

Report 75-3
GRAVEL RESOURCES OF THE RED DEER AREA

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GRAVEL RESOURCES OF THE RED DEER AREA

Increasing demands for quality gravel prompted an investigation for additional reserves within central Alberta. For the purpose of this report the area within a radius of approximately 25 miles from the City of Red Deer was chosen for study. In terms of the encompassing townships the area may be described as lying between range 23 west of the fourth meridian and range 3 west of the fifth meridian, and between townships 34 and 42 (Fig. 1). An area of approximately 3,000 square miles is thus included. The major parts of the counties of Red Deer and Lacombe fall within the study region.

The bedrock underlying the entire area belongs to the nonmarine Tertiary and Upper Cretaceous Paskapoo Formation which consists of grey to greenish grey, thick-bedded, calcareous, cherty sandstone; grey and green mudstone; minor carbonate, thin limestone, coal and tuff beds (Green, 1972). The overlying surficial deposits of most of the area have been mapped by Stalker (1956, 1960) and Bayrock, Boydell and Reimchen (1974). A reconnaissance mapping of the southwest portion was carried out by the writer. A simplified composite map of the surficial geology is presented in figure 2.

Investigations for gravel during the summer of 1973 were confined to areas blanketed by preglacial deposits, glaciofluvial deposits (including outwash, deltaic, esker and lag gravel deposits), and recent alluvium and terrace deposits as outlined in figures 3, 4, 5 and 6. Surrounding deposits include tills, lacustrine materials and sand dunes which yield little or no coarse-grained sediments. Topographic base maps on a scale of 1:50,000 were employed for surface control. Air photos were scanned to provide further interpretation with respect to the areal extent of deposits and location of pits and exposures. Prospective areas were visited and bulk sampled. Drilling was undertaken to supplement surface information and as a result approximately 200 auger holes were drilled with a truck-mounted 8-inch auger at regular intervals within promising areas. Drilling was

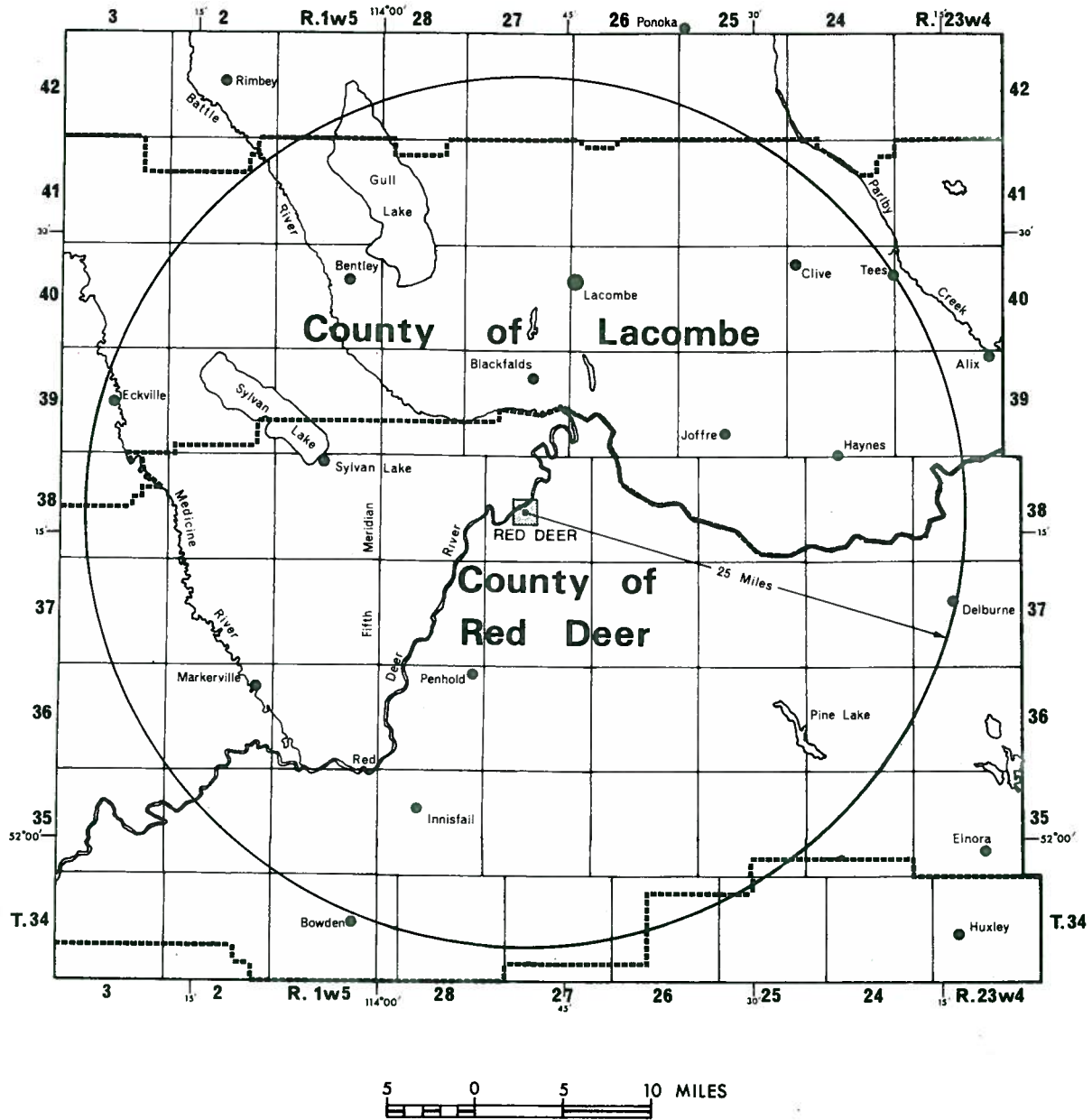
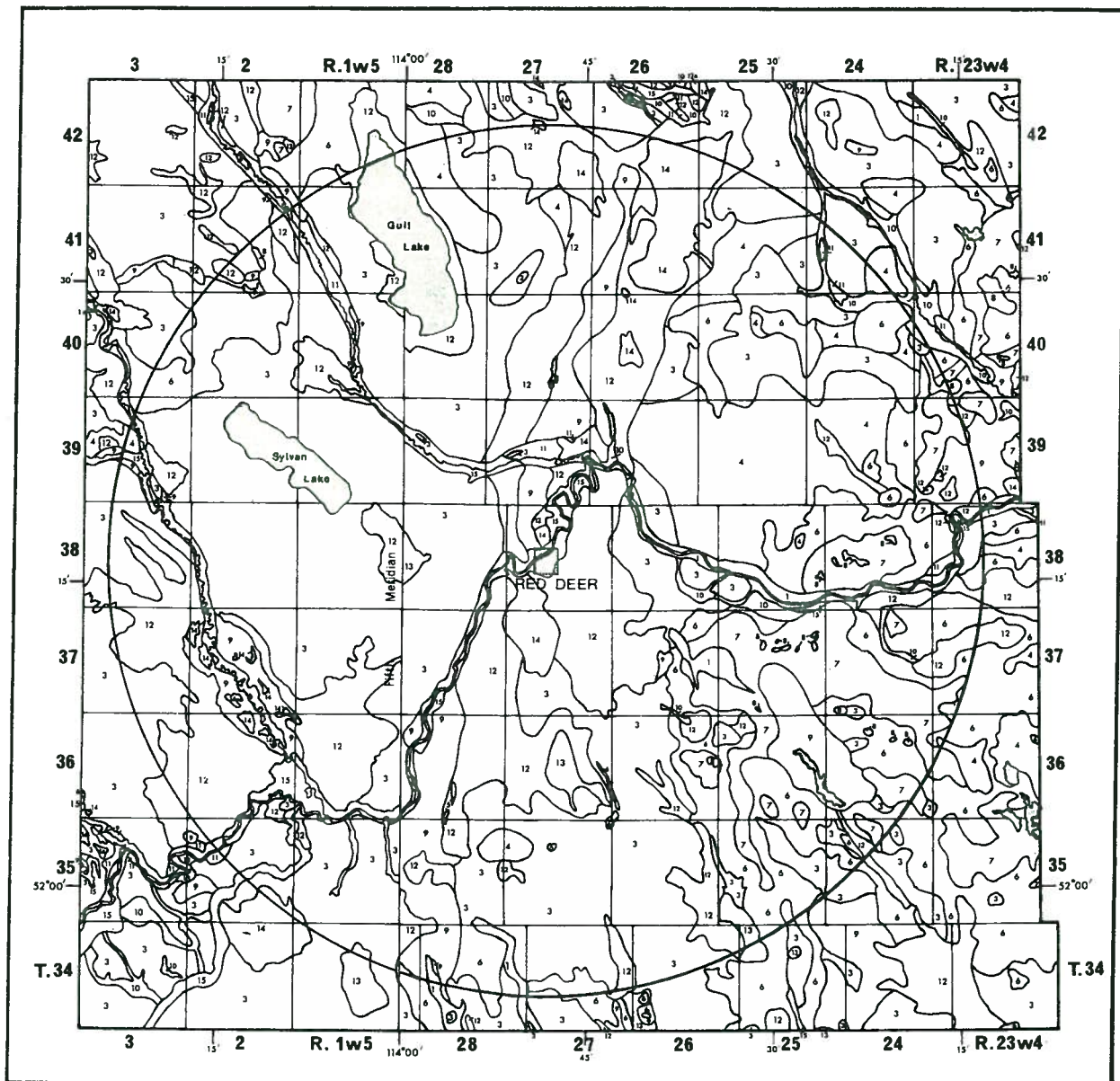


FIGURE 1. Location of study area.



LEGEND

QUATERNARY

Recent		Pleistocene		Pleistocene (contd.)		TERTIARY AND QUATERNARY	
15	Alluvium	10 11	Alluvium	6 7	Hummocky moraine	2	Alluvium
14	Aeolian	9	Outwash	5	Drumlin (Nil)	CRETACEOUS AND TERTIARY	
Pleistocene and Recent		8	Stagnant ice deposits	3 4	Ground moraine	1	Bedrock
12 13	Lacustrine						

FIGURE 2. Surficial geology.

commonly confined to depths of less than 25 feet and sites were selected only along road allowances. Satisfactory samples were obtained from drilling although few materials greater than 3 inches in diameter were recovered. Testhole data from records in the files of the Groundwater Division were used in addition to information obtained from the 1973 drilling program.

Location of pits, exposures and testholes are given in figures 3 to 6. The depth of gravel in each occurrence is indicated wherever the thickness exceeds 5 feet. Sample numbers of each are given and the pertinent analyses may be referred to in tables 1 and 2 and in appendices B, C and D of this report.

Table 1. Coal Content of the Sand Fraction (minus #8) of Pit Samples

Sample No.	Percent Coal	Sample No.	Percent Coal	Sample No.	Percent Coal
1	0.86	21	0.89	41	0.06
2	0.35	22	1.58	42	0.43
3	0.23	23	0.70	43	0.05
4	0.34	24	2.05	44	0.20
5	0.08	25	1.11	45	0.29
6	0.09	26	0.26	46	0.33
7	0.05	27	0.31	47	0.43
8	0.30	28	0.04	48	0.41
9	0.04	29	0.15	49	0.18
10	3.18	30	0.33	50	0.16
11	0.45	31	0.77	51	0.22
12	0.61	32	0.42	52	0.41
13	0.37	33	0.14	53	0.23
14	0.91	34	0.22	54	0.42
15	0.38	35	0.37	55	0.06
16	1.22	36	0.58	56	0.19
17	0.61	37	0.47		
18	0.93	38	0.37		
19	0.31	39	0.40		
20	1.38	40	0.18		

Table 2. Coal Content of the Sand Fraction
(minus #8) of Exposure Samples

Sample No.	Percent Coal
A	0.54
B	0.51
C	0.13
D	2.69
E	0.10
F	0.29

As coal is a particularly undesirable material in gravel aggregate, coal contents were determined for the minus #8 sieve fraction of pit and exposure samples, according to the Alberta Highways and Transport laboratory procedures.

Sieve analyses were run on all samples and deviate from ASTM and Alberta Highways and Transport procedures only in the use of a slightly different nest of coarse sieves.

Pebble counts were run on the minus 1 1/4-inch and plus 5/8-inch fraction of pit and exposure samples. Quartzite pebbles were counted independently of metamorphics, which normally consist of gneisses. The chert typically shows very little indication of erosional deterioration and, although some workers discourage the use of chert-bearing gravels (Price, 1958), there appears to be little concern for its effects in regular usage. The sandstones vary considerably from soft Paskapoo-derived rock to well-cemented Lower Cretaceous materials. Deposits which contain high percentages of igneous and metamorphic rock are of good quality except in areas where weathering has produced friable pebbles. Vein quartz was arbitrarily counted with igneous pebbles. Shale and ironstone are normally considered detrimental materials.

Some indication is given of the degree of roundness of the pit and exposure pebbles retained on the 5/8-inch mesh sieve (Plates 1 and 2; Appendices B and C). The ultimate use of the gravel will dictate the roundness desired.

Descriptions of the amount of surface incrustation are provided for pit and exposure samples in appendices B and C, respectively (minus 1 1/4-inch, plus 5/8-inch mesh fraction). *Extreme* incrustation is applied to gravels including a larger number of pebbles with one-half or greater of their surface covered with a carbonate layer. *Moderate* incrustation is used to describe gravels with a larger number of pebbles with one-quarter to one-half the surface covered. Gravels having pebbles with small patches of carbonate scale on the surface are classified as having *slight* incrustation.

Properly graded quartzite-rich gravels are much preferred as a quality product except where crushing costs rise as a result of working harder rock. Preglacial gravels have particularly high contents of quartzite; therefore, those deposits located west of Lacombe in township 41, range 27, west of the fourth meridian are regarded as excellent.

Recent alluvial and Pleistocene outwash deposits normally include good quality gravels, although the former are frequently somewhat inaccessible in deeper river valleys and the latter are more unpredictable in occurrence (for example, major outwash deposits such as those in the Lacombe-Red Deer and Pine Lake areas contain predominantly sand). However, commercial quantities of good quality gravel from this source are outlined in this report. Outwash sheets in the Markerville and Huxley areas appear to be almost entirely devoid of gravel. Localized occurrences of outwash deposits constitute some of the most important gravel sources in many parts of the area (for example, in the Ponoka, Tees and Eckville areas). Lag gravel materials are of poor quality. They typically contain high contents of clay and silt and high percentages of weak and friable pebbles such as shale and sandstones, both probably derived from local bedrock.

Eskers have been important sources of gravel in a few localities but large reserves of coarse sediments are relatively rare within them. Associated kame or outwash complexes, such as the one located in township 41, range 2, west of the fifth meridian, are of considerable importance.

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Bayrock, L. A., T. H. F. Reimchen and A. N. Boydell (1974):

Surficial geology of the Rocky Mountain House area; Alberta Research Map, scale 1:250,000.

Green, R. (1972): Geological map of Alberta; Res. Coun. Alberta Map 35, scale 1 inch to 20 miles.

Price, G. C. (1958): Evaluation and selection of aggregates for concrete construction; presented at 39th Ann. Conv., Good Roads Association, Montreal.

Stalker, A. MacS. (1956): Beiseker, Alberta; Geol. Surv. Can. Paper 55-7.

-----, 1960: Surficial geology of the Red Deer-Stettler map-area, Alberta; Geol. Surv. Can. Mem. 306, 140 pages.

PLATE 1. Pebbles retained on the 5/8-inch sieve

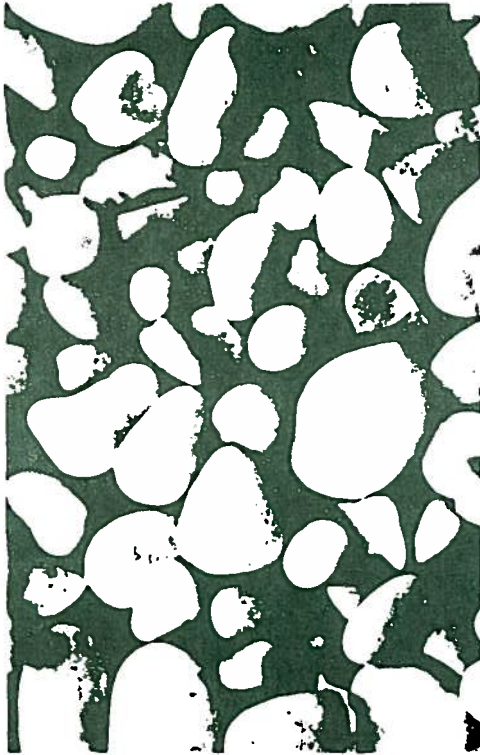


FIGURE 1. Pit 5, SE Sec. 5, Tp. 41, R. 27, W. 4 Mer; quartzite rich, subround and broken, no incrustation.



FIGURE 2. Pit 30, S 1/2 Sec. 27, Tp. 37, R. 24, W. 4 Mer; quartzite and granite, subangular, moderate incrustation.

PLATE 2. Pebbles retained on the 5/8-inch sieve

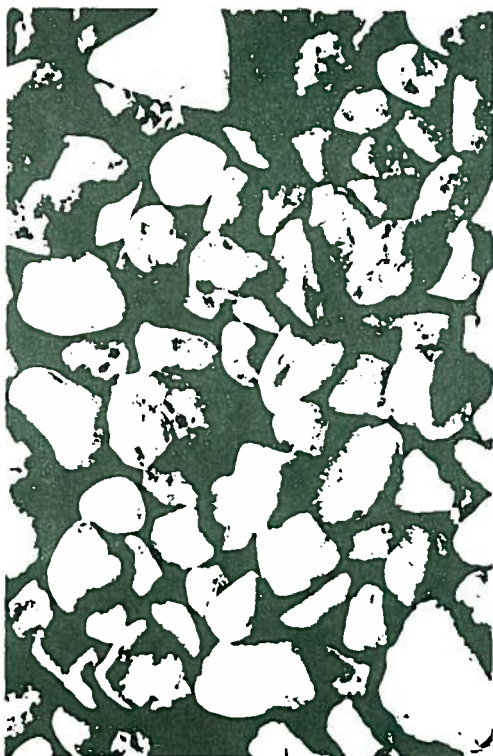


FIGURE 1. Pit 29, SE Sec. 13, Tp. 37, R. 24, W. 4 Mer; igneous rich, subangular to subround, extreme incrustation.



FIGURE 2. Pit 40, NE Sec. 12, Tp. 36, R. 2, W. 5 Mer; carbonate rich, subround, very slight incrustation.

APPENDIX A

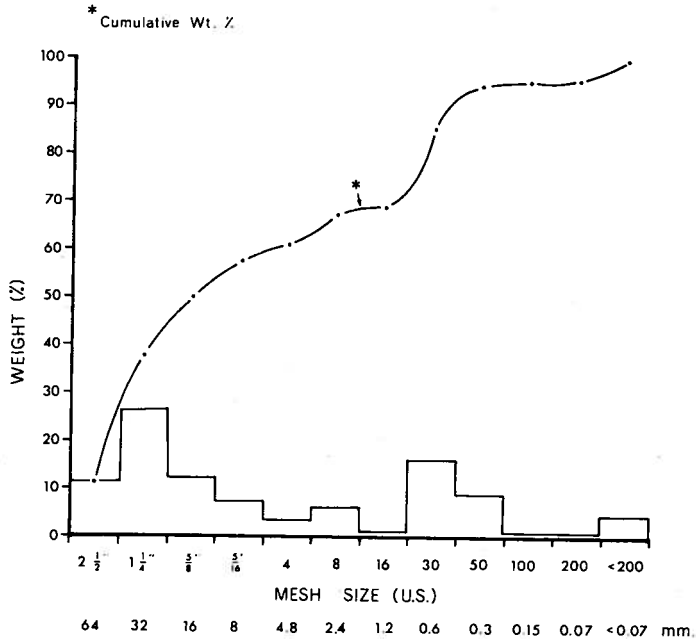
GLOSSARY

<i>Aeolian:</i>	deposited by wind action.
<i>Alluvial/alluvium:</i>	pertaining to sediments of relatively recent time deposited by rivers.
<i>Drumlin:</i>	oval to elongate hill composed of till, formed beneath flowing ice, with its long axis parallel to the direction of ice movement.
<i>Esker:</i>	sinuous ridge of gravel and sand deposited from channels in a decaying glacier or ice sheet through which streams passed.
<i>Glaciofluvial:</i>	pertaining to sediment deposited by streams flowing from glacier ice.
<i>Ground moraine:</i>	till with nearly level to gently undulating topography.
<i>Hummocky moraine:</i>	till forming rolling or hummocky topography.
<i>Kame:</i>	a mound commonly composed of gravel and sand whose form is the result of original deposition against or upon melting ice.
<i>Lacustrine:</i>	deposits laid down under water on the bed of a lake.
<i>Outwash:</i>	sediment deposited by meltwater streams beyond active glacier ice.
<i>Pleistocene:</i>	glacial epoch or ice age.
<i>Preglacial:</i>	pertaining to or occurring in geologic time before the glacial epoch.
<i>Stagnant ice deposits:</i>	pertaining to sediments deposited beneath ice which has ceased to move.
<i>Surficial:</i>	unconsolidated materials lying on the bedrock.
<i>Till:</i>	nonsorted, nonstratified sediment, composed mainly of a mixture of clay, sand and gravel, deposited by a glacier or ice sheet.

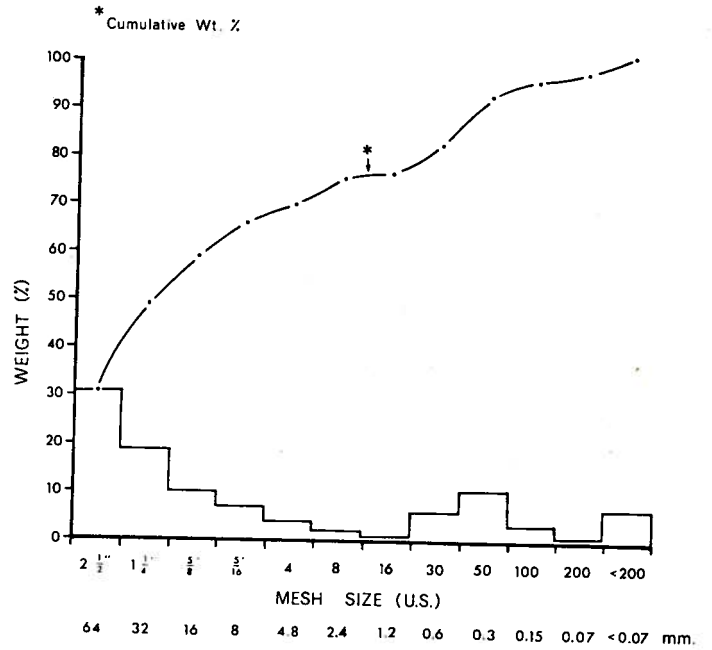
APPENDIX B

RESULTS OF ANALYSES FOR PIT SAMPLES

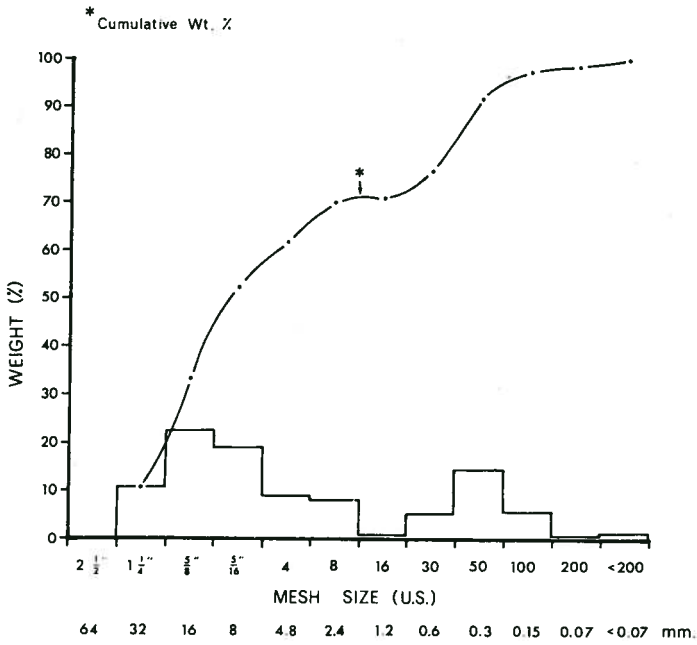
HISTOGRAMS OF SIEVE ANALYSES



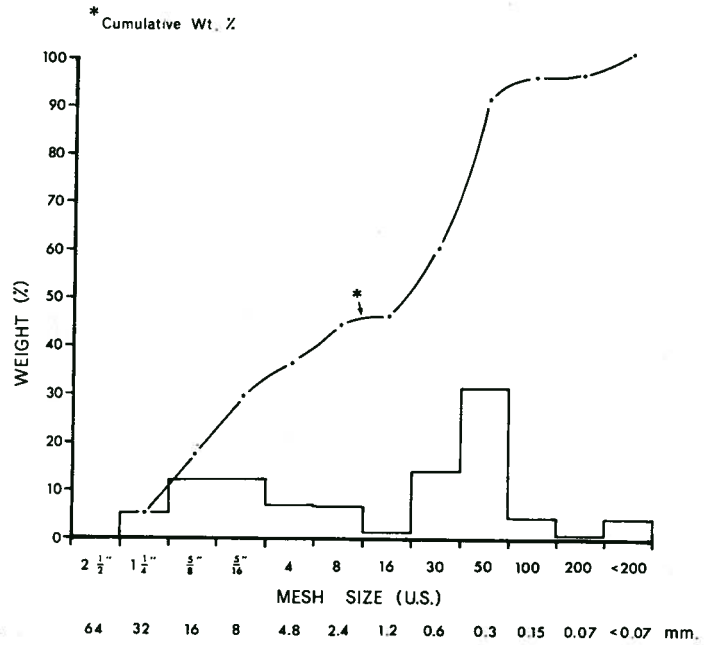
SAMPLE NO.: Pit 1
 DEPTH : 0-20
 LOCATION : W1/2 23-39-27W4



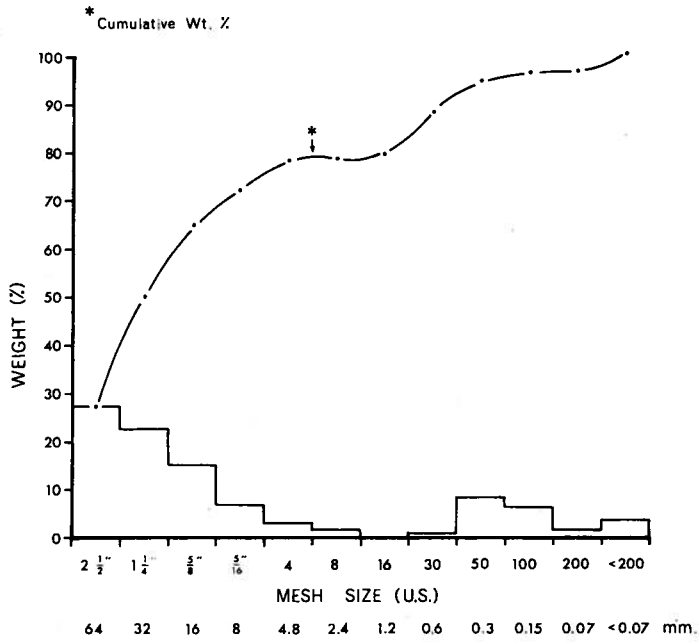
SAMPLE NO.: Pit 2
 DEPTH : 0-10
 LOCATION : NW 21-34-2W5



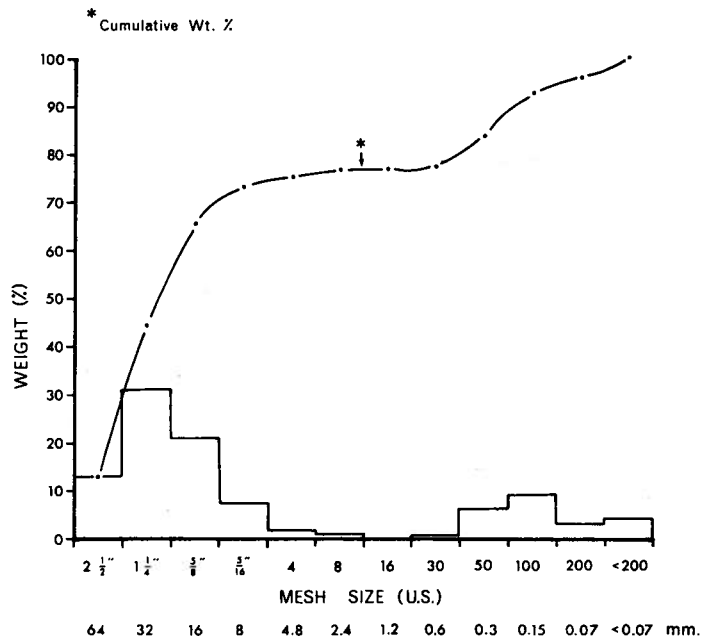
SAMPLE NO.: Pit 3
 DEPTH : 0-2
 LOCATION : NE 9-35-2W5



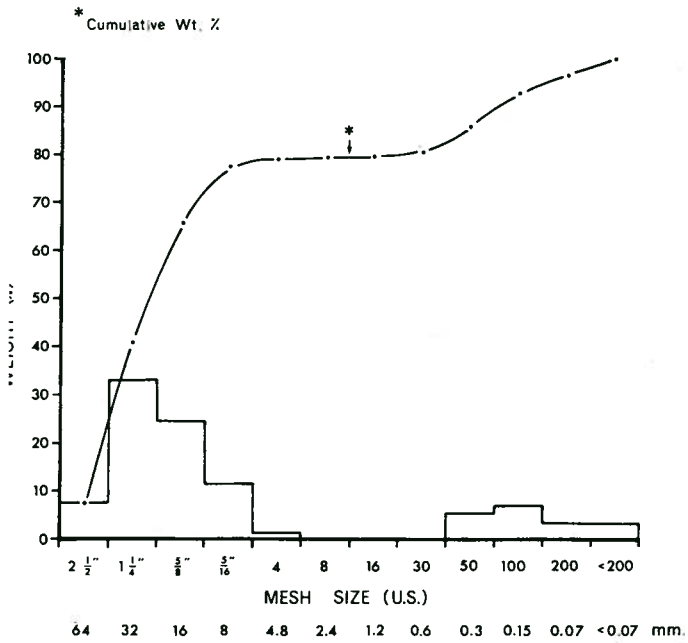
SAMPLE NO.: Pit 4
 DEPTH : 0-8
 LOCATION : NE 6-35-2W5



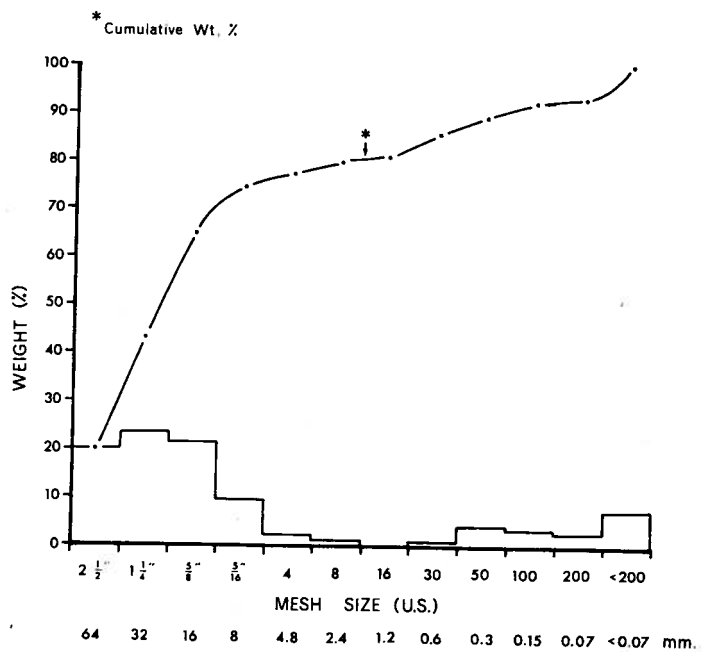
SAMPLE NO.: Pit 5
 DEPTH: 0-10
 LOCATION: SE 5-41-27W4



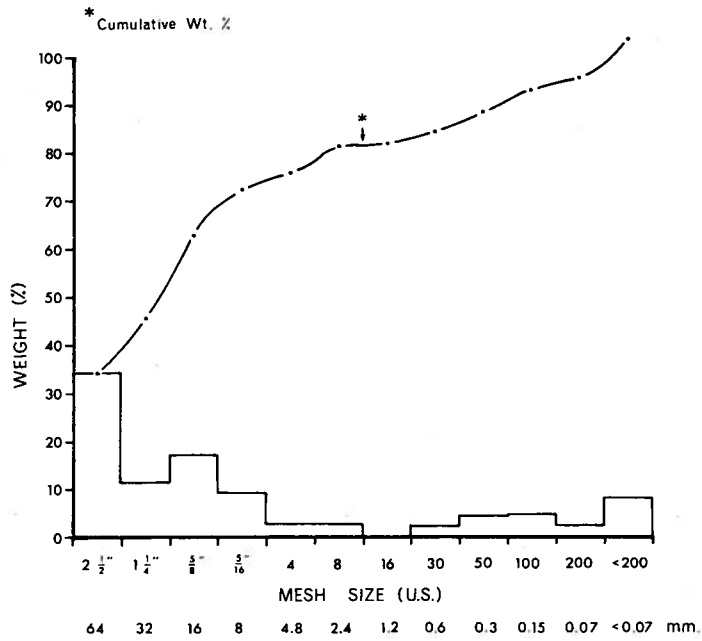
SAMPLE NO.: Pit 6
 DEPTH: 3-15
 LOCATION: W1/2 4-41-27W4



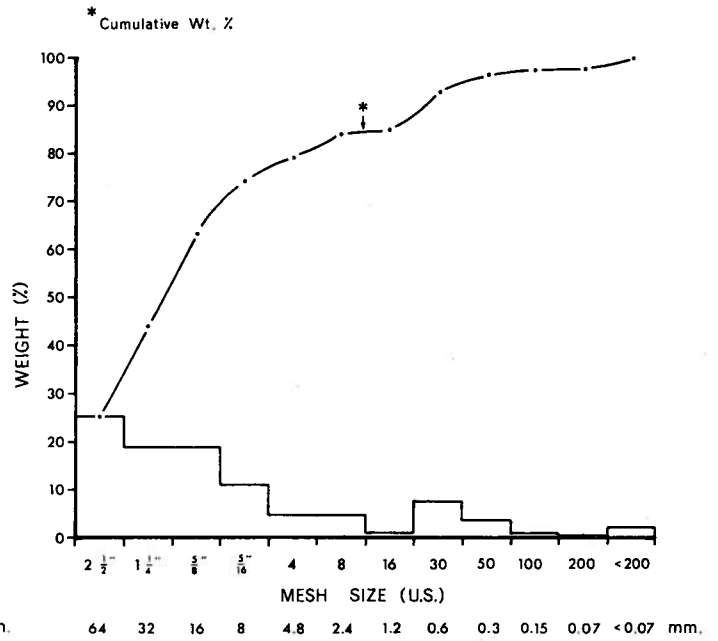
SAMPLE NO.: Pit 7
 DEPTH: 3-20
 LOCATION: SE 16-41-27W4



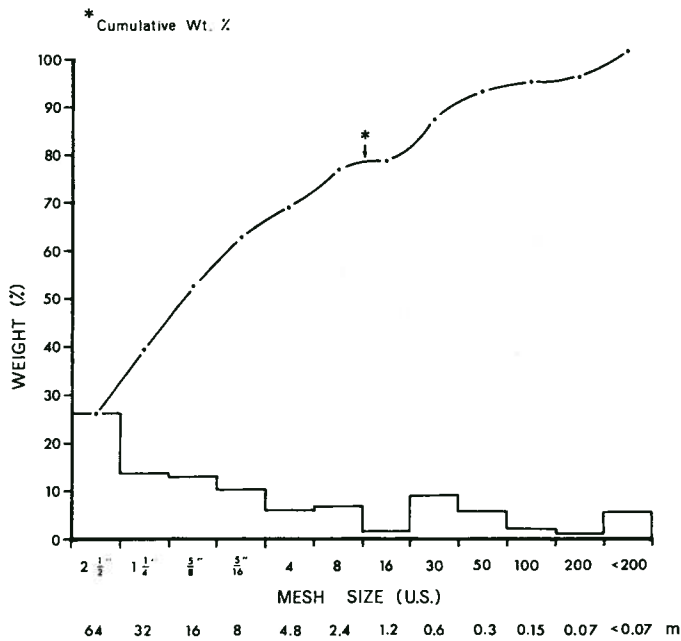
SAMPLE NO.: Pit 8
 DEPTH: 2-5
 LOCATION: SW 27-41-27W4



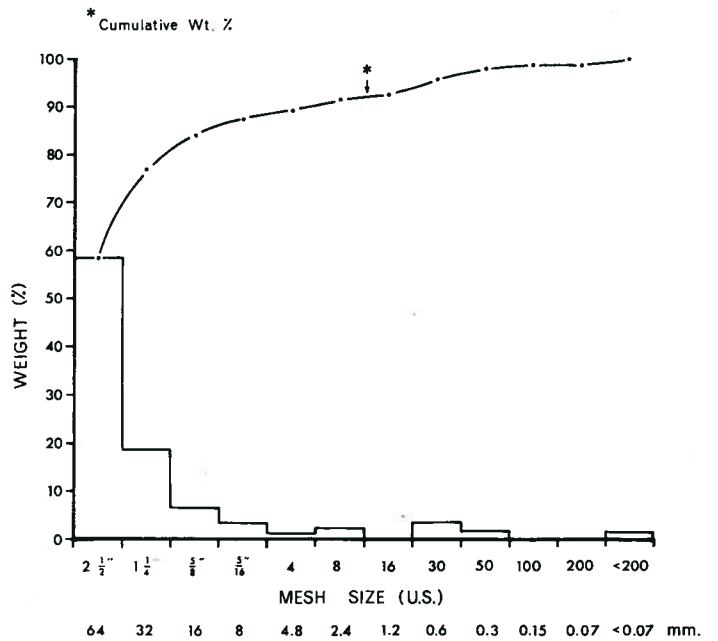
SAMPLE NO.: Pit 9
 DEPTH: 1-2
 LOCATION: E1/2 22-41-27W4



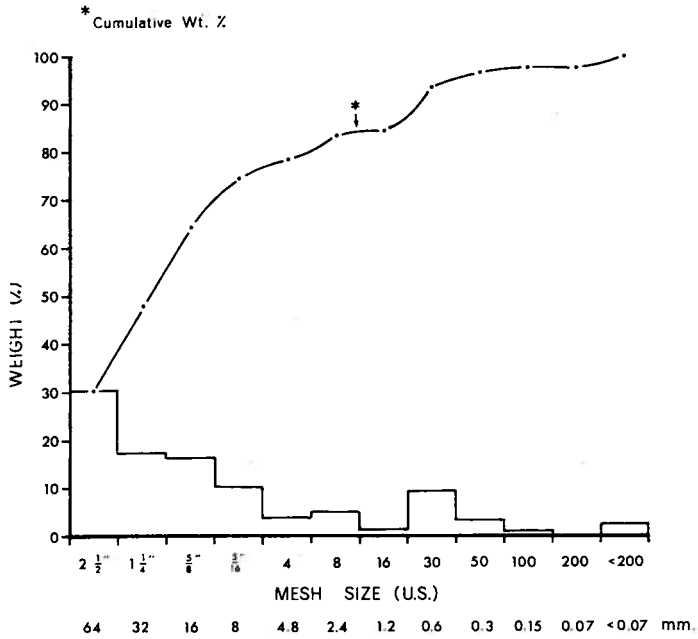
SAMPLE NO.: Pit 10
 DEPTH: 0-6
 LOCATION: N1/2 22-42-26W4



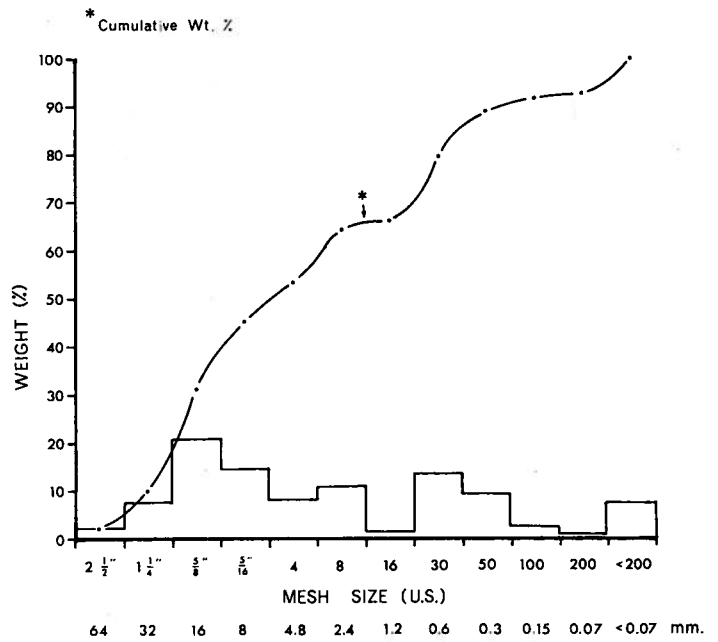
SAMPLE NO.: Pit 11
 DEPTH: 5
 LOCATION: SW 25-42-26W4



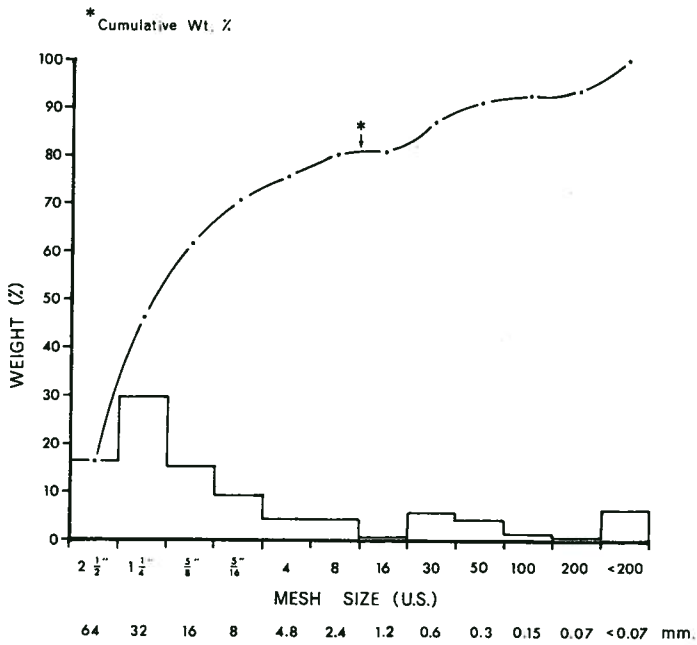
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 DEPTH: 10-15
 LOCATION: SW 35-42-26W4



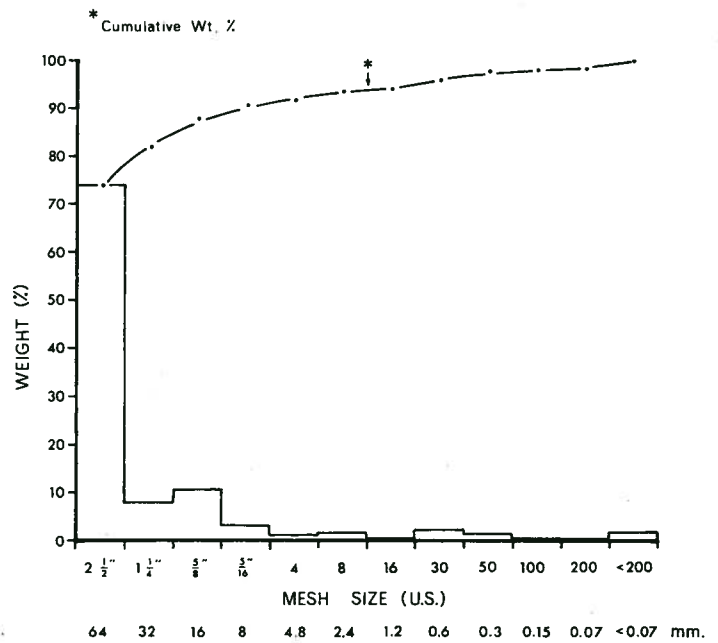
SAMPLE NO.: Pit 13
 DEPTH: 4-6
 LOCATION: SW 27-42-26W4



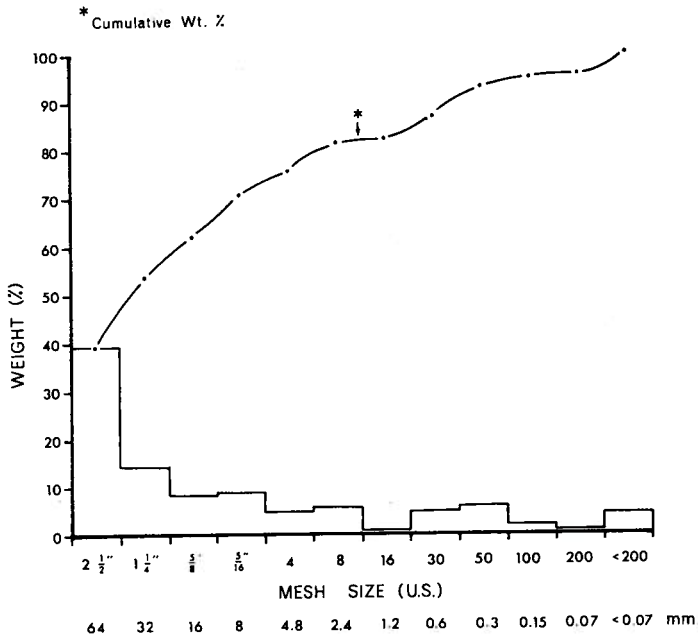
SAMPLE NO.: Pit 14
 DEPTH: 0-5
 LOCATION: N1/2 1-42-25W4



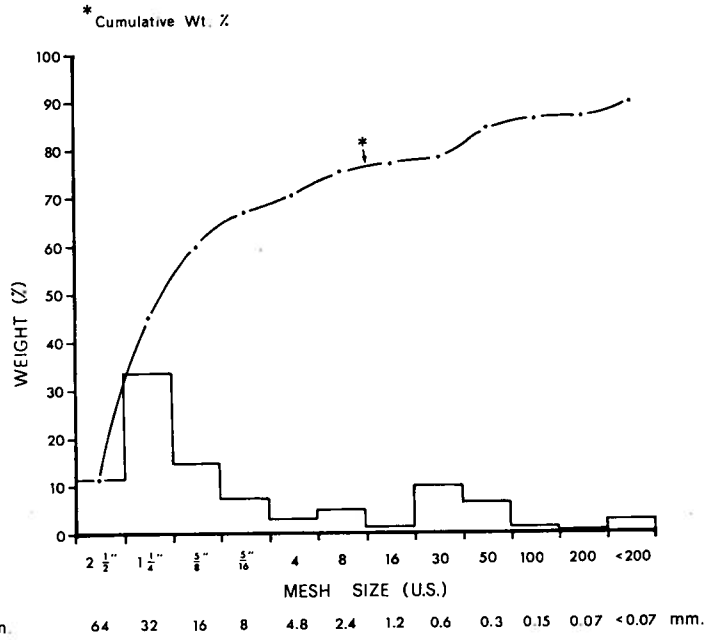
SAMPLE NO.: Pit 15
 DEPTH: 12-15
 LOCATION: SE 16-40-1W5



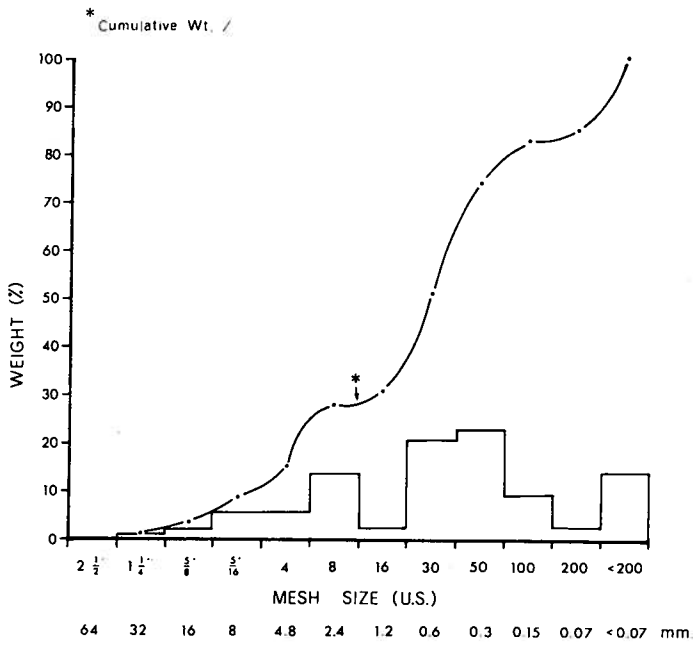
SAMPLE NO.: Pit 16
 DEPTH: 6-10
 LOCATION: E1/2 21-39-27W4



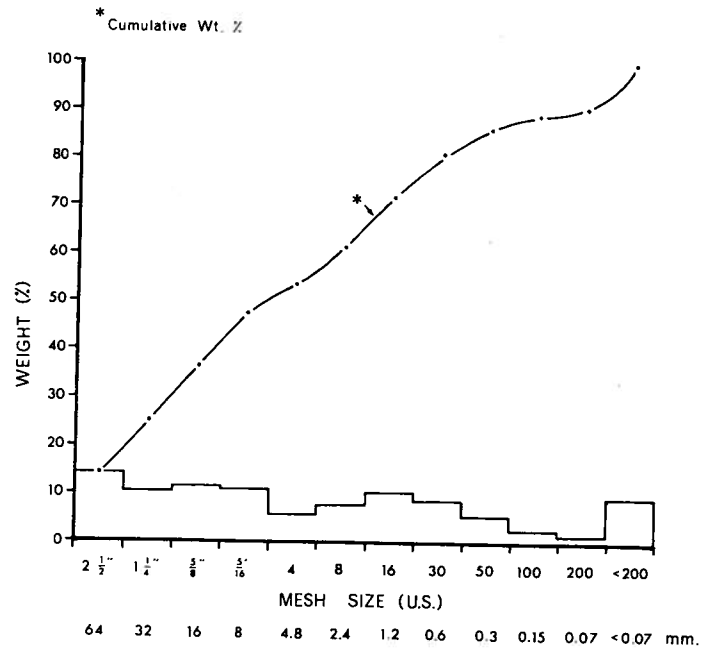
SAMPLE NO.: Pit 17
 DEPTH: 2-6
 LOCATION: N 1/2 31-40-23W4



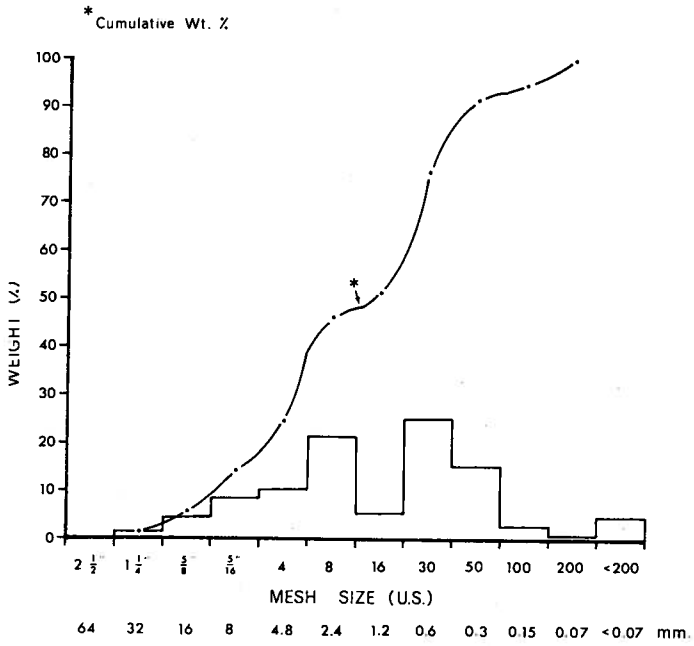
SAMPLE NO.: Pit 18
 DEPTH: 2-5
 LOCATION: S 1/2 29-40-23W4



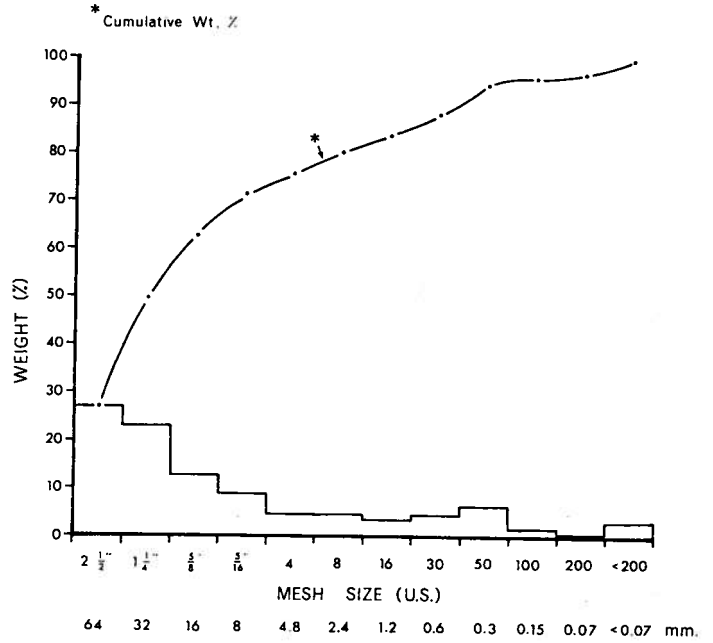
SAMPLE NO.: Pit 19
 DEPTH: 0-5
 LOCATION: NW 12-41-28W4



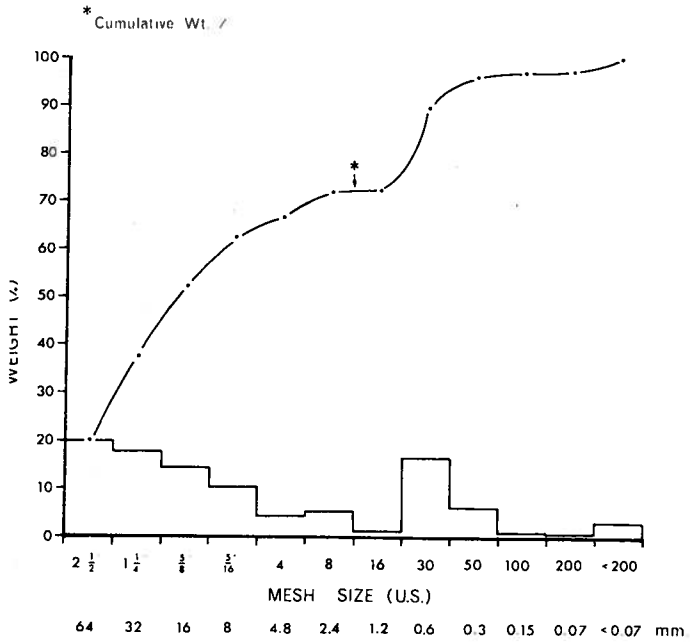
SAMPLE NO.: Pit 20
 DEPTH: 3
 LOCATION: S 1/2 5-41-24W4



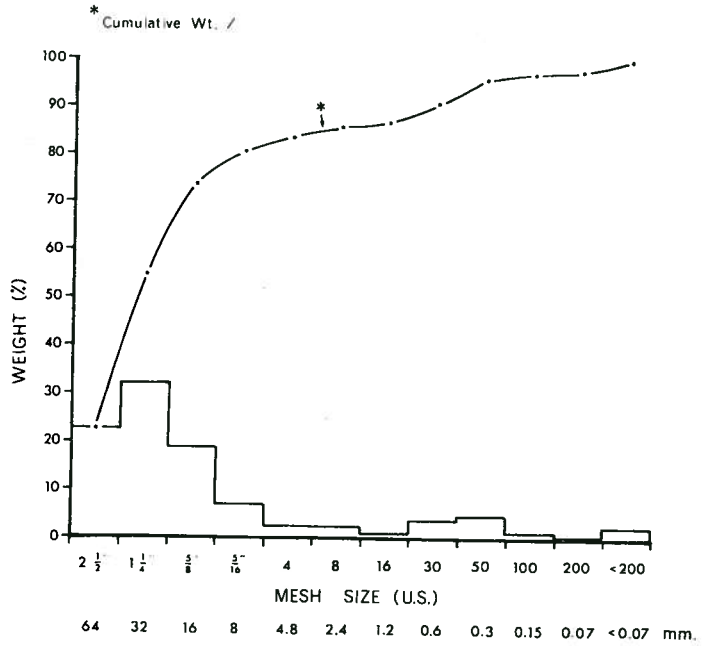
SAMPLE NO.: Pit 21
 DEPTH: 3-6
 LOCATION: W1/2 36-40-24W4



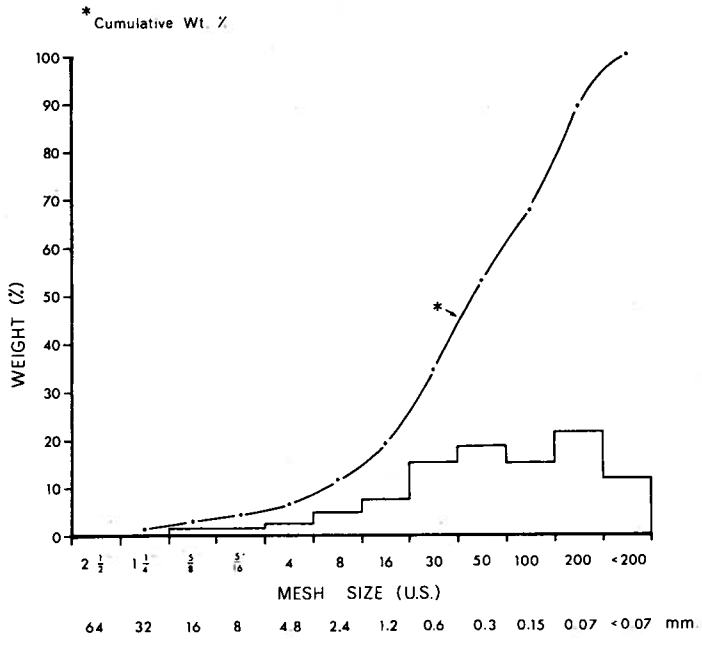
SAMPLE NO.: Pit 22
 DEPTH: 2-5
 LOCATION: NW 33-38-23W4



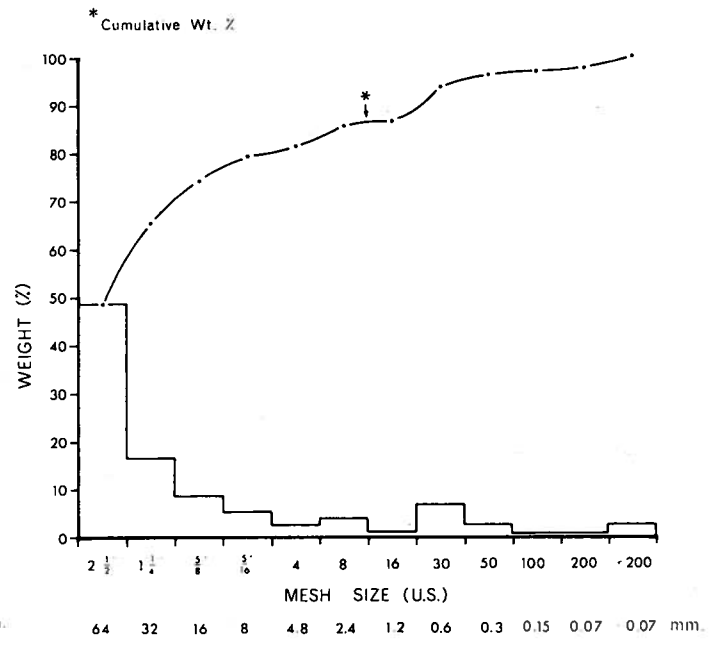
SAMPLE NO.: Pit 23
 DEPTH: 0-4
 LOCATION: W1/2 17-36-23W4



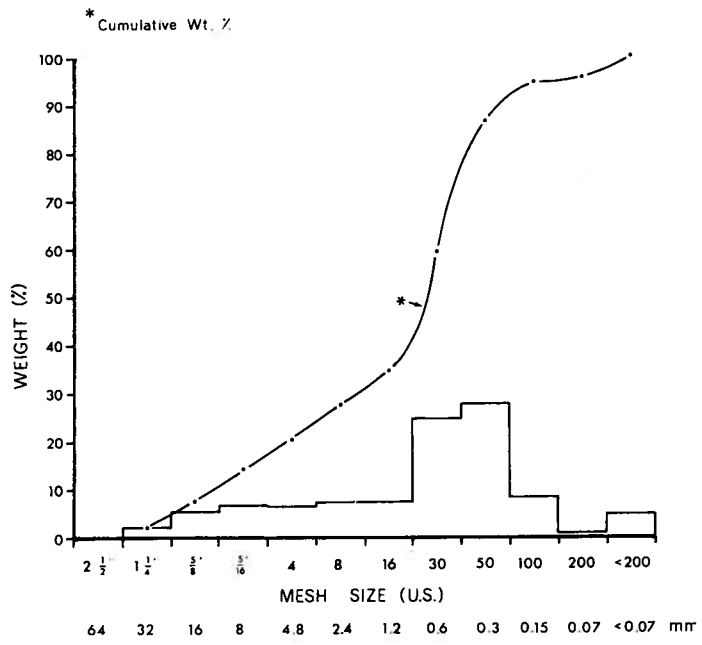
SAMPLE NO.: Pit 24
 DEPTH: 0-10
 LOCATION: SW 18-38-23W4



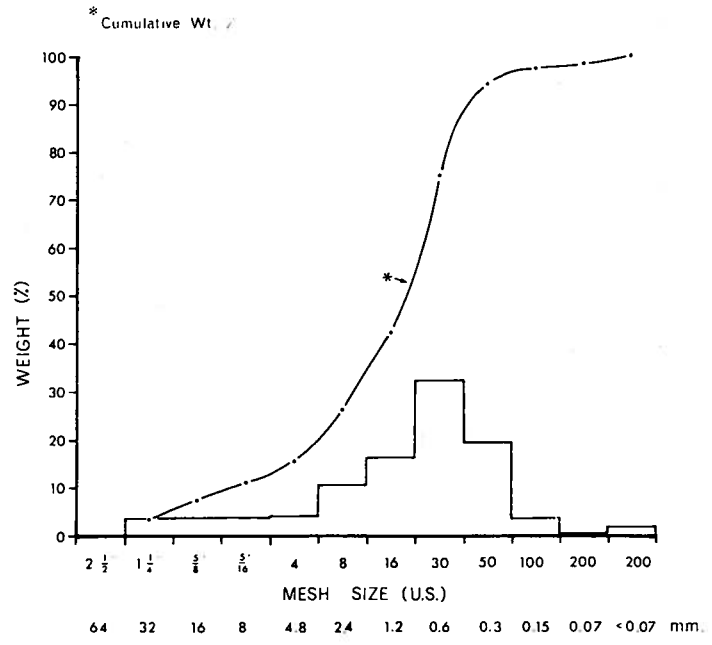
SAMPLE NO.: Pit 25
 DEPTH: 20-25
 LOCATION: NW 33-37-26V:4



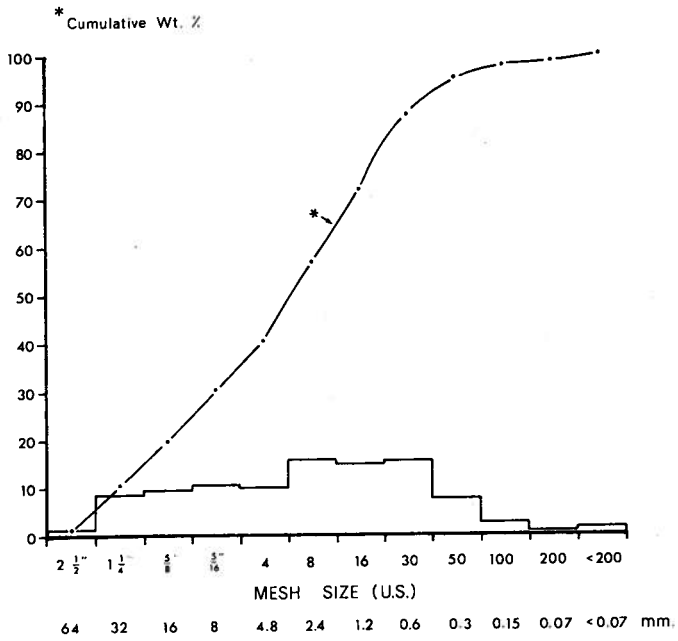
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 DEPTH: 2-7
 LOCATION: NW 3-38-24V:4



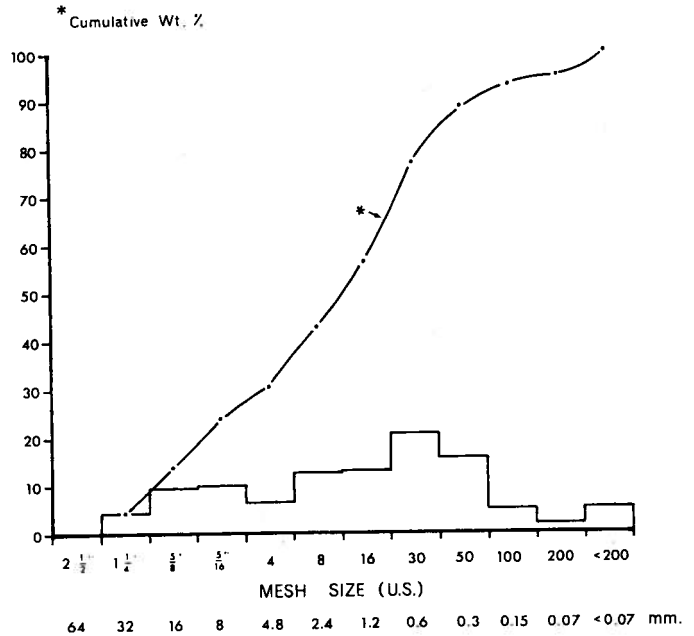
SAMPLE NO.: Pit 27
 DEPTH: 0-6
 LOCATION: SW 1-38-24W4



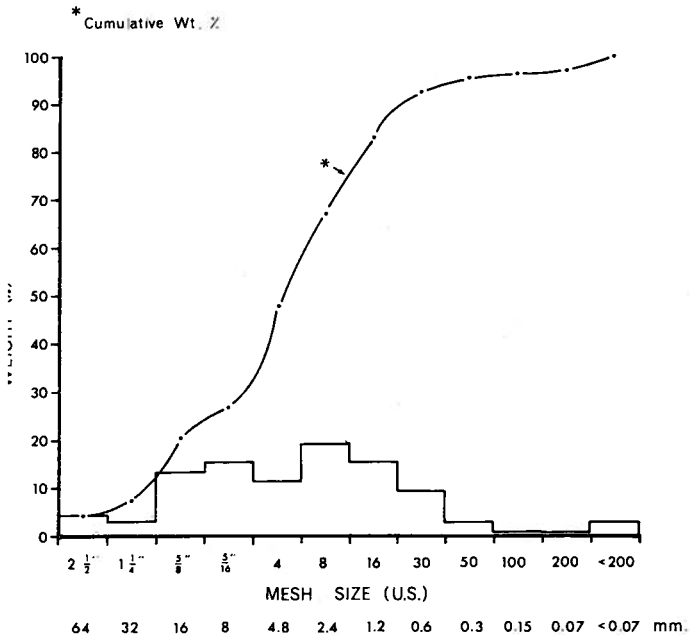
SAMPLE NO.: Pit 28
 DEPTH: 0-6
 LOCATION: E 1/2 14-37-24W4



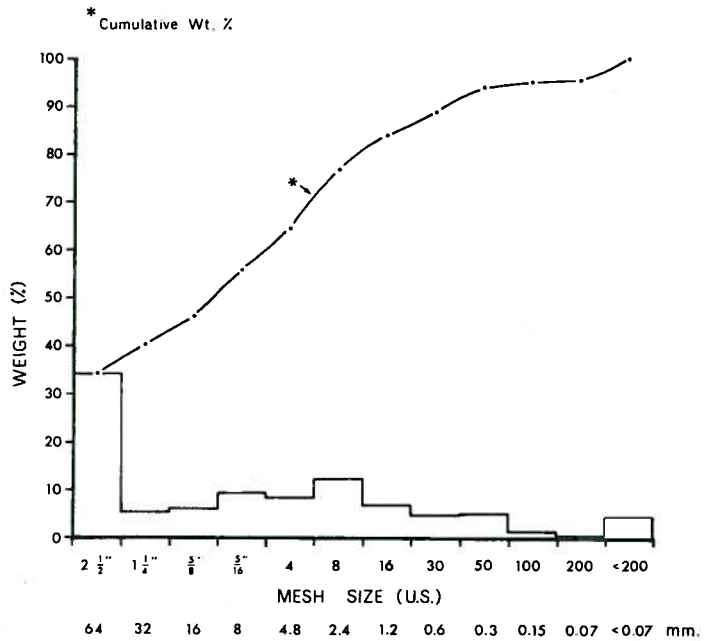
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 DEPTH : 0-5
 LOCATION : SE 13-37-24W4



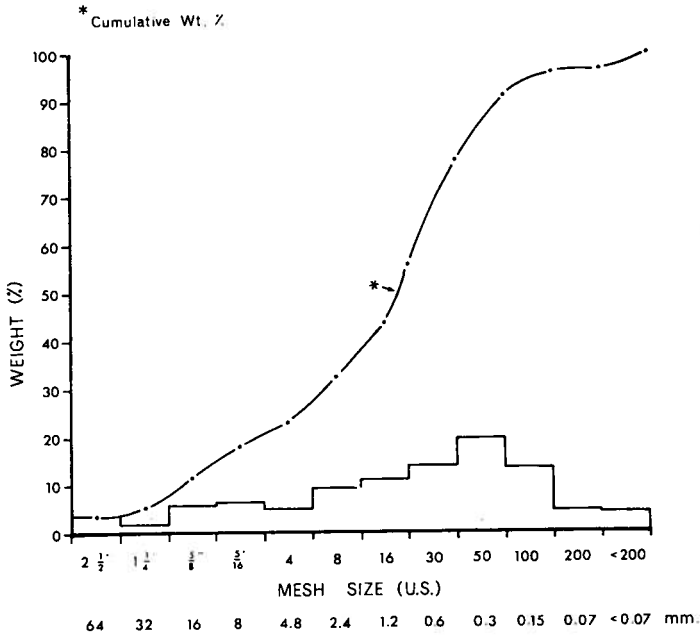
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 DEPTH : 0-4
 LOCATION : S 1/2 27-37-24W4



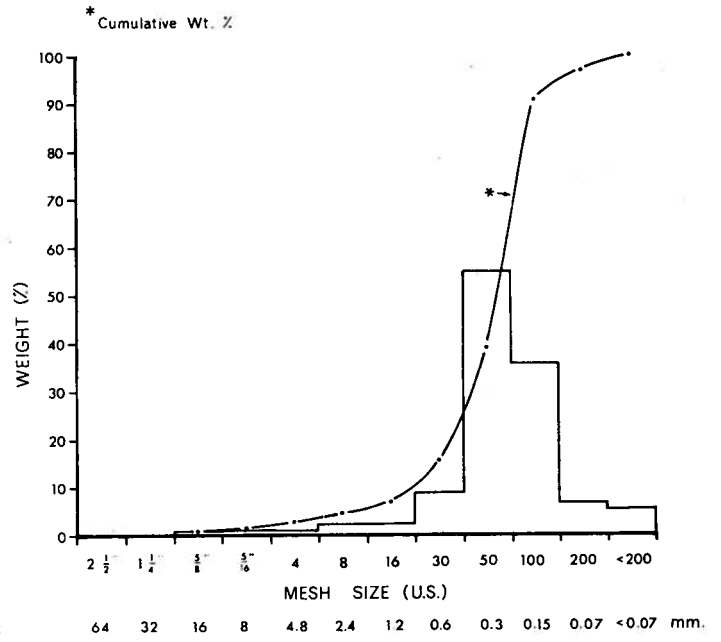
SAMPLE NO.: Pit 31
 DEPTH : 0-8
 LOCATION : SW 4-38-24W4



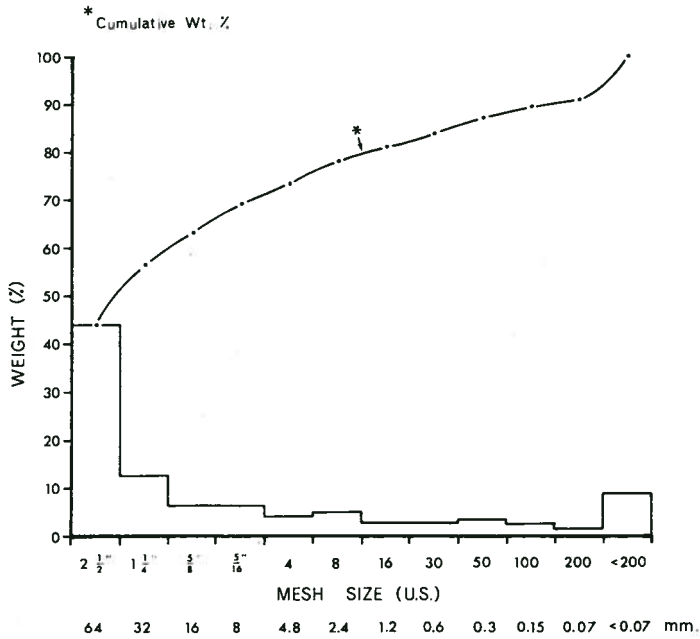
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 DEPTH : 5-10
 LOCATION : W 1/2 34-37-25W4



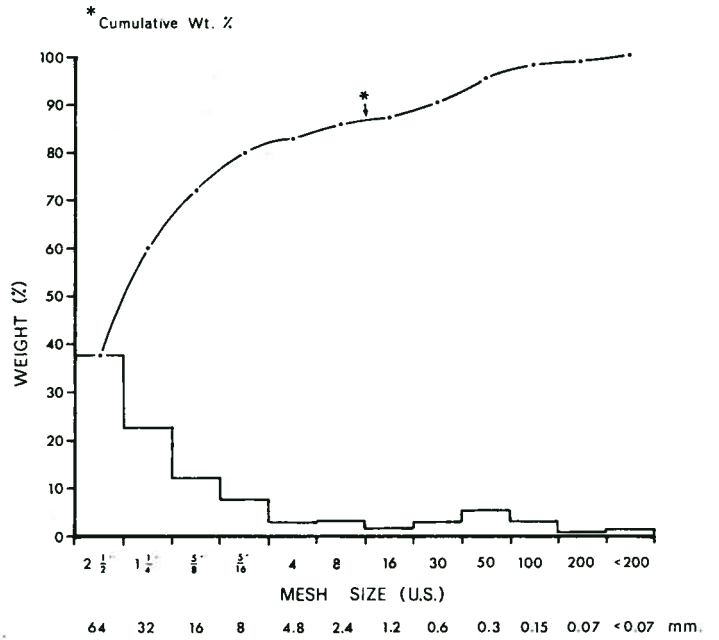
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 DEPTH : 0-8
 LOCATION : NE 4-37-25W4



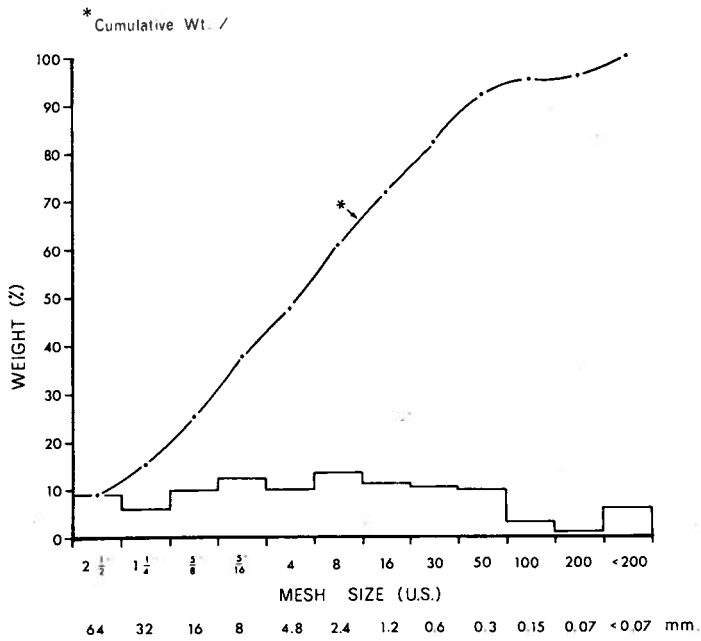
SAMPLE NO.: Pit 34
 DEPTH : 0-35
 LOCATION : N 1 2 26-36-25W4



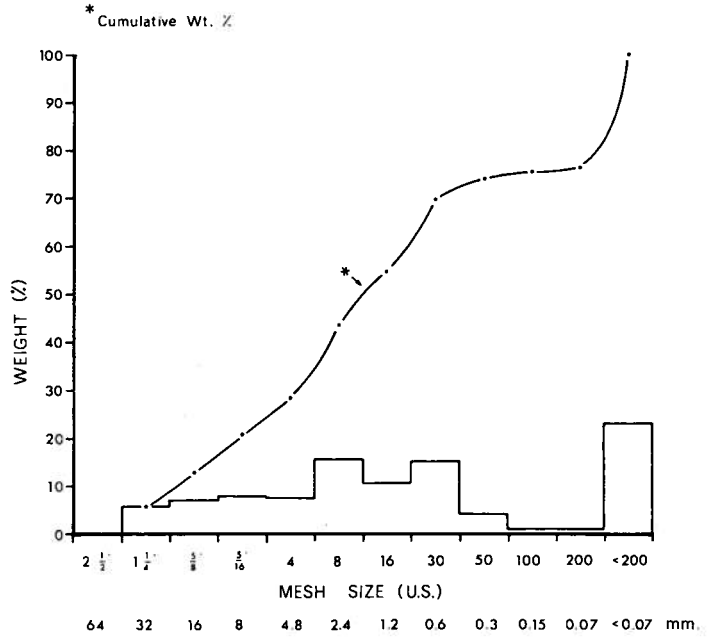
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 DEPTH : 0-3
 LOCATION : S 1/2 5-37-28W4



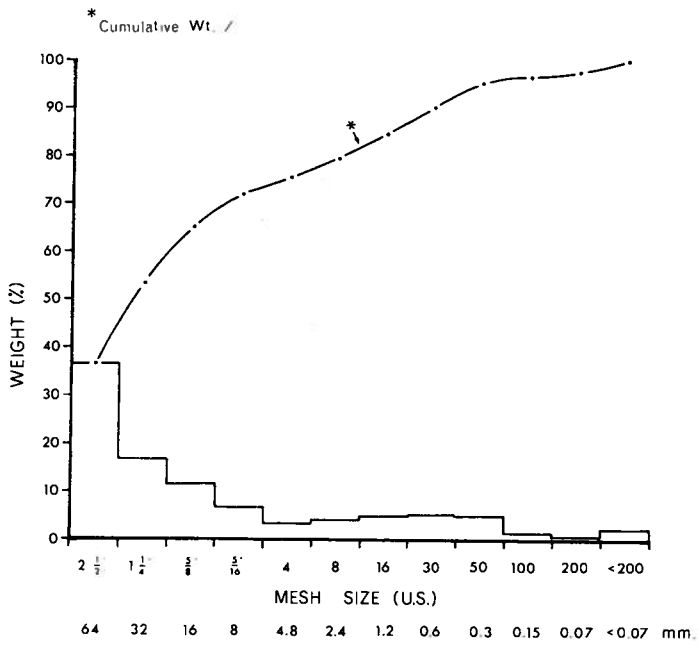
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 DEPTH : 3-23
 LOCATION : SE 29-36-28W4



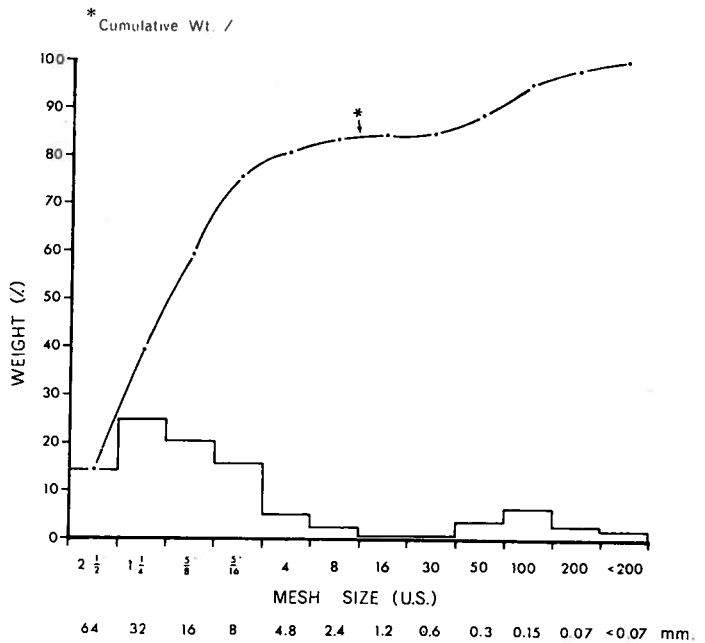
SAMPLE NO.: Pit 37
 DEPTH : 7-10
 LOCATION : SE 13-40-28W4



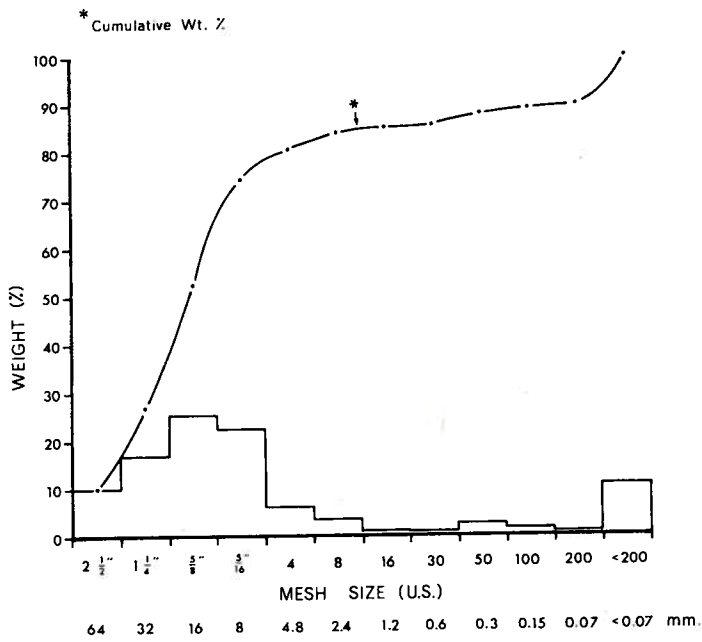
SAMPLE NO.: Pit 38
 DEPTH : 1-4
 LOCATION : E1 25-41-3W5



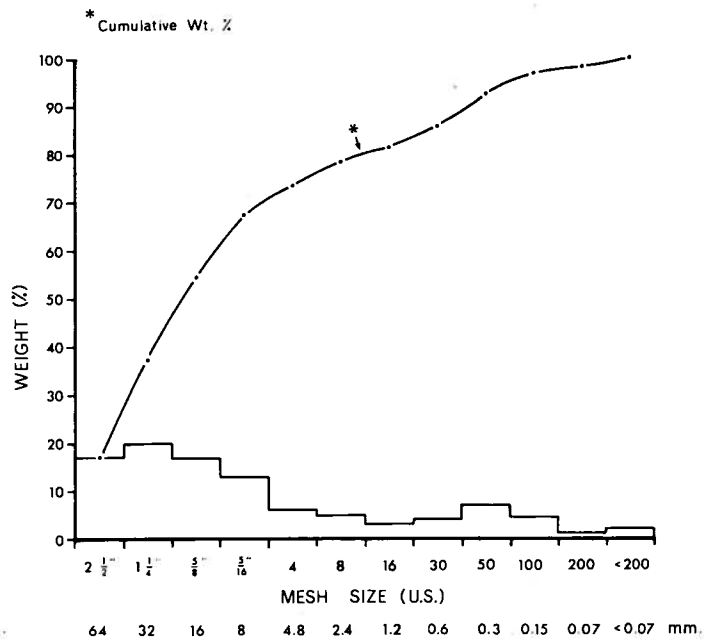
SAMPLE NO.: Pit 35
 DEPTH : 1-5
 LOCATION : S1 216-39-3W5



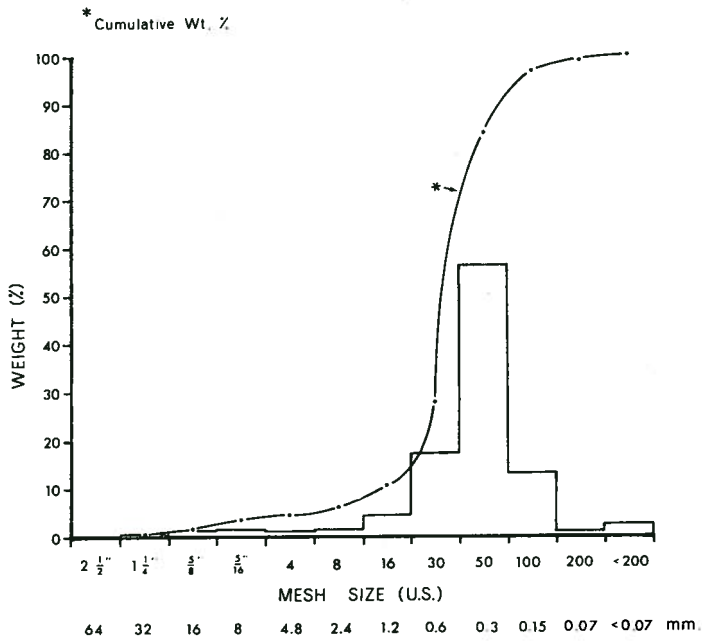
SAMPLE NO.: Pit 40
 DEPTH : 3-10
 LOCATION : NE 12-36-2W5



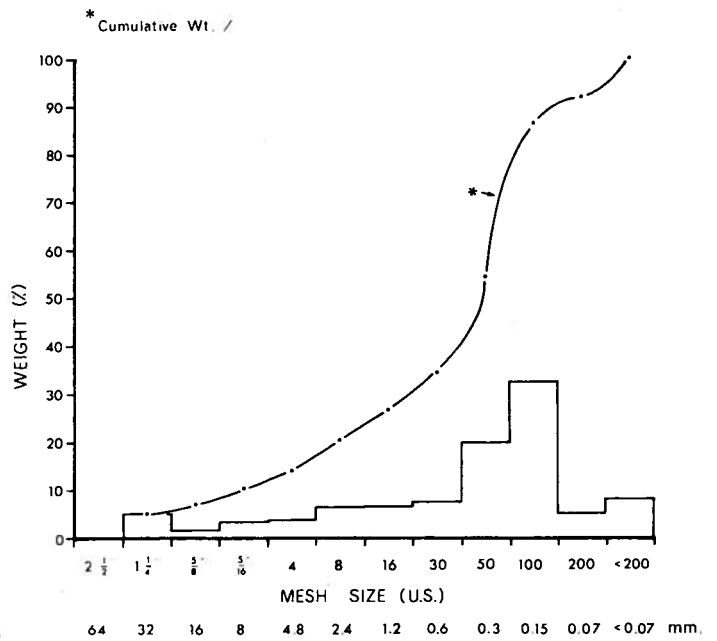
SAMPLE NO.: Pit 41
 DEPTH: 0-9
 LOCATION: NW 19-35-3W5



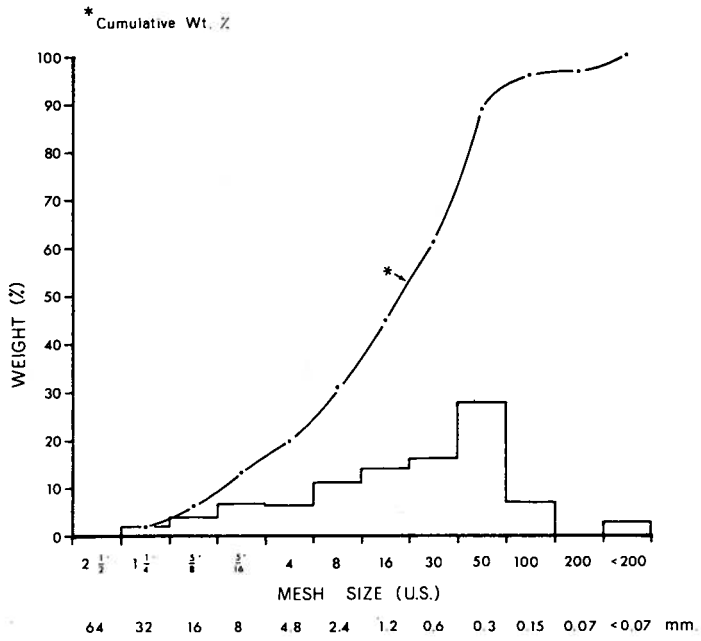
SAMPLE NO.: Pit 42
 DEPTH: 0-7
 LOCATION: NE 12-35-3W5



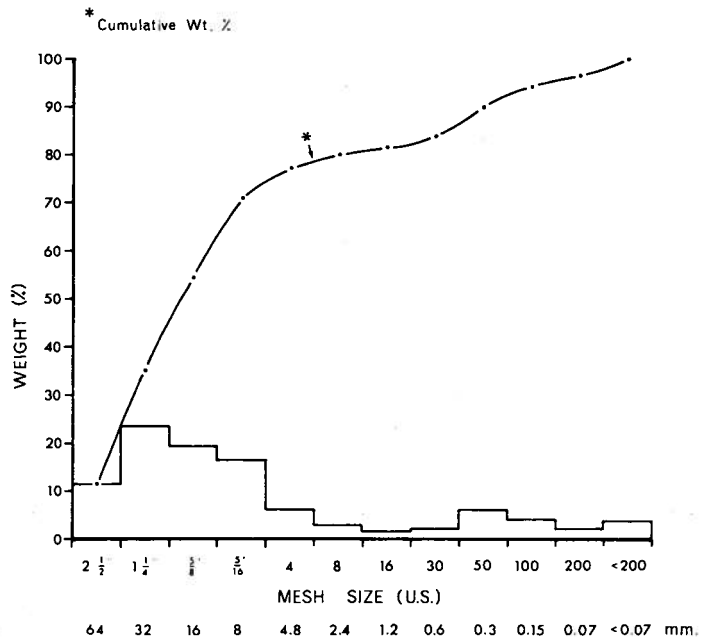
SAMPLE NO.: Pit 43
 DEPTH: 2
 LOCATION: W 1/2 8-35-24W4



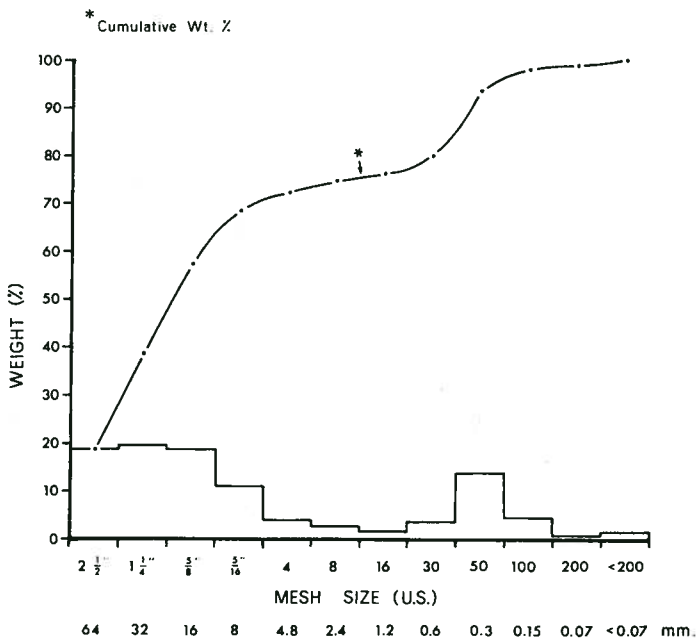
SAMPLE NO.: Pit 44
 DEPTH: 0-4
 LOCATION: N 1/2 11-35-25W4



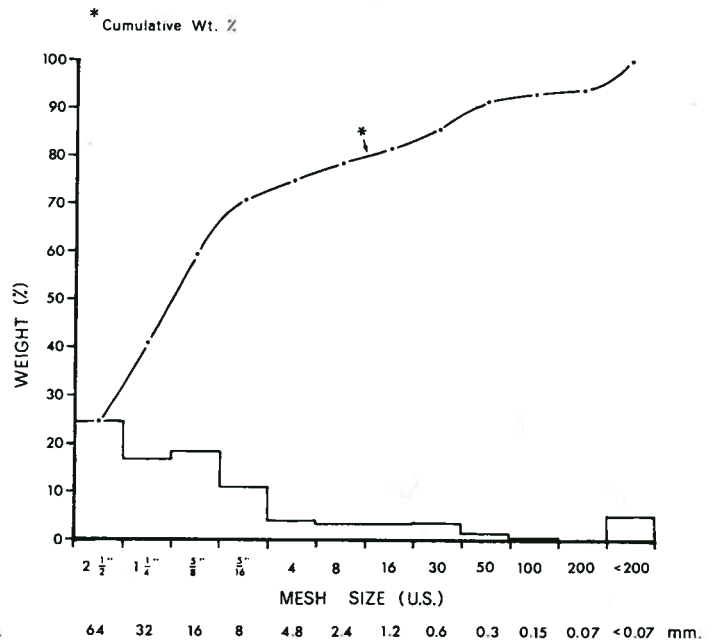
SAMPLE NO.: Pit 45
 DEPTH: 1-7
 LOCATION: SE 14-35-25W4



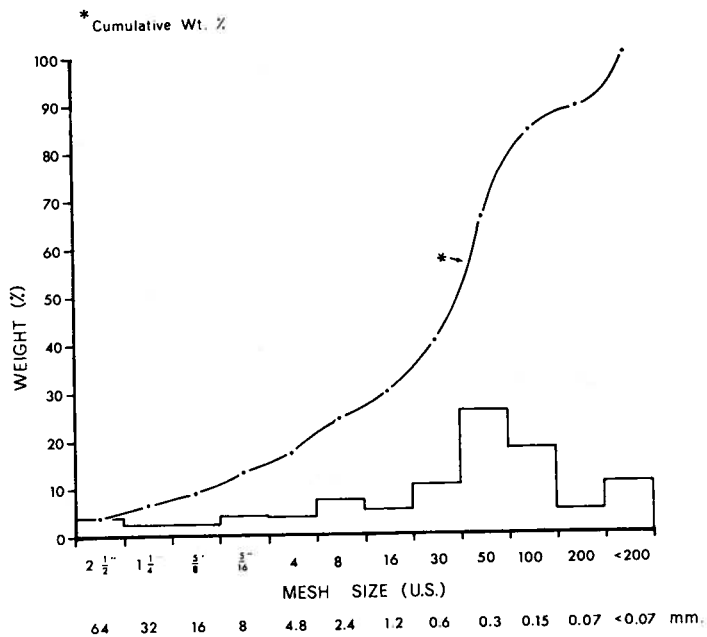
SAMPLE NO.: Pit 46
 DEPTH: 4-11
 LOCATION: N1 2 12-38-28W4



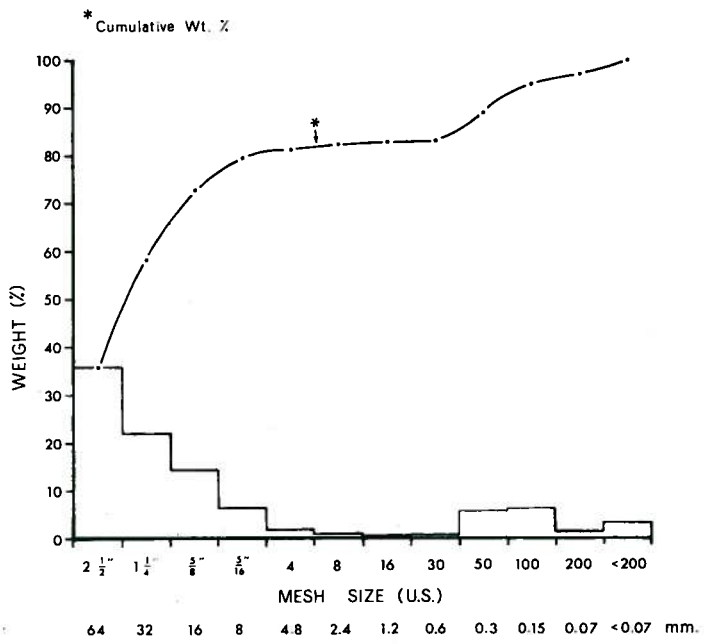
SAMPLE NO.: Pit 47
 DEPTH: 0-7
 LOCATION: NW 27-38-27W4



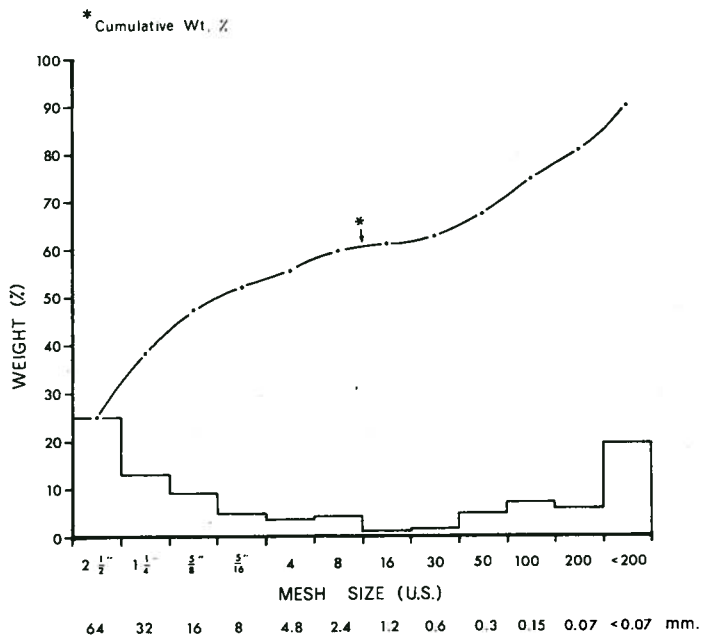
SAMPLE NO.: Pit 48
 DEPTH: 0-7
 LOCATION: Cr. 20-39-27W4



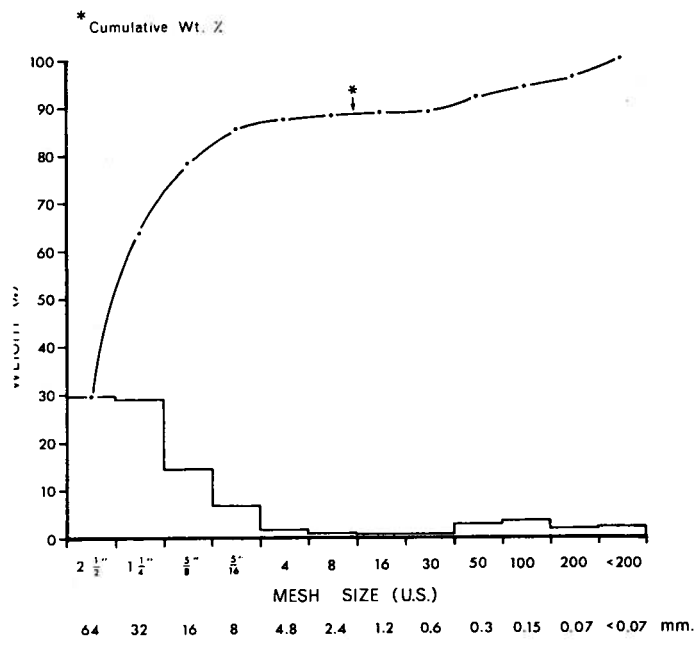
SAMPLE NO.: Pit 49
 DEPTH: 4-16
 LOCATION: W1/2 11-41-2W5



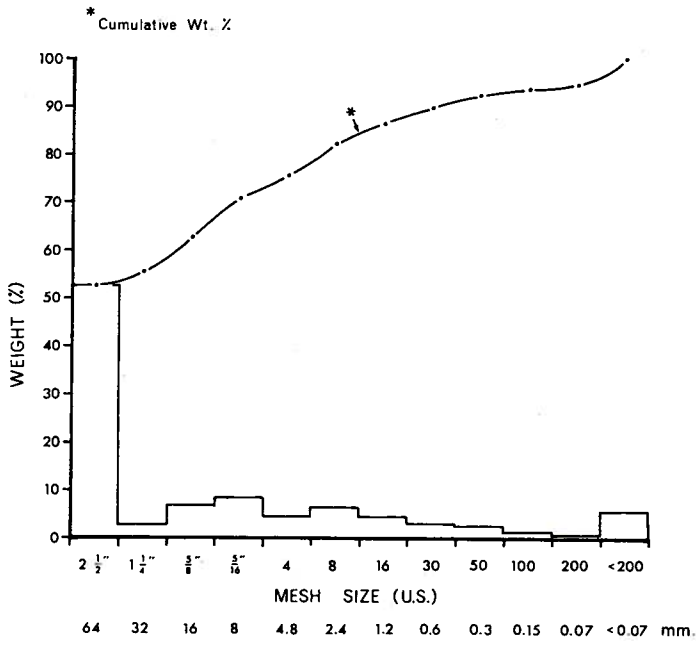
SAMPLE NO.: Pit 50
 DEPTH: 4-8
 LOCATION: NE 14-35-3W5



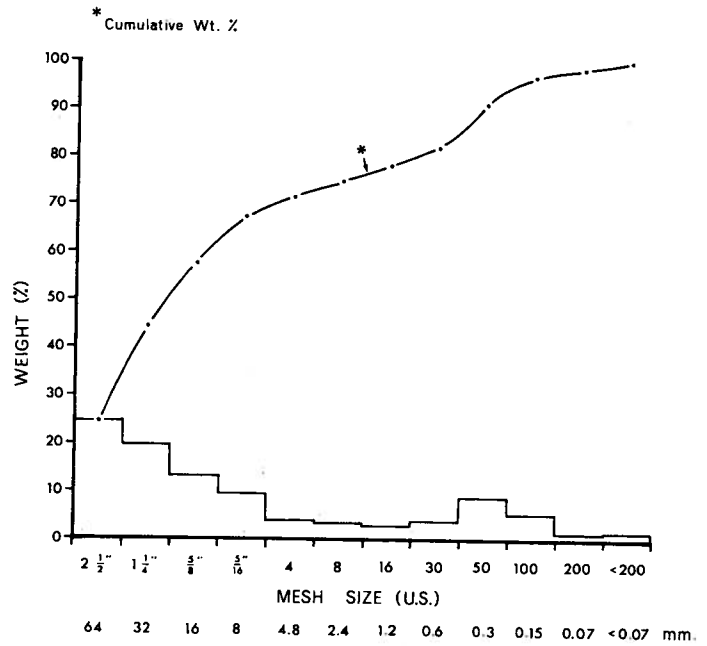
SAMPLE NO.: Pit 51
 DEPTH: 3
 LOCATION: NE 11-35-3W5



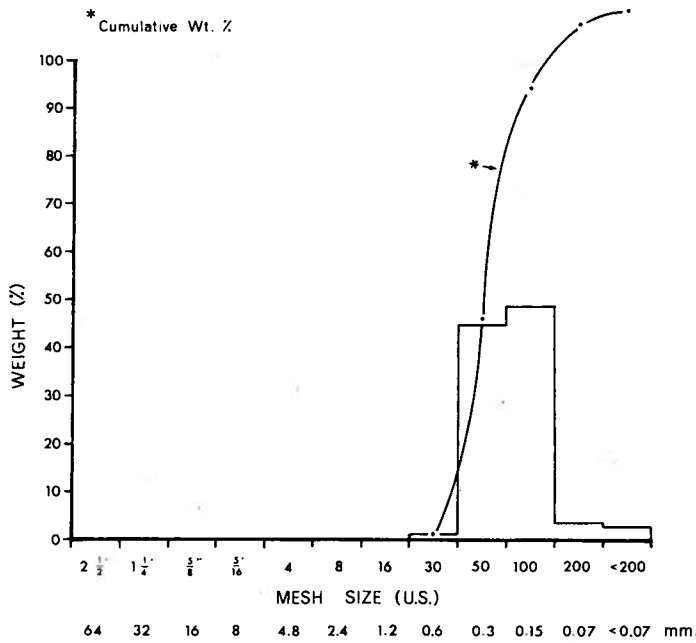
SAMPLE NO.: Pit 52
 DEPTH: 6-10
 LOCATION: S1/2 4-43-24W4



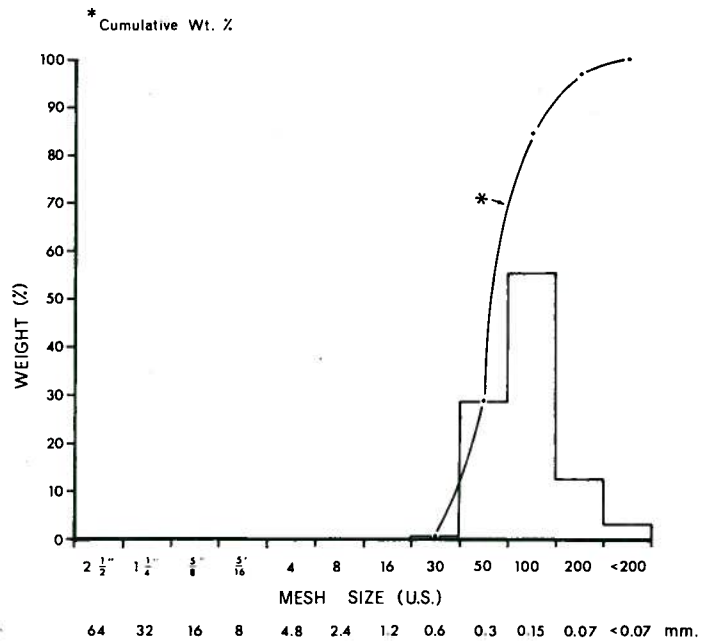
SAMPLE NO.: Pit 53
 DEPTH: 3-6
 LOCATION: NE 34-34-25W4



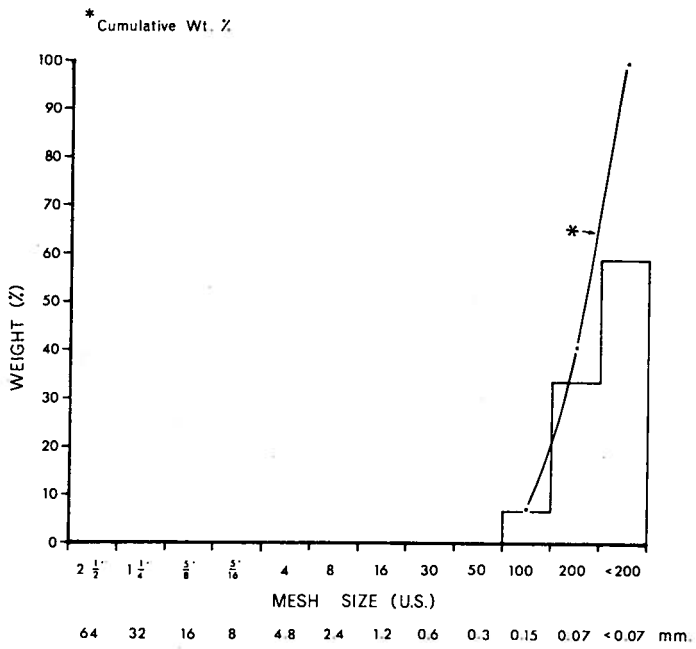
SAMPLE NO.: Pit 54
 DEPTH: 10-19
 LOCATION: NE 8-36-28W4



SAMPLE NO.: Pit 55
 DEPTH: 9-12
 LOCATION: SE 5-39-27W4

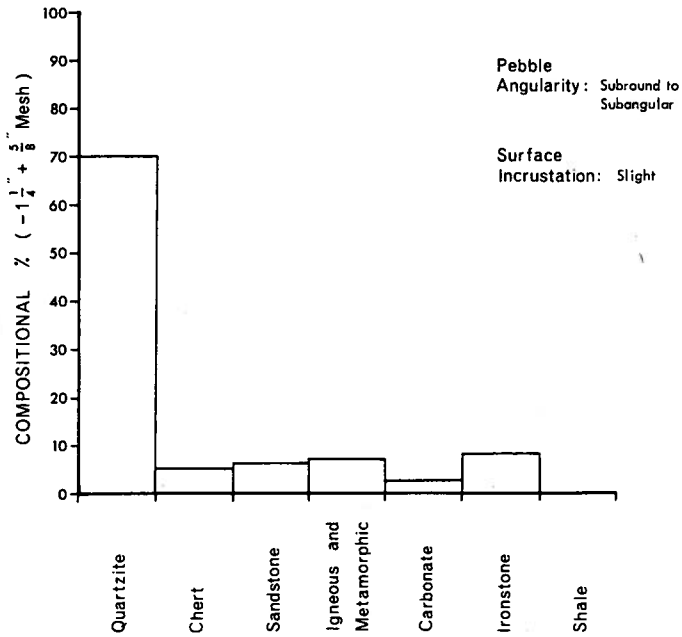


SAMPLE NO.: Pit 56
 DEPTH: 4-6
 LOCATION: W1/2 29-35-28W4

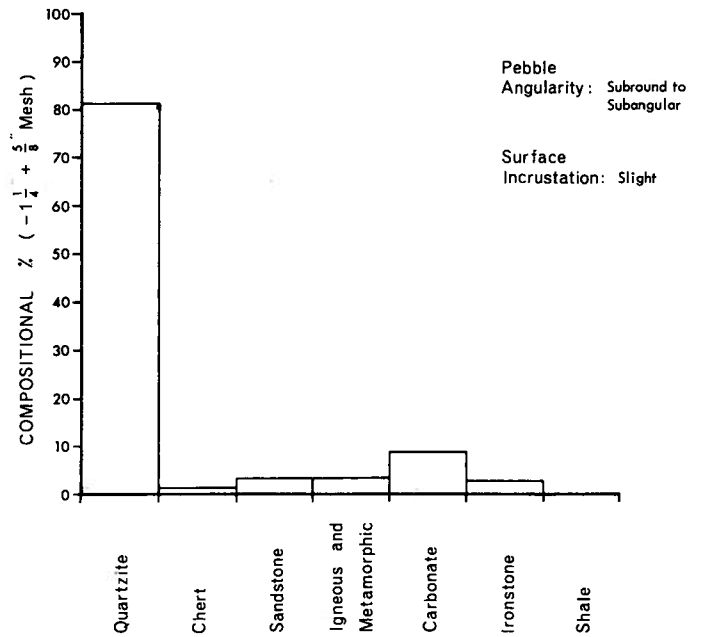


SAMPLE NO. : Pit 57
 DEPTH : 2-3
 LOCATION : NE 10-38-27W4

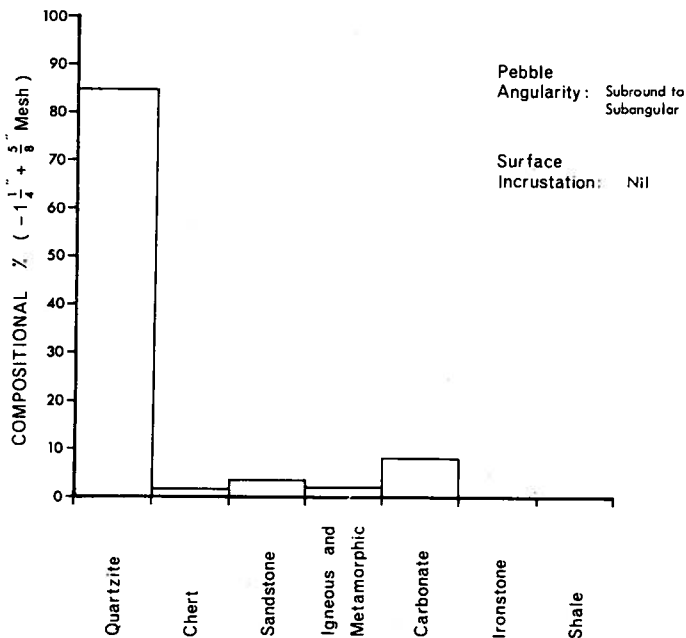
HISTOGRAMS OF PEBBLE COUNTS



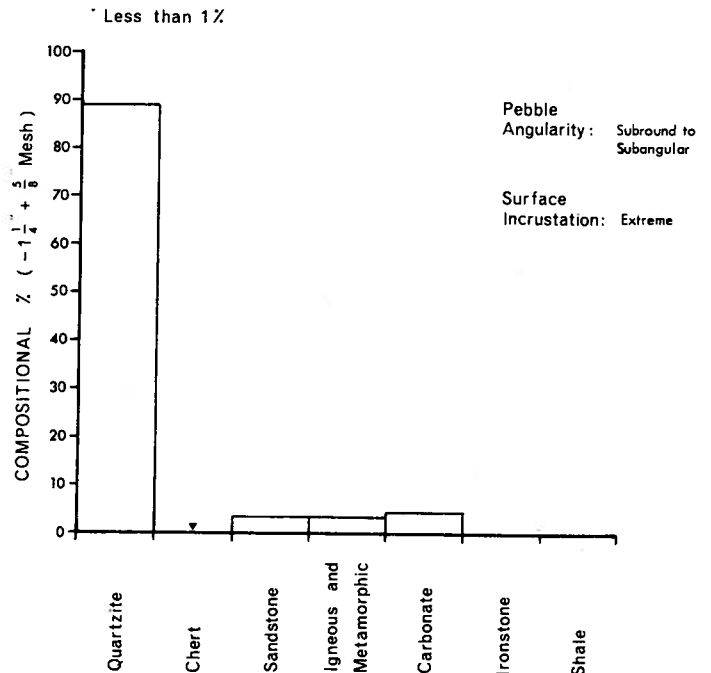
SAMPLE NO.: Pit 1
DEPTH: 0 - 20
LOCATION: W 1/2 28-39-27W4



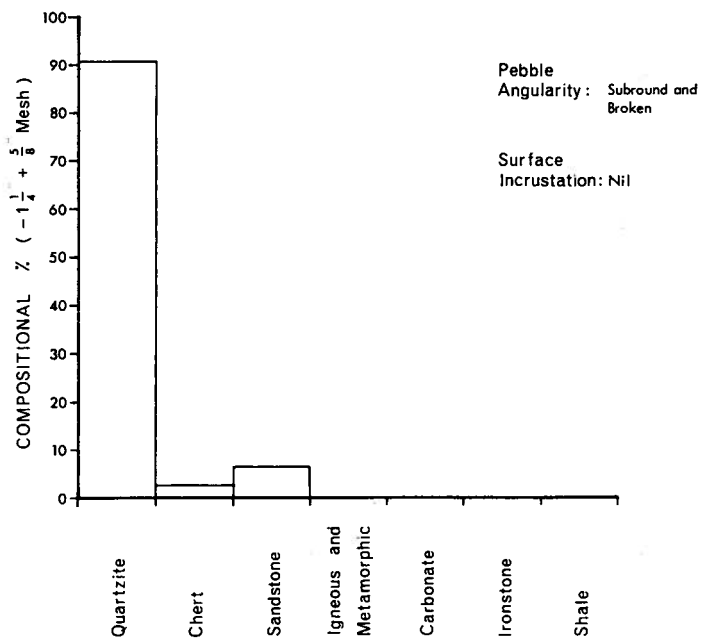
SAMPLE NO.: Pit 2
DEPTH: 0 - 10
LOCATION: NW 21-34-2W5



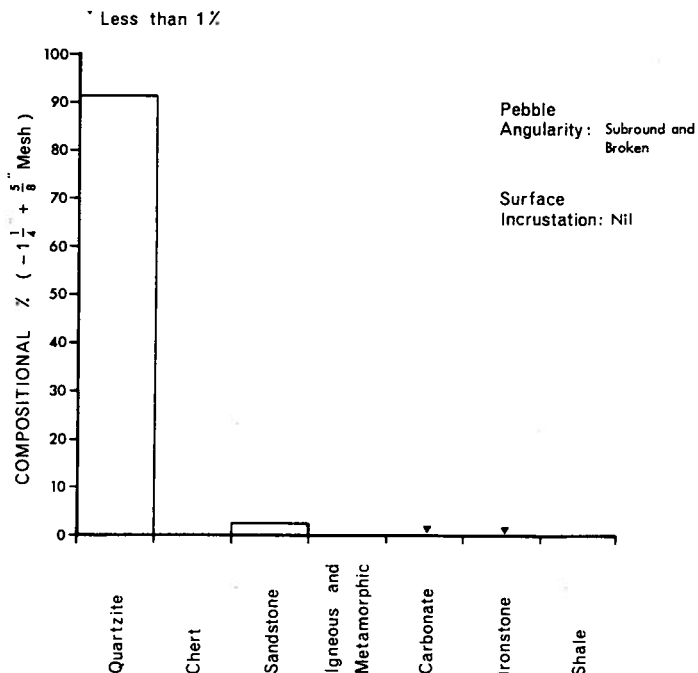
SAMPLE NO.: Pit 3
DEPTH: 0 - 2
LOCATION: NE 9-35-2W5



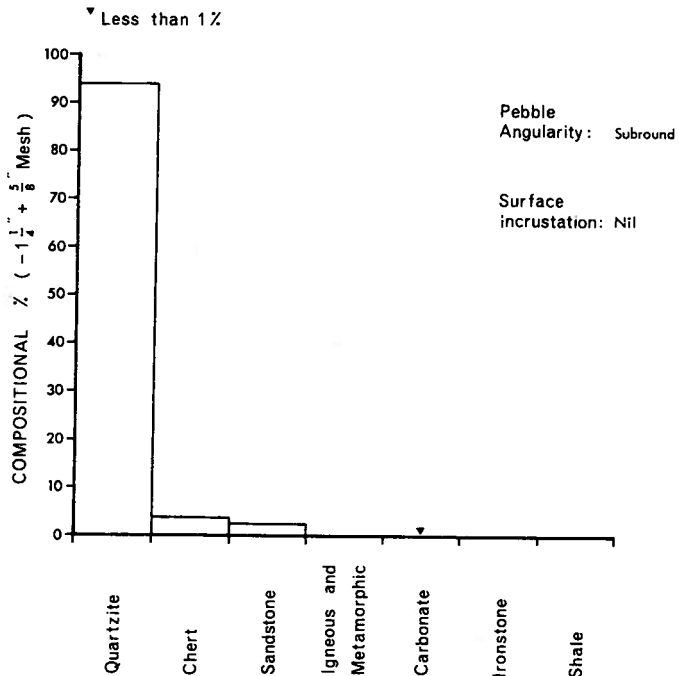
SAMPLE NO.: Pit 4
DEPTH: 0 - 8
LOCATION: NE 6-35-2W5



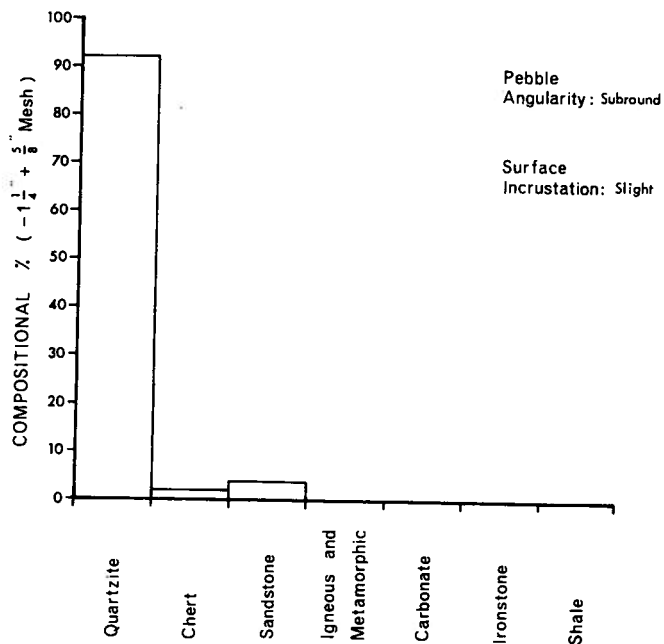
SAMPLE NO.: Pit 5
DEPTH: 0 - 10
LOCATION: SE 5-41-27W4



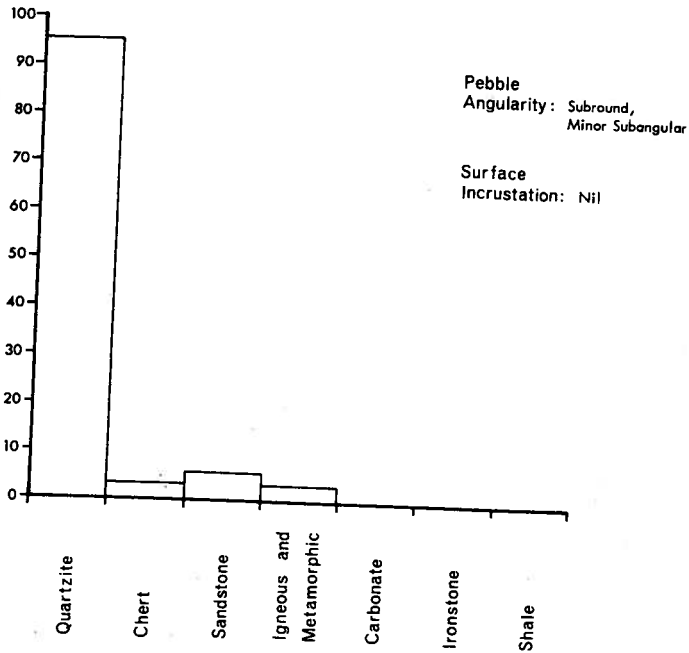
SAMPLE NO.: Pit 6
DEPTH: 3 - 15
LOCATION: W 1/2 4-41-27W4



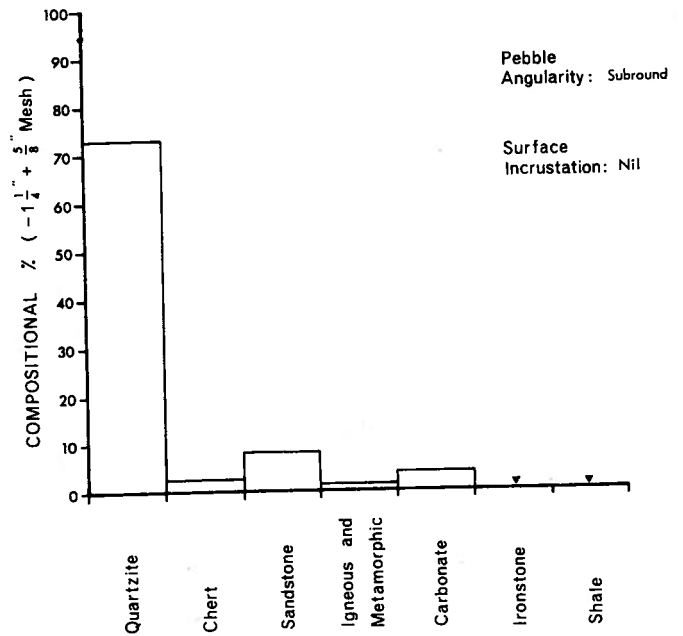
SAMPLE NO.: Pit 7
DEPTH: 3 - 20
LOCATION: SE 16-41-27W4



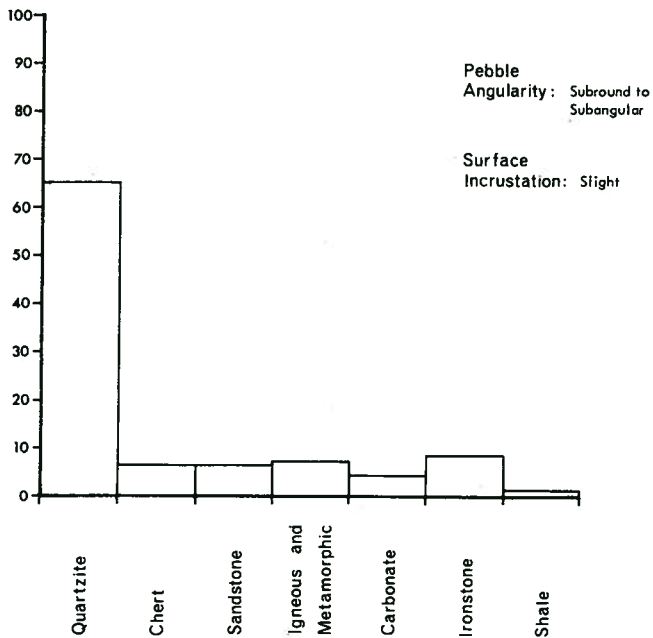
SAMPLE NO.: Pit 8
DEPTH: 2 - 5
LOCATION: SW 27-41-27W4



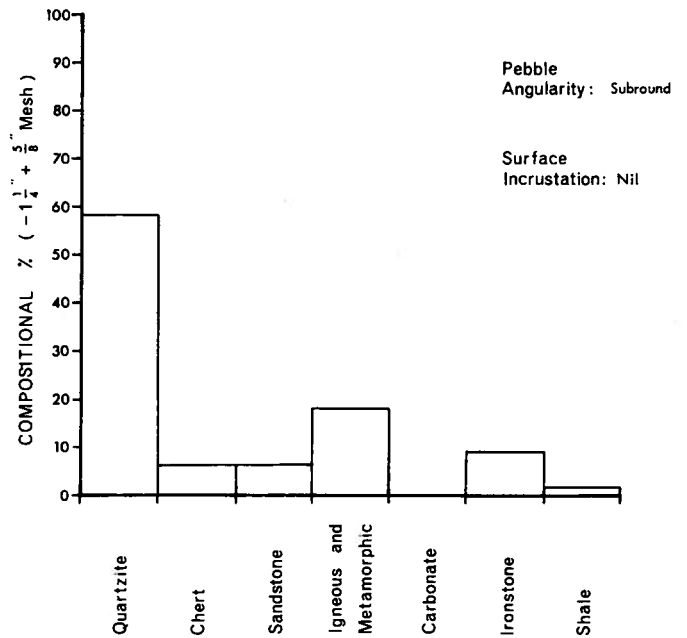
SAMPLE NO.: Pit 9
DEPTH: 1 - 2
LOCATION: E 1/2 22-41-27W4



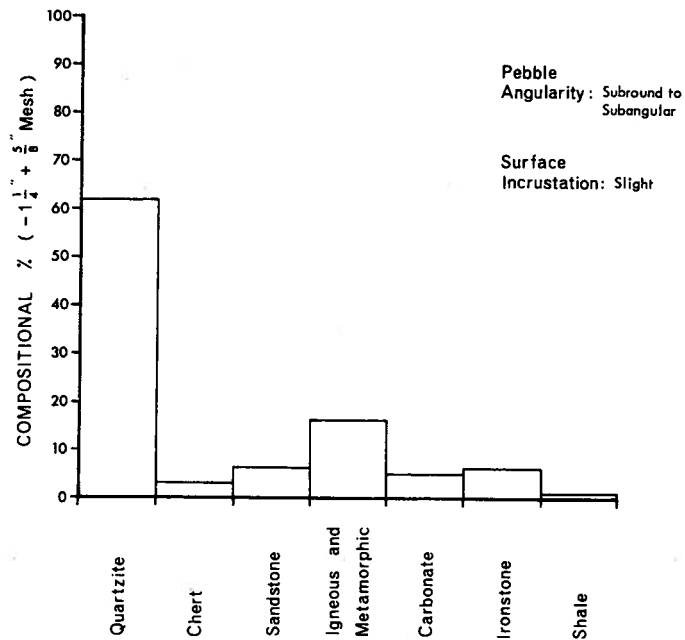
SAMPLE NO.: Pit 10
DEPTH: 0 - 6
LOCATION: N 1/2 22-42-26W4



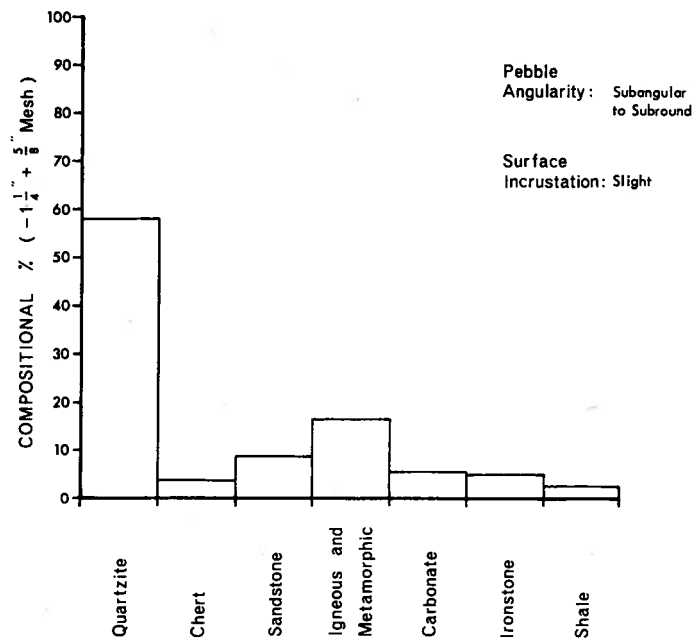
SAMPLE NO.: Pit 11
DEPTH: 5
LOCATION: SW 25-42-26W4



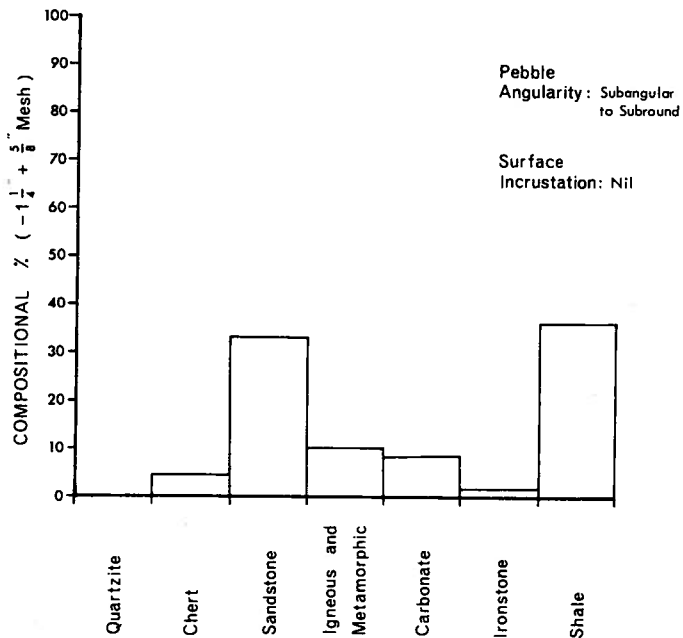
SAMPLE NO.: Pit 12
DEPTH: 10 - 15
LOCATION: SW 35-42-26W4



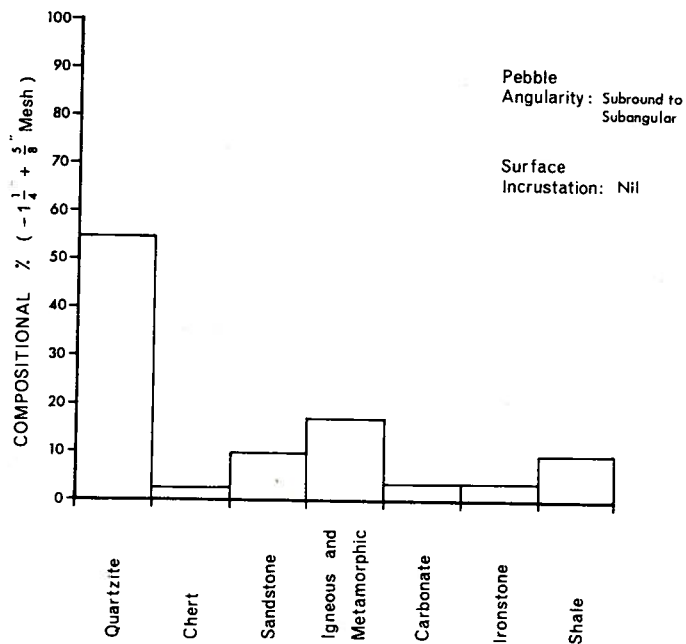
SAMPLE NO.: Pit 13
DEPTH: 4-6
LOCATION: SW 27-42-26W4



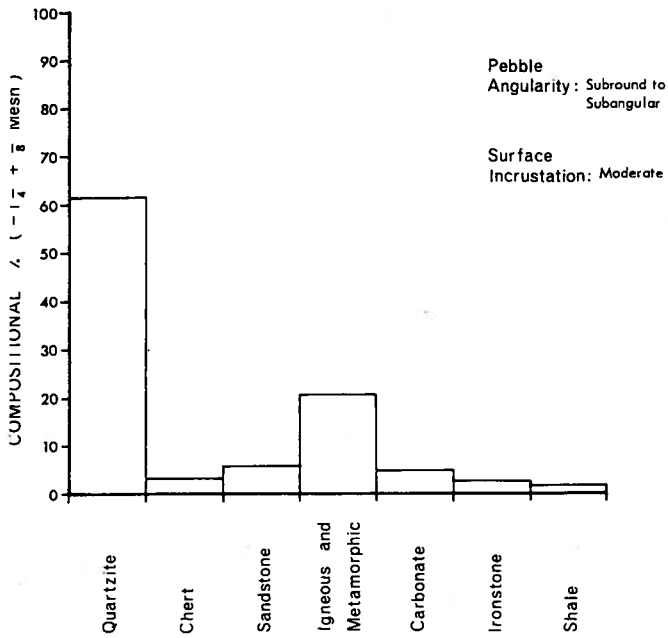
SAMPLE NO.: Pit 14
DEPTH: 0-5
LOCATION: N 1/2 1-42-25W4



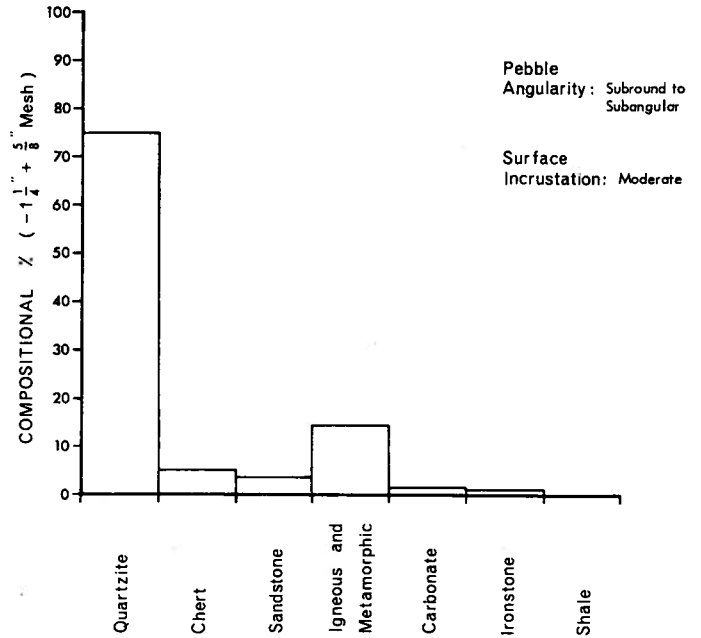
SAMPLE NO.: Pit 15
DEPTH: 12-15
LOCATION: SE 16-40-1W5



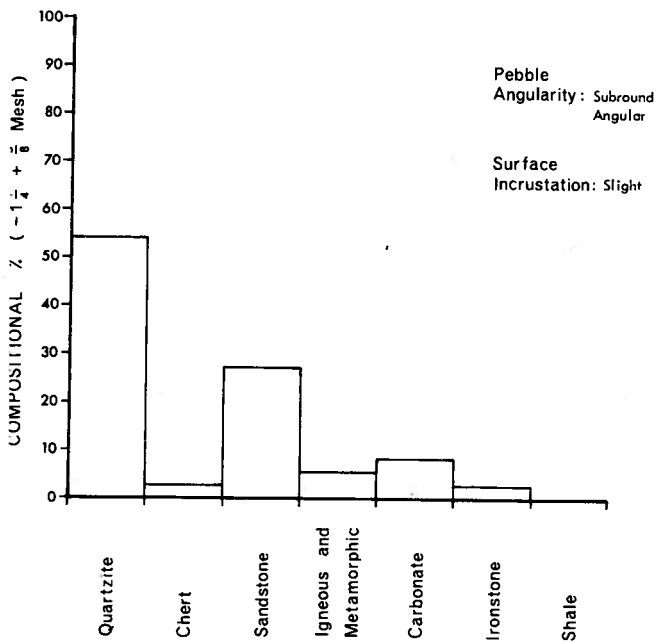
SAMPLE NO.: Pit 16
DEPTH: 6-10
LOCATION: E 1/2 21-39-27W4



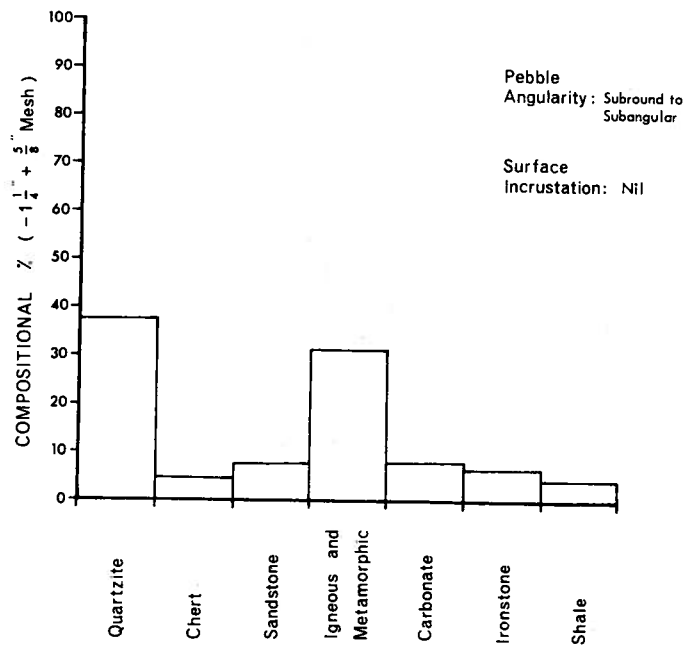
SAMPLE NO.: Pit 17
DEPTH: 2 - 6
LOCATION: N 1/2 31-40-23W4



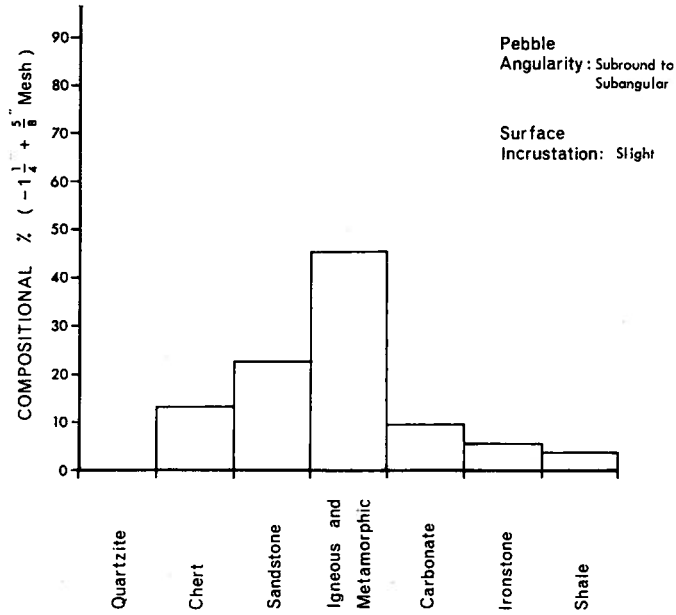
SAMPLE NO.: Pit 18
DEPTH: 2 - 5
LOCATION: S 1/2 29-40-23W4



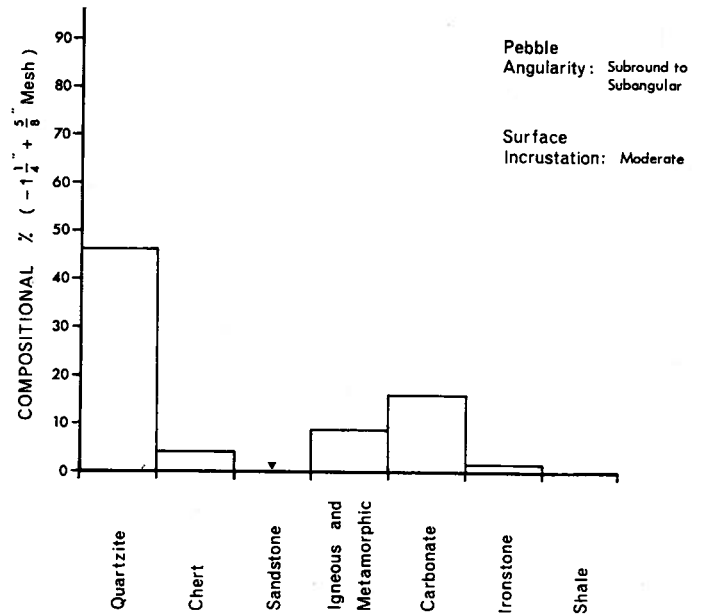
SAMPLE NO.: Pit 19
DEPTH: 0 - 5
LOCATION: NW 12-41-28W4



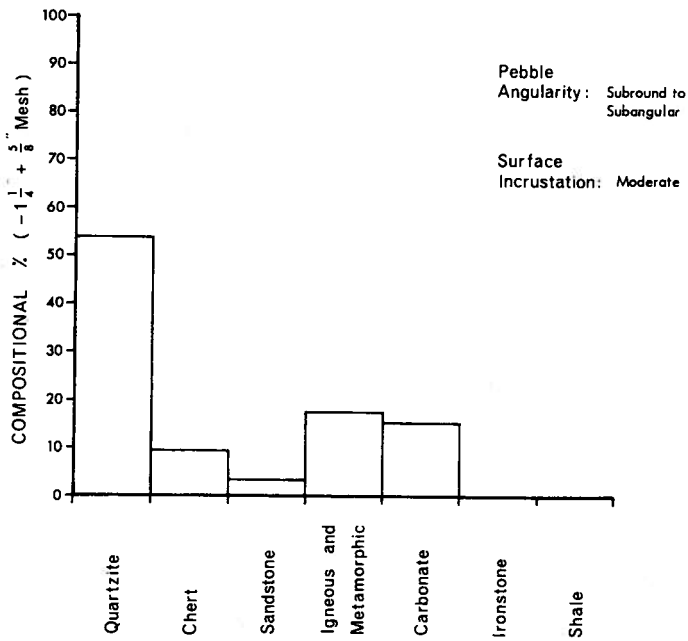
SAMPLE NO.: Pit 20
DEPTH: 3
LOCATION: S 1/2 5-41-24W4



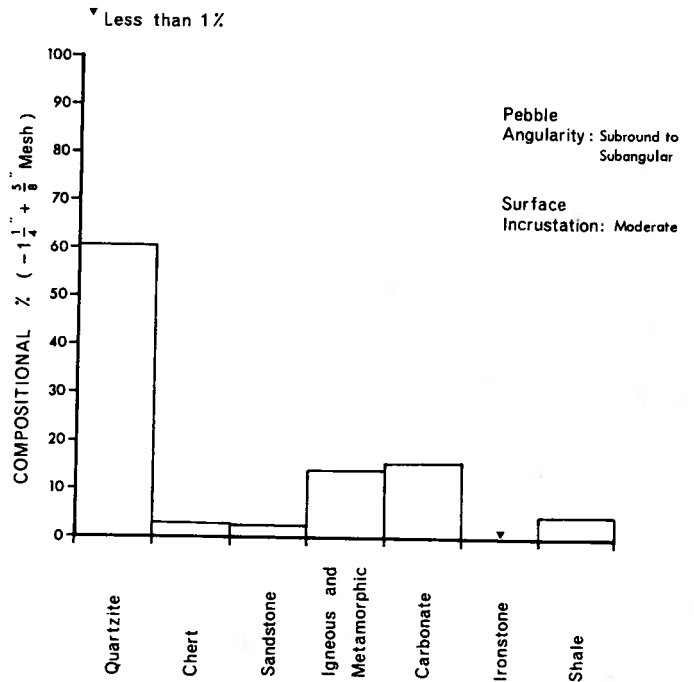
SAMPLE NO.: Pit 21
 DEPTH: 3 - 6
 LOCATION: W 1/2 36-40-24W4



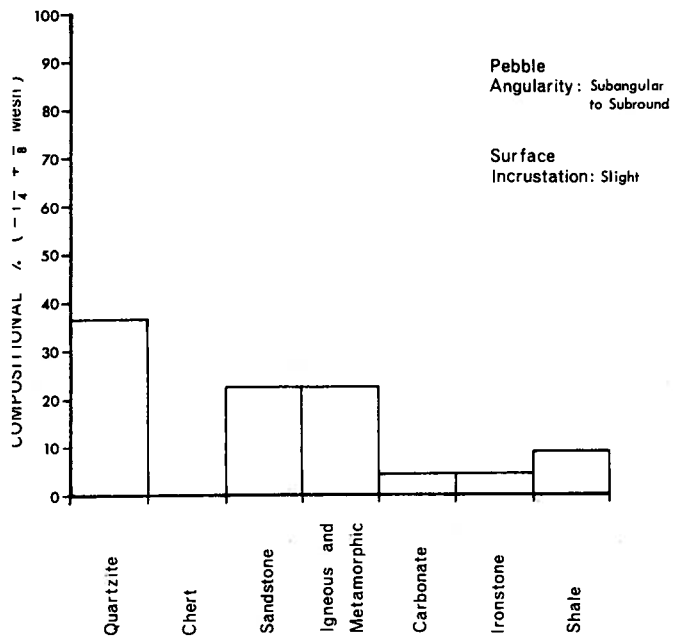
SAMPLE NO.: Pit 22
 DEPTH: 2 - 5
 LOCATION: NW 33-38-23W4



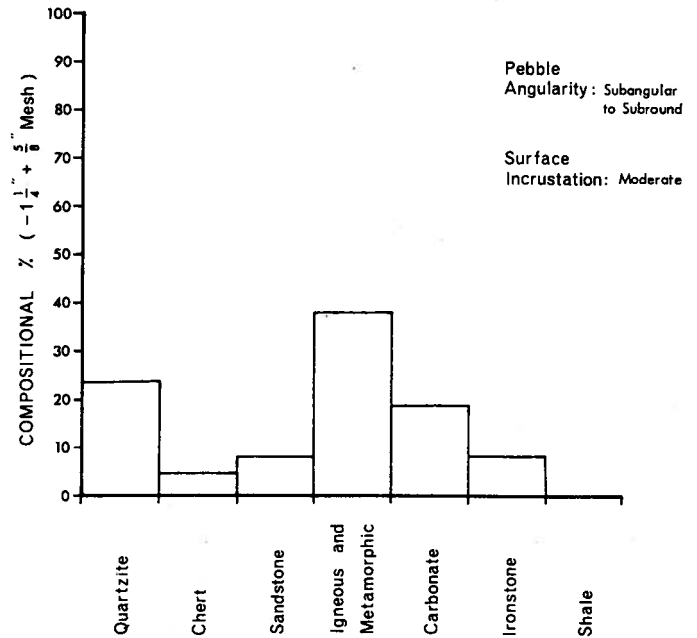
SAMPLE NO.: Pit 23
 DEPTH: 0 - 4
 LOCATION: W 1/2 17-38-23W4



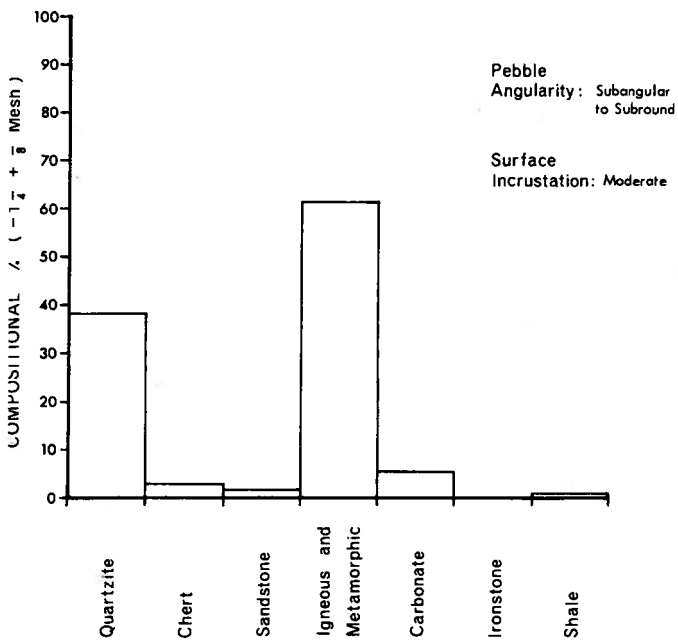
SAMPLE NO.: Pit 24
 DEPTH: 0 - 15
 LOCATION: SW 18-38-23W4



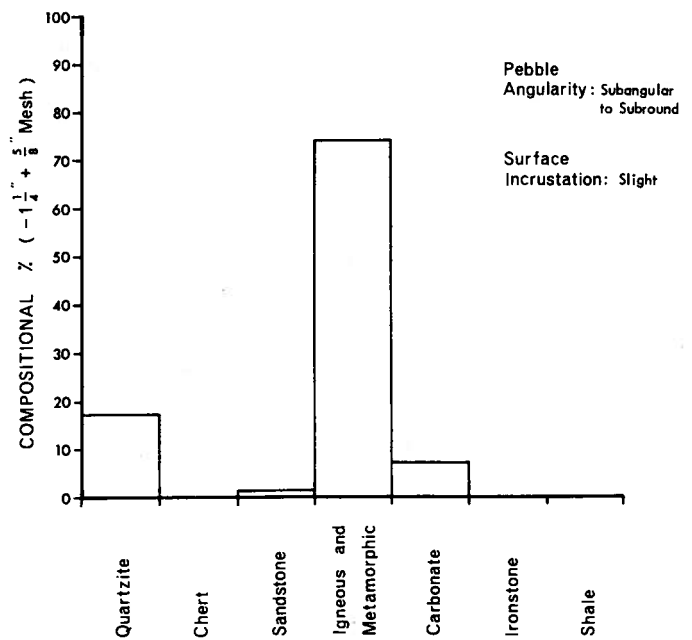
SAMPLE NO.: Pit 25
DEPTH: 20 - 25
LOCATION: NW 33-37-26W4



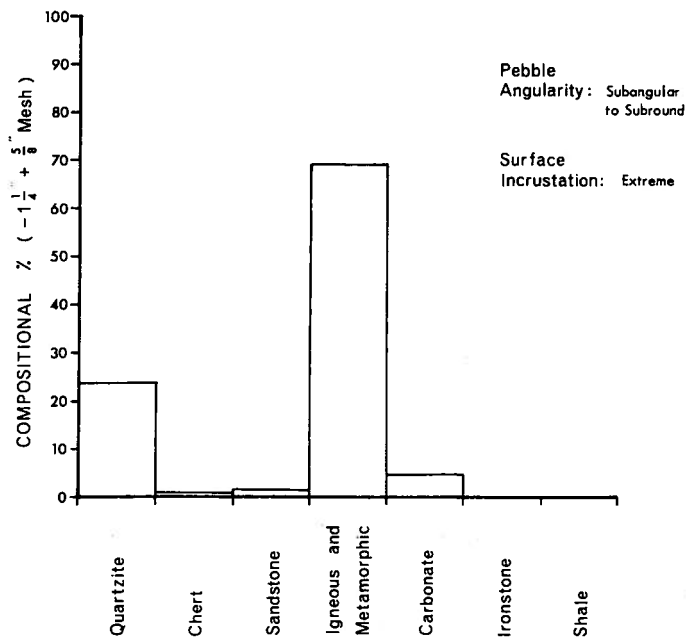
SAMPLE NO.: Pit 26
DEPTH: 2 - 7
LOCATION: NW 3-38-24W4



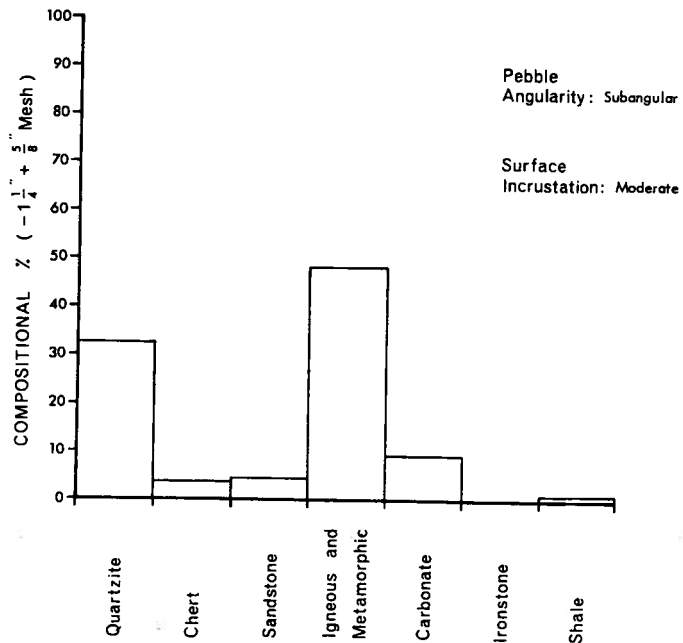
SAMPLE NO.: Pit 27
DEPTH: 0 - 6
LOCATION: SW 1-38-24W4



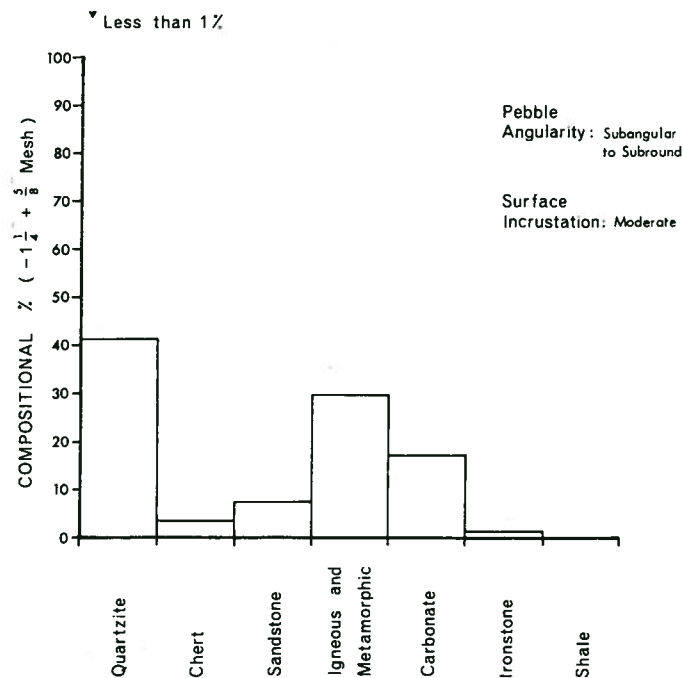
SAMPLE NO.: Pit 28
DEPTH: 0 - 6
LOCATION: E 1/2 14-37-24W4



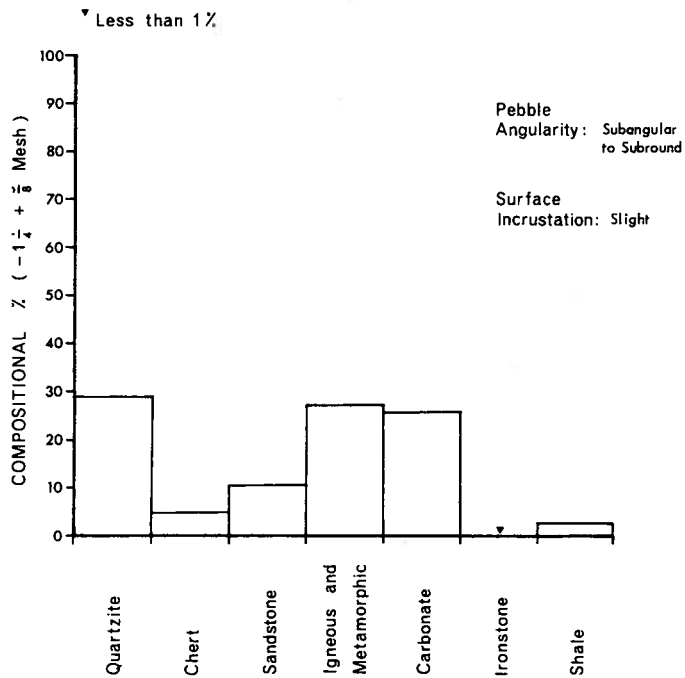
SAMPLE NO.: Pit 29
DEPTH: 0 - 5
LOCATION: SE 13-37-24W4



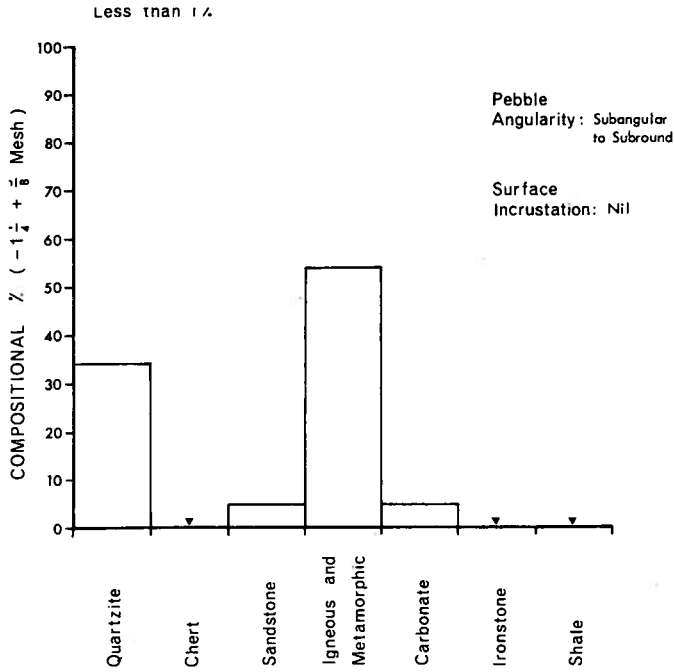
SAMPLE NO.: Pit 30
DEPTH: 0 - 4
LOCATION: S 1/2 27-37-24W4



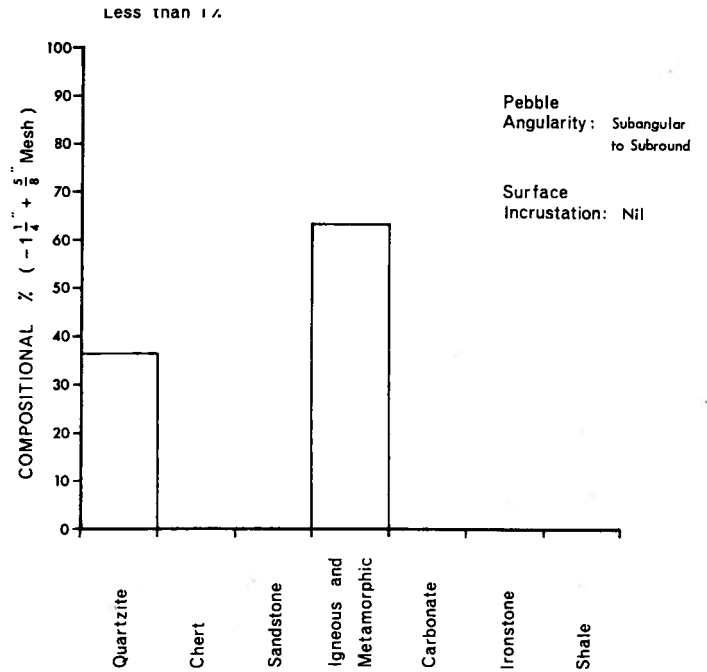
SAMPLE NO.: Pit 31
DEPTH: 0 - 8
LOCATION: SW 4-38-24W4



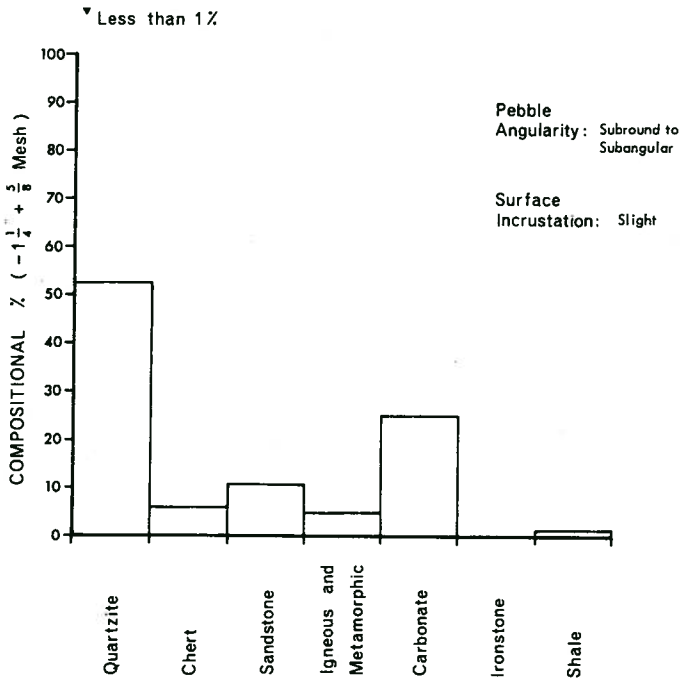
SAMPLE NO.: Pit 32
DEPTH: 5 - 10
LOCATION: W 1/2 34-37-25W4



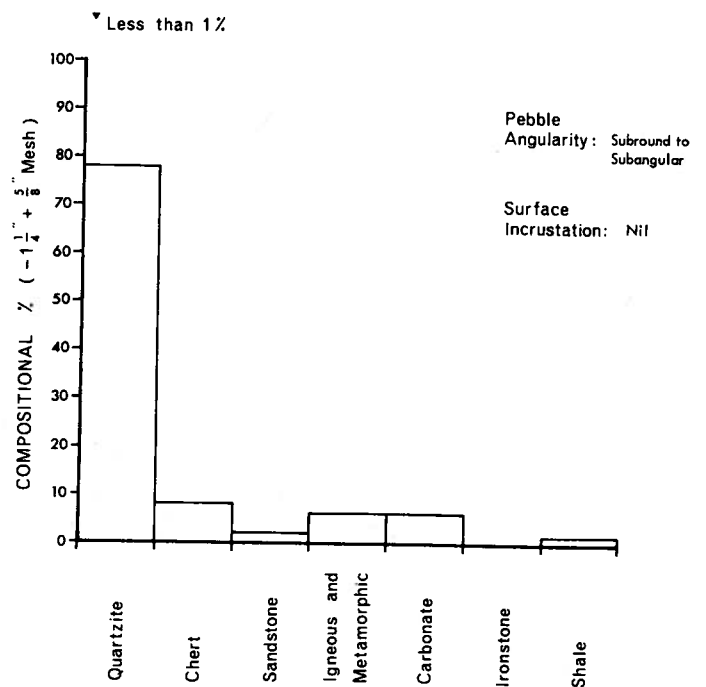
SAMPLE NO.: Pit 33
DEPTH: 0 - 8
LOCATION: NE 4-37-25W4



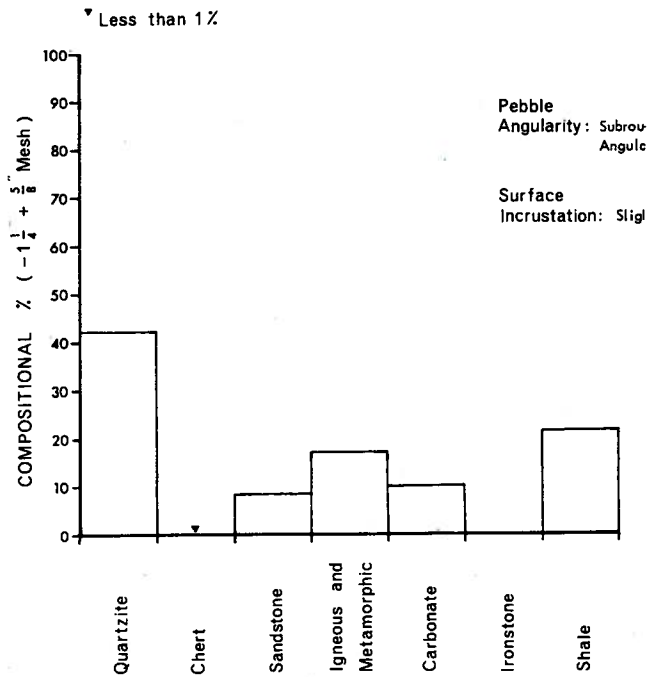
SAMPLE NO.: Pit 34
DEPTH: 0 - 35
LOCATION: N1/2 28-36-25W4



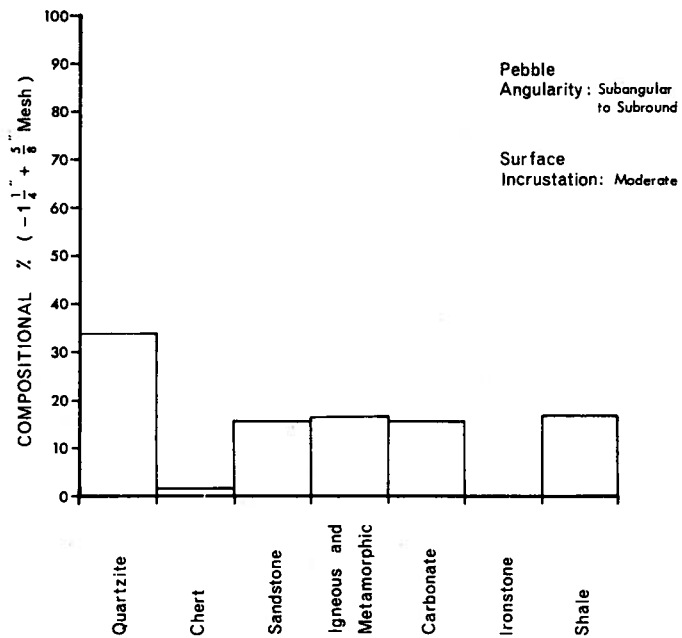
SAMPLE NO.: Pit 35
DEPTH: 0 - 3
LOCATION: S1/2 5-37-28W4



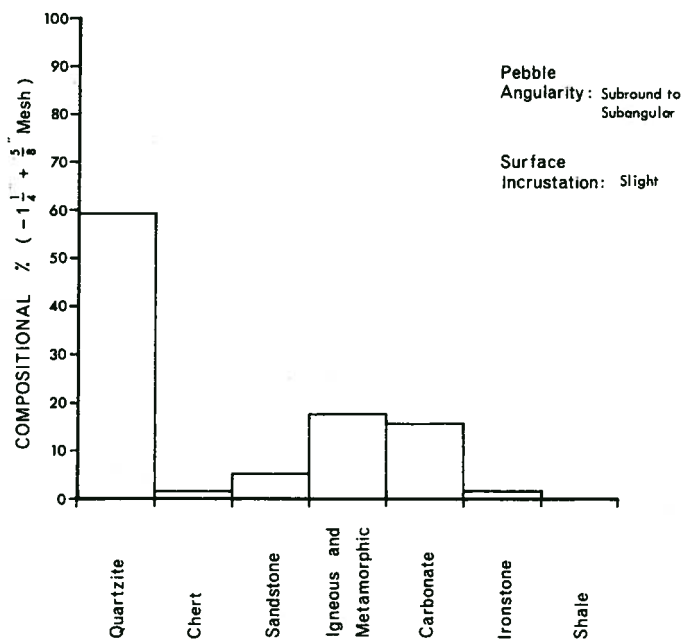
SAMPLE NO.: Pit 36
DEPTH: 3 - 23
LOCATION: SE 29-36-28W4



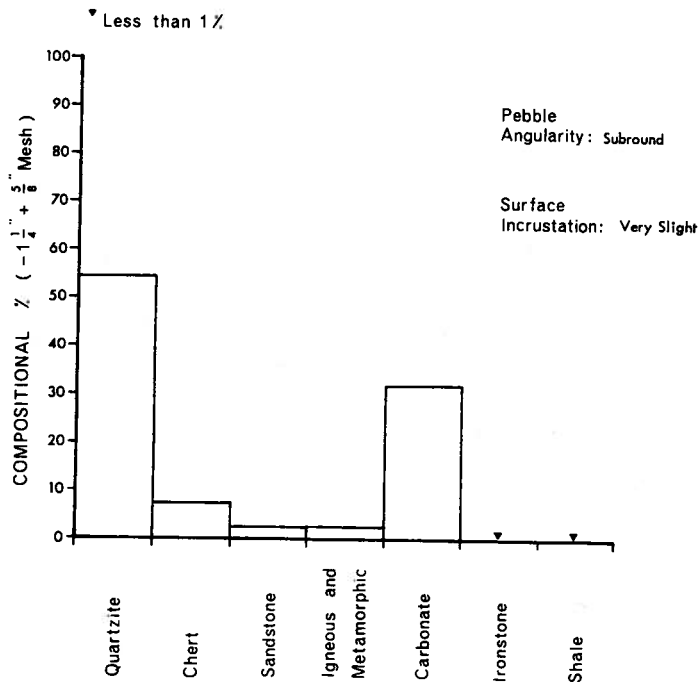
SAMPLE NO.: Pit 37
DEPTH: 7 - 10
LOCATION: SE 13-40-28W4



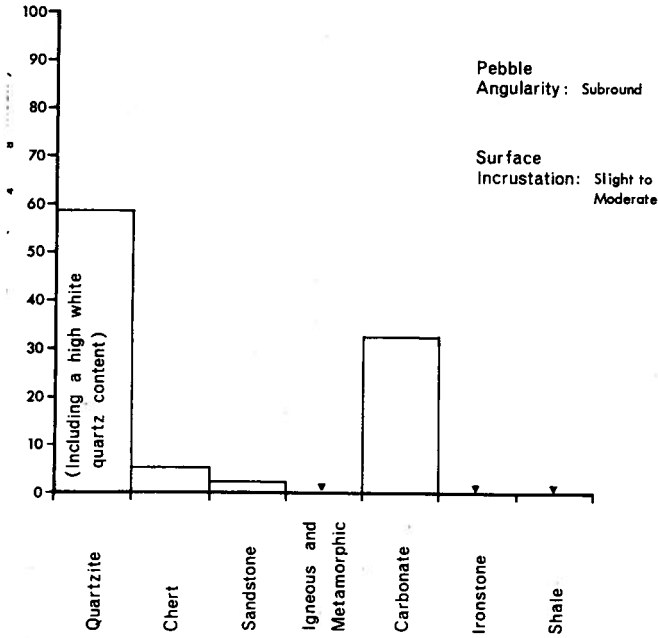
SAMPLE NO.: Pit 38
DEPTH: 1 - 4
LOCATION: E 1/2 5-41-3W5



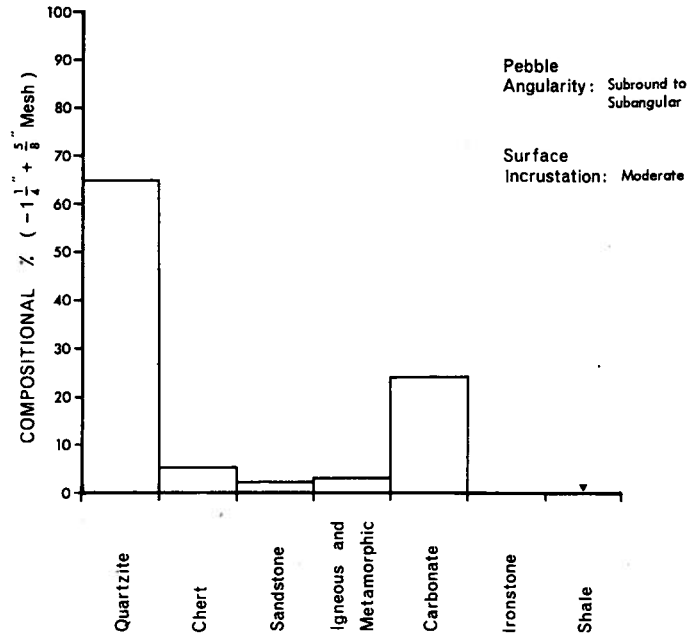
SAMPLE NO.: Pit 39
DEPTH: 1 - 5
LOCATION: S 1/2 16-39-3W5



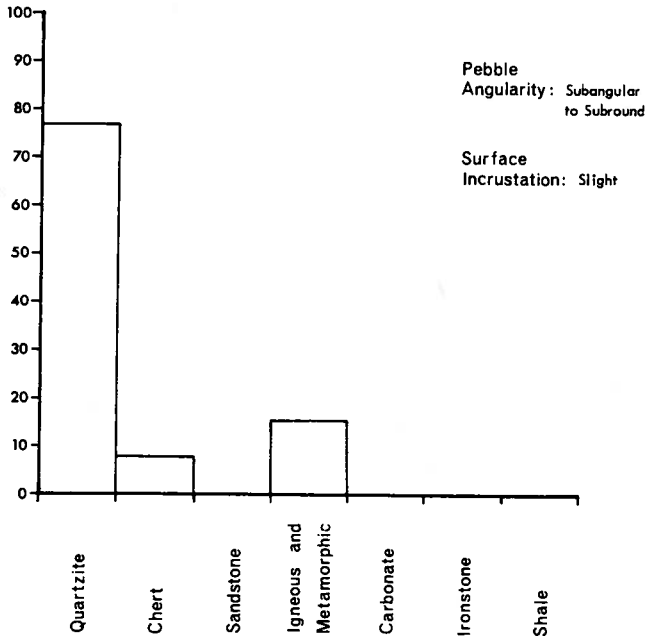
SAMPLE NO.: Pit 40
DEPTH: 3 - 10
LOCATION: NE 12-36-2W5



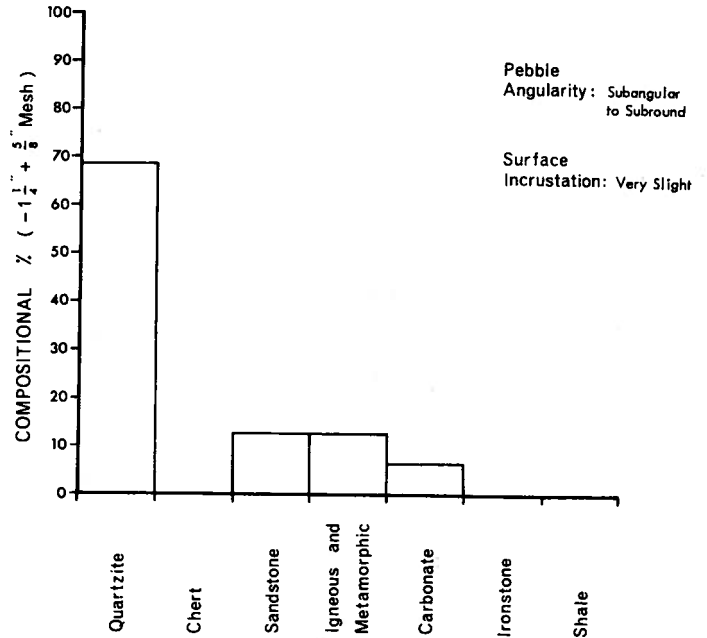
SAMPLE NO.: Pit 41
DEPTH: 0-9
LOCATION: NW 19-35-3W5



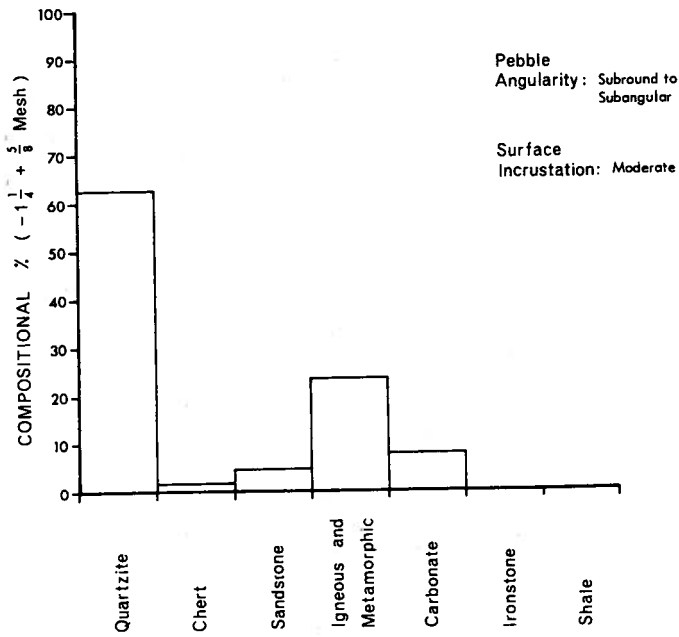
SAMPLE NO.: Pit 42
DEPTH: 0-7
LOCATION: NE 12-35-3W5



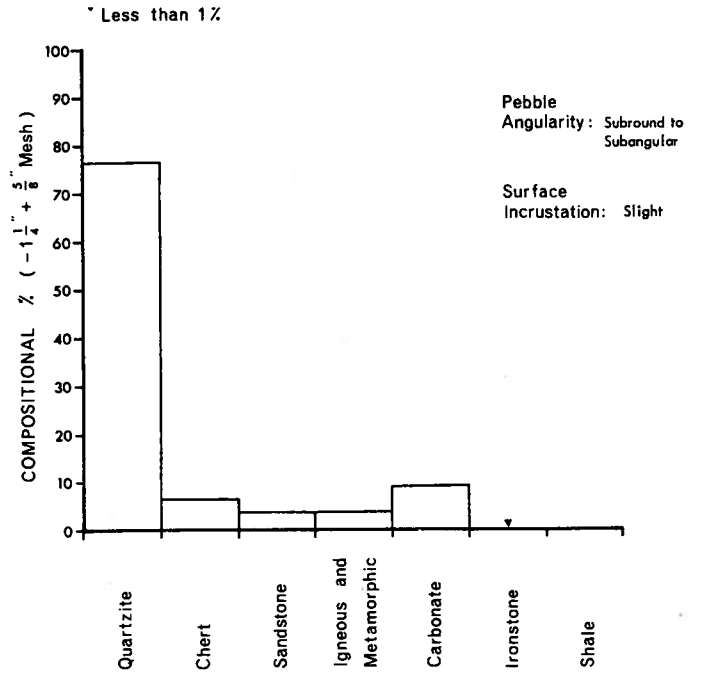
SAMPLE NO.: Pit 43
DEPTH: 2
LOCATION: W 1/2 8-35-24W4



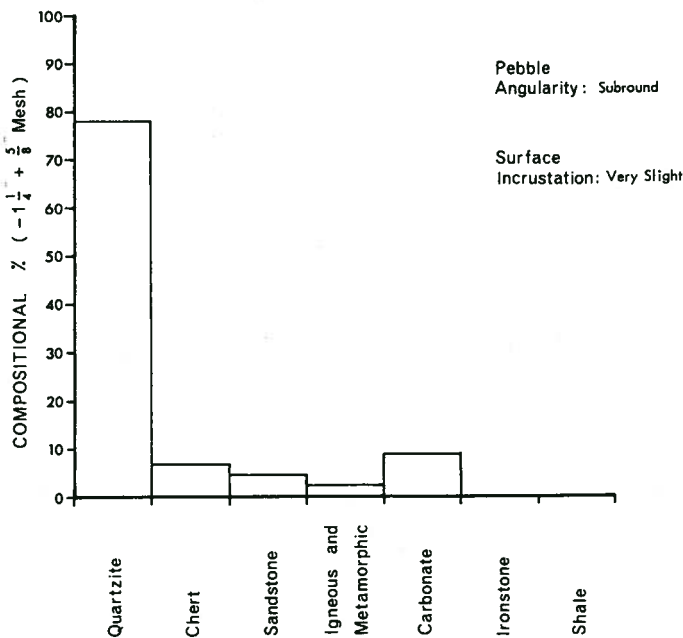
SAMPLE NO.: Pit 44
DEPTH: 0-4
LOCATION: N 1/2 11-35-25W4



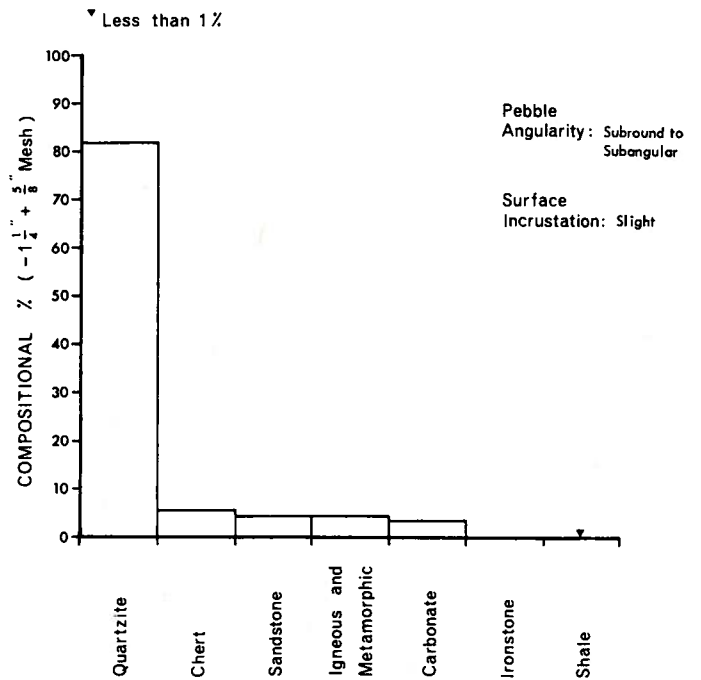
SAMPLE NO.: Pit 45
DEPTH: 1 - 7
LOCATION: SE 14-35-25W4



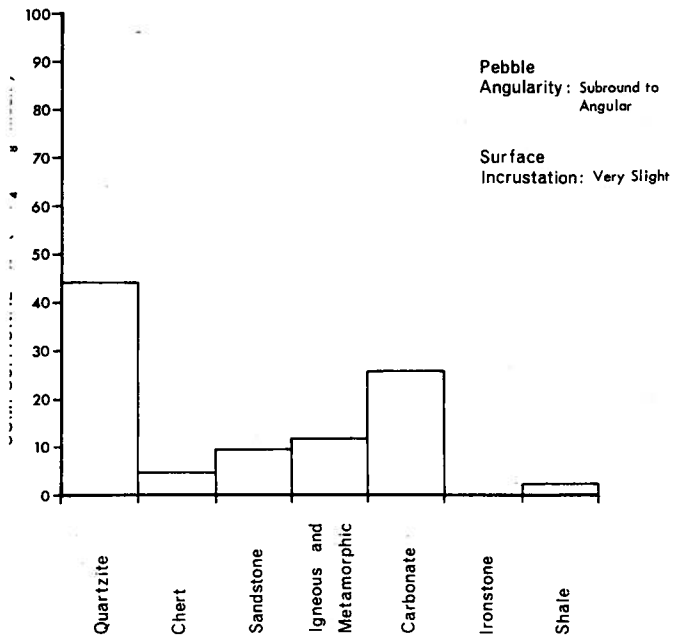
SAMPLE NO.: Pit 46
DEPTH: 4 - 11
LOCATION: N1/2 12-38-28W4



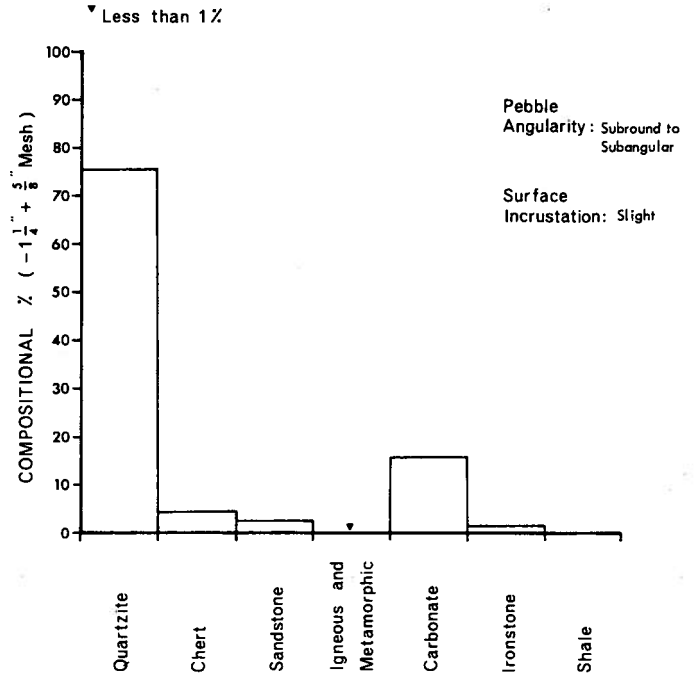
SAMPLE NO.: Pit 47
DEPTH: 0 - 7
LOCATION: NW 27-38-27W4



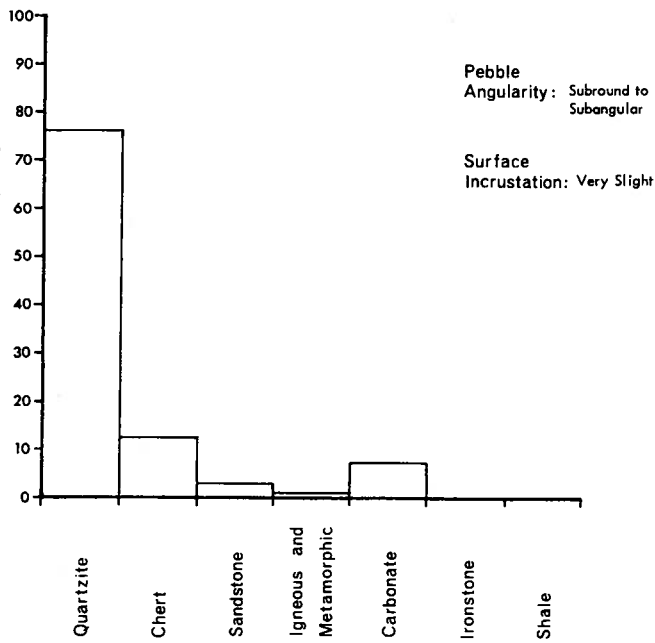
SAMPLE NO.: Pit 48
DEPTH: 0 - 7
LOCATION: Cr. 20-39-27W4



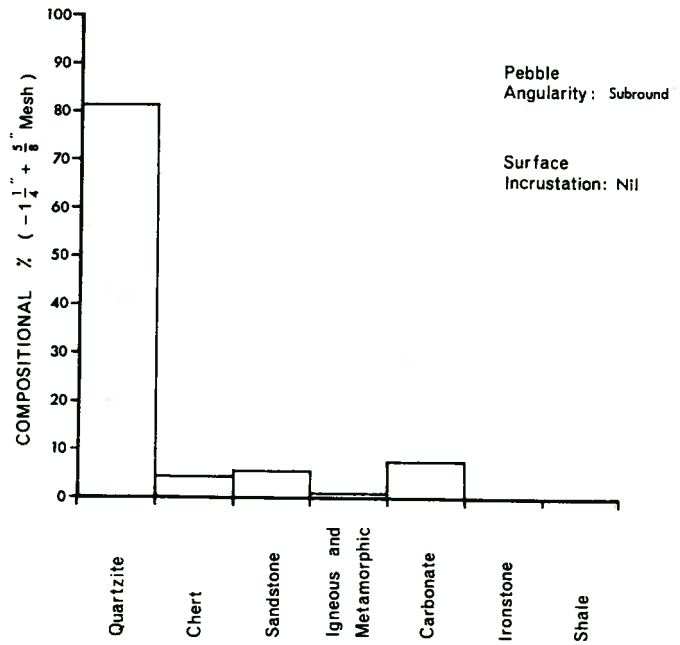
SAMPLE NO.: Pit 49
DEPTH: 4 - 16
LOCATION: W1/2 11-41-2W5



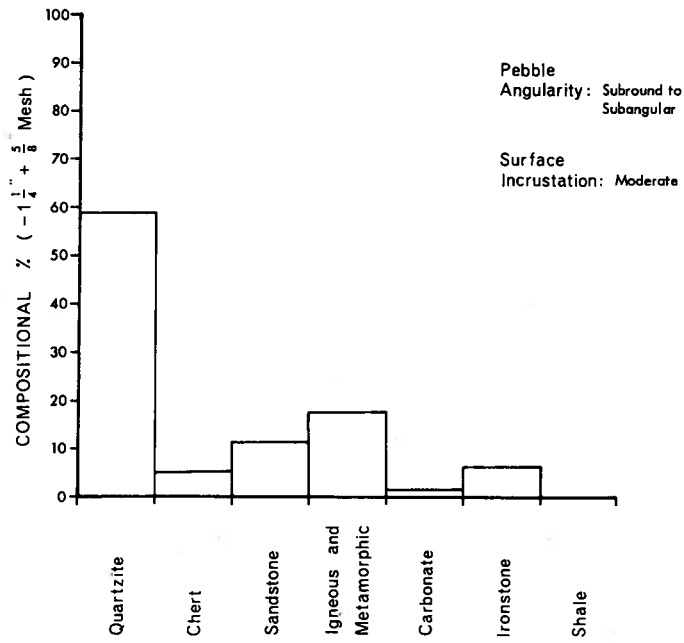
SAMPLE NO.: Pit 50
DEPTH: 4 - 8
LOCATION: NE 14-35-3W5



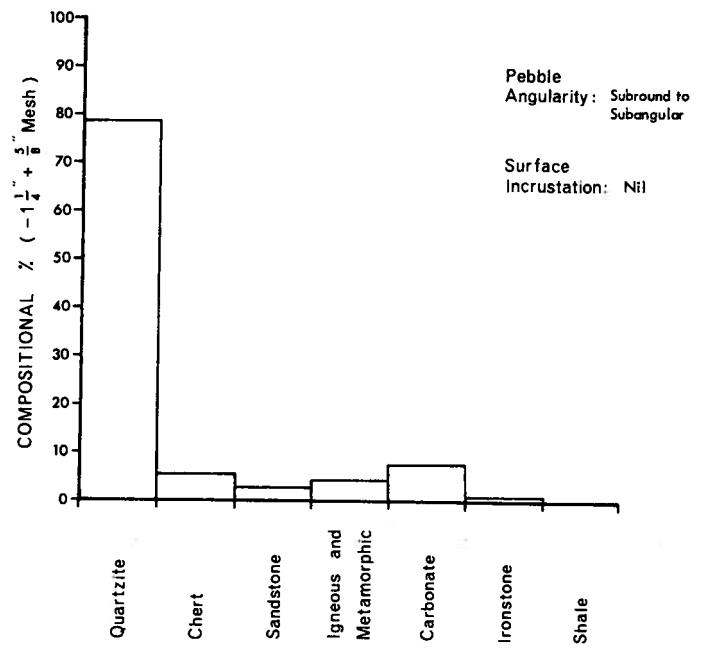
SAMPLE NO.: Pit 51
DEPTH: 3
LOCATION: NE 11-35-3W5



SAMPLE NO.: Pit 52
DEPTH: 6 - 10
LOCATION: S1/2 4-43-24W4



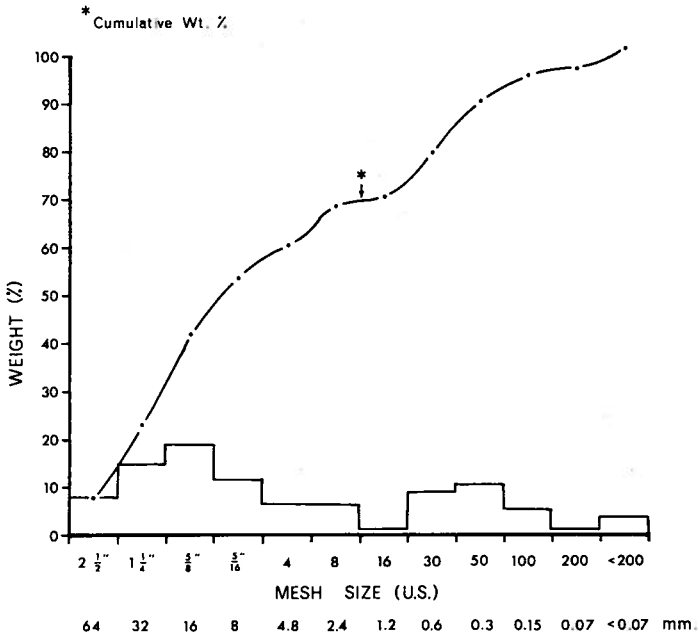
SAMPLE NO.: Pit 53
 DEPTH: 3 - 6
 LOCATION: NE 34-34-25W4



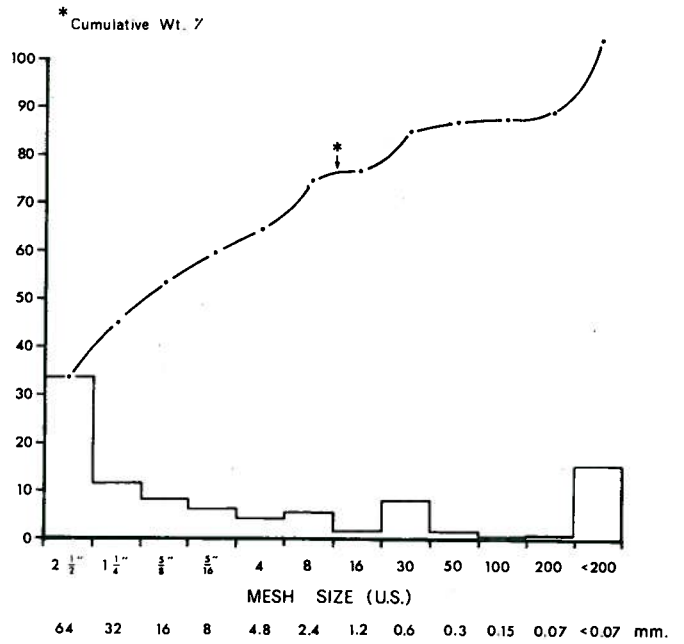
SAMPLE NO.: Pit 54
 DEPTH: 10 - 19
 LOCATION: NE 8-36-28W4

APPENDIX C
RESULTS OF ANALYSES FOR EXPOSURE SAMPLES

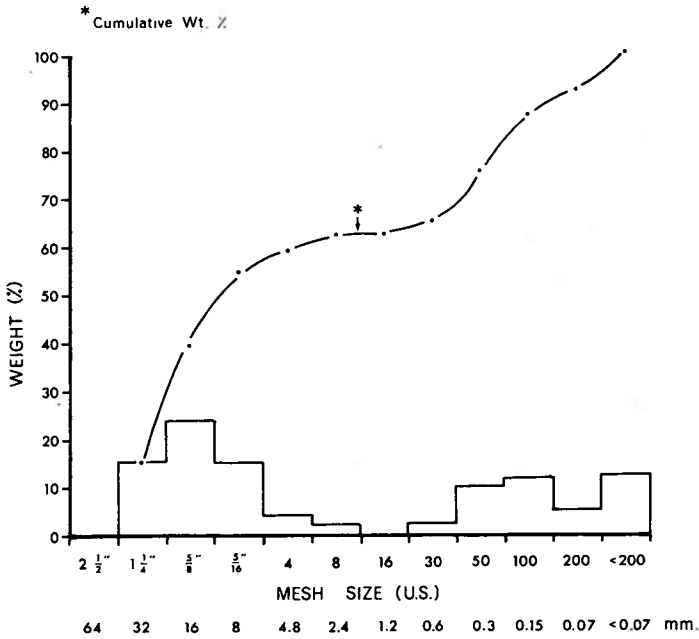
HISTOGRAMS OF SIEVE ANALYSES



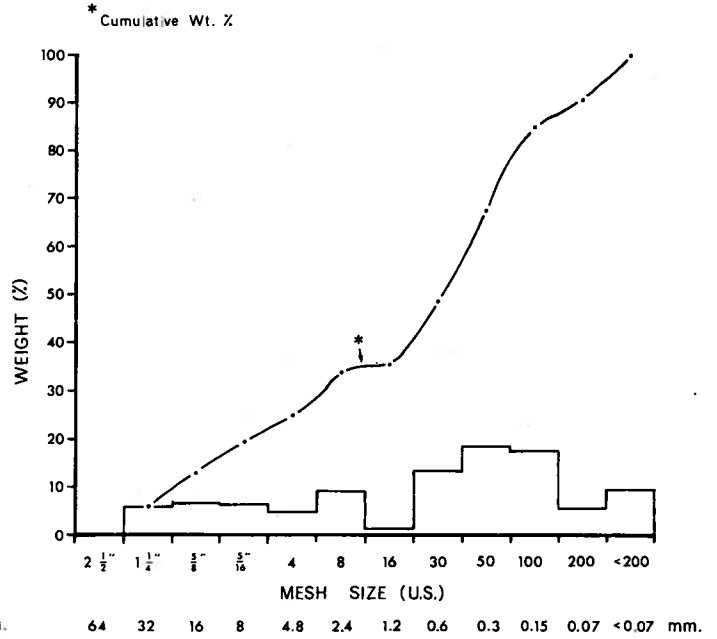
SAMPLE NO.: Exposure A
 DEPTH: 2-5
 LOCATION: SE 5-42-26W4



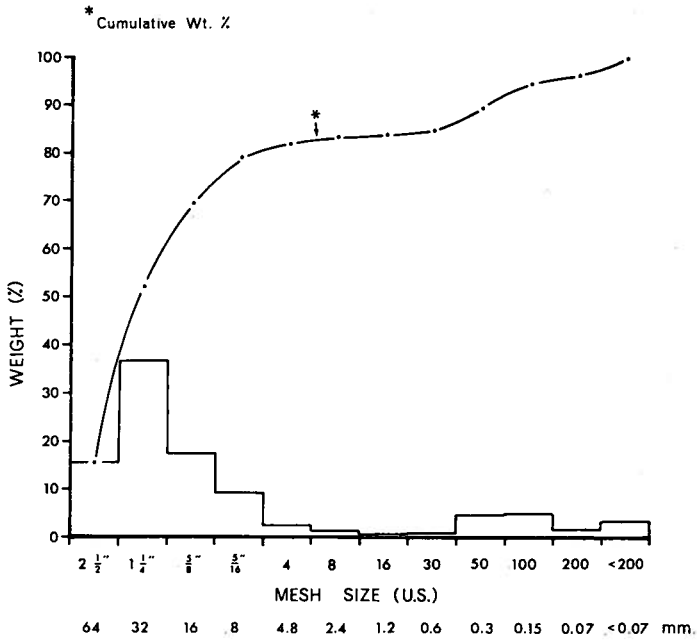
SAMPLE NO.: Exposure B
 DEPTH: 0-4
 LOCATION: NE 7-41-24W4



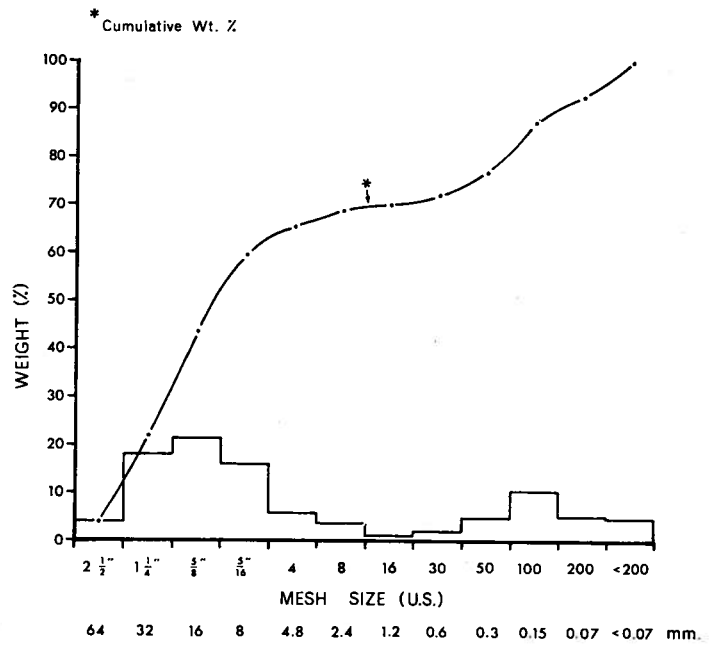
SAMPLE NO.: Exposure C
 DEPTH: 30-40
 LOCATION: SE 24-39-27W4



SAMPLE NO.: Exposure D
 DEPTH: 0-25
 LOCATION: NW 12-40-23W4

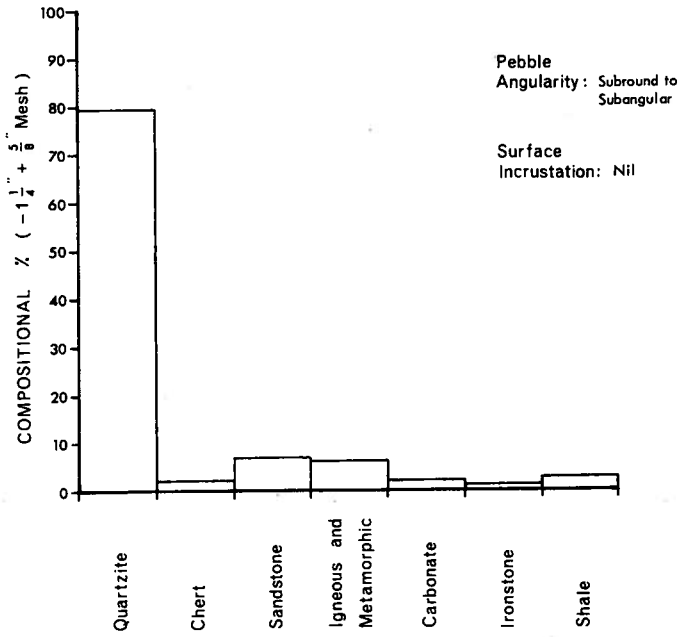


SAMPLE NO.: Exposure E
 DEPTH : 5-10
 LOCATION : S1/2 19-38-27W4

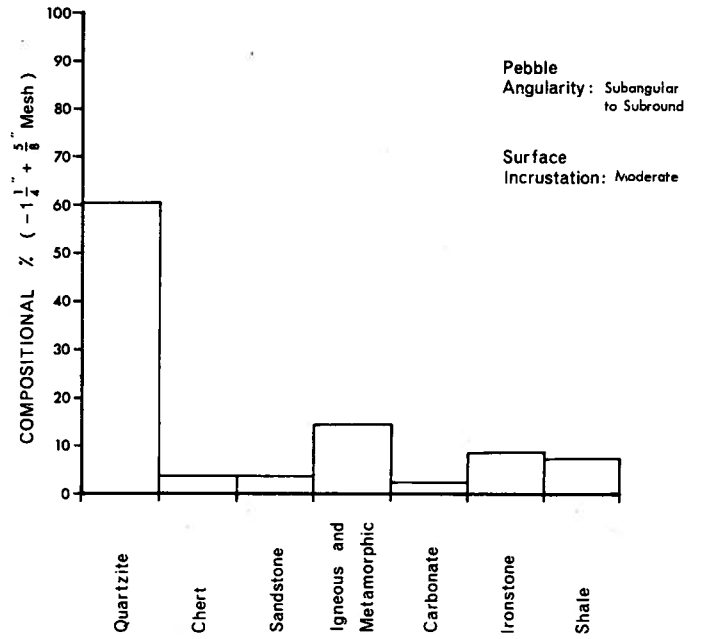


SAMPLE NO.: Exposure F
 DEPTH : 0-8
 LOCATION : NW 9-36-28W4

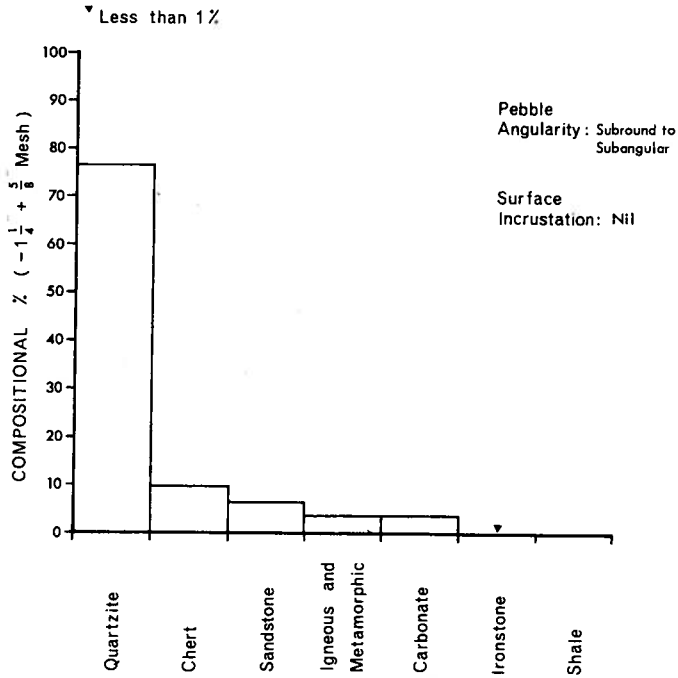
HISTOGRAMS OF PEBBLE COUNTS



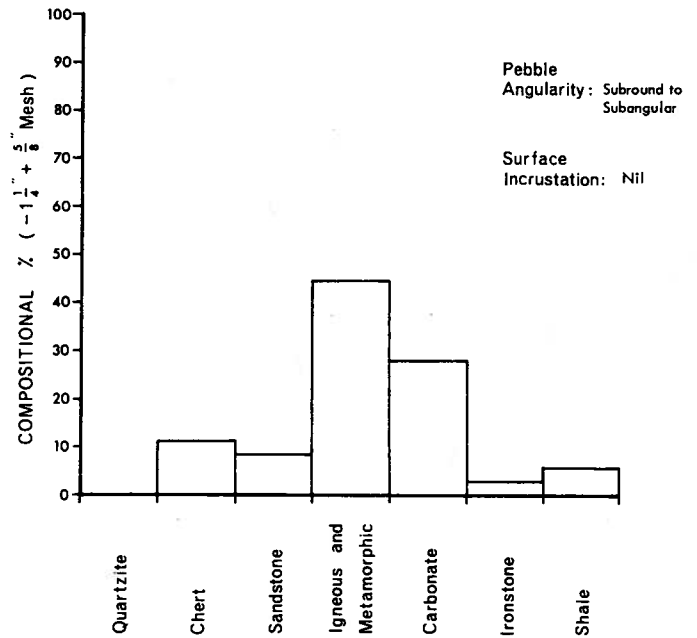
SAMPLE NO.: Exposure A
DEPTH: 2 - 5
LOCATION: SE 5-42-26W4



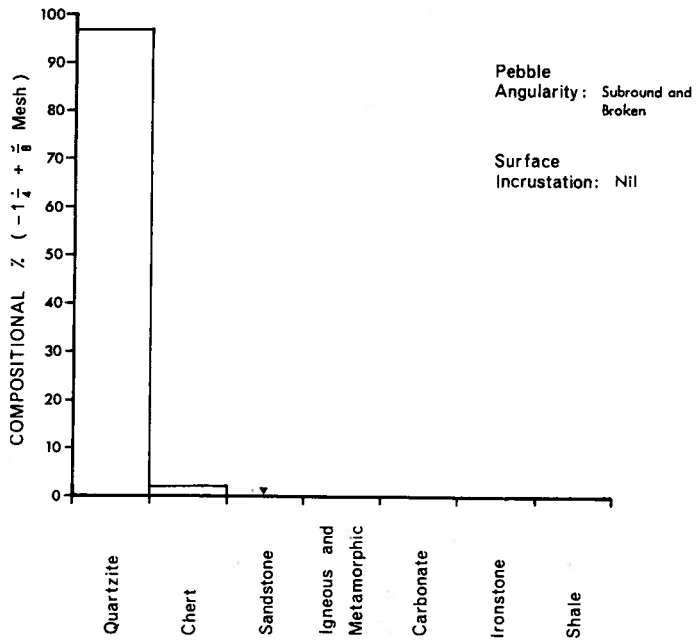
SAMPLE NO.: Exposure B
DEPTH: 0 - 4
LOCATION: NE 7-41-24W4



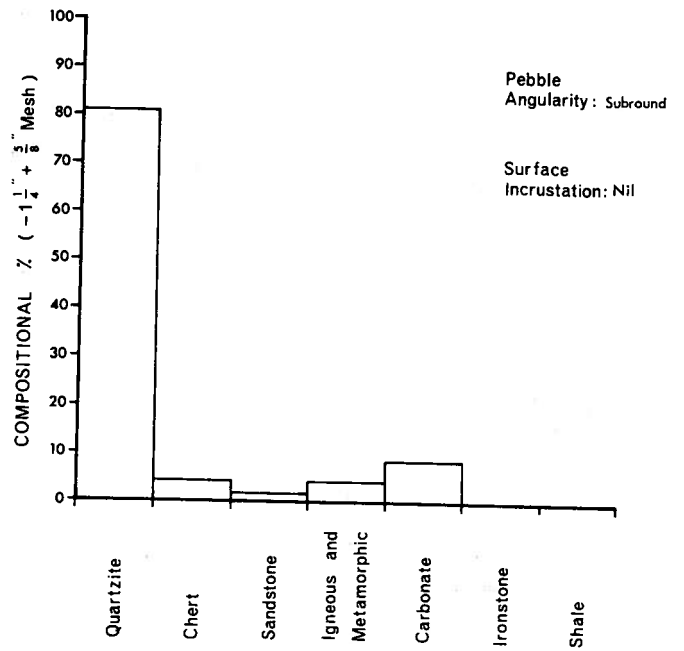
SAMPLE NO.: Exposure C
DEPTH: 30 - 40
LOCATION: SE 24-39-27W4



SAMPLE NO.: Exposure D
DEPTH: 0 - 25
LOCATION: NW 12-40-23W4



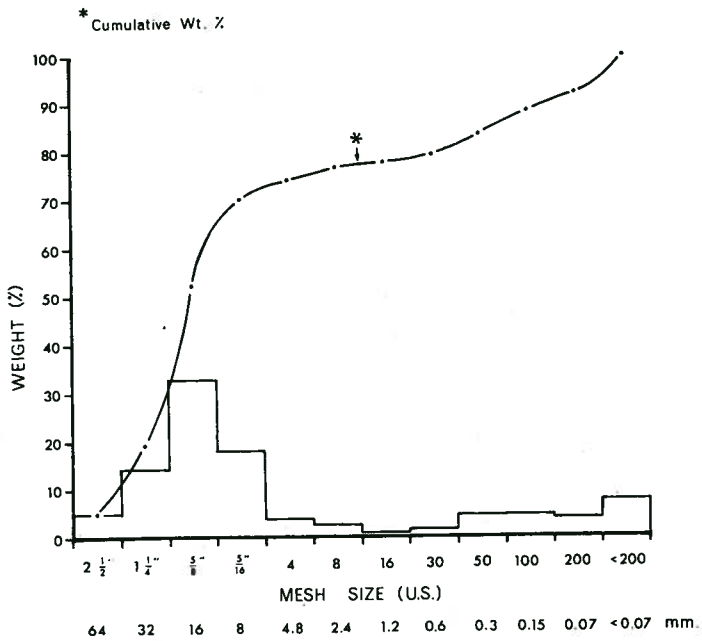
SAMPLE NO.: Exposure E
DEPTH : 5 - 10
LOCATION : S 1/2 19-38-27W4



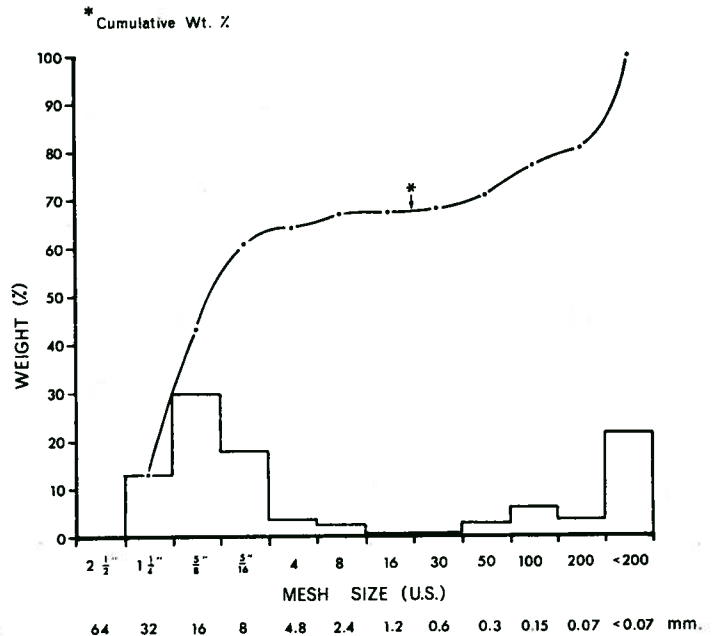
SAMPLE NO.: Exposure F
DEPTH : 0 - 8
LOCATION : NW 9-36-28W4

APPENDIX D

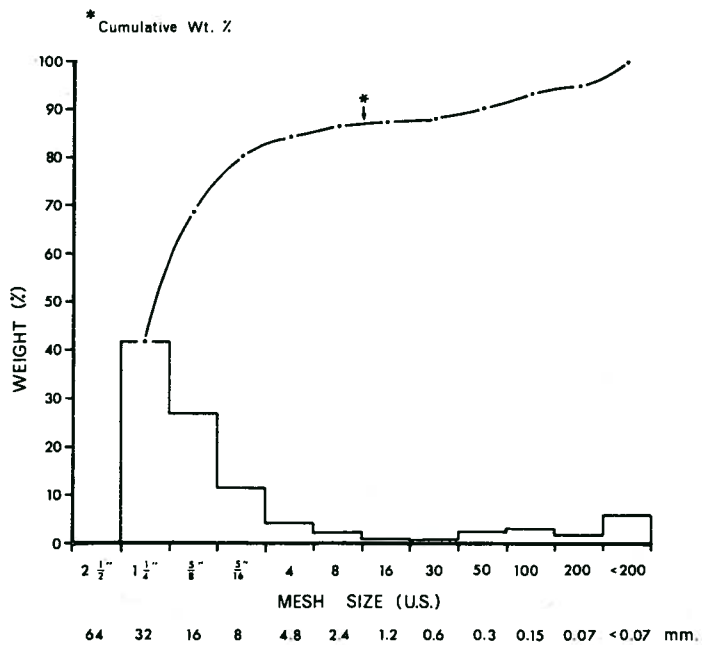
HISTOGRAMS OF SIEVE ANALYSES FOR TESTHOLE SAMPLES



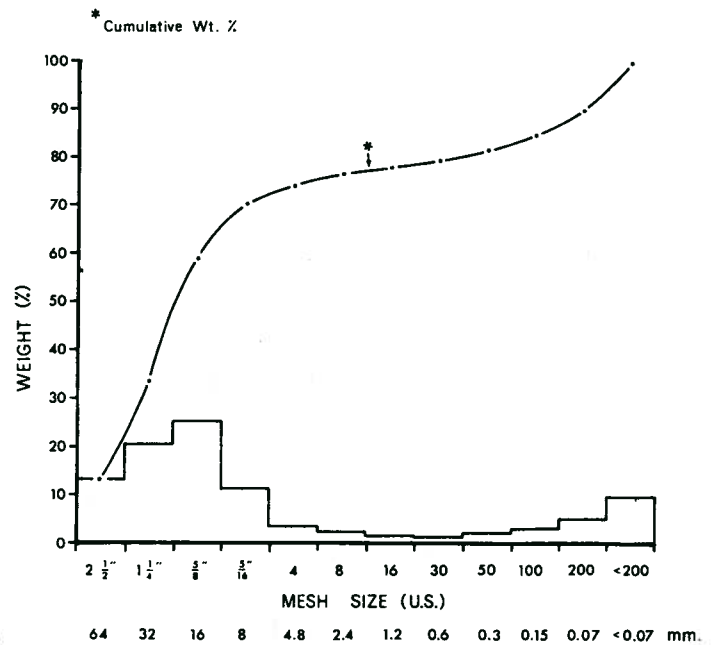
SAMPLE NO.: Hole 1
 DEPTH : 12, 27
 LOCATION : W 1/2 18-36-1W5



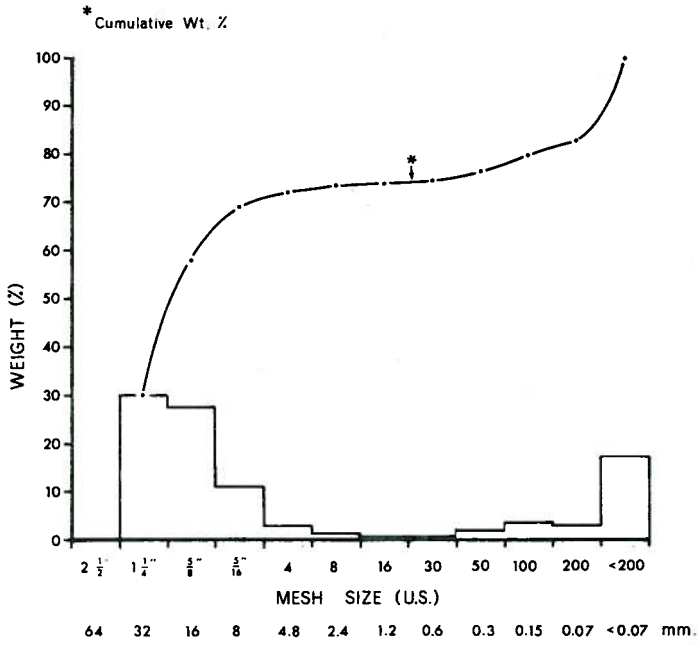
SAMPLE NO.: Hole 2
 DEPTH : 13, 27
 LOCATION : SE 13-36-2W5



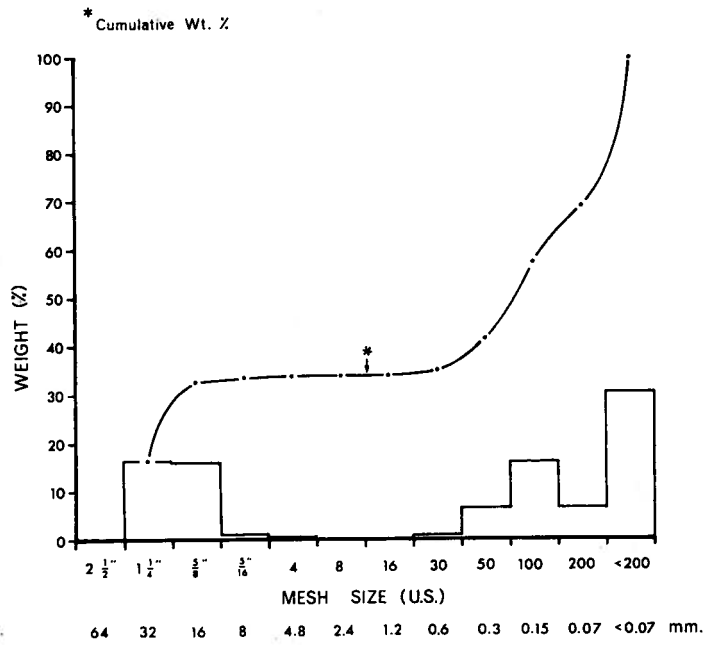
SAMPLE NO.: Hole 3
 DEPTH : 18
 LOCATION : S 1/2 18-36-1W5



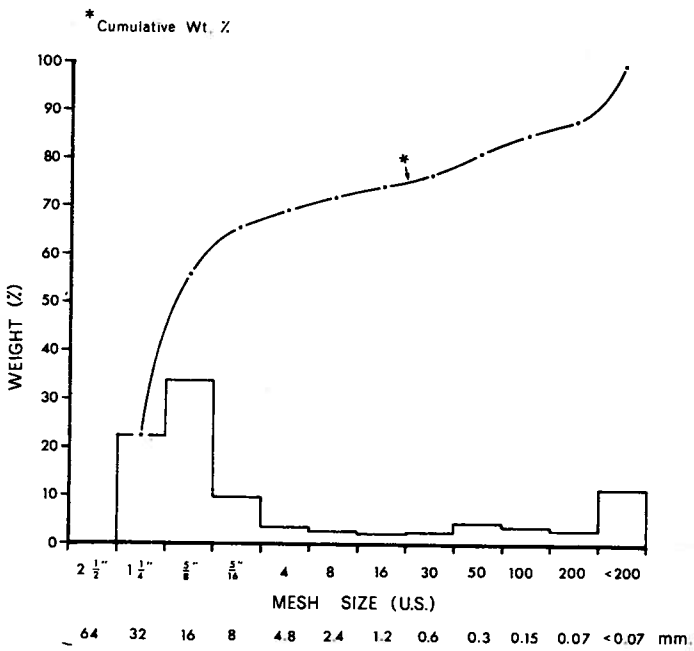
SAMPLE NO.: Hole 4
 DEPTH : 9, 23, 27, 33
 LOCATION : SW 30-35-2W5



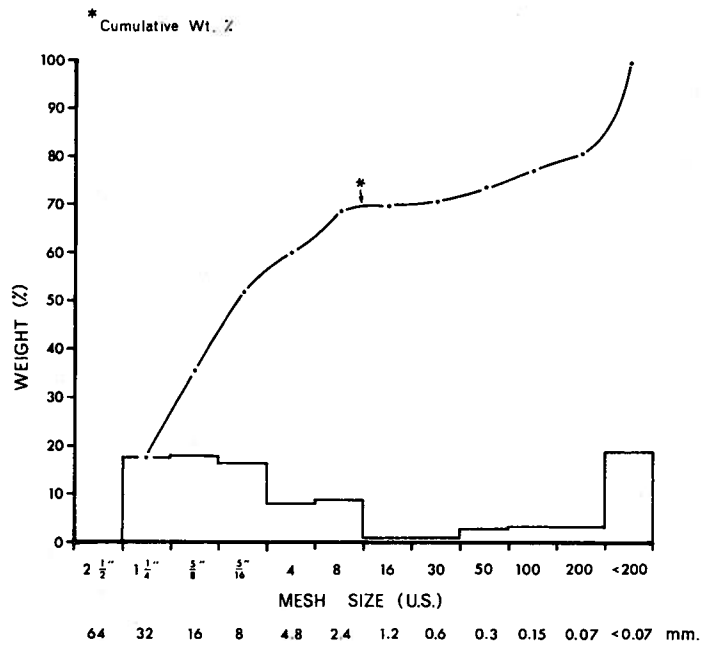
SAMPLE NO.: Hole 5
 DEPTH : 12, 23
 LOCATION : NW 21-35-3W5



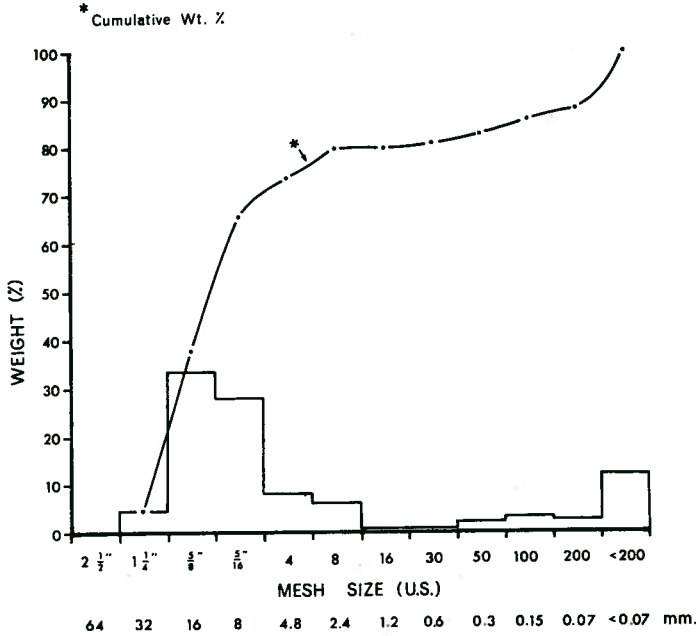
SAMPLE NO.: Hole 6
 DEPTH : 9
 LOCATION : SW 4-35-3W5



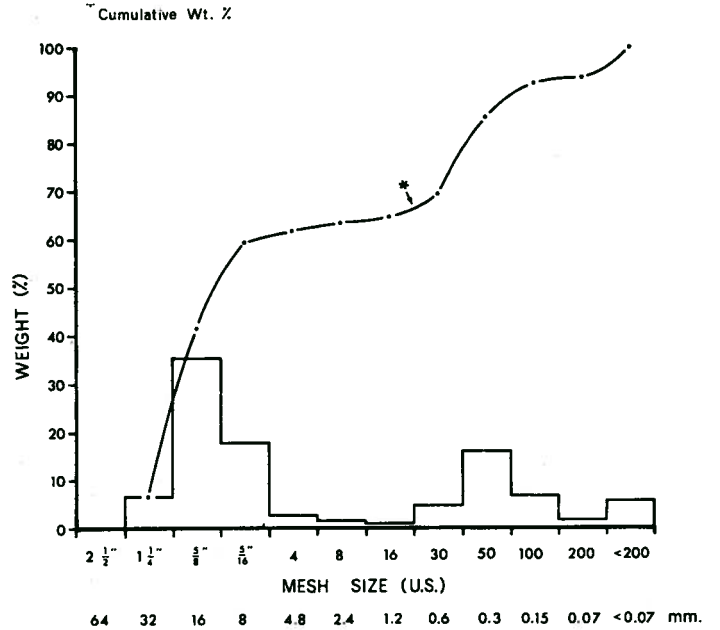
SAMPLE NO.: Hole 7
 DEPTH : 12
 LOCATION : S 1/2 29-36-28W4



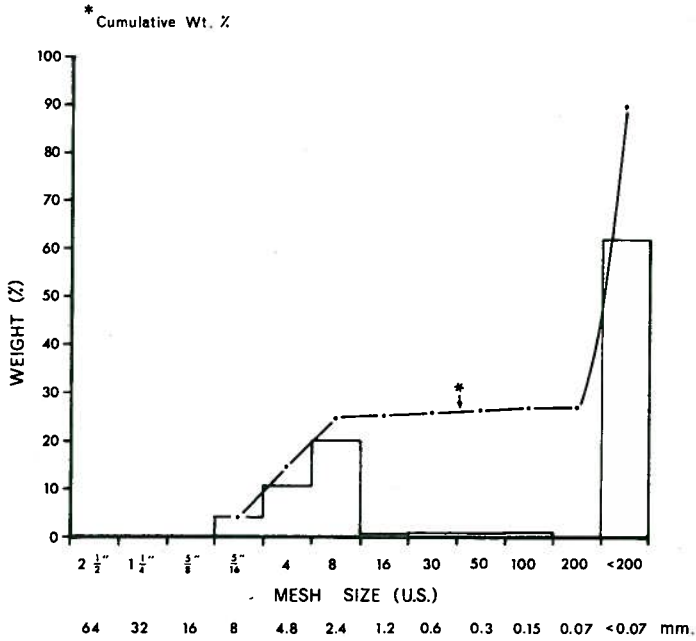
SAMPLE NO.: Hole 8
 DEPTH : 18
 LOCATION : SW 20-36-28W4



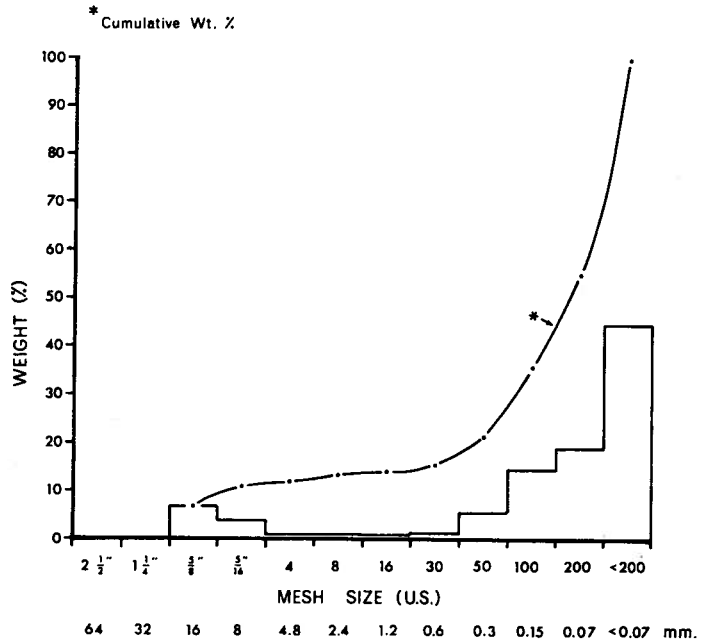
SAMPLE NO.: Hole 9
 DEPTH : 12
 LOCATION : SE 31-36-28W4



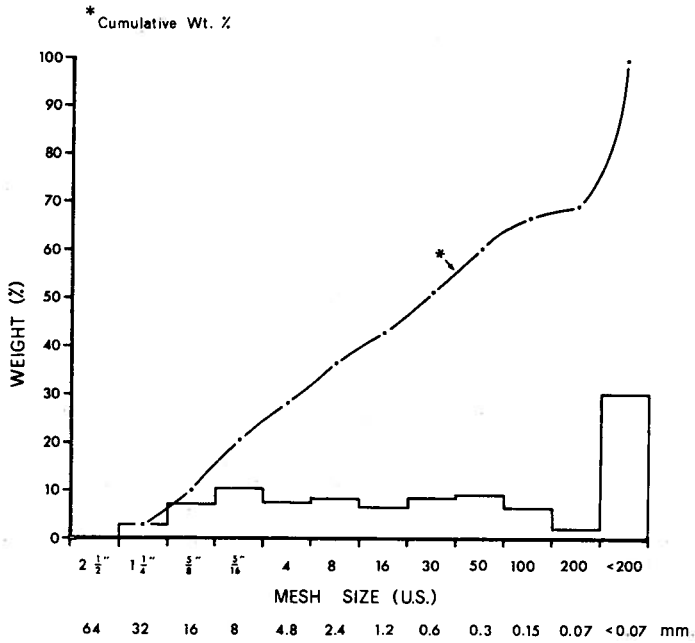
SAMPLE NO.: Hole 10
 DEPTH : 8
 LOCATION : NW 2-40-27W4



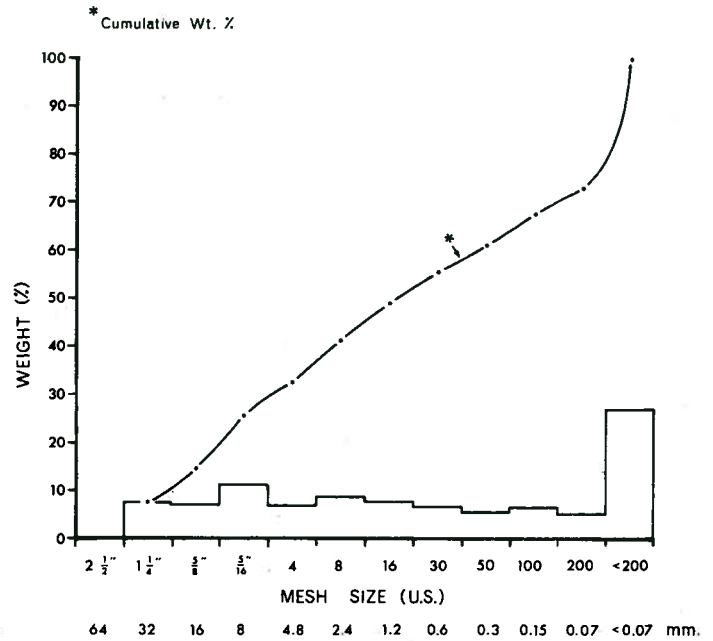
SAMPLE NO.: Hole 11
 DEPTH : 8
 LOCATION : SW 17-39-27W4



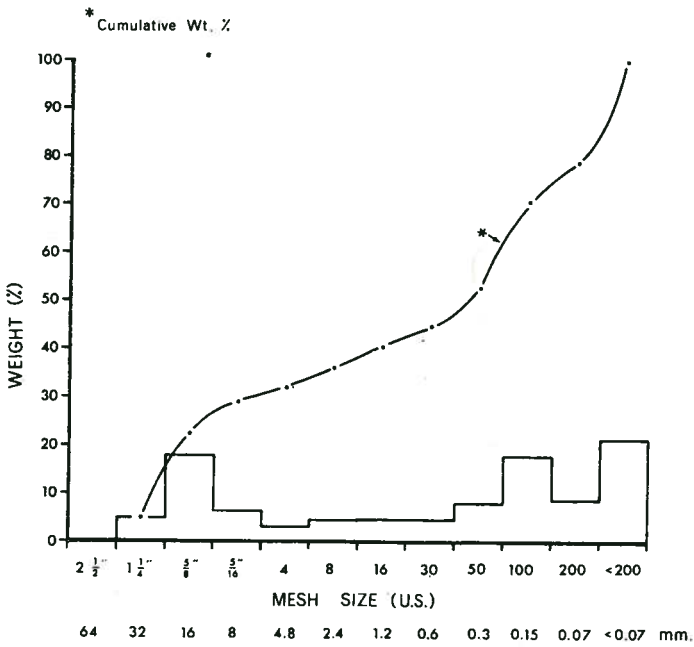
SAMPLE NO.: Hole 12
 DEPTH : 18
 LOCATION : NE 3-40-29W4



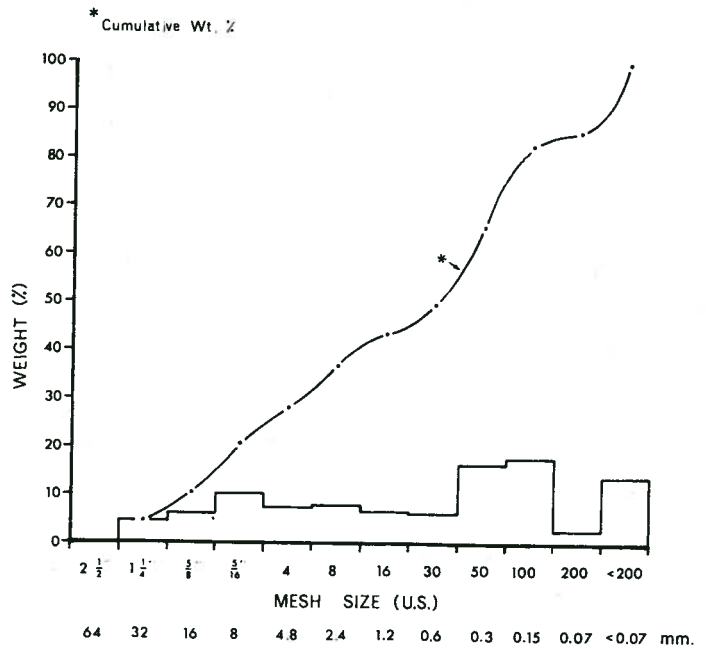
SAMPLE NO.: Hole 13
 DEPTH : 7, 18
 LOCATION : N1/2 10-42-24W4



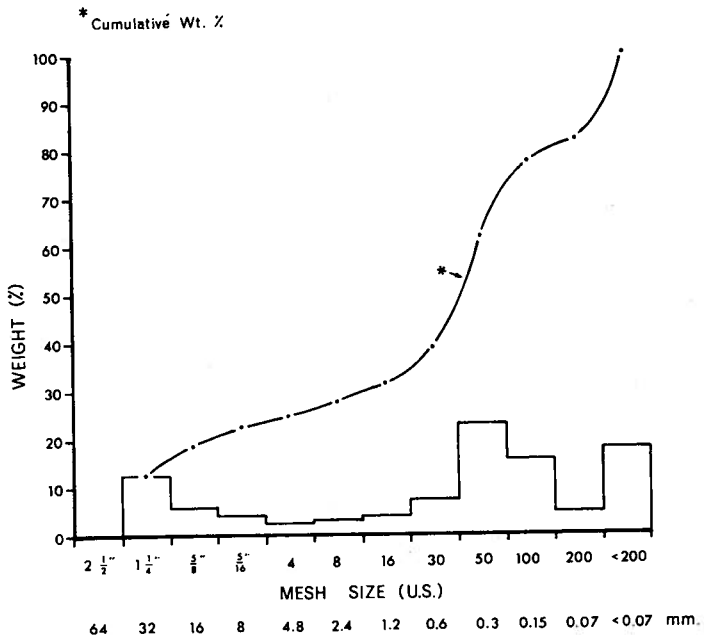
SAMPLE NO.: Hole 14
 DEPTH : 6
 LOCATION : SE 18-41-24W4



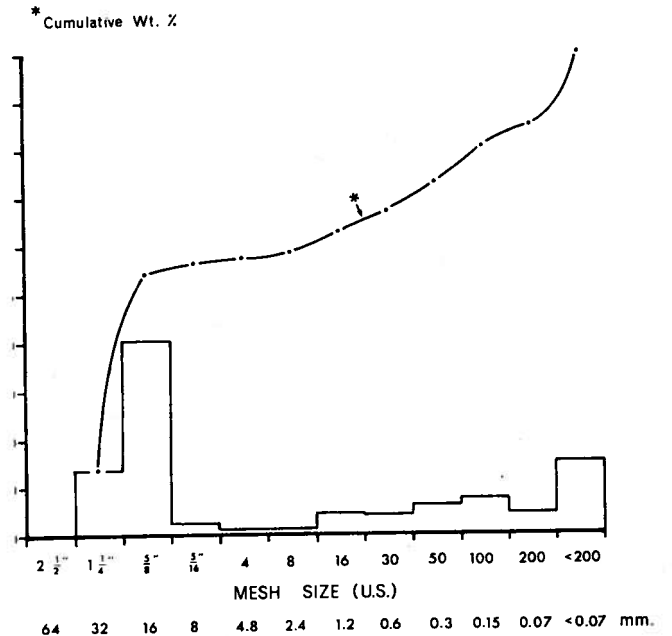
SAMPLE NO.: Hole 15
 DEPTH : 12
 LOCATION : NW 5-41-24W4



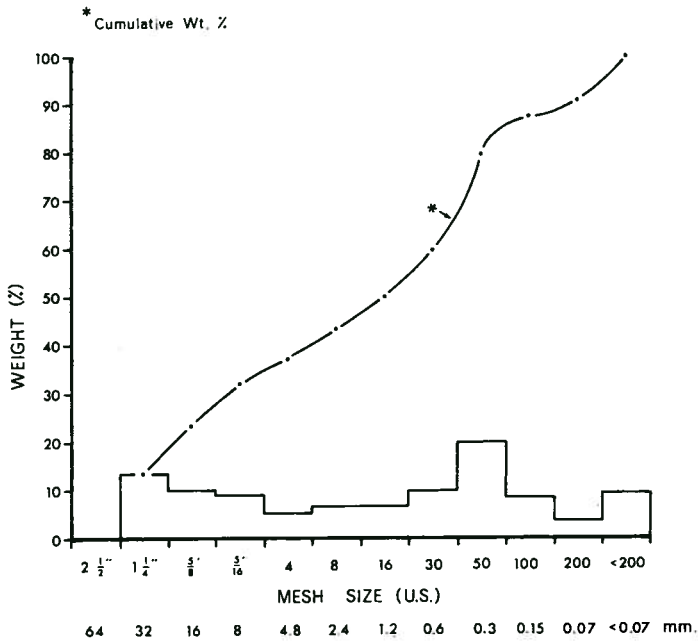
SAMPLE NO.: Hole 16
 DEPTH : 6
 LOCATION : SE 32-40-24W4



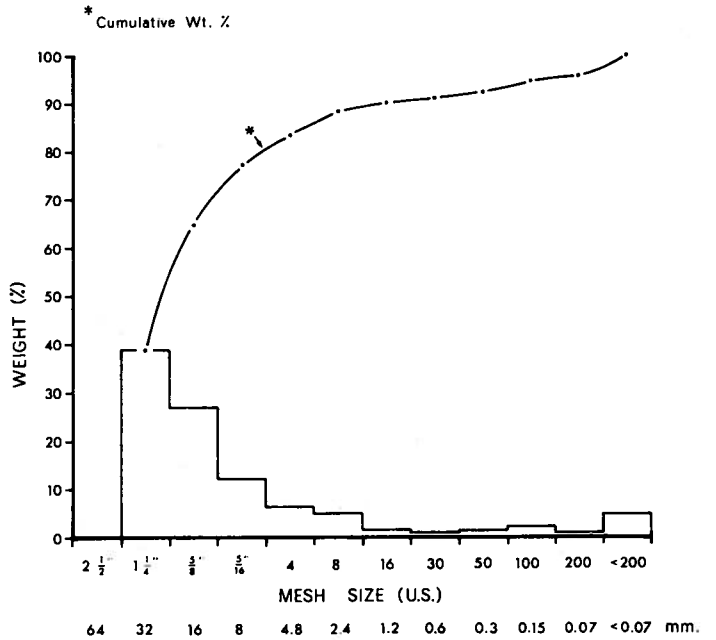
SAMPLE NO.: Hole 17
 DEPTH : 8
 LOCATION : NW 33-40-24W4



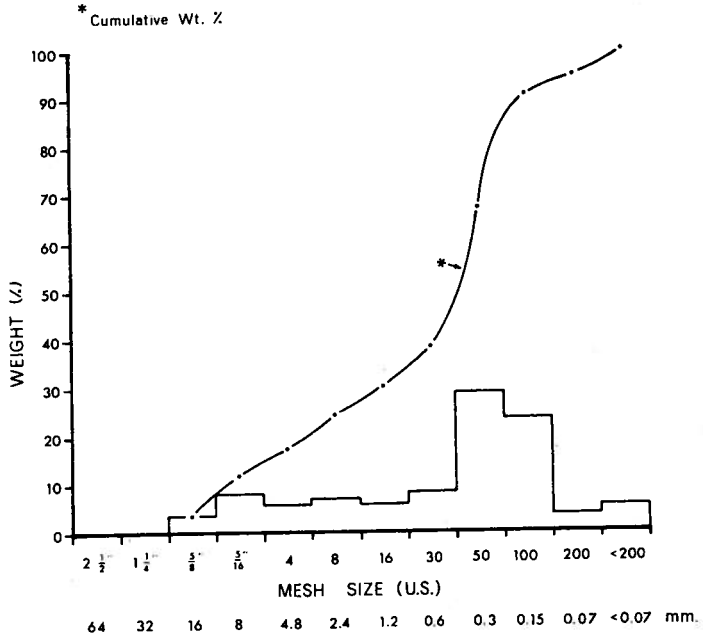
SAMPLE NO.: Hole 18
 DEPTH : 6
 LOCATION : S1/2 14-40-23W4



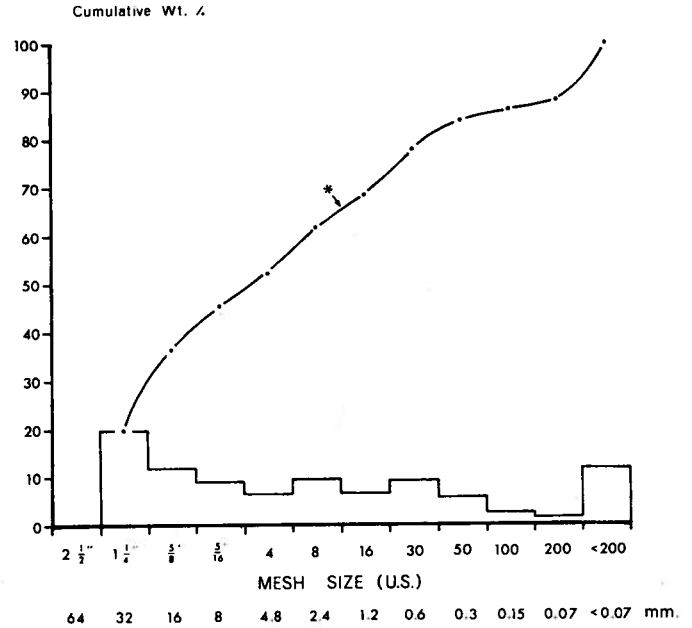
SAMPLE NO.: Hole 19
 DEPTH : 13, 17, 28
 LOCATION : SW 1-40-23W4



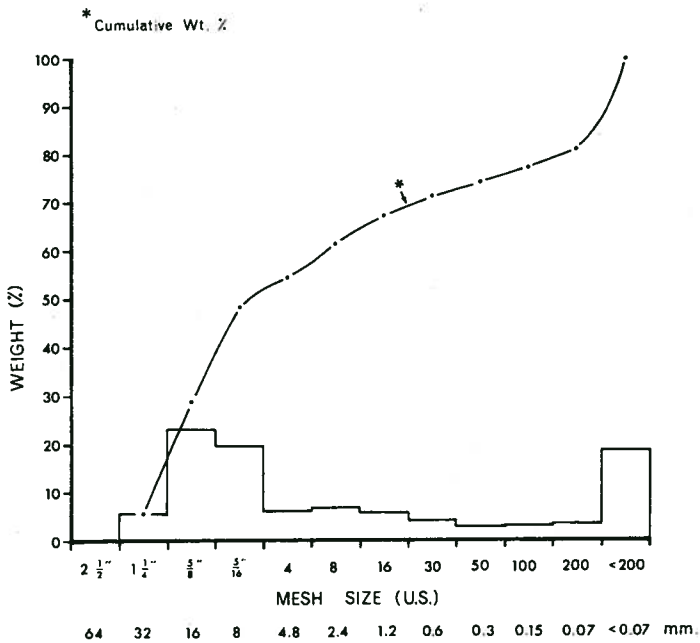
SAMPLE NO.: Hole 20
 DEPTH : 5
 LOCATION : E 1/2 20-39-23W4



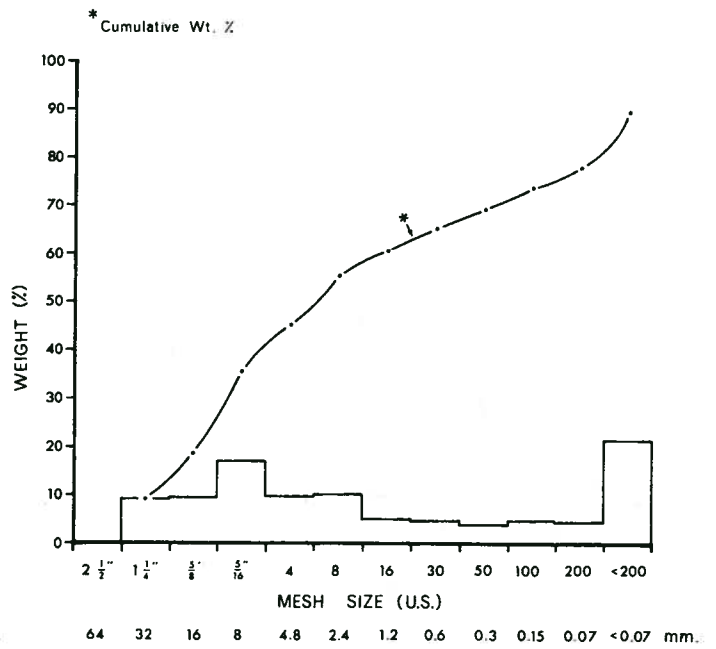
SAMPLE NO.: Hole 21
 DEPTH : 3
 LOCATION : SE 28-39-23W4



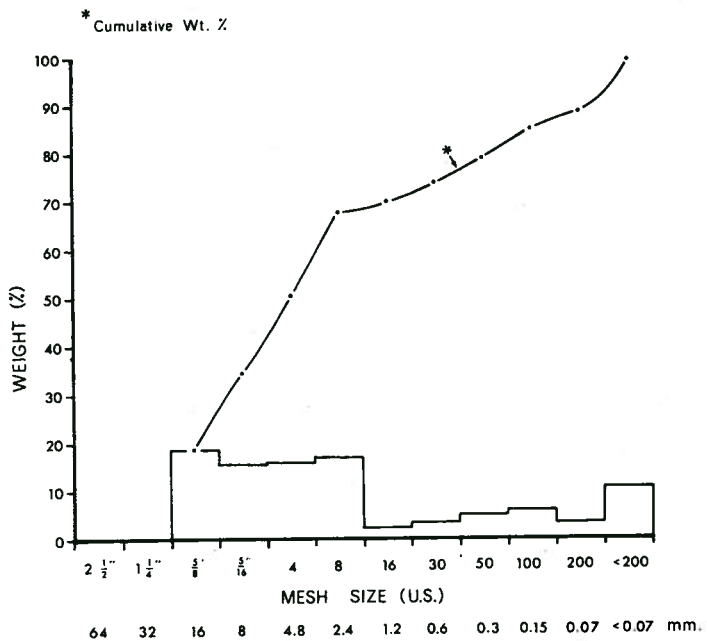
SAMPLE NO.: Hole 22
 DEPTH : 10
 LOCATION : NW 34-37-25W4



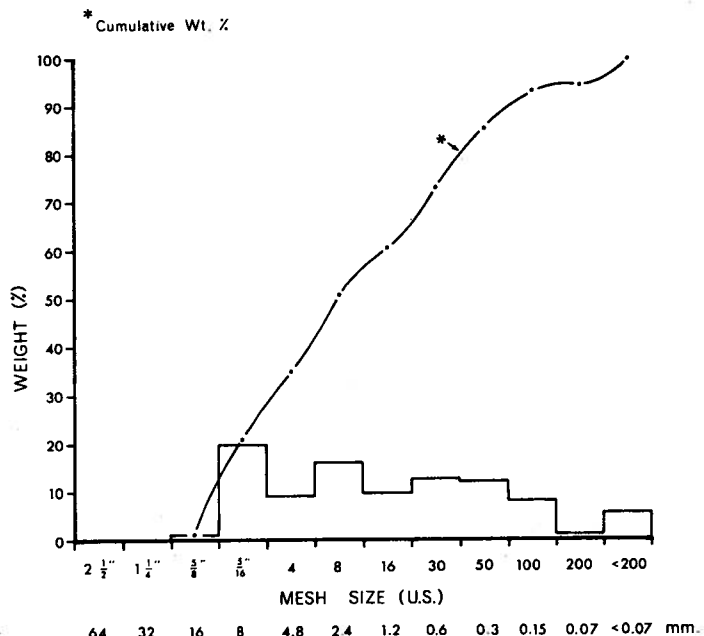
SAMPLE NO.: Hole 23
 DEPTH : 12
 LOCATION : SW 4-38-25W4



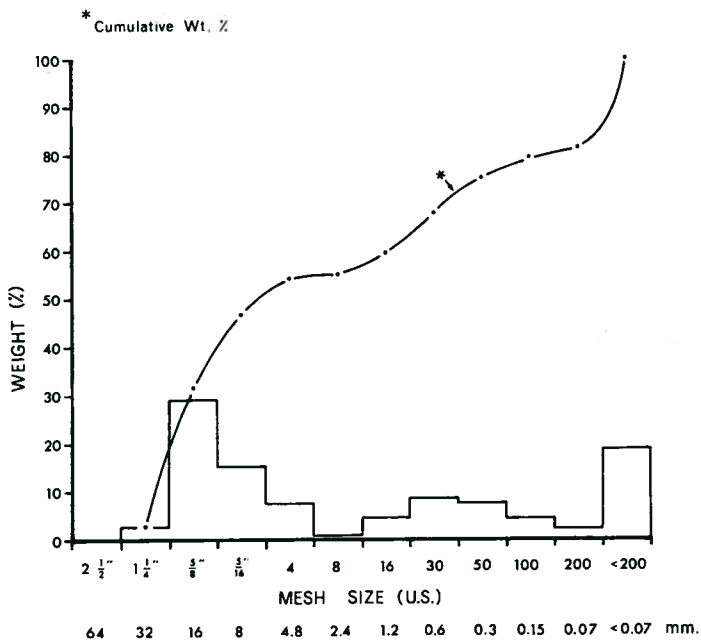
SAMPLE NO.: Hole 24
 DEPTH : 5
 LOCATION : NW 1-38-26W4



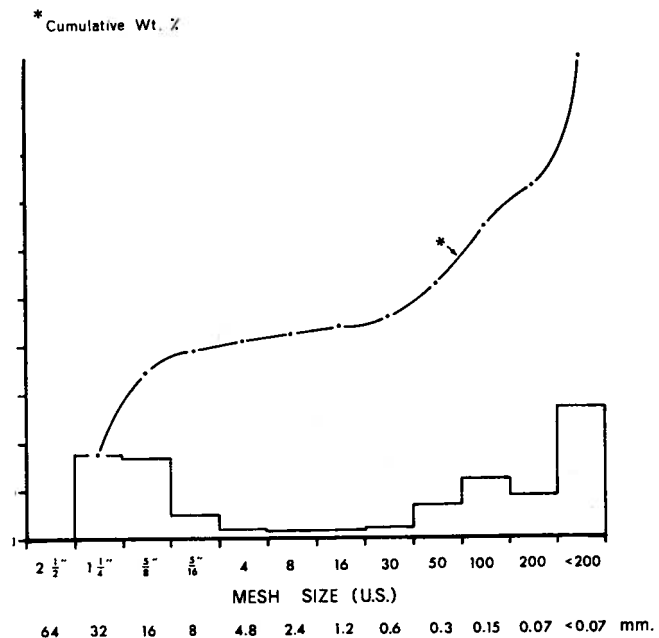
SAMPLE NO.: Hole 25
 DEPTH : 6
 LOCATION : SE 3-37-25W4



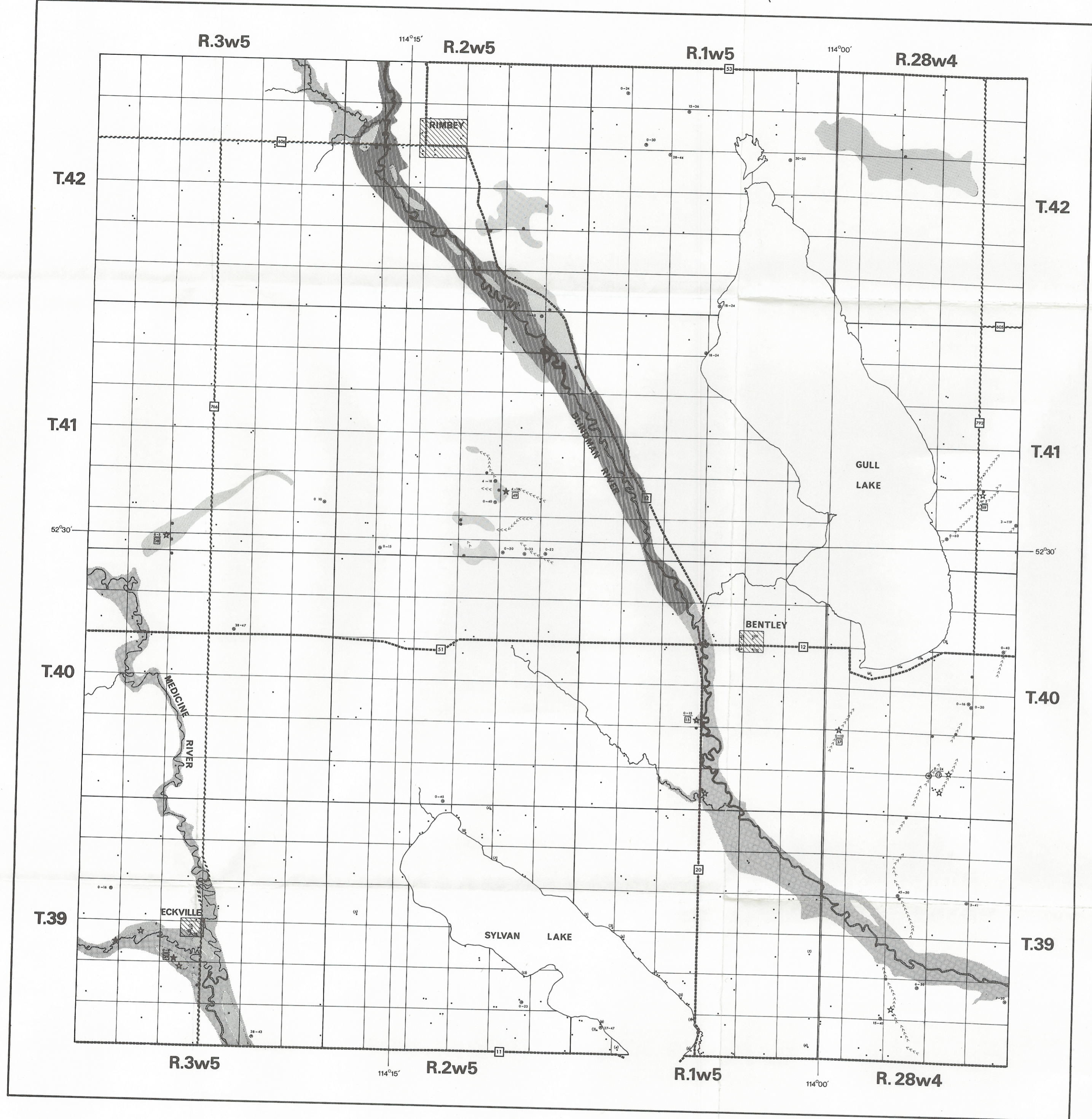
SAMPLE NO.: Hole 26
 DEPTH : 12
 LOCATION : S 1/2 26-36-25W4



SAMPLE NO.: Hole 27
 DEPTH : 20
 LOCATION : NW 1-35-25W4

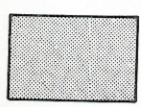
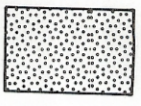
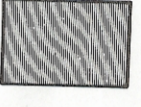
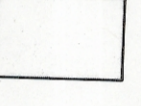
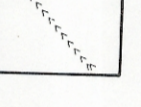



SAMPLE NO.: Hole 28
 DEPTH : 8
 LOCATION : NW 31-40-27W4







LEGEND



Surficial Geology

-  RECENT ALLUVIAL DEPOSITS (ALLUVIUM)
-  AS ABOVE (TERRACE)
-  GLACIOFLUVIAL
-  AS ABOVE (OUTWASH, INCLUDING DELTA AND KAME DEPOSITS)
-  ESKER
-  PREGLACIAL DEPOSITS


Test Holes

-  From data on file with Groundwater Division; no gravel above 50', number of holes indicated
-  As above; 5' or more gravel above 50', gravel interval indicated
-  From 1973 drilling program; no gravel
-  As above; 5' or more gravel; gravel interval/sample number indicated

Gravel Pits

-  Active; maximum depth/sample number indicated
-  Inactive; maximum depth/sample number indicated

Exposures

-  Outcrop or road cut; sample number indicated

Highways



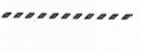
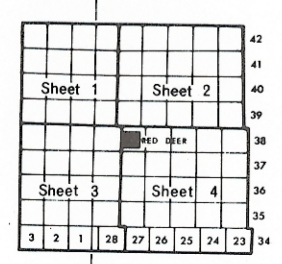
-  Main highway, four lane
-  Main highway, two lane
-  Secondary highway

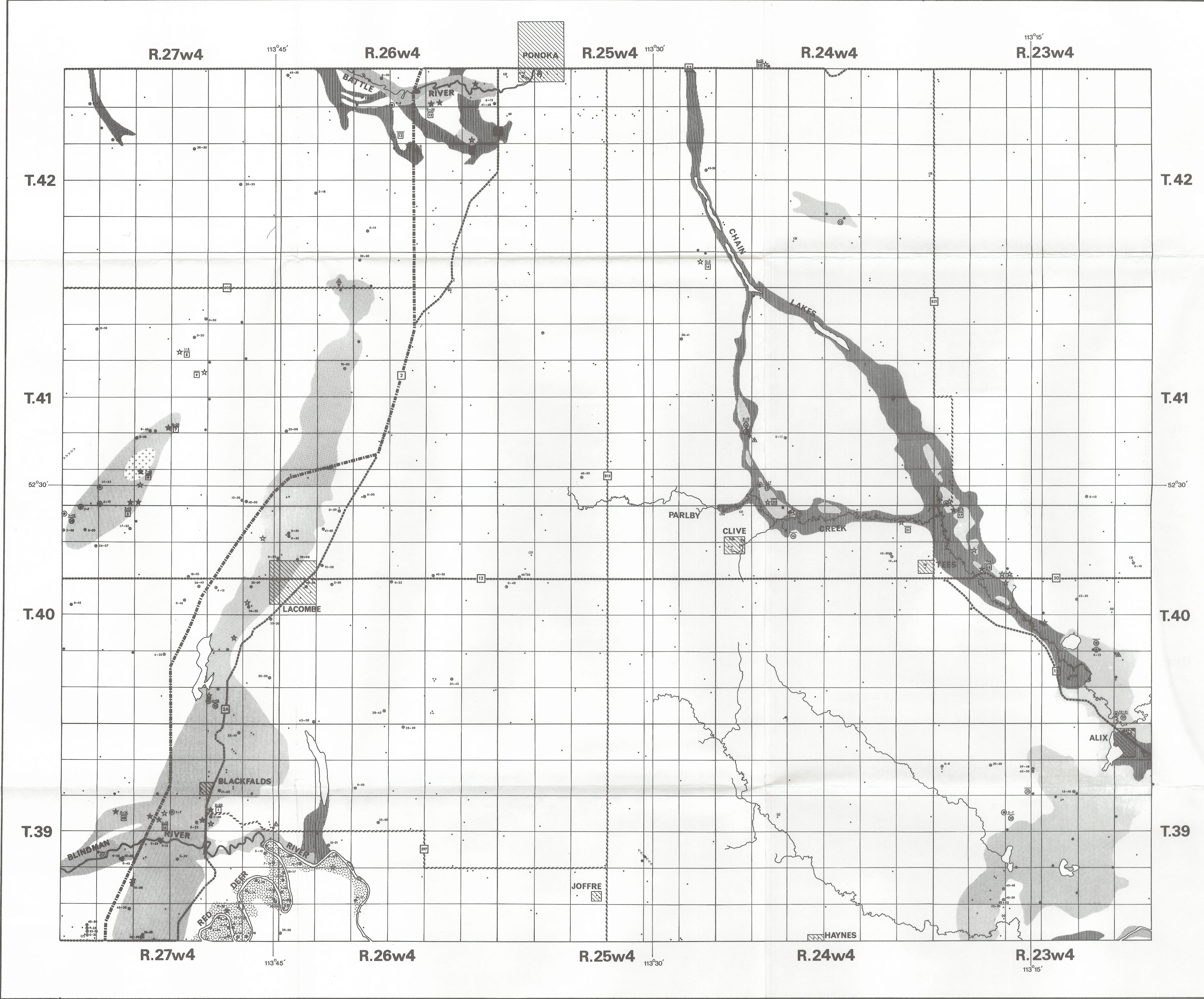


FIGURE 3. GRAVEL RESOURCES OF THE RED DEER AREA (NORTHWEST SEGMENT)

To accompany Alberta Research Council Report 75-3
by M. E. Holter




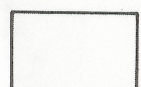
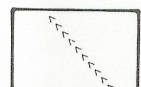



LOCATION MAP







LEGEND



Surficial Geology

-  RECENT ALLUVIAL DEPOSITS (ALLUVIUM)
-  AS ABOVE (TERRACE)
-  GLACIOFLUVIAL
-  AS ABOVE (OUTWASH, INCLUDING DELTA AND KAME DEPOSITS)
-  ESKER
-  PREGLACIAL DEPOSITS


Test Holes

-  From data on file with Groundwater Division; no gravel above 50', number of holes indicated
-  As above; 5' or more gravel above 50', gravel interval indicated
-  From 1973 drilling program; no gravel
-  As above; 5' or more gravel; gravel interval/sample number indicated




Gravel Pits

-  Active; maximum depth/sample number indicated
-  Inactive; maximum depth/sample number indicated

Exposures

-  Outcrop or road cut, sample number indicated

Highways

-  Main highway, four lane
-  Main highway, two lane
-  Secondary highway

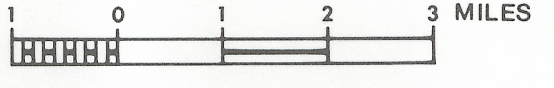
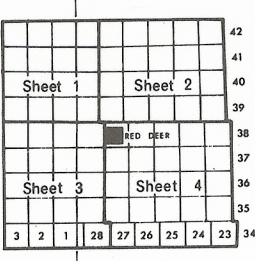
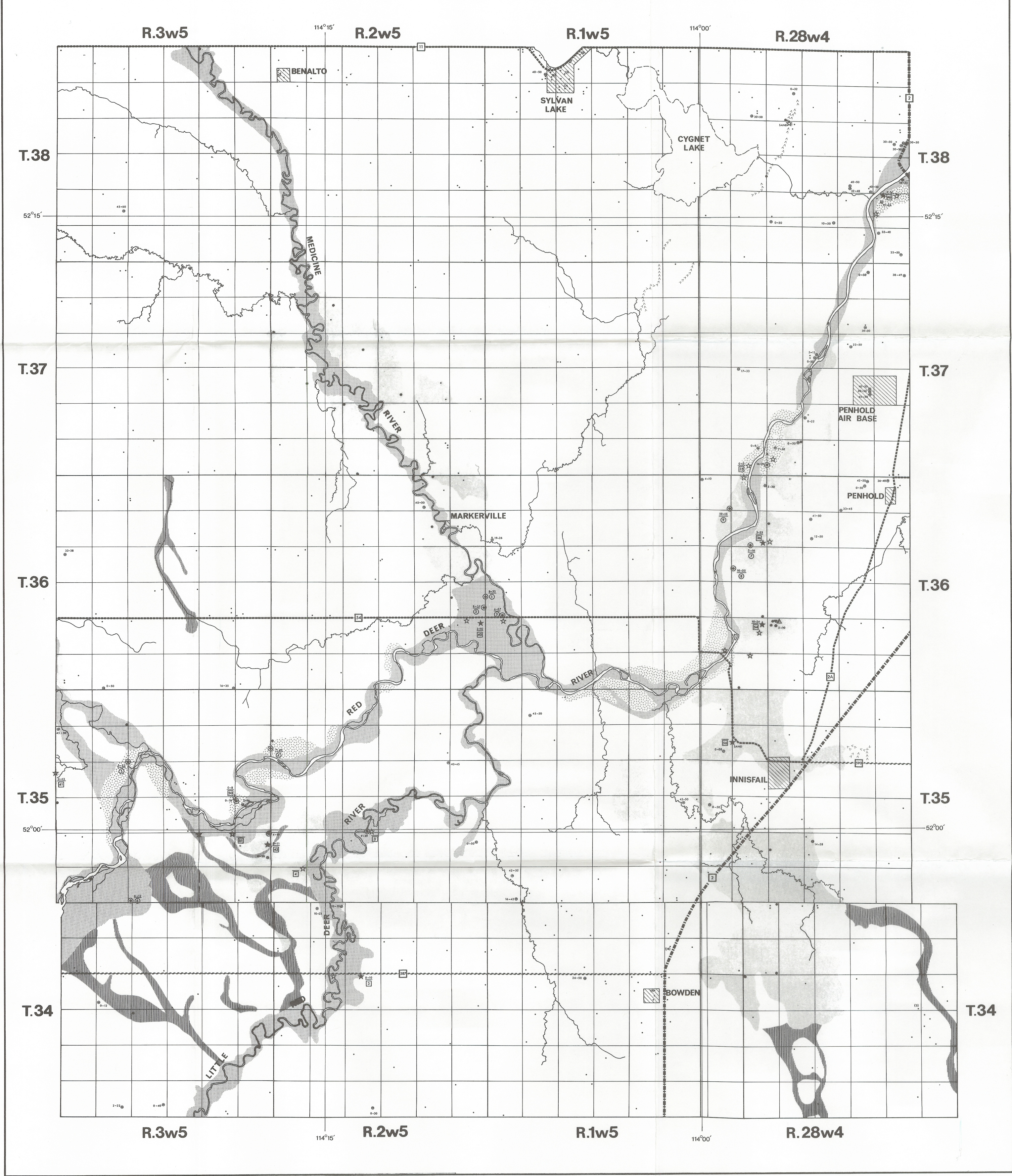


FIGURE 4. GRAVEL RESOURCES OF THE RED DEER AREA (NORTHEAST SEGMENT)

To accompany Alberta Research Council Report 75-3 by M. E. Holter





LEGEND

Surficial Geology

- RECENT ALLUVIAL DEPOSITS (ALLUVIUM)
- AS ABOVE (TERRACE)
- GLACIOFLUVIAL
- AS ABOVE (OUTWASH, INCLUDING DELTA AND KAME DEPOSITS)
- ESKER
- PREGLACIAL DEPOSITS

Test Holes

- From data on file with Groundwater Division; no gravel above 50', number of holes indicated
- As above; 5' or more gravel above 50', gravel interval indicated
- From 1973 drilling program; no gravel
- As above; 5' or more gravel; gravel interval/sample number indicated

Gravel Pits

- Active; maximum depth/sample number indicated
- Inactive; maximum depth/sample number indicated

Exposures

- Outcrop or road cut; sample number indicated

Highways

- Main highway, four lane
- Main highway, two lane
- Secondary highway

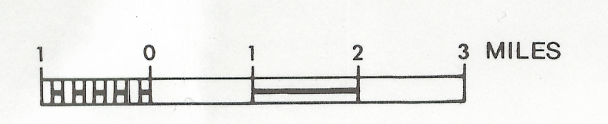
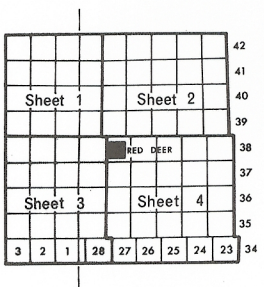
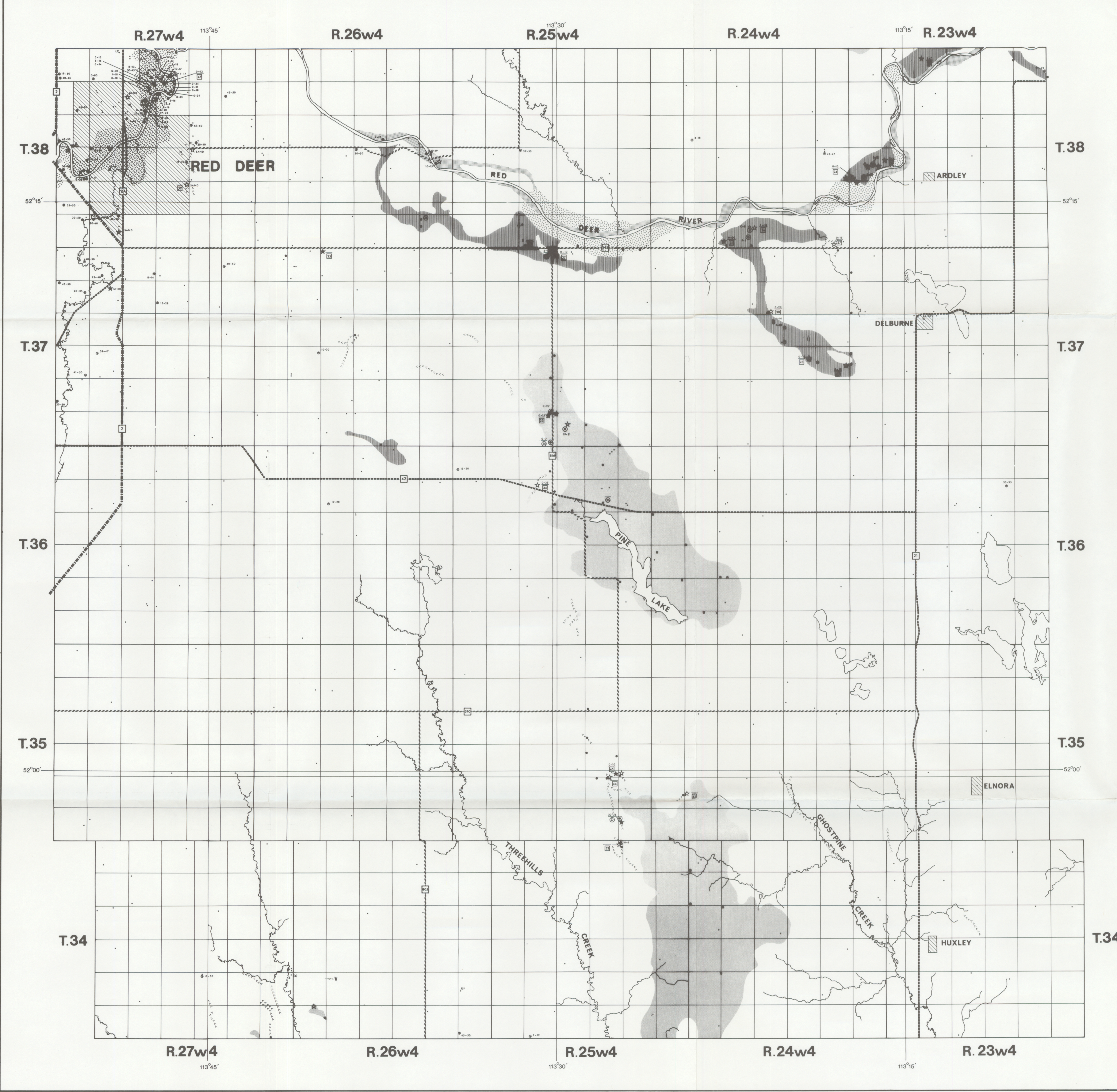


FIGURE 5. GRAVEL RESOURCES OF THE RED DEER AREA (SOUTHWEST SEGMENT)



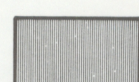

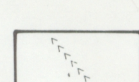
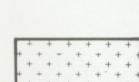
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





LEGEND



Surficial Geology

-  RECENT ALLUVIAL DEPOSITS (ALLUVIUM)
-  AS ABOVE (TERRACE)
-  GLACIOFLUVIAL
-  AS ABOVE (OUTWASH, INCLUDING DELTA AND KAME DEPOSITS)
-  ESKER
-  PREGLACIAL DEPOSITS


Test Holes

-  From data on file with Groundwater Division; no gravel above 50', number of holes indicated
-  As above; 5' or more gravel above 50', gravel interval indicated
-  From 1973 drilling program; no gravel
-  As above; 5' or more gravel; gravel interval/sample number indicated



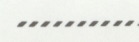
Gravel Pits

-  Active; maximum depth/sample number indicated
-  Inactive; maximum depth/sample number indicated

Exposures

-  Outcrop or road cut; sample number indicated

Highways

-  Main highway, four lane
-  Main highway, two lane
-  Secondary highway

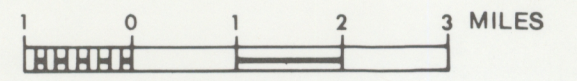
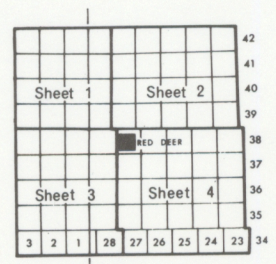


FIGURE 6. GRAVEL RESOURCES OF THE RED DEER AREA (SOUTHEAST SEGMENT)

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LOCATION MAP