



RAP Aggregate Quality

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RAP ETG

December 17, 2009

Seattle, WA

Reclaimed Material



Reclaimed Material

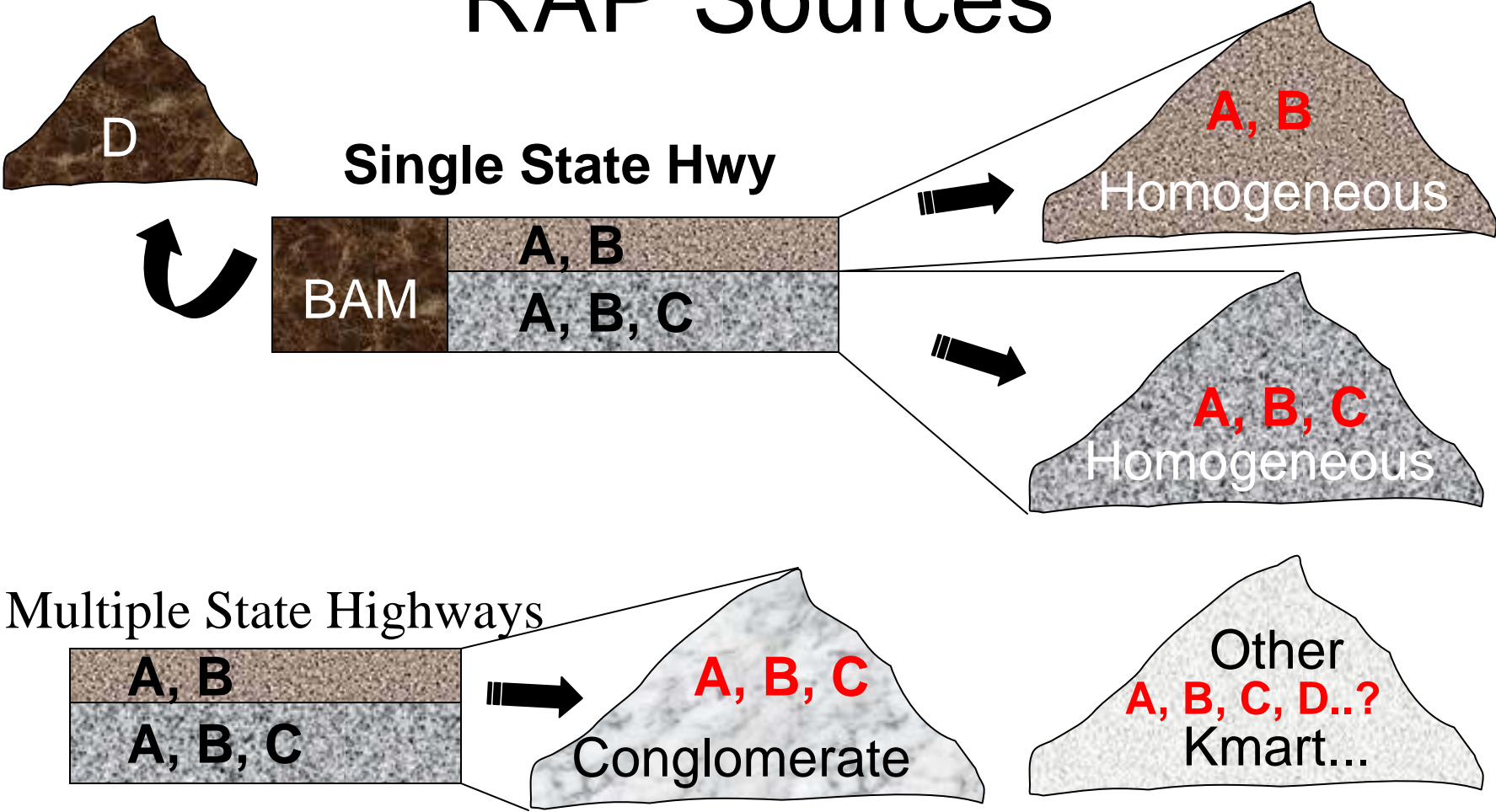
A photograph of a large industrial site, likely a recycling or waste processing facility. The foreground is dominated by large, dark piles of material, possibly crushed concrete or asphalt. In the background, there is a large, light-colored building with an American flag on top. The sky is overcast and grey.

We have quantity
But what about
Quality?

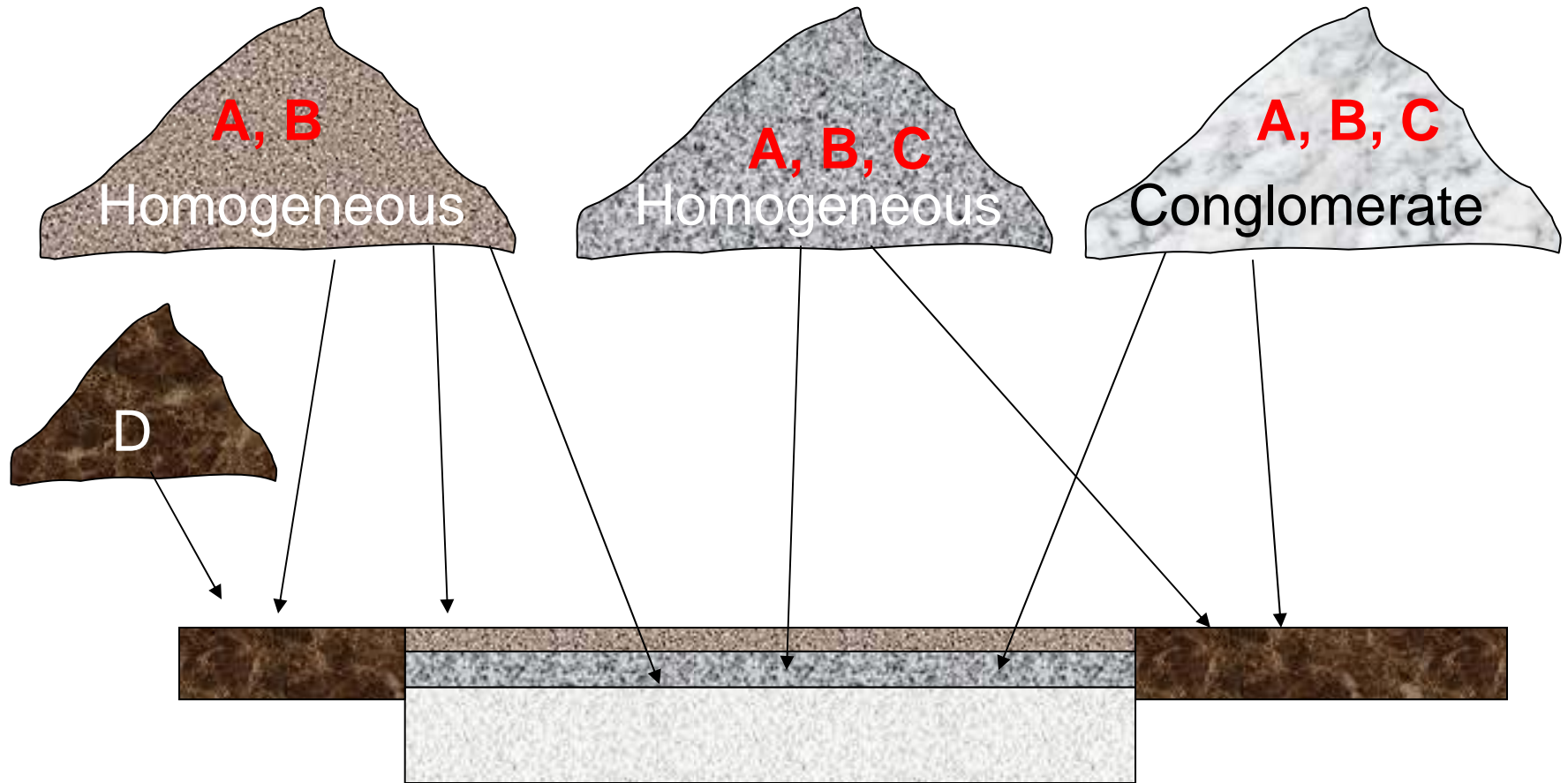


Reclaimed Material

RAP Sources



New Overlays



Coarse Aggregate Quality

Test	A	B	C	D
NaSO4 Soundness	15	15	20	25
LA Abrasion- Max loss	40	40	40	45
Max % Deleterious				
Shale	1.0	2.0	4.0	-
Clay Lumps	0.25	0.5	0.5	-
Coal & Lignite	0.25	-	-	-
Soft and Unsound	4.0	6.0	8.0	-
Other Deleterious	4.0	2.0	2.0	-
Total Deleterious	5.0	6.0	10.0	-



Illinois' Quality of RAP Study

Questions?

- How to prepare RAP for Testing?
- Which quality test to use?

Study

- 12 aggregates tested using normal tests
 - Sodium Sulfate Soundness
 - Los Angeles Abrasion
 - Illinois' Deleterious Count
 - Plus MicroDeval Testing
- AC added to aggregates
- Aged 24 hours
- Either used Ignition Oven or Extraction to remove AC
- Aggregates tested again

How to prepare RAP for testing?

- Use as is
- Use Ignition Oven Samples
- Use Extracted Samples

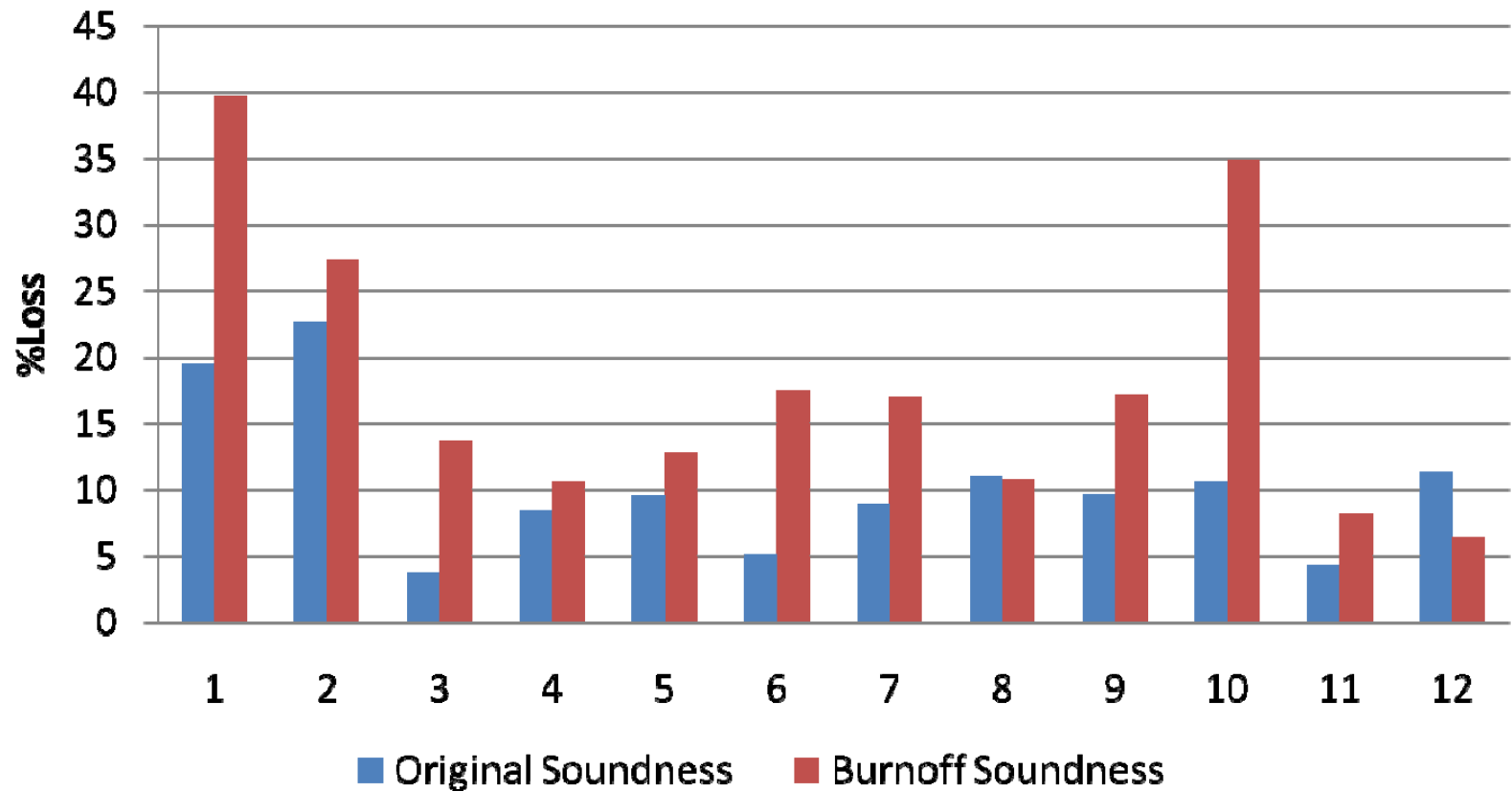
Use As Is

- Material cannot be oven dried
- Material would contaminate testing equipment
- AC does not allow for normal testing

Ignition Oven

- Aggregate is “damaged” during burn off
 - Erroneous Results
 - Soundness Example (#12 is actual RAP)
- Illinois has aggregates that chemically change when ignited

Ignition Oven Soundness



Extracted Samples

- Little to zero breakdown of aggregates
- Can be oven dried
- No damage to equipment

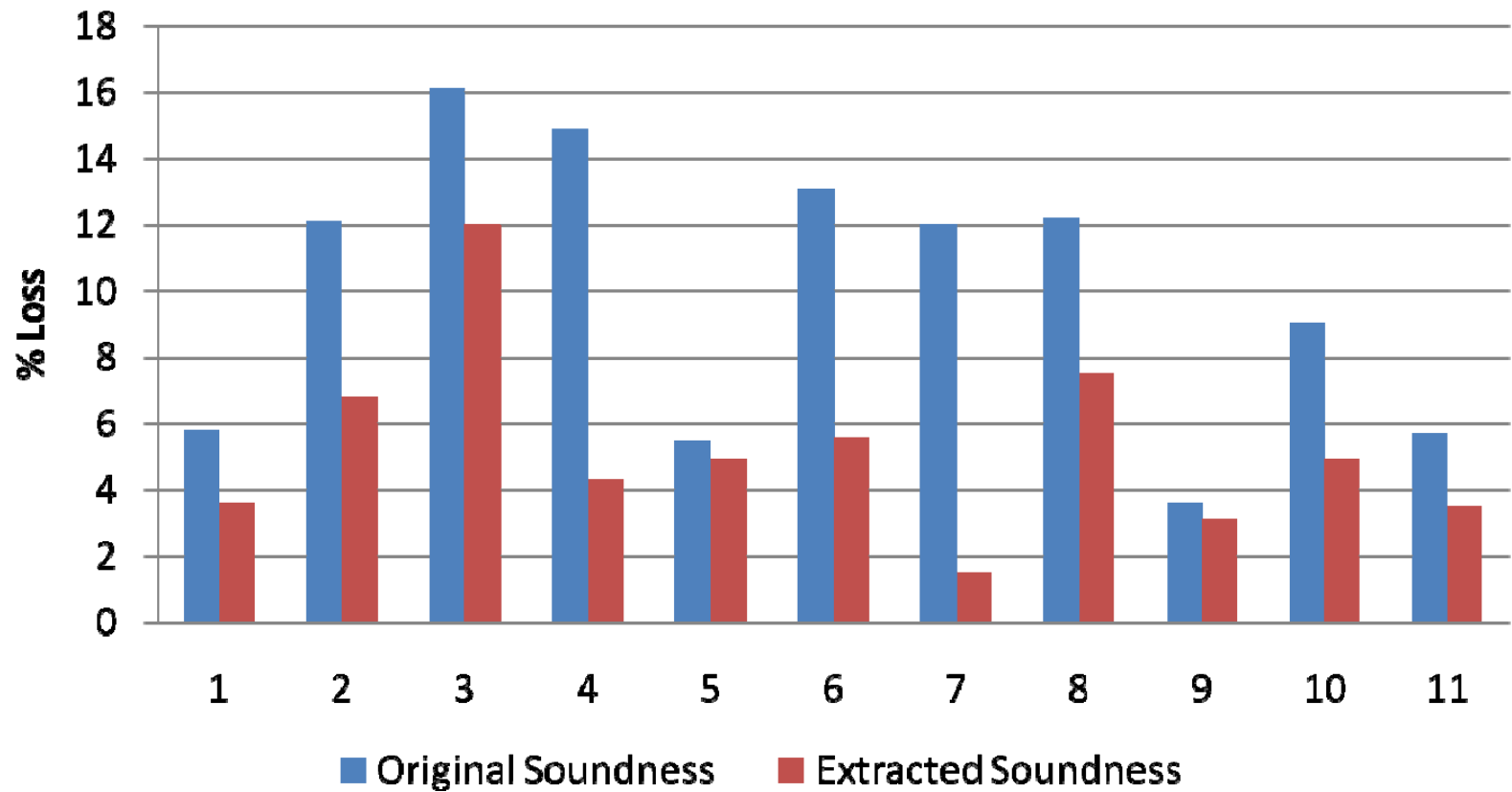
Which Test to Use?

- Sodium Sulfate Soundness
- Los Angeles Abrasion
- MicroDeval

Sodium Sulfate Soundness

- Extraction does not completely remove AC from pore structure giving much lower losses
- Sodium Sulfate is expensive
- 9-day test

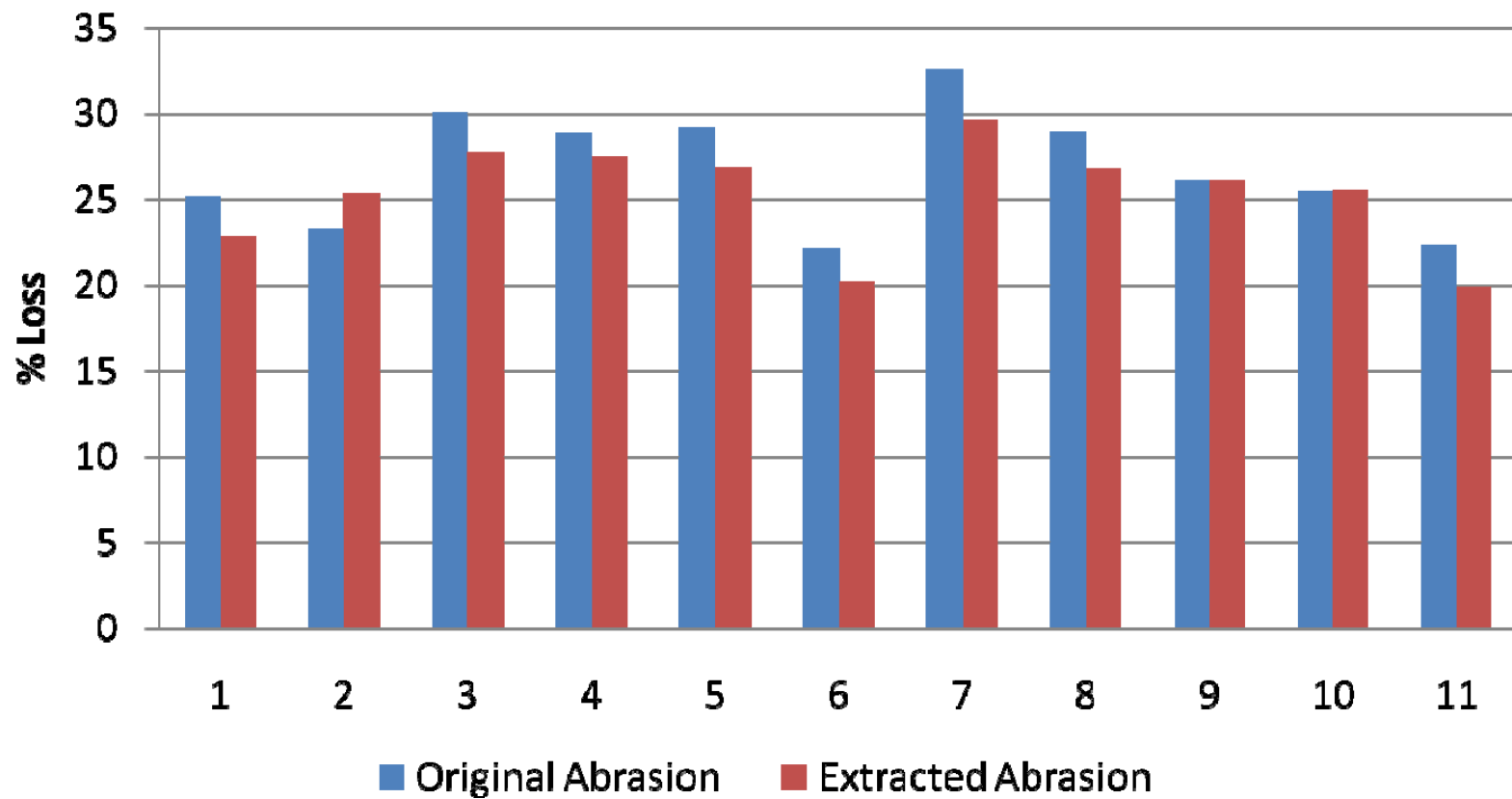
Extracted Soundness



Los Angeles Abrasion

- Results are comparable
- larger sample size needed

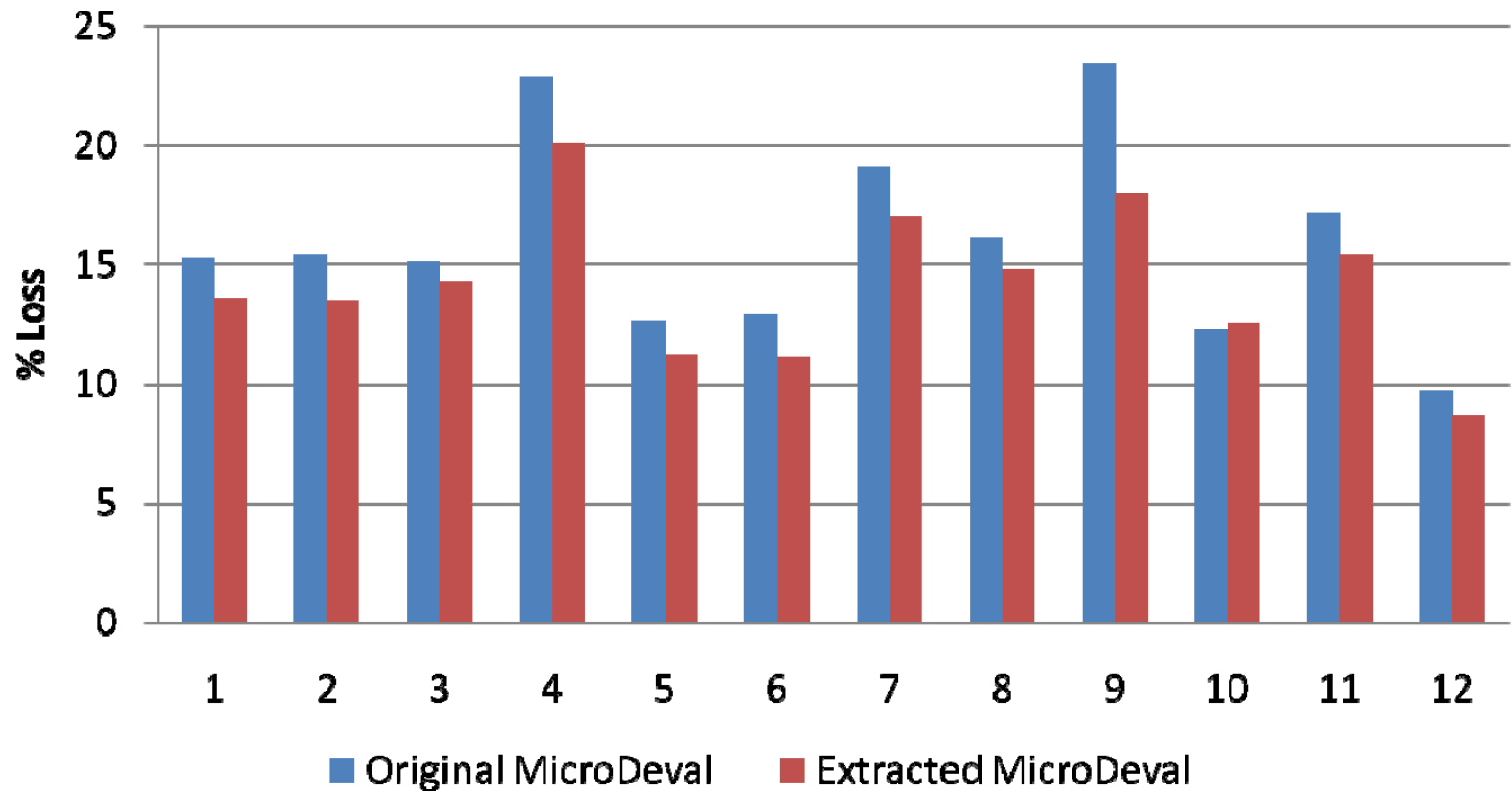
Extracted Los Angeles Abrasion



MicroDeval

- Illinois is using as diagnostic test for all qualities
- Small sample size
- Set specification 2% lower for RAP

Extracted MicroDeval



Aggregate Quality of RAP

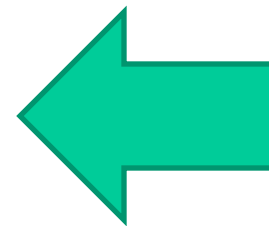
- Quality Issue
 - Surface A or B quality
 - Binder A, B or C quality
 - Shoulders A, B, C or D quality
- Tracking quality is difficult
- Mixed piles could have multiple qualities
- Recently developed procedures for assigning aggregate quality of RAP

Aggregate Quality of RAP

- Quality determination procedures:
 - Crush/screen pile up to 5,000 tons
 - Sample – Multi locations and blend
 - Extract AC off aggregate
 - Trichloroethylene
 - N-Propyl Bromide (a bit safer)
 - Send aggregate sample to Springfield for testing
 - If passes assigned “B” Quality to aggregate

RAP Aggregate Quality Micro Deval Test

**Sample +
with Water**





Before

Note sharp edges



After

Rounded edges



Lincoln's Home

Springfield, Illinois