



REPORT OF CONCRETE TESTING

PROJECT:

LVMPD EVENTS #040215-1500

REPORTED TO:

LAS VEGAS METROPOLITAN POLICE DEPT.
6753 WEST CHARLESTON BLVD.
LAS VEGAS, NEVADA 89146

ATTN: LIEUTENANT TOM MONAHAN

APS JOB NO: 10-03088

DATE: MAY 5, 2004

INTRODUCTION

This report is written to present the results of our field and laboratory work we performed on a concrete mass found in a shallow trench in the desert outside of the City of Las Vegas that contains the remains of a female homicide victim whose identity is unknown. Our work was requested and authorized by you on March 17, 2004.

The scope of our work was limited to:

1. Performing a visual examination of the concrete mass at the coroner's laboratory in Las Vegas.
2. Review the case file photographs at the department offices in Las Vegas.
3. Request specific concrete samples for laboratory testing and analysis.
4. Performing petrographic analysis testing on three concrete sections and concrete splatter samples obtained from a box-cutter style knife found near the scene.
5. Provide opinions with regard to specific questions regarding the case such as:
 - A. Approximate age of the concrete.
 - B. The type of concrete mixture used in the grave.
 - C. The number of concrete placements used to encase the victim.
 - D. Likely origin of the materials in the concrete.
 - E. Relationship of the concrete splatters to the concrete in the grave.

CONCLUSIONS

Based on our observations, test results and past experience, our conclusions are as follows:

1. The concrete in the grave is consistent with a pre-packaged dry concrete mixture consisting of portland cement, crushed aggregate and sand. The coarse aggregate was primarily comprised of crushed carbonate (limestone), which is typically derived from a limestone bedrock quarry.

The fine aggregate was comprised of primarily fine-grained extrusive volcanic particles with some feldspar and quartz grains.

2. The concrete mass was made in three separate placements. The material in all three placements was relatively well mixed and uniform in composition.
 - A. The first placement extends nearly the full length of the bottom of the grave and appears to have been placed with a low slump. The body was then placed face-up on top of this first placement while the concrete was still in a plastic state. The body produced depressions in the concrete placement in the areas of the head, shoulders and buttocks.
 - B. The second placement covered the lower portion of the body starting at the lower buttocks area and extending beyond and covering the feet. Both the legs and feet are completely encased within this concrete. This mixture was placed with a higher slump (more fluid than the first placement). The concrete in placements #1 and #2 are comprised of the same constituents.
 - C. The third placement extends from the edge of placement #2 in the pelvic region and extends several inches beyond the head and appears to have been placed with a low slump. Placement #3 did not bond to either placement's #1 or #2. The concrete in all three placements is comprised of the same constituents.
3. The concrete mass was not produced using materials at the gravesite.
4. The age of the concrete is greater than one month and less than 5 years. We estimate the age to be between 1 to 3 years. To achieve a better understanding of the age of the concrete, test specimens could be fabricated, buried and analyzed.
5. The material adhered to the box-cutter knife is concrete. The concrete splatters on the knife are comprised of the same constituents as the concrete in the grave.

SAMPLE IDENTIFICATION

<u>Sample No.</u>	<u>Original Sample Dimensions</u>
P-1/P-2	441 mm (17-3/8") x 302 mm (11-7/8") x 116 mm (4-9/16") thick
P-3	194 mm (7-5/8") x 64 mm (2-1/2") x 54 mm (2-1/8") thick and 160 mm (6-5/16") x 51 mm (2") x 54 mm (2-1/8") thick
Knife Splatters	Approximately 10 grams
Site Gravel	Approximately 10 pounds

FIELD OBSERVATIONS

Field observations were performed at the coroner's laboratory in Las Vegas, Nevada, on March 18, 2004. Our observations were as follows:

The first section of concrete examined was from the bottom of the grave down the length of the grave (approximately 6 feet) with a maximum thickness of roughly 6 inches and was identified as placement #1. This concrete contained numerous consolidation voids on the surface that the body was laid onto. The mixture appeared to have been placed with a low slump or was beginning to dry out and set up. There were clear depressions where the head, shoulders and back had been in contact with the concrete. This surface did not conform well at all with the backside of the body preserving very little surface detail. In the area of the back of the head we observed intermittent black hair fibers adhered to the cement paste.

TEST RESULTS

Our complete petrographic analysis test results appear on the attached sheet entitled 00 LAB 001 "Petrographic Examination of Hardened Concrete, ASTM: C856." A brief summary of these results is as follows:

1. The coarse aggregate in the sections was comprised of 3/8" maximum sized carbonate gravel that was fairly well graded with fair overall distribution.
2. Pozzolanic admixtures were not observed in the concrete samples.
3. The paste color of the sections was light to medium gray with the slump estimated to be medium (2" to 5").
4. The paste hardness of the sections was judged to be medium with the paste/aggregate bond considered good.
5. The depth of carbonation was up to 1" in section P-1/P-2 and completely carbonated in the knife splatters.
6. The water/cement ratio of the sections was estimated at between 0.48 to 0.53 with approximately 5-7% unhydrated cement particles.

Air Content Testing

Sample Identification	P-1/P-2	P-3
Total Air Analysis -		
Air Void Content, %	2.7	3.5
Spacing Factor, in	0.019	0.014
Entrapped Air (%)	1.2	0.8
Entrained Air (%)	1.5	2.7

TEST PROCEDURES

Laboratory testing was performed on March 29, 2004, and subsequent dates. Our procedures were as follows:

Petrographic Analysis

A petrographic analysis was performed in accordance with APS Standard Operating Procedure 00 LAB 001, A Petrographic Examination of Hardened Concrete, ASTM:C856-latest revision. The petrographic analysis consisted of reviewing cement paste and aggregate qualities on a whole basis as well as on a cut/polished section. The depth of carbonation was documented using a phenolphthalein indicator solution applied on a freshly cut and polished surface of the concrete sample. The water/cement ratio of the concrete was estimated by viewing a thin section of the concrete under an Olympus BH-2 polarizing microscope at magnification up to 1000x. Thin section analysis was performed in accordance with APS Standard Operating Procedure 00 LAB 013, Determining the Water/Cement of Portland Cement Concrete, APS Method. The samples are first highly polished, then epoxied to a glass slide. The excess sample is cut from the glass and the slide is polished until the concrete reaches 25 microns or less in thickness.

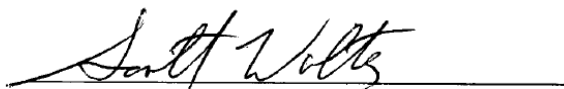
Air Content Testing

Air content testing was performed using APS Standard Operating Procedure 00 LAB 003, "Microscopical Determination of Air Void Content and Parameters of the Air Void System in Hardened Concrete, ASTM: C457-latest revision." The linear traverse method was used. The concrete section was cut perpendicular with respect to the horizontal plane of the concrete as placed and then polished prior to testing.

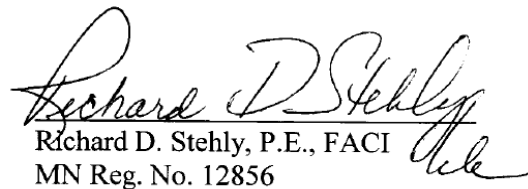
REMARKS

The test samples will be retained for a period of at least thirty days from the date of this report. Unless further instructions are received by that time, the samples may be discarded.

Report Prepared By:



Scott F. Wolter, P.G.
President
MN License No. 30024

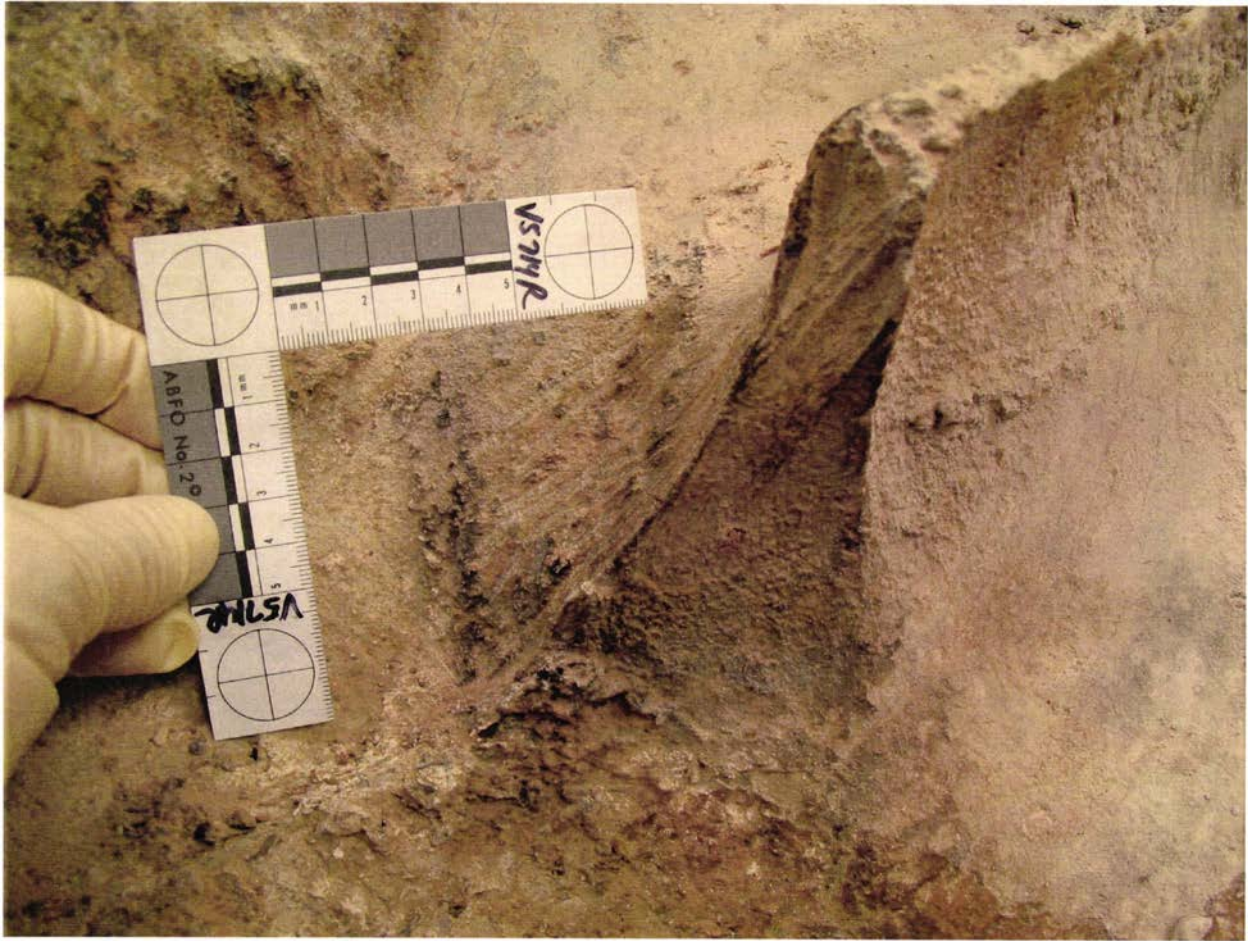


Richard D. Stehly, P.E., FACI
MN Reg. No. 12856



The bottom of the grave contained a stiff concrete mixture identified as placement #1.

In the area of the lower buttocks a pronounced change in the consistency of the concrete was observed, a cold joint, indicating the contact between two separate placements. This concrete, identified as placement #2, contained very few voids and molded very well with all observable surfaces of the lower portions of the body. This indicates the second concrete placement was of a higher slump and more fluid. The fact that the underside of the legs had molded perfectly indicates the more fluid material was able to flow around the legs and occupy all void-space. A prominent, thin ridge (approximately 5" high by $\frac{3}{4}$ " thick) of hardened cement paste was observed where the paste flowed between the legs of the victim. Folds of skin in the area of the vagina were imbedded in the ridge along with numerous pubic hair fibers observed.



A cold joint contact between placements #1 & 2 runs roughly along the area at the bottom of the buttocks region of the victim. The higher slump of placement #2 molded perfectly around the legs as well as in the areas between the legs. Skin folds in the vagina and the texture of the skin was preserved in the paste of placement #2.

On the feet end of the grave, the placement #2 concrete was approximately 8" thick and exhibited a relatively flat top surface that was consistent with a higher slump concrete. An approximately 20" long section at the feet of the concrete mass had been cut off by the Las Vegas Fire Department with a concrete cut-off saw. Upon wetting the cut surface of placement #2, we observed relatively well distributed, crushed carbonate and sand aggregate within a medium to light gray cement paste matrix.



The lower leg area of the concrete mass was cut off exposing a crushed carbonate coarse aggregate in placement #2. The mixture looked well distributed and consistent with a processed material.

On the relatively flat top surface of the placement #2 concrete we observed concrete rubble that appeared consistent with a very low slump concrete. The concrete rubble was adhered to the surface of placement #2 and appeared to represent material spread away from a third concrete placement.



The feet end of placement #2 was cut off and exhibited a flat top surface indicating a higher slump. On this surface, concrete rubble was observed that is consistent with a very low slump concrete representing a third placement.

The top portion of the cut off section of placement #2 was also cut into to expose the feet area of the victim. The entire skeleton of the victim had been removed exposing impressions of the skin within the cement paste. The preservation of textures of the skin was excellent which included perfect impressions of skin folds and prints on the bottom of the feet.



Prints from the bottom of the feet were preserved within the cement paste of placement #2.

The head and torso region was covered with a third placement (#3) of concrete that extended from the middle pelvic region to several inches beyond the head. Numerous consolidation voids were observed throughout this section indicating the material was relatively dry and placed with a low slump. There was virtually no bond where the material was in contact with placement# 1 . Placement #3 overlapped placement #2 in the pelvic region, but did not appear to have bonded.



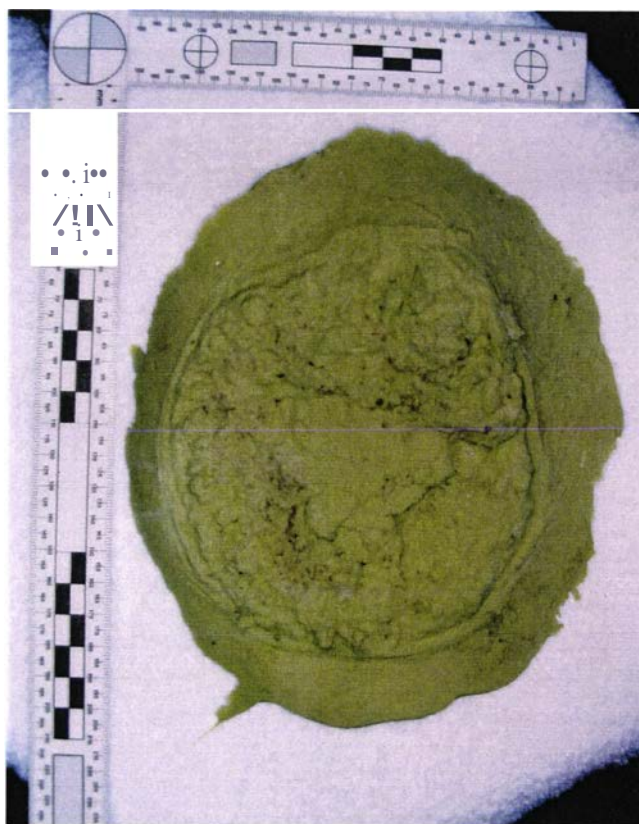
Placements #2 and #3, as seen near the open hole in the middle of the concrete mass, did not bond together.

The body of the victim molded perfectly in the concrete of placement #3 preserving excellent surface detail. Textural differences were clearly observed between the skin and areas where tissues (muscle, fat, glands, etc.) in the body were exposed . The excellent quality of preservation of several physical features of the body, were such that molds were made that will hopefully aid in identification of the victim .

Multiple wounds were also preserved in the concrete and have shed light on the type of killer who committed this crime. The left breast had been cut off from the victim's body. The right breast had numerous cut marks and some missing flesh. The right nipple was missing with what appeared to be bite marks indicating that the nipple had been bitten off.



The breasts of the victim experienced severe trauma. A portion of the lower left breast was cut out and the nipple had apparently been bitten off. The entire right breast was cut off.



This mold was taken of the area of the left breast, which was cut off.

There was a rather large void in the area between the head and the left shoulder. A dark discoloration in the area adjacent to the void suggests that a chemical reaction occurred between the concrete and fluids from the body. The irregular surface texture within the void is similar to the surface texture in the area of the missing right breast. The mass could be the where the missing breast tissue went. The lack of skin texture in the void could mean the skin was removed from the breast.



An unknown void was present in the area between the left shoulder and the head at right. The surface texture in the void was similar to the area of the missing breast suggesting it ended up here.

A mold of the head and face revealed a severe wound on the right side of the mouth and jaw suggesting the victim received a forceful impact.



A mold was made of the head of the victim, which revealed a wound on the right side of the mouth made from a forceful impact.

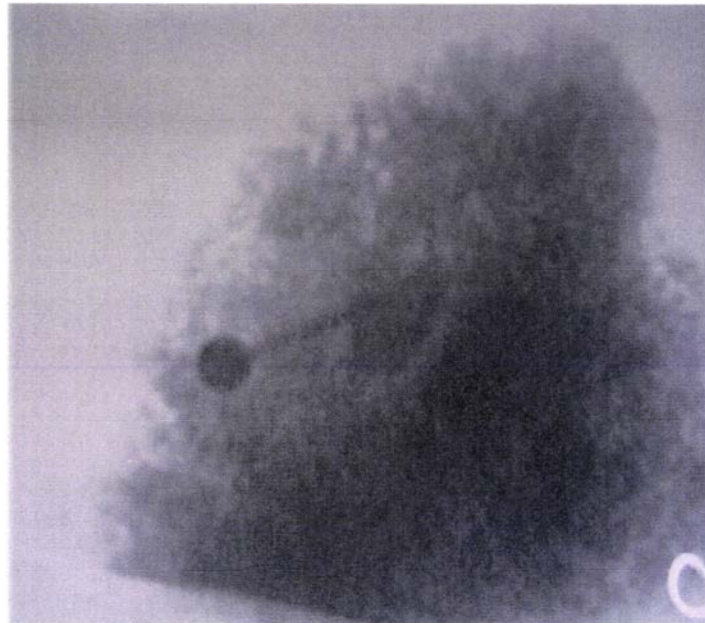


Preservation of the ear in the concrete allowed for making a mold, which might aid in identification of the victim.

After about 4 hours of examining the concrete, the case file was reviewed, which included about 200 photographs. The photos included aerial shots of the gravesite, processing of the crime scene, collection of evidence, the making of several molds, and x-ray photos of evidence within the concrete. The x-ray photos indicate that an earring and a body-piercing stud are present with the concrete.



An x-ray of a section of concrete indicates the presence of an earring likely belonging to the victim.



An x-ray of a section of concrete indicates the presence of a stud piercing likely belonging to the victim.

One important piece of evidence collected at the scene was a blue handled box-cutter knife that was found a few feet from the grave under a bush. Close-up photos of the box-cutter knife showed numerous concrete splatters on the knife. Examination of the splatters may be able to link the splatter, and the knife, to the concrete in the grave.



Concrete paste splatters were present on the handle of a box-cutter knife found a few feet from the grave.

00 LAB 001 Petrographic Examination of Hardened Concrete
ASTM: C-856

Job #: 10-03088
Sample Identification: P-1/P-2

Date: 5-3-04 / 5-4-04
Performed by: S. Wolter/G. Moulzolf

I. General Observations

1. **Sample Dimensions:** Our analysis was performed on a 441 mm (17-3/8") x 302 mm (11-7/8") x 19 mm (3/4") thick polished section that was cut from the original 448 mm (17-3/8") x 302 mm (11-7/8") x 116 mm (4-9/16") thick section.
2. **Surface Conditions:**

Top: Rough, irregular poorly consolidated (unfinished) surface
Bottom/Outer: Rough, irregular, formed surface placed on grade
3. **Reinforcement:** None observed.
4. **General Physical Conditions:** Carbonation along the perimeter of the sample ranged from negligible up to 1". Carbonation along the perimeter of the leg impressions ranged from negligible up to 1/8". Intermittent dark brown discoloration up to 1/4" within consolidation void space area along upper (shin area) of open leg areas. The source of the "staining" was most likely organic fluids coupled with the loss of pH in the concrete paste. Some irregular shaped consolidation void space observed in the upper 3" of the concrete mass. Good overall condition.

II. Aggregate

1. **Coarse:** 10 mm (3/8") maximum sized carbonate gravel. Rock types include limestone and dolostone. Fairly well graded with fair to good overall distribution.
2. **Fine:** A relatively coarse ended natural extensive volcanic sand with some quartz and feldspar particles that was fairly well graded. The grains were mostly sub-angular with many angular particles. Good overall uniform distribution.

III. Cementitious Properties

1. **Air Content:** 2.7% total, 1.2% entrapped, 1.5% entrained
2. **Depth of carbonation:** Variable along the perimeter ranging from negligible up to 25 mm (1")
3. **Pozzolan presence:** None observed
4. **Paste/aggregate bond:** Good
5. **Paste color:** Light to medium gray
6. **Paste hardness:** Medium
7. **Paste proportions:** 23 to 25%
8. **Microcracking:** None observed
9. **Secondary deposits:** None observed
10. **Slump:** Estimated, medium (3-5")
11. **Water/cement ratio:** Estimated at between 0.48 to 0.53 with approximately 5-7% unhydrated or residual portland cement clinker particles.
12. **Cement hydration:** Alites- well to fully; Belites- low to well

IV. Conclusions

The general overall quality of the concrete was good.

00 LAB 001 Petrographic Examination of Hardened Concrete
ASTM: C-856

Job #: 10-03088
Sample Identification: P-3

Date: 3-30-04 / 5-4-04
Performed by: S. Malecha/G. Moulzolf

I. General Observations

1. Sample Dimensions: Our analysis was performed on both sides of a 149 mm (5-7/8") x 54 mm (2-1/8") x 14 mm (9/16") and both sides of a 187 mm (7-3/8") x 57 mm (2-1/4") x 11 mm (7/16") thick polished section that was cut from the original 194 mm (7-5/8") x 64 mm (2-1/2") 54 mm (2-1/8") thick and 160 mm (6-3/8") x 51 mm (2") x 54 mm (2-1/8") thick section.
2. Surface Conditions:

Top: Rough, irregular poorly consolidated unfinished surface
Bottom: Rough, irregular, formed surface placed on grade
3. Reinforcement: None observed.
4. General Physical Conditions: Carbonation ranged from negligible up to 13 mm (1/2") depth from the top surface and ranged from 8 mm (5/16") up to 20 mm (13/16") depth from the bottom surface. Many irregular, entrapped sized void spaces were observed scattered throughout the sample suggesting the sample was somewhat under consolidated. Fair to good overall condition.

II. Aggregate

1. Coarse: 10 mm (3/8") maximum sized carbonate gravel. Rock types include limestone and dolostone. Fairly well graded with fair to good overall distribution.
2. Fine: A relatively coarse ended natural extensive volcanic sand with some quartz and feldspar particles that was fairly well graded. The grains were mostly sub-angular with many angular particles. Good overall uniform distribution.

III. Cementitious Properties

1. Air Content: 3.6% total, 0.9% entrapped, 2.7% entrained
2. Depth of carbonation: Ranged from negligible up to 13 mm (1/2") depth from the top surface and ranged from 8 mm (5/16") up to 20 mm (13/16") depth from the bottom surface
3. Pozzolan presence: None observed
4. Paste/aggregate bond: Good
5. Paste color: Medium gray
6. Paste hardness: Medium
7. Paste proportions: 21% to 23%
8. Microcracking: None observed
9. Secondary deposits: Small amounts white, acicular ettringite was observed thinly lining many void spaces scattered throughout the sample.
10. Slump: Estimated, medium (2-4")
11. Water/cement ratio: Estimated at between 0.48 to 0.53 with approximately 5-7% unhydrated or residual portland cement clinker particles.
12. Cement hydration: Alites- well to fully; Belites- well

IV. Conclusions

The general overall quality of the concrete was fair to good.

00 LAB 001 Petrographic Examination of Hardened Concrete
ASTM: C-856

Job #: 10-03088
Sample Identification: Knife Splatter

Date: 5-5-04
Performed by: S. Wolter

I. General Observations

1. Sample Dimensions: Our analysis was performed on a 1" diameter epoxy plug polished section that was cut from the original 12 mm (1/2") x 6 mm (1/4") x 2 mm (1/16") thick chip samples.
2. Surface Conditions:

Top: Rough, irregular surface
Bottom: Smooth, formed surface on metal knife surface
3. Reinforcement: None observed.
4. General Physical Conditions: The chip samples were completely carbonated. Remnant particles of crushed carbonate coarse aggregate were observed. Fair overall condition.

II. Aggregate

1. Fine: A relatively coarse ended natural extensive volcanic sand with some quartz and feldspar particles that was fairly well graded. The grains were mostly sub-angular with many angular particles. Good overall uniform distribution.

III. Cementitious Properties

1. Air Content: N/A
2. Depth of carbonation: Completed carbonated
3. Pozzolan presence: None observed
4. Paste/aggregate bond: Fair to good
5. Paste color: Light gray
6. Paste hardness: Medium
7. Paste proportions: N/A
8. Microcracking: None observed
9. Secondary deposits: None observed
10. Cement hydration: Alites- fully; Belites- fully

APS#
PROJECT:

10-03088
LVMPD EVENT#040215-1500

DATE: APRIL 29, 2004



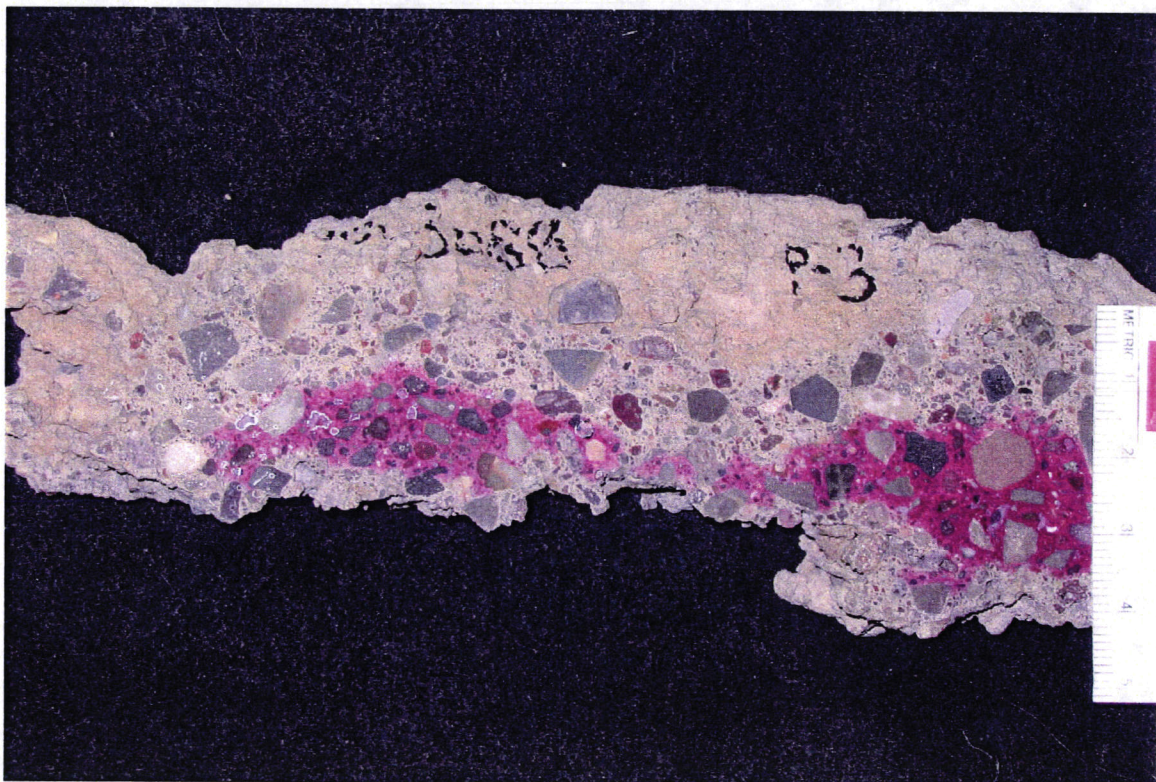
SAMPLE ID: P1-P2 DESCRIPTION: Sawcut section of concrete as recieved.



SAMPLE ID: P1-P2 DESCRIPTION: Carbonation (unstained) proceeds thinnly around the perimeter of the placement and leg impressions.



SAMPLE ID: P3 DESCRIPTION: Sawcut section of concrete as recieved.

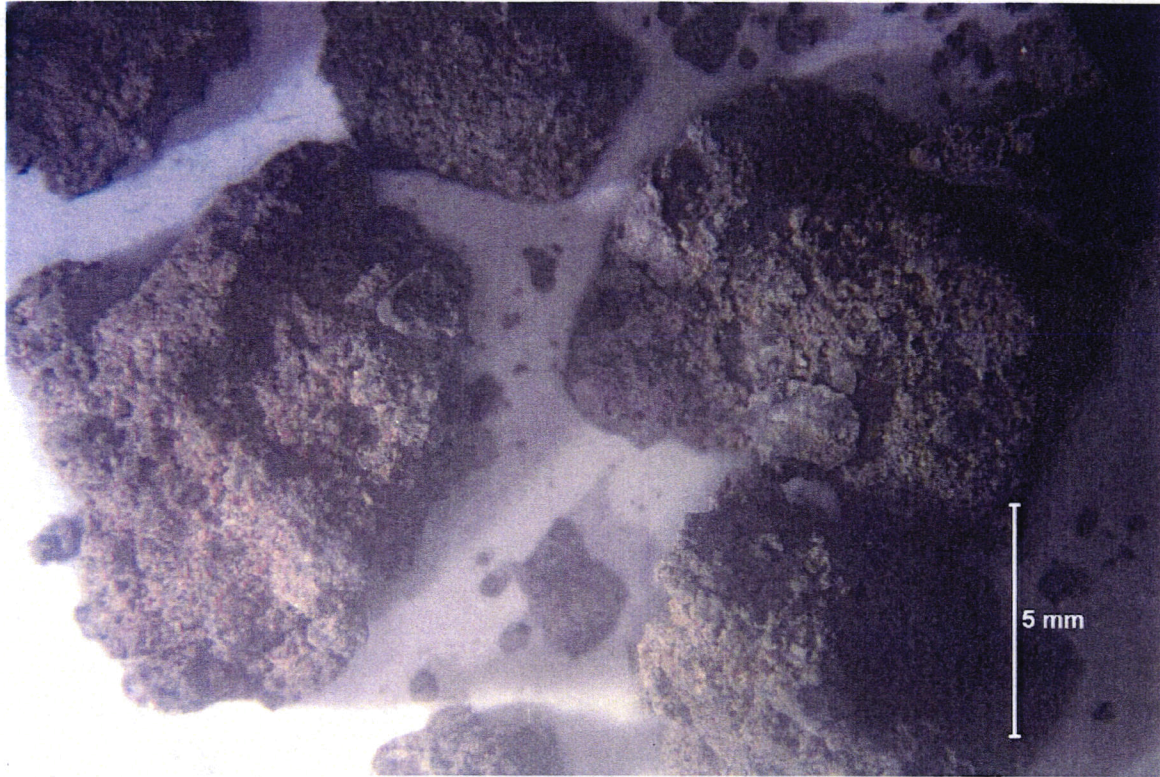


SAMPLE ID: P3 DESCRIPTION: Carbonation (unstained) proceeds deeply around the perimeter of the placement.

APS#
PROJECT:

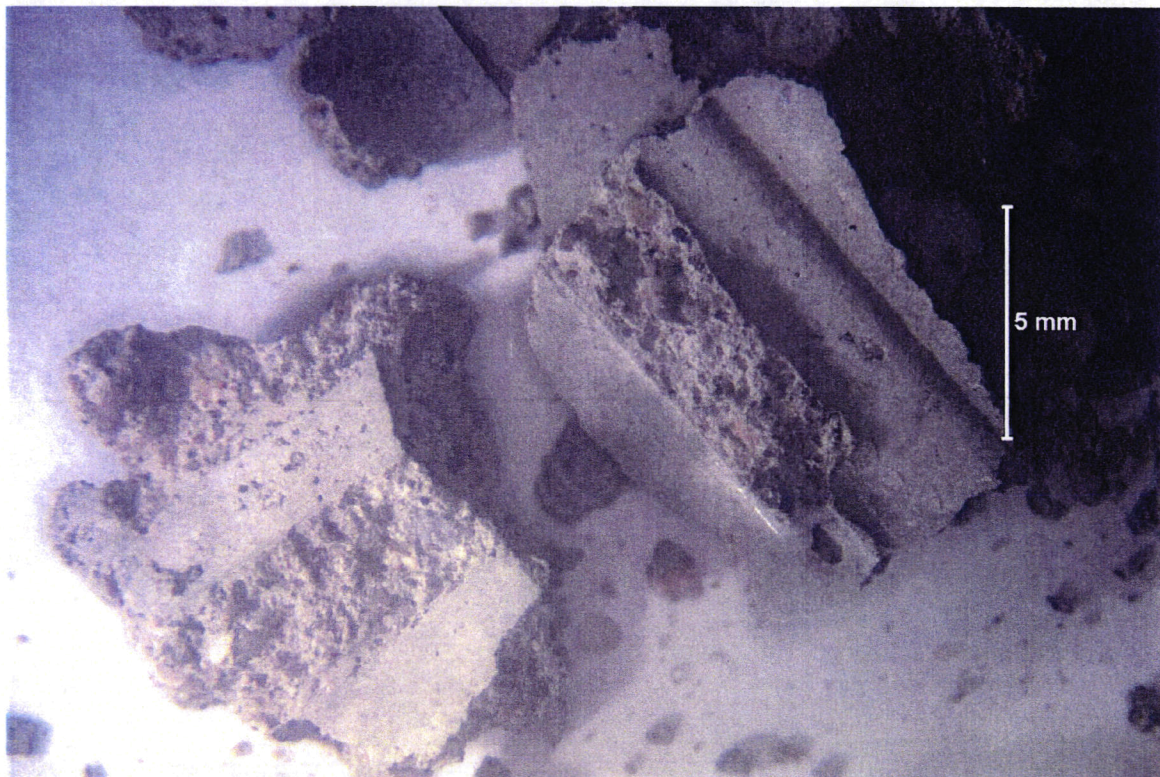
10-03088
LVMPD EVENT#040215-1500

DATE: APRIL 29, 2004



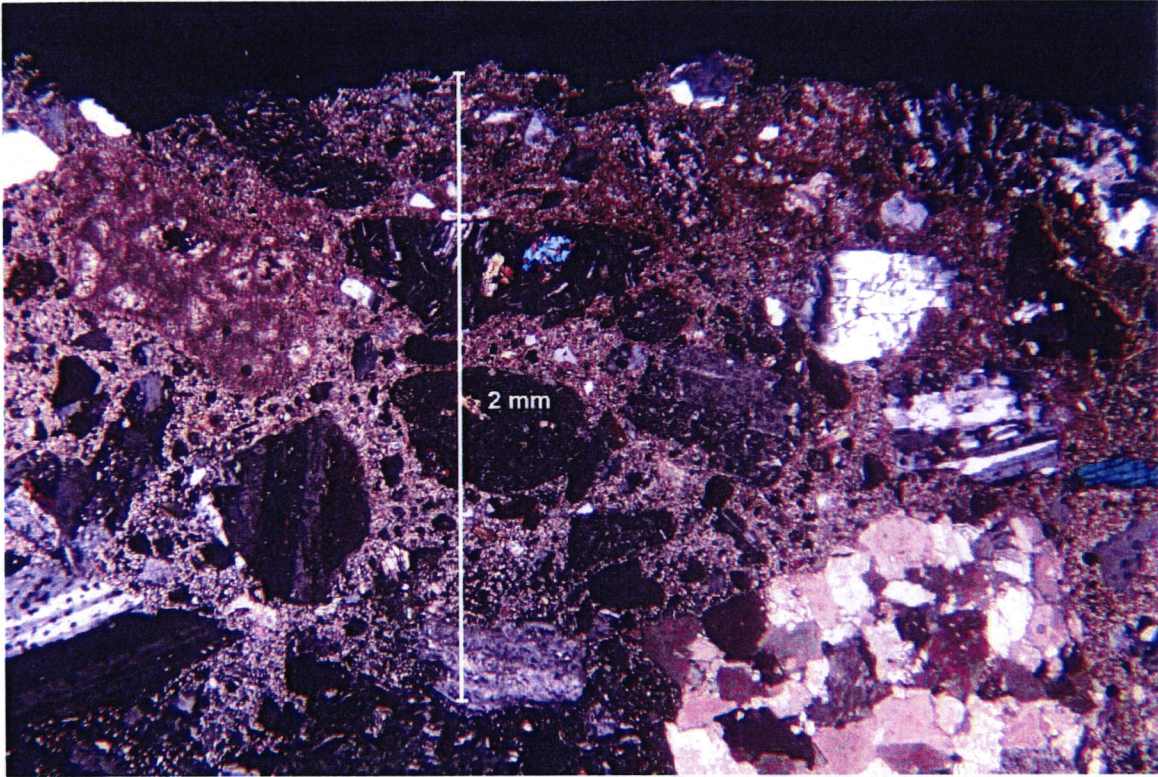
SAMPLE ID: Knife DESCRIPTION: Outer surfaces of concrete splatters removed from knife.

MAG: 7.5x

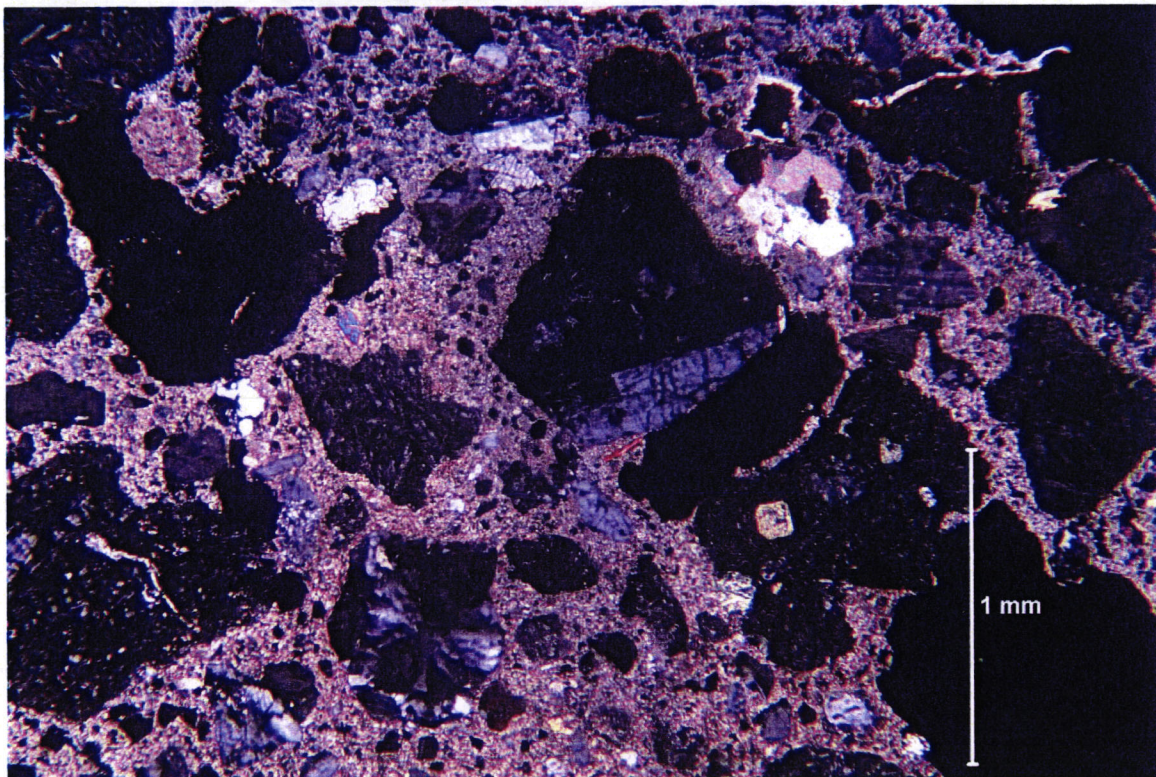


SAMPLE ID: Knife DESCRIPTION: Formed inner surfaces of concrete splatters removed from knife.

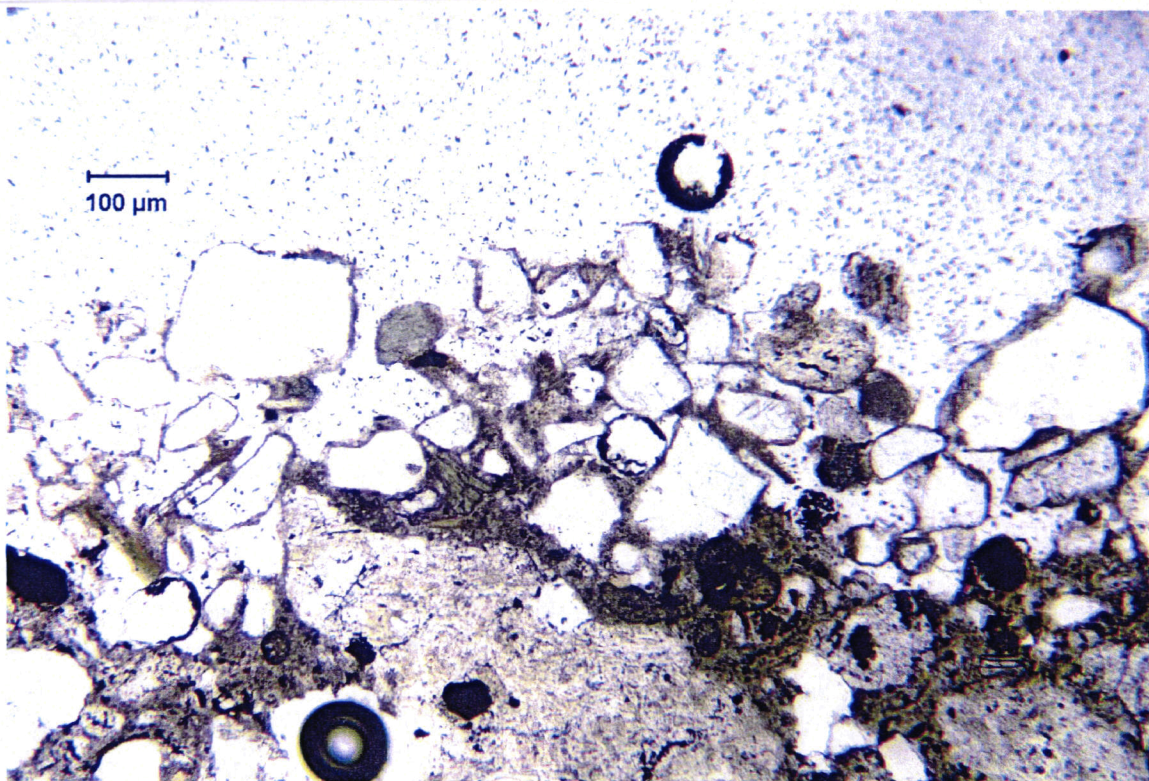
MAG: 7.5x



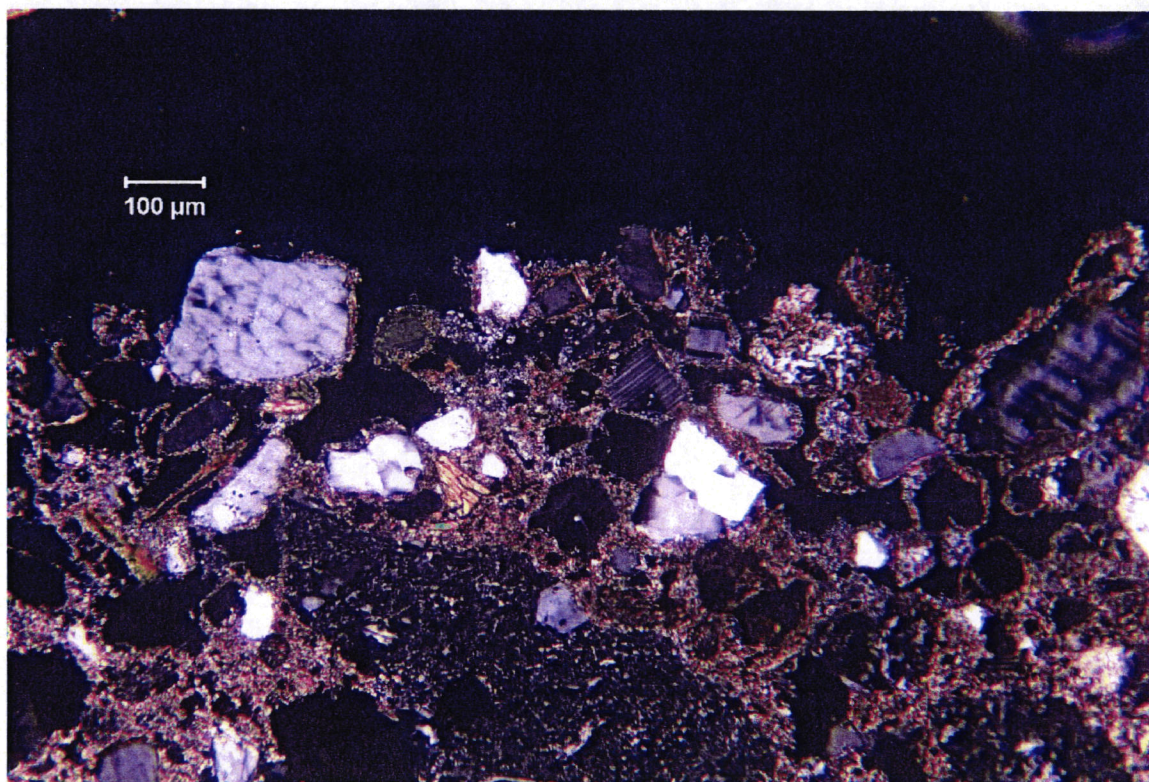
SAMPLE ID: P-2 DESCRIPTION: Carbonation (brightly colored) proceeds to 2mm depth from the victim leg impression (top) in thin section of concrete under cross polarized light.
MAG: 40x



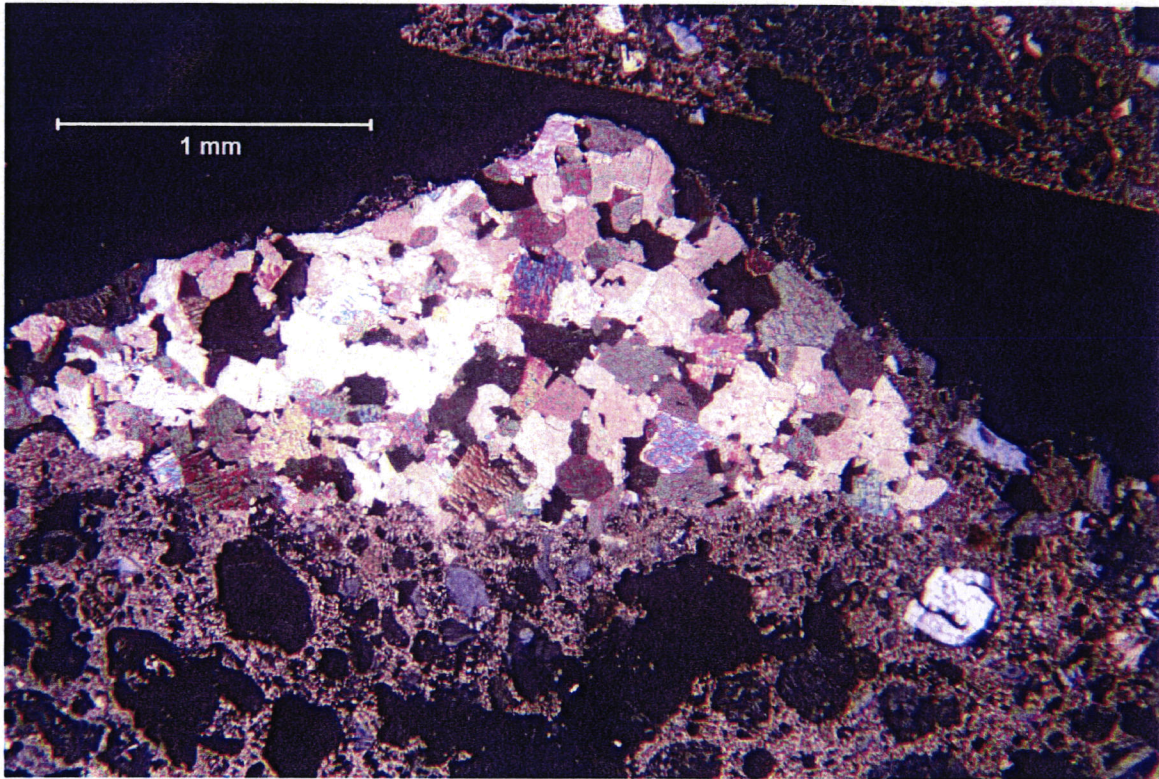
SAMPLE ID: P-3 DESCRIPTION: Carbonated (brightly colored) paste in thin section of concrete under cross polarized light.
MAG: 40x



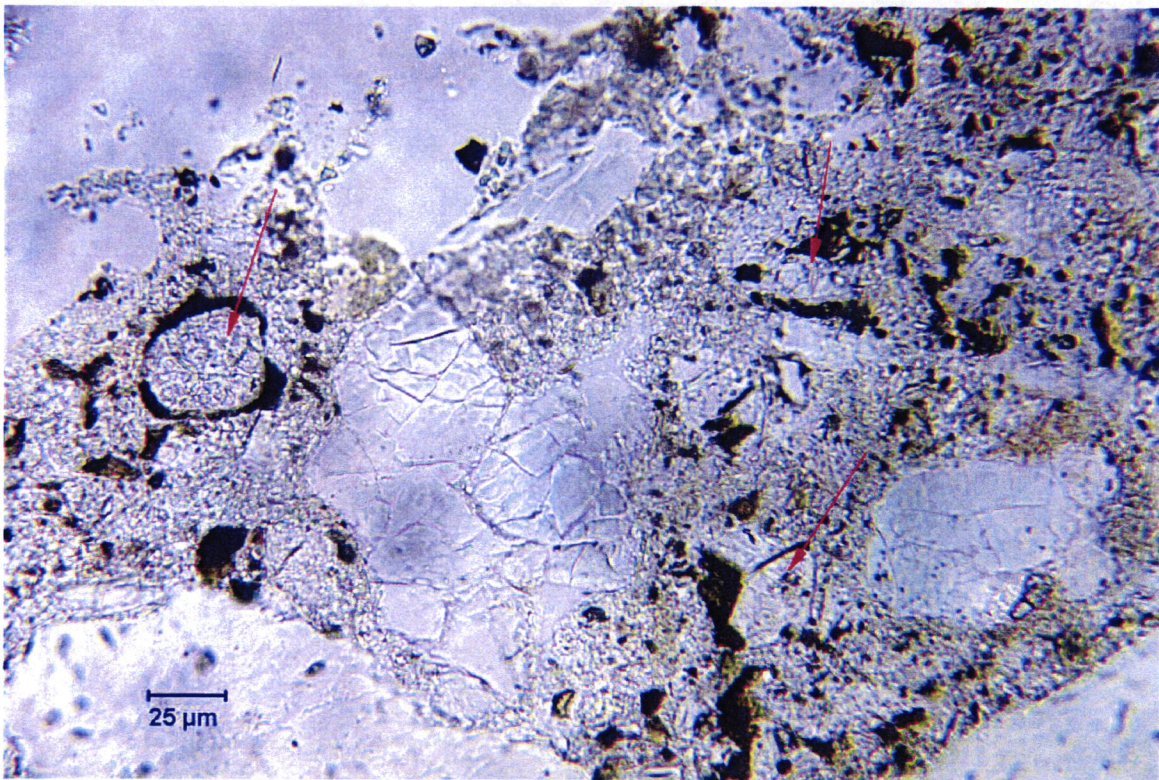
SAMPLE ID: Knife DESCRIPTION: Poorly cemented fine quartz and feldspar sand adhered (?) to the outer surface of a concrete splatter in thin section under plane polarized light.
MAG: 100x



SAMPLE ID: Knife DESCRIPTION: Poorly cemented fine quartz and feldspar sand adhered (?) to the outer surface of a concrete splatter in thin section under plane polarized light.
MAG: 100x



SAMPLE ID: Knife DESCRIPTION: Brightly colored carbonate particle in thin section of concrete splatter under cross polarized light.
MAG: 40x

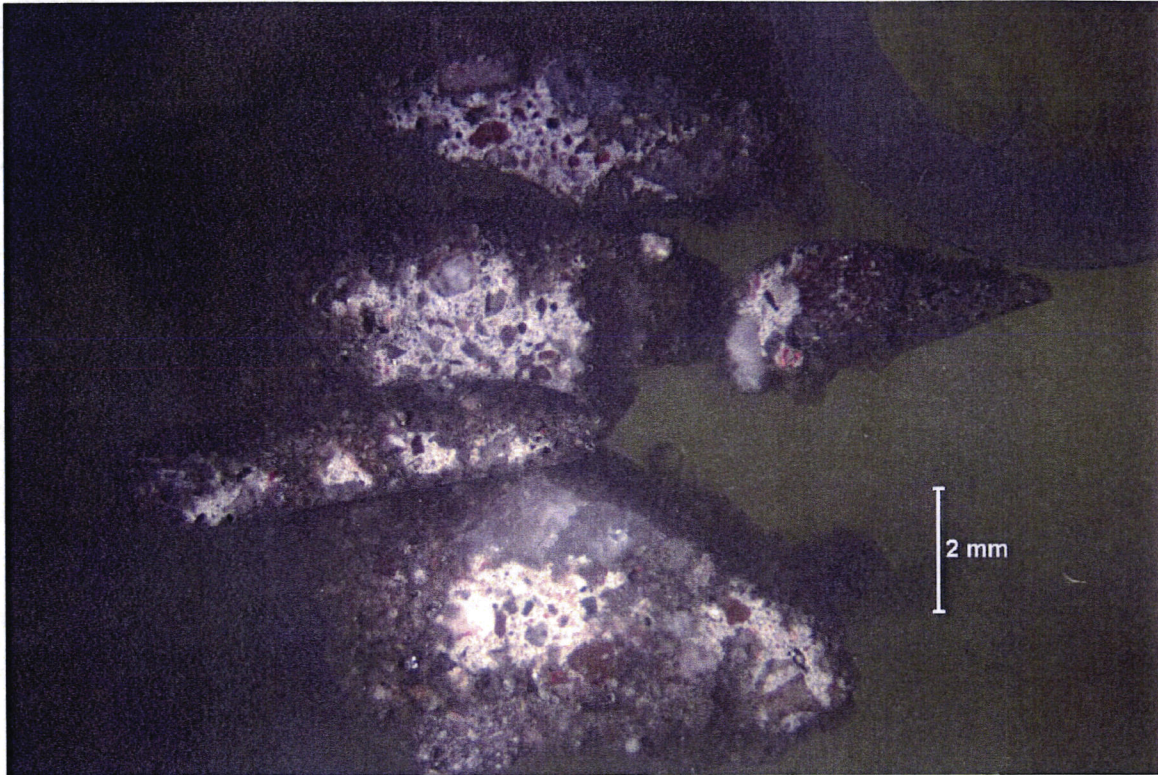


SAMPLE ID: Knife DESCRIPTION: Fully hydrated portland cement clinker relics in thin section of concrete splatter under cross polarized light.
MAG: 400x

APS#
PROJECT:

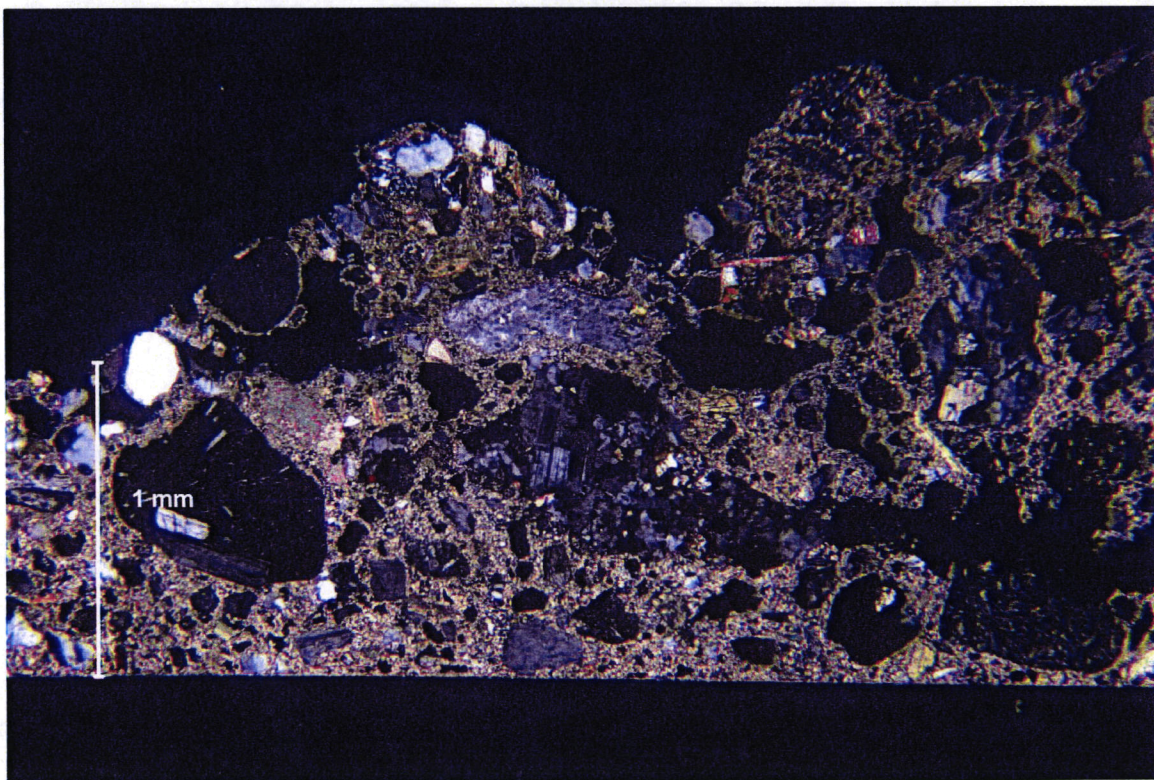
10-03088
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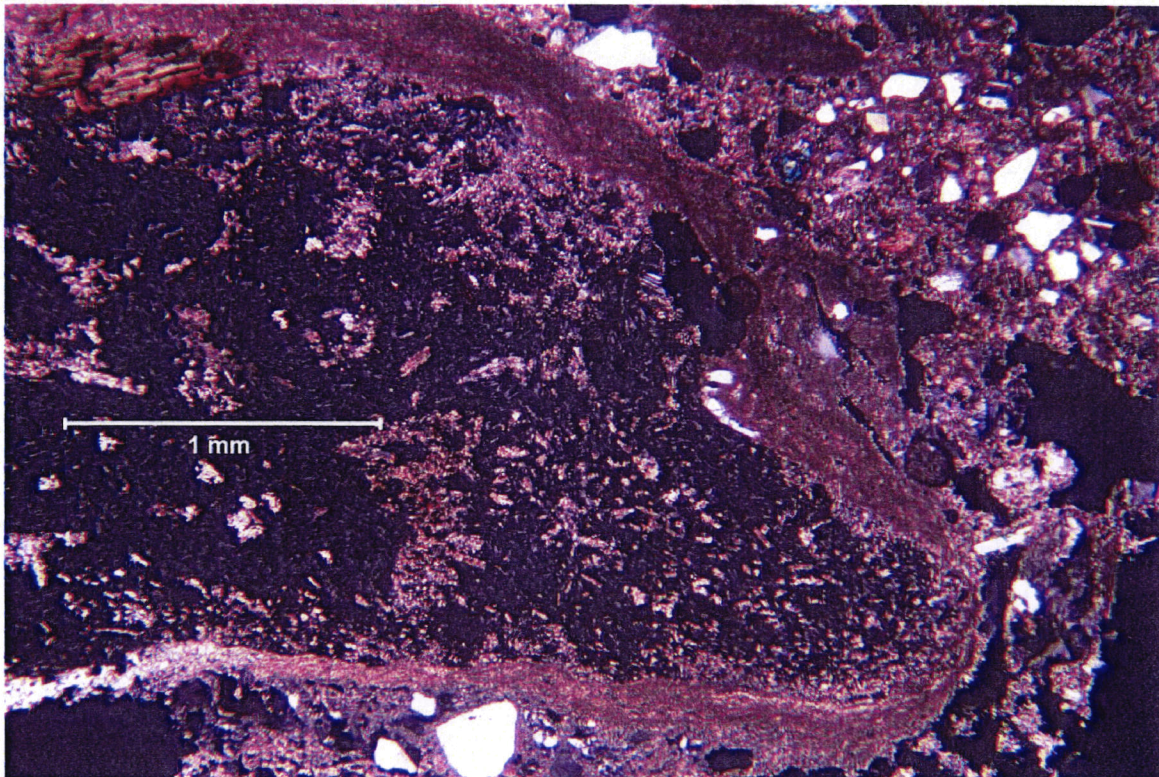
SAMPLE ID: Knife DESCRIPTION: Cross sections of epoxy-impregnated concrete splatters removed from knife.

MAG: 10x



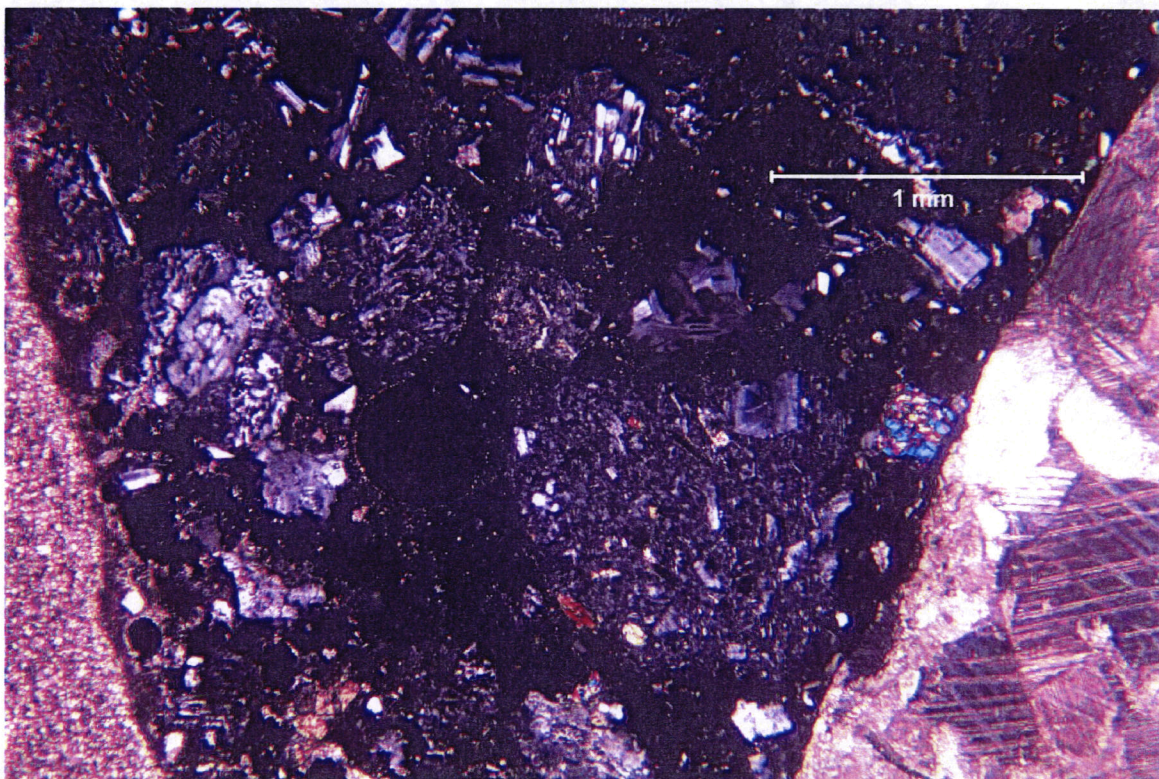
SAMPLE ID: Knife DESCRIPTION: Fully carbonated concrete splatter removed from knife, in thin section under cross polarized light. Smooth formed inner surface of splatter is at bottom of image.

MAG: 40x



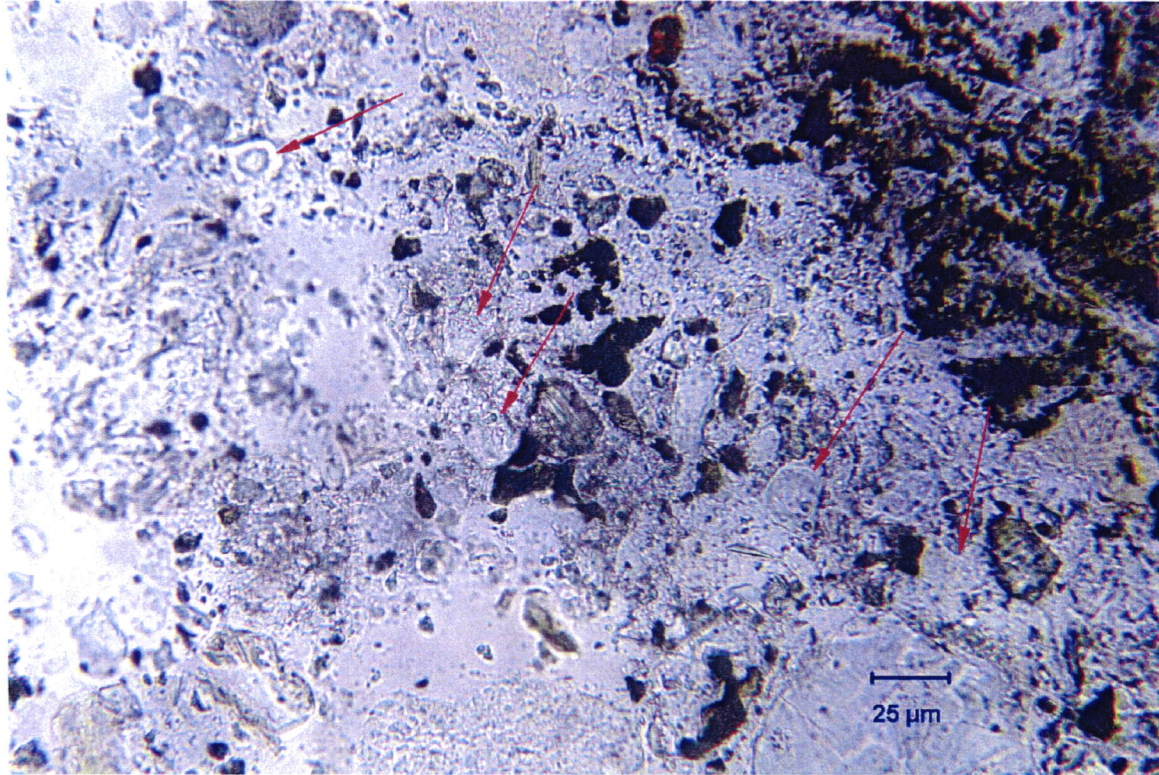
SAMPLE ID: P-1 DESCRIPTION: Carbonate coating a coarse aggregate particle incorporated in the concrete in thin section under cross polarized light.

MAG: 40x

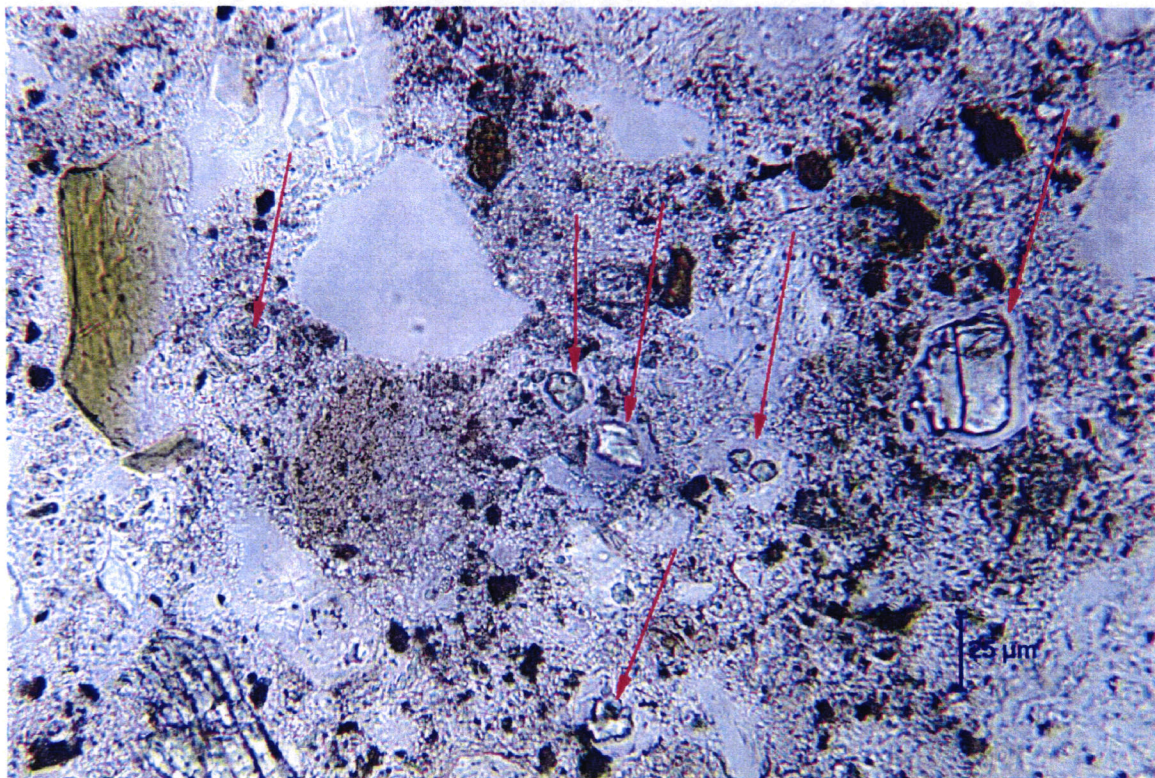


SAMPLE ID: P-1 DESCRIPTION: Mafic extrusive volcanic fine aggregate particles in thin section of concrete under cross polarized light. Note brightly colored carbonate coarse aggregate particles at left and right side of image.

MAG: 40x



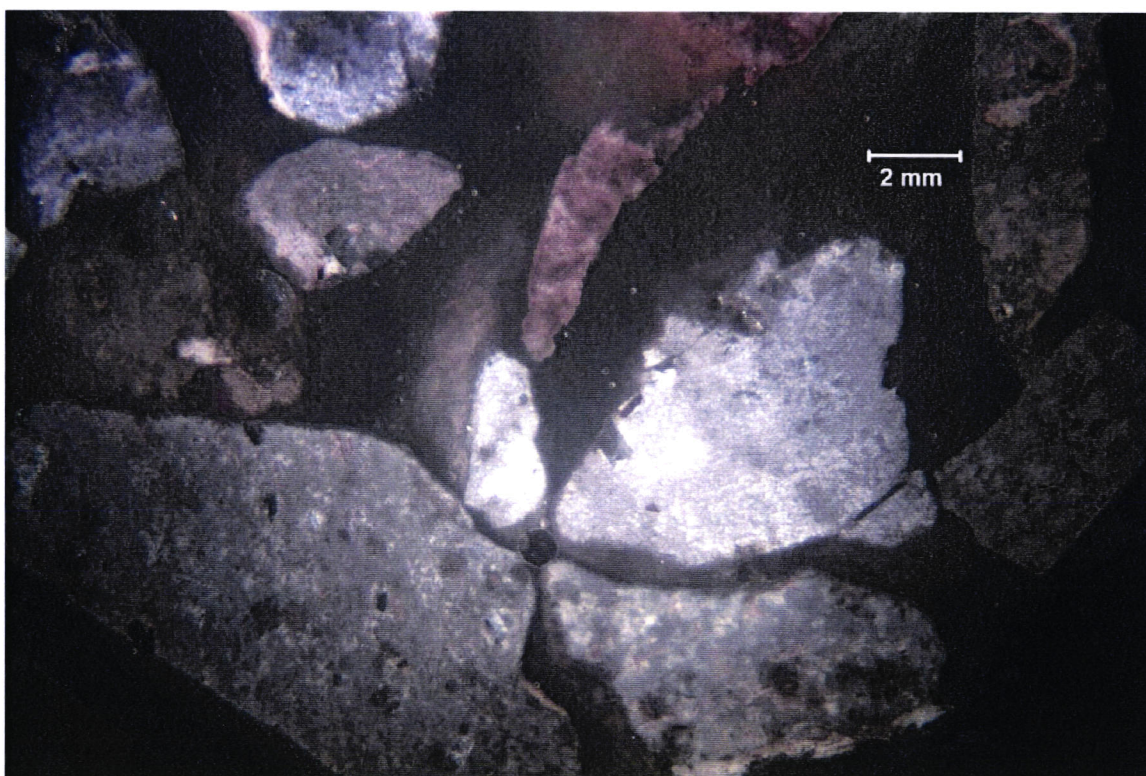
SAMPLE ID: P-2 DESCRIPTION: Well to fully hydrated portland cement clinker particles in thin section of paste under plane polarized light.
MAG: 400x



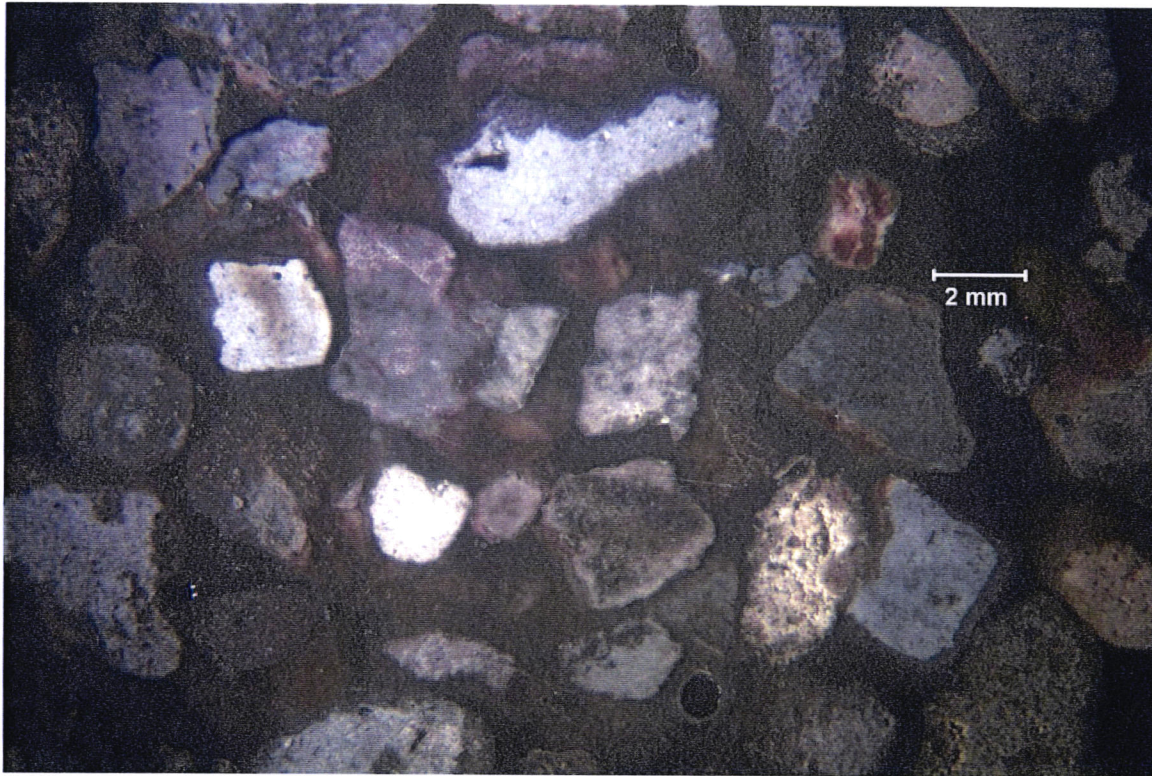
SAMPLE ID: P-3 DESCRIPTION: Well hydrated portland cement clinker particles in thin section of paste under plane polarized light.
MAG: 400x



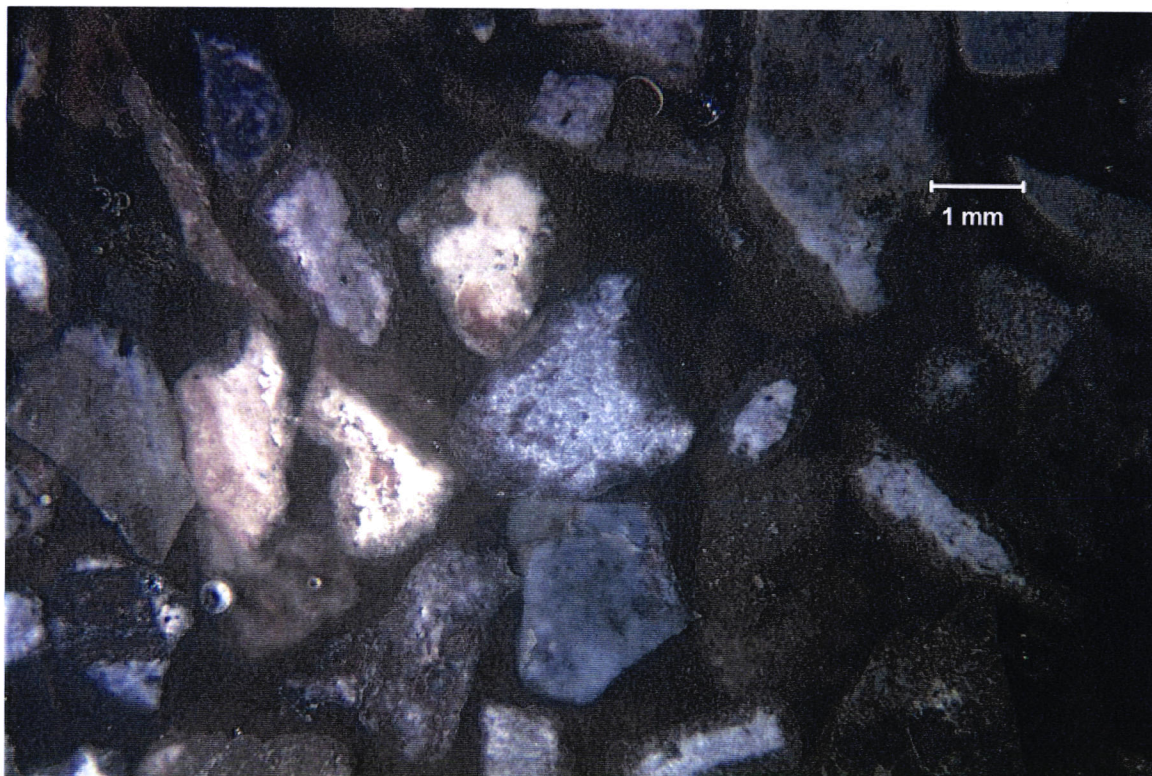
SAMPLE ID: Crime Scene Material DESCRIPTION: Overall view of the basalt aggregate in polished cross section of material retained on the #4 sieve.
MAG: 7.5x



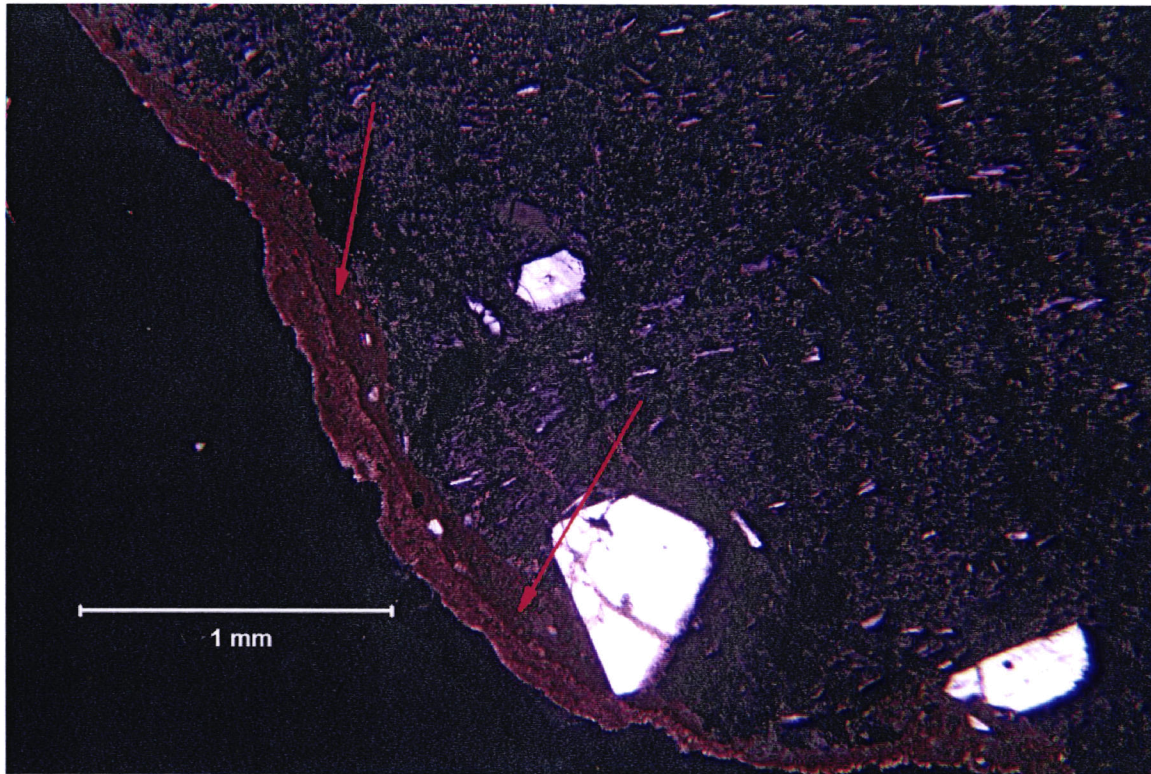
SAMPLE ID: Crime Scene Material DESCRIPTION: Another overall view of the basalt aggregate in polished cross section of material retained on the #4 sieve.
MAG: 7.5x



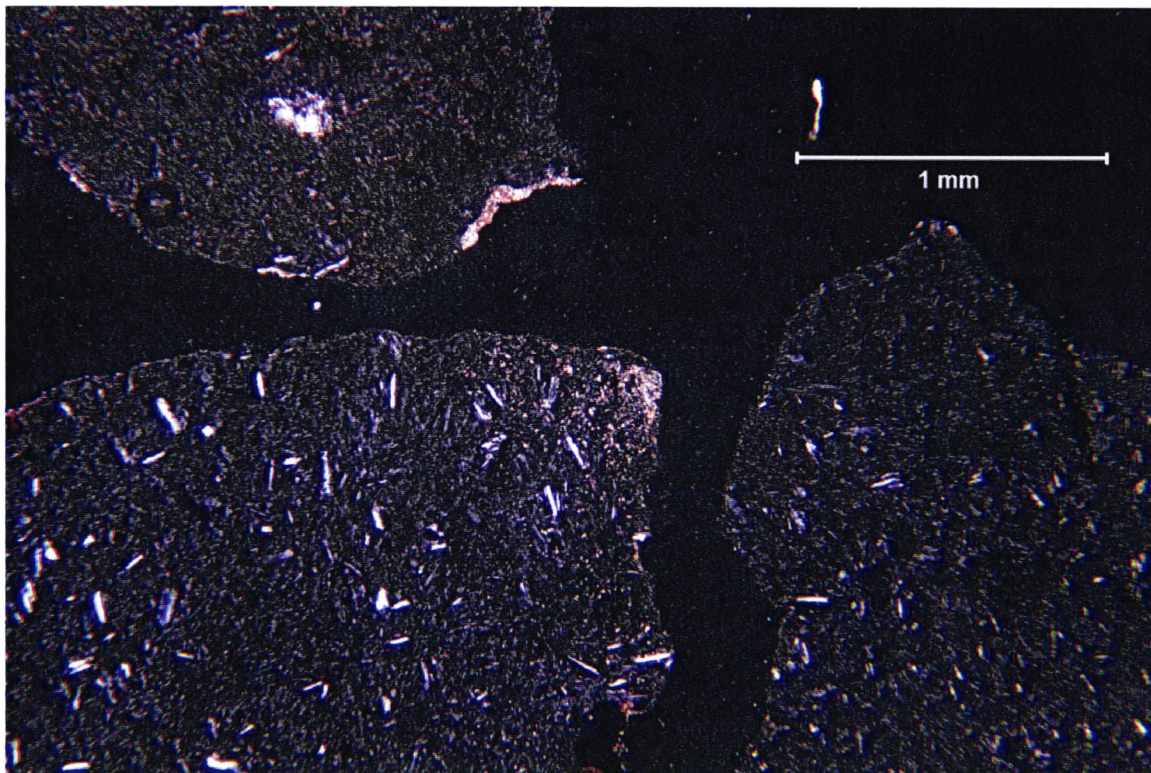
SAMPLE ID: Crime Scene Material DESCRIPTION: Overall view of the basalt-rich aggregate in polished cross section of material retained on the #8 sieve.
MAG: 7.5x



SAMPLE ID: Crime Scene Material DESCRIPTION: Overall view of the basalt-rich aggregate in polished cross section of material retained on the #16 sieve.
MAG: 15x



SAMPLE ID: Crime Scene Material DESCRIPTION: A calcite coated basalt particle in thin section of material retained on the #4 sieve under cross polarized light. The calcite is marked by red arrows.
MAG: 40x

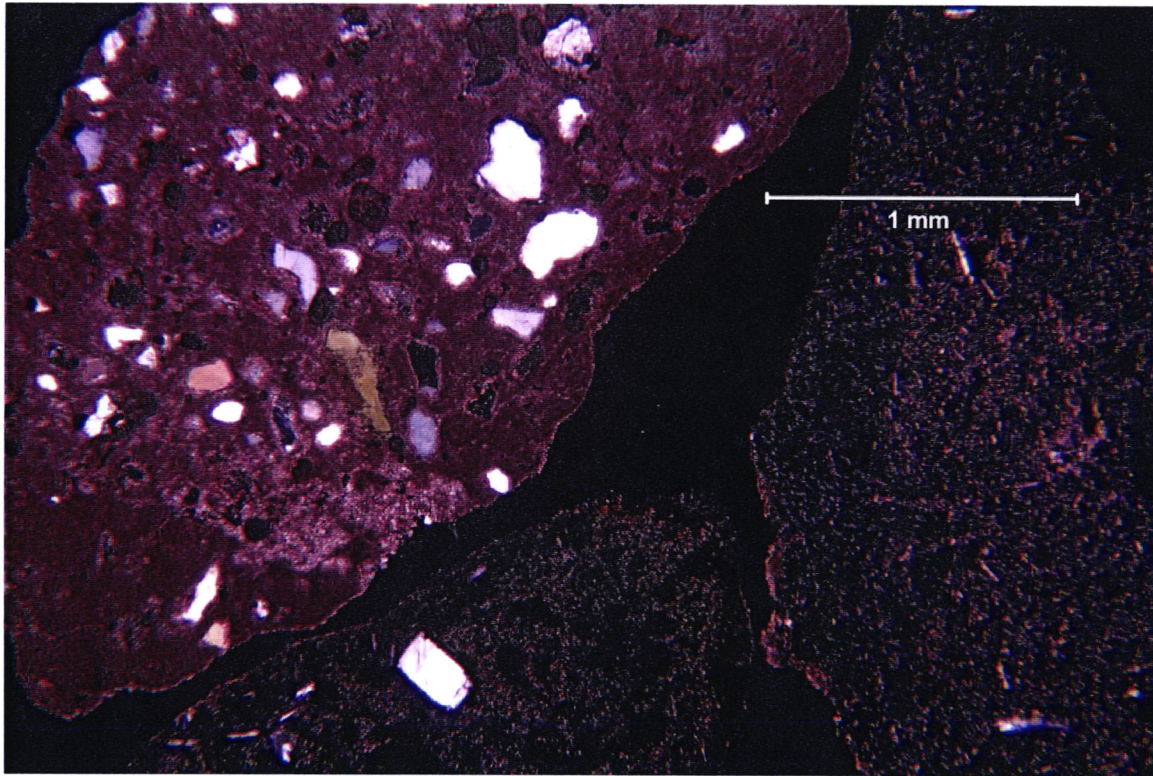


SAMPLE ID: Crime Scene Material DESCRIPTION: Three basalt aggregate particles in thin section of material retained on the #8 sieve under cross polarized light.
MAG: 40x

APS#
PROJECT:

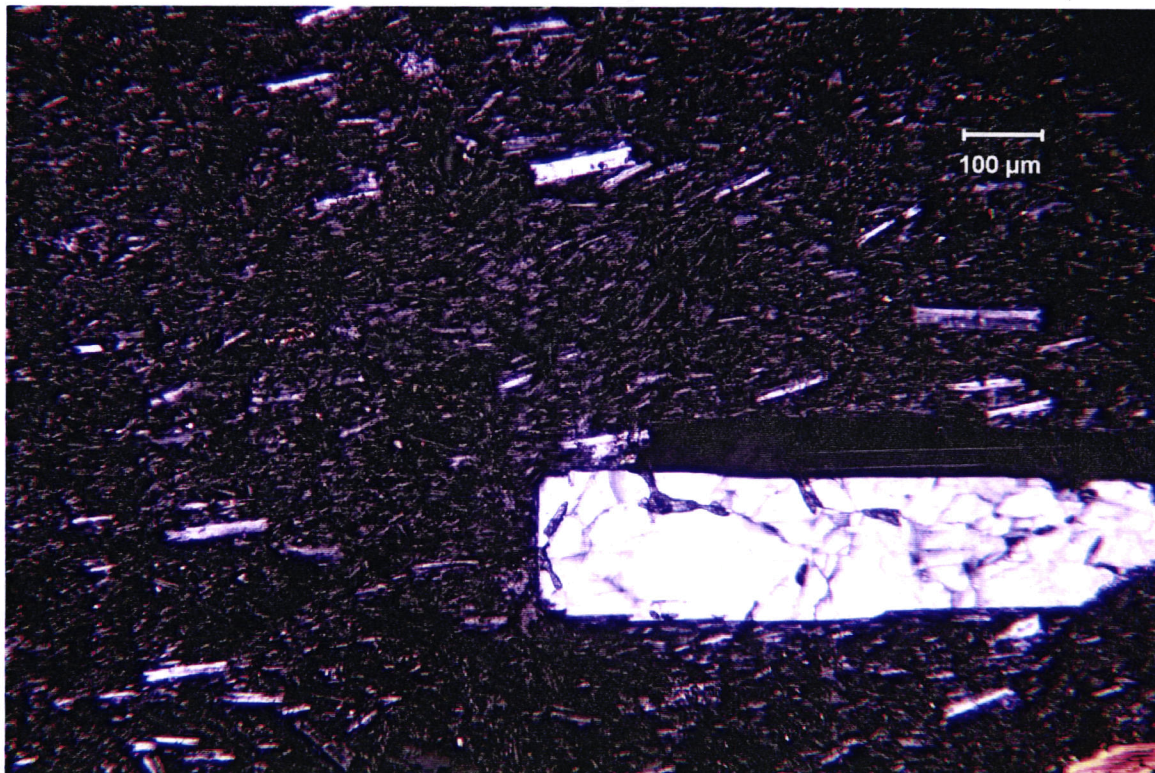
10-03088A
LVMPD EVENT # 040213-1500
Petrographic Analysis of Crime Scene Materials

DATE: JUNE 10, 2004



SAMPLE ID: Crime Scene Material
MAG: 40x

DESCRIPTION: A calcite and two basalt particles in thin section of material retained on the #16 sieve under cross polarized light. The calcite contain bright quartz sand particles.



SAMPLE ID: Crime Scene Material
MAG: 100x

DESCRIPTION: The basalt aggregate particles contain lineated phenocrysts and ground mass (trachytic texture) in thin section under cross polarized light.