

APPENDIX H

**QA Laboratory
Testing Results**

APPENDIX H-1

Stockpile QA Laboratory Results

APPENDIX H-1A

**QA Laboratory Results – Zone 2A
Fine Filter Material**



**AEM - 2021 IVR Dyke Construction
Project No. 21452873**

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-05	Location: Fine Filter Stockpile
Source: Stockpile	Specification: Zone 2A
Date Sample Collected: 2021-03-03	Tested By: Brandon Gray
Date Sample Tested: 2021-03-04	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

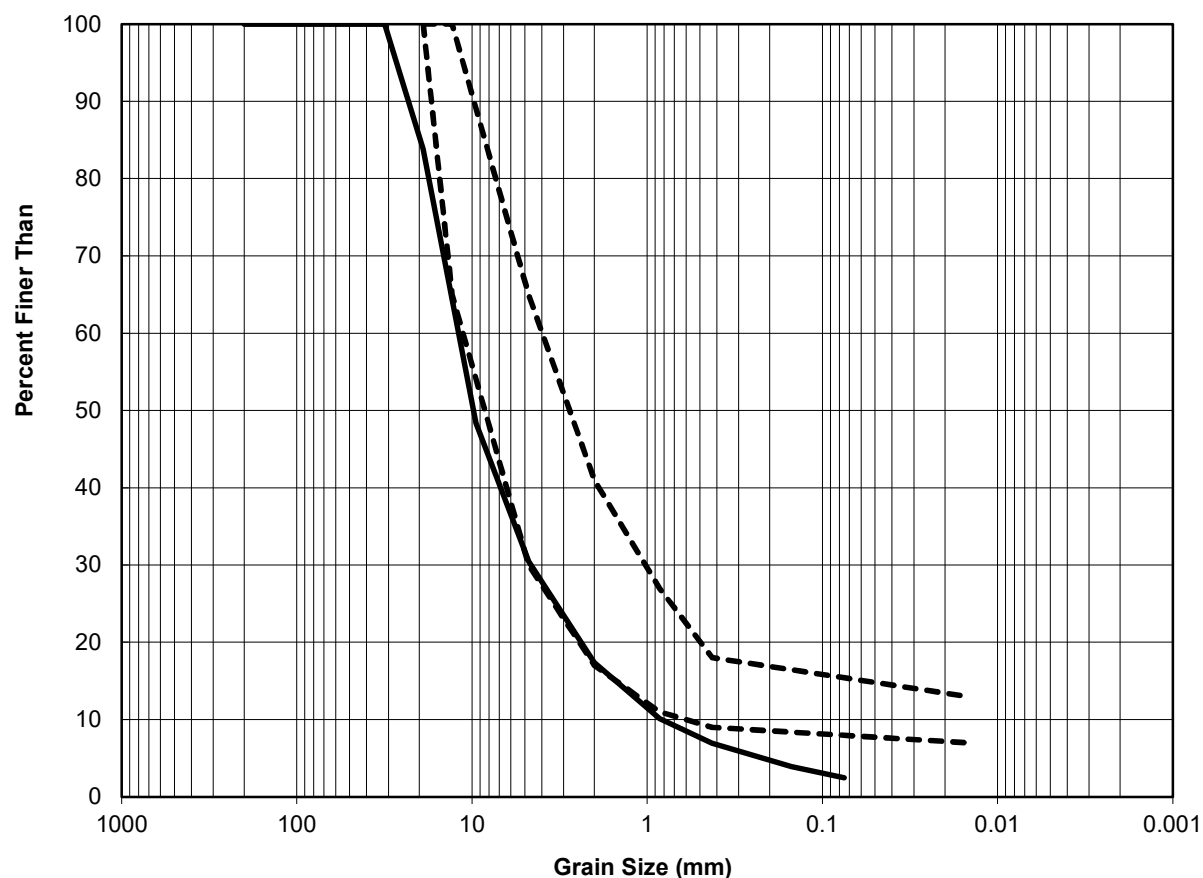
Material Specifications:

Grain Size Analysis Results

Zone 2A

Opening	Passing (%)	Opening (mm)	Passing (%)
31.5 mm	100.0	19	100
19 mm	83.8	13	100-65
12.5 mm	83.8	4.75	65-30
9.5mm	48.4	2	41-17
4.75 mm	30.4	0.85	27-11
2.00 mm	17.4	0.425	18-9
850 µm	10.1	0.015	13-7
425 µm	7.0	0.0075	10-6
150 µm	3.9		
75 µm	2.5		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:
 Sampled from test pad.

Water content as received in lab (%): 4.3%

APPENDIX H-1B

**QA Laboratory Results – Zone 2B
FFAB Material**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-06	Location: Mixing Pad
Source: Stockpile	Specification: Zone 2B
Date Sample Collected: 2021-03-03	Tested By: Brandon Gray
Date Sample Tested: 2021-03-04	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

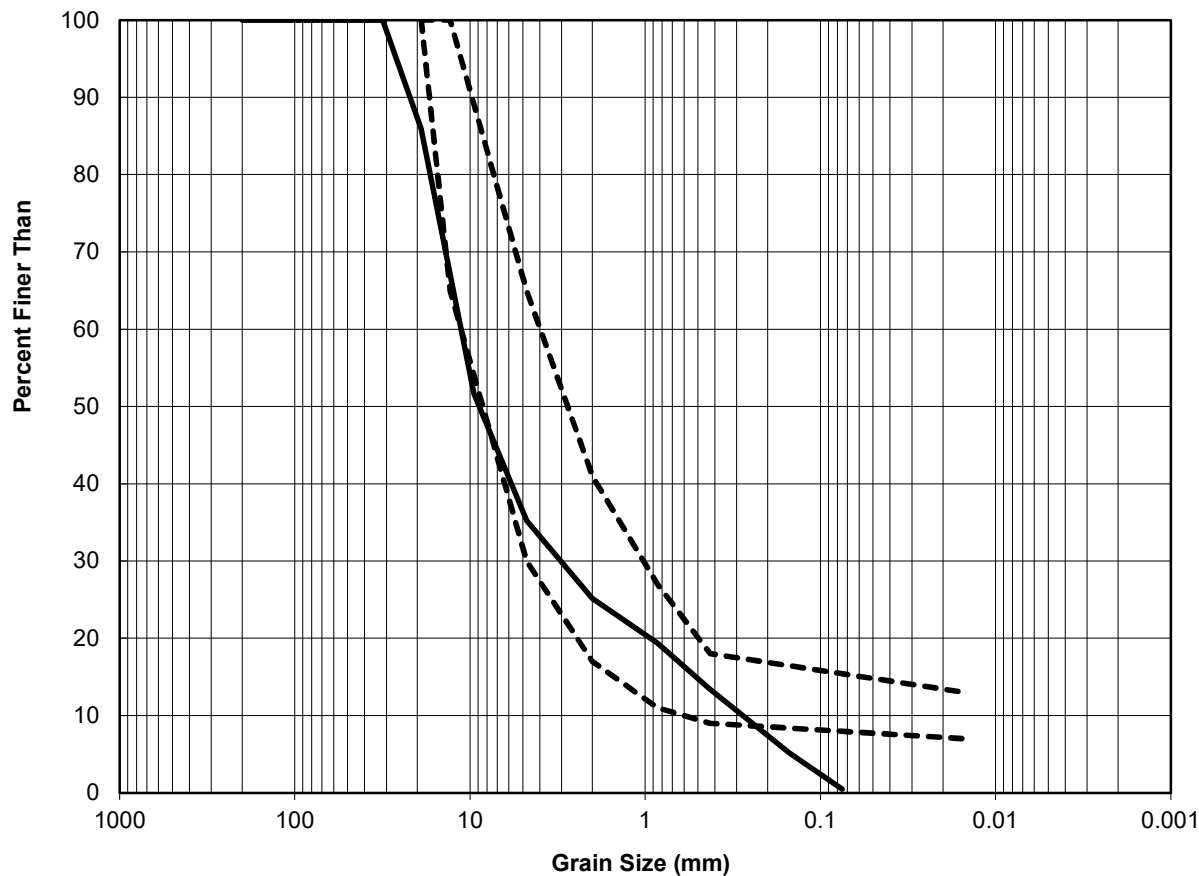
Material Specifications:

Grain Size Analysis Results

Zone 2A

Opening	Passing (%)	Opening (mm)	Passing (%)
56 mm	100.0	19	100
31.5 mm	100.0	13	100-65
19 mm	85.9	4.75	65-30
12.5 mm	85.9	2	41-17
9.5 mm	51.7	0.85	27-11
4.75 mm	35.2	0.425	18-9
2.00 mm	25.2	0.075	13-7
850 µm	19.3	0.0075	10-6
425 µm	13.4		
150 µm	5.2		
75 µm	0.5		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Type 2B sampled at mixing pad. Specification for Zone 2A provided for reference.

Water content as received in lab (%): 5.3%

APPENDIX H-1C

**QA Laboratory Results – Zone 3
Coarse Filter Material**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-03	Location: Coarse Filter Stockpile
Source: Stockpile	Specification: Zone 3
Date Sample Collected: 2021-02-24	Tested By: Brandon Gray
Date Sample Tested: 2021-02-26	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

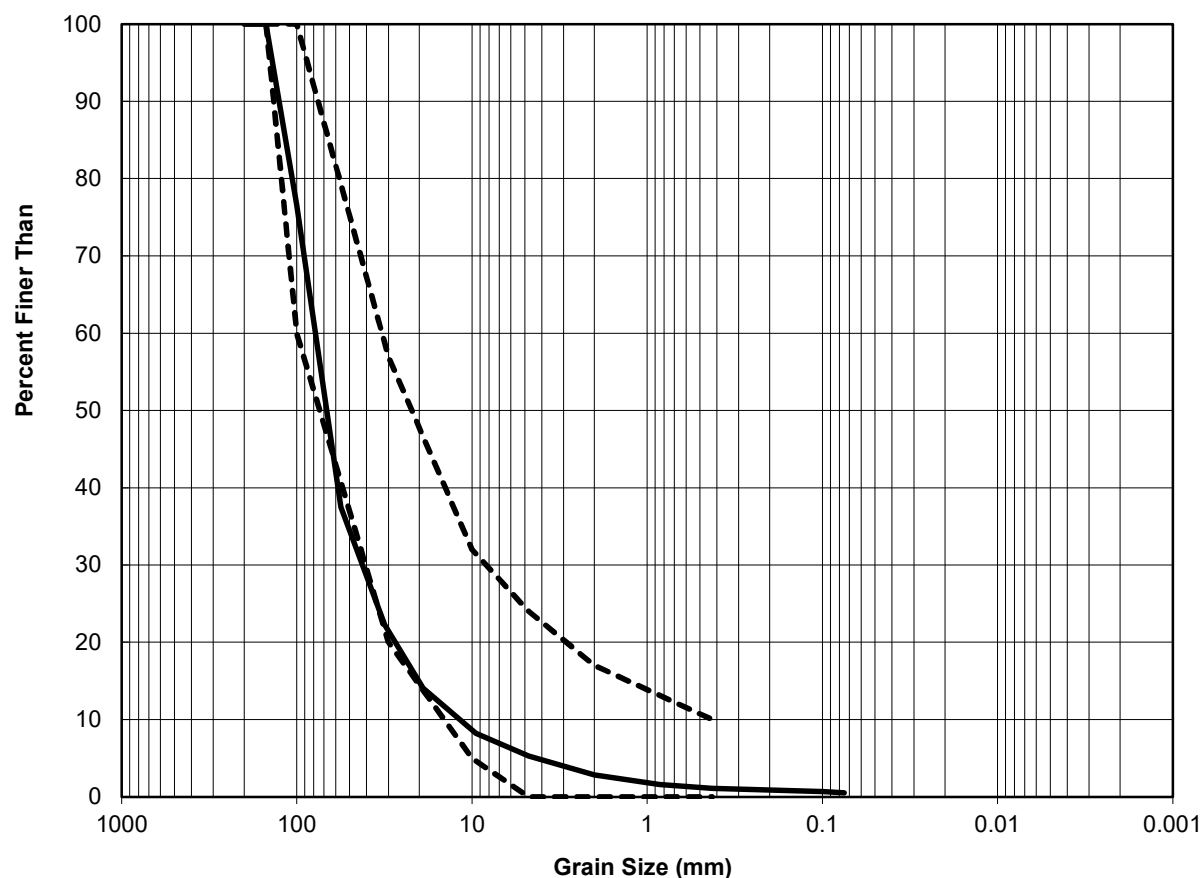
Material Specifications:

Grain Size Analysis Results

Zone 3

Opening (mm)	Passing (%)	Opening (mm)	Passing (%)
150 mm	100.0	150	100
100 mm	76.6	100	100-60
56 mm	37.5	30	57-20
31.5 mm	22.2	10	32-5
19 mm	14.1	4.75	24-0
9.5mm	8.2	2	17-0
4.75 mm	5.3	0.425	10-0
2.00 mm	2.8	0.075	5-0
850 µm	1.6		
425 µm	1.1		
100 µm	0.7		
75 µm	0.5		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:
 Sampled from western face of existing stockpile.

Water content as received in lab (%): -

APPENDIX H-1D

**QA Laboratory Results – Zone 4
Esker Material**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-02	Location: South Esker Pile
Source: Stockpile	Specification: Zone 4
Date Sample Collected: 2021-02-21	Tested By: Brandon Gray
Date Sample Tested: 2021-02-24	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

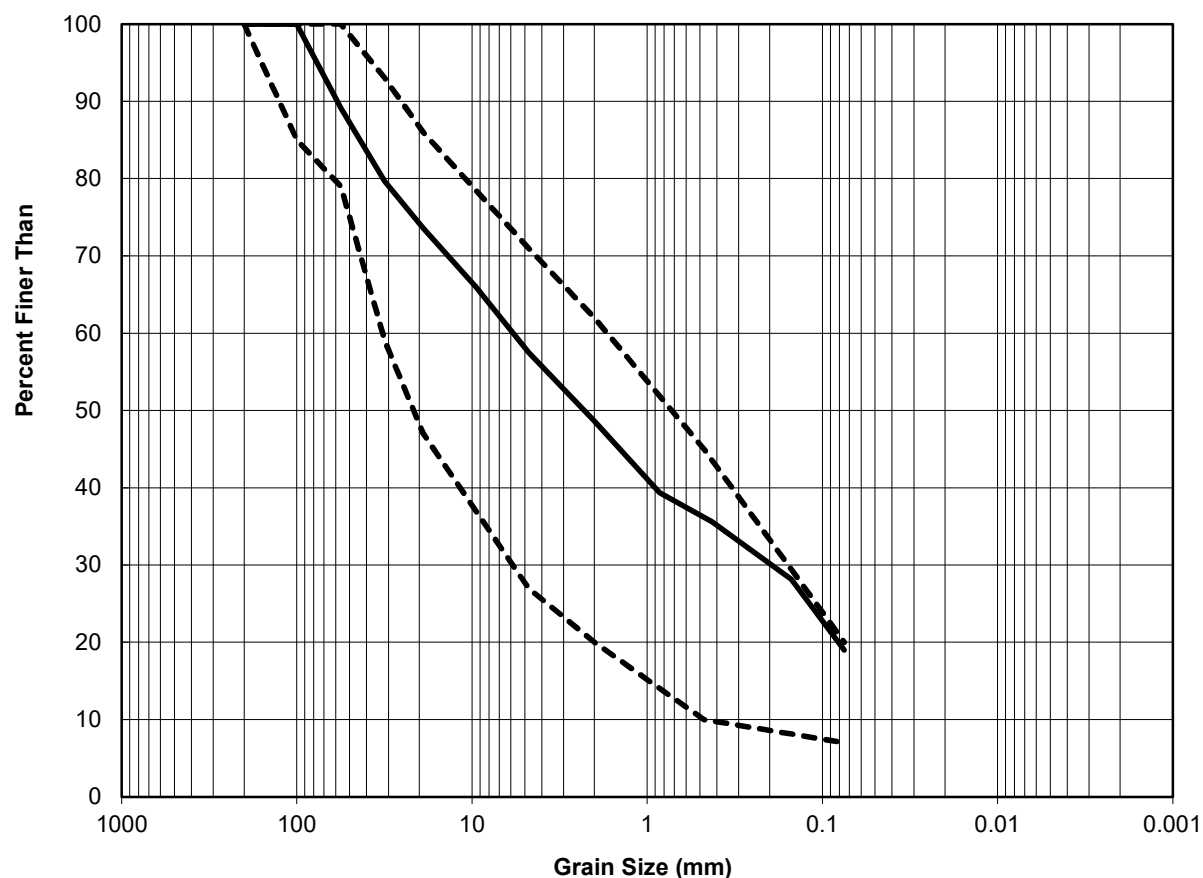
Material Specifications:

Grain Size Analysis Results

Zone 4

Opening	Passing (%)	Opening (mm)	Passing (%)
100 mm	100.0	200	100
56 mm	89.1	100	100-85
31.5 mm	79.7	56	100-79
19 mm	73.6	31.5	93-59
12.5 mm	73.6	19	86-47
9.5mm	66.0	4.75	71-27
4.75 mm	57.5	2	62-20
2.00 mm	48.6	0.475	45-10
850 µm	39.3	0.075	20-7
425 µm	35.6		
150 µm	28.1		
75 µm	19.0		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:
 Sampled from top of west esker stockpile.

Water content as received in lab (%): 9.9%

APPENDIX H-1E

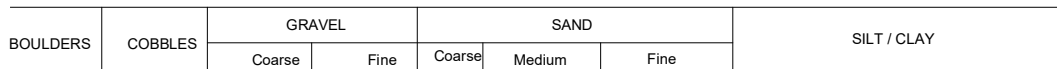
QA Laboratory Results – Bentonite Material



**AEM - 2021 IVR Dyke Construction
Project No. 21452873**

[illegible]

Water content as received in lab (%): 14.8%



APPENDIX H-2

IVR Dike QA Laboratory Results

APPENDIX H-2A

**QA Laboratory Results – Zone 2A
Fine Filter Material**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-19	Location: Sta. 0+405, Key trench, elev. 2.5 mbgs
Source: IVR Dyke	Specification: Zone 2A
Date Sample Collected: 2021-03-24	Tested By: Brandon Gray
Date Sample Tested: 2021-03-26	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

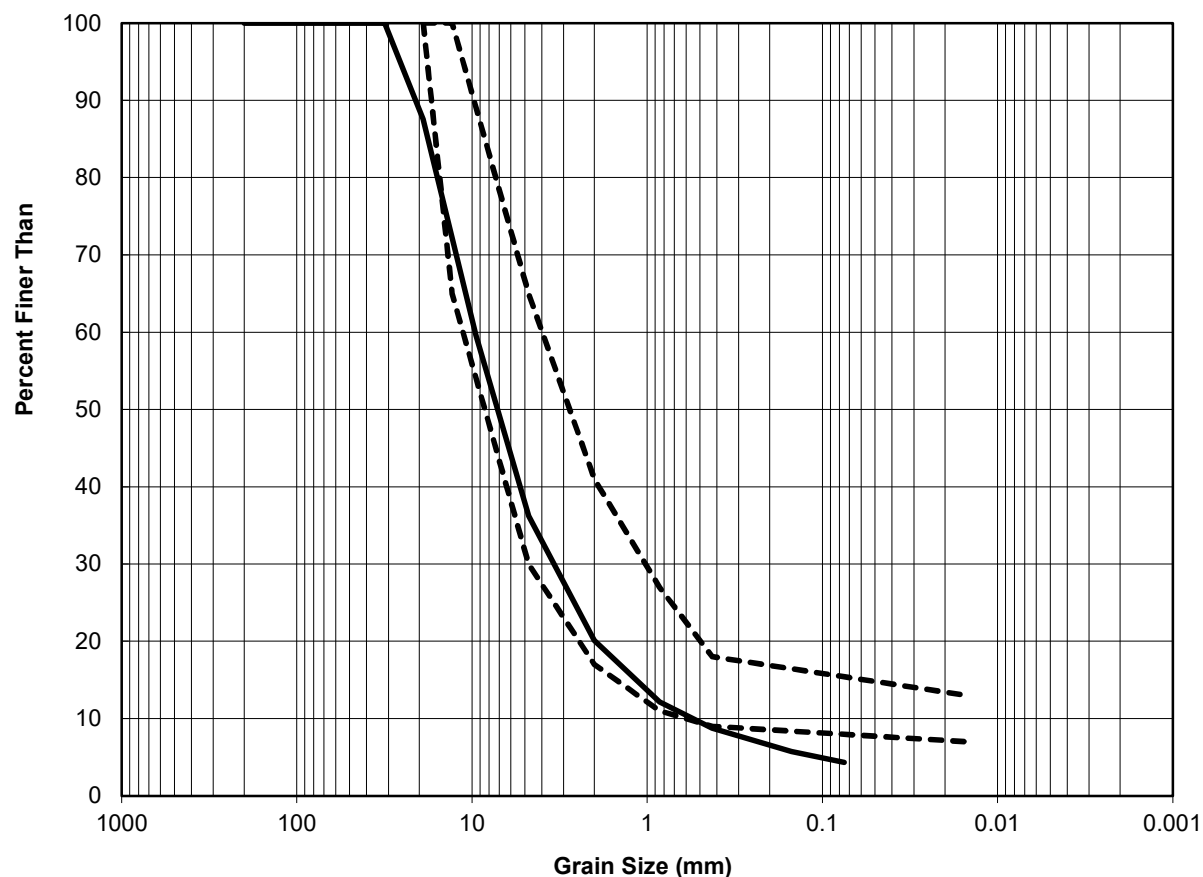
Material Specifications:

Grain Size Analysis Results

Zone 2A

Opening	Passing (%)	Opening (mm)	Passing (%)
56 mm	100.0	19	100
31.5 mm	100.0	13	100-65
19 mm	87.6	4.75	65-30
12.5 mm	67.6	2	41-17
9.5 mm	59.6	0.85	27-11
4.75 mm	36.2	0.425	18-9
2.00 mm	20.1	0.075	13-7
850 µm	12.2	0.0075	10-6
425 µm	8.8		
150 µm	5.7		
75 µm	4.3		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Water content as received in lab (%): 2.3%



GOLDER

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-25 Location: Spillway, Sta. 0+020
Source: IVR Dyke Specification: Zone 2A
Date Sample Collected: 2021-04-24 Tested By: Brandon Gray
Date Sample Tested: 2021-04-25 Reviewed By: -

Reference

ASTM D6913-04

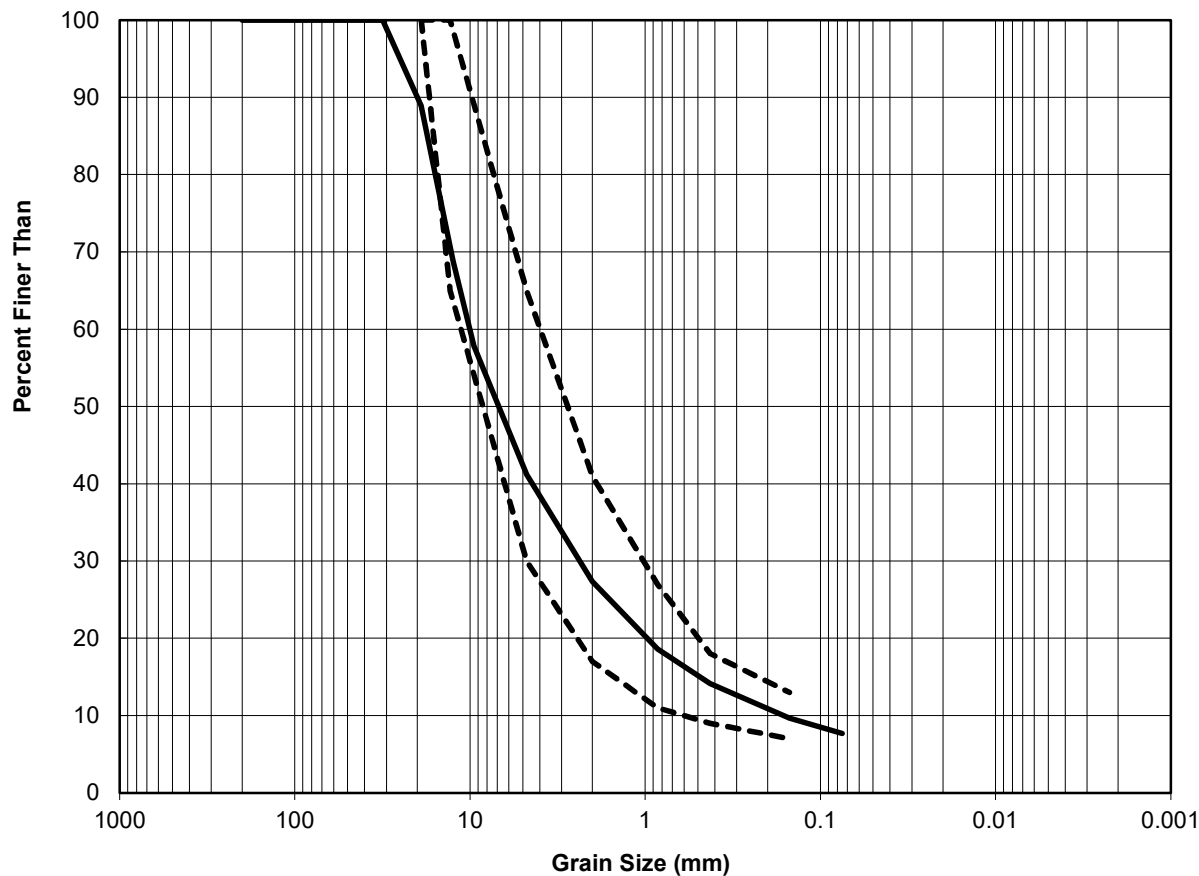
Material Specifications:

Grain Size Analysis Results

Zone 2A

Opening	Passing (%)	Opening (mm)	Passing (%)
200 mm	100.0	19	100
150 mm	100.0	13	100-65
100 mm	100.0	4.75	65-30
56 mm	100.0	2	41-17
31.5 mm	100.0	0.85	27-11
19 mm	89.0	0.425	18-9
12.5 mm	68.8	0.15	13-7
9.5mm	57.8	0.075	10-6
4.75 mm	41.2		
2.00 mm	27.4		
850 µm	18.6		
425 µm	14.2		
150 µm	9.7		
75 µm	7.7		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Water content as received in lab (%): 3.6%

APPENDIX H-2B

**QA Laboratory Results – Zone 2B
FFAB Material**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-20	Location: Sta. 0+045, Under installed LLDPE
Source: IVR Dyke	Specification: Zone 2B
Date Sample Collected: 2021-03-24	Tested By: Brandon Gray
Date Sample Tested: 2021-03-26	Reviewed By: Marion Habersetzer

Reference

ASTM D6913-04

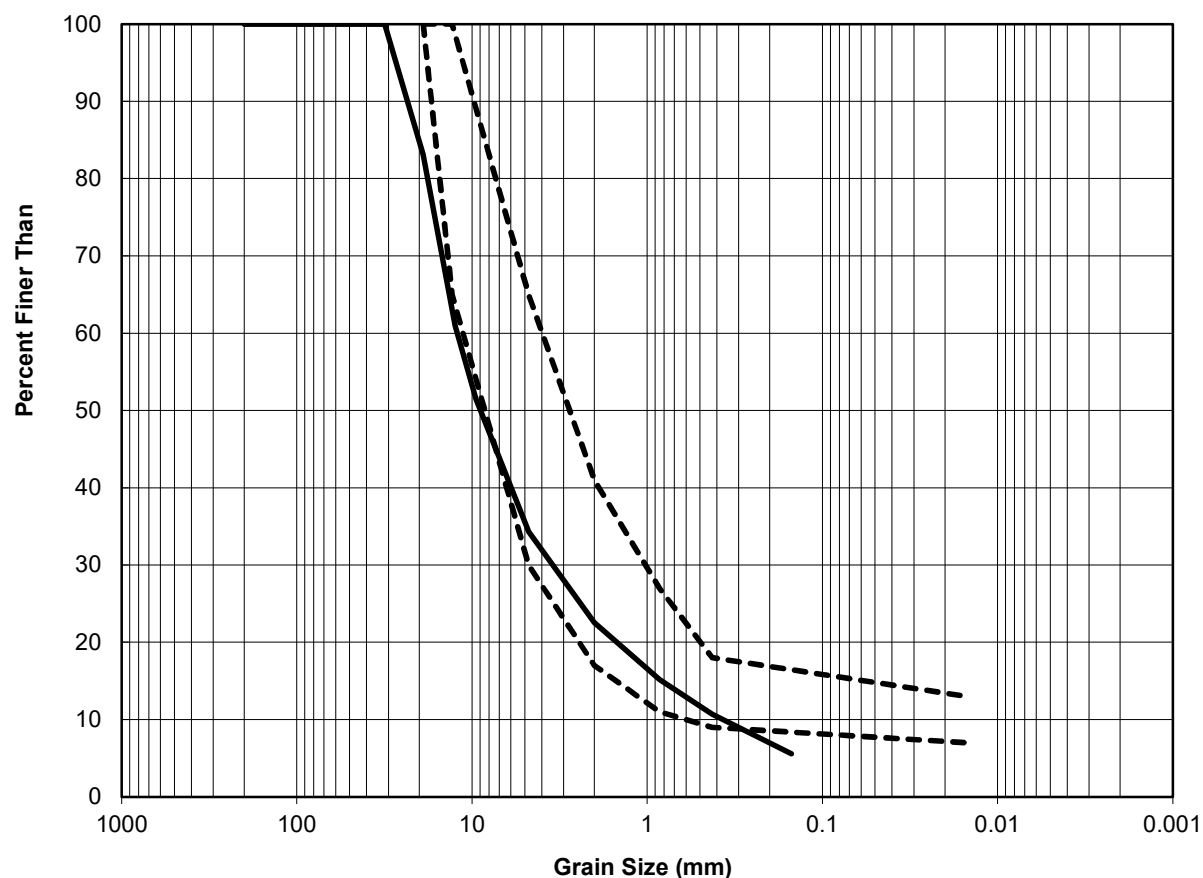
Material Specifications:

Grain Size Analysis Results

Zone 2A

Opening	Passing (%)	Opening (mm)	Passing (%)
56 mm	100.0	19	100
31.5 mm	100.0	13	100-65
19 mm	83.1	4.75	65-30
12.5 mm	61.0	2	41-17
9.5 mm	51.5	0.85	27-11
4.75 mm	34.3	0.425	18-9
2.00 mm	22.6	0.075	13-7
850 µm	15.2	0.0075	10-6
425 µm	10.7		
150 µm	5.6		
75 µm	3.3		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Water content as received in lab (%): 2.3%

**GOLDER**

Grain Size Analysis

(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

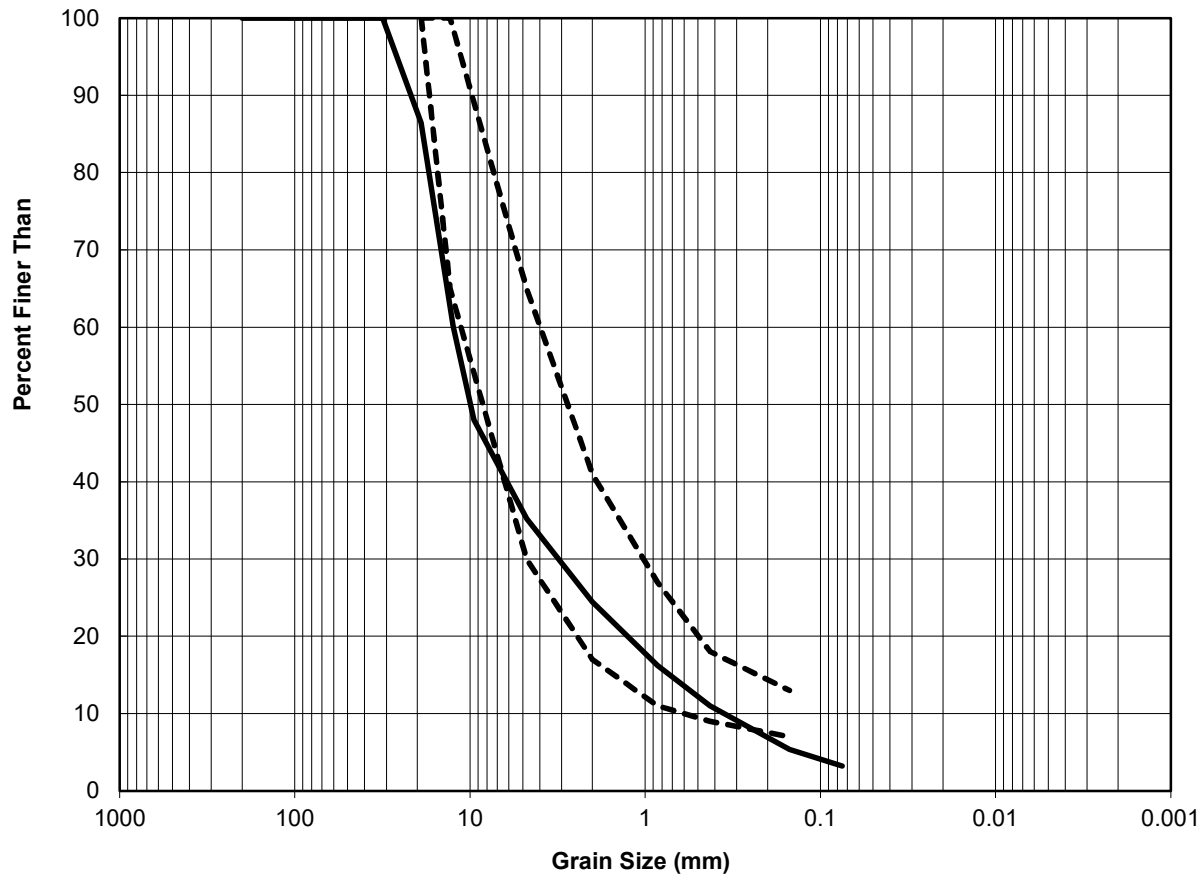
Sample ID: QA21-23 Location: Sta. 0+400, over liner hinge
Source: IVR Dyke Specification: Zone 2B
Date Sample Collected: 2021-04-21 Tested By: Brandon Gray
Date Sample Tested: 2021-04-23 Reviewed By: -

Reference

ASTM D6913-04

Material Specifications:**Grain Size Analysis Results****Zone 2A**

Opening	Passing (%)	Opening (mm)	Passing (%)
200 mm	100.0	19	100
150 mm	100.0	13	100-65
100 mm	100.0	4.75	65-30
56 mm	100.0	2	41-17
31.5 mm	100.0	0.85	27-11
19 mm	86.5	0.425	18-9
12.5 mm	60.1	0.15	13-7
9.5mm	48.0	0.075	10-6
4.75 mm	35.2		
2.00 mm	24.4		
850 µm	16.2		
425 µm	11.0		
150 µm	5.4		
75 µm	3.2		

Graphical Analysis

BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Water content as received in lab (%): 8.5%

APPENDIX H-2C

**QA Laboratory Results – Zone 3
Coarse Filter Material**

Grain Size Analysis

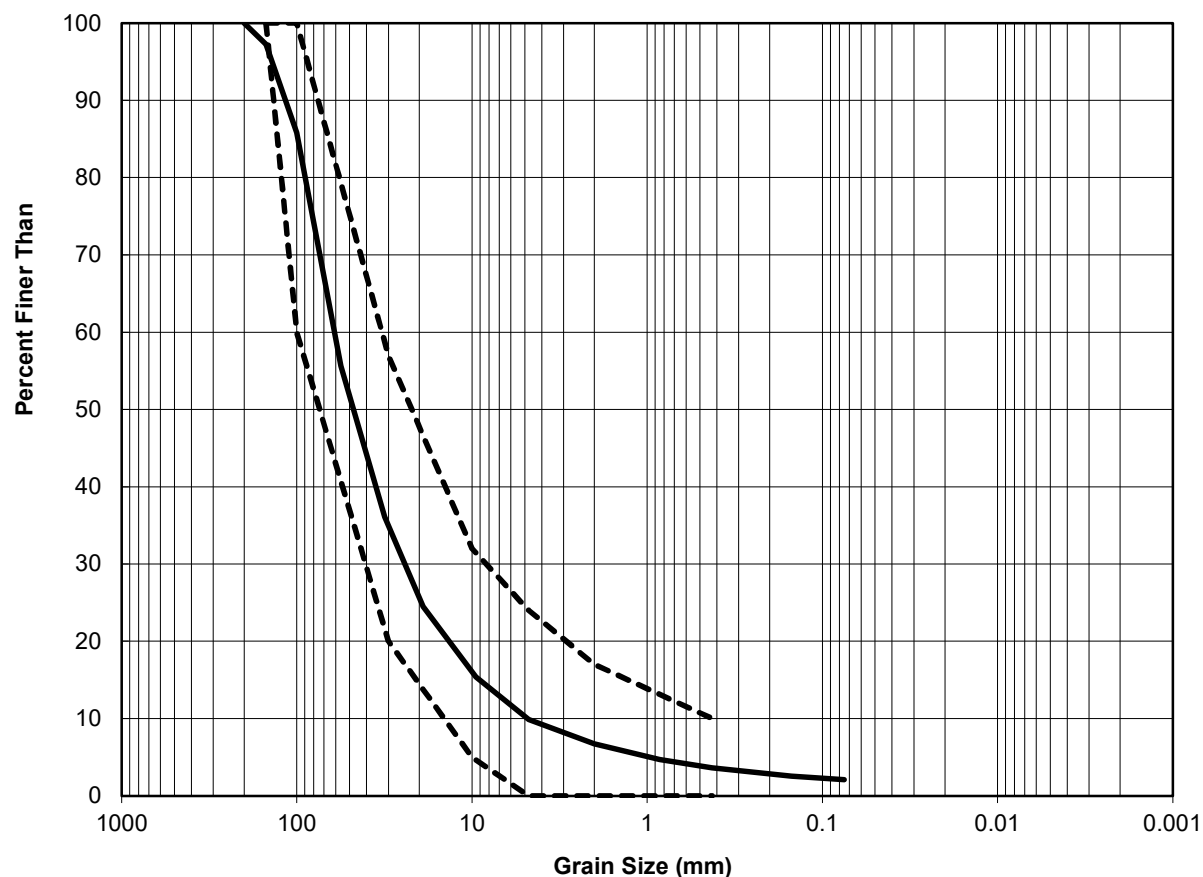
(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-21	Location: Sta. 0+070, Offset Centerline of Key Trench
Source: IVR Dyke	Specification: Zone 3
Date Sample Collected: 2021-04-02	Tested By: Brandon Gray
Date Sample Tested: 2021-04-04	Reviewed By: Marion Habersetzer

Reference ASTM D6913-04		Material Specifications:	
Grain Size Analysis Results		Zone 2A	
Opening	Passing (%)	Opening (mm)	Passing (%)
200 mm	100.0	150	100
150 mm	97.3	100	100-60
100 mm	85.8	30	57-20
56 mm	55.6	10	32-5
31.5 mm	36.1	4.75	24-0
19 mm	24.5	2	17-0
12.5 mm	24.5	0.425	10-0
9.5mm	15.4	0.075	5-0
4.75 mm	9.9		
2.00 mm	6.7		
850 µm	4.7		
425 µm	3.6		
150 µm	2.6		
75 µm	2.1		

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Comments:

Water content as received in lab (%): 1.4%

Grain Size Analysis

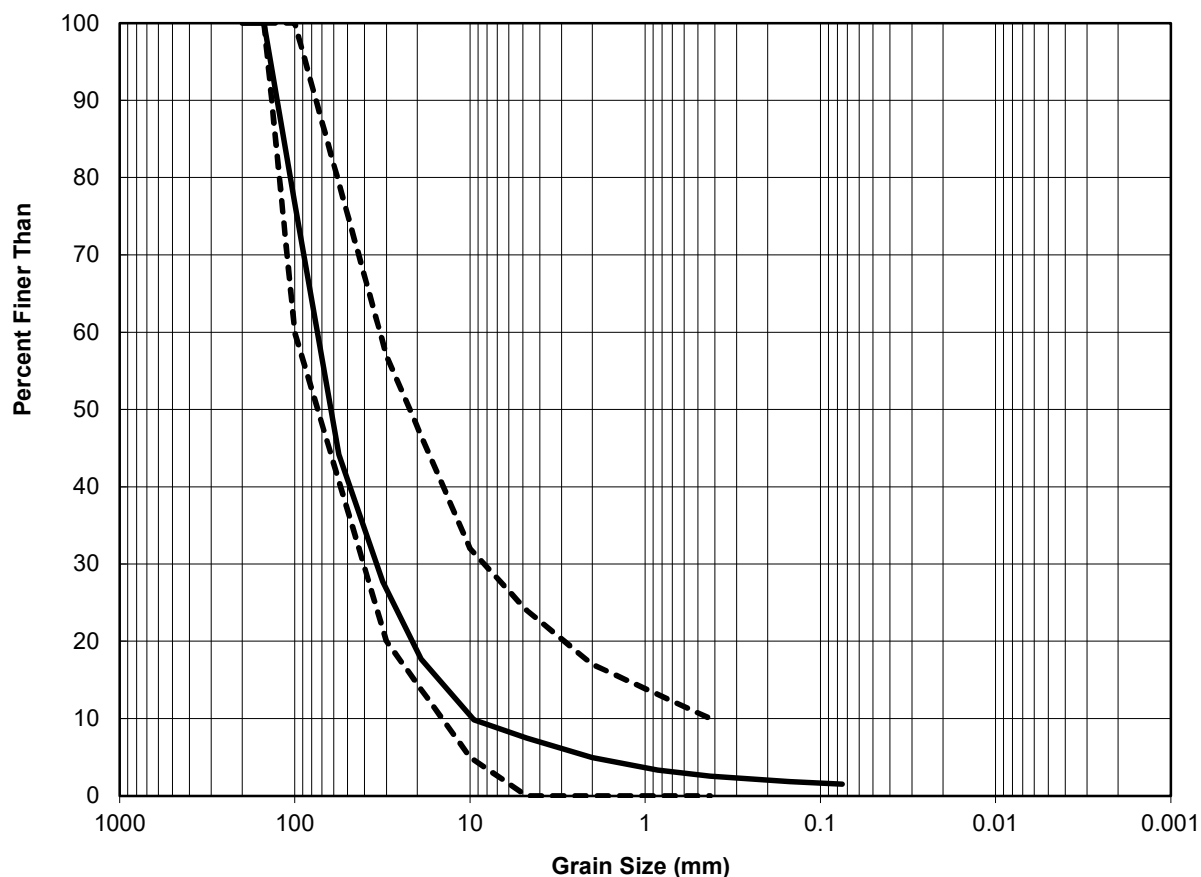
(Mechanical Analysis)

AEM - 2021 IVR Dyke Construction
Project No. 21452873

Sample ID: QA21-28	Location: Spillway, Sta. 0+030
Source: IVR Dyke	Specification: Zone 3
Date Sample Collected: 2021-04-25	Tested By: Brandon Gray
Date Sample Tested: 2021-04-25	Reviewed By: -

Reference		Material Specifications:	
ASTM D6913-04			
Grain Size Analysis Results		Zone 2A	
Opening	Passing (%)	Opening (mm)	Passing (%)
200 mm	100.0	150	100
150 mm	100.0	100	100-60
100 mm	76.7	30	57-20
56 mm	44.1	10	32-5
31.5 mm	27.7	4.75	24-0
19 mm	17.7	2	17-0
9.5mm	9.9	0.425	10-0
4.75 mm	7.5	0.075	5-0
2.00 mm	4.9		
850 µm	3.3		
425 µm	2.6		
150 µm	1.8		
75 µm	1.5		

Graphical Analysis



Comments:

Water content as received in lab (%): -

APPENDIX H-2D

**QA Laboratory Results – Zone 4
Esker Material**

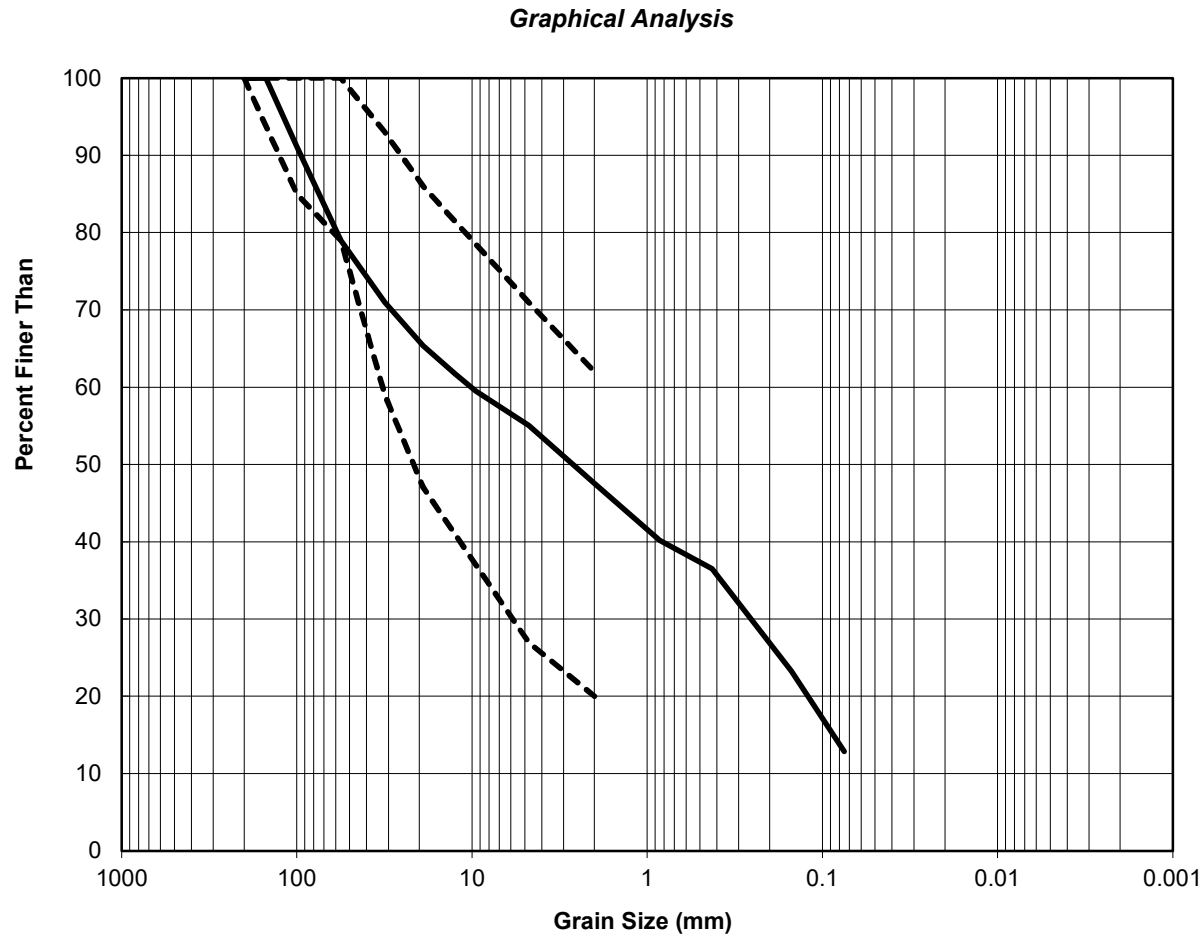


**AEM - 2021 IVR Dyke Construction
Project No. 21452873**

Reference		Material Specifications:	
ASTM D6913-04			
Grain Size Analysis Results		Zone 2A	
Opening	Passing (%)	Opening (mm)	Passing (%)
200 mm	100.0	200	100
150 mm	100.0	100	100-85
100 mm	91.2	56	100-79
56 mm	79.0	31.5	93-59
31.5 mm	71.0	19	86-47
19 mm	65.4	4.75	71-27
12.5 mm	61.7	2	62-20
9,5mm	59.5	0.475	45-10
4.75 mm	55.0	0.075	20-7
2.00 mm	47.5		
850 µm	40.2		
425 µm	36.5		
150 µm	23.3		
75 µm	12.9		

Comments:

Water content as received in lab (%): 10.6%



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	