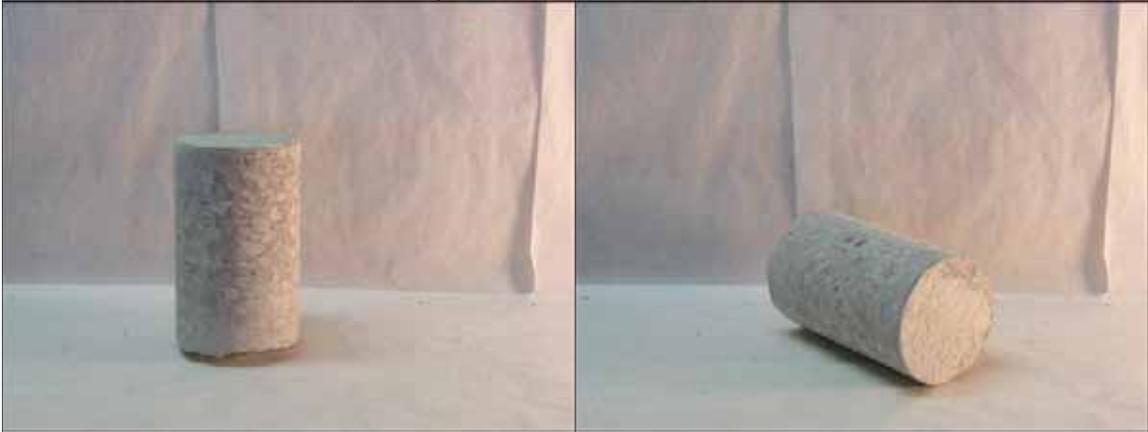


Appendix E
US23 SHRP Section 19 Core Site



NB US23, section 19, station 341+00, at joint, (MTU ID US23-05).



NB US23, section 19, station 341+15, "edge", (MTU ID US23-01).



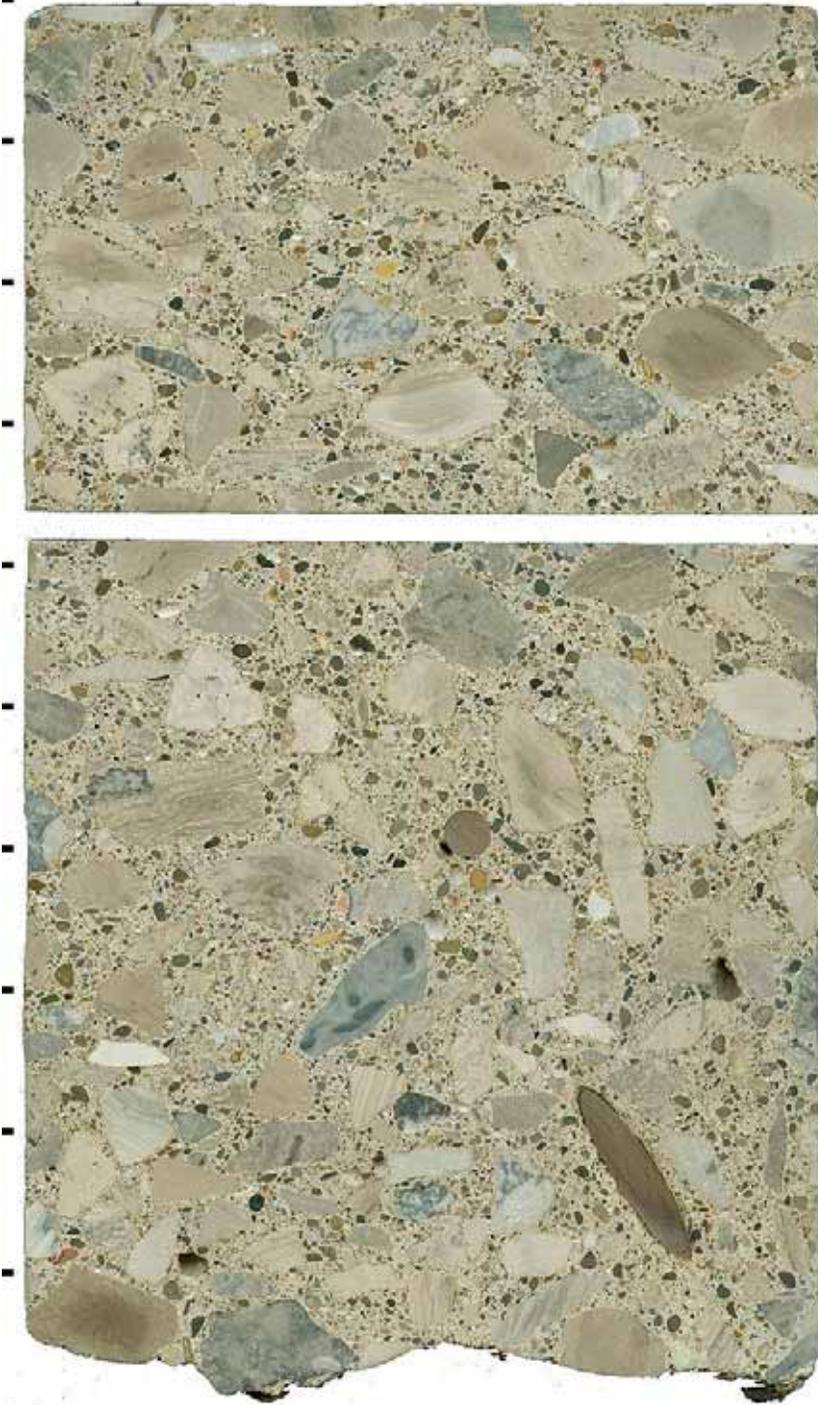
NB US23, section 19, station 341+09, "6 ft. from edge", (MTU ID US23-03).

Appendix E
US23 SHRP Section 19 Core Site



NB US23, section 19, station 341+15, "7 ft. from edge", (MTU ID US23-04).

Appendix E
US23 SHRP Section 19 Core Site



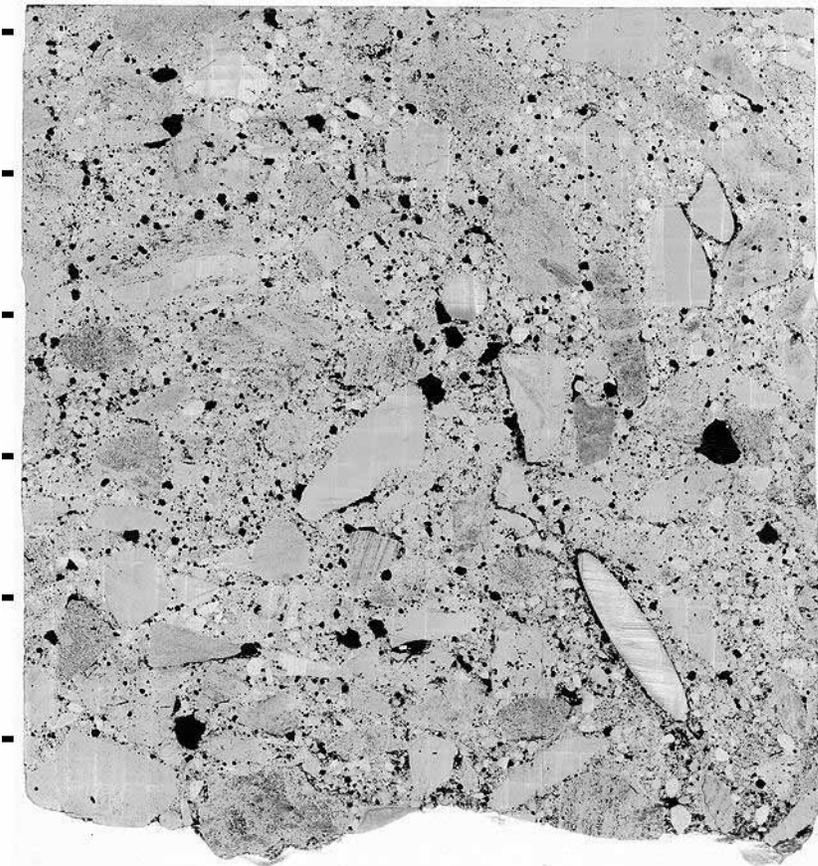
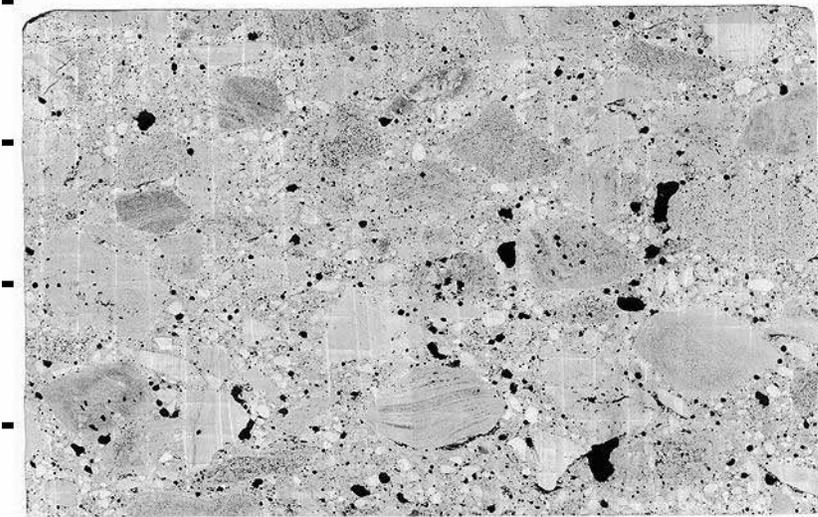
Slabs representing full cross section through pavement, as polished, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



Slabs representing full cross section through pavement, after sodium cobaltinitrite stain, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



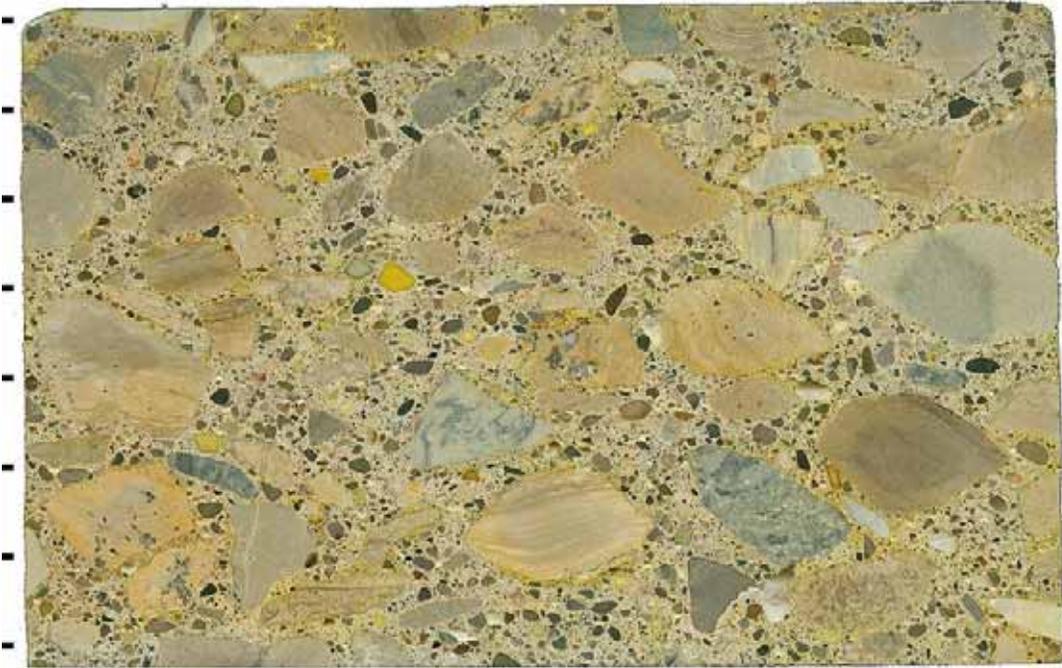
Slabs representing full cross section through pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



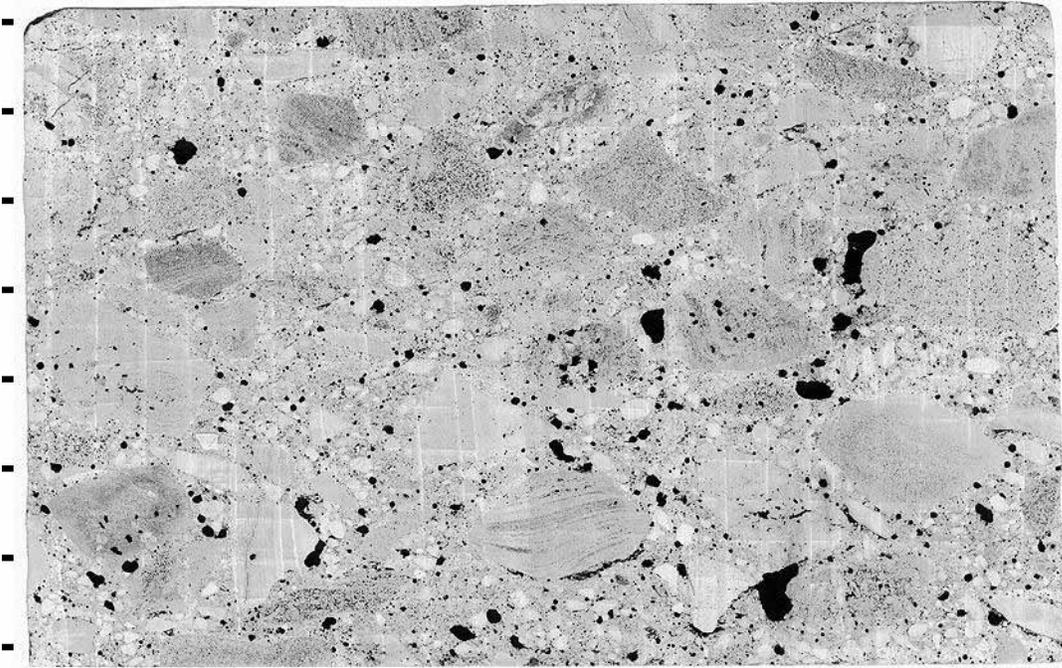
Slab representing cross section through top half of pavement, as polished, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



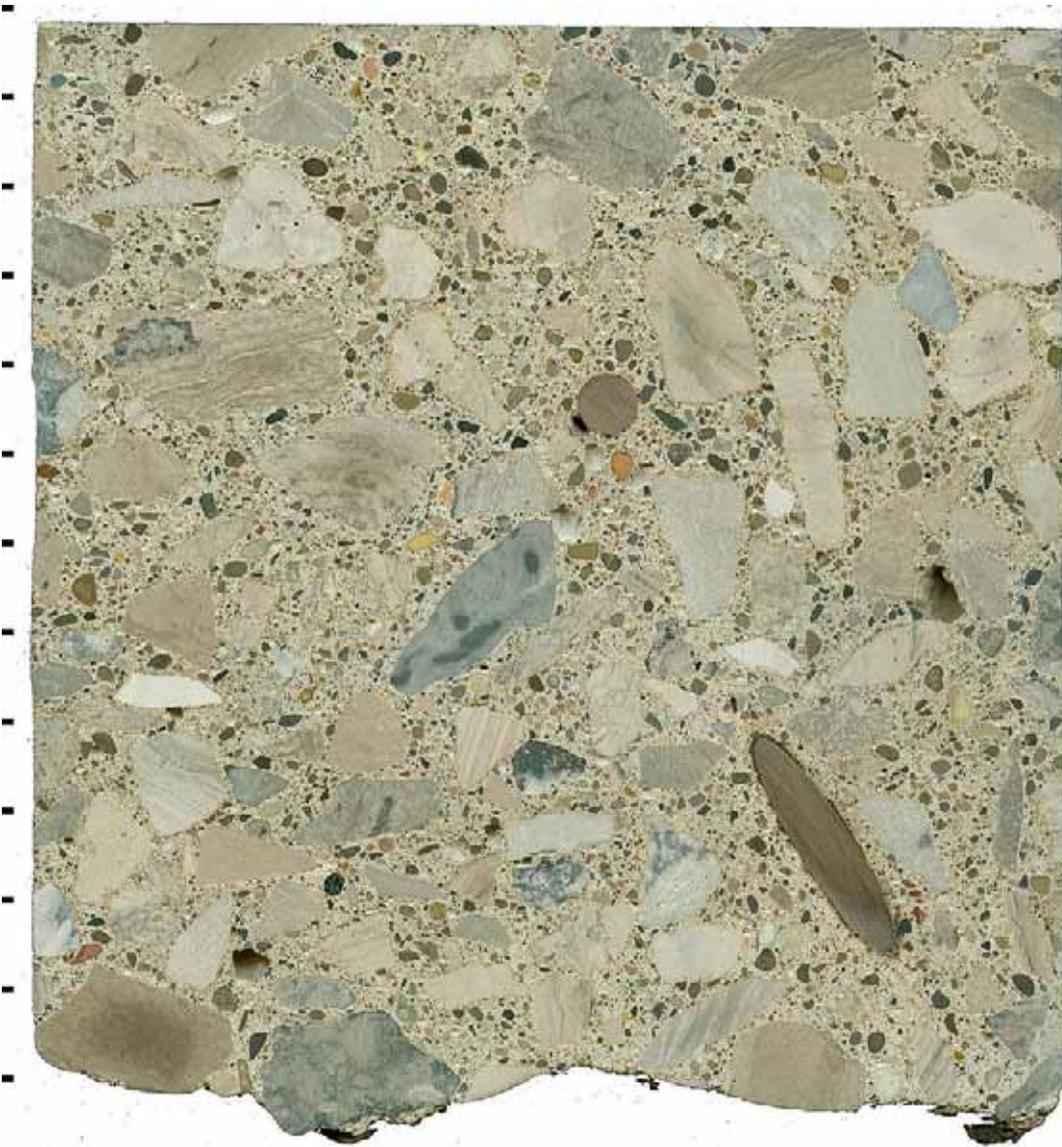
Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



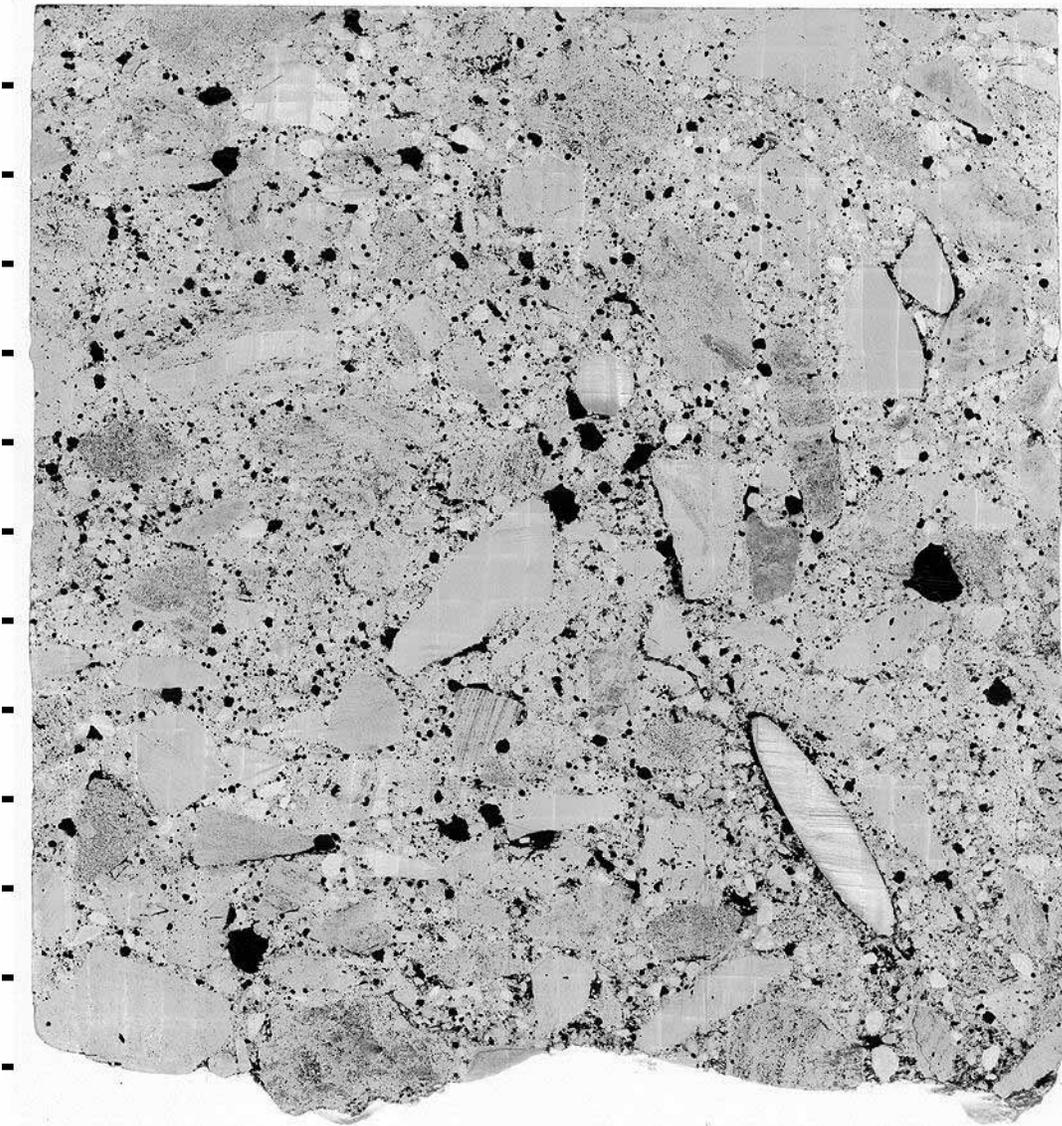
Slab representing cross section through bottom half of pavement, as polished, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



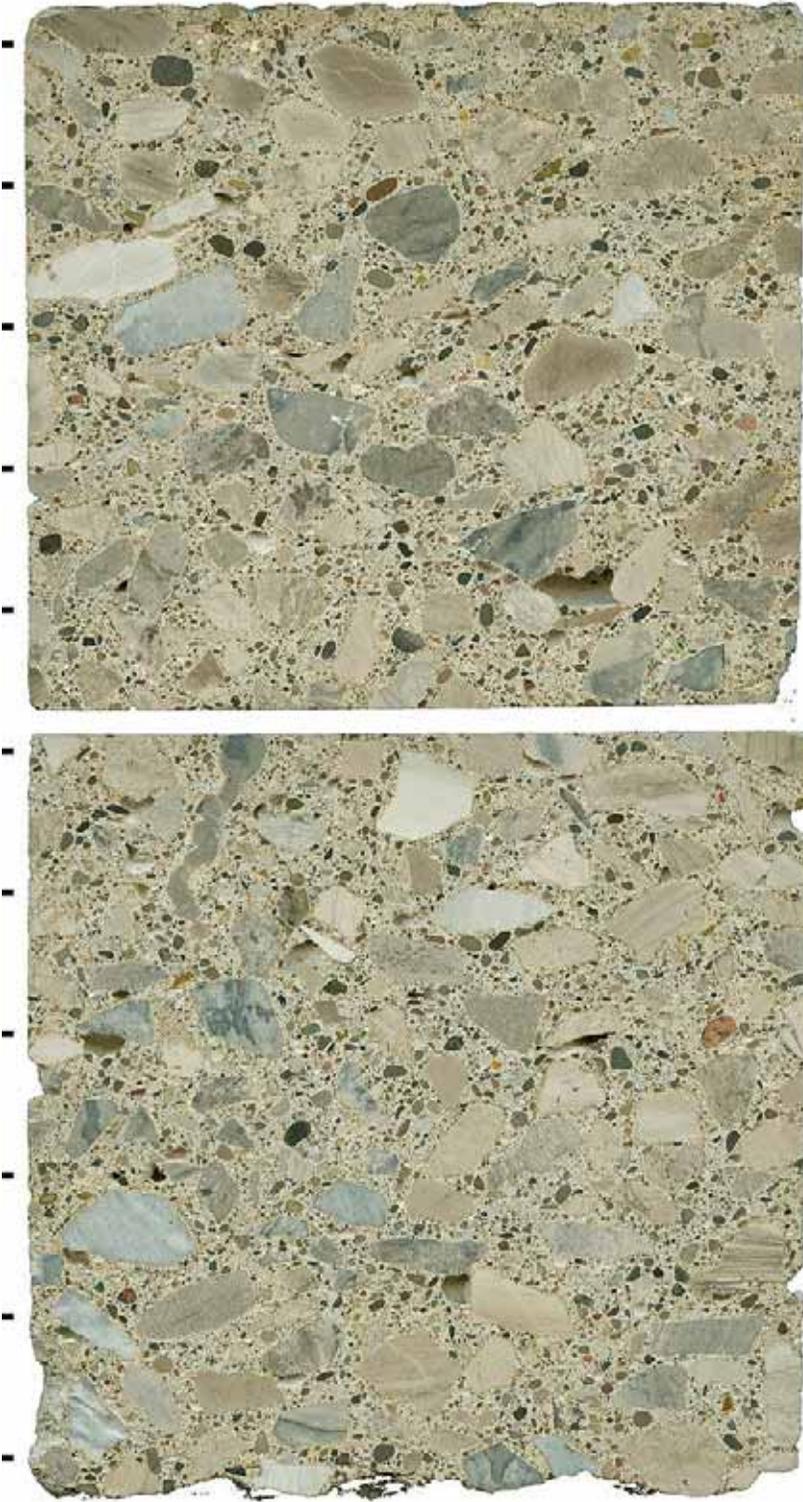
Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



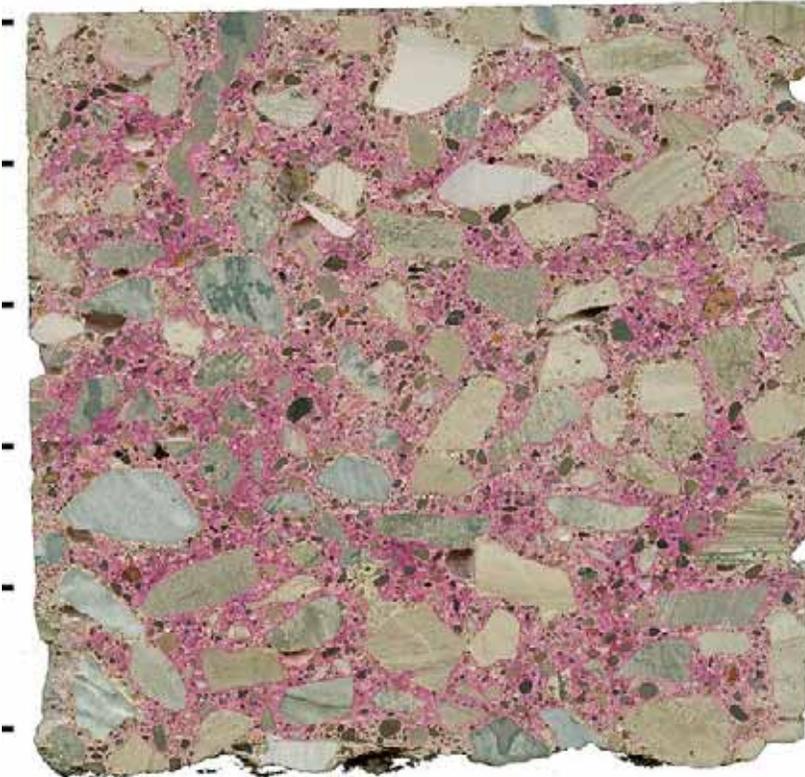
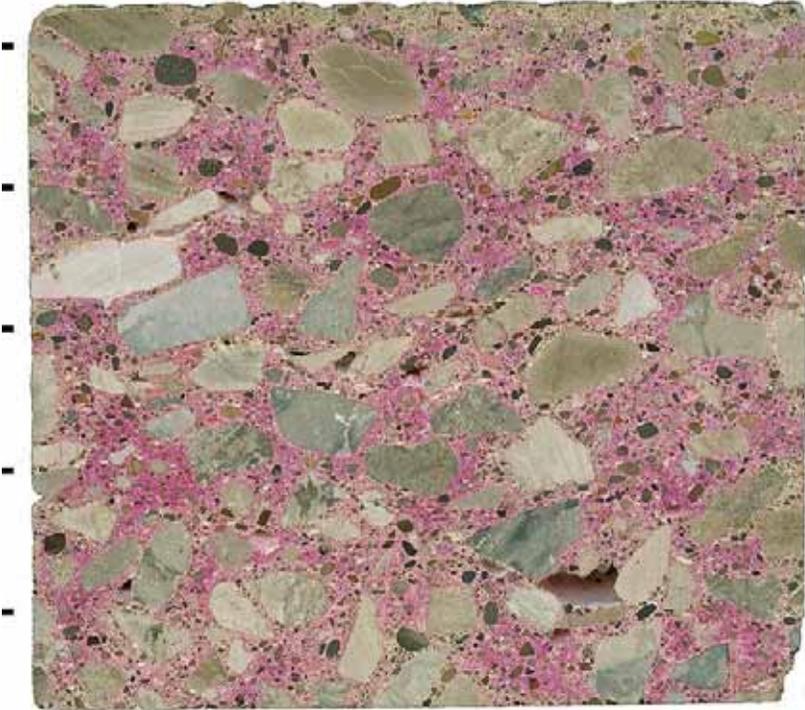
Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+00, at transverse joint, MTU ID US23-05, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



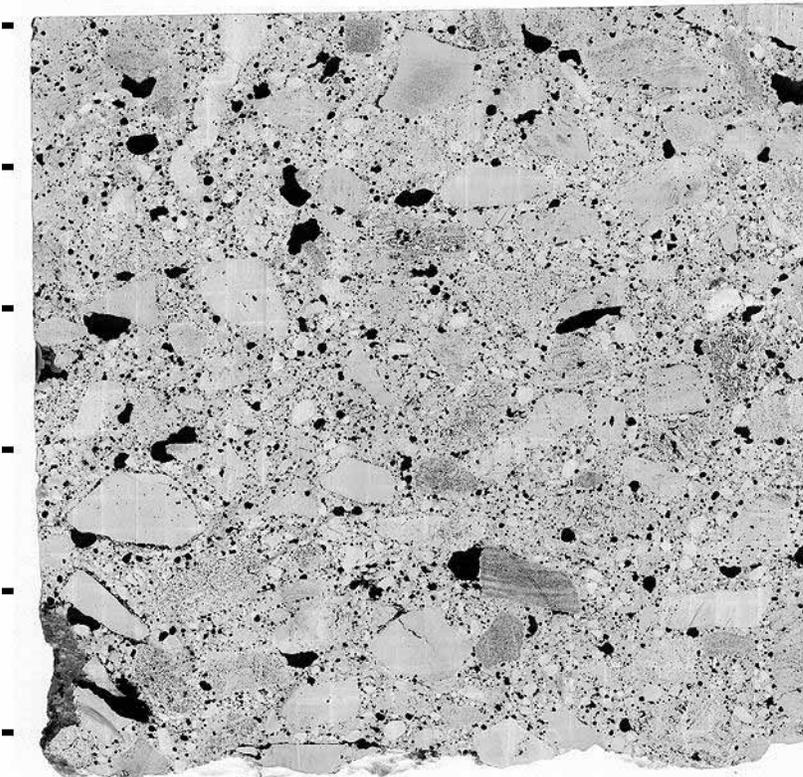
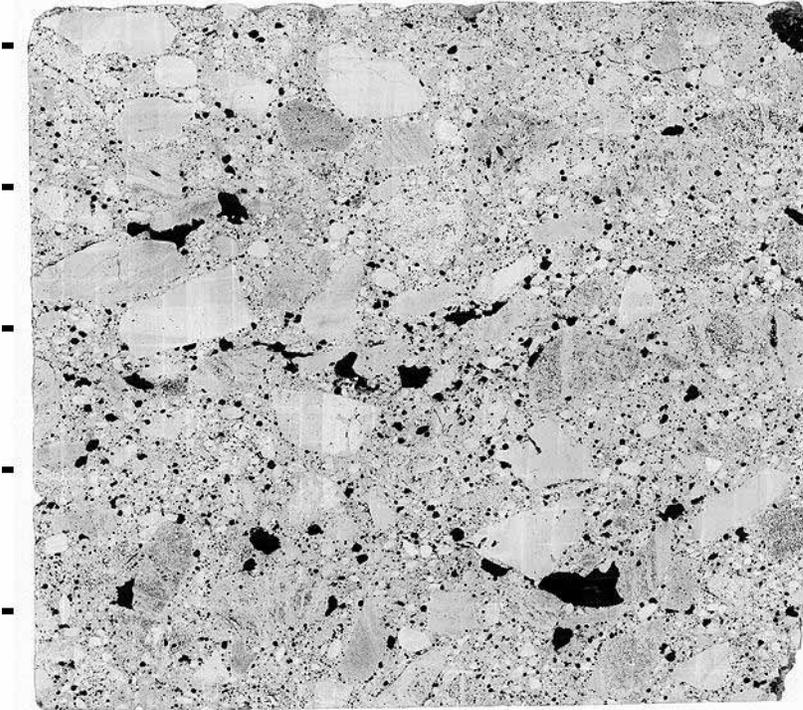
Slabs representing full cross section through pavement, as polished, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



Slabs representing full cross section through pavement, after phenolphthalein stain, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



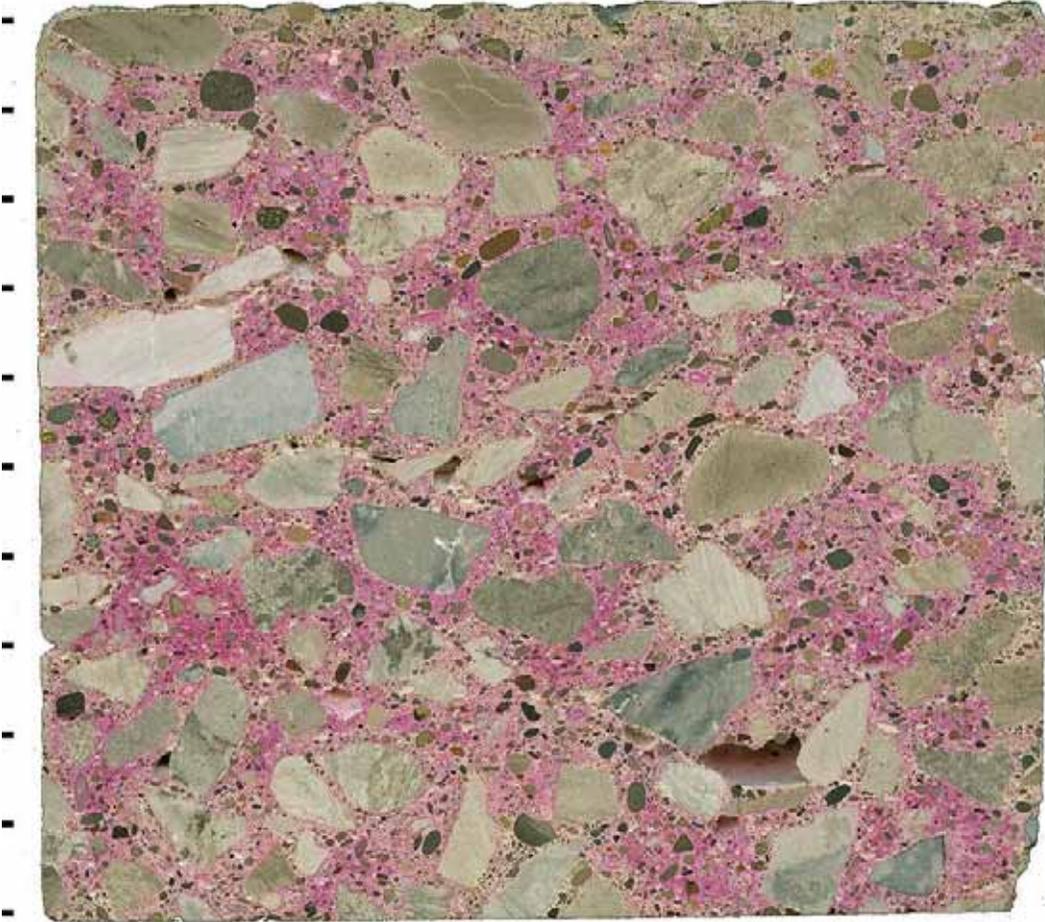
Slabs representing full cross section through pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every inch.

Appendix E
US23 SHRP Section 19 Core Site



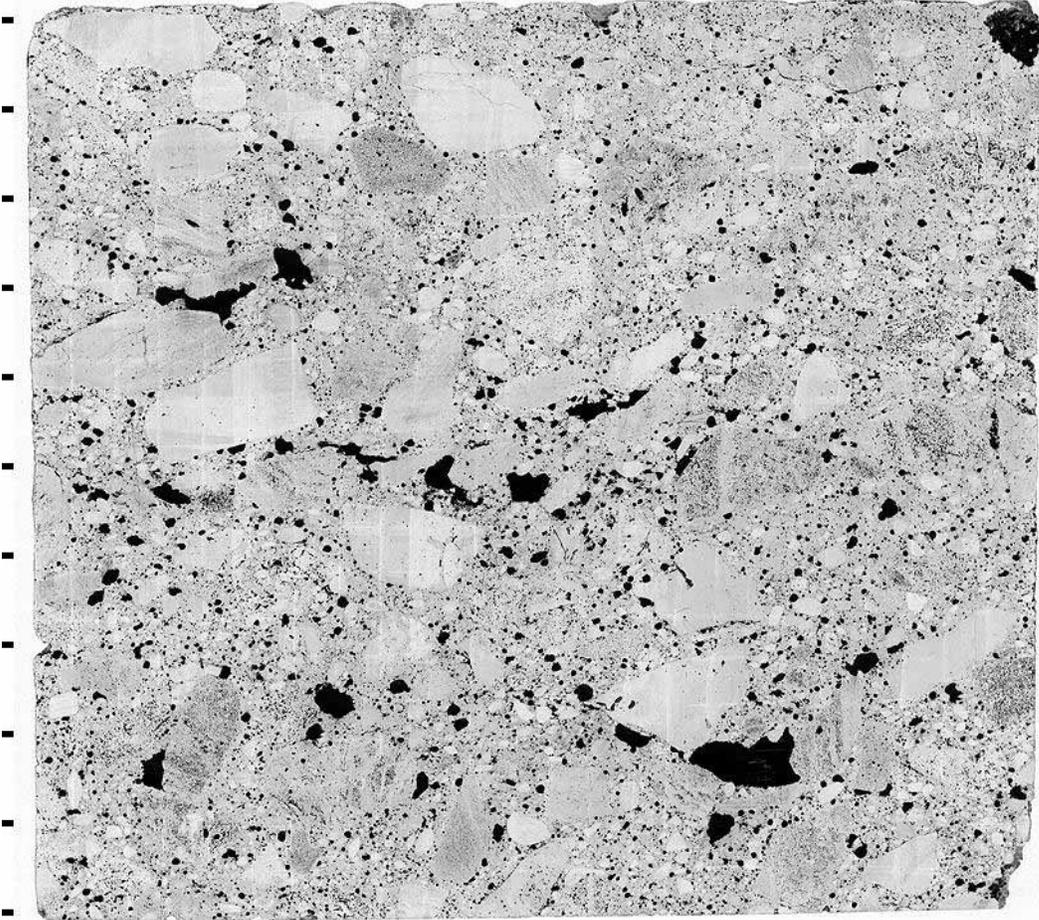
Slab representing cross section through top half of pavement, as polished, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



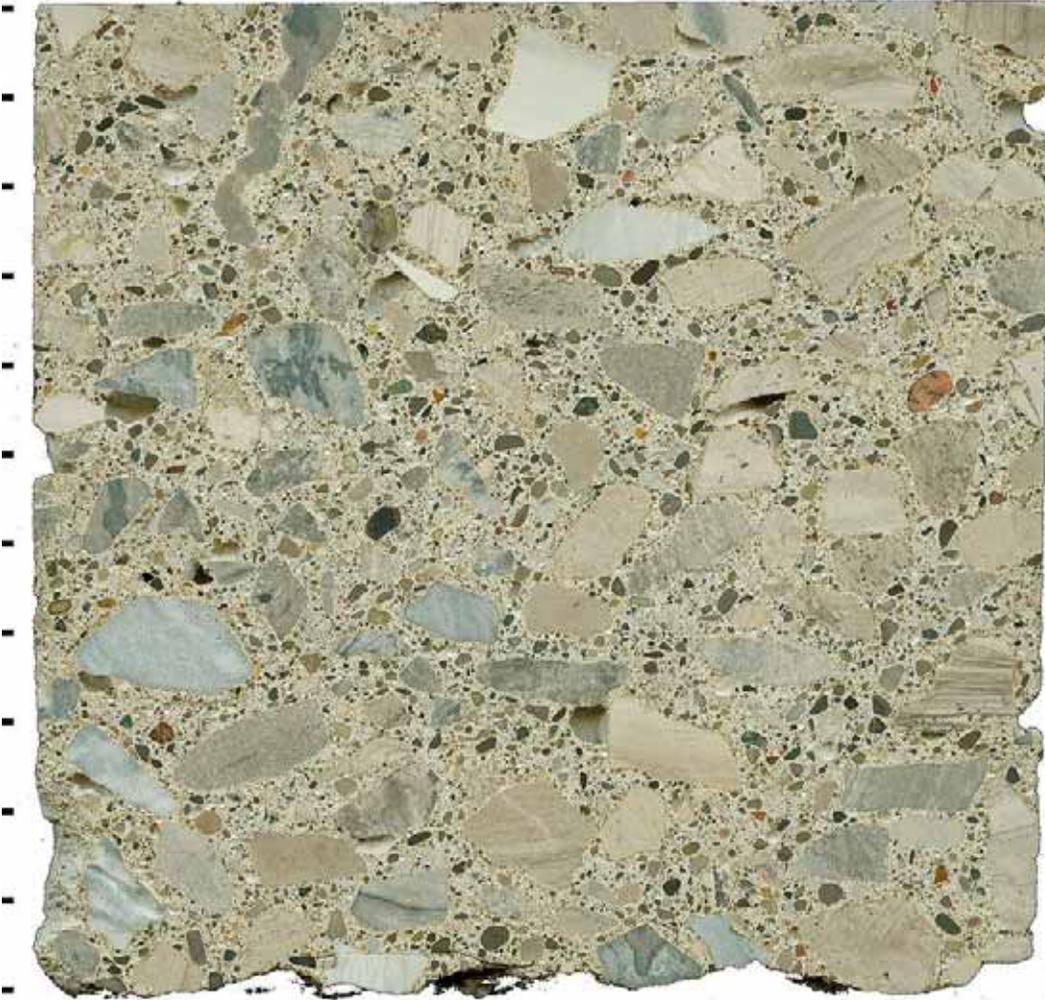
Slab representing cross section through top half of pavement, after phenolphthalein stain, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



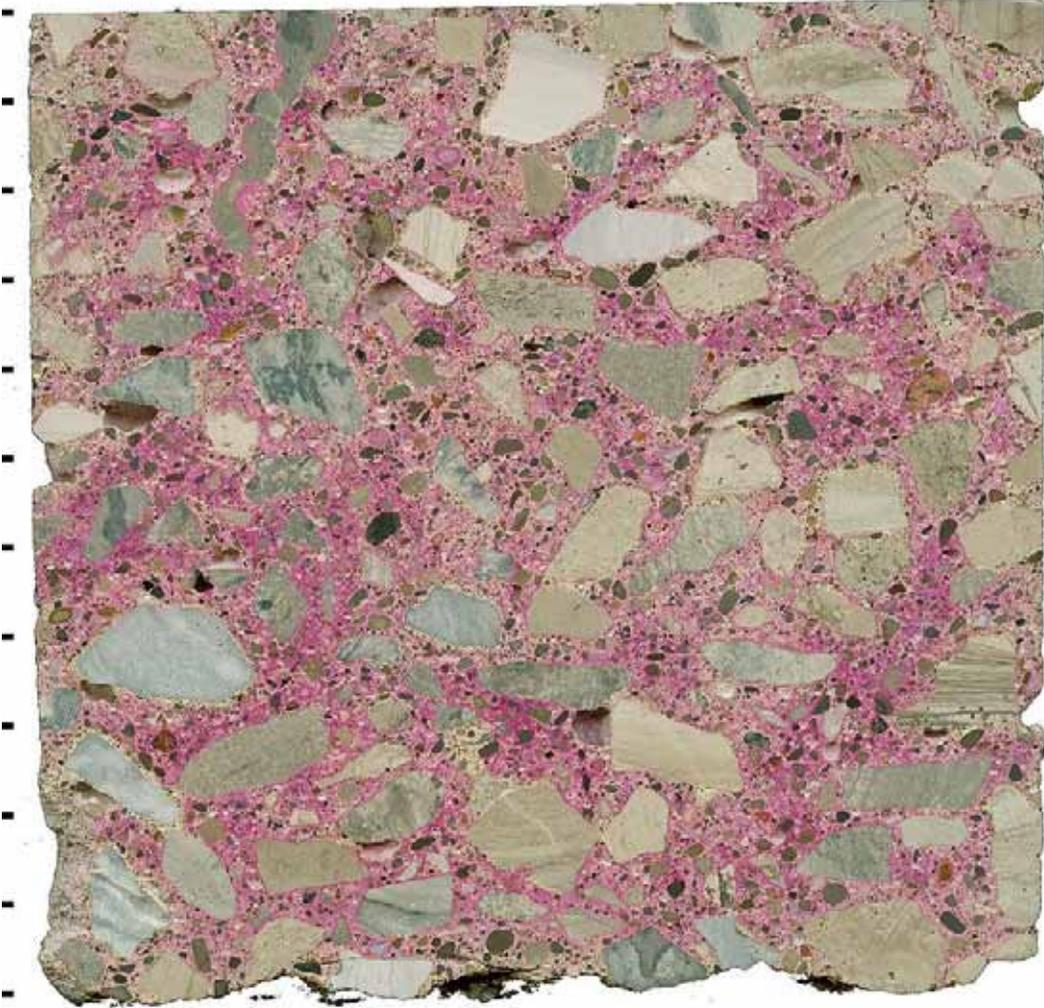
Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



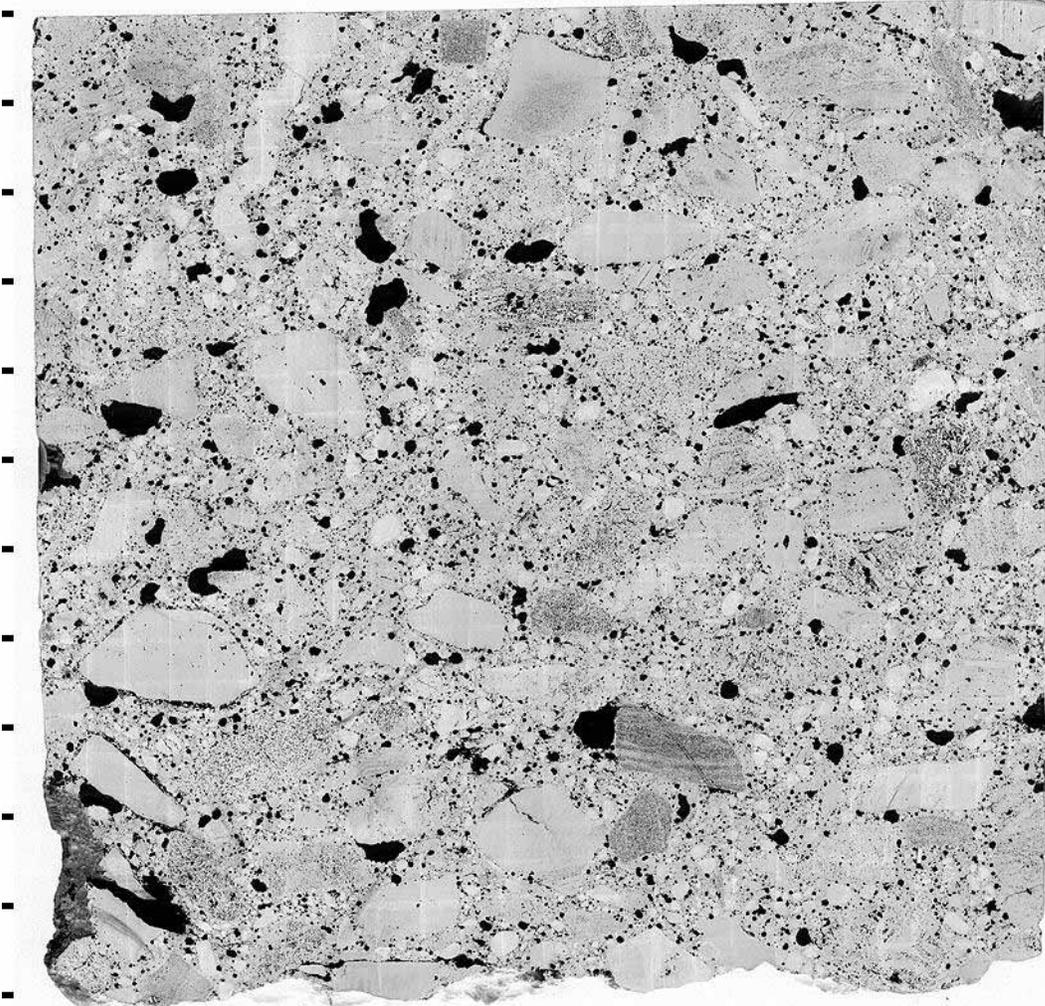
Slab representing cross section through bottom half of pavement, as polished, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



Slab representing cross section through top half of pavement, after phenolphthalein stain, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site



Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, NB US23, Section 19, constructed 1993, station 341+09, away from transverse joint, MTU ID US23-03, tic marks every half inch.

Appendix E
US23 SHRP Section 19 Core Site

NB US-23, section 19, constructed 1993, at transverse joint, MTU ID US23-05

Data Analysed - 5/ 8/ 7 at 16:53			
Operator Name - Matt			
Sample ID - us23-05			
Raw Data			
	bottom half	top half	summary
Total Traverse Length (mm)	1886.041	1886.041	3772.082
Total Area Analyzed (cm ²)	37.0	37.0	73.9
Air Stops	56	32	88
Paste Stops	180	194	374
Aggregate Stops	486	496	982
Secondary Phase Stops	0	0	0
Total Stops	722	722	1444
# of Air Void Intercepts	509	376	885
# of Filled Void Intercepts	0	1	1
Results			
Air vol%	7.8	4.4	6.1
Paste vol%	24.9	26.9	25.9
Aggregate vol%	67.3	68.7	68.0
Secondary Phase vol%	0.0	0.0	0.0
Spacing Factor (mm)	0.231	0.281	0.276
Paste/Air ratio	3.21	6.06	4.25
Specific Surface (mm ² /mm ³)	13.9	18.0	15.4
Void Frequency (voids/m)	270	199	235
Average Chord Length (mm)	0.287	0.222	0.260

Appendix E
US23 SHRP Section 19 Core Site

NB US-23, section 19, constructed 1993, away from transverse joint, MTU ID US23-03

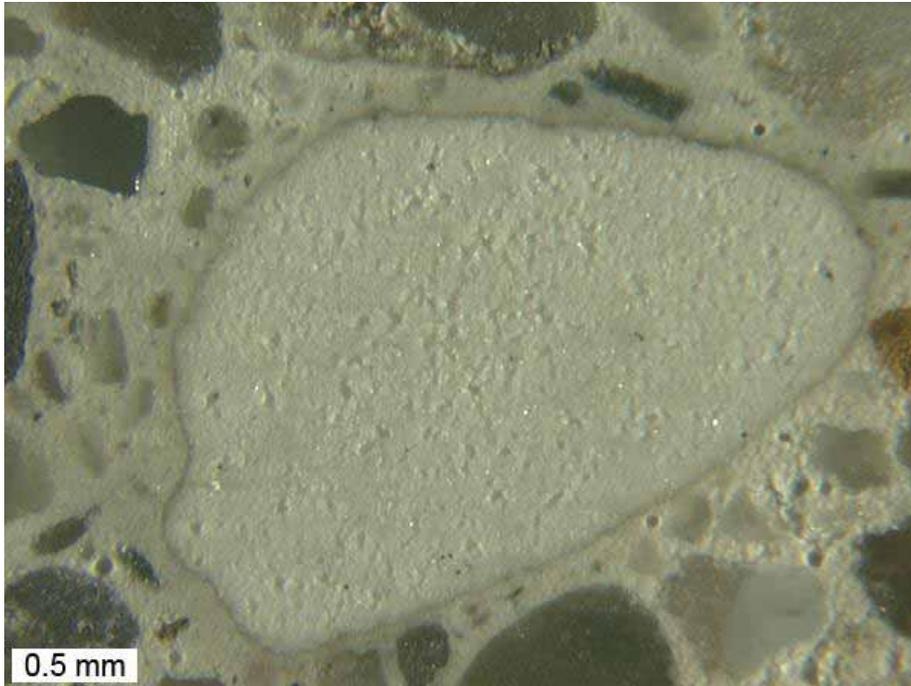
Data Analysed - 5/ 9/ 7 at 12:10			
Operator Name - Matt			
Sample ID - us23-03			
Raw Data			
	bottom half	top half	summary
Total Traverse Length (mm)	1886.041	1886.041	3772.082
Total Area Analyzed (cm ²)	37.0	37.0	73.9
Air Stops	56	38	94
Paste Stops	200	215	415
Aggregate Stops	466	469	935
Secondary Phase Stops	0	0	0
Total Stops	722	722	1444
# of Air Void Intercepts	580	544	1124
# of Filled Void Intercepts	0	0	0
Results			
Air vol%	7.8	5.3	6.5
Paste vol%	27.7	29.8	28.7
Aggregate vol%	64.5	65.0	64.8
Secondary Phase vol%	0.0	0.0	0.0
Spacing Factor (mm)	0.225	0.224	0.239
Paste/Air ratio	3.57	5.66	4.41
Specific Surface (mm ² /mm ³)	15.9	21.9	18.3
Void Frequency (voids/m)	308	288	298
Average Chord Length (mm)	0.252	0.182	0.218

Appendix E
US23 SHRP Section 19 Core Site



Fine aggregate particles with darkened rims in contact with the cement paste, before and after sodium cobaltinitrite stain, polished slab from NB US23, Section 19, constructed 1993, at transverse joint, top half of core, MTU ID US23-05.

Appendix E
US23 SHRP Section 19 Core Site



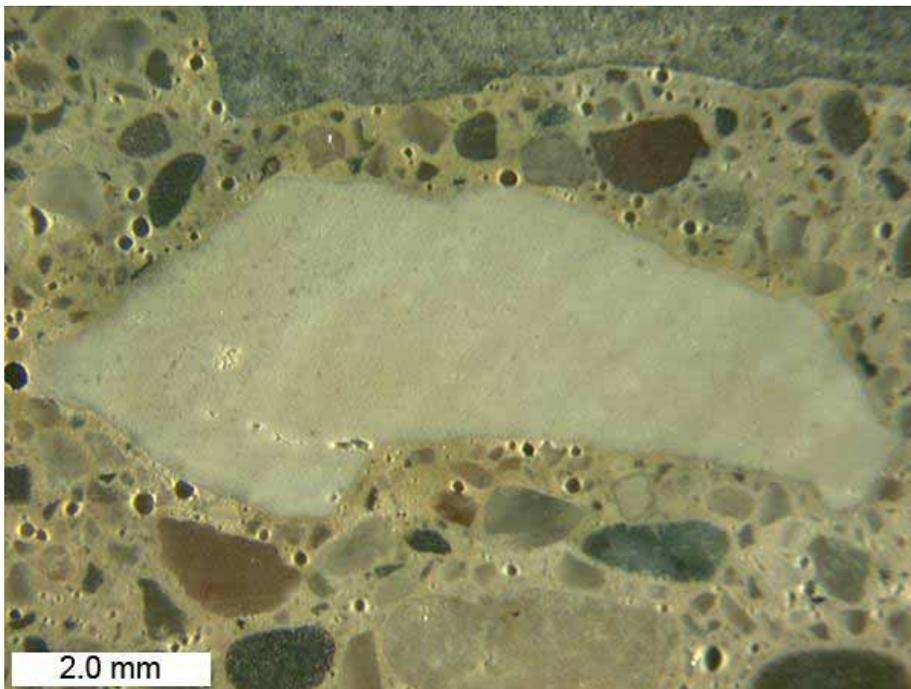
Coarse aggregate particle with darkened rim in contact with the cement paste, without cracking, before and after sodium cobaltinitrite stain, polished slab from NB US23, Section 19, constructed 1993, at transverse joint, top half of core, MTU ID US23-05.

Appendix E
US23 SHRP Section 19 Core Site



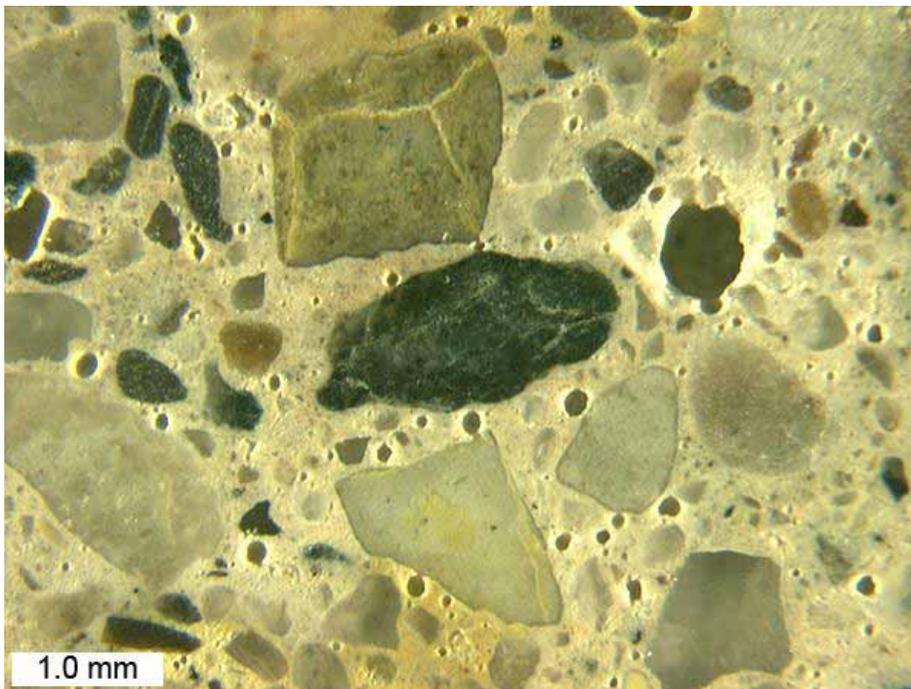
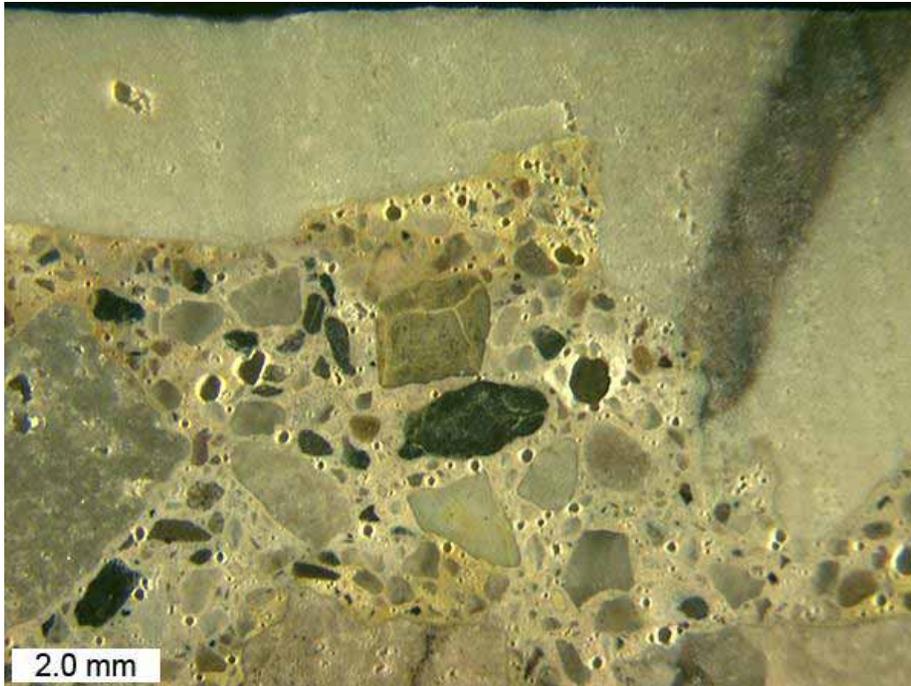
Fine aggregate particle with darkened rim in contact with the cement paste, with cracking, before and after sodium cobaltinitrite stain, polished slab from NB US23, Section 19, constructed 1993, at transverse joint, top half of core, MTU ID US23-05.

Appendix E
US23 SHRP Section 19 Core Site



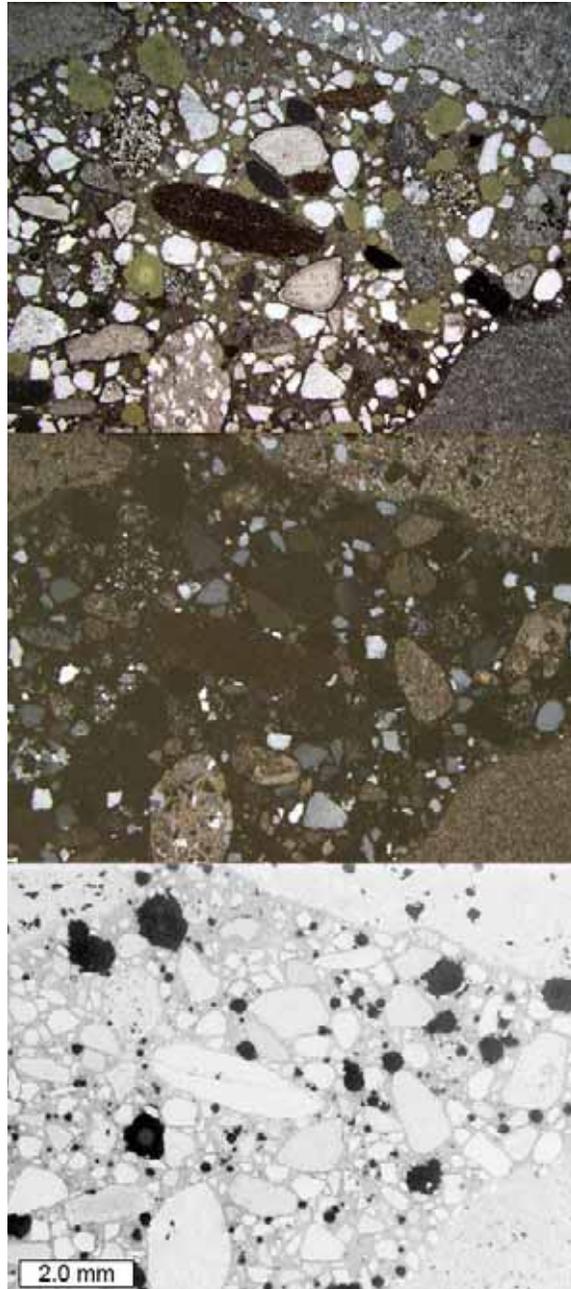
Coarse aggregate particle with darkened rim in contact with the cement paste, without cracking, before and after sodium cobaltinitrite stain, polished slab from NB US23, Section 19, constructed 1993, at transverse joint, top half of core, MTU ID US23-05.

Appendix E
US23 SHRP Section 19 Core Site



Successively close-up images of fine aggregate particles near pavement surface exhibiting alkali silica reactivity with associated cracks, after sodium cobaltinitrite stain, polished slab from NB US23, Section 19, constructed 1993, at transverse joint, top half of core, MTU ID US23-05.

Appendix E
US23 SHRP Section 19 Core Site



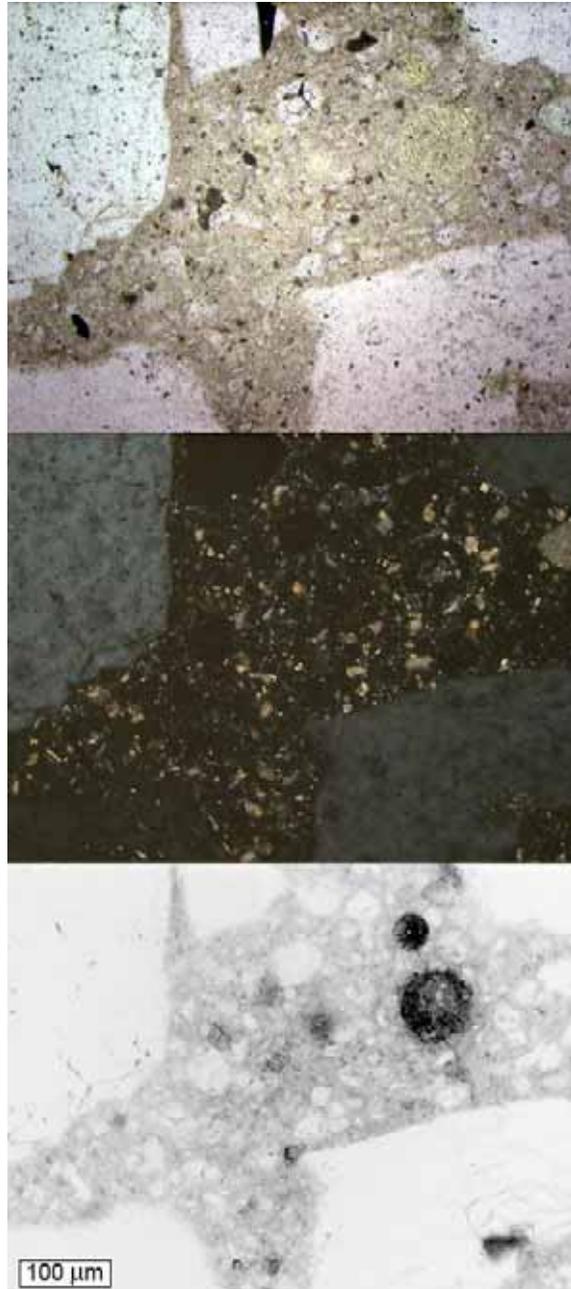
Example of chert particle, and brown siltstone particle, both with minor cracking associated with alkali-silica reaction, from thin section prepared from core from US23, Section 19, away from joint, MTU ID US23-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.

Appendix E
US23 SHRP Section 19 Core Site



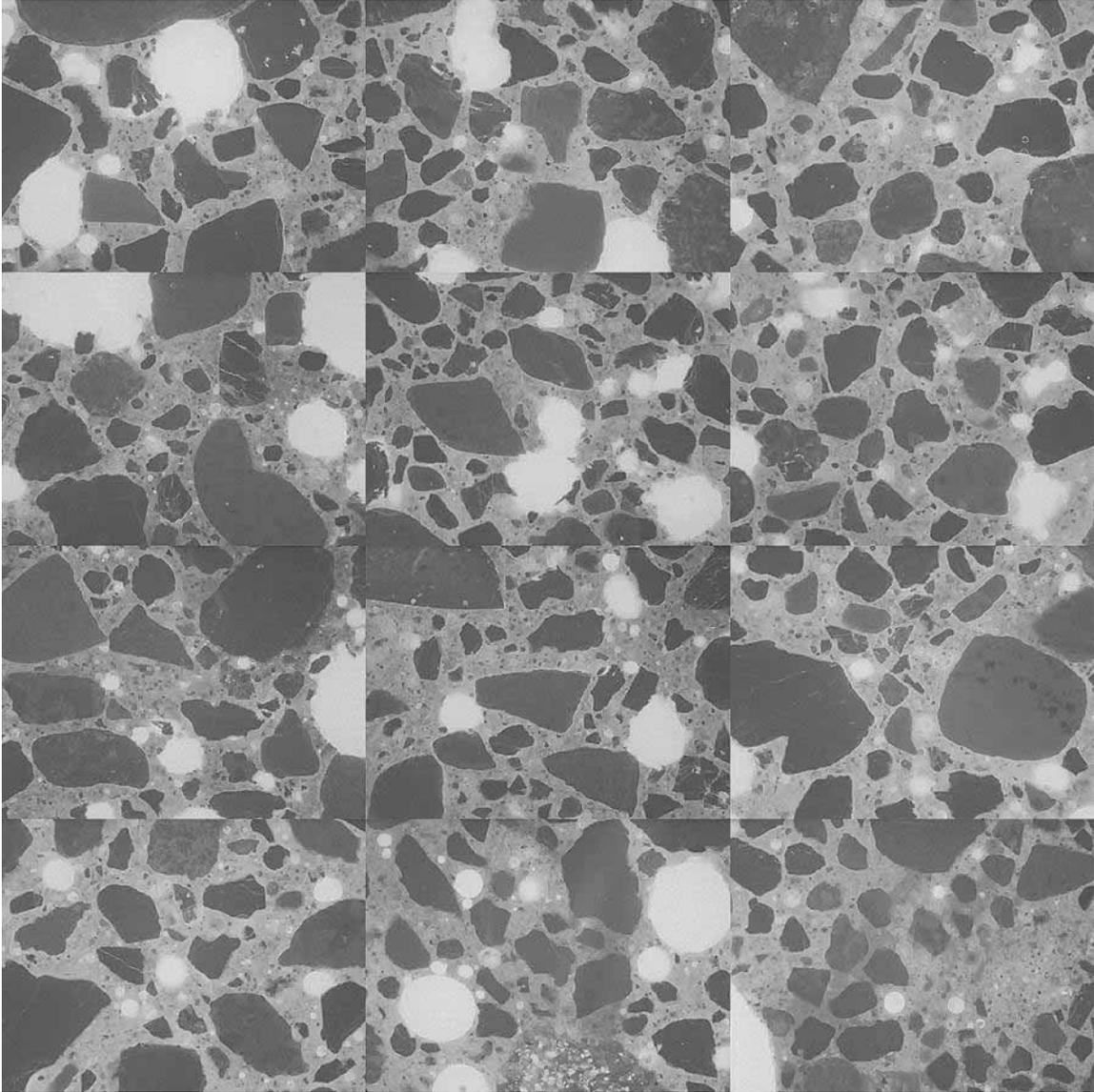
Close-up example of chert particle, and brown siltstone particle from previous figure, both with minor cracking associated with alkali-silica reaction, from thin section prepared from core from US23, Section 19, away from joint, MTU ID US23-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.

Appendix E
US23 SHRP Section 19 Core Site



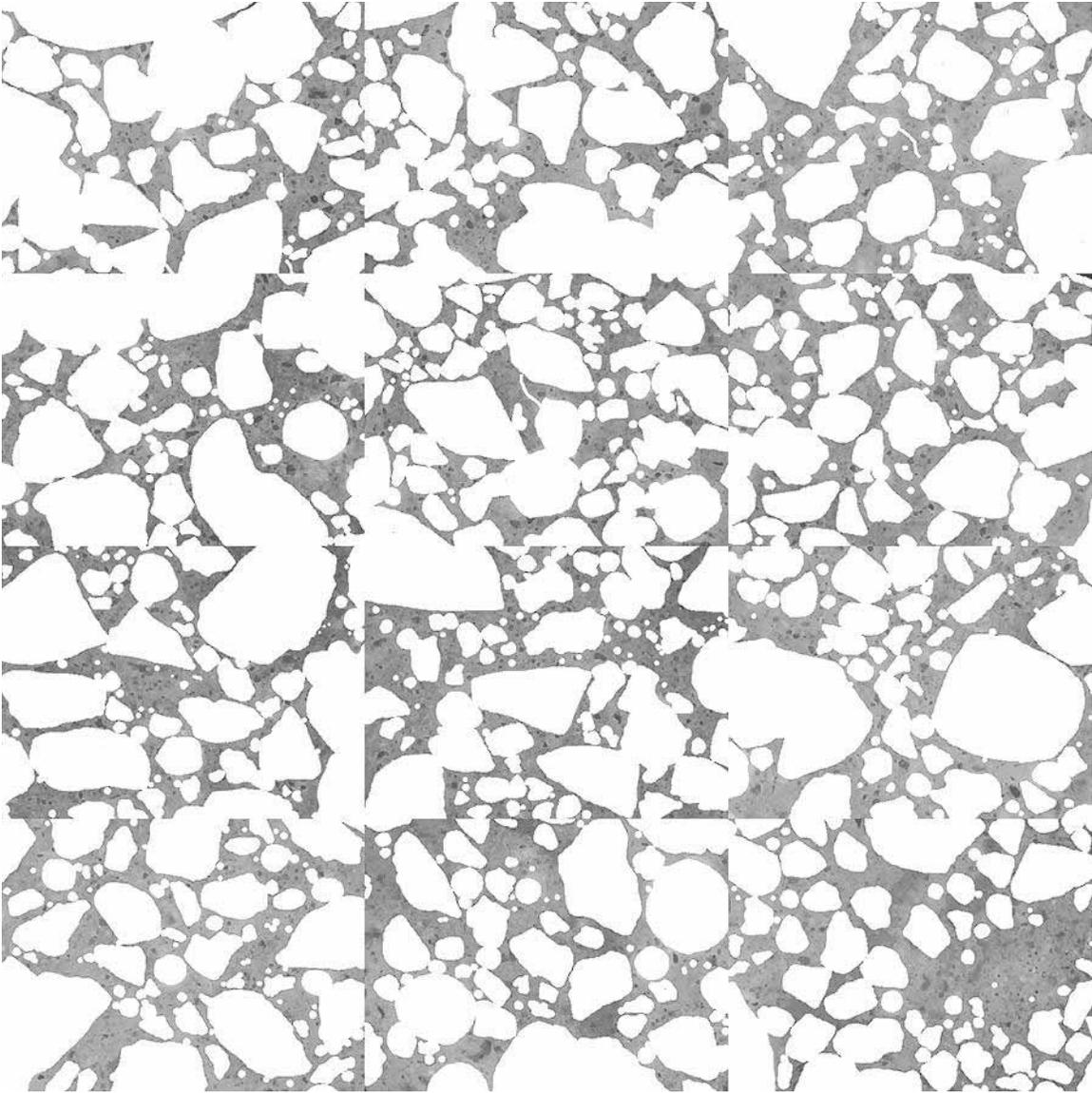
Carbonate dust in cement paste fraction in thin section prepared from core from US23, Section 19, away from joint, MTU ID US23-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.

Appendix E
US23 SHRP Section 19 Core Site



Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from US23, Section 19, away from transverse joint, MTU ID US23-03 (each individual frame measures 2.612 x 1.959 mm).

Appendix E
US23 SHRP Section 19 Core Site



Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core US23, Section 19, away from transverse joint, MTU ID US23-03, after masking out air voids and fine aggregate to isolate cement paste (each individual frame measures 2.612 x 1.959 mm).

Appendix E
US23 SHRP Section 19 Core Site

Average cement paste pixel intensities per frame, and equivalent w/c values (as compared to 28-day moist cured mortar samples) from thin section prepared from core from US23, Section 19, away from transverse joint, MTU ID US23-03.

cement paste pixel fluorescence measurements (average intensity per frame)			
96	98	111	84
91	99	83	85
111	111	100	97
equivalent w/c ($y = 0.0044x + 0.0329$)			
0.46	0.45	0.46	0.52
0.40	0.43	0.46	0.40
0.41	0.52	0.52	0.47