



# Scriver Block Exterior Investigation Northfield, MN

Prepared for the  
Northfield Historical Society

Submitted June 2, 2023

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1. West Elevation



2. North Elevation



3. North Elevation

## INTRODUCTION

### STUDY SUMMARY

This study was commissioned by the Northfield Historical Society (NHS) with a grant from the Minnesota Historical Society's Legacy Grant Program as an addendum to the 2022 Condition Report. In that report recommendations were made for further investigation that were not a part of the initial scope of that work:

- Work with NHS to investigate the Basement Stairwell Area Drain
- Detailed inspection of the upper cornice, stucco, brick, and stone
- Sample the historic mortar and have it tested for strength and composition by a regional testing agency

### PROJECT LOCATION

Scriver Block

408 Division Street\*

Northfield, Minnesota 55057

*\*The Scriver Block property consists of several historic storefronts spanning from 20-22 Bridge Square to 404-408 Division Street.*

### HISTORIC DESIGNATION

The Scriver Block is both individually listed on National Register Historic Properties and a contributing property within the Northfield Commercial Historic District. It has been owned and managed by the Northfield Historical Society since 1975.

### METHODOLOGY

Field survey investigations were conducted on October 6, 2022 by Todd Grover and Bob Mack of Macdonald & Mack. Both Todd Grover and Bob Mack contributed to this report with the testing performed by American Engineering Testing out of their St. Paul laboratory.

### ACKNOWLEDGMENTS

The authors wish to thank Cathy Osterman and Travis Farrington of NHS for generously sharing their time and knowledge.

This publication was made possible in part by the people of Minnesota through a grant funded by an appropriation to the Minnesota Historical Society from the Minnesota Arts and Cultural Heritage Fund. Any views, findings, opinions, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily represent those of the State of Minnesota, the Minnesota Historical Society, or the Minnesota Historic Resources Advisory Committee.

## STAIRWELL AREA DRAIN

On the northeast corner of the building there is a basement stairwell that is accessed from the sidewalk along Division Street. At the base of these stairs is an area drain. In the earliest photos of the building from 1874 the basement access did not exist. It was in the 1915 image that a railing and the steps to the basement appear. This corresponds with the note in the HSR that in 1895 the J. H. McGuire barber shop was first located in the basement. The area drain is not from this vintage, but may have been installed more recently, maybe in 1978, a time noted in the HSR that the Basement Meeting Room was remodeled.

The basement stairwell area drain was inspected by George LaRoche of LaRoche's Sewer, Drain, and Septic Services with assistance from Cathy Osterman of the NHS on October 6, 2022. Ms. Osterman summarized their findings as follows:

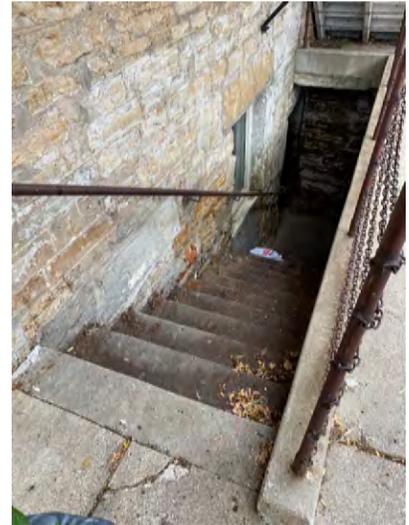
George LaRoche has come and gone and all we're dealing with is a drainage pit. It appears to be two 3' drums about 16" in diameter and coated with concrete stacked on top of one another and not sealed together. The drum/ pipe goes down about 6' into 8" of mud. It drains to the ground. No pipe connects anywhere to [drain] the water anywhere. It just holds it until it seeps into the ground. It is FAR below the city's pipes and George said he would not be surprised if the bottom was actually bedrock.

Without a connection to a more formal drainage system, the water seeps into the ground at various rates depending on the saturation and porosity of the surrounding earth and stone. Since the drums are below the level of the basement, water in the pit should not enter the building. If, on the other hand, the surrounding soil is unable to absorb the water, it can fill the drums and overflow into the area way and into the building. The location of the drums prevents any modification to flow by gravity to the City's sewer system, therefore other repairs should be considered.

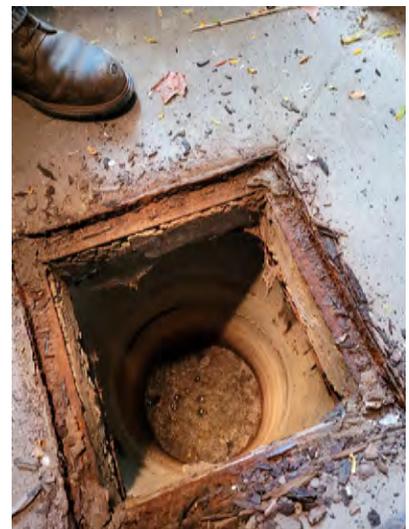
The NHS has not noted water infiltration from the area drain outside the door which hopefully points to the proper functioning of the drain. However, relying on its continued function to prevent water from entering the basement is risky.

### Recommendations:

- Regularly cleaning debris from the drums may help the water to flow more readily to the underlying soils.
- As noted in the 2022 condition report under Priority 2: install a sidewalk curb at the top of the stairs to redirect sidewalk runoff.
- Install a larger drywell in the same general area when the Exterior Stairwell is restored.



4. Stairwell



5. Area Drain



## SECOND FLOOR EXTERIOR INVESTIGATIONS

### PLATTEVILLE LIMESTONE

The original exterior walls are Platteville Limestone, a material with distinct layers of sedimentation. It is moderately durable as long as the layers are under compression and it is not exposed to extreme weathering, as they are at most locations on the wall. Where there is no compression, such as on windowsills, column capitals, or arch tops, the layers are easily separated by freeze-thaw action. The lack of compression is even more problematic when the layers are placed in a vertical orientation.

*Recommendations: The layered nature of the stone means that consolidation treatments and water-repellent coatings are ineffective, so no remedial treatments currently are available. It is wise, however, to remove flaking stone so that it does not fall in an uncontrolled manner. It also may be appropriate to add a sheet-metal cover the prevent water from sitting on the sill. Such a treatment would not be noticeable from the ground and would be easily eversible. This sheet metal would turn up on the jambs (preferably into a mortar joint) and under the sill of the window. It would be sloped to drain with a small drip edge to ensure no water stays on the metal or causes deterioration to the underlying sill.*

### ALTERATIONS

The second-floor stone on portions of the north façade and much of the east façade has been covered with stucco with brick trim. The stucco and brick are applied directly to the historic stone that serves as a substrate, rather than using a lath or other anchoring system to bond the two materials. The stucco and brick were installed as part of a series of storefront renovations that were completed over a number of years. This included removing the single arched windows and installing pairs of windows, opening up the storefront entrances, and a canopy over the sidewalk. See photos below.

While the lower portion of these facades were restored in the 1980s, the upper portion of the buildings remain in their altered state. However, the condition of these materials is failing. Portions of the stucco and brick have fallen, and the remainder is easily removed. There are large areas of cracking in the stucco and numerous areas where water can infiltrate the stucco and dislodge it through freeze-thaw cycles. The mortar below the stucco appears to be original to the building. It is very soft, and samples were removed for further analysis; please see the Mortar Analysis section of this report.

Where the brick and stucco in the midsection of the Division Street elevation have already been removed, large gaps between the masonry



8. Deteriorating Windowsill



9. Deteriorating Stone with Vertical Bedding Planes



10. Photo from 1966



11. Photo from 1980



12. Photo from 1982 Restoration



13. Photo from 1982 Restoration



14. Cornice

and the metal cornice have been created. Because the roof configuration has changed over time, it is assumed that the cornice has been salvaged and reinstalled with a wood nailer at the bottom of the cornice. Now where the brick is missing and the rough surface of the stone is exposed, large gaps between the masonry and metal have opened up. The gap is big enough for squirrels and chipmunks to enter the void behind the cornice. Most likely they are using this area as a space for their nests.

It does not appear that water is entering the cornice at the open joints, so, at this time, it seems that the goal should be to keep the squirrels out while considering longer-term plans for the building. These plans might include returning the historic appearance to these facades. However, any potential treatment should, therefore, be easily reversible.

*Recommendations: Install a sealant backer rod in the crack then to fill the outer layer with a material such as stainless steel wool (<https://pestplug.com/>) Squirrels will not chew materials such as this, so it would keep them out while not rusting and still remaining easily removable.*

## ELEVATION RESTORATION

As noted previously, and as seen in the photos and the HSR, the second floor of the Division Street elevation has been modified starting in the 1950s. Single arched windows trimmed in Plattleville limestone were located on the second floor rather than the paired of windows that currently exist. The decorative cornice seen on the north side of the building continued along the entire east side. Stone piers extended to the cornice and brick chimneys were placed atop the building. The restoration of these elements would follow the already restored elements



15. Cornice Gap



16. West Elevation

on the first floor. However, the decision to restore to this original appearance is becoming more present because the windows, brick, stucco, and surrounding materials are in poor condition and must be repaired in the next two years. Accelerated decay is creating more issues of water migrating through the exterior walls, now impacting once sound materials. One example of the condition of the restored keystones on the First National Bank Building. When we were conducting our investigation we noticed that two of the keystones had shifted due to rusting/shifted anchors. As the stucco and brick deteriorates, more and more water is able to enter the exterior walls, furthering the deterioration.

While the restoration of the facade will be costly and also impact some of the interior finishes of the apartments; the repairs needed to maintain the existing will also be expensive due to their deterioration. However, in this later scenario, money is being spent on non-historic materials, some of which were not detailed appropriately and have lesser long-term durability. In order to restore to the historic appearance, these steps would have to occur:

- Remove the stucco, brick, and windows
- Restore the original window openings with new stone
- Repoint stone on entire facade
- Install new arched top windows and storms
- Restore metal cornice, which necessitates the fabrication of missing elements
- The restoration of the chimneys is not a critical, as they no longer serve the individual units below.

*Recommendations: We believe now is the most economical opportunity to restore the facade. The repair of the existing materials will be expensive But these costs will only be applied to maintain or replace non-historic materials. Additionally, any future restoration will only undo the money spent to maintain this current configuration. While the restoration will be more expensive, in the long run, it will be the least money spent to achieve the goal of a restored east facade.*



17. Deteriorated stucco



18. Cracked stucco



19. Current Configuration of West Elevation



20. Restored West Elevation, the Red Indicates Elements to be Restored

## MORTAR TESTING

Mortar samples were taken on both the north and east facades. These mortar samples were delivered to American Engineering Testing (AET) in St. Paul for both chemical and petrographic analysis. AET did full analysis of only Sample 2, from the unaltered portion of the east façade. The report suggests that the historic mortar has a compressive strength of approximately 1,000 pounds per square inch (psi). The analysis determined that the mortar consisted of natural cement, lime, and sand. Whether the lime was a separate ingredient, or a component of the natural cement could not be determined.

The investigations also revealed remnants of a softer lime-based mortar on the weather side of the sample. The origins of this mortar also could not be determined. If it were from an earlier repointing project there probably would have been more mortar remaining, and since it was from the unaltered portion of the east façade it is not remnants of a later stucco application.

*Recommendations: We recommend that for future restoration work NHS work with a qualified mason and a Historic Architect to oversee the work. The mortar must be softer than the underlying mortar.*

*The Natural Cement found in the original mortar is a material that is not as frequently used in contemporary restoration mortars. Before any work is to occur, the historic mason should develop samples of Natural Cement, Lime/Portland Cement, and Hydraulic Lime mortars using matching sand to develop a mixture that is less than 1000 psi, matches the color and texture of the existing mortar, but would be durable to weathering.*



21. Existing mortar

**APPENDIX A:  
MORTAR TEST**



# REPORT OF MORTAR ANALYSIS

**Project:**

Scriver Block Mortar  
Northfield

**Reported To:**

MacDonald & Mack Architects  
3101 East Franklin Avenue  
Minneapolis, MN 55406

**AET Project No.:** P-0018411

**Attn:** Todd Grover

**Date:** December 12, 2022

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## INTRODUCTION

This report presents the results of laboratory work performed by our firm on one of two mortar samples submitted by Todd Grover of MacDonald & Mack Architects on November 17, 2022. We understand the samples were obtained at the above-referenced location. The age of the mortar samples is unknown to us, but we understand the building construction dates to the late 1800's. The scope of our work was confined to performing petrographic and chemical analysis on sample #2, per ASTM C1324 "Examination and Analysis of Hardened Masonry Mortar" to document the condition, composition, and proportions of the mortar.

## CONCLUSIONS

Based on our observations and analysis:

1. The following table outlines the volumetric proportions of ingredients documented in the submitted sample:

<u>Sample ID</u>	<u>Natural Cement</u>	<u>Sand</u>
#2	1	1.1

2. The mortar was composed of a well consolidated mixture of natural cement and a naturally occurring sand. Based on the polishability of the sample, we estimate the compressive strength to be near 1,000 psi. The mortar paste was moderately soft (Mohs 2.5 - 3) and medium light gray in coloration (Munsell® N6). Many relict nodules of natural cement phenograins and hydrated lime were observed throughout the mortar binder. It was not clear if the hydrated lime was an intentional separate ingredient or a component of the natural cement. SEM/EDS observations indicated the presence of magnesium in the relict natural cement/lime – typical of North American natural cements produced from an argillaceous dolomitic limestone source rock. The mortar binder was fully carbonated and non-air entrained.

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3. Thin (< few millimeters) remnants of a lighter-colored and softer lime-based mortar coated the surfaces of the darker-colored natural cement mortar. The lime mortar was very soft (Mohs < 2) and very pale orange in coloration (Munsell® 10YR 8/2). The lime mortar was possibly a tuckpoint or repair material.
4. The fine aggregate in the mortar was a natural quartz, feldspar, and lithic sand. Lithic particles documented in the fine aggregate included: granite, basalt, felsite, greywacke, chert, and a few carbonates. The sand was fairly well graded with a wide range of particle sizes present in the mortar. The individual grains were mostly sub-round to sub-angular.

## SAMPLE IDENTIFICATION

### Sample Type: Hardened Masonry Mortar

<u>Sample ID</u>	<u>Sample Size</u>
#1	4 Fragments ~ 45 grams
#2	3 Fragments ~ 85 grams

## TEST PROCEDURES

Laboratory testing was performed on November 18, 2022, and subsequent dates. Our procedures were as follows:

### 1.0 Chemistry

Chemical Analysis was performed following procedures in ASTM C1324-latest revision, Standard Test Method for Examination and Analysis of Hardened Masonry Mortar. The test method is used for providing the proportion of the components in some masonry mortars. The petrographic findings suggest this method is applicable for this sample to provide the raw data that is used for estimating the mortar composition.

Dry Loss and Loss on ignition data at 105°, 550° and 950°C was measured following ASTM C1324-10, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar," Section 9.5. Insoluble residue was determined following ASTM C1324 Section 9.4. Siliceous aggregate content was calculated from the insoluble residue. Silicon and calcium content was measured, when applicable, according to ASTM C1324, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar."

### 2.0 Petrography

Petrographic observations were performed in accordance with Standard Operating Procedure 24 LAB 005, "Examination and Analysis of Hardened Masonry Mortar," ASTM C1324 - Section 8 Petrographic Examination. The hand sample was viewed under an Olympus SZX12 stereo-zoom microscope with

magnification up to 100x. Thin section analysis was performed in accordance with Standard Operating Procedure 24 LAB 012, "Preparation of Thin Sections for Petrographic Analysis, AET Method". The samples are first epoxy-impregnated, highly polished, then epoxied to a glass slide. The excess sample is cut from the glass and the slide is polished until the material reaches 25 microns or less in thickness. The resulting sample is reviewed under a Nikon E600 petrographic microscope at magnifications up to 600x. Thin section analysis is used to identify various cementitious and non-cementitious portions of the mortar.

## REMARKS

The remaining portions of the sample will be retained for a period of sixty days from the date of this report. Unless further instructions are received by that time, the samples may be discarded. The services for this project have been conducted in a manner consistent with that level of care and skill exercised by members of the profession currently practicing in this area under similar budget and time constraints. The results relate only to the sample analyzed. No warranty, expressed or implied, is made.

We appreciate the opportunity to have been of service to you on this project. If you have any questions regarding the information presented in this report or if we can be of additional assistance, please contact us.

Report Prepared By:  
**American Engineering Testing, Inc.**



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## CHEMICAL RESULTS

Chemical results and calculations are below. Table I reports the measured chemical composition of the mortar sample following ASTM C1324. Table II reports the calculated values. The calculated volumetric ratio of natural cement to sand is presented in Table III.

**Table I: Measured Composition of Mortar Sample**

<u>Client ID</u>	<u>#2</u>
Loss @ 105 ° C	1.03
Loss @ 550 ° C	2.21
Loss @ 950 ° C	13.5
% Soluble Silica	1.8
% Insoluble Residue	66.9

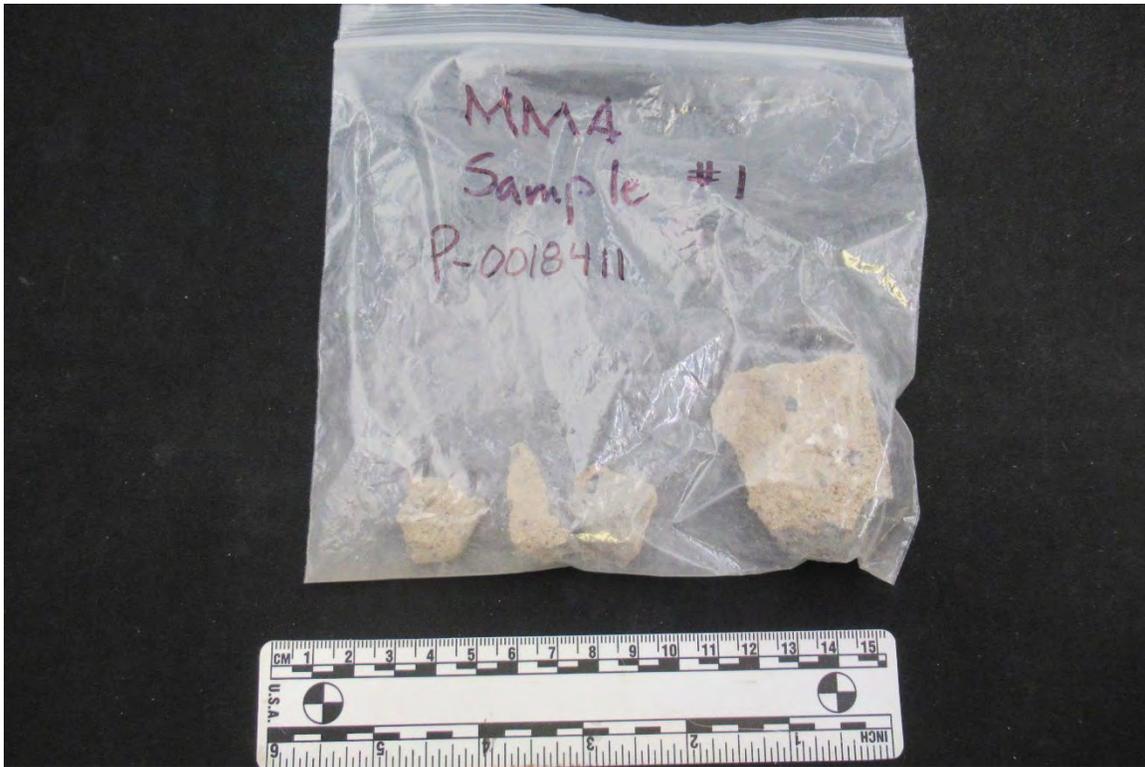
**Table II: Calculated Composition of Mortar Sample**

<u>Client ID</u>	<u>#2</u>
Siliceous Sand %	66.9
Natural Cement %	31.7

**Table III: Calculated Volumetric Composition of Mortar Sample**

<u>Client ID</u>	<u>#2</u>
Natural Cement content	1
Sand content	1.1
Natural Cement to Sand	1 : 1.1

Photo: 1



Sample ID:

#1

Description: Mortar sample as received in the laboratory.

Photo: 2

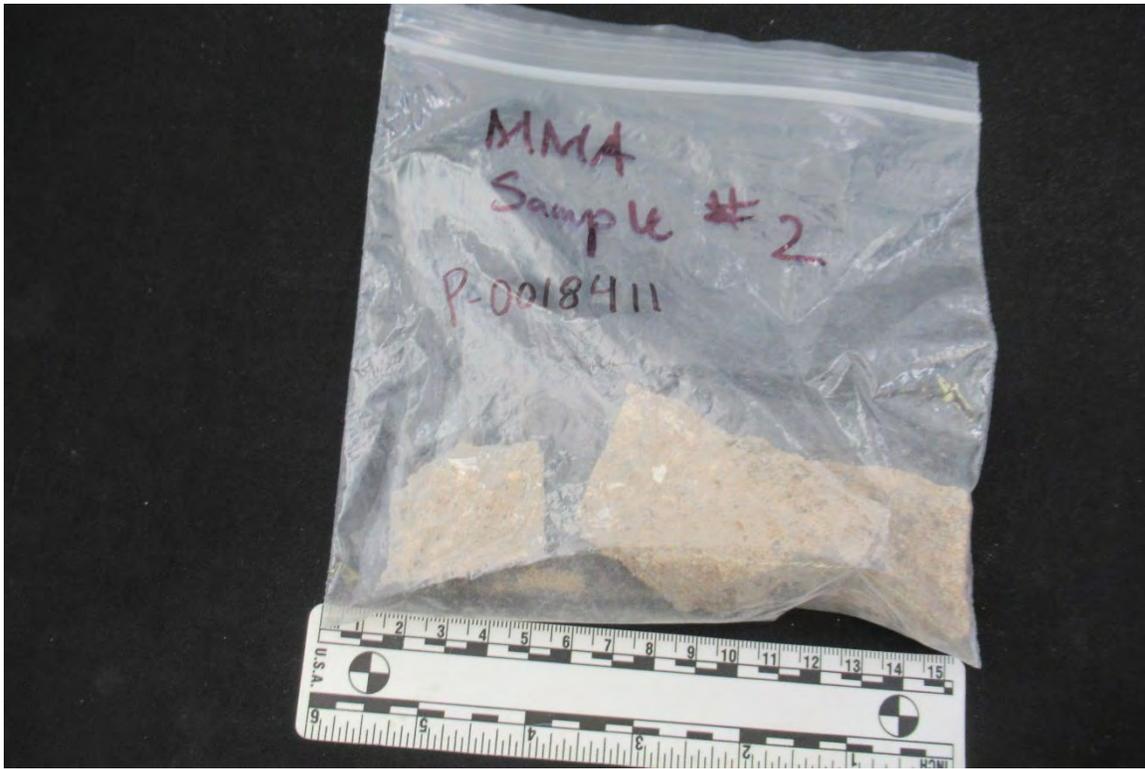


Sample ID:

#1

Description: View of mortar fragments. No testing was performed on this sample.

Photo: 3



Sample ID:

#2

Description: Mortar sample as received in the laboratory.

Photo: 4

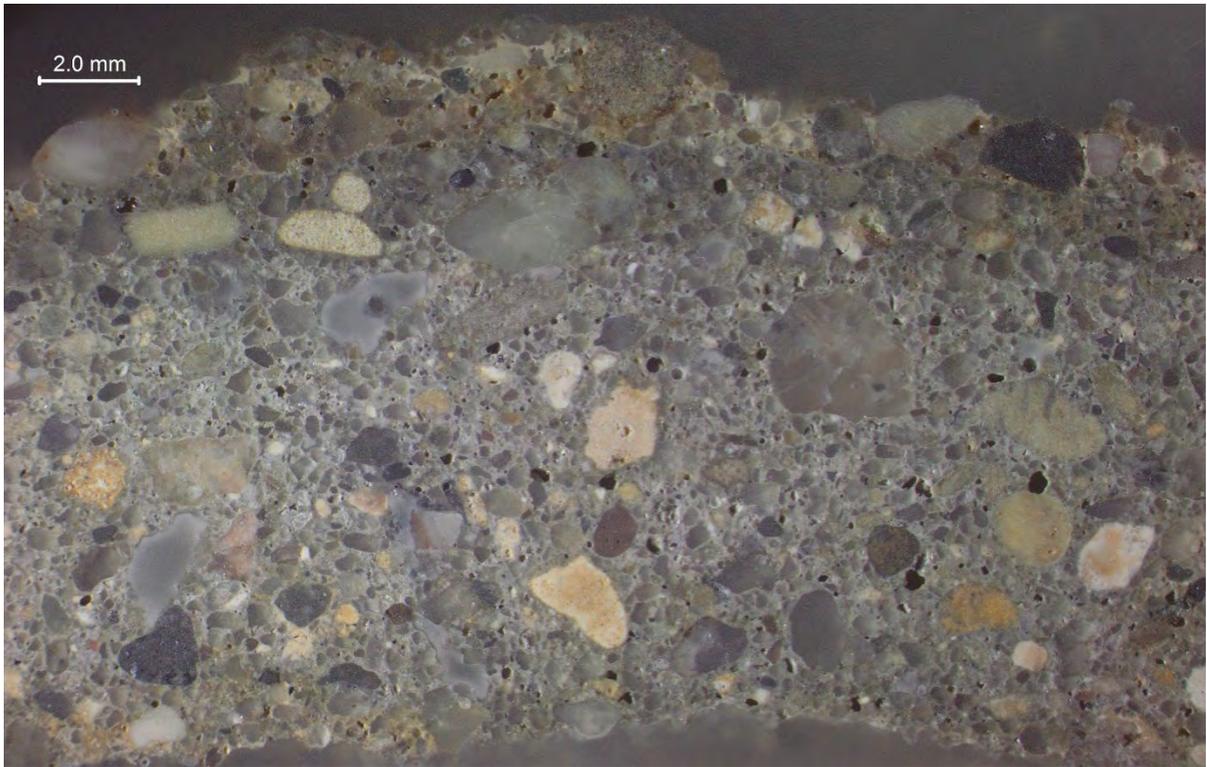


Sample ID:

#2

Description: View of mortar fragments.

Photo: 5

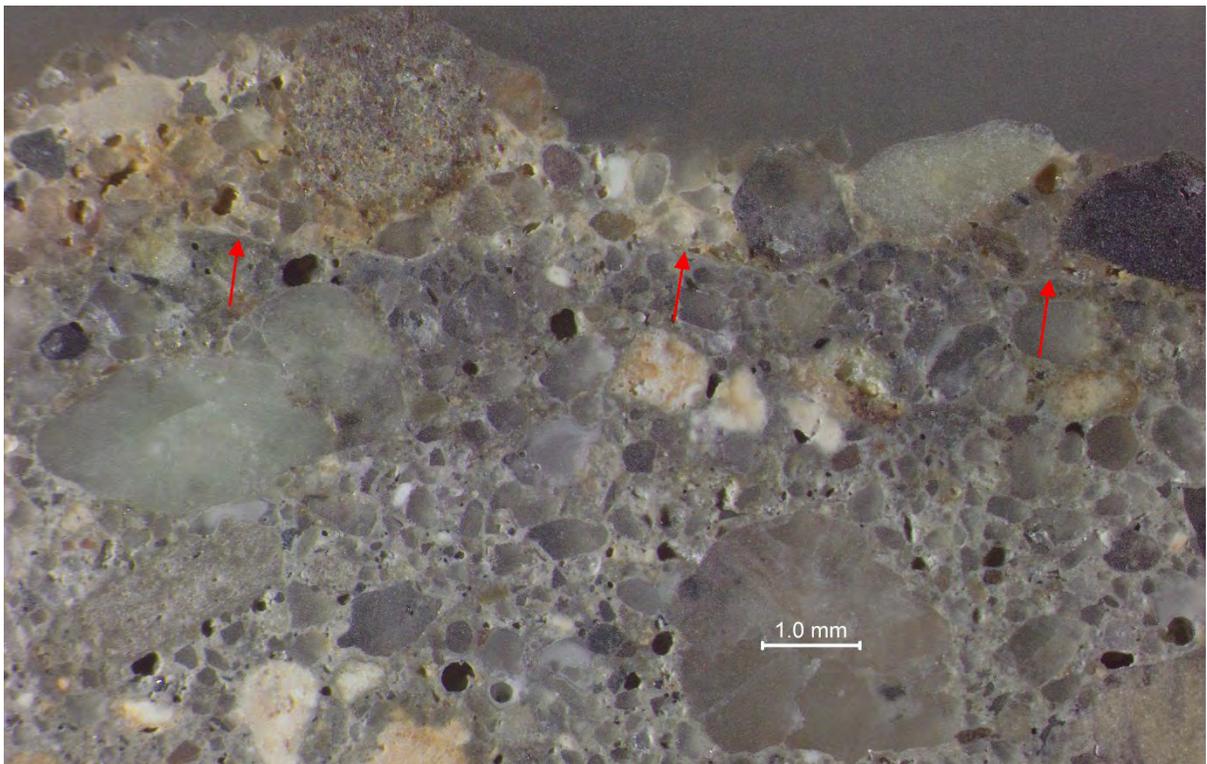


Sample ID:  
Mag:

#2  
5x

Description: Lapped surface of mortar sample viewed under low magnification.

Photo: 6

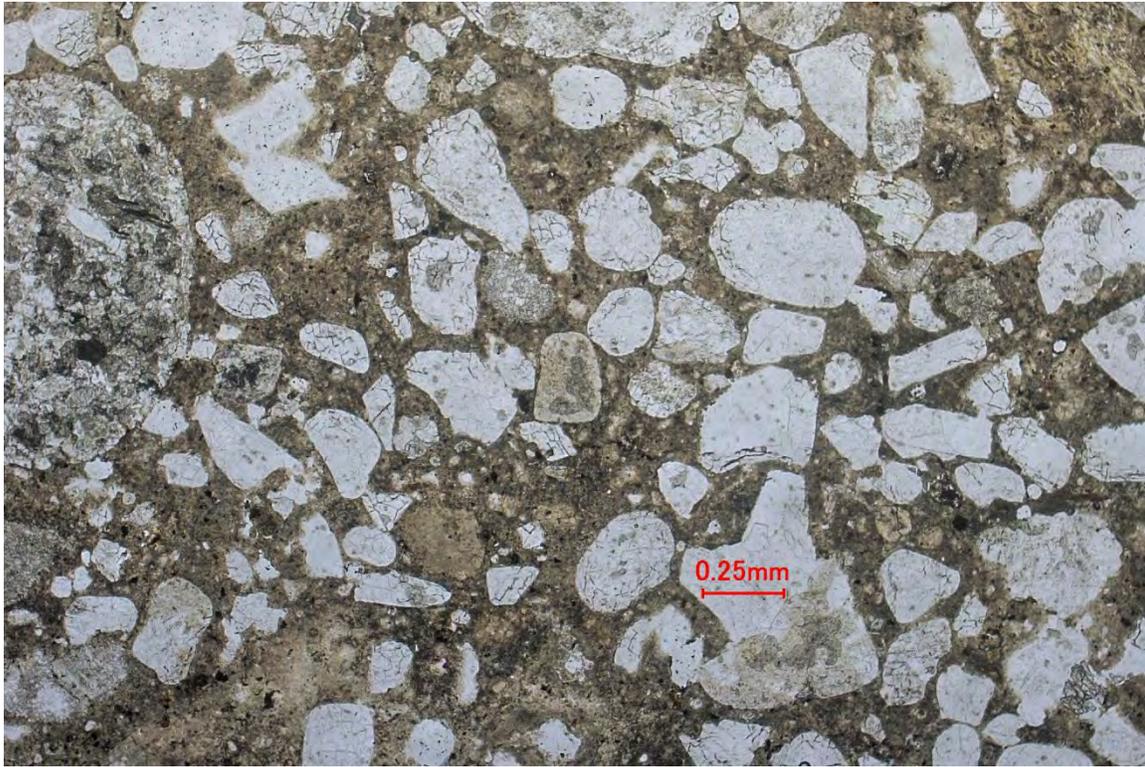


Sample ID:  
Mag:

#2  
10x

Description: Contact (red arrows) between darker-colored natural cement mortar (bottom) and lighter-colored lime-based mortar (top), viewed on saw cut and lapped surface of mortar sample under magnification.

Photo: 7



Sample ID:  
Mag:

#2  
40x

Description: Overall view of mortar in thin section under transmitted plane polarized light.

Photo: 8



Sample ID:  
Mag:

#2  
40x

Description: Same view as above under transmitted cross polarized light. Note the brightly colored carbonated binder.

Photo: 9

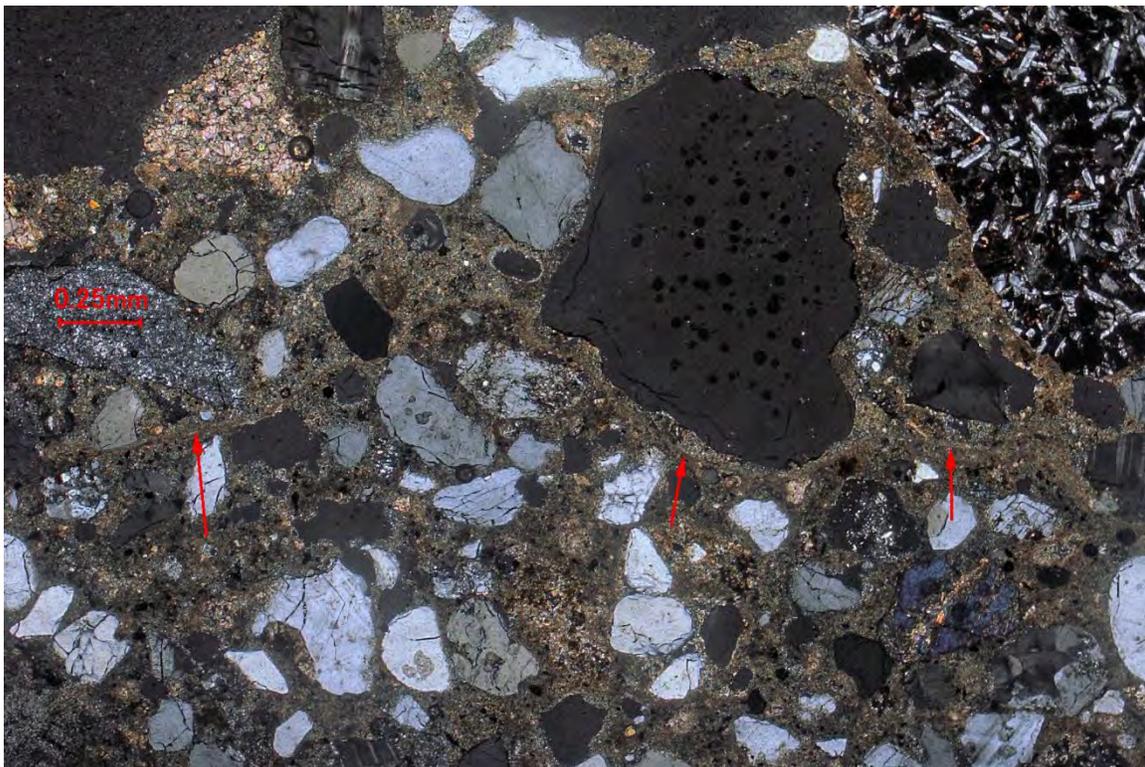


Sample ID:  
Mag:

#2  
40x

Description: Contact (red arrows) between natural cement mortar (bottom) and lime-based mortar (top), viewed in thin section under transmitted plane polarized light.

Photo: 10

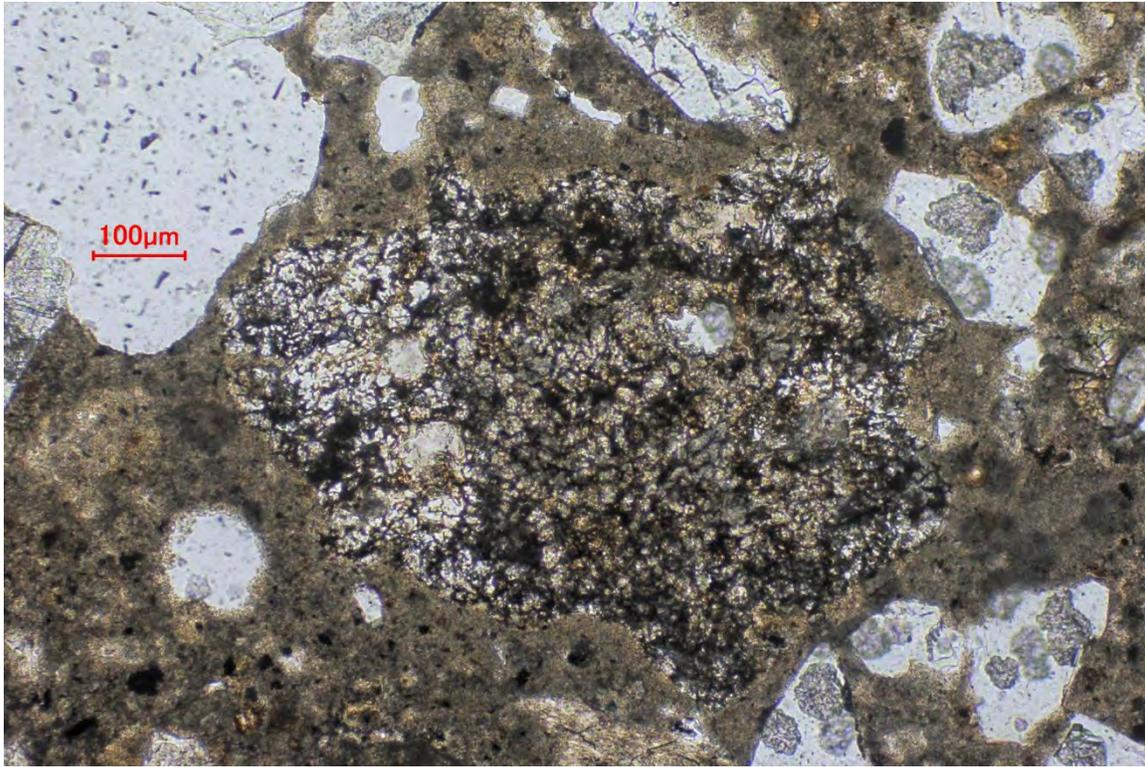


Sample ID:  
Mag:

#2  
40x

Description: Same view as above under transmitted cross polarized light.

Photo: 11

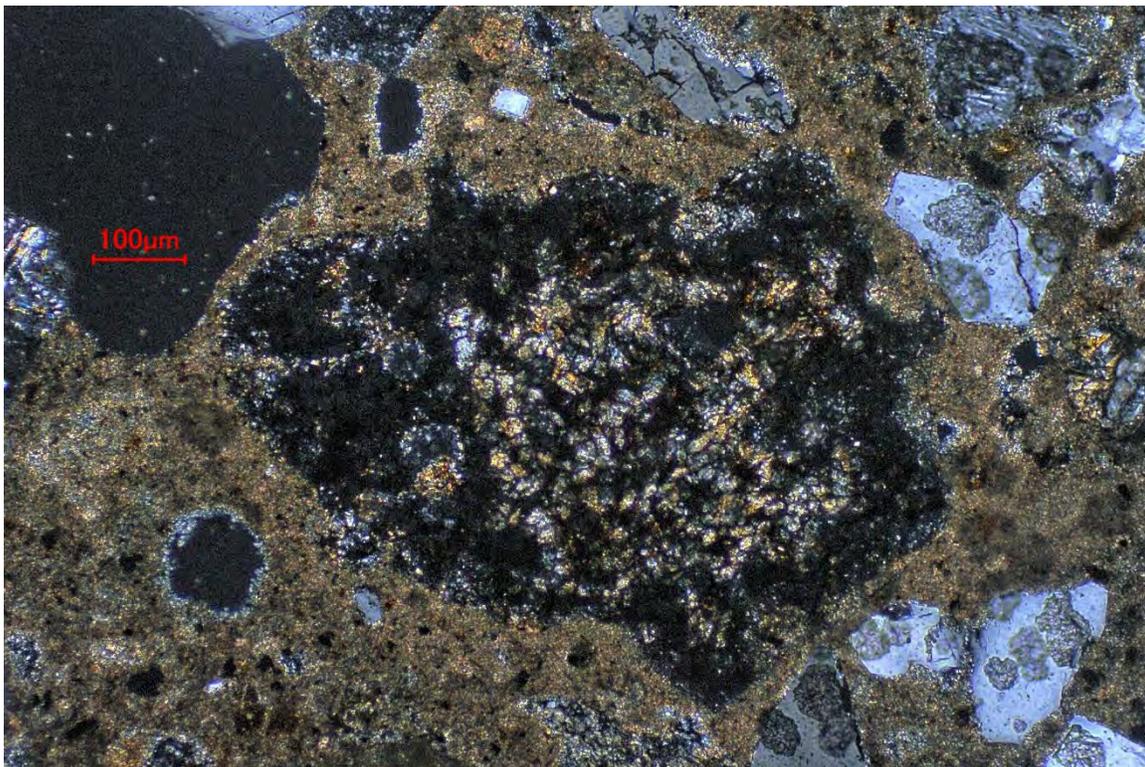


Sample ID:  
Mag:

#2  
100x

Description: Natural cement grain (center) within mortar binder which exhibits a crude 'clinker-like' texture. Viewed in thin section under transmitted plane polarized light.

Photo: 12

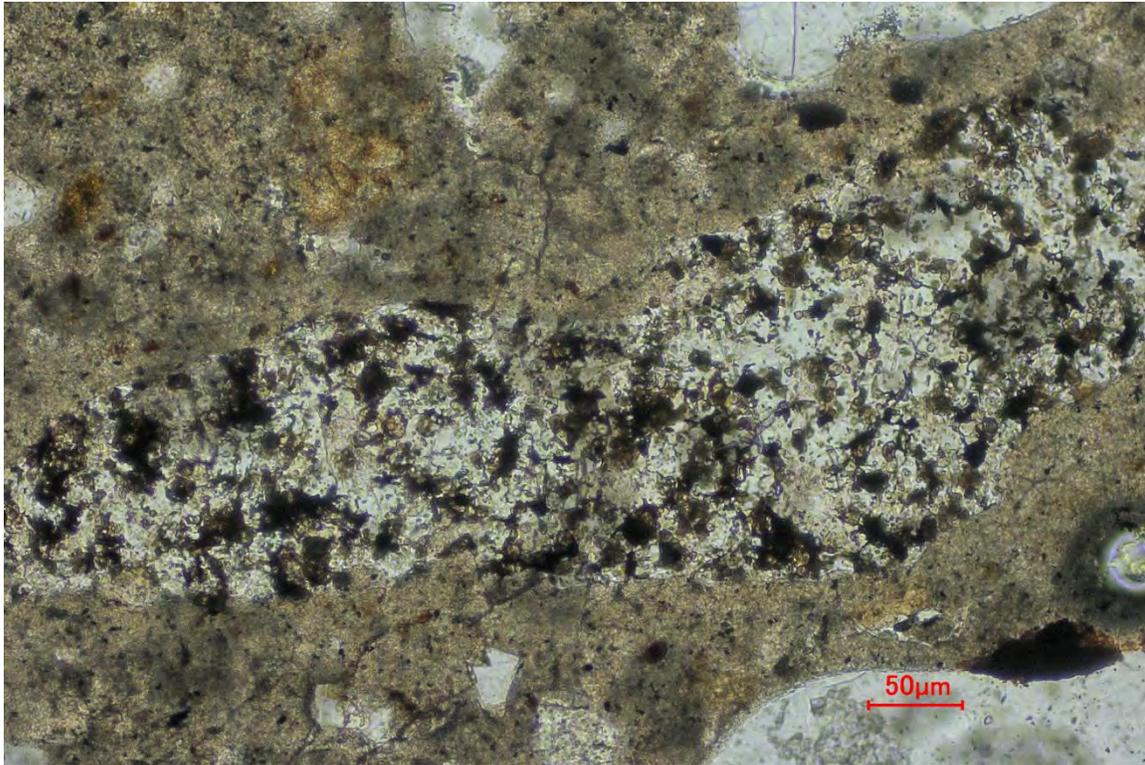


Sample ID:  
Mag:

#2  
100x

Description: Same view as above under transmitted cross polarized light. Note the perimeter of the grain has hydrated (black/isotropic) while the center remains unhydrated.

Photo: 13

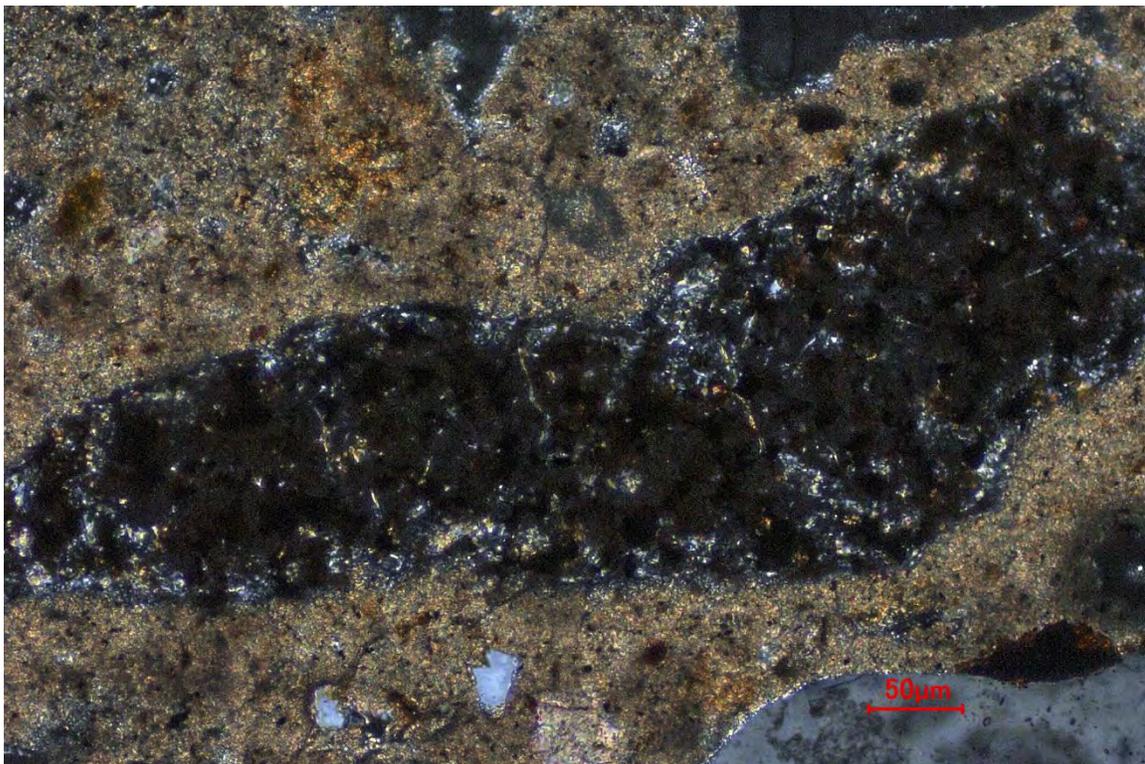


Sample ID:  
Mag:

#2  
200x

Description: Natural cement grain (center) within mortar binder which exhibits a crude 'clinker-like' texture. Viewed in thin section under transmitted plane polarized light.

Photo: 14

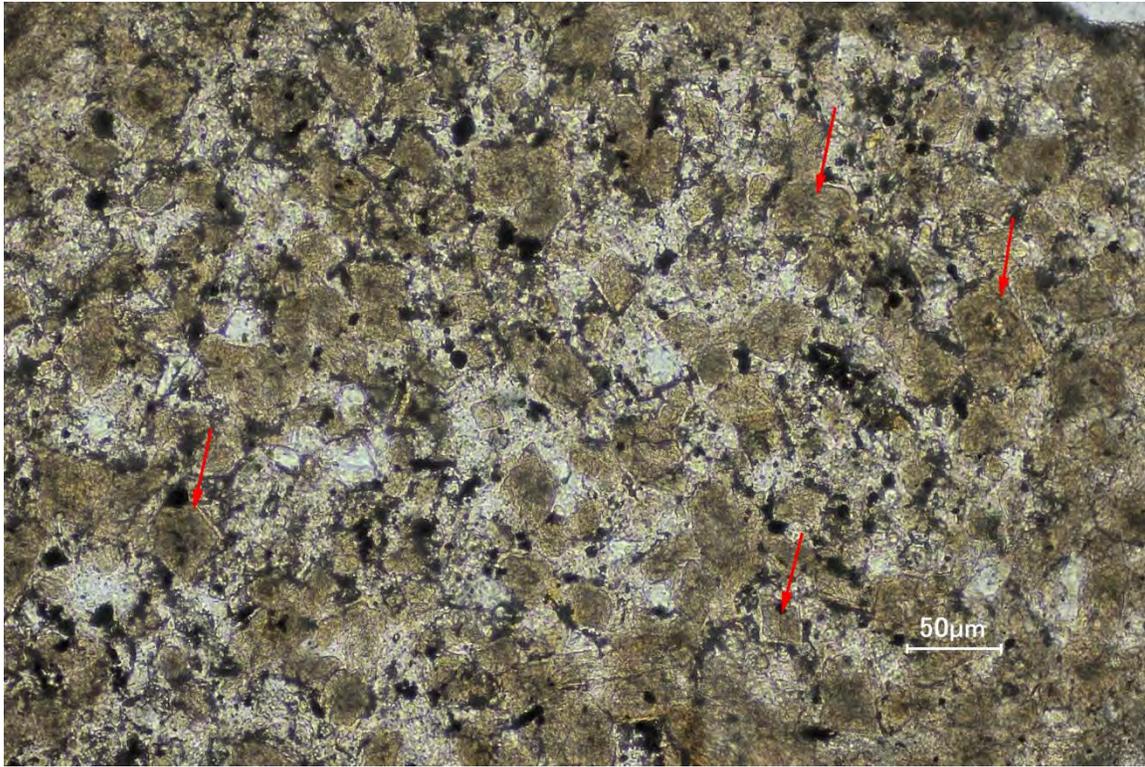


Sample ID:  
Mag:

#2  
100x

Description: Same view as above under transmitted cross polarized light. Note the grain has hydrated and appears black/isotropic.

Photo: 15

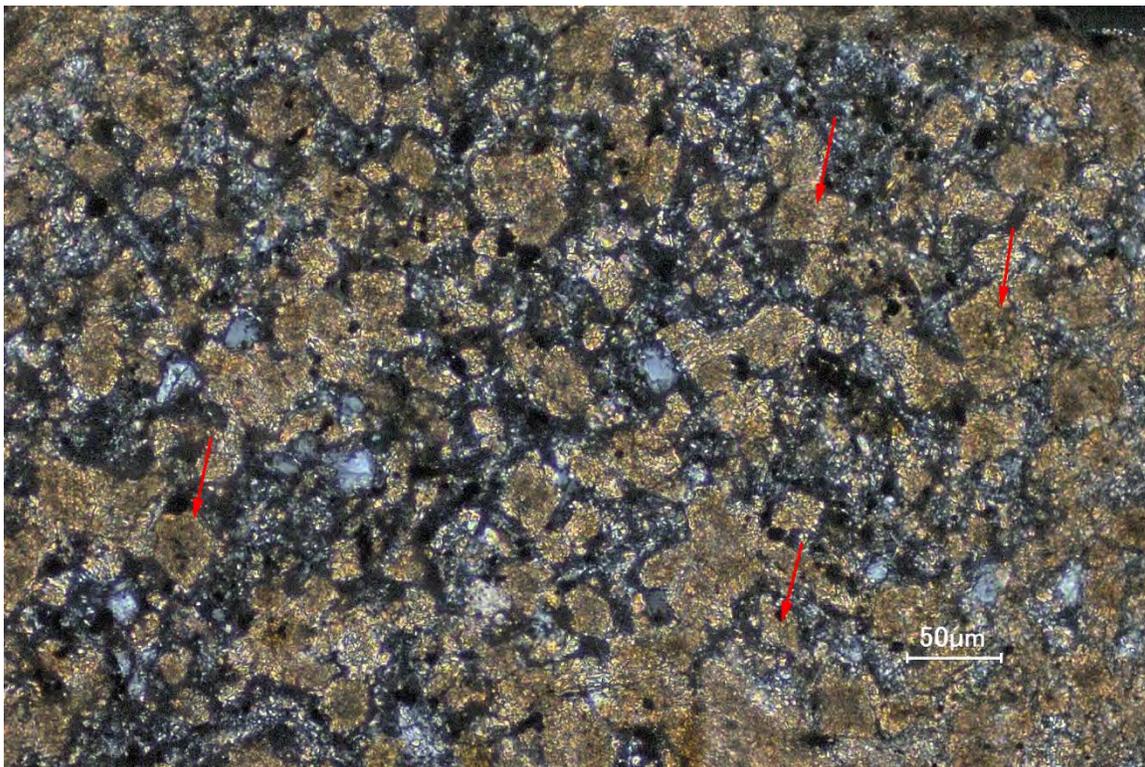


Sample ID:  
Mag:

#2  
200x

Description: Relict dolomite rhombs (red arrows) within nodule of natural cement/lime viewed in thin section under transmitted plane polarized light.

Photo: 16



Sample ID:  
Mag:

#2  
200x

Description: Same view as above under transmitted cross polarized light.