The Green Monster Mine is approximately 13 miles west of Goodsprings, Nevada, in Clark County, Nevada.

The mine is owned by the Hearst Estate and is being leased by Roy Jacobsen, who has been working the property since 1942. The property is being worked for the lead and zinc content of the ore. Mostly zinc.

The local stratigraphic section includes several hundred feet of dolomite, limestone and quartzite covered by alluvial gravel and slope wash. The general strike of the area is northwest and the dip is southwest at varying angles.

In general the ore above the 400 foot level is 15 to 20 per cent zinc and 1 percent lead. Below the 400 foot level the zinc values start dropping and the lead values start increasing. In general the ore above the 400 foot level is oxidized with but small traces of sulfide lead. However, below the 400 foot level the galena becomes more prominent and in one shoot as much as 10 per cent lead was reported in the form of galena.

The ore in general occurs in tabular bodies elongated to the plane of bedding. Most of the ore is a mixture of hydrozincite, calamine, smithsonite, cerrussite, anglesite and galena with traces of aurichalcite in a gangue of white dolomite.

The ore occurs as aggregates of brown to gray minerals. The brown is of course iron stain. The calamine forms fireable
aggregates of acicular appearing crystals which are badly iron stained. The aurichalcite is present only in traces. Assay for copper shows as a trace.

Hydrozincite and cerussite are the most abundant ore minerals.

The ore the writer worked on was probably from below the 400 foot level. This conclusion was arrived at by comparing the mineralization and assays of the project ore with the geological reports.

The work the writer did on this ore was almost entirely devoted to developing a method for concentration and/or extraction of uranium from the ore. The lead and zinc content of the ore was noted but no work was done aimed toward the extraction of the lead and zinc minerals.

The primary uranium bearing mineral consists of kasolite which in Fords' Dana, is listed as having the following composition: PbO-UO₃-SIO₂-H₂O.

The other minerals of value consisted of oxidized lead and zinc minerals with a small percentage of galena, no sphalarite being noted.

The gangue consisted of dolomitic limestone. The chemical analysis of the ore is as follows:

17.8% CaO
13.6% MgO
1.9% Fe
1.36% U₂O₈
9.34% Zn
14.01% Pb
.55% Al₂O₃
.51% S
.53% SiO₂
The specific gravity of the ore is 2.9 and the Ph is 6.

No actual settling tests were run but throughout the testing no difficulties were encountered due to low settling rates and the ore appeared to settle quite rapidly.

The ore upon being received was crushed in rolls to 100 per cent minus 10 mesh. It was then mixed and sampled by coning, quartering and splitting. Approximately 1000 grams were taken for a screen analysis.

The results of the screen analysis are as follows:
The Tyler Standard Screen Scale

Cumulative Logarithmic Diagram of Screen Analysis on Sample of GREEN MONSTER ONE

Name: GIULONE, H.R. Date: SEPT 63

<table>
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<tr>
<th>Millimeters</th>
<th>Inches</th>
<th>Tyler Mesh</th>
<th>U. S. No.</th>
<th>Sample Weights</th>
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<th>Per Cent Cumulative Weights</th>
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<th>Per Cent Cumulative Weights</th>
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Totals: 1052.2 100.0%

THE W. S. TYLER COMPANY, CLEVELAND 14, OHIO, U.S.A.
These results obviously show that there is no concentration of the valuable constituents by particle size separation. If they show anything they point to the fact that the finer size range contained the largest fractions of U₃O₈. This was confirmed by a microscopic examination of the sizes which also showed that no appreciable liberation of the kasolite was achieved until the minus 200 mesh range was reached.

The results of the screen analysis seemed to point to a straight hydrometallurgical process. However, to affirm this several tests were run on the possibilities of a gravity separation being obtained. The products of these tests were examined by microscope which showed that no appreciable separation had been achieved. Consequently, and due to the involved assay for U₃O₈ the microscopic results, assays were not run.

The next testing done was to attempt to float the dolomitic gangue, thereby concentrating the uranium in the tails. The writer would like to point out that during the preliminary testing he was searching for a trend more than a finished process. Consequently due to the time involved complete accurate metallurgical balances were not maintained. All tail sampling was done by dip sampling which yields accurate samples but does not lend itself to metallurgical balancing.

Due to the fine mesh of liberation a 100 per cent minus 150 mesh grind was used. This was determined to be a 15 minute grind.

The test work is as follows: (on all float tests 500 grams Denver Sub "A" cell was used)

<table>
<thead>
<tr>
<th></th>
<th>15 min. grind</th>
<th>5 min cond.</th>
<th>Conc : 76gm</th>
<th>U₃O₈ : 8.2%</th>
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</thead>
<tbody>
<tr>
<td>500 gms ore</td>
<td>5 min cond.</td>
<td>.5 lbs ton 708</td>
<td>Ph 9 with Na₂CO₃</td>
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<tr>
<td>200 C</td>
<td></td>
<td>Tails : 1.46% U₃O₈</td>
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</tbody>
</table>

(4)
Froth medium heavy. No frother added.

\#2

15 min. grind 5 min cond
500 gms ore .5 lbs ton 708
Ph 9 with Na₂CO₃
70° C Tails : 1.48% U₃O₈

Froth medium heavy. No frother added.

Since no appreciable difference was observed in floating hot against floating cold the remainder of the test work was done at room temperature or approximately 20°C.

\#3

15 min grind 5 min cond cleaning
500 gms ore .5 lbs ton: 708 Middlings 53 gms
Ph 9 .92% U₃O₈

Tails 1.45

Cleaning: froth: light and lacy; no frother added.

Rougher froth medium heavy; no frother added.

It appeared to the author at this point the floating the gangue off appeared to lead to a blind alley as even .795% U₃O₈ ore was still highgrade. Therefore the following float tests were made:

\#4

15 min. grind 5 min. cond - float
.5 lbs ton
do decylamine
acetate
+ Na₂CO₃ to Ph₂

Conc 72 gm 1.92% U₃O₈

Tails: 1.28% U₃O₈

Pine oil .1 lb/ton added for frother.

This test showed no results so only one more test was made.

This test was avoided until the last as it was considered a "shot in the dark". A reagent 404 float was made. This produced no results either so floatation as a means of ore dressing was dropped.

(5)
If the ore had had a better mesh of liberation more test work would have been done. With mesh of liberation of minus 200 mesh and the results of the tests that had been made, the process of floating the ore did not appear to be promising.

The next test made was a sulfuric acid leach. This test was undertaken with the full knowledge that the reagent consumption would be prohibitive but, never the less, the writer felt that the testing should be done if only to prove whether or not the ore was amendable to a sulfuric acid leach.

Test:

50 gms ore to Ph of 0.9 with H2SO4

Added a 50% by weight concentrated H2SO4 solution.

Kept pulp hot in steam bath and agitated intermitantly for 24 hours.

The extraction on this test was 98 per cent of the U3O8.

\[ \frac{1}{5} \text{ tons of concentrated H}_2\text{SO}_4 \text{ per ton of dry ore.} \]

The process could be feasible, maybe, if sulfurous acid could be used for the major neutralization and sulfuric acid used only for the final neutralization. This, however, would call for considerable research.

No further test work was done on acid leaching other than the one preceding test.

Several other leaching tests were conducted. Some were entered into with the prior knowledge that they probably would not work, but with no absolute knowledge that they would not work available, the tests were conducted.

One test performed was with a hot saturated brine solution made slightly acid with H2SO4. What was hoped for was that the Pb
present in the kasolite would go into solution and somehow take with it the U3O8. Some uranium actually did enter the solution but the highest extraction obtained was 19.3%.

Another test performed was with a NaCN and Na2CO3 solution. Since all the uranium present was theoretically in the hexavalent state the writer hoped that the uranium would complex with the cyanide and thus enter solution. However, the test work showed that the solubility of the uranium was due entirely to the Na2CO3 and cyanide actually reduced the solubility probably due to the fact that cyanide is a good reducing agent.

The most promising test work was done with sodium carbonate leaching. So far an extraction of 64% has been realized. Future tests will be conducted with a Na2CO3 leach.

The writer intends to investigate a pressure leach using Na2CO3 and NaHCO3 plus oxidizing with air or oxygen at several atmospheres pressure.

TRY FLOATATION USING AO4 WITH NaOH FOR PH CONTROL