Docket No. 40-8610

January 6, 1981

MEMORANDUM FOR: Stepan Chemical Company File

FROM: Myu Campbell, Radiation Specialist

SUBJECT: DOCUMENTS RECEIVED FROM LICENSEE DURING 80-01 INSPECTION

Enclosed are four (4) documents which were given to my by Mr. E. Swanson of Stepan Chemical Co. on November 24, 1980. The first is a copy of an aerial picture of the Maywood Chemical facility circa 1951. The second is a copy of the plot plan of the facility, also circa 1951. The third is a copy of an internal memorandum dated September 9, 1968 describing the closeout survey of the south dike area. The fourth is a copy of an internal memorandum dated July 26, 1963 describing the thorium process which was used by Maywood Chemical.

Myu Campbell
Radiation Specialist

Enclosures: As Stated

10 CFR [illegible]MATION

cc: HRSpicer

Memo to: D. H. Francis (4)

From: E. A. Swanson ——

EAS SEP 9 1968

Date: September 9, 1968

Subject: Status of Burial Project

The burial of waste material from the south dike was completed on August 3, 1968. A preliminary radiation survey was made by us, and indicated that the entire area had sufficient cover, showing that all readings were below 0.2 mrs/hr., the average limit specified by AEC for unrestricted use. Isotopes, Inc., of Westwood, N. J., made the final radiation survey on August 7. This survey, along with the building 77 area survey, was sent to the AEC on August 15, requesting that both former storage areas be released from the licensing requirements. In response to this request, Mr. R. G. Gilbert, Compliance Inspector for the AEC Newark office, made an independent survey of both former storage areas on Thursday, September 5. His survey substantiated the Isotopes survey, showing that both areas were well below the 0.2 mrs/hr. average. Spot readings of 0.3 and 0.4 mrs/hr. were noted. The AEC allows spot readings as high as 1.0 mrs/hr.

A letter received from the AEC on September 9, 1968, is attached, and states that both former storage areas can be released on an unrestricted basis.

Mr. John Russo of the Radiological Health Program of the New Jersey State Department of Health was called and informed of the AEC decision. A copy of the AEC letter was sent to Mr. Russo.

EAS/db

TO [illegible] INFORMATION

To: D. H. Francis

From: E. H. Nichols

Date: July 26, 1963

cc: DHFrancis - 4
[redacted]
JHuber
EHNichols
HRSpiess
JPAlrutz

Subject: Thorium Process as of 1948 - Monazite Sand to Thorium Nitrate and Oxide.

Sand Processing

1. A charge of approximately 1000 pounds - 66° H_2SO_4 is placed in each of two kettles. The acid is heated until it begins to fume at which time about 8 bags of monazite sand is added. (The sand is not actually weighed and 8 full bags are not always added). The charge in the kettles is approximately 1000 pounds acid and 900 pounds monazite in each kettle. The mixture is cooked for about 4 hours with constant agitation.

2. When the mixture has cooked the required time it is dumped into receiving tanks where it is diluted with water. The material is agitated for 1 hour and the gravity is checked and adjusted to 40° Be by adding water. After the agitation has been completed the solution is allowed to stand for ½ hour and the rare earth salts with the exception of Thorium settle out. The 40° Be liquid is decanted off the top and pumped into a storage tank to be used for manufacturing of thorium salts. The R.E. salts remaining are dissolved in cold water and pumped to storage tanks.

   This original separation of thorium from the rest of the R.E. salts is not quantative. It is dependent on the fact that thorium sulfate is soluble in concentrations less than 40° Be and the other R.E. sulfates are insoluble in hot solutions at this concentration.

3. The 40° Be liquor, Thorium Sulfate, is pumped to the #2 evaporator and the solution is concentrated to 56° Be. At this concentration the thorium salts in solution are precipitated. The salts precipitated are really a mixture of ThP_2O_5; SO_4; HSO_3. The acid solution remaining from this precipitation is pumped to a storage tank and sold as spent sulfuric acid.

When the spent acid has been decanted the precipitated salts are dissolved in cold water to make a solution of 40° Be. This 40° Be solution is pumped to a lead storage tank or direct to Building #21 for processing to thorium salts.

Thorium Nitrate

The 40° Be liquor from process 31-01-1 is pumped to a lead tank and then diluted to 20° Be. This solution is allowed to settle and is then decanted to another lead tank. The residue is allowed to accumulate for several batches after which it is filtered on a Nutsch and stored in metal drums. This "black mud" is saved as the source of mesothorium.

The decanted solution is precipitated with oxalic acid (lab test shows a slight excess of acid) and the solution, after settling is pumped to the lime tank for disposal. The thorium oxalate which has been precipitated is washed several times in the same tank until laboratory tests show it is free from acid. The thorium oxalate is then filtered on a Nutsch filter and stored in wooden service containers.

"Soda ash extraction" - 1200 pounds thorium oxalate is added to 15% soda ash solution in steel tanks, (Na_2CO_3 + $NaHCO_3$); the small amount of $NaHCO_3$ is added to eliminate the possibility of an NaOH. When this crude thorium oxalate is converted to the carbonate any R.E. salts present are insoluble and the thorium carbonate is soluble. The solution is agitated and heated to 80° after which it is filtered in a press. The liquor (thorium carbonate) is placed in tank #2, and the press cake (R.E. Carbonate) is returned to tank #1 where it is washed and refiltered. The washed R.E.Carbonate cake is returned to process 31-05-1 where it is used in the manufacturing of R.E. Chloride cake.

The Thorium carbonate solution in tank #2 is treated with caustic soda, a laboratory control is used to determine the amount of caustic, and the thorium is precipitated as $ThOH_4$. It is filtered in a press and the filtrate is returned to tank #1 as soda ash liquor for the next batch. In time this soda ash becomes so contaminated with silicates, etc. that a new batch is made and the old batch is pumped to the lime tanks for disposal.

The $ThOH_4$ is washed and pressed again until it is free from alkalies. This material is Thorium hydroxide technical.

Thorium Nitrate Finishing

Thorium hydroxide is dissolved in the HCl and made to 30° Be in a wooden tank. It is then transferred to a stoneware crock in which it is accurately measured by volume and °Be to determine the amount of electrolyte H_2SO_4 to use. The H_2SO_4 is added from measuring tanks to the solution which is cooled with ice and constantly agitated by hand. The solution starts at 30°Be and steadily falls with the addition of H_2SO_4 the Be falls to about 10°Be at which time it begins to rise. This is the critical point and determine when enough H_2SO_4 has been used. (as a check against calculated amount) Thorium sulfate precipitates and is filtered on a Nutsch. The solution is returned to process 21-02-1 to recover the R.E. values.

Thorium Sulfate is dissolved in cold water in a stoneware crock. Aqua ammonia is added with hand agitation and $Th(OH)_4$ is precipitated. The $Th(OH)_4$ is filtered on a suction filter, the liquor is discarded and the hydroxide is dissolved in HCl and the precipitation of $Th(SO_4)_2$ is repeated as above. The $Th(SO_4)_2$ obtained by the second crystallization is tested with a spectroscope for presences of R.E. If any R.E. is present, a third precipitation is made as the two above.

The $(SO_4)_2$ which has passed the test with the spectroscope is converted to $Th(OH)_4$ with aqua ammonia as previously. It is filtered on a Nutsch and the product is pure $Th(OH)_4$.

75 pounds HNO_3 is added to a stoneware crock and $Th(OH)_4$ is slowly added from the cake on the Nutsch. $Th(OH)_4$ is added to excess when the solution becomes cloudy. It is allowed to settle and the clear solution is transferred to another stoneware crock where H_2S is bubbled through to ppt. the heavy metals. The solution is filtered through filter papers on glass funnels and then evaporated in enamel pots to 150°C. The material is stirred out while cooling and the product is $Th(NO_3)_4$.

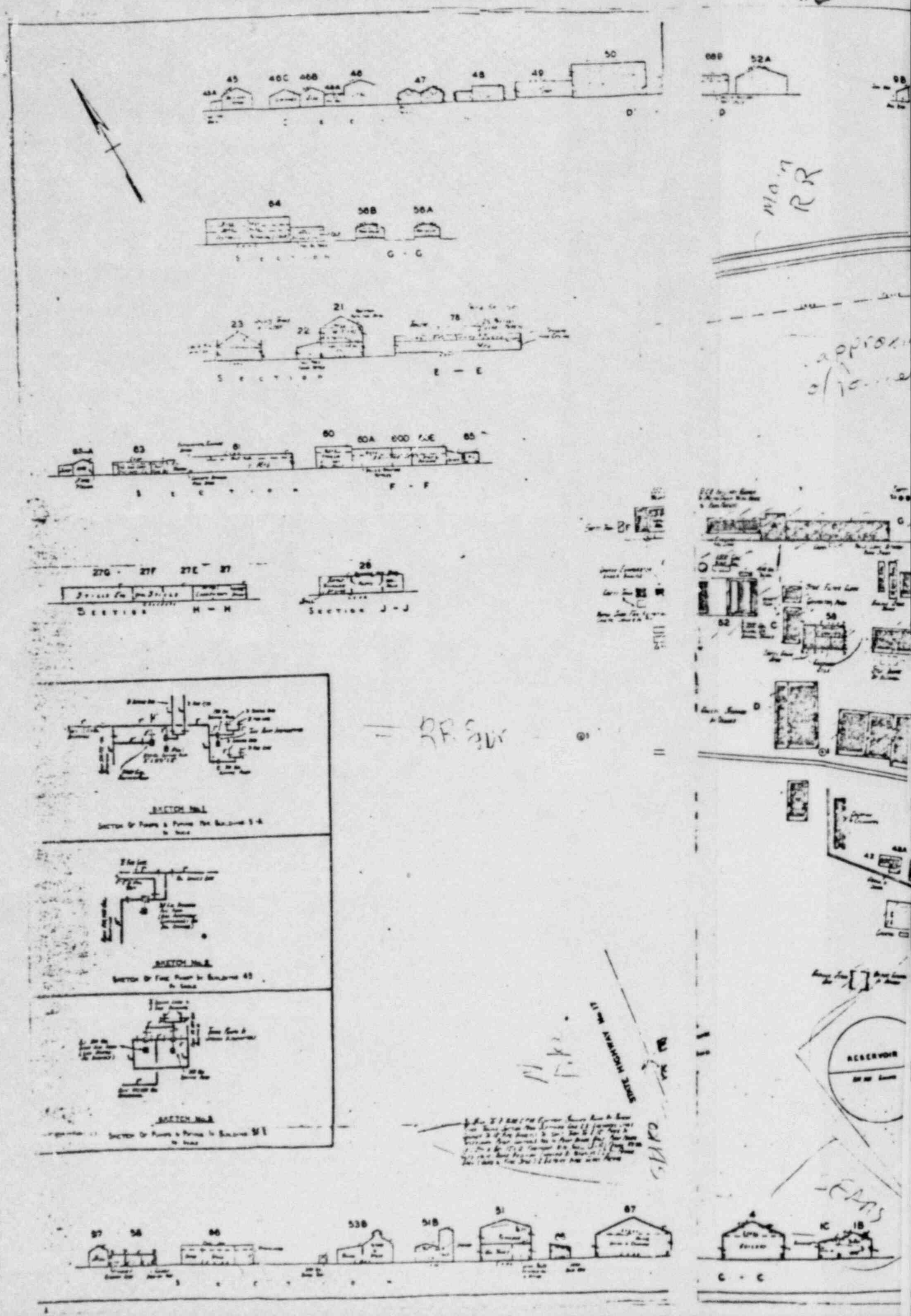
Thorium Oxide C. P.

To make a crystal for production of Thorium oxide the previous evaporation in process 31-02-2 is stopped before the temperature reaches 150°C and additional HNO_3 is added. This liquor on cooling produces a large crystal which is filtered out and the liquor goes back as HNO_3 for the next batch.

The crystals are placed in silica dishes and ignited to the oxide over gas burners. When the open gas burners have ignited all that is possible at that temperature the material is placed in the gas furnaces (Lanthanum Building) and the final ignition is made.

The oxide is sifted through a 60 mesh sieve, packed, and shipped - ThO_2.

EHN/fe



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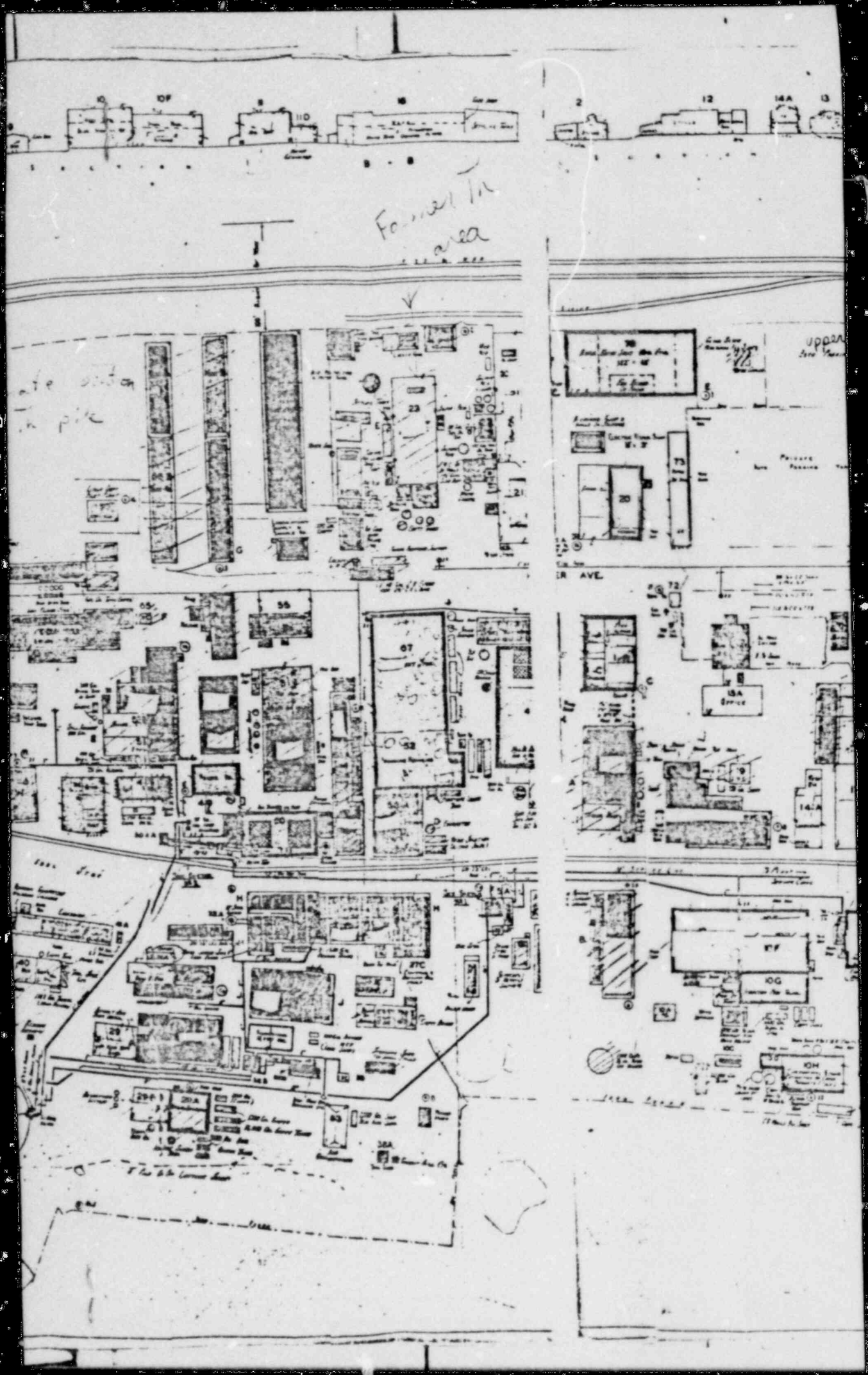
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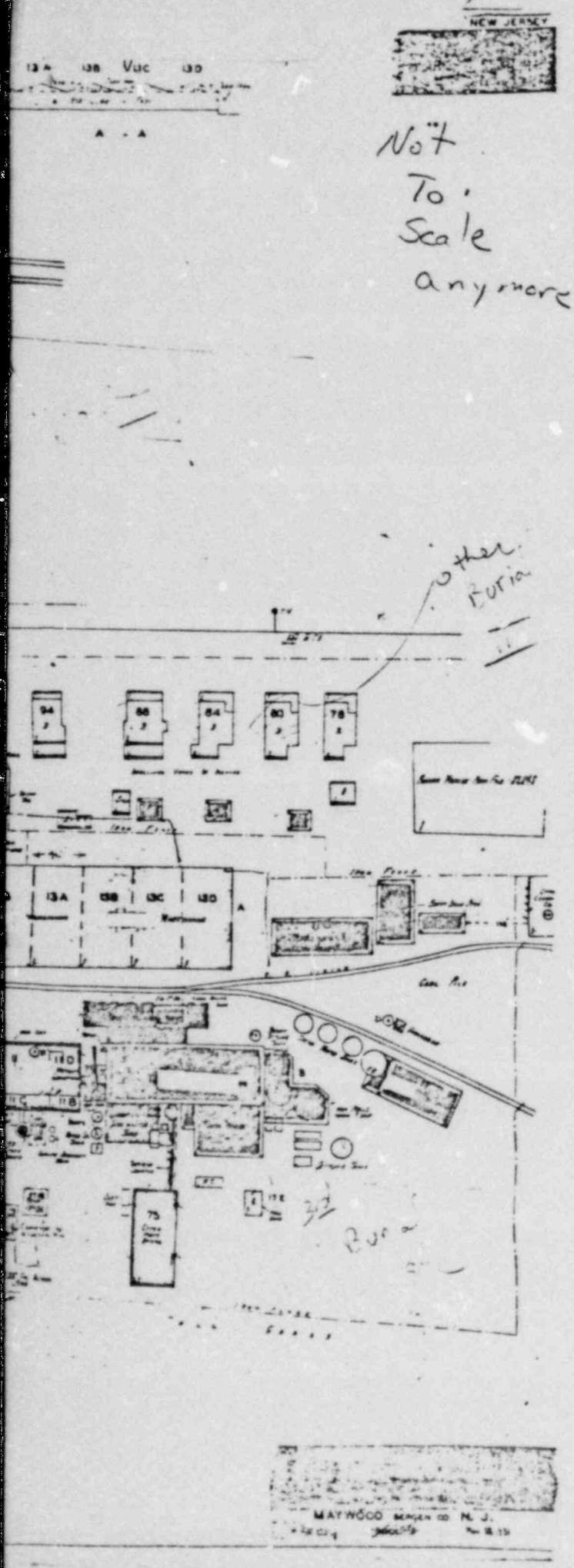
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