AGRICULTURAL LIME IN CENTRAL MISSISSIPPI

by

ALVIN R. BICKER, JR.
and
JAMES H. MAY

INFORMATION SERIES MGS–77–1

MISSISSIPPI GEOLOGICAL, ECONOMIC AND

TOPOGRAPHICAL SURVEY

WILLIAM HALSELL MOORE
Director and State Geologist
2525 N.West Street
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ABSTRACT

The 1974 Mississippi Legislature authorized the establishment of a State-operated agricultural lime plant to be located in South Mississippi. The Mississippi Geological Survey was designated as the agency to select the location of the plant site.

Limestone and marls of the Vicksburg Group of Oligocene age contain the only material in sufficient quantity to be effectively used as raw material for a plant. The Vicksburg Group crops out in a narrow belt that trends northwest-southeast in the south central part of the State near the latitude of Jackson, Mississippi.

Thickness of the Vicksburg Group varies from approximately 40 feet near the western end of the outcrop belt to as much as 90 feet in the east. Chemical analyses show the average calcium carbonate content to be higher in the material located in the east.

On the basis of prior investigations, reconnaissance surveys and transportation requirements three sites were selected for further investigations; one site located near Waynesboro in Wayne County and two sites in Jasper County, one near Bay Springs and the other southeast of Heidelberg. After thorough review of the accumulated data the site near Waynesboro was selected for the location of the proposed plant.

INTRODUCTION

On April 5, 1974, the Mississippi Legislature enacted into law Senate Bill 2571 establishing authority to the Mississippi Department of Agriculture and Commerce for the construction of an agricultural lime plant in south central Mississippi. The Mississippi Geological, Economic and Topographical Survey was designated as the agency to select a plant site within the outcrop area of the Vicksburg Group.

Recent unsuccessful attempts to enact legislation for the establishment of an agricultural lime plant in south Mississippi were conducted during earlier legislative sessions. In 1971, the Geological Survey was requested to recommend areas in south Mississippi which have surface exposures of limestone that could be utilized for agricultural lime. Data collected by the agency during years of its existence show that the most southerly outcrops of limestone in the State are in formations of the Vicksburg Group. Upon receiving the request for locations of limestone outcrops in 1971 the Geological Survey initiated a reconnaissance survey of the outcrop area of the Vicksburg Group. Concurrent with this reconnaissance survey was a detailed investigation of the geology of Smith County, which was completed in 1972. Also in 1972, a detailed investigation of Wayne County was initiated. Reports on the geology of Rankin, Hinds, Jasper and Warren Counties were published previously. Outcrops of strata of the Vicksburg Group are present in all of the listed counties. Therefore, when Senate Bill 2571 was passed, the Geological Survey had compiled a large volume of data on the counties that have exposures of limestone.

REGIONAL GEOLOGY

Limestone in south central Mississippi is present in strata of the Vicksburg Group and the Chickasawhay and Paynes Hammock Formations of Oligocene age. Formations of the Vicksburg Group are exposed in a narrow outcrop belt that extends from near Vicksburg in Warren County east-southeastward to the Mississippi-Alabama boundary in the latitude of Wayne County. The Chickasawhay and Paynes Hammock Formations overlie the Vicksburg Group, but are restricted to the eastern part of the State and are present only in Wayne and Jasper Counties. (Figure 1)

Strata of the Vicksburg Group were referenced by T. A. Conrad in 1846, who observed marls and limestones containing marine fossils at and near Vicksburg, Mississippi. Surface exposures in the outcrop belt have been described in the following counties: Warren (Mellen, 1941), Yazoo (Mellen, 1940), Hinds (Moore, 1965), Rankin (Baughman, 1971), Smith (Luper, 1972), Jasper (DeVries, 1963), and Wayne (May, 1974).

In the western part of its outcrop area the Vicksburg Group is composed of the Mint Spring, Glendon, Byram and Bucatunna Formations. Eastward in the locality of Jasper County additional limestone is developed in the lower part of the Vicksburg Group. This additional limestone section is the Marianna Formation. It occupies a stratigraphic position between the underlying Mint Spring Formation and the overlying Glendon Formation. The Marianna Formation continues to thicken eastward and at some localities in Wayne County the Marianna contributes an additional forty feet of limestone to the total Vicksburg section. (Figures 2 and 3)

Of the above listed formations only the Marianna and Glendon contain material of sufficient calcium carbonate content to be successfully utilized as an agricultural limestone. The Mint Spring and Byram Formations are composed predominantly of calcareous, argillaceous, arenaceous, glauconitic marls. Locally, the formations contain thin beds of limestone. Calcium carbonate content of the marls has been reported to be as high as 78 percent and as low as 17 percent. The calcium carbonate content is

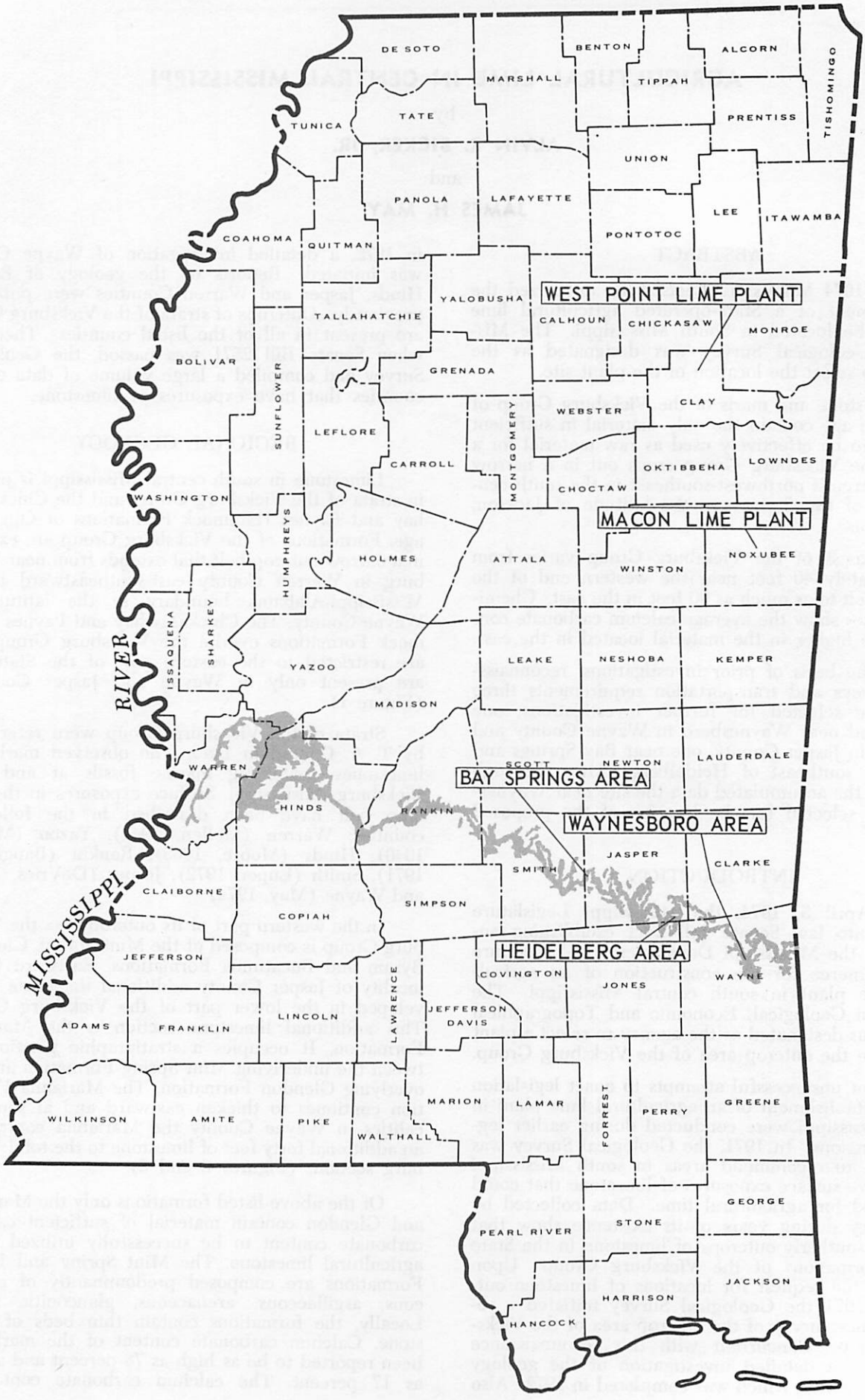

Figure 1 - Outcrop Belt of Limestone and Marl in the Oligocene Vicksburg Group.

			WESTERN MISSISSIPPI–HINDS COUNTY		EASTERN MISSISSIPPI–WAYNE COUNTY	
SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	LITHOLOGIC CHARACTER	STRATIGRAPHIC UNIT	LITHOLOGIC CHARACTER
QUATERNARY	RECENT		ALLUVIUM	Sand, yellowish–gray to yellowish–orange. Some gravel, silt and clay. Contains organic material in some localities.	ALLUVIUM	Sand, yellowish–gray to yellowish–orange. Some gravel, silt, clay and organic material.
	PLEISTOCENE		LOESS	Silt, tan to brown. Contains fossils of land snails. In eastern part of county represented by weathered silts called brown loam.		
			PRE–LOESS TERRACE DEPOSITS	Gravel, multicolored, chert and quartz. Sand, red, fine– to coarse–grained. Occasional clay lenses and silicified wood.	TERRACE DEPOSITS	Sand, multicolored, fine– to coarse–grained quartz, ferruginous; lenses of chert and quartz gravel and clay.
			CITRONELLE FORMATION	Gravel, multicolored, chert and quartz. Sand, reddish–brown to red, fine– to coarse–grained quartz.	CITRONELLE FORMATION	Sand, mostly dark yellowish–orange, fine– to coarse–grained, ferruginous; contains multicolored chert and quartz gravel.
TERTIARY	MIOCENE		CATAHOULA FORMATION	Sand, gray to white, kaolinitic, locally indurated. Gray, buff, green and purple silty clays.	CATAHOULA FORMATION	Sand, brown to gray, fine– to medium–grained (some chert gravel); interbeds of silt and clay; locally indurated.
	OLIGOCENE	VICKSBURG			PAYNES HAMMOCK FORMATION	Marl, olive–gray to grayish–yellow, fossiliferous, sandy, glauconitic; interbeds of clay and claystone ledges.
					CHICKASAWHAY FORMATION	Limestone, olive–gray to grayish–yellow, fossiliferous, sandy, glauconitic; interbeds of marls and clays.
			BUCATUNNA FORMATION	Clay, dark–gray to black, finely carbonaceous, pyritiferous, sparingly fossiliferous, thin sand laminae. Weathers to chocolate brown.	BUCATUNNA FORMATION	Clay, light to dark–gray, silty to sandy, micaceous, carbonaceous, fossiliferous. Locally bentonitic.
			BYRAM FORMATION	Marl, gray–green, glauconitic, fossiliferous, clayey; slightly sandy in lower part. Contains indurated ledges on the outcrop.	BYRAM FORMATION	Marl, greenish–gray to dark olive–gray, clayey to sandy, glauconitic, fossiliferous.
			GLENDON FORMATION	Limestone, gray, fossiliferous, glauconitic, sandy; interbeds of gray–green, sandy, glauconitic, fossiliferous marl.	GLENDON FORMATION	Limestone, medium–gray to light–gray, fossiliferous, pyritic, sandy. Hard ledges with interbeds of marl.
					MARIANNA FORMATION	Limestone, light–gray to yellowish–gray, fossiliferous, clayey. Softer and more homogeneous than overlying Glendon.
			MINT SPRING FORMATION	Marl, gray–green, fine– to coarse–grained, glauconitic, fossiliferous; clayey in middle portion in some localities.	MINT SPRING FORMATION	Marl, light greenish–gray to dark–gray, clayey to sandy, fossiliferous, glauconitic.
			FOREST HILL FORMATION	Silty sand, dark–gray, fine– to very fine–grained, carbonaceous, laminated, sparingly fossiliferous.	FOREST HILL FORMATION	Clay, medium to dark–gray, silty, carbonaceous, sparingly fossiliferous. Sandy in some localities.

Figure 2 - Correlation of Near-Surface Geologic Section in Western and Eastern Mississippi along Vicksburg Outcrop.

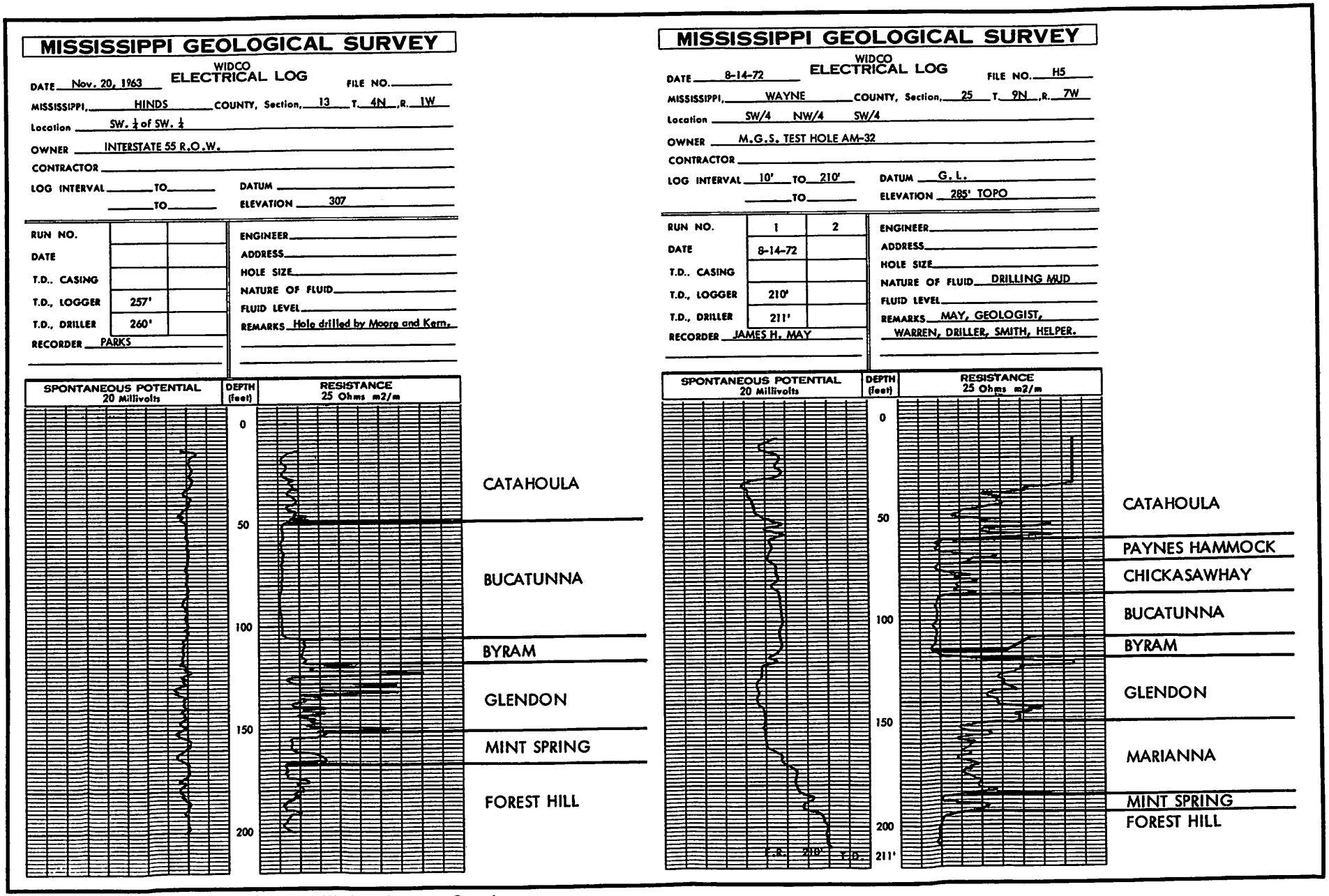

Figure 3 – Correlation of Electrical Logs in Hinds and Wayne Counties.

usually in the lower percentage figures because of the inclusion of clay, sand and glauconite. The Bucatunna Formation is predominantly a micaceous, sparingly fossiliferous clay. Locally, the Bucatunna contains thin beds of marl or thin lenses of sand.

The Vicksburg Group overlies the Forest Hill Formation throughout the area of outcrop. The nature of the contact between the Mint Spring Formation and the underlying Forest Hill Formation has been reported to be disconformable. The stratigraphic sequence overlying the Vicksburg Group changes from east to west along the outcrop from Wayne County to Warren County.

In Wayne County the Chickasawhay and Paynes Hammock Formations overlie the upper formation of the Vicksburg Group. The contact between the Chickasawhay Formation and the underlying Bucatunna Formation is reported as disconformable (May, 1974). In Jasper County the Chickasawhay Formation was reported not to have been observed at the outcrop by DeVries (DeVries, 1963). However, from test hole data DeVries interpreted a fine-grained glauconitic, lignitic sand bed overlying the Bucatunna Formation as the lateral equivalent of the limestone facies of the Chickasawhay Formation. From the same test hole data, DeVries reported a 14-foot bed of sand which he tentatively correlated as Paynes Hammock Formation. Neither of the above sand zones contain faunal evidence which may suggest the formation to which they belong. However, the glauconitic nature may be indicative of marine deposition and suggests it may have been deposited during the late Oligocene age. Normally at surface localities in Mississippi, lower Miocene sands have not been reported to be glauconitic, although rare glauconite has been reported in the subsurface.

In Smith county, Luper (Luper, 1972) reported the Miocene age Catahoula Formation to overlie the Bucatunna Formation unconformably. Although Luper did not report the presence of late Oligocene age sediments in Smith County, other writers have assigned strata present at the surface in the southeast part of the county to the Paynes Hammock Formation. MacNeil (MacNeil, 1944) reported the presence of a sand section overlying the Vicksburg Group which contains fauna that suggest the sand is correlative with the Paynes Hammock Formation. He further suggests the Paynes Hammock to have overlapped the Chickasawhay Formation, which was not present at this locality. The most westward locality in Mississippi where upper Oligocene age Chickasawhay or Paynes Hammock Formations or equivalents have been reported in surface outcrops is in southeast Smith County.

The normal stratigraphic sequence in Rankin, Hinds and Warren Counties as reported by Baughman (Baughman, 1971), Moore (Moore, 1965) and Mellen (Mellen, 1941) shows the formations of the Vicksburg Group to be overlain by the Catahoula Formation of Miocene age. Most reports term the contact between the formations as disconformable.

At different localities within the outcrop area terrace deposits overlie different formations of the Vicksburg Group. At the surface the age of some of these terrace deposits is subject to controversy. Although most reports list the age of these terrace deposits as Pliocene or Pleistocene, the age of some of the deposits may be Miocene. In the shallow subsurface at down-dip locations, data from test holes clearly show that pre-Catahoula or Catahoula age erosion did occur. At different locations, Miocene age sediments are present overlying different formations of the Vicksburg Group, from the youngest formation to the oldest. At one known subsurface locality in Hinds County the entire Vicksburg Group has been eroded and replaced by channel sands of Miocene age. Moore (Moore, 1965) reports two terrace deposits at the surface in Hinds County that may be Miocene terrace sands.

It is not in the scope of this investigation to determine the age of all terrace deposits that overlie the Vicksburg Group. Undoubtedly many of the terrace deposits are of the age as determined by investigators who identified them in the field. It is only to suggest that some may be of Miocene age. In each county where formations of the Vicksburg Group are at the surface these formations are overlain by terrace deposits locally. This investigation shows that one area in Jasper County has experienced severe erosion of the Vicksburg Group, where up to the entire limestone section has been removed and replaced with terrace deposits. One result of the replacement of the limestone by terrace deposits is to lessen the thickness of limestone and is an important factor to be considered in the selection of an area for the calculation of limestone reserves.

As stated above the Vicksburg Group thickens from west to east within its outcrop area in Mississippi. According to the cited references the Marianna Formation is recognized as being present only in Jasper and Wayne Counties. The Marianna attains its maximum thickness in Wayne County where forty-seven feet of the limestone was reported in test hole data by May (May, 1974). As the Mint Spring and Byram Formations normally consist of marls which contain low percentages of calcium carbonate, these formations were not considered in the reserve calculations and are eliminated in discussion of the individual county areas.

Mellen (Mellen, 1941) reported the Glendon Formation in Warren County to consist of alternating beds of semi-crystalline limestone and marl. Materials of both types of sediments are similar in composition, with the limestone containing less clastic material. Detailed descriptions of samples from a test hole located in Sec. 13, T. 16 N., R. 3 E., show the limestones to be light gray, hard, massive, glauconitic and fossiliferous. The marls are grayish-brown, soft, glauconitic, calcareous, arenaceous and fossiliferous with some montmorillonitic clay. The beds of limestone are from one foot to four feet thick. The marl beds are from one-half foot to more than 10 feet thick. Maximum thickness of the Glendon Formation is reported to be sixty-two feet and the minimum thickness twenty-six feet.

Available chemical analyses of materials from test holes located in Warren County show the calcium carbonate content of the limestone to be as low as 60 percent and as high as 86 percent. Analyses of composited samples of limestone and marls show the calcium carbonate content to be from 59 to 84 percent.

Moore (Moore, 1965) reported the Glendon Formation in Hinds County to consist of alternating beds of limestone and marl similar in physical characteristics to the Glendon in Warren County. The beds of limestone are not consistent laterally and may vary in thickness from one locality to another. The beds were reported to be 2 to 3 feet thick and the intervening marl beds to be as much as 30 feet thick. Data from a test hole located in northwestern Hinds County shows the Glendon Formation consists of four beds of limestone separated by layers of marl 5 feet thick and the lowest layer of marl to be 22 feet thick. Total thickness of the Glendon Formation at this location was reported to be 42 feet. Data from numerous test holes in Hinds County shows the Glendon to be from 25 feet to 50 feet thick. The average thickness is 35 feet. Analysis of a composited sample of the upper 29 feet of the Glendon Formation taken from the above test hole shows the calcium carbonate content to be 80 percent.

Baughman (Baughman, 1974) reported the Glendon Formation in Rankin County to be comprised of alternating beds of limestone and marl. The beds of limestone are normally one to two feet thick, but range from one-half foot to as much as eight feet thick. The interbedded marls are as much as 12 feet thick. Maximum reported thickness of the Glendon Formation is 50 feet. Reported data from test holes shows the average thickness to be 24 feet. Cored sections of the Glendon Formation were not available for description, but reported descriptions from test hole samples and outcrops show the lithology to be similar to the Glendon Formation in Hinds and Warren Counties. Only one chemical analysis of the limestone in Rankin County is available. This analysis shows the calcium carbonate content of the limestone to be 83.8 percent. Reported analyses from early bulletins show the calcium carbonate content of various samples of limestone to be from 65.8 percent to a high of 93 percent. Analyses which included marl with the limestone in the samples that were analyzed show the calcium carbonate content to be as low as 53.3 percent. Mellen (Mellen, 1942) reported the operation of an agricultural lime plant in Rankin County during the year 1942. The material mined was marl of the Mint Spring Formation underlying the Glendon Formation. Thickness of the section being excavated was reported to be 12 feet. An analysis of a composited section from the quarry face shows the calcium carbonate content to be 76.8 percent. It is interesting to note that the marl of the Mint Spring at this quarry as reported, has a higher calcium carbonate content than some samples of material from the Glendon Formation at locations in Rankin and other counties. Reported analyses show the marls of the Mint Spring Formation in other areas to be much less calcareous.

In Smith County, Luper (Luper, 1972) reported the Glendon Formation to be alternating beds of hard limestone and soft marl. The composition of the limestone and marl is similar, both consisting of gray, glauconitic, arenaceous, argillaceous and fossiliferous sediments. The limestone is semi-crystalline and indurated, whereas the marl contains more clay and is generally soft with thin indurated layers. Luper reported the beds of limestone in Smith County to be thicker than those of Rankin, Hinds and Warren Counties. Although many beds of limestone were reported to be from 3 to 6 feet thick, some test holes penetrated beds up to 14 feet thick. Beds of marl are as thick as 35 feet. The formation was reported to be from 15 to 59 feet thick, with the average thickness being 34 feet. Chemical analyses of the limestone from samples of core holes located in eastern Smith County show the calcium carbonate content to range from 74 to 94 percent. Marls from some of the same core holes have a calcium carbonate content of 62 to 82 percent. Luper chose not to differentiate the Marianna Formation from the Glendon because of the difficulty in identifying the characteristics of the two formations. In the present investigation it is believed that the Marianna Formation is present in extreme western Jasper County and undoubtedly extends westward into Smith County.

In a report on the geology of Jasper County, (DeVries, 1963) reported the Glendon Formation consists of blue-gray, soft to dense, fossiliferous, slightly glauconitic and argillaceous limestone interbedded with fossiliferous, sandy marl. The Glendon was reported to be from 3 feet to 42 feet thick. DeVries noted the presence of the Marianna Formation in Jasper County. The formation consists of beds of bluish-gray, fossiliferous, sandy, glauconitic marl and soft limestone. DeVries stated that identification of the Marianna is difficult and that the formation may be present only locally. Although DeVries indicates the probable presence of the Marianna in several test holes, the data from the test holes did not present conclusive evidence for the presence of the formation. During the present investigation test holes were drilled in two areas of Jasper County, one area near Heidelberg in the southeast part of the county, the other area west of Bay Springs in the extreme western part. The writers believe that data from these test holes supports the determination that the Marianna Formation is present in Jasper County as far west as the Jasper-Smith County boundary. The test holes penetrated 15 to 33 feet of sediments that were assigned to the Marianna. Average thickness was determined to be about 25 feet. In the same areas the average thickness of the Glendon Formation was determined to be about 20 feet. Chemical analyses of composited samples show the calcium carbonate content of the limestone and marl to range from 79 to 92 percent.

May (May, 1974) reported the Marianna, Glendon, Chickasawhay and Paynes Hammock Formations to be present in Wayne County. All contain limestone and marl suitable for use as agricultural lime. May described the Marianna Formation as consisting of light-gray to yellowish-gray, argillace-

ous limestone and marl. The Marianna is more homogeneous and softer than the overlying Glendon Formation. The thickest section of Marianna reported was 47 feet. In the present report, 45 feet of Marianna was penetrated in test holes located in an area three miles north of Waynesboro. Selected sections of the Marianna from cored material analyzed 62 to 93 percent calcium carbonate. The unweathered Glendon Formation is present as hard ledges of medium-gray to light-olive-gray, fossiliferous limestone interbedded with gray to greenish-gray, fossiliferous marl. May reported the thickness of the Glendon to be from 15 to 36 feet. Throughout the county the formation is usually within the range of 20 to 25 feet thick. A composited sample of a 28 foot section of Glendon Formation from a core hole drilled in the prospective area three miles north of Waynesboro analyzed 95 percent calcium carbonate.

May reported the Chickasawhay Formation in Wayne County to be composed of olive-gray to grayish-yellow, fossiliferous, argillaceous to arenaceous limestone interbedded with bluish-green, fossiliferous marls and clays. The thickness of the formation was reported to be from 14 to 42 feet. Individual beds of limestone are from 2 to 11 feet thick and beds of marl are up to 15 feet thick. May reported the lithology of the Paynes Hammock Formation to be similar to that of the Chickasawhay. The Paynes Hammock is composed of olive-gray to grayish-yellow, fossiliferous, arenaceous, glauconitic marl with interbedded fossiliferous clay, sand and limestone. Average thickness of the Paynes Hammock as penetrated in test holes is 16 feet. In one test hole as much as 23 feet of limestone and marl was present. In test holes for this investigation the limestone and marl of the Chickasawhay and Paynes Hammock were combined to calculate the limestone and marl reserves. The thickest section of combined limestone and marl penetrated was 35 feet.

FIELD PROCEDURE

Preceding the passage of Senate Bill 2571, communications between representatives of the Mississippi Department of Agriculture and Commerce and the Mississippi Geological Survey established one factor that was an important consideration in plant site selection. That factor was transportation, both highway and rail. This factor severely limited potential plant sites.

The writers were assigned to the project in the early part of April 1974 and began compiling data concerning logical potential sites. Availability of adequate transportation, surface outcrops and thickness of limestone, and topography were prime considerations in selecting prospective areas. Areas near Bay Springs and Heidelberg in Jasper County and an area near Waynesboro in Wayne County were selected as prospective sites for further investigation.

Because of prior commitment of Survey drilling equipment the drilling of test holes at selected sites was, of necessity, postponed until completion of the prior project. During the months of April and May field observations of prospective sites were made. Contact with local citizens was initiated to permit drilling operations on private property.

On June 10, 1974, the drilling operations began. James May, staff geologist, was in charge of these operations. The Waynesboro area was selected as the locality to start the field program, as May had recently completed an investigation in this area and was more familiar with the geology and environment. The field program consisted of drilling of test holes to determine thickness and altitude of both limestone and overburden, electrical logging of test holes, and securing of core samples for chemical analyses.

In each area test holes were located at drilling sites that were accessible and spaced so as to be the most advantageous for securing adequate data for calculating the volume of limestone. Time and accessibility limited the number of test holes which could be drilled. Test holes were drilled to a depth sufficient to penetrate the entire thickness of the Vicksburg Group. Upon completion of each test hole an electrical log was run if physical conditions of the test hole so permitted. Electrical logs show in graphic form the formations or strata that the test holes penetrated. The logs permit an accurate correlation of depths, thicknesses and types of material in the test holes. In each area a core hole locality was selected adjacent to the test hole which indicated the most advantageous potential core recovery of limestone.

OFFICE PROCEDURE

For each area the existing seven and one-half minute topographic quadrangle map was utilized for descriptive and quantitative purposes. The topographic map was limited to include the immediate area being investigated. The scale of each original work map was enlarged to twice its original printed size. The scale of the enlarged maps was approximately one inch equal one thousand feet. Base maps of the same scale were prepared to illustrate the areas of mineable limestone and thickness of same and to help in the calculation of the volume of limestone and associated overburden. Electrical logs of the test holes were used to correlate and verify field observations of the altitude and thickness of the limestone at each test hole site. The original work maps were incorporated into the printed series of maps described below.

A series of maps were constructed to illustrate the areal extent and thickness of limestone (and marl) and overburden in each study area. Each test hole was plotted and pertinent data, such as elevation and thickness of limestone, was utilized in the construction of the individual maps. The areas of subcrop shown on the maps represent the upper surface of a particular limestone and marl sequence as it would appear if all the overburden were removed. Because of mining procedure the thickness of limestone used for calculations was that thickness lying above the natural drainage of the area to be mined. For conservative estimates the natural drainage was selected at a level at least 10 feet above the lowest drainage elevation in the immediate areas as shown on the topographic map.

The subcrop and isopach maps were utilized in estimating the total volume of available limestone and marl. Only those areas overlain by the subcrop of limestone would have a complete thickness above natural drainage which could be used to calculate the volume of limestone and marl in a given area. As the topography becomes involved total thickness decreases where erosion has removed the upper part of limestone. Therefore, in calculating the volume of limestone in an area with hilly topography, the area enclosed by each contour of the topographic map was multiplied by the appropriate thickness number. This number was usually represented by the contour interval of the map.

Each unit bounded by the contour of the map was measured by using a planimeter to obtain the area of the unit in square inches. This figure was converted to acres by using a conversion factor applicable for the scale of the map. Multiplying the number of acres by the thickness in feet gives a resultant in acre-feet which can then be converted to cubic yards of volume within the unit.

This method was used to calculate the volume of limestone and volume of overburden at each prospective site. To facilitate computation and for illustration the maps of the prospective sites were subdivided into units within each area and numbered to correspond with the calculation results shown in the accompanying figures.

For core analyses each core was composited into intervals with similar physical characteristics and a chemical analysis made on each interval. The chemical analyses were made by the Mississippi State Chemical Laboratory, Mississippi State, Mississippi.

BAY SPRINGS AREA

An investigation was conducted in an area two miles north of Bay Springs, Jasper County, Mississippi, to determine its potential for producing limestone of sufficient quality and quantity for use as agricultural lime. The study area centers in Section 17, Township 2 North, Range 10 East, and extends into Section 16 on the east, Sections 18 and 19 to the west and Section 20 to the south (See maps). Highway 15 crosses the eastern edge of the area in a north-south direction. The Illinois Central Gulf Railroad, also running north-south, is near the eastern boundary of the Bay Springs site.

The Bay Springs site is composed of approximately 700 discontinuous acres. The site was divided into seven principal areas in order to indicate feasibility and to estimate the volume of limestone more accurately. Since the Bay Springs site is dissected by public roads this fact was taken into consideration while estimating the volume of obtainable limestone. A buffer zone 200 feet to either side of existing roads was not included in the acreage suitable for possible development. This buffer zone would protect roadside residences as well as assure the stability of the roads. Test hole data indicated that the material underlying many of the roads contained varying amounts of montmorillonitic clay which if disturbed could result in massive slumping. Other acreage not included was that which contained churches, cemeteries, residences and barns. The acreage in Section 16 which is occupied by the Bay Springs Industrial Park was also considered unfeasible for obtaining agricultural limestone. This is due to the presence in the Park of existing industry, existing water and sewage lines, sewage disposal system, and the water well and storage tank for the public water system.

The limestone and marl exposed in the Bay Springs area belong to the Oligocene age Vicksburg Group which crops out in an irregular belt from Vicksburg to Waynesboro, Mississippi. The formations containing the limestone and marl are the Glendon and the Marianna-Mint Spring. The Marianna and Mint Spring share a facies relationship throughout the Vicksburg outcrop belt in Mississippi. In the Bay Springs area, the Mint Spring with its glauconite and quartz sand is more apparent than it is to the east. The Glendon, which is characteristically hard limestone ledges with soft interbeds, shows signs of severe erosion in the Bay Springs area. In many of the test holes the Glendon was not present due to this erosion. The Marianna is mostly soft marl with occasional limestone ledges. In some test holes the Marianna and Glendon are both missing. The Glendon and Marianna, where both are present, are thinner in the Bay Springs area than toward the east. The chemical analyses from a core hole in the area indicate that both the Glendon and the Marianna contain $CaCO_3$ in sufficient percentages to make them suitable for use as agricultural lime.

Area 1 lies along an east-west ridge with about two-thirds of its acreage in Section 18 and the remainder in Section 17. It contains approximately 165 acres. The portion of Area 1 in Section 18 is mostly covered with timber. Phaltie Church and Cemetery are in this portion. The portion of Area 1 in Section 17 is used as residential sites, pasture and timberland. Most of the land is privately owned. Area 1, excluding the buffer zone, is underlain by 2,233,583 cubic yards of limestone and marl. The overburden is 1,377,851 cubic yards.

Area 2, which contains approximately 60 acres, is located mostly in the northeast quarter of Section 17, Township 2 North, Range 10 East. The land is presently utilized predominantly as pasture land. Some of the rougher terrain is in timber. An abandoned limestone quarry is visible at this location. The land is under private ownership. This area, excluding the buffer zone, is underlain by 1,811,319 cubic yards of limestone and marl. The overburden is 561,137 cubic yards. The upper limestone contains cavities as indicated by a visible cave in the abandoned quarry and by test hole data.

Area 3 is in the northeastern corner of Section 17. This study area originally included the western part of Section 16 which was determined to be unfeasible because of its utilization as an industrial park. Area 3 contains approximately 65 acres. It is utilized as residences, pasture, and timberland. An estimated 481,537 cubic yards of limestone and marl underlie Area 3 outside the buffer zones. The overburden is 224,086 cubic yards.

Area 4 extends from the east central portion to the southeast portion of Section 17. It contains approximately 100 acres. Most of this acreage is improved pasture land. This area, excluding the buffer zone, is underlain by approximately 1,422,388 cubic yards of limestone and marl. The overburden is 1,940,893 cubic yards.

Area 5, which contains approximately 130 acres, includes the central and southwest part of Section 17. The terrain in this area is rugged. The land is mostly forested except for a strip along the asphalt county road which is utilized as residential sites and pasture. Test Hole LT-40 located in this area revealed the thickest limestone and marl section in the Bay Springs area. Area 5, excluding the buffer zone, contains an estimated 4,018,986 cubic yards of limestone and marl overlain by 4,457,868 cubic yards of overburden.

Area 6 is located in the southeast corner of Section 18, the northeast corner of Section 19, and the northwest corner of Section 20. It contains approximately 40 acres. The entire area is forested. An estimated 983,446 cubic yards of limestone and marl is overlain by 851,901 cubic yards of overburden. Test Hole LT-48 in this area failed to penetrate any limestone or marl. This would indicate severe channeling in this location.

Area 7 is located in the southwest part of Section 18 and the northwest part of Section 19. It contains approximately 220 acres. The land is being utilized as residential sites, a small amount of crop production, and timber production. The terrain is rugged. An abandoned limestone quarry is visible near the center of the southwest quarter of Section 18. The southern part of Area 7 contains a number of residences. Area 7, excluding the buffer zone, is estimated to contain 3,589,301 cubic yards of limestone and marl overlain by 2,776,180 cubic yards of overburden.

HEIDELBERG AREA

A prospective agricultural lime site was investigated southeast of, and partially in, the town of Heidelberg in southeastern Jasper County. Most of the study area is located in Section 2, Township 10 North, Range 10 West. The area extends into Section 3 to the west and Section 1 to the east. Highway 11 traverses the site in a northeast-southwest direction. The Southern Railroad is located one-half mile west of the western boundary of the site.

Approximately 600 discontinuous acres are included in the Heidelberg site. To facilitate calculations and indicate feasibility the maps dealing with this site show seven principal areas where limestone is most readily available.

The limestone exposed in the Heidelberg area is of the Vicksburg Group of Oligocene age. The formations represented are the Glendon and Marianna-Mint Spring. The Marianna and Mint Spring share a facies relationship throughout the Vicksburg outcrop belt in Mississippi. The Glendon is characteristically hard limestone ledges with soft interbeds whereas the Marianna is softer and more homogeneous. Chemical analyses of samples from both formations indicate that the $CaCO_3$ content of the limestone in this area is well within acceptable limits for agricultural purposes.

Area 1, which contains approximately 140 acres, is located along the section line dividing Sections 2 and 3 and extends into the corporate limit of Heidelberg. Most of the acreage involved is privately owned and is being utilized primarily as pasture, but includes some forest land. The available limestone in Area 1 was calculated to be 5,209,263 cubic yards with 379,673 cubic yards of overburden. The upper part of the limestone contains cavities.

Area 2 contains approximately 70 acres and is located to the east of Area 1 in the northwest quarter of Section 2. An asphalt road divides the area into an eastern portion and a western portion. Several private residences are located along the west side of the road. Much of the eastern half of Area 2 is undeveloped and privately owned. Area 2 contains 538,744 cubic yards of limestone overlain by 177,797 cubic yards of overburden.

The acreage southeast of Highway 11 in Section 2 was divided into three study areas which were designated Area 3, Area 3a, and Area 3b. Area 3 contains approximately 150 acres and is the largest of the aforementioned areas. It is located in the east central part of Section 2. Area 3 is traversed by a power line and gas line. The majority of this land is forested. Much of the timberland is owned by Masonite Corporation. The improved pasture land in the northeast part of Area 3 is owned individually.

Area 3 is underlain by 2,718,774 cubic yards of limestone. It has 5,291,361 cubic yards of overburden.

Area 3a is located north of Area 3. This area is utilized as improved pasture land, and is privately owned. An estimated 346,337 cubic yards of limestone are overlain by 29,629 cubic yards of overburden. The surface area is about 33 acres.

Area 3b adjoins Area 3 on the southwest. This is an undeveloped area underlain by 185,162 cubic yards of limestone. The overburden is 170,388 cubic yards. The surface area is about 20 acres.

Area 4 is located between the section line dividing Sections 1 and 2 and the county road in Section 1. It encompasses about 60 acres. Most of this land is improved pasture land under private ownership. The southernmost part is covered with timber. Area 4 is underlain by 1,148,282 cubic yards of mineable limestone. Overlying the limestone is 1,965,102 cubic yards of overburden.

The land to the east of the county road in Section 1 is designated as Area 4a. It contains approximately 120 acres of land which is mostly in timber. It is underlain by 2,527,879 cubic yards of mineable limestone with 4,263,390 cubic yards of overburden.

Test Hole Number	Thickness of Limestone & Marl		Overburden	Elevation Top of Lime
	Above Natural Drainage	Total		
LT-28	42	42	8	427
LT-28A**	42	42	8	427
LT-29	18	18	41	398
LT-30*	25	25	45	410
LT-31*	22	22	38	407
LT-32	42	42	34	396
LT-33*	20	20	39	366
LT-34***	21	21	29	396
LT-35	15	15	25	405
LT-36	10	10	52	413
LT-37	34	34	38	393
LT-38	0	0	0	-
LT-39	25	25	49	396
LT-40	45	45	52	408
LT-41**	0	0	0	-
LT-42	17	17	42	393
LT-43	16	16	64	396
LT-44	0	0	0	-
LT-45	20	20	40	405
LT-46*	40	40	46	414
LT-47*	30	30	67	405
LT-48***	0	0	0	-
LT-49***	36	36	14	401

*Estimated
**Core
***Samples

Average thickness of limestone and marl 26 feet.

Table 1 - Bay Springs Area Test Hole Data Summary (Based on quality of limestone and marl as determined from electrical logs and drill cuttings).

Calculation Area No.	Location	Cubic Yards
1	Sec. 17 & 18, T. 2 N., R. 10 E.	2,233,583
2	Sec. 17, T. 2 N., R. 10 E.	1,811,319
3	Sec. 17, T. 2 N., R. 10 E.	481,537
4	Sec. 17, T. 2 N., R. 10 E.	1,422,388
5	Sec. 17, T. 2 N., R. 10 E.	4,018,986
6	Sec. 18, 19 & 20, T. 2 N., R. 10 E.	983,446
7	Sec. 18 & 19, T. 2 N., R. 10 E.	3,589,301
	Total	14,540,560

Table 2 - Estimated Volume of Limestone and Marl in Vicksburg Group (Bay Springs Area).

Calculation Area No.	Location	Cubic Yards
1	Sec. 18 & 19, T. 2 N., R. 10 E.	1,377,851
2	Sec. 17, T. 2 N., R. 10 E.	561,137
3	Sec. 17, T. 2 N., R. 10 E.	224,086
4	Sec. 17, T. 2 N., R. 10 E.	1,940,893
5	Sec. 17, T. 2 N., R. 10 E.	4,457,868
6	Sec. 18, 19 & 20, T. 2 N., R. 10 E.	851,901
7	Sec. 18 & 19, T. 2 N., R. 10 E.	2,776,180
	Total	12,189,916

Table 3 - Estimated Volume of Overburden (Bay Springs Area).

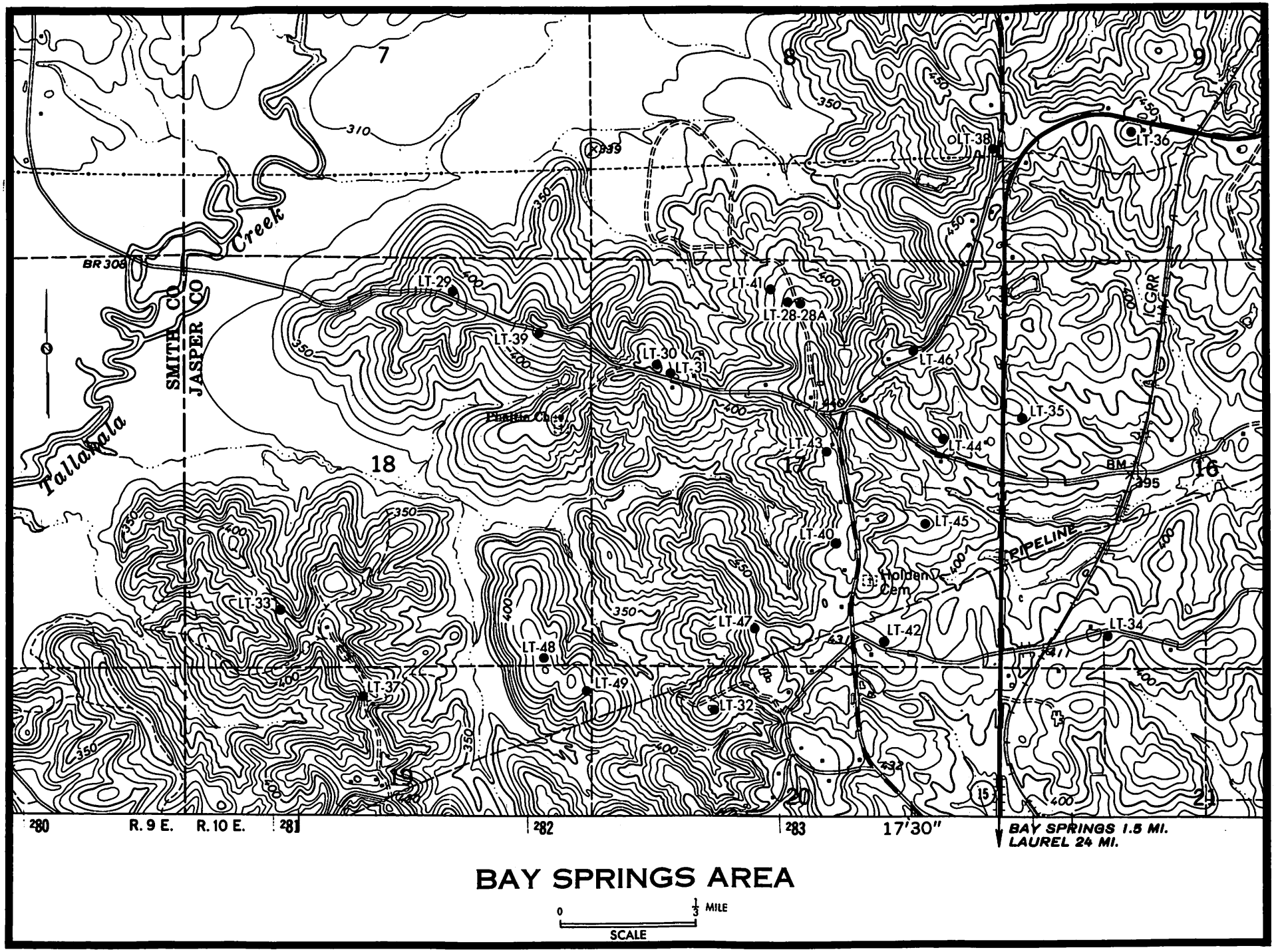

Figure 4 – Topographic Map.

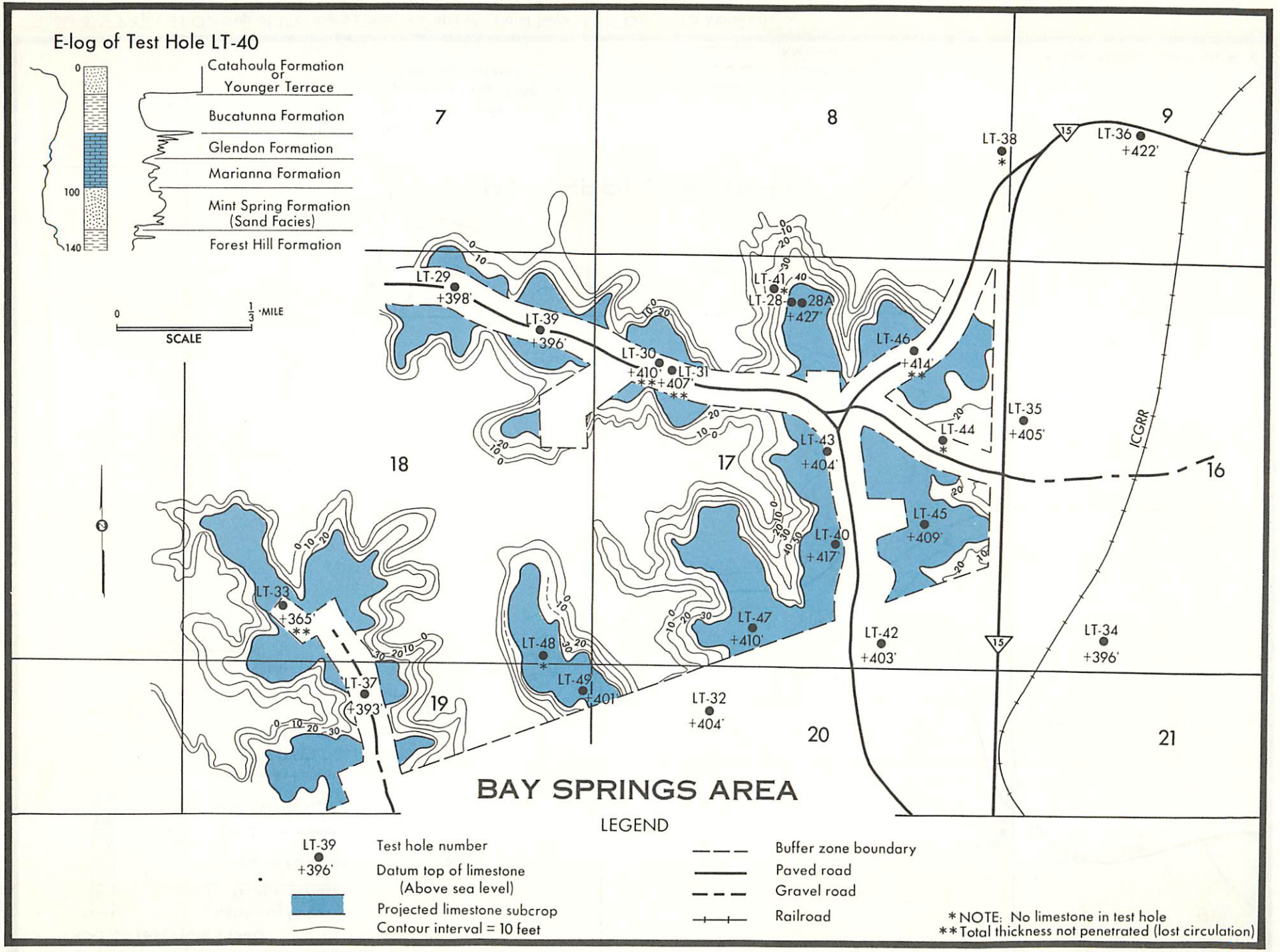

Figure 5 - Projected Subcrop and Isopach of Vicksburg Limestone and Marl.

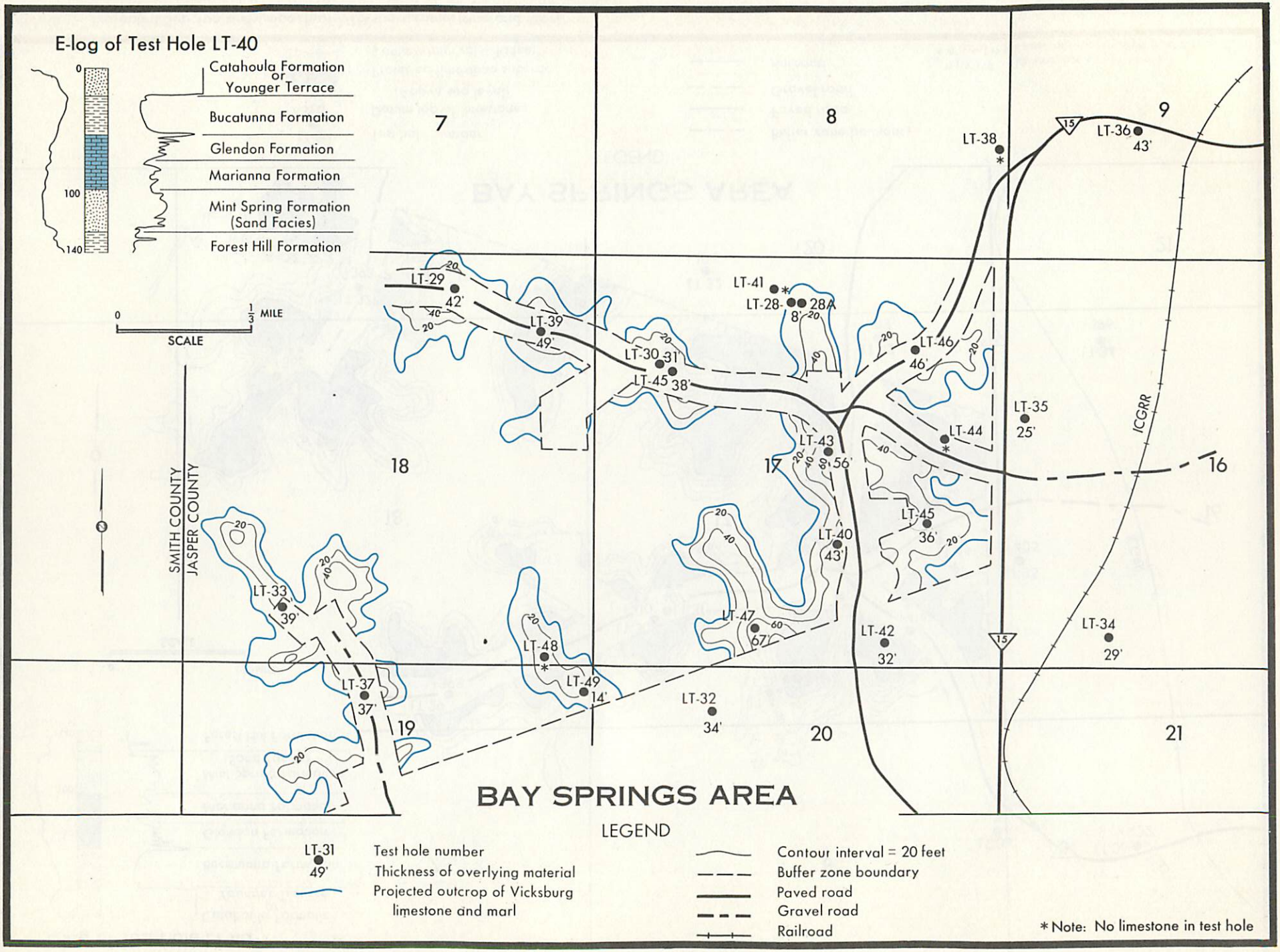

Figure 6 - Projected Outcrop of Vicksburg Limestone and Marl and Isopach of Overlying Material.

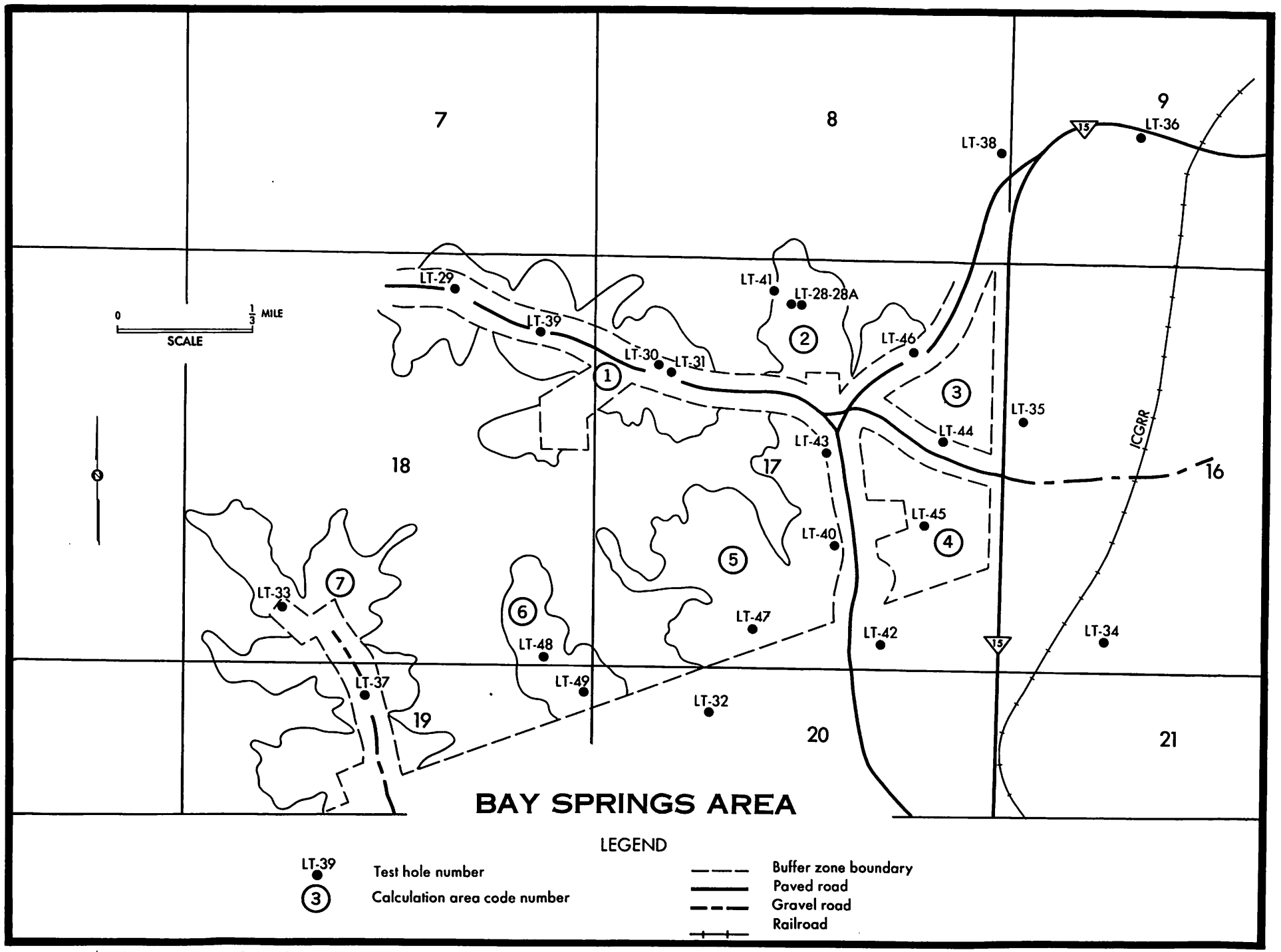

Figure 7 – Calculation Areas for Volume of Limestone and Marl (Calculations based on Estimates of Availability, Quality, Elevation Above Natural Drainage, and Limestone to Overburden Ratio).

Test Hole Number	Thickness of Limestone & Marl		Overburden	Elevation Top of Lime
	Above Natural Drainage	Total		
LT-10	0	60	77	263
LT-11	20	60	56	374
LT-12	40	45	0	375
LT-13*	47	50	3	387
LT-14*	24	50	36	354
LT-15*	27	50	38	357
LT-16	60	62	2	389
LT-17	0	0	0	-
LT-18	20	60	35	360
LT-19**	47	52	2	393
LT-20	0	60	111	329
LT-21	0	56	23	332
LT-22	10	60	57	358
LT-23	0	59	72	348
LT-24	0	60	64	346
LT-25*	30	60	9	366
LT-26*	20	60	15	350
LT-27*	25	60	20	365

*Estimated
**Core

Average thickness Glendon 25 ft. Marianna 30 ft.

Table 4 - Heidelberg Area Test Hole Data Summary (Based on Quality of Limestone and Marl as Determined from Electrical Logs and Drill Cuttings).

Calculation Area No.	Location	Cubic Yards
1	Sec. 2 & 3, T. 10 N., R. 10 W.	4,769,323
2	Sec. 2, T. 10 N., R. 10 W.	538,744
3	Sec. 2, T. 10 N., R. 10 W.	2,718,778
3a	Sec. 2, T. 10 N., R. 10 W.	346,337
3b	Sec. 2, T. 10 N., R. 10 W.	185,162
4	Sec. 1, T. 10 N., R. 10 W.	1,148,282
4a	Sec. 1, T. 10 N., R. 10 W.	2,527,879
	Total	12,150,310

Table 5 - Estimated Volume of Limestone and Marl in Vicksburg Group (Heidelberg Area).

Calculation Area No.	Location	Cubic Yards
1	Sec. 2, T. 10 N., R. 10 W.	379,673
2	Sec. 2, T. 10 N., R. 10 W.	177,797
3	Sec. 2, T. 10 N., R. 10 W.	5,291,361
3a	Sec. 2, T. 10 N., R. 10 W.	29,629
3b	Sec. 2, T. 10 N., R. 10 W.	170,388
4	Sec. 1, T. 10 N., R. 10 W.	1,965,102
4a	Sec. 1, T. 10 N., R. 10 W.	4,263,390
	Total	12,277,340

Table 6 - Estimated Volume of Overburden (Heidelberg Area)

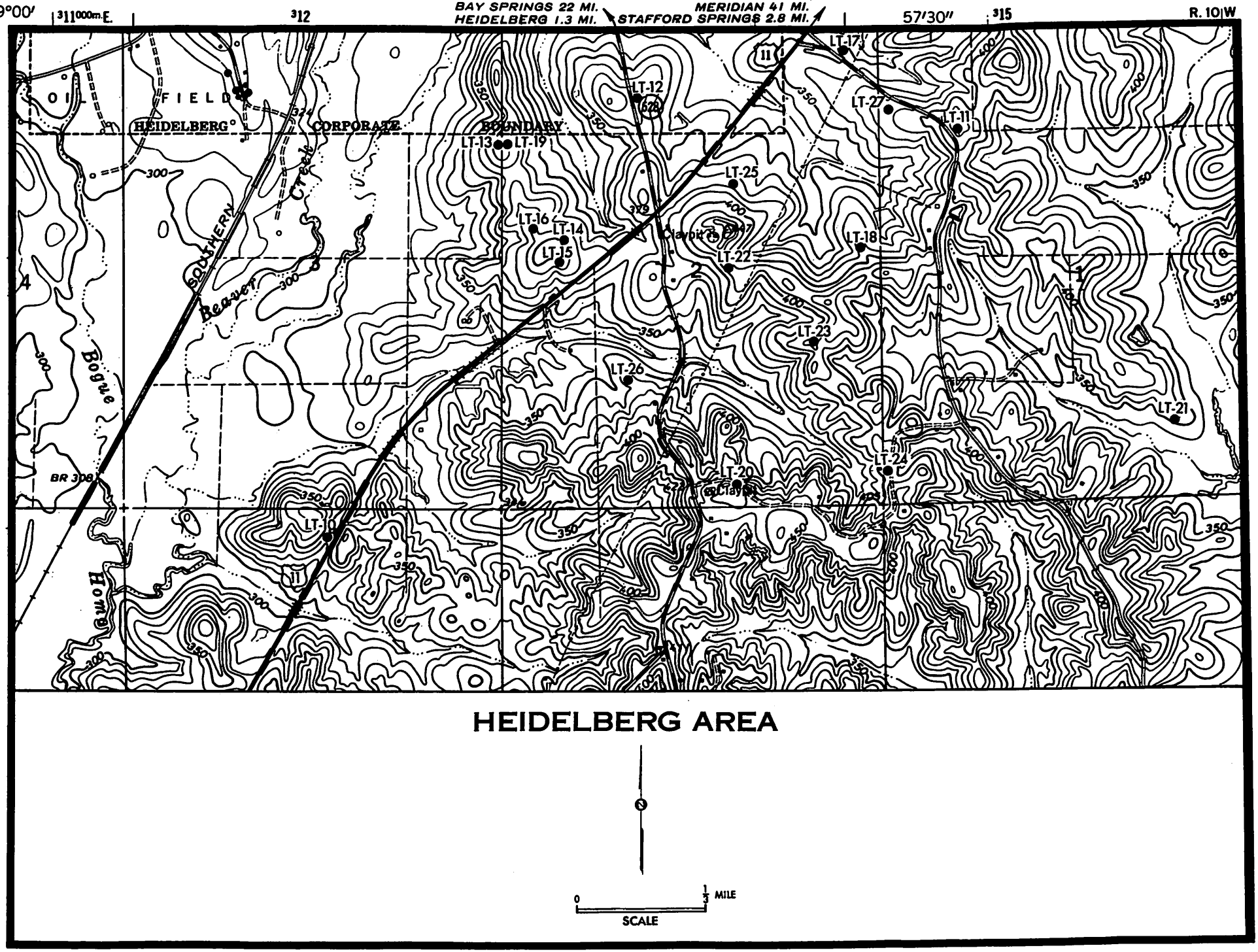

Figure 8 – Topographic Map of Heidelberg Area.

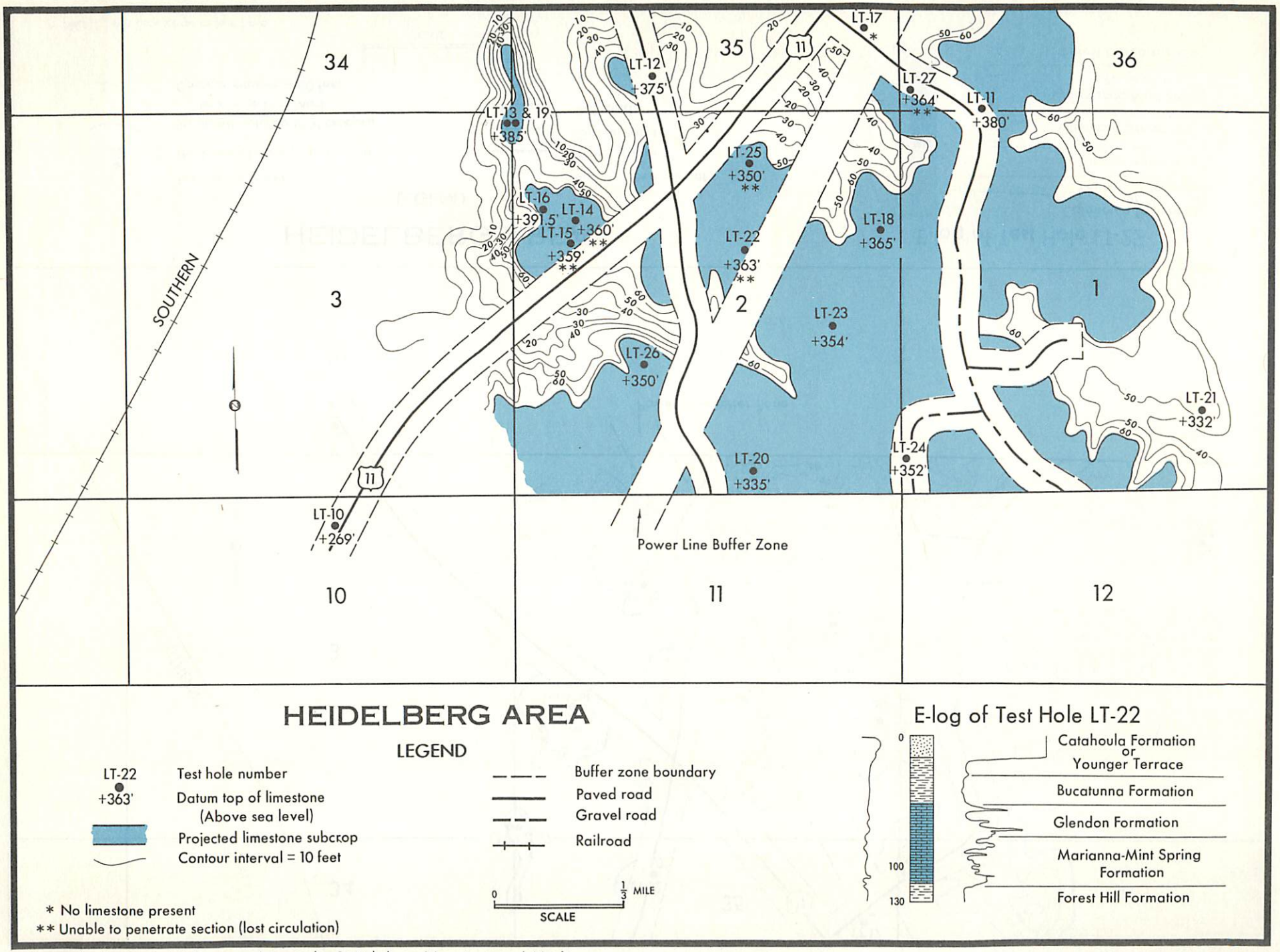

Figure 9 - Projected Subcrop and Isopach of Vicksburg Limestone and Marl.

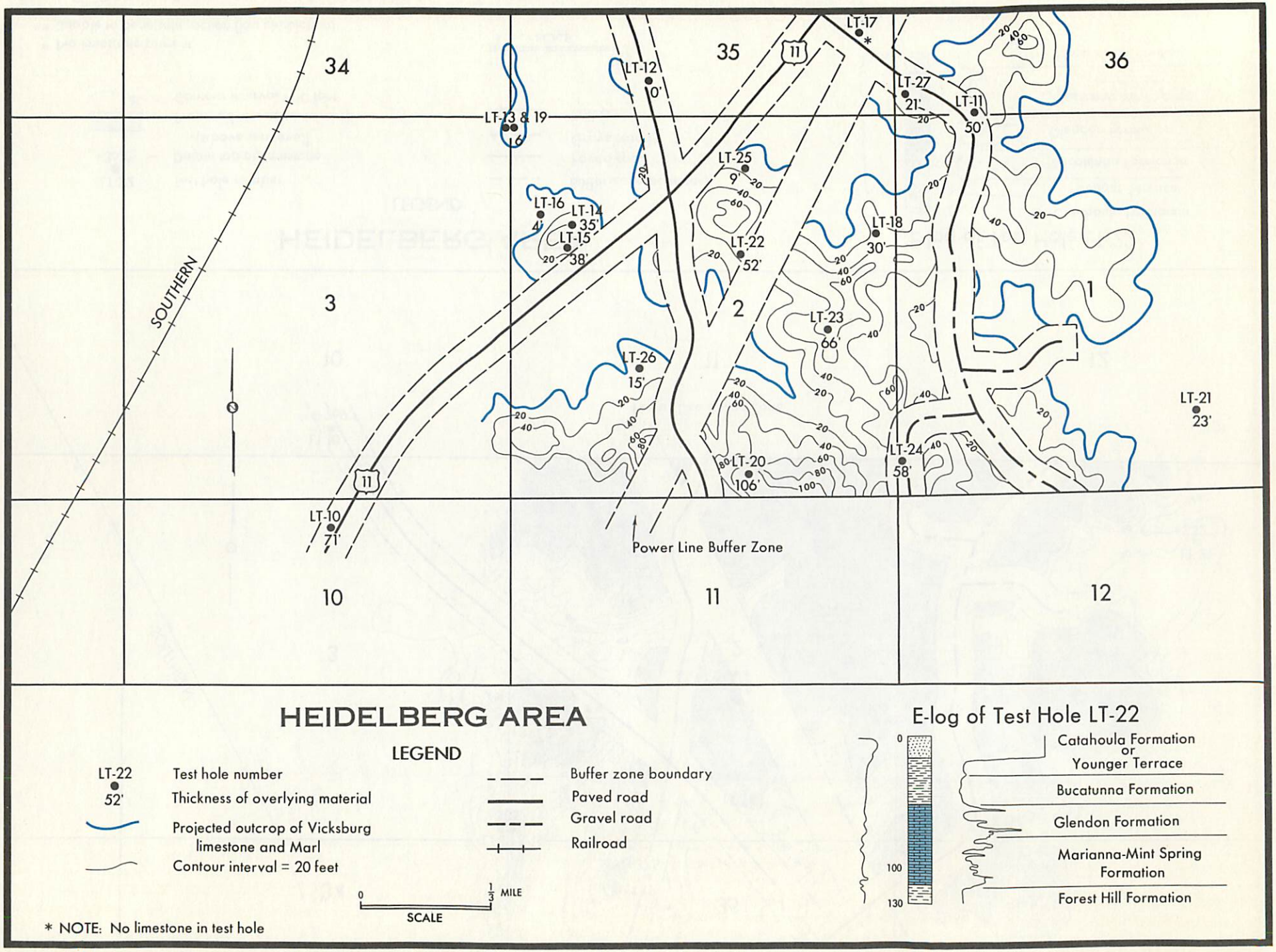

Figure 10 – Projected Outcrop of Vicksburg Limestone and Marl, and Isopach of Overlying Material.

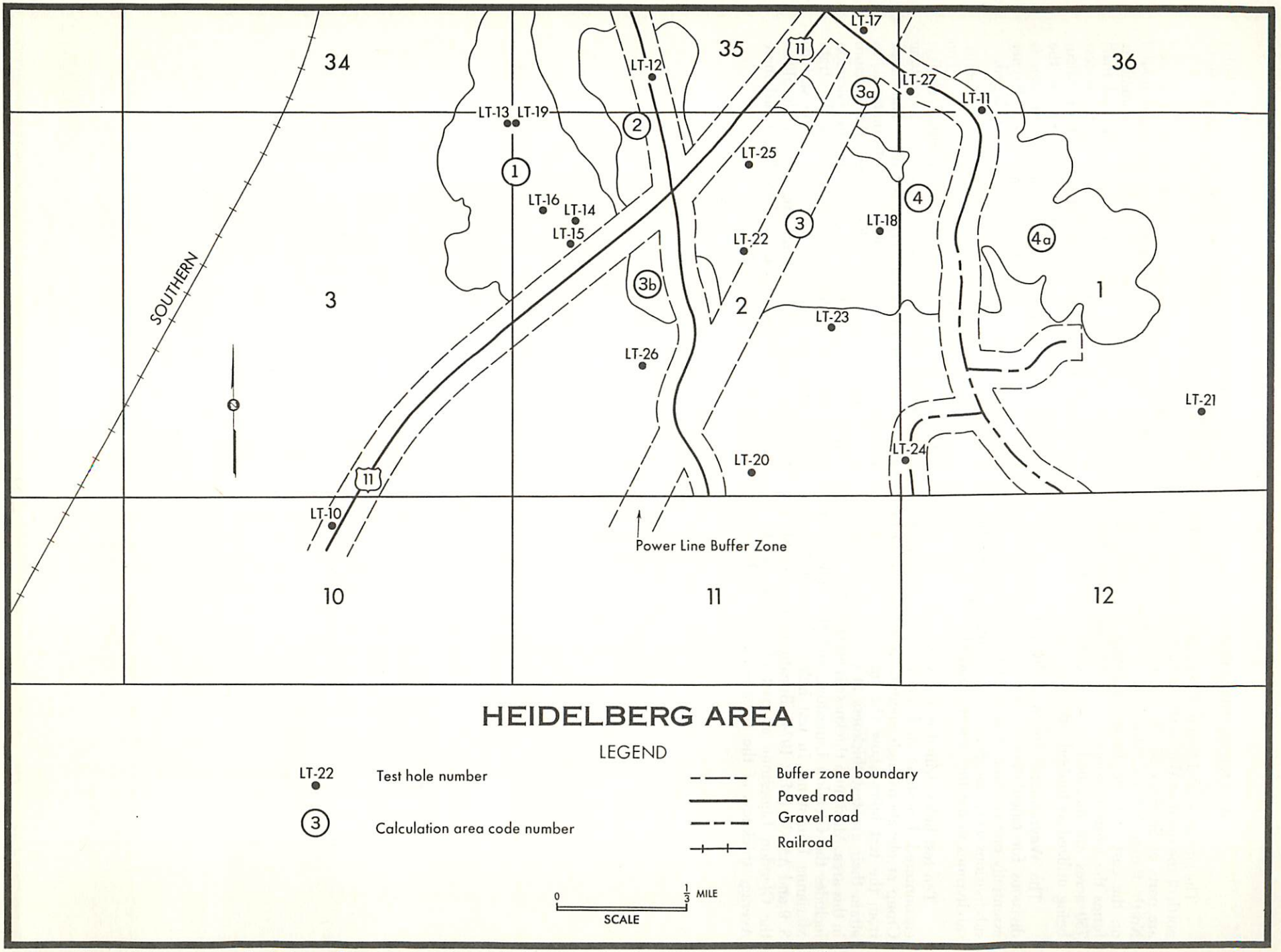

Figure 11 - Calculation Areas for Volume of Limestone and Marl (Calculations based on Estimates of Availability, Quality, Elevation above Natural Drainage, and Limestone to Overburden Ratio).

WAYNESBORO AREA

The site is located two to three and one-half miles north of the town of Waynesboro. Included in the area are parts of Sections 23, 24, 25 and 26, Township 9 North, Range 7 West. Highway 45 adjoins the area on the east and the Illinois Central Gulf Railroad forms the western boundary of the area. More than 750 acres are included in the tract. All acreage is being utilized as timberland.

The Waynesboro site was divided into 8 subdivisions for calculation purposes. Since this site is essentially one continuous tract of land the individual subdivisions were not discussed separately as were the subdivisions in the Bay Springs and Heidelberg areas.

Ten test holes drilled in the Waynesboro area all encountered limestone and marl of the Vicksburg Group at elevations high enough to be mined. Data from the test holes show the limestones and marls attain their greatest thickness at or near the surface in this area. Maximum thickness is 80 feet. The section includes the Glendon Limestone and the underlying Marianna Limestone. In test hole numbers LT-3, 6, 8, 9 and AM-32 (May 1974) Bucatunna Clay overlies the Glendon Limestone as part of the overburden. Average thickness of the Bucatunna Clay is 20 feet. At the localities of the remainder of the test holes overburden consists of terrace material from 0 to 33 feet thick.

Limestone and marl of the Chickasawhay and Paynes Hammock Formations were encountered overlying the Bucatunna Clay in test hole numbers LT-3, 6, 8, 9 and AM-32. This limestone and marl section is from 20 to 35 feet thick in these test holes. The Chickasawhay Formation has been calculated to underlie approximately 500 acres in the southern part of the area. The Waynesboro area is the only site where the Chickasawhay and Paynes Hammock Formations are significantly developed.

The Glendon consists of crystalline, fossiliferous, hard limestone ledges with soft interbeds. The Marianna Limestone is soft, fossiliferous, chalky, and more homogeneous than the Glendon. Limestone and marl of the Chickasawhay and Paynes Hammock Formations are similar in composition to materials in the Glendon. Chemical analyses show the calcium carbonate content of the materials in the Glendon Formation to be slightly higher than that in the strata of the Marianna Formation. At or near the surface the upper part of the formations at some localities has been weathered and if so, the calcium carbonate may be less due to leaching.

Test Hole Number	Thickness of Limestone & Marl			Overburden	Elevation Top of Lime (Vicksburg)
	Above Natural Drainage	Total	Chickasawhay		
LT-1	43	66		22	213
LT-2*	30	54		19	196
LT-3	65	78	35	57	188
LT-4**	50	64		0	230
LT-5	45	58		24	191
LT-6	60	80	22	22	205
LT-7*	37	51		33	217
LT-8	56	78	22	34	206
LT-9	44	70	20	64	184
AM-16	30	30		70	188
AM-32	30	68	20	60	167

*Estimated
**Core

Note: Chickasawhay-Paynes Hammock interval not included in overburden figures.

Average thickness Glendon 30 ft. Marianna 50 ft.

Table 7 - Waynesboro Area Test Hole Data Summary (Based on Quality of Limestone and Marl as Determined from Electrical Logs and Drill Cuttings).

Calculation Area No.	Location	Cubic Yards
1	Sec. 24, T. 9 N., R. 7 W.	5,148,749
2	Sec. 24, T. 9 N., R. 7 W.	3,292,976
3	Sec. 23, T. 9 N., R. 7 W.	4,774,632
4	Sec. 23, T. 9 N., R. 7 W.	1,633,521
5	Sec. 26, T. 9 N., R. 7 W.	1,666,861
6	Sec. 25, T. 9 N., R. 7 W.	8,845,477
7	Sec. 25, T. 9 N., R. 7 W.	3,509,669
8	Sec. 26, T. 9 N., R. 7 W.	1,972,451
	Total	30,844,336

Table 8 - Estimated Volume of Limestone and Marl in Vicksburg Group (Waynesboro Area).

Calculation Area No.	Location	Cubic Yards
1	Sec. 24 & 25, T. 9 N., R. 7 W.	1,724,274
2	Sec. 25 & 26, T. 9 N., R. 7 W.	4,607,945
	Total	6,332,219

Table 9 - Estimated Volume of Limestone and Marl in the Chickasawhay - Paynes Hammock Formations (Waynesboro Area).

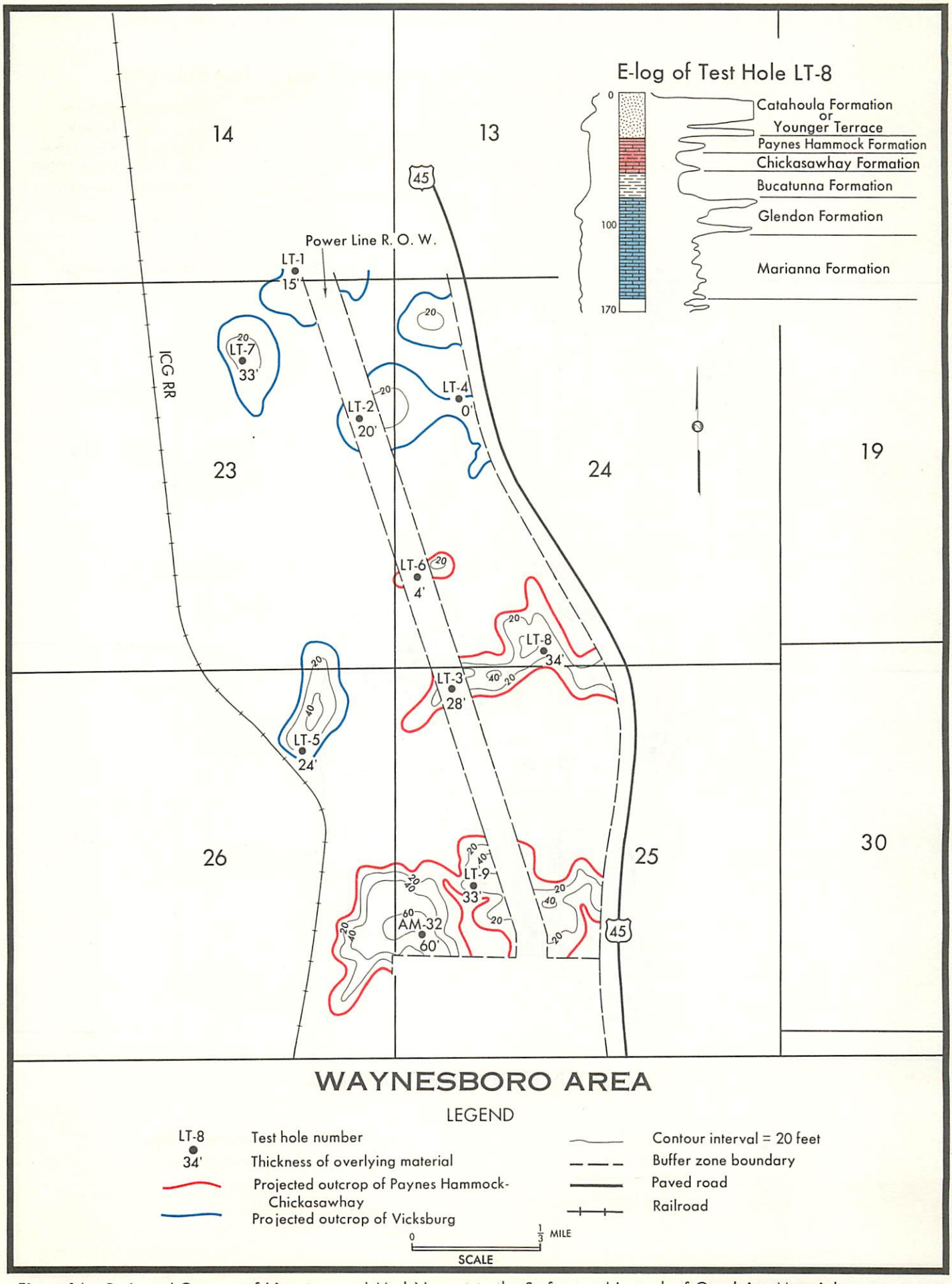

Figure 14 - Projected Outcrop of Limestone and Marl Nearest to the Surface and Isopach of Overlying Material.

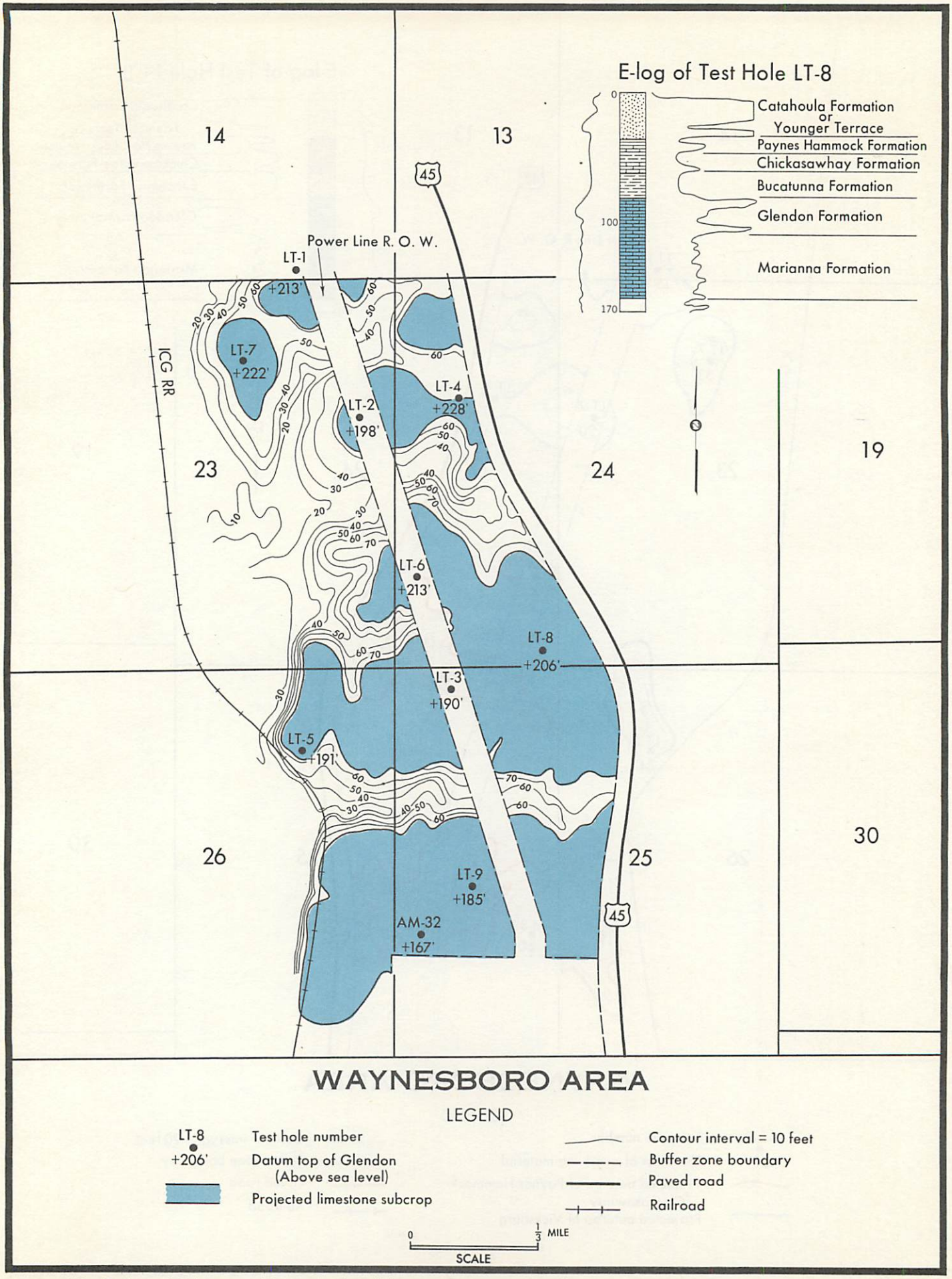

Figure 13 – Projected Subcrop and Isopach of Vicksburg Limestone and Marl.

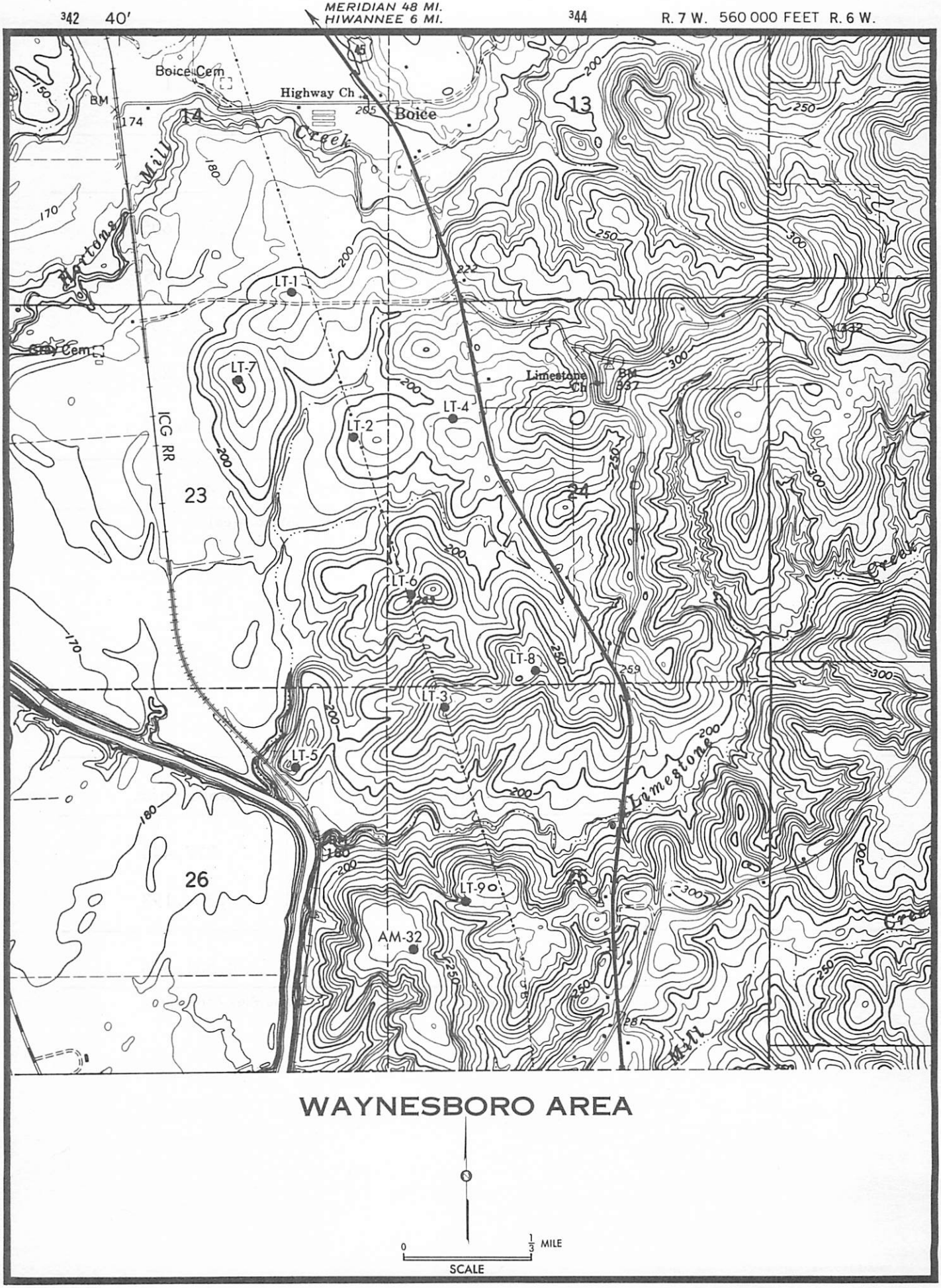

Figure 12 – Topographic Map of Waynesboro Area.

Calculation Area No.	Location	Cubic Yards
1	Sec. 23, T. 9 N., R. 7 W.	1,707,605
2	Sec. 23, T. 9 N., R. 7 W.	640,815
3	Sec. 24 & 25, T. 9 N., R. 7 W.	5,556,204
4	Sec. 25 & 26, T. 9 N., R. 7 W.	4,333,839
5	Sec. 26, T. 9 N., R. 7 W.	185,206
	Total	12,423,669

Table 10 - Estimated Volume of Overburden Overlying Vicksburg Group (Waynesboro Area).

Calculation Area No.	Location	Cubic Yards
1	Sec. 24 & 25, T. 9 N., R. 7 W.	327,443
2	Sec. 25 & 26, T. 9 N., R. 7 W.	4,204,193
	Total	4,531,636

Table 11 - Estimated Volume of Overburden Overlying Paynes Hammock-Chickasawhay Formations. (Waynesboro Area)

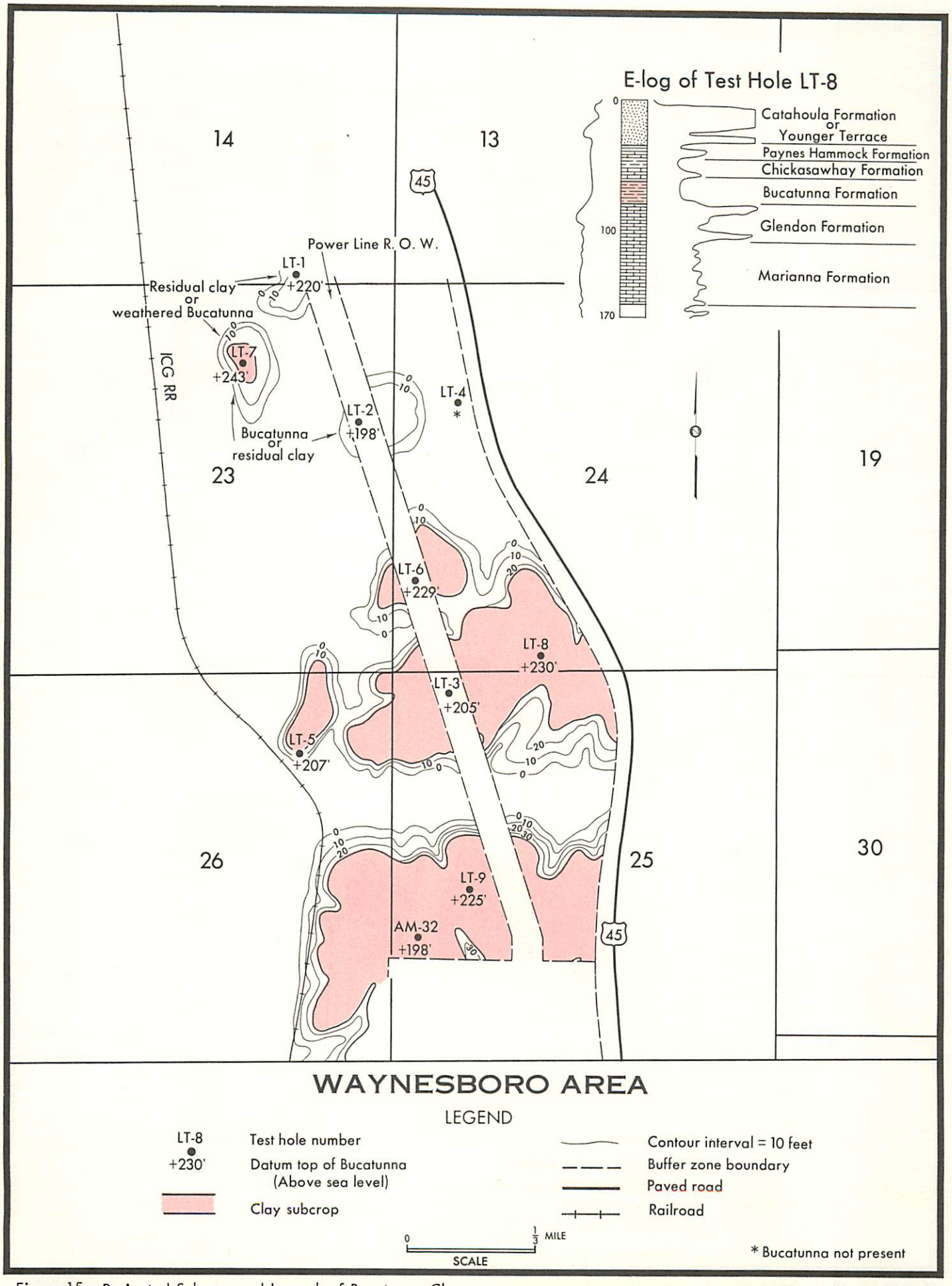

Figure 15 - Projected Subcrop and Isopach of Bucatunna Clay.

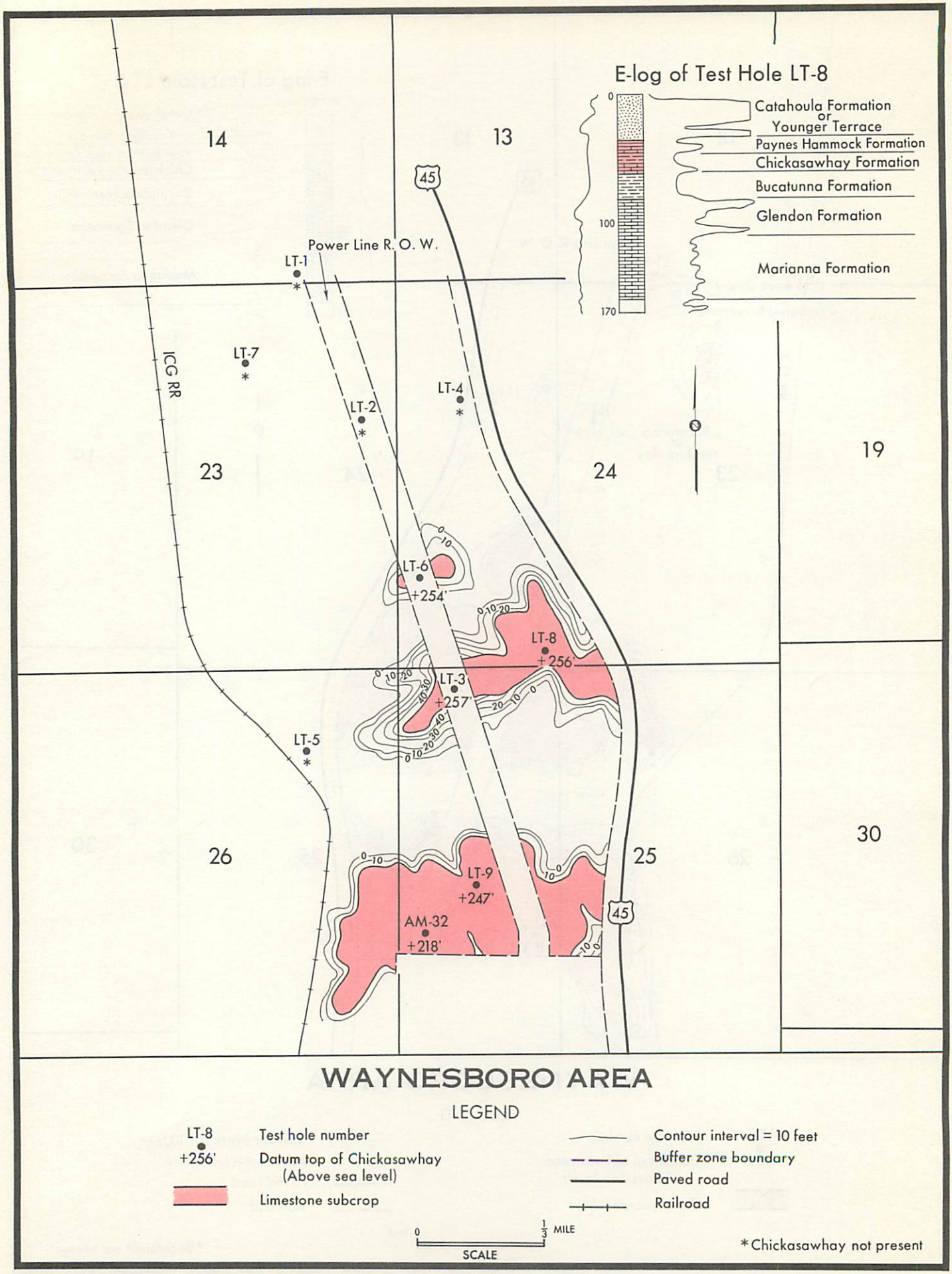

Figure 16 - Projected Subcrop and Isopach of Chickasawhay-Paynes Hammock Limestone and Marl.

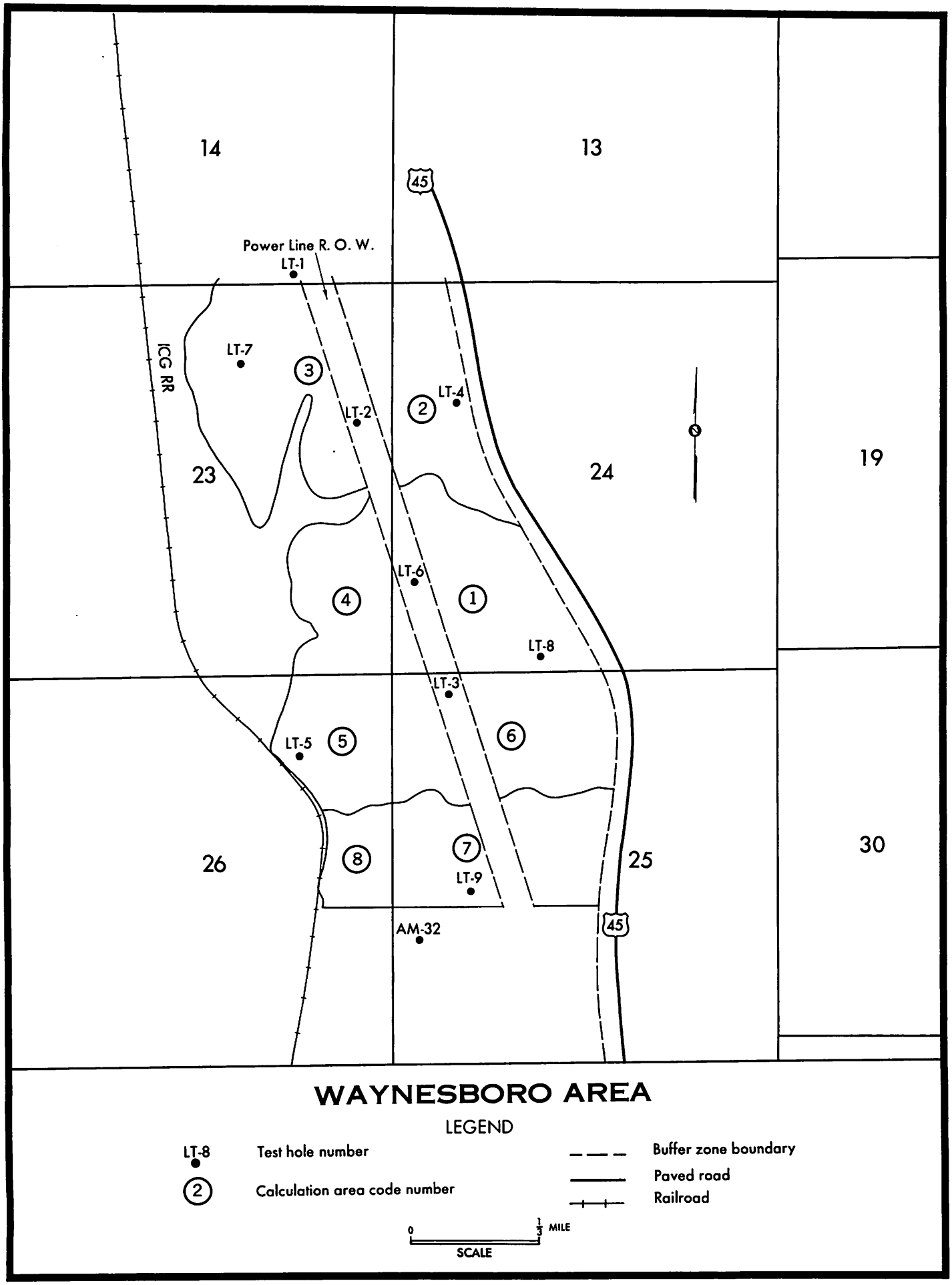

Figure 17 - Calculation Areas for Volume of Limestone and Marl (Vicksburg) - Calculations based on Estimates of Availability, Quality, Elevation above Natural Drainage, and Limestone to Overburden Ratio.

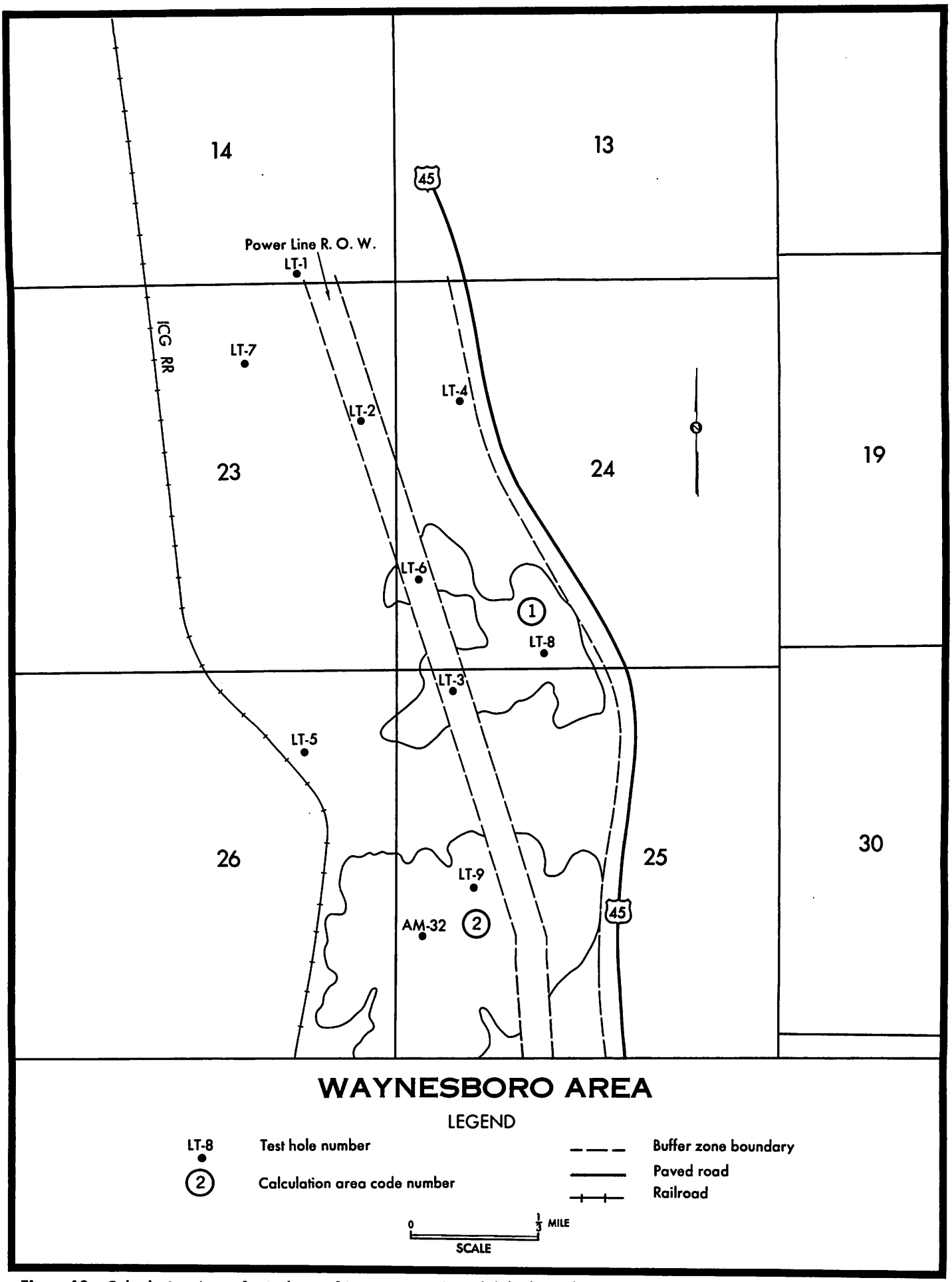

Figure 18 - Calculation Areas for Volume of Limestone and Marl (Chickasawhay) - Calculations based on Estimates of Availability, Quality, Limestone to Overburden Ratio, and Elevation above Natural Drainage.

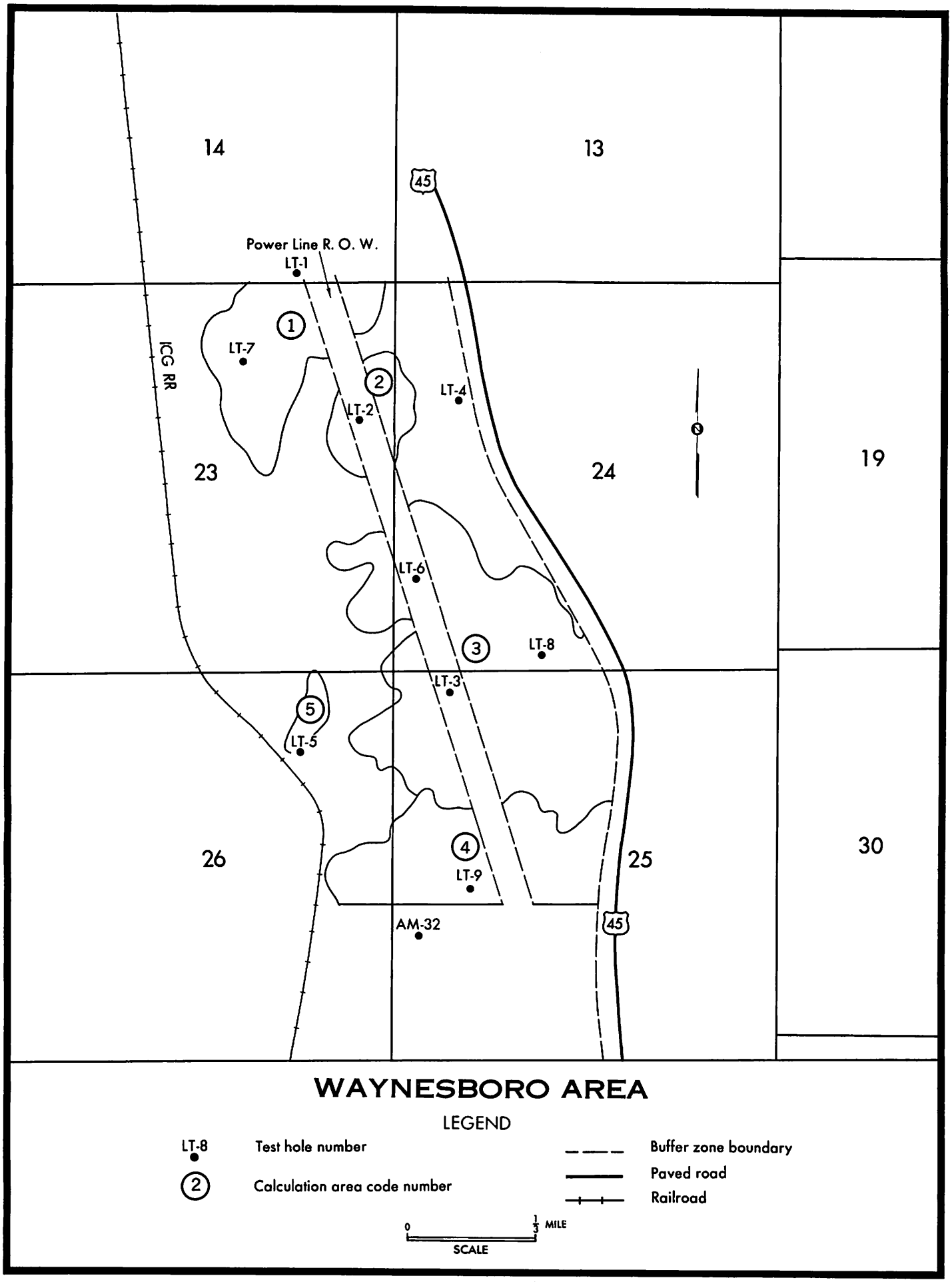

Figure 19 - Calculation Areas for Volume of Overburden Overlying Vicksburg Limestone and Marl (Volume of Bucatunna not Calculated).

SUMMARY AND RECOMMENDATIONS

Using guidelines of the Division of Lime, Mississippi Department of Agriculture and Commerce, the Geological Survey investigated three areas as potential sites for the location of an agricultural lime plant. Guidelines considered were amount of lime-bearing materials available, proximity of rail transportation and acreage acquisition. The nearness of rail transportation should be self-explanatory. Acreage acquisition for plant and limestone reserves will be by lease method with royalty payments to the mineral owner. This method is being employed by the Agriculture Department at their existing lime plants.

Using these guidelines to calculate the volume of mineable limestone, the area near Heidelberg was eliminated as a prospective site due to present day land use patterns. Much of the area is adjacent to roadways which would need to be protected by a buffer zone and is also the site of a number of residences which must be considered. In addition the low limestone volume to overburden ratio, the total limestone reserve, and added transportation costs involved with changing railroads were other factors in the decision to eliminate the Heidelberg area from further consideration. The total volume of limestone and marl in the Heidelberg area was calculated to be 12,150,310 cubic yards. Overburden was calculated as 12,277,340 cubic yards.

The following table shows the comparison of the calculated volume of mineable limestone available at the Bay Springs and Waynesboro sites:

	Bay Springs	Waynesboro
Mineable limestone	14,540,560 Cu. Yards	37,176,555 Cu. Yards
Overburden	12,189,916 Cu. Yards	16,955,305 Cu. Yards
Total acres to be mined	694	766

Comparison of the chemical analyses by the Mississippi State Chemical Laboratory are as follows:

Bay Springs Area

Footage Interval	$CaCO_3$ Percent
Glendon Fm.	
7'-11'	93.6
Marianna Fm.	
13'-21'	79.0
21'-27'	82.6
27'-42'	84.0

Waynesboro Area

Footage Interval	$CaCO_3$ Percent
Glendon Fm.	
0-28'	95.0
Marianna Fm.	
28'-32'	93.0
32'-46'	88.0
46'-62'	62.5

Examination of test hole data shows the section of limestone and marl to be more consistent in thickness and more homogeneous in the Waynesboro Area than in the Bay Springs Area. Average thickness of mineable material in the Bay Springs Area is 26 feet, whereas at Waynesboro the average thickness is 46 feet. This thickness somewhat reflects geologic conditions existing at the sites. At the Bay Springs locality the thin sections of limestone and marl are in part the result of erosion. In many areas the upper part of the limestone has been eroded and replaced by sand and/or clay. The less desirable lower part of the section is all that remains in many localities. This inconsistency is well illustrated by data from test hole numbers LT-29, 35, 36, 39, 41, 42, 43, 44, 45 and 48. Test holes LT-41, 44 and 48 are examples of extreme erosional conditions that may be encountered. In these test holes the limestone has been completely replaced by clay and/or sand. Test hole LT-41 was located less than 100 yards from test hole LT-28 which has a section of limestone and marl 42 feet thick. This illustrates the abruptness with which the section varies in the Bay Springs area. Much of the Bay Springs Area was inaccessible to the field party for drilling test holes because of the nature of the terrain and the forested conditions. Therefore, due to the known extreme erosional conditions existing in the area, the investigators feel that it is possible that other areas included in the calculations of the Bay Springs prospect may also be severely eroded. These conditions were not encountered in the area investigated near Waynesboro. Erosion encountered in this area was at the surface in the updip area of the outcrop. This erosion and leaching involved only the upper few feet and does not include all of the upper section. The Glendon or upper part of the limestone is present in all test holes drilled in the Waynesboro site.

Comparison of the calcium carbonate content of the materials involved shows the percent of calcium carbonate of the limestone to be greater in the Waynesboro Area than at Bay Springs. At Waynesboro the procedure of mining only that material above natural drainage will dictate that in most of the area only the upper part of the limestone will be mined. Chemical analyses show the upper part of the limestone at Waynesboro to contain 90 to 95 percent calcium carbonate. In the Bay Springs area all of the limestone section is above natural drainage and the entire section was included in the calculation of the volume of limestone. As much of the upper section at the Bay Springs site has been removed, only the lower section that contains a lower percentage of calcium carbonate remains. Analysis of the lower section shows the calcium carbonate to be in the low 80 percent zone and below.

Physical comparison of the two sites shows the following: At Waynesboro the limestone reserves are in one tract, adjacent to the railroad and U. S. Highway 45. Sufficient frontage and acreage for a 5,000 foot railroad spur is available on the site. Preparation of the road-bed for a rail spur would be at the lowest possible cost as terrain adjacent to the existing rail line is nearly flat. Access from Highway

45 to potential crusher and loading location would be accomplished with a roadway approximately three-quarters of a mile in length. An existing county road of approximately half this length adjoins the tract to the north. All mining operations would be conducted on the site without disruption of public vehicle traffic. The quarry floor will be limestone, allowing operations in more inclement weather. Quality control of mined limestone should be at a minimum. The electrical power line traversing the area from north to south should pose no problems to transportation during mining operations as the Survey drilling rig crossed under the power line at four different locations. Overburden to limestone ratio is approximately 1 to 2 over the entire area. However, during the early years of the plant life operating in the north end of the tract this ratio should be approximately 1 to 4, as there should be approximately 10 million cubic yards of available limestone compared to 2½ million cubic yards of overburden. Overburden will increase as mining operations progress to the south. If the area south of Limestone Creek were deleted the limestone reserves would be decreased by approximately 10,090,065 cubic yards and the overburden would be decreased by approximately 10,638,278 cubic yards. Calculations of limestone were conservative in regard to mining to depths above natural drainage and it is possible that the limestone reserve calculation could be greater. However, the thickness of limestone is sufficient for mining operations below natural drainage should this type of mining be contemplated.

At Bay Springs the limestone reserves are in seven scattered tracts, two of which adjoin Highway 15, neither of which would be centrally located for mining operations. None of the tracts adjoin the railroad and none are of sufficient length to accommodate a rail spur of 3,000 feet (recommended length of rail spur, personal communication Transportation Branch, Research and Development Center). A rail spur to any of the tracts would necessitate a crossing of Highway 15, and at least one county road, would involve property owners not included in the reserve tract, and be more costly due to road bed preparation because of terrain irregularities. Overburden immediately becomes a problem in mining operations. This problem is more acute in the Bay Springs area due to the more deeply dissected terrain. The overall overburden to limestone ratio is approximately 1 to 1 with 12,189,916 cubic yards of overburden to 14,540,560 cubic yards of limestone. The scattered tracts will necessitate additional cost of hauling limestone from quarry to crusher site. Experience of the Agriculture Department shows this cost to be from 14.8 to 16.8 cents per ton for a three mile and two mile haul, respectively. The three mile haul is by 10 ton truck and the two mile haul is by 5 ton truck. With a crusher site centrally located, these mileage figures would be appropriate for approximately three-fourths of the limestone mined. Much of this hauling could be accomplished on existing county roads. Such traffic would be a detriment to maintenance of these roads and would cause an additional traffic hazard in areas of rural residences. The varied depositional conditions encountered would pose a problem in quality control. In some instances the quarry floor would consist of clay which could delay quarry operations for a longer period of time during or after inclement weather.

Transportation data of crushed limestone shipped from State-operated lime plants for the period July 1, 1973 to June 30, 1974, shows that where rail transportation was available at the Macon plant, 26,325 tons were shipped by rail and 52,564 tons by truck. An additional 119,954 tons were shipped by truck from the West Point plant. For this period 15 per cent of the shipped limestone was by rail. Oral communications with the Department of Agriculture indicate that a large percentage of the limestone trucked from the West Point plant was to "Delta" destinations.

It should be noted that some areas of limestone reserves were deleted in the Bay Springs area. These buffer zones were omitted due to existing land use patterns. To acquire acreage under existing paved county roads, a State Highway, residences and other rural buildings would be prohibitive in cost. Under the Department of Agriculture proposed acreage acquisition of lease by royalty payment, these properties could not be acquired. The Department will experience enough difficulty in attempting to lease improved pasture land and land adjoining rural residences. There will be some twenty-six different land owners to negotiate leases with on the investigated tracts, some of whom may not agree with the Department of Agriculture payment of royalty for lease acquisition. Communication from the Department of Agriculture indicates that eminent domain proceedings will not be used to secure acreage for a plant location. If such proceedings were to become a reality, a fair market value for lands involved would be in order. Such land that was deleted from the Bay Springs area would command an enormous price if they were included. This would add to the cost factor of crushed limestone.

It was the recommendation of the writers based on factors of mineable limestone reserve, thickness of limestone, continuity of limestone, quality of limestone, overburden to limestone ratio, total overburden, compactness of proposed area, less cost of providing accessibility to transportation, less hazardous and uninterrupted mining operations, shorter hauls from quarry to crusher, present land use patterns, and less potential damage by environmental pollutants such as noise and dust, that the Waynesboro Area should be selected as the site for the proposed Agricultural Limestone Plant.

The recommendation of the writers was accepted and a 200-ton-per-hour capacity plant is presently in operation at the Waynesboro Site.

All original test hole cuttings, cores, field notes, electrical logs, and maps are available for observation at the Geological Survey.

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TEST HOLE AND CORE HOLE DATA

The following are descriptions of cuttings and cores from test holes drilled and/or cored during the geologic study of potential agricultural lime producing sites in Jasper and Wayne Counties, Mississippi. All the described samples are cataloged and stored in the Survey's Sample Library, where they are available for public observation. The samples were washed prior to microscopic examination.

The test hole locations and elevations were determined from 7.5 minute topographic maps.

All thicknesses and depths are expressed in feet.

SAMPLE DESCRIPTIONS

WAYNE COUNTY

LT-1

Location: SE/4, SE/4, SW/4, SE/4, Sec. 14, T.9N., R.7W. Elevation: 235 feet

Footage Interval	Description
0-15	Clay, red, yellowish to gray, silty, bentonitic appearance.
15-22	Marl, light gray to grayish yellow, fossiliferous, clayey, (residuum?)
22-40	Limestone, white to yellow, crystalline, fossiliferous, glauconitic, weathered.
40-50	Limestone, light gray, crystalline, fossiliferous, glauconitic, argillaceous inclusions.
50-62	Limestone, white to light gray, fossiliferous, finely glauconitic, slightly chalky, with thin marl beds.
62-74	Marl, light gray, very glauconitic, fossiliferous, pyritic with some indurated ledges.
74-76	Clay, medium gray, slightly carbonaceous.
76-90	Marl, light gray, fossiliferous, glauconitic, hard ledges.

LT-2

Location: NW/4, SE/4, SE/4, NE/4, Sec. 23, T.9N., R.7W. Elevation: 218 feet

Footage Interval	Description
0-10	Clay, tan to red, bentonitic appearance.
10-20	Clay, light to dark brown, slightly calcareous with limestone nodules and fossils (residuum). Note: Lost circulation.

LT-3

Location: NW/4, NE/4, NW/4, NW/4, Sec. 25, T.9N., R.7W. Elevation: 280 feet

Footage Interval	Description
0-28	Sand, clear, medium to coarse, round to subangular, poorly sorted, frosted and ferruginous stain, becoming more fine-grained in bottom 10 feet.
28-43	Marl, medium gray, fossiliferous, glauconitic, clayey.
43-52	Marl, medium gray, fossiliferous, glauconitic, sandy.
52-59	Marl, medium gray, fossiliferous, glauconitic, argillaceous.
59-75	Limestone, yellow to light gray, fossiliferous, glauconitic, hard; interbedded with marl, gray, fossiliferous, glauconitic, sandy.
75-90	Clay, gray, silty, carbonaceous, glauconitic.
90-120	Limestone, white to yellow, fossiliferous, glauconitic, interbedded with marl.
120-130	Limestone, light to medium gray, fossiliferous, glauconitic.
130-168	Limestone, white to light gray, slightly fossiliferous, finely glauconitic, slightly chalky, with some thin marl beds. Limestone softer than limestone 120-130.
168-176	Marl, light gray, fossiliferous, glauconitic, sandy.
176-182	Marl, gray, fossiliferous, glauconitic, clayey.
182-185	Sand, clear, fossiliferous, glauconitic.
185-190	Silt, gray, carbonaceous.

LT-4 (CORE)

Location: SW/4, NE/4, SW/4, NW/4, Sec. 24, T.9N., R.7W. Elevation: 228 feet

Footage Interval	Description
0-18	Limestone, light yellowish gray, fossiliferous, some red weathered material 12 to 13 feet.
18-32	Limestone, light yellowish gray, fossiliferous, hard, soft streaks at 26 to 28 feet and 31 to 32 feet.
32-42	Marl, yellowish gray to greenish gray, fossiliferous, partially indurated.
42-48	Marl, yellowish gray to greenish gray, fossiliferous, softer than above.
48-62	Marl, light greenish gray, fossiliferous, glauconitic, partially indurated.
62-64	Marl, dark gray, fossiliferous, glauconitic; claystone nodules at 63 feet; some fossiliferous sand in bottom foot.
64-67	Sand, dark gray, micaceous.

LT-5

Location: SW/4, SW/4, NE/4, NE/4, Sec. 26, T.9N., R.7W. Elevation: 215 feet

Footage Interval	Description
0-2	Silt, light gray, red mottled, sandy.
2-8	Sand, clear, fine to coarse-grained, round to subangular, poorly sorted, frosted and ferruginous stain, fossil fragments and limestone nodules.
8-20	Clay, light gray, red mottled, slightly silty to silty.
20-24	Clay, reddish brown, lime nodules (residuum).
24-34	Limestone, light gray, fossiliferous, crystalline, slightly glauconitic, weathered.
34-70	Limestone, light gray, fossiliferous, finely pyritic, slightly chalky, slightly glauconitic; some thin marl beds.
70-78	Clay, medium gray, slightly sandy, slightly fossiliferous.
78-90	Marl, light to medium gray, sandy, fossiliferous, glauconitic, clayey, indurated ledge 80 and 89 feet.
90-110	Clay, medium gray, silty, slightly sandy, finely micaceous, carbonaceous, slightly fossiliferous.

LT-6

Location: NE/4, NW/4, SW/4, SW/4, Sec. 24, T.9N., R.7W. Elevation: 255 feet

Footage Interval	Description
0-4	Clay, reddish brown, slightly glauconitic, slightly fossiliferous, (residuum).
4-12	Limestone, light gray to yellowish gray, fossiliferous, glauconitic, slightly sandy, weathered.
12-26	Marl, light to yellowish gray, red stain, fossiliferous, silty, clayey, slightly sandy.
26-42	Clay, gray, silty, slightly carbonaceous, slightly calcareous, slightly fossiliferous.
42-76	Limestone, tan to reddish tan, crystalline, fossiliferous, slightly sandy, weathered, very porous, reddish color probably due to oxidation.
76-110	Limestone, white to light gray, fossiliferous, finely glauconitic, chalky appearance, soft, becoming marly 100 to 110 feet.
110-126	Marl, light gray, fossiliferous, glauconitic, sandy, in part indurated.
126-140	Marl, light gray, fossiliferous, glauconitic, very sandy.

LT-7

Location: SE/4, SW/4, NW/4, NE/4, Sec. 23, T.9N., R.7W. Elevation: 255 feet

Footage Interval	Description
0-12	Sand, clear to tan, medium-to coarse-grained, some glauconite, lime nodules, streak of brown silty clay.
12-20	Clay, light gray to brown, silty, sandy.
20-33	Clay, light brownish gray, slightly silty, fossil fragments.
33-40	Limestone, yellowish tan, fossiliferous, very porous.

LT-8

Location: SW/4, SE/4, SE/4, SW/4, Sec. 24, T.9N., R.7W. Elevation: 290 feet

Footage Interval	Description
0-24	Sand, reddish orange, medium-to coarse-grained, rounded to subangular, silty.
24-28	Clay, light gray, slightly sandy.
28-34	Sand, clear to yellow, fine-to medium-grained, rounded to subangular.
34-46	Marl, light gray, fossiliferous, glauconitic, slightly sandy, in part indurated.
46-60	Marl, light gray, fossiliferous, slightly glauconitic, clayey, in part indurated.
60-84	Clay, gray, silty, fossiliferous, carbonaceous, becoming marly in bottom 2 feet.
84-88	Limestone, gray, fossiliferous.
88-106	Marl, grayish brown, fossiliferous, sandy, in part indurated.
106-110	Limestone, light gray, fossiliferous, glauconitic.
110-160	Limestone, light gray, fossiliferous, glauconitic, chalky, marly, becoming sandy at 140 to 150 feet.
160-170	Marl, light gray to gray, fossiliferous, glauconitic, sandy, with thin clay streaks.

LT-9

Location: SE/4, NE/4, NW/4, SW/4, Sec. 25, T.9N., R.7W. Elevation: 280 feet.

Footage Interval	Description
0-24	Sand, dark yellowish orange, fine-to very coarse-grained, rounded to subangular quartz, ferruginous, light yellowish gray clay from 15'-18', rare black grains.
24-33	Clay, weathered reddish brown at top then greenish gray, glauconitic, calcareous.
33-39	Marl, light yellowish gray, fossiliferous (ostracodes and foraminifers), calcareous.
39-45	Marl, dark gray, very argillaceous, slightly calcareous.
45-55	Limestone, light yellowish gray, fossiliferous, arenaceous, marl streaks.
55-95	Clay, light olive gray, silty to sandy, calcareous, carbonaceous, micaceous, fossiliferous.
95-97	Marl, olive gray, very fossiliferous, foraminifera and fossil fragments.
97-130	Limestone, light olive gray, hard ledges with some softer marl streaks, very fossiliferous.
130-150	Marl, light yellowish gray, fossiliferous (abundant **Lepidocyclina**), ledges in the 140-150 foot interval.
150-165	Marl, light olive gray, arenaceous (quartz and glauconite), fossiliferous.
165-170	Clay, dark gray, silty, carbonaceous.
170-174	Marl, light olive gray, very fossiliferous, arenaceous.
174-180	Clay, dark gray, silty, carbonaceous, sparingly fossiliferous.

JASPER COUNTY

LT-10

Location: SW/4, NW/4, NW/4, NE/4, Sec. 10, T.10N., R.10W. Elevation: 340 feet

Footage Interval	Description
0-10	Sand, grayish, yellow to reddish brown, argillaceous, ferruginous.
10-19	Clay, light olive gray (weathered reddish brown near top), glauconitic.
19-44	Clay, dark gray, silty, carbonaceous, micaceous.
44-64	Marl, light gray, very arenaceous (medium-grained subangular quartz), fossiliferous, echinoid spine noted, rare dark grains, hard streaks.
64-71	Clay, dark gray, silty, carbonaceous, slightly calcareous.
71-77	Marl, light olive gray, fossiliferous (abundant foraminifers).
77-81	Limestone, light olive gray, smooth-textured, hard, fossiliferous.
81-90	Marl, olive gray, fossiliferous, argillaceous.
90-103	Limestone, light olive gray, fossiliferous, hard ledges, softer marl streaks, pyritic.
103-130	Marl, very light gray, soft, argillaceous, fossiliferous, some harder streaks.
130-139	Marl, very light gray, fossiliferous, arenaceous.
139-160	Clay, dark gray, silty, carbonaceous, pyritic, slightly calcareous, arenaceous in lower part.

LT-11

Location: SE/4, NW/4, NW/4 (Irregular Section), Sec. 1, T.10N., R.10W. Elevation: 430 feet

Footage Interval	Description
0-18	Sand, light brown, medium-to coarse-grained, angular to subangular quartz, scattered black grains, ferruginous, light red clay streaks.
18-25	Clay, dark gray, silty.
25-29	Sand, medium gray, subangular, quartz, medium-to coarse-grained.
29-50	Clay, dark gray, silty, micaceous, carbonaceous, white precipitate on clay particles.
50-56	Marl, light gray, very fossiliferous (abundant foraminifers).
56-59	Limestone, light gray, hard, fossiliferous.
59-71	Marl, dark gray, argillaceous near top and becoming more fossiliferous in lower part.
71-87	Limestone, yellowish gray, hard ledges, fossiliferous, softer interbedded marl.
87-115	Marl, very light gray, fossiliferous (abundant **Lepidocyclina**).
115-120	Marl, very light gray, glauconitic.
120-140	Clay, dark gray, silty, carbonaceous, fossiliferous, sandy in lower part.

LT-12

Location: SW/4, NE/4, NW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 375 feet

Footage Interval	Description
0-12	Limestone, light brown (weathered), hard ledges, abundant **Lepidocylina.**
12-38	Marl, yellowish gray, fossiliferous, argillaceous, bryozoa noted.
38-45	Marl, medium gray, fossiliferous, glauconitic.
45-60	Clay, dark gray, silty, carbonaceous, arenaceous in lower part.

LT-13

Location: NW/4, SW/4, NW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 395 feet

Footage Interval	Description
0-10	Clay, reddish brown, fossiliferous, weathered limestone at 6 feet. (lost circulation)

LT-14

Location: SE/4, SW/4, NW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 395 feet

Footage Interval	Description
0-2	Sand, reddish brown, fine-to medium-grained, scattered black grains, ferruginous.
2-30	Clay, yellowish gray and reddish brown mottled, silty, bentonitic, ferruginous.
30-35	Clay, dark brown to dark gray, weathered, silty, ferruginous.
35-40	Limestone, grayish orange, weathered, fossiliferous, badly leached. (lost circulation)

LT-15

Location: NE/4, NW/4, SW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 397 feet

Footage Interval	Description
0-4	Sand, dark yellowish orange, fine-to medium-grained quartz, subangular, ferruginous.
4-38	Clay, yellowish gray, smooth-textured, bentonitic, ferruginous. (lost circulation in weathered zone at 38′ at contact with limestone.)

LT-16

Location: SW/4, SW/4, NW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 395 feet

Footage Interval	Description
0-4.5	Clay, light brown, weathered, calcareous.
4.5-8	Limestone, yellowish gray, hard, fossiliferous, weathered.
8-20	Marl, light brown to yellowish gray, fossiliferous, gypsiferous, weathered.

20-34	Limestone, light brown, weathered, hard ledges with soft marl interbeds, fossiliferous.
34-40	Marl, very light gray, argillaceous, fossiliferous.
40-55	Marl, light olive gray, argillaceous, fossiliferous, soft, numerous bryozoa.
55-67	Marl, greenish gray, glauconitic, fossiliferous.
67-80	Clay, dark gray, silty to sandy, carbonaceous, sparingly fossiliferous, fissile.

LT-17

Location: NE/4, NE/4, NE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 355 feet

Footage Interval	Description
0-6	Sand, dark yellowish orange, argillaceous, ferruginous.
6-12	Clay, yellowish gray, bentonitic.
12-14	Sand, light brown, subangular quartz and ferruginous weathered material.
14-36	Clay, dark gray, silty, pyritic, slightly calcareous, micaceous, fossiliferous.
36-50	Silt, dark gray, arenaceous, carbonaceous, slightly calcareous, fossiliferous.
50-70	Clay, dark gray, silty, carbonaceous, micaceous, sparingly fossiliferous.

LT-18

Location: SE/4, SE/4, NE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 395 feet

Footage Interval	Description
0-6	Sand, light brown, fine-to medium-grained quartz, ferruginous.
6-23	Clay, yellowish gray, bentonitic.
23-30	Clay, dark gray, silty, carbonaceous.
30-35	Marl, medium gray, fossiliferous, soft.
35-37	Limestone, light gray, smooth-textured, hard, fossiliferous.
37-48	Marl, light to dark gray, very fossiliferous, coquina-like.
48-60	Limestone, light gray, hard ledges with softer interbeds, fossiliferous.
60-97	Marl, very light gray, soft, fossiliferous, argillaceous, more glauconitic last few feet.
97-110	Clay, dark gray, silty, carbonaceous, pyritic, slightly calcareous.

LT-19 (CORE)

Location: NW/4, SW/4, NW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 395 feet

Footage Interval	Description
0-3.5	Clay, dark reddish brown, ferruginous, probably residual clay.
3.5-6.5	Marl, grayish orange, weathered, very fossiliferous, hard streaks.
6.5-9.0	Limestone, grayish yellow, weathered, hard ledges with soft interbeds, fossiliferous.
9.0-14	Limestone, yellowish gray, not as badly weathered as above, some hard ledges with soft interbeds.
14-15	Marl, light brown, weathered, argillaceous, fossiliferous.
15-18	Cavity (no recovery).
18-24	Limestone, light yellowish gray, hard ledges, argillaceous, fossiliferous.
24-30	Marl, greenish gray (unweathered), argillaceous, hard ledges, fossiliferous.
30-42	Marl, greenish gray to very light gray, argillaceous, fossils not as apparent as in material above, homogeneous.
42-51	Marl, greenish gray speckled, glauconitic, fossiliferous, hard ledge at 45′-46′, claystone pebbles at 51′.
51-54	Clay, dark gray, silty, laminated, carbonaceous, slightly calcareous.

LT-20

Location: SE/4, SW/4, SE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 440 feet

Footage Interval	Description
0-20	Sand, yellowish orange, medium-grained, subangular to well-rounded quartz, scattered dark grains.
20-63	Sand, very pale orange, fine-to coarse-grained, subangular to well-rounded quartz, some dark grains, micaceous.
63-82	Clay, dark yellowish brown (weathered on top) to dark gray, silty, carbonaceous, glauconitic.

82-90	Marl, light olive gray, fossiliferous, arenaceous, micaceous.
90-106	Clay, dark gray, silty, carbonaceous, fossiliferous in lower part.
106-111	Marl, dark gray, fossiliferous (abundant foraminifera).
111-113	Limestone, light gray, fine-textured, fossiliferous.
113-125	Marl, dark gray, fossiliferous.
125-142	Limestone, light gray, hard ledges with softer interbeds, fossiliferous.
142-168	Marl, very light gray, argillaceous, fossiliferous (bryozoa and foraminifera).
168-180	Clay, dark gray, silty, carbonaceous, sparingly fossiliferous.

LT-21

Location: NW/4, SE/4, SE/4 (Irregular Section), Sec. 1, T.10N., R.10W. Elevation: 355 feet

Footage Interval	Description
0-12	Sand and clay, light gray to light brown mottled, ferruginous.
12-19	Clay, light gray to dark brown (weathered), bentonitic.
19-23	Clay, dark gray, silty.
23-46	Limestone, light gray, fine-textured, hard ledges with soft interbeds, fossiliferous.
46-78	Marl, very light gray, fossiliferous (broyozoa and foraminifera), soft, glauconitic in lower part.
78-90	Clay, dark gray, silty, carbonaceous, calcareous.

LT-22

Location: NW/4, NW/4, SE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 415 feet

Footage Interval	Description
0-18	Sand, light brown, medium-to coarse-grained, mostly subangular quartz, ferruginous.
18-34	Clay, weathered light brown and gray mottled near top, then bluish gray, arenaceous last 4 feet.
34-52	Clay, dark gray, silty, carbonaceous, calcareous.
52-59	Marl, dark gray, very fossiliferous (many foraminifera).
59-61	Limestone, light olive gray, fine-textured, hard, fossiliferous.
61-68	Marl, dark gray, argillaceous, fossiliferous.
68-82	Limestone, light olive gray, hard ledges with softer interbeds, fossiliferous.
82-119	Marl, very light gray, fossiliferous, glauconitic, some hard streaks.
119-130	Clay, dark gray, silty to arenaceous, carbonaceous, calcareous.

LT-23

Location: SW/4, NE/4, SE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 420 feet

Footage Interval	Description
0-15	Sand, reddish orange, fine-to medium-grained, mostly subangular quartz, ferruginous, some fossils and glauconite.
15-24	Sand, yellowish orange, coarse-grained, subangular quartz.
24-34	Clay, weathered brown and gray near top and dark gray beneath, silty to arenaceous, carbonaceous.
34-40	Marl, yellowish gray, arenaceous, fossiliferous.
40-45	Limestone, light gray, arenaceous, fossiliferous, hard ledges.
45-66	Clay, dark olive gray, silty, carbonaceous, slightly calcareous.
66-72	Marl, dark gray, fossiliferous, silty.
72-74	Limestone, light gray, fine-textured, fossiliferous.
74-82	Marl, dark gray, fossiliferous, argillaceous.
82-103	Limestone, light gray, hard ledge with softer interbeds, fossiliferous, pyritic.
103-131	Marl, very light gray, argillaceous, fossiliferous, some hard streaks, many bryozoa and foraminifera noted, more glauconitic in lower part.
131-150	Clay, dark gray, silty, carbonaceous, slightly calcareous.

LT-24

Location: SW/4, SW/4, SW/4 (Irregular Section), Sec. 1, T.10N., R.10W. Elevation: 410 feet

Footage Interval	Description
0-9	Sand, reddish orange, fine-to coarse-grained, mostly subangular quartz, ferruginous, gravel from surface.
9-13	Clay, multicolored, silty, micaceous, ferruginous.

13-18	Sand, light brown, medium-grained, subangular quartz, micaceous, ferruginous.
18-32	Clay, dark gray, silty, fissile, white precipitate on particles.
32-46	Marl, light gray, arenaceous, fossiliferous, hard ledge at 39 feet, very fossiliferous in lower part.
46-58	Clay, dark gray, silty, fossiliferous.
58-64	Marl, medium gray, fossiliferous (numerous foraminifera).
64-69	Limestone, light gray, hard, fossiliferous.
69-76	Marl, medium gray, soft, fossiliferous.
76-94	Limestone, light gray, hard ledges with soft interbeds, fossiliferous.
94-126	Marl, very light gray, soft, argillaceous, fossiliferous, glauconitic in lower part.
126-130	Clay, dark gray, silty, carbonaceous.

LT-25

Location: NW/4, SW/4, NE/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 375 feet.

Footage Interval	Description
0-9	Clay, reddish brown, arenaceous, changing to yellowish gray bentonitic clay.
9-20	Limestone, light brown, hard ledge overlying cavity at about 15 feet. Lost circulation in cavity.

LT-26

Location: SW/4, NE/4, SW/4 (Irregular Section), Sec. 2, T.10N., R.10W. Elevation: 365 feet

Footage Interval	Description
0-15	Clay, mottled reddish brown to light gray, arenaceous, bentonitic in lower part.
15-20	Limestone, light brown, hard, fossiliferous. Lost circulation in cavity at about 20 feet.

LT-27

Location: SW/4, NW/4, NW/4 (Irregular Section), Sec. 1, T.10N., R.10W. Elevation: 385 feet

Footage Interval	Description
0-10	Clay, light gray, silty, some ferruginous staining, bentonitic.
10-21	Clay, yellowish brown, weathered appearing.
21-25	Limestone, reddish brown, weathered, very fossiliferous. Lost circulation in cavity at 25 feet.

LT-28

Location: SE/4, NE/4, NE/4, NW/4, Sec. 17, T.2N., R.10E. Elevation: 435 feet.

Footage Interval	Description
0-7	Clay, reddish brown, residual material badly weathered.
7-19	Limestone, light brown, weathered, hard ledges, fossiliferous, softer interbeds.
19-30	Marl, light yellowish gray, argillaceous, hard streaks, fossiliferous.
30-43	Marl, light greenish gray, fossiliferous, glauconitic.
43-52	Marl, greenish gray, very glauconitic, arenaceous, fossiliferous, reddish brown weathered zone in lower part.
52-62	Clay, dark gray, silty, carbonaceous, micaceous, slightly calcareous.
62-70	Silt, dark gray, argillaceous, carbonaceous, micaceous, calcareous.

LT-28A (CORE)

Location: SE/4, NE/4, NE/4, NW/4, Sec. 17, T.2N., R.10E. Elevation: 435 feet

Footage Interval	Description
0-7	Clay, light gray, silty, ferruginous, bentonitic.
7-20	Limestone, light brown, weathered, fossiliferous, hard ledges, soft marl interbeds.
20-28	Marl, yellowish gray, argillaceous, hard streaks, fossiliferous.
28-43	Marl, greenish gray, argillaceous, glauconitic, hard streaks.
43-52.5	Marl, dark greenish gray, arenaceous, glauconitic, fossiliferous.
52.5-56	Clay, dark gray, carbonaceous, silty, slightly calcareous.

LT-29

Location: SW/4, NE/4, NW/4, NE/4, Sec. 18, T.2N., R.10E. Elevation: 440 feet

Footage Interval	Description
0-17	Sand, light brown, medium-grained, subangular quartz, ferruginous.
17-30	Clay, light brown to dark gray, silty, micaceous, carbonaceous.
30-42	Clay, yellowish brown, silty, weathered appearance.
42-60	Marl, light yellowish gray, weathered, argillaceous to arenaceous, fossiliferous.
60-75	Clay, yellowish brown, silty, calcareous, weathered, bentonitic.
75-105	Clay, dark gray, silty to arenaceous, carbonaceous, micaceous.
105-140	Silt, dark gray, arenaceous, carbonaceous, micaceous, carbonized and pyritized wood fragments in the 120-140 foot interval.

LT-30

Location: SW/4, SE/4, NW/4, NW/4, Sec. 17, T.2N., R.10E. Elevation: 455 feet

Footage Interval	Description
0-24	Sand, reddish brown, medium-to coarse-grained, poorly sorted, subangular to rounded quartz, ferruginous.
24-45	Clay, light to yellowish gray, silty, bentonitic appearance, ferruginous. Note: Lost circulation at 45′.

LT-31

Location: NW/4, NE/4, SW/4, NW/4, Sec. 17, T.2N., R.10E. Elevation: 445 feet

Footage Interval	Description
0-10	Sand, reddish brown, medium-to coarse-grained, subangular to rounded quartz.
10-23	Sand, light brown, medium-grained, subangular to rounded quartz.
23-38	Clay, light brown to light gray, silty, ferruginous.
38-41	Limestone, dark yellowish orange, weathered, fossiliferous. Note: Lost circulation in cavity at 41′.

LT-32

Location: SW/4, NW/4, NE/4, NW/4, Sec. 20, T.2N., R.10E. Elevation: 430 feet

Footage Interval	Description
0-6	Sand, light brown medium-grained, subangular quartz.
6-26	Clay, yellowish gray, silty, bentonitic appearance.
26-34	Marl, dusky yellow, fossiliferous, weathered, abundant foraminifera.
34-43	Limestone, light brown, weathered, fossiliferous, hard ledge at 34 and 39 feet.
43-67	Marl, grayish yellow, soft, argillaceous, homogeneous, fossiliferous.
67-82	Marl, grayish yellow, arenaceous, fossiliferous (numerous bryozoa), becoming very sandy (medium-grained, subangular quartz), micaceous.
82-100	Sand, yellowish gray to dark gray, medium-grained, subangular quartz, clay streaks, carbonaceous in lower part.

LT-33

Location: SE/4, NE/4, SW/4, SW/4, Sec. 18, T.2N., R.10E. Elevation: 405 feet

Footage Interval	Description
0-20	Sand, light brown, fine-to medium-grained, subangular quartz, ferruginous.
20-40	Clay, brown and gray mottled, sand streaks, ferruginous, weathered. Note: Lost circulation at 39′.

LT-34

Location: NW/4, SW/4, SE/4, SW/4, Sec. 16, T.2N., R.10E. Elevation: 425 feet

Footage Interval	Description
0-10	Sand, light brown, medium-grained, mostly subangular quartz, clay streaks.
10-21	Clay, light gray and reddish brown mottled, silty, bentonitic appearance.
21-29	Clay, dark yellowish orange, silty, weathered.
29-40	Marl, light yellowish gray, fossiliferous, argillaceous, weathered.
40-50	Marl, yellowish gray, arenaceous, glauconitic, fossiliferous, weathered.
50-60	Sand, medium dark gray, fine-to medium-grained, subangular quartz, micaceous, clay streaks, dark grains in sand.

LT-35

Location: SW/4, NW/4, SW/4, NW/4, Sec. 16, T.2N., R.10E. Elevation: 430 feet

Footage Interval	Description
0-3	Sand, light brown, medium-grained, subangular quartz, ferruginous.
3-12	Clay, light gray to light brown, silty, weathered.
12-25	Clay, dark gray, silty, carbonaceous, pyritic.
25-28	Marl, light yellowish gray, weathered dark brown on top, fossiliferous.
28-40	Marl, yellowish gray, very sandy, glauconitic.
40-55	Sand, yellowish orange, medium-to coarse-grained, subangular quartz, glauconitic, fossiliferous.
55-63	Clay, dark gray, silty to arenaceous, carbonaceous, micaceous.
63-90	Sand, yellowish gray speckled, medium-grained, subangular quartz, scattered dark grains, micaceous, dark gray clay streaks.

LT-36

Location: NE/4, SW/4, NE/4, SW/4, Sec. 9, T.2N., R.10E. Elevation: 465 feet

Footage Interval	Description
0-25	Sand, light brown, medium-to very coarse-grained, subangular quartz, ferruginous, poorly sorted.
25-43	Clay, light gray to light brown, smooth-textured.
43-48	Marl, dark to light brown, weathered, fossiliferous.
48-59	Marl, very light yellowish gray, fossiliferous, hard streaks.
59-75	Sand, dark reddish brown, poorly sorted subangular quartz, weathered, fossiliferous, glauconitic.
75-100	Sand and clay, light gray to dark brown, medium-grained, subangular, quartz, micaceous, carbonaceous.

LT-37

Location: SE/4, NE/4, NE/4, NW/4, Sec. 19, T.2N., R.10E. Elevation: 430 feet

Footage Interval	Description
0-10	Sand, reddish brown, medium-to coarse-grained, poorly sorted quartz, ferruginous.
10-24	Sand, light brown, medium-grained, subangular quartz.
24-37	Clay, dark gray, silty, carbonaceous, pyritic.
37-71	Marl, light yellowish gray, fossiliferous, hard ledges, argillaceous.
71-78	Sand, light yellowish gray, medium-grained, subangular quartz, glauconitic, fossiliferous.
78-93	Clay, dark gray, silty, carbonaceous, micaceous.
93-100	Sand, light to dark gray, black grains, carbonaceous, pyritic.

LT-38

Location: SE/4, SE/4, NE/4, SE/4, Sec. 8, T.2N., R.10E. Elevation: 435 feet

Footage Interval	Description
0-15	Sand, reddish brown, fine-to medium-grained, subangular quartz.
15-23	Clay, light gray, silty, bentonitic appearance.
23-35	Clay, dark reddish brown, weathered, sand streak.
35-58	Sand, medium to dark brown, medium-grained, subangular quartz, glauconitic.
58-70	Sand, light brown, medium-grained, subangular quartz, micaceous, scattered dark grains, light gray bentonitic clay streaks.

LT-39

Location: NE/4, SW/4, NE/4, NE/4, Sec. 18, T.2N., R.10E. Elevation: 445 feet

Footage Interval	Description
0-33	Sand, reddish brown, medium-to coarse-grained, poorly sorted, subangular quartz.
33-49	Clay, dark gray, silty, carbonaceous, micaceous, weathered yellowish orange in lower part.
49-73	Marl, yellowish gray, fossiliferous, argillaceous, hard streaks, more quartz and glauconite in lower part.
73-80	Clay, dark gray, silty, carbonaceous.
80-90	Sand and clay, light brown to dark gray, micaceous, carbonaceous.

LT-40

Location: SE/4, SW/4, NW/4, SE/4, Sec. 17, T.2N., R.10E. Elevation: 460 feet

Footage Interval	Description
0-18	Sand, reddish brown to very pale orange, medium-to coarse-grained, poorly sorted, subangular to rounded quartz, ferruginous, rare fossil fragments.
18-26.5	Clay, yellowish gray, silty, weathered.
26.5-43	Clay, dark gray, silty, carbonaceous.
43-51	Marl, grayish orange, weathered, fossiliferous (abundant foraminifera).
51-68	Limestone, yellowish orange to gray, weathered, fossiliferous, three ledges in the interval 51-61 feet, soft interbeds.
68-95	Marl, light yellowish gray, argillaceous, fossiliferous, hard streak about 77 feet, more quartz sand and glauconite in lower part.
95-110	Sand, yellowish gray, fossiliferous, mostly medium-grained, subangular quartz, glauconitic, micaceous.
110-123	Sand, yellowish gray, fine-to medium-grained, mostly subangular quartz, scattered dark grains, very micaceous, calcareous.
123-140	Clay, dark gray, silty to arenaceous, carbonaceous.

LT-41 (Cored from 8' to 32')

Location: Center of NE/4, NE/4, NW/4, Sec. 17, T.2N., R.10E. Elevation: 417 feet

Footage Interval	Description
0-8	Sand, reddish brown, medium-to coarse-grained, mostly subangular quartz, ferruginous.
8-22	Clay, light gray to reddish brown mottled, smooth-textured, bentonitic.
22-24	Clay, very light brown, bentonitic.
24-28	Clay, dark reddish brown, residual.
28-36	Clay, black, weathered material.
36-41	Marl, dark brown to yellowish gray, fossiliferous, extremely weathered.
41-70	Clay, dark gray, silty to arenaceous, micaceous, carbonaceous, more sand in lower part.

LT-42

Location: NE/4, SE/4, SW/4, SE/4, Sec. 17, T.2N., R.10E. Elevation: 435 feet

Footage Interval	Description
0-12	Sand, pale yellowish orange, medium-grained, mostly subangular quartz, scattered black grains, argillaceous, ferruginous.
12-32	Clay, multicolored, silty, ferruginous, bentonitic.
32-58	Marl, yellowish gray, weathered, fossiliferous, arenaceous.
58-75	Sand, pale yellowish orange, medium-to coarse-grained quartz and glauconite, fossiliferous, argillaceous.
75-100	Sand and clay, dark gray, speckled sand, carbonaceous clay, pyritic, micaceous.

LT-43

Location: SE/4, SW/4, SW/4, NE/4, Sec. 17, T.2N., R.10E. Elevation: 460 feet

Footage Interval	Description
0-27	Sand, yellowish orange, medium-to coarse-grained, poorly sorted, subangular to well-rounded quartz, ferruginous, becoming finer grained in lower part.
27-36	Clay, white, arenaceous, kaolinitic.
36-49	Clay, dark gray, sandy, carbonaceous, bentonitic.
49-56	Clay, light to dark gray, silty, bentonitic, carbonaceous.
56-60	Marl, yellowish gray, weathered, very fossiliferous, abundant foraminifera.
60-85	Limestone and marl, yellowish gray, fossiliferous, ledges, arenaceous in lower part.
85-90	Sand, yellowish gray speckled, glauconitic, fossiliferous, ferruginous weathered zone. Note: Lost circulation at 90 feet.

LT-44

Location: NE/4, SW/4, SE/4, NE/4, Sec. 17, T.2N., R.10E. Elevation: 448 feet

Footage Interval	Description
0-10	Sand, pale yellowish orange, mostly medium-to coarse-grained, subangular quartz, scattered well-rounded quartz, ferruginous, some dark grains.
10-19	Sand, pale yellowish orange, medium-grained, subangular quartz, argillaceous, micaceous, dark grains.
19-26	Clay, multicolored, silty to arenaceous, kaolinitic, ferruginous.
26-38	Clay, dark gray, silty, some yellowish gray bentonitic clay, pyritic.
38-48	Residual material, light brown to reddish brown, glauconitic sand with residual clay, fossil fragments, weathered marl.
48-62	Sand, grayish orange speckled, coarse-grained, mostly subangular quartz, glauconitic, fossiliferous.
62-68	Clay, dark gray, silty, carbonaceous, micaceous.
68-90	Sand and clay, light to dark gray, silty, micaceous, speckled sand, dark grains, some bentonitic appearing clay, pyritized wood fragments.

LT-45

Location: NW/4, SW/4, NE/4, SE/4, Sec. 17, T.2N., R.10E. Elevation: 445 feet

Footage Interval	Description
0-17	Sand, yellowish orange, medium-to coarse-grained, subangular to well-rounded quartz, poorly sorted, some black grains, ferruginous.
17-36	Clay, yellowish gray, silty, ferruginous, some bentonite.
36-68	Marl, yellowish gray to light gray, badly weathered near top, fossiliferous, argillaceous, glauconitic, very arenaceous in lower part.
68-80	Clay, dark gray, silty to finely arenaceous, carbonaceous, micaceous.

LT-46

Location: SW/4, SW/4, NE/4, NE/4, Sec. 17, T.2N., R.10E. Elevation: 460 feet

Footage Interval	Description
0-10	Sand, yellowish orange, medium-to coarse-grained, subangular to well-rounded quartz, scattered black grains, ferruginous.
10-26	Sand, very pale orange, medium-to coarse-grained, mostly subangular quartz, micaceous, black grains.
26-30	Clay, multicolored, silty to arenaceous, ferruginous.
30-40	Clay, dark gray, silty to arenaceous, carbonaceous, pyritic.
40-46	Clay, grayish yellow, bentonitic, weathered.
46-56	Limestone and marl, yellowish gray, hard ledges, fossiliferous, weathered. Note: Lost circulation at 56 feet.

LT-47

Location: NW/4, SE/4, SE/4, SW/4, Sec. 17, T.2N., R.10E. Elevation: 472 feet

Footage Interval	Description
0-10	Sand, yellowish orange, medium-to very coarse-grained, subangular to well-rounded quartz, poorly sorted, ferruginous.
10-29	Sand, very pale orange, medium-to very coarse-grained, mostly subangular quartz, black specks, argillaceous.
29-62	Clay, dark gray to light gray, silty, carbonaceous, bentonitic, light yellowish gray bentonite in lower part.
62-65	Residual material, brown, weathered marl.
65-67	Limestone and marl, yellowish brown, fossiliferous, ledge at 67 feet.
	Note: Lost circulation at 67 feet.

LT-48

Location: SW/4, SE/4, SE/4, SE/4, Sec. 18, T.2N., R.10E. Elevation: 428 feet

Footage Interval	Description
0-20	Sand, yellowish orange, medium-grained, mostly subangular with some well-rounded quartz, argillaceous, black grains.
20-45	Sand, light gray, fine-to medium-grained, subangular quartz, scattered black grains, argillaceous.
45-58	Clay, multicolored, arenaceous, ferruginous, manganiferous ?, weathered.
58-62	Sand, light tan speckled, coarse-grained, glauconitic, ferruginous, weathered.
62-110	Sand and clay, yellowish brown to dark gray, fine-to medium-grained quartz and fissile bentonitic clay, weathered in upper part, micaceous, black specks, carbonaceous.

LT-49

Location: SE/4, NE/4, NE/4, NE/4, Sec. 19, T.2N., R.10E. Elevation: 415 feet

Footage Interval	Description
0-14	Clay, yellowish gray, silty to arenaceous, bentonitic, ferruginous.
14-24	Limestone and marl, yellowish orange, fossiliferous, first few feet composed almost entirely of foraminifera, hard ledge at 22 feet.
24-50	Marl, yellowish gray to light gray, fossiliferous, speckled, partially indurated, glauconitic, hard ledge at 49 feet.
50-58	Sand, yellowish orange, coarse-grained quartz and glauconite, fossiliferous, weathered, ferruginous.
58-63	Clay, dark gray, silty.
63-70	Sand, yellowish brown speckled, medium-grained, subangular quartz, black grains, micaceous, argillaceous streaks.

APPENDIX

The following are copies of original correspondence pertinent to the selection of the Wayne County location as the site of the proposed agricultural lime plant.

THE STATE OF MISSISSIPPI
DEPARTMENT OF AGRICULTURE AND COMMERCE
JACKSON
39205

JIM BUCK ROSS
COMMISSIONER

September 13, 1974

Mr. Alvin Bicker
State Geological Survey
Jackson, Ms

Dear Mr. Bicker:

In regards to and in answer to our conversation, I am offering the following information. I would like to say that we have many variables that enter into the crushing of lime. For instance, we can crush approximately 200 tons of lime per hour under ideal conditions but this can vary from 30 tons per hour up to the maximum of 200 tons. You can readily see how our operating cost can vary quite a bit from the minimum to the maximum. The figures listed below are based on an average of a six month period of full time operation of both plants, one located at Macon, Ms. and the other located at West Point, Ms.

The average cost of owning a front end loader is $3.37 per hour. The average cost of operating a front end loader is $2.43 per hour. If we add the $3.00 cost per hour for an operator, we have a total cost of $8.80 per hour. We can load 200 tons per hour with front end loader operating continuously, but we never get continuous service. Therefore, if we add 50% cost to this for non-continuous use we have a cost of $13.20 per hour. This will make the cost per ton for loading trucks vary from $.44 per ton to $.66.

The trucks hauling the rock from the pit to the crusher will have an average cost of $5.25 per hour. We do not have the delay in this operation that we have in the loading of the trucks with the crushed lime. From the figures that we have available and to the best of our ability, we have arrived at an average cost of $.76 per ton of transporting lime from the pit to the crusher. This cost is based on a three mile haul from pit to crusher. The cost also includes the ripping of the Rock Lime and the piling of the rock in the pit so that it can be loaded on the trucks and taken to the crusher.

At the present time at the Macon Plant we are hauling lime from a pit that is located approximately four miles from the crusher. We also have the problem of crossing Highway 45, which is not only dangerous but it results in loss of valuable time. All of this adds an additional cost of transporting the rock to be crushed to the crusher.

In comparing the truck traffic and rail shipment we have an additional cost in rail shipment of $6.00 to $7.00 per 50 ton car. This cost is caused by having to prepare the car for shipment and then sealing off the car after loading it. There is also about a one hour to one and half hour additional labor involved in the loading of a boxcar as compared to the loading of a truck. This makes the cost of rail shipment about $.20 per ton more than by truck.

Attached is a copy of the tons of lime shipped by rail and by truck.from both state owned lime plants.

Sincerely,

P.C. McInnis

Enc

PCM:mlb

THE STATE OF MISSISSIPPI
DEPARTMENT OF AGRICULTURE AND COMMERCE
JACKSON
39205

JIM BUCK ROSS
COMMISSIONER

September 20, 1974

Mr. Alvin Bicker, Jr.
Geological Survey
2525 N. West
Jackson, Miss.

Dear Sir:

In answer to our telephone conversation I am submitting the following information.

The cost per ton of hauling lime from the pit to the crusher at the West Point Plant will average approximately 16.8¢ per ton. This is using a chevrolet truck with a five yard dump body and hauling of four miles round trip or two miles each way.

At the Macon Plant the average cost per ton is approximately 14.8¢ per ton for a three mile haul each way. The reason for the difference in cost per ton is that we are using a 10 yard dump truck at the Macon Plant and only a five yard dump truck at the West Point Plant.

The leasing arrangements are voluntarily agreed upon by the Mississippi State Department of Agriculture and the land owner that is involved. The royalty paid to the land owner is 10¢ per ton of lime crushed and sold. In addition to this 10¢ there is an additional one or two cents per ton paid to the land owner where the crusher is located. This one or two cents is paid to the land owner where the mill is located even though the lime is received from someone else' property.

It is a policy of the State Department of Agriculture to do all the leasing on a voluntary basis which has been very successful in the past. As far as I know it is not the intention of the Department to enter into eminent domain proceedings in order to secure a lease for any Liming Operation that is being done now or will be done in the future.

Sincerely,

P. C. McInnis

PCM:jcs

THE STATE OF MISSISSIPPI
DEPARTMENT OF AGRICULTURE AND COMMERCE
JACKSON
39205

JIM BUCK ROSS
COMMISSIONER

October 11, 1974

Mr. Alvin Bicker
Mississippi Geological Survey
Jackson, MS 39205

Dear Sir:

In determining the amount of limestone needed, the only thing that you can say is "How much is available?" We can say that a source of lime is needed for 500,000 - 750,000 tons per year for a period of 40 to 60 years or longer. The demand for lime at the present time is unlimited. All that can be crushed is needed and is now being sold.

This source of lime should be in the close proximity of rail transportation.

Sincerely,

P. C. McInnis
Division of Lime

PCMc:se

Form 1027—3-70—5M

MISSISSIPPI
STATE CHEMICAL LABORATORY
BOX CR - STATE COLLEGE, MISSISSIPPI 39762

August 13, 1974

DR. JAMES P. MINYARD, JR.
State College

Analysis No. 494,148 - 494,155

Analysis of LIME Marked:

Received on 7/31/74 from Miss. Geological Economic & Topographical Survey

Address Box 4915, Jackson, MS 39216 Attn: Mr. William H. Moore, Director

RESULTS:

Dear Mr. Moore:

Listed below are our findings on the eight samples of lime as given to Mr. Bicker by telephone today.

Laboratory Number	Sample Marked	Acid-Neutralizing Value Expressed as $CaCO_3$ Equivalent
	Wayne County (LT-4)	Waynesboro Area
494,148	0'-28'	95.0%
494,152	28'-32'	93.0%
494,153	32'-46'	88.0%
494,155	46'-62'	62.5%
	Jasper County (LT-19)	Heidelberg Area
494,149	8'-12'	81.0%
494,150	12'-18'	92.2%
494,151	24'-42'	84.9%
494,154	42'-50'	82.0%

Please call on us when we may be of further service to you.

Sincerely yours,

Enclosures

James P. Minyard, Jr.
State Chemist

PLEASE GIVE NUMBER WHEN REFERING TO THIS ANALYSIS

Form 1027—3-70—5M

MISSISSIPPI
STATE CHEMICAL LABORATORY
BOX CR - STATE COLLEGE, MISSISSIPPI 39762

August 20, 1974

DR. JAMES P. MINYARD, JR.
State College

Analysis No. 495,701 - 495,705

Analysis of LIME Marked:

Received on 8/19/74 from Miss. Geological Eco. & Topographical Survey - Attn: Mr. Alvin R. Bicker

Address Box 4915, Jackson, MS 39216

RESULTS: Bay Springs Area

Dear Mr. Bicker:

The lime samples sent to us from Well LT28-A in Jasper County are as follows:

Lab. No.	Marked	Calcium Carbonate Equivalent
495,701	7-11	93.6%
495,702	13-21	79.0%
495,703	21-27	82.6%
495,704	27-42	84.0%
495,705	42-52	18.4%

Sincerely yours,

Enclosures

James P. Minyard, Jr.
State Chemist

PLEASE GIVE NUMBER WHEN REFERING TO THIS ANALYSIS