Kumar & Associates, Inc.®
Geotechnical and Materials Engineers
and Environmental Scientists

2390 South Lipan Street
Denver, CO 80223
phone: (303) 742-9700
fax: (303) 742-9666
email: kadenver@kumarusa.com
www.kumarusa.com

An Employee Owned Company

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

February 9, 2024
Revised: February 19, 2024

Colorado Aggregate Recycling
Attn: Matt Bustamante
8900 Highway 93, Unite A
Golden, Colorado 80403

Subject: Laboratory Test Results, Class 6 Aggregate Base Course/Recycled Concrete, 2024 Colorado Aggregate Recycling, Colorado Springs Pit, Colorado

Project No. 23-1-248

Dear Mr. Bustamante:

Attached are the results of laboratory testing performed on a bulk sample of recycled concrete material submitted to our Denver laboratory by a representative of Colorado Aggregate Recycling. The sample was assigned Kumar & Associates, Inc. (K+A) laboratory sample number 3201. We understand the sample was requested to be tested to evaluate the material's suitability to be classified as CDOT Class 6 aggregate base course (ABC). The sample originated from Colorado Aggregate Recycling's Colorado Springs Pit. Laboratory testing was performed to determine the material classification parameters, including Atterberg Limits, gradation, and moisture-density relationships (modified Proctor). R-Value (Hveem-stabilometer) and Los Angles Abrasion testing was also performed. The results of the testing are summarized in the attached Table and figures.

Based on the testing results, the submitted sample meets the gradation and Atterberg limit specifications for Class 6 ABC presented on Table 703-2 in the Colorado Department of Transportation's (CDOT) 2021 *Standard Specifications for Road and Bridge Construction. The testing indicated* the material had an R-value of 80 at an exudation pressure of 300 psi and a 40% loss as evaluated by the Los Angles Abrasion test.

If you have questions or need further information, please call.

Sincerely,
KUMAR & ASSOCIATES, INC.

Justin Cupich, P.E.

COLORADO REGISTERED
JUSTIN D. CUPICH
60144
2/19/24
PROFESSIONAL ENGINEER

JDC/mm
Attachments
cc: File

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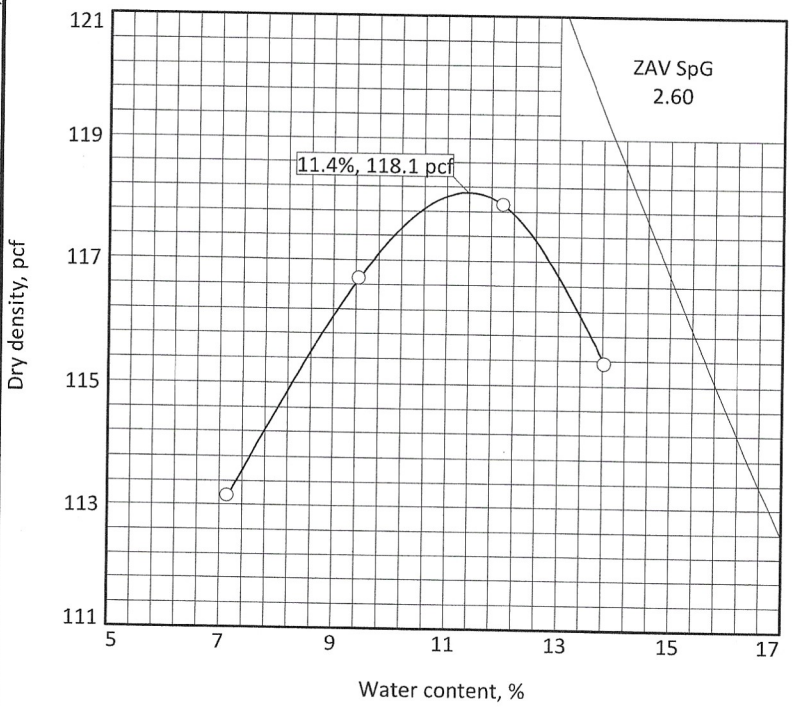
TABLE 1
SUMMARY OF LABORATORY TEST RESULTS
COLORADO SPRINGS PIT

PROJECT NO.: 23-1-248
PROJECT NAME: 2023 COLORADO AGGREGATE RECYCLING LABORATORY TESTING
DATE RECEIVED: 12/21/2023

SAMPLE NO.	DATE TESTED	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	GRADATION		PERCENT PASSING No. 200 SIEVE	ATTERBERG LIMITS		R-VALUE @ 300 PSI	LOS ANGELES ABRASION		SOIL OR BEDROCK TYPE
				GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTICITY INDEX (%)		GRADING	PERCENT LOSS (%)	
3201	1/9/24	118.1	11.4	51	43	6	NV	NP	80	B	40	WELL-GRADED GRAVEL WITH SILT AND SAND (RECYCLED CONCRETE)

COMPACTION TEST REPORT

Curve No. 3201



Preparation Method	
Rammer: Wt.	10 lb.
Drop	18 in.
Type	Manual
Layers: No.	five
Blows per	56
Mold Size	0.075 cu. ft.
Test Performed on Material Passing	3/4 in. Sieve
%>3/4 in.	0
%<No.200	6.3
Atterberg (D 4318): LL	NV
PI	NP
NM (D 2216)	
Sp.G. (D 854)	2.6
USCS (D 2487)	GW-GM
AASHTO (M 145)	A-1-a
Date: Sampled	12/21/23
Received	12/21/23
Tested	1/9/24
Tested By	DS

COMPACTION TESTING DATA
AASHTO T 180-22 Method D Modified

	1	2	3	4	5	6
WM + WS	10613.0	10835.0	10983.0	10957.0		
WM	6478.0	6478.0	6478.0	6478.0		
WW + T #1	1382.3	1538.1	1276.2	1376.4		
WD + T #1	1304.8	1431.1	1159.9	1245.8		
TARE #1	220.1	299.9	192.0	302.2		
WW + T #2						
WD + T #2						
TARE #2						
MOIST.	7.1	9.5	12.0	13.8		
DRY DENS.	113.1	116.7	117.9	115.3		

SIEVE TEST RESULTS

Opening Size	% Passing	Specs.
1"	100	100
3/4"	100	95-100
3/8"	70	
#4	49	30-65
#8	40	25-55
#16	30	
#30	21	
#50	14	
#100	9	
#200	6.3	3-12

TEST RESULTS

Maximum dry density = 118.1 pcf

Optimum moisture = 11.4 %

Material Description

well-graded gravel with silt and sand

Remarks:

Project No. 23-1-248 **Client:** Colorado Aggregate Recycling

Project: 2023 Colorado Aggregate Recycling Lab Testing

○ **Loc.:** ABC Class 6 Recycled Concrete Pile - Colorado Springs Pit

Checked by: JJM

Title: Lab Manager

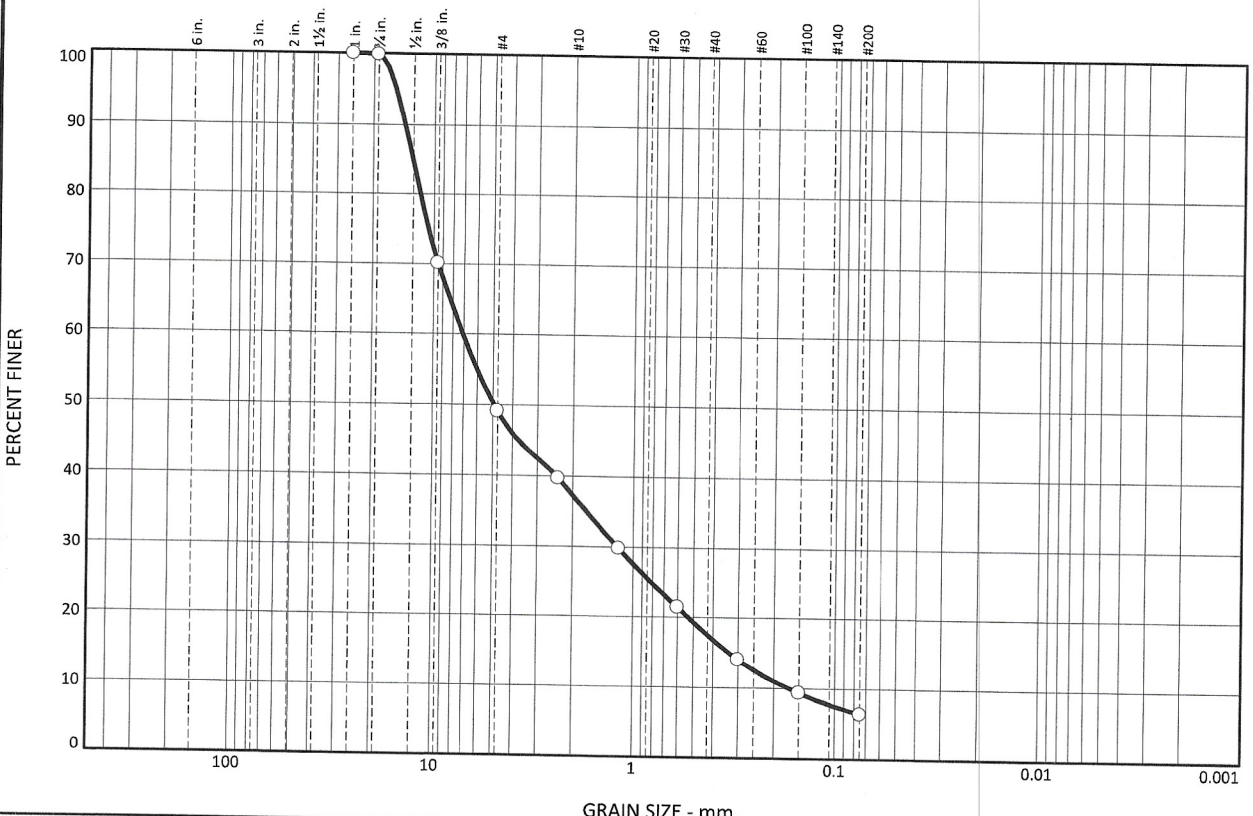
Kumar & Associates, Inc.

Denver, Colorado

Figure

Particle Size Distribution Report

AASHTO T 27 & T 11



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	51	12	20	11	6	

Test Results (AASHTO T 27 & T 11)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1"	100	100		
3/4"	100	95-100		
3/8"	70			
#4	49	30-65		
#8	40	25-55		81
#16	30			61
#30	21			44
#50	14			29
#100	9			19
#200	6.3	3-12		13

* AASHTO M 147 Class 6 ABC

Material Description

well-graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Classification

USCS= GW-GM AASHTO= A-1-a

Test Remarks

Location: ABC Class 6 Recycled Concrete Pile - Colorado Springs Pit
Sample Number: 3201

Sample Date: 12/21/23

Kumar & Associates, Inc.

Denver, Colorado

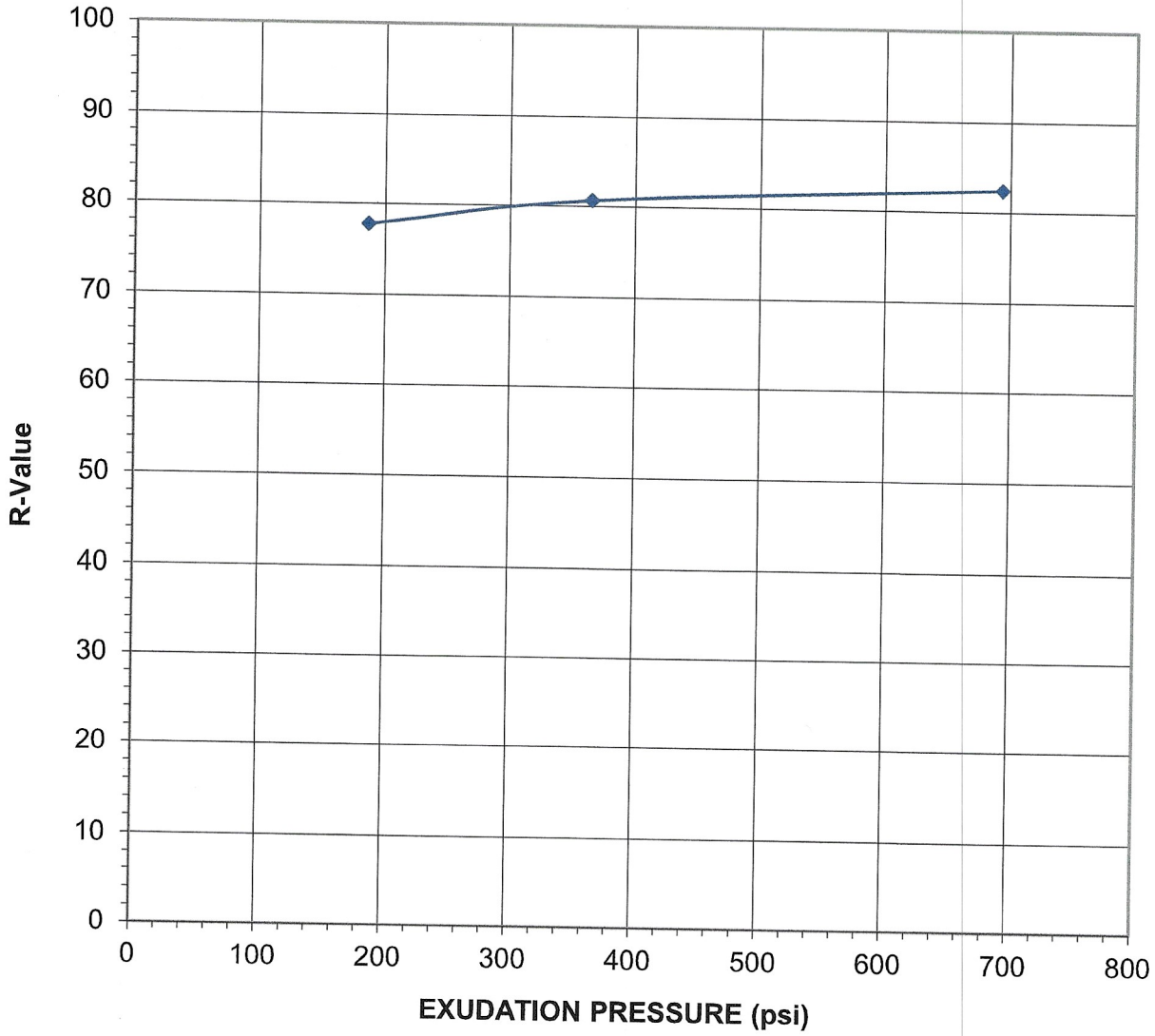
Client: Colorado Aggregate Recycling
Project: 2023 Colorado Aggregate Recycling Lab Testing
Project No: 23-1-248

Figure

Tested By: HS **Checked By:** JJM

R-VALUE

TEST SPECIMEN	1	2	3	4	R-VALUE (300 psi)
MOISTURE CONTENT (%)	13.9	13.0	12.1		
DENSITY (pcf)	114.5	112.4	109.9		
EXPANSION PRESSURE (psi)	0.000	0.000	0.000		
EXUDATION PRESSURE (psi)	187	365	693		
R-VALUE	78	81	82		80



SOIL TYPE: Well-Graded Gravel with Silt and Sand

LOCATION: ABC Class 6 Recycled Concrete Pile - Colorado Springs Pit

DATE SAMPLED: 12/21/23 DATE RECEIVED: 12/21/23 DATE TESTED: 2/12/24

GRAVEL: 51 SAND: 43 SILT AND CLAY: 6

LIQUID LIMIT: NV PLASTICITY INDEX: NP