GRANULAR RESOURCE INVENTORY
- MACKENZIE -
ARCTIC RED RIVER 106 N
(1:125,000)
Produced for Northern & Indian Affairs
by Dept. of Energy, Mines & Resources

GRANULAR RESOURCE INVENTORY-MACKENZIE

ARCTIC RED RIVER NTS 106N

SCALE 1:125,000

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For - Department of Indian and
Northern Affairs

SUMMARY

Sources of unconsolidated granular material are distributed throughout most of the Arctic Red River map area. In most cases these deposits are glaciofluvial material and are most abundant in the northeastern half of the map area.

Devonian and Cretaceous bedrock underlies the map area. The most abundant rock types are fissile and bituminous shale, sandstone and conglomerate. The shale and thin bedded sandstone between Arctic Red River and Fort McPherson are presently being used for road construction.

TABLE OF CONTENTS

INTRODUCTION

This report attempts to assess the quantity of granular material available for construction. Both unconsolidated and bedrock sources are considered. Glaciofluvial and fluvial materials are considered first rate sources of sand and gravel. Lacustrine deposits are of variable quality whereas eolian material is of limited use because of its fine texture. Generally, moraines have only been considered where they are known to be hummocky and to contain some coarse granular material. Terminal moraines are usually considered to be sources of granular material whereas ground moraines are not.

Shales and sandstones have been considered in this report as fill for road and other construction uses.

The information which appears in this report and on the accompanying map has been compiled largely from published and unpublished manuscripts and personal communication with officers of the Geological Survey of Canada. Supplementary data, mainly on depths, thicknesses and, in some cases, on texture of deposits have been obtained from confidential reports of other government departments and industry. (See Sources of Information).

The basic document used in this compilation is a surficial geology map at a scale of 1:125,000 (Hughes, 1972). It is indexed as GSC Open File Number 97 and may be viewed at Geological Survey of Canada offices in Ottawa, Calgary and Vancouver; ozalid copies may be obtained at nominal

cost. All areal data are derived from this source; all major and most minor unconsolidated deposits of granular material are represented at this scale.

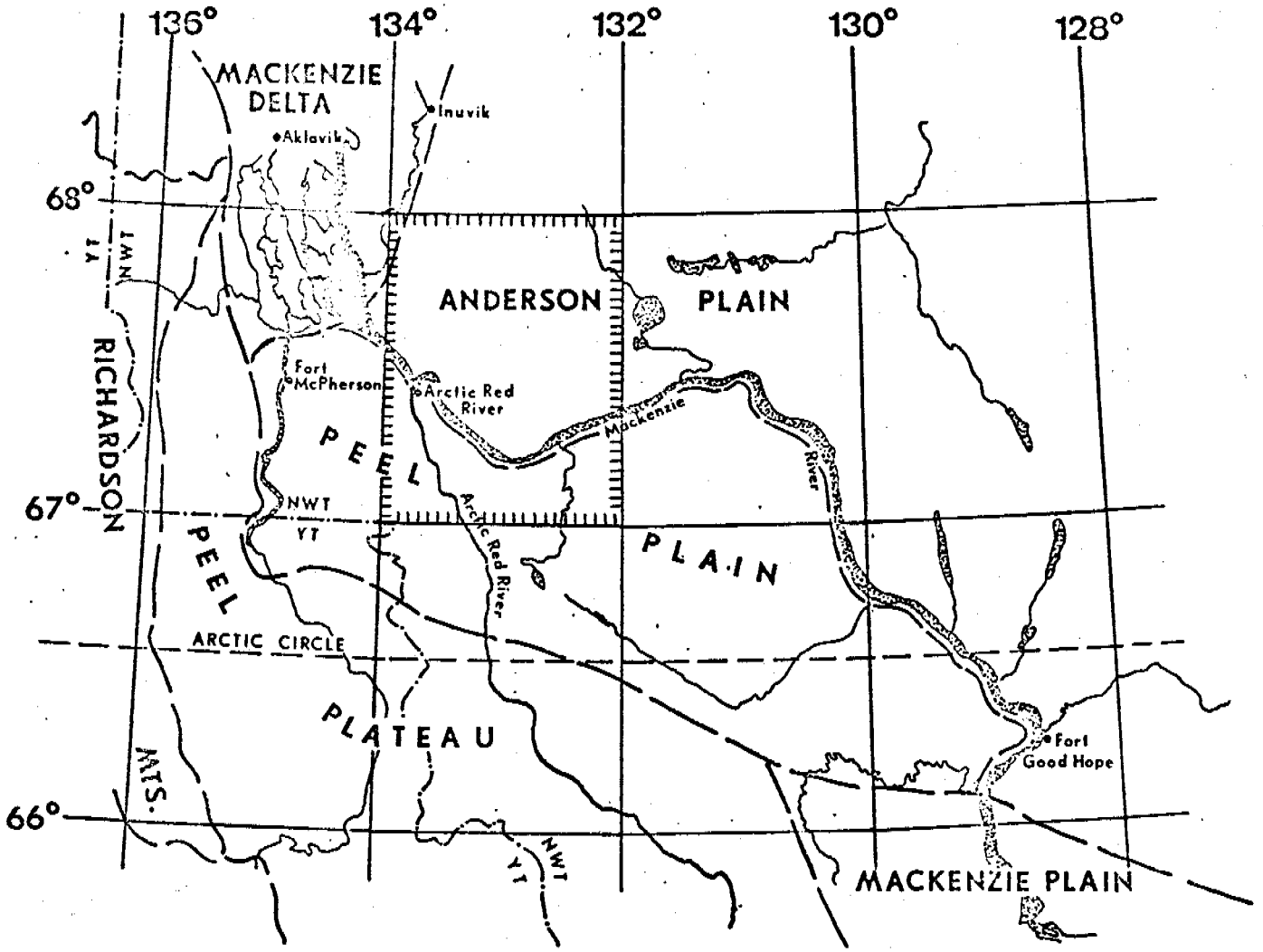
A derived map for granular material has been produced from the basic surficial geology map in close association with the field geologist. His field observations provide additional data on thickness, texture, ice content, drainage, and the variability of the map units.

To supplement thickness and textural data, additional information was gathered from seismic shot hole records and samples, and from other drill hole logs.

Areal extent of deposits were estimated by planimetric means. Average thickness for each deposit was estimated from the data mentioned above and adjusted according to several other variables such as drainage, height above water table, and amount of ground ice. From this, a volume of granular material was estimated. All estimated volumes of material appear in a tabular summary at the end of the paper.

No bedrock geology overlay accompanies this report as the map area is underlain for the most part by the same geological formation, Devonian shale and sandstone.

For purposes of description, areas of granular material are numbered to correspond to a tabular summary of materials. Areas which appear to have little material with respect to anticipated demand or areas which require more detailed work are discussed in the report.



ARCTIC RED RIVER

PHYSIOGRAPHIC REGIONS

0 MI. 80

after BOSTOCK 1967

GENERAL GEOLOGY AND PHYSIOGRAPHY

Two major physiographic regions, the Anderson Plain to the north and the Peel Plain to the south, are represented in the Arctic Red River map area. A third physiographic region, the Mackenzie Delta appears in the northwest corner (Bostock, 1967). Bedrock is not well exposed in the map area except in stream and river channels. Surficial material of glacial origin appears in various geomorphological forms. The majority of these deposits are located in the northeast half of the map area.

The entire map area is underlain by shale and sandstone. Covering this bedrock is a ground morainal till overlain by various other geomorphological forms. Eskers are ubiquitous. A glaciofluvial outwash plain covers parts of the northeast area, and glaciolacustrine and glaciofluvial plains cover parts of the southeast. Because the rivers cut through morainal till the fluvial deposits in this area are mainly silt and clay.

Unconsolidated Deposits

Glaciofluvial Deposits, G.

Glaciofluvial deposits in this area were formed as outwash plains, terraces and channels, and sinuous ridged eskers. They have a rolling or hummocky relief. Material in these deposits varies from sand to gravel with mixtures of both. The topography of these deposits is variable with local relief up to 120'.

The glaciofluvial deposits average 30' in thickness but may be up to 60'. Approximately 80% is available as a granular resource. The eskers average 10'-20' in height and 80% of this material also is available as a granular resource.

Glaciolacustrine Deposits, GL.

The glaciolacustrine materials in this map area are the result of deposition within a glacial lake. For the most part, these are fine grained material but may contain some sand. About 50% of this material is available as granular construction material.

Moraine Deposits, M.

In this study only end or terminal moraines are considered for granular material. This type of deposit occurs as hummocky or ridged topography. Although the deposits are often large and fairly thick (50'), high ice contents may preclude the extraction of large quantities of this material. One per cent of the material is considered available for construction material.

Bedrock

The surficial deposits of the Arctic Red River map area are underlain principally by Devonian shales and sandstones of the Imperial, Canol and Hare Indian formations. Devonian sandstone and shale form the lower Ramparts at Arctic Red River. Only in the southwestern portion of the map

area the shale and sandstone is Lower Cretaceous. Both rock types are thin bedded and fissile.

MATERIALS

The principal deposits of glaciofluvial sands and gravels are found at Sandy and Deep Lakes and adjacent areas in the northeast part of the map area. (See grain size curves station 65 and 65 and 67.) Several large areas of hummocky and ridged moraine are associated with the glaciofluvial deposits.

In the south-eastern part of the map area in the Tree River Basin there is an extensive esker, glaciofluvial and glaciolacustrine outwash complex. A similar but smaller complex is found along Fat Rabbit River. Although the esker and glaciofluvial deposits contain much granular material, the glaciolacustrine material is predominantly silt and clay with much ice.

Many eskers and small glaciofluvial deposits are distributed throughout the map area.

The bedrock is shale, and sandstone which can be ripped at many locations for fill material. Between Arctic Red River and Fort McPherson, thin bedded shales and sandstones are currently being used for highway construction. Shale bedrock, where near the surface, would provide materials for highway construction between Arctic Red River and the Rengling River. At Rengling River thin bedded shale and sandstone is covered by 2 to 10 feet of till. Although inferior in strength and durability to natural granular materials they have low ice contents which are advantageous for winter

construction. Shale materials would not be suitable for surface courses for highway use.

Near Arctic Red River and northeast of it there is an extensive area of hummocky terrain. The best source of material, however, for the community may be the large esker to the southeast of Arctic Red River which contains over 70% sand and gravel (station 92). An esker on the east side of the Mackenzie River opposite Cony Bay could provide similar material.

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
Area I ARCTIC RED RIVER				
a) Gr glaciofluvial ridged; sand and gravel.	.04	12	.48	.38
b) tMh morainal hummocky, till	1.09	50	56.81	.56
c) Esker; sand and gravel. (appendix II, station 92)	3.0 mi.	10	.088	.072
d) Mounds; 28; gravel.				
Area II FISHING BEAR LAKE				
a) tMhm morainal hummocky, rolling; till	22.41	50	1,166.71	.1166
b) sgGp glaciofluvial plain; sand and gravel.	1.48	12	18.56	14.84

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
c) Gh glaciofluvial hummocky; sand and gravel.	.20	12	2.44	1.95
d) Eskers; 6; sand and gravel	9.8 mi.	10	.284	.25
e) Mounds; 8; gravel.				
Area III RENGLENG RIVER				
a) tMhm morainal hummocky, rolling; till	2.54	50	132.11	1.32
b) Eskers; 2; sand and gravel.	2.00 mi.	10	.060	.04
Area IV CARIBOU LAKE - WEST SHORE				
a) GL glaciofluvial lacustrine undifferentiated; sand and gravel.	.87	12	10.72	8.56
b) Gm glaciofluvial rolling; sand and gravel.	.12	12	1.48	1.18
c) Eskers; 3; sand and gravel.	2.40 mi.	10	.072	.056

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
Area V SANDY LAKE				
a) Gp glaciofluvial plain; sand and gravel. (appendix II, station 65)	21.90	36	810.36	665.01
b) Gh glaciofluvial hummocky; sand and gravel.	.53	36	16.08	12.85
c) Gm glaciofluvial rolling; sand and gravel.	.78	36	29.28	27.42
d) sGm glaciofluvial rolling; sand.	.20	36	7.32	5.85
e) Esker; sand and gravel. (appendix II, station 67)	1.6 mi.	10	.05	.04
Area VI LOCHE LAKE				
a) tMhm morainal hummocky, rolling; till	17.80	50	926.96	9.29
b) gGp glaciofluvial plain; gravel.	3.51	36	131.76	105.40

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
c) bGh glaciofluvial hummocky; boulders.	.55	36	20.50	16.41
d) Gh glaciofluvial hummocky; sand and gravel.	.20	36	7.32	5.85
3) Gp/fo glaciofluvial plain; sand and gravel; organic.	.78	36	29.28	23.42
f) Gp glaciofluvial plain; sand and gravel.	.35	36	13.20	10.56
g) Gte glaciofluvial terraced, eroded; sand and gravel.	.35	36	13.20	10.56
h) Eskers; 5; sand and gravel.	7.60 mi.	10	.22	.18
i) Eskers; 5; sand and gravel.	3.40	10	.10	.08
Area VII RABIT HAY RIVER				
a) Gh glaciofluvial hummocky; sand and gravel.	.59	36	21.96	17.56

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
b) Gm glaciofluvial rolling; sand and gravel.	.08	36	.96	.76
c) Gp glaciofluvial plain; sand and gravel.	.12	36	1.48	1.03
d) Esker; sand.	8.0 mi.	10	.24	.19
e) Esker; sand.	1.60 mi.	10	.05	.045
f) Eskers; 2; sand.	4.20 mi.	10	.12	.11
g) Eskers; 9; sand.	4.10 mi.	10	.12	.10
Area VIII TREE RIVER				
a) GLp glaciolacustrine plain; silt, sand and gravel.	21.01	25	547.78	273.89
b) Gp glaciofluvial plain; sand and gravel.	5.34	20	111.49	89.00
c) Gm glaciofluvial rolling; sand and gravel.	.59	20	12.25	8.74

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
d) Gr glaciofluvial ridged; sand and gravel.	.78	20	16.25	10.00
e) Esker; sand and gravel.	1.20 mi.	10	.04	.03
Area IX				
a) Ghr glaciofluvial hummocky ridged; sand and gravel.	1.56	12	19.52	15.61
b) Gh glaciofluvial hummocky; sand and gravel.	.87	12	11.72	8.57
c) Gr glaciofluvial ridged; sand and gravel.	.47	12	5.84	4.67
d) tMh morainal hummocky till	.27	50	14.16	.14
e) Eskers; 3; sand and gravel (appendix II, station 74)	5.10 mi.	20	.59	.47

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
Area X ADAM CABIN CREEK				
a) Gh glaciofluvial hummocky; sand and gravel.	.40	12	4.84	3.69
b) Gp glaciofluvial plain; sand and gravel.	.39	12	4.88	3.90
c) Gr glaciofluvial ridged; sand and gravel.	.39	12	7.32	4.68
d) Eskers; 4; sand and gravel.	1.80 mi.	10	.15	.12
Area XI SWAN LAKE				
a) s, gGh glaciofluvial hummocky; sand and gravel.	.35	12	4.36	3.48
b) Ghr glaciofluvial hummocky, ridged; sand and gravel.	.12	12	1.44	1.14
Area XII FROG CREEK				
a) gGe glaciofluvial eroded; gravel.	.79	12	9.72	7.75

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$)	
			total	available
b) sGp glaciofluvial plain; sand.	.62	12	7.80	6.24

SOURCES OF INFORMATION

Bostock, H.S.
1967: Physiographic Regions of Canada, Geol. Surv. Can., map 1254A.

Hughes, O.L.
1969: Surficial Geology of Northern Yukon Territory and Northwestern District of Mackenzie, Northwest Territories, Geol. Surv. Can., Report and Map 1319A, Paper 69-36.

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1972: Surficial Geology Map of Arctic Red River, GSC Open File 97.

Hume, G.S.
1954: The Lower Mackenzie River Area, Northwest Territories and Yukon, Geol. Surv. Can., Mem. 273.

Norris, D.K., Price, R.A., and Mountjoy, E.W.
1963: Northern Yukon Territory and Northwestern District of Mackenzie, Geol. Surv. Can., Map 10-1963.

Prest, V.K., Grant, D.R., and Rampton, V.N.
1967: Glacial Map of Canada, Geol. Surv. Can., Map 1253A.

APPENDIX I, Part I

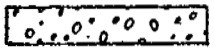
Unconsolidated Granular Materials

Each map sheet has a surficial geology legend (see appendix). This legend, differentiated by means of patterns, only indicates granular material classified by genetic characteristics. In some cases only part of a map unit has been patterned, indicating that only that portion is considered a suitable source for ganular material.

Legend

GLACIOFLUVIAL

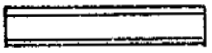
coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand



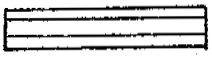
mixed or interbedded sand and gravel

predominantly sand or sand with some fine material

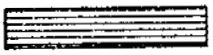
GLACIOLACUSTRINE



coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand.



mixed or interbedded sand and gravel

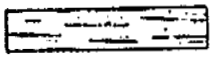


predominantly sand or sand with some fine material

FLUVIAL

only sand and gravel deposits are patterned

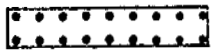
MORAINAL



predominantly till; unsorted matrix of silt, clay, and sand imbedded with pebbles, cobbles and boulders

MARINE

coarse grained granular material: cobbles, pebbles, gravel; may be mixed with coarse sand



mixed or interbedded sand and gravel

predominantly sand or sand with some fine material

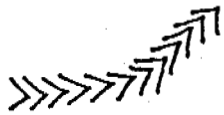
EOLIAN

fine and medium sandy material

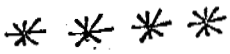
COLLUVIUM

only the patterned area is coarse grained

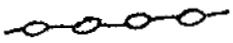
Symbols



eskers



gravel mounds



morainal ridge found within moraine

APPENDIX I, Part II

GRANULAR RESOURCE UNITS

GRANULAR RESOURCE AREAS (black)

granular resource area (see text for corresponding description)

APPENDIX I, Part III

SURFICIAL GEOLOGY AND LANDFORMS

TEXTURE		GENESIS		MORPHOLOGY		SLOPE (superscript)	
f	fen	O	organic	v	veneer	1	moderate (<5°)
p	peat	M	morainic	p	plain	2	steep (5°-15°)
c	clay	G	glaciofluvial	d	drumlin		
si	silt	L	lacustrine	s	fluted striated		>15° normally in Cx unit
s	sand	A	alluvial fluvial	t	terrace		
g	gravel			h	hummocky		
b	boulder	C	colluvial	r	ridged		
t	till	E	eolian	e	eroded		
		U	upland, rolling bedrock controlled	f	fan		
				m	rolling		
		R	rock outcrop	c	channelled		
				k	kettled thermokarst		
				x	complex		

Complex Units:

e.g. in: Mp-fO, fO constitutes 25% to 49% of area
: Mp/fO, fO = 5% - 24% of area

Using all four elements of the legend, a smooth ground moraine surface with moderate slope would be tMp^1; hummocky and ridged glaciofluvial gravel would be gGhr. Note that there are inconsistencies in the use of Mp and Mv mainly because of the difficulty in estimating till thickness.

APPENDIX II

TEXTURAL DATA

The textural data presented in this appendix was gathered during the summer of 1972 when spot checking of surficial and bedrock sources of granular materials was carried out. Although these grain size curves were plotted from the test results of single samples, it is believed that the samples are representative of the deposits tested.

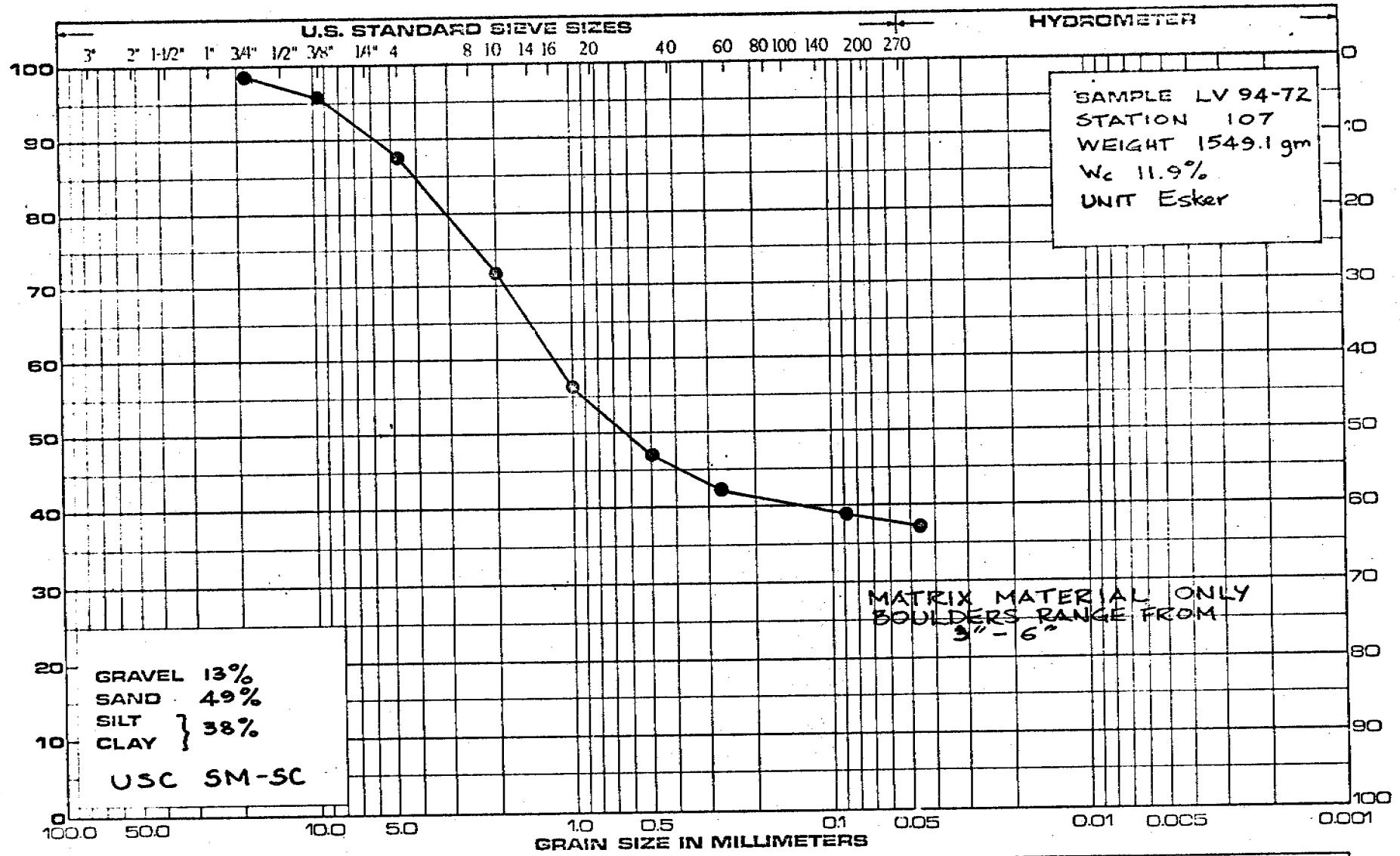
Reference to samples are by station and sample number. Cross reference with the "Tubular Summary" and UTM grid is included so that location of data on the 1:250,000 scale map can be established (see table below).

SAMPLE LOCATIONS

ARCTIC RED RIVER

STA	SAMPLE	TABULAR SUMMARY		GRID REFER.
		AREA	UNIT	UTM
65	LV61-72	Va	GP	PL074268
67	LV62-72	Ve	Esker	PL186208
74	LV67-72	IXe	Esker	PK218382
92	LV80-72	Ic	Esker	NK568760
107	LV94-72	--	Esker	NK874961

PARTICLE SIZE DISTRIBUTION



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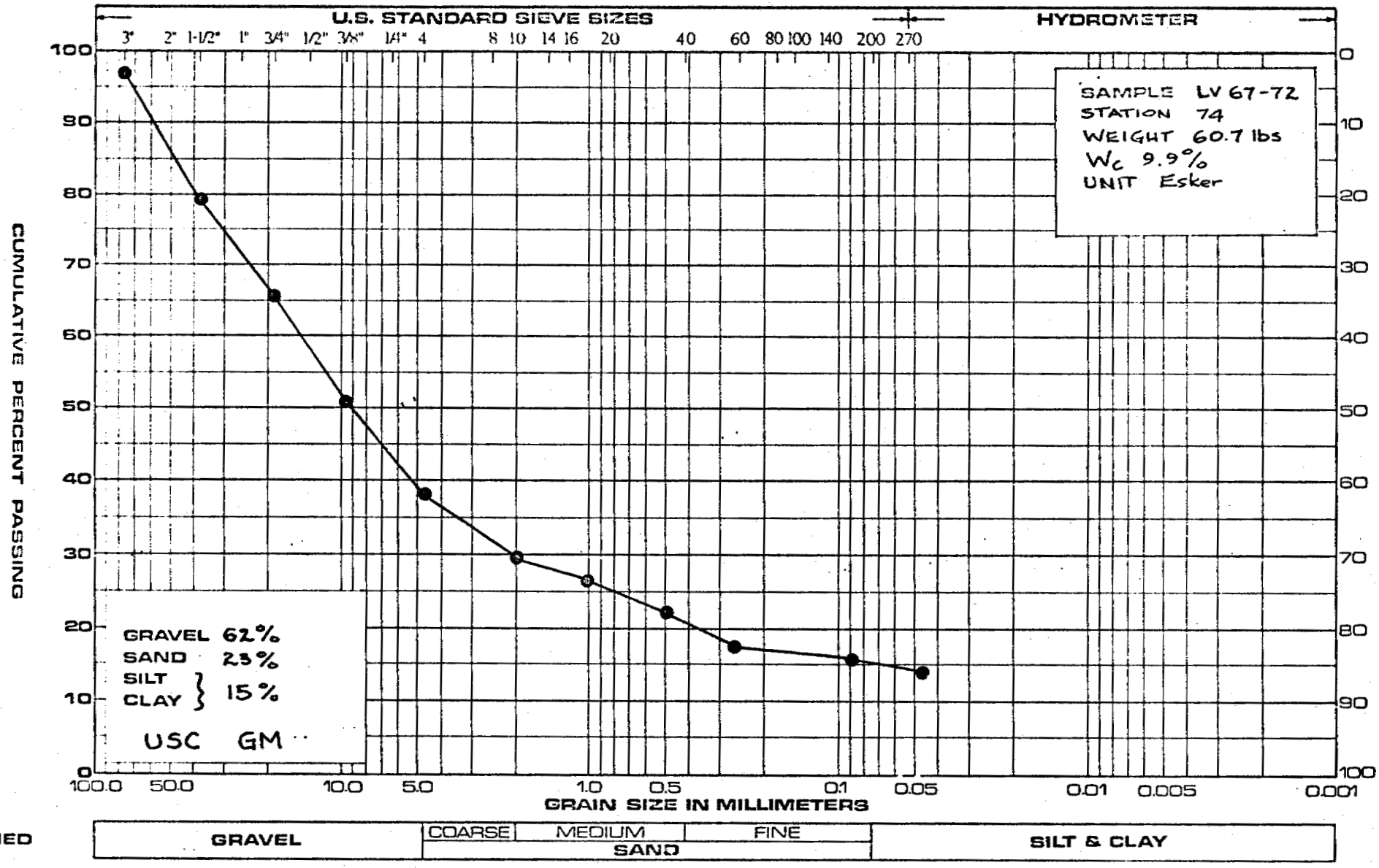
PARTICLE SIZE DISTRIBUTION



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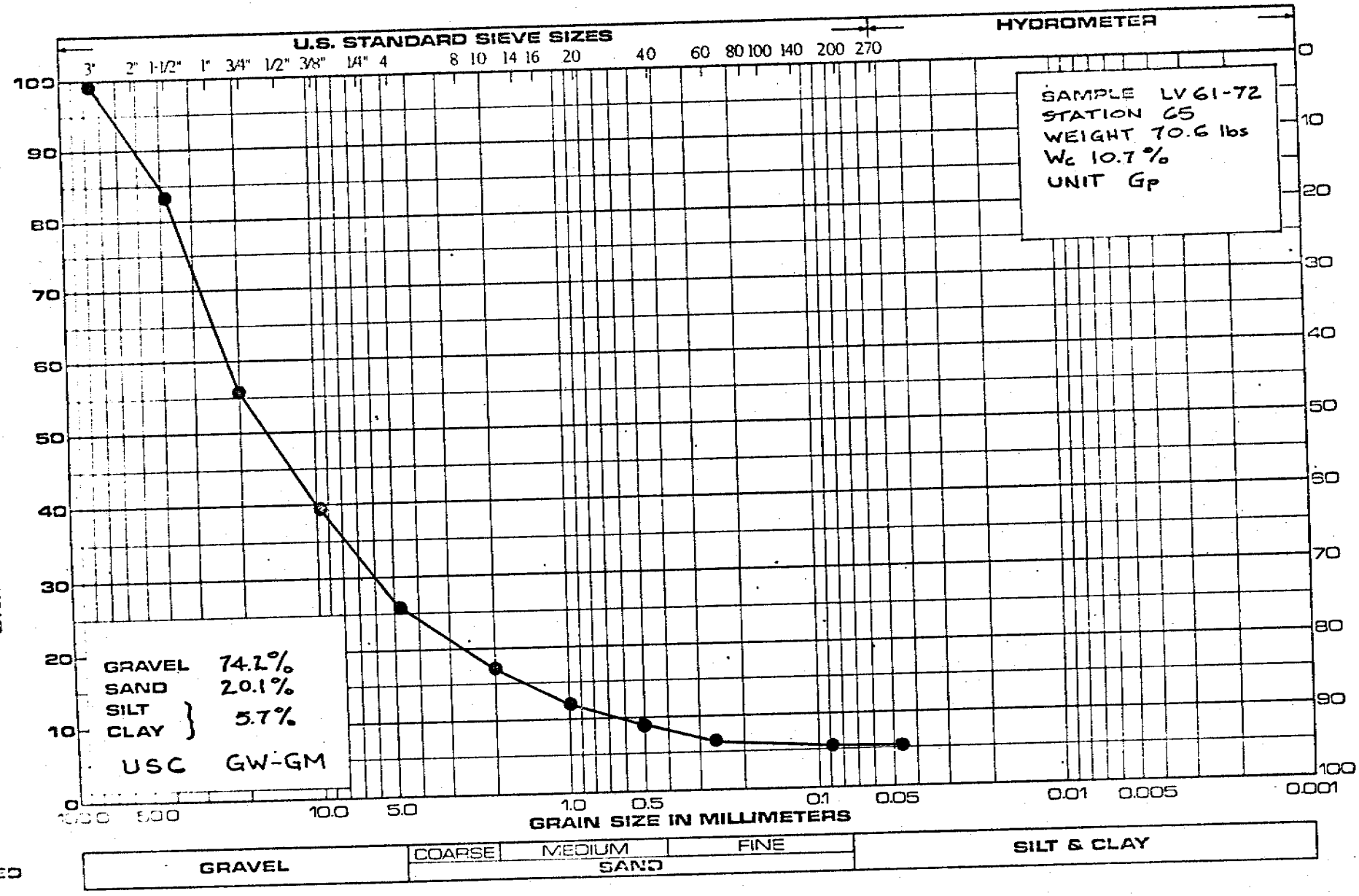

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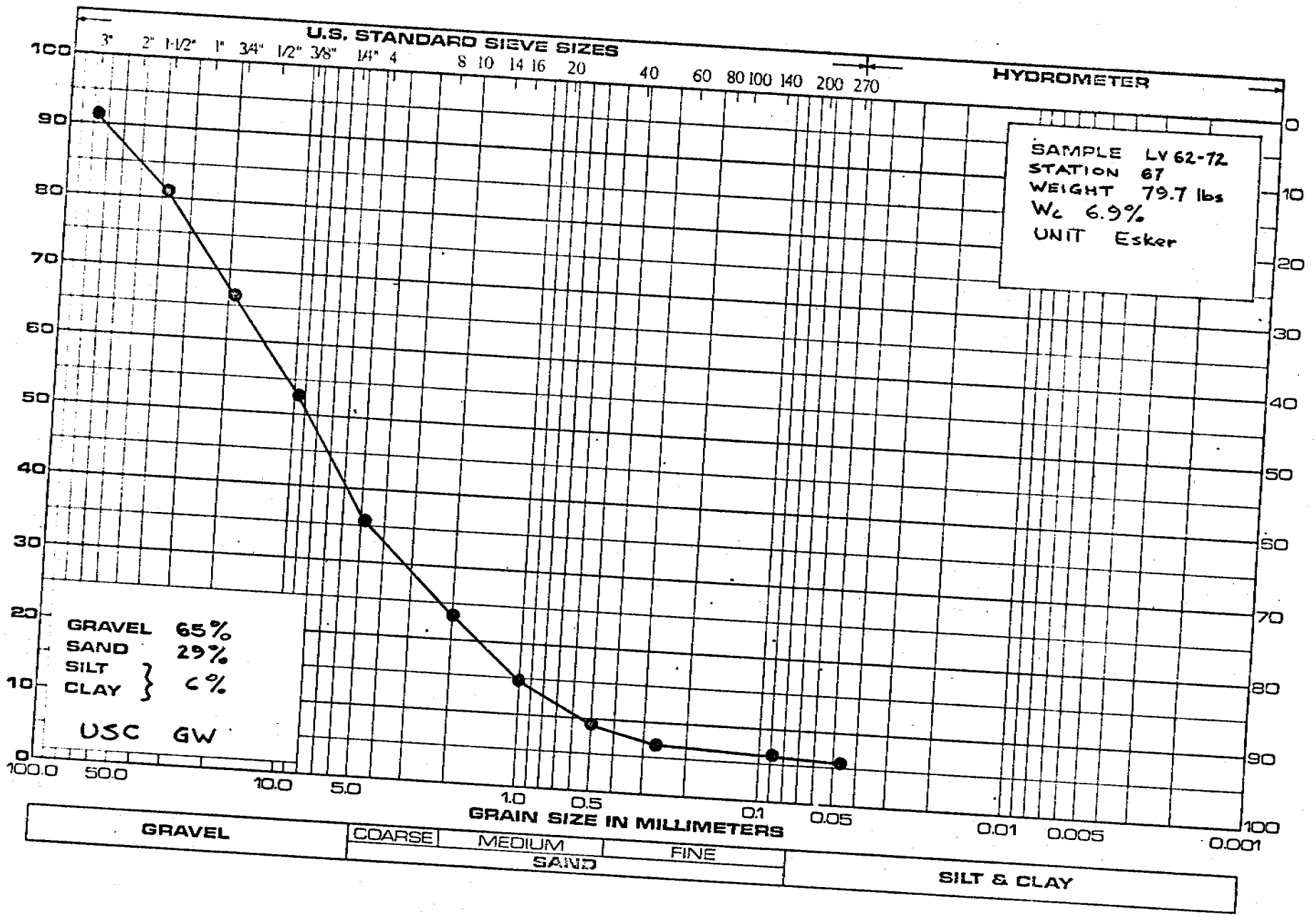

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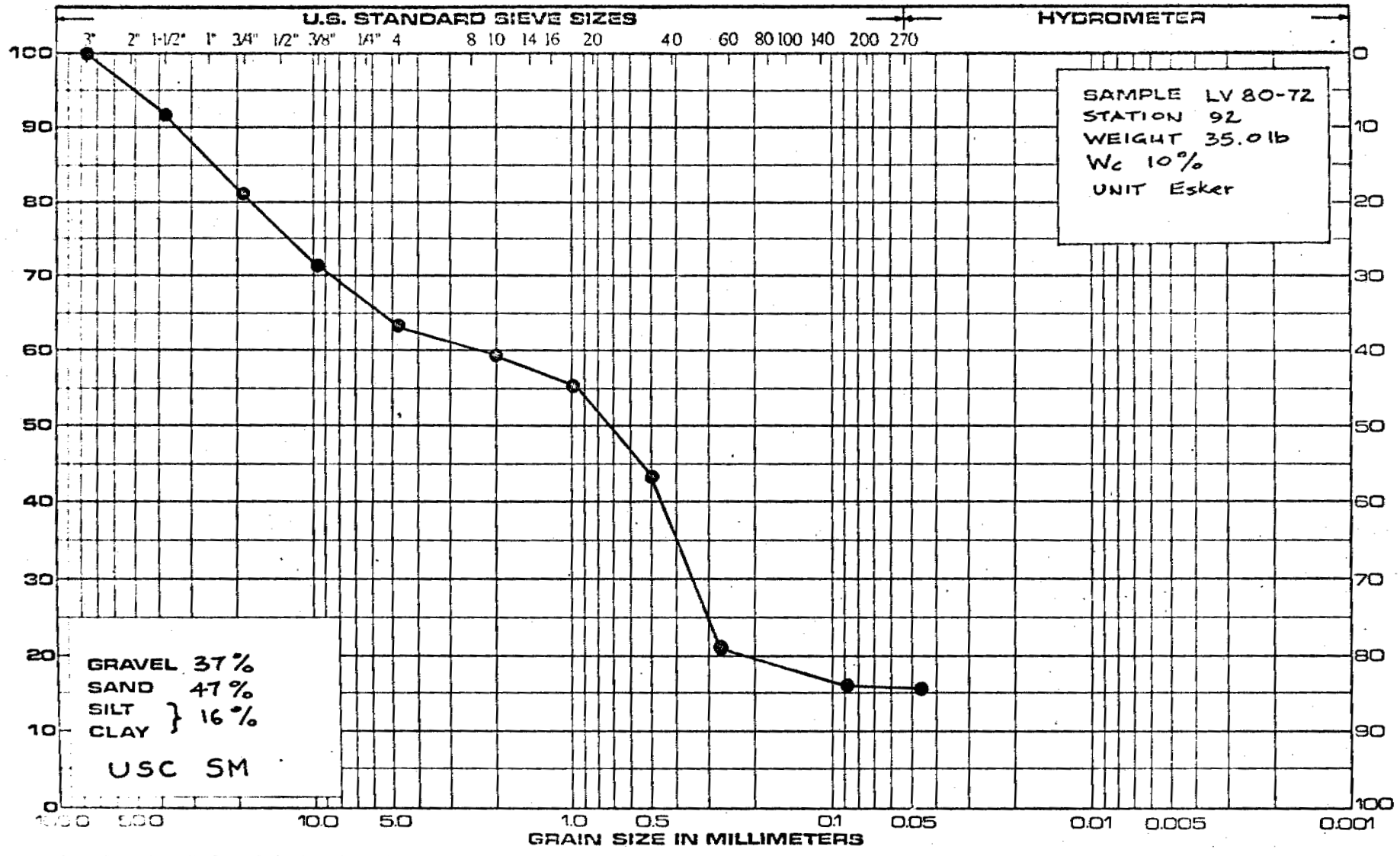

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