quality (hardest) rock can be crushed and used for surfacing roads and for the manufacture of concrete. The lower quality rock is generally suitable for base rock, and poor rock may be used for select subgrade.

Gravel deposits are widespread in the valleys of the Rogue, Applegate, and Illinois Rivers and tributary streams. The gravel occurs on benches, terraces, flood plains, and in stream channels. It varies considerably in thickness and quality. The younger gravel at or near river level is generally of better quality than the older, higher, weathered gravel.

The Applegate River is the major source for gravel in the Grants Pass area. Normal high water should annually replenish a large portion of the gravel supply at the river's mouth. Blocking of upstream gravel by a dam on the Applegate River is not expected to have an immediate effect on gravel supply at the mouth, but long-range effects could be significant. Most other population centers in the County appear to have sufficient aggregate for the foreseeable future.

In the more rapidly developing parts of the County, serious consideration should be given to zoning areas of aggregate resources in order to insure adequate reserves for future requirements.

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GLOSSARY

Agglomerate. An assemblage of coarse volcanic fragments.

Aggregate. Sand, gravel and crushed rock used in the construction industry.

Alluvial. Describes sediment deposited by a river.

Amphibolite. A metamorphic crystalline rock composed chiefly of the minerals amphibole and plagioclase.

Amygdaloidal. Texture of an igneous rock containing gas cavities or vesicles.

Andesite. A dark-colored, fine-grained lava rock similar to basalt; when crystals are visible, they are generally andesine.

Argillite. A partially metamorphosed rock derived from either mudstone or shale.

Basalt. A dark-colored igneous rock occurring either as lava flows or as small dikes or sills.

Biotite. A common black mica found in igneous rocks.

Breccia. A coarse-grained clastic rock composed of angular broken rock fragments greater than 2 millimeters, cemented together in a finer grained matrix.

Chert. A hard, extremely dense sedimentary rock composed of silica.

Chlorite. A greenish-gray colored mineral found in low-grade metamorphic rocks.

Conglomerate. A rock that is the cemented equivalent of gravel.

Contact aureole. A zone of metamorphic rocks surrounding a large intrusive body.

Dacite. A fine-grained extrusive rock having the same chemical composition as andesite; generally gray in color.

Diabase. A dark igneous intrusive rock of medium-grain size containing abundant dark minerals.

Diorite. A plutonic rock intermediate in composition between granite and gabbro; generally contains black and white minerals and has a granitic texture.

Dunite. An ultrabasic rock composed chiefly of olivine.

Enstatite. An olive-green to yellowish-brown mineral common to dark igneous rocks.

Epidote. A yellow to blackish-green mineral found in low-grade metamorphic rocks.

Extrusive. Describes a once molten rock that erupted onto the surface of the earth; lava, volcanic ash, etc.

Fault. A surface or zone of rock fracture along which there has been displacement.

Feldspathic. Describes a sedimentary rock containing 10 to 25 percent feldspar.

Flow breccia. Breccia formed during the movement of a lava flow.

Formation. A body of rock of considerable thickness and extent that has distinctive characteristics and can be mapped. Usually is named for some geographic feature.

Gabbro. A dark-colored basic igneous intrusive rock having a granitic texture.

Gneiss. A metamorphic rock in which alternating layers of light and dark minerals produce banding.

Granite. A coarse-grained plutonic rock containing quartz and pinkish feldspar.

Granitic. Describes any coarse-grained plutonic rock having the texture of granite.

Graywacke. A dark sandstone composed of quartz, feldspar, and abundant rock fragments partially altered to clay.

Greenstone. An altered ultrabasic igneous rock which has taken on a greenish color due to greenish minerals formed during metamorphism.

Hornblende. A dark-colored amphibole mineral commonly found in plutons and extrusive rocks of intermediate and acid composition.

Intrusive. Describes once molten rock that intruded rocks of the earth's crust and cooled slowly; granite, etc.

Lithic tuff. A tuff that contains appreciable amount of rock fragments.

Mafic. Describes igneous rocks composed of one or more dark minerals.

Marble. Recrystallized limestone.

Marine sediment. Sediment deposited in a marine environment.

Metamorphism. Alteration of solid rock at great depth due to high temperature and pressure in the earth's crust.

Metavolcanic. Describes a rock composed of volcanic materials which show evidences of metamorphism.

Mudstone. An indurated rock composed of sand and silt; lacking in shaley laminations.

Olivine. A common mineral in basalt, and the chief component in some ultrabasic rocks.

Peridotite. A coarse-grained plutonic rock composed chiefly of olivine with or without other dark minerals.

Pillow basalt. Pillow-shaped masses of basalt up to 3 feet or more in diameter; forms when lava flows into water.

Plagioclase. A dark-gray feldspar found in basic to intermediate igneous rocks.

Pluton. A large deep-seated intrusive body having a granitic texture.

Porphyritic. A texture of a rock where larger crystals occur in a finer-grained matrix.

Pyroclastic. Clastic rock formed by expulsion from a volcanic vent.

Pyroxene. A group of dark rock-forming minerals found inintermediate and more basic rocks.

Quartz diorite. A group of plutonic rocks having a composition of diorite but with 20 percent, or more, light-colored constituents and containing an appreciable amount of quartz.

Quartzite. A rock composed of sand grains cemented together by silica or by recrystallization during metamorphism.

Rhyolite. A group of extrusive igneous rocks having the composition of granite; usually very fine grained or porphyritic (visible crystals); and usually exhibits flow banding.

Schist. A strongly foliated crystalline rock formed by dynamic metamorphism.

Serpentinite. A rock composed of serpentine group minerals; greenish foliated rock formed by metamorphism of a rock containing magnesium silicate minerals such as olivine and pyroxene.

Shale. A fine-grained, indurated sedimentary rock that splits into thin layers.

Silicification. The introduction of or replacement by silica.

Slate. A compact, fine-grained metamorphic rock having thin, slatey cleavage.

Stock. A large granitic intrusion having less than 40 square miles exposure.

Stratigraphic position. The position of a strata relative to the vertical position or age of another strata; may or may not be in super position (the same outcrop).

Thrust fault. A fault with a dip of 45 degrees or less in which the upper rock mass has been thrust up over the lower.

Tuff. A compacted deposit of volcanic ash.

Ultrabasic. Describes a dark igneous rock that is very low in silica; peridotite and serpentinite are examples.

Unconformity. Where rock units are separated stratigraphically by a long erosional time break.

APPENDIX

TABULATION OF AGGREGATE RESOURCES IN JOSEPHINE COUNTY

The following list of aggregate-resource sites provides laboratory results and general information for all known gravel pits, rock quarries, and prospects in Josephine County. The information has been compiled in part from data supplied by: Josephine County Departments of Engineering, Planning, and Soils; Oregon Department of Geology and Mineral Industries; Oregon State Highway Division; U.S. Department of Transportation, Bureau of Public Roads; U.S. Bureau of Land Management; and U.S.D.A. Forest Service.

Each aggregate source is located and identified by number on the accompanying map of Josephine County. Most of the location descriptions, grouped by township, range, and section, and all of the laboratory results were supplied by the contributing agencies. Since field inspection of the pits and quarries was spotty, the locations given for some may be suspect. Some of the operations may now be inactive or abandoned.

Owners of the resource site are indicated when known. The name of the property has usually originated from geographic or private usage. When no name was available for Federal land locations, the last four digits of the Bureau of Public Roads source number was used for identification.

The type of rock is given for the rock quarries. The geologic formation indicates the mapping unit (designated by symbol) in which the quarry, pit, or prospect is found. Rock types of individual quarries should be identified in the field since local variations within the formations may be the actual resource.

Laboratory test results indicate the condition of the rock relative to its performance in construction. The Los Angeles Rattler (L.A.R.) is a test to determine the ability of the rock to withstand abrasion. Values range from about 12 percent loss for extremely hard rock to a maximum of 30 percent for paving or oil rock, 35 percent for base rock, and 45 percent for subbase. The maximum figure is considered very poor and 21 percent or less is considered good.

The sodium sulfate test (Na_2SO_4) is to determine the weathering characteristics of the rock by subjecting the rock to a simulated freeze and thaw procedure. Percent loss of rock breakdown of 12 is maximum allowable for portland cement concrete.

Classification of a quarry as good, fair, or poor was based on the tests and is purely relative. The quantity of aggregate available at each site ranges up to 20,000 cubic yards (small), 20,000 to 100,000 c.y. (medium), and over 100,000 c.y. (large). Quantities in many cases were estimated and may actually represent the amount of material removed from the site and not the amount remaining.

The final column is reserved for comments concerning the use for which the deposit is best suited and general information or notes that may aid the reader with identification or location.

Although 66 percent of the sites listed are quarries, the majority of rock used commercially is from gravel pits. Many of the rock quarries are located on Federal forest land and are used intermittently from time to time for local road building and maintenance.

APPENDIX - JOSEPHINE COUNTY AGGREGATE SOURCES

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T33S, R5W							
1	19 SE/SW	OSHD	Foley Gulch Bar	Gravel	GP	Qal	17.3-31.8
2	19 SW/SE	OSHD	Golden Bar	Gravel	GP	Qal	10.2
3	23 NE/SE	BLM	0100	Talus	Q	Jgv	33
4	26 NW/NE	BLM	0101	Metased.	Q	Jgs	35
5	26 NW/NW	BLM	0084	Metavol.	Q	Jgv	20
6	28 NE/NW	BLM	0092	Metavol.	Q	Jgv	17
7	28 SW/SW	BLM	0091	Metavol.	Q	Jgv	24
8	30 SW/NE	BLM	0083	Basalt	Q	Jgs	37
9	31 NW/SE	BLM	0082	Andesite	Q	Jgv	
T33S, R6W							
10	2 NE/NE	OSHD	Prospect	Metavol.	Q	Jrv	30
11	2 SE/NE	OSHD	Stage Coach Pass	Metavol.	Q	Jrv	26.4
12	21 NE/NW	OSHD	Farmer Gulch	Metavol.	Q	Jrv	25.4
13	22 NW/NE	OSHD	Wolf Cr. Cut	Metavol.	Q	Jgv	
14	22 NE/SE	OSHD	Coyote Cr.	Metased.	Q	Jgs	16.3-46.3
15	23 NW/SW	OSHD	Coyote Cr. Bar	Gravel	GP	Qal	35
16	24 SE 1/4		Coyote Cr.	Gravel	GP	Qal	
17	29 SE/NE	BLM		Metavol.	Q	Jgv	18
T33S, R7W							
18	31 SW/SE	OSHD	Groebli	Metased.	Q	Jgs	23.8
19	35 SE 1/4	BLM		Metavol.	Q	Jgv	
20	36 NW/SE	Josephine Co.	Josephine Co.	Metavol.	Q	Jgv	16.96
T33S, R8W							
21	3 NW/SE	BLM	0044	Sandstone	Q	Jds	28.1
22	11 NW/NE	BLM	0043	Sandstone	Q	Jds	29
23	11 NE/SE	BLM	0042	Metavol.	Q	Jrv	20.9
24	13 SE/NW	BLM	0041	Metavol.	Q	Jrv	17.2
25	13 SW 1/4	BLM	0005	Metavol.	Q	Jrv	14,21
26	23 NE/NE	BLM	0040	Metavol.	Q	Jrv	28.1
27	23 NW/SE	BLM	0039	Metavol.	Q	Jrv	20
28	26 NE/SW	BLM	0061	Metavol.	Q	Jrv	14
29	26 SE/SW	BLM	0038	Metavol.	Q	Jrv	38.1
30	35 NW/SE	BLM	0037	Metavol.	Q	Jrv	19.0
31	36 SE/SW	BLM	0036	Metavol.	Q	Jrv	26.3
T33S, R9W							
32	29 SE/NW	BLM	0102	Sandstone	Q	Jds	27
33	32 SW 1/4	BLM	0066	Sandstone	Q	Jds	22
34	33 SW/NW	BLM	0071	Sandstone	Q	Jds	36
35	33 SW/NE	BLM	0065	Sandstone	Q	Jds	17
36	34 SE/NW	BLM	0035	Chert	Q	Jds	25
T34S, R5W							
37	1 SE/NW	BLM		Metased.	Q	TRas	36
38	2 NE/SW	R. Dollar Co.	0025	Metavol.	Q	TRav	16
39	5 NW/SE	Private	0024	Gravel	GP	Qal	
40	8 NW/NW	OSHD	Tom East Cr.	Gravel	GP	Qal	31.8
41	9 NW 1/4	Roy Killian	0090	Gravel	CP	Qal	
T34S, R6W							
42	S. Sec. line 4-5			Shale	Q	Jgs	
43	5 NW/SE		Flume Gulch	Shale	Q	Jgs	
44	5W. Center			Gravel	GP	Qal	

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
	NP	21-24	2.71-2.85	Variable	Medium	
			2.87	Good	Large	Dredge tailings (contains large percentage boulders) requires crushing
				Fair	Small	Talus containing much mudstone; use for embankments and base rock
				Poor	Small	Base Rock
	NP	0	2.89		Small	Embankment
						Pit Run Rock
				Fair	Small	
			2.78	Poor	Small	Pit Run
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			3.04	Poor	Small	Rip Rap
	NP	20	2.86	Fair		Surfacing
			2.89	Fair	Large	Oil Rock
	NP	14-16	2.86-2.96	Variable	Medium	
	9	27	2.85	Poor	Small	Subbase
				Good	Large	Gold placer tailings
				Good	Medium	
---	---	---	---	---	---	---
18			2.60	Fair	Medium	Rip Rap
3.5	NP	20	2.87	Good	Medium	
---	---	---	---	---	---	---
	5	29	2.67	Fair		Metasandstone
	7	33	2.64	Fair		Subbase
	7	31	2.73	Fair		
			2.84			
4	NP	0	2.97	Good	Large	Oil & Topping
	3	3	2.75	Fair		
	6	29	2.85	Fair	Medium	
3	NP	0	2.89	Good	Large	Oil Rock
	7	33	2.79	Poor		Weathered in part, Subbase
	2	27	2.86	Fair		
	3	28	2.75	Fair		
---	---	---	---	---	---	---
	NP	0		Fair		
2	NP	0		Fair		Crushed Rock
	10	37		Poor		Pit Run, Embankment
	NP	0		Good		Pit Run
5	NP	0		Fair		Crushed Rock
---	---	---	---	---	---	---
				Poor		Pit Run
	NP	0	2.88	Good		Crushed Rock
				Good	Large	Placer tailings; abundant boulders; requires crushing
20.2			2.88	Poor		
						Silt & boulders
---	---	---	---	---	---	---
						Location approximate
						Placer tailings

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T34S, R6W Cont'd.							
45	6 NE/NW	Josephine Co.		Shale	Q	Jgs	32
46	9 N1/2/NE	C.G. Guth	Leland Placer	Gravel	GP	Qal	10-24.5
47	9 NE cor.	OSHD	Leland Placer	Gravel	GP	Qal	
48	11 SW/NE	OSHD, & Pvt.	Houle Bar	Gravel	GP	Qal	20
49	11 SW/NE	Tracy	Moorehead Bar	Gravel	GP	Qal	15.4-24.5
50	11 SE/NE	OSHD	Sunny Valley Bar	Gravel	GP	Qal	
51	11 NE/NW	OSHD	Grave Cr. Bar	Gravel	GP	Qal	14.5-21.8
52	12 SE/SE	OSHD	Moser Cr. Bar	Gravel	GP	Qal	10, 12.7
53	21 SW/NE	BLM		Metavol.	Q	Jgv	48
54	23 NE/SW	T. L. Garcia	Garcia Prospect	Metased.	Q	Jgs	14.5
55	23 NE/SW	OSHD	Sexton Mt. Roadcut	Metavol.	Q	Jgv	24.0-31.8
56	35 SW/SE			Gravel	GP	Qal	
T34S, R7W							
57	2 SW 1/4	BLM		Metavol.	Q	Jrv	
58	3 SW/NE			Gravel	GP	Qal	
59	8 SE 1/4			Metased.	Q	Jgs	
60	9 NW/SE	BLM		Metased.	Q	Jgs	21
61	11 NE/NE	BLM	0075	Metavol.	Q	Jrv	18
62	11 NE/SW	BLM	0077	Metabasalt	Q	Jrv	23
63	15 NE/NE	BLM		Metavol.	Q	Jrv	25
64	15 SW/NW	BLM	0086	Greenstone	Q	Jrv	26
65	22 SW/NW	Josephine Co.	0087	Metavol.	Q	Jrv	16
66	23 NE 1/4	BLM	0063	Metavol.	Q	Jrv	16
67	25 NE/SE	BLM		Metased.	Q	Jgs	33
68	25 SW/SE			Metased.	Q	Jgs	43
69	27 NE/NW	BLM	0085	Metavol.	Q	Jrv	22
70	33 SW/NW	BLM	0079	Metavol.	Q	Jrv	16
71	33 NW/SW	BLM	0081	Metavol.	Q	Jrv	15, 17
T34S, R8W							
72	28 NW/NE	BLM	0022	Metamorp.	Q	Jrg	27
T34S R9W							
73	6 SW/NE	BLM	0080	Sandstone	Q	Jds	31
74	6 NE/SW		0006	Sandstone	Q	Jds	18
75	6 NW 1/4	BLM	0093	Sandstone	Q	Jds	18-23
76	7 NE/NE		0068	Sandstone	Q	Jds	21
77	7 NE/SW		0067	Sandstone	Q	Jds	20
78	8 SE/SW	BLM	0032	Sandstone	Q	Jds	21.8
79	8 NW/SE	BLM	0072	Sandstone	Q	Jds	24
80	9 NW/NE	BLM	0033	Sandstone	Q	Jds	20
81	10 NE/NW	BLM	0034	Sandstone-Chert		Jds	
82	15 NW/SW	BLM	0031	Sandstone	Q	Jds	
83	15 SW/SW	BLM	0030	Sandstone	Q	Jds	
84	17 SE/NW	BLM	0070	Sandstone	Q	Jds	25
85	17 SW 1/4	BLM	0074	Chert	Q	Jds	
86	17 SW/NE		0069	Sandstone	Q	Jds	20
87	18 Center		0076	Chert	Q	Jds	15
88	21 SW/NE	BLM	0029	Sandstone	Q	Jds	19
89	22 NE/SW		0073	Sandstone	Q	Jds	21
90	27 SW/NE	BLM	0028	Sandstone	Q	Jds	21.8
91	33		Buck Creek	Sandstone	Q	Jds	37.7
92	34 NE1/2/SE	BLM	Hobson Horn	Sandstone	Q	Jds	23
93	35 SW 1/4		0021	Sandstone	Q	Jds	19
T34S, R10W							
94	12 SE/NW	BLM	Hummingbird	Sandstone-Chert	Q	Jds	
95	25		Lazy Creek	Sandstone	Q	Jds	17.6

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
				Poor		Base Rock
.2-1.4	NP	21	2.91-3.01	Good	Large	Oil Rock
				Good	Large	Placer tailings; large boulders require crushing
	NP	16-20	2.90-2.97	Good	Medium	BPR Source # 0089
2.8	NP	18-22	2.78-2.97	Good	Large	BPR Source # 0088
	2	20			Small	Surfacing
.2-2.1	NP	20	2.82-2.94	Good	Small	Surfacing
	NP	17	2.94	Good	Small	Oil Rock
	NP	O		Poor		Embankment only
.5	NP	22	2.84	Good	Large	
5,28.5	NP		2.86-2.89	Poor	Large	Select embankment
						Location approximate
						Location approximate
						Placer tailings; location approximate
						Location approximate
				Fair		Pit Run
	NP	O		Good		
	2	30	2.77	Fair		Surfacing
	7	31		Poor		Subbase
	NP	O	2.87	Poor		
				Poor		
	NP	O				Surfacing
	NP	O		Poor		Pit Run
	NP	O		Poor	Small	Pit Run
	NP	O			Large	
	11	40		Fair		Subbase
4	NP	60	2.92	Poor	Small	Surfacing
	NP	O		Poor	Large	Subbase
	NP	31		Poor		Subbase
	NP	O		Fair		
	NP	O	2.71, 2.75	Fair		Crushed Rock
4	NP	O		Fair		Crushed Rock
4	NP	O		Fair		Crushed Rock
	NP	45	2.64	Poor		Requires washing
4	NP	O		Fair		Crushed Rock
	NP	31	2.74	Fair		Crushed Rock
7	NP	O		Fair		Crushed Rock
						Underlain by serpentine & shale
4	NP	O		Poor		Crushed Rock
	NP	O	2.74			
			2.69		Medium	Massive Jointing
6	NP	O				Crushed Rock
			2.69			
	NP		2.49		Small	Loc. by section only
7	NP	O	2.73	Fair	Large	Upper part highly weathered with clay seams; BPR Source #0013
5	NP	O	2.78	Poor	Small	Crushed Rock, location approximate
				Good	Large	BPR Source #0096
	NP					Loc. by section only

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T35S, R5W							
96	1 SW/SW	BLM	0104	Granite	Q	gd	48
97	7 NW/SE			Rock	Q	TRav	
98	18 SW/SW	BLM	Walker Mt. prosp.	Gravel	GP	Qal	9.1
99	19 NW/SW	BLM	Soldier Cr. prosp.	Metavol.	Q	TRav	12.7
100	25 NW/SW	BLM		Metavol.	Q	TRav	16
101	27 SE/NW	Bate Lumber	0059	Gravel	GP	Qal	14
102	29 SW/SW	BLM	Louse Cr. prosp.	Metasandstone	Q	Ca	18.1
103	36 NW/NE	Bate Lumber	0058	Metavol.	Q	TRav	22
104	36 SW/NW	Josephine Co.	0099	Metavol.	Q	TRav	
T35S, R6W							
105	2 SE/SW	OSHD	Prospect	Gravel	GP	Qal	20
106	3 SW 1/4			Granite	Q	gd	
107	5 NW/SE			Granite	Q	gd	
108	10 SW cor.	Busted Rock Co.	Jump Off Joe Cr. #5	Gravel	GP	Qal	
109	10 NE/SW	Eugene Potts	Potts Bar	Gravel	GP	Qal	17.2-22.7
110	10 E. center	Josephine Co.	Jump Off Joe Cr. #2	Gravel	GP	Qal	
111	13 S. center	OSHD	Chancellor Q.	Perid.-Serp.	Q	sp	20.9-31
112	14 NW 1/4			Granite	Q	gd	
113	14 SE 1/4			Granite	Q	gd	
114	16 NE/NE	OSHD	Russell Rd. Bar	Gravel	GP	Qal	11.7-20
115	16 SW/SW	H. Janis	Janis Bar	Gravel	GP	Qal	15.7
116	19 NE 1/4	Josephine Co.	Jump Off Joe Cr. #3	Gravel	GP	Qal	
117	20 N. center	J. Barker	Jump Off Joe Cr. #1	Gravel	GP	Qal	
118	27 NE center		Louse Creek	Gravel	GP	Qal	
119	25 NW/SW	OSHD	Sylvia Lake prosp.	Gravel	GP	Qal	17.2, 18.1
120	33 NE/SW			Granite	Q	gd	
121	36 SE/SE	Private	Smith "Pit"	Granite	Q	gd	
T35S, R7W							
122	6 NE/SE	Private	0023	Gravel	GP	Qal	
123	11 NW/NE	BLM	Hog Creek	Gravel	GP	Qal	44
124	13 S. center			Shale	Q	Jgs	
125	14 W. center	Trenor Scott		Shale	Q	Jgs	
126	15 NE/SE	Trenor Scott		Shale	Q	Jgs	
127	23 SE/NW			Shale	Q	Jgs	
128	26 E1/2/SE	OSHD	Robertson Bridge Bar	Gravel	GP	Qal	18.2, 16.24
129	27 SW/NE	BLM	0098	Shale		Jgs	29
130	29 NE/NE/SE		Prospect	Serpentine	Q	sp	19
131	29 SW/SE		Prospect	Metavol.	Q	Jgv	13
132	33 NW/SE	Josephine Co.	Picket Creek	Slaty Shale	Q	Jgs	25
T35S, R8W							
133	1 NW 1/4	Frank Sanford	0003	Gravel	GP	Qal	22
134	5 NW 1/4	BLM	0004	Gabbro	Q	gb	33
135	34		Minnow Cr.	Metavol.	Q	Jgv	149
T35S, R9W							
136	1 SE/NW	BLM	0026	Quartz diorite	Q	qd	33.6
137	2 NW/NW	BLM	0027	Quartz diorite	Q	qd	15.1
138	14 NW/SW		0094	Quartz diorite	Q	qd	24
139	14 SW/NW		0095	Quartz diorite	Q	qd	23
140	15 SE 1/4	BLM	0097	Quartz diorite	Q	qd	47
T36S, R5W							
141	7 SW/NW	Axtell		Granite	Q	qd	
142	7 E1/2/NW			Granite	Q	qd	
143	9 NE/NE	OSHD	Jones Cr. prosp.	Metavol.	Q	TRav	10.9
144	14 NE/SE	BLM	Bloody Run Cr. pros.	Metavol.	Q	TRav	11.8
145	15 SW/SE	Private	Weston Bar	Gravel	GP	Qal	17.2
146	22 NE/NE	Josephine Co.	Pearce Bar	Gravel	GP	Qal	16.2-36.3

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
				Poor	Small	Pit Run, Embankment
						Location approximate
.4	NP	21	2.92	Good		Oil Rock
.6	NP	22	2.92	Good		Undeveloped site
					Small	Pit Run
				Good	Small	Crushed gravel
1.0	NP	26	2.74	Good	Large	Oil Rock, metasandstone
				Fair	Small	Crushed Rock
	NP	22	2.86	Fair	Small	Oil Rock
						Location approximate
						Location approximate
.7, 11.6	NP-12	19-29	2.80-2.95	Good	Large	Oil Rock
					Small	
.6-5.9	2, 7	23,29	2.62-2.84	Fair	Large	
					Large	
1.1,2.3	NP-7	21-36	2.85,2.94	Good	Large	Oil Rock; may require washing
.6	NP	22	2.99	Good	Large	Oil Rock
				Good	Small	
					Small	
					Small	
.9, 2.5	NP	22,24	2.94,2.95	Good		Oil Rock, overburden 4' average
						Location approximate
6, 8	NP	28,30	2.67,2.68		Large	
	5	31		Poor	Small	
				Poor	Small	Pit Run, subbase only
					Small	
					Small	
1.9	NP	21	2.80,2.86	Good	Medium	Oil Rock
	NP	O		Fair	Small	
	4	29				
	NP	O				
	NP	O		Fair	Small	
	NP	O	2.94	Fair		Contains boulders 16" maximum
	NP	O	3.03	Poor		Highly fractured
					Small	Loc. by section only
	NP	31	2.67	Poor	Large	
	NP	41	2.84	Good	Medium	
	NP	O		Fair	Medium	
	NP	O		Fair	Medium	
	NP	O		Poor	Medium	Embankment
					Large	Disintegrated granite, select fill
					Large	Disintegrated granite, select fill
.9	NP	20	2.89	Good		
	NP	22	2.89	Good	Large	
3.1	NP	22	2.73	Good	Medium	Oil Rock
	NP,2	20-29	2.82-2.93	Variable	Small	Oil Rock

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM.	ABRASION
T36S, R5W Cont'd.							
147	22 SE/NW	Private	Pruitt Bar	Gravel	GP	Qal	21.8
148	26 SE/NW	Private	Green Cr.	Metavol.	Q	TRav	10
149	26 SW 1/4	K. Jackson	B & J Construction	Metavol.	Q	TRav	
150	30 NE/SE	Harbeck		Granite	Q	qd	
T36S, R6W							
151	4 NW 1/4			Granite	Q	qd	
152	7 SW/SW	OSHD	Schmidt Quarry	Granite	Q	qd	
153	8 SW 1/4	Private		Granite	Q	qd	
154	13 SE/NE	Josephine Co.		Granite	Q	qd	
155	13 SW 1/4	Private		Gravel	GP	Qal	
156	14 NW/SW	Brumbach		Gravel	GP	Qal	
157	14 SW/SE	Josephine Co.	Schroeder Bar	Gravel	GP	Qal	19
158	18 SW 1/4	Kelly Const.		Gravel	GP	Qal	
159	19 N 1/2/NE	Copeland S & G	Christie Bar	Gravel	GP	Qal	13.6-18.2
160	20 NE/NW	Gilbert	Spencer Bar	Gravel	GP	Qal	18.46-19.24
161	20 NW/SW	Copeland S & G	Junction Bar	Gravel	GP	Qal	22.7
162	24 SE/NE		Disposal Plant Bar	Gravel	GP	Qal	14.2, 17.5
163	27 SE/NW	BLM	0002	Granite	Q	qd	
164	29 NW/NW	OSHD	Hofman Bar	Gravel	GP	Qal	14.5-21.8
165	30 SE/NE	Gilbert	0105	Gravel	GP	Qal	17
166	30 SW/SE	OSHD	Woody Bar	Gravel	GP	Qal	18.1
167	30 SE 1/4	Gilbert		Gravel	GP	Qal	
168	31 E 1/2/SW	OSHD	Slate Creek Bar	Gravel	GP	Qal	14.4-19
169	34 NE/SW			Granite	Q	qd	
T36S, R7W							
170	11 NW 1/4	Portola Lumber	Prospect	Shale	Q	Jgs	
171	14 NE/NE			Shale	Q	Jgs	
172	17		Shan Creek	Metavol.	Q	Jgv	17.6
173	19		Cross Spur #2	Metavol.	Q	Jgv	11.6
174	20		Limpy Creek	Serp.	Q	sp	44.1
175	29		Cross Spur #1	Serp.	Q	sp	31.2
T36S, R8W							
176	6		Taylor Camp	Gneiss	Q	Jrg	27.4
177	7		Barr Mine	Gneiss	Q	Jgs	21.9
178	14		Headwaters	Metavol.	Q	Jgv	27.9
179	16		Red Dog	Metavol.	Q	Jgv	17
180	20			Metavol.	Q	Jgv	20
181	22		Secret Ridge #1	Metavol.	Q	Jgv	15.4
182	28		Secret Ridge #2	Metavol.	Q	Jgv	21.8
183	28		Onion Ridge	Metavol.	Q	Jgv	23.2
T36S, R9W							
184	20		Flat Top	Gabbro	Q	gb	20
185	21		Red Dog	Gabbro	Q	gb	17
T37S, R5W							
186	19 NW 1/4	Josephine Co.		Metavol.	Q	TRav	
187	19 NW 1/4	Josephine Co.	Onion Creek	Metavol.	Q	TRav	
188	19 N 1/2	Private		Gravel	GP	Qal	
189	19 NW/NW	Josephine Co.		Gravel	GP	Qal	
190	20 NW/NE	OSHD	Powell Bar	Gravel	GP	Qal	17.2-20.9
191	21 SE/NW	Copeland S & G		Gravel	GP	Qal	
192	21 NW/SE 1/4	J. H. Davidson		Gravel	GP	Qal	
193	25 SE/NE			Diorite	Q	di	
194	28 NW/SE			Diorite	Q	di	
195	33 SE/SE			Metavol.	Q	TRav	
196	34 NE 1/4	K. Hyde		Gravel	GP	Qal	

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
5	NP-5	21-26	2.84	Good	Large	Oil Rock
	NP	19	2.89	Good	Large	Oil Rock
					Small	Abandoned - nearby houses
					Large	Disintegrated granite, roadside quarry
					Small	
					Large	Disintegrated granite
.8, 5	NP	22	2.78	Good	Medium	Oil Rock
					Small	Select fill
.5, 2.0	NP	17,18	2.78-2.93	Good	Medium	Commercial source
				Good	Large	Commercial source
.3, 2.4	NP	21	2.84,2.88	Good	Large	Commercial source
	NP	20,23	2.71,2.79	Good	Medium	Abandoned
					Small	Roadside quarry
.2, .7	NP	19-23	2.84-2.94	Good	Large	Oil Rock
	NP	O	2.89	Good		Oil Rock
	NP	19,20	2.91	Good	Medium	Oil Rock
				Good		
.3	NP	21	2.88-2.91	Good	Large	Oil Rock
					Small	Abandoned
						Undeveloped
	1	2.68		Good	Small	Loc. by section only
	NP			Good		Loc. by section only
	1	2.65		Poor		Loc. by section only, subbase only
	NP	2.53		Fair	Small	Loc. by section only
					Small	Loc. by section only
	3	2.97			Medium	Loc. by section only
	6	2.57		Fair	Small	Loc. by section only
	NP			Good	Medium	Loc. by section only
				Good	Small	Loc. by section only
	NP	2.86		Good		Loc. by section only
	NP	2.62		Good		Loc. by section only
	NP			Fair	Small	Loc. by section only
	NP			Good	Medium	Loc. by section only
	NP	2.77		Good		Loc. by section only
.2	NP	19-22	2.78-2.92	Good	Large	Oil Rock
						Commercial source
						Commercial source
						Commercial source

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T37S, R5W Cont'd.							
197	35 SW/NE	Woodcock & Yock	Redsull Bar	Gravel	GP	Qal	18.1, 20
198	35 NW/SW	L. Woodcock		Metavol.	Q	TRav	
199	35 SW/SW	L. Woodcock		Metavol.	Q	TRav	
T37S, R6W							
200	6 SE/SE	OSHD	Bungarner Bar	Gravel	GP	Qal	16.3
201	8 W 1/2NE	Private	Rogers Bar	Gravel	GP	Qal	18.1
202	9 NW 1/4		Bolt Mt.	Quartz diorite	Q	qd	
203	18 SE/NW	Josephine Co.	Cheney Rd.	Metased.	Q	Jgs	
204	19 SW 1/4	Ideal Cement Co.	Marble Mtn.	Limestone	Q	TRas	
205	24 NE 1/4	Josephine Co.		Metavol.	Q	TRav	
206	24 NW 1/4			Gravel	GP	Qal	
T37S, R7W							
207	10 NW/SE	OSHD	Lowden	Metased.	Q	Jgs	13.6, 16.3
208	18 NW/SE	OSHD	Neale Gravel Prosp.	Gravel	GP	Qal	18.1, 20.0
T37S, R8W							
209	19		Spaulding Mill	Metavol.	Q	Jrv	11.6
T37S, R9W							
210	1		The Swede	Metavol.	Q	Jrv	12.9
211	23		Sixmile #2	Metavol.	Q	Jrv	20.5
212	24		Sixmile #1	Metavol.	Q	Jrv	15.6
T38S, R5W							
213	1 SW/SE	Private	Stone Bar	Gravel	GP	Qal	17.2
214	2 SE/SE	Private	Water Gap Prosp.	Granite	Q	qd	
215	11 NW/SW	Frank Duncan	0062	Gravel	GP	Qal	
216	12 NW/NE	Caswell	Gold Hill #1	Gravel	GP	Qal	
217	13 SE/NW	OSHD	Thomas Quarry	Granite	Q	di	
218	15 SW 1/4	Private	Horsehead	Marble	Q	TRas	
219	16 SW/NE	Private	0045	Metavol.	Q	TRav	18.1
220	17 SE/NW	Private	0046	Metavol.	Q	TRav	17.2
221	23 NW/NE			Gravel	GP	Qal	
222	26 SW/NE	BLM	0014	Gravel	GP	Qal	16
223	26 E1/2SW1/4	OSHD	Williams Cr. Bar	Gravel	GP	Qal	16.3-33.2
224	34 NE/SE			Gravel	GP	Qal	
T38S, R6W							
225	17 SW1/4, 18SE	BLM & E. Hanson	0010	Gravel	GP	Qal	16
226	18 NE/SW	G. Lindeen	0019	Gravel	GP	Qal	15
227	20 NE/SE	Bates Lumber Co.	0007	Gravel	GP	Qal	18
228	25 NW/SW	BLM	Silver Tip Saddle	Gr. gneiss	Q	TRav	26
229	26 SE/NE	BLM	0078	Basalt	Q	TRav	11-17
T38S, R7W							
230	1 SE 1/4	BLM	0064	Basalt	Q	TRav	27
231	9 SW/SE		Crooks Creek	Gravel	GP	Qal	
232	13 SE 1/4	R. L. Ffost	0009	Gravel	GP	Qal	18
233	16 NW/NW	BLM	Selma #4	Gravel	GP	Qal	
234	35 SW/NE	BLM	0051	Gravel	GP	Qal	
T38S, R8W							
235	10 SE/SW	W. Thayer		Gravel	GP	Qal	
236	10 S 1/2/SE	OSHD	Deer Cr. Bar	Gravel	GP	Qal	20.2-25.4
237	11 NE/SE	OSHD		Gravel	GP	Qal	24.5
238	19 NW 1/4		Placer tailings	Gravel	GP	Qal	
239	24 NW/NE	Josephine Co.	Selma #3	Metased.	Q	Jgs	

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
	NP	25	2.84, 2.86	Good	Medium	Commercial source Abandoned
.4	NP	21	2.89	Good	Large	Oil Rock
.5	NP	21	2.84	Good	Large	Oil Rock
					Large	
					Large	Cement manufacture - shut down
.7			2.69, 2.79	Good	Large	Oil Rock
2.0	6-14	31-38	2.74-2.89	Fair	Small	Requires washing
				Good	Medium	Loc. by section only
	NP		2.77	Good	Small	Loc. by section only
	NP		2.57	Good		Loc. by section only
	NP		2.65	Good		Loc. by section only
	NP	21	2.93	Good		
	NP	O				
					Large	Rip Rap
	2	38	2.88		Medium	Requires washing
	6	45	2.89			Requires washing
	NP	O		Good	Small	
	NP	22	2.86-2.99	Variable	Small	Base Rock
	NP	O	2.91	Good	Large	Oil Rock
	NP	O	2.86	Good	Large	Oil Rock
	NP	O		Good	Medium	Oil Rock
	NP	O		Fair	Large	Surfacing; BPR source #0020
8, 9.0	4	O-36		Good	Small	Requires washing
	NP	O		Poor		Weathered; Pit run
5	NP	O	2.87	Good	Small	
1.7	NP-2	21, 24	2.82, 2.88			BPR source #0018, Abandoned
3.4	2	26	2.82	Fair	Small	Oil Rock

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T38S, R8W Cont'd.							
240	24 NW/SW			Metased.	Q	Jgs	
241	26 SW/NE		Reeves Creek	Shale	Q	Jgs	
242	28 NW/SW	BLM		Peridotite	Q	pd	15.1
243	28 SE/SW	OSHD	Sauers Flat	Gravel	GP	Qal	16.3
T38S, R9W							
244	36 NW/SW			Gravel	GP	Qal	
T39S, R5W							
245	13 SW/SE		0012	Metavol.	Q	TRav	26-35
246	14 SE 1/4	BLM	0055	Metavol.	Q	TRav	18
247	14 SE/SE	BLM	0103	Metavol.	Q	TRav	24
248	21 NW/SE	BLM	0001	Gabbro	Q	gb	
249	30 SE/SW	BLM	0049	Quartz diorite	Q	qd	21
250	31 NW/SE			Quartz diorite	Q	qd	27
T39S, R6W							
251	2 NW/NW	Josephine Co.	0056	Metased.	Q	TRav	32
252	3 SW/NW1/4	BLM	Cedar Flat	Metavol.	Q	TRav	
253	12 NE/SW	BLM		Metavol.	Q	TRav	28
254	13 center	BLM		Metavol.	Q	TRav	30
255	18		Little Grayback #1	Metavol.	Q	TRav	28.4
256	23 center	BLM	0011	Metavol.	Q	TRav	18
257	29 SW/NE	U. S. Forest Service	White Rock	Quartzite	Q	TRas	21.7
T39S, R7W							
258	3	BLM	0050	Metavol.	Q	TRav	
259	13		Little Grayback #2	Metavol.	Q	TRav	16.7
260	28 E1/2/NW	OSHD	Steingart Bar	Gravel	GP	Qal	18.1
261	29 SW/SE	OSHD	Loesch Bar	Gravel	GP	Qal	17.2, 20
262	35 NE/SW	R. K. Plumly	0052	Metavol.	Q	TRav	31
T39S, R8W							
263	4 SW 1/4	Josephine Co.		Gravel	GP	Qal	
264	9 NW/NW	OSHD	Kerby Bar	Gravel	GP	Qal	14.6-23.6
265	9 NW 1/4	Cabax Mills		Gravel	GP	Qal	
266	21 SE/NE	Steve's Readimix		Gravel	GP	Qal	
267	21 N 1/2 SW	OSHD	Cave Junction Bar	Gravel	GP	Qal	13.6-20.9
268	26 SW/SW	Clyde's Readimix		Gravel	GP	Qal	
269	27 NW/NW	OSHD		Metavol.	Q	TRav	20.9
270	27 SE/NW	M. Barlow		Gravel	GP	Qal	
271	30 SW/NE			Peridotite	Q	pd	
272	32 SW/NE	L. G. Ketchum		Gravel	GP	Qal	
273	32 center			Gravel	GP	Qal	
274	35 NE/SE	OSHD	Sucker Cr. Bar	Gravel	GP	Qal	20.9
T40S, R5W							
275	12 SE/NE		Thompson "Pit"	Metavol.	Q	TRav	
276	13 NW/NE		Carberry "Pit"	Granitic	Q	TRav	
277	15 SW/SW		Lewis Creek #1	Slate	Q	Ca	
278	21 NW/NW		Pine Gulch	Granitic	Q	qd	
T40S, R6W							
279	7 NE/SE		Yeager "Pit"	Metavol.	Q	TRav	36.9
280	29 NE 1/4		Sucker Creek	Gravel	GP	Qal	28.6
281	35		Swan Mountain	Metavol.	Q	TRav	23.8

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
.3			3.16	Good	Large	Oil Rock
.5	NP	26	2.85	Fair	Large	Oil Rock
						Placer
	NP	O	2.74	Variable	Large	Base Rock - embankment
14	NP	O	2.83	Fair		
						Highly fractured; excess overburdened
9	NP	O	2.75	Fair	Medium	Surfacing
	NP	O		Fair		Loc. by section only
				Poor	Small	Pit Run, embankment
						BPR source #0008
	NP	36	2.75	Poor	Small	Loc. by section only
	NP	O	2.74	Poor	Small	
	3		2.66	Fair	Small	Loc. by section only
	NP	38		Poor	Small	Pit Run
	3-4		2.64	Good	Medium	Rip Rap
						Location approximate
	NP		2.89	Good	Small	Loc. by section only
	NP	20	2.89	Good	Small	Oil Rock
1, 3.0	NP, 4	21,24	2.85,2.86	Good	Large	Class A concrete; oil rock
	9	35		Poor	Small	Embankment
1.1-1.5	NP	20-25	2.79-2.86	Variable	Medium	Oil Rock
						Commercial source
	NP-2	18-22		Good	Small	Oil Rock
						Commercial source
			2.61	Good	Small	
						Commercial source
					Large	
2.1,2.4	NP	21	2.79,2.85	Good	Medium	Class A concrete; oil rock
					Small	Base Rock
					Small	
					Small	
					Small	
				Poor	Medium	Loc. by section only, subbase only
	NP		2.87	Fair		Loc. by section only
	NP		2.60	Fair		Loc. by section only

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF MATERIAL	PIT OR QUARRY	FM	ABRASION
T40S, R7W							
282	10 NW 1/4		0048	Metavol.	Q	TRav	
283	10 NW 1/4	BLM	0053	Limestone	Q	TRas	30
284	14		W. Fork Althouse	Metavol.	Q	TRav	16.6
285	21		Deadman	Metavol.	Q	TRav	15.3
286	23		Eight Gulch	Metavol.	Q	TRav	21.6
287	26 SW 1/4	Josephine Co.	0057	Basalt	Q	TRav	23.6
288	29		Ridge Line	Metavol.	Q	TRav	19.1
289	35		French Peak	Metavol.	Q	TRav	14.7
T40S, R8W							
290	5 SW/NE	OSHD	West Fork Bridge	Gravel	GP	Qal	24.5-30
291	5 SE/SE	OSHD	Patton Bar	Gravel	GP	Qal	18.1-29
292	8 SE/NW			Gravel	GP	Qal	
293	9 SW/NW	BLM	Logan Cut Bar	Gravel	GP	Qal	
294	18 NE 1/4	Johnson & OSHD	Rough & Ready Cr. Bar	Gravel	GP	Qal	
295	19 SW/SE	O'Brien		Gravel	GP	Qal	
296	20 NW/NW	BLM	Indian Hill Prosp.	Sandstone	Q	Km	20
297	26 SW/NW	Valley Readimix		Gravel	GP	Qal	
298	27 SE/NE	Josephine Co.		Metavol.	Q	TRav	
T40S, R9W							
299	25 NE/NW	OSHD	O'Brien Bar	Gravel		Qal	23.1
T41S, R5W							
300	3 center SE 1/4		Low Gap	Metavol.	Q	TRav	
301	5 SW/NE		Steves Fork	Granite/slate	Q	TRas	
302	5 NW 1/4		Rock Spine	Metavol.	Q	TRav	
303	5 NE/SW		Rock Spine #1	Metavol.	Q	TRav	
304	6 NE/SE		Rock Spine #3	Quartzite	Q	TRas	
305	12 NW/NE		Sutton Gulch	Metased.	Q	TRas	
306	15		Middle Fork	Metavol.	Q	TRav	
T41S, R7W							
307	12		Bolan "Pit"	Metavol.	Q	TRav	33.1
308	15		Steves Fork #2	Metased.	Q	TRas	18.1
T41S, R8W							
309	4		Sanger Peak	Metavol.	Q	TRav	18.8
310	15		Dunn Creek	Metavol.	Q	TRav	

Na_2SO_4 (% loss)	PI	LL	SPECIFIC GRAVITY	QUALITY	QUANTITY (cy)	REMARKS
			2.67	Poor	Small	Surfacing
	NP		2.85	Good		Loc. by section only
	3			Good		Loc. by section only
	3		2.90	Good		Loc. by section only
	NP		2.72	Fair	Small	Pit Run
	NP		2.55	Good		Loc. by section only
				Good	Small	Loc. by section only
	NP	21,22	2.73-2.84	Fair	Large	Oil Rock
	NP-3	21-25	2.68-2.80	Fair	Medium	Oil Rock
						Bench Gravel
	NP	17	2.75,2.88			BPR source #0017
						BPR source #0015
2.8			2.67	Good	Large	Rip Rap
						Commercial source
1.9,4.1	NP	25	2.76,2.85	Fair	Medium	Class A concrete
						Base Rock
					Small	Base Rock
						Base Rock
					Small	Base Rock
					Small	Base Rock
					Small	Base Rock
						Base Rock, loc. by section only
	3		2.74	Poor		Loc. by section only
	NP		2.50	Good		Loc. by section only
	7		2.75	Good		Loc. by section only
					Medium	Loc. by section only

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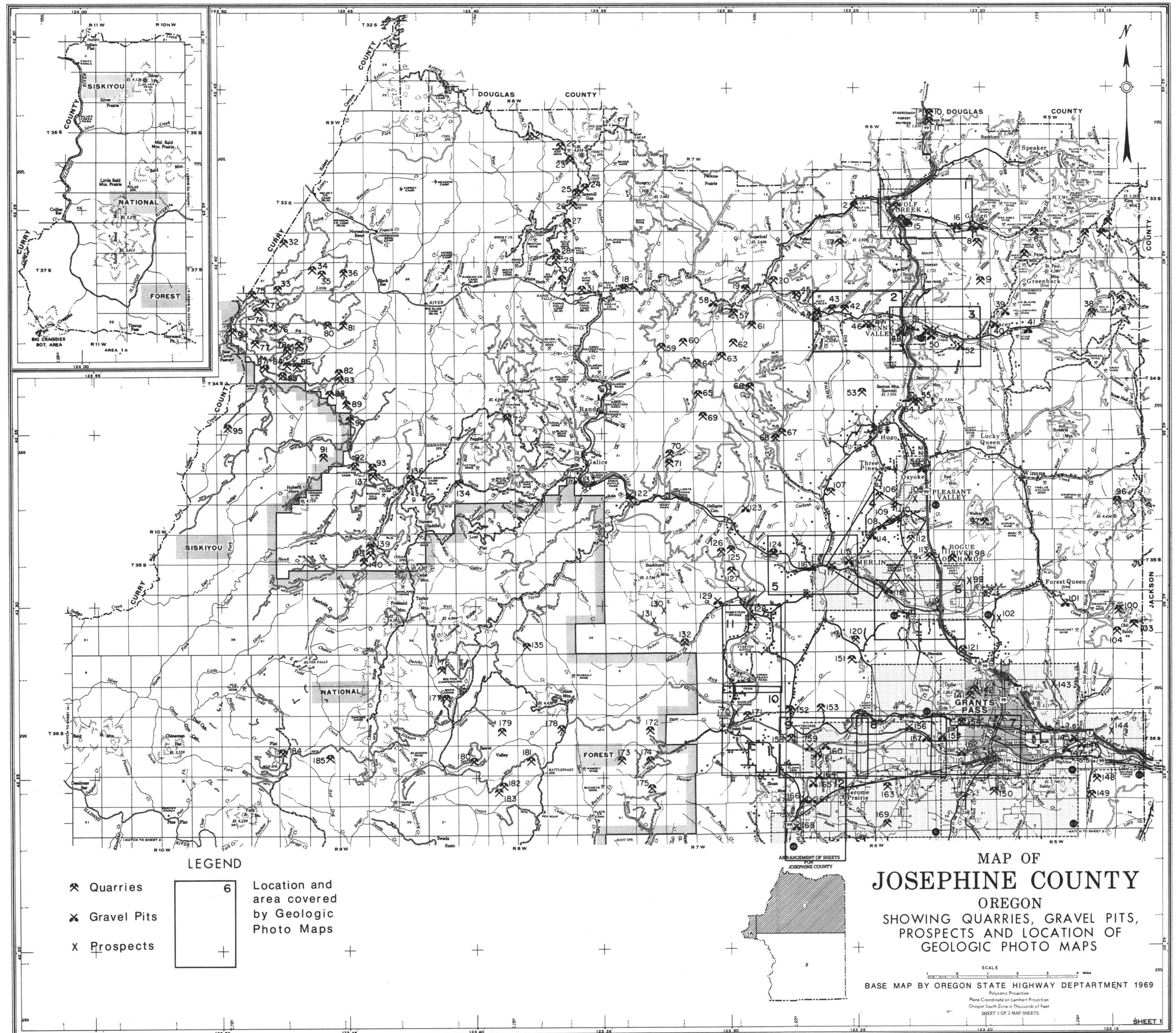
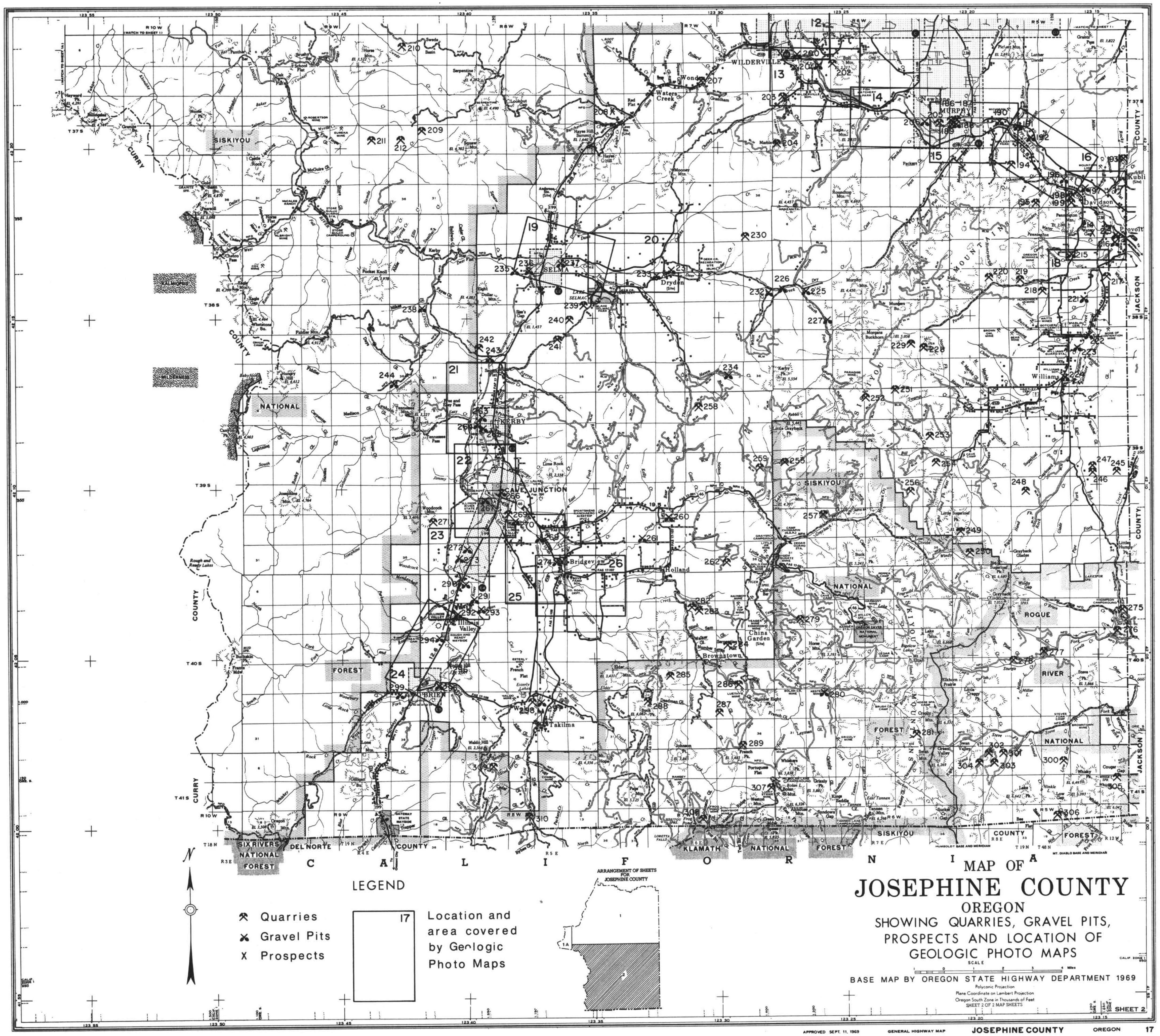
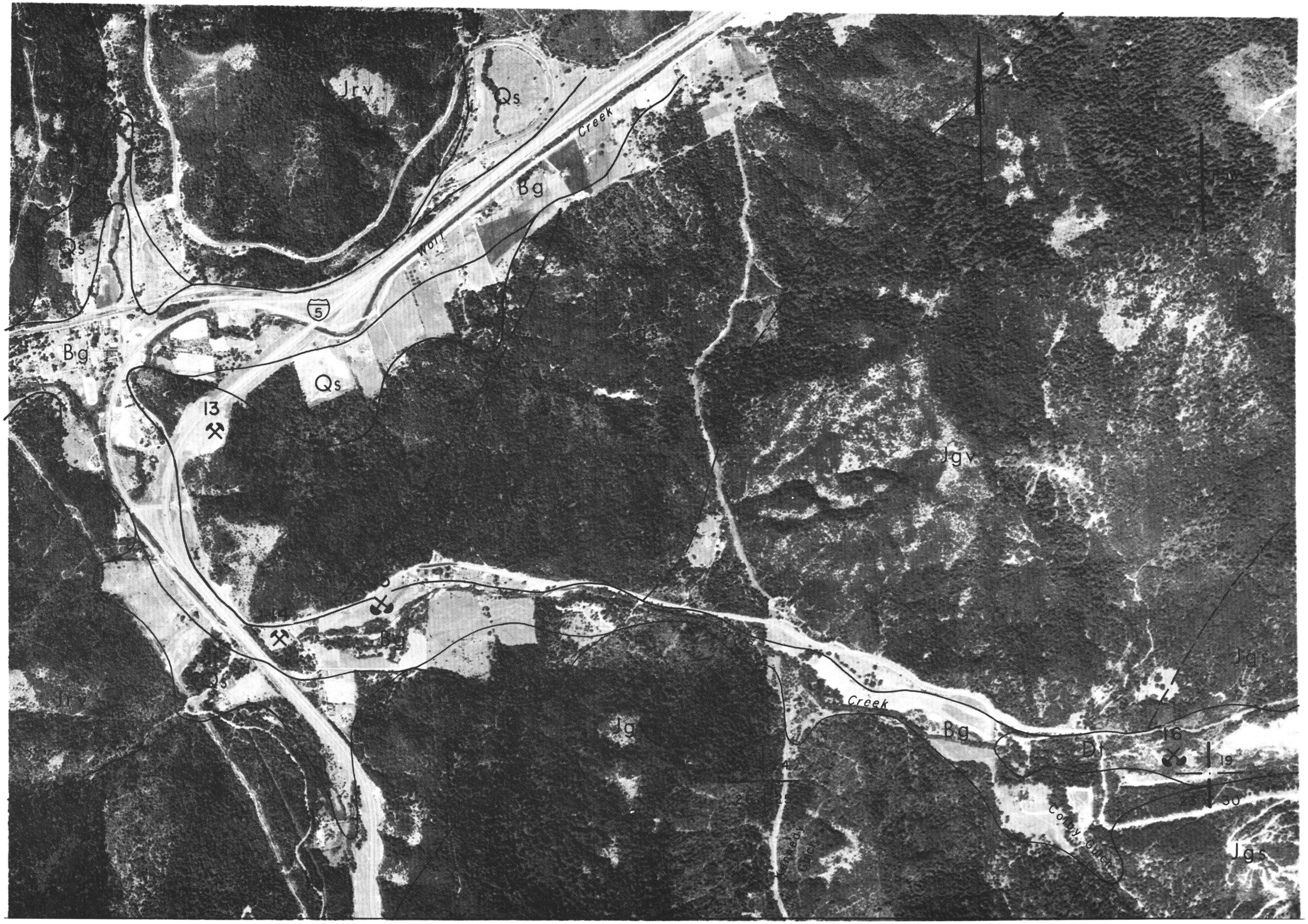


MAP OF
JOSEPHINE COUNTY
OREGON
SHOWING QUARRIES, GRAVEL PITS, PROSPECTS AND LOCATION OF GEOLOGIC PHOTO MAPS
LEGEND
Quarries
Gravel Pits
Prospects
Location and area covered by Geologic Photo Maps
BASE MAP BY OREGON STATE HIGHWAY DEPTARTMENT 1969
ARRANGEMENT OF SHEETS FOR JOSEPHINE COUNTY
SHEET 1
DOUGLAS COUNTY
CURRY COUNTY
JACKSON COUNTY
SISKIYOU
NATIONAL
FOREST
GRANTS PASS
MERLIN
WOLF CREEK
GALICE
ROGUE RIVER ORCHARDS
PLEASANT VALLEY



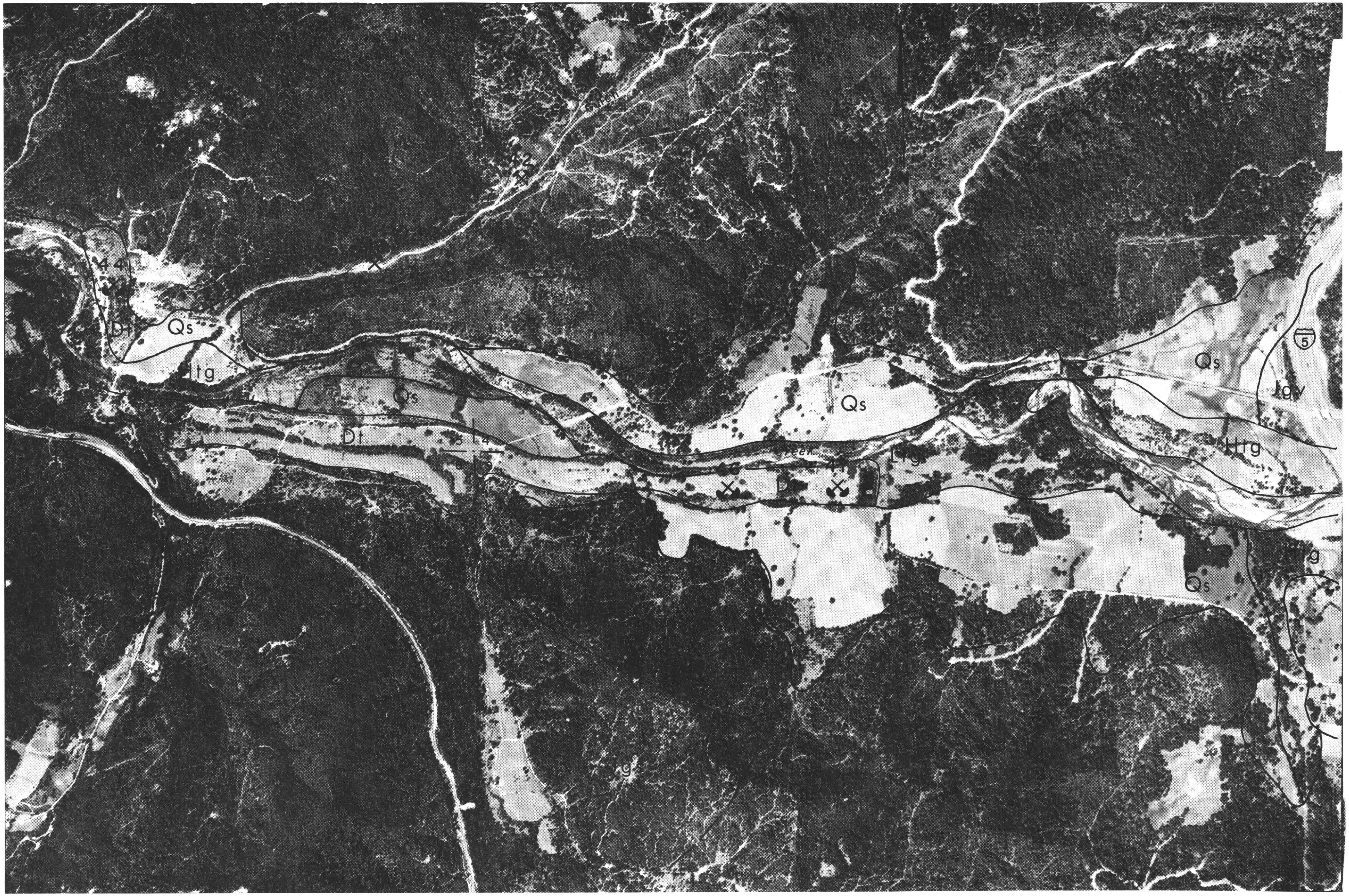
MAP OF
JOSEPHINE COUNTY
OREGON
SHOWING QUARRIES, GRAVEL PITS, PROSPECTS AND LOCATION OF GEOLOGIC PHOTO MAPS
BASE MAP BY OREGON STATE HIGHWAY DEPARTMENT 1969
LEGEND
Quarries
Gravel Pits
Prospects
17
Location and area covered by Geologic Photo Maps
ARRANGEMENT OF SHEETS FOR JOSEPHINE COUNTY
SHEET 2
CALIFORNIA
JACKSON COUNTY
CURRY COUNTY
SISKIYOU NATIONAL FOREST
ROGUE RIVER NATIONAL FOREST
KLAMATH NATIONAL FOREST
SIX RIVERS NATIONAL FOREST
DEL NORTE COUNTY
SISKIYOU COUNTY
KALMIOPSIS WILDERNESS
SISKIYOU MOUNTAINS
WILDERVILLE
MURPHY
SELMA
KERBY
CAVE JUNCTION
Bridgeview
Holland
O'BRIEN
Takilma
Williams
Provolt
Dryden
Wonder
Waters Creek
Kubli
Davidson
Illinois Valley
China Garden
Brownstown

OFR 75-9



SHEET 3

OFR 75-9



SHEET 4

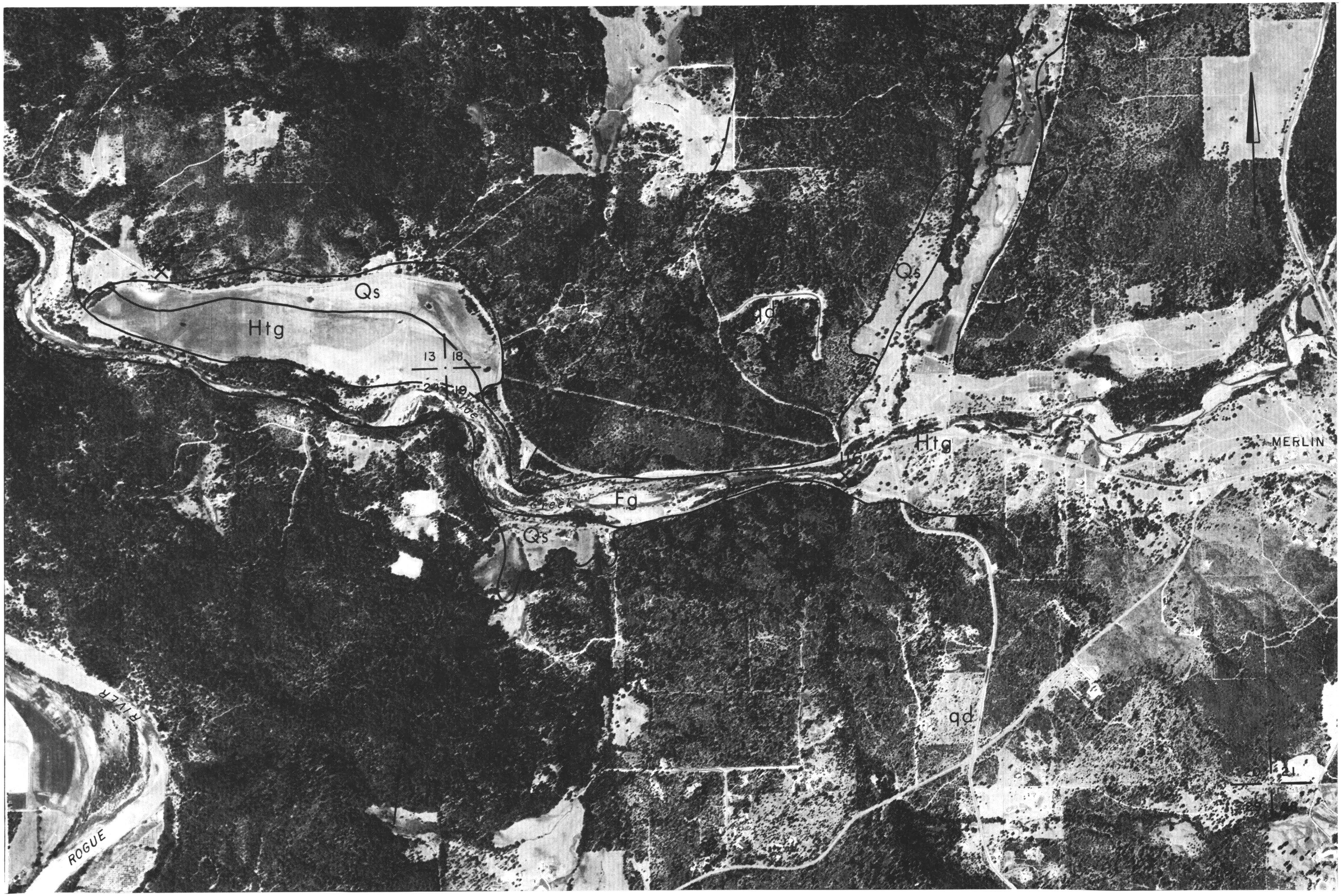
OFR 75-9

SHEET 5

OFR 75-9

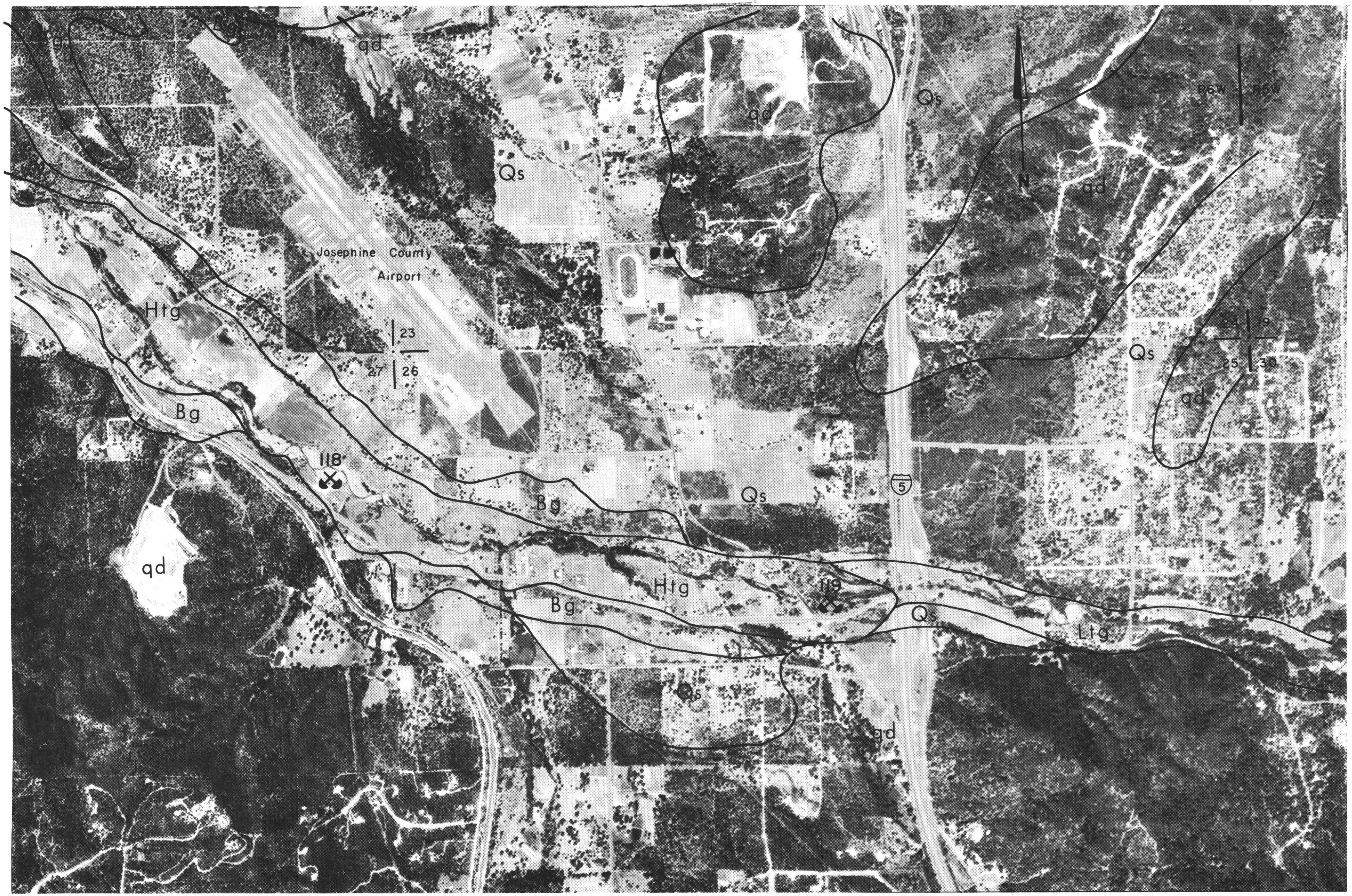
SHEET 6

OFR 75-9

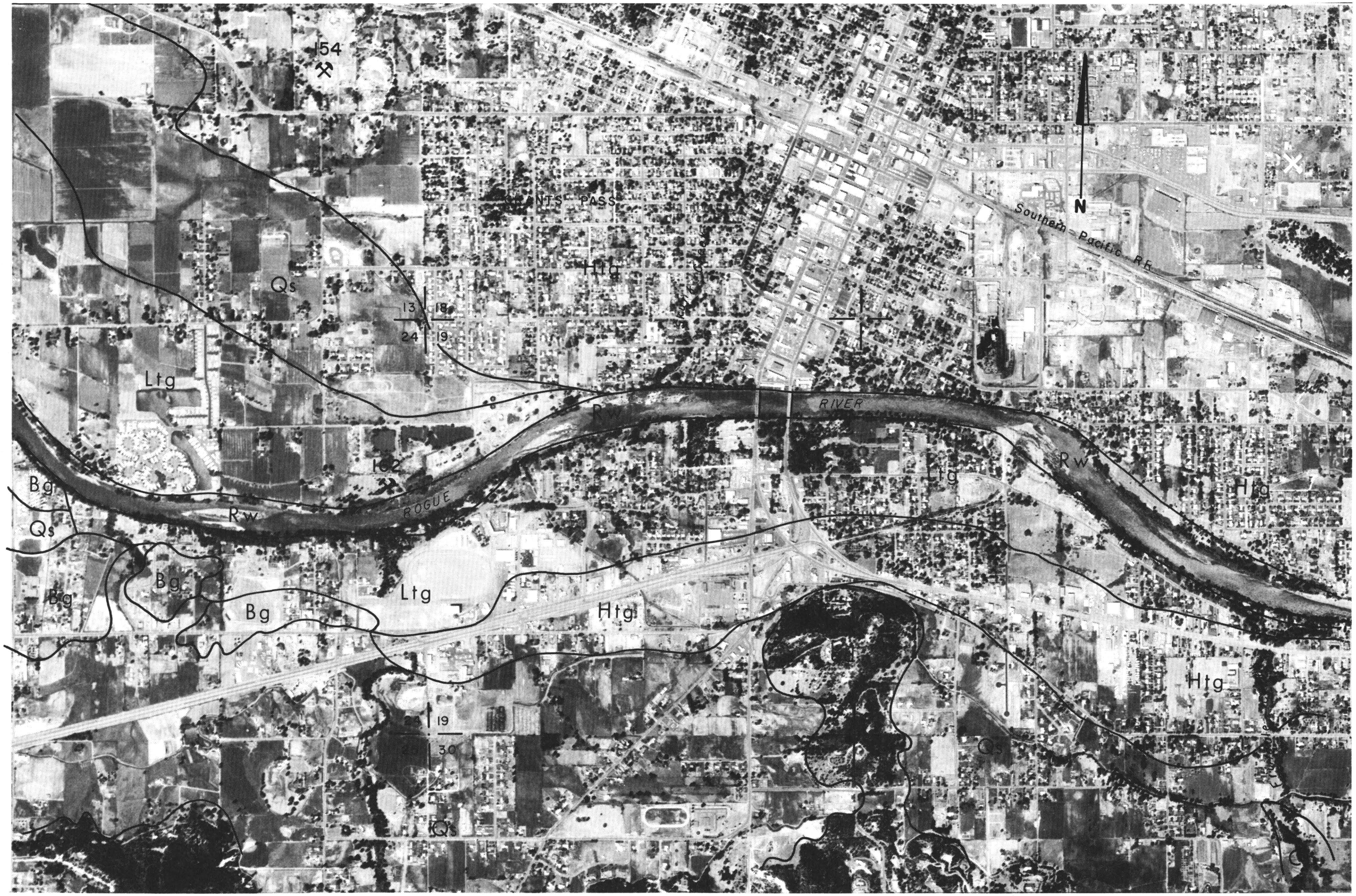


SHEET 7

OFR 75-9


qd
Bg
Qs
qd
R6W
R5W
N
qd
Josephine County
Airport
Htg
22
23
27
26
Qs
24
19
25
30
qd
Bg
118
Bg
Qs
5
qd
Htg
119
Bg
Qs
Ltg
Qs
qd

OFR 75-9

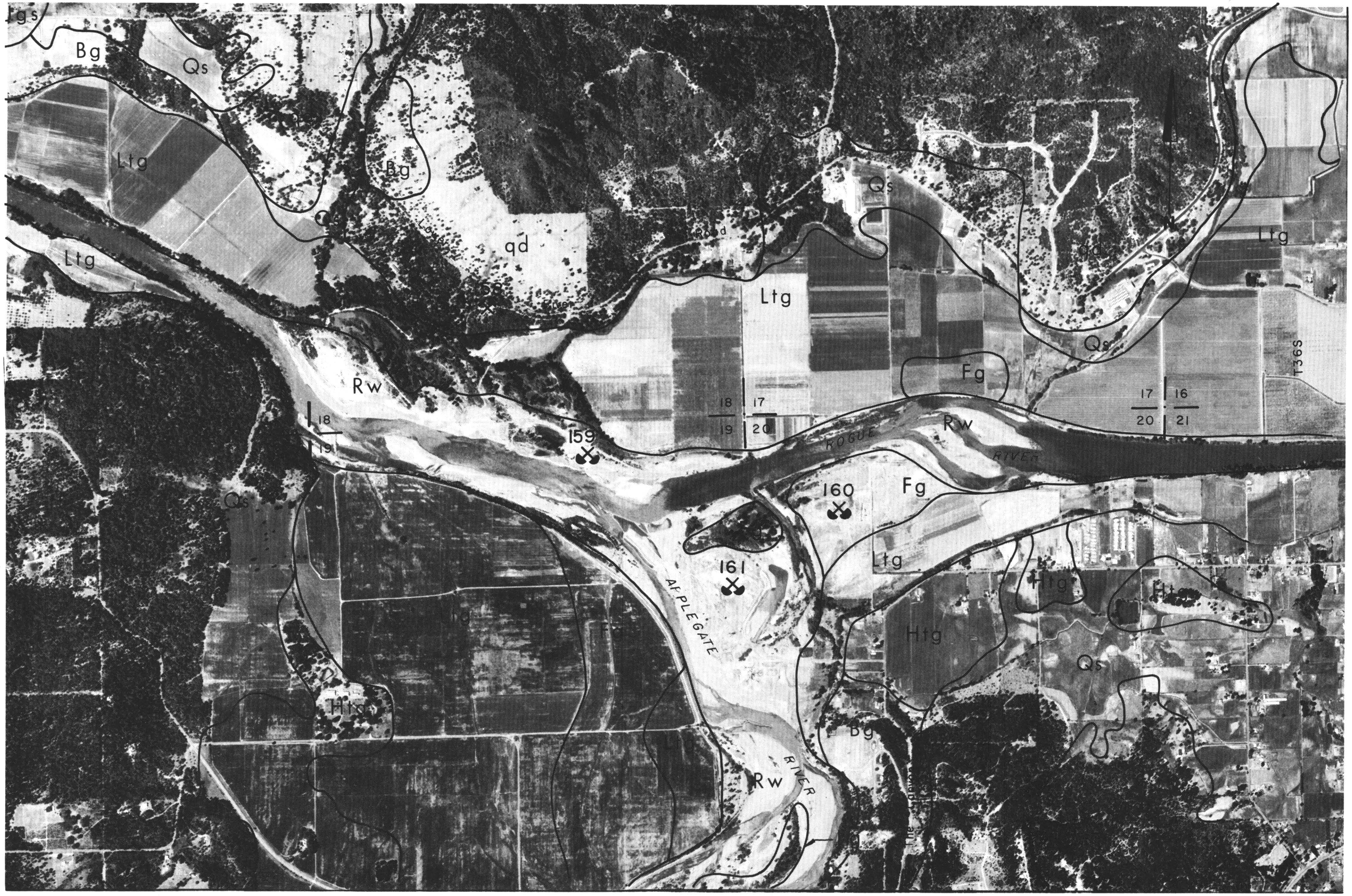


SHEET 9

OFR 75-9

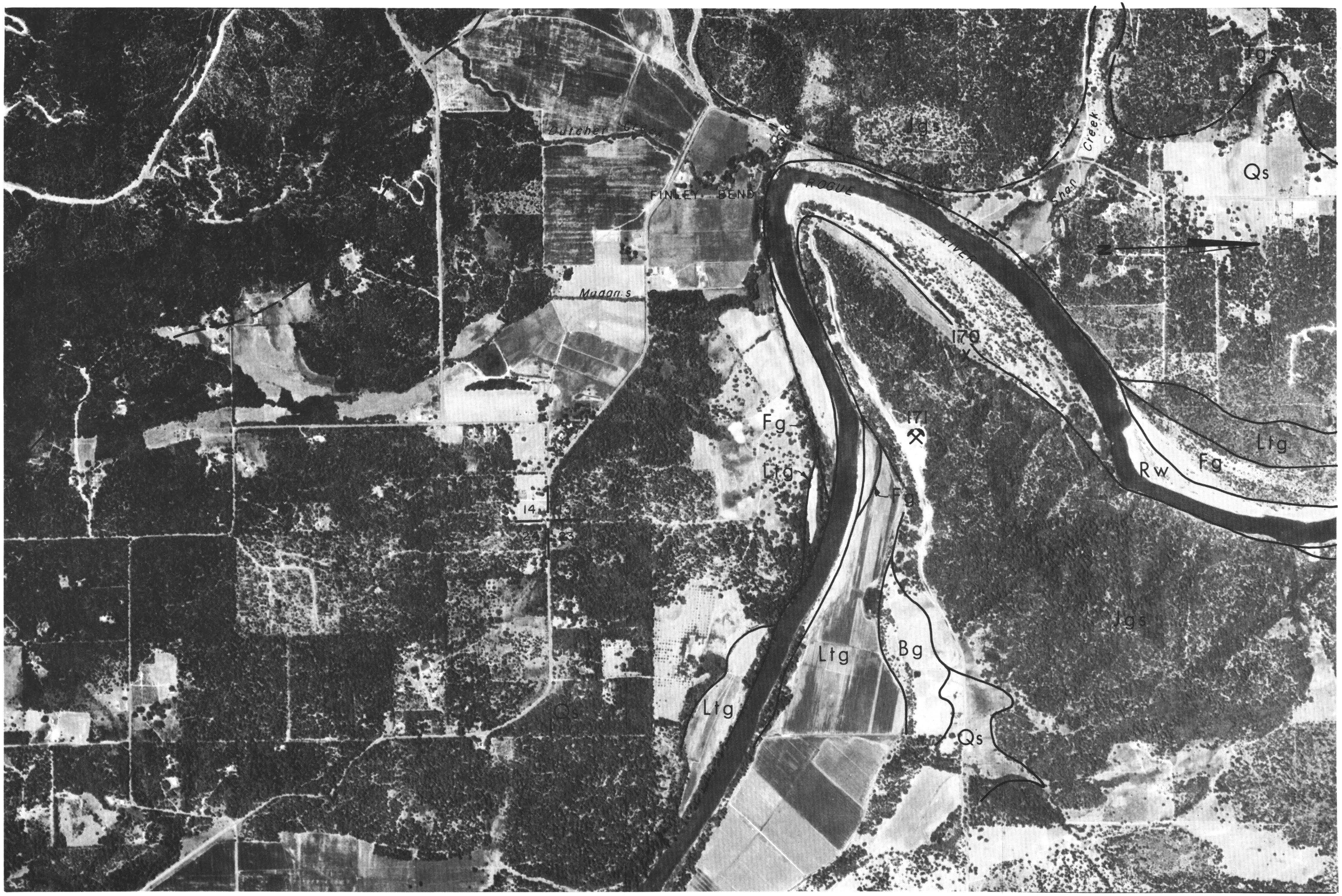
SHEET 10

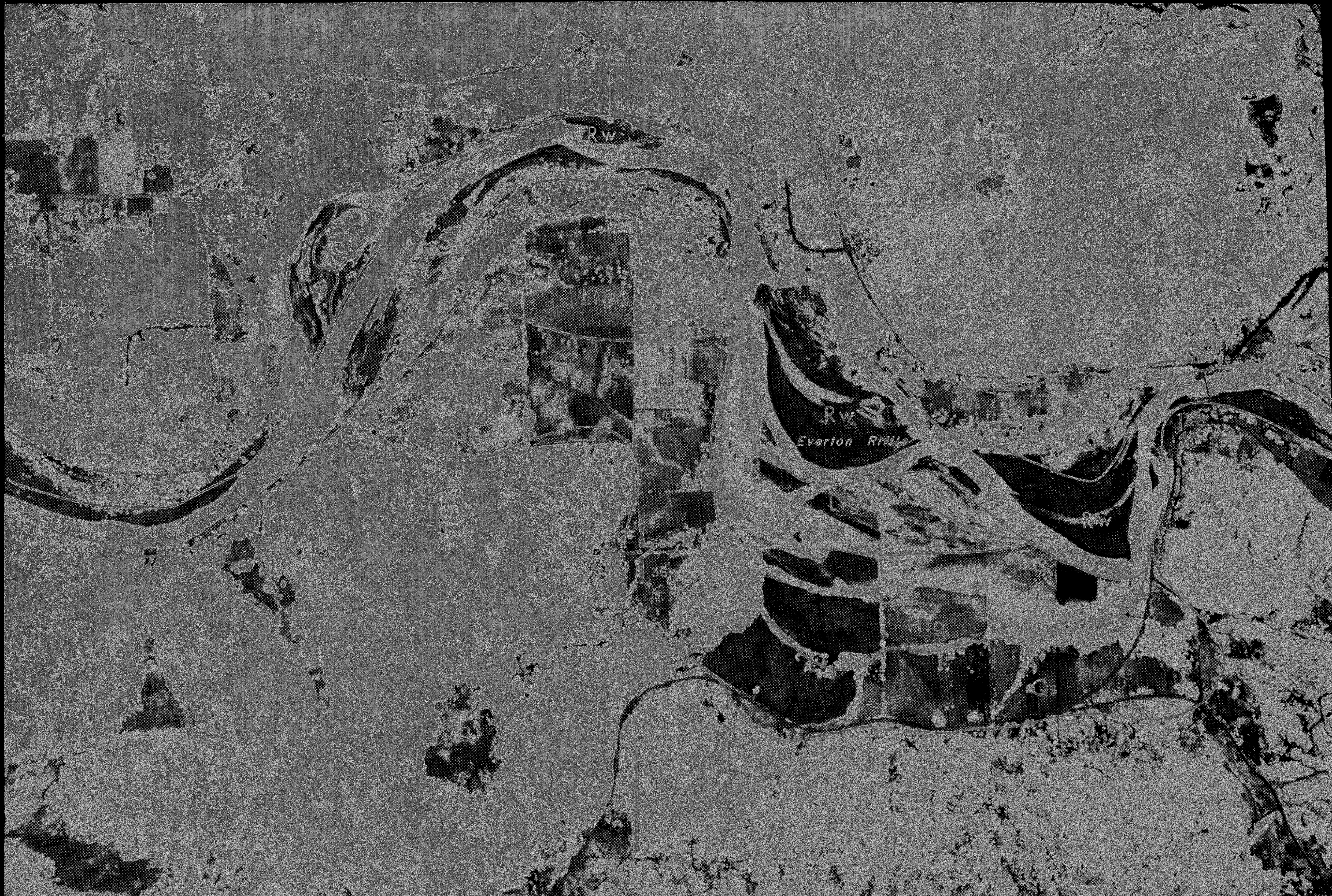
OFR 75-9



SHEET 11

OFR 75-9





SHEET 13

OFR 75-9

SHEET 14

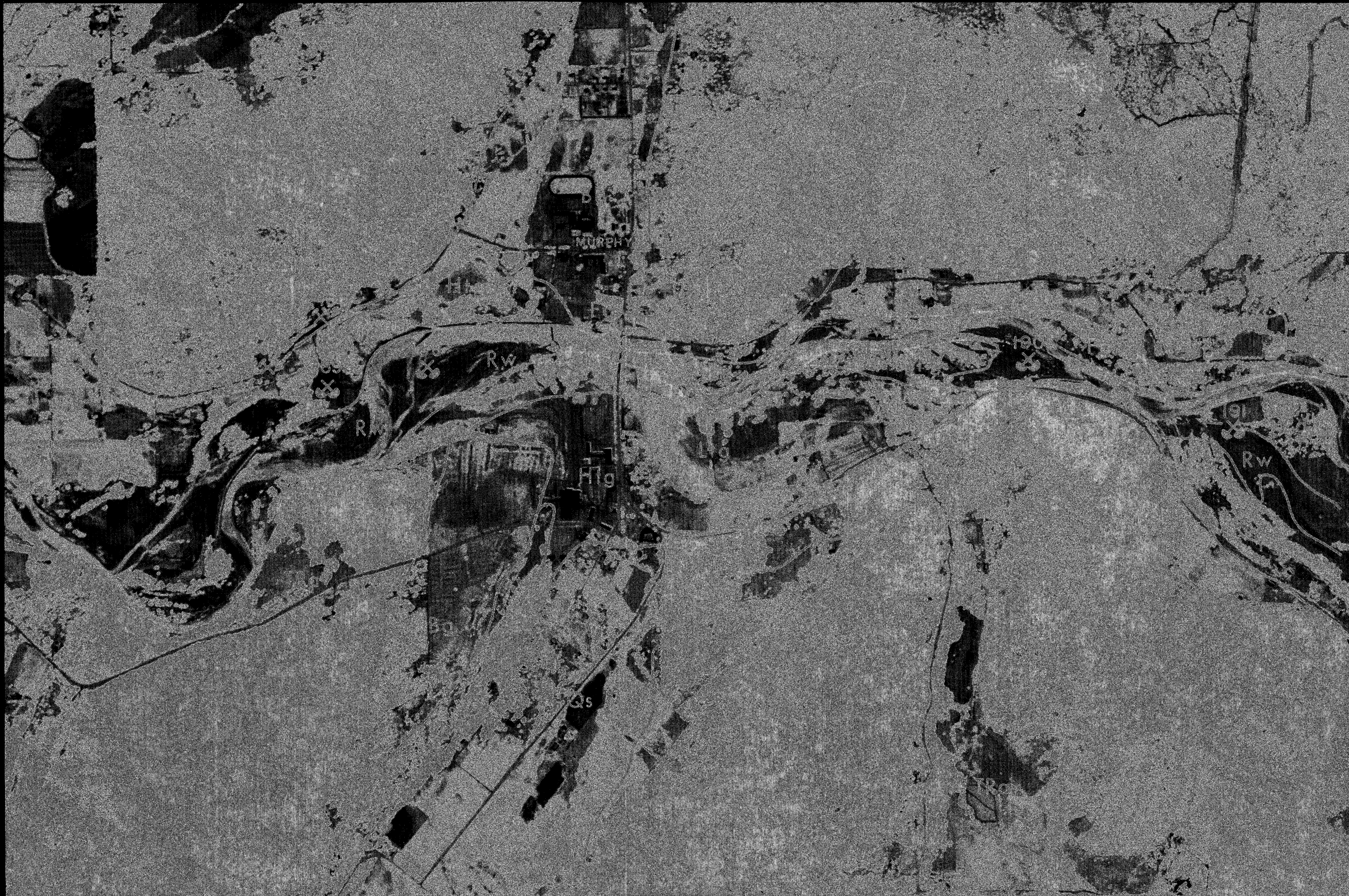
OFR 75-9


200
Htg
Rw
APPLEGATE
6
5
7
8
Htg
Fg
w
201
202
N
Ca
Htg
Ca
Qs
RIVER
sp
Cheney
TRav
Ltg
Rw
Ltg
203
Jgs
Htg
Ltg
gb
Fg
Htg
TRav
TRas

OFR 75-9

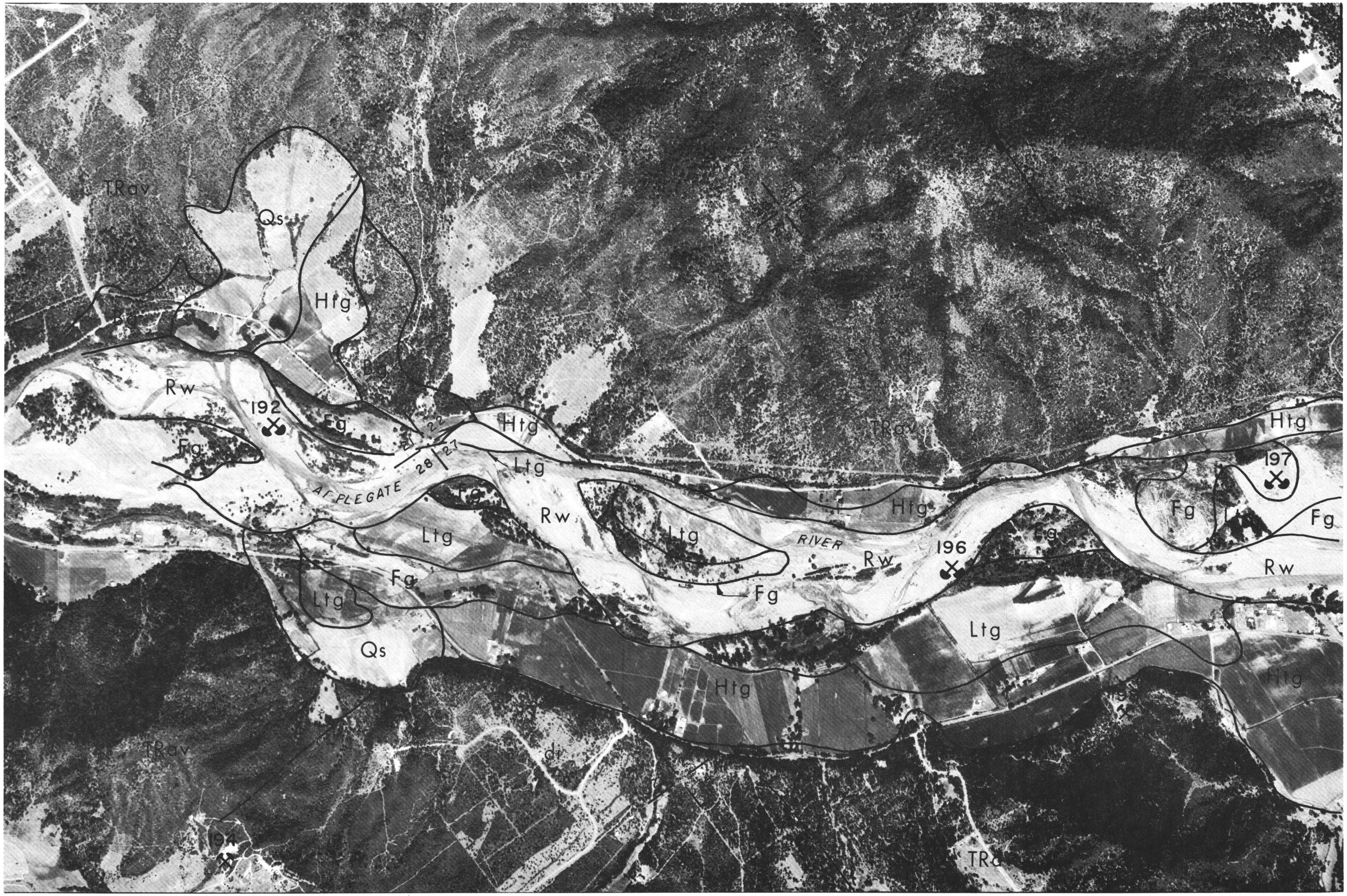
SHEET 16

OFR 15-9



SHEET 17

OFR 15-9


TRav
Qs
Htg
Rw
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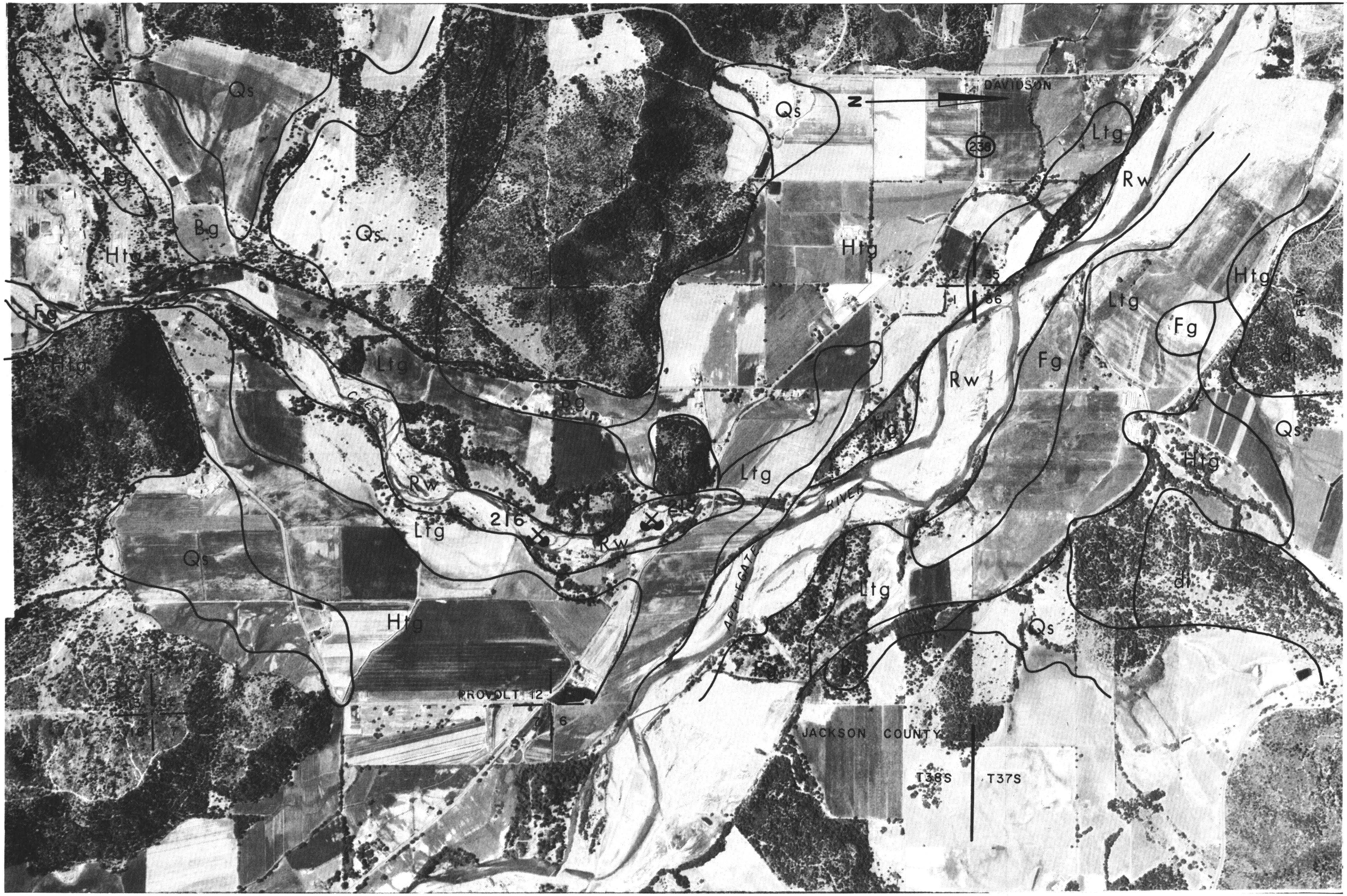
Fg
22
28
27
APPLEGATE
Ltg
RIVER
196
197
Htg
Fg
Rw
Ltg
Qs
di
194
TRa

OFR 75-9

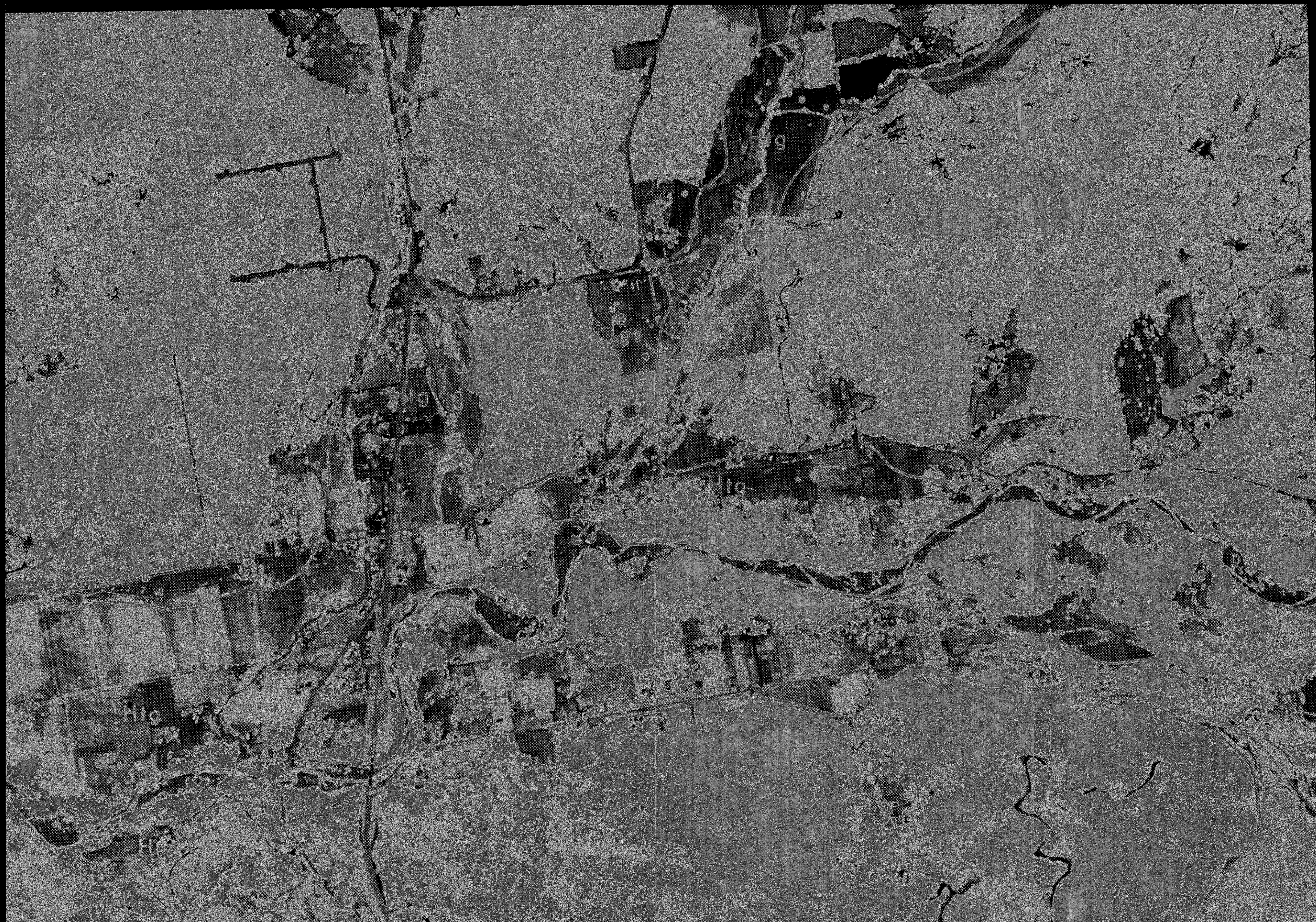


SHEET 19

OFR 75-9

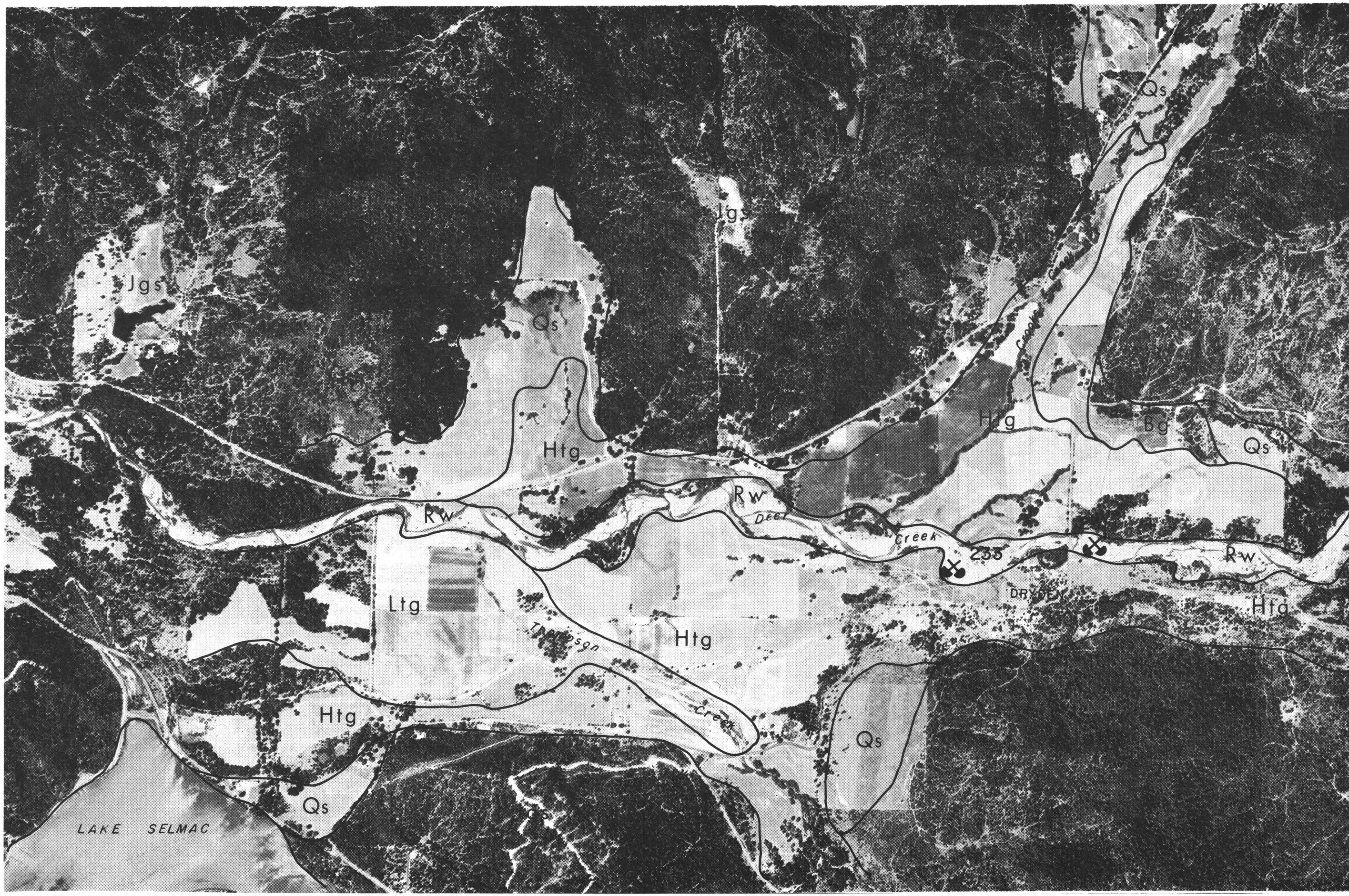
SHEET 20

OFR 75-9

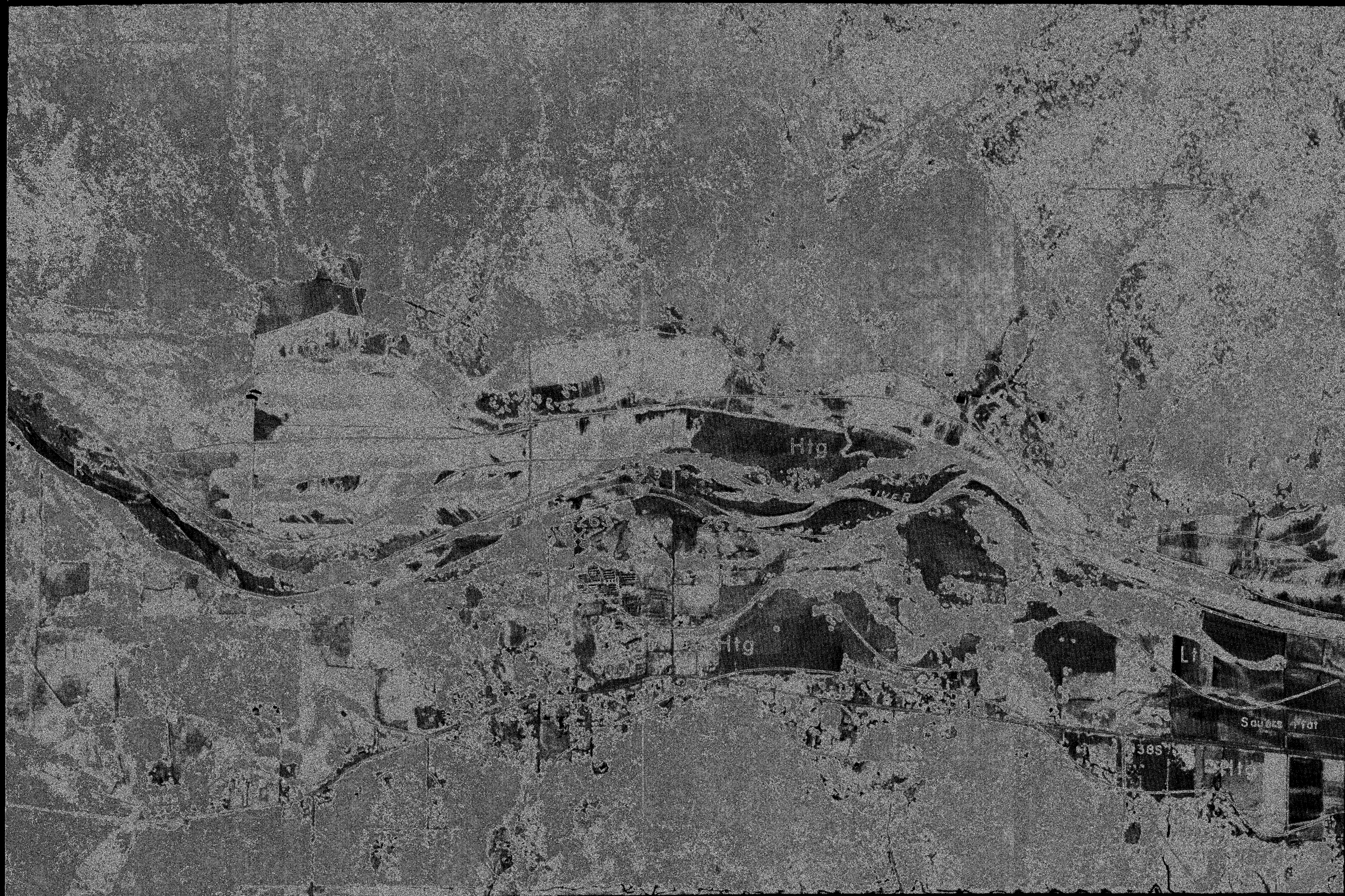


SHEET 21

OFR 75-9


Jgs
Jgs
Qs
Qs
Htg
Bg
Qs
Rw
Rw
Deer
Creek
233
Rw
DRYDEN
Htg
Ltg
Htg
Creek
Htg
Qs
Qs
LAKE SELMAC

OFR 75-9

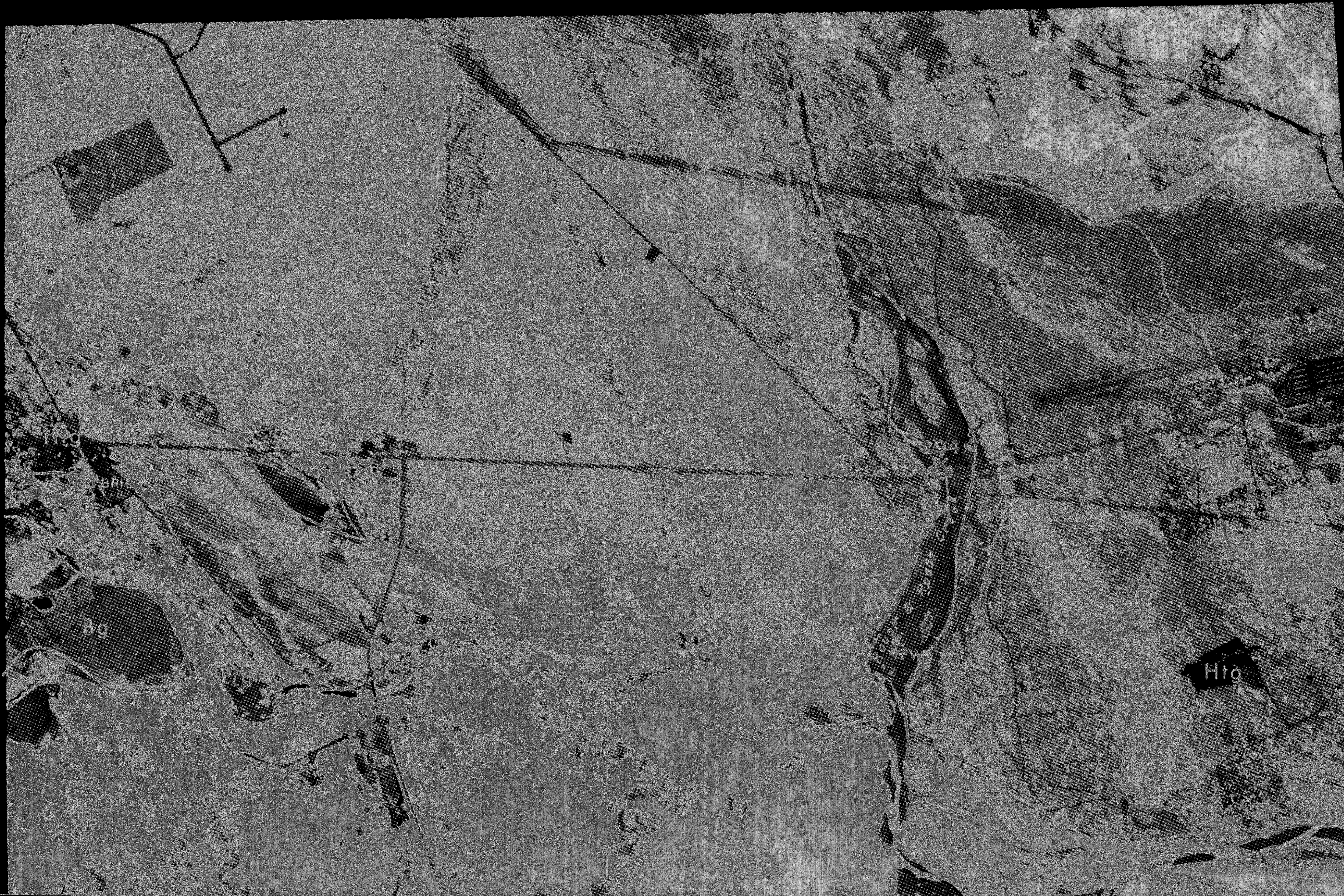


OFR 15-9

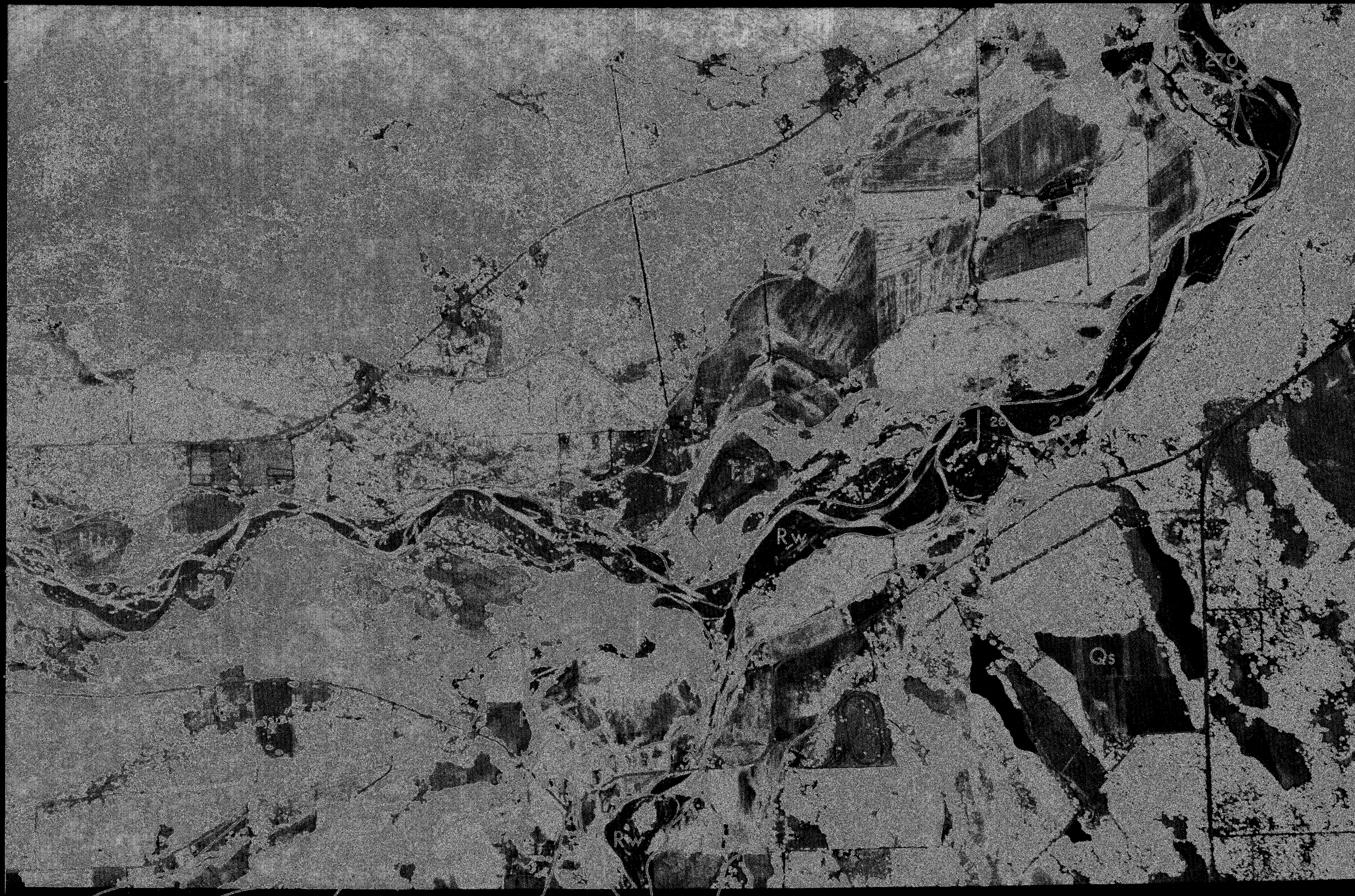

Valley
Airport
Htg
Hig
Htg
Qs
292
290
273
Rw
Ig
Fg
272
199
291
RIVER
Rw
293
Bg

SHEET 25

OF 75-7

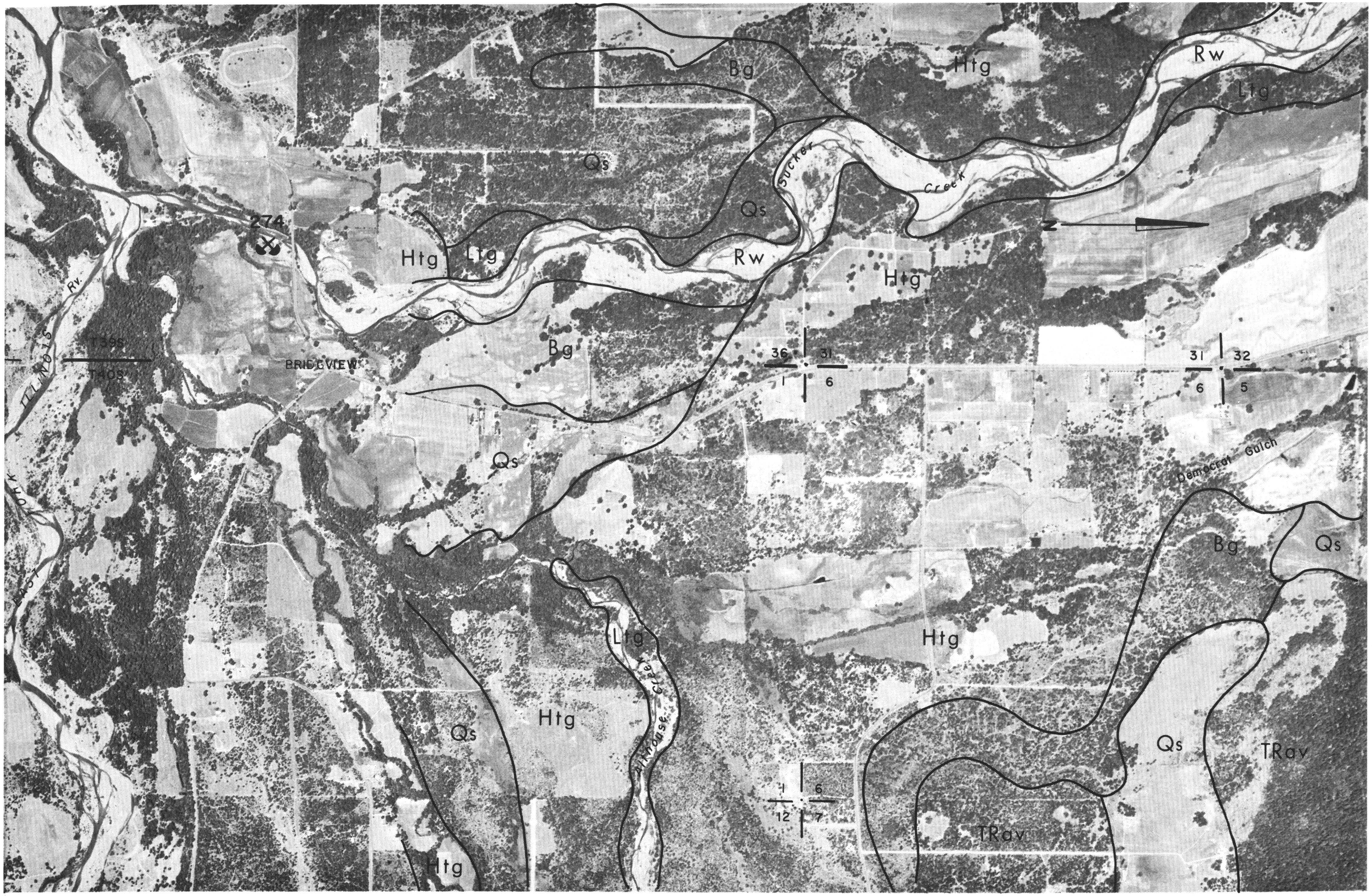


SHEET 26



SHEET 27

OFR 75-9



Rw
Ltg
Htg
Bg
Qs
Sucker
Creek
274
Htg
Ltg
Rw
Htg
Rv.
ILLINOIS
FORK
EAST
T39S
T40S
BRIDGEVIEW
Bg
36
31
1
6
31
32
6
5
Qs
Democrat Gulch
Bg
Qs
Ltg
Htg
Htg
Qs
Qs
TRav
1
6
12
7
TRav
Htg