

# Impact Absorption of Quartz Pebbles Conglomerate into the Host Rock at Middlesboro Crater Kentucky

By: Kathleen E. Bussiere, Margaret T. Covley, and Scott McKenzie

Geology Department, Mercyhurst University, Erie PA 16508

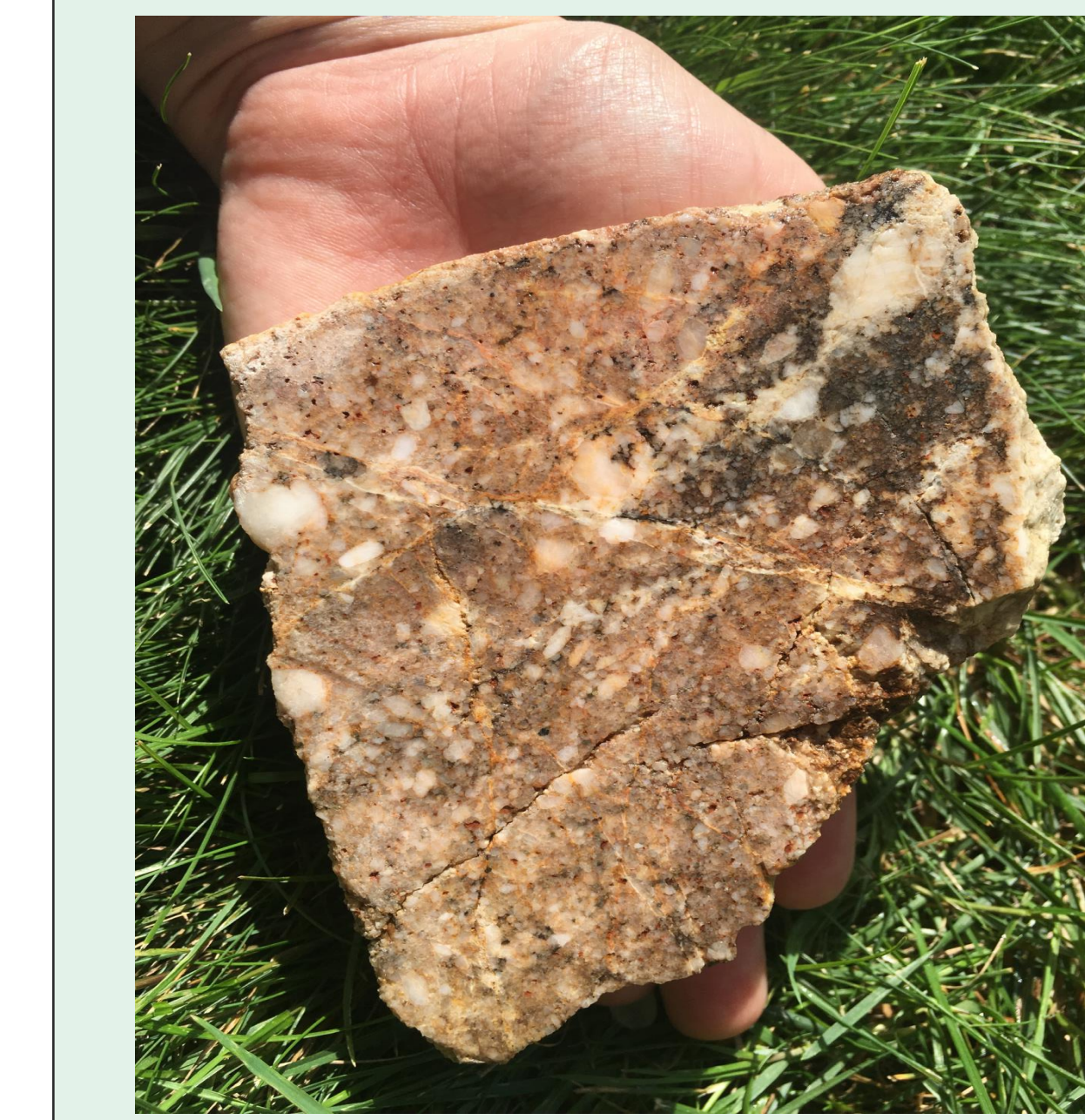
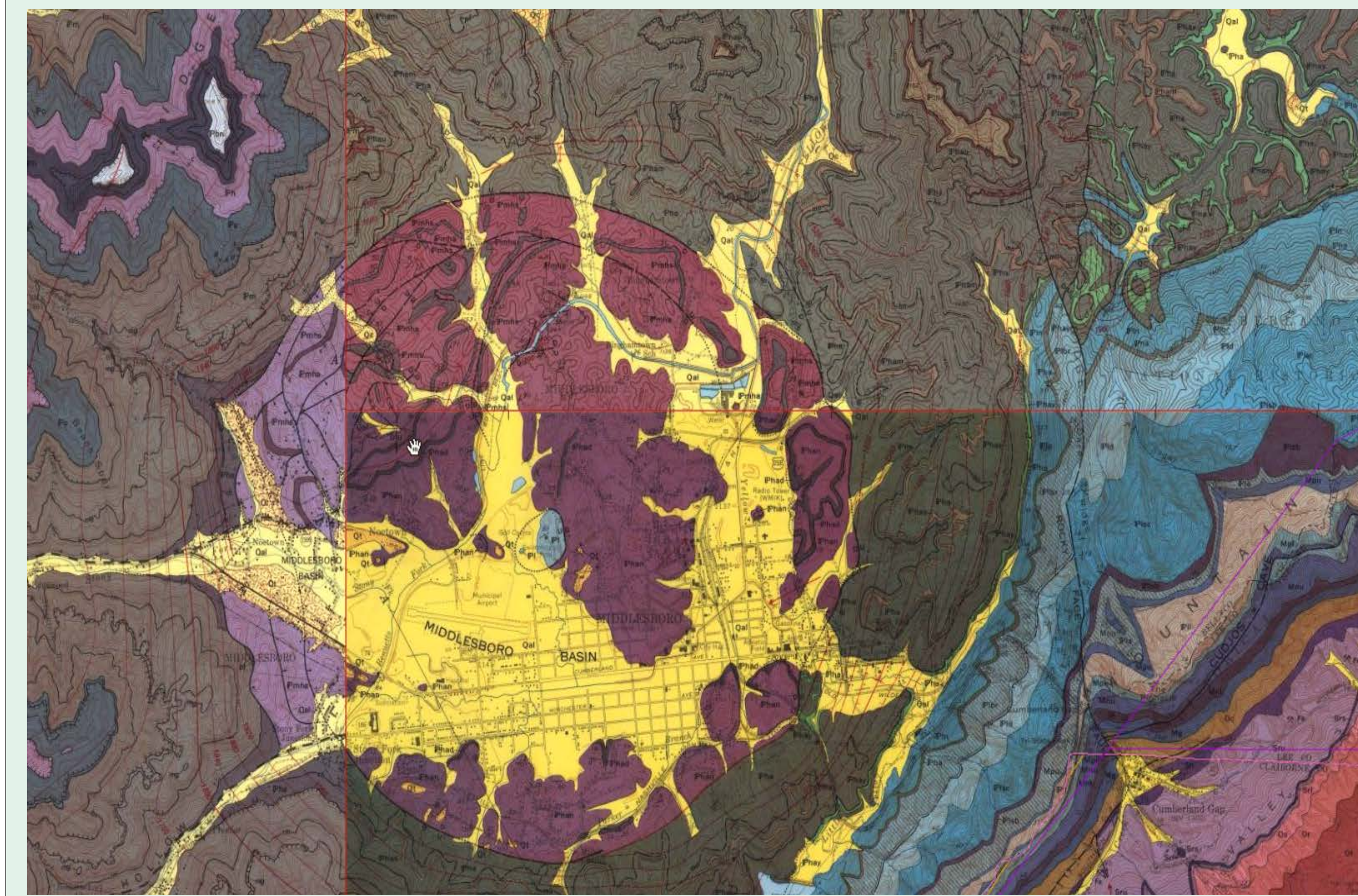


## Introduction:

Middlesboro, KY impact area comprises the “Lower Pennsylvanian Lee and Breathitt Formations and Upper Mississippian strata of the Pennington Formation and Newman Limestone” (Milam 2004). Geographically located at 36 degrees 37 hours N, 83 degrees 44 hours W, it lies in Bell county Kentucky in the south eastern most point of the state. The complex crater is approximately 300 Ma years in age and five and a half kilometers in diameter. The earliest proposal of impact origin was in 1963 by K. J. Englund and J. B. Roen, their evidence was based on shattercones and multiple intersecting sets of planer fractures in quartz.



Sample 1: 19.8cm by 22.5cm  
Largest pebble: 2cm  
Smallest pebbles: <0.5cm



Sample four: 9.5cm  
Largest pebble: 2.6cm  
Smallest pebble: <0.1cm

## Discussion:

At the impact site in Middlesboro, KY quartz pebbles were absorbed into the host rock, conglomerate. You can see the visual prgression from quartz pebbles, to stringers until they are completely absorbed into the rock. The evolution from pebbles to stringers shows that temperatures must have reached a minimum of 1550 degrees C.

## Collection of Samples

- Samples studied in this project were collected by Scott McKenzie and Sandy Porter.
- Collected during a processes of examining 16 impact craters across the United States in 1995.
- Found at the Middlesboro golf course in Middlesboro, KY.
- Before this time the area had almost exclusively been searched for samples by NASA astronauts and a few other researchers.



Sample 2: 6.3cm at widest point  
Largest pebble: 1.4cm  
Smallest pebble: <0.1cm

## Description of Samples:

All samples were taken from the central uplift on the grounds of the Middlesboro Country Club, with permission.

Sample one’s structure shows that the quartz pebbles are still well formed with only minor deformation of a few small inclusions. There are no quartz stringers or shock darkening present.

Sample two shows some spherical retention in the larger pebbles, though smaller pebbles possess a greater degree of flattening moving towards a stringer form. No shock darkening is present.

Sample three has clearly defined quartz stringers along with intense deformation on the larger pebbles. No shock darkening is present.

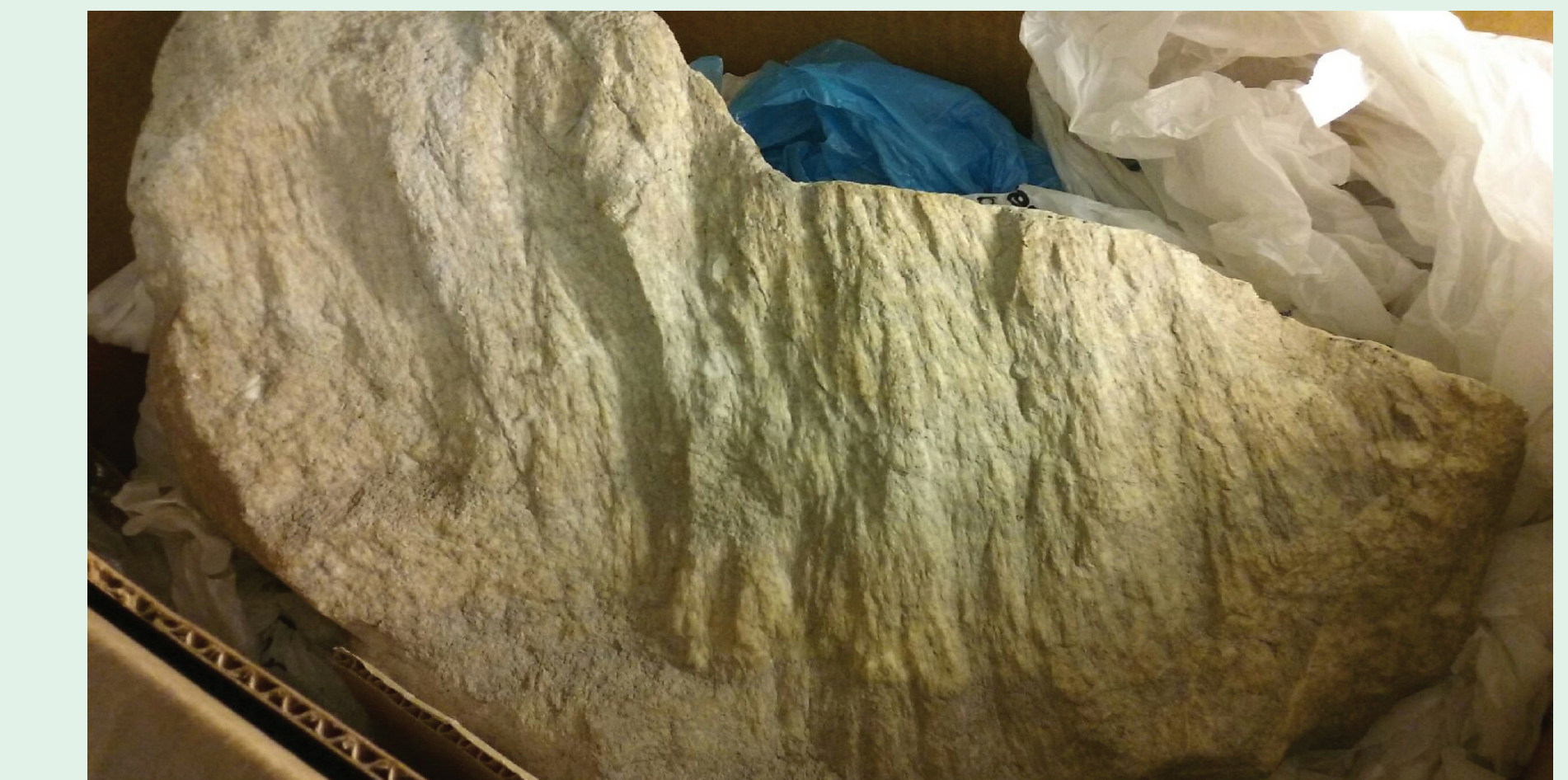
Sample four structure shows that shock darkening is prevalent, the larger pebbles have deformed to the point where the lengthening has started to blend the pebbles together and quartz stringers are fully formed with one measuring 7.4cm.

Sample five shows absorption of a 2.5cm quartz pebble by the conglomerate host rock, shock darkening is present, though on close inspection a few small (<0.1cm) pebbles are still intact.



Sample five: 3.9cm  
Absorption pebble: 2.5cm

## Shattercones from collection site:



## Future Reseach:

Thin sectioning of each sample to produce a detailed analysis using a petrographic microscope to futher confirm the extent of absorption of the quartz pebbles along with planner deformation features and verification of the shock darkening nature of quartz.

## Acknowledgments:

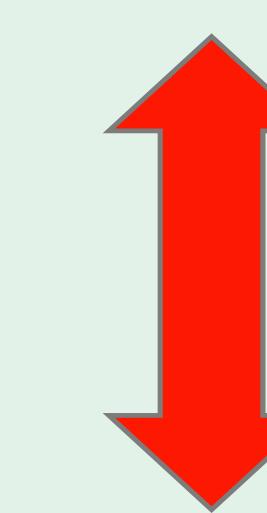
Special thanks to Sandy Porter, and the owners of the Middlesboro Country Club.

## Cited Sources:

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## Heat Index

Silica Melt



1550°C

Solid Quartz



Sample 3: 5.5cm at widest point  
Largest pebble: 2.3cm  
Pebble of intrest lower right corner: 0.4cm high  
Smallest pebble: <0.1cm