

THE NORTH CAROLINA STATE MINERALS RESEARCH LABORATORY

AND

MINERAL WASTES IN NORTH CAROLINA

PREPARED FOR

INTERSTATE MINING COUNCIL

May 10, 1968

NORTH CAROLINA STATE UNIVERSITY

ASHEVILLE, N. C.

MINERALS RESEARCH LABORATORY
180 COXE AVENUE
ZIP 28801

TO: Members of the Interstate Mining Council

FROM: The Staff of the Minerals Research Laboratory

This brochure is designed to give you a general picture of the mineral waste or tailings problems faced by the mineral industry of North Carolina and to show you how the Minerals Laboratory is helping to solve these problems.

Since it was established in 1946, the Laboratory's principal objectives have been to assist the mineral producers, to aid in establishing new industries in the State and to properly develop the mineral resources of the State. With these objectives as a guide, the Laboratory staff felt an obligation to help with the waste and stream pollution problems. In 1959 the Laboratory Advisory Committee formed a special subcommittee, chaired by Mr. Bruce Silvis, which studied mineral wastes and recommended an intensified research program by the Laboratory in this field. Tailings studies have been in progress continuously since that time.

This research has been directed toward the following goals:

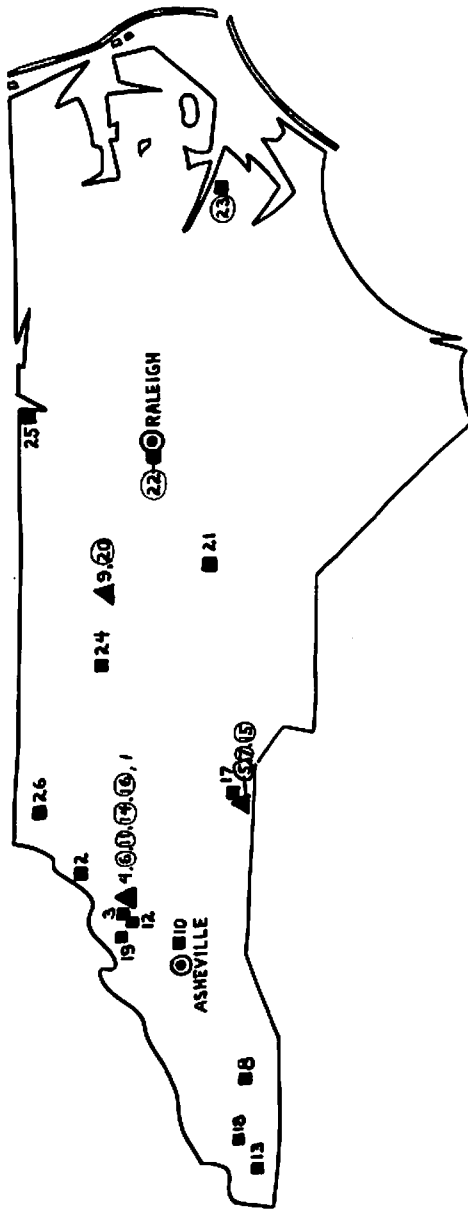
- (1) Reducing the quantities of waste by increasing plant efficiency.
- (2) Upgrading tailings to create saleable products, and
- (3) Seeking uses for wastes.

The results of research on waste from mica, feldspar and phosphate mills are described briefly in this brochure.

Mine and mill wastes are a significant part of the overall mining problems which are of concern to your Council. Valuable property and, in some cases, valuable ore reserves are being lost under waste piles, and these tailings represent wasted mineral resources. Marring of the scenery is also of considerable concern from both aesthetic and economic standpoints, because of the increasing importance of tourism in the State.

Several companies, with the help of the Minerals Laboratory, are converting or soon will be converting wastes into useful products. However, most of the mineral producers have made little progress toward utilizing these materials. The Laboratory, therefore, plans to continue the waste research program to the fullest extent that our facilities will permit. We would like to work with your Council in any way possible to help solve these major problems.

TAILINGS PILES FROM MINERALS SEPARATION PLANTS



- SINGLE TAILS PILE
- ▲ SEVERAL PILES, ONE AREA
- ⊙ PILE RESEARCHED BY M.R.L.

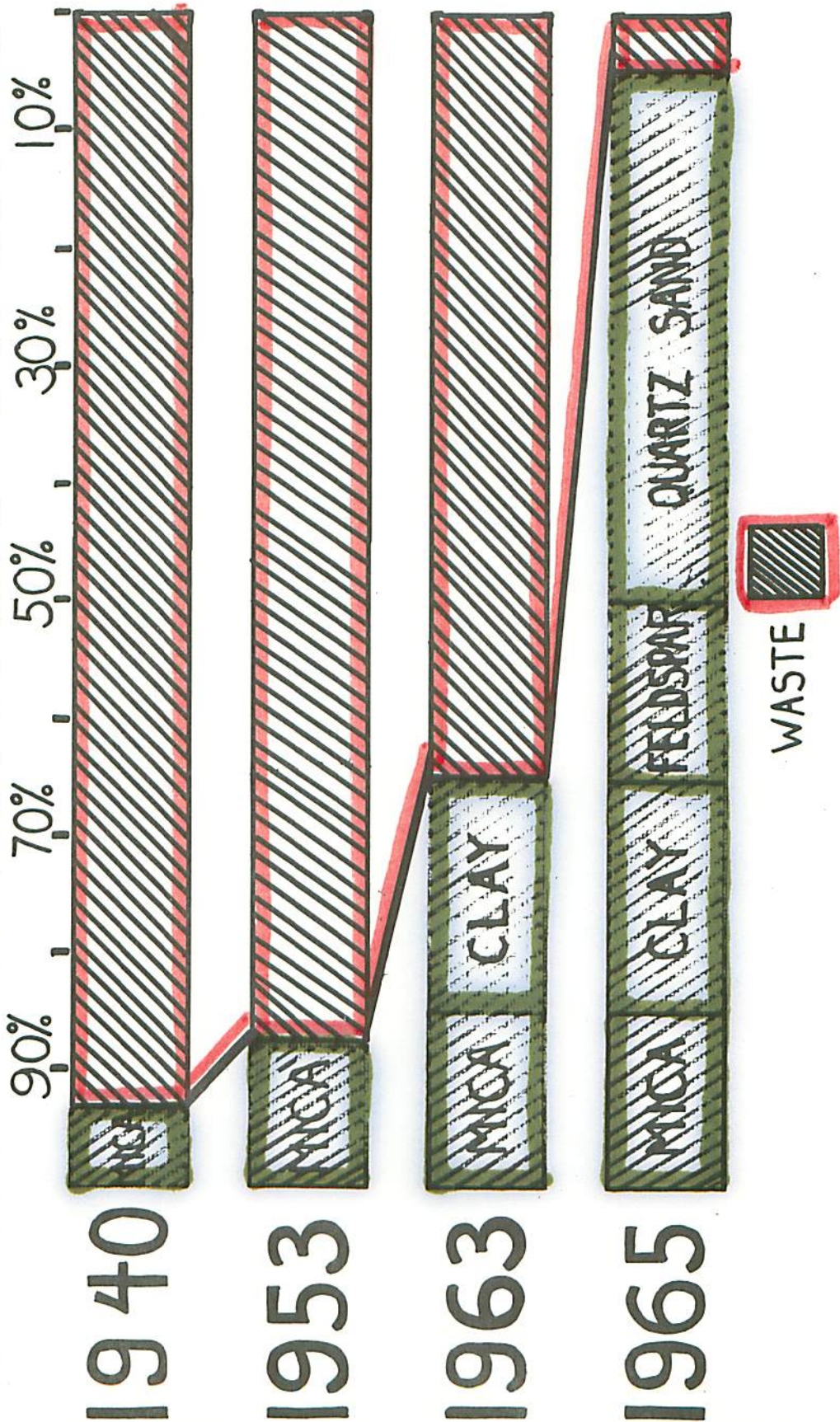
DESCRIPTION OF LOCALITIES - SHOWN ON TAILINGS MAP

Map Locality	Company Name and Location	Active	Studied	Nature of Tails
1	Fine Mica Co., Newdale	No	No	Mica jig tails. Approx. 1,000 tons.
2	Cranberry Magnetite Corp., Cranberry	No	No	Quartz & iron silicates. Over 100,000 tons.
3	Deneer Mica Co., Newdale	Yes	No	Quartz, residual mica, & feldspar. Approx. 200,000 tons.
4	Diamond Mica Co., Spruce Pine	Yes	No	Quartz & mica slimes.
5	Dixie Mines, Inc., Kings Mtn.	Yes	Yes	Quartz, feldspar, & clay. Approx. 100,000 tons.
6	Feldspar Corp., Spruce Pine	Yes	Yes	Clay slimes, quartz, feldspar, & mica. Over 200,000 tons.
7	Foote Minerals Co., Kings Mtn.	Yes	Yes	Quartz, spar, spodumene, & beryl. Approx. 500,000 tons.
8	Franklin Mineral Prod. Co., Franklin	Yes	No	Fine mica.
9	General Minerals Co., Greensboro	Yes	No	Quartz & pyrophyllite.
10	Grove Stone & Sand Co., Swannanoa	Yes	Yes	Quartz, other minerals, & slimes. Over 200,000 tons.
11	Harris Mining Co., Spruce Pine	Yes	Yes	(1) Qtz., spar, & mica. Approx. 200,000 tons. (2) Qtz. & clay slimes. Approx. 200,000 tons.
12	Hassett Mining Co., Burnsville	Yes	No	Not known.
13	Hitchcock Corp., Murphy	Yes	No	Marble, talc, & tremolite.
14	Inter. Min. & Chem. Corp., Spruce Pine	Yes	Yes	As (6).
15	Kings Mtn. Mica Co., Kings Mtn.	Yes	Yes	Iron minerals & mica. Approx. 100,000 tons.
16	Lawson-United Feld. & Min. Co., Spruce Pine	Yes	Yes	As (6).
17	Lithium Corp. of America, Bessemer City	Yes	No	Carbonate-alumina-silica fines. Approx. 100,000 tons.
18	Nantahala Talc & Limestone Co., Andrews	Yes	No	Marble fines.
19	Northwest Olivine Co., Spruce Pine	Yes	No	Olivine, talc, & serpentine. Approx. 10,000 tons.
20	Piedmont Minerals Co., Greensboro	Yes	Yes	Quartz & pyrophyllite. Approx. 200,000 tons.
21	Standard Mineral Co., Robbins	Yes	Yes	Quartz & pyrophyllite. Approx. 200,000 tons.
22	Superior Stone Co., Raleigh	Yes	No	Limestone & granite fines @ many locations.
23	Texas Gulf Sulphur Co., Aurora	Yes	Yes	Clay slimes. Solids - approx. 1,000,000 tons.
24	Vulcan Materials Co., Winston-Salem	Yes	No	Not known.
25	Tungsten Mining Co., Tungsten	No	No	Quartz & sulfides.
26	Appalachian Sulfide Co., Jefferson	No	No	Quartz, rock, & sulfides.

Note:

Estimated mineral producer tailings piles in existence - over five million tons.
 Estimated mineral producer tails added - over one million tons per year.

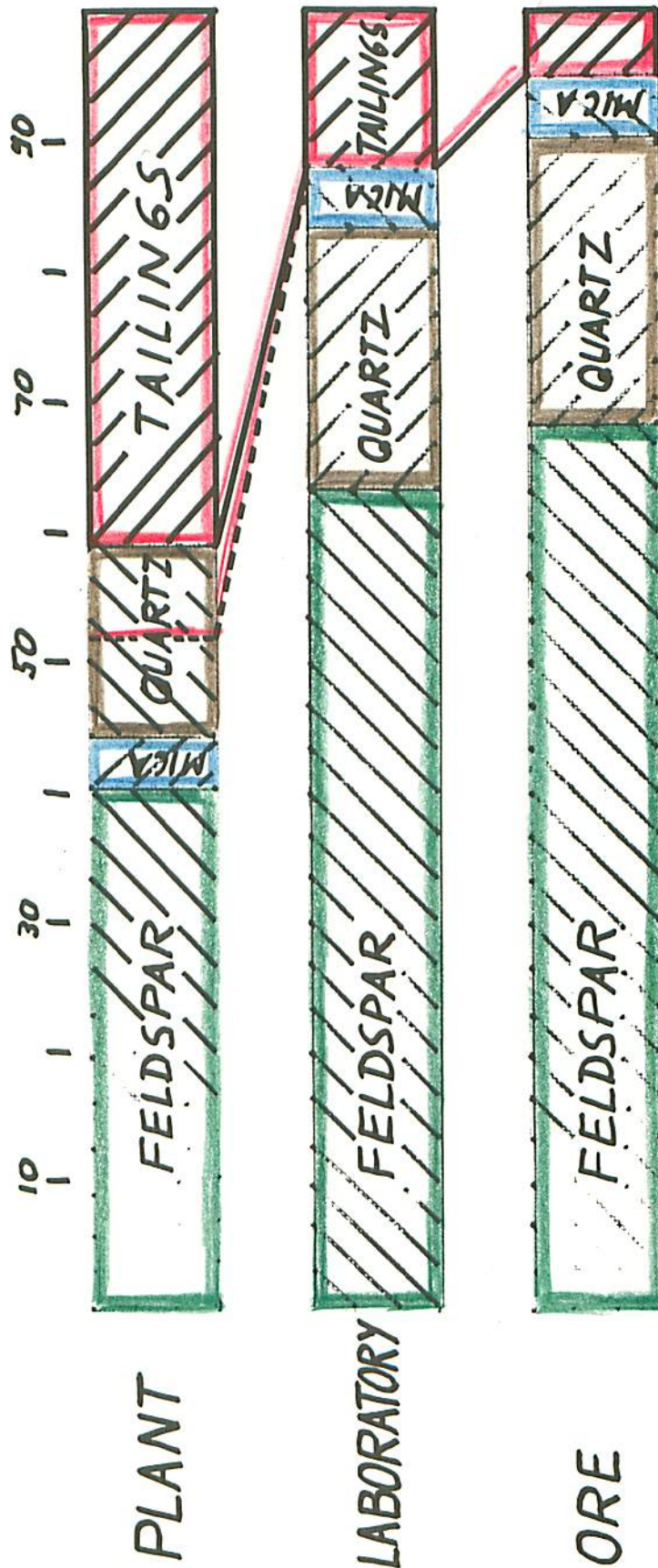
KINGS MOUNTAIN MICA CO.



HOW KINGS MOUNTAIN MICA COMPANY'S
TAILINGS PROBLEMS WERE SOLVED

- ORE: Weathered granite and pegmatite containing quartz, feldspar, mica and clay. Ore is soft and is mined by scrapers.
- 1940: Only coarse mica was recovered by simple crushing and screening process. For each ton of mica, 20 tons of waste.
- 1950: Spiral process, developed by Minerals Research Laboratory, was installed to recover fine-sized mica. For each ton of mica, eight tons of waste.
- 1963: Mica recovery was further increased by flotation, and clay was recovered for brick manufacture. For each ton of mica and clay, two tons of waste.
- 1965: Flotation plant, based on MRL research, was built to recover feldspar, quartz and remainder of mica. For every 20 tons of products, only one ton of waste.
- PRESENT PRODUCTS: Numerous grades of ground mica
High-potash feldspar
Brick clay
Quartz sand

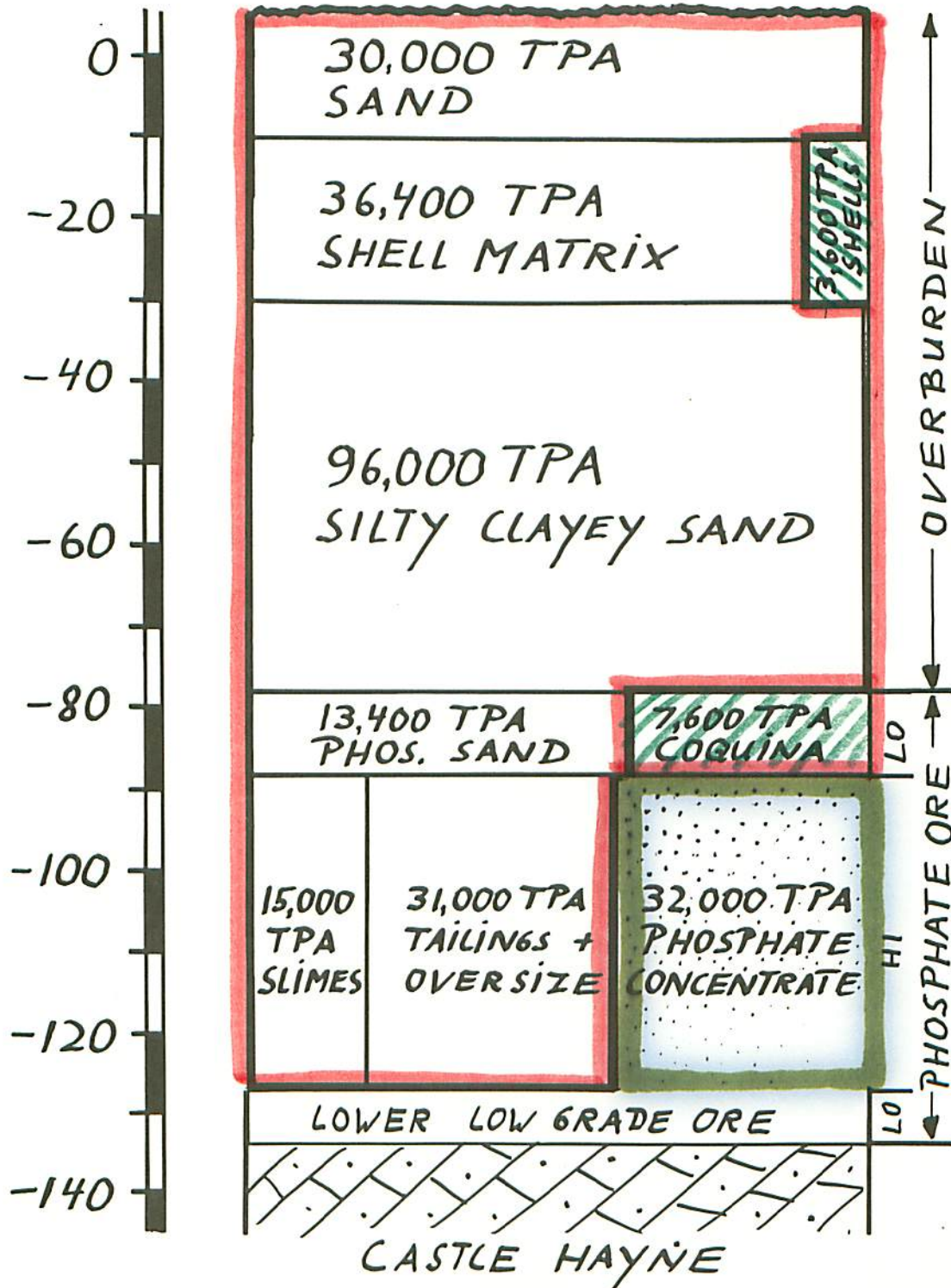
FELDSPAR TAILINGS PROBLEMS



THE FELDSPAR INDUSTRY IN THE SPRUCE PINE AREA

- ORE: Hard, coarse-grained granite, containing feldspar, quartz, mica and garnet. Ore must be blasted and drop-balled at the mine.
- PRE-1940: Feldspar blocks were hand-cobbed from the ore. Mica was sometimes hand-cobbed. For each ton of product, five to ten tons of waste.
- 1940'S: Flotation plants built. Feldspar, mica and quartz products recovered. About 60 percent of ore recovered as saleable products.
- MRL RESEARCH: Current research at the MRL shows that more than 80 percent of ore could be recovered.
- PRESENT PRODUCTS: Feldspar - glass and pottery grades
Quartz glass-sand
Mica

T.G.S. ORE BODY



THE TEXAS GULF SULPHUR COMPANY
PHOSPHATE COMPLEX

- ORE: Phosphorite ore bed, 40 feet thick, beneath 80 to 100 feet of overburden. Ore consists principally of phosphorite, quartz, clay and shell fragments. Twenty-eight million tons of overburden and 9 million tons of ore moved annually by 72 cubic-yard and 19 cubic-yard draglines.
- 1966: Based to a large degree on research and pilot plant work by the MRL, TGS constructed a flotation mill which began operating in March 1966 with capacity of 3 million tons of phosphate concentrate per year. Approximately 40 percent of ore zone, or mill feed, is recovered as concentrate.
- 1967: Chemical plants began operating in 1967. Products are sulphuric acid, phosphoric acid, triple superphosphate and diammonium phosphate.
- POSSIBLE FUTURE PRODUCTS: MRL studies indicate that shell, limestone, lime, quartz sand and ilmenite might be recovered economically.
- PRINCIPAL TAILINGS PROBLEM: Fifteen thousand gpm of slimes at 5 to 7 percent solids and difficult to dewater to higher than 10 percent solids.