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INFRAME

# Cost Effective Pothole Patching

# Patching Materials

- Hot Mix Asphalt
- Cold mix
  - Locally available
  - High-Performance, proprietary

# Cincinnati's Pothole Repair Procedure Using HMA

## CLASS I REPAIR

- Cut area around with a jack hammer
- Clean hole with a brush/broom
- Apply tack
- Place HMA
- Compact using vibratory plate
- Seal edges
- Approx. time for 2-person crew = 30 minutes

## CLASS II REPAIR

- This step not performed
- Clean hole with a brush/broom
- Apply tack
- Place HMA
- Compact using vibratory plate
- Seal edges
- Approx. time for 2-person crew = 15 minutes

# City's Winter Pothole Repair Program

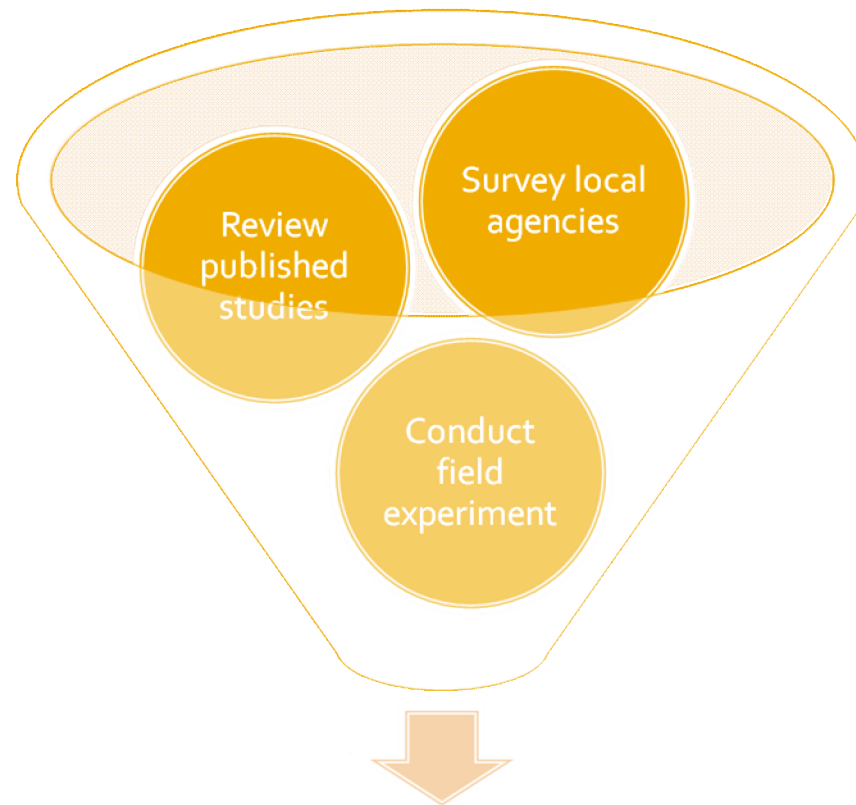
- Emulsion based high-performance material
- Throw (dump) and tamp
- 10 minutes for 2-person crew
- Repairs treated temporary and replaced in Spring



# Study Objectives

- Compare the performance of HMA patching to high-performance cold mix patching
- Verify the assumption that cold mix patching is a temporary solution.

# Tasks



**Prepare recommendations**

# Previous Studies

- SHRP
- ODOT
- NSF
- AASHTO
- DOTs

# SHRP Research

- SHRP H-106, 1991
- 1200 test repairs in US and Canada
- Materials:
  - UPM
  - Perma-Patch
  - QPR2000
  - PennDOT<sub>486</sub>
  - HFMS-2

# SHRP Research Findings

- Quality of repair materials used, not the repair method, is important
- Throw-and-roll method or the spray-injection method produce repairs as durable as those using the more costly and time-consuming semi-permanent method
- Annual savings could range between \$24 million and \$89 million, depending on the rate of adoption.

# Other Studies

- ODOT research
  - Nine asphalt-cement-based materials were tried in field experiments.
  - Two mixes - HPM cold mix and PennDOT 485 cold mix showed satisfactory performance. The HPM cold mix, in particular, performed well under all installation conditions for both rigid and flexible surfaces.
- NSF Study – UPM performed well
- AASHTO Survey:
  - 19 agencies use UPM, reported satisfactory performance

# Pothole Operation in Other Cities

- Telephone survey of 10 cities
- Grand Rapids, Traverse City, Evansville, Louisville, Bloomington, Denver using UPM for 10+ years

# Use of High-Performance Cold Mix in Ohio

City	Mix Type	How long	Comments
Akron	UPM	10 years	Winter installation; dump and go
Cincinnati	UPM/QPR2000	20 years	Winter installation; dump and go/tamp
Cleveland	UPM	30 years	Temporary patch
Dayton	UPM	30 years	Hand tamped; 2-3 years life
Toledo	UPM	20 years	Dump and temp/roll; 75% last a long time



**What is UPM?**



## Unique's Heavy-Duty Patching Material... UPM

### Permanent Pavement Repairs Easily in any Weather

■ UPM's super high-performance will save you time and money patching potholes – or your money back!

■ Over 90% of all UPM patches outlast the surrounding pavement. Unique has been making UPM for almost 30 years – and we are not afraid to guarantee it.

For detailed UPM product information call (800) 441-4881.

On-site demonstrations throughout North America.



**PREPARE** the area by sweeping and removing loose debris.



**APPLY** the ready-to-use material.



**COMPACT** using any blunt object, or by slowly driving back and forth over it.

# Field Experiment

- 30 installations
- Compare performance of Cincinnati's Class I repairs with UPM

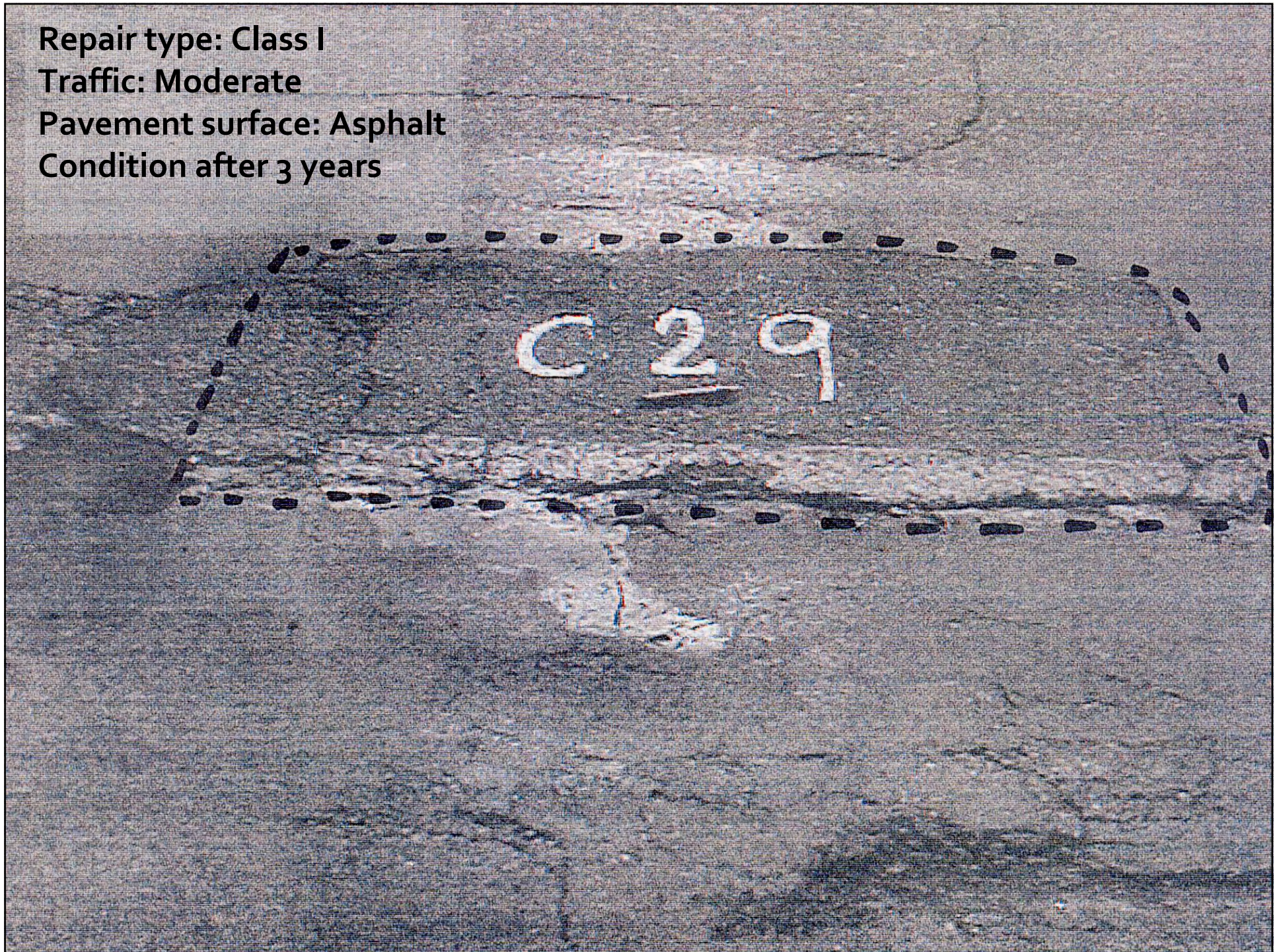


Repair type: Class I

Traffic: Moderate

Pavement surface: Asphalt

Condition after 3 years





Repair type: Class I

Traffic: Heavy

Pavement surface: Concrete

Condition after 3 years



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Repair type: Class I

Traffic: Heavy

Pavement surface: Asphalt

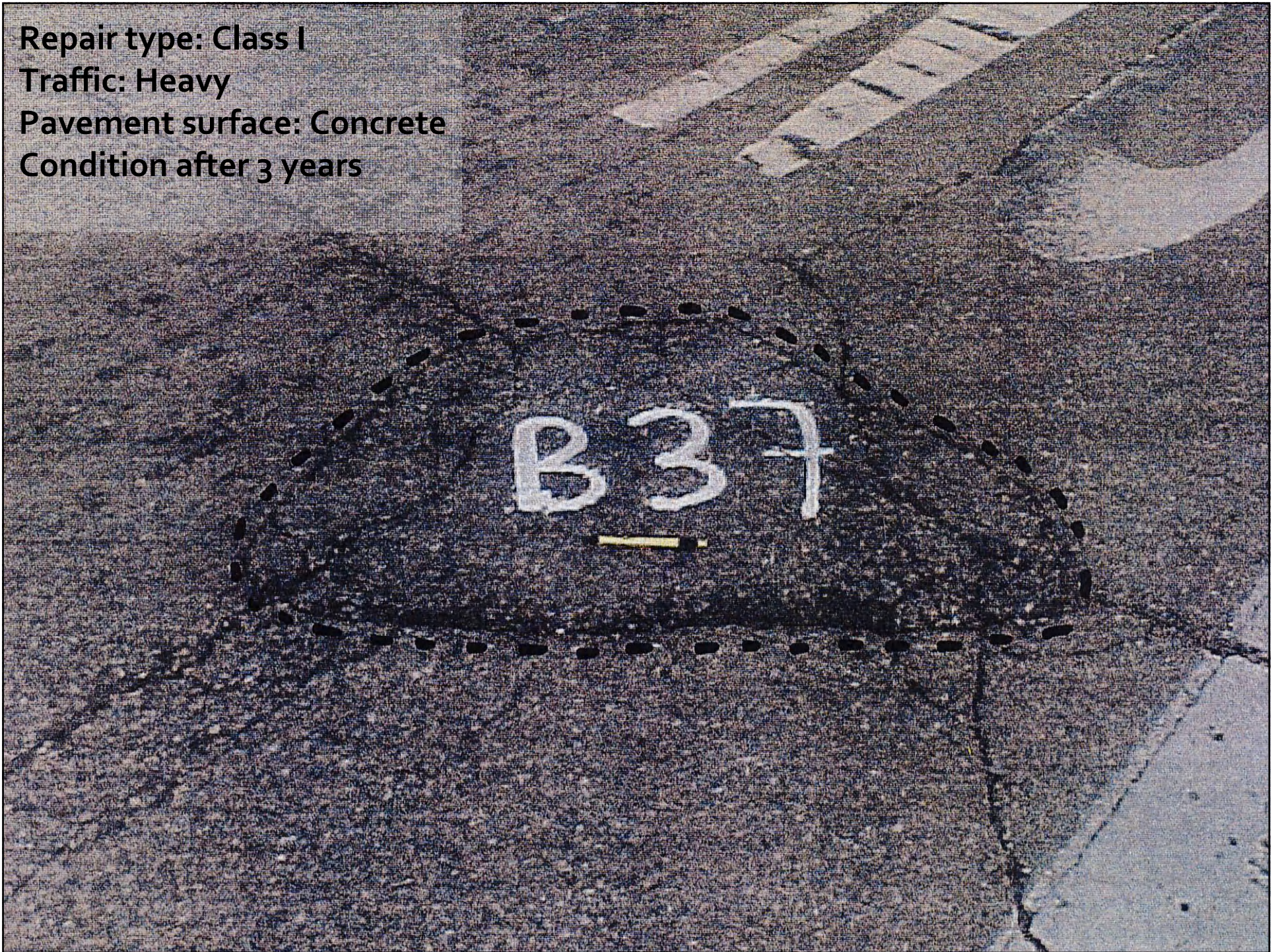
Condition after 3 years

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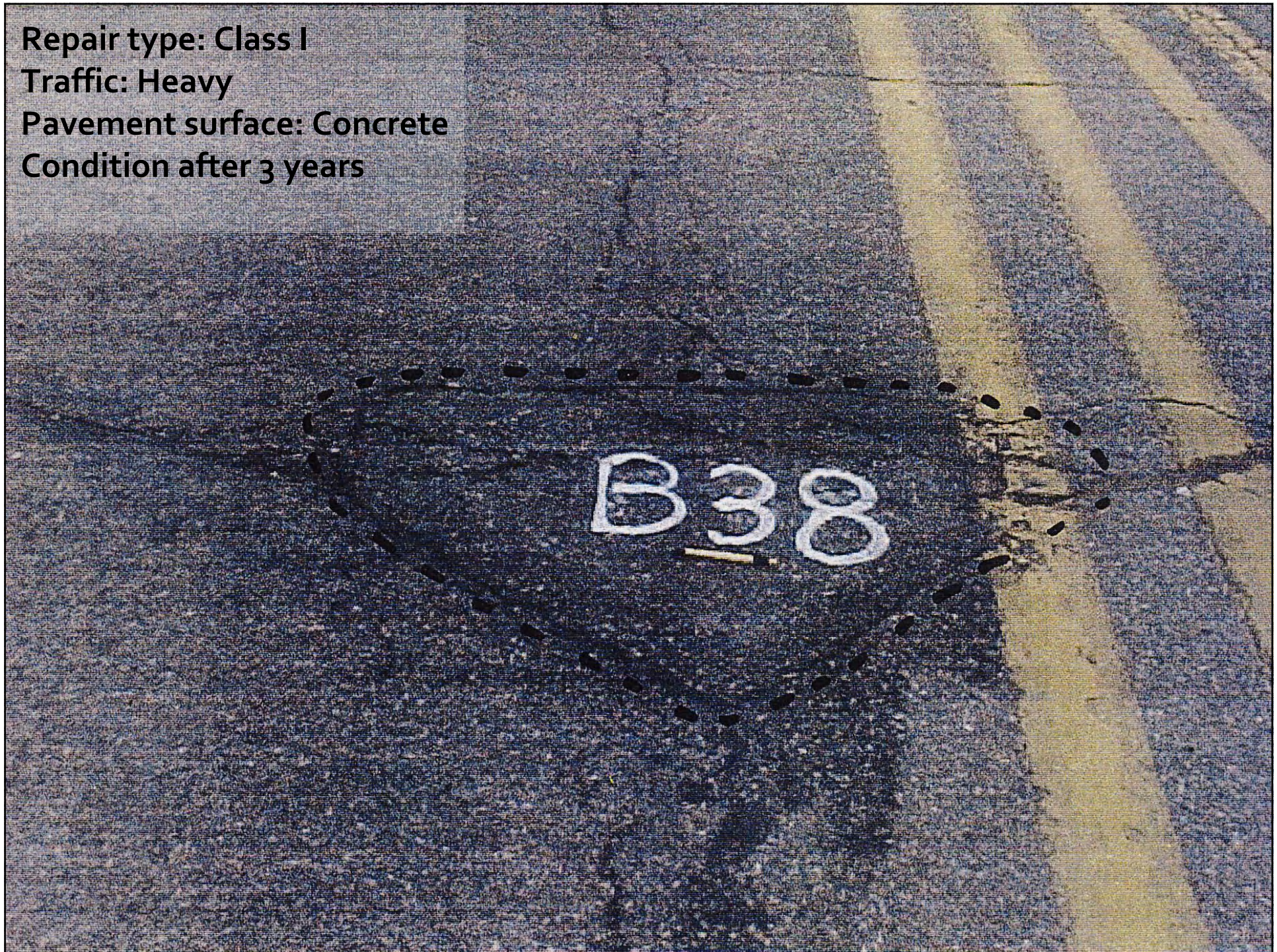


Repair type: Class I  
Traffic: Heavy  
Pavement surface: Concrete  
Condition after 3 years



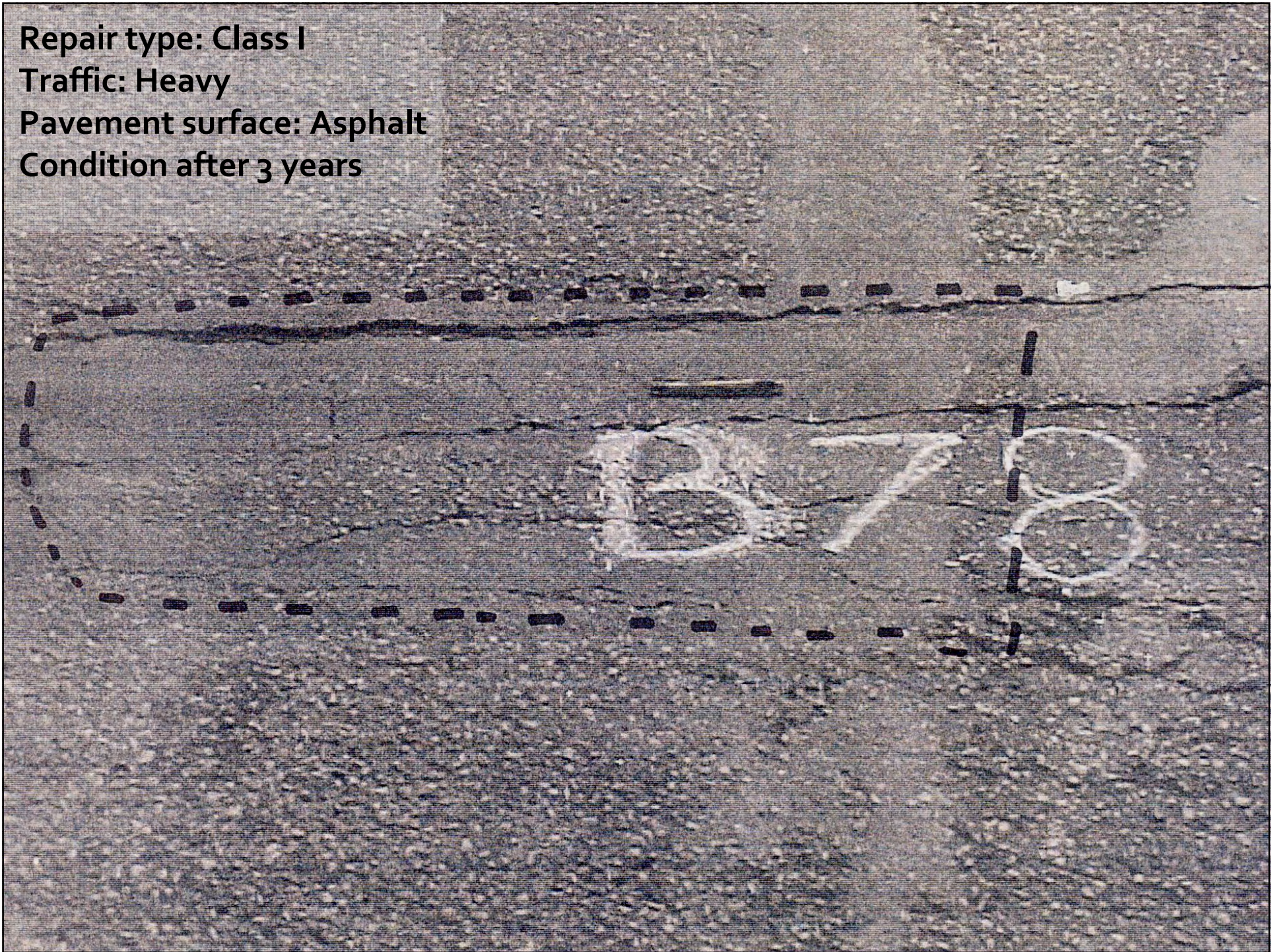


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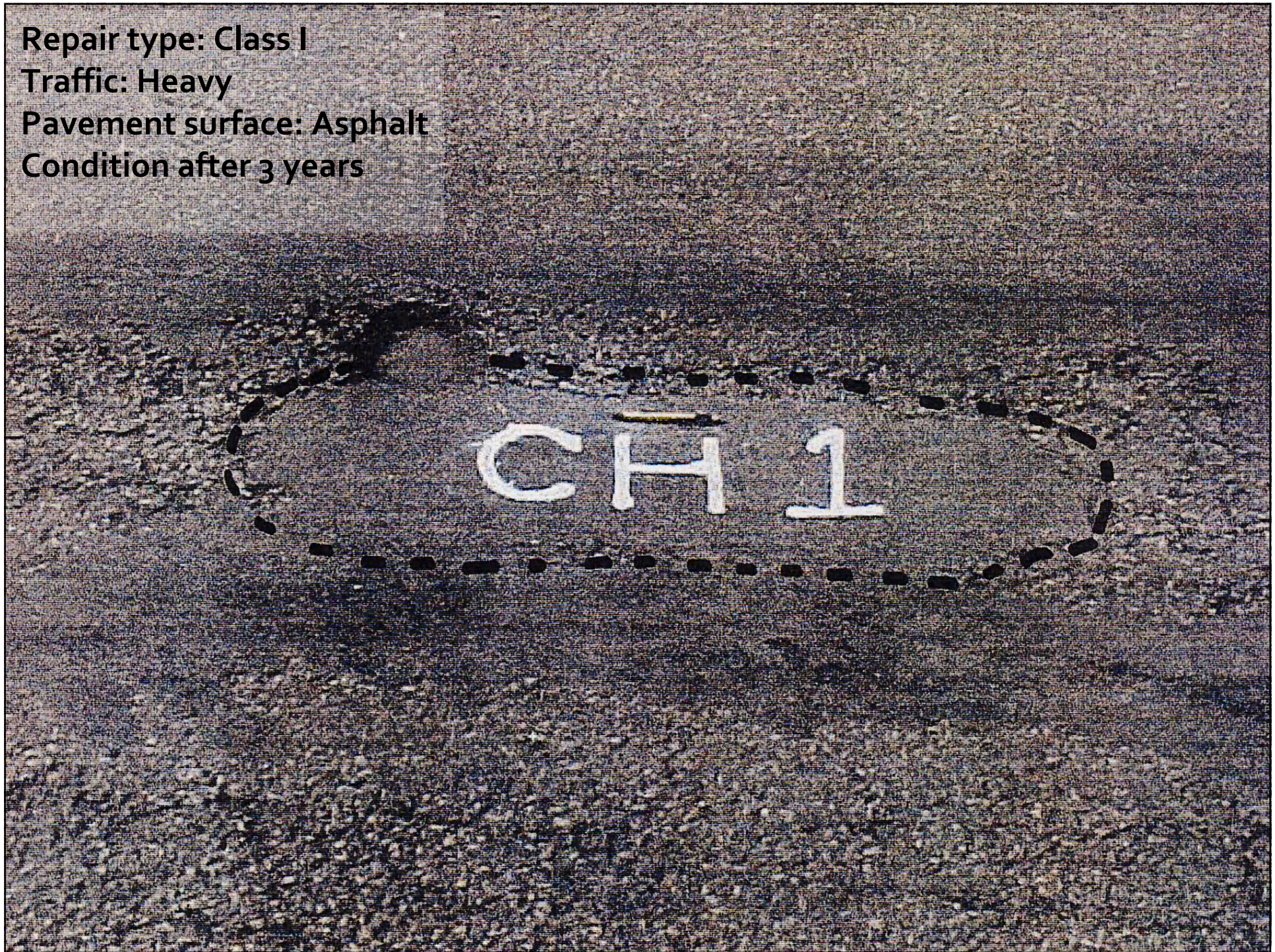


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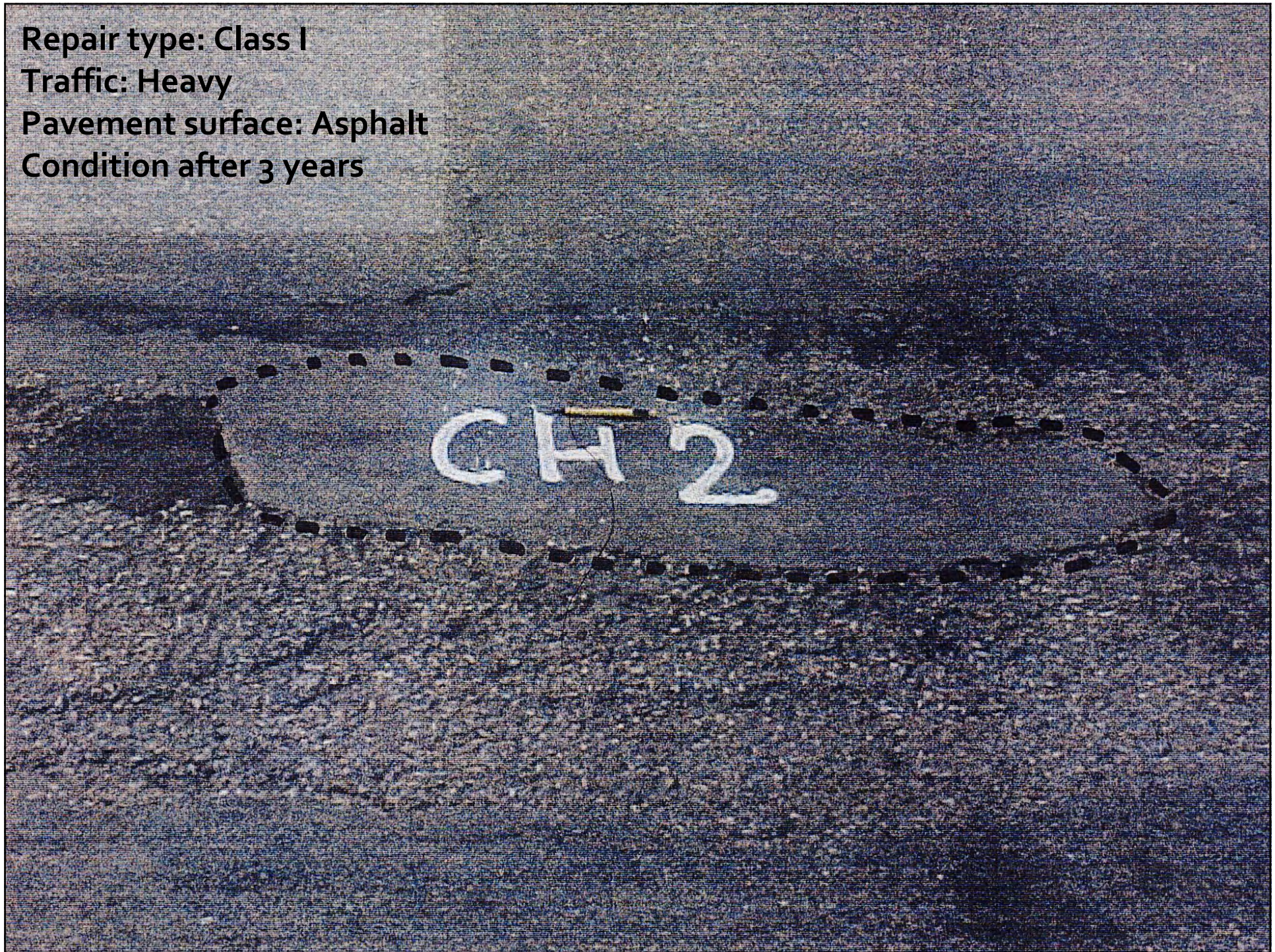


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**Traffic: Heavy**

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**Condition after 3 years**



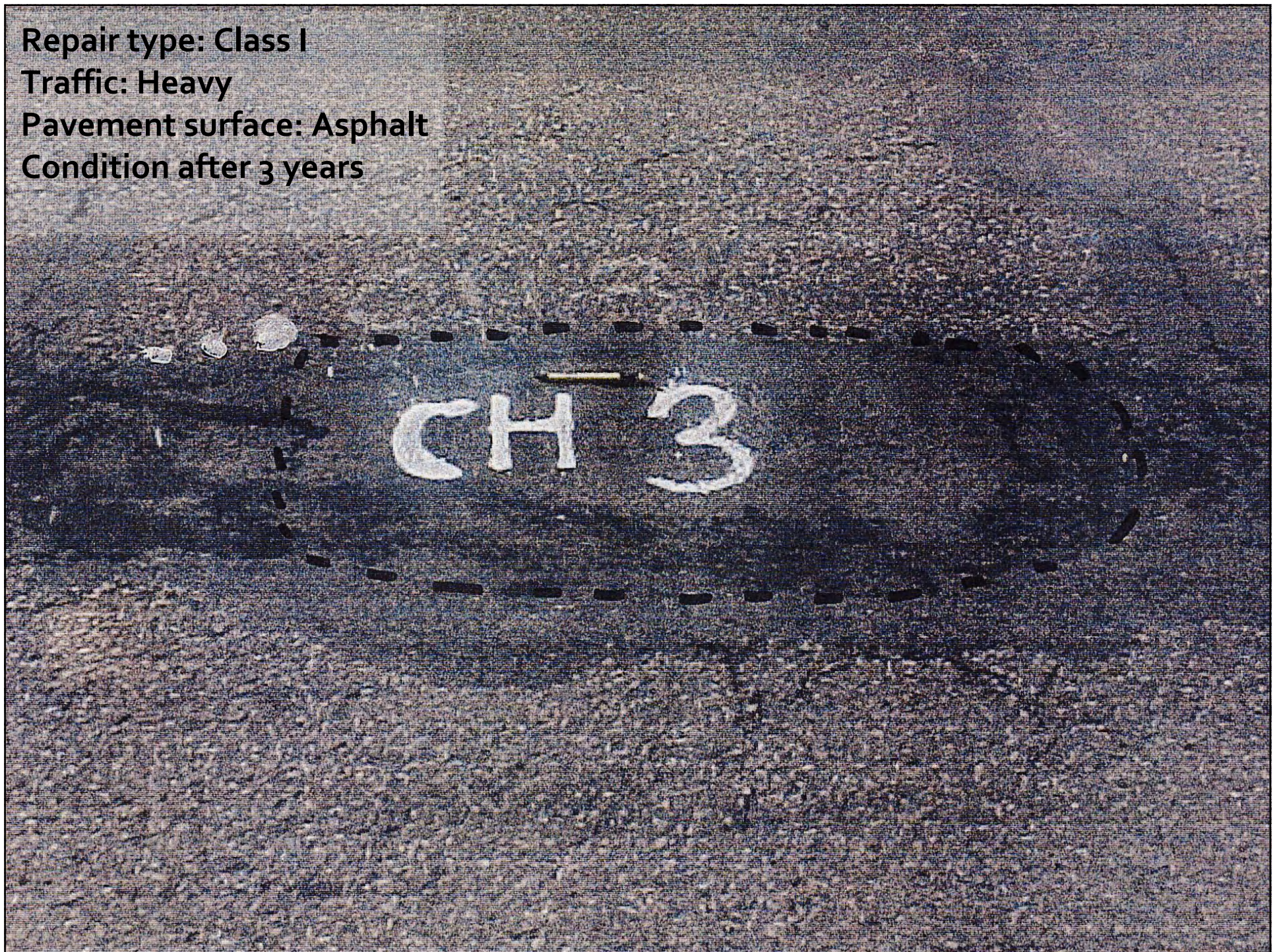


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Repair type: Class I  
Traffic: Heavy  
Pavement surface: Concrete  
Condition after 3 years



CH6

A photograph of a concrete pavement surface. In the center, there is a circular area outlined by a dashed black line. Inside this circle, the letters 'CH6' are painted in white. A small, thin, yellowish object is resting on the pavement just above the 'CH6' text. The surrounding pavement is a dark, textured grey.



**Repair type: Class I**

**Traffic: Moderate**

**Pavement surface: Asphalt**

**Condition after 3 years**





# Condition Analysis

- HMA Class I repairs
  - Some distress was noticed in all repairs within 7 to 10 months after repair
  - Severity of distress increased with time
- UPM repairs
  - Minimal to no distress after three years



# Cost Analysis

	HMA	UPM
Cost per typical 50 lb repair		
Material cost	\$0.62 (@ \$25/ton)	\$1.50 (@ \$60/ton)
Labor cost	\$20.00 (30 minutes)	\$6.67 (10 minutes)
Equipment cost	\$0.38	\$0.38
Total Cost	\$21.00	\$8.55

**Table 21. Summary of inputs for cost-effectiveness examples**

Input	Example Number				
	1	2	3	4	5
Material Type	Local	UPM	Local	Spray injection	Local
Repair Procedure	Throw-and-roll	Throw-and-roll	Semi-permanent	Spray injection	Throw-and-roll
Material Cost (\$/ton)	20	85	20	0	20
Wages for Repair Crew (\$/day)	300	300	600	0	300
Wages for Traffic Control (\$/day)	250	250	250	250	250
Equipment Cost for Repair Crew (\$/day)	50	50	100	900	50
Equipment Cost for Traffic Control (\$/day)	30	30	30	30	30
Productivity (tons/day)	4.0	4.0	1.5	4.0	4.0
Initial Need (tons)	200	200	75	200	200
User Delay Costs (\$/day)	1,000	1,000	1,000	1,000	10,000
Estimated Repair Life (months)	3	21	12	21	3
Estimated 5 year Cost (\$, without user delay)	710,000	138,570	252,000	168,570	710,000
Estimated 5 year Cost (\$, with user delay)	1,710,000	281,430	502,000	311,430	10,710,000
Cost-effectiveness (\$/ft <sup>3</sup> of initial need—without user delay)	44.38	8.66	42.08	10.54	44.38
Cost-effectiveness (\$/ft <sup>3</sup> of initial need—with user delay)	106.88	17.59	83.75	19.46	669.38

Note: This chart is a duplication of Table 21, *Summary of inputs for cost-effectiveness examples*, found on page 76 of SHRP-H-353, INNOVATIVE MATERIALS DEVELOPMENT AND TESTING VOLUME 2: POTHOLE REPAIR (1991).

# Conclusions

- UPM (high-performance cold mix) performed than conventional HMA patching material
- Present study reinforces findings from past research
- High-performance cold mix repairs should not be viewed as temporary repairs

**Thank you**