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DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 5 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 365424.1331 E 2295976.7536	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-01	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 45; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 907.3
	16. DATE HOLE: STARTED 08/03/04; COMPLETED 08/11/04
7. THICKNESS OF OVERBURDEN 106.5 Feet	17. ELEVATION TOP OF HOLE 952.80 Feet
8. DEPTH DRILLED INTO ROCK 10 Feet	18. TOTAL CORE RECOVERY FOR BORING 89 %
9. TOTAL DEPTH OF HOLE 116.5 Feet	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., dry to mst.							4, 15, 18, 15, 20, 21, 7, 7, 8
			*mst. @ El. 949.8-El. 948.3							
948.3	4.5									
		SC-SM	SILTY CLAYEY SAND (SC-SM), br., low pl., mst., w/gravel				23	54	23	6, 9, 8, 7
946.3	6.5									
		SM	SILTY SAND (SM), br., non pl., mst., w/few gravels							8, 7, 6, 10, 8
943.8	9.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gravels				2	92	6	4, 4, 4, 2, 4, 4
940.8	12.0									
		SP	POORLY GRADED SAND (SP), br., mst., w/tr. gravel							3, 4
939.8	13.0									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst. -Cobbles and Boulders							6, 12, 11, 10, 13, 9, 8
936.3	16.5									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst				56	33	11	7, 8, 1, 12, 10, 9
932.8	20.0		*w/tr. org. @ El. 933.3-El. 932.8							15

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-01

PLATE D1

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 952.8	Hole No. CD-04-01
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst. w/tr. org. -Cobbles and Boulders *dry to mst., no tr. org. @ El. 930.3-El. 927.3							26, 46, 25, 38, 56, 46, 75, 93, 34, 45, 48
927.3	25.5									
924.8	28.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry.				63	31	6	32, 46, 47, 30, 40
922.8	30.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL(SP-SM), br., mst.							35, 15, 18, 19
919.8	33.0	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., dry., w/few gravels				10	80	10	17, 14, 19, 23, 18, 21
910.8	42.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst., w/tr. coal frags. *no tr. coal frags. @ El. 916.8-El. 910.8 *dry to mst. @ El. 913.8-El. 910.8							17, 18, 15, 17, 15, 15, 23, 12, 11, 13, 12, 11, 20, 16, 16, 15, 16, 20
908.8	44.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry., w/few gravels				13	80	7	15, 15, 18, 17

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 952.8	Hole No. CD-04-01
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., dry., w/few gravels							18
907.8	45.0									20
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet					▼ 8/04/04		12
										26
										23
										8
										12
										15
										10
										14
			*mst. to wet, @ El. 904.8-El. 901.8							18
										7
										9
901.8	51.0									11
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet, w/few gravels							9
										11
		SP-SM								14
										18
										21
898.8	54.0									28
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. to wet							10
										15
										18
										5
										10
895.8	57.0									17
895.2	57.6		POORLY GRADED SAND WITH SILT (SP-SM), br, mst., few gravel							9
			POORLY GRADED SAND WITH SILT (SP-SM), br, mst., w/tr. gravel							12
										18
							2	92	6	7
										10
892.8	60.0									13
			NO SAMPLE - NO RECOVERY							18
		NS								31
891.3	61.5									45
890.6	62.2	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br to gr, mst. to wet							15
890.5	62.3	SM	SILTY SAND (SM), gr. to bk, non. pl., wet, w/l. orgs.							18
										23
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							10
		SP-SM								16
										21
887.8	65.0									7
			SILTY SAND (SM), br., non. pl., mst. to wet, w/tr. gravel							11
										15
		SM					1	71	28	15
										22
885.3	67.5									28
884.8	68.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet							7

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 952.8	Hole No. CD-04-01
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	10 BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet							9, 11, 13, 10, 10
		SP-SM	*w/tr. orgs. @ El. 882.3-El. 879.3							5, 7, 9, 10, 12, 15
879.3	73.5									
			SILTY SAND (SM), br., non pl. to low pl., mst. to wet							9, 14, 23, 6, 10, 18
		SM	*w/lt. br., non pl. @ El. 876.3-El. 873.3				0	85	15	6, 10, 18, 8, 10, 12
			*w/lt. br., low pl., wet @ El. 873.3-El. 870.3							11, 13, 18, 10, 12, 17
870.3	82.5									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), lt. br., mst. to wet							6, 14, 20, 14, 20, 23
			*w/tr. gravel @ El. 867.3-El. 865.0				1	89	10	11, 11, 18, 12, 16
865.0	87.8									
		ML	SILT (ML), br. to gr., low pl., mst., w/few sand		28	23				19, 11, 13, 18
862.8	90.0									
		CL	LEAN CLAY (CL), gr., m. pl., mst., w/tr. sand				0	1	99	11, 12, 14, 6
860.8	92.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 952.8	Hole No. CD-04-01
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL	LEAN CLAY (CL), gr., m. pl., mst., w/tr. sand				0	1	99	10, 12, 5, 6, 8, 6, 8, 12, 8, 12, 14, 9, 12, 16, 10, 16, 26, 12, 18, 23
			*w/br., low pl. @ El. 852.7-El. 851.5				0	1	99	
850.2	102.6									10, 16, 20
		CL-ML	SANDY SILT-LEAN CLAY (CL-ML), br., low pl., mst.							14, 21, 33, 26, 38
			*w/tr. gravel @ El. 849.3-El. 846.8		22	17				
846.8	106.0									
846.3	106.5	CL	LEAN CLAY (CL), br. to gr., m. pl., mst., w/few sand & tr. gravel							55
		SS	SANDSTONE: light brown to gray, mod. hard, very fine grained with frequent iron staining and many clay seams and shale interbeds.	0	RQD					BEGAN CORING ~TOR at 843.8.
			0.3' Clay, gray, soft and silty from 846.3 to 846.0.							
			Mod. to severely broken into gravel size fragments from 846.0 to 845.0.	L 1.1	LOSS					
			70° fracture, open with rough, irregular surface and heavy iron staining from 844.1 to 844.0.							
			0.2' Clay Seam, gray, soft, fissile from 843.8 to 843.6.							
			0.1' Clay Seam, light gray, soft to mod. hard, silty from 845.5 to 843.4.	0						
			Mod. to severely broken into gravel size fragments with heavy iron staining from 843.4 to 841.7 and 841.2 to 840.2.							
			Near vertical fracture, open with smooth and sub-planar surface with iron staining from 841.1 to 840.2.	L 0.0						
			Clay coated bedding plane at 839.9.							
			Mod. broken with iron stained fragments from 839.3 to 838.2 and 837.5 to 836.8.	0						
			60° fracture, open with rough, irregular surface, iron stained from 836.2 to 836.3.							
836.8	116.0			L 0.3						Actual bottom of boring at 836.3.

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-1

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 6 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 365523.2914 E 2296509.5481	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
4. HOLE NO. (As shown on drawing title and file number) CD-04-02	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 74; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 905.12
7. THICKNESS OF OVERBURDEN 107.4 Feet	16. DATE HOLE: STARTED 02/24/04; COMPLETED 02/27/04
8. DEPTH DRILLED INTO ROCK 12.2 Feet	17. ELEVATION TOP OF HOLE 982.72 Feet
9. TOTAL DEPTH OF HOLE 119.6 Feet	18. TOTAL CORE RECOVERY FOR BORING 98%
	19. NAME OF INSPECTOR J. MCINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
981.2	1.5	CL	LEAN CLAY (CL), gr., m. pl., dry, w/few sand & gravel							2 5 6
978.2	4.5	CL	SANDY LEAN CLAY (CL), br. to gr., low pl., dry, w/grovel		26	17				2 6 16 6 8 8
976.7	6.0	SC	CLAYEY SAND WITH GRAVEL (SC), br. to gr., low to m. pl., dry				27	38	35	4 7 6
975.2	7.5	CL	SANDY LEAN CLAY (CL), br. to gr., low pl., dry, w/few gravel				6	34	60	4 7 10
973.7	9.0	SC-SM	SILTY CLAYEY SAND (SC-SM), br. to gr., low pl., dry to mst., w/tr. grovel & org.							3 5 7
972.2	10.5	CL	SANDY LEAN CLAY (CL), br. to gr., m. pl., dry to mst., w/few gravel							3 6 6
967.7	15.0	SM	SILTY SAND (SM), br. to gr., low pl., dry to mst., w/tr. gravel *br., non pl. to low pl. @ El. 970.9-El. 967.7				13	59	28	4 8 12 4 10 10 4 11 10
962.72	20.0	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br. to gr., low pl., dry *br., mst. @ El. 966.2-El. 962.7		21	16				5 8 9 5 11 12 6 7 11 5

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.7 | Hole No. CD-04-02

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 2 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.		21	15				7, 8
										5, 14, 9
			*tr. gravel @ El. 960.2-El. 958.7				4	57	39	3, 7, 4
		SC-SM	*dry, w/tr. coal frags. @ El. 958.7-El. 957.2							5, 11, 11
										5, 9, 13
			*br. to gr. @ El. 955.7-El. 952.7							5, 6, 7
										11, 28, 18
952.7	30.0		*dry @ El. 954.2-El. 952.7							
		SC	CLAYEY SAND (SC), br., low pl., mst., w/few gravel		22	14	12	45	43	5, 10, 9
951.2	31.5									
		SC-SM	SILTY CLAYEY SAND (SC-SM), br., low pl., mst., w/few gravel							4, 4, 7
949.7	33.0									
949.2	33.5	SM	SILTY SAND (SM), dk. gr., non pl., mst., w/tr. gravel							5
			POORLY GRADED SAND WITH GRAVEL (SP), br., dry							9, 7
										5, 7, 7
										5, 7, 7
		SP	*mst, w/tr. gravel @ El. 945.2 -El. 943.7							4, 4, 6
										3, 4, 4
			*dk. br., dry to mst, w/tr. gravel, coal frags. & org. @ El. 942.2-El. 940.7							3, 5, 6
940.7	42.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), gr. to blk., dry, w/tr. org.							3, 4, 4
939.2	43.5									
938.7	44.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry							4

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.7	Hole No. CD-04-02
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED GRAVEL WITH SAND (GP), br., dry							7
										5
			*lt. br., low recovery @ El. 937.7-El. 936.2							7
										10
936.2	46.5									7
			POORLY GRADED GRAVEL (GP), lt. br., dry, low recovery							15
										38
										39
		GP								40
										44
933.2	49.5									70
			POORLY GRADED GRAVEL WITH SAND (GP), br. to gr., dry, w/tr. coal frags.							30
										33
931.7	51.0									24
			POORLY GRADED GRAVEL (GP), br. to gr. and r., dry							24
										58
930.2	52.5									105
		GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry. w/tr. org.							6
										6
928.7	54.0									10
		NS	NO SAMPLE-NO RECOVERY							26
										61
927.2	55.5									83
			WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry. w/tr. coal frags.							21
										78
										66
			*no tr. coal frags @ El. 925.7-El. 921.2							27
										43
		GW-GM	*lt. br.@ El. 924.2-El. 922.7							46
										33
										39
										36
										18
										33
921.2	61.5									39
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry							24
										71
919.7	63.0									62
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br. to gr, dry							20
										34
918.2	64.5									32
		GW	WELL GRADED GRAVEL WITH SAND (GW), br., dry.							18
										25
916.7	66.0									36
		GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), gr., dry				61	33	6	20
										32
915.2	67.5		POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), lt. br., dry							66
914.7	68.0	GP-GM								29

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.7	Hole No. CD-04-02
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
913.7	69.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), lt. br., dry							67, 39
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							10, 19, 18
			×dry @ El. 912.2-El. 910.7							7, 11, 14
			×lt. br., dry @ El. 910.7-El. 909.2							5, 9, 10
			×dry, w/tr. coal frags. and orgs. @ El. 909.2-El. 907.7							4, 9, 17
			×lt. br., dry @ El. 907.7-El. 906.2							7, 11, 12
906.2	76.5		POORLY GRADED SAND (SP), br., mst., w/tr. gravel	02/27/04			1	95	4	3, 6, 10
			×no tr. gravel @ El. 904.7-El. 903.2							3, 6, 8
			×w/sli.org. odor @ El. 903.2-El. 901.7							3, 6, 9
										4, 9, 13
										6, 11, 20
			×w/few gravel and sli. org. odor @ El. 898.7-El. 897.4							6, 13, 22
897.4	85.3		POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							10, 22, 26
										13, 32, 23
894.2	88.5	CL-ML	SANDY SILT-LEAN CLAY WITH GRAVEL (CL-ML), br. to gr., low pl., mst.							14, 21, 22
892.7	90.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), gr., low pl., mst.,							10, 15, 17
894.7	92.0				28	19				8

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.7 | Hole No. CD-04-02

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 5 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
889.7	93.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), gr., low pl., mst.		28	19				14 19
886.6	96.1	GC	CLAYEY GRAVEL WITH SAND (GC), br. to gr., low pl., mst. *br., w/tr. coal frags. @ El. 886.7-El. 886.6							14 17 29 9 26 38
885.2	97.5	NS	NO SAMPLE-NO RECOVERY							100/.1 - - -
883.7	99.0	GC	CLAYEY GRAVEL WITH SAND (GC), br., low pl., mst., w/tr. c. frags.							12 15 14
882.2	100.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst							7 14 24
880.7	102.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), drk. gr., low pl., mst.							34 34 25
879.2	103.5	CL	SANDY LEAN CLAY (CL), gr., low pl., mst., w/few gravel, c. frags. & orgs.							11 12 13
877.7	105.0	CL	LEAN CLAY WITH SAND (CL), gr., low pl., mst., w/tr. gravel							5 12 22
875.6	107.1	CL	LEAN CLAY (CL), gr., low to m. pl., dry, w/tr. sand *br. to gr., low pl., w/few sand and gravel @ El. 876.2-El. 875.6							13 25 36 15 100/.1
875.3	107.4	NS	NO SAMPLE-NO RECOVERY							AUGER
866.7	116.0	SS	SANDSTONE: light gray, fine to medium grained, mod. hard with occasional shale stringers. 0.3' Clay, dark gray, mod. hard, (possibly shale) from 875.3 875.0. Near vertical fracture, open with smooth, sub-planar, iron-stained, clay coated surface from 875.0 to 874.8. 0.2' Clay, light brown, soft, friable from 874.6 to 874.4. Clay coated bedding plane at 874.2. Highly weathered soft and friable from 873.8 to 873.1. Vertical fracture, open with smooth, planar, iron-stained surface from 873.1 to 873.0. Mod. weathered from 873.1 to 872.2. 20° fracture, open with slightly rough, irregular, iron-stained surface at 872.5. Numerous shale stringers from 872.0 to 870.9. 30° fracture, open with rough, irregular surface from 871.5 to 871.3.	0 L 0.2 44 L 0.0 70	← RQD ← LOSS					BEGAN CORING ~TOR @ 875.0

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-02

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.7	Hole No. CD-04-02
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		
		SS	SANDSTONE: continued. Horizontal fracture (bedding plane) open with rough, irregular, iron-stained surface at 870.7. 45° fracture, open with slightly rough, planar, iron-stained surface, slightly broken from 870.2 to 870.1. Slightly weathered from 868.8 to 867.9. Near vertical fracture, open with slightly rough, sub-planar, heavily iron-stained surface from 868.1 to 868.6; mod. broken from 868.1 to 867.9. 60° fracture, open with slightly rough, sub-planar, iron-stained surface from 865.6 to 865.3.		
863.1	119.6			L 0.0	← LOSS
					BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 4 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 365543.4851 E 2296652.5259	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-03	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 27; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 913.3
	16. DATE HOLE: STARTED 07/22/04; COMPLETED 07/30/04
7. THICKNESS OF OVERBURDEN 72.5 Feet	17. ELEVATION TOP OF HOLE 958.32 Feet
8. DEPTH DRILLED INTO ROCK 10 Feet	18. TOTAL CORE RECOVERY FOR BORING 30%
9. TOTAL DEPTH OF HOLE 82.5 Feet	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
956.8	1.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							5, 7, 10
955.3	3.0	CL-ML	SANDY SILT-LEAN CLAY (CL-ML), br., low pl., mst., w/tr. gravel							7, 10, 12
952.3	6.0	SC	CLAYEY SAND (SC), br., low pl., mst., w/few gravel				12	60	28	16, 9, 5, 1, 1, 3
951.5	6.8	SC-SM	SILTY CLAYEY SAND (SC-SM), dk. br., low pl., dry, w/tr. gravel		29	22				10, 7
949.3	9.0	SC	CLAYEY SAND W/GRAVEL (SC), br., low pl., mst.				19	49	32	5, 5, 4, 4
941.8	16.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.				35	56	9	4, 5, 5, 3, 4, 5, 4, 3, 3, 7, 9, 6, 5, 12, 9
938.8	19.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gravel				5	88	7	2, 4, 5, 3, 3, 6
938.3	20.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst.							3

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 958.3	Hole No. CD-04-03
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst *w/tr. coal frogs. and organics @ El. 935.8-El. 932.8							4 5 4 6 5 8 10 11 8 11 12 7 10
932.0	26.3									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst. *w/tr. orgonics @ El. 929.8-El. 928.3				76	19	5	17 16 24 21 15 18 20
928.3	30.0									
		NS	NO SAMPLE-NO RECOVERY							17 21 18
926.8	31.5									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., mst. *br. @ El. 923.8-El. 914.8							17 18 22 30 33 47 30 51 56 47 55 38
							67	24	9	29 57 48 46 51 38
										52 100 46/0.1
916.7	41.6									
916.3	42.0	NS	NO SAMPLE-AUGER							AUGER
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							41 51 63
914.8	43.5									
914.3	44.0	NS	NO SAMPLE-NO RECOVERY							28

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 958.3 | Hole No. CD-04-03

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 3 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE - NO RECOVERY							36
913.3	45.0									29
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/few grave	07/28/04						3
										6
							6	86	8	9
										10
										12
910.3	48.0									15
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							7
										10
										8
										7
		SP-SM								8
907.3	51.0									9
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gravel and org. odor							11
										12
										10
										6
										6
904.3	54.0									7
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							2
										3
										5
										3
										8
901.6	56.7									13
			POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC), br., mst.							10
		SP-SC					39	52	9	12
										4
										9
899.1	59.2									10
			CLAYEY GRAVEL WITH SAND (GC), br., low to m. pl., mst.							14
		GC			27	17				8
										14
897.1	61.2									50/0.2
			NO SAMPLE-AUGER							
		NS								AUGER
891.8	66.5									
891.3	67.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst.							10
		CL	LEAN CLAY WITH SAND (CL), gr., low pl., mst.							12
890.3	68.0									17

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-03

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 958.3 | Hole No. CD-04-03

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 4 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL	LEAN CLAY WITH SAND (CL), gr., low pl., mst.							15 25 38 18 31 42 30 38 54
885.8	72.5									
		SH	SHALE: Dark gray, soft, clayey, mod. to severely broken.	0	← RQD					BEGAN CORING ~ TOR @ 885.8 No Recovery on runs 1 & 2 (Reported very soft zone.)
884.6	73.7									
		SS	SANDSTONE: Light gray, soft to mod. hard, silty with frequent iron staining, mod. broken. 0.05' Clay seam, light gray, soft silty from 879.3 to 879.2. 0.05' Clay seam, soft, light brown, sandy from 878.6 to 878.5.	L 2.0 0 L 3.0 0	← Loss					
875.8	82.5			L 2.0						
										BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 8 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 364336.2055 E 2296684.4052	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55
4. HOLE NO. (As shown on drawing title and file number) CD-04-4	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 112; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 903.7
	16. DATE HOLE: STARTED 02/29/04; COMPLETED 03/12/04
7. THICKNESS OF OVERBURDEN 168.1 Feet	17. ELEVATION TOP OF HOLE 982.40 Feet
8. DEPTH DRILLED INTO ROCK 11.9 Feet	18. TOTAL CORE RECOVERY FOR BORING 96 %
9. TOTAL DEPTH OF HOLE 180.0 Feet	19. NAME OF INSPECTOR J. MCINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
982.1	0.3	NS	NO SAMPLE - ASPHALT							AUGER
980.9	1.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry							4 11 10
977.9	4.5	NS	NO SAMPLE - NO RECOVERY							5 6 6 3 4 5
976.4	6.0	CL	LEAN CLAY WITH SAND (CL), br., m. pl., dry, tr. gravel		34	19	1	20	79	3 3 4
974.5	7.9	CL-ML	SILT-LEAN CLAY (CL-ML), br., low pl., dry, few sand, tr. gravel							3 6 6
970.4	12.0	CL-ML	SANDY SILTY CLAYEY WITH GRAVEL (CL-ML), br. to bk., low pl., dry, l. coal frags and org. *dry to mst. @ El. 973.4-El. 971.9 *br., no c. frags. or orgs. @ El. 971.9-El. 970.4							3 5 6 3 8 5 3 4 5
968.9	13.5	SC	CLAYEY SAND (SC), br., low pl., mst., w/few gravel		23	14	11	42	47	3 6 7
962.9	19.5	CL-ML	SANDY SILT-LEAN CLAY (CL-ML), br., low pl., mst. w/few gravel *br. to gr. @ El. 964.4-El. 962.9							7 6 9 6 9 11 5 9 10 5 9 11
962.4	20.0		SANDY SILTY CLAYEY W/GRAVEL (CL-ML), br. to gr., low pl., mst.							5

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-4

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 2 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
961.4	21.0	CL-ML	SANDY SILTY-CLAY WITH GRAVEL (CL-ML), br. to gr., low pl., mst.							6 8
959.9	22.5	SC	CLAYEY SAND WITH GRAVEL (SC), br., low pl., dry							5 5 8
958.4	24.0	SC-SM	SILTY CLAYEY SAND (SC-SM), br., low pl., dry, w/few grovel				9	53	38	5 8 11
952.4	30.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry							8 13 12 25 33 17 8 14 11 5 8 10
950.9	31.5	SC	CLAYEY SAND W/GRAVEL (SC), br., low pl., dry, low recovery							4 7 6
949.4	33.0		CLAYEY SAND (SC), lt. br., low pl., dry, w/tr. gravel							5 4 5
947.9	34.5	CL	SANDY LEAN CLAY (CL), br., low pl., mst., w/tr. gravel		25	16	4	39	57	5 5 6
946.4	36.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), lt. br., dry, low recovery							5 7 10
944.9	37.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry				40	51	9	5 11 9
941.9	40.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry, low recovery							4 3 3 6 5 7
938.4	44.0	NS	NO SAMPLE - NO RECOVERY							15 18 16 13 28 35 18

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-04

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-4
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE - NO RECOVERY							26 28 22 22 24 9 18 17
934.4	48.0									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., dry				41	47	12	8 5 5
932.9	49.5									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry							6 9 14
931.4	51.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), lt. br., dry, w/tr. cool frags, org., and few gravel							20 23 16
929.9	52.5									
		NS	NO SAMPLE - NO RECOVERY							18 31 43
928.4	54.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry, tr. gravel							12 17 13
							0	92	8	3 4 7
			*lt. br., tr. coal frags. and org., @ El. 925.4-El. 923.9							4 6 9
			*tr. coal frags. and org., few grave @ El. 923.9-El. 922.4							4 6 9
			*lt. br., few gravel @ El. 922.4 -El. 920.7							5 7 11
			*few gravel @ El. 920.7-El. 917.9							8 9 11
										7 5 8
917.9	64.5									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							9 6 10
916.4	66.0									
			POORLY GRADED SAND WITH SILT (SP-SM), lt. br., dry, w/tr. cool frags., orgs., & few gravels							14 8 8
			*no coal frags. and org. @ El. 914.9-El. 914.4							5
914.4	68.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-4
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
913.4	69.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), lt. br., dry, few gravel							7 11
911.9	70.5	SP	POORLY GRADED SAND WITH GRAVEL (SP), lt. br., dry							6 10 12
910.4	72.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry, tr. gravel				4	88	8	4 10 11
908.9	73.5	SP	POORLY GRADED SAND (SP), lt. br., dry, few gravel							5 5 10
907.4	75.0		POORLY GRADED SAND WITH GRAVEL (SP), lt. br., dry							5 9 13
904.4	78.0	SW	WELL GRADED SAND WITH GRAVEL (SW), br. to gr., dry, few coal frags.							7 16 16 5 10 11
902.9	79.5	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet				▼ 03/01/04			4 7 9
901.4	81.0	SW	WELL GRADED SAND WITH GRAVEL (SW), br., wet							4 9 9
895.4	87.0	SP	POORLY GRADED SAND (SP), br. to gr., wet, few gravel *mst. to wet from El. 896.9-El. 895.4							2 4 6 9 8 10 3 8 3 5 5 8
893.9	88.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, tr. gravel				3	91	6	4 5 9
890.4	92.0	SP	POORLY GRADED SAND (SP), br. to gr., wet, few gravel							5 5 11 5 7 12 14

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-4

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 5 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND (SP), br. to gr., wet, few gravel							10 10
			*br., mst., w/tr. coal frags. @ El. 889.4-El. 887.9							3 4 5
887.9	94.5									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							5 6 7
			*tr. org. @ El. 886.4-El. 884.9							9 8 8
			*wet, tr. org. @ El. 884.9-El. 883.4							6 7 7
883.4	99.0									
		SW	WELL GRADED SAND WITH GRAVEL (SW), br., wet							4 4 6
881.9	100.5									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							7 6 8
			*mst. @ El. 880.4- El. 878.9							8 16 32
878.9	103.5									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst.							31 34 18
877.4	105.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet				32	60	8	45 31 20
875.9	106.5									
		SM	SILTY SAND (SM), br., non pl., mst. to wet, few gravel				9	73	18	10 6 7
874.4	108.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. to wet							8 9 8
872.9	109.5									
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst., few gravel							8 5 5
871.4	111.0									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. to wet							6 7 8
869.9	112.5									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							10 12 8
868.4	114.0									
		CL-ML	SILT/LEAN CLAY (CL-ML), gr., low pl., mst., tr. sand		28	22				3 3 6
866.4	116.0									10

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-04

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-4
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL-ML	SILT/LEAN CLAY (CL-ML), gr., low pl., mst., tr. sand *mst. to wet @El. 865.4-El. 863.9				0	1	99	11, 8, 3, 4, 4, 4, 5, 6, 3, 4, 5, 4, 5, 7, 7, 8, 8
857.9	124.5									
		CL	LEAN CLAY (CL), gr., low to m. pl., mst., tr. sand *low pl. @ El. 856.4-El. 853.6		29	19				4, 6, 8, 4, 4, 5, 5, 5, 8
853.6	128.8									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, tr. coal frags.							9, 10, 13
851.9	130.5									
		SM	SILTY SAND (SM), gr., non pl., wet				0	83	17	17, 17, 17
850.4	132.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst. *dry to mst., tr. coal frags. @ El. 848.9-El. 847.4							14, 16, 16, 22, 27, 24, 10, 16, 14
845.9	136.5									
		SM	SILTLY SAND (SM), br. to gr., non pl., mst. to wet							10, 9
844.8	137.6									
844.2	138.2	CL	LEAN CLAY (CL), gr., low to m. pl., dry to mst., tr. sand							16
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst., W/tr. coal frags. & orgs. *mst. to wet @ El. 842.9-El. 842.4							8, 12, 17, 5
842.9	139.5									
842.4	140.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-4

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst. to wet ×wet @ El. 841.4-El. 839.9							11, 13, 10, 12, 11
839.9	142.5									
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst., tr. coal frags.							8, 12, 17
838.4	144.0									
		SM	SILTY SAND (SM), br. to gr., non pl., mst., tr. gravel ×gr., wet, w/tr. coal frags. @ El. 836.9-El. 835.2				1	83	16	6, 10, 15, 7, 12, 19
835.2	147.2									
834.6	147.8	CL	LEAN CLAY (CL), gr., med. pl., mst., few sand							7, 10
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr. to y., mst. to wet, w/ tr. gravel, coal frags., & org.							20, 12, 17, 16
832.4	150.0									
		SC-SM	SILTY CLAYEY SAND (SC-SM), br. to gr., low pl., mst.		21	15				6, 8, 16
830.9	151.5									
		SM	SILTY SAND (SM), gr., non pl., wet ×tr. coal frags. @ El. 829.4-El. 827.9							10, 13, 22, 8, 13, 18
827.9	154.5									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst. to wet							8, 12, 22
826.4	156.0									
		SM	SILTY SAND (SM), br. to gr., non pl., mst. to wet ×mst. @ El. 824.9-El. 823.4 ×tr. gravel, coal frags., & org. @ El. 823.4-El. 821.9 ×tr. gravels & few org. @ El. 821.9 to El. 820.4 ×wet, tr. gravel & coal frags. @ El. 820.4 to El. 818.9				1	82	17	8, 13, 17, 10, 12, 15, 15, 22, 23, 11, 13, 19
818.9	163.5		POORLY GRADED SAND (SP), br., mst., w/tr. gravel & c. frags.							11, 13, 15
818.4	164.0	SP								12

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-4
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND (SP), br., mst., w/tr. gravel & coal frags.							16 17
										8 11 15
			*tr. org. @ El. 817.4-El. 814.7							8 16 22
814.7	167.7		CLAYEY SAND WITH GRAVEL							
814.3	168.1	SC	(SC), br. to gr., low pl., mst.							
										BEGAN CORING
		SH	SHALE: dark gray, soft to mod. hard, severely to mod. weathered, silty.	0	←RQD					
			Severely weathered, fissile, soft clayey from 814.3 to 812.5 with 0.5' loss.	L0.5	←LOSS					
			Severely weathered, clayey from 812.4 to 810.1.							
			Mod. broken from 809.9 to 803.9.							
			0.6' Sandstone, light gray, mod. hard, medium grained with many shale stringers from 803.9 to 803.3.	72						
				L0.0						
				76						
802.4	180.0			L0.0						
										BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 3 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 363430.6113 E 2296699.9119	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL D-120
4. HOLE NO. (As shown on drawing title and file number) D-04-05	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 35; UNDISTURBED 0
5. NAME OF DRILLER WANSTRATH	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 902.6
	16. DATE HOLE: STARTED 05/04/04; COMPLETED 05/04/04
7. THICKNESS OF OVERBURDEN 54.0	17. ELEVATION TOP OF HOLE 939.9 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 54.0	19. NAME OF INSPECTOR J. McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
938.4	1.5	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst., w/tr. org. (rt.), & coal frags.							2 4 4
936.9	3.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst., tr. coal frags.							5 5 6
935.4	4.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst.							3 12 17
929.4	10.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. *tr. coal frags. @ El. 933.9-El. 929.4							12 12 13 12 14 18 5 7 8 5 11 14
927.9	12.0	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br. to gr., dry, few gravel				14	75	11	12 11 13
926.4	13.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst.							6 8 9
923.4	16.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							8 12 15 10 12 13
921.9	18.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., mst				25	63	12	8 12 16
919.9	20.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst., w/tr. org. *no org. @ El. 920.4-El. 919.9							12 17 21 12

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 939.9	Hole No. D-04-05
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
917.4	22.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low to m. pl., mst. *m. pl. @ El. 918.9-El. 917.4		31	16				6 6 5 3 5
915.9	24.0		SANDY LEAN CLAY (CL), br., low to m. pl., mst., tr. gravel				1	44	55	4 4 4
912.9	27.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							7 8 7 4 4 4
909.9	30.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br. to gr., dry to mst. *br., mst. @ El. 911.4-El. 909.9							3 6 15 15 31 34
908.4	31.5	GM	SILTY GRAVEL WITH SAND (GM), br. to gr., non pl., dry				53	35	12	12 22 36
906.9	33.0	SP	POORLY GRADED SAND (SP), lt. br., mst.							5 8 9
905.4	34.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), lt. br., mst.				0	89	11	3 4 4
900.9	39.0	SP	POORLY GRADED SAND (SP), lt. br., dry, tr. gravel *mst., w/few gravel, coal frags., & org. @ El. 903.9-El. 902.4 *br. mst., @El. 902.4-El. 900.9				▼ 05/04/04			4 5 8 5 7 8 3 3 4
899.4	40.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst.				0	95	5	2 4 5
897.9	42.0	SP	POORLY GRADED SAND (SP), br., mst., w/tr. gravel, tr. coal frags. & org.							2 6 4
895.9	44.0	SM	SILTY SAND (SM), br.to bk., non pl., mst., w/l. coal frags., org., & tr. gravel							6 7 6 3

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 939.9	Hole No. D-04-05
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
894.9	45.0	SM	SILTY SAND (SM), br.to bk., non pl., mst., w/l. coal frags., org., & tr. gravel							4 6
891.9	48.0	SP	POORLY GRADED SAND (SP), br., mst.							5 6 7 5 4 5
890.4	49.5	NS	NO SAMPLE-NO RECOVERY							2 3 5
885.9	54.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet ×mst. @ El. 887.4-El. 885.9							4 5 8 3 4 8 5 7 9
			BOTTOM OF HOLE							

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PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-05

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 363449.9475 E 2296776.0352	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
4. HOLE NO. (As shown on drawing title and file number) D-04-06	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 12; UNDISTURBED 0
5. NAME OF DRILLER BRAG	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 06/16/04; COMPLETED 06/16/04
7. THICKNESS OF OVERBURDEN 30.0 Feet	17. ELEVATION TOP OF HOLE 967.6 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0 Feet	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							1, 2, 4, 8, 11, 11, 10, 12, 16, 14, 20, 26
961.6	6.0									
		SM	SILTY SAND (SM), br., non pl., mst., few gravel				8	73	19	13, 19, 35, 10, 23, 27
958.6	9.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							11, 23, 24, 16, 27, 24, 11, 15, 19, 9, 9, 17, 11, 17, 10, 9, 9, 20
949.6	18.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.				26	59	15	19, 50, 31, 12
947.6	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-06

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 967.6	Hole No. D-04-06
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.				26	59	15	22
946.6	21.0		POORLY GRADED SAND W/SILT AND GRAVEL (SP-SM), br., mst.							22
946.3	21.3	SP-SM								4
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.							4
										6
944.5	23.1									4
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.		24	19				4
										5
										3
										3
942.1	25.5									3
		SM	SILTY SAND WITH GRAVEL (SM), br., low pl., mst.				18	41	41	2
										5
										6
										5
										8
939.1	28.5									6
		CL	GRAVELLY LEAN CLAY WITH SAND (CL), br., low pl., mst.							3
										5
937.6	30.0									5
			BOTTOM OF HOLE							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 10 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 363453.9193 E 2296815.5110	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-07	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 150; UNDISTURBED 0
5. NAME OF DRILLER H. HURD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 900.1
	16. DATE HOLE: STARTED 03/20/04; COMPLETED 03/31/04
7. THICKNESS OF OVERBURDEN 223.3 Feet	17. ELEVATION TOP OF HOLE 982.4 Feet
8. DEPTH DRILLED INTO ROCK 14.8 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 238.1 Feet	19. NAME OF INSPECTOR J. DINGRANDO, J. McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
981.9	0.5	NS	NO SAMPLE - ASPHALT							AUGER
980.4	2.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), dk. br., mst.							10 14 19
978.9	3.5	CL	SANDY LEAN CLAY (CL), lt. br., low to m. pl., mst., w/few gravel				9	30	61	10 15 17
977.4	5.0	NS	NO SAMPLE-NO RECOVERY		.32	18				6 11 12
971.4	11.0	CL	SANDY LEAN CLAY (CL), lt. br., m. pl., mst., w/few gravel ×low recovery @ El. 975.9-El. 974.4 ×br., low to m. pl. @ El. 974.4-El. 971.4							5 10 14 9 9 12 5 7 12 6 7 11
969.9	12.5		SANDY LEAN CLAY WITH GRAVEL (CL), br., low to m. pl., dry to mst.							4 6 13
968.4	14.0		SANDY LEAN CLAY (CL), br., low pl., dry to mst., w/few gravel							4 7 10
966.9	15.5	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., dry to mst.							10 11 19
965.4	17.0	NS	NO SAMPLE-NO RECOVERY							9 14 11
963.9	18.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), lt. br. to gr., non pl., dry							5 8 13
962.4	20.0	SM	SILTY SAND WITH GRAVEL (SM), lt. br. to gr., non pl., dry							5 16 46

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-07

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 2 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL	SANDY LEAN CLAY (CL), lt. br. to gr., low pl., dry, w/few gravel				8	30	62	7 38 40
		CL	*br. @ El. 960.9-El. 959.4							10 17 21
		CL	*br. to gr. @ El. 959.4-El. 957.9							6 15 16
957.9	24.5	SM	SILTY SAND WITH GRAVEL (SM), br. to gr., low pl., dry							6 38 45
		SM	*dry to mst. @ El. 954.9-El. 953.4							15 16 22
		SM	*non pl. to low pl. @ El. 953.4-El. 951.9							7 13 15
951.9	30.5	CL	SANDY LEAN CLAY (CL), br. to gr., low pl., dry, tr. gravel				1	40	59	12 22 26
950.4	32.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), gr. to y., low pl., dry							15 20 30
948.9	33.5	CL	SANDY LEAN CLAY (CL), br. to gr., m. pl., dry to mst., w/few gravel		32	21				10 11 21
947.4	35.0	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br. to gr., low pl., dry							7 8 17
945.9	36.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., dry to mst.							11 16 17
944.4	38.0	CL	SANDY LEAN CLAY (CL), br., low to m. pl., dry to mst., w/few gravel							11 12 16
942.9	39.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., mst.							6 11 12
		CL	*dry @ El. 941.4-El. 938.4							7 10 19
938.4	44.0									13 13 15 7 16 33

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-07

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 3 OF 10 SHEETS

a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SC	CLAYEY SAND WITH GRAVEL (SC), br., low pl., dry				26	47	27	15 18 24
936.9	45.5	CL	GRAVELLY LEAN CLAY WITH SAND (CL), br., low pl., mst.							7 12 13
			*br. to gr., dry @ El. 935.4-El. 932.4							7 9 17
										8 13 15
			*low to m. pl., @ El. 932.4-El. 930.9							7 10 14
			*br. to gr., dry to mst. @ El. 930.9-El. 929.4							7 14 13
929.4	53.0	SM	SILTY SAND (SM), br., low pl., dry, few gravel				6	62	32	9 10 12
927.9	54.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., dry							9 13 15
926.4	56.0		GRAVELLY LEAN CLAY WITH SAND (CL), br., low pl., dry							11 21 22
924.9	57.5		SANDY LEAN CLAY WITH GRAVEL (CL), br.to gr., low pl., dry to mst.							21 20 20
923.8	58.6	SM	SILTY SAND WITH GRAVEL (SM), br., low pl., mst.							16 19 25 31 28
921.0	61.4	GC	CLAYEY GRAVEL WITH SAND (GC), br. to gr., m. pl., mst.		31	20				46 18 36 48
			*low pl., dry to mst. @ El. 920.4 -El. 918.9							
918.9	63.5	SM	SILTY SAND WITH GRAVEL (SM), br. to gr., low pl., dry							17 15 36
917.7	64.7	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., dry							14 35 44
915.9	66.5	CL	GRAVELLY LEAN CLAY WITH SAND (CL), br., low pl., dry							40 102 44
914.4	68.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 4 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.							21 27
913.4	69.0		POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							
912.9	69.5	SP								59
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.							18 40 43
911.4	71.0									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							38 76 87
909.9	72.5									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.				15	79	6	22 38 33
908.4	74.0									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., dry to mst.							10 17 22
			*mst. @ El. 906.9-El. 905.4, El. 903.9-El. 899.4, and El. 896.4-El. 894.9							12 16 16
			*tr. coal frags. @ El. 902.4-El. 900.9							7 11 13 8 9 11 8 11 15
900.9	81.5									
			POORLY GRADED SAND (SP), br., mst.					▼ 03/22/04		7 11 13
			*br. to gr., wet, w/tr. gravel @ El. 899.4-El. 897.9 and El. 894.9-El. 893.4							7 8 10
			*mst. to wet, w/tr. org. @ El. 897.9-El. 896.4							5 7 13 7 10 15 7 11 16
893.4	89.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gravel							8 9 14
			*wet @ El. 891.9-El. 890.4							7 10 10
890.4	92.0									

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DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-07
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br. to gr., wet, w/ tr. orgs.							9, 11, 12
			*no tr. org. @ El. 888.9-El. 884.4							9, 9, 13
			*dry @ El. 887.4-El. 885.9							12, 16, 16
			*mst. to wet @ El. 885.9-El. 884.4							10, 20, 26
884.4	98.0									
			POORLY GRADED SAND (SP), br. to gr., wet, w/tr. org., and gravel							24, 26, 27
			*br., w/no tr. org. & gravel @ El. 882.9-El. 881.4							16, 20, 26
881.4	101.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr.,wet, tr. cool frags., tr. org., few grovel				6	84	10	12, 16, 23
879.9	102.5									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet, few org.							9, 12, 16
878.4	104.0									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br. to gr., mst.							9, 15, 15
876.9	105.5									
		SW	WELL GRADED SAND WITH GRAVEL (SW), br. to gr., wet							6, 12, 15
			*few coal frags. and org. @ El. 875.4-El. 873.9							6, 10, 14
873.9	108.5									
		SP	POORLY GRADED SAND (SP), br. to gr., wet, w/few gravel							9, 16, 20
872.4	110.0									
			POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							16, 23, 30
										16, 22, 26
										36, 48, 55
										19, 19, 27
866.4	116.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 6 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							16 22 26
864.9	117.5									
		SP-SM	POORLY GRADED SAND WITH SLT (SP-SM), br., mst., w/few gravel				9	81	10	16 20 23
863.4	119.0									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							5 9 13
861.9	120.5									
			POORLY GRADED SAND (SP), br. to gr., wet, w/few gravel							6 9 12
			*br., w/no gravel @ El. 860.4-El. 857.4							12 23 32
			*br., w/tr. coal frags. @ El. 857.4-El. 854.4							9 16 20 10 15 17 13 23 35
854.4	128.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet							13 18 26
852.9	129.5									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet							19 18 16
851.4	131.0									
		SW	WELL GRADED SAND WITH GRAVEL (SW), br. to gr., wet							19 19 19
850.1	132.3									
		CL	LEAN CLAY (CL), gr., low to m. pl., mst., tr. sand							8 7 9
			*m. pl. @ El. 848.4-El. 846.9		28	16				5 6 9 9 10 9
845.4	137.0									
			SANDY LEAN CLAY (CL), gr., low pl., mst. to wet							6 6
844.3	138.1									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet, tr. coal frags. and gravel							7 10 13 19
842.4	140.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE - NO RECOVERY							6 6 7
840.9	141.5									
		SM	SILTY SAND (SM), br., non pl., mst., tr. coal frags.				0	86	14	21 31 55
839.4	143.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, tr. coal frags. and gravel							8 10 14 10 15 13
836.4	146.0									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet, tr. coal frags.							8 13 15
834.9	147.5									
		SM	SILTY SAND WITH GRAVEL (SM), br. to gr., non pl., wet, tr. coal frags.							13 19 21
833.4	149.0									
832.8	149.6	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							13
		ML	SANDY SILT (ML), gr., non pl., wet		NP	NP				14 16
831.9	150.5									
		SM	SILTY SAND (SM), br. to gr., non to low pl., wet							8 15 30
830.4	152.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet ×br. @ El. 828.9-El 825.9							10 18 18 10 15 21 9 15 19
825.9	156.5									
		SM	SILTY SAND (SM), br. to bk., non pl., wet, tr. coal frags. and few crg. ×br. to gr. @ El. 822.9-El. 819.9 and El. 818.4-El. 816.9 ×br. to gr. to bk. @ El. 819.9-El. 818.4							8 10 13 7 12 24 8 10 18 13 19 22 15 23 29
818.4	164.0									

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-07

PLATE D35

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-07
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
816.9	165.5	SM	SILTY SAND (SM), br. to gr., non pl., wet							13, 14, 17
815.4	167.0	SP	POORLY GRADED SAND (SP), br. to gr., wet, few coal frags., tr. org.							11, 13, 17
813.9	168.5	SM	SILTY SAND (SM), br. to gr., non pl., wet							11, 15, 23
812.0	170.4	SP	POORLY GRADED SAND (SP), br. to gr., wet, few coal frags./org.							12, 17, 25
811.2	171.2	CL	LEAN CLAY WITH SAND (CL), gr., m. pl., wet		32	20				10, 17, 26
803.4	179.0	SP	POORLY GRADED SAND (SP), br., wet *br. to gr., w/tr. coal frags. @ El. 810.9-El. 809.4 *w/tr. gravel from El. 809.4-El. 803.4							20, 22, 25, 10, 12, 18, 7, 8, 14, 12, 20, 22, 11, 17, 18
801.9	180.5	SM	SILTY SAND (SM), br.to gr., non pl., mst., tr. gravel				2	79	19	8, 14, 22
800.4	182.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, tr. gravel							9, 11, 15
794.4	188.0	SM	SILTY SAND (SM), br. to gr., non pl., wet, tr. org. and gravel *no gravel @ El. 798.9-El. 794.4 *mst. to wet @ El. 797.4-El. 795.9 *tr. coal frags. @ El. 797.4-El. 794.4							19, 28, 30, 15, 16, 16, 14, 18, 27, 12, 14, 20

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.4 | Hole No. CD-04-07

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 9 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							24 25 22
			*tr. org. @ El. 792.9-El. 789.9							10 12 15
			*few org. @ El. 789.9-El. 788.4							12 10 11
			*gr. to bk. @ El. 791.4-El. 788.4							14 14 19
			*tr. coal frags. @ El. 791.4-El. 783.9							12 16 19 11 14 15
783.9	198.5									14 23 27
		SP	POORLY GRADED SAND (SP), br. to gr., mst., tr. gravel							11 22 32
			*wet @ El. 782.4-El. 780.9							13 23 27
			*l. coal frags. @ El. 780.9-El. 779.4							14 20 20
779.4	203.0									
		SM	SILTY SAND (SM), gr., non pl., mst., l. coal frags., and tr. gravel							14 14 27
777.9	204.5									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							17 23 27
			*mst. to wet @ El. 776.4-El. 774.9							9 18 19 14 18 19 16 24 27
771.9	210.5									
			POORLY GRADED SAND (SP), br., wet, tr. gravel							14 20 24
770.4	212.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-07

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.4	Hole No. CD-04-07
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 10 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND (SP), br., wet, tr. gravel							11, 19, 26
768.9	213.5									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							29, 30, 30
			*few org. @ El. 765.9-El. 764.4							20, 24, 24, 22, 29, 30
764.4	218.0									
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet, few gravel and tr. coal frags.							19, 23, 38
762.9	219.5									
		SM	SILTY SAND (SM), br., non pl., wet, w/few gravel, so. coal frags. & orgs.							19, 26, 28
			*br. to bk., w/l. coal frags. & org. @ El. 761.4-El. 759.9							33, 34
759.9	222.5		POORLY GRADED SAND WITH GRAVEL (SP), br., mst., tr. coal frags.							86
759.4	223.0	SP								105
759.1	223.3	NS	NO SAMPLE - AUGER							AUGER
		SS	SANDSTONE: light gray, mod. hard to hard, medium to fine grained with occasional zones of carbonaceous stringers.							BEGAN CORING ~TOR @ 758.8.
			0.3' mod. broken into sub-rounded, iron-stained gravel sized fragments from 859.1 to 858.8.	39	RQD					
			30° fracture, open with smooth, planar, iron-stained surface from 858.9 to 858.8.							
			45° fracture, open with smooth, planar, iron-stained surface from 857.0 to 856.8.							
			0.1' Clay seam, brown, mod. hard, shaly from 856.6 to 856.5.							
			0.05' Clay seam, brown to dark gray, mod. hard, shaly at 856.1.							
			Mod. broken with many carbonaceous, clayey shale inclusions and iron-stained fragments from 856.0 to 855.3 and from 854.8 to 854.1.	LO.0	LOSS					
			Mod. broken with many high angle fractures with clayey shale surfaces, iron-staining, sulfur and shale inclusions from 853.9 to 852.8.							
			Many siltstone inclusions and stringers from 852.8 to 849.4.							
			Mod. broken with few carbonaceous stringers from 848.1 to 847.8.	72						
			Many shale stringers from 846.6 to 846.4.							
746.4	236.0			LO.0	Actual bottom of boring at 744.3.					

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-07

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 3¼" HSA
2. LOCATION (Coordinates or Station) N 363468.1543 E 2296853.2406	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
4. HOLE NO. (As shown on drawing title and file number) D-04-08	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED 0
5. NAME OF DRILLER BRAGG	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 06/17/04; COMPLETED 06/17/04
7. THICKNESS OF OVERBURDEN 30.0	17. ELEVATION TOP OF HOLE 966.7 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
963.7	3.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							1 2 2 / 1 2 5
962.2	4.5	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.				24	62	14	5 18 16
956.2	10.5	ML	GRAVELLY SILT WITH SAND (ML), br., low pl., mst.							5 8 6 / 7 11 9 / 3 4 5 / 3 15 26
953.2	13.5	CL-ML	SANDY SILT LEAN CLAY WITH GRAVEL (CL-ML), br., low pl., mst.		25	20				5 5 11 / 5 11 11
950.2	16.5	SM	SILTY SAND WITH GRAVEL (SM), br., low pl., mst.				19	40	41	5 6 6 / 9 10 13
947.2	19.5	CL-ML	SANDY SILT/LEAN CLAY WITH GRAVEL (CL-ML), lt. br., low pl., dry							8 8 9 / 8 9 7
946.7	20.0		SILT LEAN CLAY WITH SAND (CL-ML), lt. br., low pl., mst., few grg.				8	17	75	4

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MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-08

PLATE D39

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 966.7 | Hole No. D-04-08

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL-ML	SILT LEAN CLAY WITH SAND (CL-ML), lt. br., low pl., mst., few gra.				8	17	75	7 8 7 8 16
944.2	22.5									
		CL	SANDY LEAN CLAY WITH GRAVEL (CL), lt. br., low to m. pl., mst. *br., m. pl. @ El. 941.2-El. 938.2		36	23				15 15 13 6 8 14 7 7 15 9 11 16
938.2	28.5									
		SM	SILTY SAND (SM), lt. br., low pl., mst., few gravel				12	40	48	8 8 11
936.7	30.0									
			BOTTOM OF HOLE							

LRH FORM 1836-A
MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. D-04-08

PLATE D40

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 9 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2"&3" SPT, 2" NQWL, 4" HSA
2. LOCATION (Coordinates or Station) N 363475.4053 E 2296994.4136	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME - 750 ATV
4. HOLE NO. (As shown on drawing title and file number) CD-04-09	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 57; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 901.5
	16. DATE HOLE: STARTED 08/18/04; COMPLETED 09/09/04
7. THICKNESS OF OVERBURDEN 180.7 Feet	17. ELEVATION TOP OF HOLE 930.00 Feet
8. DEPTH DRILLED INTO ROCK 10.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100%
9. TOTAL DEPTH OF HOLE 190.7 Feet	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SC	CLAYEY SAND WITH GRAVEL (SC), dk. gr., low pl., mst., w/few org. and topsoil							2, 2, 2
			*tr. org. @ El. 928.0-El. 926.4.				26	58	16	5, 6, 5
			*br., med. pl. @ El. 926.4-El. 923.5		33	19				3, 5, 8, 3, 4, 5
923.5	6.5									WH
			CLAYEY SAND (SC), br. to gr., low pl., mst., few gravels				14	38	48	6, 9, 1, 4, 6
921.0	9.0									
		CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., mst.							3, 6, 5, 5, 5, 8
918.0	12.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., low pl., mst.							10, 15, 10, 3, 3, 10, 24, 31
914.0	16.0									
			SILTY SAND (SM), br., non pl., mst., few gravel				13	73	14	5, 8, 10, 5, 7, 9
911.0	19.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst.							3, 5
910.0	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-09

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 930.0	Hole No. CD-04-09
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst.							6, 6, 8, 8
			*w/tr. org. and few gravel @ El. 908.0-El. 905.0							5, 6, 7
										4, 4, 5
			*w/tr. gr. @ El. 905.0-El. 902.0							10, 18, 10
										6, 14, 5
			*wet @ El. 902.0-El. 899.0							4, 5, 4
							1	91	8	3, 3, 6
		SP-SM	*mst. to wet, w/tr. gravel @ El. 899.0-El. 896.0							5, 5, 5
										5, 4, 4
			*wet, tr. gravel @ El. 896.0-El. 893.0							4, 5, 4
										3, 4, 7
			*tr. gravel @ El. 893.0-El. 890.0							4, 5, 5
							3	89	8	2, 3, 3
			*br. to gr., w/few gravels @ El. 890.0-El. 887.0							2, 3, 3
							9	83	8	9, 8, 5
887.0	43.0									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							6, 7
886.0	44.0									

▼ 08/19/04

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 930.0	Hole No. CD-04-09
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							8, 9, 10, 9, 10, 8, 8, 6, 3, 4, 2, 3, 7, 4, 5, 8
878.0	52.0									
			POORLY GRADED SAND WITH SLT (SP-SM), br., mst., few gravel				6	88	6	5, 5, 8, 7, 8, 9
875.0	55.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							8, 9, 12, 9, 10, 11
			*mst. to wet @ El. 872.0-El. 869.0							8, 12, 13, 6, 15, 12
869.0	61.0									
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet, w/tr. gravel							10, 8, 11, 12, 6, 7
			*mst. @ El. 866.0-863.0				1	93	6	7, 10, 12, 10, 12, 14
			*wet @ El. 863.0-862.0							4, 5
862.0	68.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 930.0 | Hole No. CD-04-09

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 4 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet., tr. gravel							7, 8, 6, 8, 6, 8, 9, 9, 10, 13, 20, 12, 13, 13, 7, 8, 13, 10, 11, 8, 6
			*tr. coal frags. @ El. 854.0-El. 851.5							
851.5	78.5									
		CL	LEAN CLAY (CL), gr., low pl. mst., few sand and tr. gravel				4	6	90	8, 10, 8, 6, 5, 6, 8, 5, 6
847.2	82.8									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, tr.gravel							10, 3, 6, 11, 5, 6, 9, 8, 6, 11, 10, 10
841.2	88.8									
		CL-ML	SILT/LEAN CLAY (CL/ML), br. to gr., low pl., mst., tr. sand and gravel		26	19				12, 8, 11
839.4	90.6									
		CL	SANDY LEAN CLAY (CL), br., low to m. pl., wet.							15, 6, 7
838.0	92.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 930.0	Hole No. CD-04-09
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL	SANDY LEAN CLAY (CL), br., low to m. pl., wet.							10, 3, 7
836.7	93.3									
		SM	SILTY SAND (SM), br., non. pl., mst., tr. gravel				1	71	28	15, 3, 8, 15
					NP	NP				5, 7, 8
			*non. pl. to low pl., wet @ El. 832.0-El. 830.0							4, 12, 14
			*br. to gr., low pl., wet @ El. 830.0-El. 827.0							4, 9, 12, 4, 10, 15
			*dk. br. to gr., mst. to wet, tr. coal frags. @ El. 827.0-El. 824.0							6, 9, 13, 3, 5, 75
824.0	106.0									4, 5, 12
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. org.							7, 7, 11
821.0	109.0									8, 8, 14
		SM	SILTY SAND (SM), br. to gr., non pl., wet, w/tr. coal frags.				1	75	24	9, 10, 15
818.0	112.0									3, 4, 10
		SP-SM	POORLY GRADED SAND WITH SLT (SP-SM), br. to gr., wet, w/tr. coal frags.							8, 7, 11
			*dk. gr. to bk., wet, w/l. coal frags. and org. @ El. 816.5-El. 813.5							7, 8, 12
814.0	116.0									6, 6

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 930.0	Hole No. CD-04-09
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
813.5	116.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), dk. gr. to bk., wet, w/l. coal frags. and org.							9
		SM	SILTY SAND (SM), dk. gr., non. pl. to low pl., wet, w/tr. coal frags. few org.							6 8 7
			*br. to gr., non. pl., w/tr. gra. @ El. 811.0-El. 809.0.							5 6
							1	82	17	14 6 10 15
809.0	121.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							15 19 18
			*w/tr. gra. @ El. 806.0-El. 803.0							5 5 6 5 6 9 5 7 11
803.0	127.0	SM	SILTY SAND (SM), br. to gr., non pl., wet, w/tr. gravel							8 12 14 9 9 14
			*gr., coal frags. and org. @ El. 800.0-El. 797.0				2	78	20	6 12 13 10 11 8
797.0	133.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. coal frags.							14 10 14 10 14 14
			*tr. gravel @ El. 794.0-El. 790.0							7 11 15 6 13 17 12 16
790.0	140.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-09

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 930.0 | Hole No. CD-04-09

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
788.0	142.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra. and few coal frags.							18 10 11 16
785.0	145.0	SM	SILTY SAND (SM), br., non pl., mst., few gra.				6	76	18	14 14 18 11 21 32
780.0	150.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gr.							14 20 25 10 20 24 10 7 6 8
770.0	160.0	NS	NO SAMPLE-NO RECOVERY							AUGER
768.5	161.5	SM	SILTY SAND (SM), br., non pl., wet, tr. gra.				2	77	21	14 15 20
766.0	164.0	NS	NO SAMPLE-NO RECOVERY							AUGER

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-09

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 930.0 | Hole No. CD-04-09

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 8 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE - NO RECOVERY							AUGER
760.0	170.0									
		SM	SILTY SAND (SM), br., non pl., mst., tr. gra.				3	79	18	22 28 32
758.5	171.5									
		NS	NO SAMPLE - NO RECOVERY							AUGER
750.0	180.0									
749.3	180.7	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br. to gr., low pl., mst.							27 50/0.2
		SS	SANDSTONE: Light gray, hard, medium grained, thick bedded, fresh.							BEGAN CORING ~ TOR 748.7
			Mod. broken with clay coated fragments from 749.3 to 748.7.	64	← RQD					
			Incipiant fracture, near vertical from 747.4 to 747.1.							
			Few shale stringers from 746.6 to 746.5.							
			15° Fracture, open with smooth and planar surface from 797.1 to 797.0.							
			Few shale stringers from 744.8 to 743.8.							
			Many shale stringers from 743.8 to 743.2.							
743.2	186.8									
		SH	SHALE: Dark gray, mod. hard, silty with few sandstone stringers.							
742.0	188.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 930.0	Hole No. CD-04-09
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 9 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		REMARKS
741.6	188.4	SH	SHALE: Continued		
			Carbonaceous stringers at 743.0.		
		SS	SANDSTONE: Light gray, mod. hard with numerous shale stringers and laminations throughout.		
739.3	190.7			L 0.0	← LOSS
			Clay coated bedding planes at 740.1, 740.0, 739.9, 739.5, 739.4, 739.3.		BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 10 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 362558.3905 E 2296948.6679	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-10	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 137; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 909.1
	16. DATE HOLE: STARTED 04/07/04; COMPLETED 04/20/04
7. THICKNESS OF OVERBURDEN 212.0 Feet	17. ELEVATION TOP OF HOLE 982.29 Feet
8. DEPTH DRILLED INTO ROCK 13.3 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 225.3 Feet	19. NAME OF INSPECTOR J. McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
981.7	0.5	NS	NO SAMPLE-ASPHALT							AUGER
979.2	3.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., dry							8, 10, 8, 12, 14
977.7	4.5	SC	CLAYEY SAND WITH GRAVEL (SC), br., low pl., dry							7, 8, 11
976.2	6.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br. to gr., low pl., mst.							7, 11, 18
974.7	7.5		SANDY LEAN CLAY GRAVEL (CL), br. to gr., low pl., mst., few gra.				6	28	66	7, 9, 11
973.2	9.0	CL-ML	SANDY SILT LEAN CLAY WITH GRAVEL (CL-ML), br., low pl., dry		27	20				5, 9, 18
967.2	15.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., dry; *mst., w/tr. org. @ El. 970.2-El. 968.7							8, 10, 16, 6, 10, 8, 6, 7, 16, 12, 19, 18
965.7	16.5	SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				12	48	40	9, 9, 10
962.2	20.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., m. pl., dry; *lt. br., low to m. pl., mst. @ El. 964.2-El. 962.7; *gr., low to m. pl., mst. @ El. 962.7-El. 962.2		31	19				8, 9, 13, 9, 18, 14, 14

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-10

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
961.2	21.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), gr., low to m. pl., mst.							17, 23
959.7	22.5	CL	SANDY LEAN CLAY (CL), br., low to m. pl., dry, w/few gravel							12, 15, 27
958.2	24.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low to m. pl., mst.							7, 9, 9
956.7	25.5	CL	LEAN CLAY WITH SAND (CL), gr., m. pl., mst., tr. gravel		34	20				5, 7, 8
955.2	27.0	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br. to gr., low to m. pl., mst.							5, 6, 10
953.7	28.5	SM	SILTY SAND (SM), br., low pl., dry to mst., w/few gra.				11	40	49	5, 8, 10
950.7	31.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br. to gr., low pl., mst.							7, 16, 11, 4, 8, 9
949.2	33.0	CL	SANDY LEAN CLAY (CL), br., low pl., mst., w/few gravel							5, 7, 9
941.7	40.5	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., mst.							4, 5, 9, 6, 8, 13
		CL	*lt br., low to m. pl., dry @ El. 946.2-El. 943.2							9, 12, 15, 6, 9, 11
		CL	*lt br., m. pl., dry @ El. 943.2-El. 941.7		30	19				6, 10, 21
940.2	42.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., dry							10, 10, 8
938.7	43.5	GW	WELL GRADED GRAVEL WITH SAND (GW), br., dry							4, 7, 8
938.2	44.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry to mst., org.							6

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
937.2	45.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry to mst., w/tr. org.							5 5
932.7	49.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry to mst. ×lt. br., dry @ El. 935.7-El. 934.2 ×lt. br. to gr., dry @ El. 934.2-El. 932.7							5 6 7 10 17 21 10 17 16
931.2	51.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry to mst.				33	56	11	10 21 39
928.2	54.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							34 55 69 10 12 13
925.2	57.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry ×dry to mst., @ El. 926.7-El. 925.2							10 13 10 10 11 7
922.2	60.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry w/tr. cool frogs. ×dry, w/few gra. @ El. 923.7-El. 922.2							5 6 7 6 9 10
920.7	61.5	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry							6 10 11
919.2	63.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry							6 10 12
917.7	64.5	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., dry w/few gra.				6	87	7	8 9 12
914.2	68.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry							6 9 12 7 10 15 6

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry							14, 18
			*w/tr. coal frags. @ El. 913.2-El. 911.7							6, 8, 11
										6, 11, 17
910.2	72.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/few org. and coal frags.							12, 14, 13
					04/08/04					
			*m. to wet, w/tr. gra. @ El. 908.7-El. 907.2							7, 11, 13
			*dk. brn., wet, w/tr. gra. @ El. 907.2-El. 905.7							4, 5, 6
			*few gra. @ El. 905.7-El. 904.2				12	77	11	6, 9, 12
			*tr. gra. @ El. 904.2-El. 902.7							4, 5, 9
			*dk. brn., wet, @ El. 902.7-El. 901.2							7, 9, 13
			*wet, @ El. 901.2-El. 899.7							4, 5, 7
			*m. to wet, @ El. 899.7-El. 898.2							5, 7, 14
			*wet, w/tr. gra. @ El. 898.2-El. 896.7							3, 6, 11, 15, 15, 10
			*wet, w/tr. org. @ El. 895.2-El. 893.7							5, 5, 9
			*br. to gr., wet, w/tr. gra. @ El. 893.7-El. 892.2							3, 3, 9
			*wet, w/tr. gra. @ El. 892.2-El. 890.7							14, 15, 15
890.7	91.5									
890.2	92.0	NS	NO SAMPLE-NO RECOVERY							12

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-NO RECOVERY							12, 16, 31, 23, 24
887.7	94.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. gra. and coal frags.							41, 38, 33, 13, 13, 18
			*tr. org. @ El. 884.7-El. 883.2							3, 3, 1
			*gr. and blk., few org. @ El. 883.2-El. 881.7							3, 7, 15, 7, 9, 11
							3	88	9	4, 5, 8
										10, 11, 12, 24, 41, 42
876.0	106.2	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., mst. to wet, w/tr. coal frags.							19, 30, 36
874.2	108.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. gra.							18, 21, 21
872.7	109.5		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet, w/tr. coal frags.							10, 16, 18
871.2	111.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet							13, 17, 18, 10, 10, 11
868.2	114.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst., w/few gra.							13, 18, 27
866.2	116.0		*mst. to wet, w/no gravels @ El. 866.7-El. 866.2							13

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst. to wet							12
										12
			*tr. gra. @ El. 865.2-El. 863.7							13
										17
										21
			*wet, w/tr. gra. @ El. 863.7-El. 862.2							7
										9
862.2	120.0									11
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., mst.							10
										10
			*mst. to wet @ El. 860.7-El. 857.7							10
										30
										36
										37
										13
							38	54	8	15
857.7	124.5									20
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., mst. w/tr. coal frags. and org.							31
										43
856.2	126.0									32
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/few gra.							21
										26
										28
			*mst. to wet @ El. 854.7-El. 853.2							49
		SP-SM								51
853.2	129.0									79
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet, w/tr. coal frags. and org.							24
										46
851.7	130.5									61
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., wet, w/tr. coal frags. and org.							50
										33
850.2	132.0									27
			WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr., wet							24
										35
			*w/tr. coal frags. @ El. 848.7-El. 847.2							34
		GW-GM								18
										33
										39
										33
										51
845.7	136.5									52
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet							51
							27	64	9	54
										70
		SP-SM								34
										35
										36
842.2	140.0									31

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.2 | Hole No. CD-04-10

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 7 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
838.2	144.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet *w/tr. org. @ El. 841.2-El. 839.7							35 36 28 51 57 45 53 67
836.7	145.5	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet							18 28 47
835.2	147.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr., wet							18 29 36
833.7	148.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., wet							61 102 129
832.2	150.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet							51 53 39
830.7	151.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dk. br., wet							20 38 41
827.7	154.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., wet							43 61 76 33 41 40
826.2	156.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							28 34 39
824.7	157.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							71 102 88
822.1	160.1	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. *wet @ El. 824.2-El. 822.1							134 AUGER 50 48
820.2	162.0	SM	SILTY SAND (SM), gr., low pl., mst., w/tr. gra. *br. to gr., non. pl. to low pl., @ El. 821.7-El. 820.2		18	15				48 18 20 21
818.7	163.5		SILTY SAND WITH GRAVEL (SM), gr., low pl., wet., w/sli. org. odor							14 20 25
818.2	164.0	ML	SANDY SILT (ML), br. to gr., non. pl. to low pl., mst., w/tr. gra.				1	36	63	17

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-10

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
817.2	165.0	ML	SANDY SILT (ML), br. to gr., non. to low pl., mst., w/tr. gra.				1	36	63	21, 33
815.7	166.5	SC-SM	SILTY CLAYEY SAND (SC-SM), br. to gr., low pl., mst. to wet							14, 10, 22
812.7	169.5	SM	SILTY SAND WITH GRAVEL (SM) non. pl. to low pl., wet *gr., low pl. @ El. 814.2-El. 812.7							14, 33, 25, 15, 25, 36
806.7	175.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/few gra. and coal frags. *br. to gr. @ El. 811.2-El. 809.7 *br. to gr., w/tr. org. @ El. 809.7-El. 808.2 *br. to gr., w/tr. org. @ El. 808.2-El. 806.7							17, 24, 33, 14, 18, 27, 12, 24, 33, 14, 24, 30
805.2	177.0	SM	SILTY SAND (SM), br. to gr., non. to low pl., wet, w/few gra.							7, 10, 11
803.7	178.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst.							11, 14, 21
802.2	180.0	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra.							16, 19, 23
800.7	181.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							17, 19, 26
799.2	183.0	SM	SILTY SAND (SM), gr. to bk., non. pl., wet, w/few org. and tr. coal frags. & gravel							18, 19, 26
797.7	184.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/tr. gra.							15, 20, 18
796.2	186.0	SM	SILTY SAND (SM), gr., non. to low pl., mst. to wet				0	51	49	14, 21, 28
794.7	187.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., mst. to wet							12, 14, 21
794.2	188.0	SM	SILTY SAND (SM), gr., non. pl., mst. to wet							14

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 9 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	SILTY SAND (SM), gr., non. pl., mst. to wet							18, 48
			*br. to gr., @ El. 793.2-El. 791.7							14, 33, 44
			*br., @ El. 791.7-El. 790.2							16, 21, 33
			*br. to gr., @ El. 790.2-El. 784.2							12, 17, 25, 16, 18, 25, 12, 16, 20
							0	82	18	11, 14, 21
			*br. to gr., w/tr. gra. @ El. 784.2-El. 782.7							11, 24, 29
			*br. to gr., @ El. 782.7-El. 781.2							14, 33, 35
			*br. to gr., wet, w/tr. gra. @ El. 781.2-El. 779.7							25, 28, 41
779.7	202.5	SM	SILTY SAND WITH GRAVEL (SM), br., low pl., mst.							24, 29, 47, 28, 67, 64, 59, 109
775.7	206.5	NS	NO SAMPLE-NO RECOVERY							AUGER
775.2	207.0	SM	SILTY SAND (SM), br. to gr., low pl., mst.							12, 16, 39
773.7	208.5	NS	NO SAMPLE-NO RECOVERY							12, 24, 28
772.2	210.0	SM	SILTY SAND WITH GRAVEL (SM) br., low pl., mst.							38, 75, 100/0.4
770.8	211.4	NS	NO SAMPLE-NO RECOVERY							AUGER
770.2	212.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.2	Hole No. CD-04-10
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 10 OF 10 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		REMARKS
			SHALE: gray, mod. hard, silty.		BEGAN CORING
			Mod. broken, slightly weathered from 770.3 to 767.0 and from 766.5 to 765.2.		
			60° fracture, open with slightly rough, planar, broken surface from 766.0 to 765.6.	58	RQD
			0.05' Clay seam, gray, soft at 765.6.		
			Clay-coated bedding plane at 765.2.		
			15° fracture, open with smooth, planar surface from 763.4 to 763.2.	L0.0	LOSS
			Many sandstone stringers from 762.9 to 760.2.		
			Mod. broken from 759.1 to 758.9		
			0.05' Clay seam, dark gray, soft, carbonaceous at 758.7.		
		SH			
				69	
758.3	224.0				
			SANDSTONE: light gray, mod. hard to hard, medium grained.		
		SS	Clay coated bedding plane, gray and soft at 758.2.		
757.0	225.3		Many shale stringers from 757.7 to 757.5.	L0.0	
					BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 4 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361765.2323 E 2296833.7405	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL D-120
4. HOLE NO. (As shown on drawing title and file number) D-04-11	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 34; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 899.0
	16. DATE HOLE: STARTED 05/05/04; COMPLETED 05/06/04
7. THICKNESS OF OVERBURDEN 72.0	17. ELEVATION TOP OF HOLE 949.96 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 72.0	19. NAME OF INSPECTOR McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry, w/tr. org.							1 1 1 4 5 4
946.9	3.0	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., dry, w/few org. ×mst., no org. @ El. 943.9-El. 940.9							5 4 5 5 4 5 3 4 7
							24	60	16	9 7 13
940.9	9.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry							12 8 9 7 10 12 5 11 8
936.4	13.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry w/few gra. ×brn. to gr., @ El. 933.4-El. 930.4 ×mst., @ El. 930.4-El. 929.9							12 13 19 21 33 64 53 21 20 8 8 10 5
929.9	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-11

PLATE D60

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 949.9	Hole No. D-04-11
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
928.9	21.0	SP-SM	POORLY GRADED SAND AND SILT (SP-SM), br., mst., few gravel				12	83	5	7, 7
925.9	24.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							9, 10, 15, 19, 21, 27
919.9	30.0	SP	POORLY GRADED SAND (SP), br., dry to mst., w/tr. gra. and coal frags.							10, 18, 21
			*no tr. gra. or coal frags. @ El. 924.4-El. 922.9							8, 9, 9
			*dry, w/few gra., no coal frags. @ El. 922.9-El. 921.4							10, 6, 6
			*mst., w/few gra., no coal frags. @ El. 921.4-El. 919.9							6, 6, 7
918.4	31.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/few gra.				14	81	5	7, 7, 8
916.9	33.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							6, 4, 6
			POORLY GRADED SAND (SP), br. to gr., dry w/few gra.							4, 6, 7
			*w/tr. coal frags. @ El. 915.4-El. 913.9							5, 6, 7
			*brn., dry to mst., no gra. @ El. 913.9-El. 910.9				1	95	4	7, 6, 6
										3, 4, 7
			*brn., dry to mst., w/tr. coal frags. @ El. 910.9-El. 909.4							4, 5, 6
			*brn., dry @ El. 909.4-El. 907.9							5, 6, 7
			*brn., dry to mst., w/tr. gra. @ El. 907.9-El. 905.9							6, 6, 7
905.9	44.0									8

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 949.9	Hole No. D-04-11
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND (SP), br., dry to mst., tr. gravel							7 9
			*mst., @ El. 904.9-El. 901.9							6 6 9
										6 6 5
										4 5 5
										5 4 4
			*dk. brn., wet, no gra. @ El. 898.9-El. 895.9					05/06/04		4 6 7
										4 5 8
		SP	*mst., no gra. @ El. 895.9-El. 892.9							1 5 5
							1	95	4	2 6 7
			*wet, no gra. @ El. 892.9-El. 889.9							2 6 7
										2 4 6
			*mst. to wet @ El. 889.9-El. 886.9							6 7 6
886.9	63.0									3 3 5
			SILTY SAND (SM), br., non pl., wet, w/tr. coal frags., few org.							4 5 7
		SM								5 5 6
883.9	66.0									
			POORLY GRADED SAND (SP), br., wet							6 5 6
		SP								
881.9	68.0									5

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 949.9	Hole No. D-04-11
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND (SP), br., wet							6
										8
										3
		SP								4
										6
										3
										5
877.9	72.0									6
			BOTTOM OF HOLE							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 361778.3007 E 2297022.2272	11. DATUM FOR ELEVATION SHOWN NGVD 29 (TBM or MSL)
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
4. HOLE NO. (As shown on drawing title and file number) D-04-12	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED 0
5. NAME OF DRILLER BRAGG	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 06/16/04; COMPLETED 06/16/04
7. THICKNESS OF OVERBURDEN 30.0	17. ELEVATION TOP OF HOLE 967.63 Feet
8. DEPTH DRILLED INTO ROCK 0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst., tr. org.							0, 4, 7
										5, 10, 17
			*no org. @ El. 964.6-El. 958.6							9, 23, 24
										17, 17, 20
										14, 18, 19
										10, 16, 22
958.6	9.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.				29	55	16	14, 26, 58
										5, 12, 17
955.6	12.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							18, 23, 16
										6, 10, 14
										9, 12, 9
										3, 2, 8
949.6	18.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst. to wet							8, 9, 11
948.1	19.5									
947.6	20.0	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.		26	22	22	40	38	4

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MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-12

PLATE D64

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 967.6 | Hole No. D-04-12

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.		26	22	22	40	38	14 11 6 8 6
945.1	22.5	GM	SILTY GRAVEL WITH SAND (GM), br., non. pl., mst.							4 7 11 6 5 5
942.1	25.5	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., mst.				33	56	11	5 5 7 4 6 5
939.1	28.5	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., mst.							7 8 11
937.6	30.0		BOTTOM OF HOLE							

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MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-12

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 11 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361781.1457 E 2297063.8558	11. DATUM FOR ELEVATION SHOWN NGVD 29 (TBM or MSL)
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-13	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 59; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 947.2
	16. DATE HOLE: STARTED 06/07/04; COMPLETED 06/25/04
7. THICKNESS OF OVERBURDEN 229.2 Feet	17. ELEVATION TOP OF HOLE 982.51 Feet
8. DEPTH DRILLED INTO ROCK 11.4 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 240.6 Feet	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
982.0	0.5	NS	NO SAMPLE - ASPHALT							AUGER
		CL	SANDY LEAN CLAY (CL), br. to gr., low to m. pl., dry to mst., w/few gravel							7, 8, 8
										13, 9, 10
			*dk. gr., m. pl., dry @ El. 979.0-El. 976.0		38	23				7, 8, 7
										8, 8, 10
			*dk. gr., m. pl., dry to mst., @ El. 976.0-El. 973.0				10	29	61	9, 12, 15
										10, 16, 12
			*low pl., dry @ El. 973.0-El. 970.0							10, 8, 9
										6, 10, 23
970.0	12.5	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry							10, 9, 9
										15, 15, 17
			*mst., @ El. 967.0-El. 964.0				20	61	19	12, 6, 4
										9, 10, 15
										7, 12, 21
962.5	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-13

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-13
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry							8, 12, 20
961.0	21.5									
		CL-ML	SANDY SILT LEAN CLAY (CL-ML), br., low pl., dry; *dry to mst., w/tr. gro. @ El. 958.0-El. 955.0							15, 14, 13, 8, 10, 13, 8, 9, 13, 9, 9, 17
955.0	27.5									
		GC-GM	SILTY CLAYEY GRAVEL WITH SAND (GC-GM), br., low pl., dry				32	26	42	10, 12, 12, 9, 10, 12
952.0	30.5									
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., dry to mst.							13, 13, 13, 10, 11, 10
949.0	33.5									
		NS	NO SAMPLE-NO RECOVERY							8, 8, 7
947.5	35.0									
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), dk. br., low pl., mst.		23	18		▼ 6/11/04		4, 5, 8
946.0	36.5									
		SM	SILTY SAND WITH GRAVEL (SM), br., non to low pl., dry to mst.							7, 8, 8
944.5	38.0									
		NS	NO SAMPLE-NO RECOVERY							58, 53, 30
943.0	39.5									
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., wet				33	55	12	9, 8, 9, 10, 13, 12
940.0	42.5									
		NS	NO SAMPLE-RECOVERY							13, 13, 17
938.5	44.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-13

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 3 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
937.9	44.6	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst.							36 100/0.1
937.0	45.5	NS	NO SAMPLE-AUGER							AUGER
935.5	47.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry				50	43	7	59 35 30
934.0	48.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), gr., dry							22 40 68
933.5	49.0	NS	NO SAMPLE-NO RECOVERY							181
932.5	50.0	NS	NO SAMPLE-AUGER							AUGER
931.9	50.6	NS	NO SAMPLE-NO RECOVERY							170/0.6
931.0	51.5	NS	NO SAMPLE-AUGER							AUGER
930.4	52.1	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry to mst.							68
923.5	59.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst., w/tr. gro. *w/tr. cool frags. @ El. 929.5 - El. 923.5				1	92	7	35 21 24 48 41 8 9 11 18 18 19 7 9 11
914.5	68.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry to w/tr. cool frags. *dry to mst. @ El. 920.5-El. 914.5 *no cool frags. @ El. 917.5-El. 914.5							11 22 27 11 17 20 34 54 56 23 25 21 28 16 18 8 12 19

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-13

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-13
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., dry, w/tr. gra.							9
										10
										13
										26
										35
911.5	71.0									30
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							8
										13
										13
										17
										22
908.5	74.0									28
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to dry, w/tr. gra.							23
										54
										32
										23
										25
										24
			*wet, no gravel @ El. 905.5-El. 902.5							4
										8
										12
										8
		SP-SM								9
										14
			*wet @ El. 902.5-El. 893.5							12
										22
										27
							2	87	11	8
										12
										18
										12
										14
										17
										13
										16
										19
										16
										18
										19
										12
										14
										15
			*wet, w/tr. org. @ El. 893.5-El. 890.5							8
										9
										12
										5
										8
890.5	92.0									12

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-13

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 5 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra. and org.							8, 12, 22
										9, 12, 12
			*w/tr. coal frags., no gravel @ El. 887.5-El. 884.5							10, 10, 13
										12, 15, 21
		SP-SM	*no org. @ El. 884.5-El. 881.5							8, 9, 12
										5, 9, 14
			*w/tr. coal frags. @ El. 881.5-El. 878.5							9, 15, 20
										9, 12, 18
878.5	104.0									
			NO SAMPLE-NO RECOVERY							19, 23, 17
		NS								
877.0	105.5									
			POORLY GRADED SAND WITH SILT (SP-SM), br. to bk., wet, w/tr. coal frags., org., and gravel							12, 16, 22
			*dk. gr., w/no org. or gra. @ El. 875.5-El. 872.5							12, 15, 24
										10, 12, 19
		SP-SM	*br., mst. to wet, w/no org. @ El. 872.5-El. 869.5							6, 9, 13
										5, 6, 12
			*br., mst., w/no coal @ El. 869.5-El. 866.5				1	91	8	12, 14, 17
										16, 22, 25
866.5	116.0									

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MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-13

PLATE D70

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-13

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 6 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet							6, 7, 12, 24, 30, 36
			*tr. gro. @ El. 863.5-El. 860.5							10, 13, 27, 12, 23, 26
			*tr. coal frags. @ El. 860.5-El. 857.5							19, 24, 26, 23, 19, 19
			*few coal frags. and org. @ El. 857.5-El. 854.8							9, 12, 17, 14, 16, 30
854.8	127.7	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., wet							17, 35, 53, 40, 174
			*mst. @ El. 853.0-El. 852.0							
852.0	130.5	NS	NO SAMPLE-AUGER							AUGER
851.5	131.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., mst.							54, 82, 65
850.0	132.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							40, 42, 36, 8, 9, 15
847.0	135.5		POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/few gravel							9, 13, 18, 13, 23, 26
844.0	138.5	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							17, 25, 39
842.5	140.0									

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MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-13

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-13

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							18 25 34
841.0	141.5									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., wet							20 30 32 12 28 25
838.0	144.5									
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst. *wet, w/tr. org. @ El. 835.0-El. 832.0							15 19 25 8 14 17 6 7 11 8 10 12
832.0	150.5									
		NS	DRILLED WITHOUT SAMPLING							AUGER
822.5	160.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., wet							17 35 26
821.0	161.5									
		NS	DRILLED WITHOUT SAMPLING							AUGER
818.5	164.0									

LRH FORM 1836-A
MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-13

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-13
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	DRILLED WITHOUT SAMPLING							AUGER
812.5	170.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., wet							19 24 26
811.0	171.5									
		NS	DRILLED WITHOUT SAMPLING							AUGER
802.5	180.0									
802.1	180.4	GP	POORLY GRADED GRAVEL (GP), br., wet, few sand, low recovery							157/0.4
		NS	DRILLED WITHOUT SAMPLING							AUGER
794.5	188.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-13

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 9 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
792.5	190.0	NS	DRILLED WITHOUT SAMPLING							AUGER
791.0	191.5	SM	SILTY SAND (SM), br., non. pl., mst., w/tr. gra.				3	68	29	24 26 31
782.5	200.0	NS	DRILLED WITHOUT SAMPLING							AUGER
781.0	201.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br.,wet w/few gra.							27 31 30
772.5	210.0	NS	DRILLED WITHOUT SAMPLING							AUGER
771.0	211.5	GM	SILTY GRAVEL WITH SAND (GM), br., non. pl., wet							17 41 40
770.5	212.0	NS	DRILLED WITHOUT SAMPLING							AUGER

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-13
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 10 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	DRILLED WITHOUT SAMPLING							AUGER
762.5	220.0									
		GM	SILTY GRAVEL WITH SAND (GM), br., non. pl., wet							37 54 56
761.0	221.5									
		NS	DRILLED WITHOUT SAMPLING							AUGER
753.3	229.2									
752.5	230.0	SH	SHALE: Light gray, soft, silty. 0.3' Clay with gravel, light brown, soft, silty from 753.3 to 753.0. Severely broken into gravel size fragments from 752.9 to 752.5.	0 L 0.0	← RQD ← LOSS					BEGAN CORING ~ TOR 752.5
		SS	SANDSTONE: Light gray, hard, medium grained with few to many shale stringers. 30° Fracture, open with slightly rough, sub-planar surface from 751.7 to 751.6. 15° Fracture, open with slightly rough, sub-planar surface at 751.5. Moderately broken at 751.1 and from 749.9 to 749.6.	78						

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-13
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 11 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		REMARKS
			SANDSTONE: Continued		
			Sulfur cooted core, yellow ot 748.5.		
			Numerous shale stringers from 747.0 to 746.4.		
		SS	60° Fracture, open with slightly rough, sub-planar surface from 746.4 to 746.2.		
				L 0.0	
741.9	240.6				
			BOTTOM OF HOLE		

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 361785.2800 E 2297100.9080	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
4. HOLE NO. (As shown on drawing title and file number) D-04-14	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 12; UNDISTURBED 0
5. NAME OF DRILLER BRAGG	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER ---
	16. DATE HOLE: STARTED 06/17/04; COMPLETED 06/17/04
7. THICKNESS OF OVERBURDEN 30.0	17. ELEVATION TOP OF HOLE 968.81 Feet
8. DEPTH DRILLED INTO ROCK 0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), dk. br., mst. to wet, w/tr. org.							3, 2, 3, 2, 5, 11
965.8	3.0	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), dk. br., mst. to wet, w/tr. org.							6, 8, 10, 12, 10, 8
962.8	6.0	SM	SILTY SAND WITH GRAVEL (SM), dk. br., non. pl., mst. to wet				34	49	17	2, 3, 4, 6, 6, 11
			*br., @ El. 959.8-El. 959.0							8, 6, 9, 3, 8, 9
959.0	9.8		SILTY SAND (SM), br., non. pl. to low pl., dry to mst., w/few gra.							
956.8	12.0	CL-ML	SANDY SILT AND LEAN CLAY (CL-ML), br. to gr., low pl., dry, w/few gra.				12	31	57	4, 7, 14, 7, 8, 9, 5, 12, 16, 8, 7, 5
950.8	18.0	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br. to gr., low pl., dry to mst.		27	20				4, 10, 18
948.9	19.9		SILTY CLAYEY SAND (SC-SM), br., low pl., mst., w/tr. gra.		19	15				5
948.8	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-14

PLATE D77

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 968.8	Hole No. D-04-14
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SC-SM	SILTY CLAYEY SAND (SC-SM), br., low pl., mst., w/tr. gra.		19	15				3, 4, 3, 3, 3
946.3	22.5									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry to mst., w/tr. org.							7, 6, 8, 7, 9, 9
			×mst., no org. @ El. 943.3-El. 940.3				35	44	21	6, 7, 11, 7, 11, 17
940.3	28.5									
		GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., dry to mst.							14, 17, 16
938.8	30.0									
			BOTTOM OF HOLE							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 4 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 361851.9988 E 2297291.4852	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 750 ATV
4. HOLE NO. (As shown on drawing title and file number) D-04-15	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 34; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 918.8
	16. DATE HOLE: STARTED 09/12/04; COMPLETED 09/14/04
7. THICKNESS OF OVERBURDEN 78.0	17. ELEVATION TOP OF HOLE 957.39 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 78.0	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
956.9	0.4	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br. to bk., low pl., mst., few org.							3
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry							5 8 7 8 9
954.3	3.0									
952.8	4.5	SC	CLAYEY SAND WITH GRAVEL (SC) dk. gr., low pl., mst.				16	57	27	4 5 6
949.8	7.5	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., mst. *non. to low pl. @ El. 951.3-El. 949.8		NP	NP				4 3 5 3 4 6
948.3	9.0	CL-ML	SANDY SILT AND LEAN CLAY WITH GRAVEL (CL-ML), lt. br., low pl., dry *gr., mst. @ El. 949.2-El. 948.3							8 9 8
947.0	10.3	SC	CLAYEY SAND WITH GRAVEL (SC) br., low pl., mst.				22	51	27	3 5 6
946.5	10.8	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), lt. br., low pl., dry							5
945.3	12.0	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., mst.		NP	NP				7 8
944.3	13.0	CL-ML	SANDY SILT AND LEAN CLAY WITH GRAVEL (CL-ML), br., low pl., mst.							3 5
941.8	15.5	SC	CLAYEY SAND WITH GRAVEL (SC), br., m. pl., mst.		34	16				6 4 3 4 3
940.3	17.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry, w/tr. coal frags. and org.							4 5 2
937.3	20.0	GM	SILTY GRAVEL WITH SAND (GM), br., non. pl. to low pl., mst.							3 4 3 4 5 3

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 957.3	Hole No. D-04-15
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., mst., w/few gra.				13	79	8	4, 8, 8
935.8	21.5									
		CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., m. pl., mst.		31	16				7, 6, 8, 9, 16, 8
932.7	24.6									
		SM	SILTY SAND WITH GRAVEL (SM), lt. br., non. pl., dry				41	47	12	9, 10, 7, 9, 22
930.3	27.0									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br. to gr., dry							12, 12, 13, 12, 18, 56
927.3	30.0									
		NS	NO SAMPLE-NO RECOVERY							19, 21, 21
925.8	31.5									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br. to gr., dry							3, 37, 35, 8, 15, 25
922.8	34.5									
		SP-SM	POORLY GRADED SAND WITH SLT AND GRAVEL (SP-SM), br., mst.				18	76	6	20, 21, 33, 11, 8, 9
			*wet @ El. 919.8-El. 913.8							3, 10, 11
								▼ 9/12/04		5, 7, 9, 7, 8, 9, 11, 11, 12
913.8	43.5									
913.3	44.0		POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gravel							3

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 957.3	Hole No. D-04-15
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.							4 5
			*mst., w/few gra. @ El. 912.3-El. 909.3				6	.85	9	4 5 7 8 11 13
			*w/tr. org. @ El. 909.3-El. 906.3							7 12 11 4 6 12 5 9 13 5 7 9 4 6 10 5 9 15
		SP-SM								
			*mst. @ El. 900.3-El. 897.3				0	92	8	3 10 12 4 8 7 4 7 9 4 5 6 5 5 5 4 5 6 5 7 9 10
889.3	68.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 957.3	Hole No. D-04-15
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.							10
										14
			*mst. @ El. 888.3-El. 885.3							18
										15
							0	90	10	16
										9
										12
										10
										11
		SP-SM								12
										14
										10
										11
										15
			*br. to gr., mst. @ El. 882.3-El. 879.3							7
										9
										11
										12
										15
879.3	78.0									16
			BOTTOM OF HOLE							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 361051.8850 E 2296776.0421	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL D-120
4. HOLE NO. (As shown on drawing title and file number) D-04-16	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 12; UNDISTURBED 0
5. NAME OF DRILLER WANSTRATH	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 896.7
	16. DATE HOLE: STARTED 05/12/04; COMPLETED 05/12/04
7. THICKNESS OF OVERBURDEN 30.0	17. ELEVATION TOP OF HOLE 905.68 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0	19. NAME OF INSPECTOR McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP	POORLY GRADED SAND (SP), br., mst., w/tr. gra.							2 2 3 4 6 6
902.6	3.0		*boulder noted							
		GP-GC	POORLY GRADED GRAVEL WITH CLAY AND SAND (GP-GC), br.to gr., dry							3 4 4 11 21 25
899.6	6.0									
		SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				9	60	31	7 8 6 2 4 6
896.6	9.0									
								5/12/04		
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							4 4 5 4 5 6
							42	51	7	3 1 4 6 3 2
										1 3 3
889.1	16.5									
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst.							5 5 5 5 4 5 4
			*mst. to wet, @ El. 886.1-El. 885.6							
885.6	20.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 905.6	Hole No. D-04-16
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet							5
										6
			*w/tr. gra. @ El. 884.6-El. 881.6							3
										5
							1	92	7	6
										3
										6
										7
		SP-SM								3
										5
										5
										4
										4
										6
			*w/tr. gra. @ El. 878.6-El. 875.9							7
										11
										11
										3
										4
875.9	29.7									5
875.6	30.0	ML	SANDY SILT (ML), gr., non. pl. to low pl., wet							
			BOTTOM OF HOLE							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 3 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 361009.4024 E 2296957.4768	11. DATUM FOR ELEVATION SHOWN NGVD 29 (TBM or MSL)
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL D-120
4. HOLE NO. (As shown on drawing title and file number) D-04-17	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 32; UNDISTURBED 0
5. NAME OF DRILLER WANSTRATH	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 897.0
	16. DATE HOLE: STARTED 05/05/04; COMPLETED 05/09/04
7. THICKNESS OF OVERBURDEN 58.5	17. ELEVATION TOP OF HOLE 937.56 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 58.5	19. NAME OF INSPECTOR McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							5, 8, 7, 10, 12, 13
			*mst. @ El. 934.5-El. 933.0							10, 12, 16
933.0	4.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), gr., dry							11, 15, 14
931.5	6.0	SM	SILTY SAND (SM), br., non. pl., mst.w/few gra.				14	65	21	11, 7, 9
930.2	7.3	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							5, 8, 20
928.5	9.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							9, 15, 21
927.0	10.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry				44	46	10	21, 31, 47, 13, 16, 18
924.0	13.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry							11, 13, 21, 12, 20, 23
921.0	16.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							10, 12, 16
			*mst. @ El. 919.5-El. 918.0							8, 10, 10
917.5	20.0		*dry @ El. 918.0-El. 917.5							6

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PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-17

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 937.5 | Hole No. D-04-17

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry							6 7 8 8 9
915.0	22.5		POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst. w/tr. gra.							8 8 8
							1	90	9	5 7 7 5 7 11
910.5	27.0		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry w/tr. org.							9 7 7
			×lt. br. @ El. 909.0-El. 907.5							9 11 12 7 7 8
906.0	31.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst. w/tr. gra.							8 8 10 8 8 12 8 11 10
			×wet, w/tr. org. @ El. 900.5-El. 899.0							2 7 9
			×br. to bk., wet, w/tr. org. @ El. 899.0-El. 897.0							5 7 9
			×wet @ El. 897.0-El. 895.5					▼ 5/5/04		2 4 6 2 4 7
			×mst. @ El. 895.5-El. 894.0				1	89	10	3 4 7
893.5	44.0		×wet @ El. 894.0-El. 893.5							4

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MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-17

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 937.5 | Hole No. D-04-17

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet w/tr. gra. *w/sli. org. odor @ El. 892.5-El. 891.0							5 6 4 3 4
891.0	46.5	NS	NO SAMPLE-NO RECOVERY							2 3 5
889.5	48.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet w/tr. org.							1 3 7
888.0	49.5	SP	POORLY GRADED SAND (SP), br., wet w/tr. gra.							4 4 7
886.5	51.0	NS	NO SAMPLE-NO RECOVERY							2 3 5
885.0	52.5	SP	POORLY GRADED SAND (SP), br., mst. *wet w/tr. gra.@ El. 883.5-El. 879.4				0	96	4	6 5 6 6 6 9 6 7 8 5 6
879.4	58.1	SM	SILTY SAND (SM), br., non. pl., wet							7
879.0	58.5		BOTTOM OF HOLE							

LRH FORM 1836-A
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PROJECT: BOLIVAR DAM DSA | HOLE NO. D-04-17

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 11 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 360938.9437 E 2297064.4261	11. DATUM FOR ELEVATION SHOWN NGVD 29 (TBM or MSL)
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL MOBIL B-61
4. HOLE NO. (As shown on drawing title and file number) CD-04-18	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 61; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 913.3
	16. DATE HOLE: STARTED 07/01/04; COMPLETED 07/22/04
7. THICKNESS OF OVERBURDEN 229.2 Feet	17. ELEVATION TOP OF HOLE 982.34 Feet
8. DEPTH DRILLED INTO ROCK 11.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 240.2 Feet	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
981.8	0.5	NS	NO SAMPLE-ASPHALT							AUGER
		CL	LEAN CLAY WITH SAND (CL), br. to gr., low to m. pl., mst.							26 12 9 10 10 12
978.8	3.5									
			SANDY LEAN CLAY (CL), br. to gr., low to m. pl., mst., w/few gra.				14	17	69	3 8 10
977.3	5.0									
		NS	NO SAMPLE-NO RECOVERY							8 9 12
975.8	6.5									
		CL	LEAN CLAY WITH SAND (CL), br. to gr., low to m. pl., mst.							4 7 10 14 15 13
			*br., w/tr. gra. @ El. 972.8-El. 966.8							6 10 14 7 9 10 8 9 10 5 7 7
966.8	15.5									
			SANDY LEAN CLAY WITH GRAVEL (CL), br., low to m. pl., mst.				20	25	55	6 8 8 6 6
964.4	17.9									
			LEAN CLAY WITH SAND (CL), br. to gr., m. pl., mst. w/tr. gra.		35	22				12 7 10 13
962.3	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-18

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.3	Hole No. CD-04-18
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			SANDY LEAN CLAY (CL), br. to gr., low to m. pl., mst., w/few gra.							5, 13, 12
960.8	21.5									
			LEAN CLAY WITH SAND (CL), br. to gr., m. pl., mst., w/tr. gra.		38	20				10, 12, 23, 12, 13, 54
			*br., low to m. pl., w/few gro. @ El. 957.8-El. 954.8				6	21	73	7, 11, 13, 30, 22, 13
954.8	27.5	CL	GRAVELLY LEAN CLAY WITH SAND (CL), br., low to m. pl., mst.							18, 14, 16, 8, 12, 13, 10, 14, 17, 14, 13, 17
948.8	33.5		LEAN CLAY WITH SAND (CL), br., low pl., mst., w/tr. gra.							7, 9, 11, 8
946.8	35.5	SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.				17	49	34	8, 7, 9, 12, 14, 14
943.6	38.7	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br., low pl., mst.		28	20				15, 7, 4, 5, 8
941.3	41.0	SM	SILTY SAND WITH GRAVEL (SM), br., non. to low pl., mst.							33, 28, 30, 17, 18, 16
938.3	44.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 3 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			SILTY SAND WITH GRAVEL (SM), br., non. pl. to low pl., mst.							13 14 22
936.8	45.5									
		SM	SILTY SAND (SM), br., non. pl., mst. w/few gra.				13	68	19	11 16 17 12 16 14
933.8	48.5									
			SILTY SAND WITH GRAVEL (SM), br., non. pl., mst.							10 10 11
932.3	50.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							4 12 58 100+
930.3	52.0									
		NS	NO SAMPLE-AUGER							AUGER
929.3	53.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							40 32 30
927.8	54.5									
		CL-ML	SILTY AND CLAYEY WITH SAND (CL-ML), br., low pl., mst., w/few gra.				9	20	71	137 132
926.8	55.5									
926.3	56.0	NS	NO SAMPLE-AUGER							AUGER
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry							80 100
925.3	57.0									
924.8	57.5	NS	NO SAMPLE-AUGER							AUGER
924.3	58.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry							42
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry							38 26 48 58 70
921.8	60.5									
921.3	61.0		POORLY GRADED GRAVEL (GP), lt. br., dry, w/few sand							100
		NS	NO SAMPLE-AUGER							AUGER
920.3	62.0									
919.8	62.5	GP	POORLY GRADED GRAVEL (GP), lt. br., dry, w/few sand				87	10	3	170
		NS	NO SAMPLE-AUGER							AUGER
918.8	63.5									
		GP	POORLY GRADED GRAVEL (GP), lt. br., dry, w/few sand							97 150
917.6	64.7									70/0.2
917.3	65.0	NS	NO SAMPLE-AUGER							AUGER
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst.							60 32 34 12 17 22
914.3	68.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 4 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst. w/few gra.							8
										10
								7/6/04		14
							7	86	7	4
										5
911.3	71.0									9
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet							12
										15
										17
										8
										13
908.3	74.0									17
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet w/few gra.							4
										12
										15
							9	85	6	5
										10
										15
			*w/tr. gra. @ El. 905.3-El. 899.3							8
										8
										10
										7
										15
										14
										7
										12
										15
										8
										12
										15
										8
										16
										22
										10
										18
										18
										8
										14
										18
										7
										11
										15
										10
										10
							1	91	8	12
										9
										12
890.3	92.0									13

LRH FORM 1836-A
MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-18

PLATE D91

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 5 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.							7, 8, 10, 11, 11, 12, 11, 11, 13, 12, 15, 14
			*w/few coal frags. @ El. 884.3-El. 881.3							12, 15, 20, 34, 41, 34
881.3	101.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., wet w/tr. coal frags.							26, 27, 40, 24, 21, 26
878.3	104.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. coal frags. & gravel							10, 15, 30, 11, 16, 24
875.3	107.0									
		SM	SILTY SAND (SM), br. to gr., non. pl., wet w/few gra.				6	67	27	26, 42, 55, 24, 30, 28
			*w/coal frags. @ El. 872.3-El. 869.3							11, 15, 26, 13, 17, 20
			*w/no gra. @ El. 869.3-El. 866.3							12, 17, 26, 12, 23, 26
866.3	116.0									

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MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-18

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 6 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl., wet, w/tr. coal frags.							21, 28, 30, 10, 16, 20
863.3	119.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. coal frags.							10, 15, 22, 13, 21, 26
860.3	122.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet							20, 25, 30, 7, 10, 12
857.3	125.0									
		SM	SILTY SAND (SM), br. to gr., non. pl., mst.				0	74	26	12, 20, 22, 14, 14, 16
854.3	128.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. gra. and coal frags.							12, 17, 18, 11, 13, 15
851.3	131.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet, w/tr. coal frags.							11, 11, 18, 17, 16, 15
848.3	134.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/tr. coal frags.							10, 15, 17, 10, 11, 12
			*dk. gr., w/tr. gra. and org., sl. org. odor @ El. 845.3-El. 842.3							12, 17, 23, 13, 17, 18
842.3	140.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., mst. to wet, w/tr. gro.							13 17 17 9 18 20
839.3	143.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet				18	73	9	17 20 19 14 15 19 12 17 16 11 11 19
833.3	149.0									
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/few gro							12 13 19
831.8	150.5									
		NS	NO SAMPLE-AUGER							AUGER
822.3	160.0									
			NO SAMPLE-NO RECOVERY							26 37 48
820.8	161.5									
			NO SAMPLE-AUGER							AUGER
818.3	164.0									

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MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-18

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 8 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE - AUGER							AUGER
812.3	170.0									
810.8	171.5	CL-ML	SILT AND LEAN CLAY WITH SAND (CL-ML), gr., low pl., mst.				0	29	71	12 29 70
		NS	NO SAMPLE - AUGER							AUGER
802.3	180.0									
800.8	181.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. org., w/few gra.							21 17 18
		NS	NO SAMPLE-AUGER							AUGER
794.3	188.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 9 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-AUGER							AUGER
792.3	190.0									
		GC	CLAYEY GRAVEL WITH SAND (GC), gr., med. pl., wet, w/tr. org.							36 66 36
790.8	191.5									
		NS	NO SAMPLE-AUGER							AUGER
782.3	200.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., wet							45 32 27
780.8	201.5									
		NS	NO SAMPLE-AUGER							AUGER
772.3	210.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), dk. gr., wet, w/tr. gravel & coal frags.							25 47 70
770.8	211.5									
770.3	212.0	NS	NO SAMPLE-AUGER							AUGER

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.3 | Hole No. CD-04-18

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 10 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-AUGER							AUGER
762.3	220.0									
		ML	SANDY SILT WITH GRAVEL (ML), gr., non to low pl., mst. to wet				18	25	57	17 58 62
760.8	221.5									
		NS	NO SAMPLE-AUGER							AUGER
757.3	225.0									
		GM	SILTY GRAVEL WITH SAND (GM) gr., low pl., wet							72 57 42
755.8	226.5									
		NS	NO SAMPLE-AUGER							AUGER
753.1	229.2									
		SS	SANDSTONE: Light gray, hard, medium grained, with few to many shale stringers throughout. Slightly to mod. broken from 753.1 to 752.7. Thin bedded from 752.1 to 751.7. Many shale stringers (laminations 0.05' thick), from 749.6 to 748.6. Very coarse grained from 745.3 to 744.6.	0 L 0.0 82	←RQD ←LOSS		BEGAN CORING ~ TOR @ 752.7			

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MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-18

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.3	Hole No. CD-04-18
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 11 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	REMARKS
		SS	SANDSTONE: continued.	
744.6	237.7			
		SH	SHALE: Gray, soft to mod. hard with 20% sandstone interbeds and stringers. 0.2' Sandstone, light gray, hard, from 743.0 to 742.8. 0.4' Sandstone, light gray, hard, from 742.7 to 742.3.	
742.1	240.2			LO.0
				BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 360915.8025 E 2297113.0778	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME - 45C
4. HOLE NO. (As shown on drawing title and file number) D-04-19	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 13; UNDISTURBED 0
5. NAME OF DRILLER WILLIAMS/SMITH	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER ---
	16. DATE HOLE: STARTED 08/17/04; COMPLETED 08/17/04
7. THICKNESS OF OVERBURDEN 30.0	17. ELEVATION TOP OF HOLE 959.96 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 30.0	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
958.4	1.5	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry w/tr. org.							2 5 6
957.6	2.3	SC-SM	SILTY CLAYEY SAND (SC-SM), br. to gra., low pl., dry to mst., w/tr. gra.		26	22				5 5
955.4	4.5	SP-SM	POORLY GRADED SAND WITH SLT AND GRAVEL (SP-SM), br., dry				45	47	8	5 4 4 3
952.4	7.5	CL	LEAN CLAY WITH SAND (CL), br. to gr., m. pl., dry to mst., w/tr. gra.							3 3 4 3 4 4
949.4	10.5	CL	SANDY LEAN CLAY (CL), br. to gr., m. pl., dry to mst., w/tr. gra.		33	19				3 4 7 4 4 6
947.7	12.2	CL	SANDY LEAN CLAY WITH GRAVEL (CL), br. to gr., m. pl., dry to mst.							4 5 5
945.4	14.5	SC-SM	SILTY CLAYEY SAND (SC-SM), br., low pl., dry to mst., w/few gra.							7 10 7 9 11
942.4	17.5	ML	SANDY SILT (ML), br., low pl., dry to mst.				0	45	55	5 7 9 5 7 9
939.9	20.0	SM	SILTY SAND (SM), br., non. to low pl., dry, w/few gra.							5 5 12 10 10

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. D-04-19

PLATE D99

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 959.9 | Hole No. D-04-19

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl. to low pl., dry, w/few gro.							15, 11, 12, 14, 9, 13
936.9	23.0									
			SILTY SAND WITH GRAVEL (SM), br., non. pl. to low pl., dry to mst.							15, 10, 5, 7
934.9	25.0									
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., dry to mst.				33	48	19	4, 7, 10, 7, 7, 5
931.9	28.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry							5, 7, 9, 6
929.9	30.0									
			BOTTOM OF HOLE							

LRH FORM 1836-A
MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. D-04-19

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 3 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" SPT 4" HSA
2. LOCATION (Coordinates or Station) N 360870.2976 E 2297293.8410	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL D-120
4. HOLE NO. (As shown on drawing title and file number) D-04-20	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 24; UNDISTURBED 0
5. NAME OF DRILLER WANSTRATH	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 901.5
	16. DATE HOLE: STARTED 05/12/04; COMPLETED 05/12/04
7. THICKNESS OF OVERBURDEN 64.5	17. ELEVATION TOP OF HOLE 943.51 Feet
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 64.5	19. NAME OF INSPECTOR McINTYRE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		GM	SILTY GRAVEL WITH SAND (GM), dk. br., non. pl. to low pl., dry, w/tr. org.							9, 10, 11, 11, 10, 10
940.5	3.0									
		SM	SILTY SAND (SM), br., non. pl. to low pl., mst., w/few gra. *low pl., @ El. 939.4-El. 939.0							6, 3, 2
939.0	4.5									
		SM	SILTY SAND WITH GRAVEL (SM), dk. br., non. pl., mst. to wet				15	63	22	6, 9, 8, 6, 8, 9
936.0	7.5									
		SC	CLAYEY SAND WITH GRAVEL (SC), br., low pl., mst.		24	16				3, 3, 7
934.5	9.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							7, 5, 3, 2, 3, 3, 5, 4, 2, 2, 3, 3
928.5	15.0									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., mst.							3, 3, 3, 3, 4, 5
925.5	18.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry				52	37	11	7, 15, 5, 11
923.5	20.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 943.5 | Hole No. D-04-20

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
922.5	21.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry				52	37	11	9, 15
920.6	22.9	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr., dry							11, 15, 14
918.0	25.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst., w/few gra.							9, 8, 9, 5, 5, 5
915.0	28.5	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., dry to mst.							10, 9, 9, 6, 5, 7
912.0	31.5		POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst., w/few gra.							5, 6, 7, 11, 10, 9
909.0	34.5		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., dry				22	70	8	6, 8, 11, 8, 9, 9
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to bk., dry, w/tr. gra. and coal frags., and few org.							8, 7, 8, 10, 9, 9
			*br., dry to mst., w/no coal frags. or org. @ El. 906.0-El. 903.0							9, 7, 7, 5, 5, 7
			*br., mst. to wet, w/no gra. or org. @ El. 903.0-El. 900.0							8, 7, 8
			▼ 5/12/04							8, 6, 5
899.5	44.0		*br. to gr., wet, w/no gra. or org. @ El. 900.0-El. 899.5							3

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 943.5 | Hole No. D-04-20

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. coal frags.							3 3 3 3 3 3
			*gr. to bk., wet, w/few org. and tr. gra.@ El. 897.0-El. 894.0				2	88	10	2 4 8 4 4 7
			*mst. to wet, @ El. 894.0-El. 891.0							4 6 7 5 6 7
			*w/few gra., @ El. 891.0-El. 882.0							4 4 7 3 3 3 1 2 3 4 5 8 4 5 7 4 8 13 6 8 11 5 10 13
		SP-SM								
879.0	64.5		BOTTOM OF HOLE							

LRH FORM 1836-A
MAY 04

PROJECT: BOLIVAR DAM DSA | HOLE NO. D-04-20

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 11 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361195.7799 E 2297136.8278	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 85
4. HOLE NO. (As shown on drawing title and file number) CD-04-21	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 54; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 915.4
7. THICKNESS OF OVERBURDEN 230.2 Feet	16. DATE HOLE: STARTED 09/16/04; COMPLETED 09/22/04
8. DEPTH DRILLED INTO ROCK 10 Feet	17. ELEVATION TOP OF HOLE 982.47 Feet
9. TOTAL DEPTH OF HOLE 240.2 Feet	18. TOTAL CORE RECOVERY FOR BORING 100%
	19. NAME OF INSPECTOR M. ASHCRAFT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
980.9	1.5	NS	NO SAMPLE-AUGERED							AUGER
977.9	4.5	SC	CLAYEY SAND WITH GRAVEL (SC), br., low pl., mst.				23	29	48	2, 5, 5, 2, 4, 10
968.9	13.5	CL	LEAN CLAY WITH SAND (CL), br., m. pl., mst., w/tr. gra.		40	24				5, 7, 8, 6, 7, 7
			*low to m. pl., w/few gro. @ El. 974.9-El. 968.9							9, 8, 12, 4, 4, 6, 5, 5, 5, 4, 7, 9
962.4	20.0		SANDY LEAN CLAY (CL), br. to gr., low to m. pl., mst., w/few gra.				12	28	60	6, 8, 17, 6, 12, 17
			*br., m. pl., @ El. 965.9-El. 962.4		38	22				12, 8, 13, 12, 16, 14, 4

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-21

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		CL	SANDY LEAN CLAY (CL), br., m. pl. mst., w/few gra.							6, 6, 5, 6, 7
959.9	22.5									
		SC	CLAYEY SAND (SC), br., low pl., mst., w/few gra.				11	41	48	7, 7, 12, 8, 8, 12
956.9	25.5									
		CL	SANDY LEAN CLAY (CL), br. to gr., m. pl., mst., w/few gra.		32	17				6, 8, 10, 15
954.7	27.7									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., mst.							22, 17, 13, 18, 25
							20	60	20	7, 8, 11, 4, 11, 17
949.4	33.0									
		SC-SM	SILTY CLAYEY SAND WITH GRAVEL (SC-SM), br., low pl., mst.							11, 12, 25, 37, 34, 22
946.4	36.0									
		SM	SILTY SAND WITH GRAVEL (SM), br. to gr., non. to low pl., dry to mst.							13, 17, 18, 9, 11, 14
			*dk. br., mst. @ El. 943.4-El. 940.4				19	61	20	9, 20, 16, 13, 9, 10
			*br., mst. @ El. 940.4-El. 937.4							9, 8, 9, 8
938.4	44.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
937.4	45.0	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl. to low pl., mst.							8 11
934.4	48.0	GC	CLAYEY GRAVEL WITH SAND (GC), br. to gr., low pl., dry to mst.		26	18				5 6 5 8 8 12
930.8	51.6	CL	SANDY LEAN CLAY (CL), br. to gr., low pl., dry to mst., w/few gra.				13	26	61	13 10 8 5 6 8 6
928.4	54.0	SM	SILTY SAND (SM), br. to gr., non. to low pl., mst., w/tr. org. & few gra.				9	67	24	10 11 6 10 8
926.9	55.5	SM	SILTY SAND WITH GRAVEL (SM), br. to gr., non. pl., mst., low recovery							8 8 8
924.4	58.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., mst. *cobble in shoe							- - - - -
921.9	60.5	GM	SILTY GRAVEL WITH SAND (GM), br. to gr., non. pl., mst. *cobble in shoe							- - - - -
919.4	63.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., dry to mst., low recovery *cobble in shoe							- - - - -
916.9	65.5	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), gr., wet, w/tr. gra. *cobble in shoe							- - - - -
914.4	68.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), gr., wet				▼ 9/20/04			4 4 7 5 6

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
913.9	68.5	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), gr., wet							6
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst.							5, 7, 5, 3, 6, 7
			*br. to gr., wet @ El. 910.9-El. 909.4							7, 7, 10
909.4	73.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet, w/tr. coal frags. and org.							5, 5, 6, 8, 12, 15
906.4	76.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gra.				2	87	11	3, 9, 15, 12, 12, 9
			*wet @ El. 903.4-El. 900.4							11, 10, 10, 10, 9, 16
			*wet, w/tr. coal frags. and org. @ El. 900.4-El. 897.4							10, 12, 10, 2, 2, 10
							0	91	9	9, 10, 17, 9, 12, 14
			*wet, @ El. 894.4-El. 890.4							8, 7, 8, 10, 10, 12, 7, 7
890.4	92.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982 5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.							9, 10, 12, 14, 10, 10, 12, 10, 12, 17
885.4	97.0									
		SM	SILTY SAND (SM), br., non. pl., wet, w/tr. gra.				1	87	12	14, 18, 18, 8, 12, 12
882.4	100.0									
		SP-SM	POORLY GRADED SAND WITH SLT (SP-SM), br. to gr., wet							9, 12, 10, 12, 12, 10
			*w/tr. gro. and few coal frags. @ El. 879.4-El. 876.4							6, 11, 11
			*w/tr. coal frags. @ El. 876.4 -El. 873.4							11, 19, 25, 12, 13, 15, 12, 18, 19
873.4	109.0									
		SM	SILTY SAND (SM), br. to gr, non. pl., wet, w/tr. gra. and coal frags.				0	84	16	16, 20, 22, 9, 12, 12
870.4	112.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. coal frags.							11, 13, 19, 9, 12, 13
			*no coal frags. @ El. 867.4-El. 866.4							7, 11
866.4	116.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-21

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 6 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							11, 9, 14, 18, 12, 7, 12, 13, 16, 19
861.4	121.0									
		SM	SILTY SAND (SM), br. to gr, non. pl., wet				0	78	22	9, 11, 13, 9, 12, 10
858.4	124.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							6, 9, 14, 10, 10, 12, 10, 12, 12, 11, 10, 13
852.4	130.0									
		NS	NO SAMPLE-AUGER							AUGER
842.4	140.0									

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-21

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-21

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 7 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br. to gr, non. pl., wet, w/few gra., low recovery				12	74	14	8 10 12
840.9	141.5									
		NS	NO SAMPLE-AUGER							AUGER
832.4	150.0									
		GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr, wet							8 8 10
830.9	151.5									
		NS	NO SAMPLE-AUGER							AUGER
822.4	160.0									
		SM	SILTY SAND (SM), br. to gr, non. pl., wet, w/few gra.				13	73	14	5 5 5
820.9	161.5									
		NS	NO SAMPLE-AUGER							AUGER
818.4	164.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
812.4	170.0	NS	NO SAMPLE-AUGER							AUGER
810.9	171.5	CL	SANDY LEAN CLAY (CL), br., low pl., mst., w/tr. gra.				4	38	58	6 8 10
802.4	180.0	NS	NO SAMPLE-AUGER							AUGER
800.9	181.5	SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.							12 17 20
794.4	188.0	NS	NO SAMPLE-AUGER							AUGER

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 982.5 | Hole No. CD-04-21

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 9 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
792.4	190.0	NS	NO SAMPLE-AUGER							AUGER
790.9	191.5	SM	SILTY SAND (SM), br., low pl., mst., w/tr. gra.				3	73	24	10 12 11
782.4	200.0	NS	NO SAMPLE-AUGER							AUGER
780.9	201.5	SM	SILTY SAND (SM), br., low pl., mst., w/few gra.				8	76	16	10 12 14
772.4	210.0	NS	NO SAMPLE-AUGER							AUGER
770.9	211.5	SM	SILTY SAND (SM), br., non. pl., mst. to wet, w/few gra.							4 8 8
770.4	212.0	NS	NO SAMPLE-AUGER							AUGER

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-21

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 10 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-AUGER							AUGER
762.4	220.0									
		GM	SILTY GRAVEL WITH SAND (GM), br., non. pl., mst. to wet							14 12 18
760.9	221.5									
		NS	NO SAMPLE-AUGER							AUGER
752.3	230.2									
		SS	SANDSTONE: Light gray, hard, medium grained, slightly weathered w/ occassional clay coated bedding planes. Clay coated bedding plane at 751.2, 750.5, 750.1, 749.8, 749.1.	21	◄—RQD					BEGAN CORING ~ TOR @ 752.3
748.7	233.8									
		SH	SHALE: Gray, soft to mod. hard, silty with few to many clay seam and clay coated bedding planes. Clay coated bedding plane at 747.9 and 747.6.							

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 982.5	Hole No. CD-04-21
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 11 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		REMARKS
		SH	SHALE: Continued Near vertical fracture, open with slightly rough, sub-planar surface with clay coating from 747.2 to 746.8.		
744.6	237.9		Clay coated bedding plane at 744.9 to 744.6.		
		SS	SANDSTONE: Light gray, hard, medium grained, slightly weathered with few shale stringers.	L 0.0	← LOSS
742.3	240.2		0.1' Clay seam, light gray, soft, sandy from 743.7 to 743.6. Clay coated bedding plane at 743.5. 0.05' Clay seam, gray, soft, shaly at 742.8.		BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 9 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361765.4775 E 2296939.3885	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 85
4. HOLE NO. (As shown on drawing title and file number) CD-04-22	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 52; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 901.2
7. THICKNESS OF OVERBURDEN 196.3 Feet	16. DATE HOLE: STARTED 08/17/04; COMPLETED 08/24/04
8. DEPTH DRILLED INTO ROCK 8.9 Feet	17. ELEVATION TOP OF HOLE 950.42 Feet
9. TOTAL DEPTH OF HOLE 205.2 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
949.9	0.5		SILTY SAND WITH GRAVEL (SM), br., low pl., dry to mst., w/tr. org.							3
		SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				12	44	44	5 7 5 6 6
947.7	2.7									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., dry to mst.							3 9 9
945.9	4.5									
		GP-GC	POORLY GRADED GRAVEL WITH CLAY AND SAND (GP-GC), br., dry to mst., low recovery							8 6 4
944.4	6.0									
		GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst. *cobbles in shoe *dry @ El. 940.9-El. 935.9							-
935.9	14.5									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), lt. br., dry *cobbles in shoe							-
930.9	19.5									
930.4	20.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry to mst.							-

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-22

PLATE D115

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 950.4 | Hole No. CD-04-22

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 2 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
928.4	22.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry to mst. *cobbles in shoe							- - - -
925.9	24.5	SP	POORLY GRADED SAND (SP), br., mst. w/tr. gra. *cobbles in shoe							- - - - -
922.9	27.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst. w/tr. gra.				4	90	6	5 7 8 5 8 10
919.9	30.5		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., dry to mst.							6 9 9 5 11 12
916.9	33.5	SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				12	44	44	4 9 10 5 7 9
906.4	44.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., dry to mst., w/tr. gro. *mst., w/tr. coal frags. and org. @ El. 907.9-El. 904.9				2	89	9	5 5 6 3 5 7 5 7 8 7 8 9 10 10 9 3 5 6 4 10 11

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PLATE D116

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 950.4	Hole No. CD-04-22
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst., tr. gra., coal frags., and org.				2	89	9	4 7 8
			*dry to mst. @ El. 904.9-El. 90'.9							6 7 7
										5 6 8
								▼ 8/24/04		5 7 10
										8 7 8
			*no gra. @ El. 898.9-El. 895.9							5 5 8
										8 9 9
		SP-SM	*br. to gr., wet, @ El. 895.9-El. 892.9				2	89	9	3 5 6
										2 4 6
			*no coal frags. or org. @ El. 892.9-El. 889.9							6 7 9
										4 8 7
			*br. to gr., wet, w/no coal frags. or org. @ El. 889.9-El. 886.9							6 7 9
										4 5 6
			*gr., wet, w/no coal frags. or org. @ El. 886.9-El. 883.9							3 4 4
										2 3 4
			*br. to gr., wet, w/no coal frags. or org. @ El. 883.9-El. 882.4				1	93	6	4 5 8
882.4	68.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 950.4	Hole No. CD-04-22
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/ tr. gravel				1	93	6	6 7 10
			*gr., w/tr. coal frags. @ El. 880.9 -El. 877.9							2 3 5
			*gr., w/tr. coal frags. and org. @ El. 877.9-El. 874.9							2 2 5 5 6 7 6 7 9
874.9	75.5									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), gr., wet, w/tr. coal frags. and org., sli. org. odor							2 3 4 3 5 4
871.9	78.5									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), lt. br., dry, w/few gra.				6	88	6	4 5 8 2 1 2
			*gr., wet @ El. 868.9-El. 865.9							2 2 6 3 5 9
			*mst. @ El. 865.9-El. 862.9							4 6 7 3 4 7
			*gr., wet @ El. 862.9-El. 859.9							4 6 9 5 7 9
			*gr., wet, w/tr. gra. @ El. 859.9 -El. 858.4				1	94	5	3 4 6
858.4	92.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 950.4 | Hole No. CD-04-22

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 5 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/tr. grc.				1	94	5	4, 6, 8
			*br., mst., w/tr. coal frags. @ El. 856.9-El. 853.9							6, 8, 11
										2, 2, 4
853.9	96.5									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.				33	57	10	7, 9, 22
										7, 8, 9
		SP-SM	*wet @ El. 850.9-El. 849.4							3, 5, 7
849.4	101.0									
			POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.				2	88	10	3, 5, 6
										2, 3, 4
										5, 5, 7
										4, 6, 7
843.4	107.0									
			WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br., wet							11, 17, 12
		SW-SM								13, 10, 11
840.4	110.0									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet				25	67	8	10, 14, 15
		SP-SM								9, 11, 14
837.4	113.0									
			WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., wet							6, 10, 16
		GW-GM								9, 11, 14
834.4	116.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-22

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 950.4	Hole No. CD-04-22
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. gra.							7, 10, 11, 5, 7, 12
			*br., w/few gra. @ El. 831.4-El. 828.4				9	80	11	7, 12, 15, 8, 10, 20
828.4	122.0									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), br. to gr., wet							10, 15, 17, 10, 13, 15
825.4	125.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br. to gr., wet							10, 11, 12, 10, 11, 14
			*w/tr. coal frags. @ El. 822.4-El. 820.9							11, 9, 15
820.9	129.5									
		NS	NO SAMPLE-AUGER							AUGER
810.4	140.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 950.4 | Hole No. CD-04-22

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
808.9	141.5	SP-SM	POORLY GRADED SAND WITH SLT AND GRAVEL (SP-SM), br. to gr., wet				36	53	11	17 22 27
800.4	150.0	NS	NO SAMPLE-AUGER							AUGER
798.9	151.5	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr., wet							36 30 38
790.4	160.0	NS	NO SAMPLE-AUGER							AUGER
788.9	161.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra. and org.				3	77	20	10 12 14
786.4	164.0	NS	NO SAMPLE-AUGER							AUGER

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 950 4 | Hole No. CD-04-22

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 8 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-AUGER							AUGER
780.4	170.0									
		SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra.							8 8 15
778.9	171.5									
		NS	NO SAMPLE-AUGER							AUGER
770.4	180.0									
		SM	SILTY SAND (SM), dk. gr., non. pl., wet, w/tr. gra.				1	80	19	10 18 15
768.9	181.5									
		NS	NO SAMPLE-AUGER							AUGER
762.4	188.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 950.4	Hole No. CD-04-22
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 9 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
760.4	190.0	NS	NO SAMPLE-AUGER							AUGER
758.9	191.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/few gra.				6	78	16	14 12 14
754.3	196.1	NS	NO SAMPLE-AUGER							AUGER
754.1	196.3	CL	SANDY LEAN CLAY (CL), gr., low pl., dry, w/few gra.							50/0.2
745.2	205.2	SS	SANDSTONE: Light gray, hard to medium hard, slightly weathered, thin bedded. BEGAN CORING ~ TOR @ 753.9 45° Fracture, open with slightly rough, sub-planar surface from 753.9 to 753.8. Mod. to severely broken from 753.6 to 752.9. 0.2' Clay seam, light brown, soft to mod. hard, with small gravel from 753.3 to 753.1. Clay coated iron stained bedding plane at 752.7. Clay coated bedding plane at 752.0. Many shale stringers from 750.6 to 749.9. 0.7' Shale, dark gray, medium hard, sandy, slightly weathered from 749.9 to 749.2. Many shale stringers from 749.2 to 746.4. Sulfur, yellow at 745.9 to 745.8.	0 L 0.0	← RQD ← LOSS					
			BOTTOM OF BORING							

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-22

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 9 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361245.4881 E 2296907.6209	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 85
4. HOLE NO. (As shown on drawing title and file number) CD-04-23	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 53; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 893.8
7. THICKNESS OF OVERBURDEN 181.5	16. DATE HOLE: STARTED 08/31/04; COMPLETED 09/07/04
8. DEPTH DRILLED INTO ROCK 9.4	17. ELEVATION TOP OF HOLE 935.12 Feet
9. TOTAL DEPTH OF HOLE 190.9	18. TOTAL CORE RECOVERY FOR BORING %
	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
934.6	0.5	CL	LEAN CLAY WITH SAND (CL), br. to gr., low pl., mst., w/few org. and tr. gra.							2
		SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst.				35	45	20	3 5 1 4 6
932.1	3.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., mst.				60	31	9	10 12 4 4 4 3
929.1	6.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst. *cobbles in shoe							- - - - - - -
925.6	9.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., dry to mst. *cobbles in shoe							- - - - - - - - - - -
920.6	14.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., mst. *cobbles in shoe							- - - - -
918.1	17.0	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst. *cobbles in shoe							- - - - -
915.6	19.5	NS	NO SAMPLE-NO RECOVERY							AUGER
915.1	20.0									

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-23

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 935.1	Hole No. CD-04-23
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
913.1	22.0	NS	NO SAMPLE-NO RECOVERY							AUGER
910.6	24.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst. w/tr. org. and coal frags. *cobbles in shoe							- - - - -
908.1	27.0	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., mst. *cobbles in shoe							- - - - -
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gra.				2	93	5	2 3 3 2 2 3
			*wet w/tr. orgs. @ El. 905.1-El. 902.1							2 4 6 4 6 6
			*wet, no gra. @ El. 902.1-El. 899.1							3 4 6 3 4 5
			*wet, @ El. 899.1-El. 890.1							2 3 5 5 6 7
				▼ 9/07/04			2	90	8	7 7 8 5 7 8
891.1	44.0									5 6 7 5

LRH FORM 1836-A
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-23

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 935.1	Hole No. CD-04-23
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra. *br. to gr., @ El. 890.1-El. 884.1							8, 8, 2, 2, 3, 2, 2, 5, 3, 5, 6, 3, 4, 6
884.1	51.0									
881.1	54.0	SM	SILTY SAND (SM), br., non. pl., wet, w/tr. coal frags. & org.				0	87	13	5, 5, 8, 4, 9, 10
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), dk. gr., wet, w/tr. coal frags. *br., @ El. 878.1-El. 875.1							2, 3, 5, 4, 5, 11, 4, 8, 9, 6, 8, 8
875.1	60.0									
		SM	SILTY SAND (SM), br., non. pl., wet, w/tr. gra. *no gra. @ El. 872.1-El. 869.1				0	81	19	3, 6, 8, 5, 7, 8, 3, 6, 6, 6, 8, 12
869.1	66.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet							3, 5, 7, 5
867.1	68.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 935.1	Hole No. CD-04-23
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), gr., wet							5, 9
			*w/tr. coal frags. @ El. 866.1-El. 852.6							5, 9, 10
							0	93	7	3, 5, 8
										5, 6, 10
										5, 6, 8
										3, 5, 5
										5, 8, 10
										5, 7, 9
		SP-SM								4, 6, 10
			*w/few gra. @ El. 854.1-El. 843.1							7, 10, 12
							6	86	8	
										6, 10, 12
							9	82	9	10, 10, 14
			*w/tr. coal frags. @ El. 849.6-El. 843.1							9, 10, 10
										9, 9, 13
										9, 12, 11
										8, 10, 12
843.1	92.0						12	77	11	6

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 935.1	Hole No. CD-04-23
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/few gra. and tr. coal frags.							8, 15
							12	77	11	7, 13, 16
840.6	94.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), gr., wet, w/tr. coal frags. and org.							9, 13, 12
							29	62	9	13, 15, 14
837.6	97.5	SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), gr., wet							8, 10, 16
										10, 15, 12
834.6	100.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), gr., wet							3, 4, 5
833.1	102.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gro.							6, 7, 13
							3	91	6	6, 9, 11
830.1	105.0		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet, w/tr. coal frags.							8, 10, 10
										8, 8, 13
827.1	108.0	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., mst., w/few gra.							4, 7, 9
							13	77	10	9, 11, 13
824.1	111.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., wet							8, 15, 15
										10, 15, 15
821.1	114.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							8, 14, 16
										9
819.1	116.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 935.1 | Hole No. CD-04-23

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 6 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							10, 14, 10, 14, 16, 12, 16, 17
815.1	120.0									
		SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., mst., w/few gra.				9	80	11	13, 11, 11, 10, 15, 16
812.1	123.0									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., wet							12, 14, 16, 10, 36, 45
809.1	126.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., wet							12, 15, 20, 3, 12, 14
806.1	129.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., mst.				27	59	14	16, 13, 16
804.6	130.5									
		NS	NO SAMPLE-NO RECOVERY							AUGER
795.1	140.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-23

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 935.1 | Hole No. CD-04-23

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 7 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl., wet, w/few gra.				12	73	15	3 3 7
793.6	141.5	NS	NO SAMPLE-NO RECOVERY							AUGER
785.1	150.0	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/few gra.				11	70	19	8 14 14
783.6	151.5	NS	NO SAMPLE-AUGER							AUGER
775.1	160.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/few gra.							7 7 10
773.6	161.5	NS	NO SAMPLE-NO RECOVERY							AUGER
771.1	164.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-23

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 935.1 | Hole No. CD-04-23

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 8 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-NO RECOVERY							AUGER
765.1	170.0									
		ML	SANDY SILT (ML), gr., low pl., wet				0	39	61	3 4 7
763.6	171.5									
		NS	NO SAMPLE-AUGER							AUGER
755.1	180.0									
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., wet				24	57	19	27 38 49
753.8	181.3		WELL GRADED GRAVEL WITH SAND (GW), lt. gr., mst.							
753.6	181.5	GW								
753.5	181.6	SH	SHALE: Gray, soft to mod. hard, clayey, mod. to slightly weathered. 0.3' Clay, light brown, soft to mod. hard with gravel fragments from 753.5 to 753.2. Severely to mod. broken with clay coating from 753.2 to 752.1. 0.5' Sandstone, light gray, hard, very fine grained from 751.0 to 750.6.	53	← RQD					BEGAN CORING ~ TOR @ 753.2
749.7	185.4	SS	SANDSTONE: Light gray, hard, medium grained. 0.05' Clay seam, gray, soft to mod. hardat 748.1 to 748.0.							

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DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 935.1	Hole No. CD-04-23
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 9 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d		REMARKS
			SANDSTONE: continued		
		SS			
744.2	190.9			L 0.0	← LOSS
					BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 9 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361223.4963 E 2297008.5178	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 85
4. HOLE NO. (As shown on drawing title and file number) CD-04-24	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 52; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 904.3
7. THICKNESS OF OVERBURDEN 184.4 Feet	16. DATE HOLE: STARTED 08/25/04; COMPLETED 08/31/04
8. DEPTH DRILLED INTO ROCK 10.1 Feet	17. ELEVATION TOP OF HOLE 938.65 Feet
9. TOTAL DEPTH OF HOLE 194.5 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
938.3	0.3	GM	SILTY GRAVEL (GM), gr. to bk., non. pl., mst., w/few orgs. & sand							2
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dk. br., mst. to wet, w/tr. org.				42	48	10	4, 15, 25, 22, 18
935.6	3.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst. to wet, w/tr. org., low recovery							4, 14, 16, 14, 16, 17
932.6	6.0	GM	SILTY GRAVEL WITH SAND (GM), br., non. pl., mst. to wet *cobbles in shoe							-
930.1	8.5	GW-GC	WELL GRADED GRAVEL WITH CLAY AND SAND (GW-GC), br., mst. *cobbles in shoe							-
927.6	11.0	SW	WELL GRADED SAND WITH GRAVEL (SW), br., mst., 4" cobble in sample							-
925.1	13.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., mst. *cobbles in shoe							-
922.6	16.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to gr., mst. *cobbles in shoe							-
920.1	18.5	GP	POORLY GRADED GRAVEL (GP), br. to gr., wet, w/tr. sand *cobbles in shoe							-
918.6	20.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-24

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 938.6 | Hole No. CD-04-24

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 2 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
917.6	21.0	GP	POORLY GRADED GRAVEL (GP), br. to gr., wet, w/tr. sand *cobbles in shoe							- -
915.1	23.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br. to bk., mst. w/l. coal frags. and org. *cobbles in shoe							- - - - -
912.6	26.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br. to gr., wet *cobbles in shoe							- - - - -
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst. *cobbles in shoe							- - - - -
			*w/tr. gra. @ El. 910.1-El. 907.1				3	90	7	5 7 10 3 4 6
			*dry, w/tr. gra., coal frags. and org. @ El. 907.1-El. 904.1							5 7 8 6 10 10
			*wet, w/few gra. @ El. 904.1-El. 901.1					8/31/04		7 9 8 2 3 4
			*wet, w/tr. gra. @ El. 904.1-El. 895.1				1	94	5	4 4 7 6 6 7 4 6 6 6 9 5
894.6	44.0		*br. to gr., wet, w/few gra. @ El. 895.1-El. 894.6							5

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-24

PLATE D134

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 938.6	Hole No. CD-04-24
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 3 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/few gra.							7, 8
										3, 4, 6
			*gr., w/tr. org. and no gra. @ El. 892.1-El. 889.1							3, 4, 7
										5, 7, 10
			*br., mst. @ El. 889.1-El. 886.1				0	92	8	5, 9, 9
										5, 11, 10
		SP-SM	*w/tr. org., and coal frags. @ El. 886.1-El. 883.1							4, 9, 10
										5, 9, 10
			*br., @ El. 883.1-El. 880.1							5, 7, 9
										10, 8, 9
			*w/org. and coal frags. @ El. 880.1-El. 877.1							5, 7, 9
										7, 9, 14
877.1	61.5		SILTY SAND (SM), br., non. pl., mst				0	87	13	5, 9, 9
		SM								7, 8, 10
874.1	64.5		POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet							6, 7, 11
		SP-SM								4, 5, 9
871.1	67.5		SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. coal frags.							6
870.6	68.0	SM								

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 938.6	Hole No. CD-04-24
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. coal frags.							12, 10, 4, 6, 13
868.1	70.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br. to gr., wet, w/tr. coal frags. and arg.							5, 5, 9, 5, 10, 12
865.1	73.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet				0	87	13	3, 7, 9, 5, 9, 15
862.1	76.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst. to wet							7, 10, 16, 6, 13, 15
859.1	79.5	SM	SILTY SAND (SM), br., non. pl., mst. to wet, w/tr. coal frags.				0	88	12	5, 7, 10, 10, 12, 12
856.1	82.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, w/tr. coal frags.							8, 10, 10, 4, 4, 7
			*few gra. @ El. 853.1-El. 850.1				12	81	7	7, 8, 10, 8, 12, 14
			*w/few gra. @ El. 850.1-El. 846.6							7, 11, 11, 5, 10, 11, 8
846.6	92.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 938.6 | Hole No. CD-04-24

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 5 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), gr., wet, few gra.							8, 12, 8, 9, 12, 7, 8, 11, 10, 14, 19
			×br. to gr., @ El. 844.1-El. 841.1							
841.1	97.5									
		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), gr., wet				19	73	8	8, 12, 20, 9, 14, 18
			×dk. gr., w/sli. org. odor @ El. 838.1-El. 835.1							5, 8, 12, 5, 5, 13
835.1	103.5									
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. to wet							5, 11, 13, 9, 14, 16, 7, 7, 14, 8, 12, 11
			×mst. @ El. 832.1-El. 826.1							
							17	74	9	10, 12, 12, 7, 8, 12
826.1	112.5									
		SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., mst., w/few gra.				14	76	10	10, 12, 11, 8, 12, 16
823.1	115.5									
822.6	116.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							15

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 938.6 | Hole No. CD-04-24

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 6 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							15, 20, 12, 16, 17
820.1	118.5	SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., mst.							8, 16, 21, 12, 17, 20
817.1	121.5	SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				12	76	12	12, 27, 24, 5, 7, 14
814.1	124.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst., w/few coal frags. and org.							5, 16, 20, 8, 14, 16
811.1	127.5	SM	SILTY SAND WITH GRAVEL (SM), br. to gr., non. pl., mst.							17, 19, 39, 10, 8, 10
808.1	130.5	NS	NO SAMPLE-AUGER							AUGER
798.6	140.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-24

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 938.6 | Hole No. CD-04-24

PROJECT: BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION: HUNTINGTON DISTRICT | SHEET 7 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
797.1	141.5	SM	SILTY SAND (SM), br., non. pl., mst., w/few gra.				10	70	20	7 14 13
788.6	150.0	NS	NO SAMPLE-NO RECOVERY							AUGER
787.1	151.5	SM	SILTY SAND (SM), br., non. pl., wet, w/tr. gra.				4	76	20	7 19 17
778.6	160.0	NS	NO SAMPLE-NO RECOVERY							AUGER
777.1	161.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra.				3	75	22	12 12 10
774.6	164.0	NS	NO SAMPLE - NO RECOVERY							AUGER

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PROJECT: BOLIVAR DAM DSA | HOLE NO. CD-04-24

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 938.6	Hole No. CD-04-24
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
768.6	170.0	NS	NO SAMPLE-NO RECOVERY							AUGER
767.1	171.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra. and coal frags.				2	80	18	12 12 17
758.6	180.0	NS	NO SAMPLE-NO RECOVERY							AUGER
757.1	181.5	SM	SILTY SAND WITH GRAVEL (SM), br. to gr., non. pl., mst., w/tr. coal frags.				18	55	27	27 49 59
754.6	184.0	NS	NO SAMPLE-NO RECOVERY							AUGER
754.2	184.4	GM	SILTY GRAVEL WITH SAND (GM), br. to gr., low pl., mst., w/low recovery							50/0.4
750.6	188.0	SH	SHALE: Gray, soft, clayey, severely to mod. weathered with frequent clay coated bedding planes. 0.7' Clay seam, light brown, soft with very fine gravel from 754.3 to 753.6. Severely weathered and clayey from 753.6 to 751.9 and 751.4 to 751.1.	52	◄ LOSS					BEGAN CORING

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 938.6	Hole No. CD-04-24
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 9 OF 9 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	REMARKS
		SS	SHALE Cont. 70° Fracture, open with rough, irregular surface from 751.5 to 751.2. SANDSTONE: Light gray, hard, medium grained. Mod. weathered, thin bedded and shaly from 748.8 to 747.6. Clay coated bedding planes at 747.8 and 747.3. 0.05' Clay seam, light gray, soft, silty from 747.1 to 747.0. Gravel size, white quartz inclusions at 746.3 to 745.9.	
744.1	194.5			L 0.0 ← LOSS
				BOTTOM OF BORING

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 8 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT 2" CORE 4" HSA
2. LOCATION (Coordinates or Station) N 361024.7591 E 2296909.9716	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY HC NUTTING	12. MANUFACTURER'S DESIGNATION OF DRILL CME 85
4. HOLE NO. (As shown on drawing title and file number) CD-04-25	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 51; UNDISTURBED 0
5. NAME OF DRILLER H. HERD	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 903.7
	16. DATE HOLE: STARTED 09/07/04; COMPLETED 09/15/04
7. THICKNESS OF OVERBURDEN 166.0 Feet	17. ELEVATION TOP OF HOLE 927.39 Feet
8. DEPTH DRILLED INTO ROCK 9.6 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 175.6 Feet	19. NAME OF INSPECTOR STEWART

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND WITH GRAVEL (SM), br., non. pl., dry, w/l. org. *mst. w/no orgs. @ El. 927.1-El. 924.3				34	54	12	3, 10, 6, 6, 8, 6
924.3	3.0	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), dk. br., mst., w/tr. coal frogs. *no coal frags. @ El. 921.3-El. 919.8 *cobbles in shoe							6, 7, 8, 10, 10, 13, -, -, -
917.3	10.0		*br., @ El. 919.8-El. 917.3 *cobbles in shoe				53	39	8	-, -, -, -, -
914.8	12.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst. *cobbles in shoe							-, -, -, -, -
909.3	18.0		POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gra. *cobbles in shoe *w/tr. org. @ El. 912.3-El. 909.3				2	92	6	-, -, -, -, -
907.3	20.0		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							3, 3, 6, 5, 5, 6, 6, 7, 7, 8

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 2 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							6, 10
906.3	21.0									
			POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/few gra.				12	80	8	8, 8, 9, 6, 5, 6
							▼ 9/15/04			
										6, 7, 9, 5, 7, 7
			×wet, @ El. 900.3-El. 897.3							4, 5, 3, 5, 6, 6
			×wet, w/no gra., few org. and coal frags. @ El. 897.3-El. 894.3							3, 4, 4, 3, 3, 6
		SP-SM								
			×wet, @ El. 894.3-El. 891.3				5	86	9	1, 3, 7, 3, 5, 6
			×wet, w/tr. org. and coal frags. @ El. 891.3-El. 885.3							4, 4, 5, 4, 5, 7, 5, 6, 5, 4, 4, 6
885.3	42.0									
			SILTY SAND (SM), br., non. pl., mst., w/tr. gra.				1	87	12	4, 7, 6, 2
		SM								
883.3	44.0									

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 927.3 | Hole No. CD-04-25

PROJECT BOLIVAR DAM DSA SEEPAGE STUDY | INSTALLATION HUNTINGTON DISTRICT | SHEET 3 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl., mst., w/tr. gra. ×wet, @ El. 882.3-El. 879.3				1	87	12	3 5
							1	73	26	2 4 5 3 6 7
879.3	48.0	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra. and coal frags. ×br. to gr., w/no gra. @ El. 876.3-El. 873.3 ×mst., w/no gra. or coal frags. @ El. 873.3-El. 871.8							3 6 10 6 8 12 6 7 8 7 8 10
							0	90	10	8 9 11
871.8	55.5	ML	SILT WITH SAND (ML), br., non. to low pl., wet				0	17	83	5 8 10 6 8 10
868.8	58.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. coal frags. ×br., w/few org. @ El. 862.8-El. 859.8 ×br., w/tr. gra.@ El. 859.8-El. 859.3							7 7 9 4 6 9 5 10 16 4 5 7 5 7 11 6 8 12
							1	85	14	7
859.3	68.0									

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PROJECT BOLIVAR DAM DSA | HOLE NO. CD-04-25

PLATE D144

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 4 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl., wet, w/tr. gra.				1	85	14	11, 11, 6, 6, 6
856.8	70.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst.							2, 4, 6, 5, 5, 8
			*dk. gr., wet, w/tr. coal frags. and org., few gra. @ El. 853.8-El. 850.8							4, 4, 6, 3, 3, 7
850.8	76.5		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.							10, 12, 14, 15, 18, 27
847.8	79.5	SM	SILTY SAND (SM), br., non. pl., mst., w/tr. gra.				5	81	14	10, 12, 13, 8, 6, 7
844.8	82.5	SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., wet, w/tr. gra.							2, 3, 4, 7, 10, 11
841.8	85.5	SP	POORLY GRADED SAND WITH GRAVEL (SP), br., wet, w/coal frags.							18, 17, 15, 6, 8, 11
			*mst., w/tr. org. @ El. 838.8-El. 835.8							10, 12, 15, 6, 10, 14
835.8	91.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.				17	77	6	5
835.3	92.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 5 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.				17	77	6	7, 14, 7, 9, 11
			*wet, w/tr. coal frags. and sli. org. odor @ El. 832.8-El. 829.8							3, 4, 5, 7, 10, 14
			*wet @ El. 829.8-El. 826.8							6, 9, 11, 12, 11, 11
826.8	100.5	GP-SM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst., w/tr. coal frags.							5, 7, 10, 7, 9, 13
823.8	103.5	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., mst., w/tr. org. anc few gra.				12	79	9	7, 12, 15, 8, 9, 14
820.8	106.5	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst., w/tr. coal frags. and org.							10, 14, 14, 7, 9, 12
			*no tr. cool frags. or org. @ El. 817.8-El. 814.8							6, 8, 12, 8, 15, 14
814.8	112.5	SM	SILTY SAND (SM), br. to gr., non. pl., wet, w/tr. gra.				3	84	13	10, 11, 13, 9, 8, 11
811.3	116.0		*br., mst. @ El. 811.8-El. 811.3							11

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 6 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SM	SILTY SAND (SM), br., non. pl., mst., w/tr. gra.							11, 10, 9, 12, 13
808.8	118.5									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., mst., w/tr. gro. and org.							11, 13, 15, 14
806.8	120.5									
			POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., mst.				42	47	11	16, 19, 15, 18, 20
804.3	123.0									
		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., mst. *dk. gr., wet @ El. 801.3-El. 798.3							16, 8, 14, 16, 18, 18, 8, 9, 7, 7, 11, 14
798.3	129.0									
		GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., mst.				49	43	8	8, 12, 15
796.8	130.5									
		NS	NO SAMPLE-NO RECOVERY							AUGER
787.3	140.0									

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 7 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
785.8	141.5	SM	SILTY SAND (SM), br. to gr., non. pl., mst., w/tr. coal frags. and org. and few gra.				9	72	19	15 14 19
777.3	150.0	NS	NO SAMPLE-NO RECOVERY							AUGER
775.8	151.5	SM	SILTY SAND (SM), br., low pl., mst., w/few gra.				6	70	24	12 13 15
767.3	160.0	NS	NO SAMPLE-AUGER							AUGER
765.8	161.5	CL	SANDY LEAN CLAY (CL), gr., low pl., wet, w/few gra.				6	37	57	15 13 14
763.3	164.0	NS	NO SAMPLE-NO RECOVERY							AUGER

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 927.3	Hole No. CD-04-25
PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	INSTALLATION HUNTINGTON DISTRICT	SHEET 8 OF 8 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-NO RECOVERY							AUGER
761.6	165.7		LEAN CLAY (CL), gr., low pl., dry to mst., completely wd. sh.							
761.3	166.0	CL								50/0.3
		SH	SHALE: Dark gray, soft, severely to mod. weathered, clayey with clay coated core throughout. BEGAN CORING ~ TOR @ 761.1 0.3' Clay seam, gray broken into gravel size, soft to mod. hard fragments with iron staining from 761.4 to 761.1. Moderately broken from 761.1 to 759.4. Severely broken from 759.4 to 758.5. Mod. broken from 758.5 to 758.4. ← RQD Carbonaceous bedding plane at 758.1. Very clayey from 756.5 to 754.7.	45						
751.7	175.6			L 0.0	← LOSS					
			BOTTOM OF BORING							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 360607.2520 E 2297058.5399	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TT-05-01	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/12/05; COMPLETED 9/12/05
7. THICKNESS OF OVERBURDEN 14.0 Feet	17. ELEVATION TOP OF HOLE 920.39 (S) Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 14.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
917.3	3.0		RIP RAP (Field Classification)							
914.3	6.0		SILTY SANDS & GRAVELS, br. & gr. (Field Classification)							
		SM	SILTY SAND (SM), dk. br., non pl., mst., f. gravel, c. to f. sand				4	69	27	
			br., @ El. 909.3-El. 906.3				11	70	19	
906.3	14.0									
			BOTTOM OF HOLE							

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PROJECT BOLIVAR DAM DSA

HOLE NO. TT-05-01

PLATE D150

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 360865.8466 E 2297566.8548	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-02	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED 3 — UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED 9/13/05 — COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 13.0 Feet	17. ELEVATION TOP OF HOLE 942.58 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 13.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
940.1	2.4	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst., c. gravel, c. to f. sand				41	46	13	
938.9	3.6	SC	CLAYEY SAND (SC), br., low pl., mst., f. gravel, c. to f. sand		32	21	13	41	46	
929.5	13.0	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., mst., c. gravel, c. to f. sand				23	51	26	
			BOTTOM OF HOLE							

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PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-02

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 361850.8423 E 2297284.6505	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-03	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 14.0 Feet	17. ELEVATION TOP OF HOLE 957.22 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 14.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
955.2	2.0		COARSE SAND & GRAVEL, wet (Field Classification)							
954.2	3.0	SM	SILTY SAND WITH GRAVEL (SM), br. & gr., non pl., mst., f. gravel, c. to f. sand				23	57	20	
950.2	7.0	SC	CLAYEY SAND WITH GRAVEL (SC), tan br. & gr., low pl., mst., c. gravel, c. to f. sand		31	19	30	25	45	
943.2	14.0		SAND & GRAVEL, br. & r. (Field Classification)							
			BOTTOM OF HOLE							

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PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-03

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 362607.9311 E 2297340.7844	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-04	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 12.0 Feet	17. ELEVATION TOP OF HOLE 957.21 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 12.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
954.7	2.5	SW-SM	WELL GRADED SAND WITH SILT (SW-SM), br., non pl., mst., f. gravel, c. to f. sand				11	79	10	
952.7	4.5	SC	CLAYEY SAND (SC), dk. br., low pl., mst., f. gravel, c. to f. sand		32 ▼ 9/13/05	21	12	61	27	
949.2	8.0	SM	SILTY SAND WITH GRAVEL (SM), dk. gr., non pl., mst. c. gravel, c. to f. sand				26	34	40	
945.2	12.0		SAND & GRAVEL, r. br. (Field Classification)							
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-04

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 362592.0538 E 2297167.7817	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-05	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 14.0 Feet	17. ELEVATION TOP OF HOLE 958.09 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 14.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
956.0	2.0		SAND & GRAVEL, br. (Field Classification)							
949.0	9.0	SC	CLAYEY SAND (SC), br. & gr., m. pl., mst., f. gravel, c. to f. sand		35	21	18	41	41	
946.0	12.0	SM	SILTY SAND (SM), br., non pl., mst., c. gravel, c. to f. sand				14	63	23	
944.0	14.0		SANDY GRAVEL, br., rounded (Field Classification)							
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-05

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 361252.8670 E 2296878.2174	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-06	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 17.5 Feet	17. ELEVATION TOP OF HOLE 932.52 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 17.5 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
931.0	1.5		TOP SOIL (Field Classification)							
927.5	5.0		GRAVELLY SAND, br. (Field Classification)							
919.5	13.0		SAND WITH COBBLES (Field Classification)							
915.0	17.5	GW	WELL-GRADED GRAVEL WITH SAND (GW), br., non pl., mst., c. gravel, c. to f. sand				60	37	3	
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-06

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 361662.8541 E 2296765.2330	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-07	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 10.0 Feet	17. ELEVATION TOP OF HOLE 931.02 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 10.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
930.0	1.0		TOP SOIL (Field Classification)							
927.0	4.0		GRAVELLY SAND, r. br., dmp. (Field Classification)							
924.5	6.5		SANDY GRAVEL, iron cemented (Field Classification)							
921.0	10.0	SM	SILTY SAND (SM), br., non pl., mst., f. gravel, c. to f. sand				5	81	14	
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-07

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 362631.0846 E 2296342.2681	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-08	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 12.0 Feet	17. ELEVATION TOP OF HOLE 947.94 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 12.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
946.4	1.5		SANDY (TOP SOIL), lt. br. (Field Classification)							
941.9	6.0		SAND MATRIX, f. gravel w/cobbles (Field Classification) Iron cemented El. 945.4-El. 944.4 (Field Classification)							
936.9	11.0		GRAVEL AND SAND MATRIX, w/cobbles (Field Classification)							
935.9	12.0	SP	POORLY GRADED SAND (SP), tan, non pl., mst., f. gravel, c. to f. sand				3	95	2	
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-08

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 362408.3275 E 2295925.3833	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-09	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 7.0 Feet	17. ELEVATION TOP OF HOLE 897.98 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 7.0 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
896.4	1.5		SANDY SILT (Field Classification)							
893.9	4.0	CL	SANDY LEAN CLAY (CL), br., low pl., mst., f. gravel, c. to f. sand		35	22	1	40	59	
890.9	7.0	SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., mst., f. gravel, c. to f. sand				22	68	10	
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-09

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 361675.5767 E 2296333.4567	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-10	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN 3.5 Feet	17. ELEVATION TOP OF HOLE 895.96 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 3.5 Feet	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
894.4	1.5		TOP SOIL (Field Classification)							
892.4	3.5	ML	SILT WITH SAND (ML), br., non pl., mst., f. gravel, c. to f. sand				1	28	71	
			BOTTOM OF HOLE							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA | HOLE NO. TP-05-10

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 1 SHEETS

1. PROJECT BOLIVAR DAM DSA SEEPAGE STUDY	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) N 360817.9055 E 2296243.7919	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 29
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) TP-05-11	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 9/13/05; COMPLETED 9/13/05
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE 895.65 Feet
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE	19. NAME OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		NS	NO SAMPLE-FILL (CLAY MATRIX WITH DECOMPOSING ROCK) (Field Classification)							

LRH FORM 1836
MAY 04

PROJECT BOLIVAR DAM DSA

HOLE NO. TP-05-11

PLATE D160

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 3 SHEETS

1. PROJECT BOLIVAR-MRR	10. SIZE AND TYPE OF BIT 4-1/4" HSA, 3" SPT
2. LOCATION (Coordinates or Station) N 365415.171 E 2295819.1376	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NGVD 1929
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55 ATV
4. HOLE NO. (As shown on drawing title and file number) D-06-26	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 40; UNDISTURBED 0
5. NAME OF DRILLER M. Martin	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 895.3 12/27/2006
7. THICKNESS OF OVERBURDEN 60.0 Feet	16. DATE HOLE: STARTED 12/27/2006; COMPLETED 12/28/2006
8. DEPTH DRILLED INTO ROCK 0.0 Feet	17. ELEVATION TOP OF HOLE 934.1
9. TOTAL DEPTH OF HOLE 60.0 Feet	18. TOTAL CORE RECOVERY FOR BORING %
	19. NAME OF INSPECTOR J. Black

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
932.6	1.5	SM	SILTY SAND WITH GRAVEL (SM), dk. br., non pl., c. to f. gravel, c. to f. sand, w/orgs.	31.3						6 10 10
929.6	4.5	SP	SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand	5.6						4 11 13
				4.7						13 15 15
928.1	6.0	GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), br., non pl., c. to f. gravel, c. to f. sand	5.9			65	28	7	5 10 9
926.6	7.5	SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand	4.9						8 8 10
925.1	9.0	GM	SILTY GRAVEL WITH SAND (GM), br. bk. gr., v. low pl., c. to f. gravel, c. to f. sand	8.6	23	20	51	36	13	26 37 17
923.6	10.5	SM	SILTY SAND (SM), lt. br., non pl., f. sand, w/orgs.	6.9						5 10 14
919.1	15.0	SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand	7.1						18 14 18
				4.4						12 12 10
				4.7						8 12 14
916.1	18.0		SAND (SP), br., non pl., f. gravel, c. to f. sand	4.6						13 15 14
				3.8						8 8 8
			POORLY GRADED SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand	5.3			33	63	4	11 13 14
										6

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 934.1	Hole No. D-06-26
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand *(continued)*	2.7						14, 16
				9.4						15, 15, 16
911.6	22.5									
			SAND (SP), br., non pl., f. gravel, c. to f. sand	4.0						11, 15, 12
				5.5						14, 17, 19
				4.2						21, 23, 24
				4.3						30, 28, 18
				5.2						44, 38, 25
		SP		3.3						16, 14, 24
				4.5						19, 19, 21
				4.7						56, 21, 21
				3.0						15, 20, 18
			*no f. gravel w/ f. sand @ El. 898.1-El. 896.6	5.2						53, 18, 13
			*no f. gravel @ El. 896.6-El. 892.1					▼ 12/27/06		10, 13, 13, 15, 17, 22, 13, 14, 14
892.1	42.0									
			SAND WITH GRAVEL (SP), br., non pl., f. gravel, c. to f. sand							25, 15, 25
890.6	43.5									12

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 934.1	Hole No. D-06-26
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			POORLY GRADED SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand *(continued)*				43	53	4	13
889.1	45.0									10
			SAND WITH GRAVEL (SP), br., f. gravel, c. to f. sand							9
										12
887.6	46.5									13
			SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand							6
				F.W.						8
										8
										7
		SP-SM								10
884.6	49.5									15
			SAND (SP-SM), br., non pl., f. gravel, c. to f. sand							11
										14
883.1	51.0									15
			SAND (SP), br., non pl., c. to f. sand							8
										9
										14
										8
										11
										15
										10
										13
		SP								15
										9
				F.W.						10
										14
										13
										18
										22
										14
										15
874.1	60.0									15
			BOTTOM OF HOLE @ 60.0							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 3 SHEETS

1. PROJECT BOLIVAR-MRR	10. SIZE AND TYPE OF BIT 4-1/4" HSA, 3" SPT
2. LOCATION *(Coordinates or Station)* N 361621.1944 E 2296480.1187	11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NGVD 1929
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55 ATV
4. HOLE NO. *(As shown on drawing title and file number)* D-06-27	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 31; UNDISTURBED 0
5. NAME OF DRILLER M. Martin	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 894.7 12/14/2006
7. THICKNESS OF OVERBURDEN 45.0 Feet	16. DATE HOLE: STARTED 12/14/2006; COMPLETED 12/15/2006
8. DEPTH DRILLED INTO ROCK 0.0 Feet	17. ELEVATION TOP OF HOLE 904.1
9. TOTAL DEPTH OF HOLE 45.0 Feet	18. TOTAL CORE RECOVERY FOR BORING %
	19. NAME OF INSPECTOR D. Brown

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
901.1	3.0	SP	SAND (SP), br., f. gravel, c. to f. sand	3.6						2 5 10
				4.5						10 8 8
899.6	4.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), br., non pl., c. to f. gravel, c. to f. sand	5.8			29	65	6	11 11 18
897.6	6.5	SP	SAND WITH GRAVEL (SP), br., non pl., f. gravel, c. to f. sand	6.2						12 15 14
				10.0						20
896.6	7.5	CL	CLAY WITH SAND AND GRAVEL (CL), gr. br., low pl., f. gravel, c. to f. sand	16.1	26	18				25 25
895.1	9.0	GP	GRAVEL (GP)	5.2						13 14 18
892.1	12.0	SP	SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand					▼ 12/14/06		10 2 1
										4 4 6
889.1	15.0	SP-SM	SAND WITH GRAVEL (SP-SM), gr. br., non pl., c. to f. gravel, c. to f. sand							8 5 10
										5 2 2
887.6	16.5	GP	POORLY GRADED GRAVEL WITH SAND (GP), br., non pl., c. to f. gravel, c. to f. sand				53	43	4	2 2 3
			SAND WITH GRAVEL (SP-SM), dk. gr. br., non pl., c. to f. gravel, c. to f. sand							2 3 4
										5 4 5
										8

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 904.1	Hole No. D-06-27
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 2 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	SAND WITH GRAVEL (SP-SM), dk. gr. br., non pl., c. to f. gravel, c. to f. sand *(continued)*							6, 4, 9, 6, 5, 8, 7, 7
880.1	24.0	GP-GM	GRAVEL WITH SAND (GP-GM), dk. gr., non pl., c. to f. gravel, c. to f. sand							10, 15, 15
878.6	25.5	SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand							8, 10, 15
			*c. to f. gravel, @ El. 877.1-El. 874.1							8, 12, 16
			*dk. gr., @ El. 875.6-El. 874.1							10, 13, 10
			*gr. br., @ El. 874.1-El. 868.1							9, 9, 9, 8, 8, 9, 7, 11, 13, 7, 8, 7
868.1	36.0		POORLY GRADED SAND WITH SILT (SP-SM), br., non pl., f. gravel, c. to f. sand				1	94	5	9, 9, 10, 11, 15, 18
865.1	39.0		SAND WITH GRAVEL (SP-SM), gr., non pl., f. gravel, c. to f. sand							10, 8, 9, 5, 6, 4, 18, 18, 22, 15

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 904.1	Hole No. D-06-27
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 3 OF 3 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
859.1	45.0		SAND WITH GRAVEL (SP-SM), gr., non pl., f. gravel, c. to f. sand *(continued)*							17 9
			BOTTOM OF HOLE @ 45.0							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 5 SHEETS

1. PROJECT BOLIVAR-MRR	10. SIZE AND TYPE OF BIT 4-1/4" HSA, 3" SPT
2. LOCATION *(Coordinates or Station)* N 360438.9153 E 2296557.5816	11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NGVD 1929
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. *(As shown on drawing title and file number)* D-06-28	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 20 — UNDISTURBED 0
5. NAME OF DRILLER M. Martin	14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	15. ELEVATION GROUND WATER 889.3 12/07/2006
7. THICKNESS OF OVERBURDEN 101.0 Feet	16. DATE HOLE — STARTED 12/04/2006 — COMPLETED 12/12/2006
8. DEPTH DRILLED INTO ROCK 0.0 Feet	17. ELEVATION TOP OF HOLE 981.4
9. TOTAL DEPTH OF HOLE 101.0 Feet	18. TOTAL CORE RECOVERY FOR BORING %
	19. NAME OF INSPECTOR D. Brown

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			DRILL W/O SAMPLING (NS), @ El. 981.4-El. 906.4							
961.4	20.0									

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 981.4	Hole No. D-06-28
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 2 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			DRILL W/O SAMPLING (NS)							
		NS								
937.4	44.0									

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 981.4	Hole No. D-06-28
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 3 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			DRILL W/O SAMPLING (NS)							
913.4	68.0									

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 981.4	Hole No. D-06-28
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 4 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			DRILL W/O SAMPLING (NS)							
906.4	75.0									
		CL	CLAY WITH SAND AND GRAVEL (CL), gr., m. pl., f. gravel, c. to f. sand	17.8	35	19				20, 26, 29
904.0	77.4			13.0						10, 11
903.4	78.0	SC	CLAYEY SAND WITH GRAVEL (SC), gr., low pl., c. to f. gravel, c. to f. sand	11.1						9
901.9	79.5		CLAYEY SAND (SC), br., low pl., f. gravel, c. to f. sand	16.7			10	46	44	5, 5, 11
900.4	81.0	CL	CLAY WITH GRAVEL AND SAND (CL), gr., m. pl., f. gravel, c. to f. sand	11.9						5, 9, 12
898.9	82.5	SC	CLAYEY SAND WITH GRAVEL (SC), gr., low pl., f. gravel, c. to f. sand	15.4						3, 6, 14
897.8	83.6	SM	SILTY SAND WITH GRAVEL (SM), gr., non pl., f. gravel, c. to f. sand	13.9						9, 22
897.4	84.0		CLAY WITH SAND (CL), gr., low pl., f. gravel, c. to f. sand	16.3						25
895.9	85.5	CL	SANDY CLAY (CL), gr., low pl., f. gravel, c. to f. sand	14.5			7	40	53	9, 26, 34
894.4	87.0	SC	CLAYEY SAND (SC), gr. br., low pl., c. to f. sand	16.1						8, 11, 45
891.4	90.0		CLAYEY SAND WITH GRAVEL (SC), gr. br., low pl., f. gravel, c. to f. sand	13.4						24, 30, 35
				15.6						23, 26, 30
		ML	SILT WITH SAND (ML), gr., non pl., f. sand	19.5						10, 11, 15
										8

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 981.4	Hole No. D-06-28
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 5 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
889.3	92.1	SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand					12/07/06		23 46
888.4	93.0	SM	SILTY SAND WITH GRAVEL (SM), br., non pl., c. to f. gravel, c. to f. sand				28	55	17	15 25 45
886.9	94.5	SP	SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand *f. gravel, @ El. 885.4-El. 884.5							42 55 32 35
884.5	96.9	NS	DRILL W/O SAMPLING (NS)							77/0.4 AUGER
883.9	97.5		NO RECOVERY (NS)							100/0.2
883.7	97.7		DRILL W/O SAMPLING (NS)							AUGER
882.4	99.0		NO RECOVERY (NS)							100/0.1
882.3	99.1		DRILL W/O SAMPLING (NS)							AUGER
880.9	100.5		NO RECOVERY (NS)							100/0.0
880.9	100.5		DRILL W/O SAMPLING (NS)							AUGER
880.4	101.0		BOTTOM OF HOLE @ 101.0							

DRILLING LOG	DIVISION Great Lakes and Ohio River	INSTALLATION CELRH-EC-G	SHEET 1 OF 2 SHEETS

1. PROJECT BOLIVAR-MRR	10. SIZE AND TYPE OF BIT 4-1/4" HSA, 3" SPT
2. LOCATION *(Coordinates or Station)* N 360738.7182 E 2296280.2685	11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)* NGVD 1929
3. DRILLING AGENCY FMSM	12. MANUFACTURER'S DESIGNATION OF DRILL CME 55 ATV
4. HOLE NO. *(As shown on drawing title and file number)* D-06-29	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 24; UNDISTURBED 0
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES 0
	15. ELEVATION GROUND WATER 890.7 12/13/2006
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0 DEG. FROM VERT.	16. DATE HOLE: STARTED 12/13/2006; COMPLETED 12/14/2006
7. THICKNESS OF OVERBURDEN 34.5 Feet	17. ELEVATION TOP OF HOLE 904.2
8. DEPTH DRILLED INTO ROCK 0.0 Feet	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 34.5 Feet	19. NAME OF INSPECTOR D. Brown

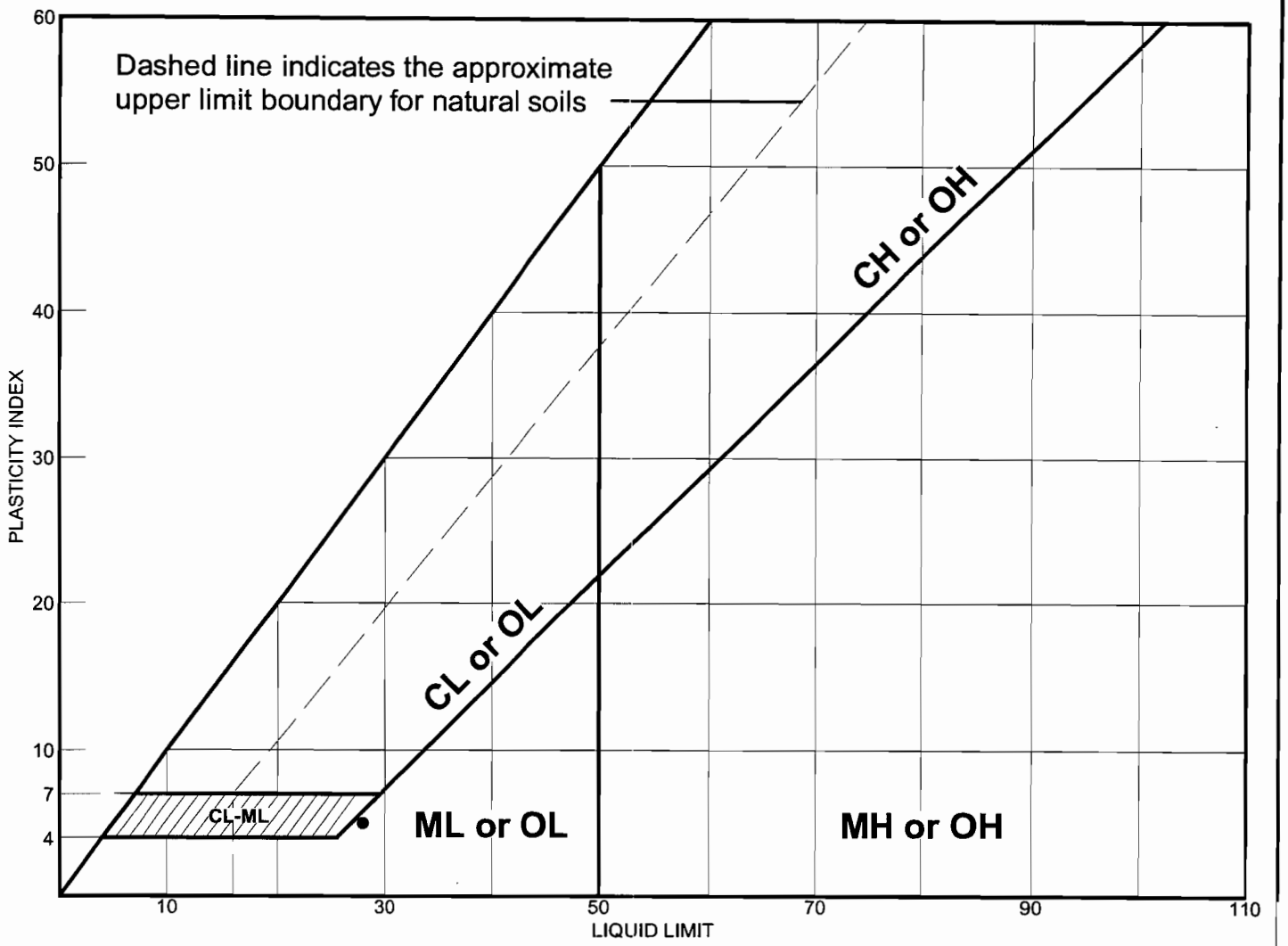
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
		SP-SM	SAND WITH GRAVEL (SP-SM), dk. gr., non pl., f. gravel, c. to f. sand	7.8						7 6 6
901.2	3.0			5.4						5 5 6
		SP	POORLY GRADED SAND WITH GRAVEL (SP), br., non pl., c. to f. gravel, c. to f. sand	5.1			41	55	4	6 7 8
898.2	6.0			6.1						8 10 11
			SAND WITH GRAVEL (SP), br., non pl., f. gravel, c. to f. sand	8.6						8 21 15
			*c. to f. gravel, @ El. 896.7-El. 895.2	5.9						25 49 15
895.2	9.0									
894.7	9.5	SP-SM	SAND WITH GRAVEL (SP-SM), gr., non pl., c. to f. gravel, c. to f. sand	8.6						12
		CL	CLAY WITH SAND AND GRAVEL (CL), dk. gr., m. pl., f. gravel, c. to f. sand	19.9	41	22				5 5
892.2	12.0			15.8						7 4 8
		SC	CLAYEY SAND WITH GRAVEL (SC), gr., low pl., c. to f. gravel, c. to f. sand	19.3						10 6 13
890.7	13.5							▼ 12/13/06		
		GC	CLAYEY GRAVEL WITH SAND (GC), br. gr., low pl., c. to f. gravel, c. to f. sand		37	20	60	21	19	25 15 15
889.2	15.0									
		GP-GM	GRAVEL WITH SAND (GP-GM), br., non pl., c. to f. gravel, c. to f. sand							14 29 30
887.7	16.5									
			POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), br., non pl., c. to f. gravel, c. to f. sand				66	26	8	18 18 28
886.2	18.0									
		SP	SAND WITH GRAVEL (SP), br., non pl., f. gravel, c. to f. sand							13 18 19 12

ACE 1836 HUNTINGTON BOLIVAR-MRR2.GPJ ACE HUNTINGTON.GDT 1/9/08

DRILLING LOG (Cont Sheet)	ELEVATION TOP OF HOLE 904.2	Hole No. D-06-29
PROJECT BOLIVAR-MRR	INSTALLATION CELRH-EC-G	SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	MC	LL	PL	% +4	% SAND	% -200	BLOWS
			SAND WITH GRAVEL (SP), br., non pl., f. gravel, c. to f. sand *(continued)*							12 11
883.2	21.0									
		GP	GRAVEL WITH SAND (GP), br., non pl., c. to f. gravel, c. to f. sand							18 13 8 12 12 8
880.2	24.0									
		SP-SM	SAND WITH GRAVEL (SP-SM), br., non pl., f. gravel, c. to f. sand							34 43 29
878.7	25.5									
		SM	SILTY SAND (SM), br., non pl., f. gravel, c. to f. sand				2	82	16	28 23 26 15 24 29 23 23 20
874.2	30.0									
		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM), br., non pl., f. gravel, c. to f. sand				1	89	10	7 14 18
872.7	31.5									
		SP-SM	SAND WITH GRAVEL (SP-SM), gr., non pl., f. gravel, c. to f. sand							15 9 15
871.2	33.0									
			SAND (SP-SM), br., non pl., f. sand	F.W.						9 9 9
869.7	34.5									
			BOTTOM OF HOLE @ 34.5							

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silt, few sand	28	23	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-01 **Sample No.:** 36 **Elev./Depth:** 87.8'-90.0'

Remarks:

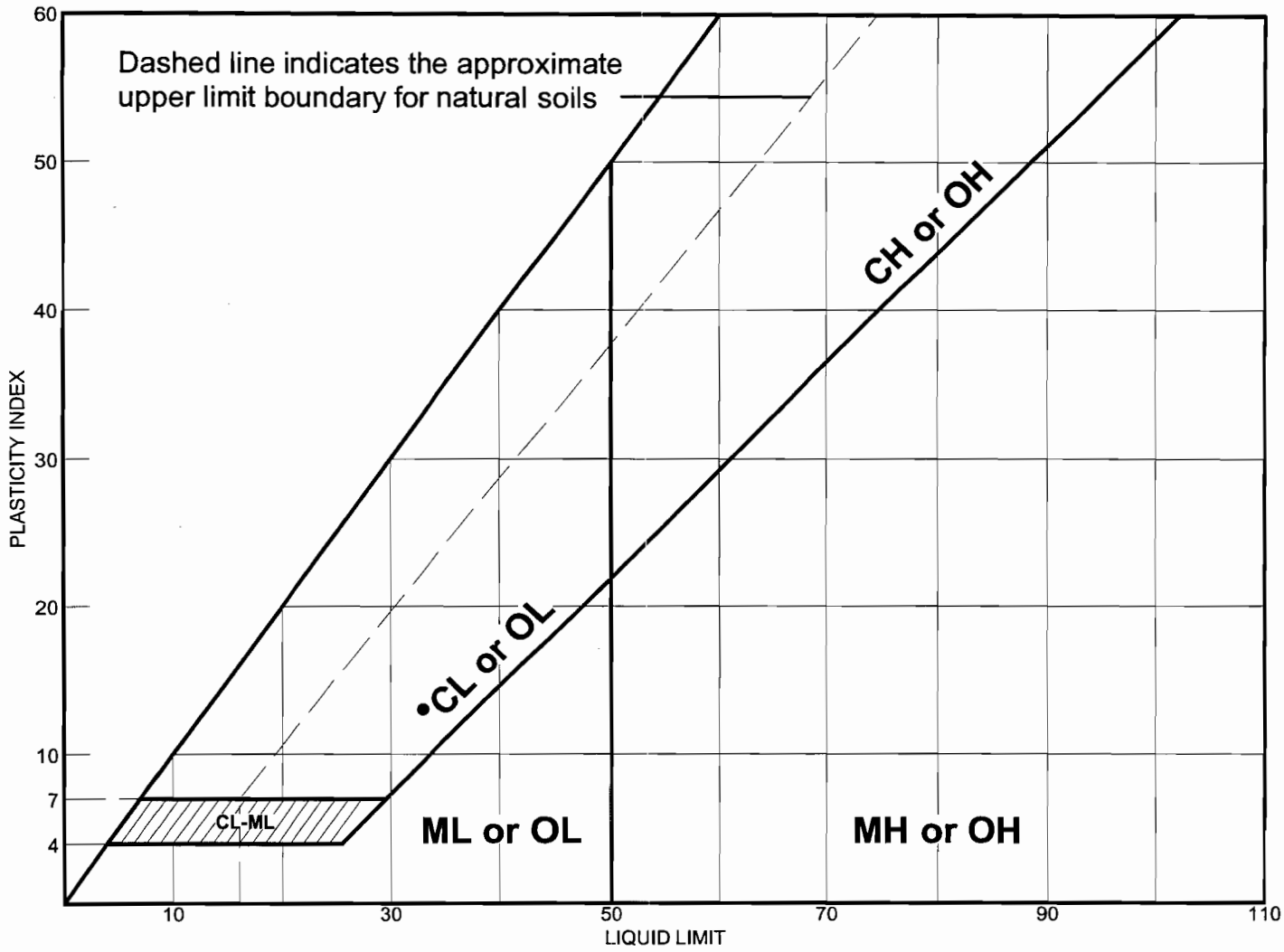
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray lean clay, trace sand	33	20	13			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-01 **Sample No.:** 39 **Elev./Depth:** 96.0'-99.0'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

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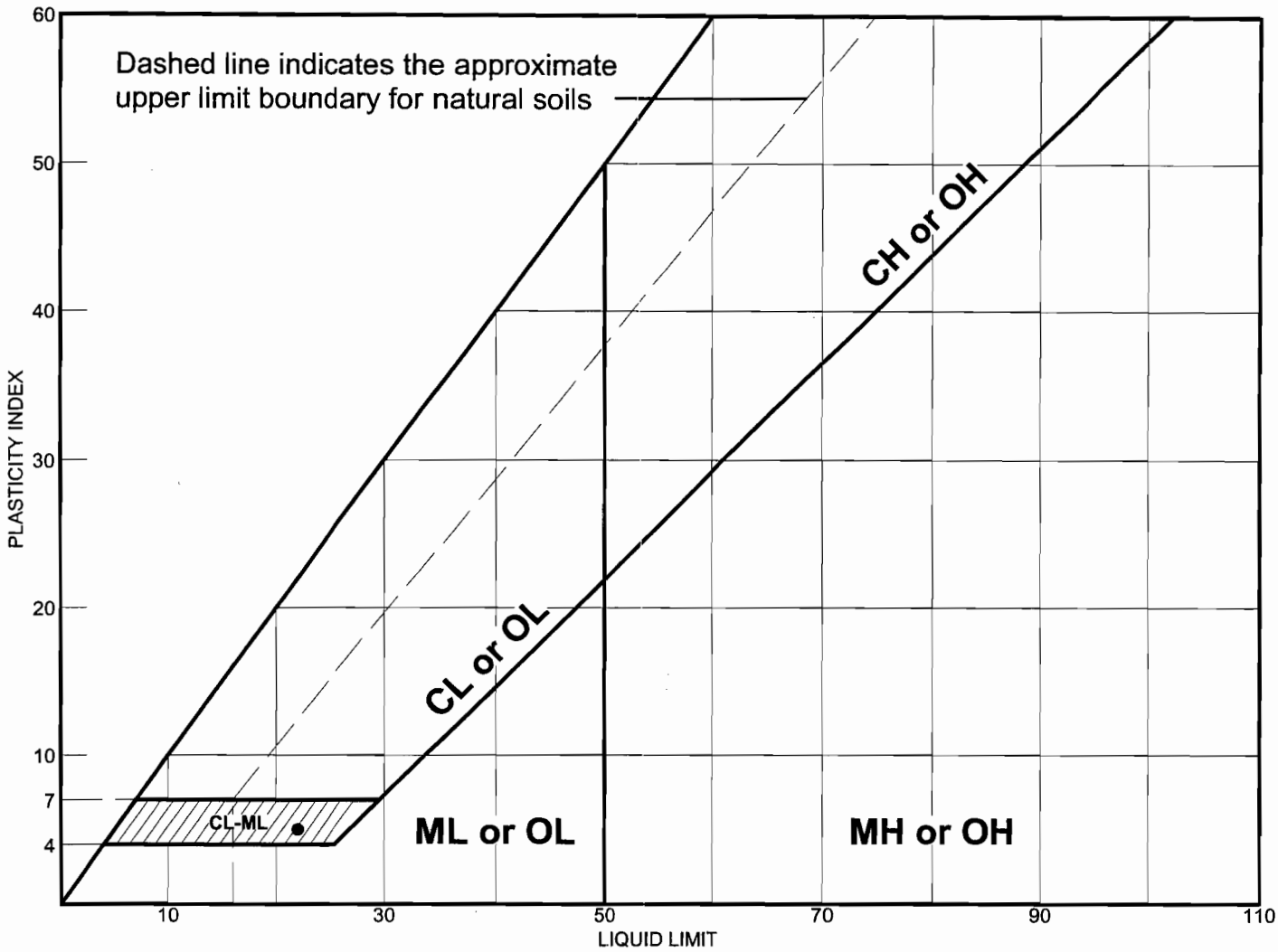
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy silt/lean clay, trace gravel	22	17	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-01 **Sample No.:** 44 **Elev./Depth:** 103.5'-106'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

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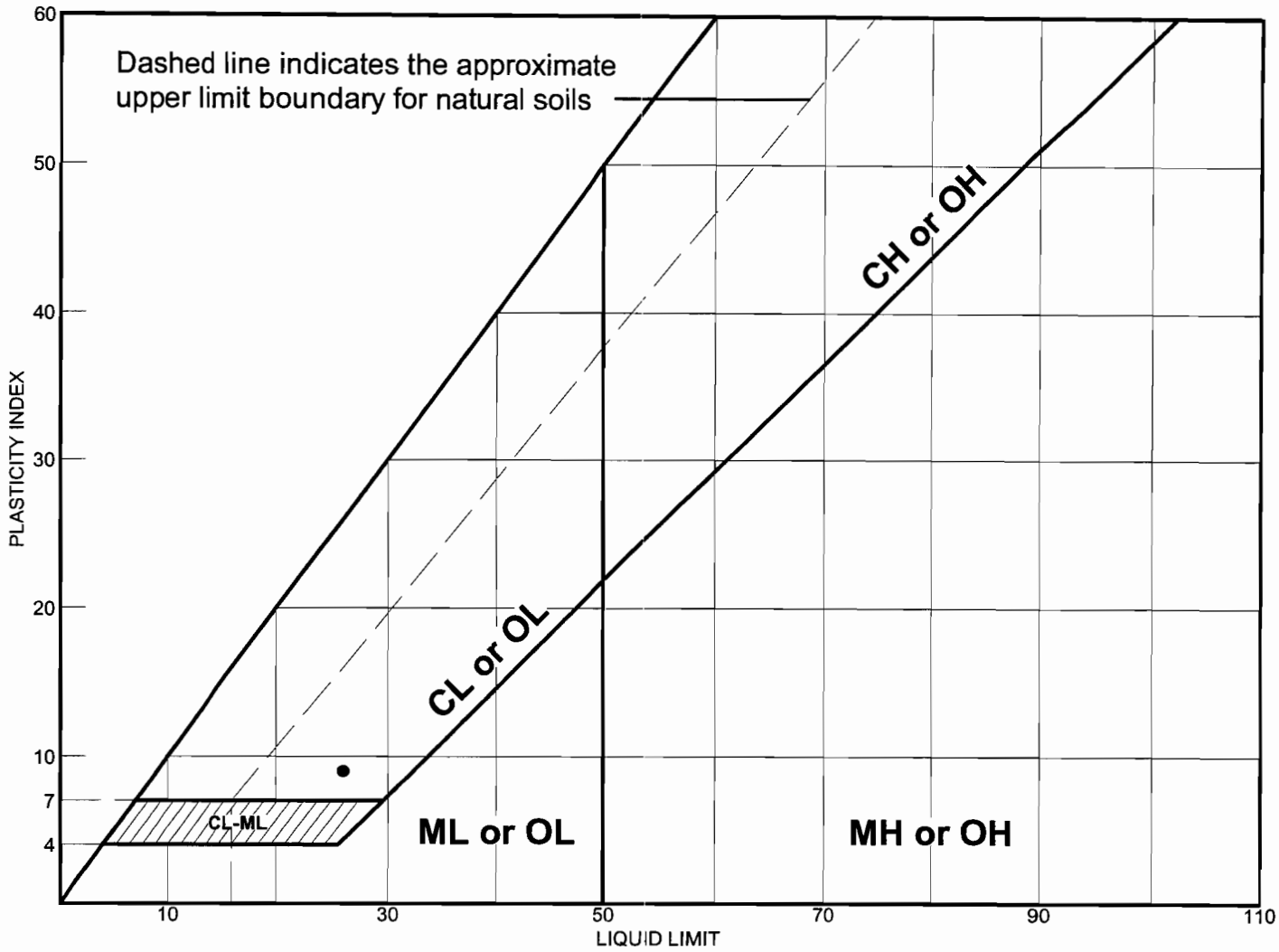
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray sandy lean clay with gravel	26	17	9			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-02 **Sample No.:** 2 **Elev./Depth:** 1.5'-3.0'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

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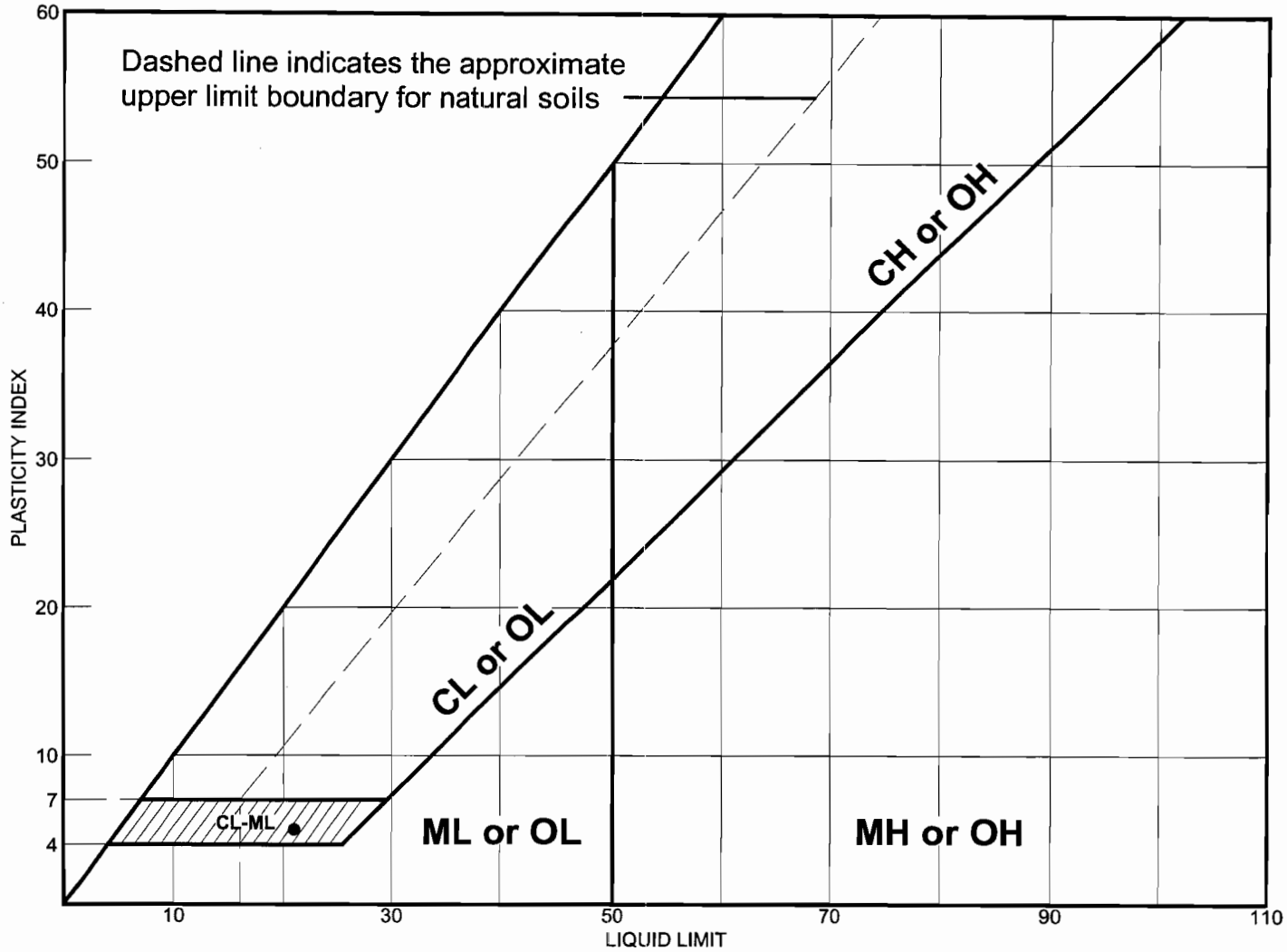
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silty/clayey sand with gravel	21	16	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-02 **Sample No.:** 12 **Elev./Depth:** 15.0'-15.4'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

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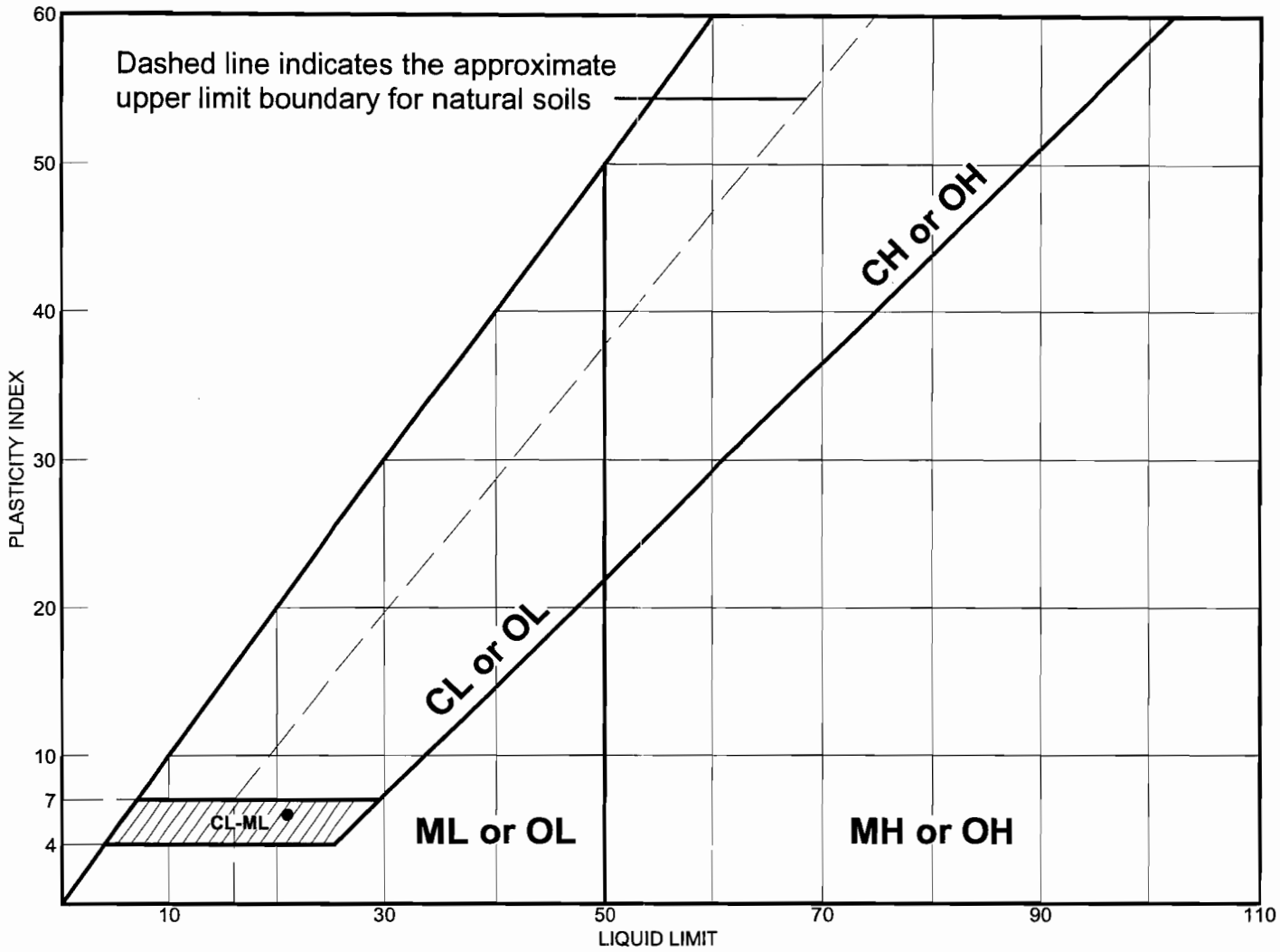
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty/clayey sand with gravel	21	15	6			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-02 **Sample No.:** 16 **Elev./Depth:** 19.5'-21.2'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

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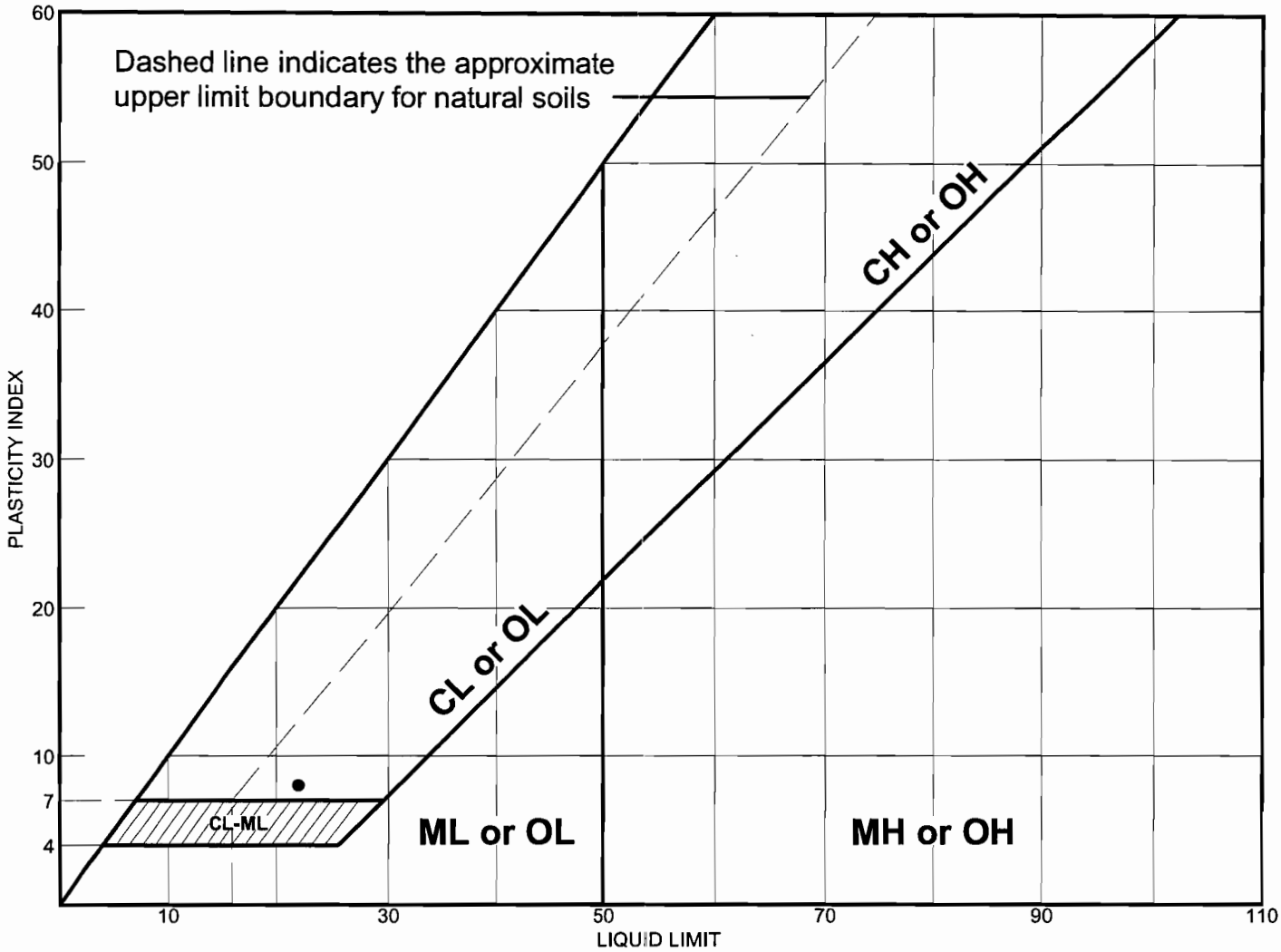
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand, few gravel	22	14	8	71.6	42.6	SC

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-02 **Sample No.:** 23 **Elev./Depth:** 30.0'-31.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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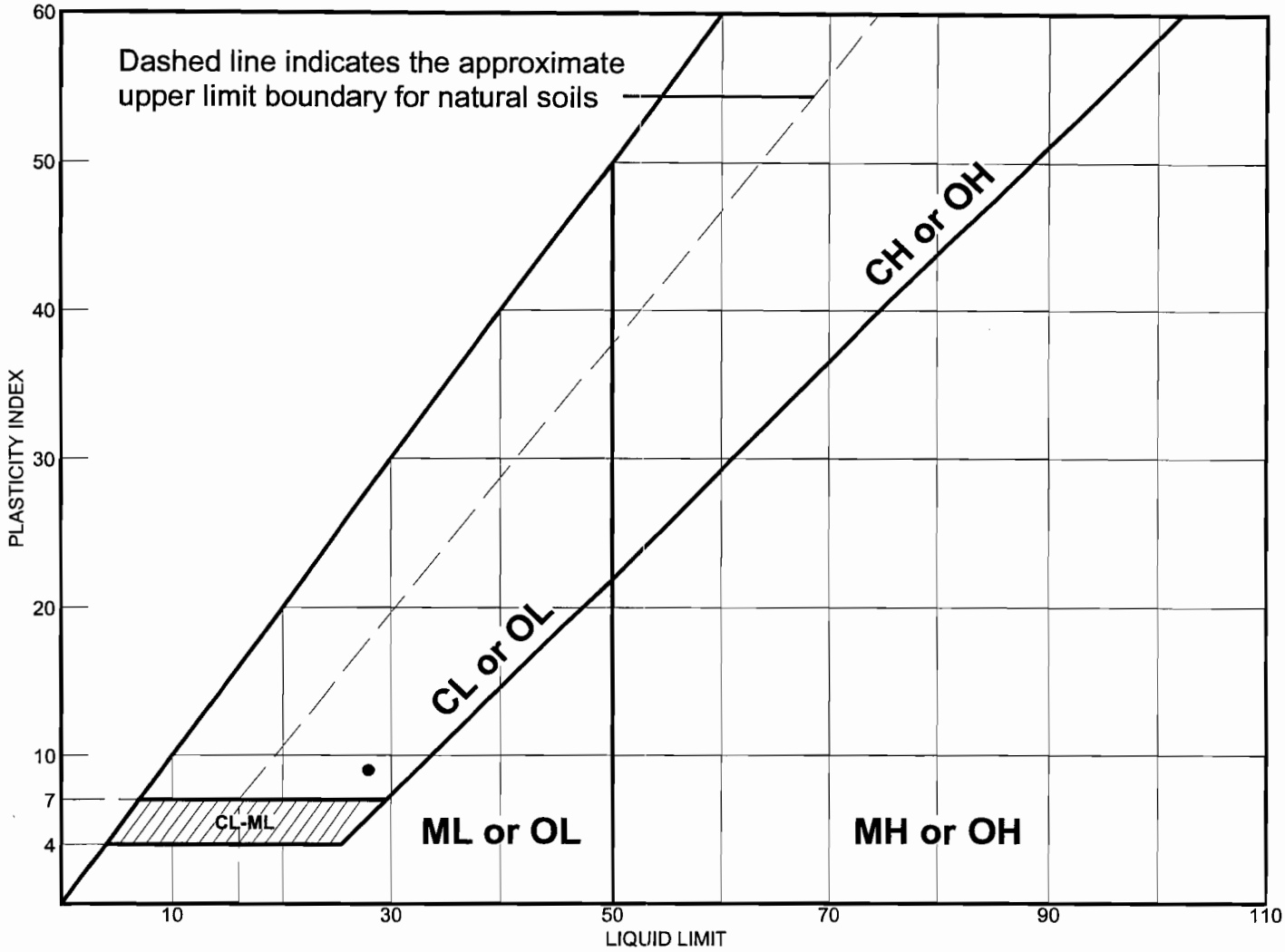
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray sandy lean clay with gravel	28	19	9			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-02 **Sample No.:** 65 **Elev./Depth:** 93.0'-95.0'

Remarks:

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LIQUID AND PLASTIC LIMITS TEST REPORT

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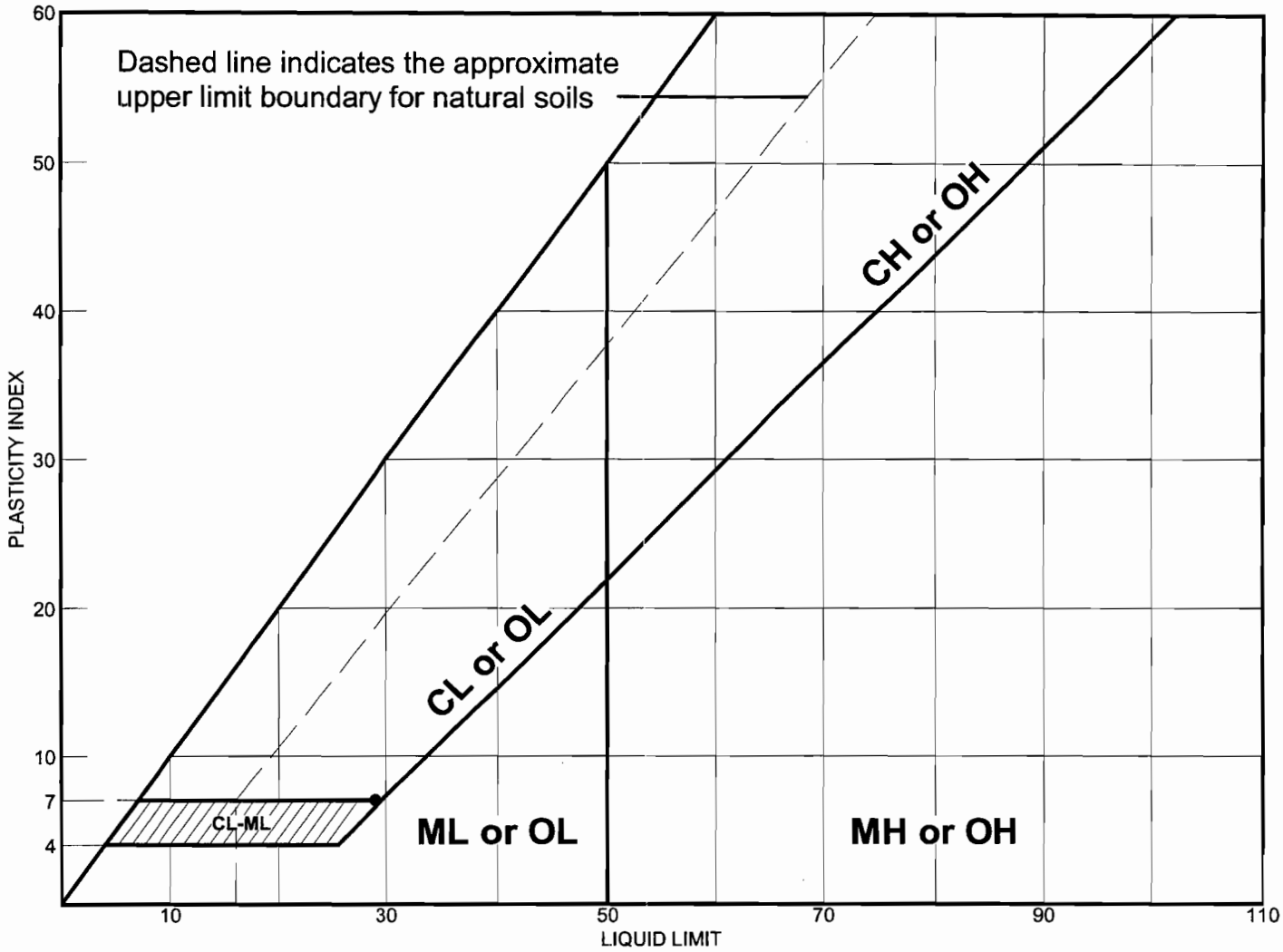
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark brown silty/clayey sand, trace gravel	29	22	7			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-03 **Sample No.:** 4 **Elev./Depth:** 6.0'-6.8'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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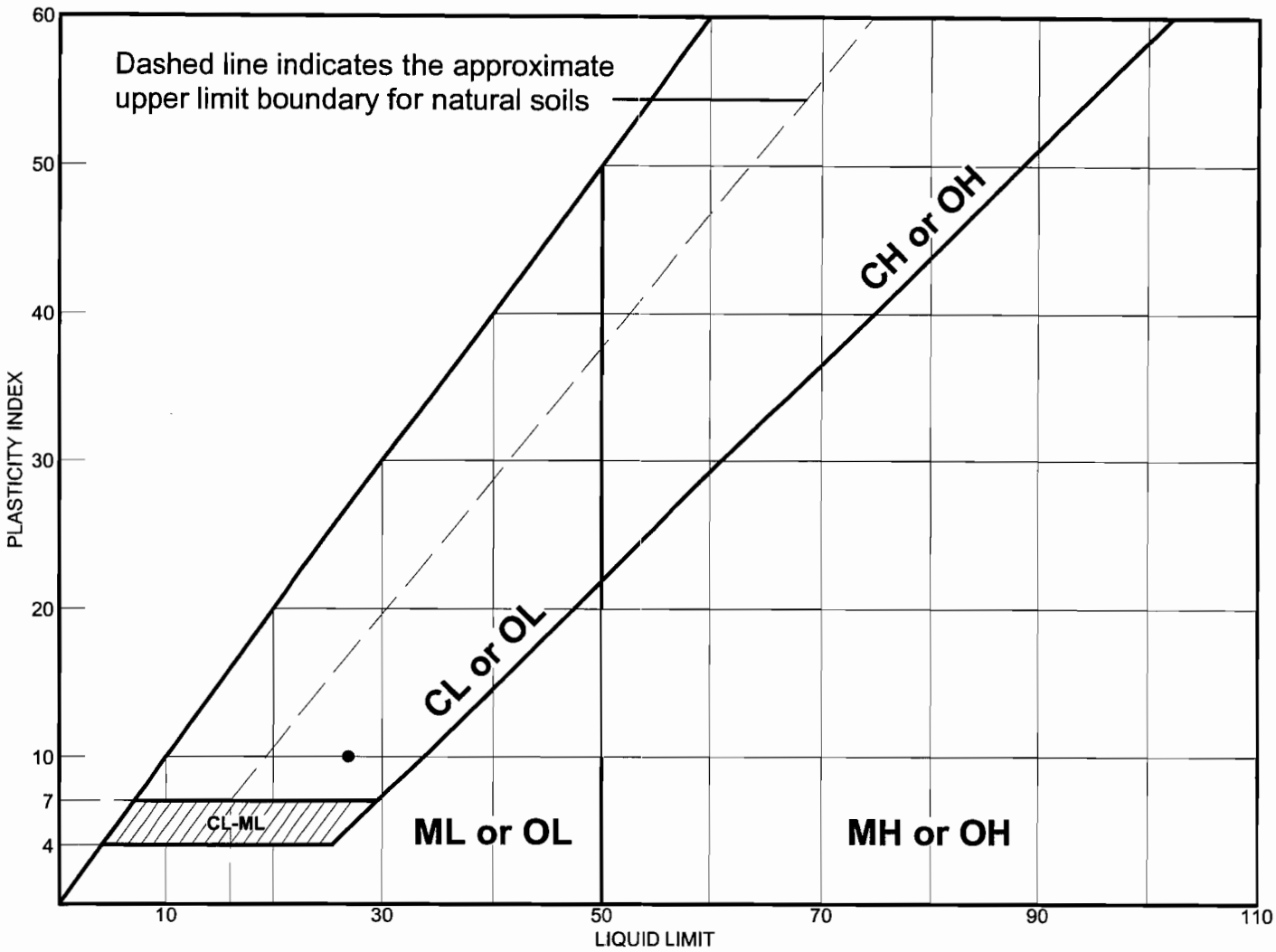
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey gravel with sand	27	17	10			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-03 **Sample No.:** 24 **Elev./Depth:** 59.2'-61.2'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

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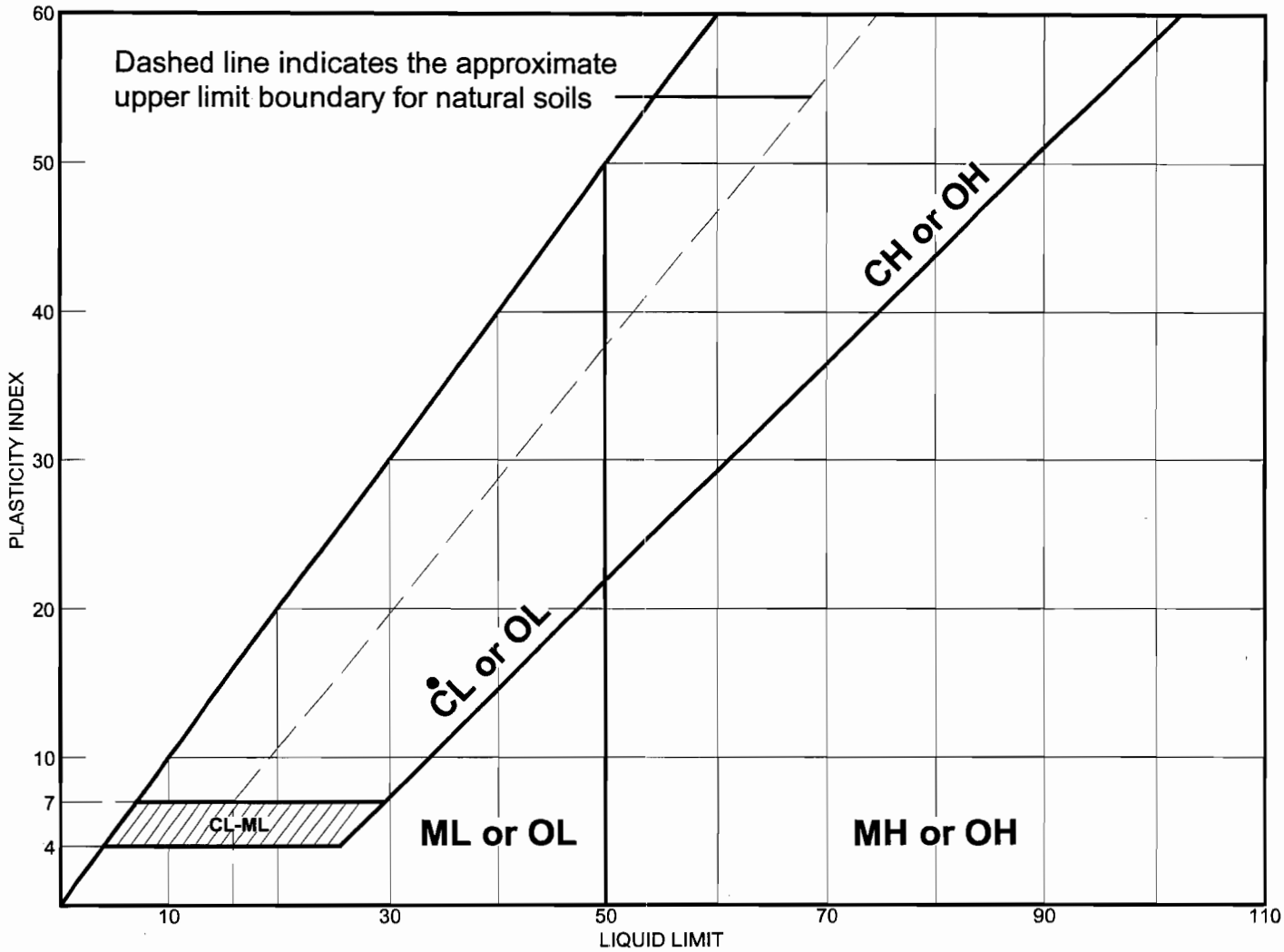
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown lean clay with sand, trace gravel	34	19	15	90.1	78.8	CL

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 4 **Elev./Depth:** 4.5'-6.0'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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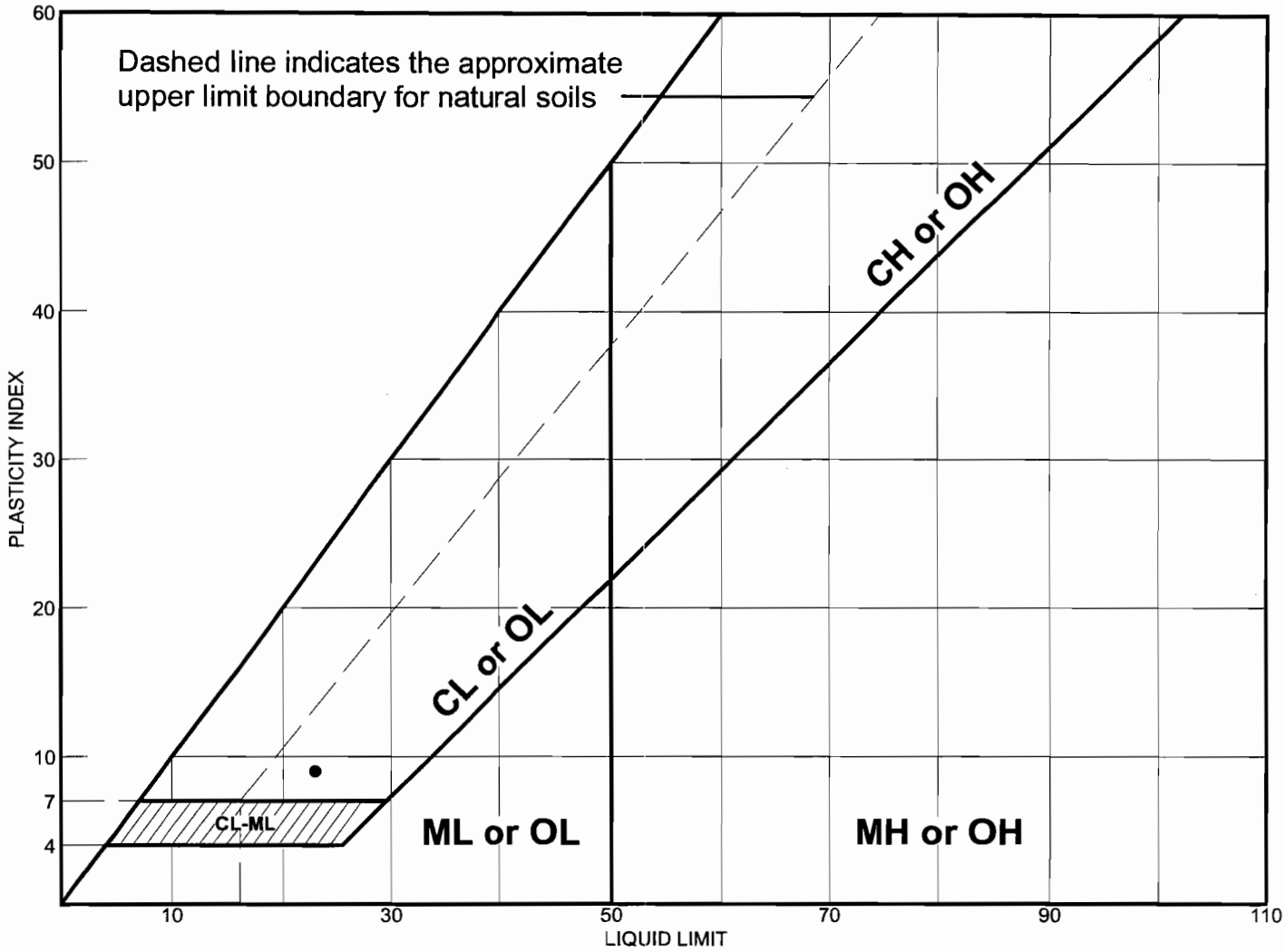
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand, few gravel	23	14	9	75.0	47.1	SC

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 9 **Elev./Depth:** 12.0'-13.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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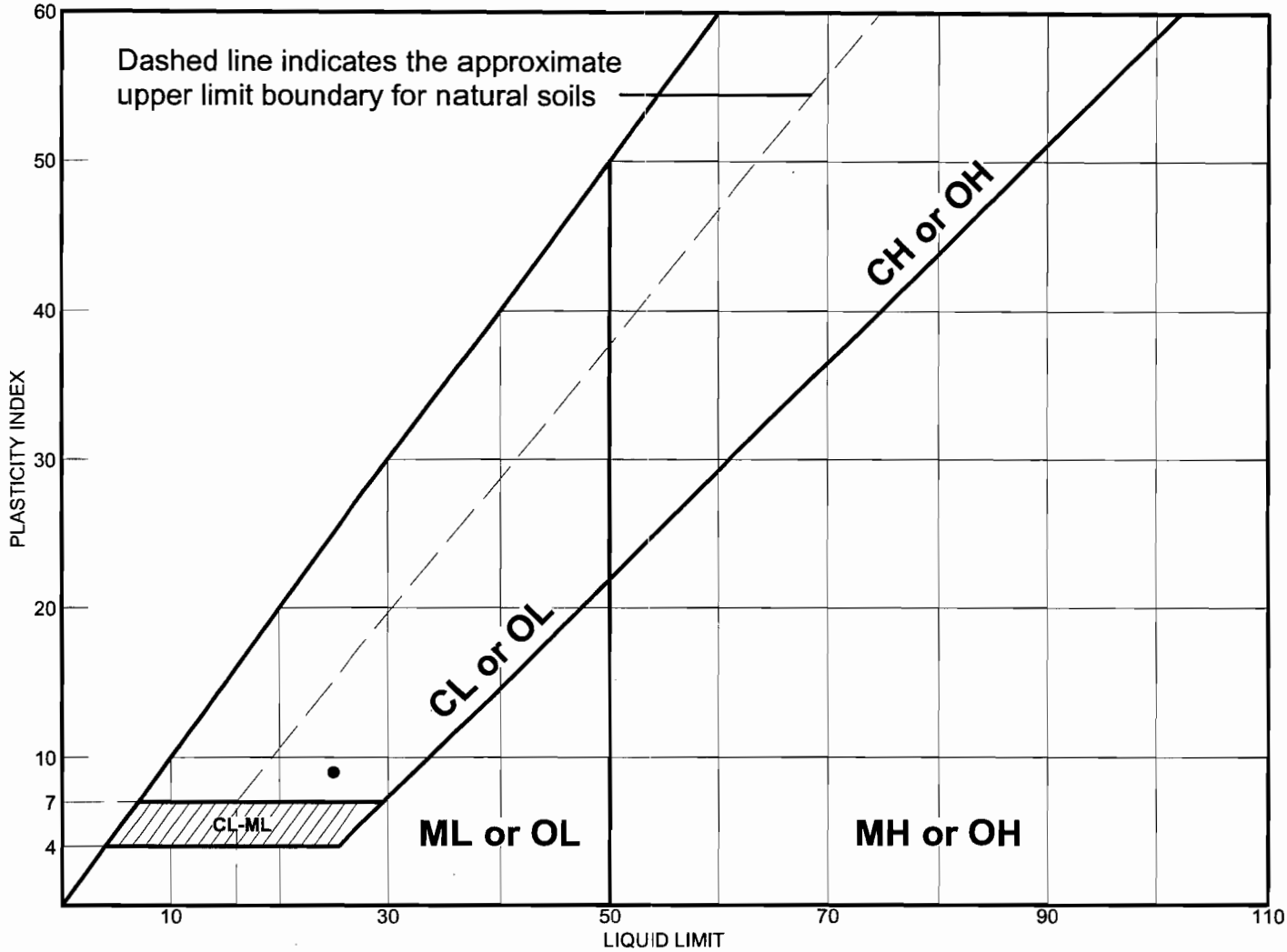
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay, trace gravel	25	16	9	82.1	57.2	CL

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 23 **Elev./Depth:** 33.0'-34.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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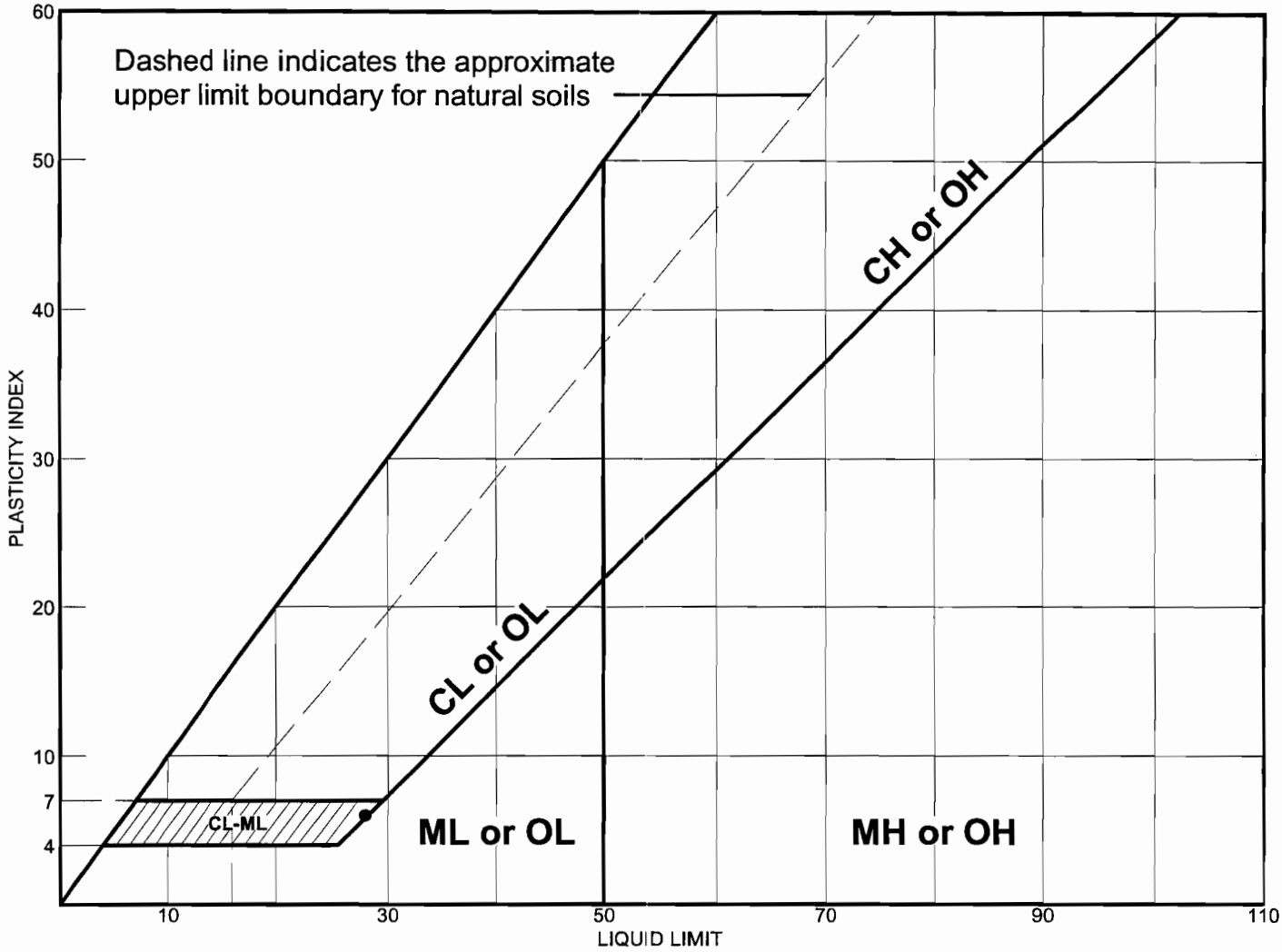
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray silt/lean clay, trace sand	28	22	6			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 75 **Elev./Depth:** 114.0'-115.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

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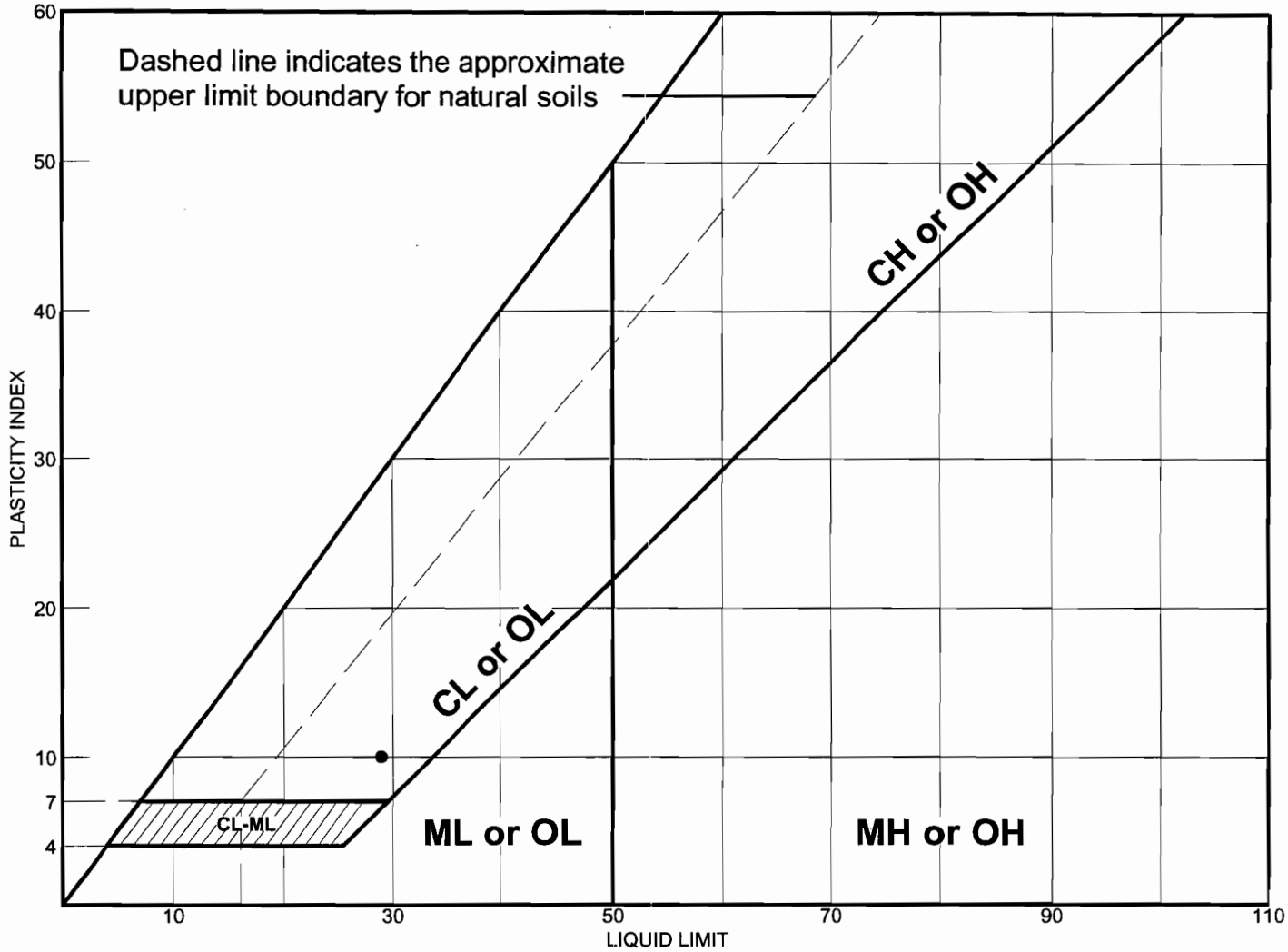
Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray lean clay, trace sand	29	19	10			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 82 **Elev./Depth:** 124.5'-126.0'

Remarks:

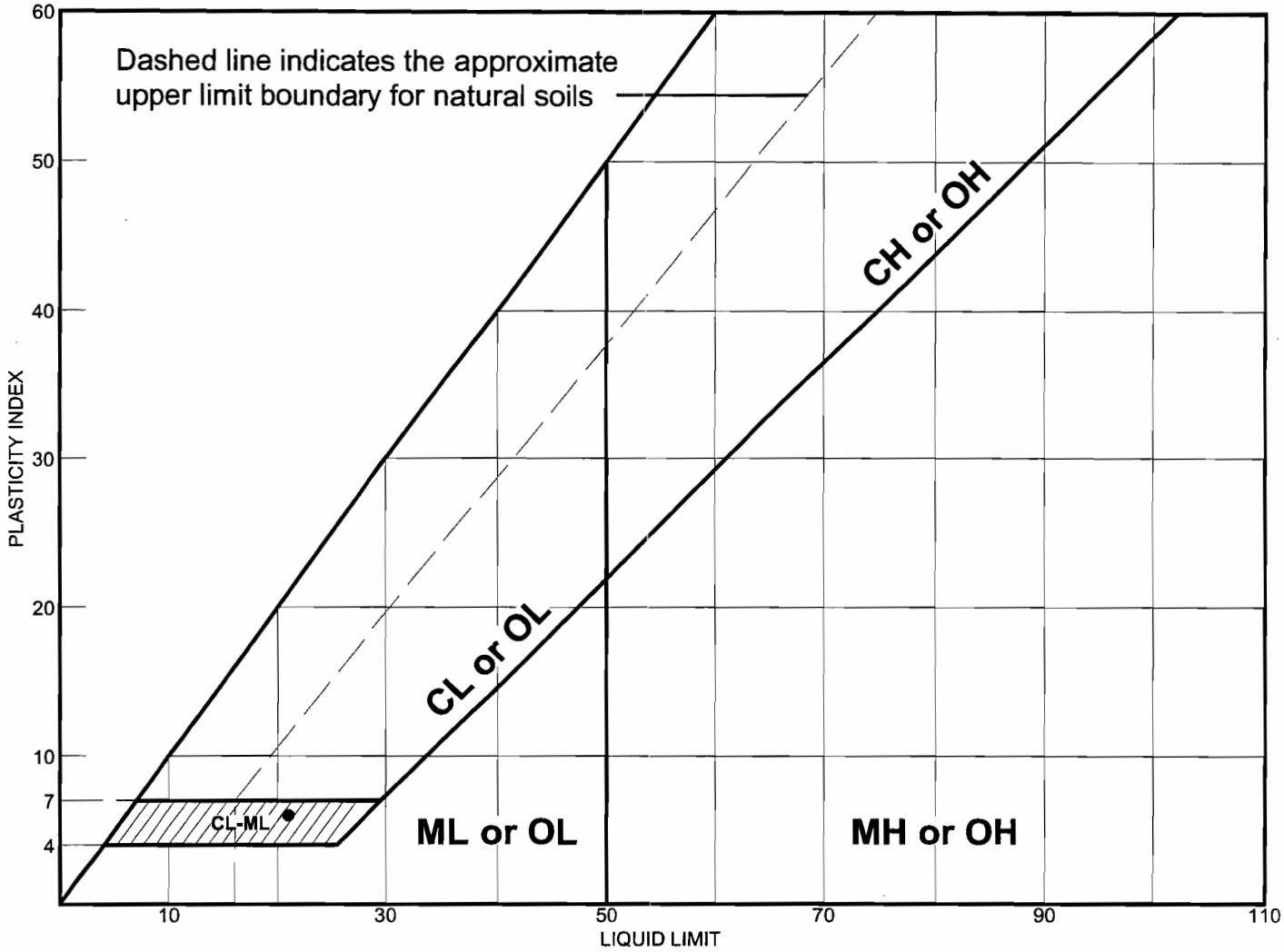
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silty/clayey sand	21	15	6			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-04 **Sample No.:** 100 **Elev./Depth:** 150.0'-151.5'

Remarks:

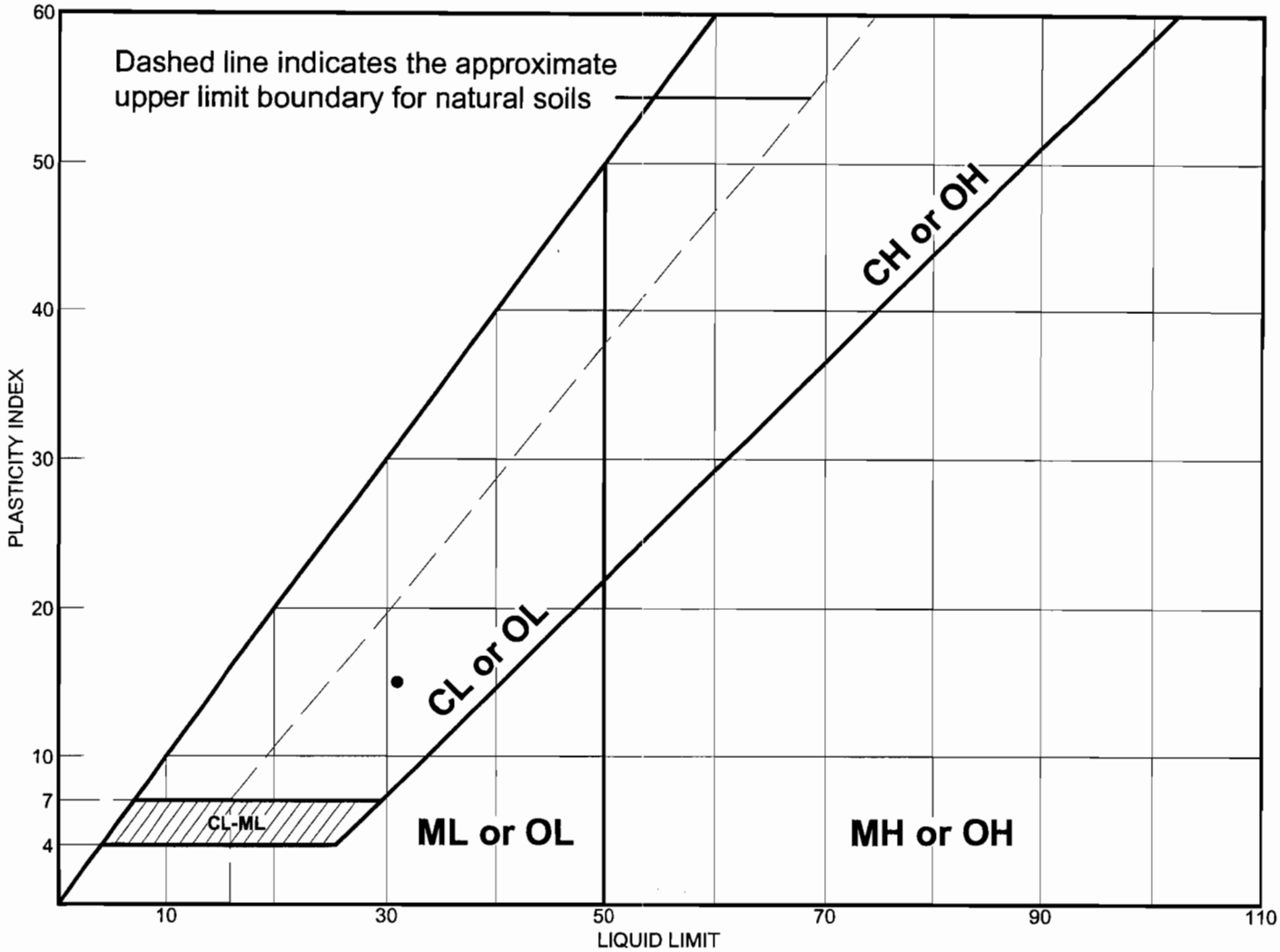
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay with gravel	31	16	15			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-05 **Sample No.:** 16 **Elev./Depth:** 21.0'-22.5'

Remarks:

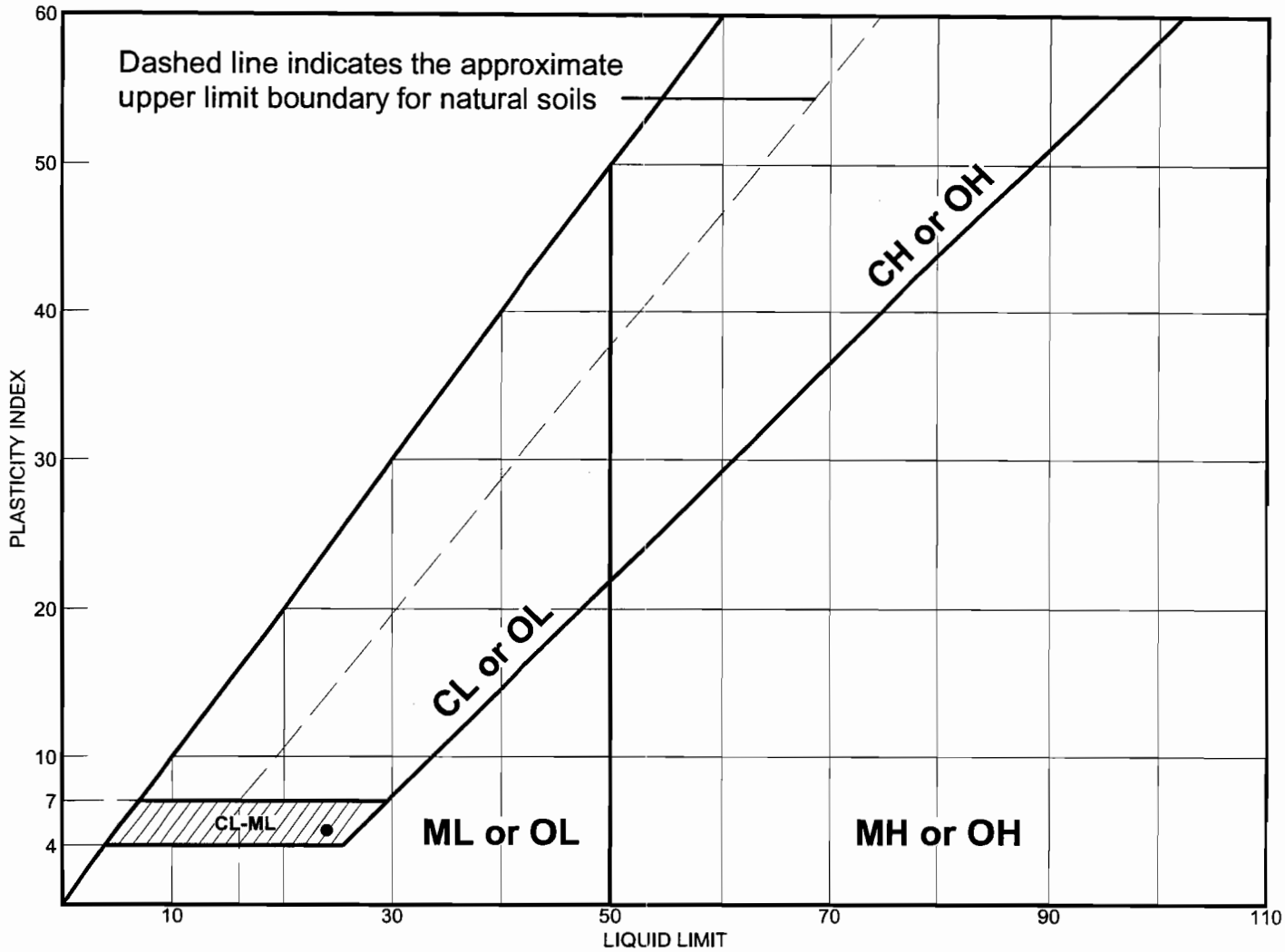
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty/clayey sand with gravel	24	19	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-06 **Sample No.:** 10 **Elev./Depth:** 23.1'-25.5'

Remarks:

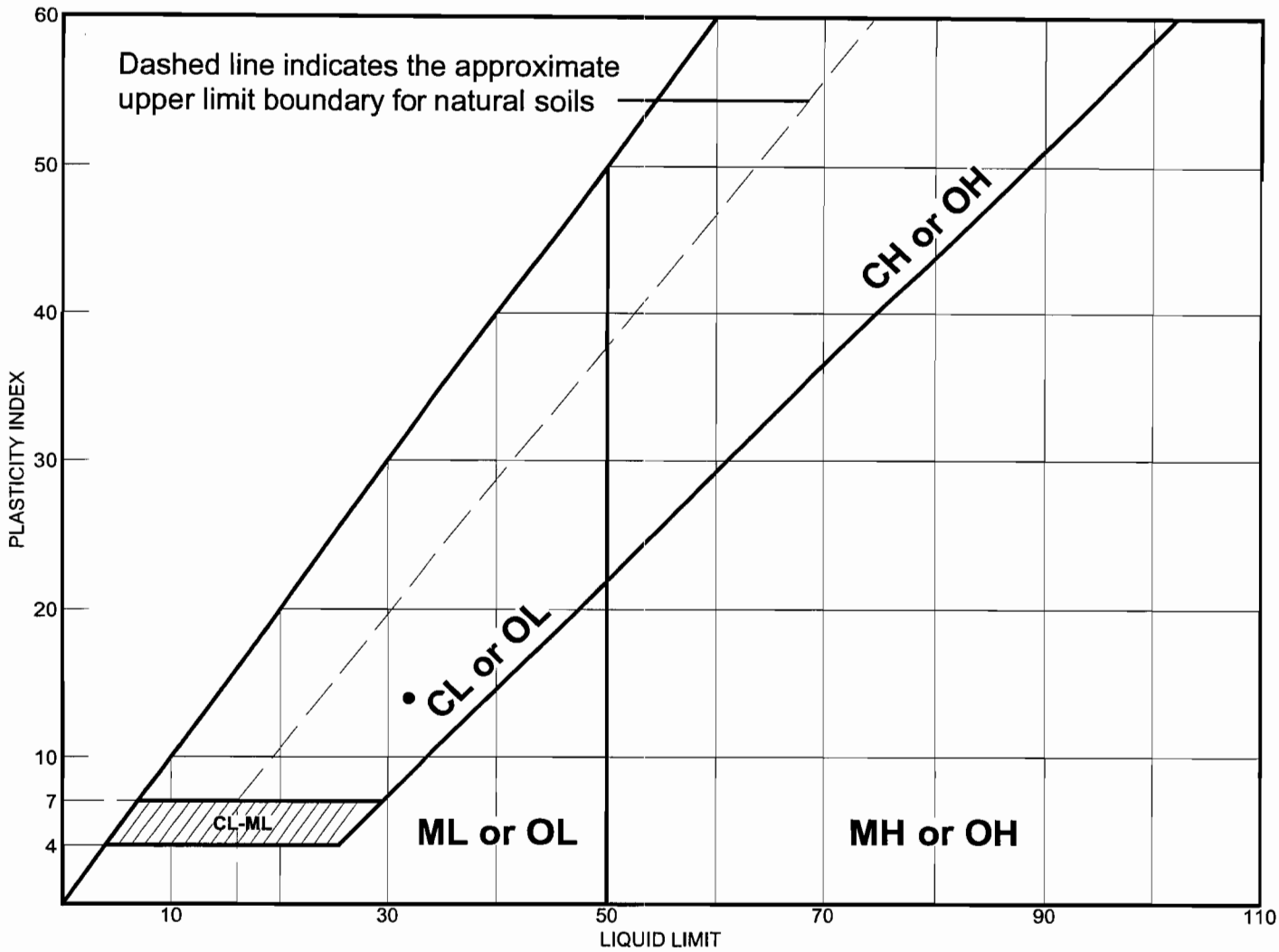
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light brown sandy lean clay, few gravel	32	18	14			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 3 **Elev./Depth:** 5.0'-6.5'

Remarks:

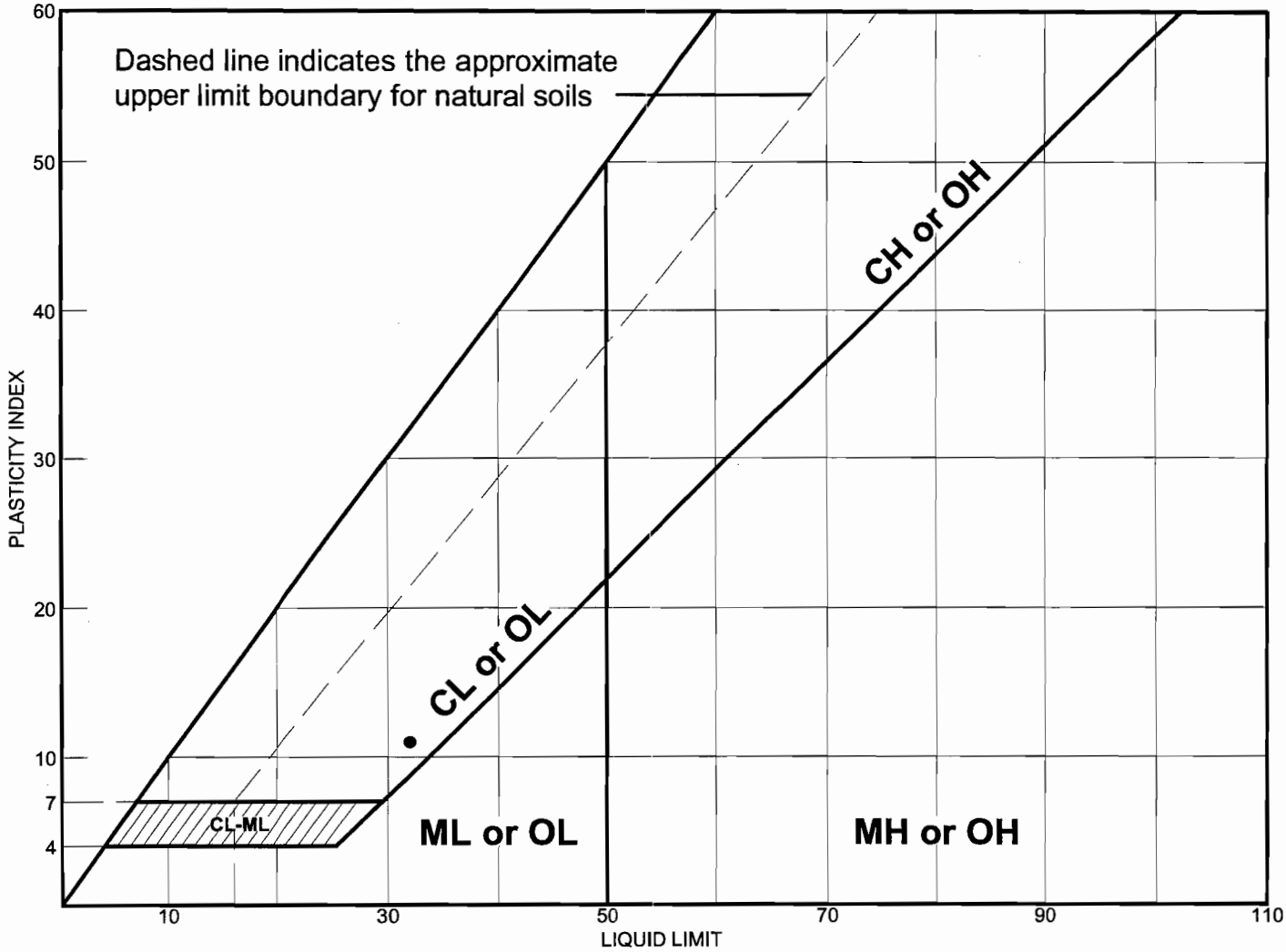
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray sandy lean clay, few gravel	32	21	11			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 21 **Elev./Depth:** 33.5'-35.0'

Remarks:

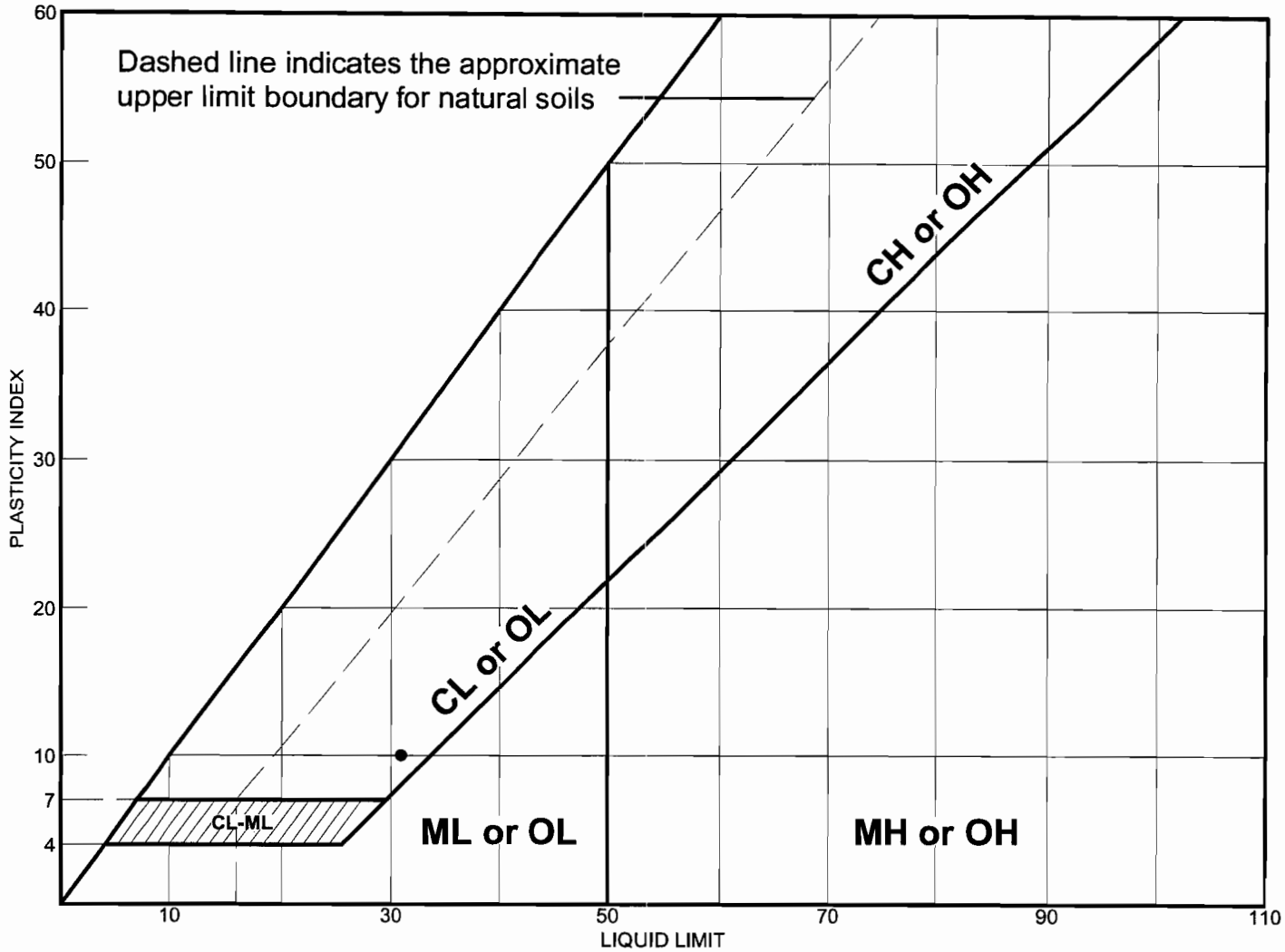
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown gravelly lean clay with sand	31	21	10			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 32 **Elev./Depth:** 50.0'-51.5'

Remarks:

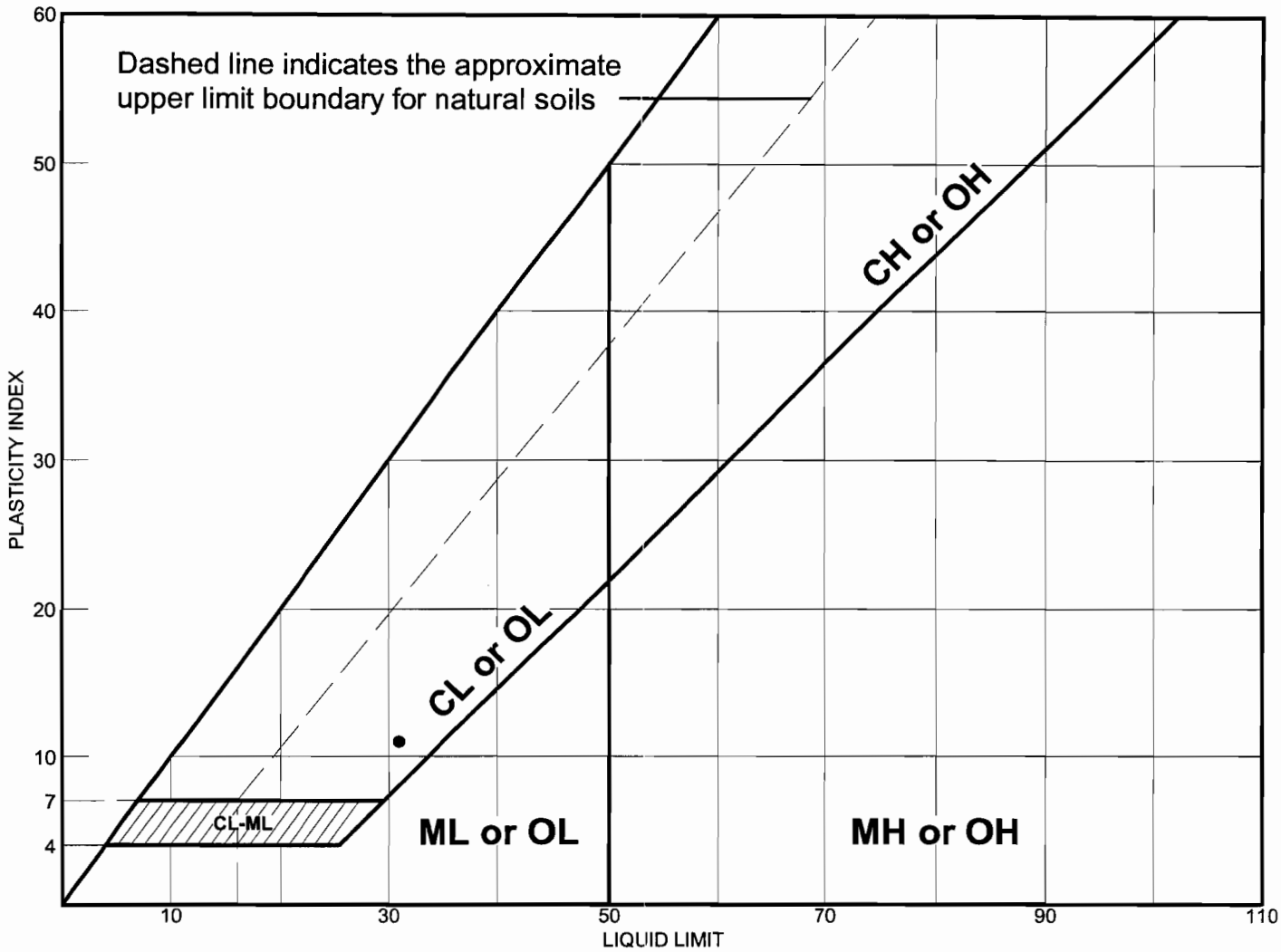
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray clayey gravel with sand	31	20	11			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 39 **Elev./Depth:** 61.4'-62.0'

Remarks:

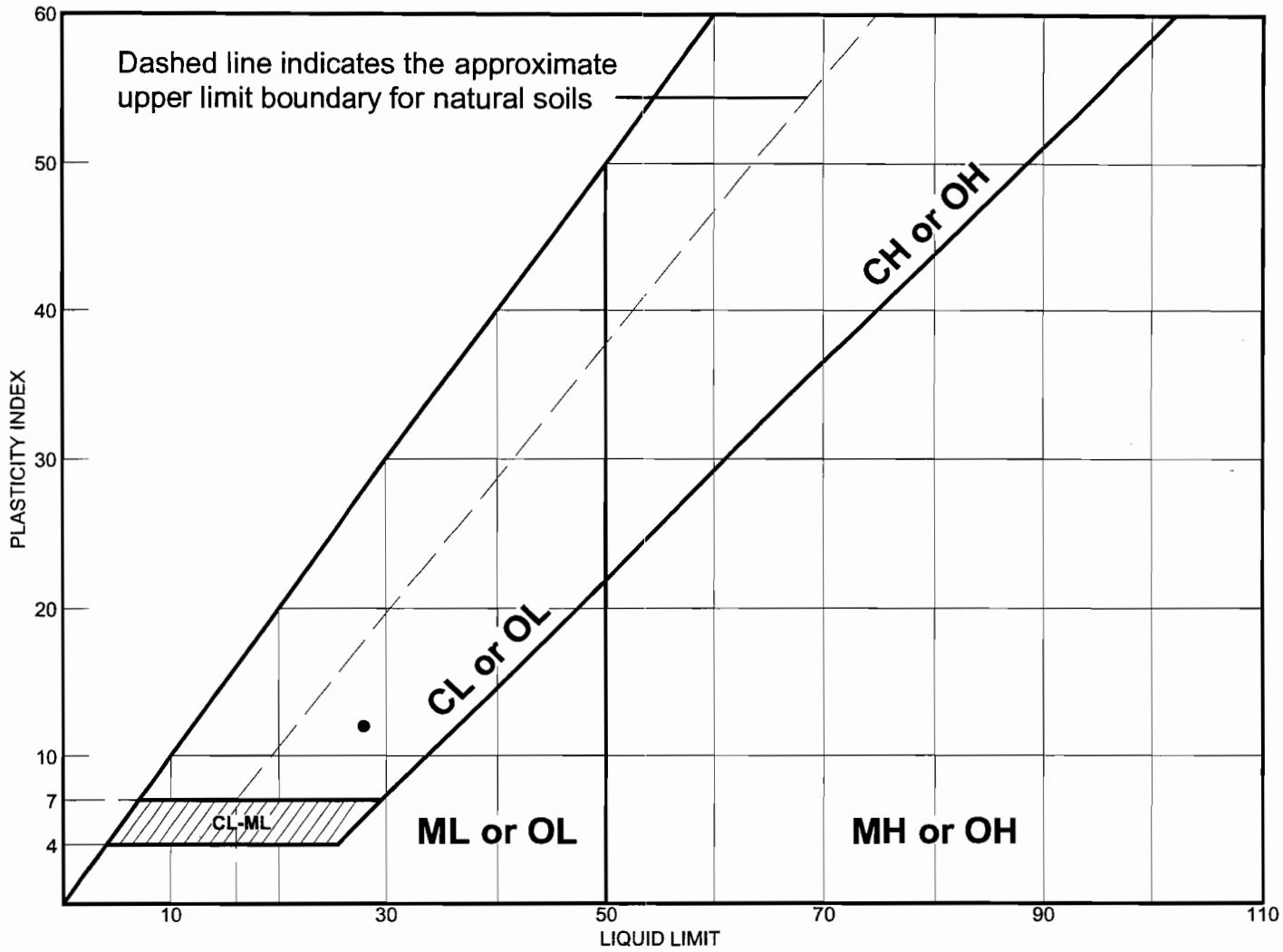
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray lean clay, trace sand	28	16	12			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 89 **Elev./Depth:** 134.0'-135.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMIT TEST DATA

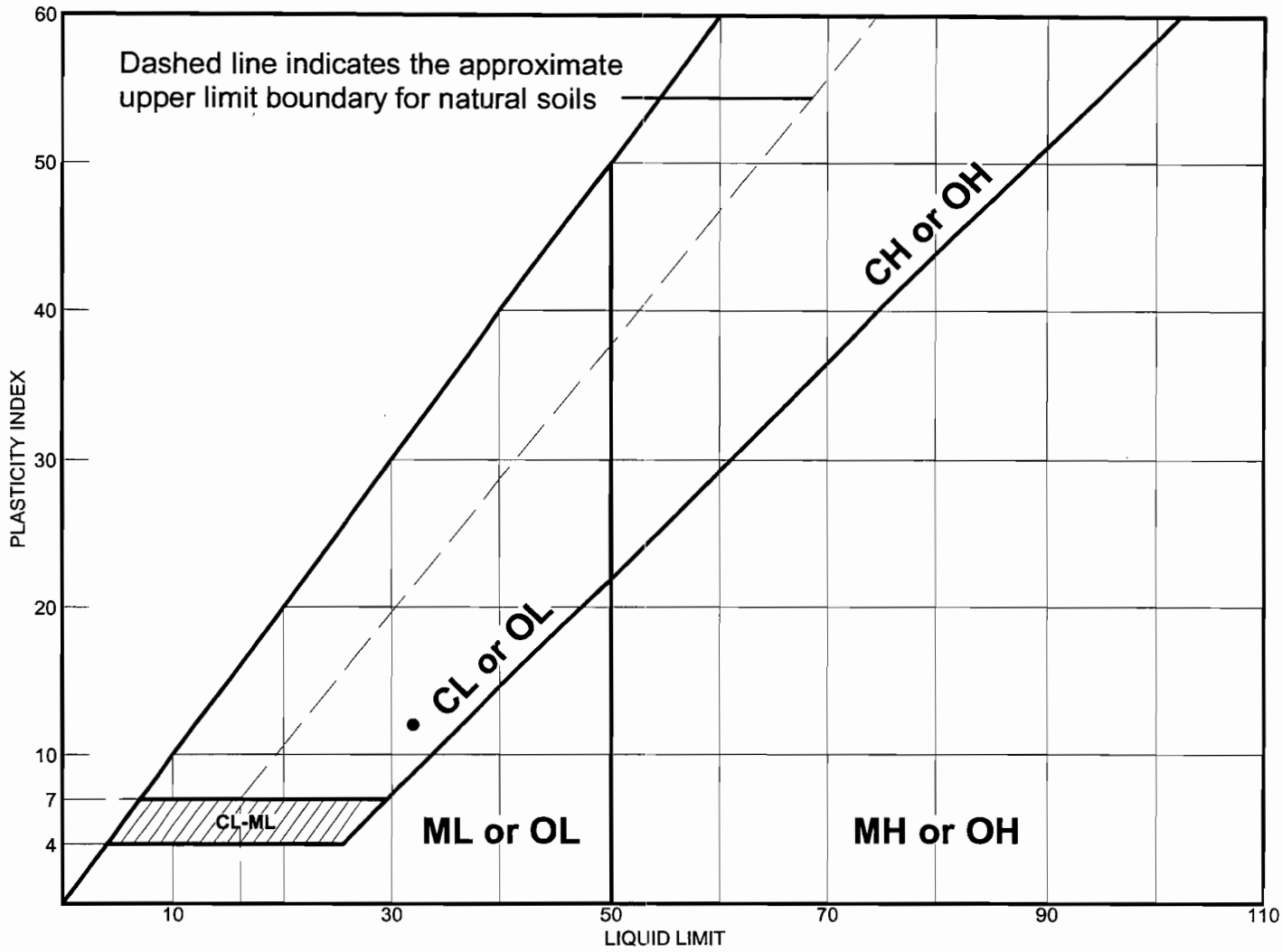
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project Number: 92528.020

Sample Data

Source: C-04-07
Sample No.: 99
Elev. or Depth: 149.6'-150.5'
Sample Length (in./cm.):
Location:
Description: Gray sandy silt
%<#40: **%<#200:** **USCS:** **AASHTO:**
Testing Remarks: NON-PLASTIC

Liquid Limit= _____
Plastic Limit= _____
Plasticity Index= _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray lean clay with sand	32	20	12			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-07 **Sample No.:** 113 **Elev./Depth:** 170.4'-171.2'

Remarks:

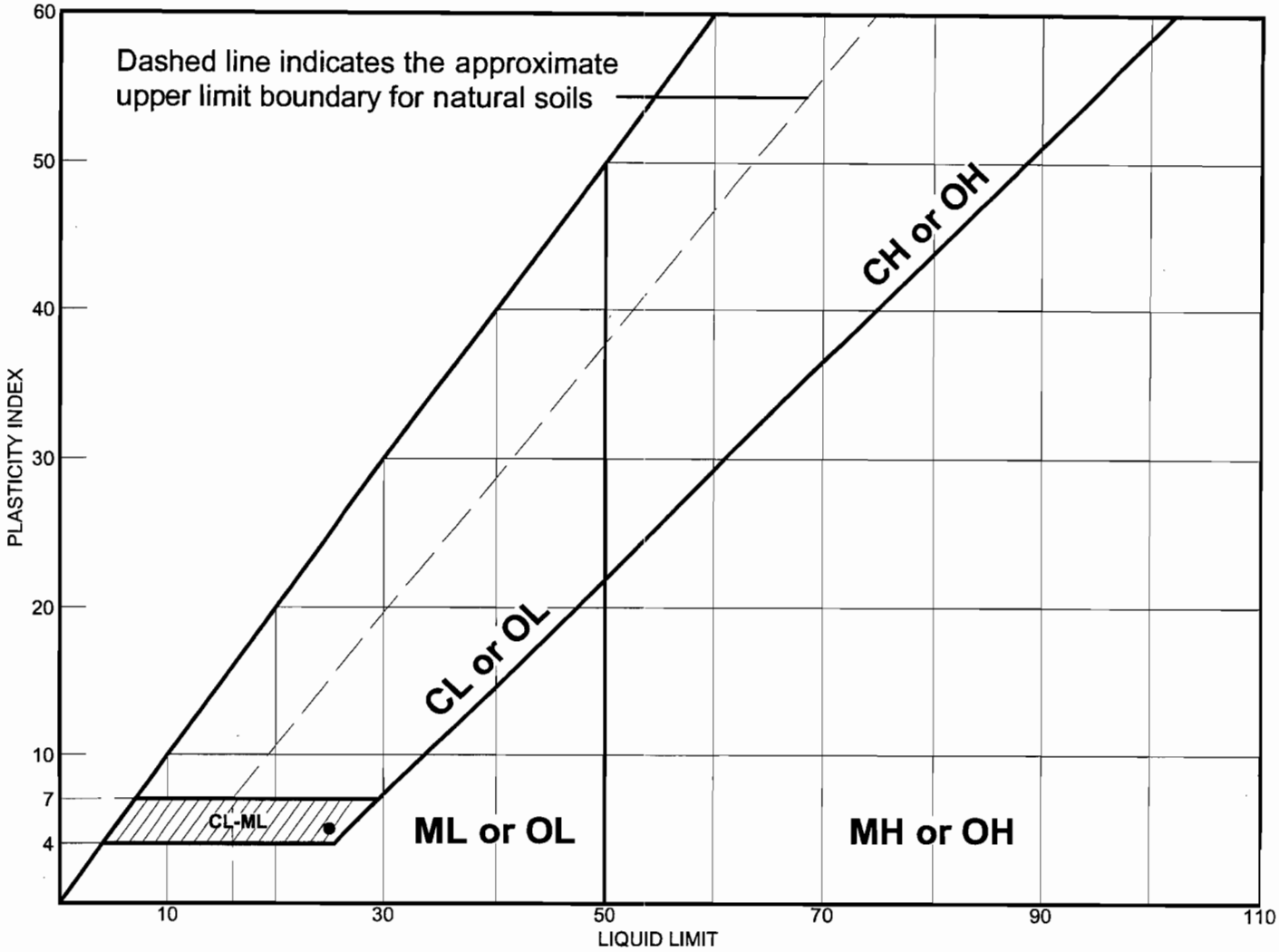
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy silt/lean clay with gravel	25	20	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-08 **Sample No.:** 5 **Elev./Depth:** 6.0'-7.5'

Remarks:

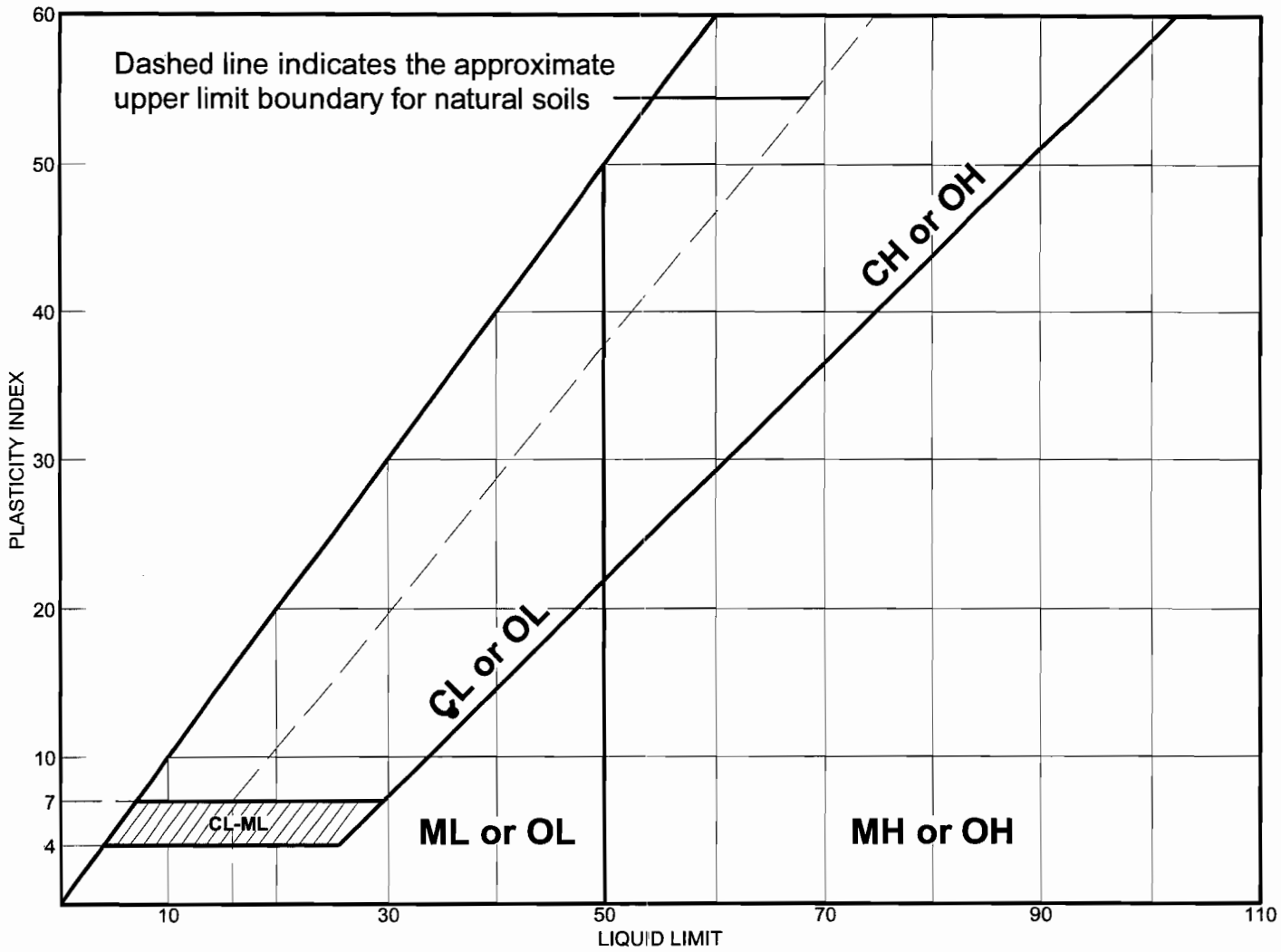
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay with gravel	36	23	13			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-08 **Sample No.:** 10 **Elev./Depth:** 13.5'-15.0'

Remarks:

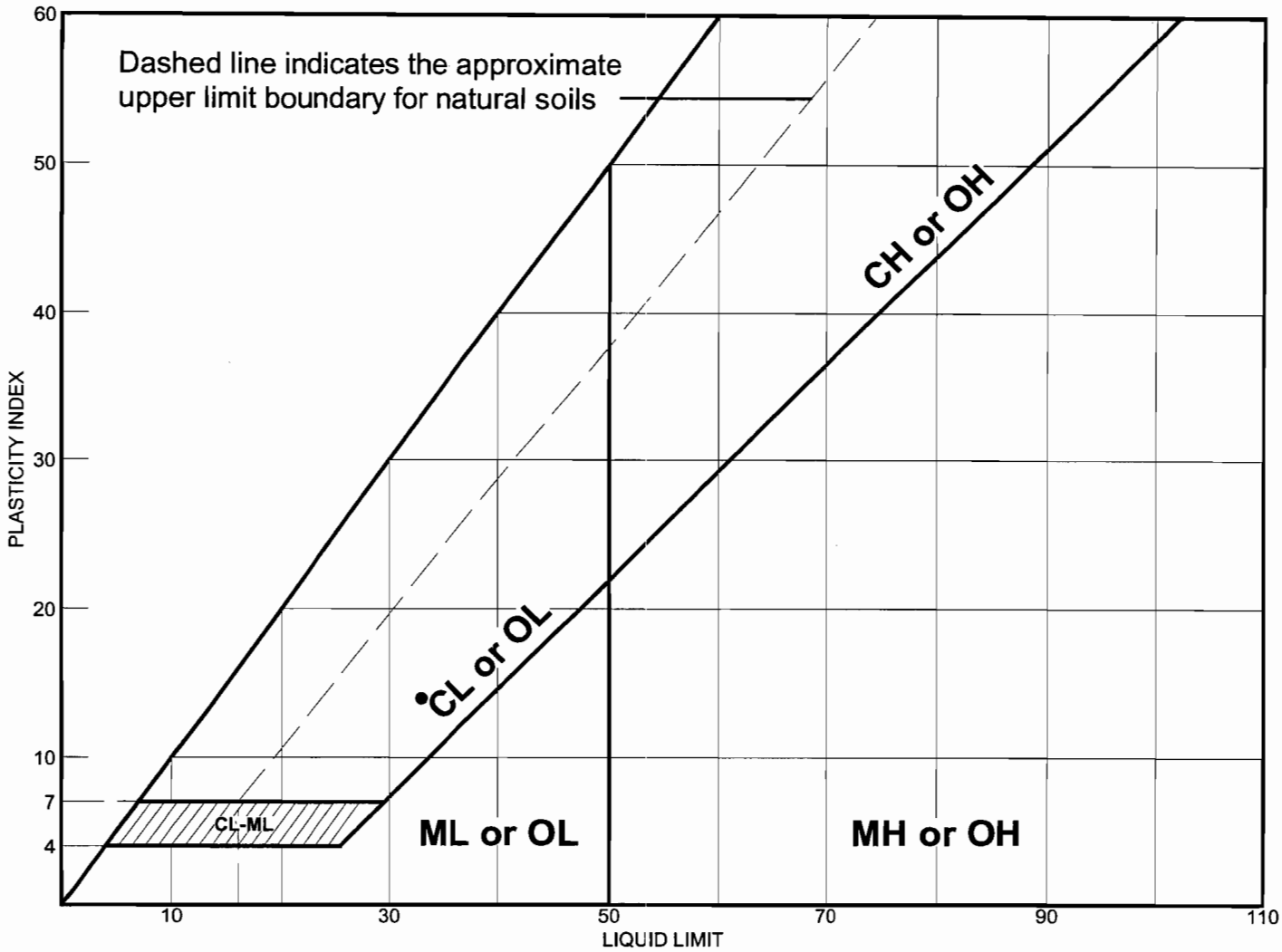
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand with gravel	33	19	14			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-09 **Sample No.:** 3 **Elev./Depth:** 3.6'-6.5'

Remarks:

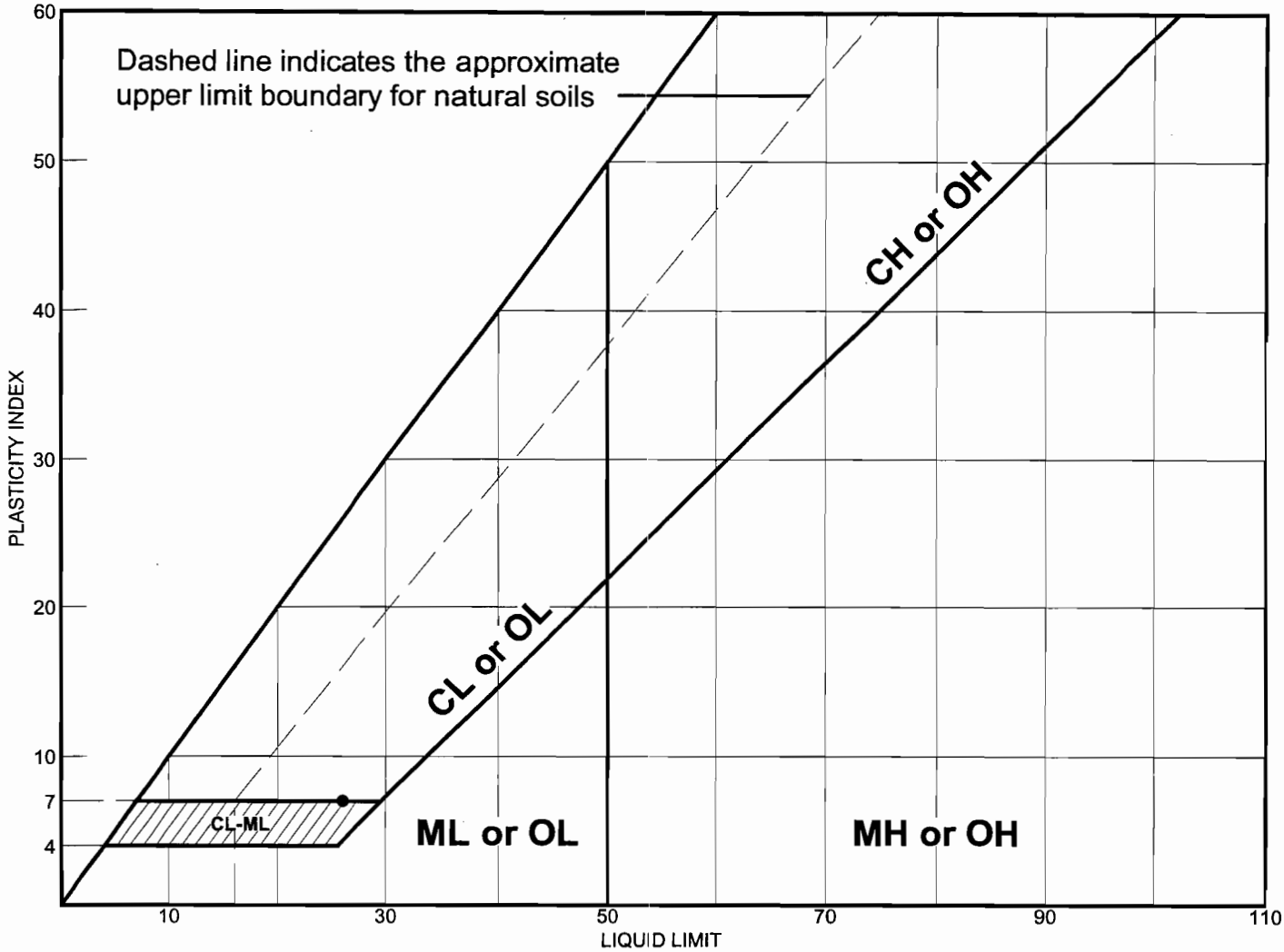
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silt/lean clay, trace sand, trace gravel	26	19	7			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-09 **Sample No.:** 32 **Elev./Depth:** 88.8'-90.6'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMIT TEST DATA

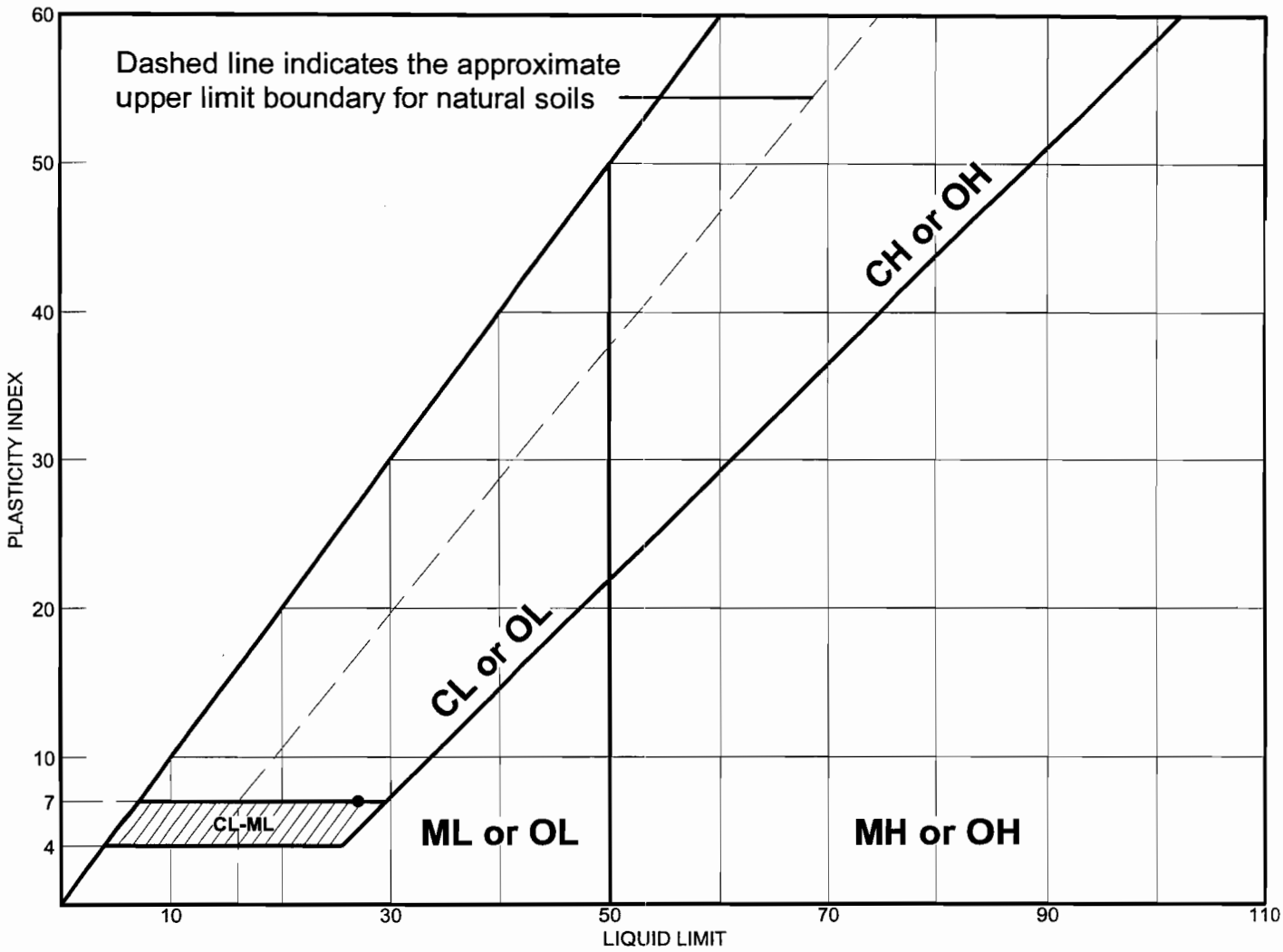
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
ı ject Number: 92528.020

Sample Data

Source: C-04-09
Sample No.: 35
Elev. or Depth: 95.5'-98.0' **Sample Length (in./cm.):**
Location:
Description: Brown silty sand, trace gravel
%<#40: **%<#200:** **USCS:** **AASHTO:**
Testing Remarks: NON-PLASTIC

Liquid Limit= _____
Plastic Limit= _____
Plasticity Index= _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy silt/lean clay with gravel	27	20	7			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-10 **Sample No.:** 6 **Elev./Depth:** 7.5'-9.0'

Remarks:

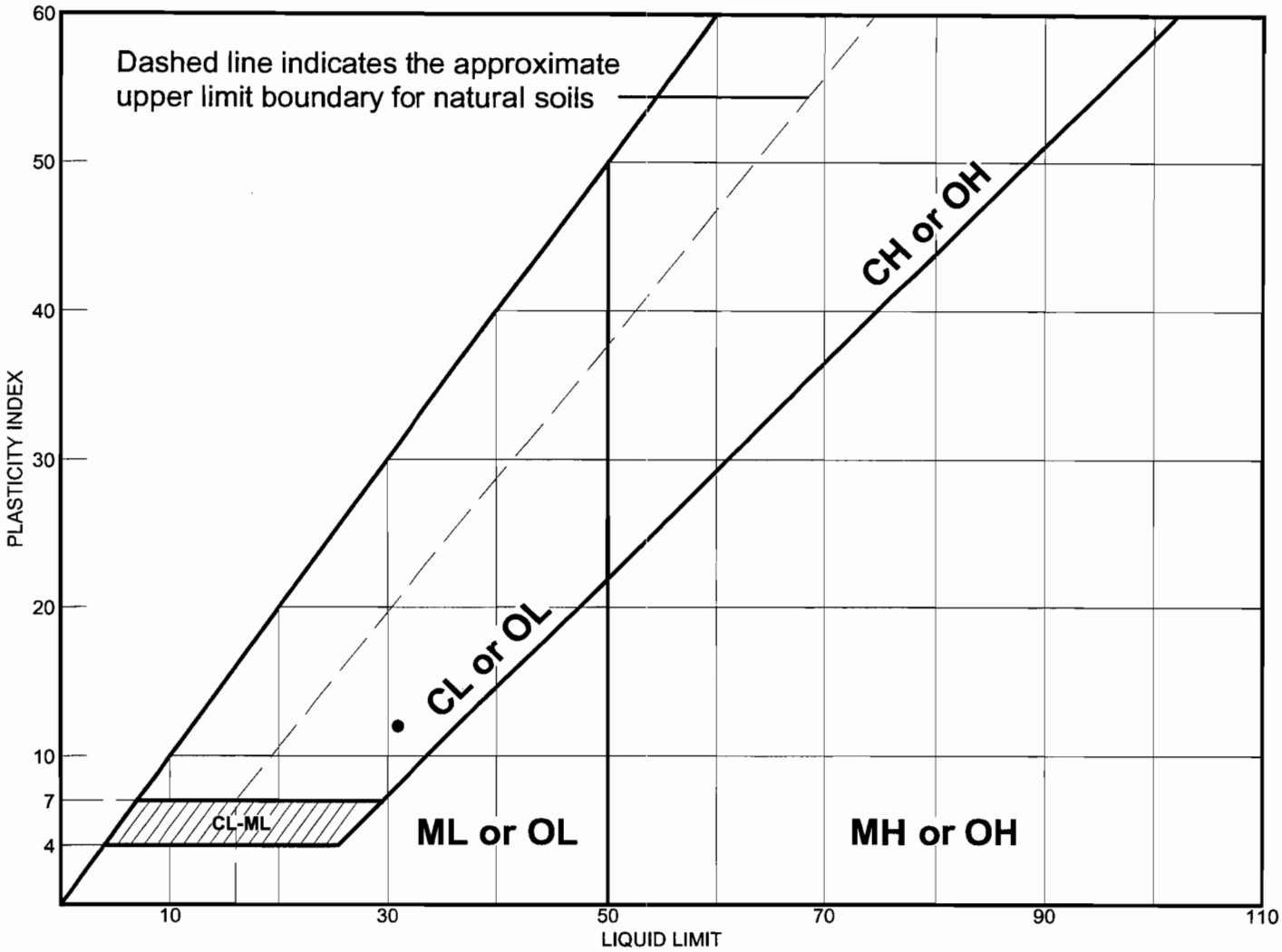
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay with gravel	31	19	12			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-10 **Sample No.:** 12 **Elev./Depth:** 16.5'-18.0'

Remarks:

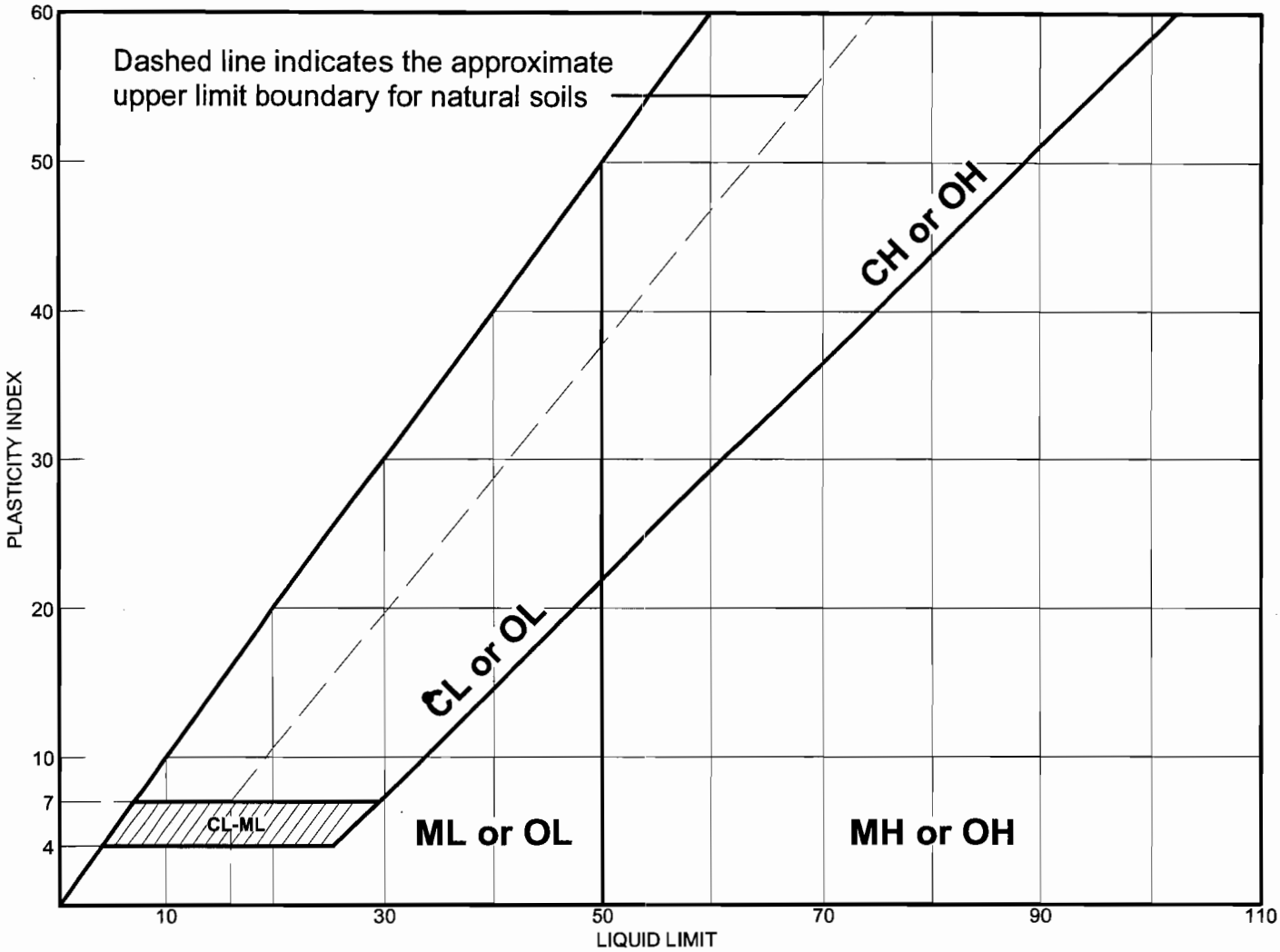
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray lean clay with sand, trace gravel	34	20	14			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-10 **Sample No.:** 17 **Elev./Depth:** 24.0'-25.5'

Remarks:

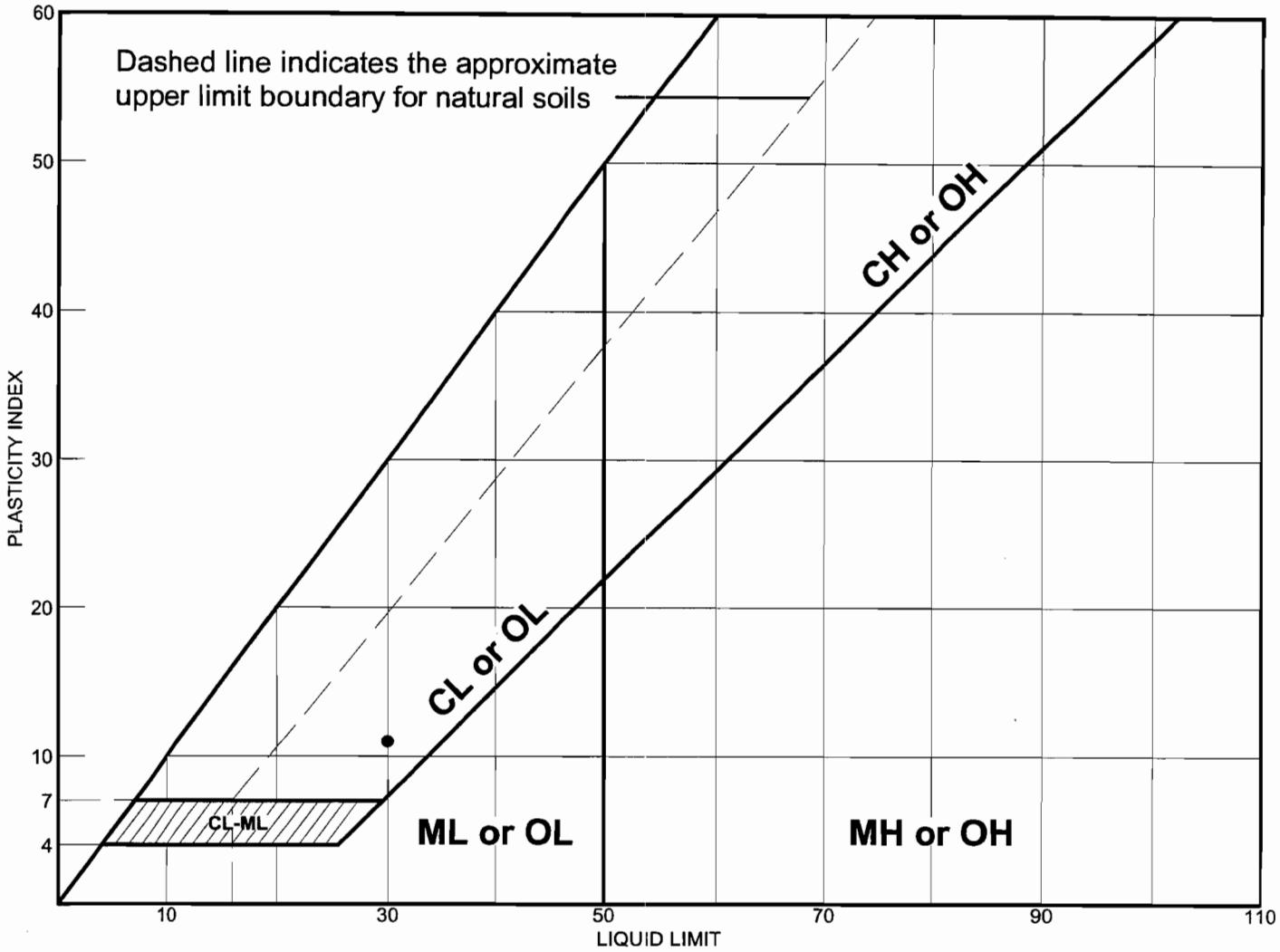
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light brown sandy lean clay with gravel	30	19	11			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-10 **Sample No.:** 27 **Elev./Depth:** 39.0'-40.5'

Remarks:

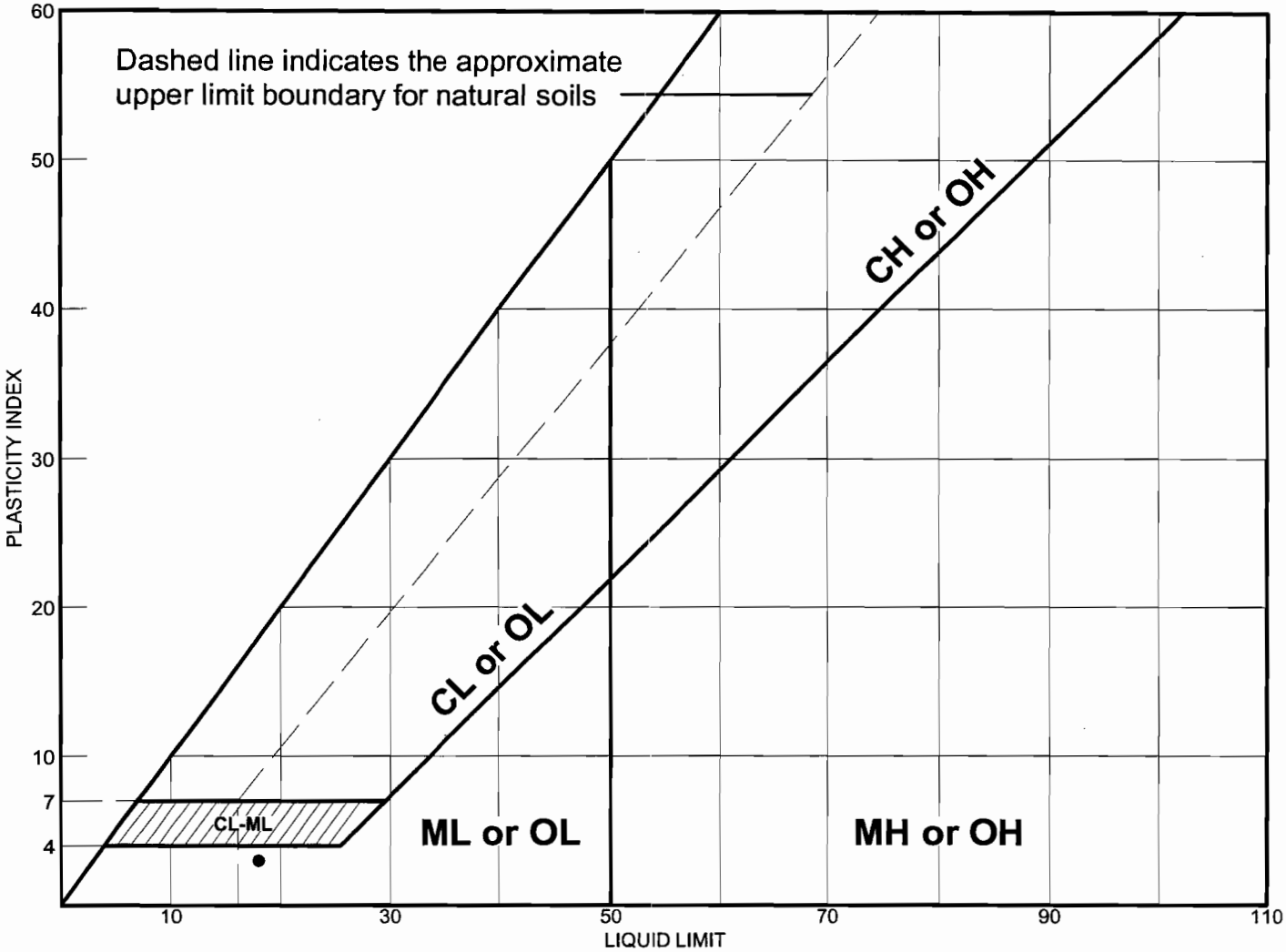
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silty sand, trace gravel	18	15	3			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-10 **Sample No.:** 105 **Elev./Depth:** 160.5'-162.0'

Remarks:

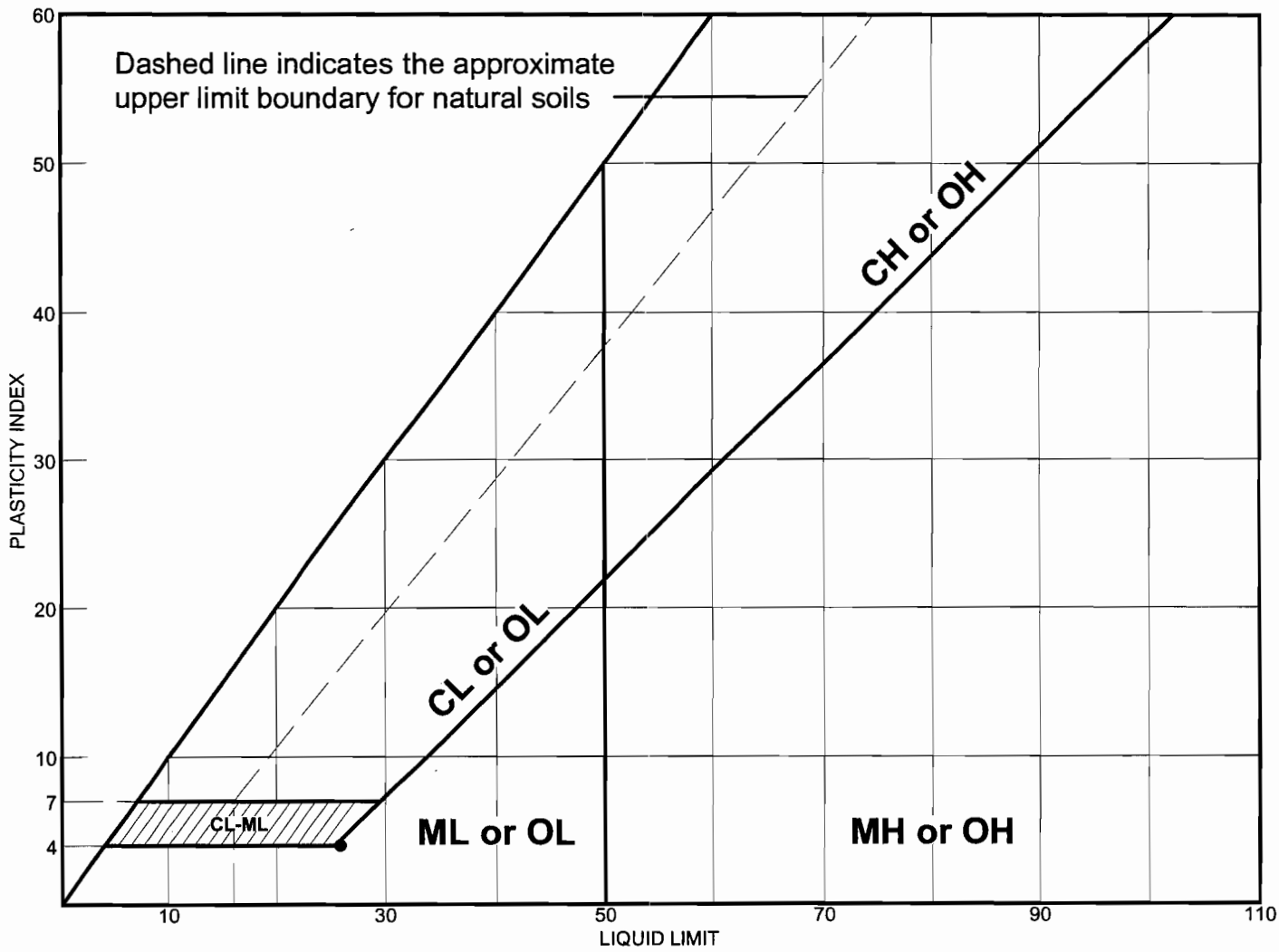
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty/clayey sand with gravel	26	22	4	59.0	38.0	SM

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-12 **Sample No.:** 8 **Elev./Depth:** 19.5'-22.5'

Remarks:

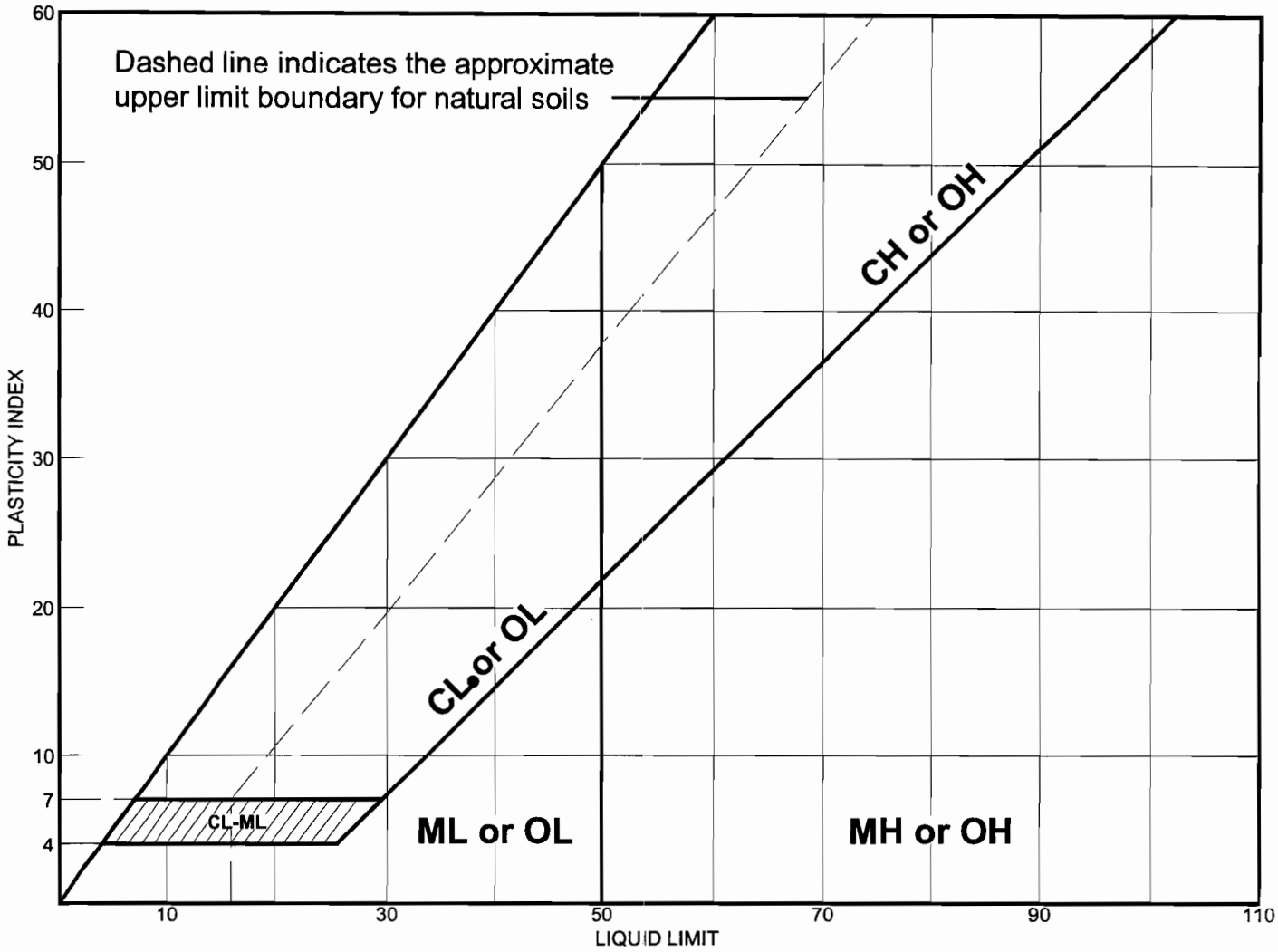
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark gray sandy lean clay, few gravel	38	23	15			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-13 **Sample No.:** 2 **Elev./Depth:** 3.5'-6.5'

Remarks:

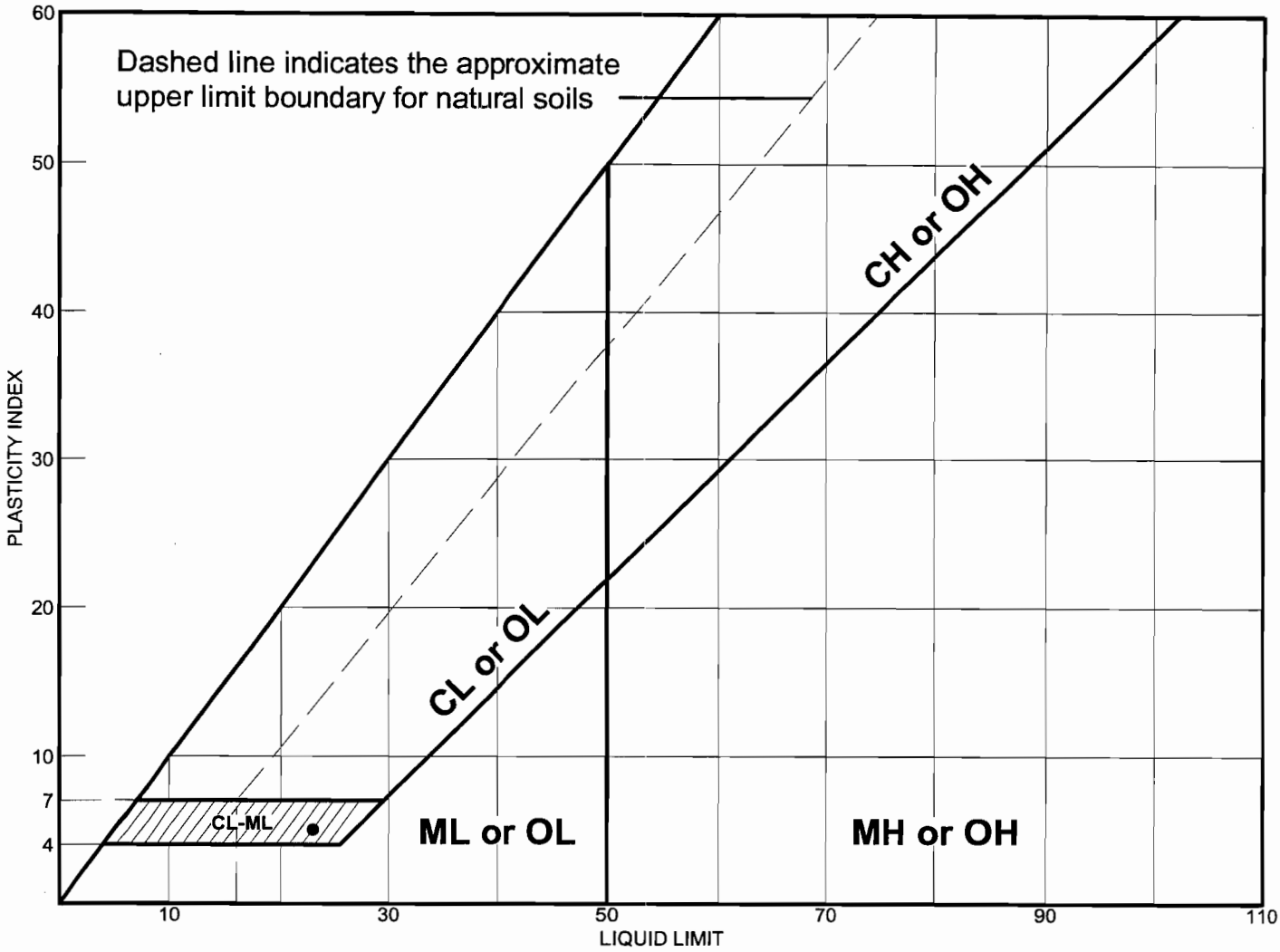
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark brown silty/clayey sand with gravel	23	18	5			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-13 **Sample No.:** 12 **Elev./Depth:** 35.0'-36.5'

Remarks:

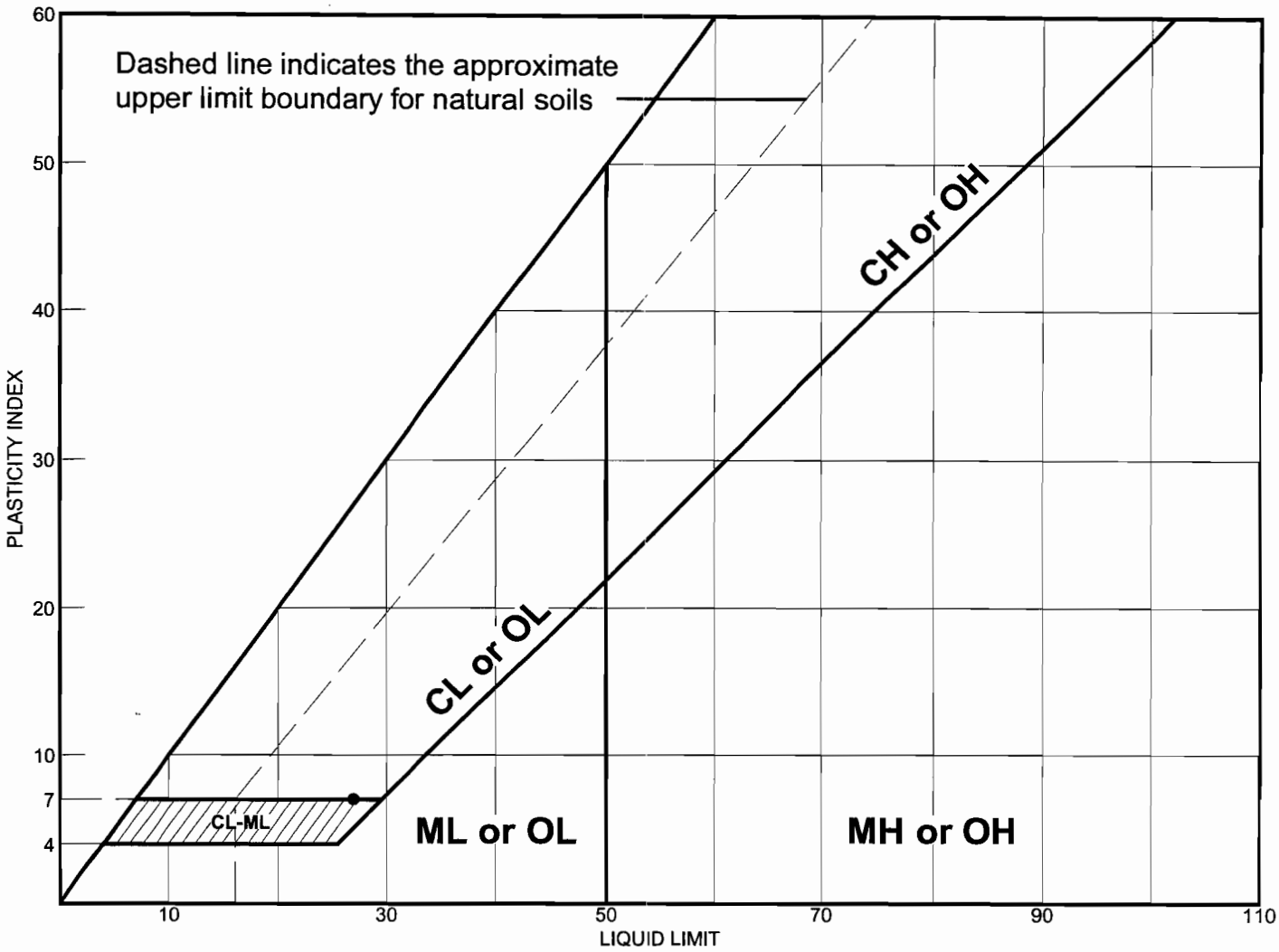
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silty/clayey sand with gravel	27	20	7			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-14 **Sample No.:** 8 **Elev./Depth:** 18.0'-19.9'

Remarks:

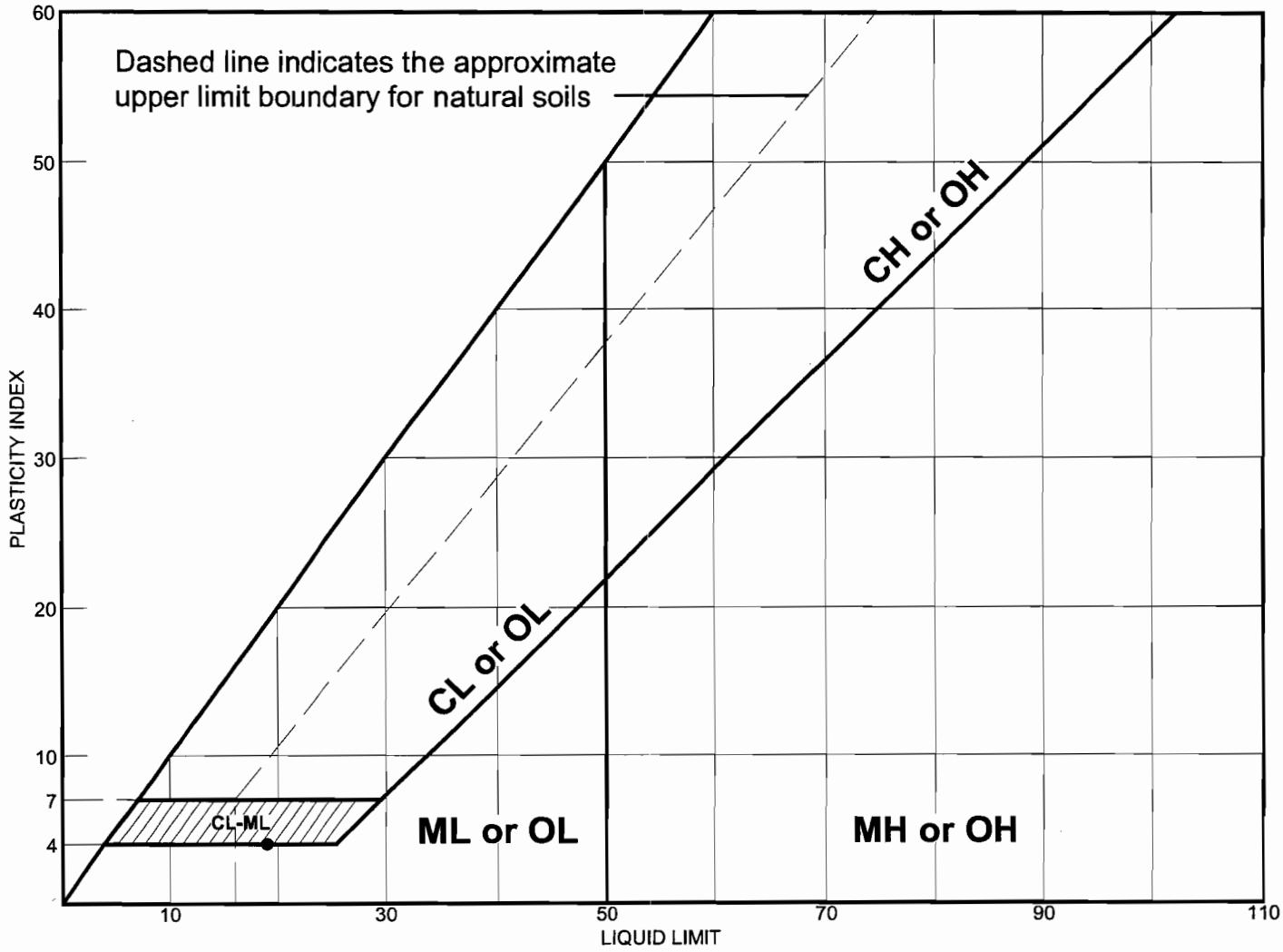
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty/clayey sand, trace gravel	19	15	4			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-14 **Sample No.:** 9 **Elev./Depth:** 19.9'-22.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMIT TEST DATA

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project Number: 92528.020

Sample Data

Source: C-04-15
Sample No.: 4
Elev. or Depth: 4.5'-6.0' **Sample Length (in./cm.):**
Location:
Description: Brown silty sand with gravel
%<#40: **%<#200:** **USCS:** **AASHTO:**
Testing Remarks: NON-PLASTIC

Liquid Limit= _____
Plastic Limit= _____
Plasticity Index= _____

LIQUID AND PLASTIC LIMIT TEST DATA

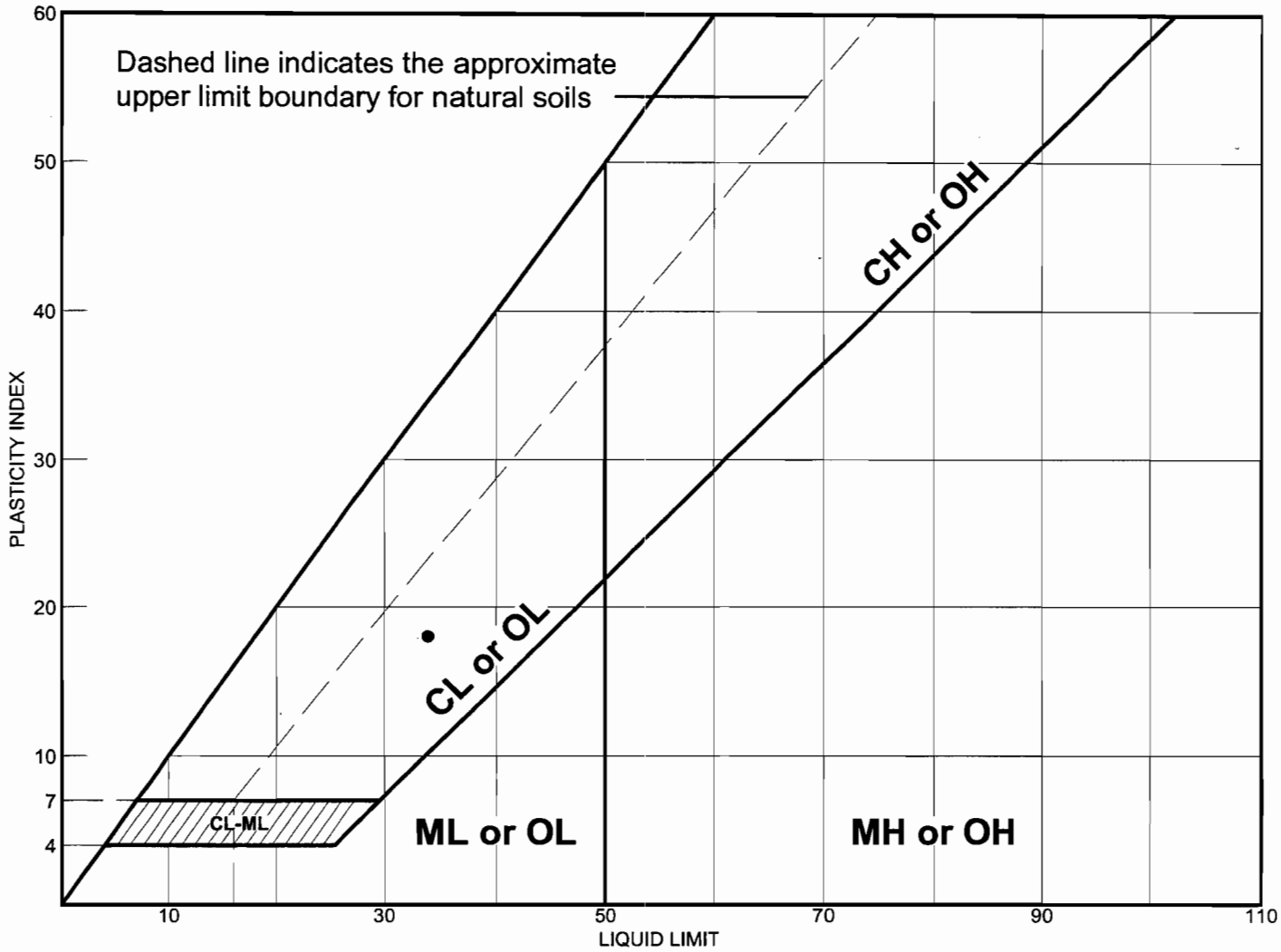
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project Number: 92528.020

Sample Data

Source: C-04-15
Sample No.: 10
Elev. or Depth: 10.8'-12.0' **Sample Length (in./cm.):**
Location:
Description: Brown silty sand with gravel
%<#40: **%<#200:** **USCS:** **AASHTO:**
Testing Remarks: NON-PLASTIC

Liquid Limit= _____
Plastic Limit= _____
Plasticity Index= _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand with gravel	34	16	18	64.9	35.5	

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-15 **Sample No.:** 12 **Elev./Depth:** 13.0'-15.5'

Remarks:

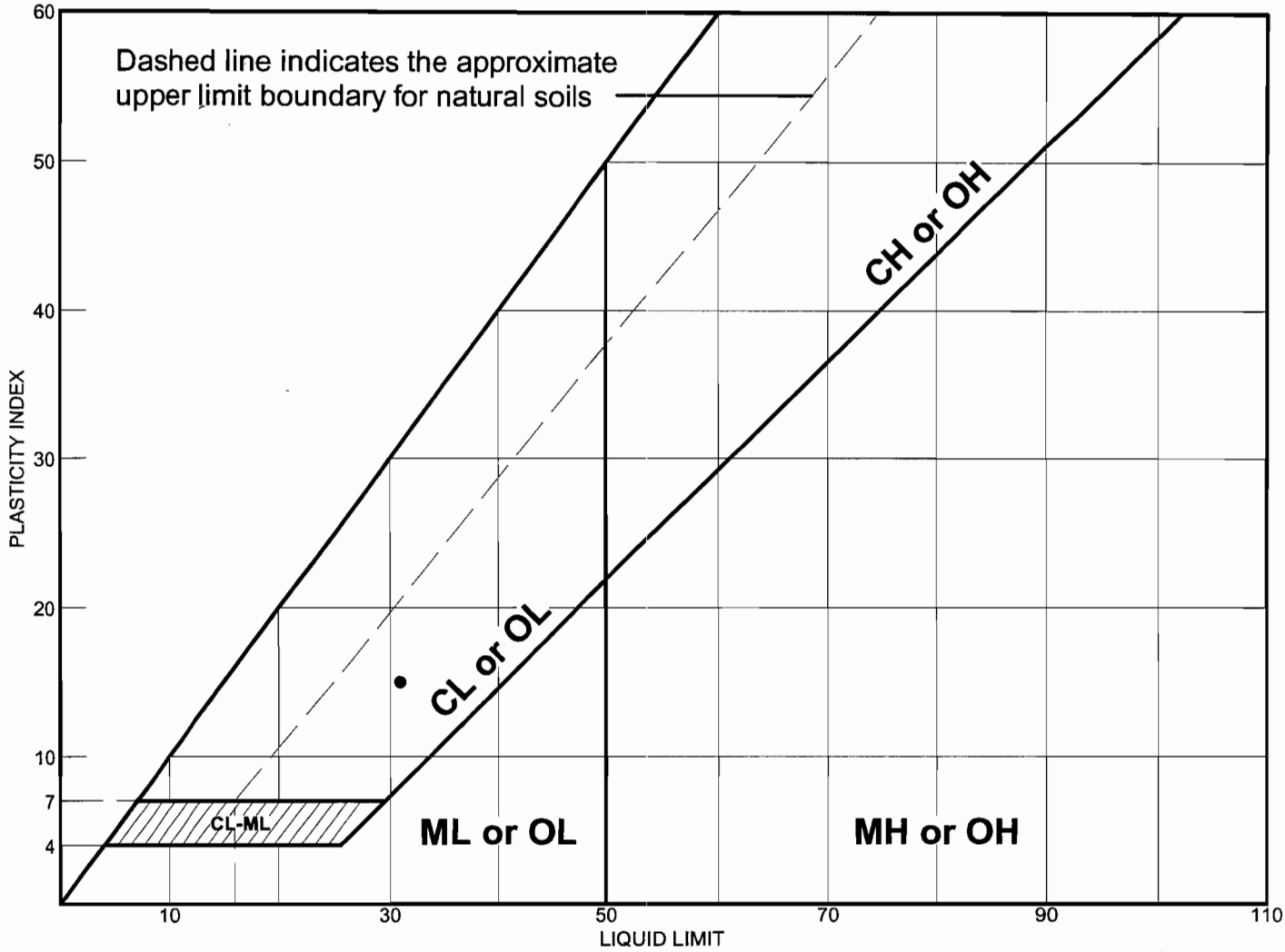
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay with gravel	31	16	15			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-15 **Sample No.:** 16 **Elev./Depth:** 21.5'-24.6'

Remarks:

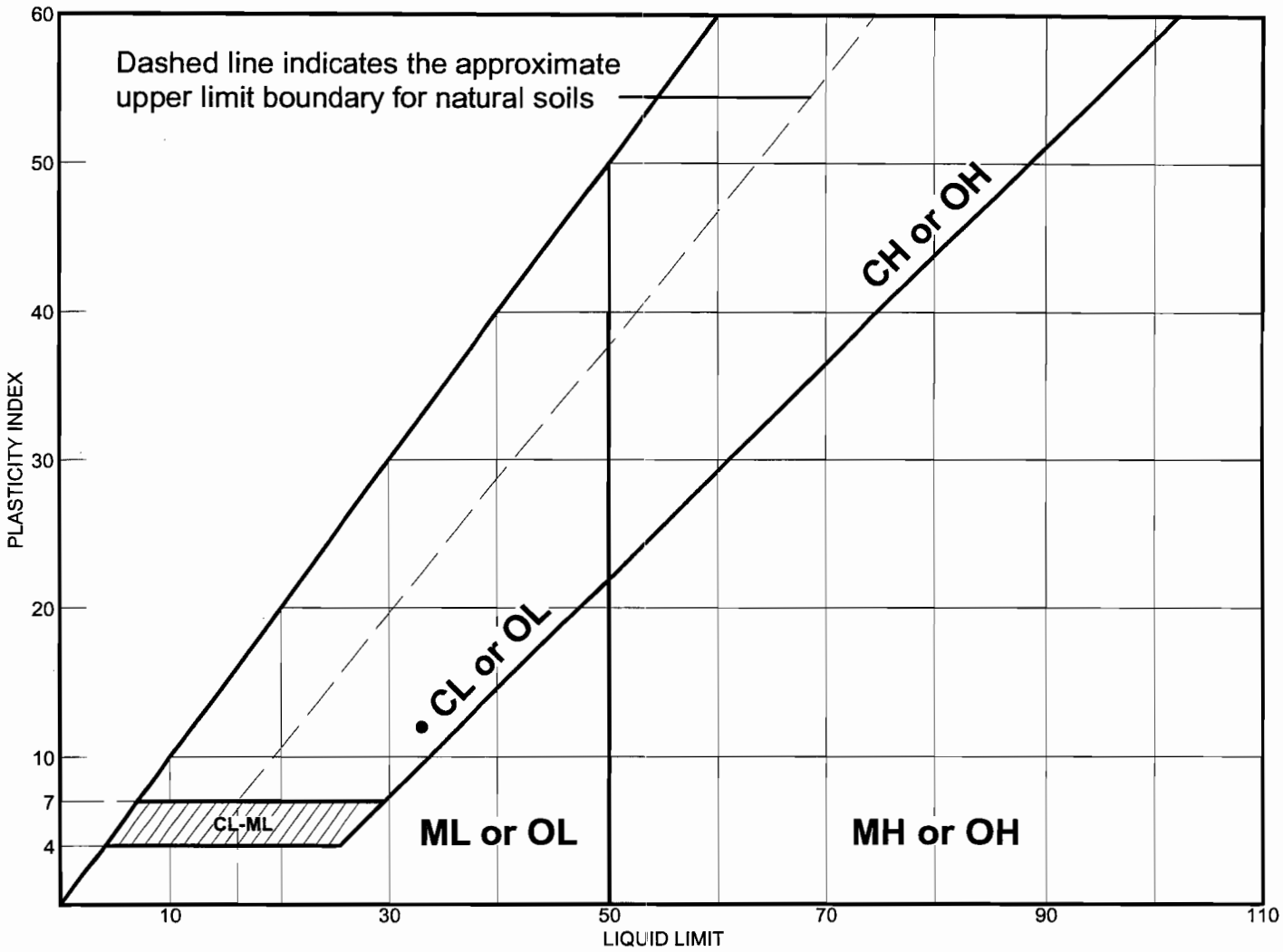
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray lean clay with sand	33	21	12			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-18 **Sample No.:** 3 **Elev./Depth:** 6.5'-9.5'

Remarks:

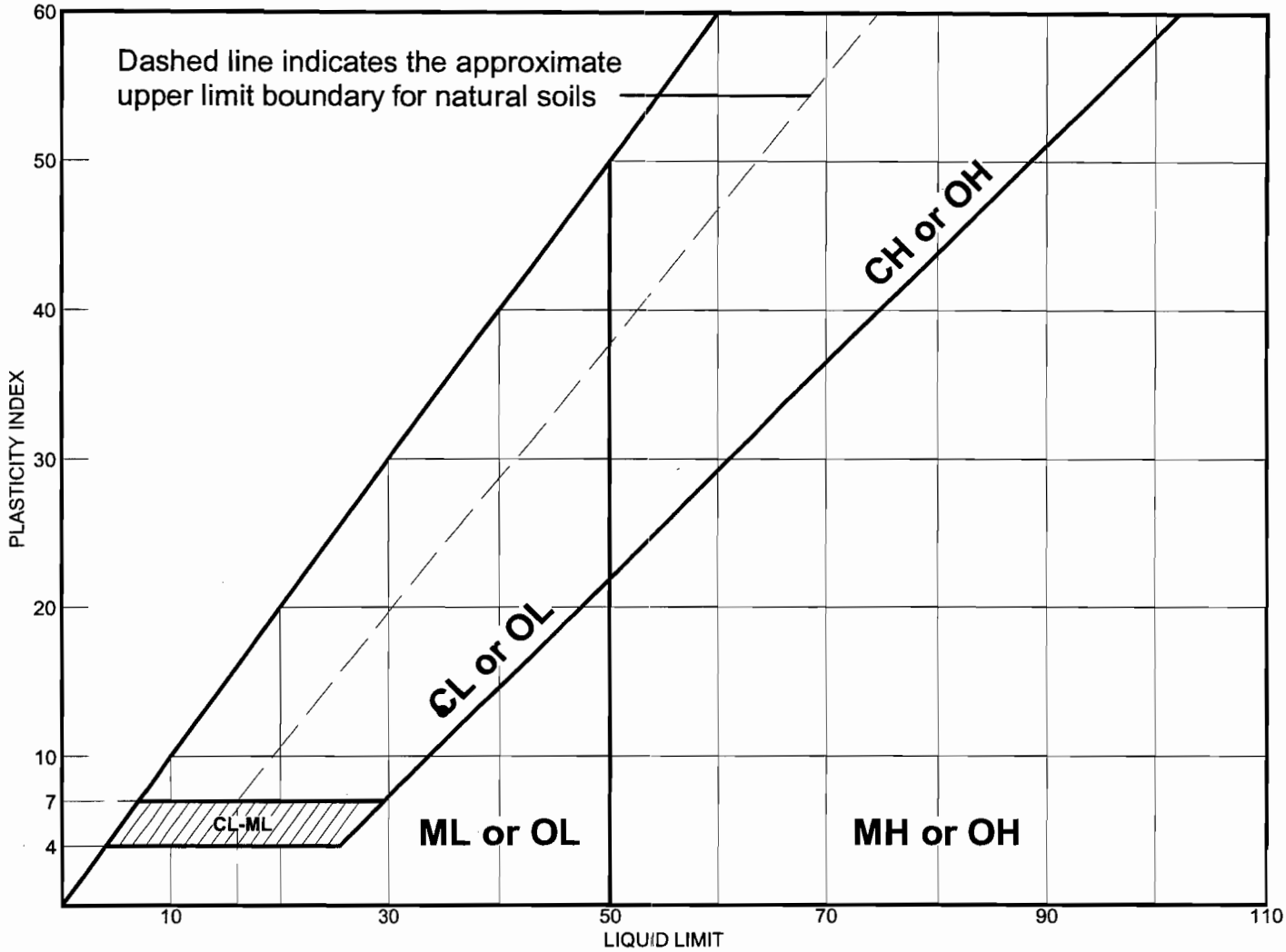
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray lean clay with sand, trace gravel	35	22	13			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-18 **Sample No.:** 7 **Elev./Depth:** 17.9'-20.0'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

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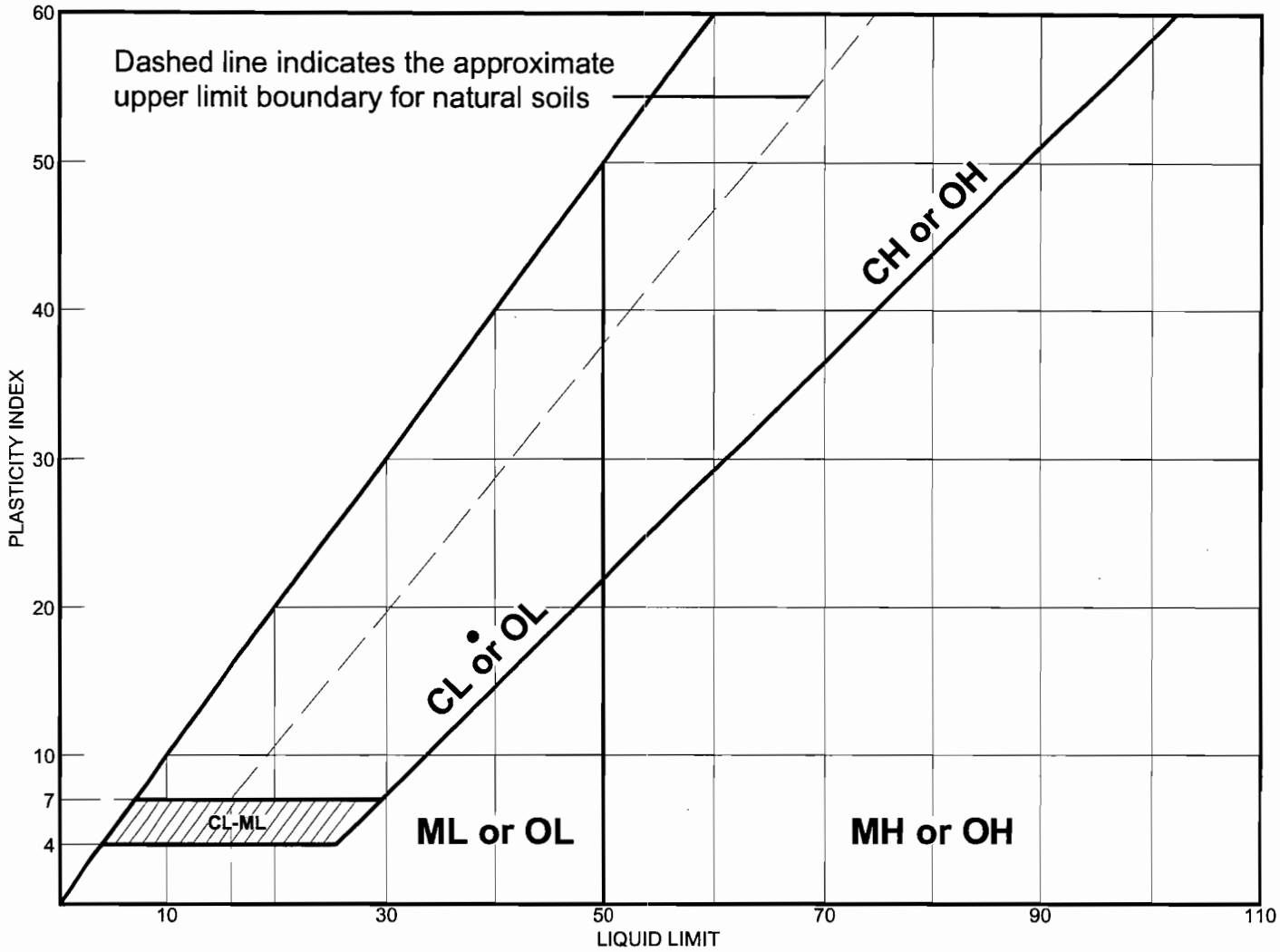
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray lean clay with sand, trace gravel	38	20	18			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-18 **Sample No.:** 9 **Elev./Depth:** 21.5'-24.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

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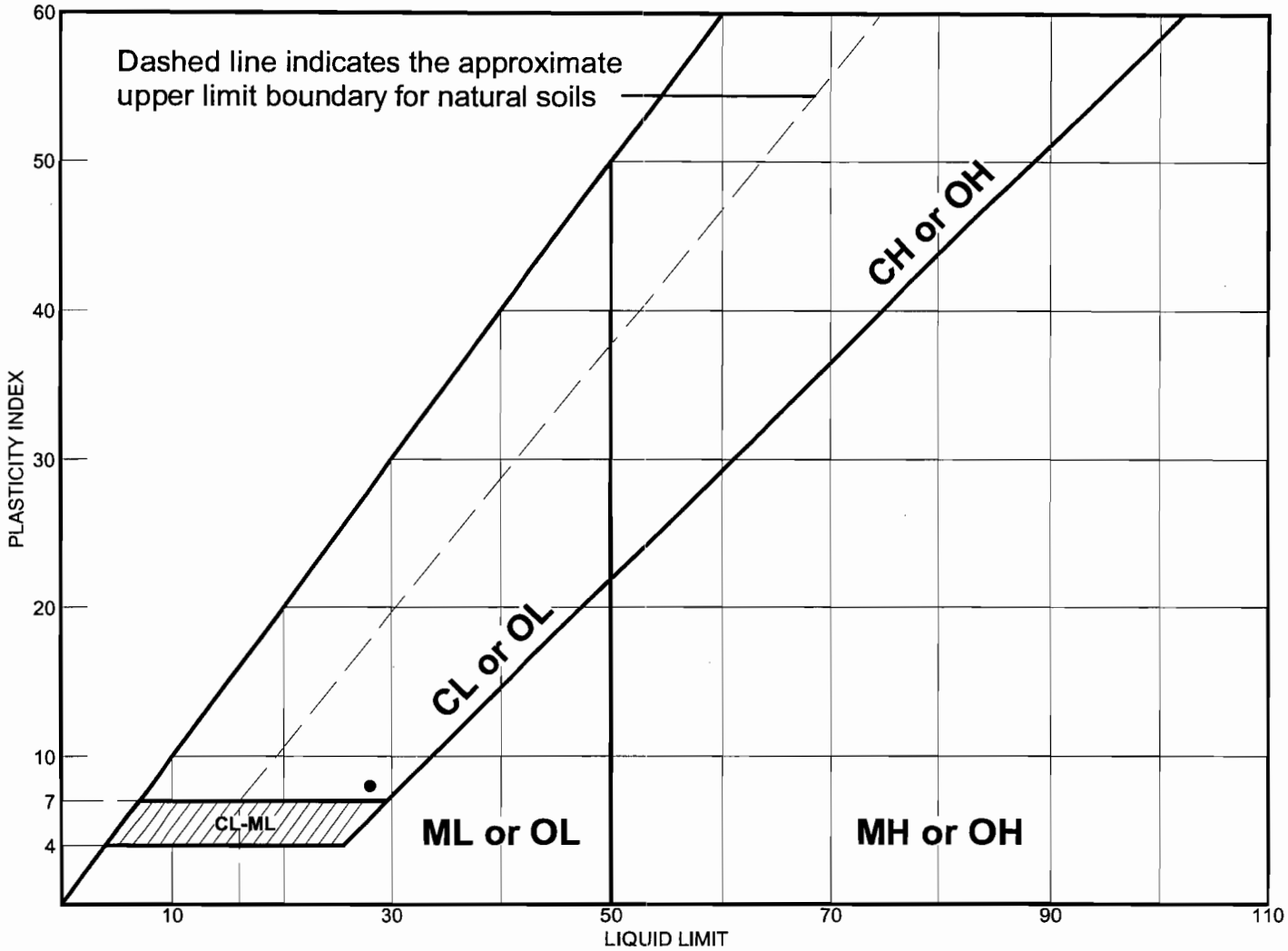
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay with gravel	28	20	8			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-18 **Sample No.:** 15 **Elev./Depth:** 38.7'-41.0'

Remarks:

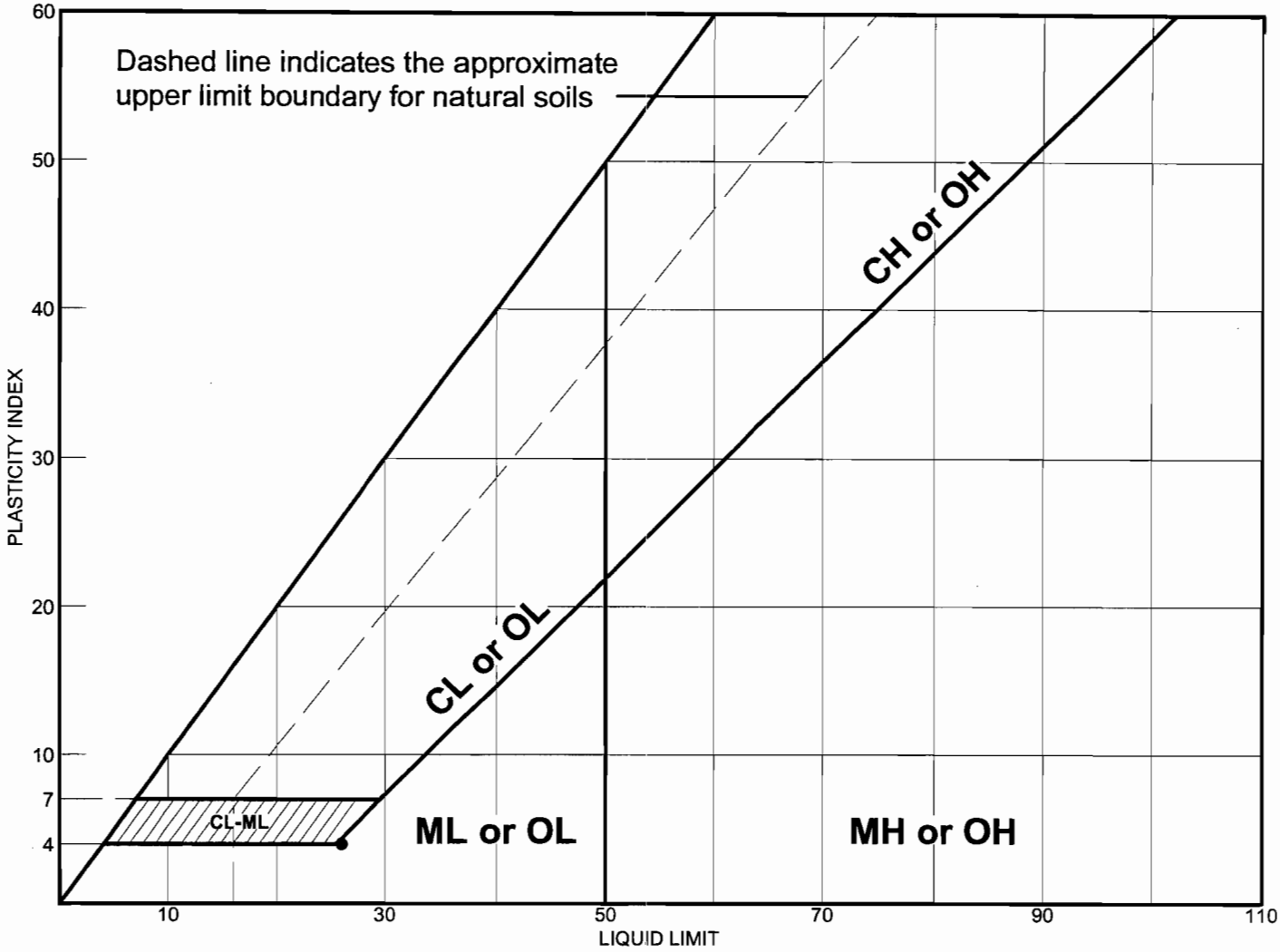
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray silty/clayey sand, trace gravel	26	22	4			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-19 **Sample No.:** 2 **Elev./Depth:** 1.5'-2.3'

Remarks:

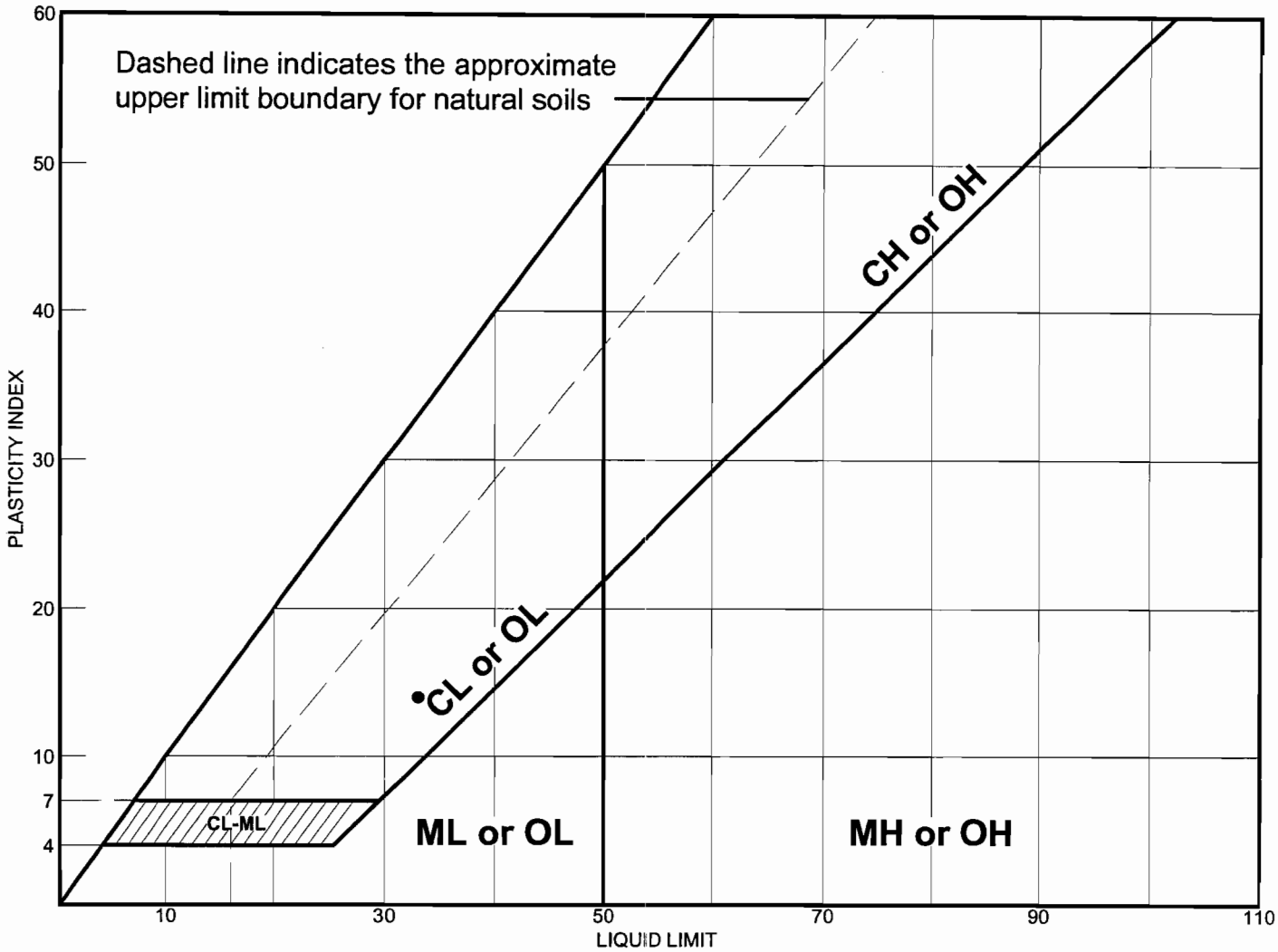
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray sandy lean clay, trace gravel	33	19	14			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-19 **Sample No.:** 5 **Elev./Depth:** 7.5'-10.5'

Remarks:

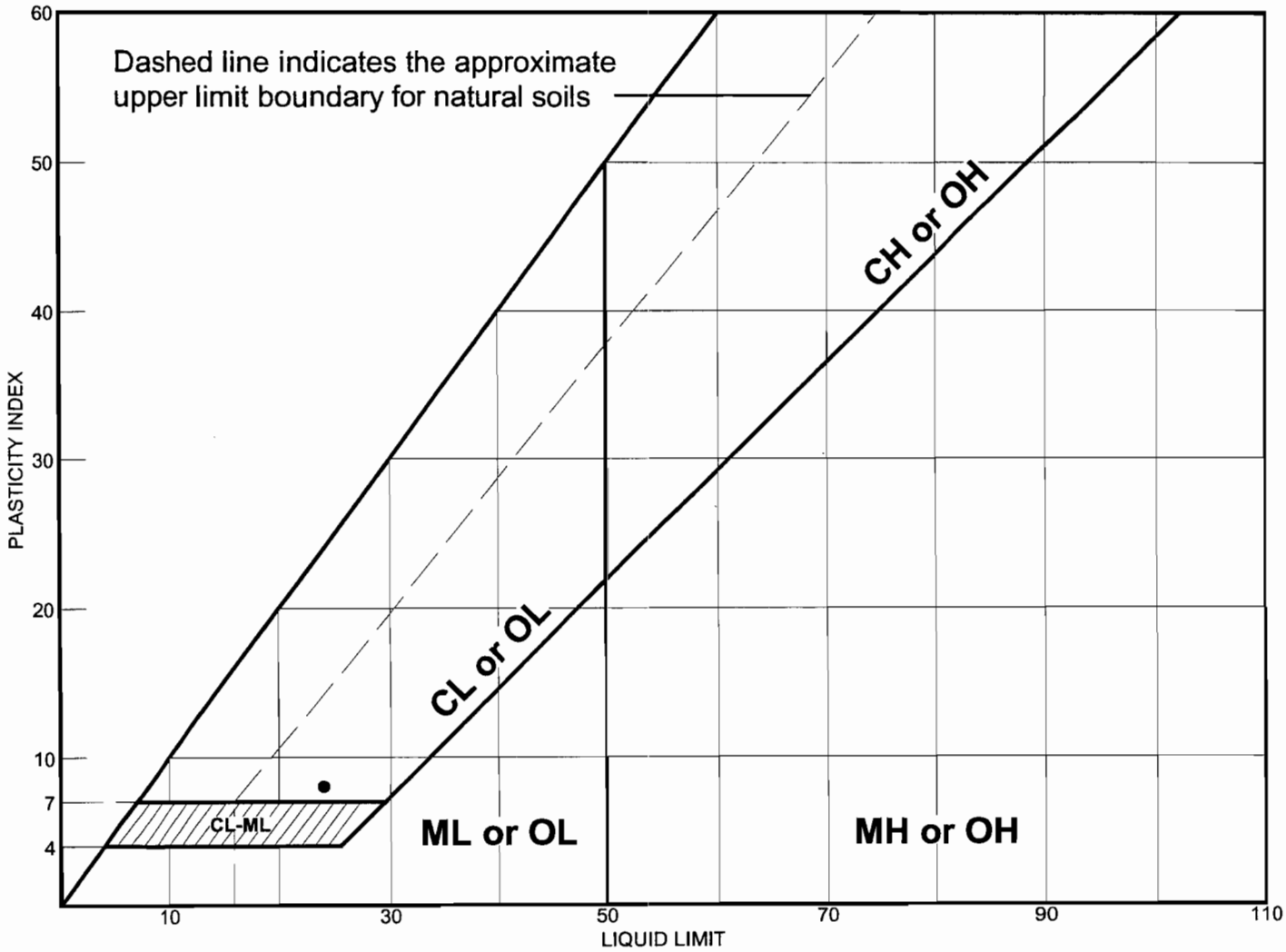
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand with gravel	24	16	8			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-20 **Sample No.:** 5 **Elev./Depth:** 7.5'-9.0'

Remarks:

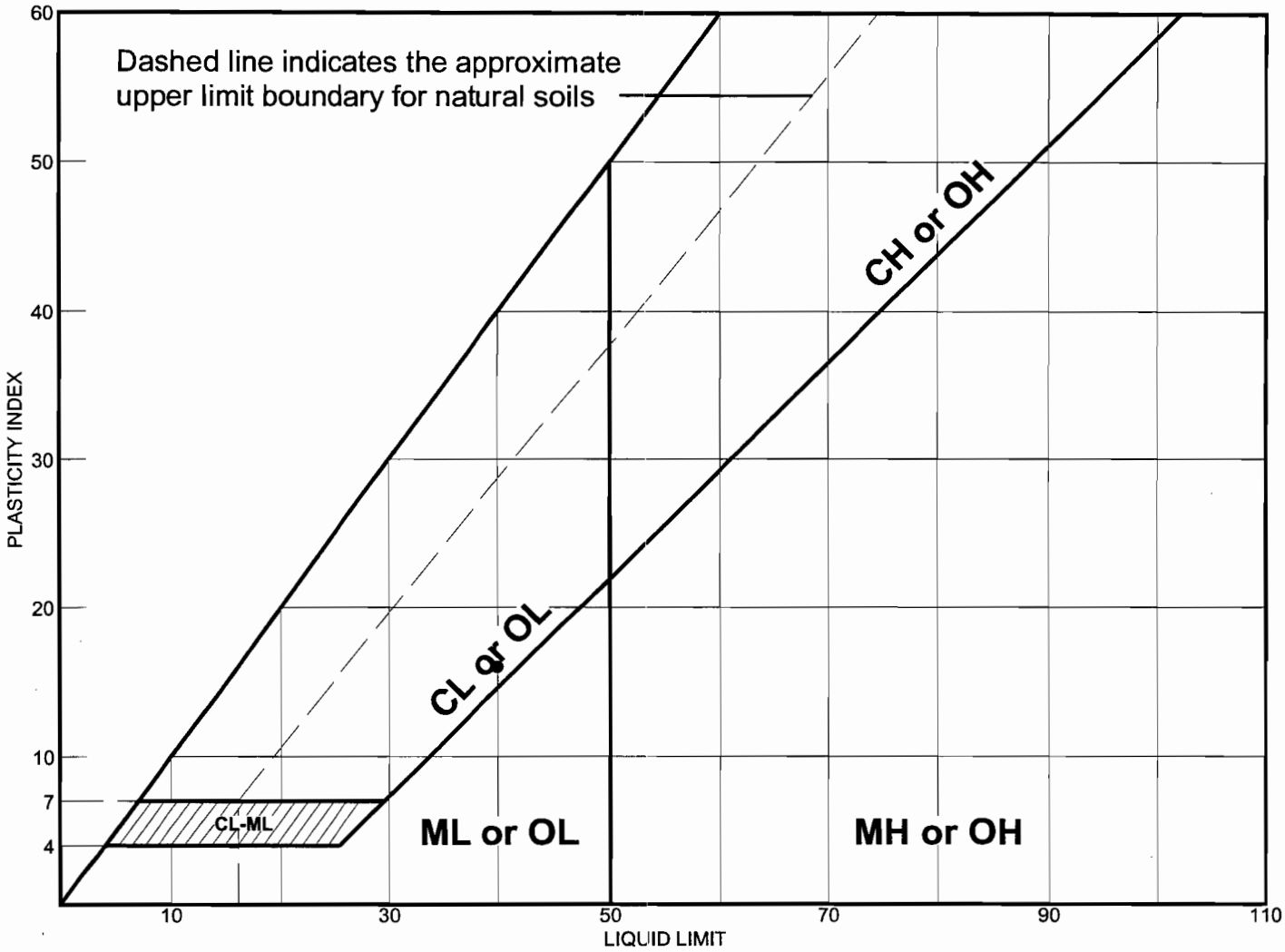
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown lean clay with sand, trace gravel	40	24	16			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-21 **Sample No.:** 2 **Elev./Depth:** 4.5'-7.5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

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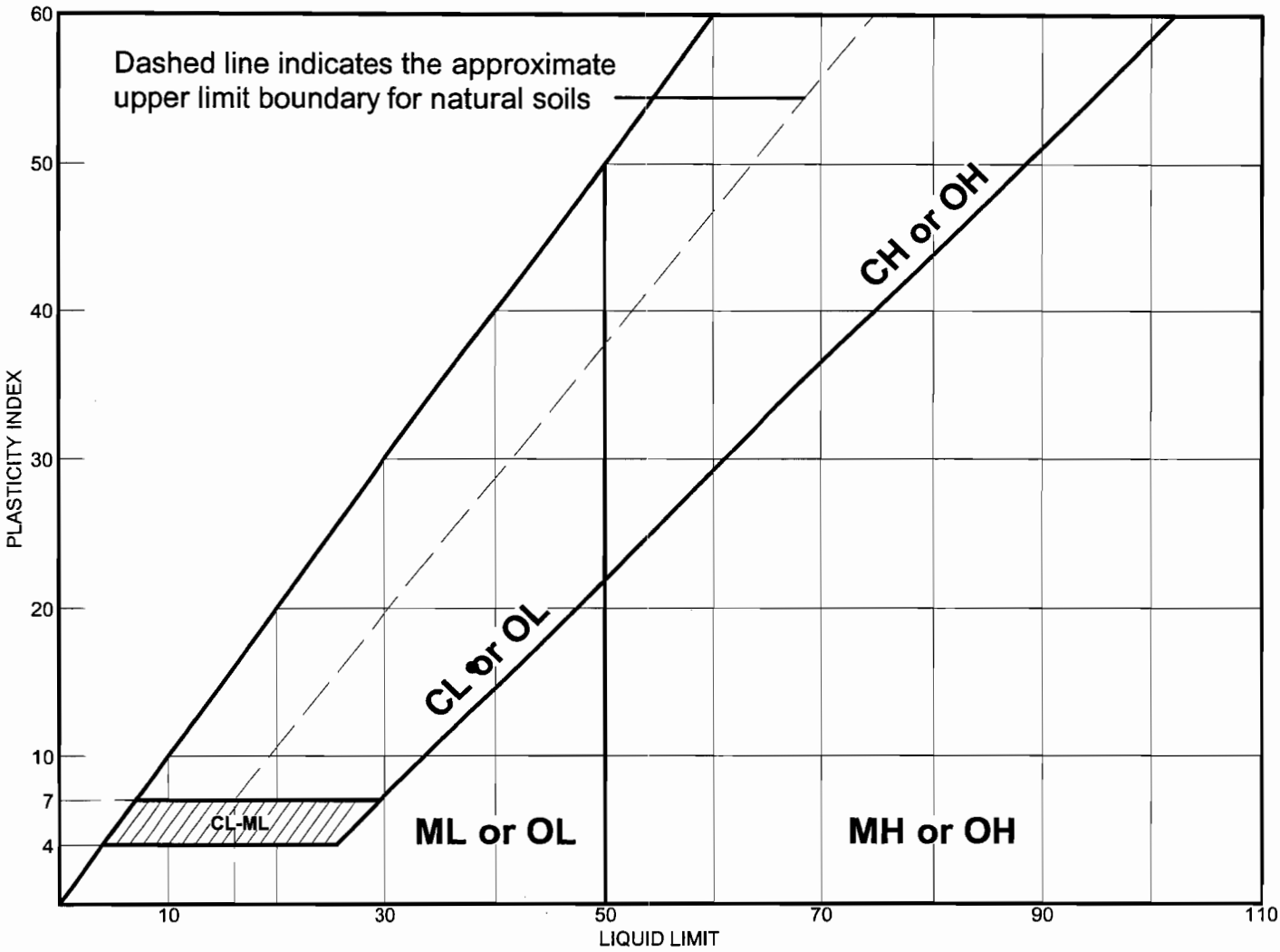
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy lean clay, few gravel	38	22	16			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-21 **Sample No.:** 6 **Elev./Depth:** 16.5'-19.5'

Remarks:

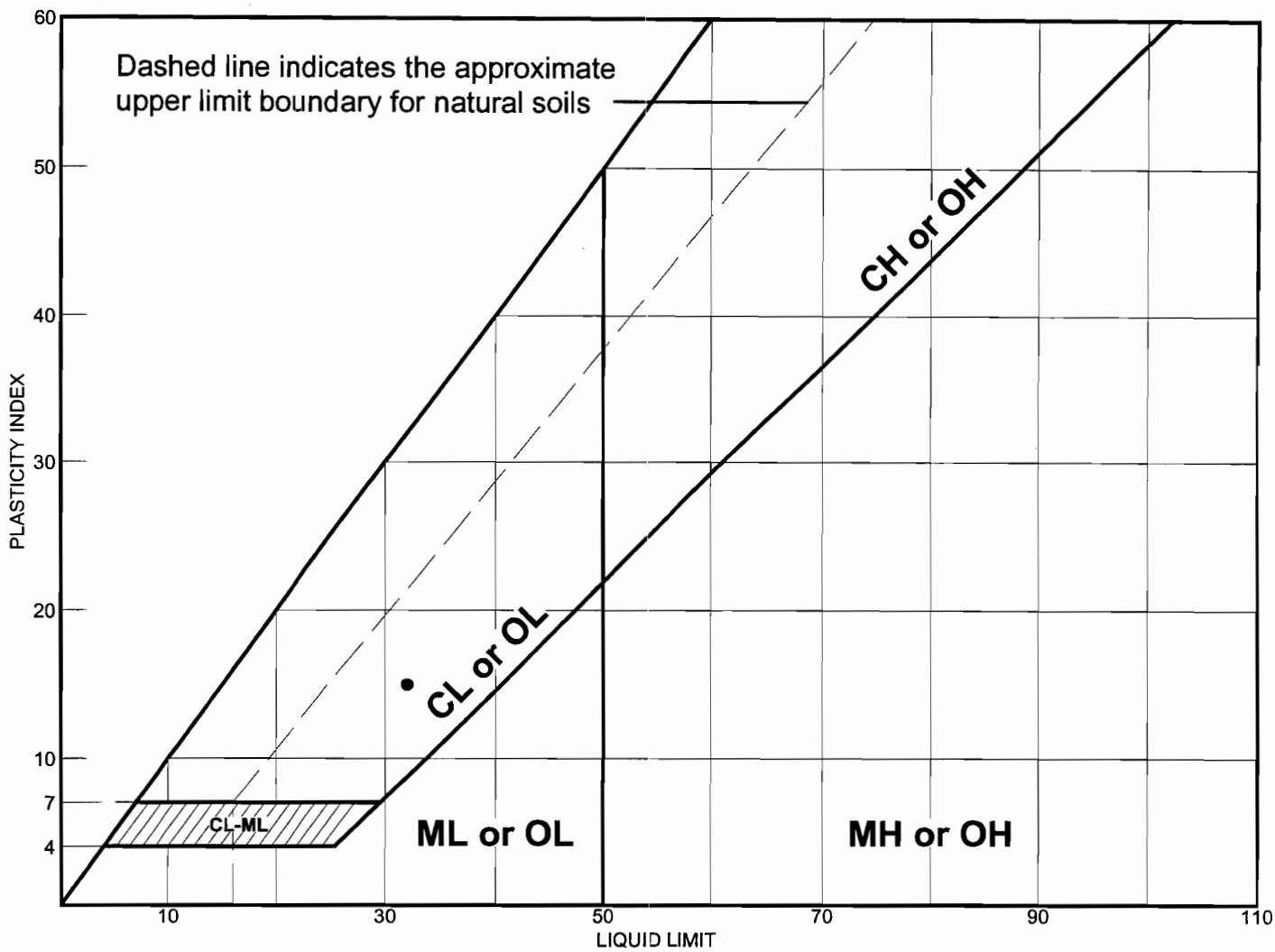
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray sandy lean clay, few gravel	32	17	15			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-21 **Sample No.:** 9 **Elev./Depth:** 25.5'-27.7'

Remarks:

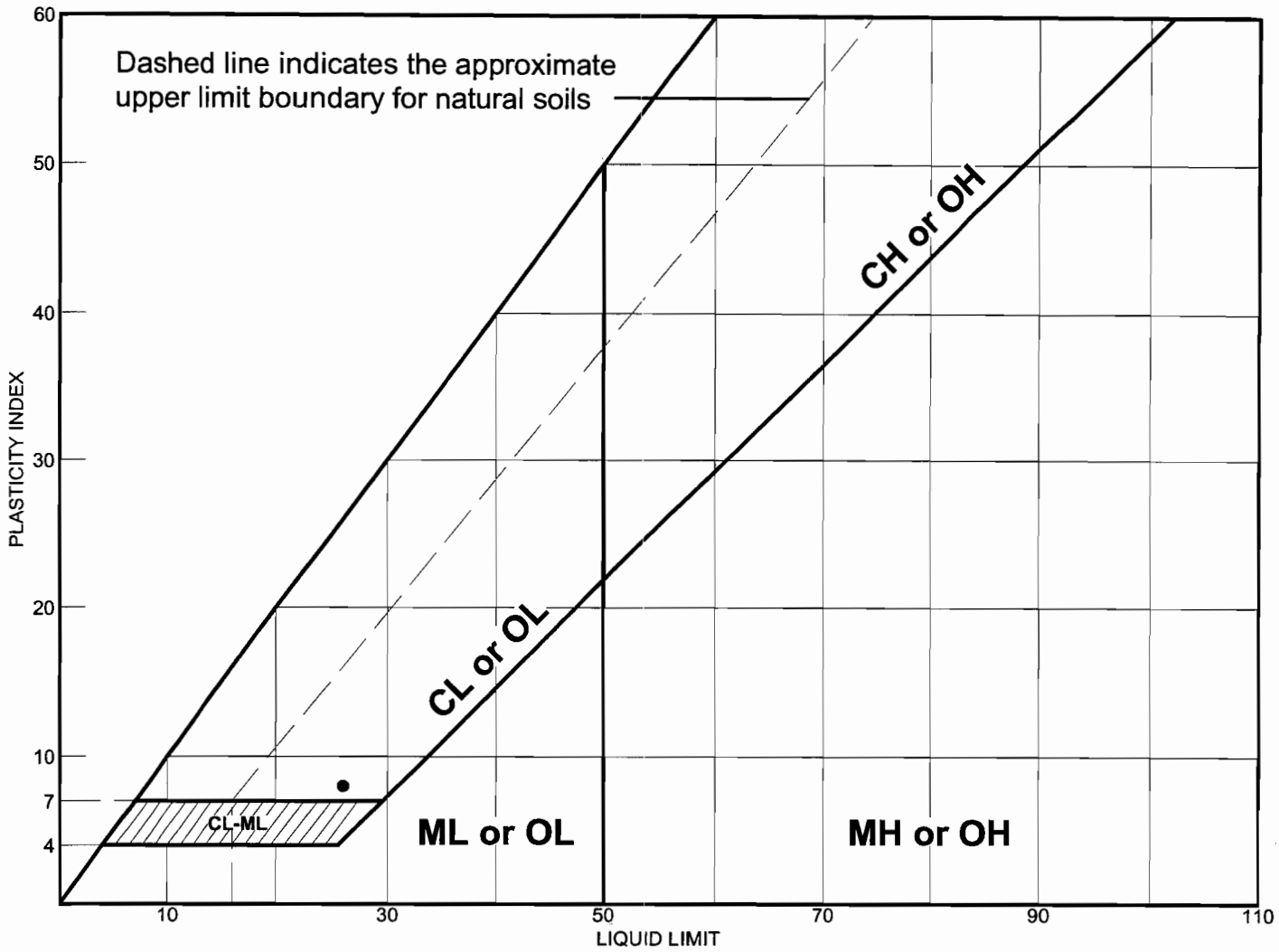
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown to gray clayey gravel with sand	26	18	8			

Project No. 92528.020 **Client:** US Army Corps of Engineers

Project: Bolivar Dam DSA-Seepage Study

DACW69-03-D-0023 (Task #20)

● **Source:** C-04-21 **Sample No.:** 16 **Elev./Depth:** 45.0'-48.0'

Remarks:

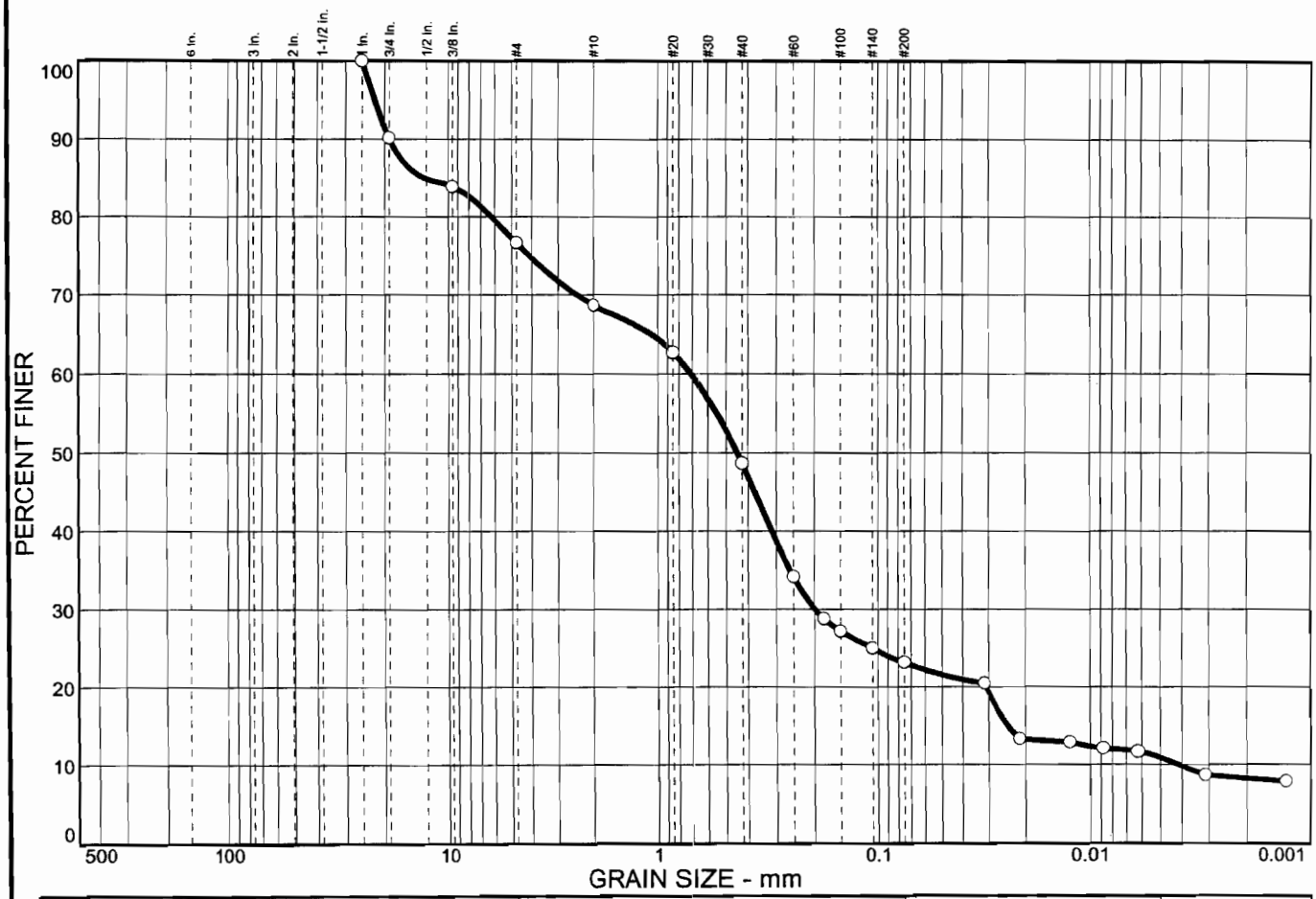
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	23.3	53.5	12.3	10.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	90.2		
0.375 in.	83.9		
#4	76.7		
#10	68.7		
#20	62.7		
#40	48.7		
#60	34.2		
#80	28.8		
#100	27.2		
#140	25.0		
#200	23.2		

* (no specification provided)

Soil Description

Brown silty/clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.8 D_{60}= 0.707 D_{50}= 0.446
D_{30}= 0.198 D_{15}= 0.0241 D_{10}= 0.0041
C_u= 171.22 C_c= 13.44

Classification

USCS= AASHTO=

Remarks

Sample No.: 4 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 4.5'-6.5'

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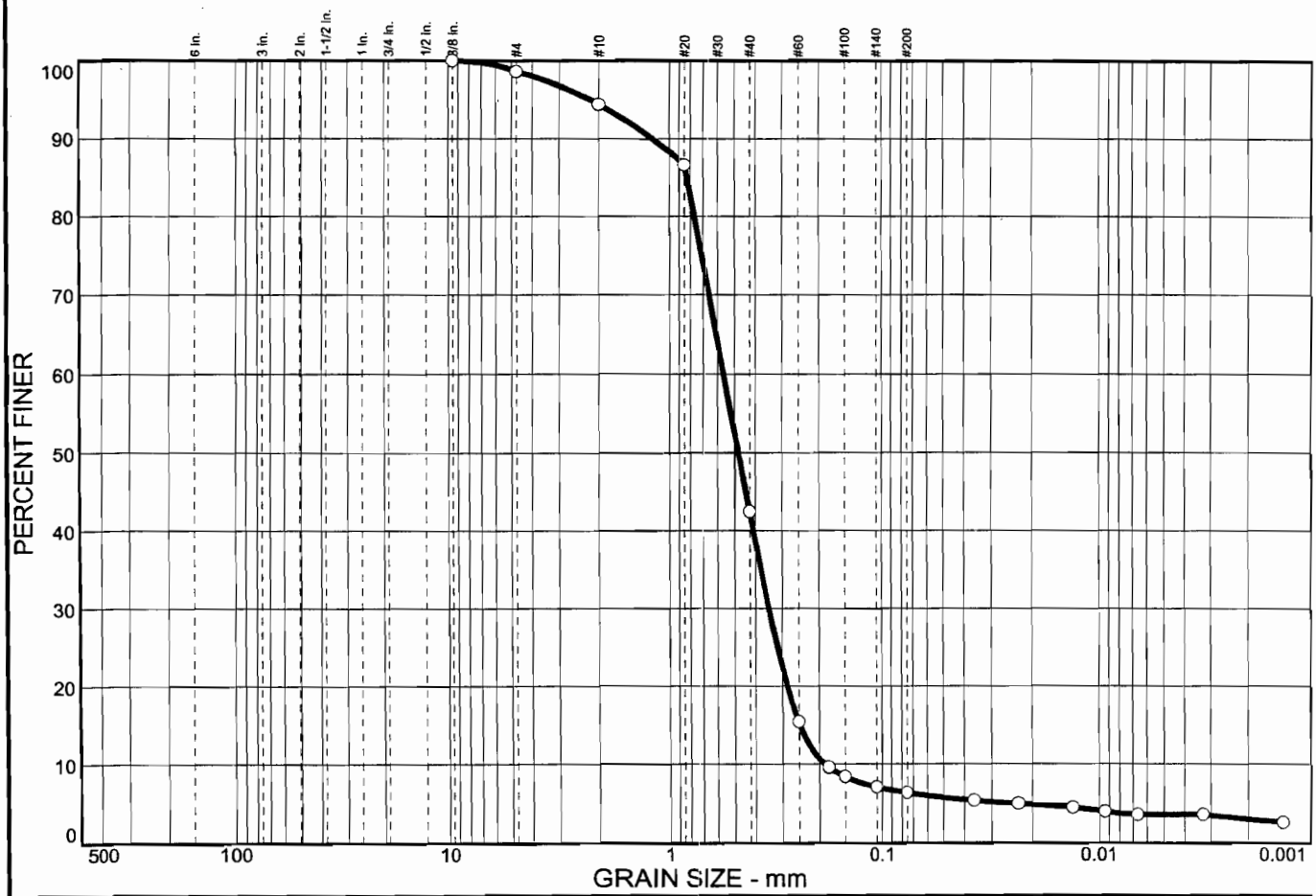
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	92.2	2.8	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.6		
#10	94.4		
#20	86.6		
#40	42.5		
#60	15.4		
#80	9.6		
#100	8.4		
#140	7.1		
#200	6.4		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.829 D_{60}= 0.561 D_{50}= 0.479
D_{30}= 0.345 D_{15}= 0.247 D_{10}= 0.188
C_u= 2.98 C_c= 1.13

Classification

USCS= AASHTO=

Remarks

Sample No.: 6 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 9.0'-12.0'

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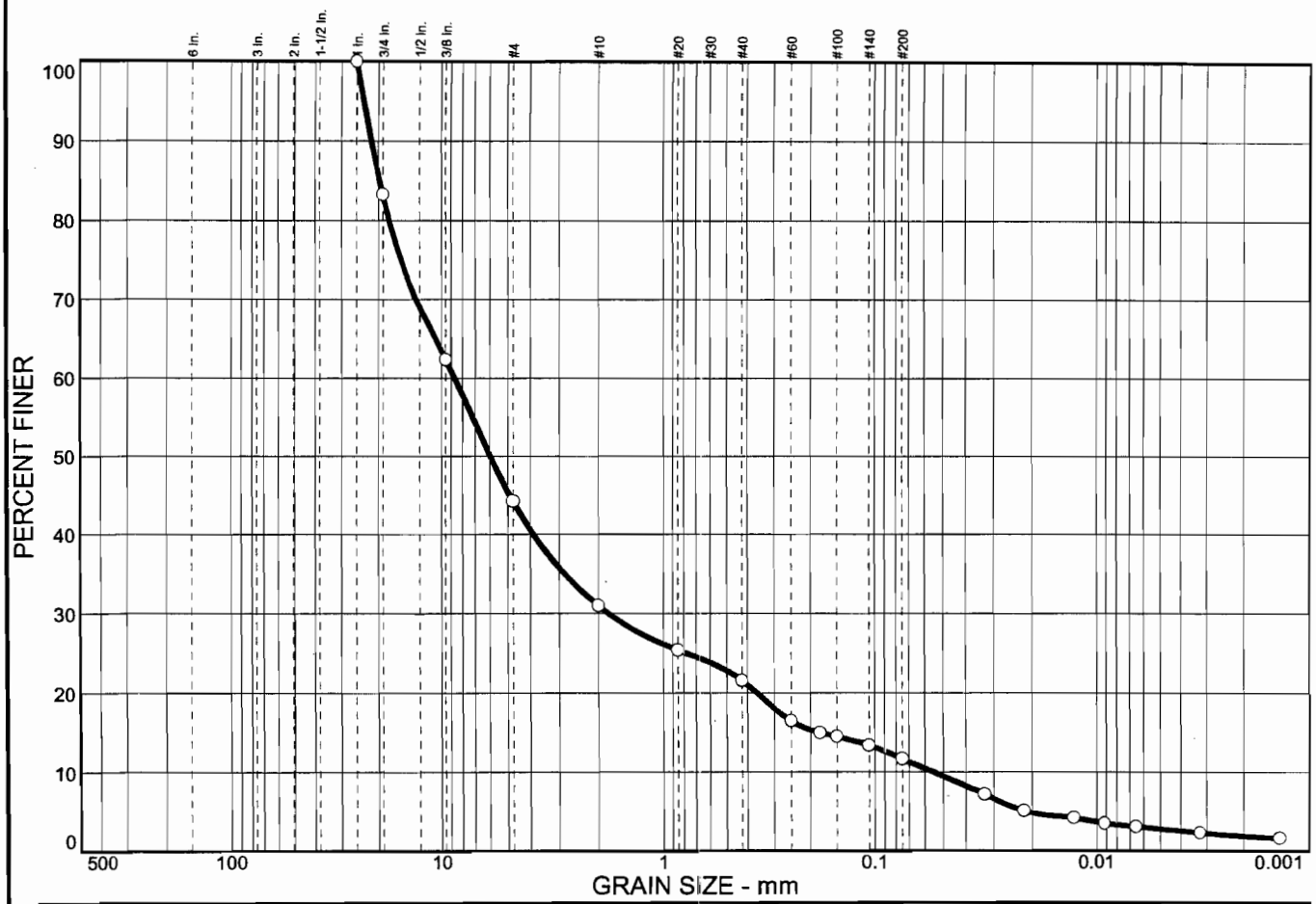
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	55.7	32.6	8.9	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	83.3		
0.375 in.	62.4		
#4	44.3		
#10	31.0		
#20	25.4		
#40	21.6		
#60	16.5		
#80	15.0		
#100	14.5		
#140	13.4		
#200	11.7		

* (no specification provided)

Soil Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 19.7 D_{60}= 8.65 D_{50}= 5.96
D_{30}= 1.79 D_{15}= 0.180 D_{10}= 0.0546
C_u= 158.44 C_c= 6.80

Classification

USCS= AASHTO=

Remarks

Sample No.: 9 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 16.5'-19.5'

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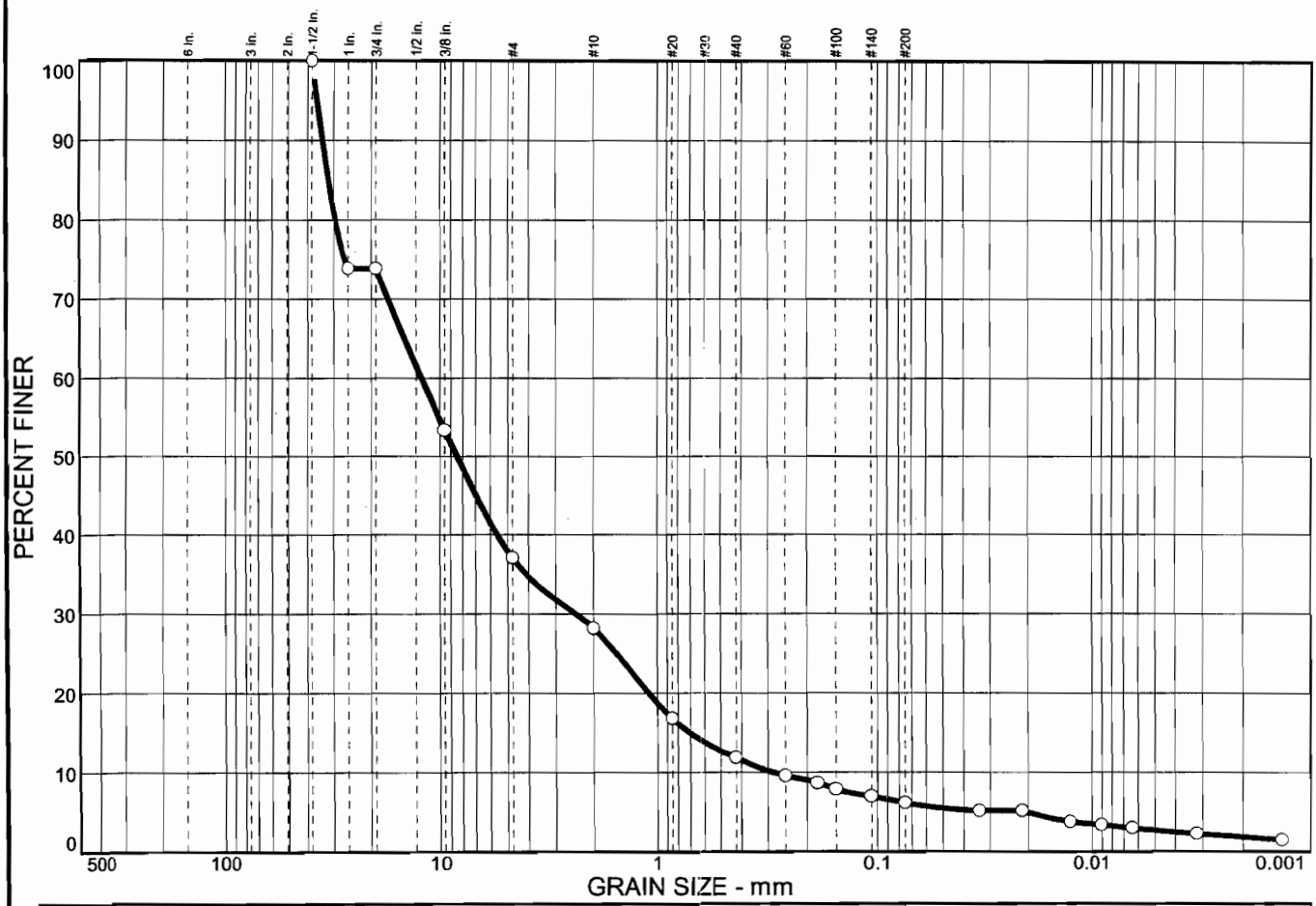
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	62.9	30.9	3.5	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	73.9		
0.75 in.	73.9		
0.375 in.	53.4		
#4	37.1		
#10	28.2		
#20	16.8		
#40	11.9		
#60	9.6		
#80	8.7		
#100	7.9		
#140	7.0		
#200	6.2		

* (no specification provided)

Soil Description

Brown well graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 31.7 D_{60}= 12.0 D_{50}= 8.42
D_{30}= 2.41 D_{15}= 0.703 D_{10}= 0.282
C_u= 42.46 C_c= 1.71

Classification

USCS= AASHTO=

Remarks

Zero reatained on the 3/4 inch sieve

Sample No.: 12 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 25.5'-28.0'

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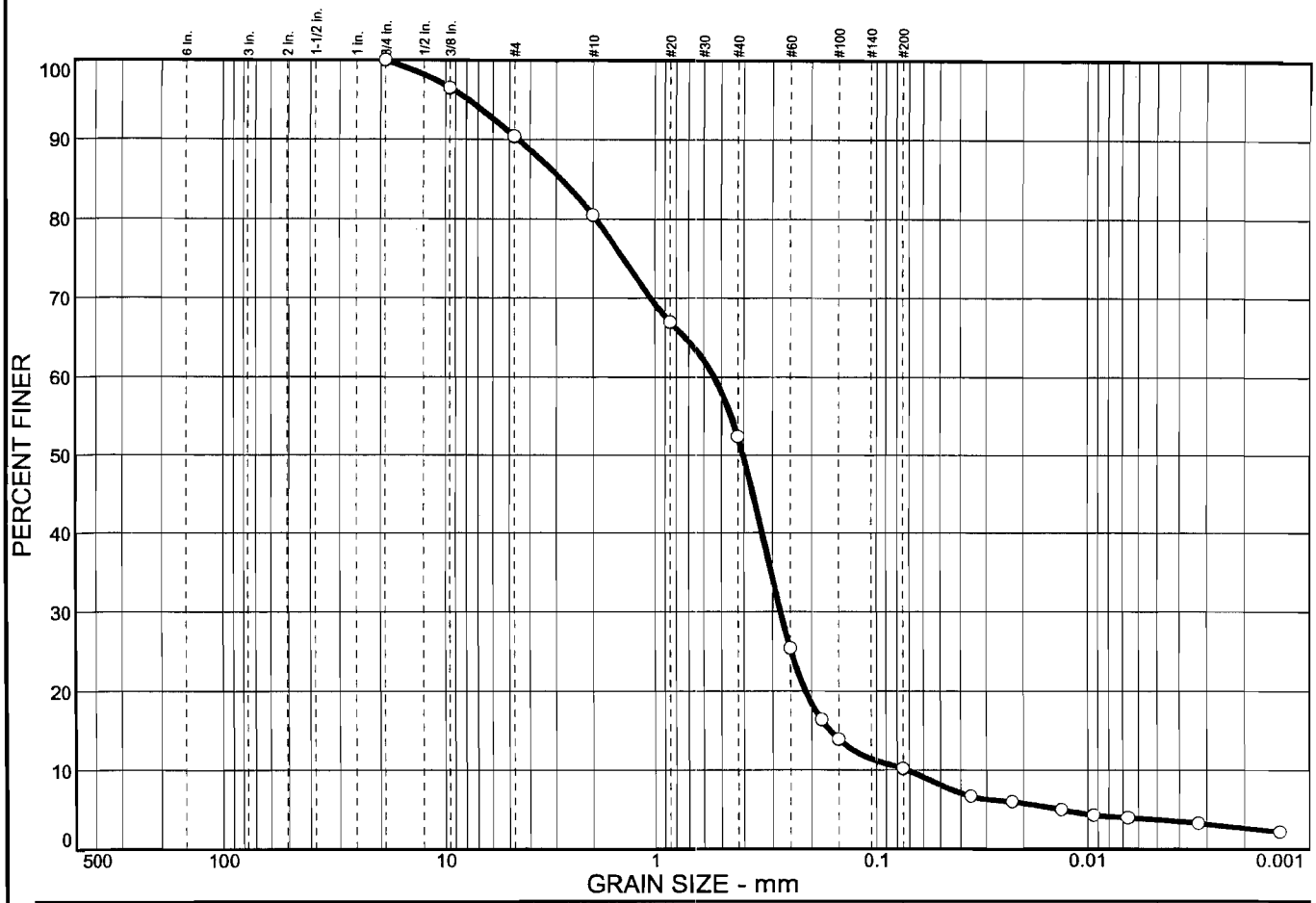
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.6	80.2	6.4	3.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.5		
#4	90.4		
#10	80.5		
#20	67.0		
#40	52.4		
#60	25.4		
#80	16.4		
#100	13.9		
#200	10.2		

* (no specification provided)

Soil Description

Brown well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.82 D_{60}= 0.538 D_{50}= 0.403
D_{30}= 0.276 D_{15}= 0.164 D_{10}= 0.0715
C_u= 7.53 C_c= 1.98

Classification

USCS= AASHTO=

Remarks

Sample No.: 14 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 30.0'-33.0'

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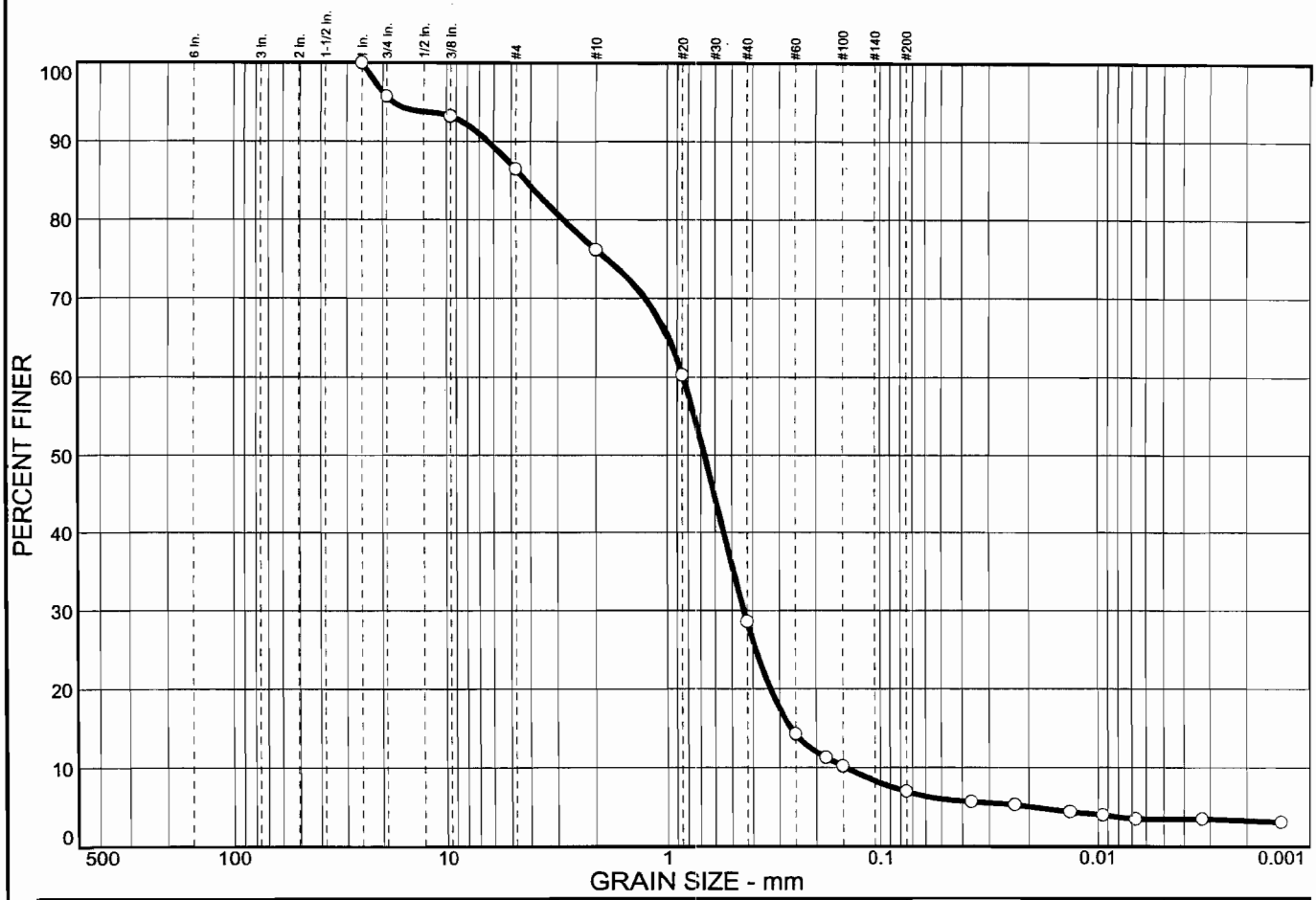
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.5	79.5	3.5	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
0.75 in.	95.7		
0.375 in.	93.2		
#4	86.5		
#10	76.2		
#20	60.3		
#40	28.6		
#60	14.3		
#80	11.3		
#100	10.2		
#200	7.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.21 D_{60}= 0.843 D_{50}= 0.669
D_{30}= 0.440 D_{15}= 0.262 D_{10}= 0.145
C_u= 5.82 C_c= 1.58

Classification

USCS= AASHTO=

Remarks

Sample No.: 18 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 42.0'-45.0'

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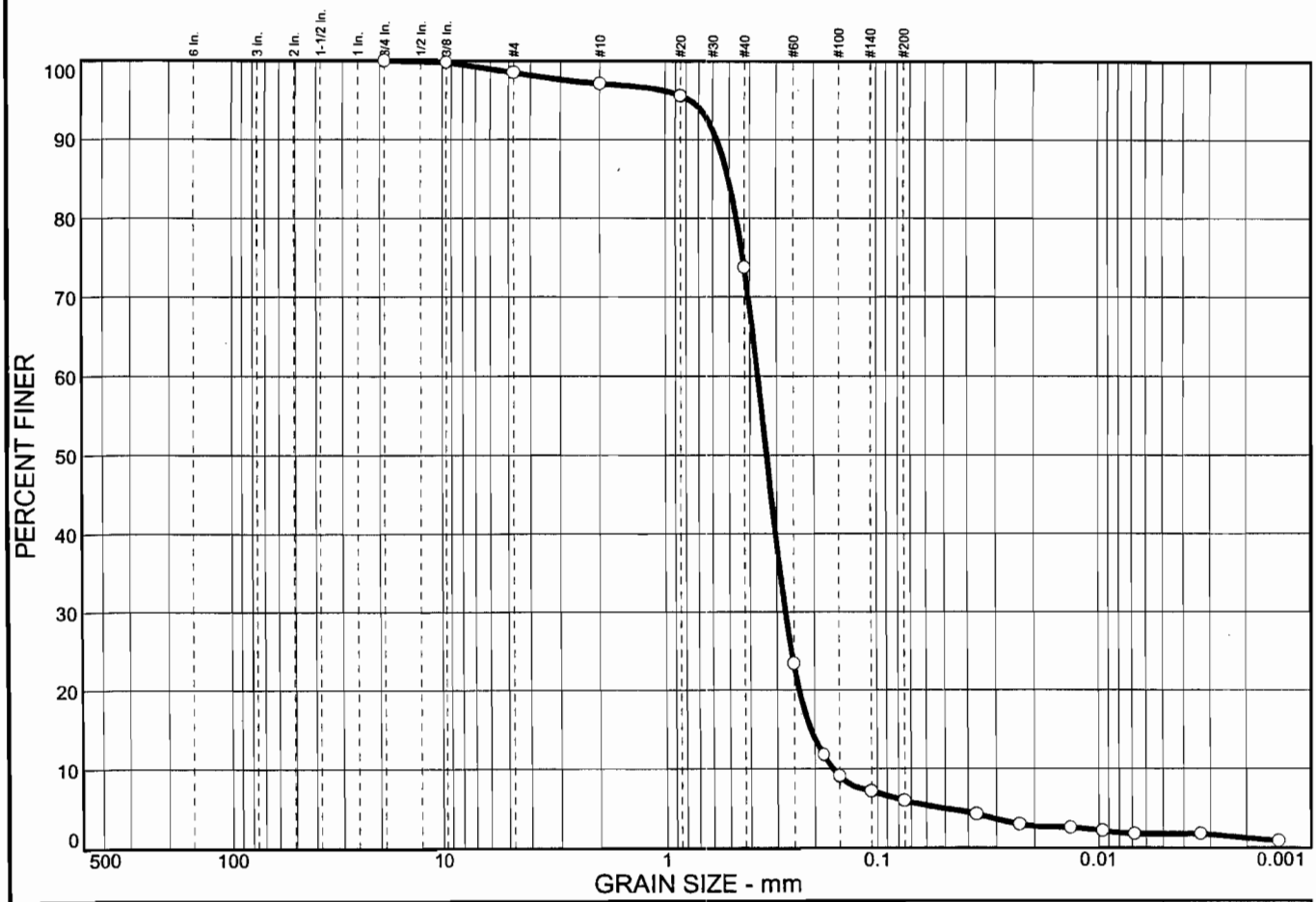
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.5	92.5	4.2	1.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.8		
#4	98.5		
#10	97.1		
#20	95.6		
#40	73.8		
#60	23.4		
#80	11.8		
#100	9.1		
#140	7.2		
#200	6.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.505 D_{60}= 0.367 D_{50}= 0.333
D_{30}= 0.273 D_{15}= 0.208 D_{10}= 0.161
C_u= 2.28 C_c= 1.26

Classification

USCS= AASHTO=

Remarks

Sample No.: 24 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 57.6'-60.0'

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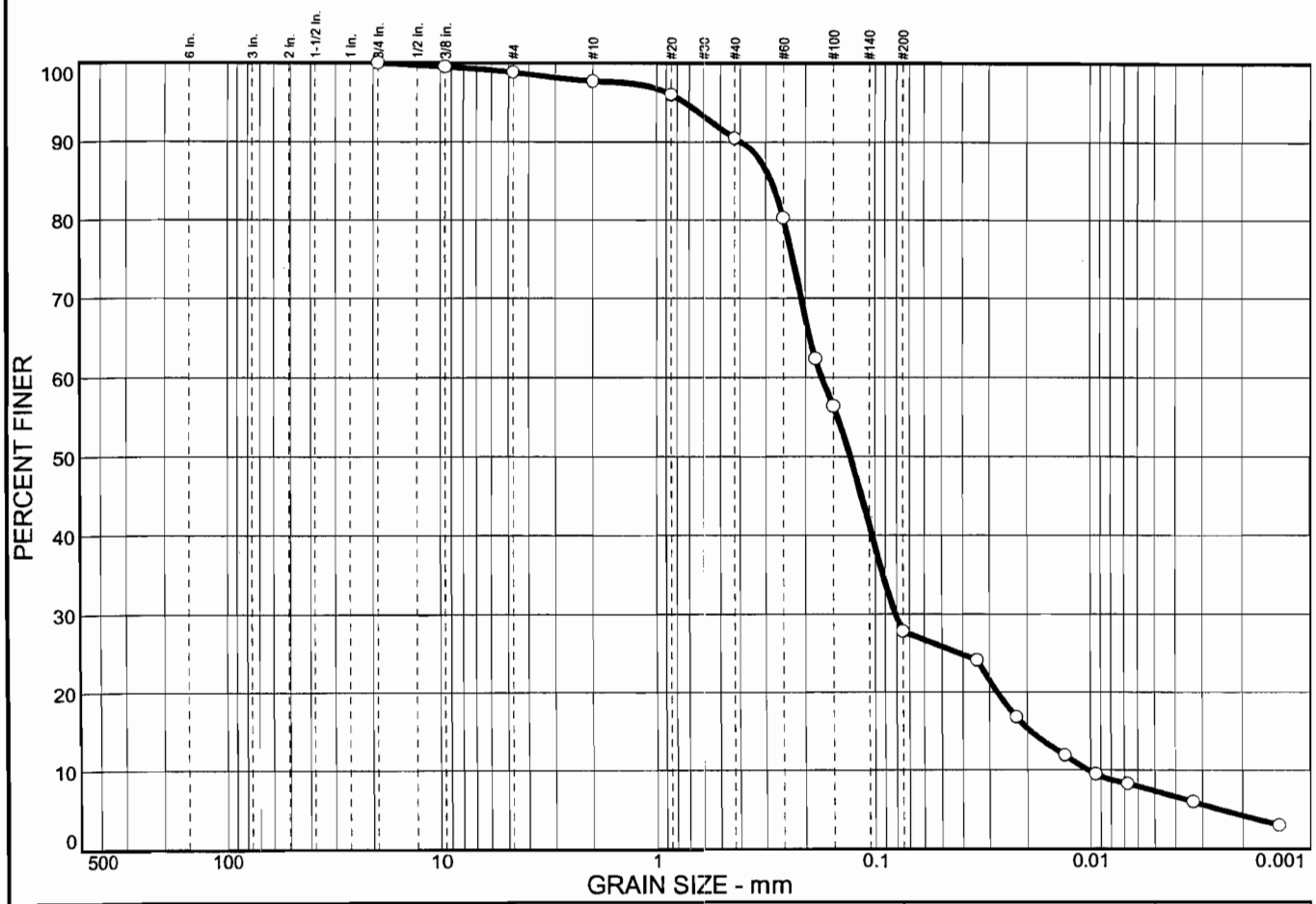
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	71.0	20.4	7.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	98.8		
#10	97.7		
#20	96.0		
#40	90.5		
#60	80.3		
#80	62.4		
#100	56.4		
#200	27.8		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.283 D_{60}= 0.169 D_{50}= 0.127
D_{30}= 0.0808 D_{15}= 0.0193 D_{10}= 0.0103
C_u= 16.37 C_c= 3.76

Classification

USCS= AASHTO=

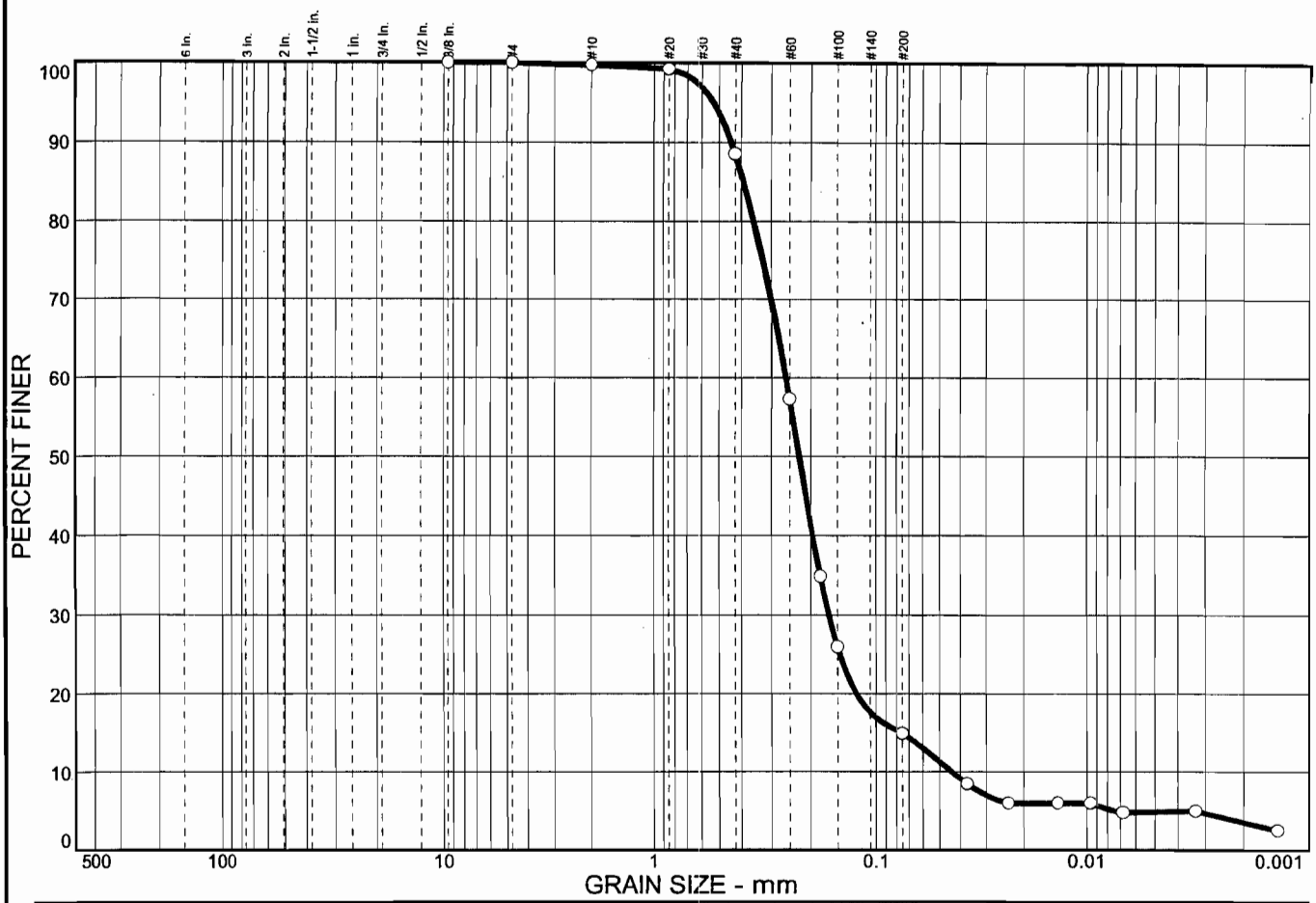
Remarks

Sample No.: 28 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 65.0'-67.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	85.1	10.0	4.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.7		
#20	99.2		
#40	88.6		
#60	57.3		
#80	34.9		
#100	26.0		
#200	14.9		

* (no specification provided)

Soil Description

Light brown silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.391 D_{60}= 0.260 D_{50}= 0.226
D_{30}= 0.164 D_{15}= 0.0761 D_{10}= 0.0436
C_u= 5.95 C_c= 2.38

Classification

USCS= AASHTO=

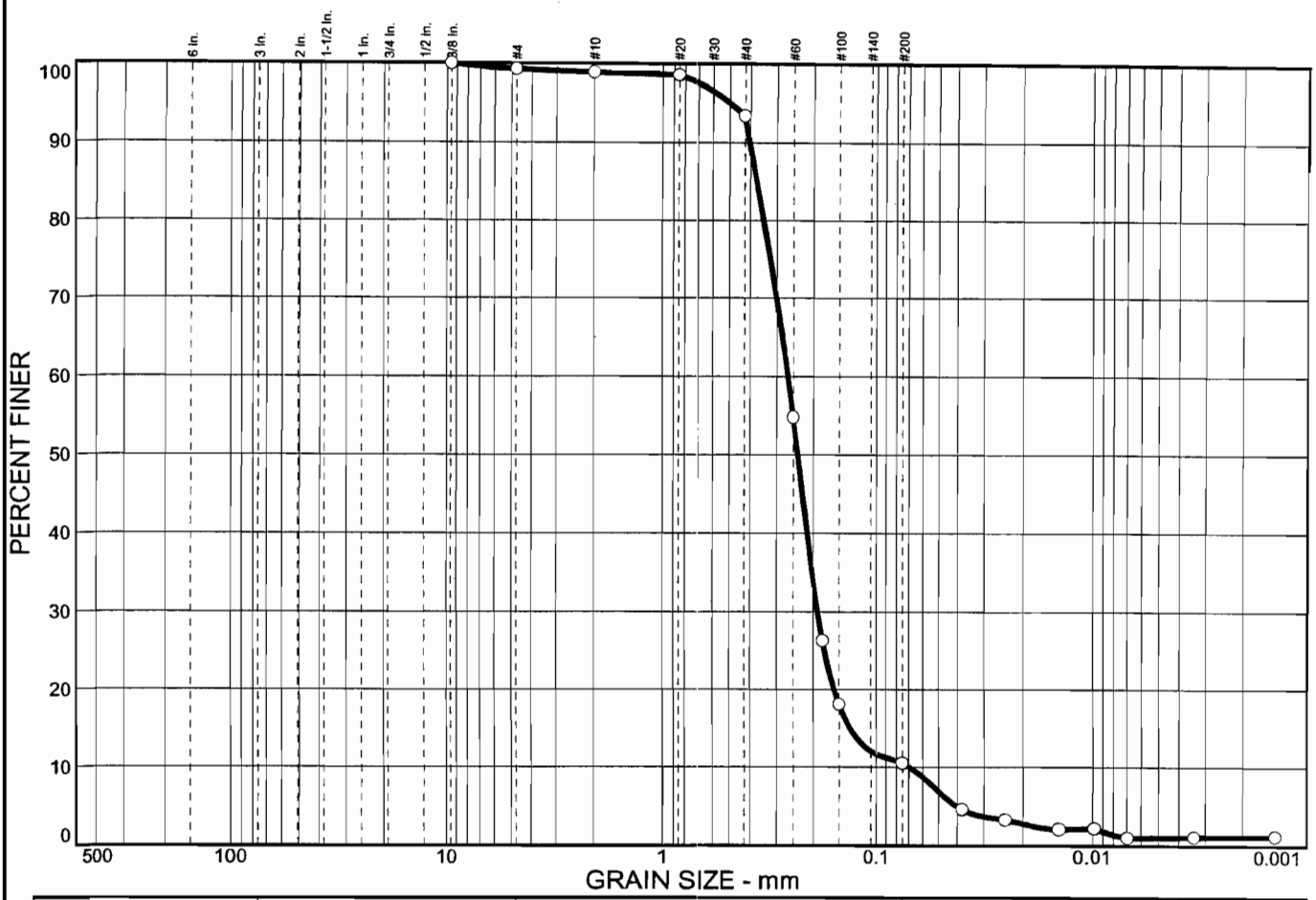
Remarks

Sample No.: 32 **Source of Sample:** C-04-01 **Date:** 06/28/2005
Location: **Elev./Depth:** 76.5'-79.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	88.8	9.5	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.3		
#10	98.9		
#20	98.6		
#40	93.4		
#60	54.8		
#80	26.3		
#100	18.1		
#200	10.5		

* (no specification provided)

Soil Description

Light brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.373 D_{60}= 0.265 D_{50}= 0.237
D_{30}= 0.190 D_{15}= 0.133 D_{10}= 0.0693
C_u= 3.83 C_c= 1.96

Classification

USCS= AASHTO=

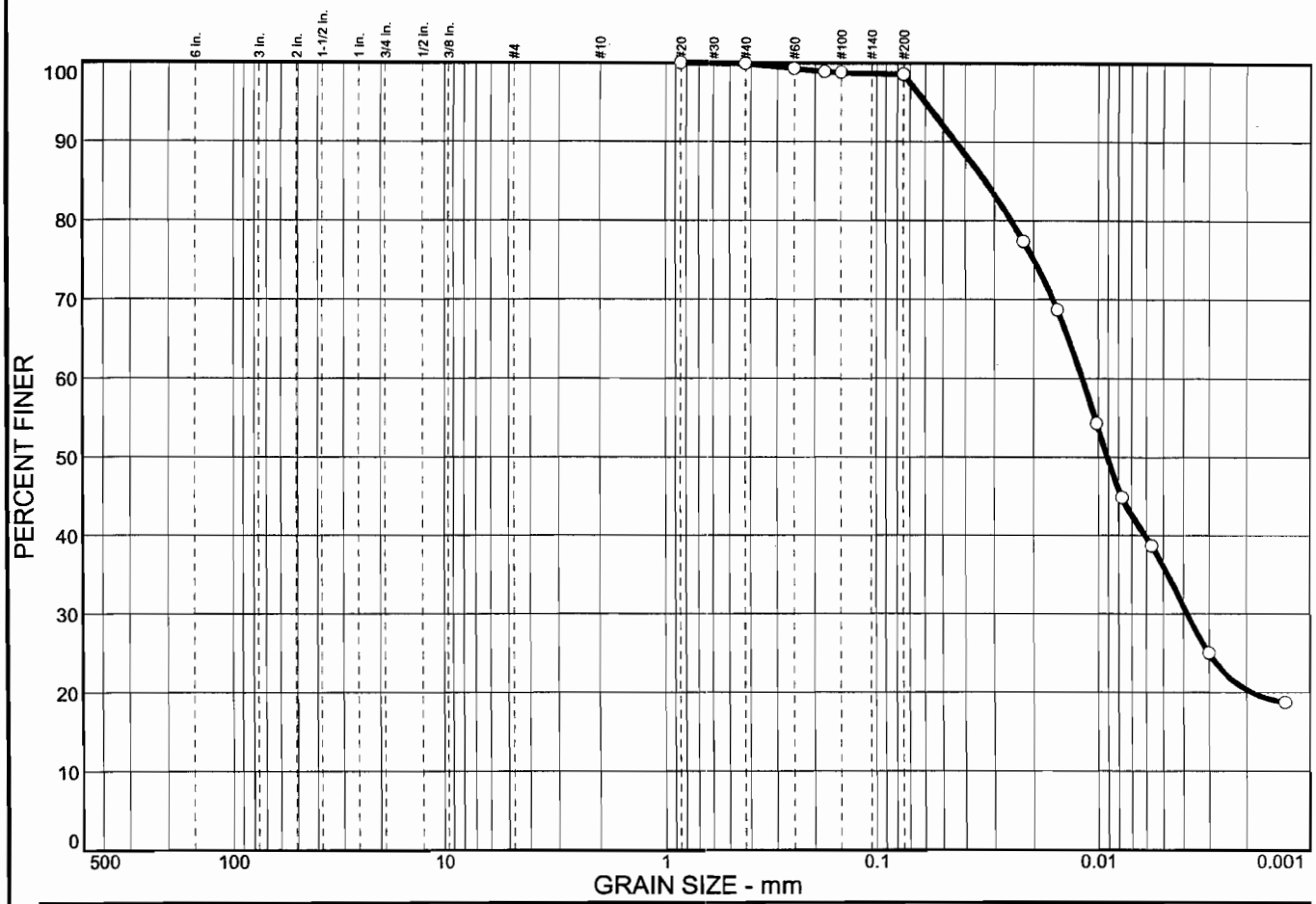
Remarks

Sample No.: 35 **Source of Sample:** C-04-01 **Date:** 06/28/2005
Location: **Elev./Depth:** 85.5'-87.8'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.4	62.5	36.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	99.9		
#60	99.3		
#80	98.9		
#100	98.8		
#200	98.6		

* (no specification provided)

Soil Description

Gray lean clay, trace sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0329 D_{60}= 0.0119 D_{50}= 0.0090
D_{30}= 0.0038 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 37 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 90.0'-93.0'

H. C. NUTTING COMPANY
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GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.7	85.1	14.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.7		
#80	99.6		
#100	99.4		
#200	99.3		

* (no specification provided)

Soil Description

Brown lean clay, trace sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0451 D_{60}= 0.0238 D_{50}= 0.0195
D_{30}= 0.0125 D_{15}= 0.0054 D_{10}= 0.0030
C_u= 8.04 C_c= 2.22

Classification

USCS= AASHTO=

Remarks

Sample No.: 41 **Source of Sample:** C-04-01 **Date:** 06/28/05
Location: **Elev./Depth:** 100.1'-101.3'

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SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	27.1	38.4	18.9	15.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	91.7		
0.75 in.	82.0		
0.375 in.	77.6		
#4	72.9		
#10	66.6		
#20	58.8		
#40	50.4		
#60	43.3		
#80	39.8		
#100	38.3		
#200	34.5		

* (no specification provided)

Soil Description

Brown to gray clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.0 D_{60}= 0.954 D_{50}= 0.413
D_{30}= 0.0375 D_{15}= 0.0044 D_{10}= 0.0014
C_u= 668.94 C_c= 1.03

Classification

USCS= AASHTO=

Remarks

Sample No.: 4 **Source of Sample:** C-04-02 **Date:** 4/29/05
Location: **Elev./Depth:** 4.5'-6.0'

H. C. NUTTING COMPANY
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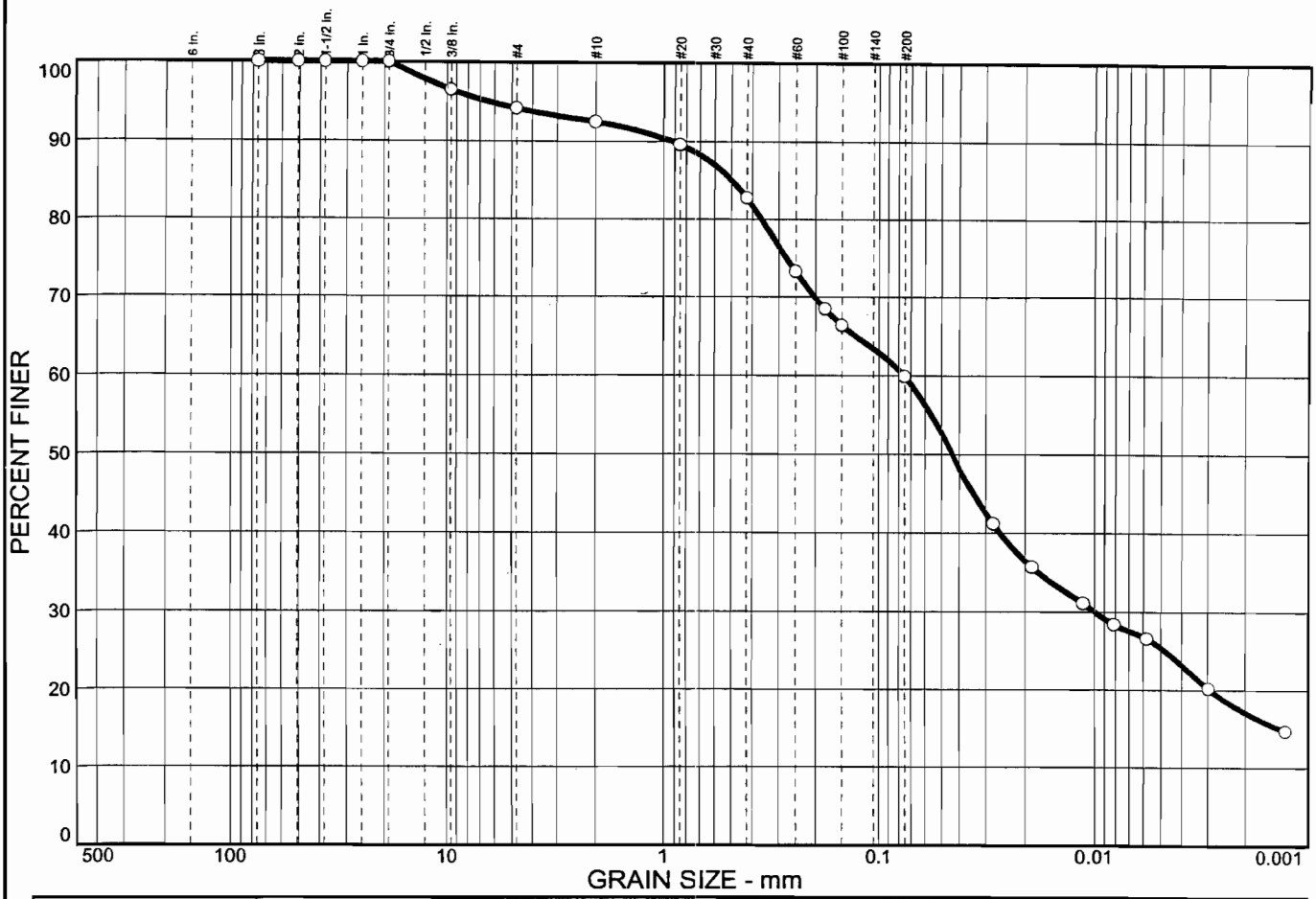
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.8	34.3	34.5	25.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	100.0		
0.375 in.	96.5		
#4	94.2		
#10	92.5		
#20	89.6		
#40	82.8		
#60	73.3		
#80	68.5		
#100	66.4		
#200	59.9		

* (no specification provided)

Soil Description

Brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.497 D_{60}= 0.0756 D_{50}= 0.0435
D_{30}= 0.0099 D_{15}= 0.0014 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: (5-6) **Source of Sample:** C-04-02 **Date:** 4-29-05
Location: **Elev./Depth:** 6.0'-7.5'

H. C. NUTTING COMPANY
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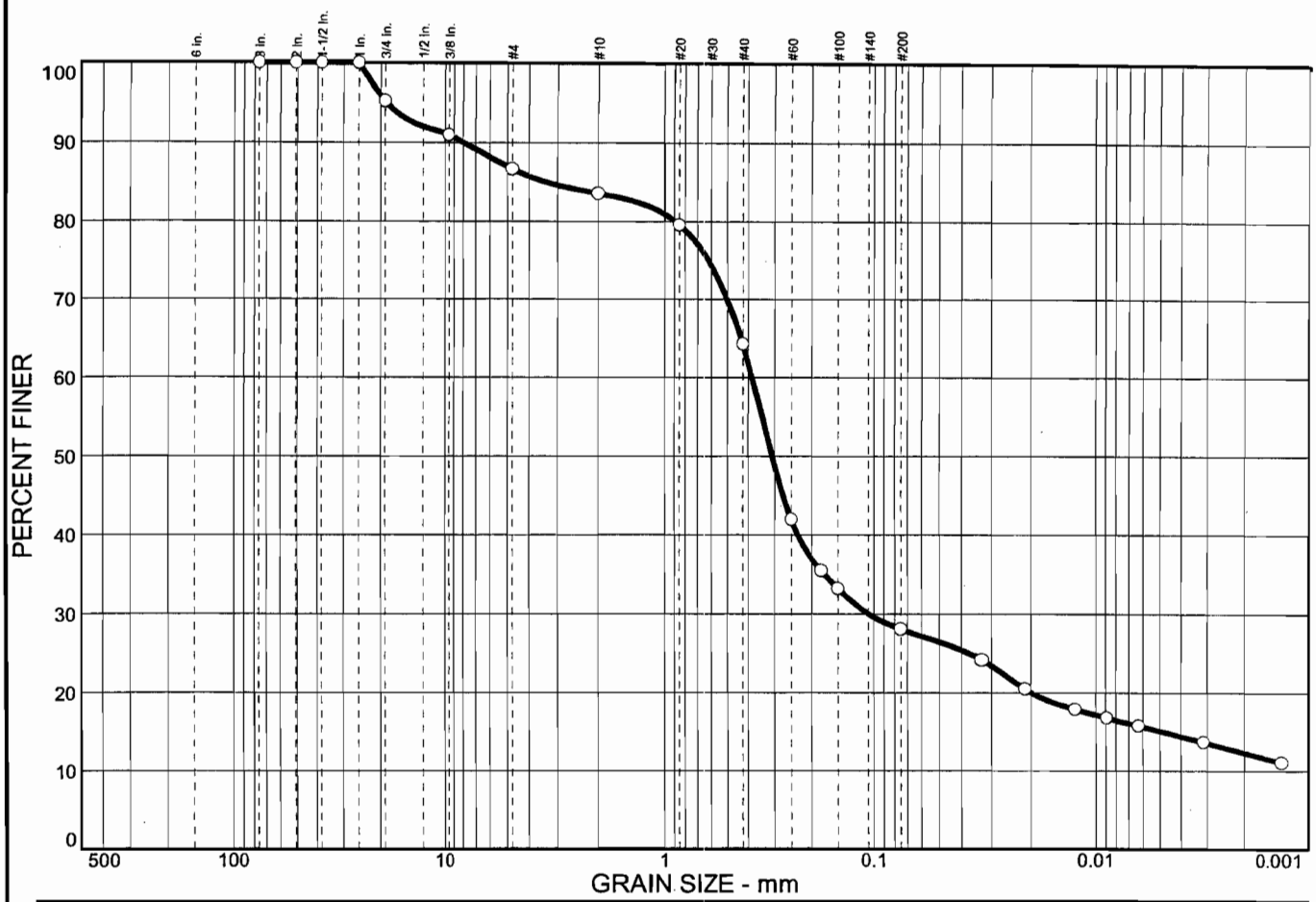
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.3	58.6	13.0	15.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	95.2		
0.375 in.	91.0		
#4	86.7		
#10	83.6		
#20	79.6		
#40	64.3		
#60	42.0		
#80	35.5		
#100	33.2		
#200	28.1		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.30 D_{60}= 0.384 D_{50}= 0.308
D_{30}= 0.105 D_{15}= 0.0048 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 11 **Source of Sample:** C-04-02 **Date:** 04-29-05
Location: **Elev./Depth:** 13.5'-15.0'

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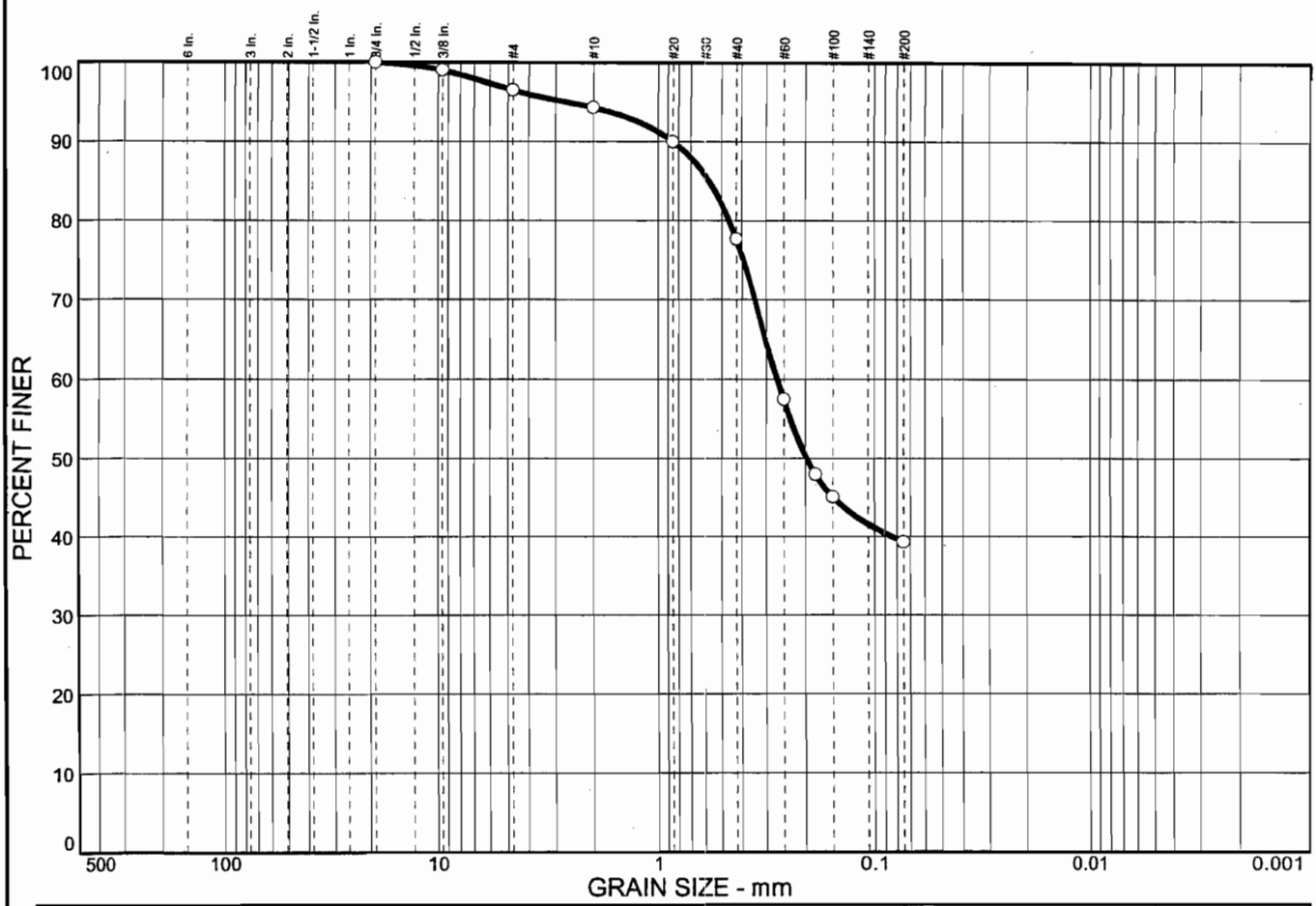
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.5	57.2	39.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.0		
#4	96.5		
#10	94.3		
#20	90.0		
#40	77.7		
#60	57.5		
#80	48.0		
#100	45.1		
#200	39.3		

* (no specification provided)

Soil Description

Brown silty/clayey sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.573 D_{60}= 0.267 D_{50}= 0.197
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Hydrometer data flawed.

Sample No.: 18 **Source of Sample:** C-04-02 **Date:** 06/28/05
Location: **Elev./Depth:** 22.5'-24.0'

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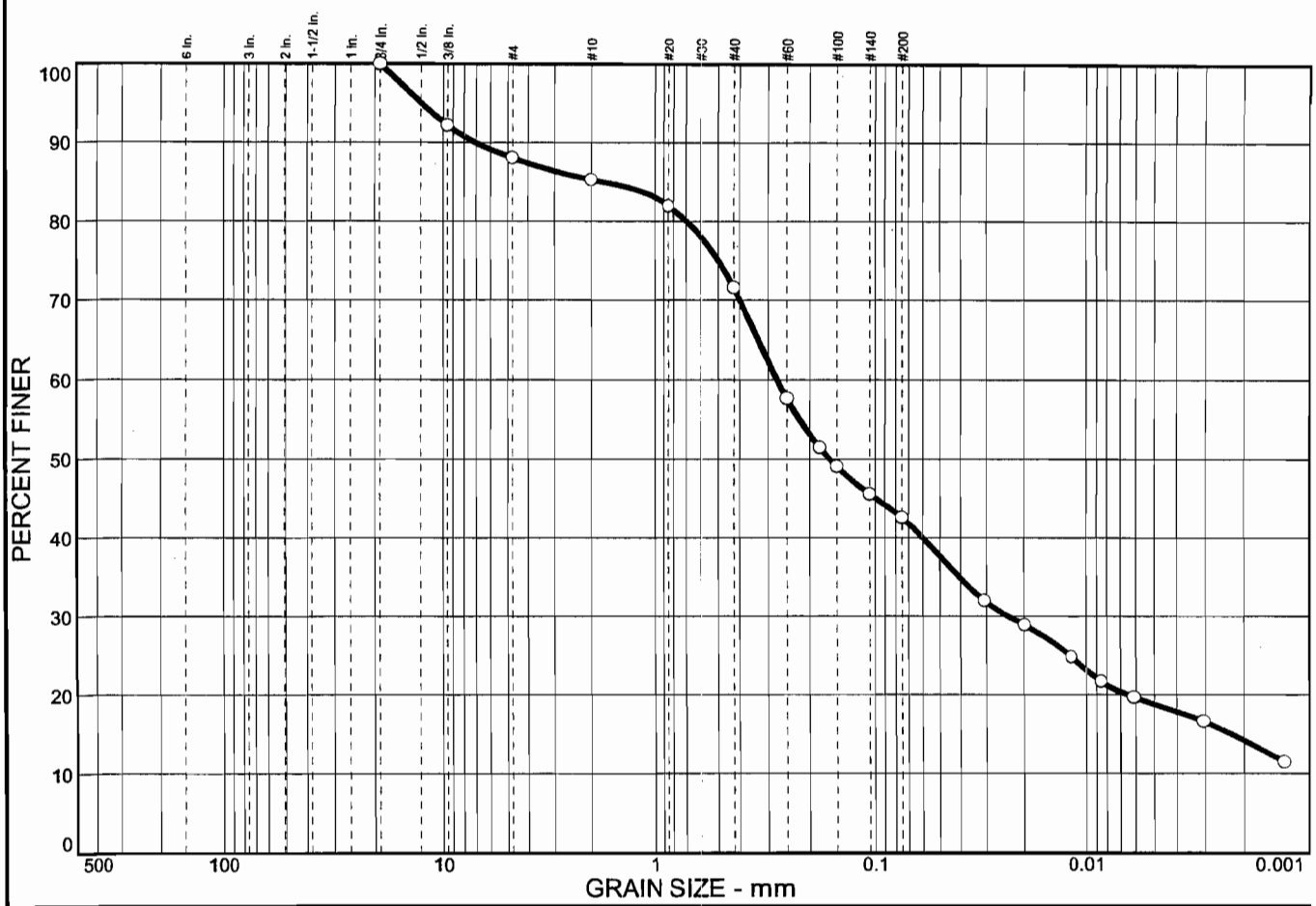
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.9	45.5	23.8	18.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	92.2		
#4	88.1		
#10	85.3		
#20	82.0		
#40	71.6		
#60	57.7		
#80	51.5		
#100	49.1		
#140	45.6		
#200	42.6		

* (no specification provided)

Soil Description

Brown clayey sand, few gravel

Atterberg Limits

PL= 14 LL= 22 PI= 8

Coefficients

D_{85}= 1.74 D_{60}= 0.274 D_{50}= 0.161
D_{30}= 0.0236 D_{15}= 0.0023 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

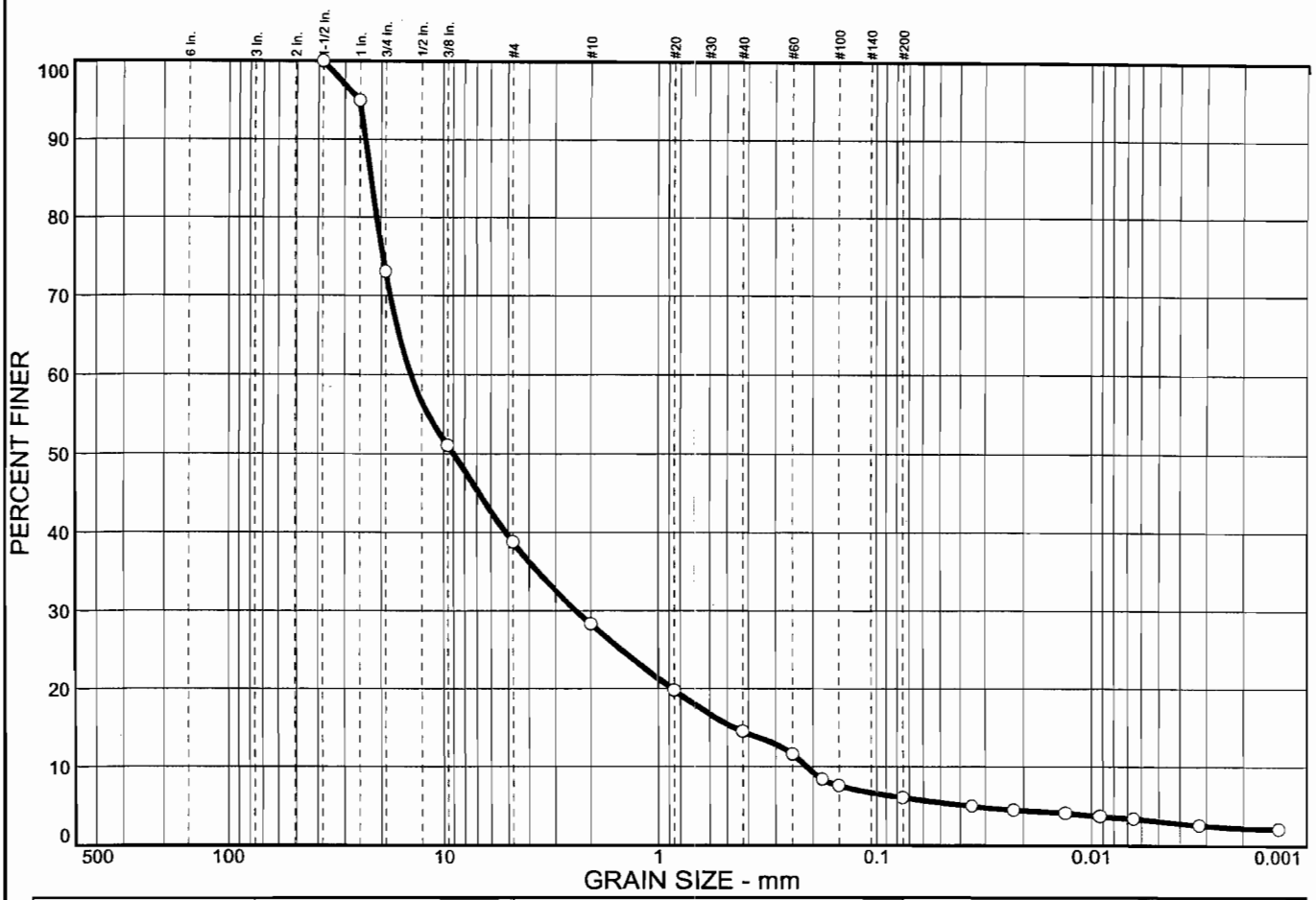
Remarks

Sample No.: 23 **Source of Sample:** C-04-02 **Date:** 07/05/05
Location: **Elev./Depth:** 30.0'-31.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	61.2	32.7	3.0	3.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.0		
0.75 in.	73.1		
0.375 in.	51.1		
#4	38.8		
#10	28.3		
#20	19.8		
#40	14.5		
#60	11.6		
#80	8.4		
#100	7.6		
#200	6.1		

* (no specification provided)

Soil Description

Gray well graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.5 D_{60}= 14.3 D_{50}= 8.95
D_{30}= 2.36 D_{15}= 0.466 D_{10}= 0.214
C_u= 66.98 C_c= 1.81

Classification

USCS= AASHTO=

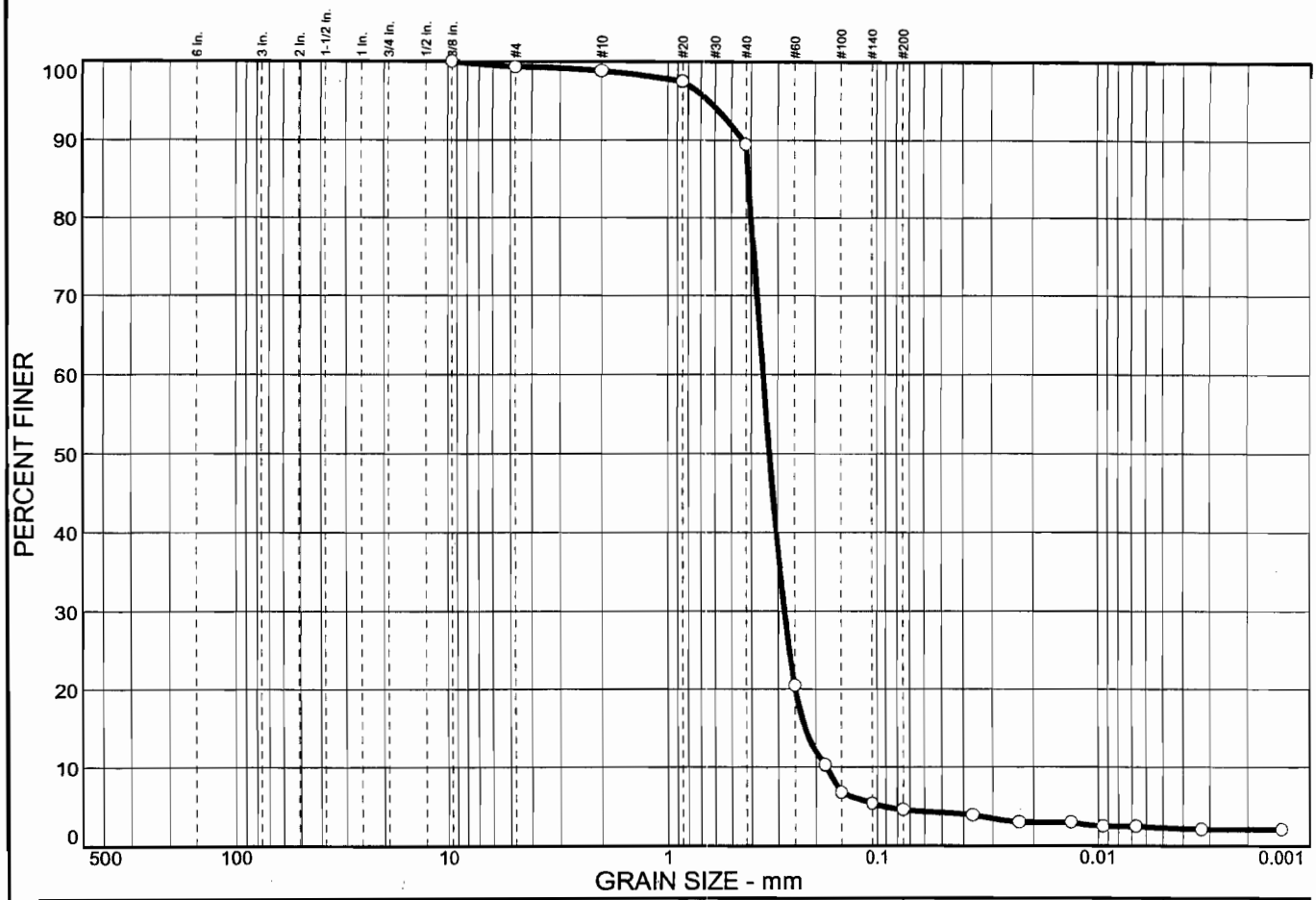
Remarks

Sample No.: 48 **Source of Sample:** C-04-02 **Date:** 06/28/05
Location: **Elev./Depth:** 66.0'-67.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	94.7	2.3	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.3		
#10	98.8		
#20	97.5		
#40	89.5		
#60	20.5		
#80	10.3		
#100	6.8		
#140	5.4		
#200	4.6		

* (no specification provided)

Soil Description

Brown poorly graded sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.413 D_{60}= 0.352 D_{50}= 0.329
D_{30}= 0.279 D_{15}= 0.224 D_{10}= 0.177
C_u= 1.99 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

Sample No.: 55 **Source of Sample:** C-04-02 **Date:** 06/28/05
Location: **Elev./Depth:** 76.5'-78.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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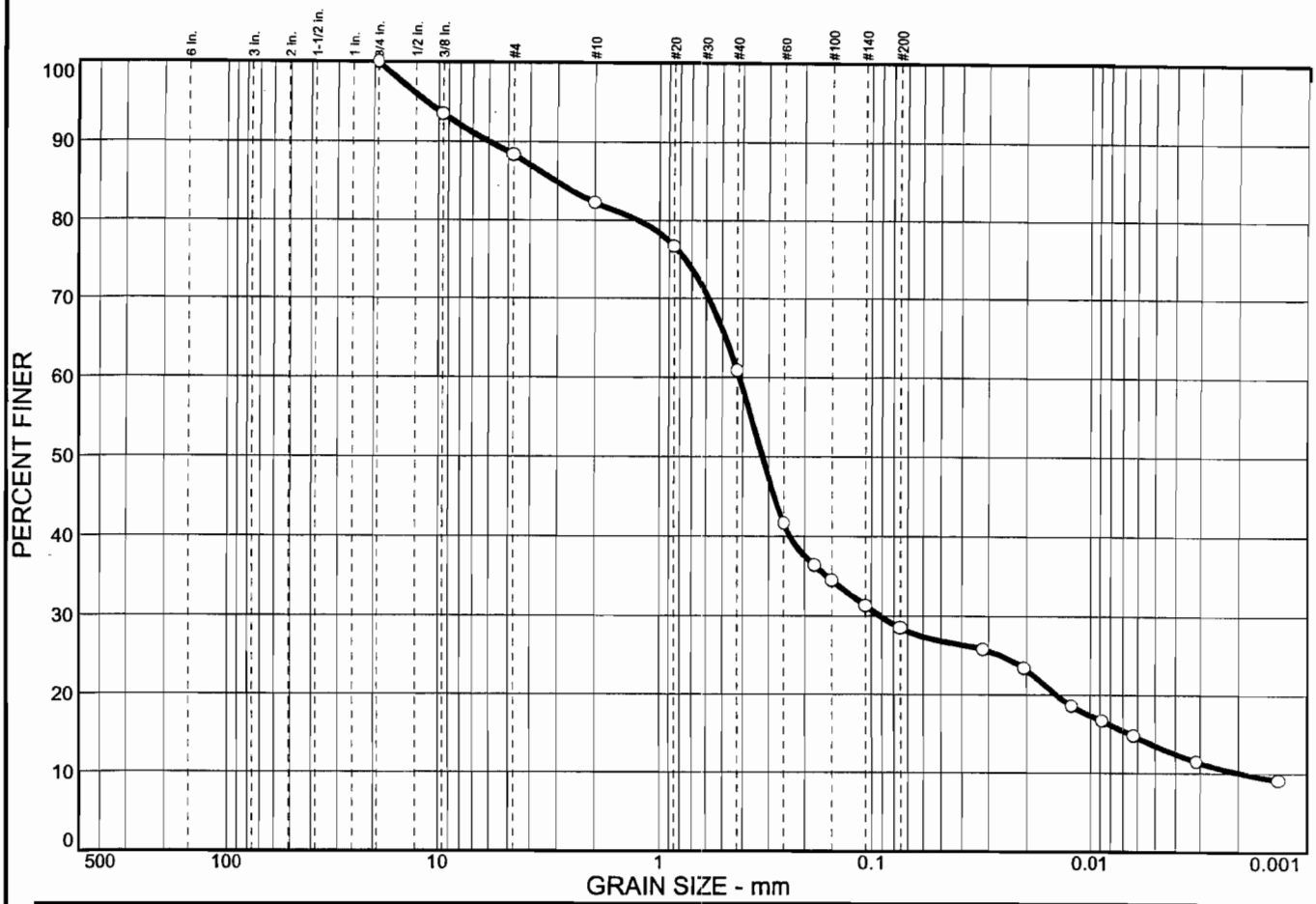
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.6	59.9	14.9	13.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.5		
#4	88.4		
#10	82.3		
#20	76.7		
#40	60.9		
#60	41.7		
#80	36.4		
#100	34.5		
#140	31.3		
#200	28.5		

* (no specification provided)

Soil Description

Brown clayey sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.03 D_{60}= 0.415 D_{50}= 0.321
D_{30}= 0.0914 D_{15}= 0.0065 D_{10}= 0.0019
C_u= 214.48 C_c= 10.43

Classification

USCS= AASHTO=

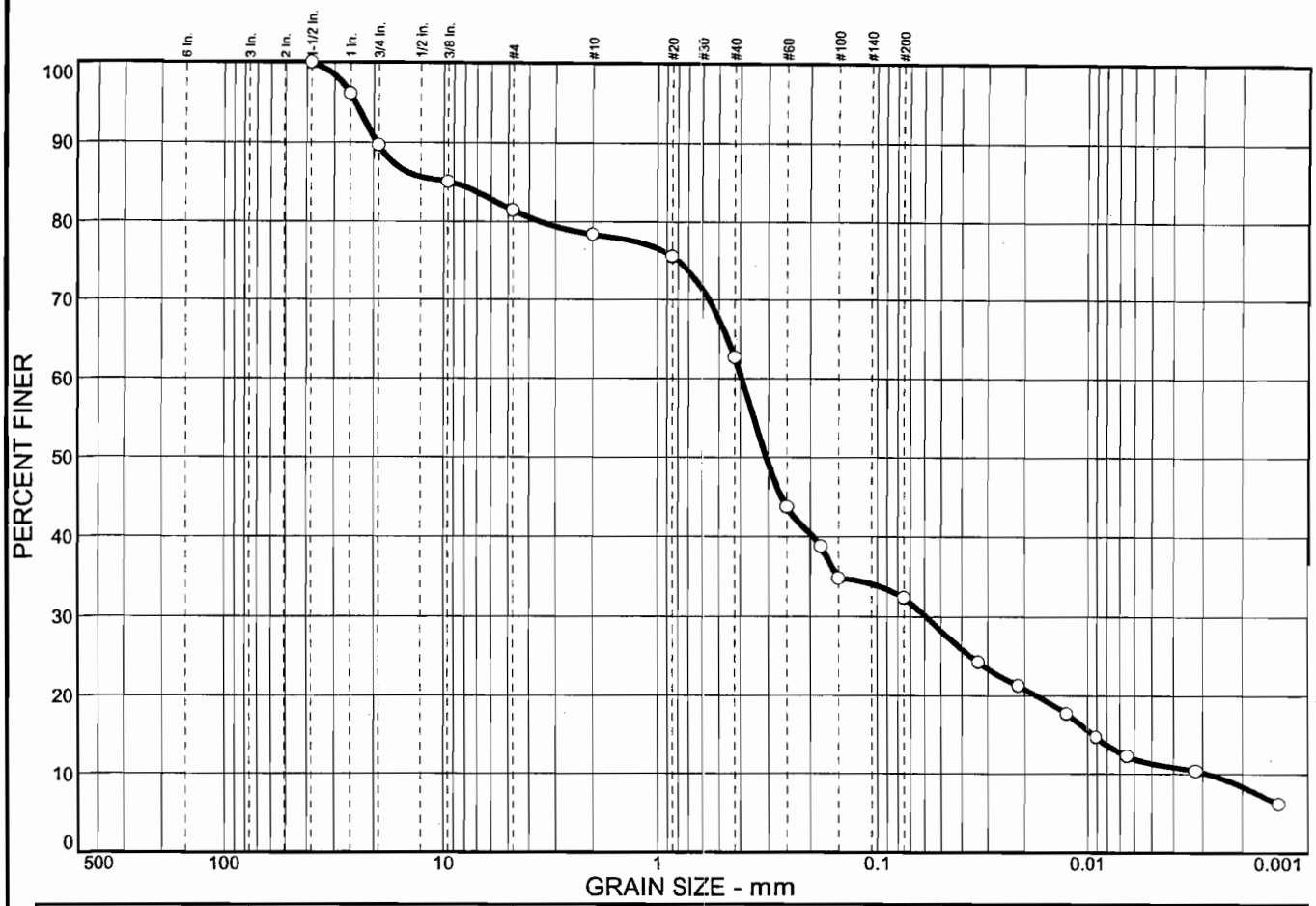
Remarks

Sample No.: 3 **Source of Sample:** C-04-03 **Date:** 06/28/05
Location: **Elev./Depth:** 3.0'-6.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.5	49.1	21.1	11.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.1		
0.75 in.	89.7		
0.375 in.	85.1		
#4	81.5		
#10	78.4		
#20	75.6		
#40	62.7		
#60	43.8		
#80	38.8		
#100	34.8		
#200	32.4		

* (no specification provided)

Soil Description

Brown clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.19 D_{60}= 0.395 D_{50}= 0.306
D_{30}= 0.0589 D_{15}= 0.0094 D_{10}= 0.0028
C_u= 139.36 C_c= 3.10

Classification

USCS= AASHTO=

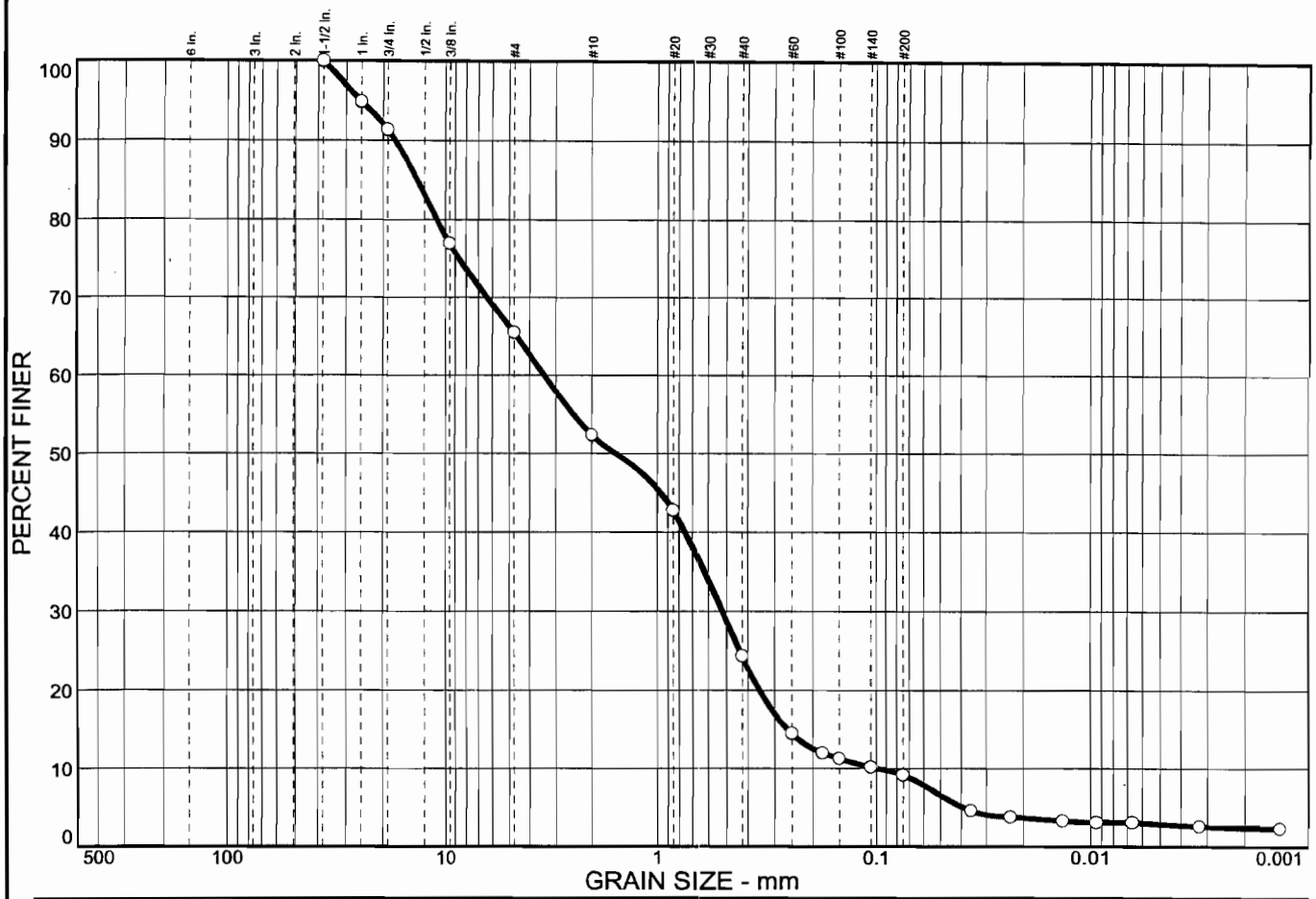
Remarks

Sample No.: 5 **Source of Sample:** C-04-03 **Date:** 06/28/05
Location: **Elev./Depth:** 6.8'-9.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	34.5	56.3	6.3	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	94.9		
0.75 in.	91.4		
0.375 in.	77.0		
#4	65.5		
#10	52.4		
#20	42.8		
#40	24.4		
#60	14.5		
#80	12.0		
#100	11.3		
#140	10.2		
#200	9.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.7 D_{60}= 3.40 D_{50}= 1.54
D_{30}= 0.521 D_{15}= 0.261 D_{10}= 0.0976
C_u= 34.82 C_c= 0.82

Classification

USCS= AASHTO=

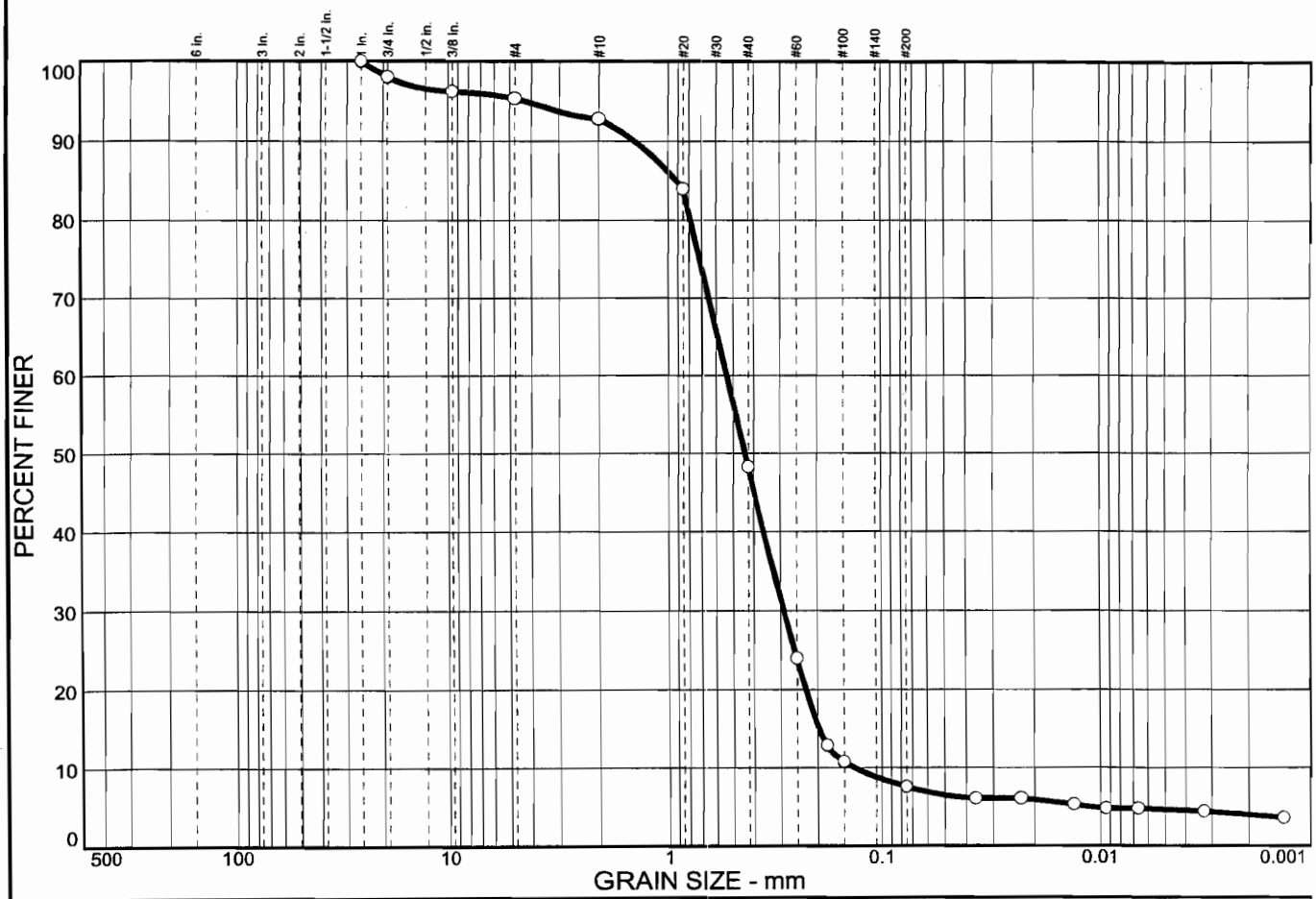
Remarks

Sample No.: 7 **Source of Sample:** C-04-03 **Date:** 06/28/05
Location: **Elev./Depth:** 12.0'-15.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.7	87.7	2.9	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	98.0		
0.375 in.	96.2		
#4	95.3		
#10	92.8		
#20	84.0		
#40	48.3		
#60	24.0		
#80	12.9		
#100	10.8		
#200	7.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.915 D_{60}= 0.535 D_{50}= 0.440
D_{30}= 0.287 D_{15}= 0.196 D_{10}= 0.133
C_u= 4.03 C_c= 1.16

Classification

USCS= AASHTO=

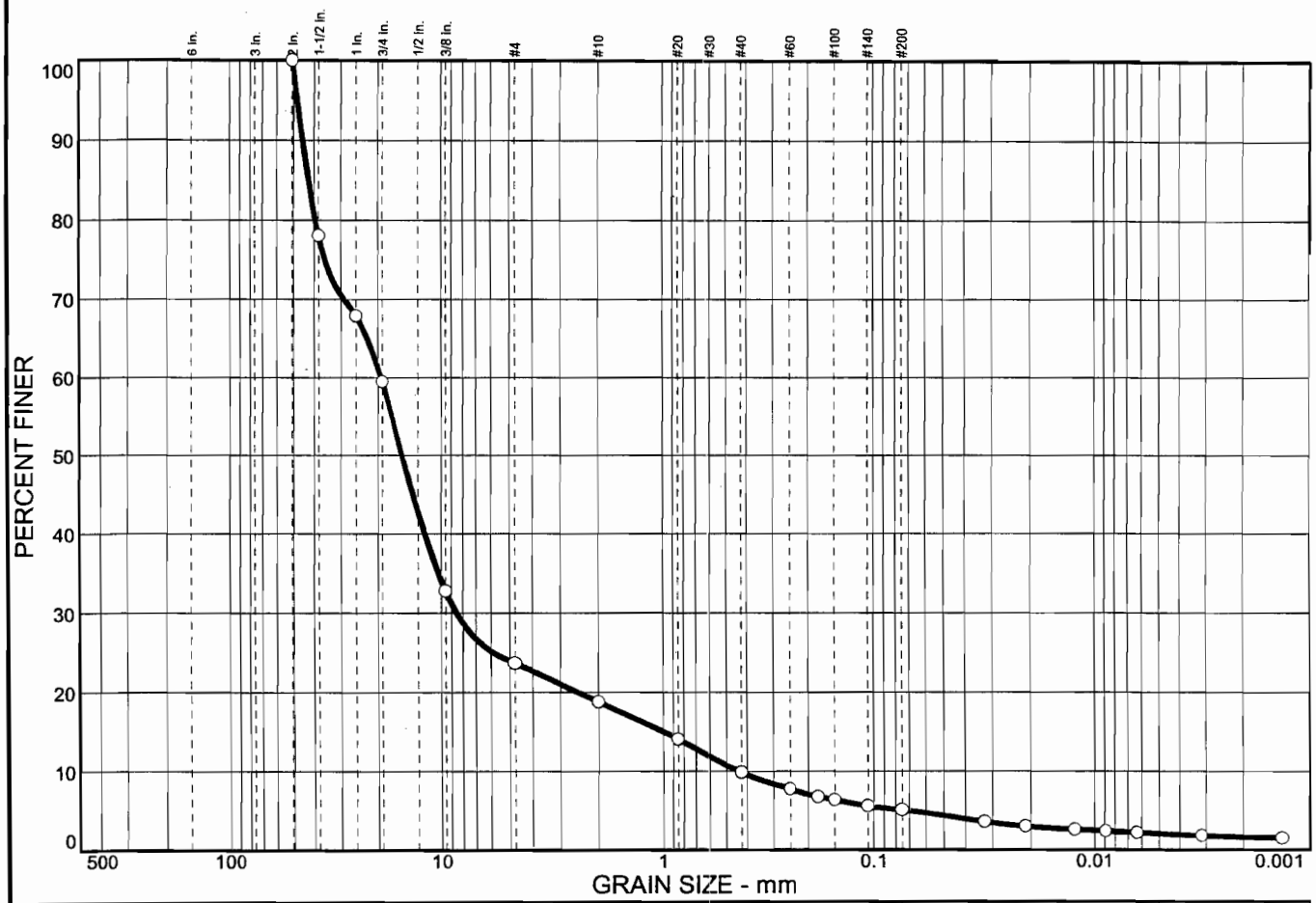
Remarks

Sample No.: 9 **Source of Sample:** C-04-03 **Date:** 06/28/05
Location: **Elev./Depth:** 16.5'-19.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	76.3	18.6	3.0	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	78.1		
1.0 in.	67.9		
0.75 in.	59.5		
0.375 in.	32.8		
#4	23.7		
#10	18.8		
#20	14.1		
#40	9.9		
#60	7.8		
#80	6.8		
#100	6.4		
#140	5.6		
#200	5.1		

* (no specification provided)

Soil Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 42.4 D_{60}= 19.3 D_{50}= 15.0
D_{30}= 8.50 D_{15}= 0.990 D_{10}= 0.433
C_u= 44.55 C_c= 8.63

Classification

USCS= AASHTO=

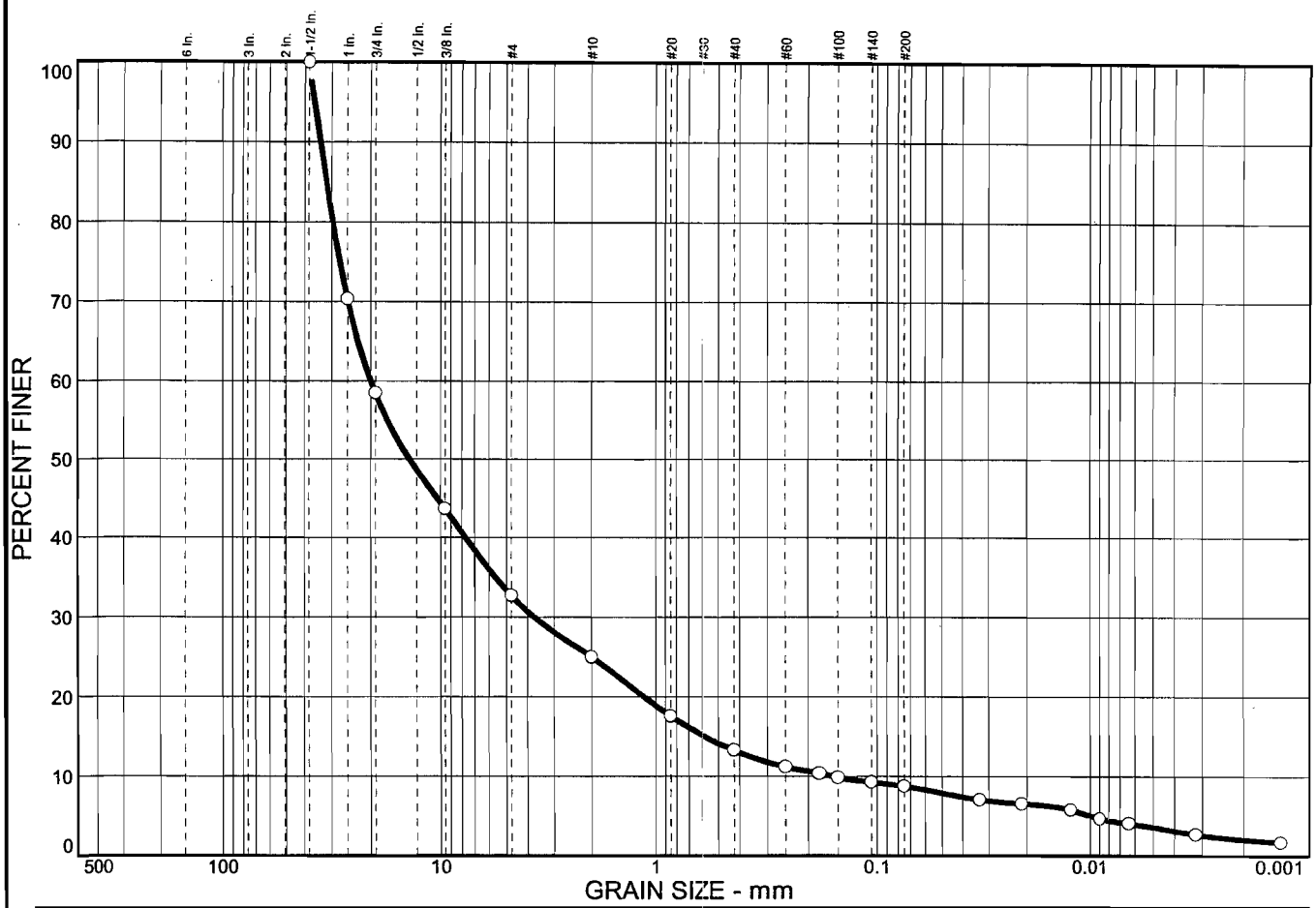
Remarks

Sample No.: 13 **Source of Sample:** C-04-03 **Date:** 06/28/05
Location: **Elev./Depth:** 26.3'-28.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	67.3	23.9	5.2	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	70.4		
0.75 in.	58.5		
0.375 in.	43.7		
#4	32.7		
#10	25.0		
#20	17.6		
#40	13.3		
#60	11.2		
#80	10.4		
#100	9.9		
#140	9.3		
#200	8.8		

* (no specification provided)

Soil Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 31.6 D_{60}= 20.0 D_{50}= 13.6
D_{30}= 3.71 D_{15}= 0.581 D_{10}= 0.156
C_u= 128.04 C_c= 4.43

Classification

USCS= AASHTO=

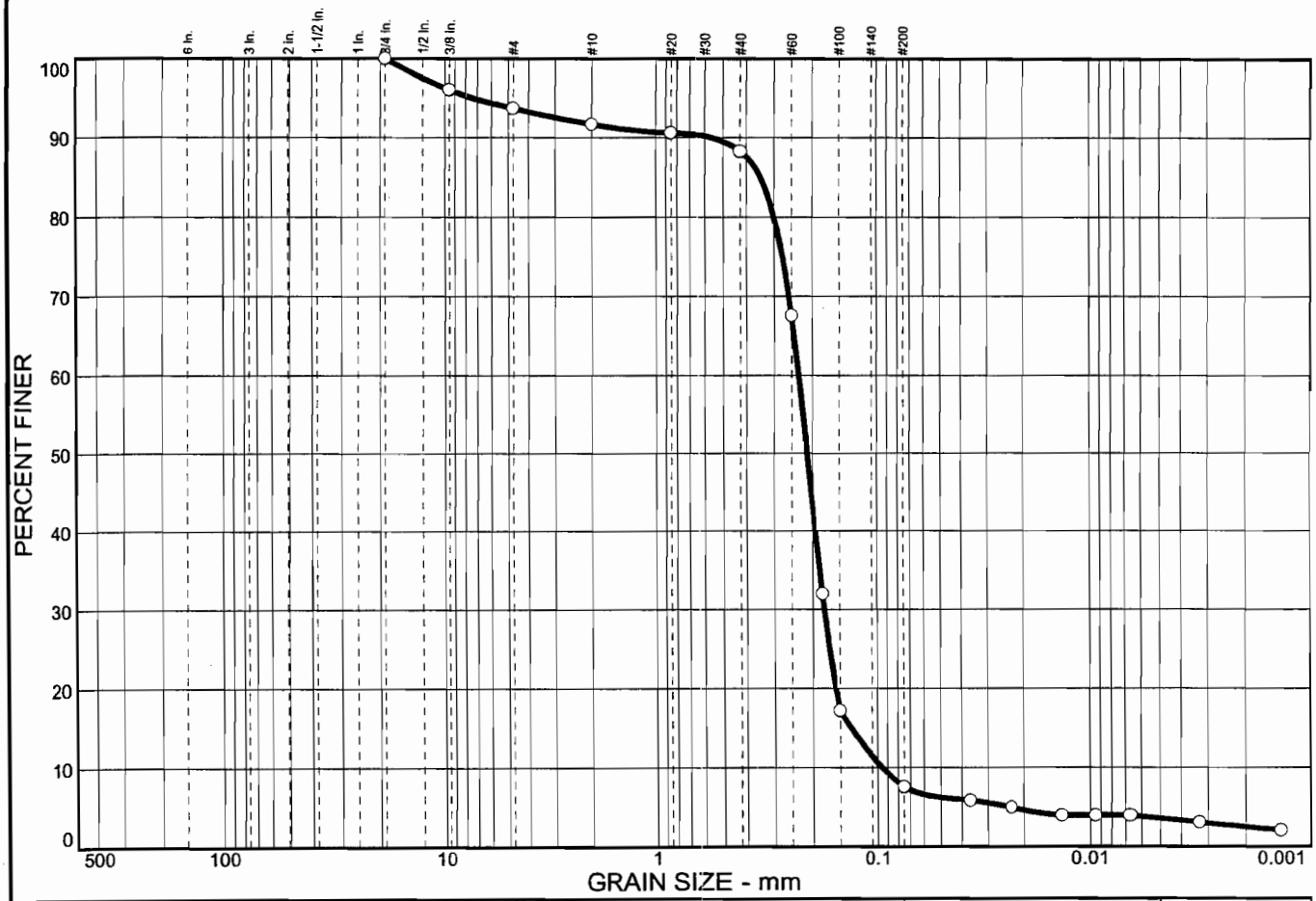
Remarks

Sample No.: 17 **Source of Sample:** C-04-03 **Date:** 06/30/05
Location: **Elev./Depth:** 37.5'-40.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.3	86.1	4.0	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.0		
#4	93.7		
#10	91.7		
#20	90.6		
#40	88.3		
#60	67.6		
#80	32.0		
#100	17.2		
#200	7.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.346 D_{60}= 0.232 D_{50}= 0.212
D_{30}= 0.176 D_{15}= 0.133 D_{10}= 0.0950
C_u= 2.44 C_c= 1.41

Classification

USCS= AASHTO=

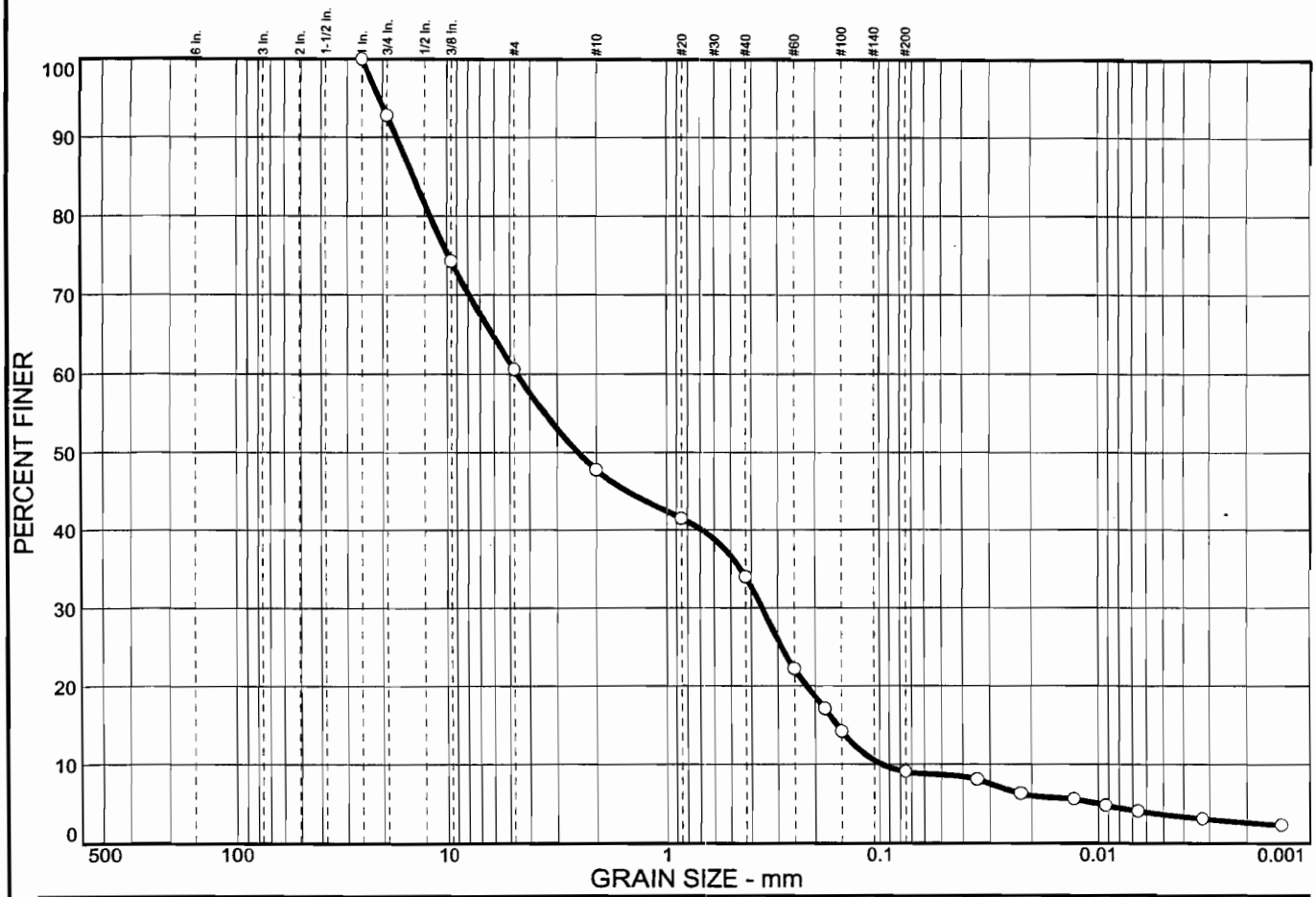
Remarks

Sample No.: 19 **Source of Sample:** C-04-03 **Date:** 06/30/05
Location: **Elev./Depth:** 45.0'-48.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	39.4	51.5	5.4	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	92.8		
0.375 in.	74.3		
#4	60.6		
#10	47.8		
#20	41.5		
#40	34.0		
#60	22.2		
#80	17.1		
#100	14.2		
#200	9.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with clay and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.3 D_{60}= 4.59 D_{50}= 2.41
D_{30}= 0.354 D_{15}= 0.158 D_{10}= 0.0969
C_u= 47.33 C_c= 0.28

Classification

USCS= AASHTO=

Remarks

Sample No.: 23 **Source of Sample:** C-04-03 **Date:** 06/30/05
Location: **Elev./Depth:** 56.7'-59.2'

H. C. NUTTING COMPANY
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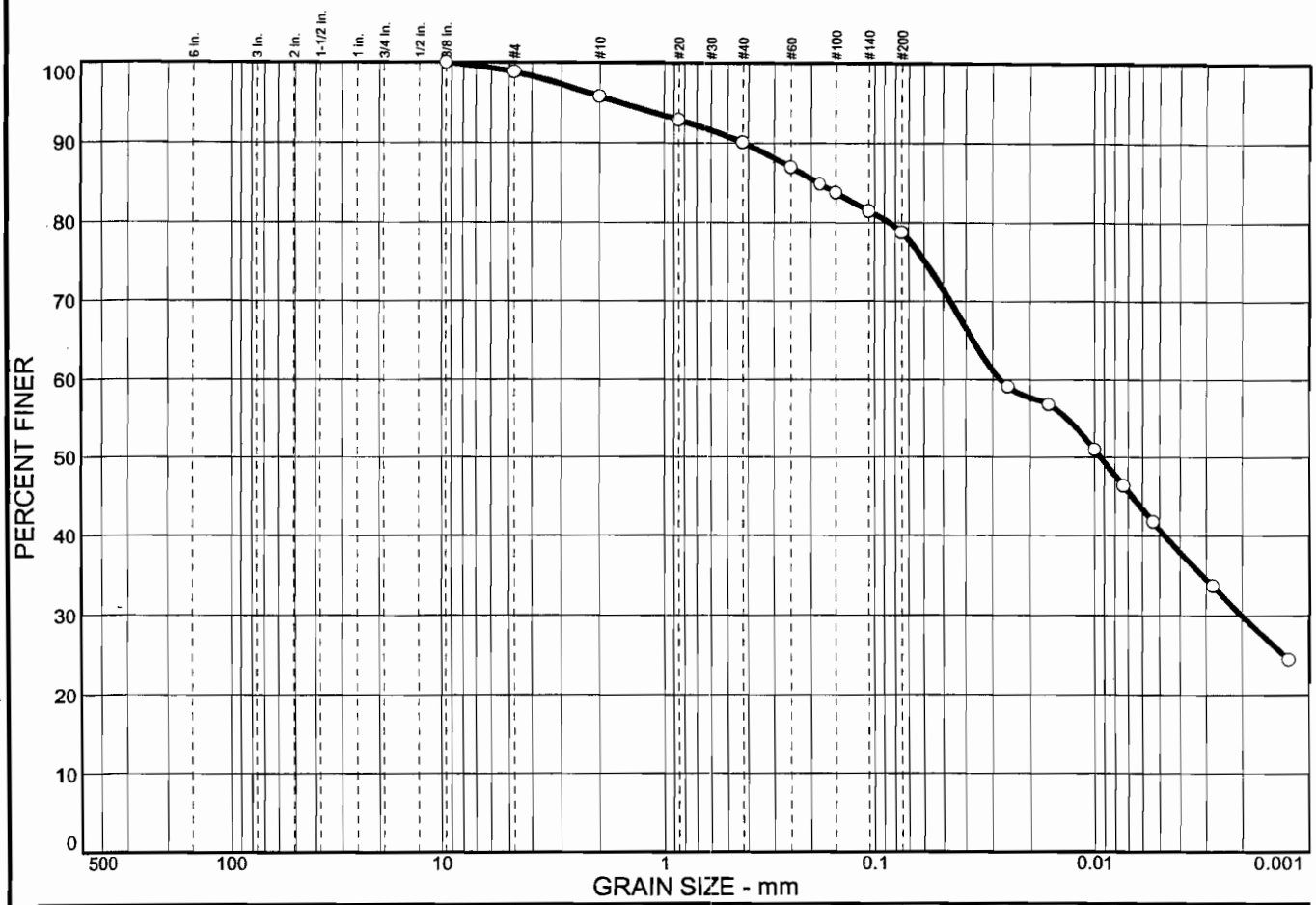
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	20.0	38.0	40.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.8		
#10	95.8		
#20	92.9		
#40	90.1		
#60	87.0		
#80	84.9		
#100	83.8		
#140	81.5		
#200	78.8		

* (no specification provided)

Soil Description

Brown lean clay with sand, trace gravel

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= 0.183 D_{60}= 0.0275 D_{50}= 0.0093
D_{30}= 0.0020 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Sample No.: 4 **Source of Sample:** C-04-04 **Date:** 7-9-05
Location: **Elev./Depth:** 4.5'-6.0'

H. C. NUTTING COMPANY
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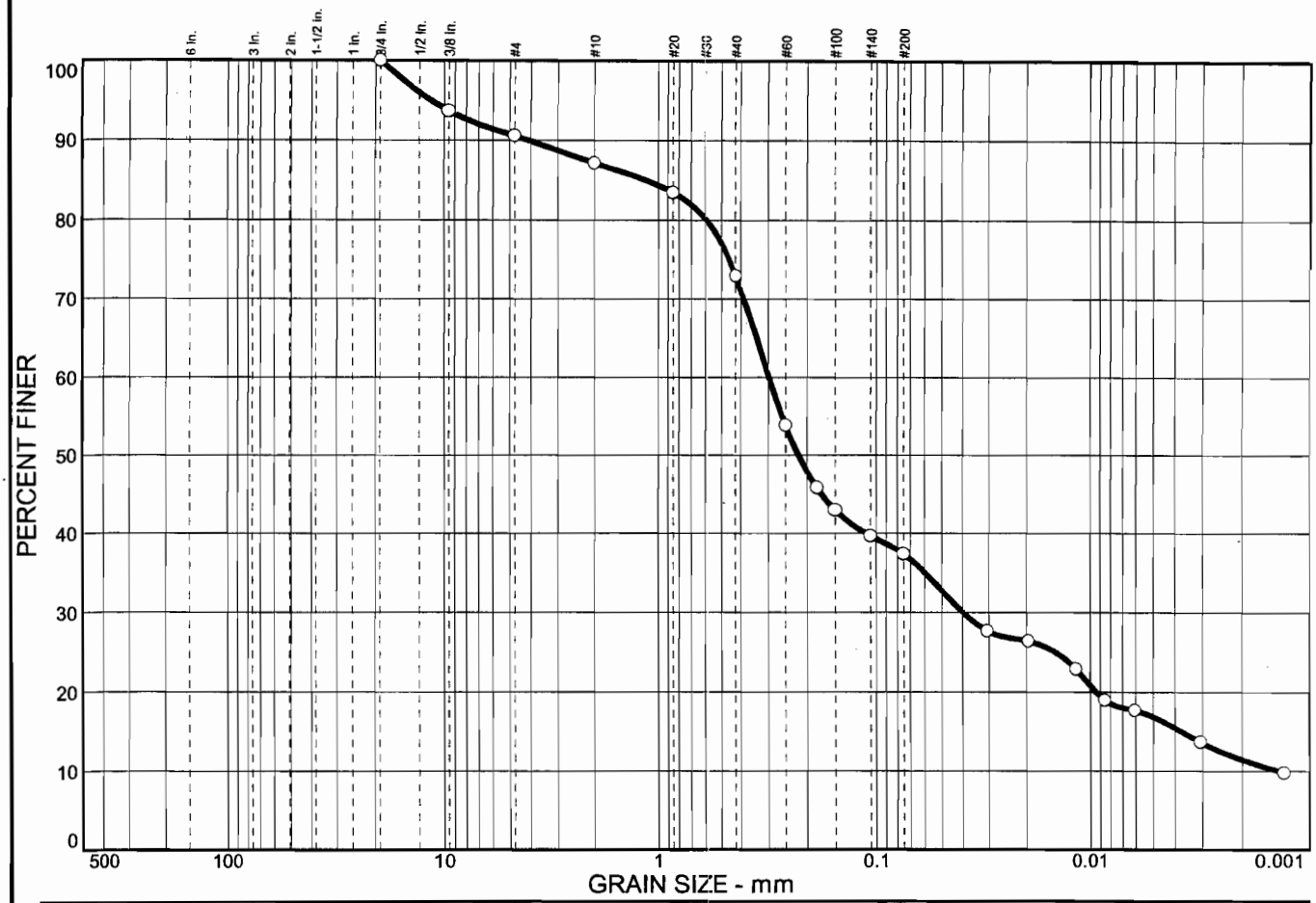
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.4	53.2	20.5	16.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.7		
#4	90.6		
#10	87.2		
#20	83.5		
#40	73.0		
#60	53.9		
#80	45.9		
#100	43.0		
#140	39.7		
#200	37.4		

* (no specification provided)

Soil Description

Brown silty/clayey sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.12 D_{60}= 0.297 D_{50}= 0.218
D_{30}= 0.0397 D_{15}= 0.0037 D_{10}= 0.0014
C_u= 214.21 C_c= 3.82

Classification

USCS= AASHTO=

Remarks

Sample No.: 16 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 22.5'-24.0'

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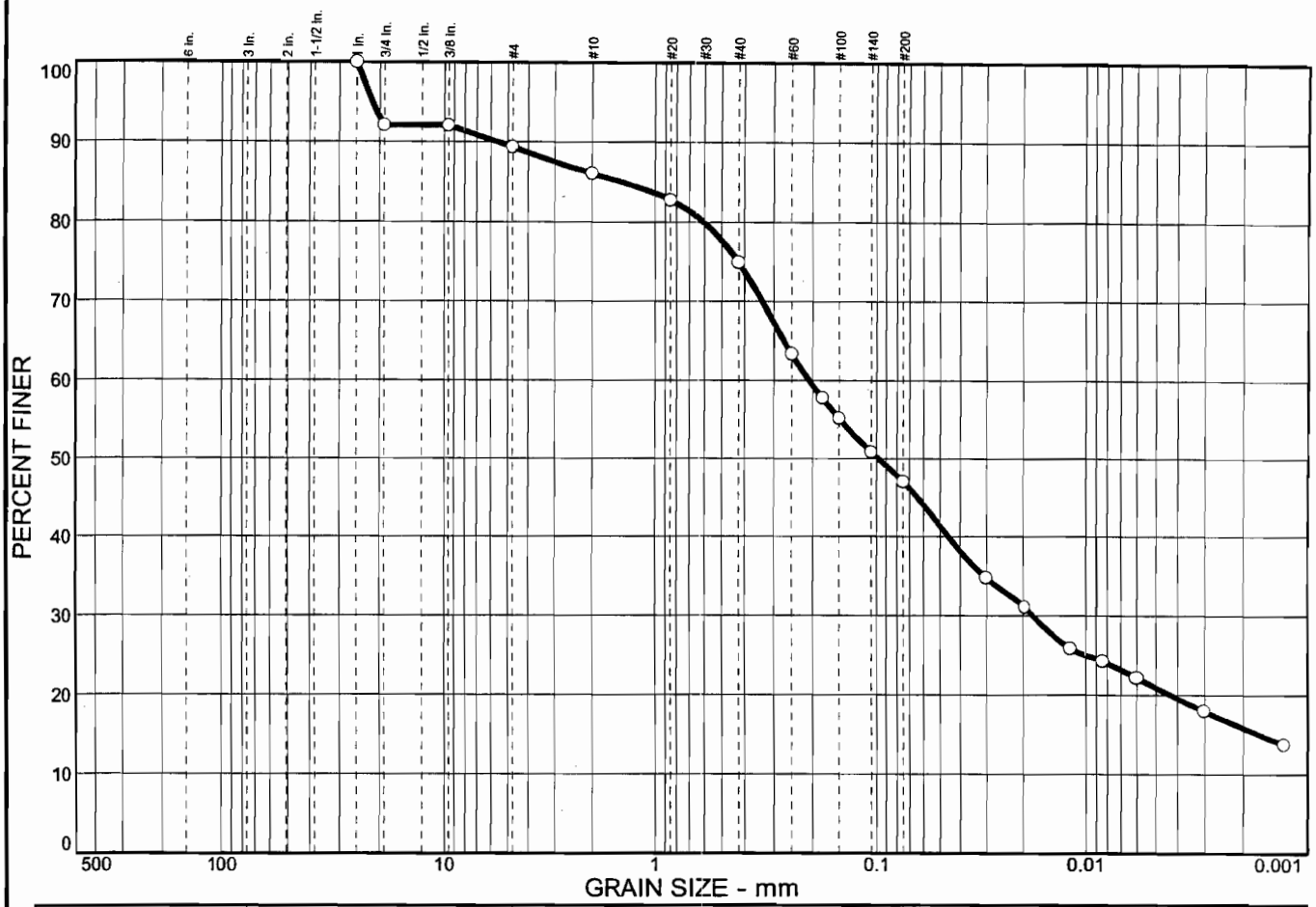
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.6	42.3	26.1	21.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	92.1		
.375 in.	92.1		
#4	89.4		
#10	86.1		
#20	82.8		
#40	75.0		
#60	63.4		
#80	57.8		
#100	55.2		
#140	50.9		
#200	47.1		

* (no specification provided)

Soil Description

Brown clayey sand, few gravel

Atterberg Limits

PL= 14 LL= 23 PI= 9

Coefficients

D_{85}= 1.41 D_{60}= 0.207 D_{50}= 0.0976
D_{30}= 0.0177 D_{15}= 0.0017 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

Zero retained on the 3/8 inch sieve.

Sample No.: 9 **Source of Sample:** C-04-04 **Date:** 7-9-05
Location: **Elev./Depth:** 12.0'-13.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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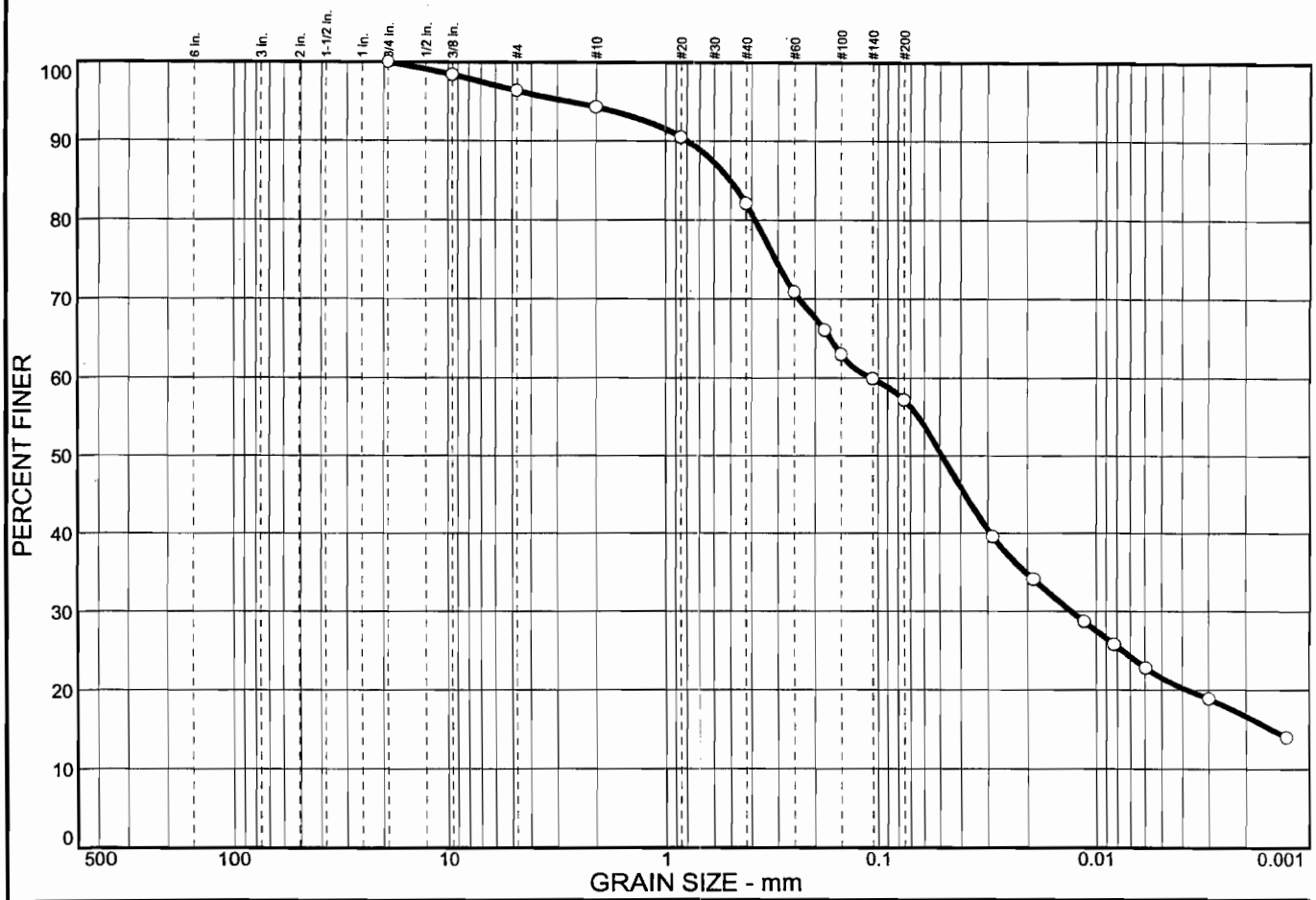
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.6	39.2	35.7	21.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	98.4		
#4	96.4		
#10	94.3		
#20	90.5		
#40	82.1		
#60	70.9		
#80	66.1		
#100	63.0		
#140	59.9		
#200	57.2		

* (no specification provided)

Soil Description

Brown sandy lean clay, trace gravel

Atterberg Limits

PL= 16 LL= 25 PI= 9

Coefficients

D_{85}= 0.503 D_{60}= 0.108 D_{50}= 0.0485
D_{30}= 0.0130 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

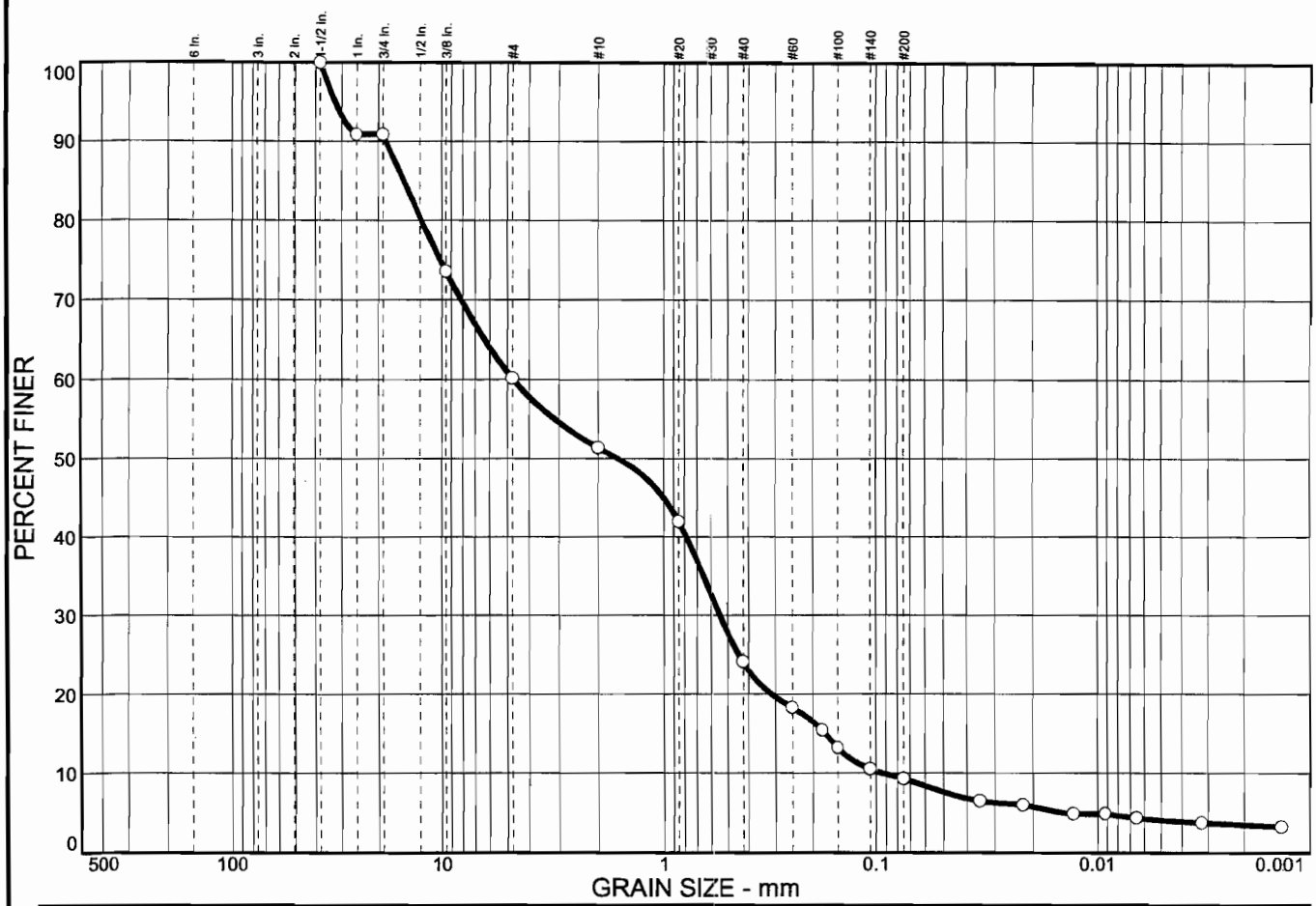
Remarks

Sample No.: 23 **Source of Sample:** C-04-04 **Date:** 7-9-05
Location: **Elev./Depth:** 33.0'-34.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	39.8	50.9	5.2	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	90.9		
0.75 in.	90.9		
0.375 in.	73.6		
#4	60.2		
#10	51.4		
#20	42.0		
#40	24.1		
#60	18.3		
#80	15.4		
#100	13.2		
#140	10.5		
#200	9.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.2 D_{60}= 4.69 D_{50}= 1.61
D_{30}= 0.544 D_{15}= 0.174 D_{10}= 0.0936
C_u= 50.06 C_c= 0.67

Classification

USCS= AASHTO=

Remarks

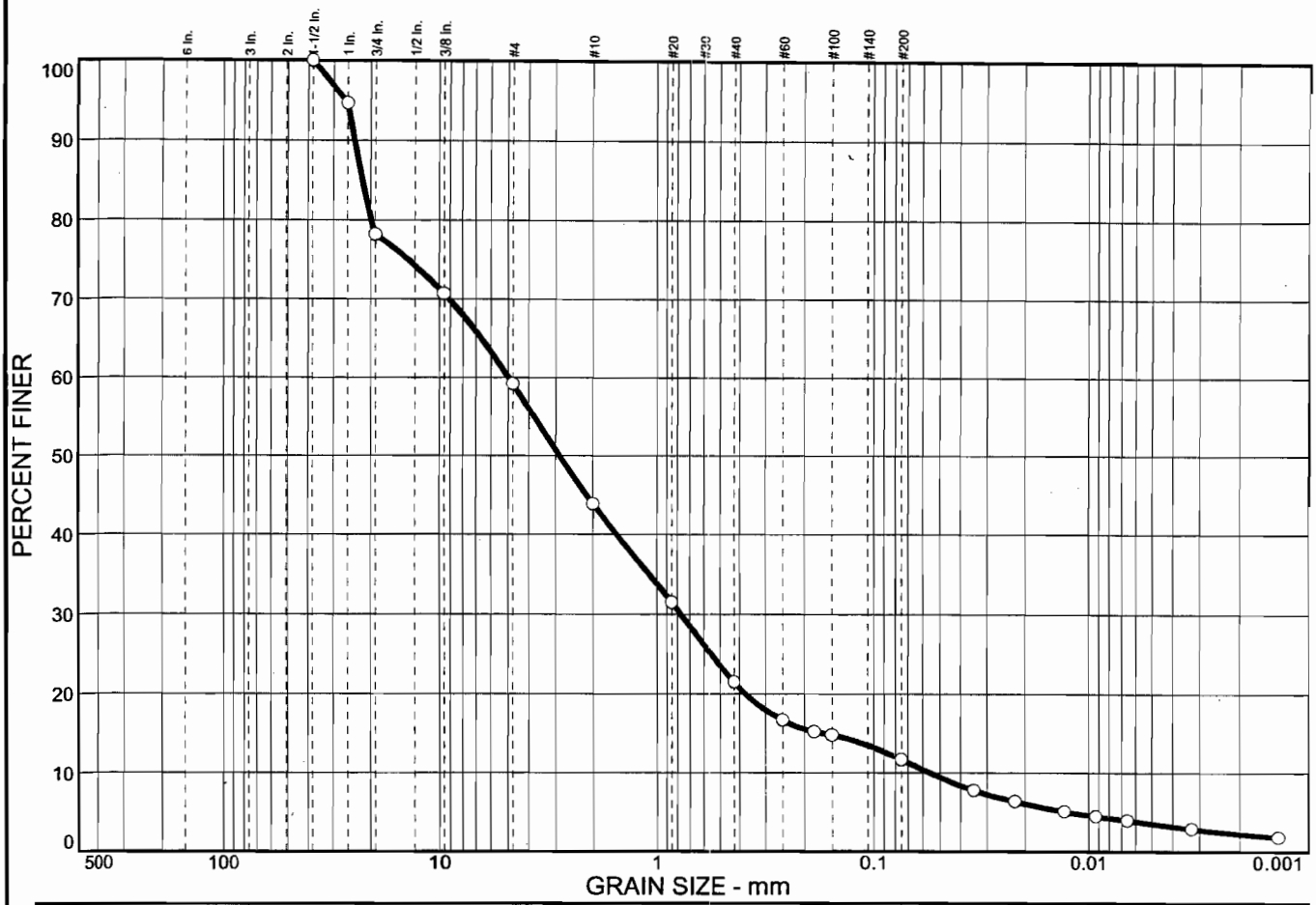
Zero retained on the 3/4 inch sieve

Sample No.: 25 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 36.0'-37.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	40.8	47.5	8.1	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	94.7		
0.75 in.	78.2		
0.375 in.	70.7		
#4	59.2		
#10	43.9		
#20	31.5		
#40	21.5		
#60	16.7		
#80	15.2		
#100	14.8		
#200	11.7		

* (no specification provided)

Soil Description

Brown to gray well graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.8 D_{60}= 4.97 D_{50}= 2.86
D_{30}= 0.769 D_{15}= 0.165 D_{10}= 0.0551
C_u= 90.19 C_c= 2.16

Classification

USCS= AASHTO=

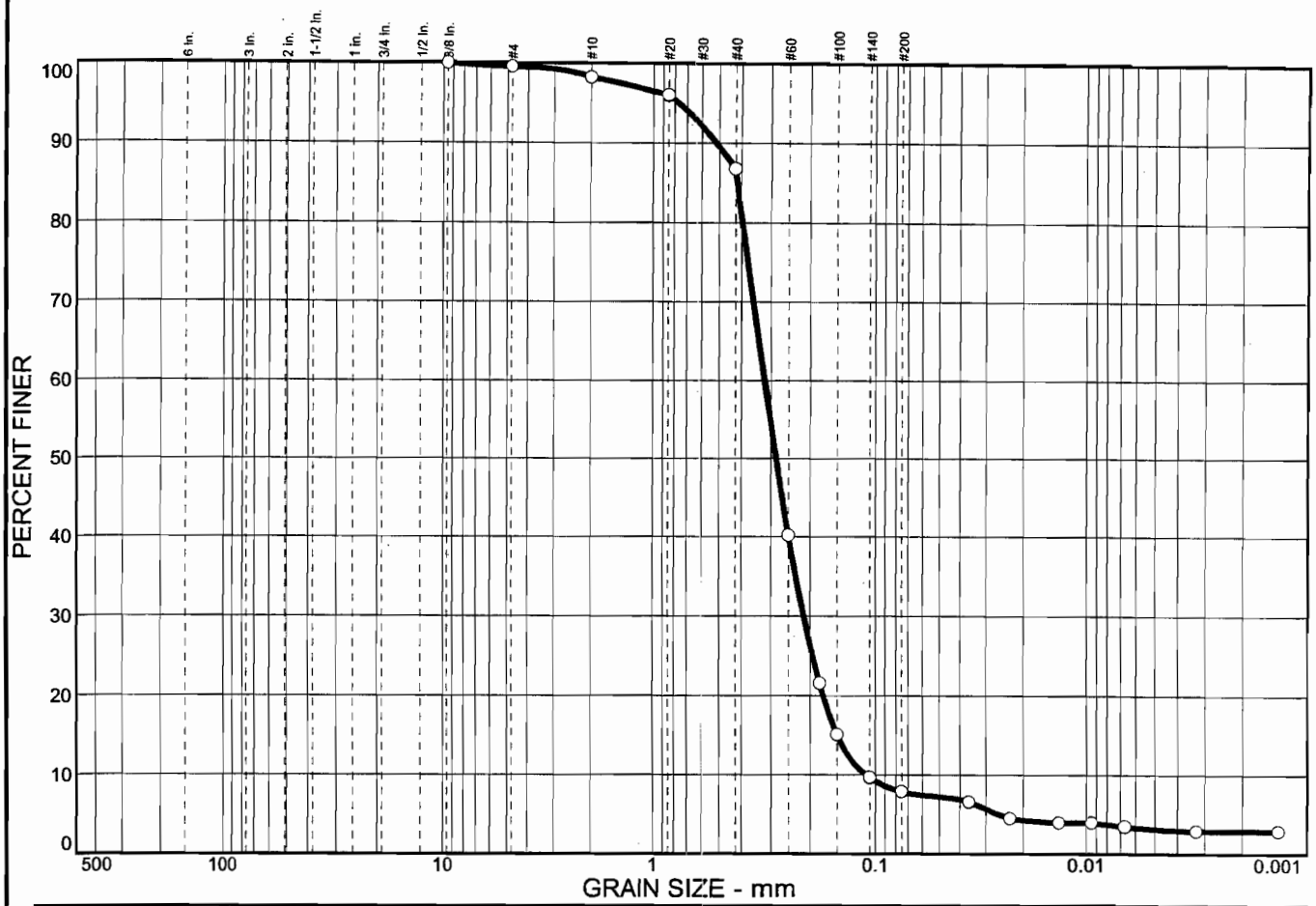
Remarks

Sample No.: 31 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 48.0'-49.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	91.6	4.7	3.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.5		
#10	98.2		
#20	96.0		
#40	86.8		
#60	40.2		
#80	21.6		
#100	15.1		
#140	9.7		
#200	7.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.417 D_{60}= 0.319 D_{50}= 0.284
D_{30}= 0.213 D_{15}= 0.149 D_{10}= 0.110
C_u= 2.90 C_c= 1.30

Classification

USCS= AASHTO=

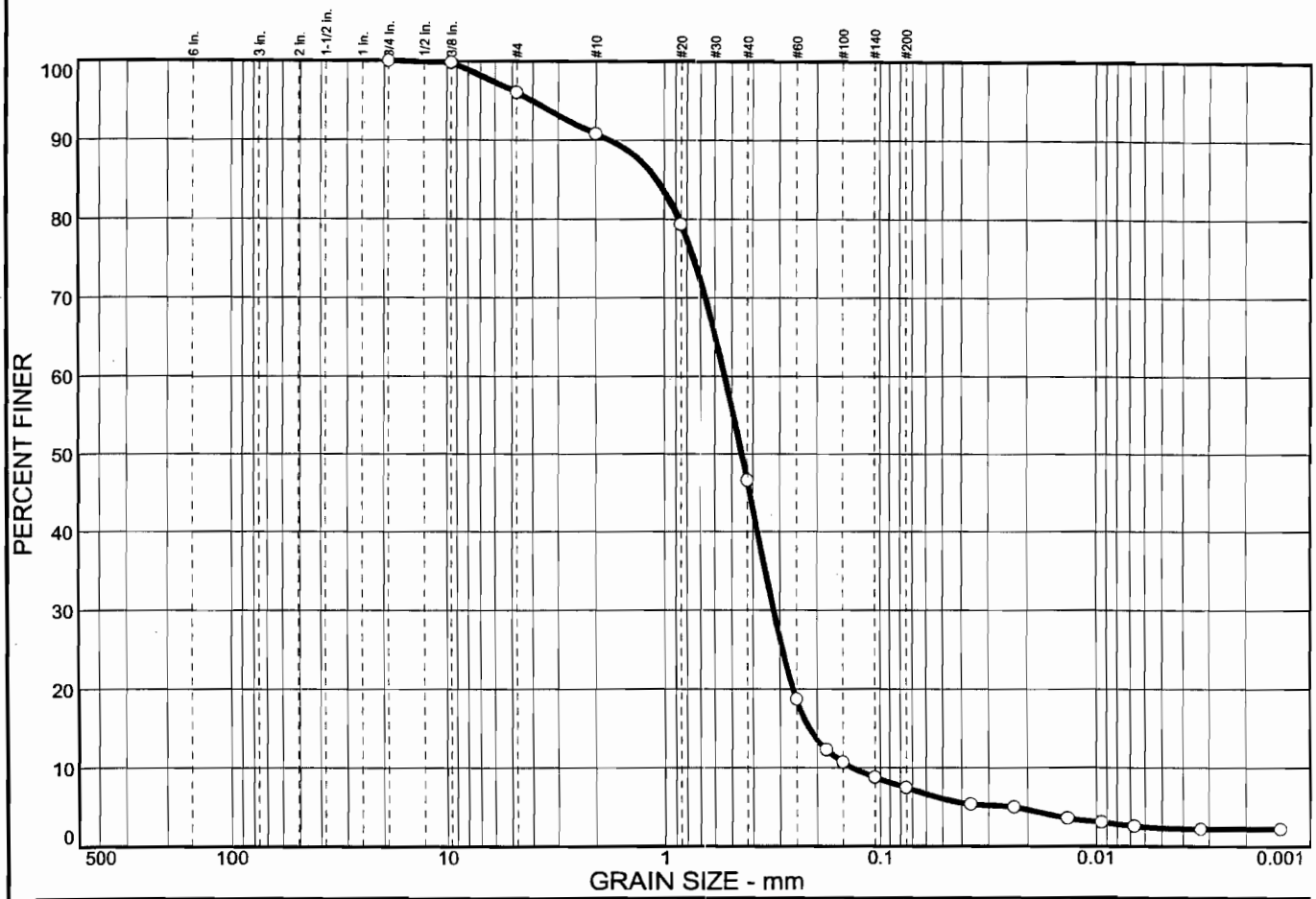
Remarks

Sample No.: 36 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 55.5'-57.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.0	88.5	5.2	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.8		
#4	96.0		
#10	90.8		
#20	79.4		
#40	46.6		
#60	18.7		
#80	12.3		
#100	10.7		
#140	8.8		
#200	7.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.07 D_{60}= 0.539 D_{50}= 0.450
D_{30}= 0.320 D_{15}= 0.217 D_{10}= 0.135
C_u= 4.00 C_c= 1.41

Classification

USCS= AASHTO=

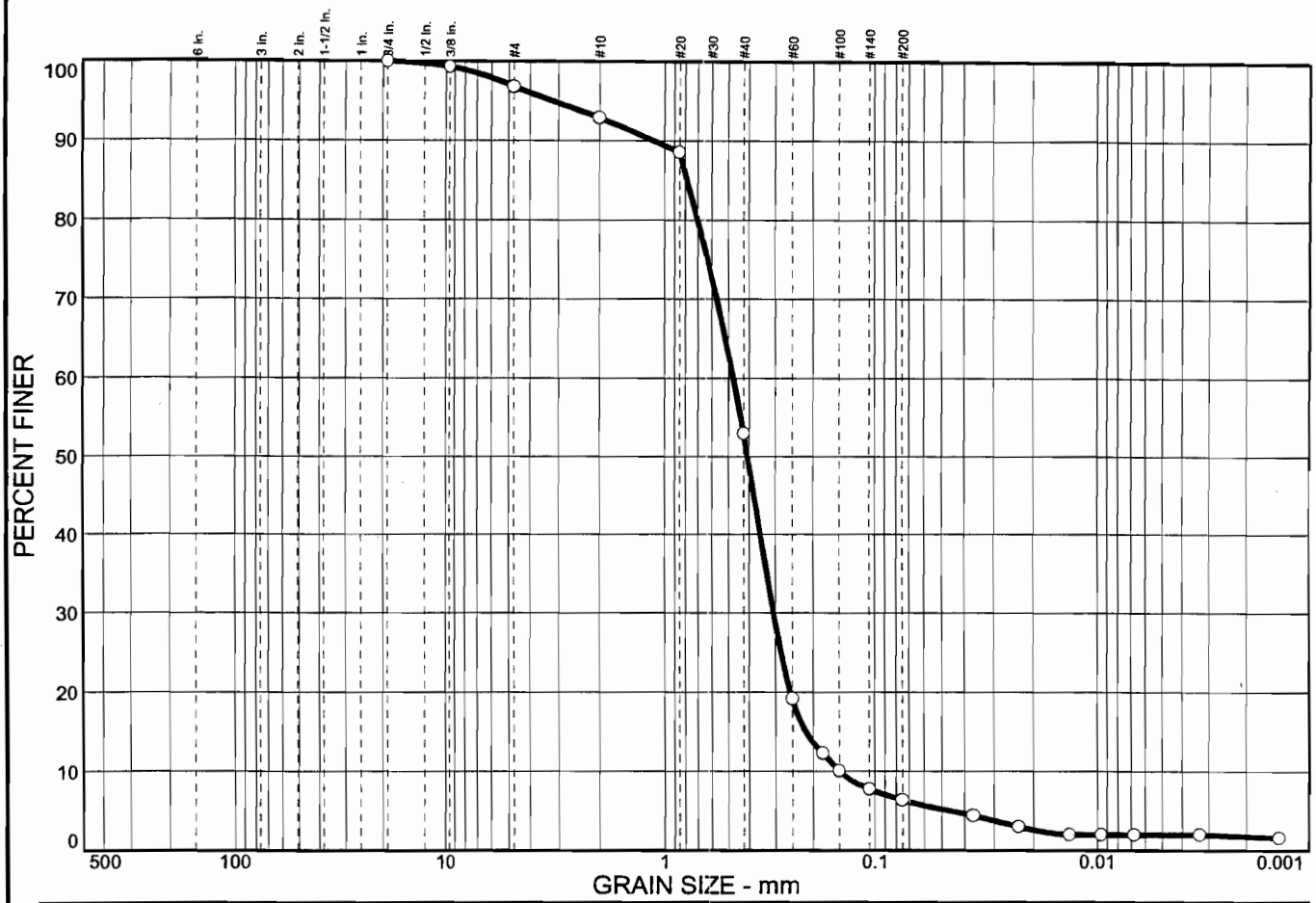
Remarks

Sample No.: 46 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 70.5'-72.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.2	90.4	4.4	2.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	99.3		
#4	96.8		
#10	92.9		
#20	88.6		
#40	53.0		
#60	19.2		
#80	12.3		
#100	10.1		
#140	7.8		
#200	6.4		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.783 D_{60}= 0.475 D_{50}= 0.407
D_{30}= 0.306 D_{15}= 0.216 D_{10}= 0.149
C_u= 3.19 C_c= 1.33

Classification

USCS= AASHTO=

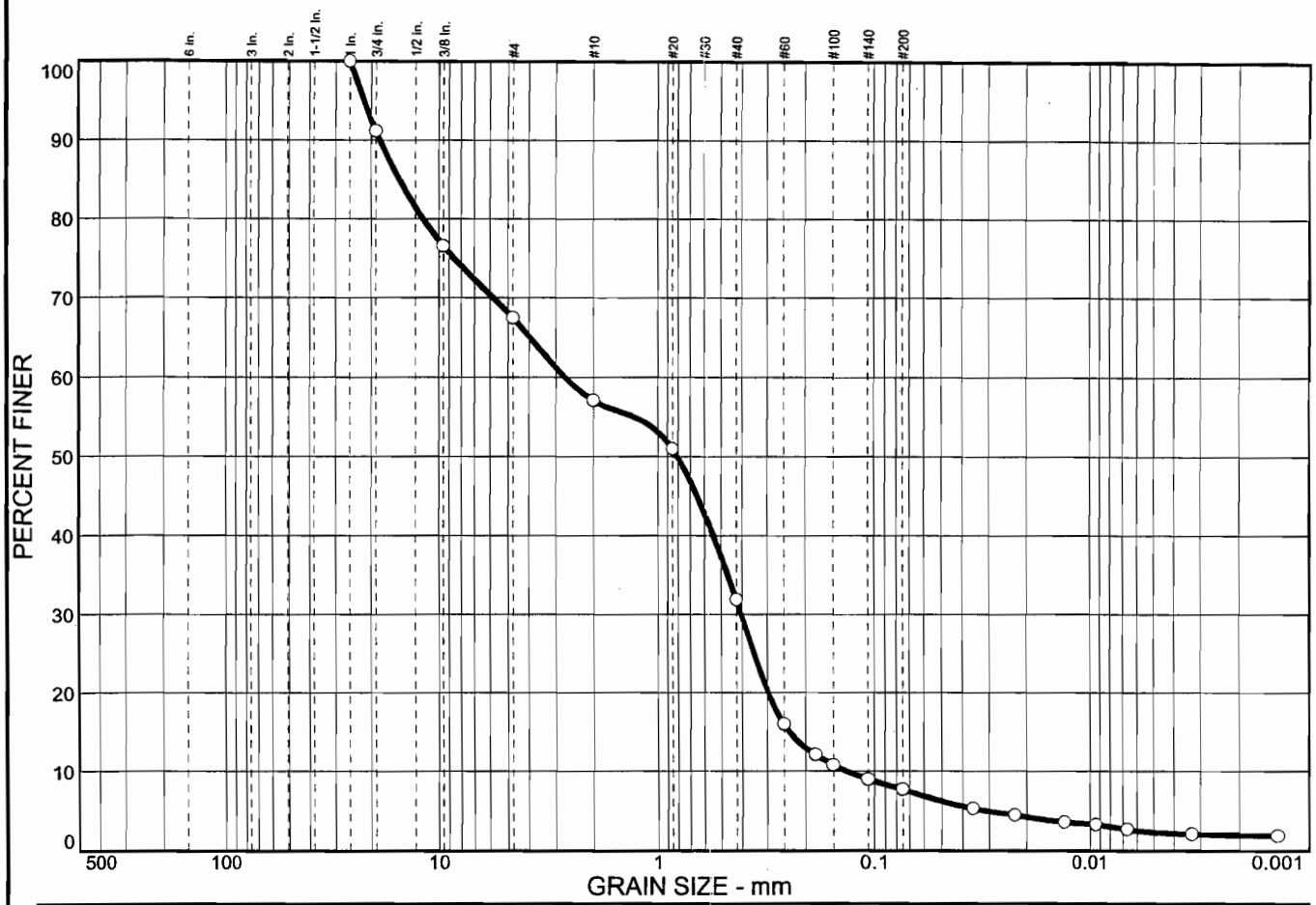
Remarks

Sample No.: 57 **Source of Sample:** C-04-04 **Date:** 7-9-05
Location: **Elev./Depth:** 87.0'-88.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	32.5	59.8	5.4	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	91.2		
.375 in.	76.6		
#4	67.5		
#10	57.1		
#20	51.0		
#40	31.9		
#60	16.0		
#80	12.1		
#100	10.8		
#140	9.0		
#200	7.7		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.9 D_{60}= 2.71 D_{50}= 0.804
D_{30}= 0.402 D_{15}= 0.236 D_{10}= 0.131
C_u= 20.66 C_c= 0.46

Classification

USCS= AASHTO=

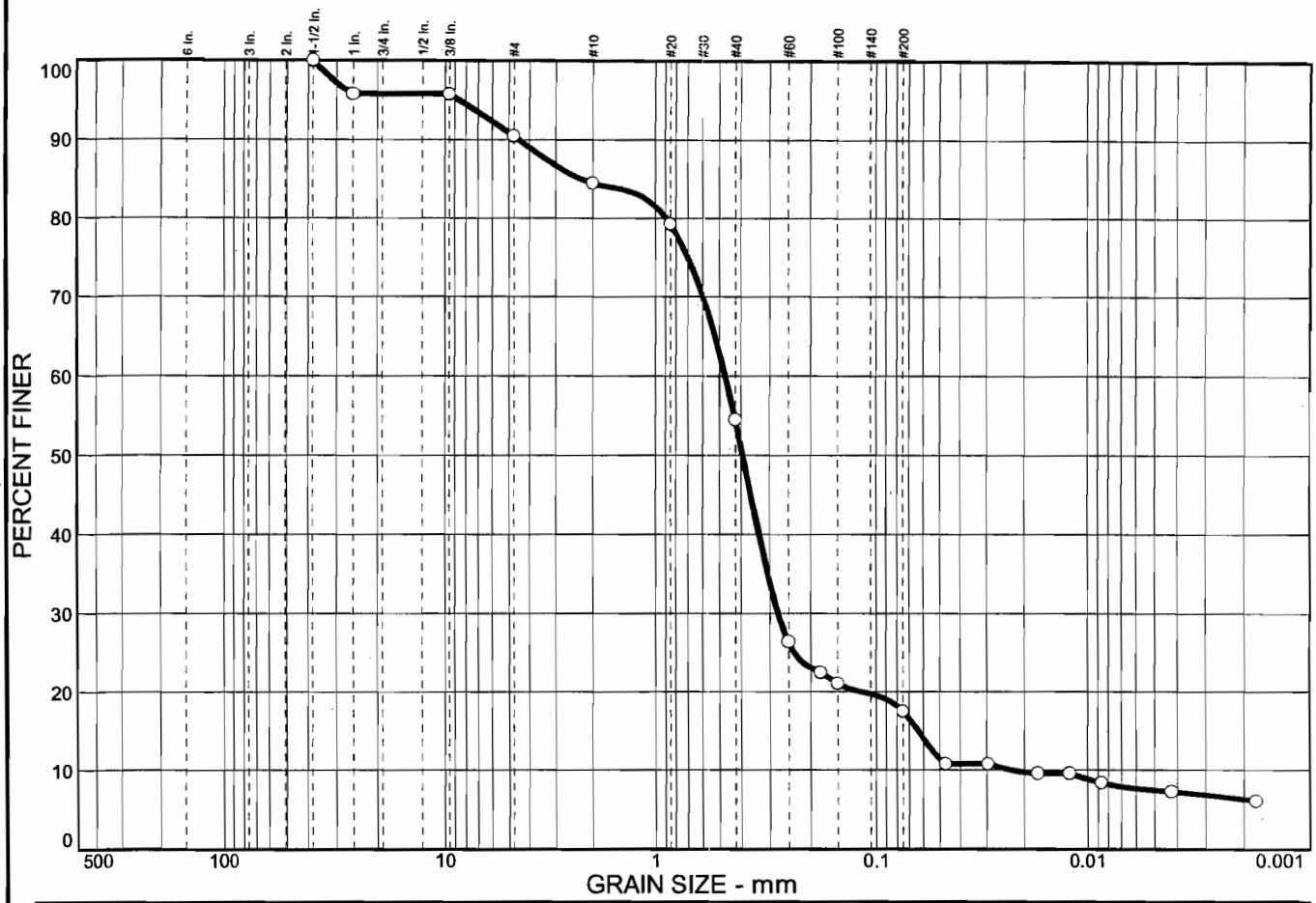
Remarks

Sample No.: 69 **Source of Sample:** C-04-04 **Date:** 7-9-05
Location: **Elev./Depth:** 105.0'-106.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.5	73.0	10.0	7.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.8		
0.375 in.	95.8		
#4	90.5		
#10	84.5		
#20	79.3		
#40	54.5		
#60	26.4		
#80	22.5		
#100	21.1		
#200	17.5		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.26 D_{60}= 0.471 D_{50}= 0.394
D_{30}= 0.276 D_{15}= 0.0634 D_{10}= 0.0227
C_u= 20.75 C_c= 7.11

Classification

USCS= AASHTO=

Remarks

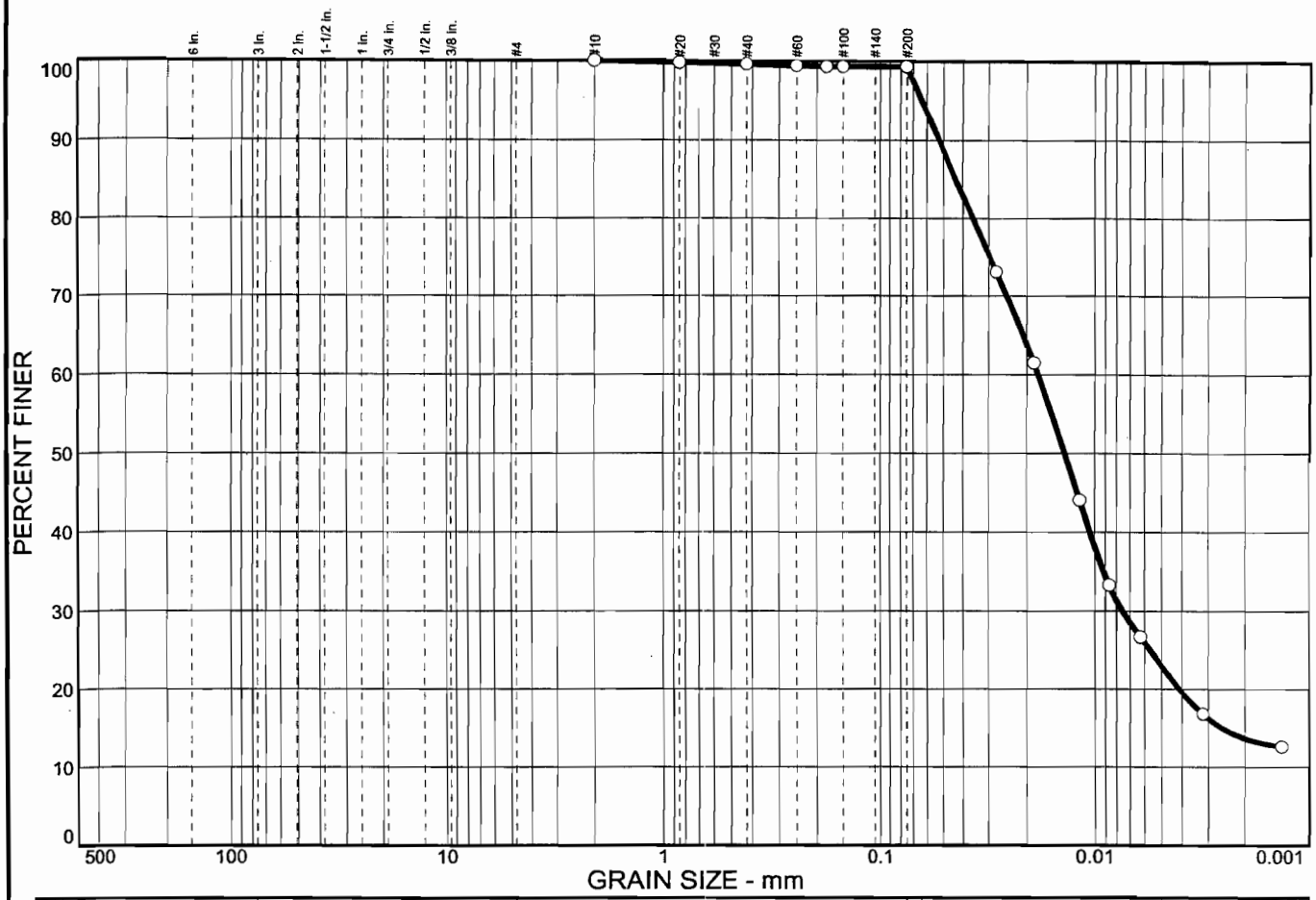
Zero retained on the 3/8 inch sieve

Sample No.: 70 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 106.5'-108.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	0.7	76.3	23.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.6		
#60	99.4		
#80	99.3		
#100	99.3		
#200	99.3		

* (no specification provided)

Soil Description

Gray silt/lean clay, trace sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0430 D_{60}= 0.0177 D_{50}= 0.0135
D_{30}= 0.0075 D_{15}= 0.0026 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 77 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 117.0'-118.5'

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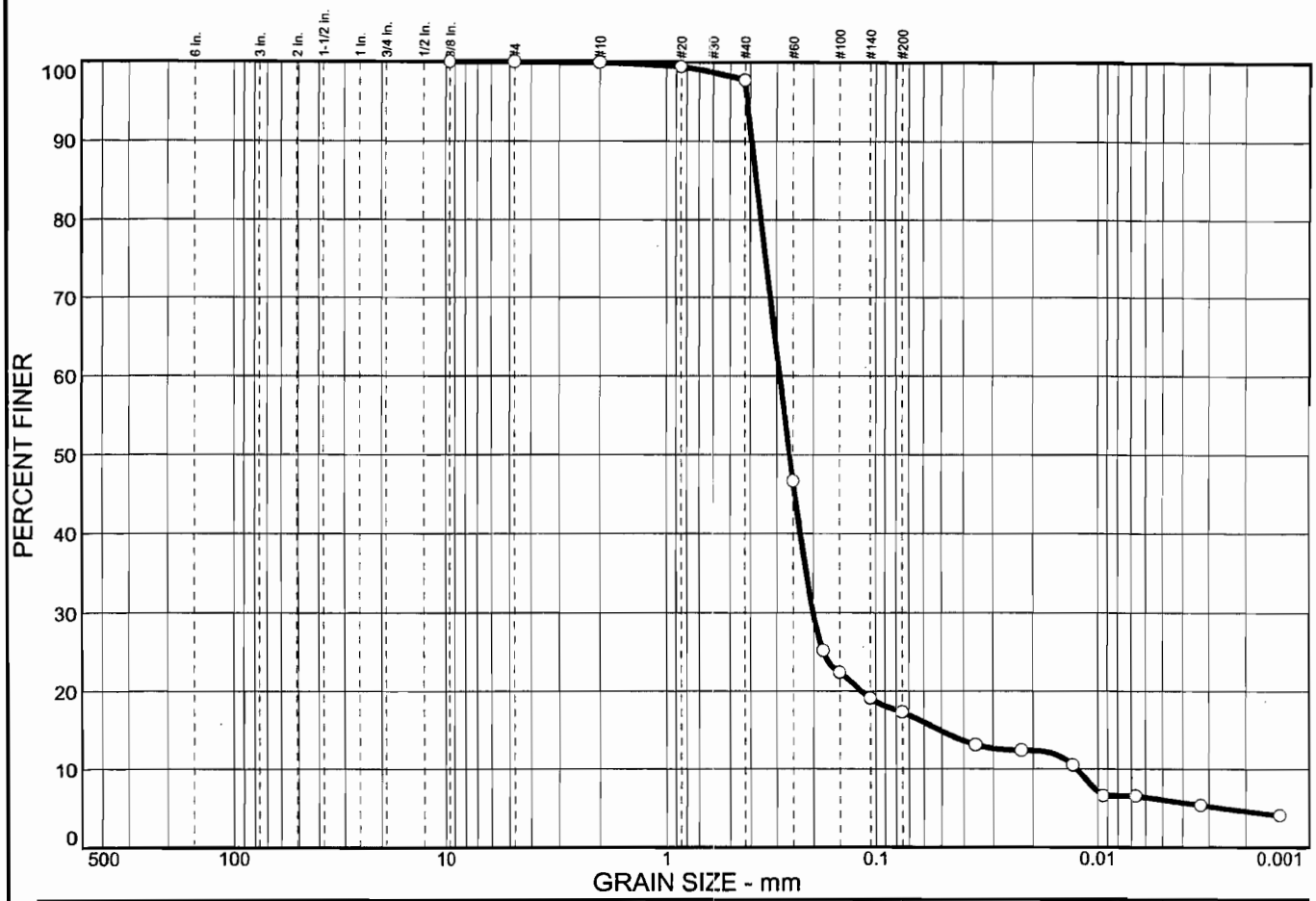
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	82.7	11.2	6.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.9		
#20	99.4		
#40	97.7		
#60	46.7		
#80	25.2		
#100	22.4		
#140	19.1		
#200	17.3		

* (no specification provided)

Soil Description

Gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.374 D_{60}= 0.290 D_{50}= 0.260
D_{30}= 0.200 D_{15}= 0.0508 D_{10}= 0.0125
C_u= 23.08 C_c= 11.02

Classification

USCS= AASHTO=

Remarks

Sample No.: 86 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 130.5'-132.0'

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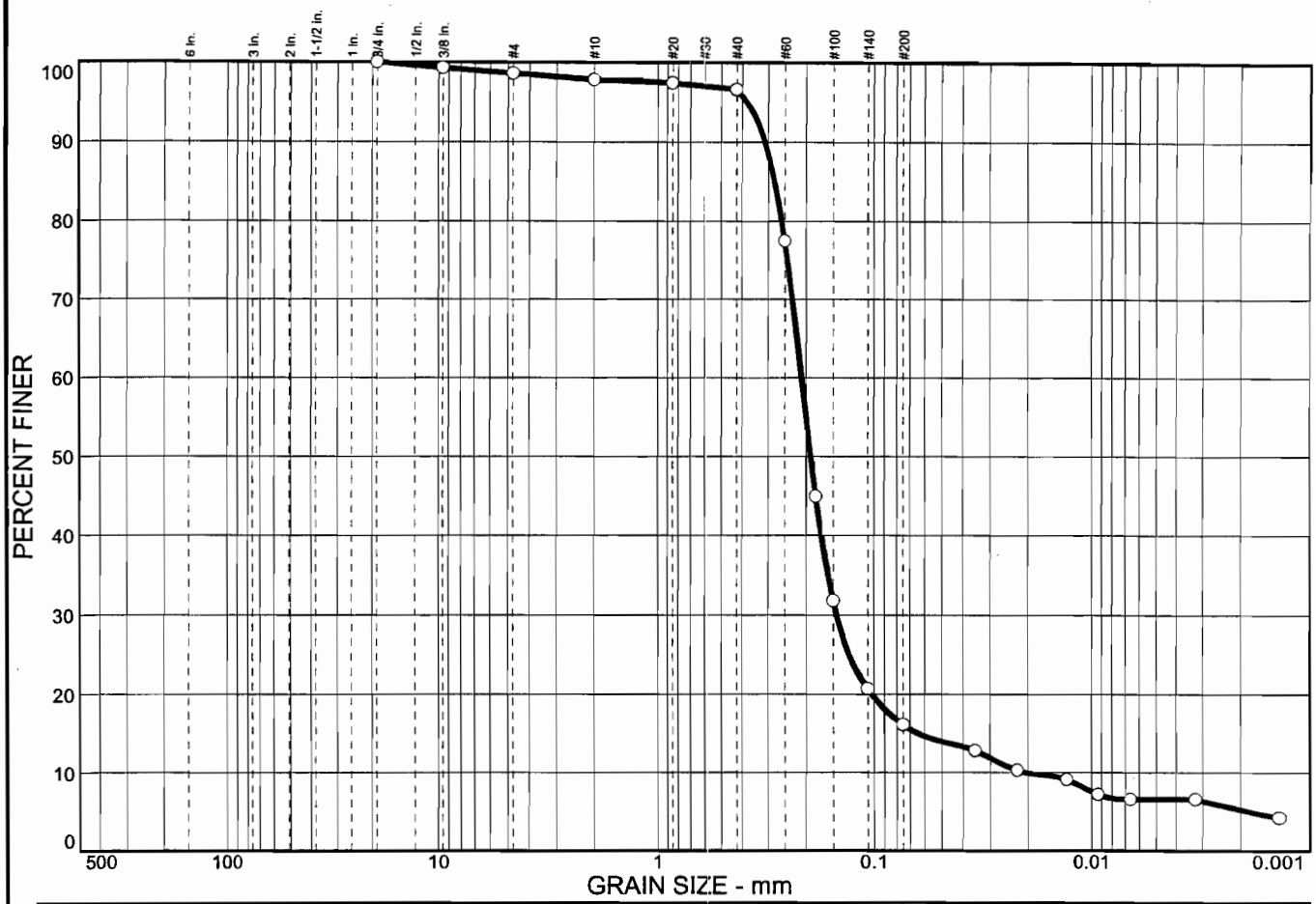
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	82.5	9.5	6.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	98.6		
#10	97.8		
#20	97.4		
#40	96.6		
#60	77.5		
#80	45.0		
#100	31.8		
#140	20.7		
#200	16.1		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.279 D_{60}= 0.209 D_{50}= 0.190
D_{30}= 0.145 D_{15}= 0.0642 D_{10}= 0.0203
C_u= 10.32 C_c= 4.96

Classification

USCS= AASHTO=

Remarks

Sample No.: 96 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 144.0'-145.5'

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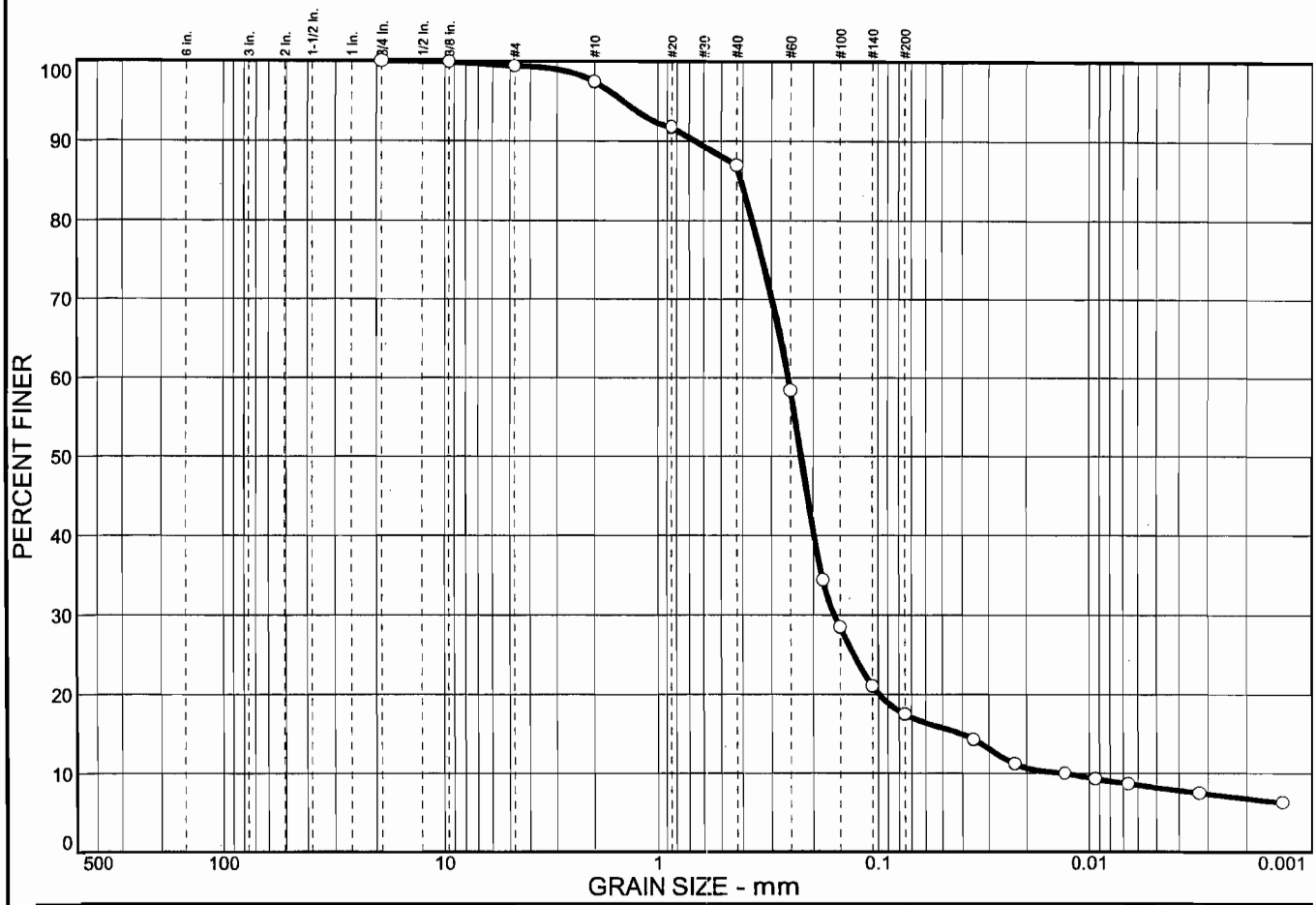
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	81.9	9.3	8.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.9		
#4	99.4		
#10	97.4		
#20	91.8		
#40	87.0		
#60	58.4		
#80	34.4		
#100	28.5		
#140	21.1		
#200	17.5		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.406 D_{60}= 0.255 D_{50}= 0.225
D_{30}= 0.159 D_{15}= 0.0404 D_{10}= 0.0132
C_u= 19.39 C_c= 7.54

Classification

USCS= AASHTO=

Remarks

Sample No.: 107 **Source of Sample:** C-04-04 **Date:** 06/30/05
Location: **Elev./Depth:** 160.5'-162.0'

H. C. NUTTING COMPANY
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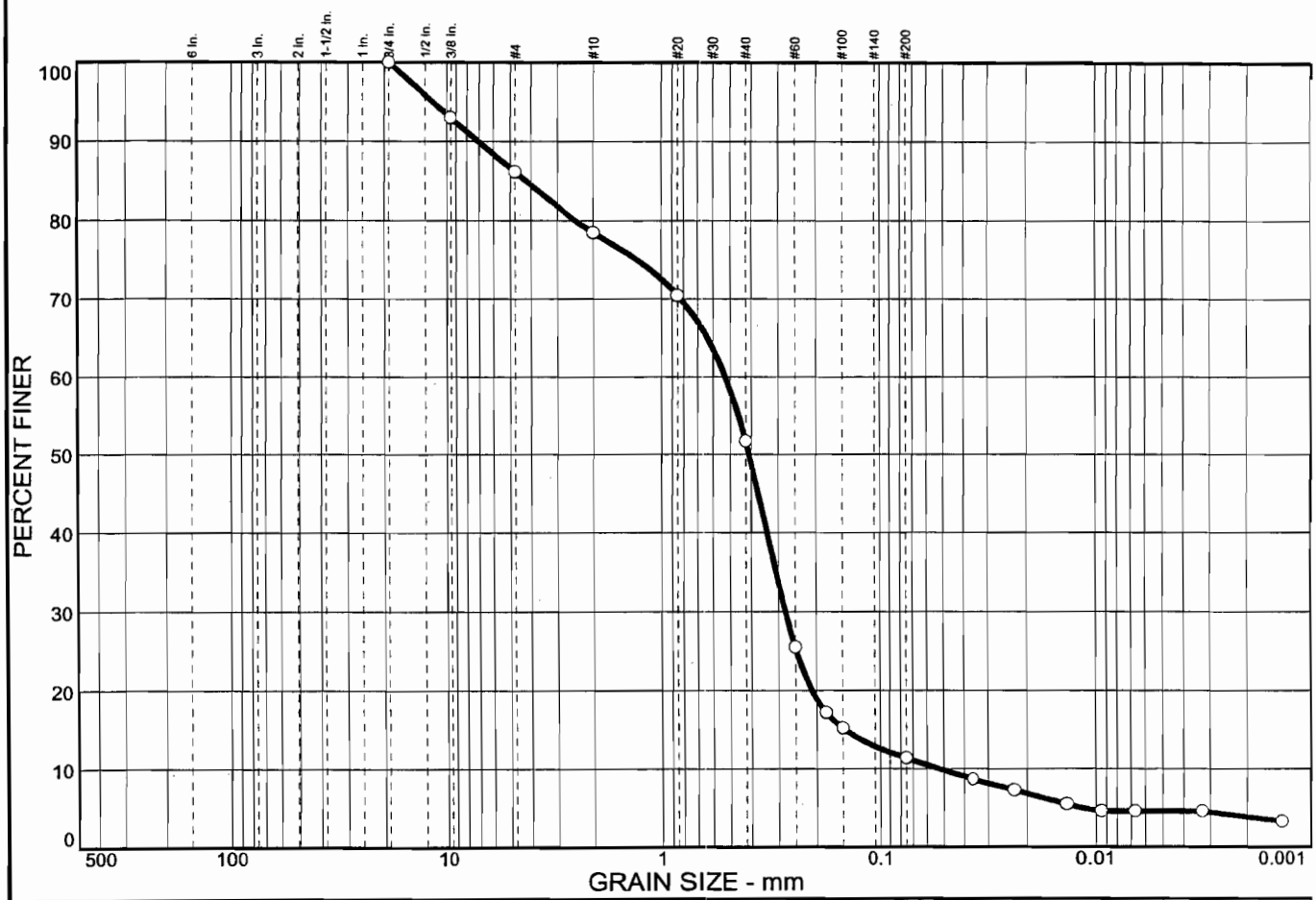
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.8	74.8	6.8	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.0		
#4	86.2		
#10	78.5		
#20	70.5		
#40	51.7		
#60	25.5		
#80	17.2		
#100	15.2		
#200	11.4		

* (no specification provided)

Soil Description

Brown to gray well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.19 D_{60}= 0.527 D_{50}= 0.410
D_{30}= 0.278 D_{15}= 0.146 D_{10}= 0.0519
C_u= 10.16 C_c= 2.82

Classification

USCS= AASHTO=

Remarks

Sample No.: 8 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 10.5'-12.0'

H. C. NUTTING COMPANY
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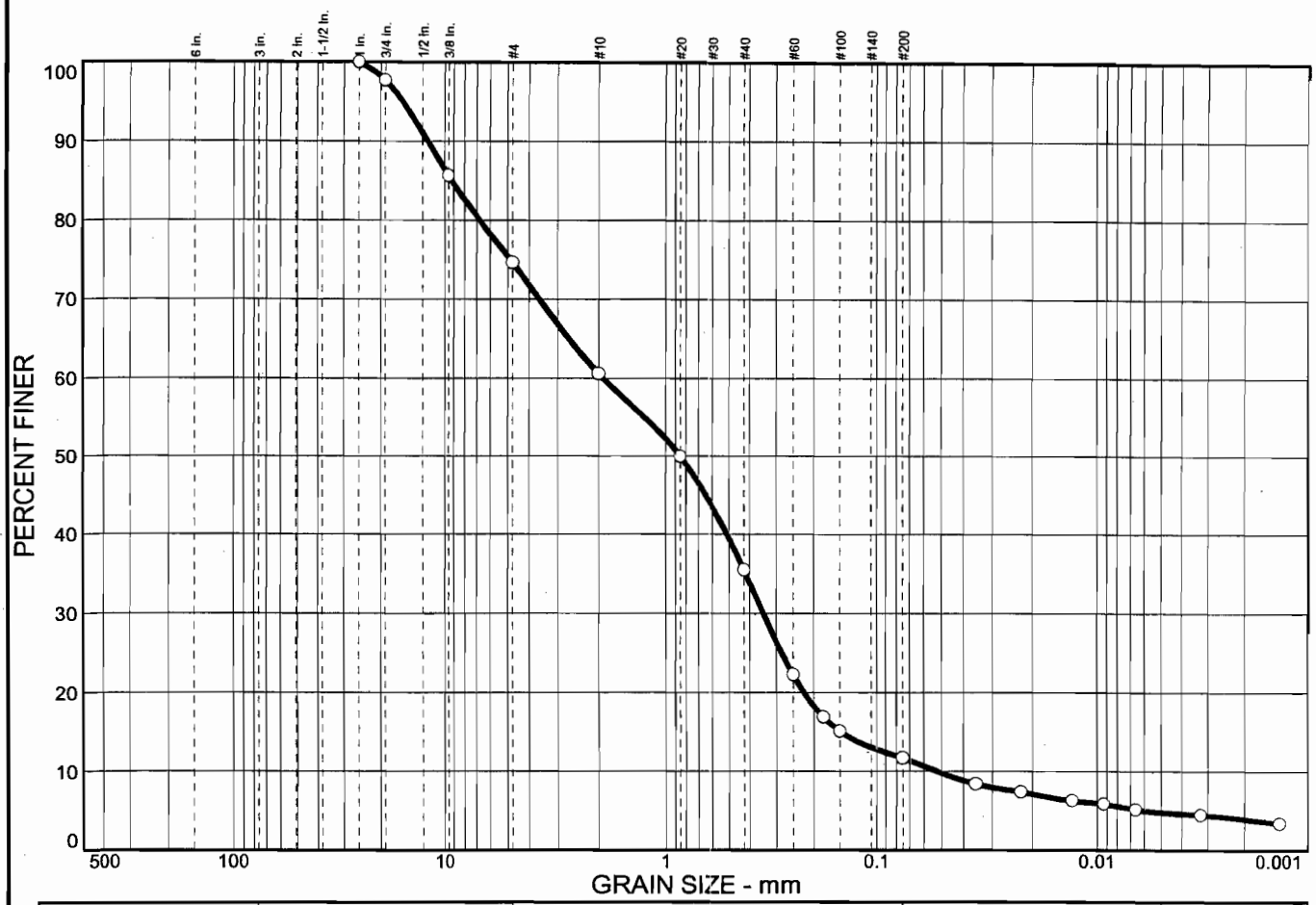
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.3	63.0	6.9	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.7		
0.375 in.	85.7		
#4	74.7		
#10	60.6		
#20	50.0		
#40	35.5		
#60	22.3		
#80	16.9		
#100	15.1		
#200	11.7		

* (no specification provided)

Soil Description

Brown well graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.16 D_{60}= 1.91 D_{50}= 0.850
D_{30}= 0.344 D_{15}= 0.148 D_{10}= 0.0519
C_u= 36.84 C_c= 1.19

Classification

USCS= AASHTO=

Remarks

Sample No.: 12 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 16.5'-18.0'

H. C. NUTTING COMPANY
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SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	44.6	34.7	20.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.5		
#10	99.3		
#20	98.6		
#40	92.4		
#60	76.7		
#80	66.8		
#100	63.6		
#140	58.7		
#200	54.9		

* (no specification provided)

Soil Description

Brown sandy lean clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.321 D_{60}= 0.118 D_{50}= 0.0609
D_{30}= 0.0216 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 17 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 22.5'-24.0'

H. C. NUTTING COMPANY
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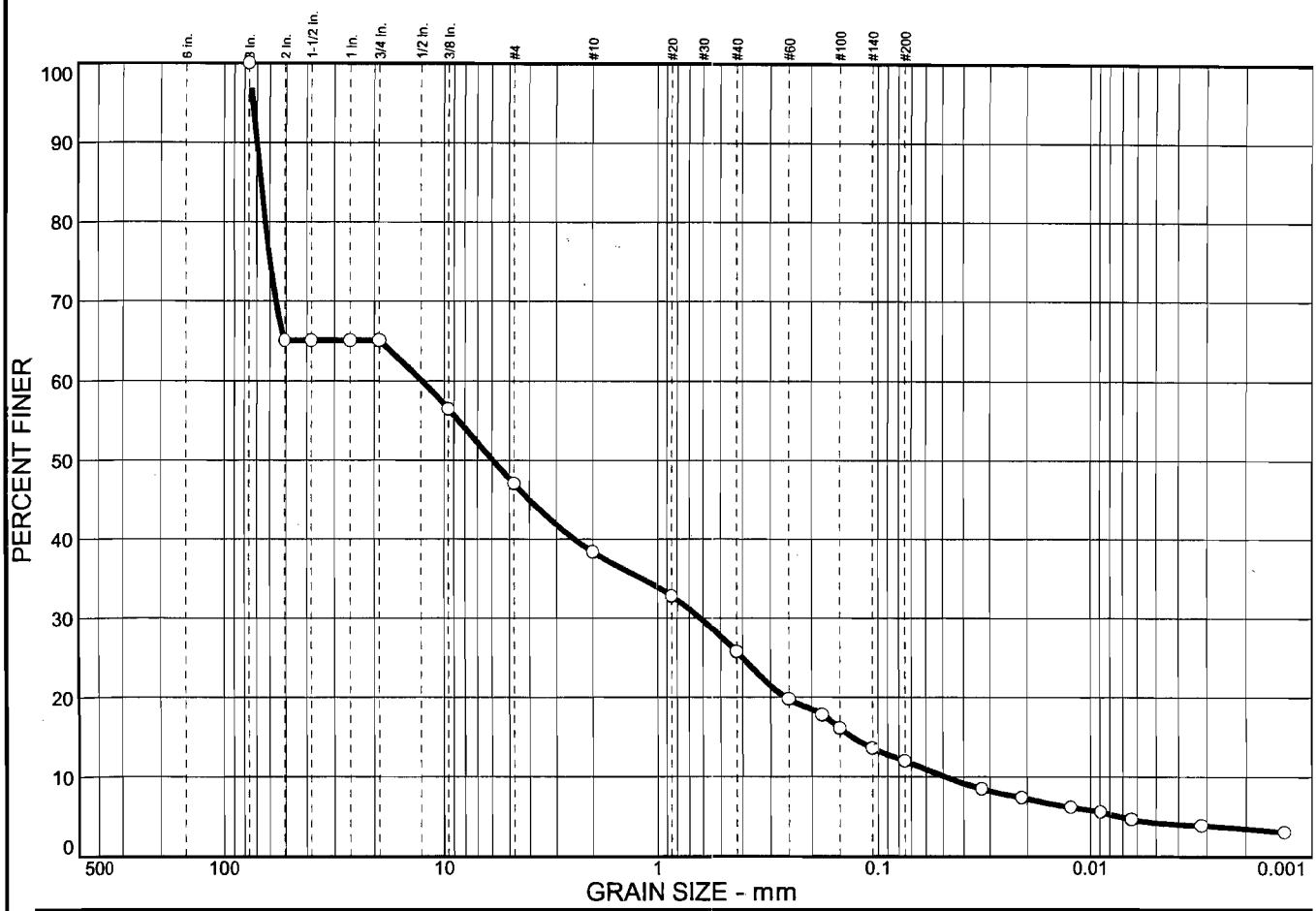
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	52.9	35.1	7.7	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	65.1		
1.5 in.	65.1		
1 in.	65.1		
0.75 in.	65.1		
0.375 in.	56.5		
#4	47.1		
#10	38.4		
#20	32.8		
#40	25.8		
#60	19.8		
#80	17.8		
#100	16.1		
#140	13.6		
#200	12.0		

* (no specification provided)

Soil Description

Brown to gray silty gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 66.4 D_{60}= 12.5 D_{50}= 5.92
D_{30}= 0.618 D_{15}= 0.132 D_{10}= 0.0483
C_u= 259.10 C_c= 0.63

Classification

USCS= AASHTO=

Remarks

Zero retained on the 1 1/2 inch, 1 inch, and 3/4 inch sieve

Sample No.: 22 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 30.0'-31.5'

H. C. NUTTING COMPANY
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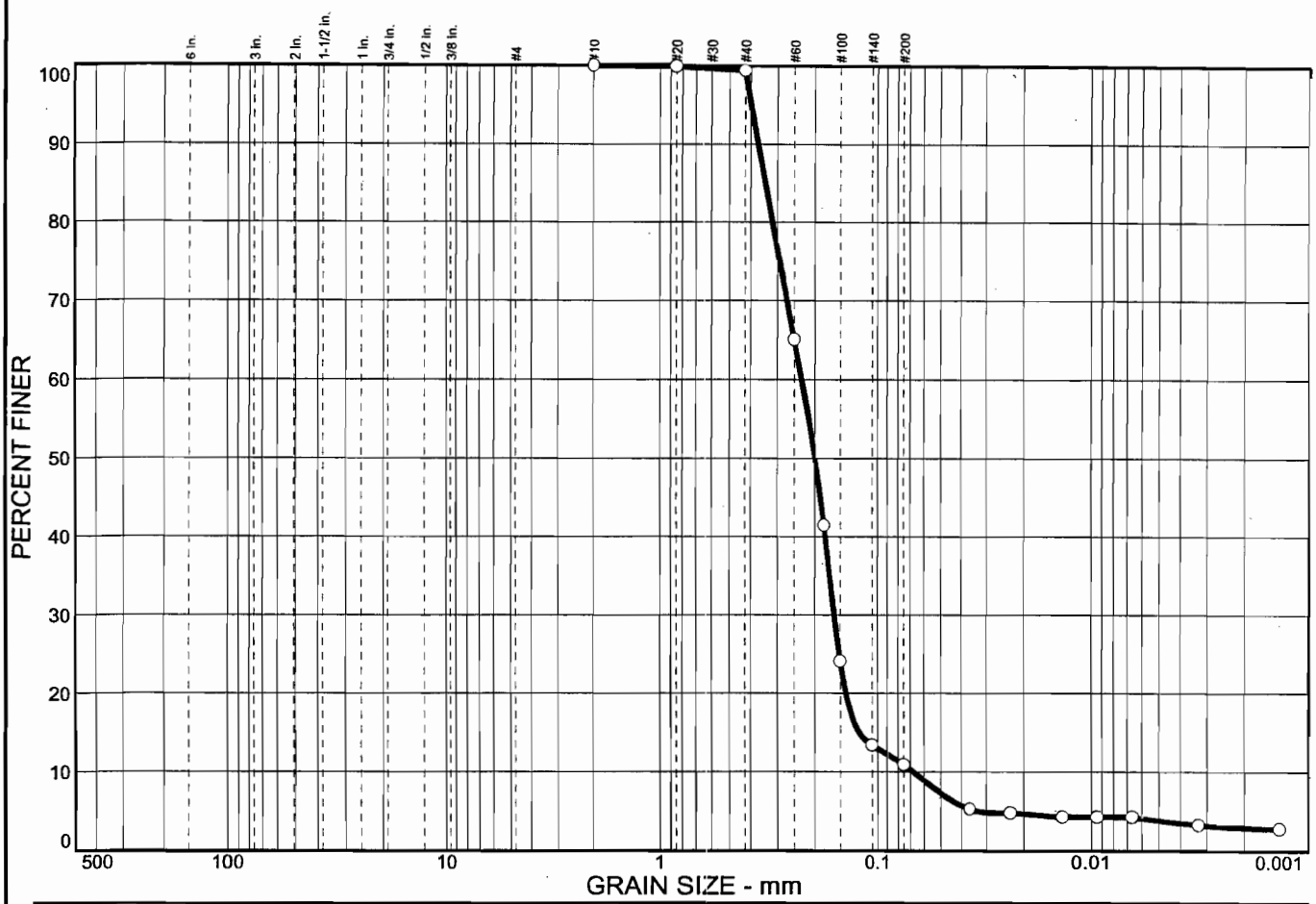
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	89.1	7.0	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.4		
#60	65.1		
#80	41.5		
#100	24.1		
#140	13.4		
#200	10.9		

* (no specification provided)

Soil Description

Light brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.341 D_{60}= 0.230 D_{50}= 0.199
D_{30}= 0.160 D_{15}= 0.122 D_{10}= 0.0674
C_u= 3.42 C_c= 1.66

Classification

USCS= AASHTO=

Remarks

Sample No.: 24 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 33.0'-34.5'

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EMPLOYEE OWNED
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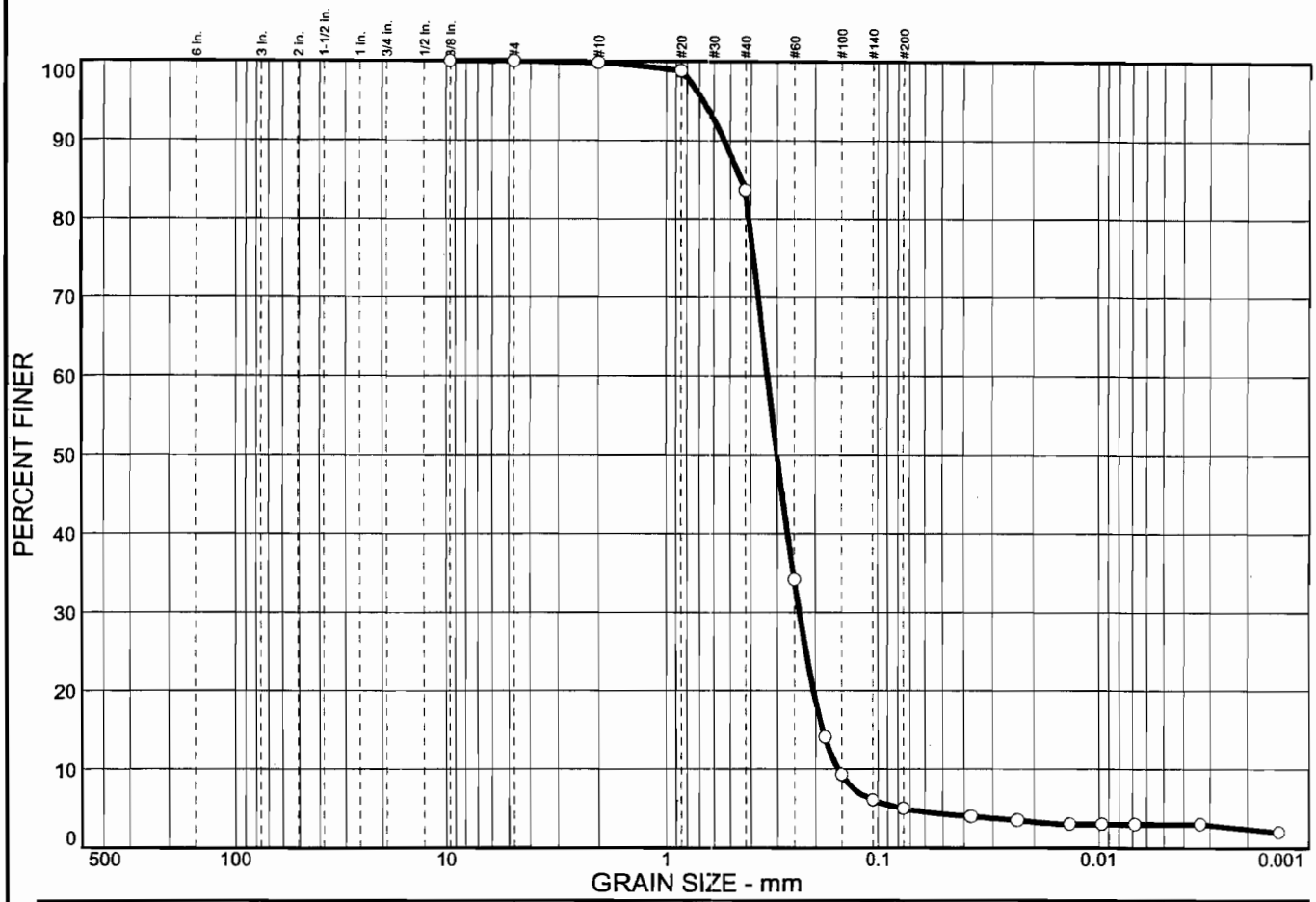
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	95.0	2.0	3.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.8		
#20	98.8		
#40	83.7		
#60	34.2		
#80	14.1		
#100	9.3		
#140	6.1		
#200	5.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.444 D_{60}= 0.333 D_{50}= 0.300
D_{30}= 0.237 D_{15}= 0.184 D_{10}= 0.156
C_u= 2.14 C_c= 1.08

Classification

USCS= AASHTO=

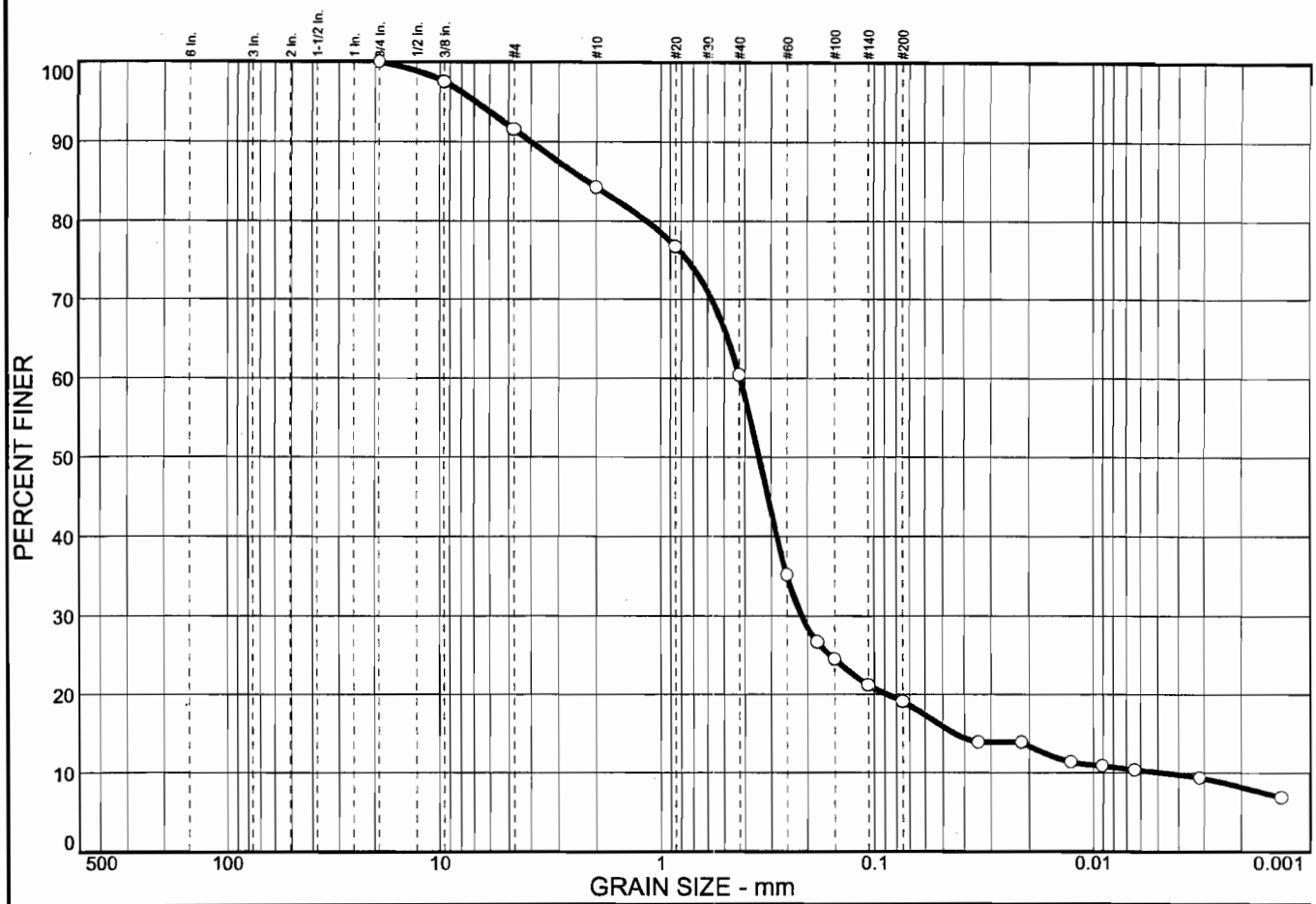
Remarks

Sample No.: 28 **Source of Sample:** C-04-05 **Date:** 06/30/05
Location: **Elev./Depth:** 39.0'-40.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.4	72.5	9.0	10.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.5		
#4	91.6		
#10	84.3		
#20	76.8		
#40	60.4		
#60	35.2		
#80	26.7		
#100	24.5		
#140	21.2		
#200	19.1		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.19 D_{60}= 0.421 D_{50}= 0.342
D_{30}= 0.212 D_{15}= 0.0440 D_{10}= 0.0047
C_u= 89.67 C_c= 22.77

Classification

USCS= AASHTO=

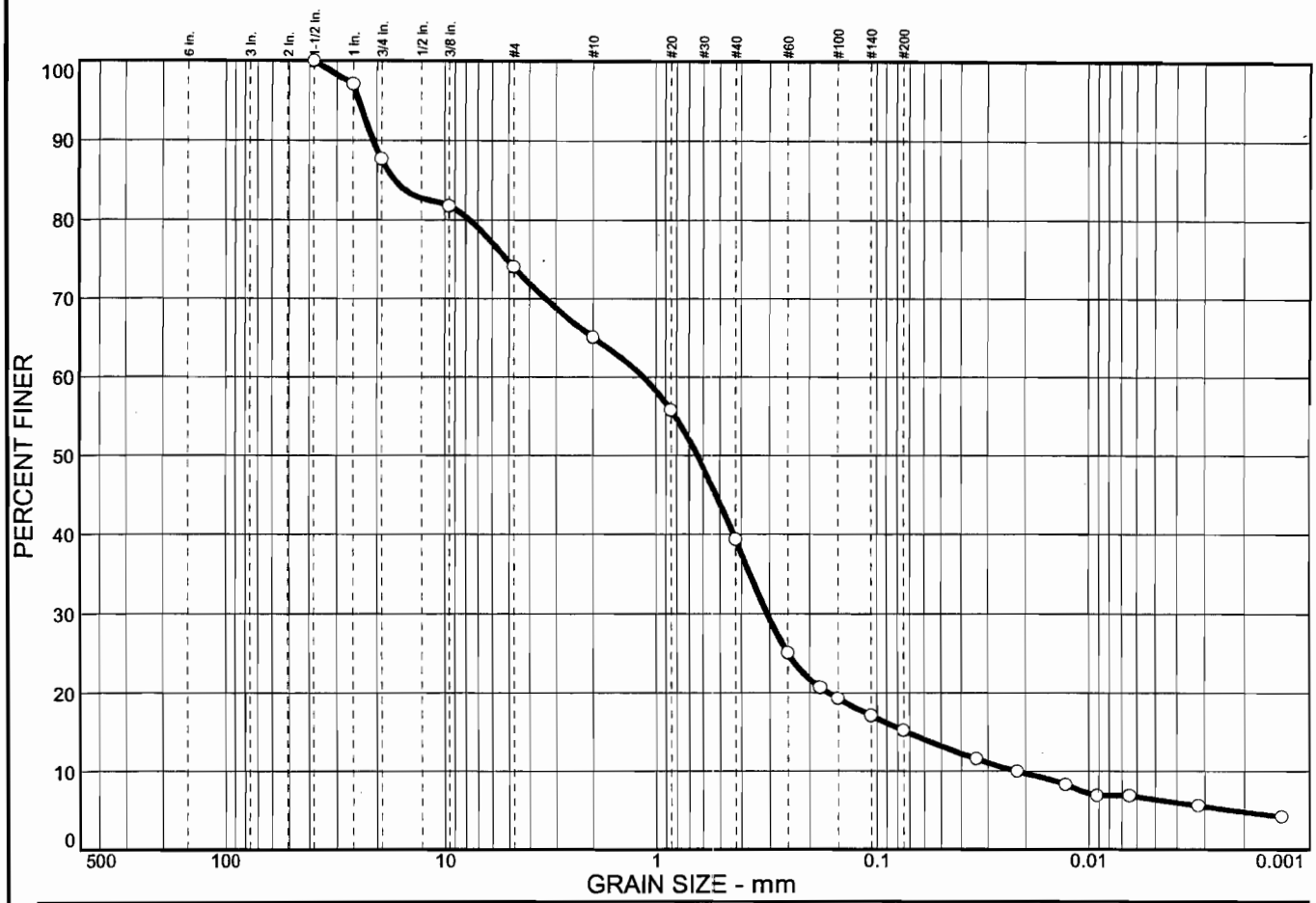
Remarks

Sample No.: 3 **Source of Sample:** C-04-06 **Date:** 06/30/05
Location: **Elev./Depth:** 3.0'-6.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.9	58.9	8.8	6.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	97.1		
0.75 in.	87.7		
0.375 in.	81.8		
#4	74.1		
#10	65.1		
#20	55.8		
#40	39.4		
#60	25.1		
#80	20.7		
#100	19.3		
#140	17.1		
#200	15.2		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.6 D_{60}= 1.15 D_{50}= 0.637
D_{30}= 0.307 D_{15}= 0.0721 D_{10}= 0.0218
C_u= 52.57 C_c= 3.77

Classification

USCS= AASHTO=

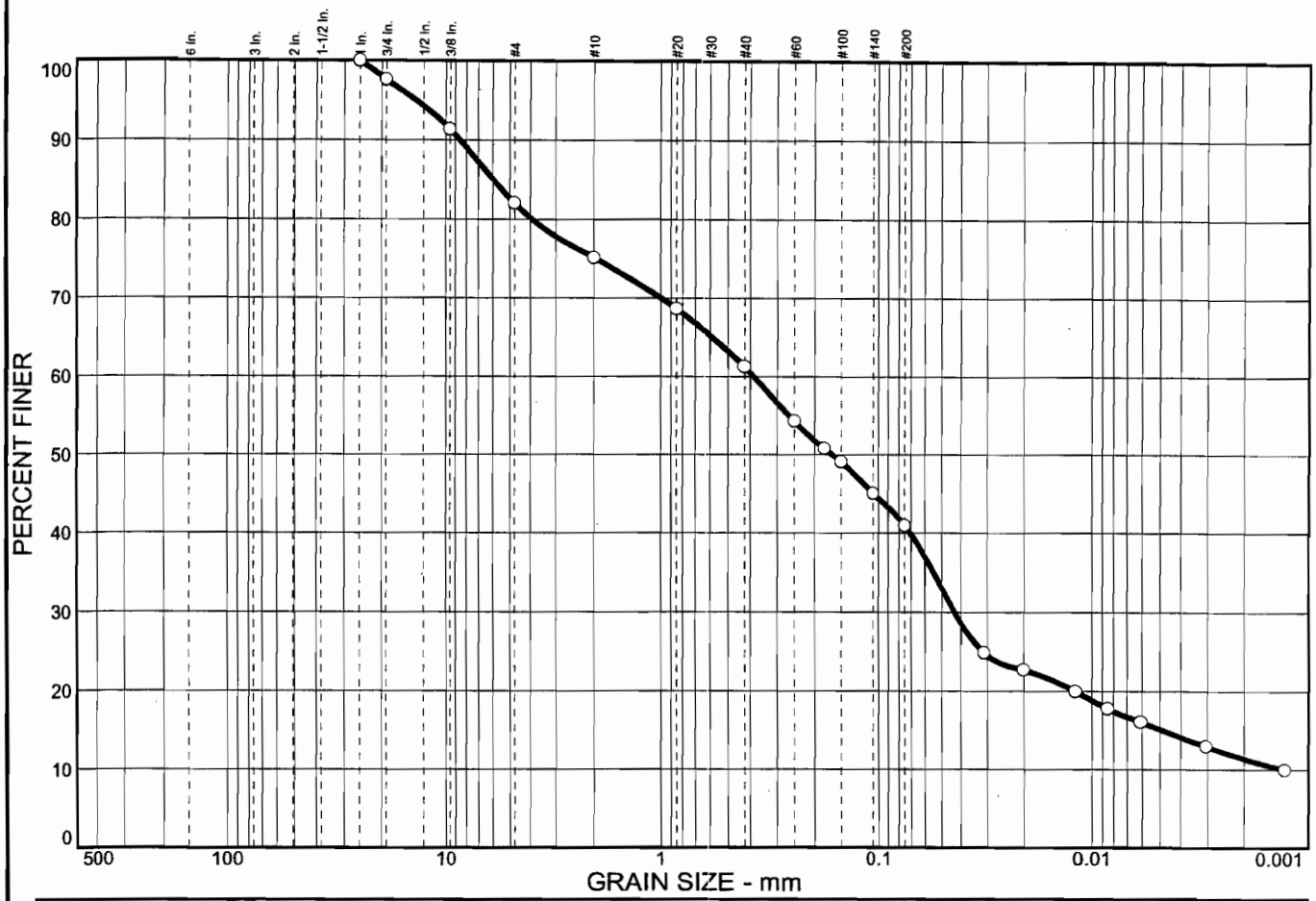
Remarks

Sample No.: 7 **Source of Sample:** C-04-06 **Date:** 06/30/05
Location: **Elev./Depth:** 18.0'-21.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.9	41.1	25.8	15.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.6		
0.375 in.	91.4		
#4	82.1		
#10	75.2		
#20	68.7		
#40	61.3		
#60	54.3		
#80	50.8		
#100	49.1		
#140	45.1		
#200	41.0		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.94 D_{60}= 0.385 D_{50}= 0.165
D_{30}= 0.0429 D_{15}= 0.0048 D_{10}= 0.0013
C_u= 295.90 C_c= 3.67

Classification

USCS= AASHTO=

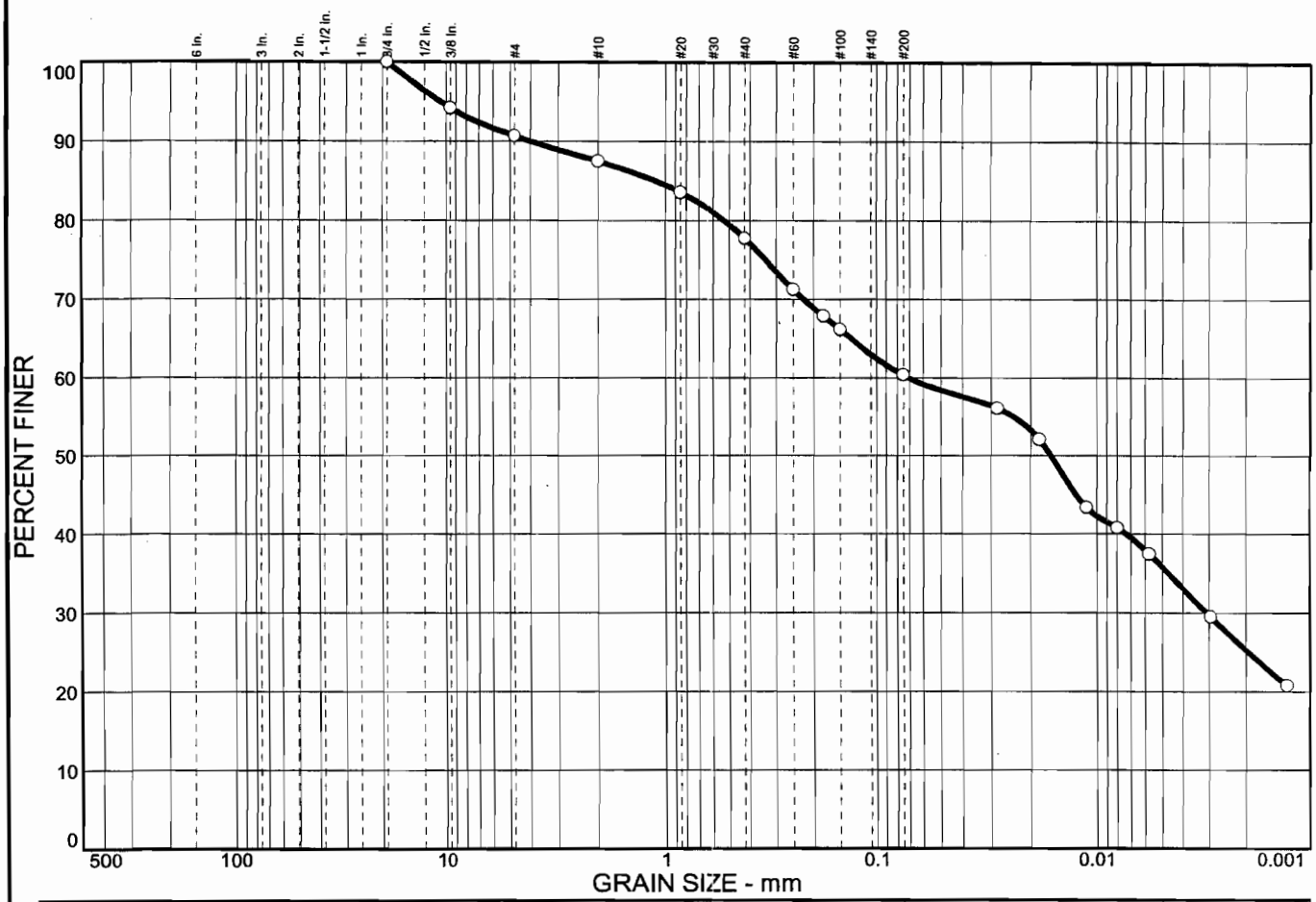
Remarks

Sample No.: 11 **Source of Sample:** C-04-06 **Date:** 06/30/05
Location: **Elev./Depth:** 25.5'-28.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.3	30.3	24.6	35.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.2		
#4	90.7		
#10	87.5		
#20	83.6		
#40	77.8		
#60	71.3		
#80	67.9		
#100	66.2		
#200	60.4		

* (no specification provided)

Soil Description

Light brown sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.10 D_{60}= 0.0701 D_{50}= 0.0162
D_{30}= 0.0031 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 2 **Source of Sample:** C-04-07 **Date:** 06/30/05
Location: **Elev./Depth:** 2.0'-3.5'

H. C. NUTTING COMPANY
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Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.1	30.2	40.5	21.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	95.7		
0.375 in.	94.0		
#4	91.9		
#10	89.8		
#20	82.0		
#40	77.7		
#60	74.5		
#80	72.5		
#100	71.2		
#200	61.7		

* (no specification provided)

Soil Description

Light brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.17 D_{60}= 0.0677 D_{50}= 0.0361
D_{30}= 0.0108 D_{15}= 0.0026 D_{10}= 0.0014
C_u= 46.98 C_c= 1.20

Classification

USCS= AASHTO=

Remarks

Sample No.: 12 **Source of Sample:** C-04-07 **Date:** 04-29-05
Location: **Elev./Depth:** 20.0'-21.5'

H. C. NUTTING COMPANY
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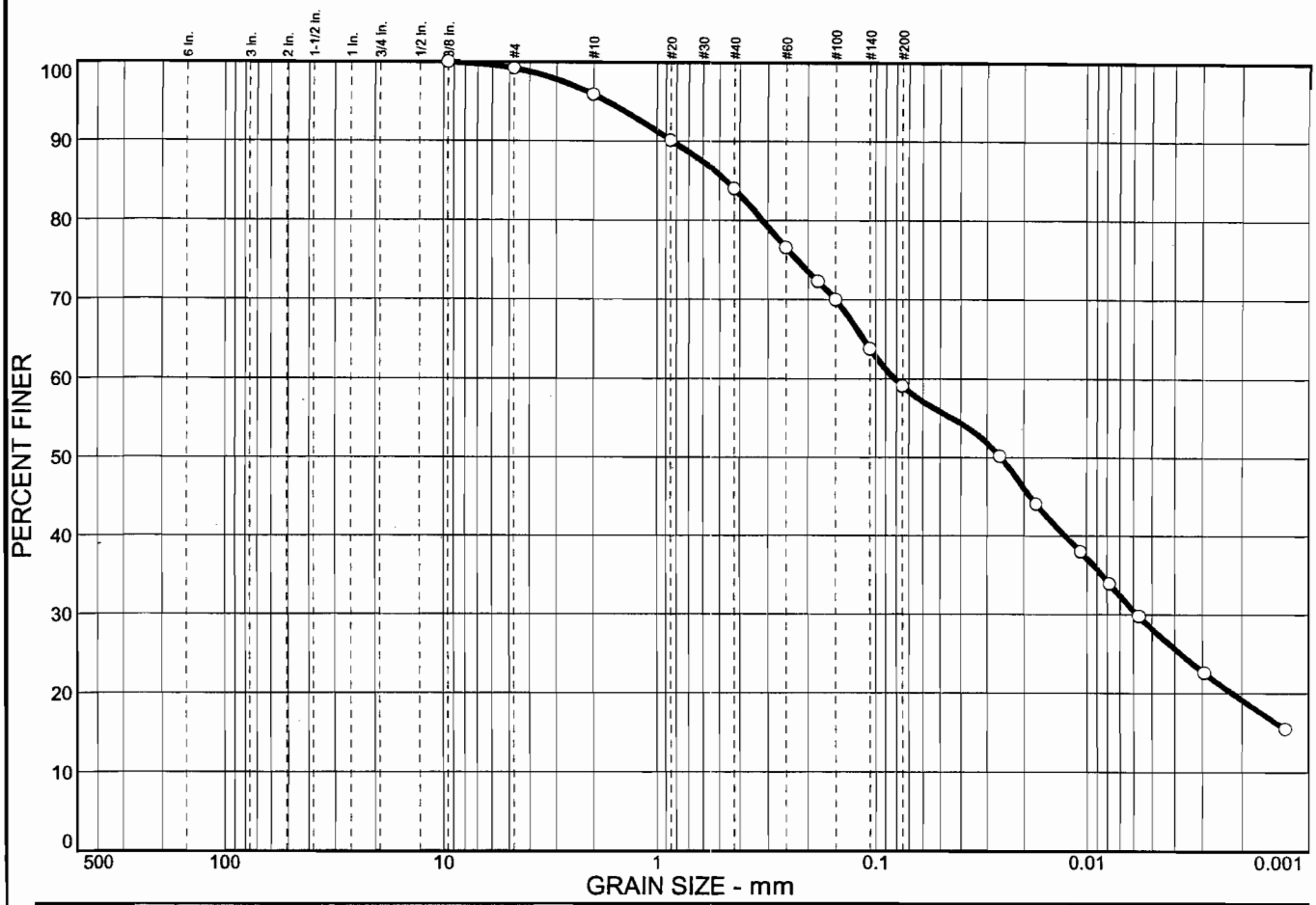
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	40.1	30.9	28.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.2		
#10	95.9		
#20	90.1		
#40	84.0		
#60	76.6		
#80	72.3		
#100	70.0		
#140	63.8		
#200	59.1		

* (no specification provided)

Soil Description

Brown to gray silty lean clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.464 D_{60}= 0.0814 D_{50}= 0.0256
D_{30}= 0.0058 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

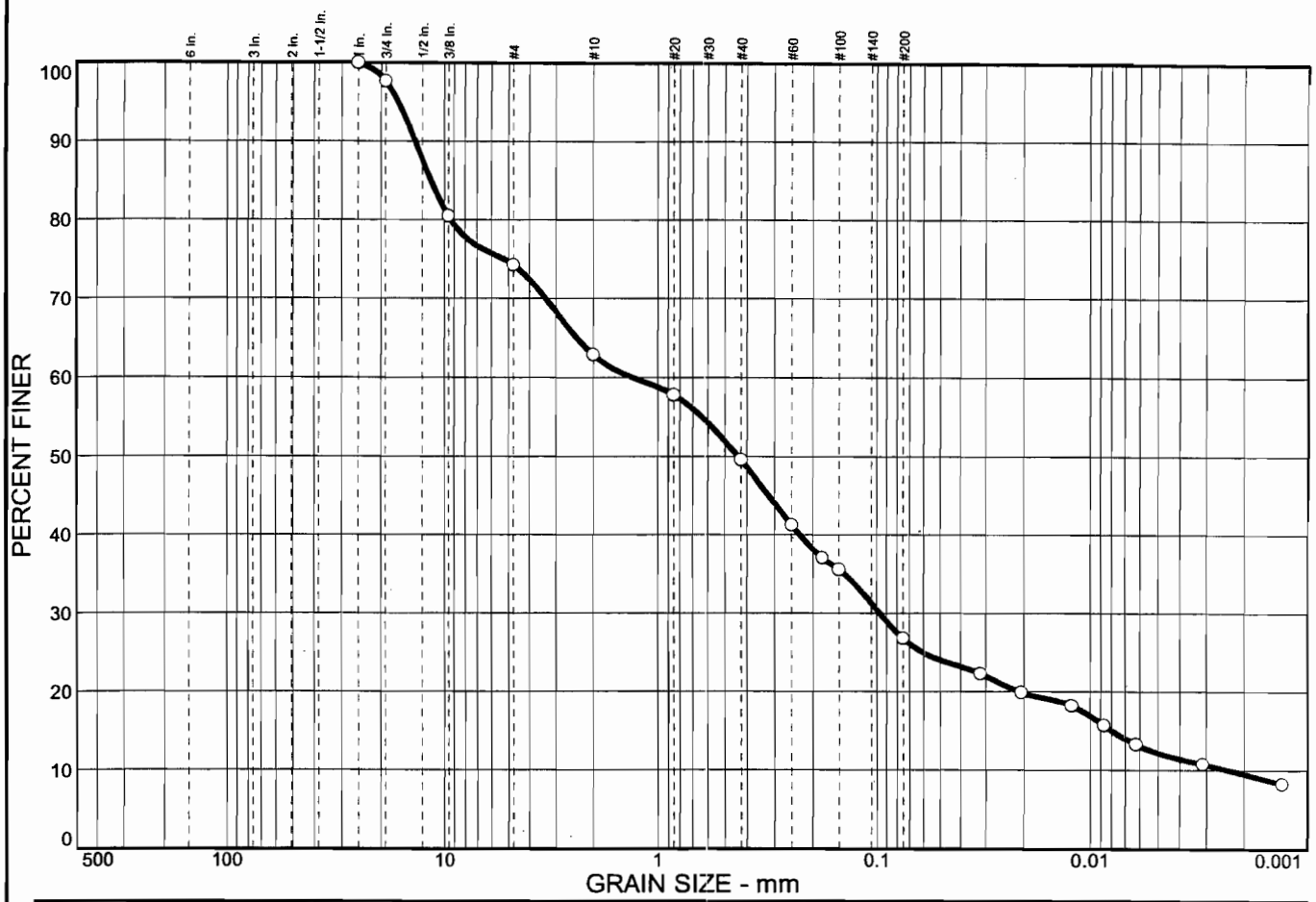
Remarks

Sample No.: 19 **Source of Sample:** C-04-07 **Date:** 7-9-05
Location: **Elev./Depth:** 30.5'-32.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.7	47.5	14.6	12.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.7		
0.375 in.	80.5		
#4	74.3		
#10	62.9		
#20	57.8		
#40	49.6		
#60	41.3		
#80	37.1		
#100	35.6		
#200	26.8		

* (no specification provided)

Soil Description

Brown clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.5 D_{60}= 1.30 D_{50}= 0.436
D_{30}= 0.0966 D_{15}= 0.0080 D_{10}= 0.0023
C_u= 555.48 C_c= 3.08

Classification

USCS= AASHTO=

Remarks

Sample No.: 28 **Source of Sample:** C-04-07 **Date:** 06/30/05
Location: **Elev./Depth:** 44.0'-45.5'

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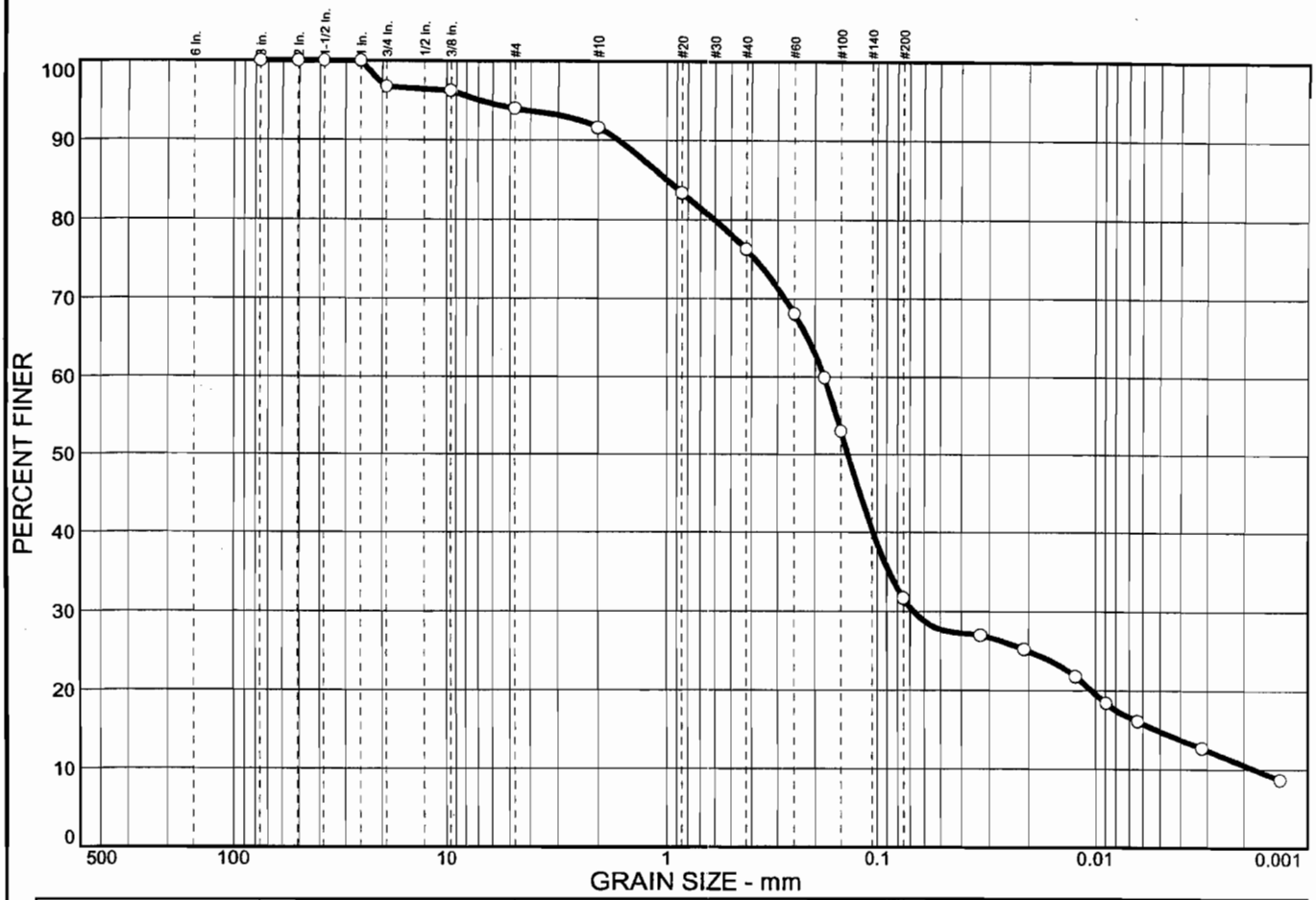
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.0	62.3	16.9	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	96.7		
0.375 in.	96.2		
#4	94.0		
#10	91.6		
#20	83.4		
#40	76.3		
#60	68.1		
#80	59.9		
#100	53.0		
#200	31.7		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.990 D_{60}= 0.181 D_{50}= 0.139
D_{30}= 0.0670 D_{15}= 0.0052 D_{10}= 0.0018
C_u= 101.86 C_c= 14.04

Classification

USCS= AASHTO=

Remarks

Sample No.: 34 **Source of Sample:** C-04-07 **Date:** 04-29-05
Location: **Elev./Depth:** 53.0'-54.5

H. C. NUTTING COMPANY
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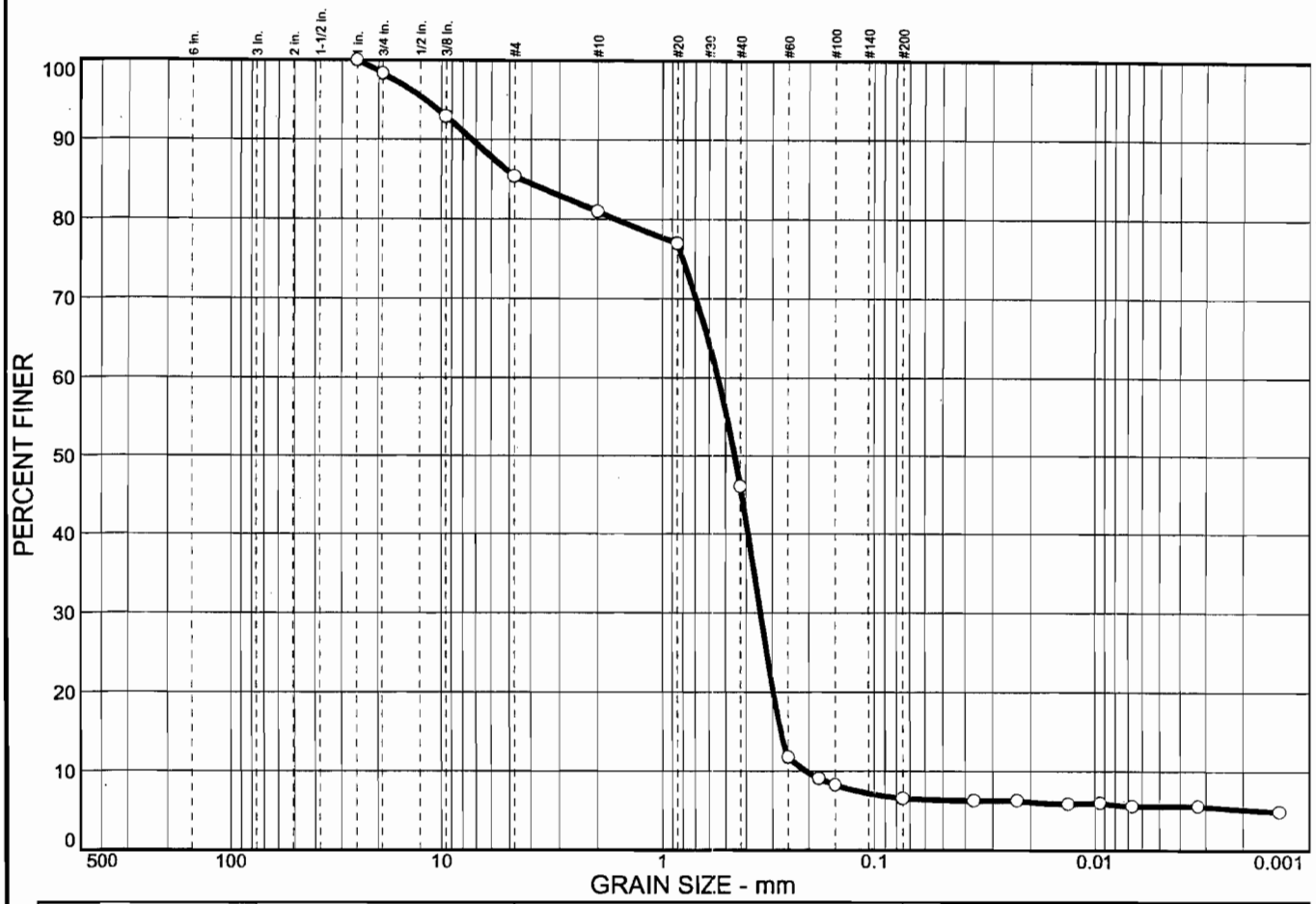
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.6	78.8	1.0	5.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	98.3		
0.375 in.	92.9		
#4	85.4		
#10	81.0		
#20	77.0		
#40	46.1		
#60	11.8		
#80	9.1		
#100	8.3		
#200	6.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.40 D_{60}= 0.542 D_{50}= 0.451
D_{30}= 0.342 D_{15}= 0.271 D_{10}= 0.206
C_u= 2.64 C_c= 1.05

Classification

USCS= AASHTO=

Remarks

Sample No.: 48 **Source of Sample:** C-04-07 **Date:** 06/30/05
Location: **Elev./Depth:** 72.5'-74.0'

H. C. NUTTING COMPANY
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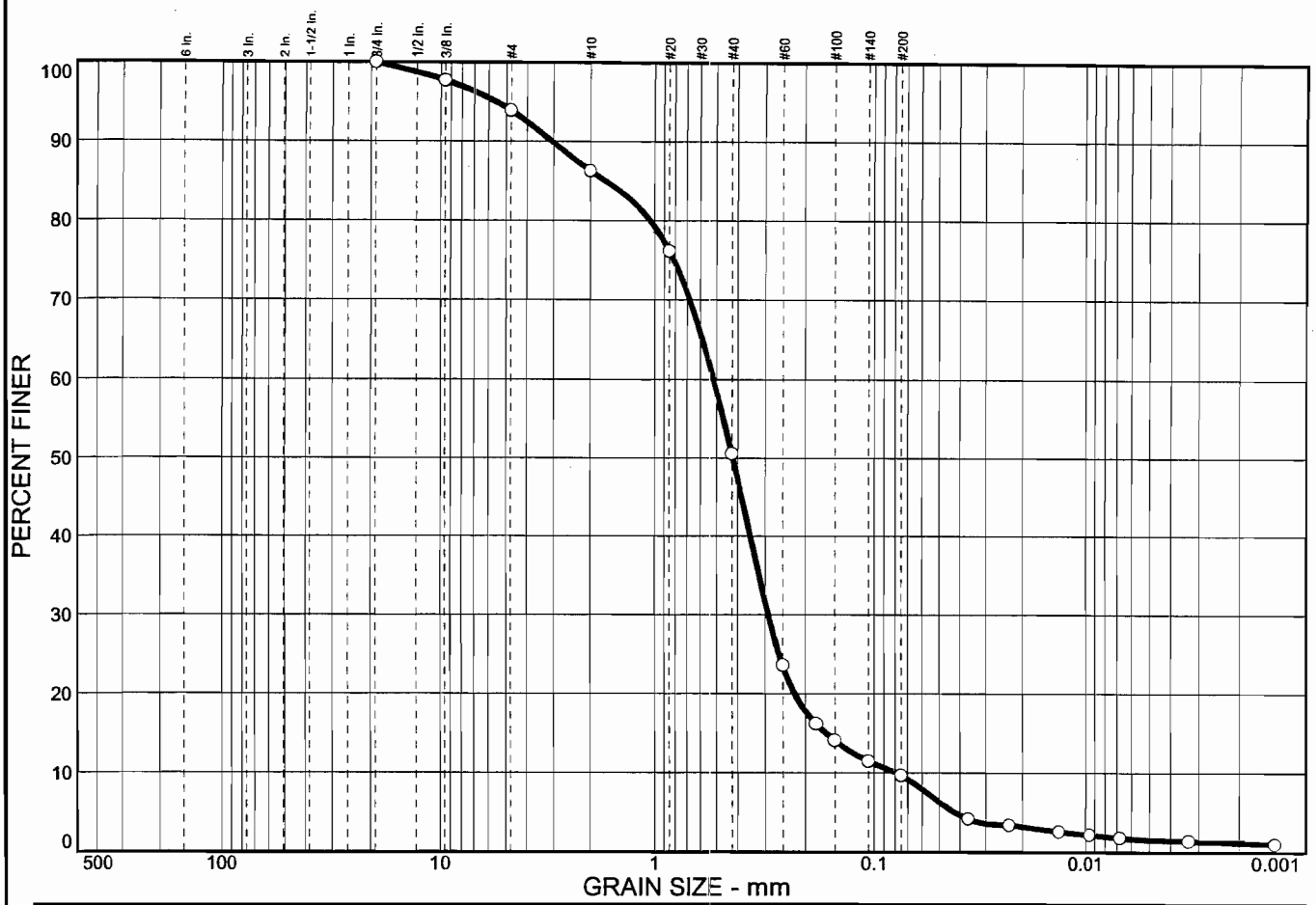
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.1	84.2	8.1	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	97.7		
#4	93.9		
#10	86.3		
#20	76.2		
#40	50.6		
#60	23.6		
#80	16.2		
#100	14.1		
#140	11.5		
#200	9.7		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.69 D_{60}= 0.517 D_{50}= 0.420
D_{30}= 0.290 D_{15}= 0.163 D_{10}= 0.0788
C_u= 6.57 C_c= 2.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 67 **Source of Sample:** C-04-07 **Date:** 7-9-05
Location: **Elev./Depth:** 101.0'-102.5'

H. C. NUTTING COMPANY
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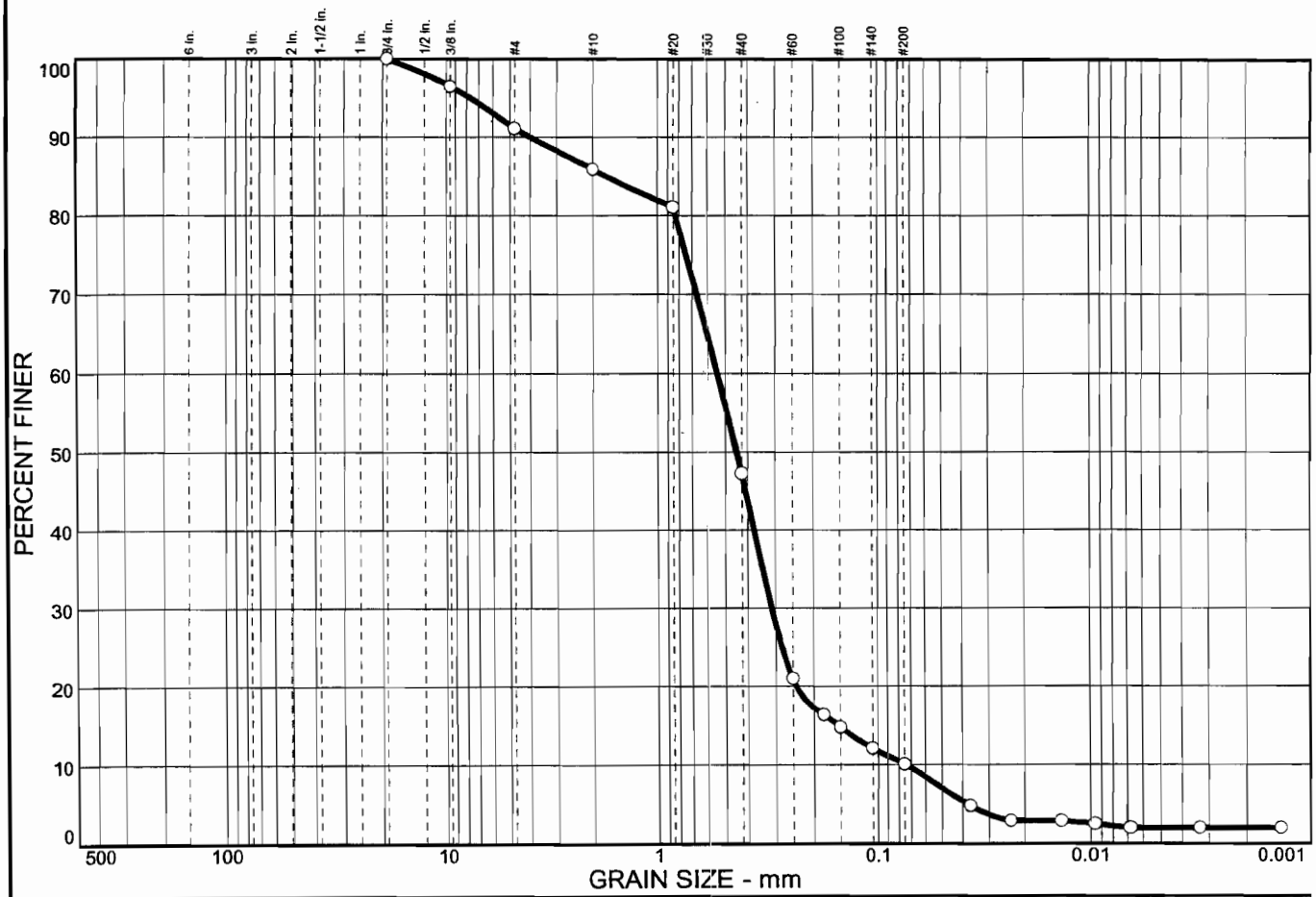
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.9	81.0	8.1	2.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.5		
#4	91.1		
#10	85.9		
#20	81.1		
#40	47.3		
#60	21.0		
#80	16.4		
#100	14.8		
#140	12.1		
#200	10.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.71 D_{60}= 0.541 D_{50}= 0.446
D_{30}= 0.312 D_{15}= 0.153 D_{10}= 0.0738
C_u= 7.33 C_c= 2.44

Classification

USCS= AASHTO=

Remarks

Sample No.: 78 **Source of Sample:** C-04-07 **Date:** 06/30/05
Location: **Elev./Depth:** 117.5'-119.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	85.8	8.4	5.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	100.0		
0.375 in.	100.0		
#4	99.7		
#10	99.4		
#20	97.9		
#40	86.5		
#60	42.6		
#80	26.5		
#100	22.5		
#200	13.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.418 D_{60}= 0.314 D_{50}= 0.277
D_{30}= 0.198 D_{15}= 0.0860 D_{10}= 0.0217
C_u= 14.49 C_c= 5.78

Classification

USCS= AASHTO=

Remarks

Sample No.: 93 **Source of Sample:** C-04-07 **Date:** 04-29-05
Location: **Elev./Depth:** 141.5'-143.0'

H. C. NUTTING COMPANY
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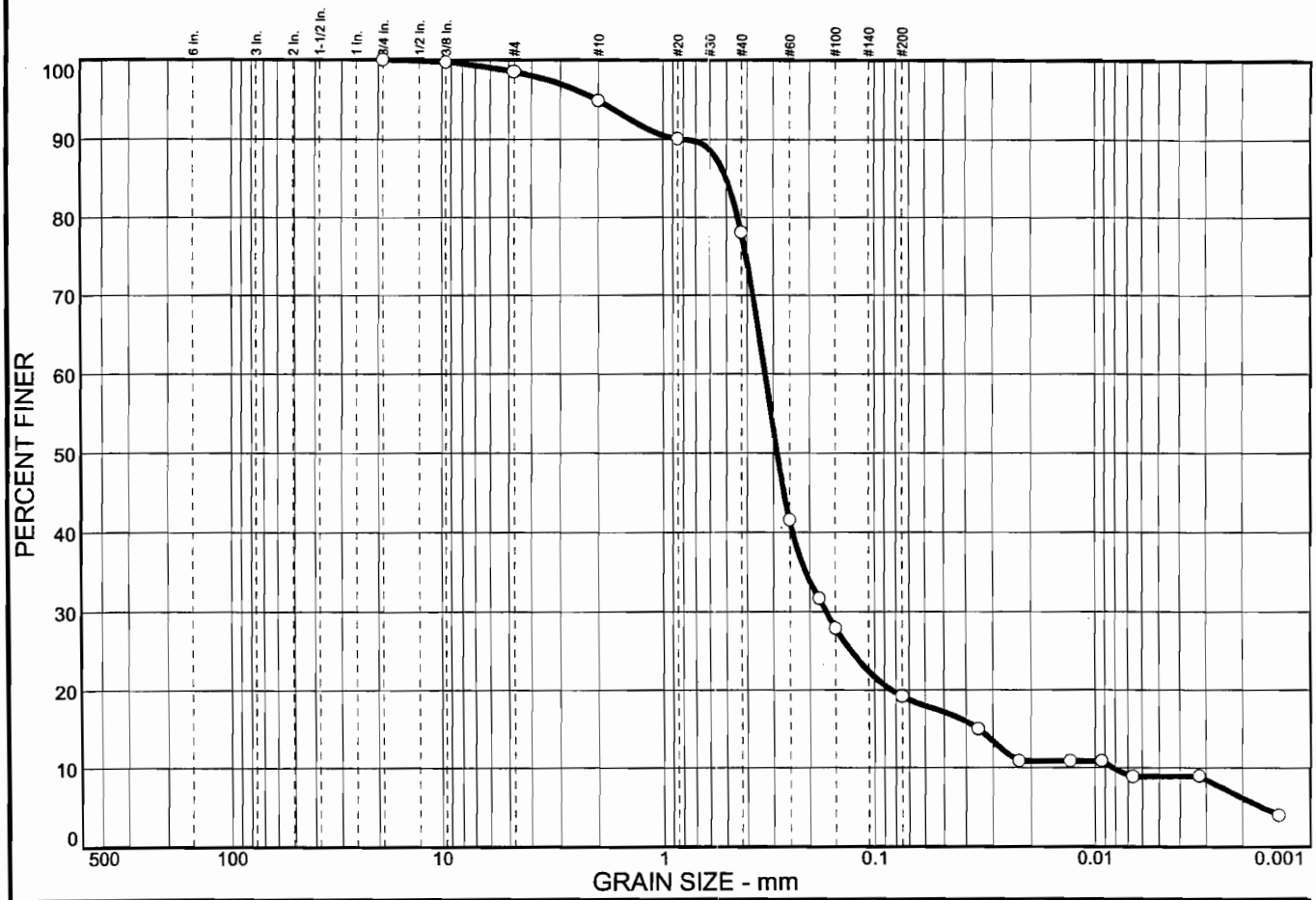
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.5	79.3	10.3	8.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.7		
#4	98.5		
#10	94.9		
#20	90.1		
#40	78.1		
#60	41.6		
#80	31.7		
#100	27.9		
#200	19.2		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.500 D_{60}= 0.328 D_{50}= 0.287
D_{30}= 0.166 D_{15}= 0.0351 D_{10}= 0.0082
C_u= 40.16 C_c= 10.30

Classification

USCS= AASHTO=

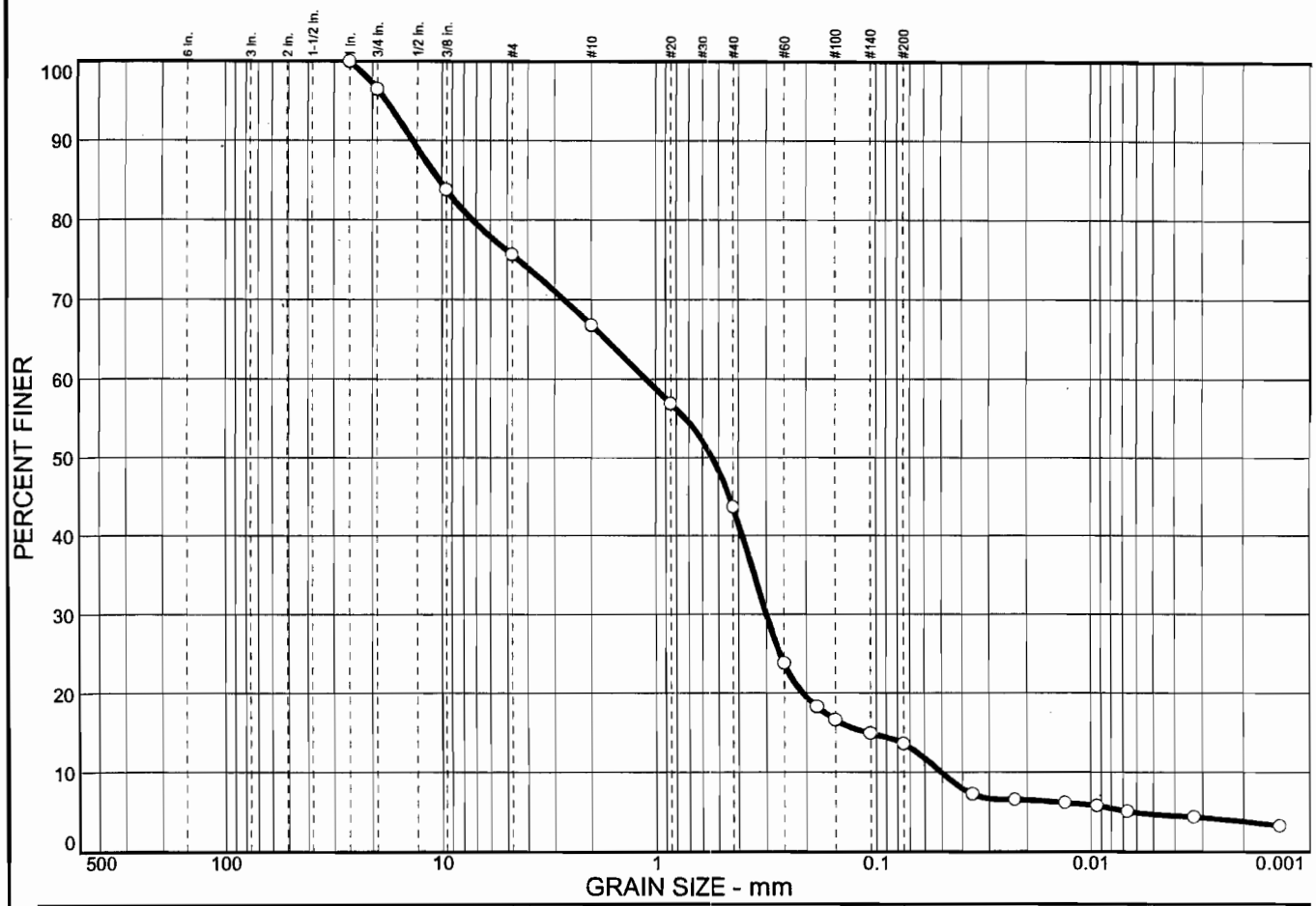
Remarks

Sample No.: 120 **Source of Sample:** C-04-07 **Date:** 06/30/05
Location: **Elev./Depth:** 179.0'-180.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	24.3	62.1	8.9	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.5		
0.375 in.	83.8		
#4	75.7		
#10	66.8		
#20	56.9		
#40	43.7		
#60	23.8		
#80	18.3		
#100	16.6		
#140	14.9		
#200	13.6		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.2 D_{60}= 1.11 D_{50}= 0.535
D_{30}= 0.300 D_{15}= 0.109 D_{10}= 0.0500
C_u= 22.13 C_c= 1.63

Classification

USCS= AASHTO=

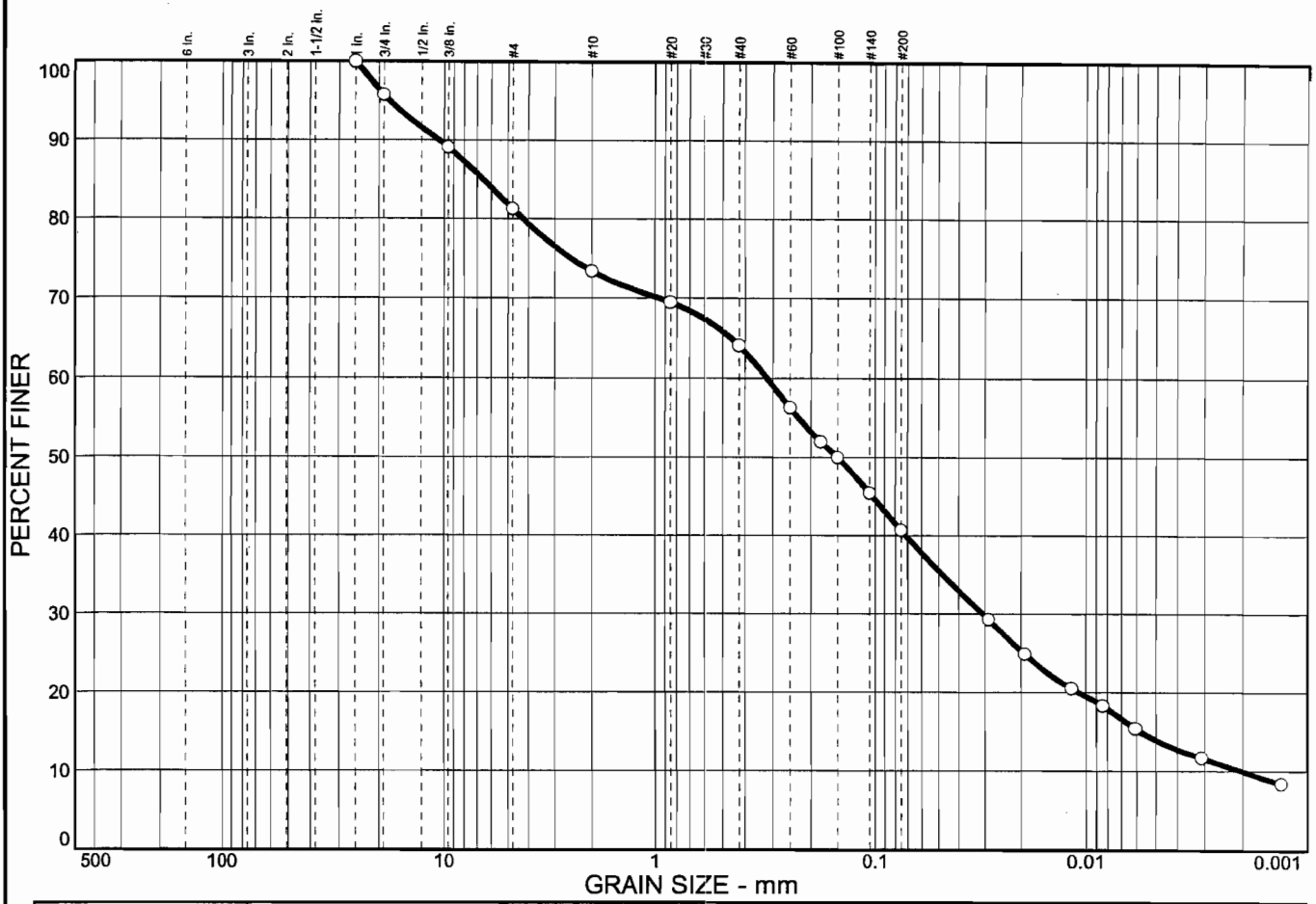
Remarks

Sample No.: 2 **Source of Sample:** C-04-08 **Date:** 06/30/05
Location: **Elev./Depth:** 1.5'-3.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.7	40.6	26.8	13.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	95.8		
0.375 in.	89.1		
#4	81.3		
#10	73.4		
#20	69.5		
#40	64.1		
#60	56.3		
#80	52.0		
#100	50.0		
#140	45.5		
#200	40.7		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.52 D_{60}= 0.319 D_{50}= 0.150
D_{30}= 0.0307 D_{15}= 0.0058 D_{10}= 0.0020
C_u= 159.34 C_c= 1.48

Classification

USCS= AASHTO=

Remarks

Sample No.: 6 **Source of Sample:** C-04-08 **Date:** 06/30/05
Location: **Elev./Depth:** 7.5'-9.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.4	17.3	45.4	29.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.8		
#4	92.6		
#10	89.1		
#20	86.7		
#40	85.3		
#60	83.5		
#80	82.2		
#100	81.2		
#140	78.7		
#200	75.3		

* (no specification provided)

Soil Description

Light brown silt/lean clay with sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.384 D_{60}= 0.0237 D_{50}= 0.0192
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 8 **Source of Sample:** C-04-08 **Date:** 06/30/05
Location: **Elev./Depth:** 10.5'-12.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.3	40.3	28.7	18.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.7		
0.375 in.	92.3		
#4	87.7		
#10	81.8		
#20	78.3		
#40	73.8		
#60	65.3		
#80	59.7		
#100	57.2		
#140	52.0		
#200	47.4		

* (no specification provided)

Soil Description

Light brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.29 D_{60}= 0.184 D_{50}= 0.0915
D_{30}= 0.0168 D_{15}= 0.0037 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

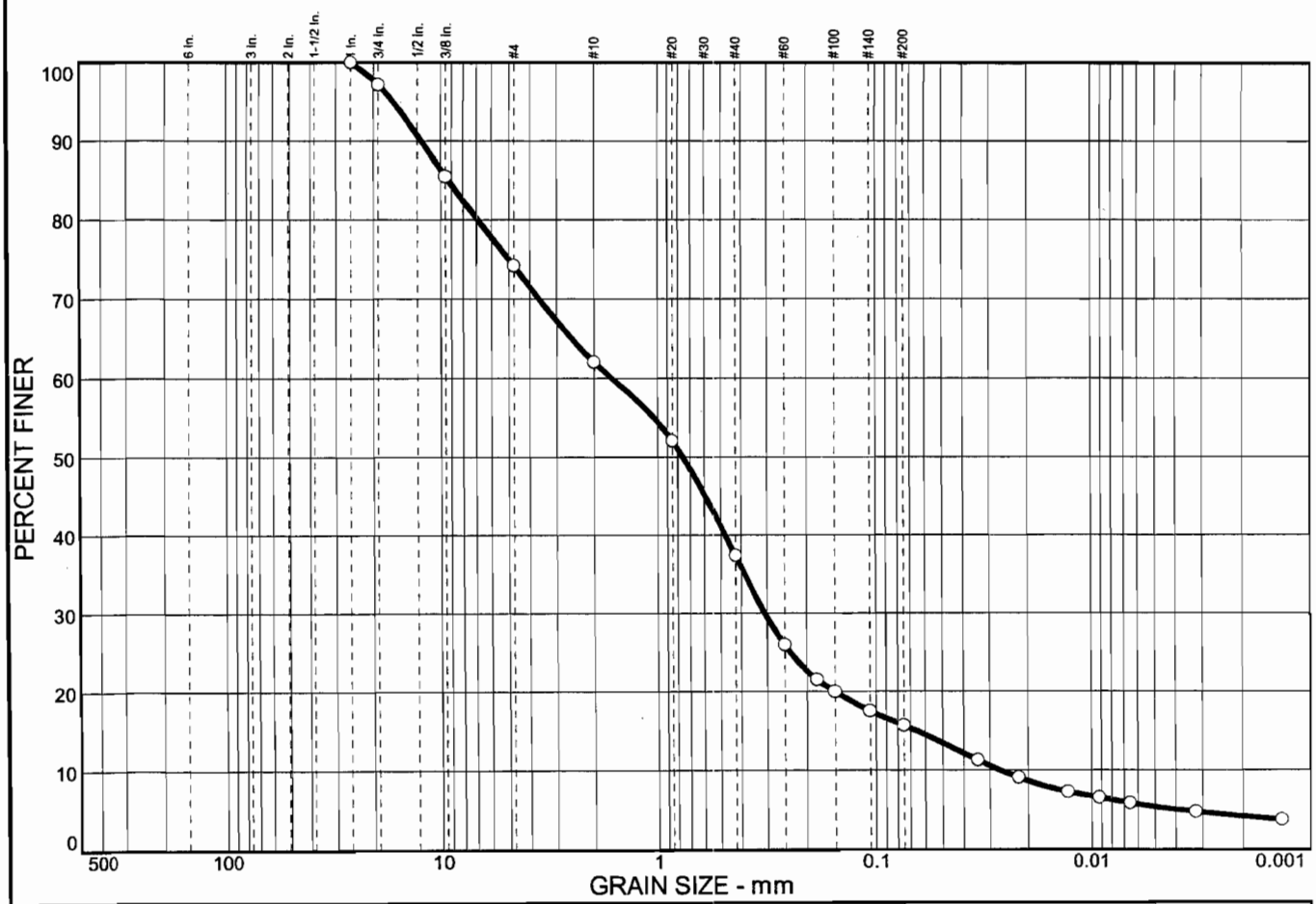
Remarks

Sample No.: 11 **Source of Sample:** C-04-08 **Date:** 06/30/05
Location: **Elev./Depth:** 15.0'-16.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.8	58.5	10.3	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.2		
0.375 in.	85.5		
#4	74.2		
#10	62.1		
#20	52.1		
#40	37.4		
#60	26.0		
#80	21.5		
#100	20.0		
#140	17.5		
#200	15.7		

* (no specification provided)

Soil Description

Dark gray clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.26 D_{60}= 1.64 D_{50}= 0.754
D_{30}= 0.307 D_{15}= 0.0656 D_{10}= 0.0268
C_u= 61.28 C_c= 2.14

Classification

USCS= AASHTO=

Remarks

Sample No.: 2 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 2.0'-3.6'

H. C. NUTTING COMPANY
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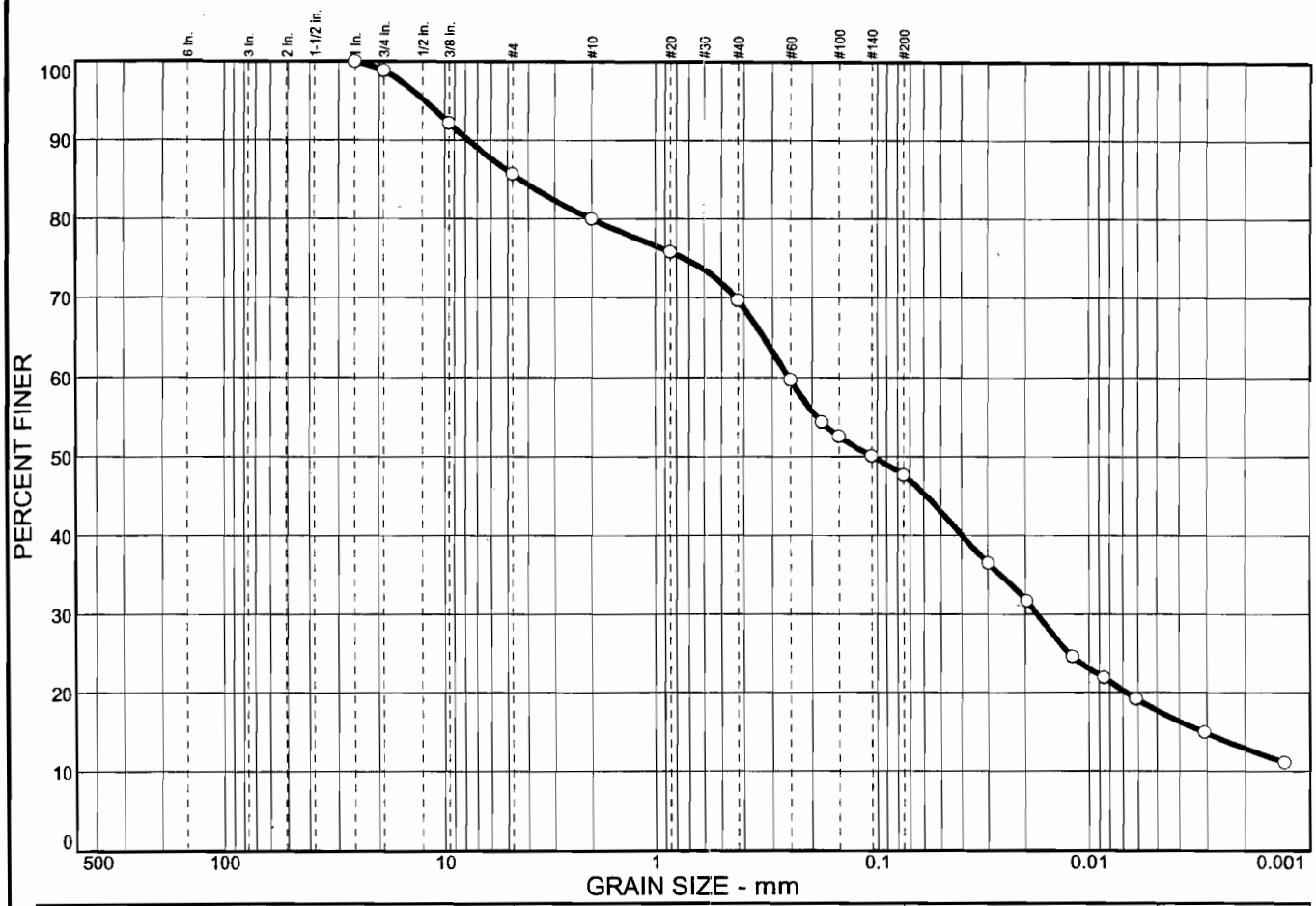
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.3	38.0	30.0	17.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	98.8		
0.375 in.	92.2		
#4	85.7		
#10	80.0		
#20	75.8		
#40	69.7		
#60	59.7		
#80	54.4		
#100	52.6		
#140	50.1		
#200	47.7		

* (no specification provided)

Soil Description

Brown to gray clayey sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.35 D_{60}= 0.254 D_{50}= 0.104
D_{30}= 0.0174 D_{15}= 0.0031 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 4 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 6.5'-9.0'

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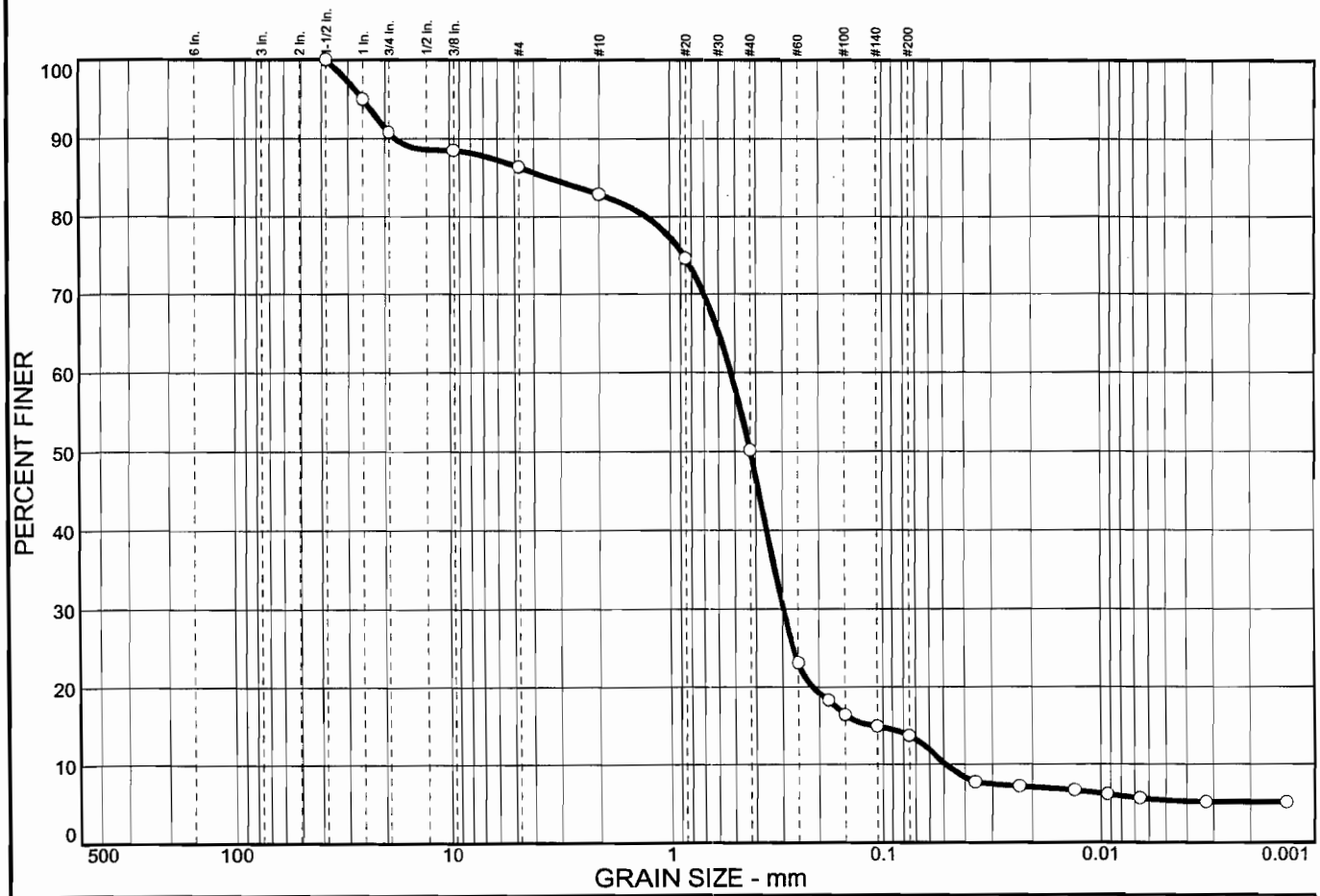
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.6	72.7	8.3	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.0		
0.75 in.	90.8		
0.375 in.	88.5		
#4	86.4		
#10	82.9		
#20	74.6		
#40	50.2		
#60	23.1		
#80	18.3		
#100	16.4		
#140	14.9		
#200	13.7		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.34 D_{60}= 0.522 D_{50}= 0.423
D_{30}= 0.296 D_{15}= 0.111 D_{10}= 0.0487
C_u= 10.72 C_c= 3.45

Classification

USCS= AASHTO=

Remarks

Sample No.: 8 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 16.0'-19.0'

H. C. NUTTING COMPANY
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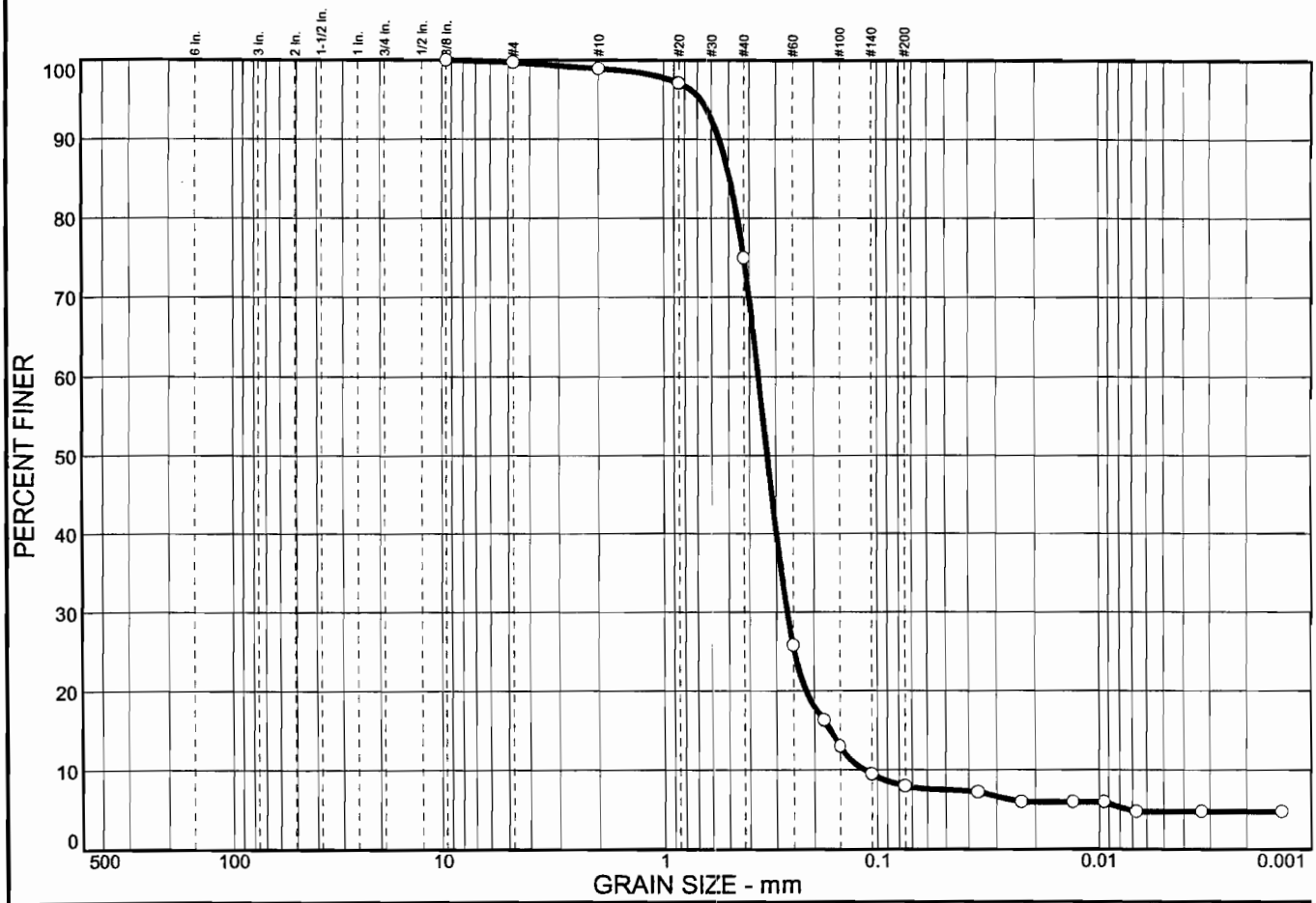
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	91.7	3.2	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.7		
#10	98.9		
#20	97.1		
#40	75.0		
#60	25.8		
#80	16.3		
#100	13.0		
#140	9.5		
#200	8.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.493 D_{60}= 0.363 D_{50}= 0.329
D_{30}= 0.266 D_{15}= 0.168 D_{10}= 0.114
C_u= 3.17 C_c= 1.71

Classification

USCS= AASHTO=

Remarks

Sample No.: 12 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 28.0'-31.0'

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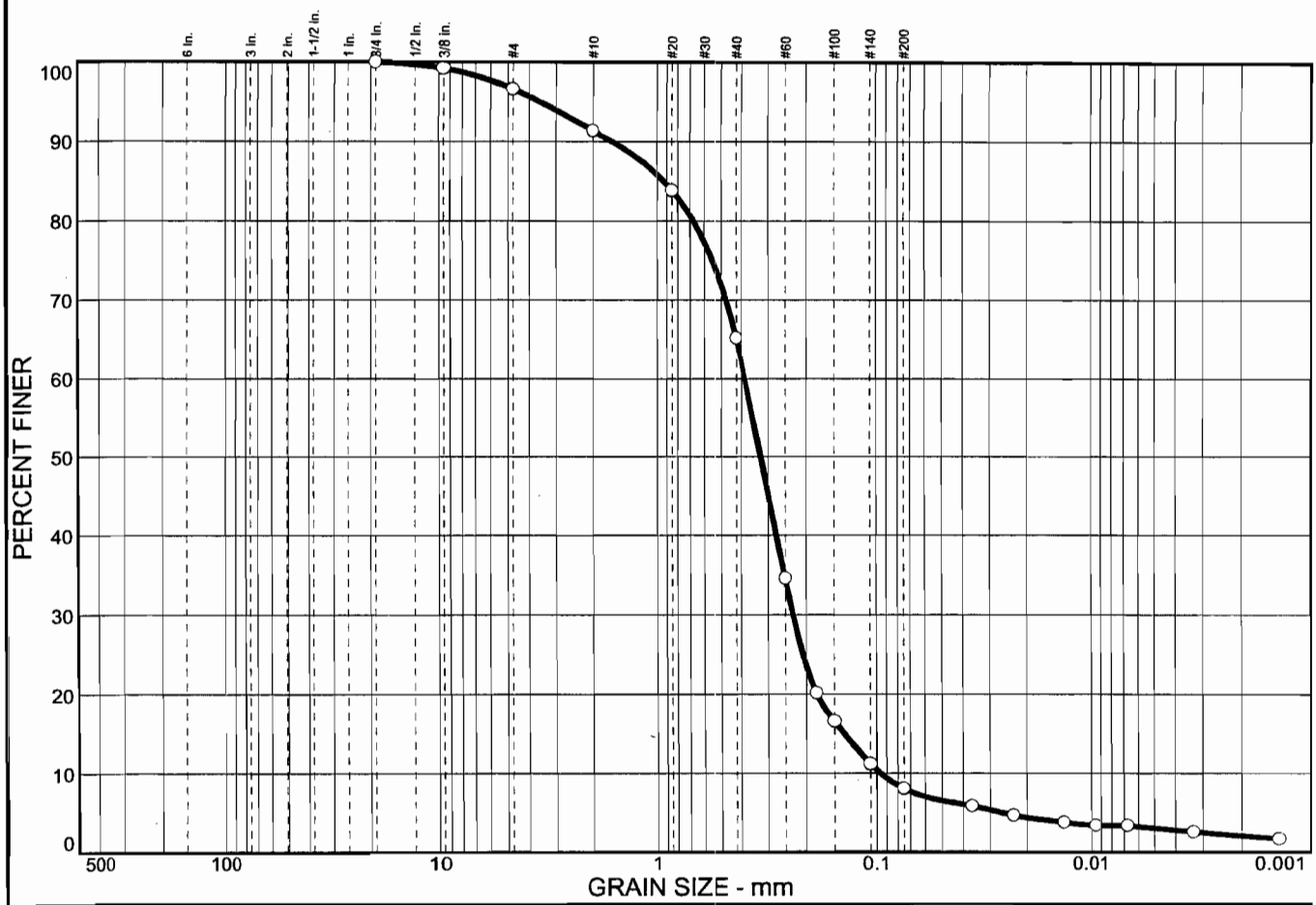
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.4	88.5	5.0	3.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.2		
#4	96.6		
#10	91.4		
#20	83.9		
#40	65.2		
#60	34.6		
#80	20.2		
#100	16.6		
#140	11.2		
#200	8.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.925 D_{60}= 0.384 D_{50}= 0.323
D_{30}= 0.230 D_{15}= 0.136 D_{10}= 0.0955
C_u= 4.02 C_c= 1.44

Classification

USCS= AASHTO=

Remarks

Sample No.: 15 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 37.0'-40.0'

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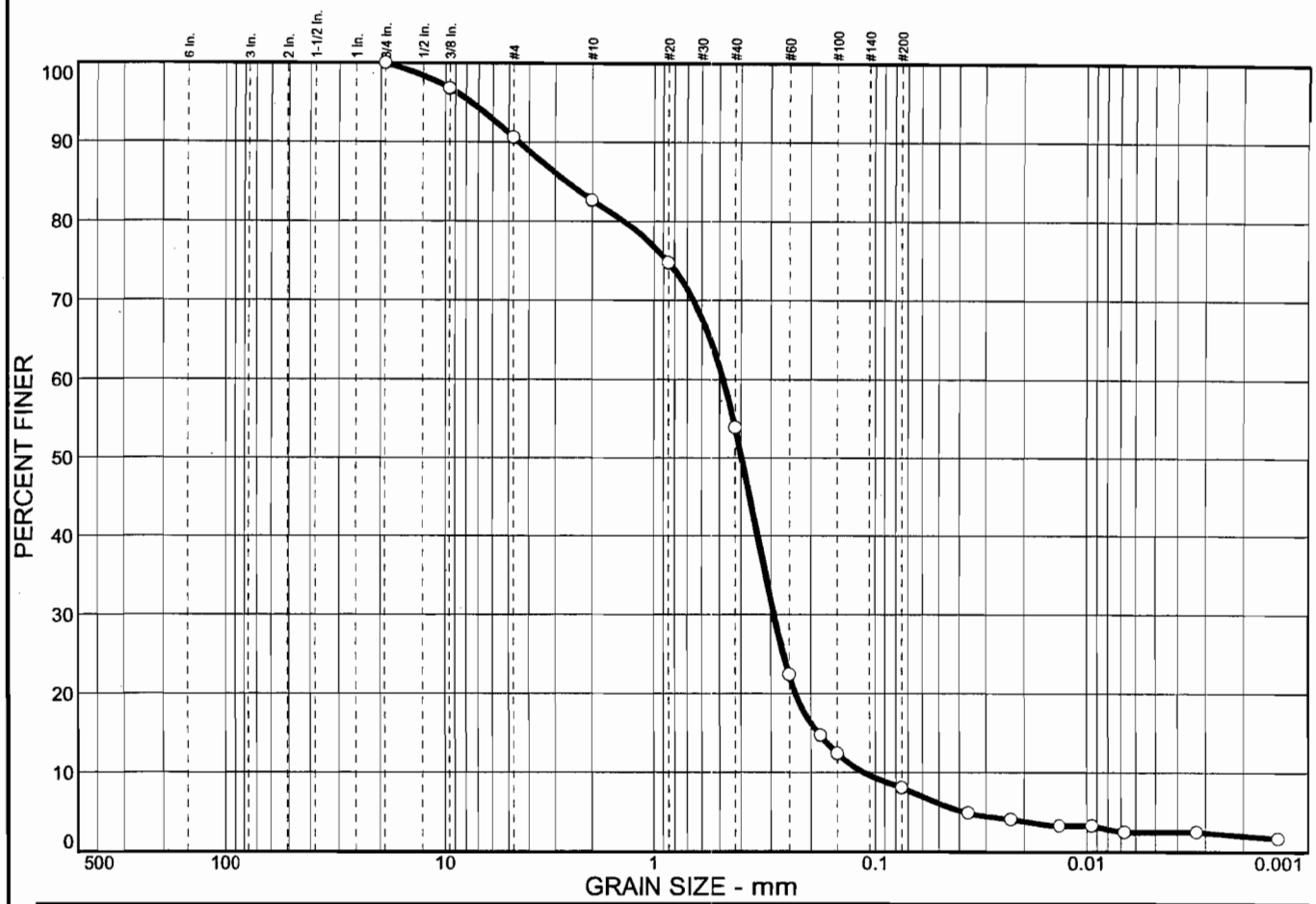
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.4	82.5	5.6	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.8		
#4	90.6		
#10	82.7		
#20	74.8		
#40	53.9		
#60	22.4		
#80	14.7		
#100	12.4		
#200	8.1		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.64 D_{60}= 0.481 D_{50}= 0.398
D_{30}= 0.290 D_{15}= 0.184 D_{10}= 0.112
C_u= 4.29 C_c= 1.57

Classification

USCS= AASHTO=

Remarks

Sample No.: 16 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 40.0'-43.0'

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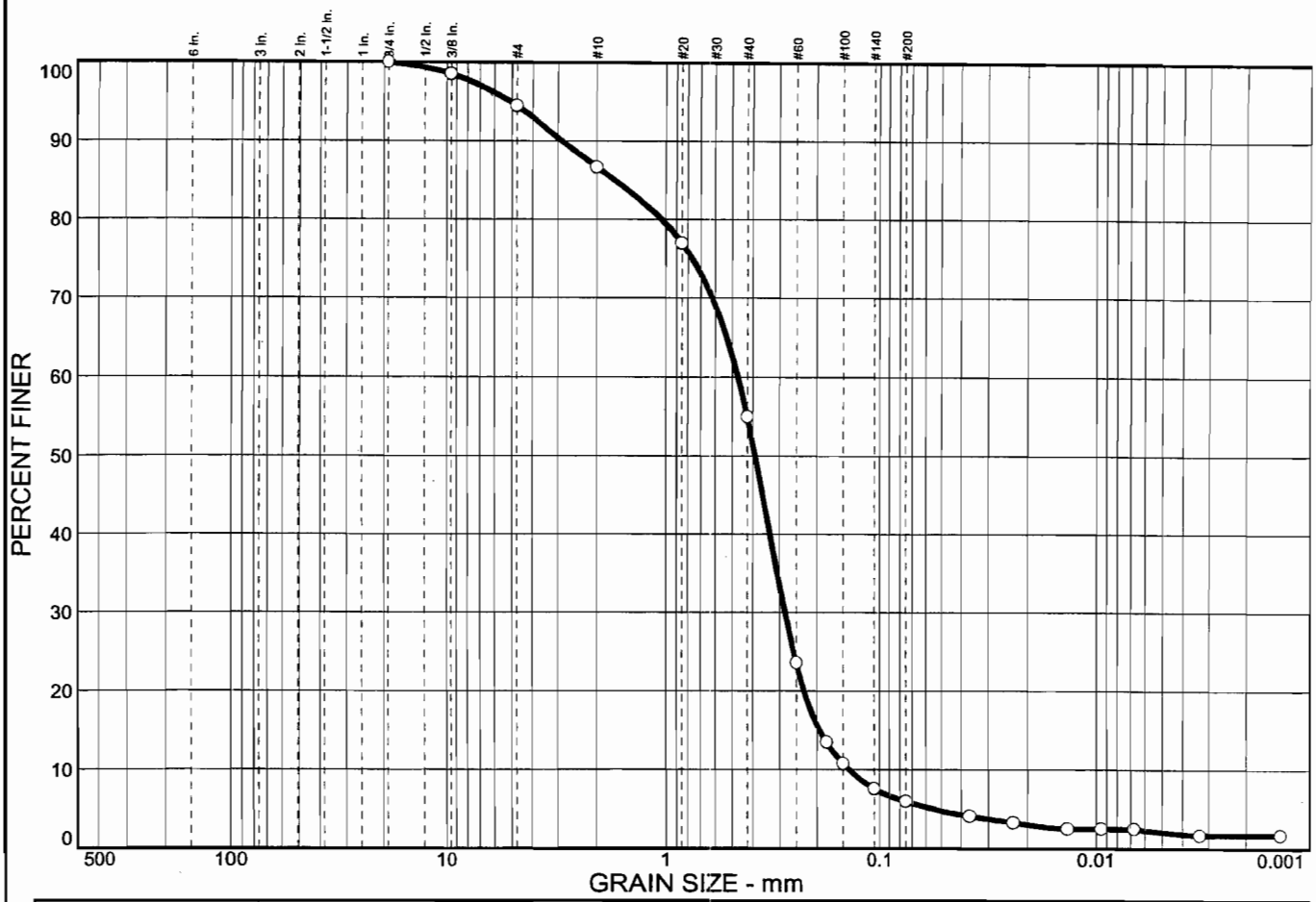
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.5	88.5	3.9	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.5		
#4	94.5		
#10	86.7		
#20	77.0		
#40	55.0		
#60	23.6		
#80	13.5		
#100	10.8		
#140	7.6		
#200	6.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.66 D_{60}= 0.470 D_{50}= 0.390
D_{30}= 0.282 D_{15}= 0.194 D_{10}= 0.140
C_u= 3.36 C_c= 1.21

Classification

USCS= AASHTO=

Remarks

Sample No.: 20 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 52.0'-55.0'

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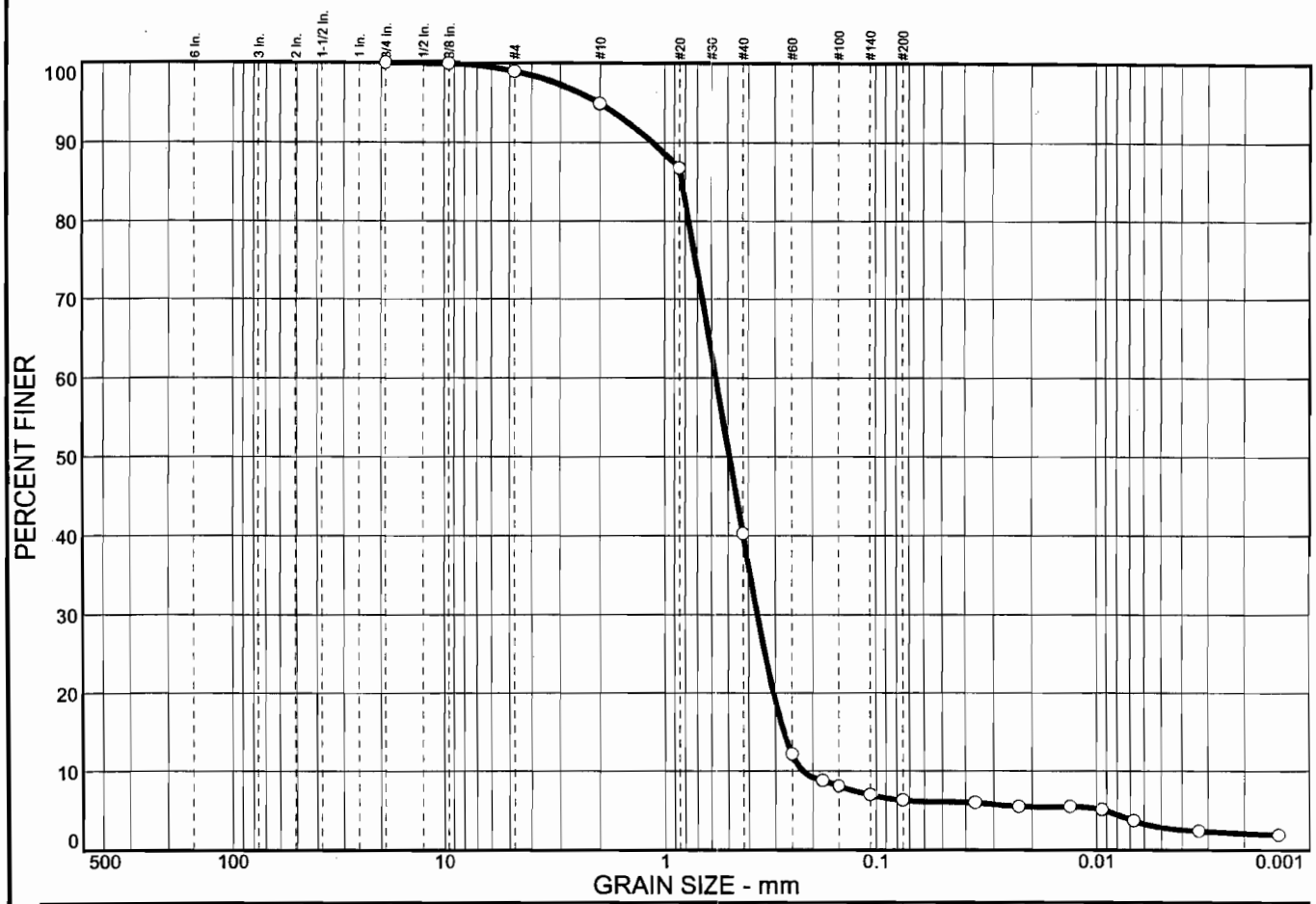
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	92.6	3.4	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.9		
#4	98.9		
#10	94.9		
#20	86.8		
#40	40.3		
#60	12.2		
#80	8.8		
#100	8.1		
#140	7.0		
#200	6.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.827 D_{60}= 0.570 D_{50}= 0.491
D_{30}= 0.363 D_{15}= 0.273 D_{10}= 0.222
C_u= 2.57 C_c= 1.04

Classification

USCS= AASHTO=

Remarks

Sample No.: 24 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 64.0'-67.0'

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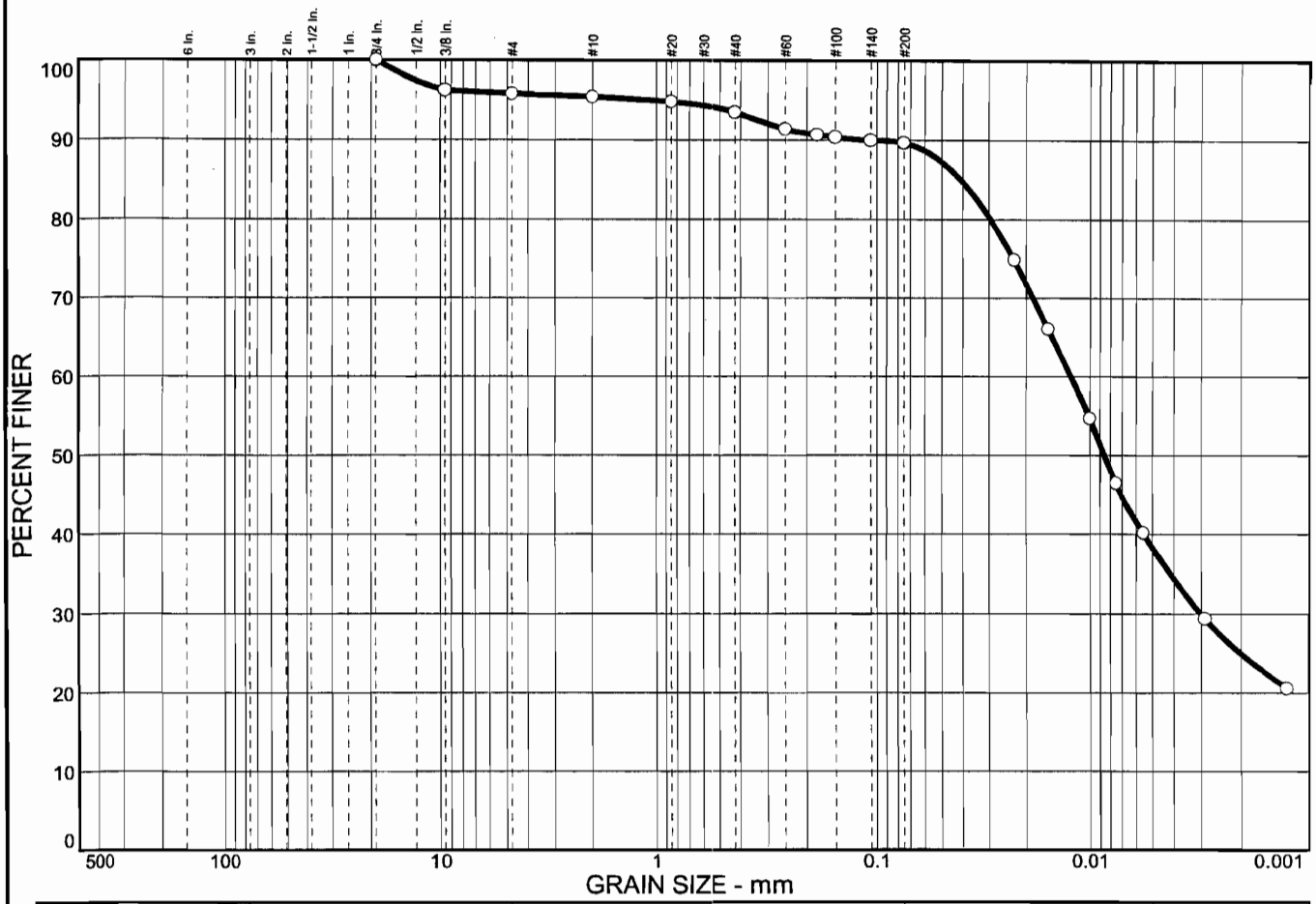
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.2	6.1	51.4	38.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.2		
#4	95.8		
#10	95.4		
#20	94.8		
#40	93.5		
#60	91.4		
#80	90.7		
#100	90.4		
#140	90.0		
#200	89.7		

* (no specification provided)

Soil Description

Gray lean clay, few sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0406 D_{60}= 0.0123 D_{50}= 0.0086
D_{30}= 0.0030 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

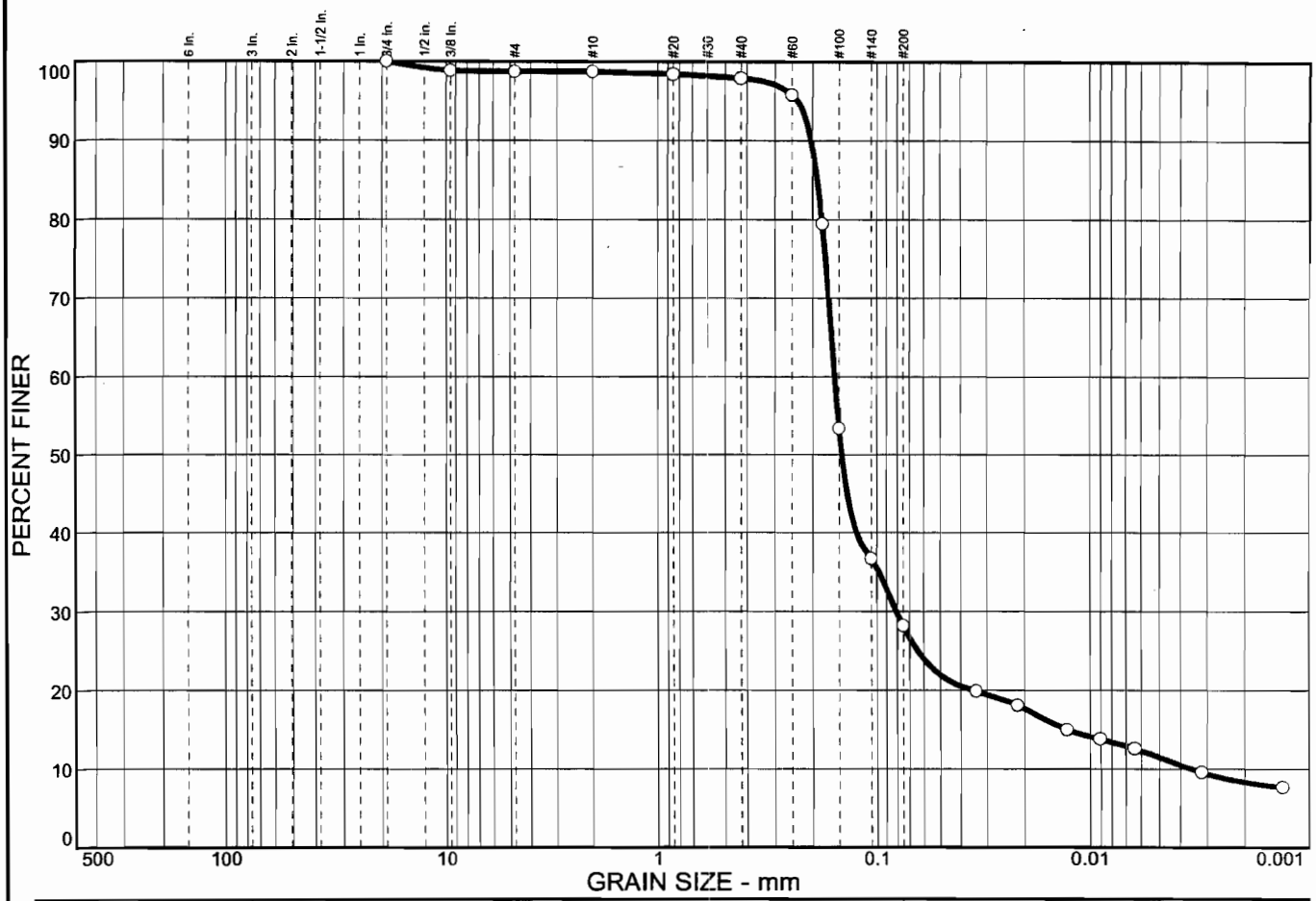
Remarks

Sample No.: 29 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 78.5'-82.8'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.3	70.5	16.7	11.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	98.7		
#10	98.7		
#20	98.4		
#40	97.9		
#60	95.8		
#80	79.5		
#100	53.4		
#140	36.7		
#200	28.2		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.189 D_{60}= 0.157 D_{50}= 0.146
D_{30}= 0.0806 D_{15}= 0.0127 D_{10}= 0.0035
C_u= 44.51 C_c= 11.66

Classification

USCS= AASHTO=

Remarks

Sample No.: 34 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 93.3'95.5'

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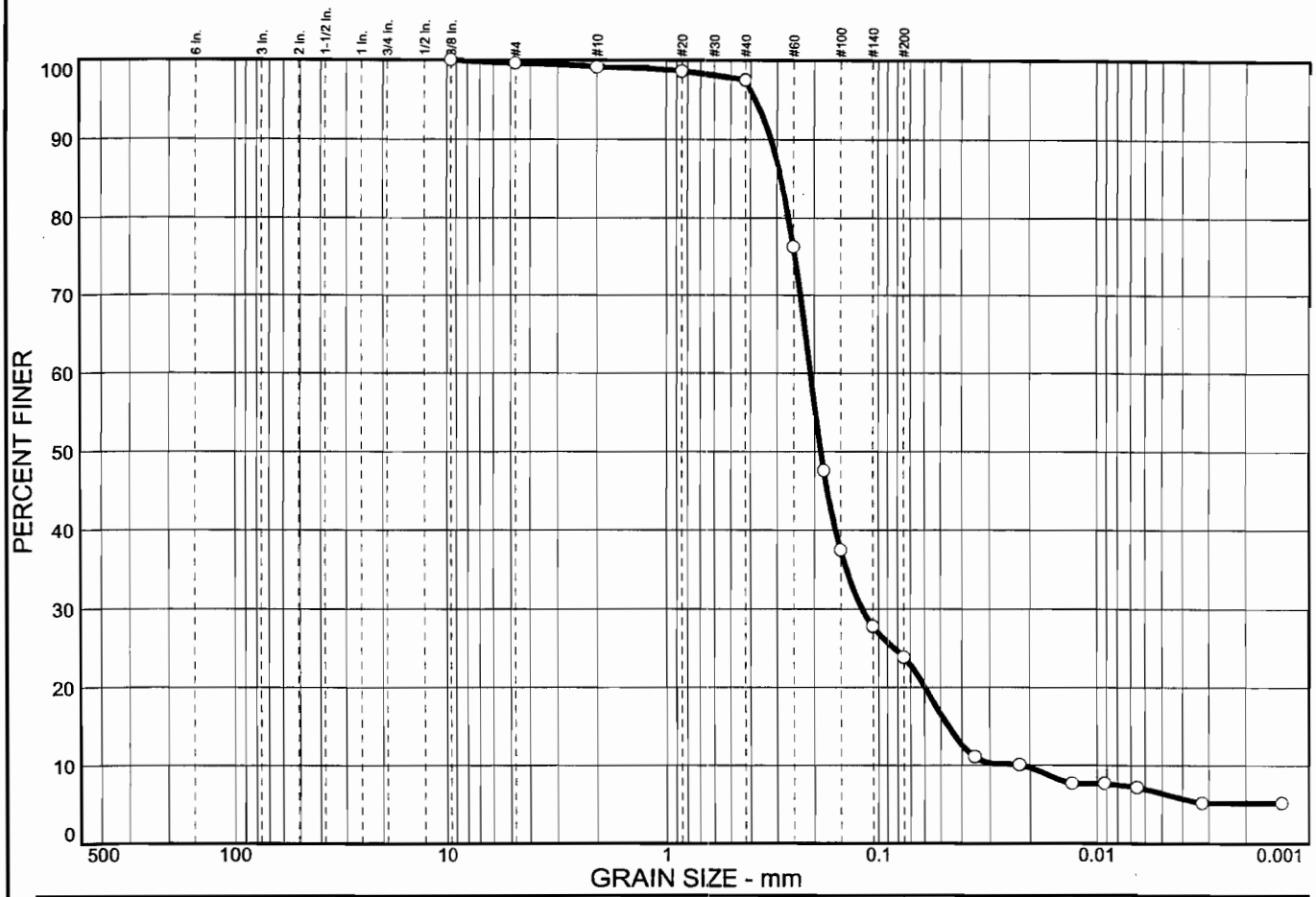
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	75.7	17.4	6.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.1		
#20	98.6		
#40	97.5		
#60	76.3		
#80	47.6		
#100	37.5		
#140	27.8		
#200	23.9		

* (no specification provided)

Soil Description

Brown to gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.286 D_{60}= 0.208 D_{50}= 0.186
D_{30}= 0.119 D_{15}= 0.0460 D_{10}= 0.0214
C_u= 9.74 C_c= 3.17

Classification

USCS= AASHTO=

Remarks

Sample No.: 40 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 109.0'-112.0'

H. C. NUTTING COMPANY
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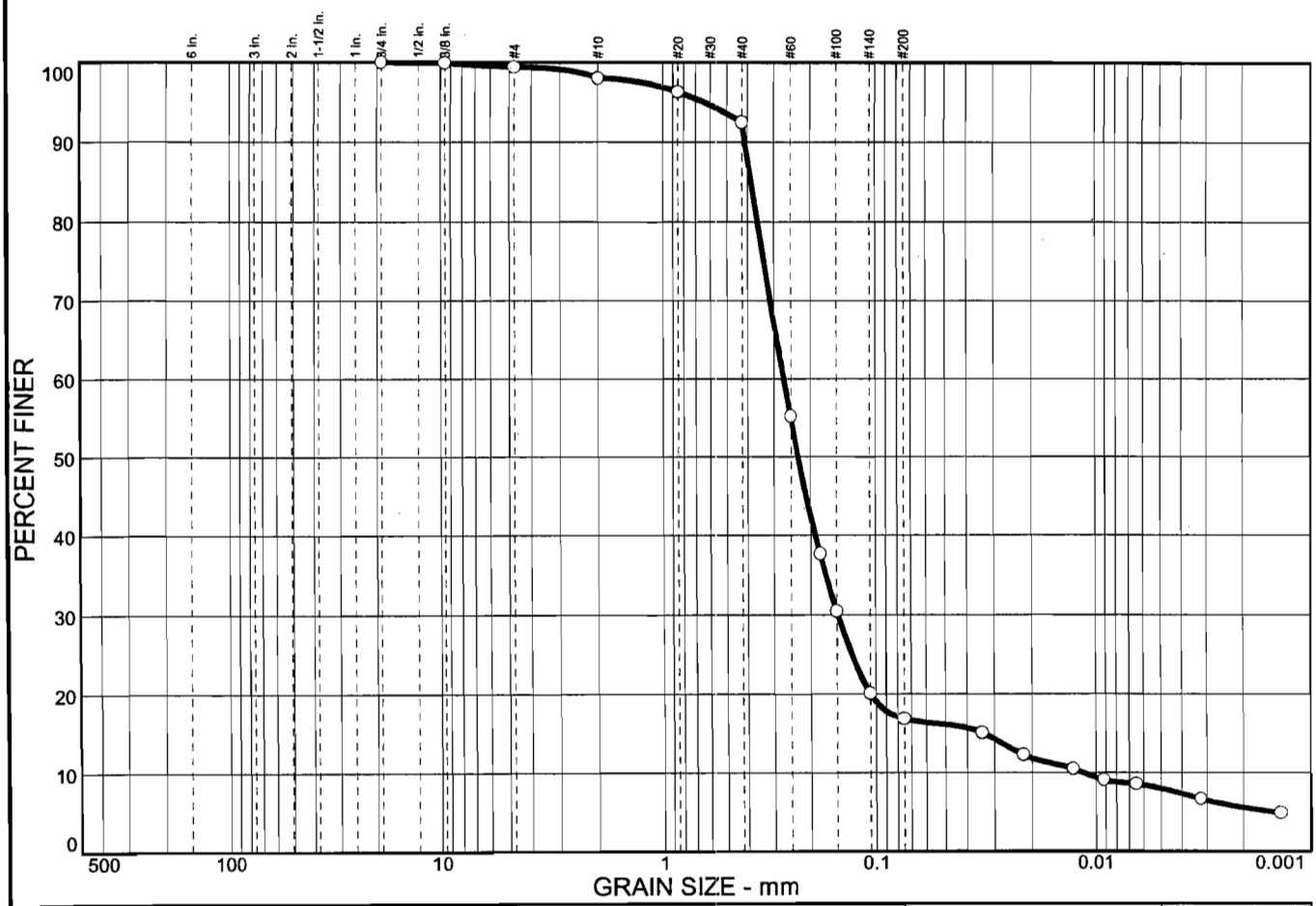
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	82.5	8.9	8.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	99.9		
#4	99.4		
#10	98.0		
#20	96.3		
#40	92.5		
#60	55.2		
#80	37.7		
#100	30.5		
#140	20.1		
#200	16.9		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.384 D_{60}= 0.270 D_{50}= 0.229
D_{30}= 0.148 D_{15}= 0.0335 D_{10}= 0.0114
C_u= 23.56 C_c= 7.10

Classification

USCS= AASHTO=

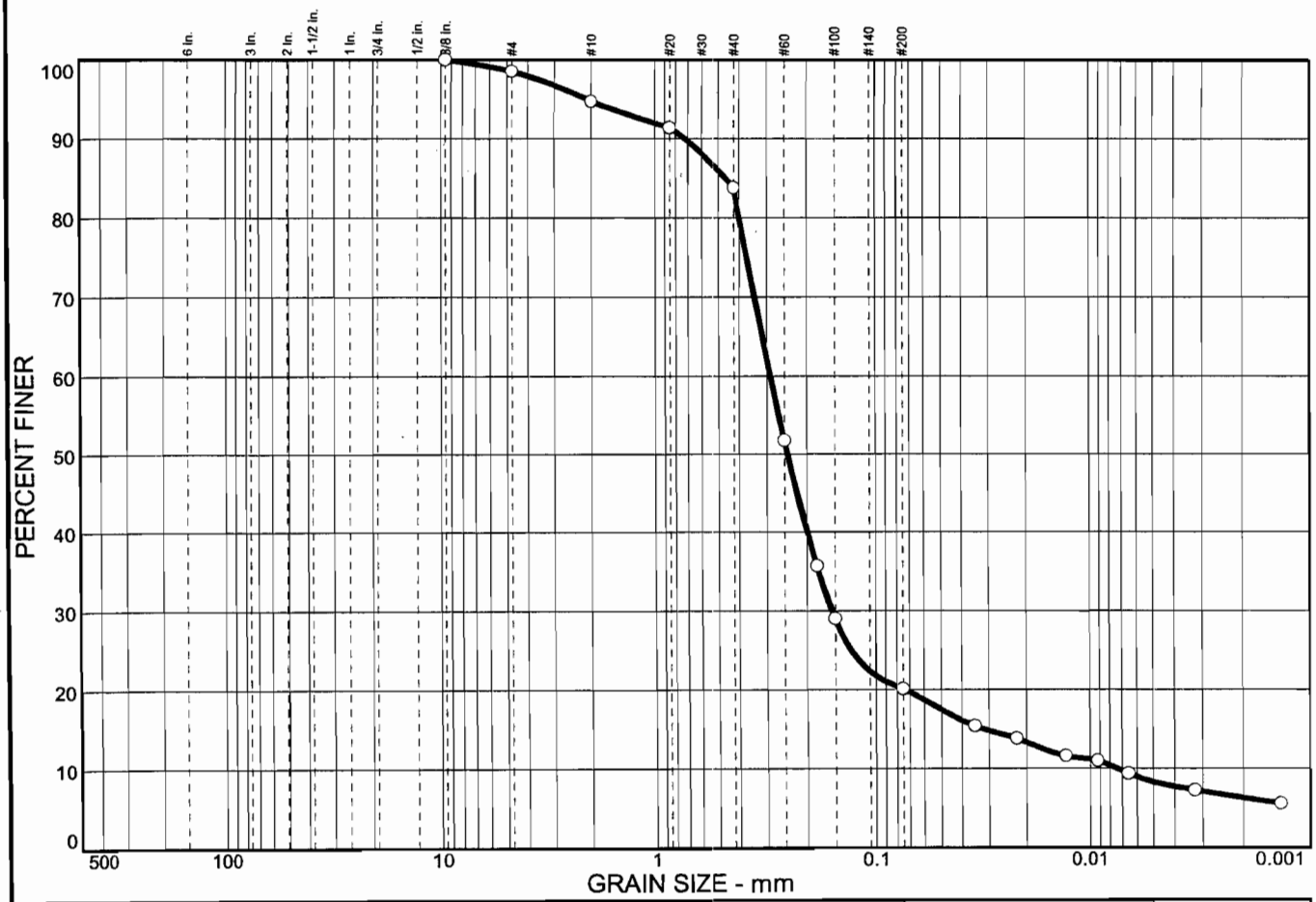
Remarks

Sample No.: 44 **Source of Sample:** C-04-09 **Date:** 7-8-05
Location: **Elev./Depth:** 119.0'-121.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.5	78.4	11.8	8.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.5		
#10	94.7		
#20	91.4		
#40	83.8		
#60	51.8		
#80	35.7		
#100	29.0		
#200	20.1		

* (no specification provided)

Soil Description

Gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.464 D_{60}= 0.288 D_{50}= 0.242
D_{30}= 0.155 D_{15}= 0.0316 D_{10}= 0.0074
C_u= 39.17 C_c= 11.28

Classification

USCS= AASHTO=

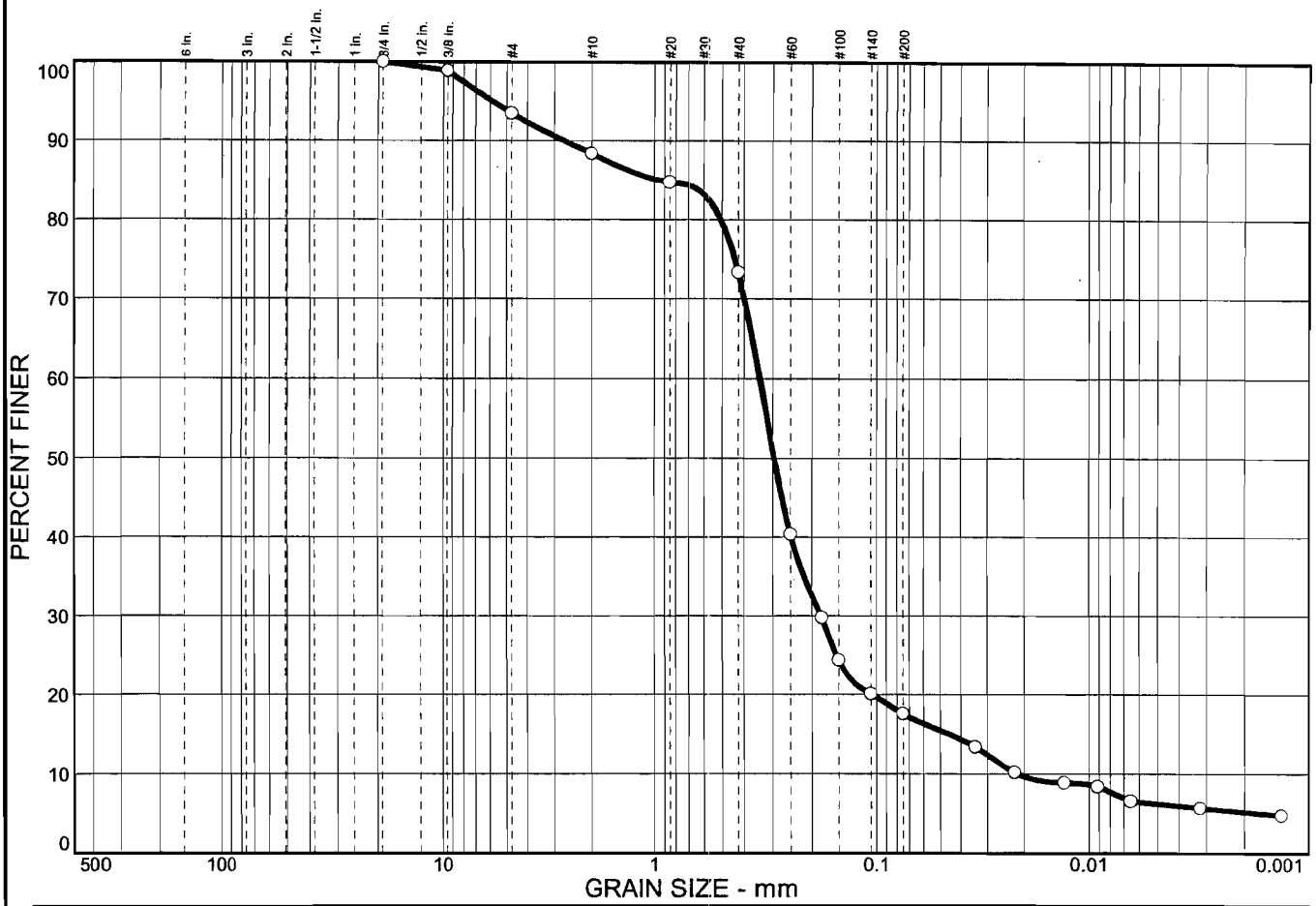
Remarks

Sample No.: 48 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 130.0'-133.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.5	75.9	11.3	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.9		
#4	93.5		
#10	88.4		
#20	84.8		
#40	73.4		
#60	40.4		
#80	29.8		
#100	24.4		
#140	20.1		
#200	17.6		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.943 D_{60}= 0.342 D_{50}= 0.295
D_{30}= 0.181 D_{15}= 0.0453 D_{10}= 0.0213
C_u= 16.03 C_c= 4.50

Classification

USCS= AASHTO=

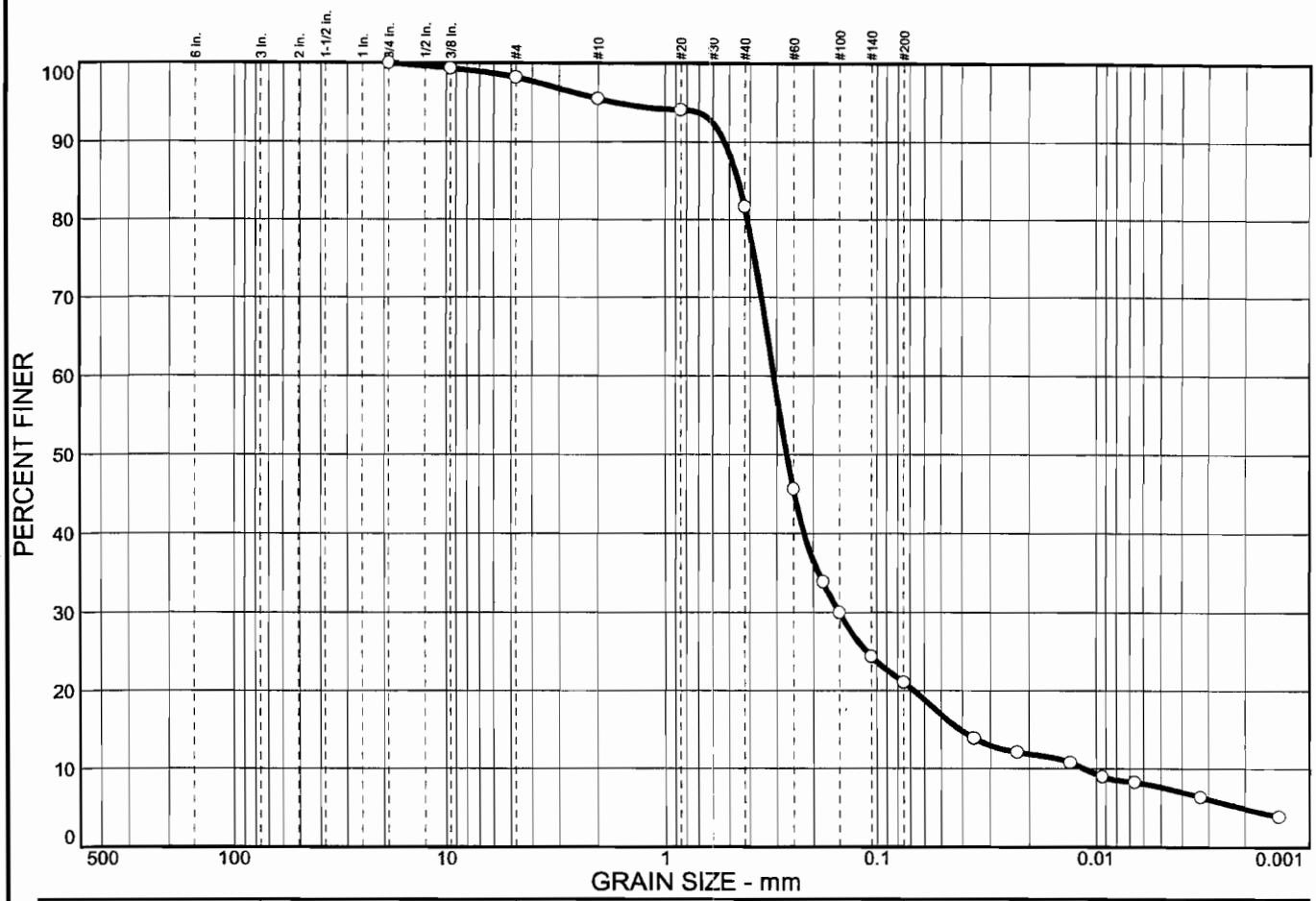
Remarks

Sample No.: 52 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 142.0'-145.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.8	77.1	13.4	7.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	98.2		
#10	95.5		
#20	94.1		
#40	81.7		
#60	45.7		
#80	33.9		
#100	30.0		
#140	24.4		
#200	21.1		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.455 D_{60}= 0.310 D_{50}= 0.269
D_{30}= 0.150 D_{15}= 0.0408 D_{10}= 0.0113
C_u= 27.36 C_c= 6.41

Classification

USCS= AASHTO=

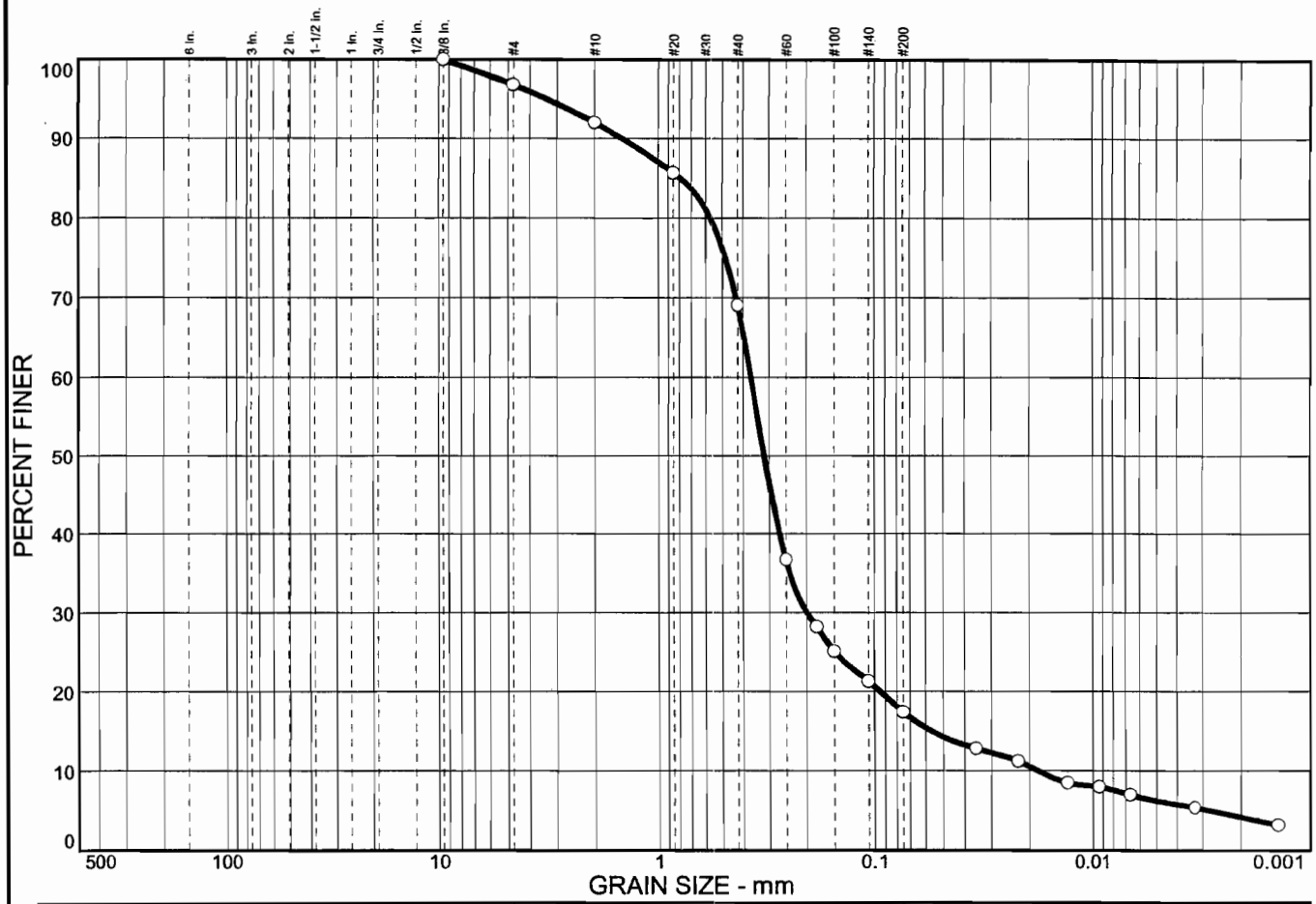
Remarks

Sample No.: 55 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 160.0'-161.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.2	79.4	11.1	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	96.8		
#10	92.0		
#20	85.7		
#40	69.1		
#60	36.7		
#80	28.2		
#100	25.1		
#140	21.3		
#200	17.4		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.786 D_{60}= 0.366 D_{50}= 0.315
D_{30}= 0.199 D_{15}= 0.0564 D_{10}= 0.0181
C_u= 20.22 C_c= 5.96

Classification

USCS= AASHTO=

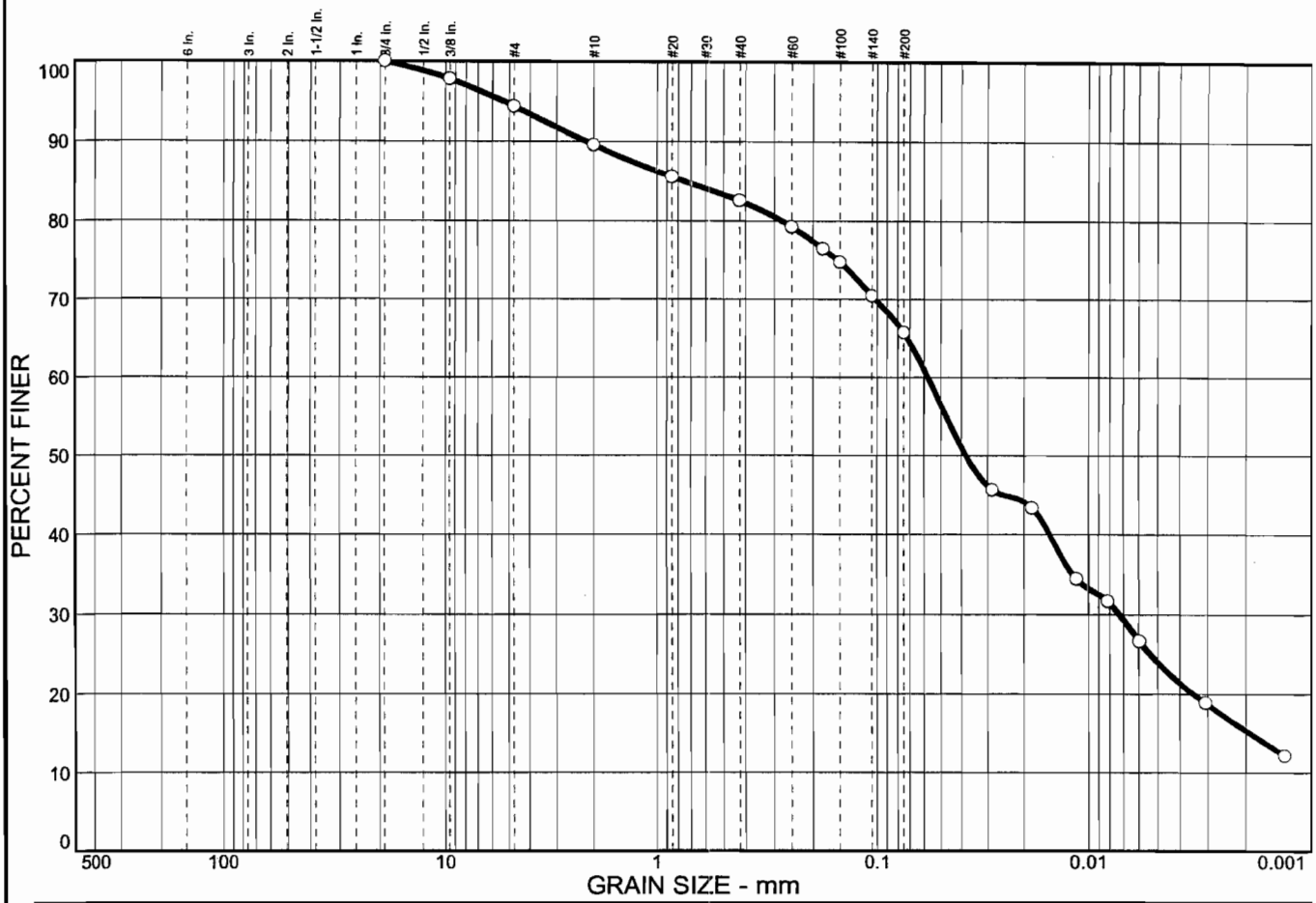
Remarks

Sample No.: 56 **Source of Sample:** C-04-09 **Date:** 06/30/05
Location: **Elev./Depth:** 170.0'-171.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.6	28.6	41.8	24.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.8		
#4	94.4		
#10	89.6		
#20	85.6		
#40	82.6		
#60	79.3		
#80	76.5		
#100	74.8		
#140	70.5		
#200	65.8		

* (no specification provided)

Soil Description

Brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.735 D_{60}= 0.0573 D_{50}= 0.0378
D_{30}= 0.0072 D_{15}= 0.0019 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

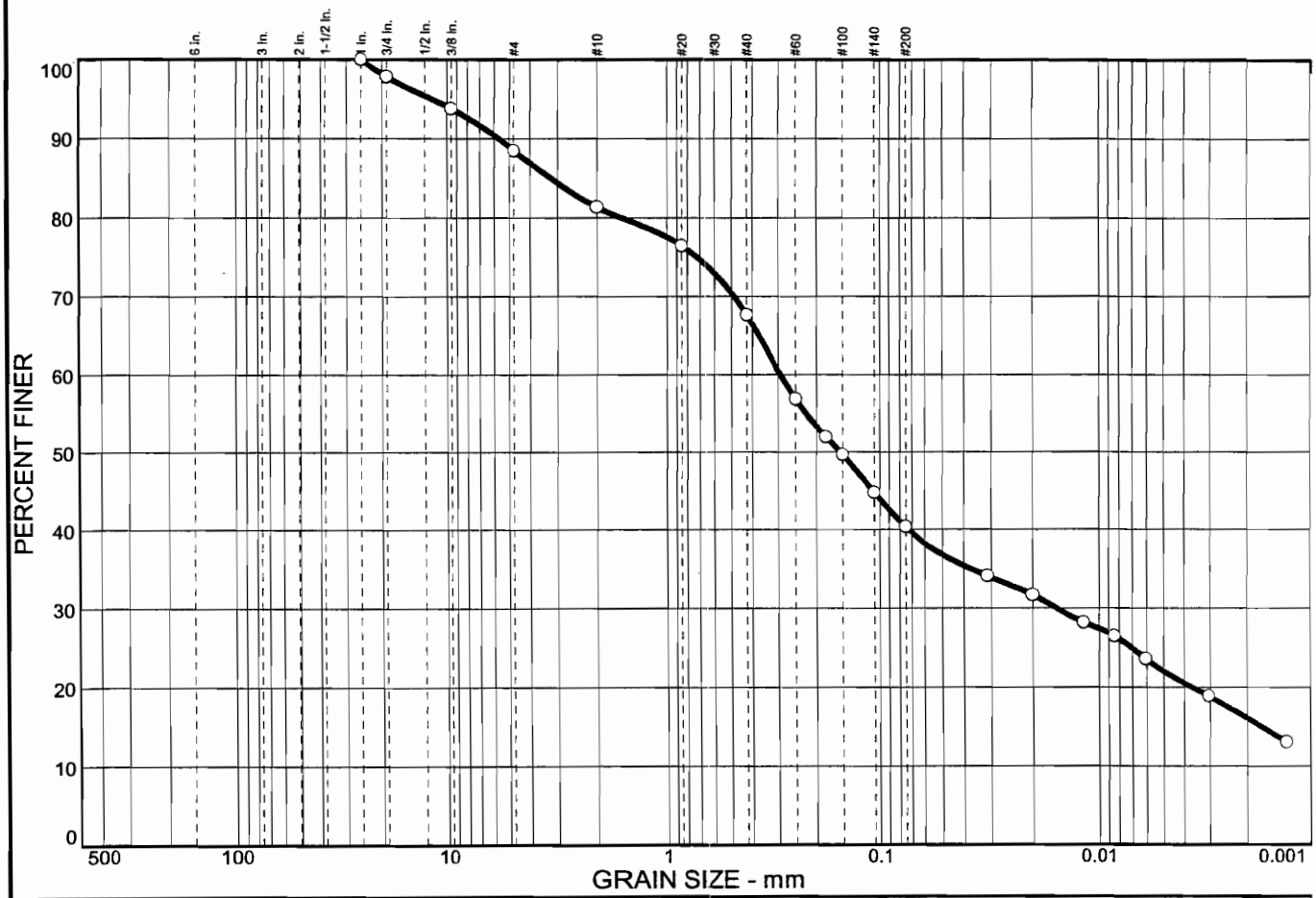
Remarks

Sample No.: 5 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 6.0'-7.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.5	48.1	18.4	22.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.8		
0.375 in.	93.8		
#4	88.5		
#10	81.4		
#20	76.5		
#40	67.7		
#60	56.9		
#80	52.0		
#100	49.7		
#140	44.8		
#200	40.4		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.19 D_{60}= 0.293 D_{50}= 0.154
D_{30}= 0.0157 D_{15}= 0.0017 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 11 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 15.0'-16.5'

H. C. NUTTING COMPANY
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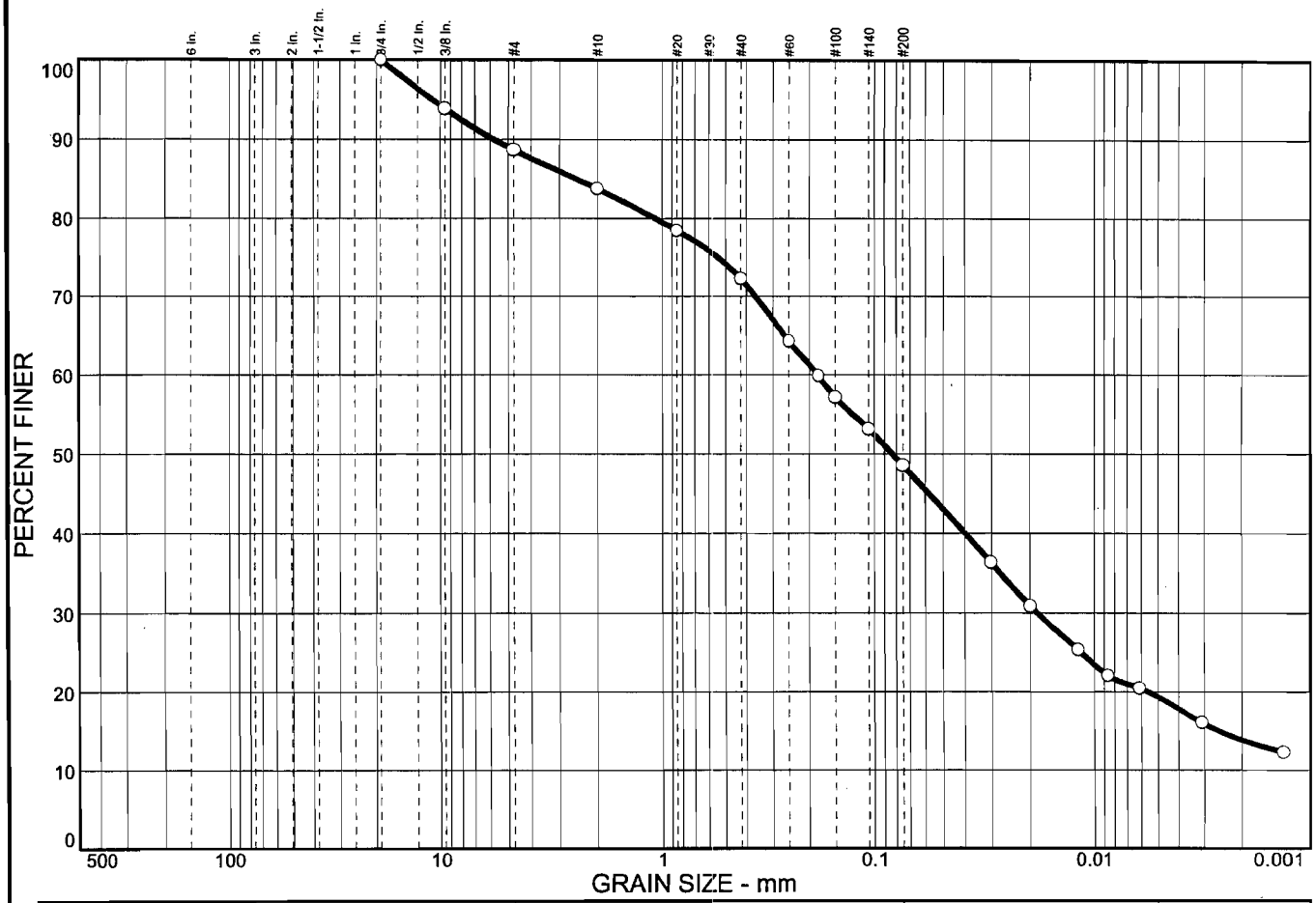
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.3	40.1	29.2	19.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.9		
#4	88.7		
#10	83.8		
#20	78.5		
#40	72.3		
#60	64.3		
#80	59.9		
#100	57.2		
#140	53.2		
#200	48.6		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.49 D_{60}= 0.181 D_{50}= 0.0829
D_{30}= 0.0184 D_{15}= 0.0025 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

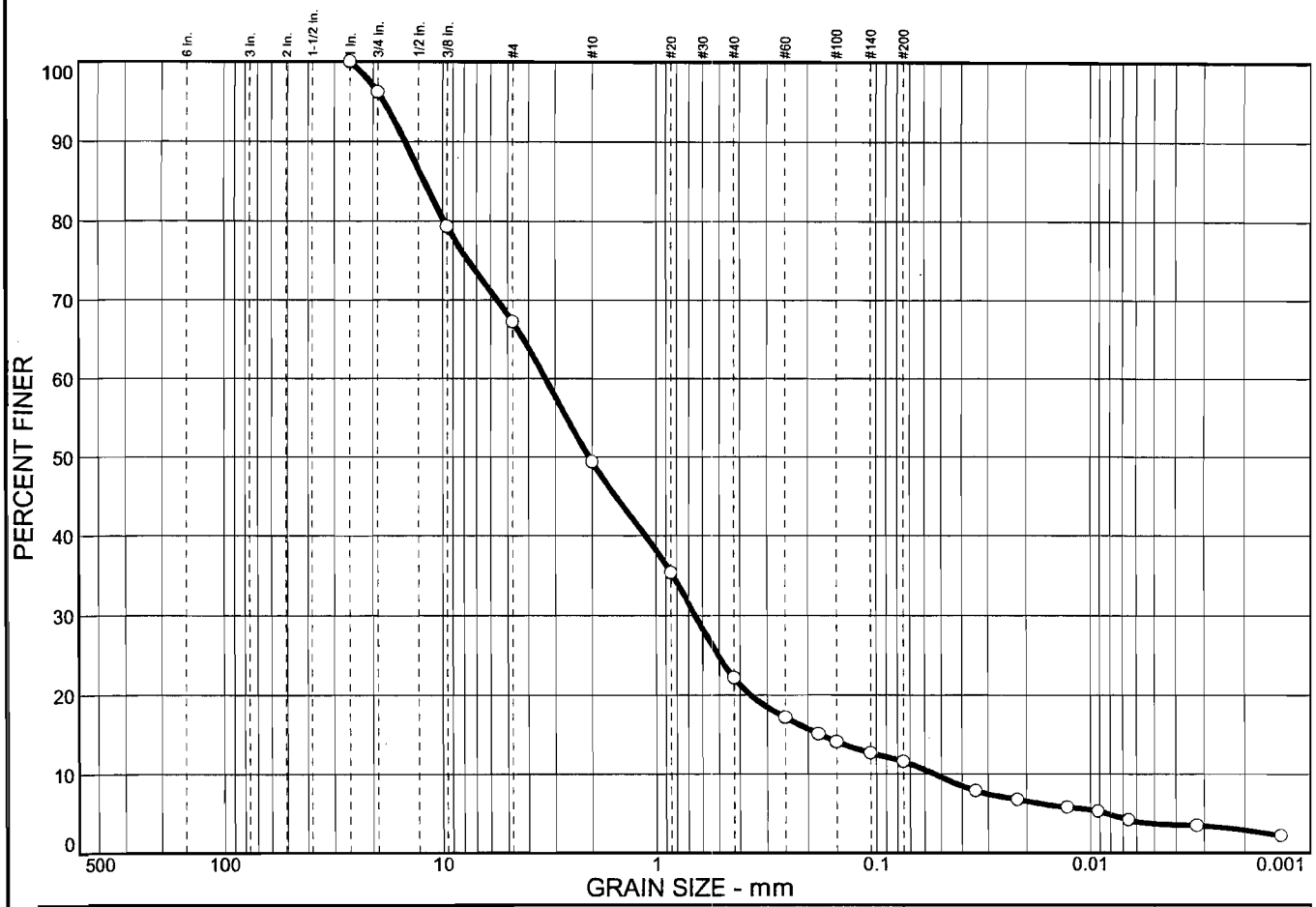
Remarks

Sample No.: 19 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 27.0'-28.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	32.7	55.7	7.9	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
.75 in.	96.2		
.375 in.	79.4		
#4	67.3		
#10	49.4		
#20	35.4		
#40	22.2		
#60	17.2		
#80	15.1		
#100	14.1		
#140	12.7		
#200	11.6		

* (no specification provided)

Soil Description

Brown well graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.9 D_{60}= 3.31 D_{50}= 2.06
D_{30}= 0.649 D_{15}= 0.177 D_{10}= 0.0535
C_u= 61.95 C_c= 2.38

Classification

USCS= AASHTO=

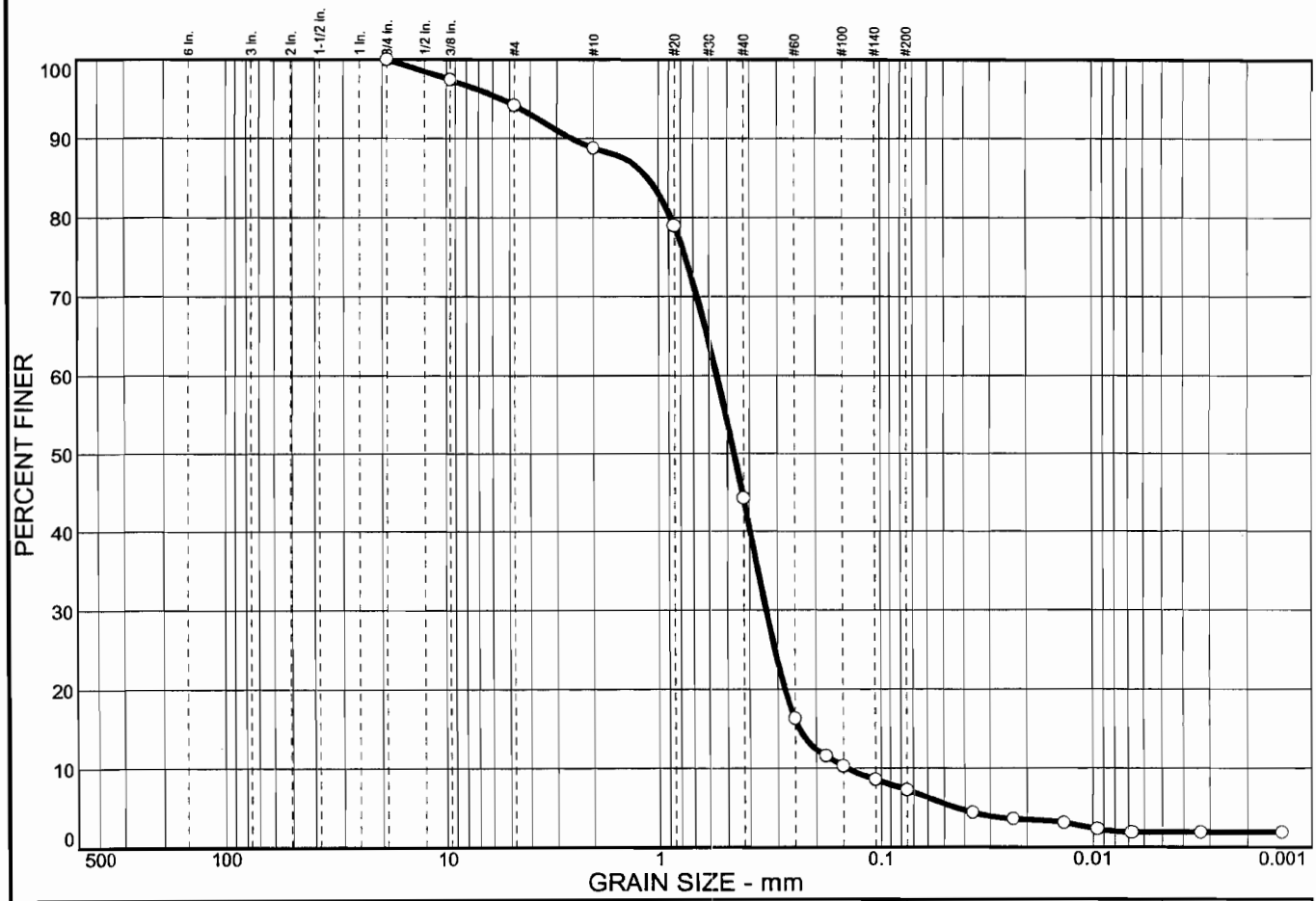
Remarks

Sample No.: 34 **Source of Sample:** C-04-10 **Date:** 7-8-05
Location: **Elev./Depth:** 49.5'-51.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.8	86.9	5.4	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	97.4		
#4	94.2		
#10	88.8		
#20	79.0		
#40	44.3		
#60	16.3		
#80	11.6		
#100	10.3		
#140	8.6		
#200	7.3		

* (no specification provided)

Soil Description

Brown well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.11 D_{60}= 0.554 D_{50}= 0.466
D_{30}= 0.337 D_{15}= 0.238 D_{10}= 0.143
C_u= 3.88 C_c= 1.43

Classification

USCS= AASHTO=

Remarks

Sample No.: 43 **Source of Sample:** C-04-10 **Date:** 7-9-05
Location: **Elev./Depth:** 63.0'-64.5'

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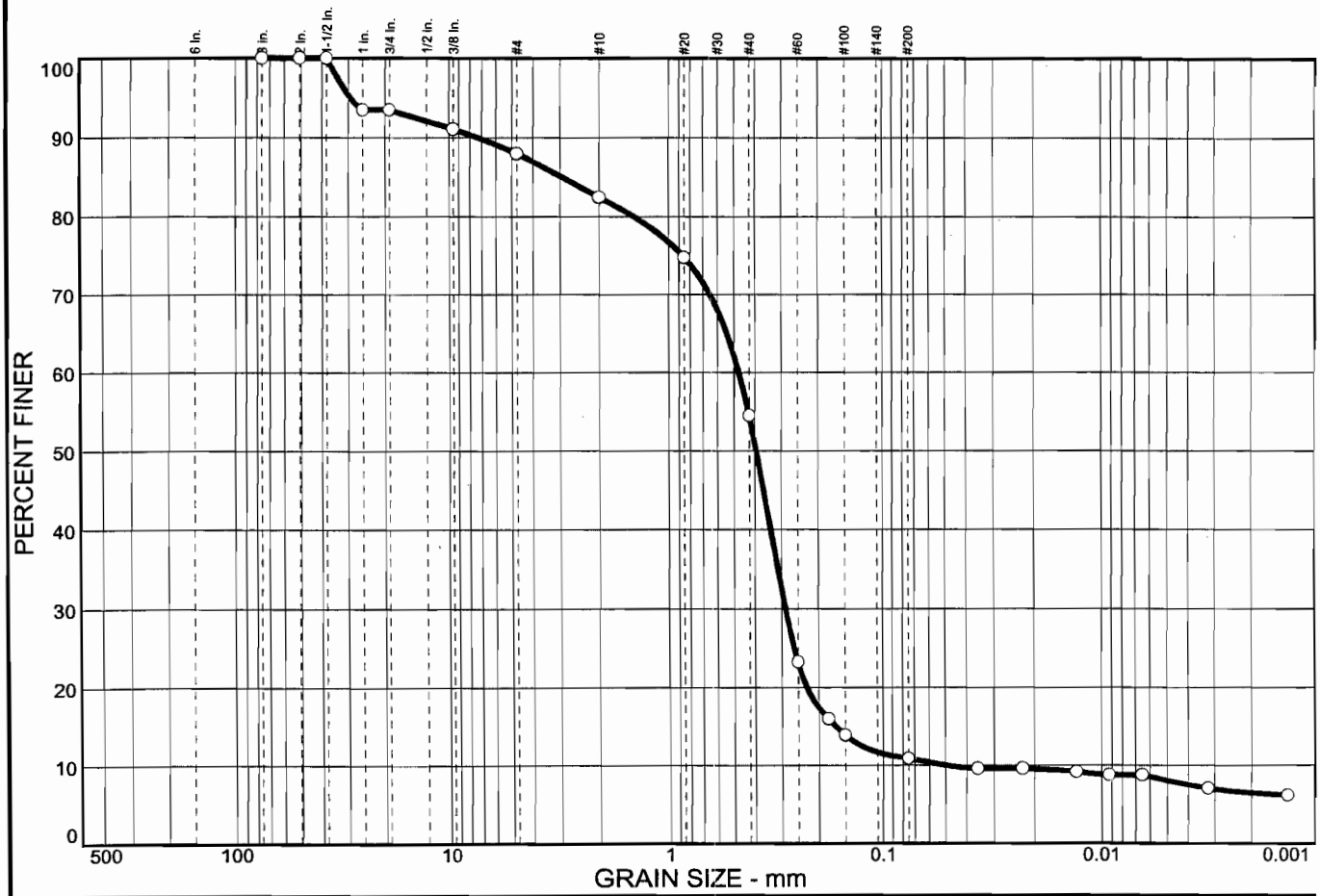
GEOTECHNICAL ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.0	77.1	2.8	8.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	93.5		
0.75 in.	93.5		
0.375 in.	91.1		
#4	88.0		
#10	82.5		
#20	74.8		
#40	54.5		
#60	23.3		
#80	16.0		
#100	13.9		
#200	10.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.90 D_{60}= 0.475 D_{50}= 0.393
D_{30}= 0.287 D_{15}= 0.166 D_{10}= 0.0483
C_u= 9.84 C_c= 3.58

Classification

USCS= AASHTO=

Remarks

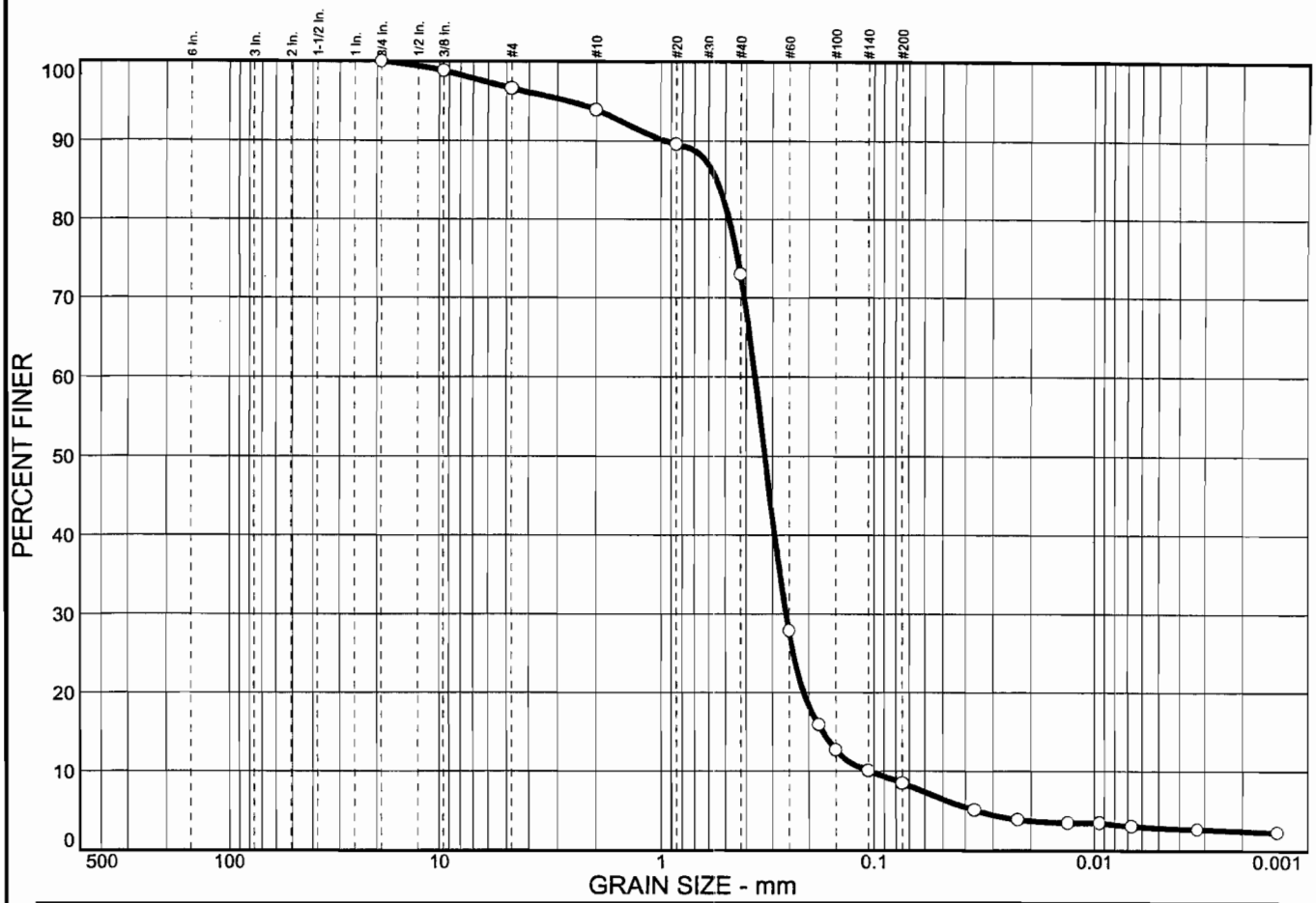
Zero retained on the 3/4 inch sieve

Sample No.: 52 **Source of Sample:** C-04-10 **Date:** 04-29-05
Location: **Elev./Depth:** 76.5'-78.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.4	88.1	5.6	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	96.6		
#10	93.9		
#20	89.6		
#40	73.0		
#60	27.9		
#80	15.9		
#100	12.7		
#140	10.1		
#200	8.5		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.549 D_{60}= 0.363 D_{50}= 0.326
D_{30}= 0.258 D_{15}= 0.172 D_{10}= 0.104
C_u= 3.50 C_c= 1.77

Classification

USCS= AASHTO=

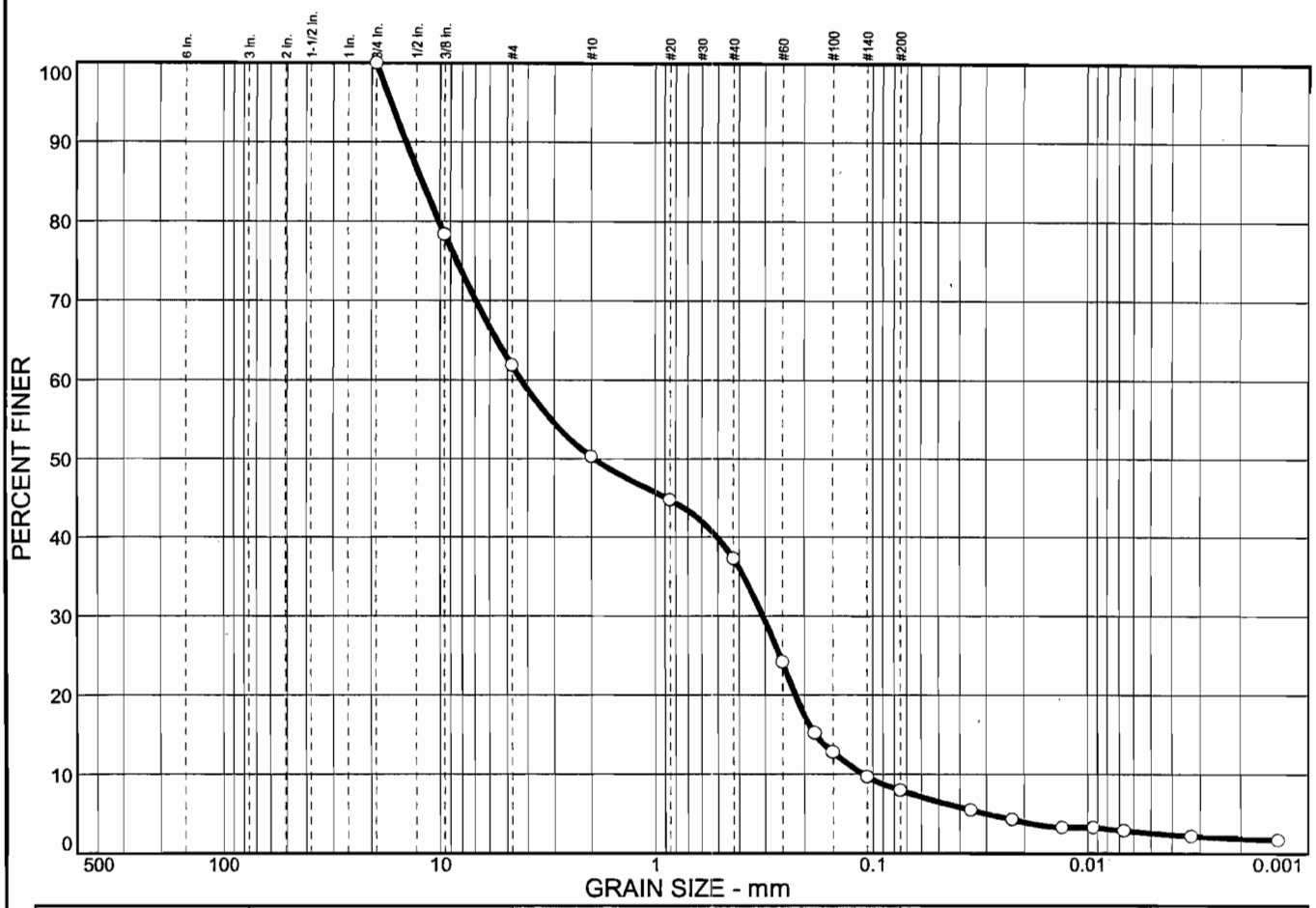
Remarks

Sample No.: 66 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 102.0'-103.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	38.1	53.9	5.4	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	78.4		
#4	61.9		
#10	50.3		
#20	44.8		
#40	37.3		
#60	24.2		
#80	15.2		
#100	12.8		
#140	9.7		
#200	8.0		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.9 D_{60}= 4.28 D_{50}= 1.93
D_{30}= 0.307 D_{15}= 0.178 D_{10}= 0.111
C_u= 38.72 C_c= 0.20

Classification

USCS= AASHTO=

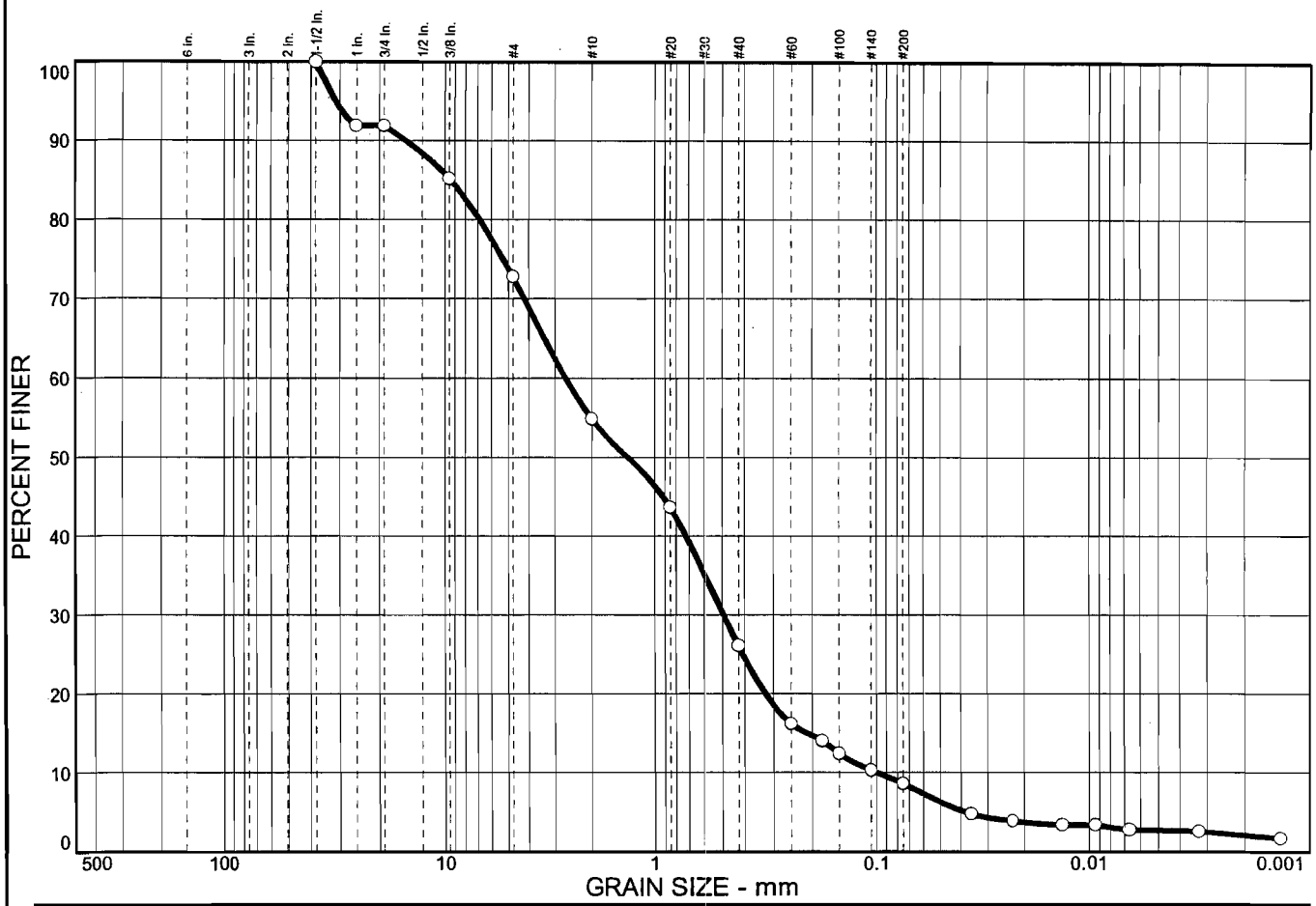
Remarks

Sample No.: 79 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 123.0'-124.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	27.2	64.2	5.9	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	91.9		
0.75 in.	91.9		
0.375 in.	85.2		
#4	72.8		
#10	54.9		
#20	43.7		
#40	26.1		
#60	16.2		
#80	14.0		
#100	12.4		
#140	10.3		
#200	8.6		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.38 D_{60}= 2.66 D_{50}= 1.33
D_{30}= 0.493 D_{15}= 0.212 D_{10}= 0.0995
C_u= 26.70 C_c= 0.92

Classification

USCS= AASHTO=

Remarks

Zero retained on the 3/4 inch sieve

Sample No.: 88 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 136.5'-138.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	36.3	45.0	17.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.7		
#4	99.2		
#10	99.0		
#20	96.0		
#40	90.9		
#60	84.1		
#80	78.9		
#100	76.5		
#200	62.9		

* (no specification provided)

Soil Description

Brown to gray sandy silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.265 D_{60}= 0.0663 D_{50}= 0.0444
D_{30}= 0.0216 D_{15}= 0.0033 D_{10}= 0.0015
C_u= 43.72 C_c= 4.65

Classification

USCS= AASHTO=

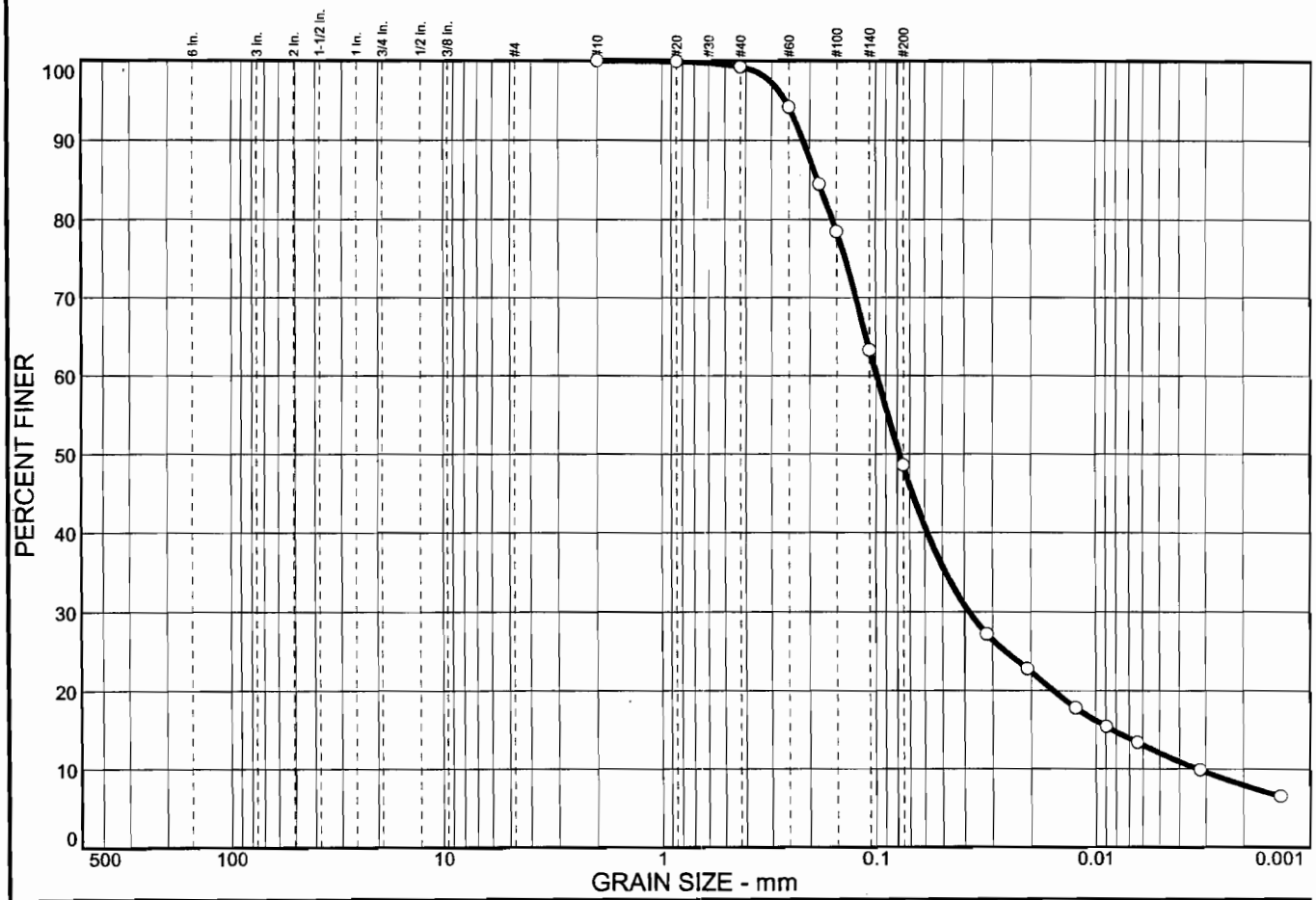
Remarks

Sample No.: 107 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 163.5'-165.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	51.4	36.5	12.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.2		
#60	94.2		
#80	84.5		
#100	78.5		
#140	63.3		
#200	48.6		

* (no specification provided)

Soil Description

Gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.183 D_{60}= 0.0986 D_{50}= 0.0778
D_{30}= 0.0380 D_{15}= 0.0084 D_{10}= 0.0033
C_u= 30.22 C_c= 4.50

Classification

USCS= AASHTO=

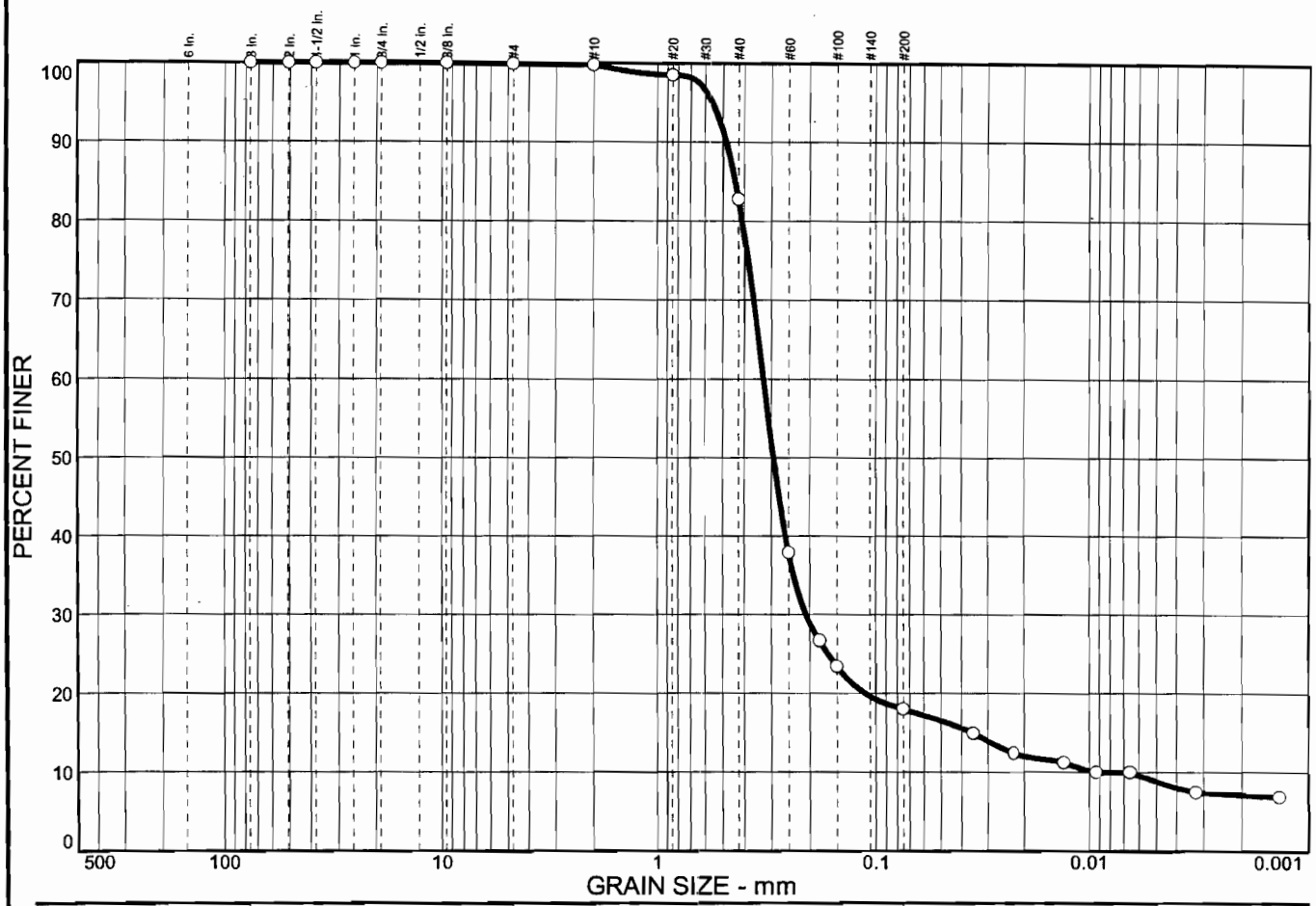
Remarks

Sample No.: 121 **Source of Sample:** C-04-10 **Date:** 06/30/05
Location: **Elev./Depth:** 184.5'-186.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	81.9	9.1	8.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	100.0		
0.375 in.	100.0		
#4	99.9		
#10	99.8		
#20	98.5		
#40	82.8		
#60	37.9		
#80	26.7		
#100	23.4		
#200	18.0		

* (no specification provided)

Soil Description

Brown to gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.439 D_{60}= 0.327 D_{50}= 0.293
D_{30}= 0.208 D_{15}= 0.0358 D_{10}= 0.0066
C_u= 49.71 C_c= 20.10

Classification

USCS= AASHTO=

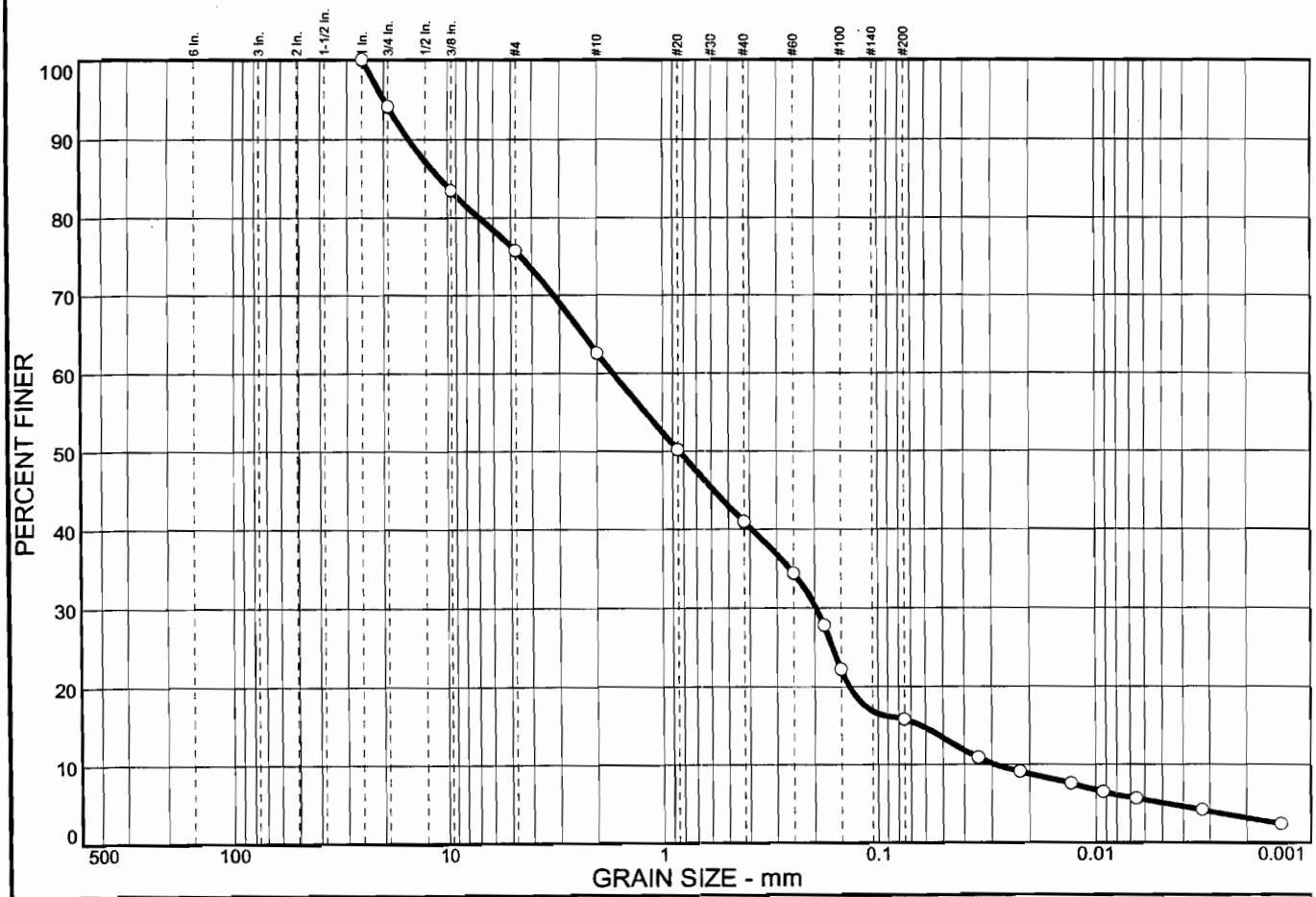
Remarks

Sample No.: 129 **Source of Sample:** C-04-10 **Date:** 04-29-05
Location: **Elev./Depth:** 196.5'-198.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	24.2	60.0	10.7	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	94.1		
0.375 in.	83.5		
#4	75.8		
#10	62.6		
#20	50.2		
#40	41.0		
#60	34.4		
#80	27.8		
#100	22.2		
#200	15.8		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.8 D_{60}= 1.69 D_{50}= 0.838
D_{30}= 0.196 D_{15}= 0.0628 D_{10}= 0.0287
C_u= 58.79 C_c= 0.79

Classification

USCS= AASHTO=

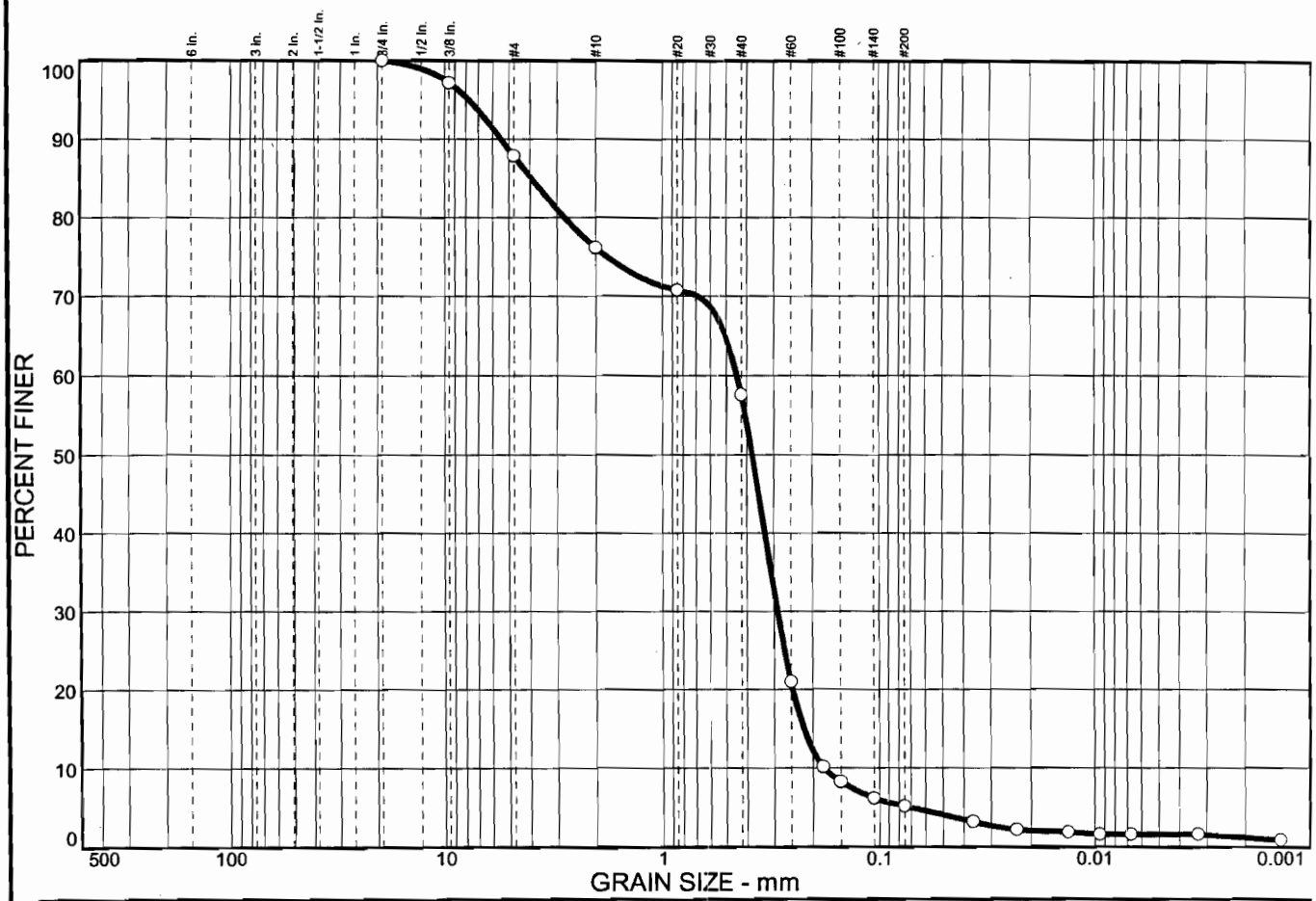
Remarks

Sample No.: 4 **Source of Sample:** C-04-11 **Date:** 06/30/05
Location: **Elev./Depth:** 7.5'-9.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.1	82.7	3.6	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.2		
#4	87.9		
#10	76.2		
#20	70.8		
#40	57.6		
#60	21.0		
#80	10.2		
#100	8.3		
#140	6.2		
#200	5.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.93 D_{60}= 0.445 D_{50}= 0.377
D_{30}= 0.288 D_{15}= 0.219 D_{10}= 0.178
C_u= 2.51 C_c= 1.05

Classification

USCS= AASHTO=

Remarks

Sample No.: 10 **Source of Sample:** C-04-11 **Date:** 06/30/05
Location: **Elev./Depth:** 19.5'-21.0'

H. C. NUTTING COMPANY
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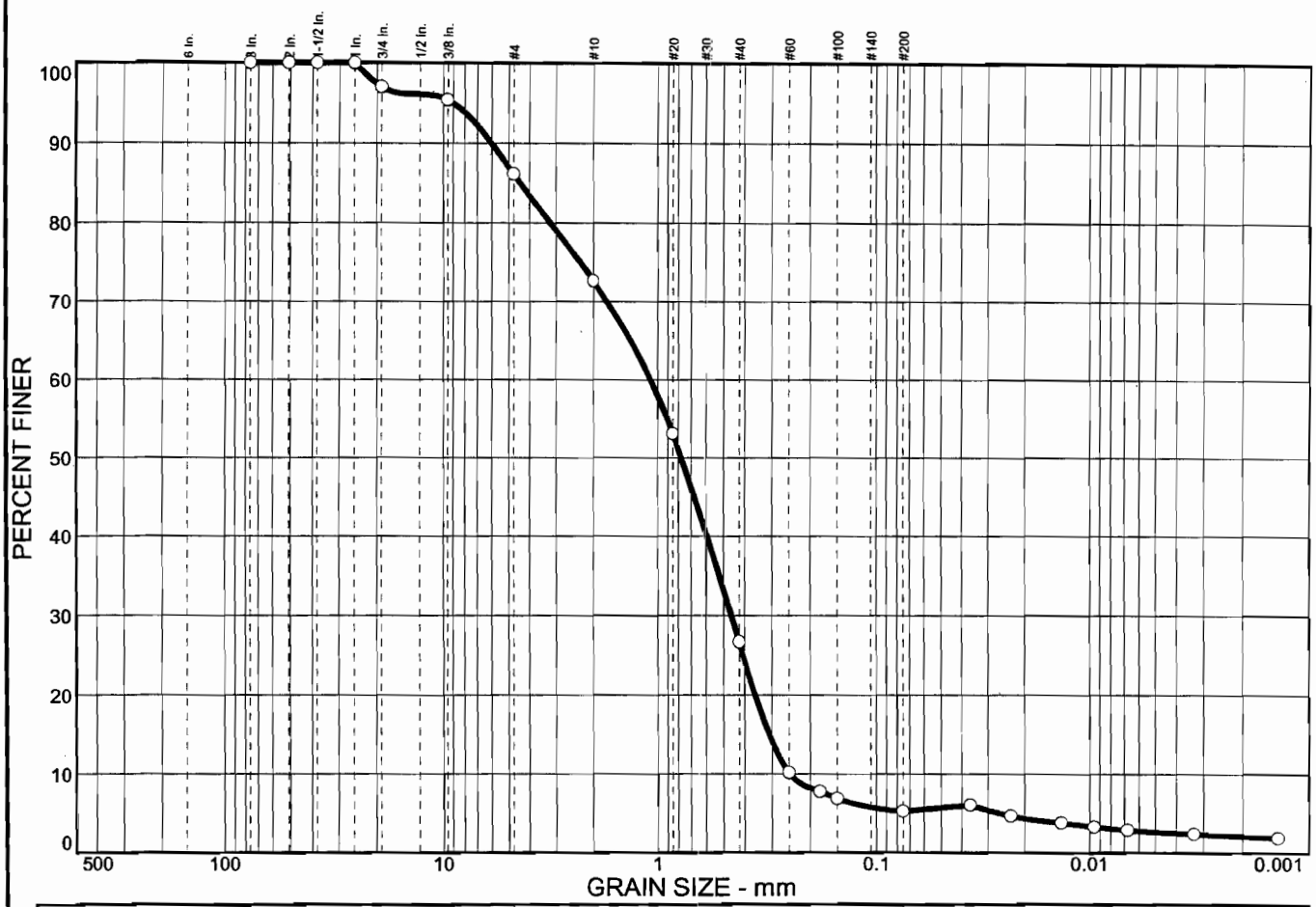
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.8	80.9	2.6	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	97.0		
0.375 in.	95.4		
#4	86.2		
#10	72.7		
#20	53.1		
#40	26.7		
#60	10.2		
#80	7.8		
#100	6.9		
#200	5.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.40 D_{60}= 1.08 D_{50}= 0.775
D_{30}= 0.462 D_{15}= 0.307 D_{10}= 0.247
C_u= 4.37 C_c= 0.80

Classification

USCS= AASHTO=

Remarks

Sample No.: 17 **Source of Sample:** C-04-11 **Date:** 04-29-05
Location: **Elev./Depth:** 30.0'-31.5'

H. C. NUTTING COMPANY
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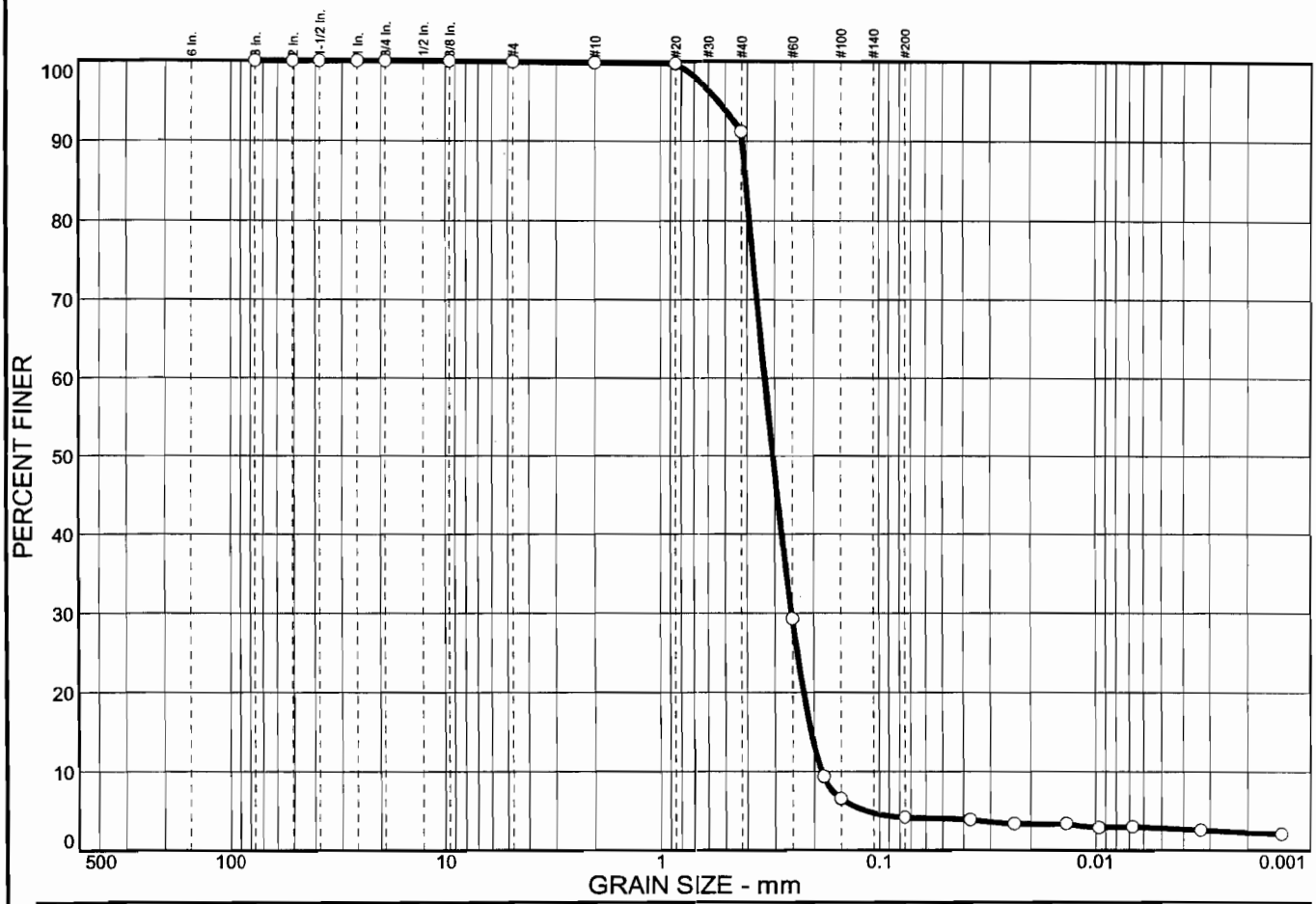
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	95.7	1.3	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	100.0		
0.375 in.	100.0		
#4	99.9		
#10	99.8		
#20	99.7		
#40	91.2		
#60	29.3		
#80	9.4		
#100	6.6		
#200	4.2		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.405 D_{60}= 0.332 D_{50}= 0.305
D_{30}= 0.252 D_{15}= 0.206 D_{10}= 0.184
C_u= 1.81 C_c= 1.04

Classification

USCS= AASHTO=

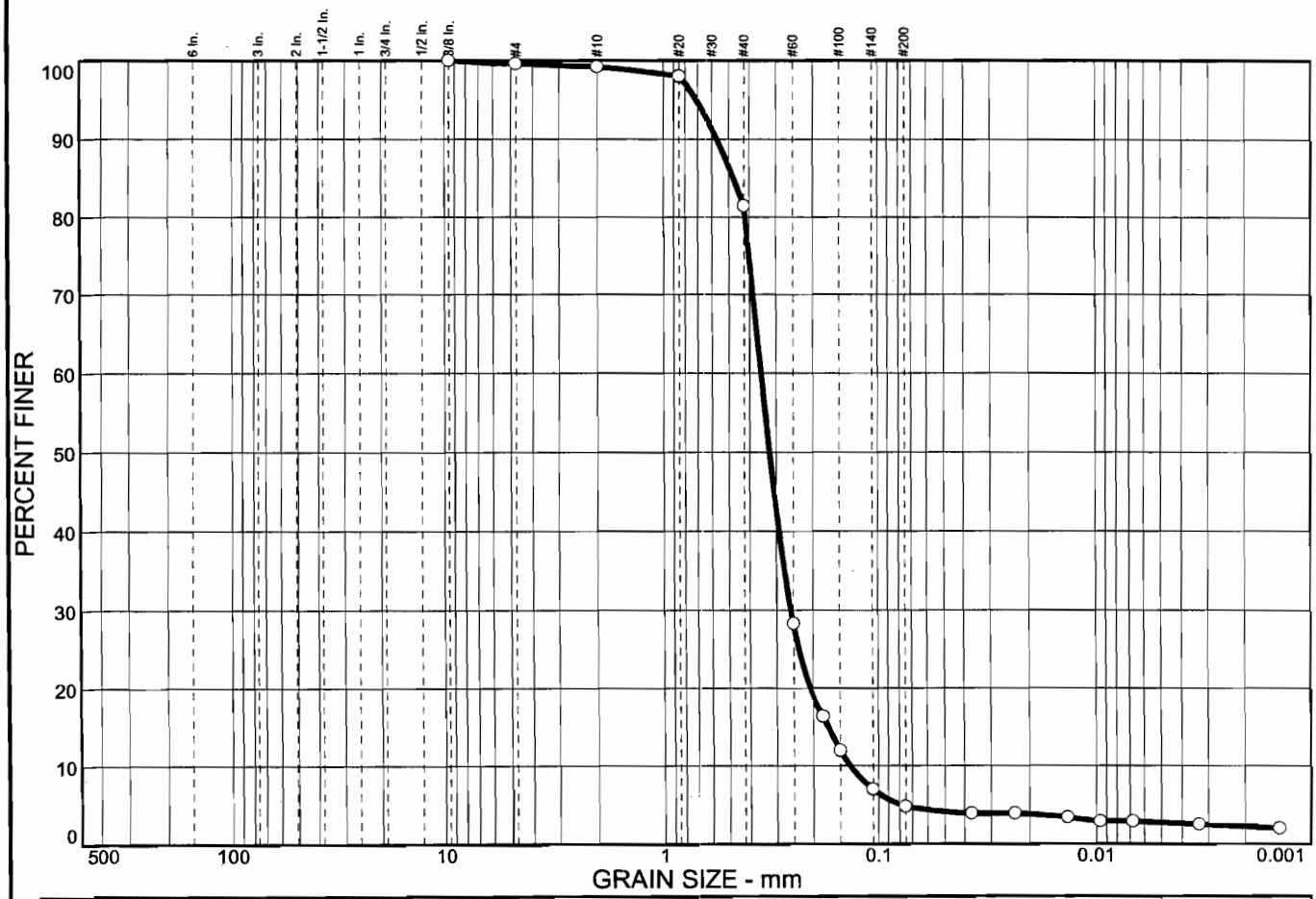
Remarks

Sample No.: 21 **Source of Sample:** C-04-11 **Date:** 04-29-05
Location: **Elev./Depth:** 36.0'-37.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	94.8	2.1	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.2		
#20	98.0		
#40	81.5		
#60	28.3		
#80	16.4		
#100	12.0		
#140	7.0		
#200	4.8		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.474 D_{60}= 0.353 D_{50}= 0.322
D_{30}= 0.257 D_{15}= 0.170 D_{10}= 0.135
C_u= 2.62 C_c= 1.38

Classification

USCS= AASHTO=

Remarks

Sample No.: 29 **Source of Sample:** C-04-11 **Date:** 06/30/05
Location: **Elev./Depth:** 54.0'-57.0'

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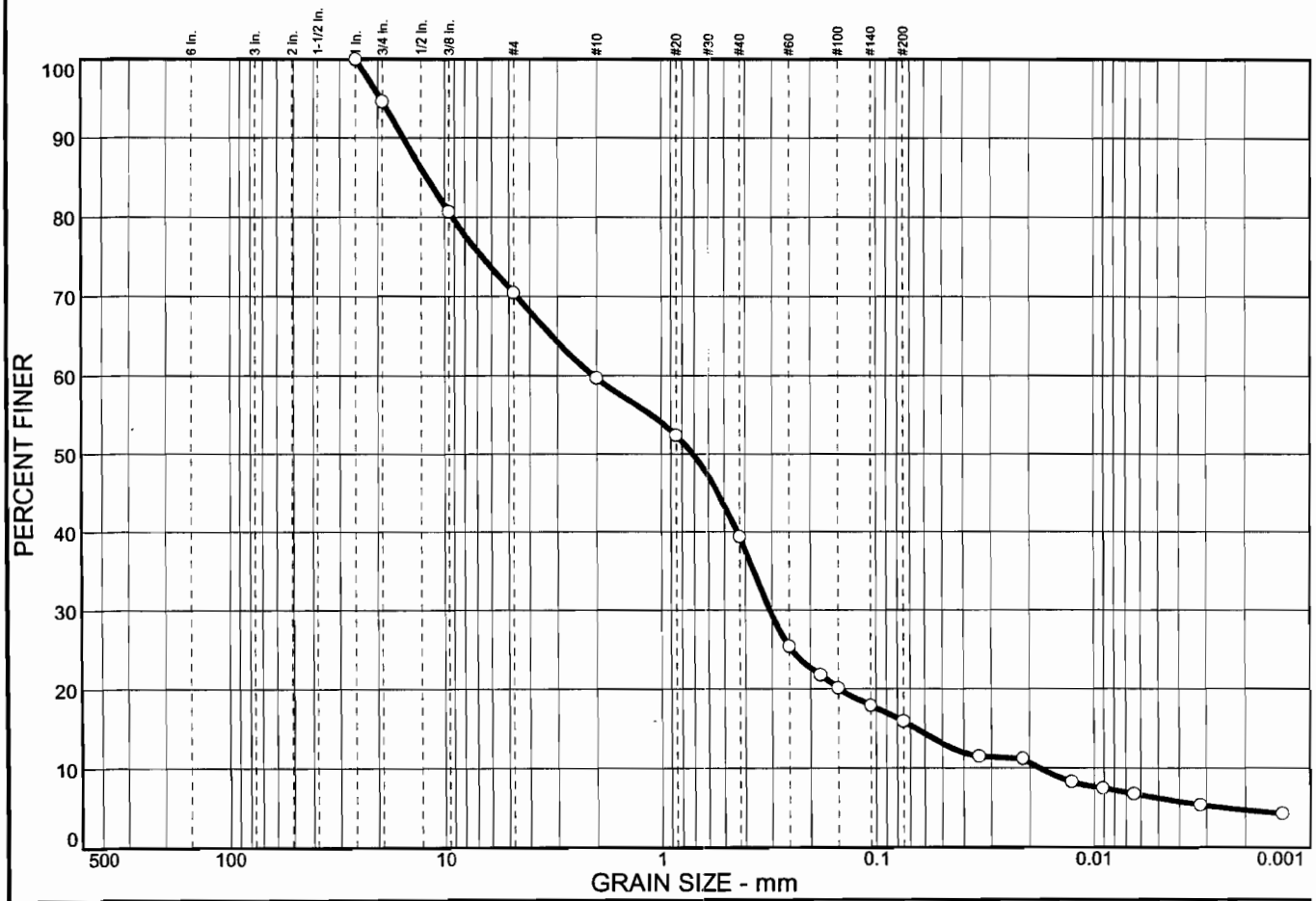
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	29.5	54.6	9.6	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	94.6		
.375 in.	80.7		
#4	70.5		
#10	59.7		
#20	52.4		
#40	39.4		
#60	25.4		
#80	21.8		
#100	20.1		
#140	17.9		
#200	15.9		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.9 D_{60}= 2.06 D_{50}= 0.709
D_{30}= 0.306 D_{15}= 0.0656 D_{10}= 0.0178
C_u= 115.62 C_c= 2.54

Classification

USCS= AASHTO=

Remarks

Sample No.: 4 **Source of Sample:** C-04-12 **Date:** 7-9-05
Location: **Elev./Depth:** 9.0'-12.0'

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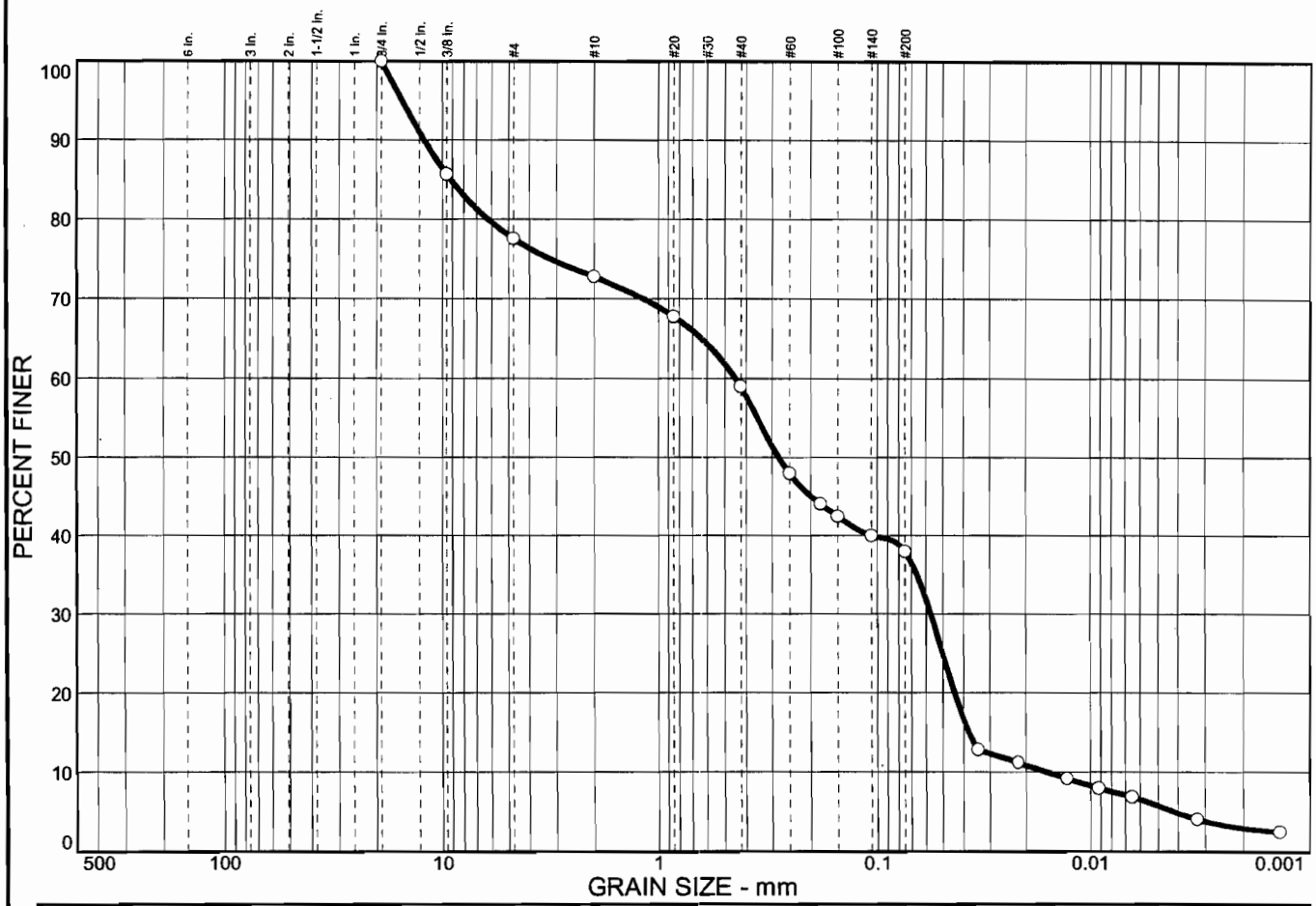
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.4	39.6	32.2	5.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	85.7		
#4	77.6		
#10	72.8		
#20	67.8		
#40	59.0		
#60	48.0		
#80	44.1		
#100	42.5		
#140	40.0		
#200	38.0		

* (no specification provided)

Soil Description

Brown silty/clayey sand with gravel

Atterberg Limits

PL= 22 LL= 26 PI= 4

Coefficients

D_{85}= 9.12 D_{60}= 0.448 D_{50}= 0.279
D_{30}= 0.0569 D_{15}= 0.0376 D_{10}= 0.0159
C_u= 28.22 C_c= 0.45

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample No.: 8 **Source of Sample:** C-04-12 **Date:** 7-9-05
Location: **Elev./Depth:** 19.5'-22.5'

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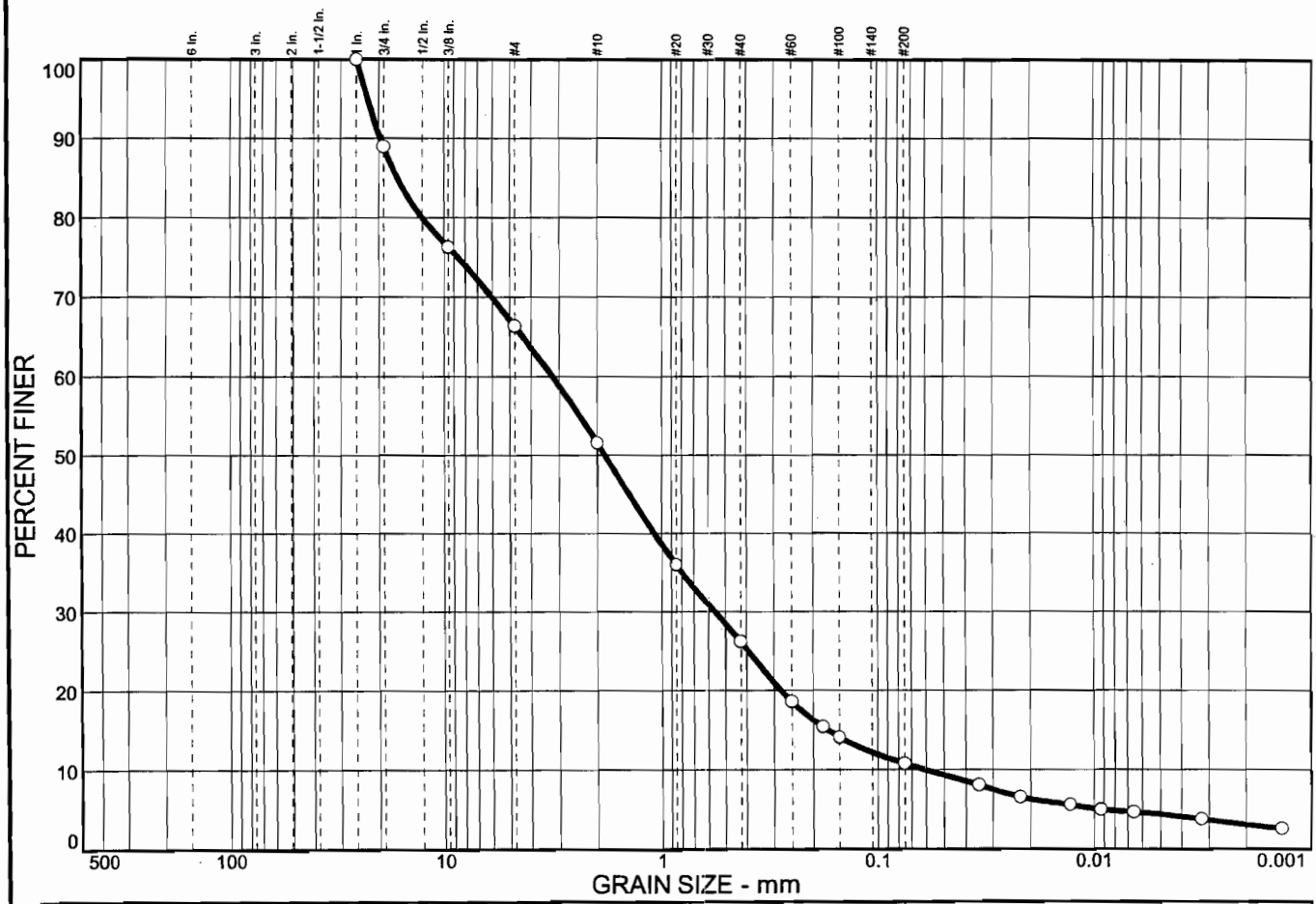
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.6	55.6	6.4	4.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	89.0		
0.375 in.	76.3		
#4	66.4		
#10	51.6		
#20	36.0		
#40	26.2		
#60	18.6		
#80	15.4		
#100	14.1		
#200	10.8		

* (no specification provided)

Soil Description

Brown well graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.5 D_{60}= 3.21 D_{50}= 1.84
D_{30}= 0.559 D_{15}= 0.171 D_{10}= 0.0600
C_u= 53.48 C_c= 1.62

Classification

USCS= AASHTO=

Remarks

Sample No.: 10 **Source of Sample:** C-04-12 **Date:** 06/30/05
Location: **Elev./Depth:** 25.5'-28.5'

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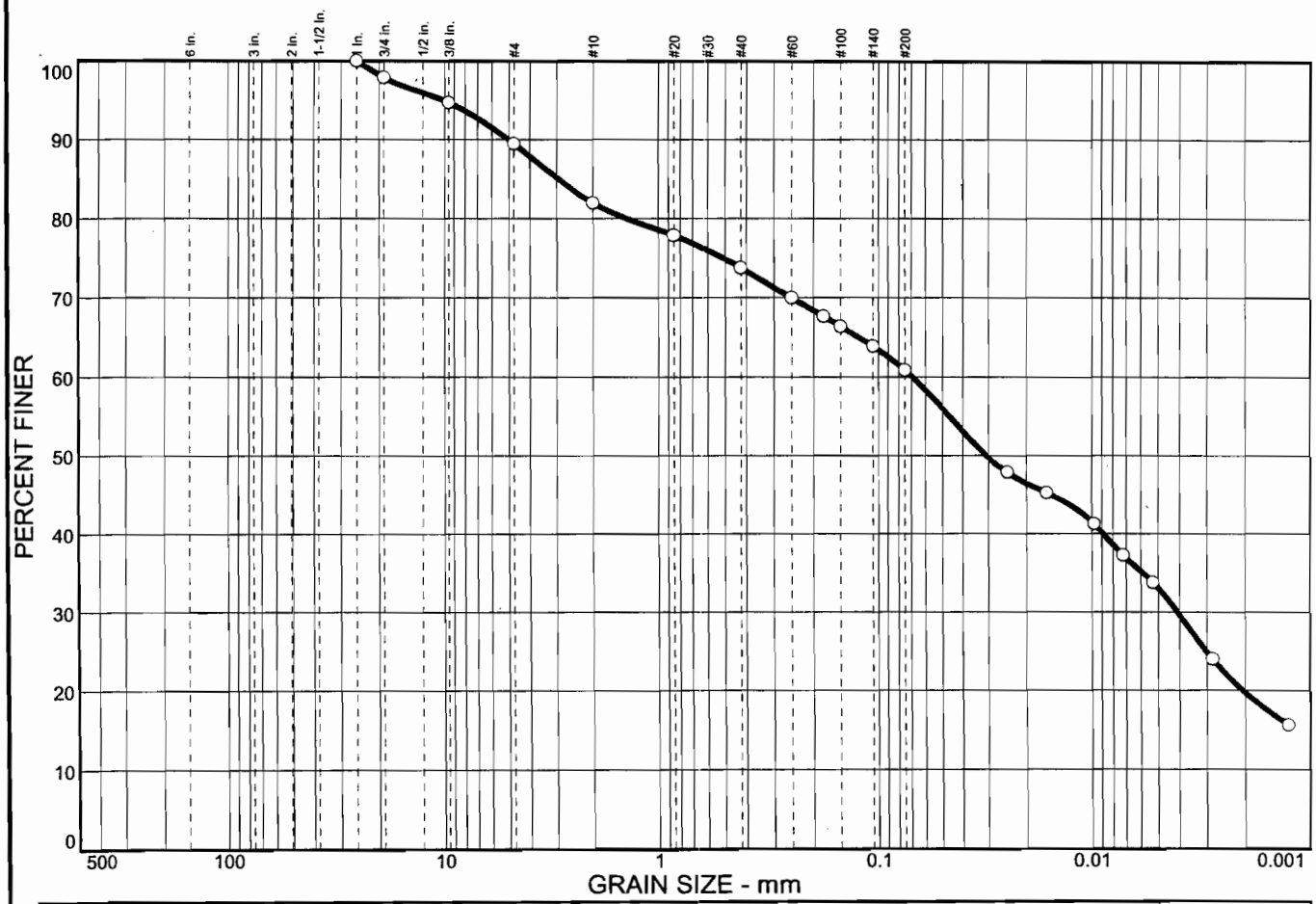
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.5	28.6	27.9	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	97.9		
.375 in.	94.7		
#4	89.5		
#10	82.0		
#20	77.9		
#40	73.8		
#60	70.0		
#80	67.7		
#100	66.4		
#140	63.9		
#200	60.9		

* (no specification provided)

Soil Description

Dark gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.92 D_{60}= 0.0689 D_{50}= 0.0306
D_{30}= 0.0041 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 3 **Source of Sample:** C-04-13 **Date:** 7-8-05
Location: **Elev./Depth:** 6.5'-9.5'

H. C. NUTTING COMPANY
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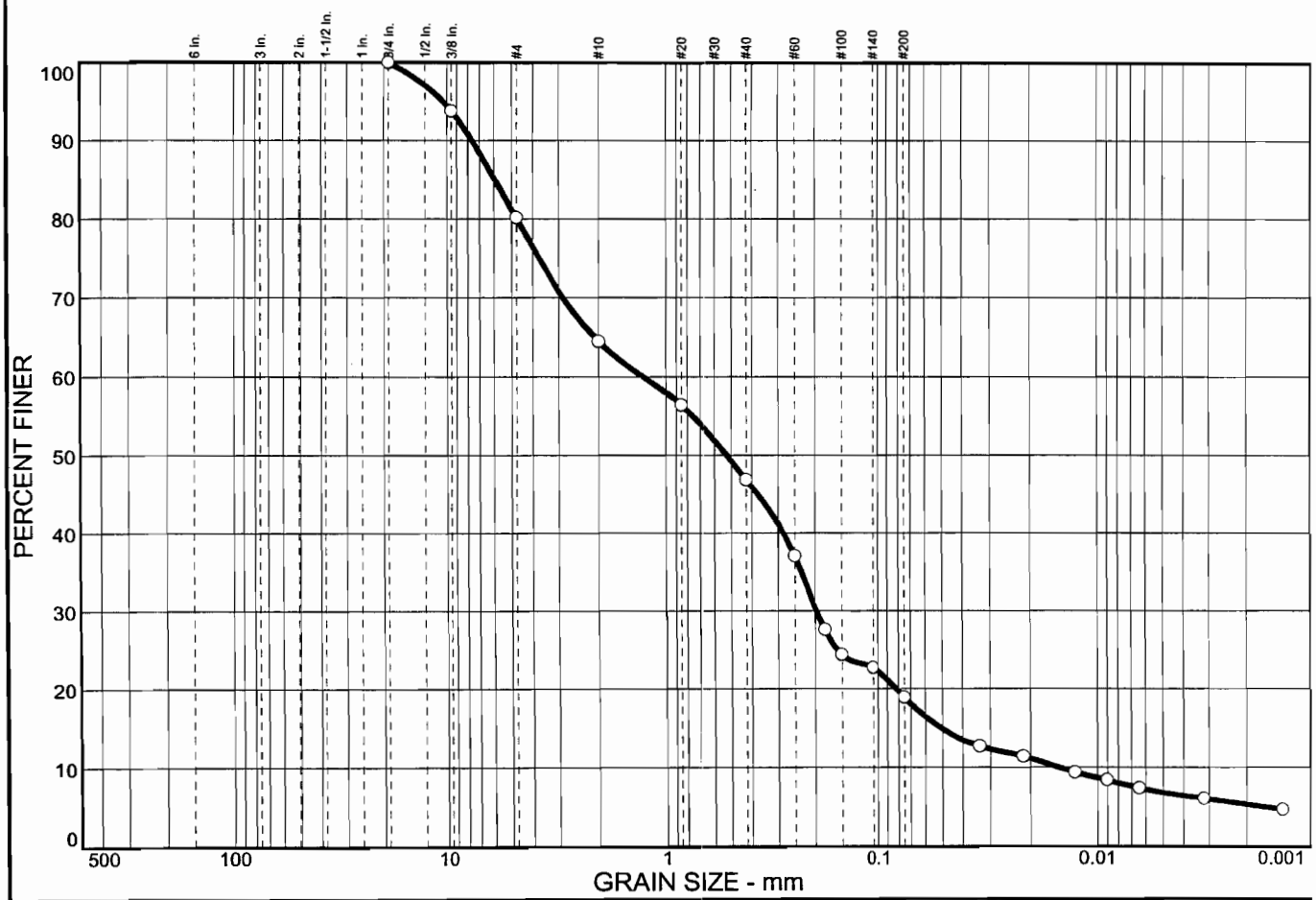
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	19.8	61.3	12.1	6.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	93.8		
#4	80.2		
#10	64.5		
#20	56.4		
#40	46.9		
#60	37.1		
#80	27.6		
#100	24.4		
#140	22.7		
#200	18.9		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.93 D_{60}= 1.26 D_{50}= 0.525
D_{30}= 0.197 D_{15}= 0.0505 D_{10}= 0.0148
C_u= 85.05 C_c= 2.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 6 **Source of Sample:** C-04-13 **Date:** 7-8-05
Location: **Elev./Depth:** 15.5'-18.5'

H. C. NUTTING COMPANY
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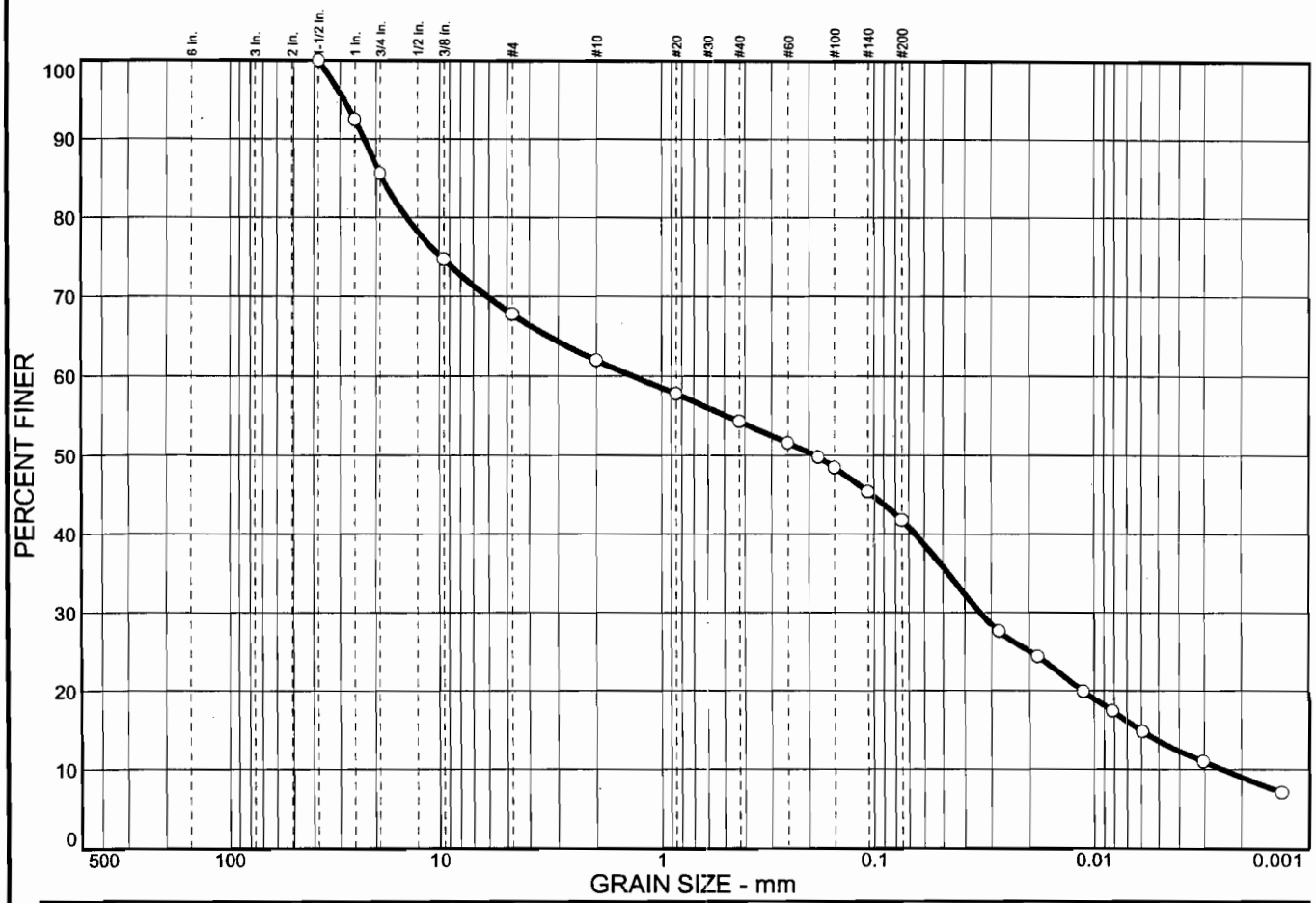
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	32.2	26.0	28.2	13.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	92.5		
.75 in.	85.6		
.375 in.	74.7		
#4	67.8		
#10	62.0		
#20	57.8		
#40	54.3		
#60	51.6		
#80	49.8		
#100	48.5		
#140	45.4		
#200	41.8		

* (no specification provided)

Soil Description

Brown silty/clayey gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 18.5 D_{60}= 1.35 D_{50}= 0.186
D_{30}= 0.0339 D_{15}= 0.0061 D_{10}= 0.0025
C_u= 550.09 C_c= 0.35

Classification

USCS= AASHTO=

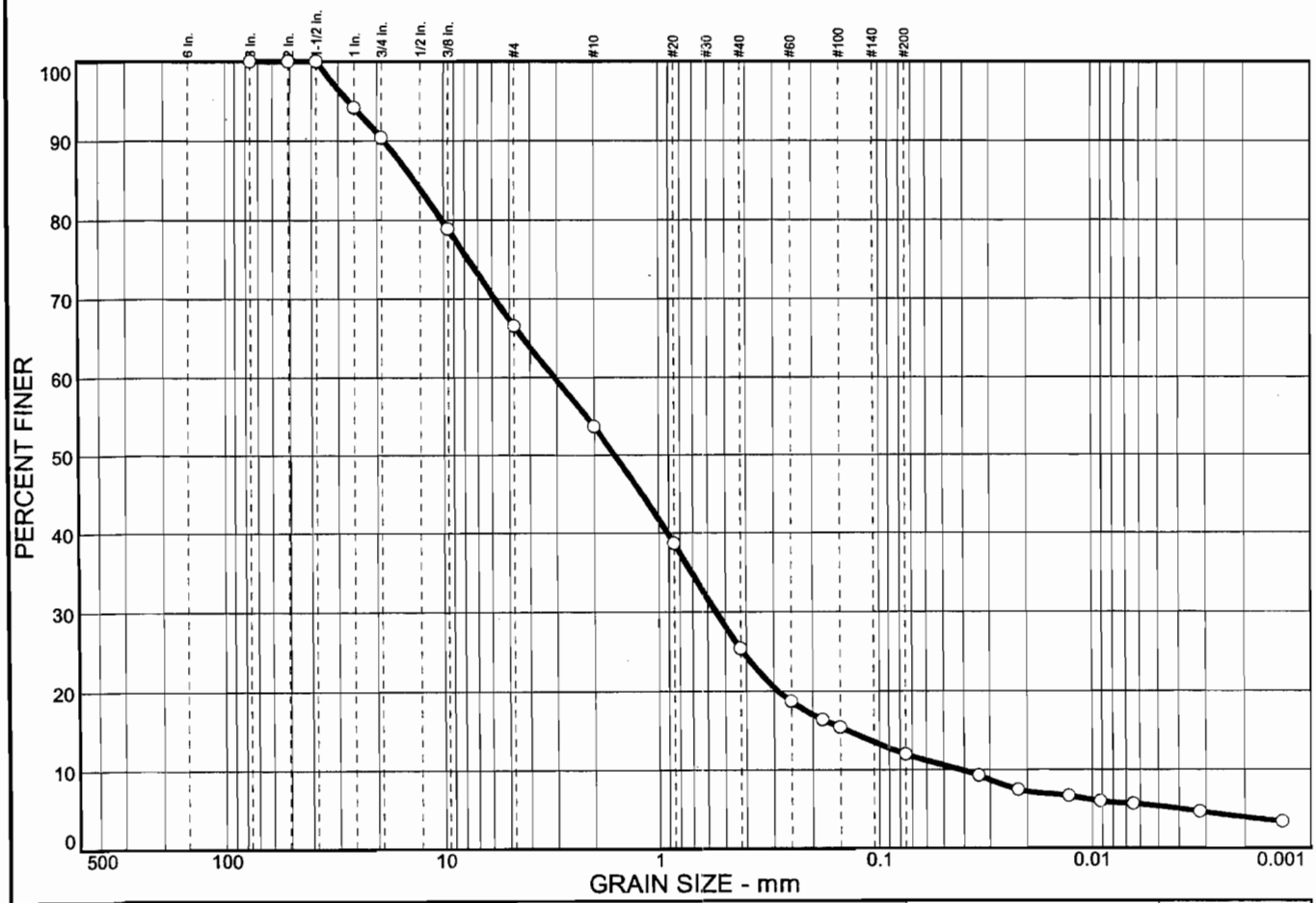
Remarks

Sample No.: 10 **Source of Sample:** C-04-13 **Date:** 7-9-05
Location: **Elev./Depth:** 27.5'-30.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.4	54.6	6.6	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	94.2		
0.75 in.	90.4		
0.375 in.	78.9		
#4	66.6		
#10	53.7		
#20	38.7		
#40	25.4		
#60	18.7		
#80	16.4		
#100	15.4		
#200	12.0		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.5 D_{60}= 3.07 D_{50}= 1.59
D_{30}= 0.549 D_{15}= 0.139 D_{10}= 0.0409
C_u= 75.08 C_c= 2.40

Classification

USCS= AASHTO=

Remarks

Sample No.: 14 **Source of Sample:** C-04-13 **Date:** 04-29-05
Location: **Elev./Depth:** 38.0'-42.5'

H. C. NUTTING COMPANY
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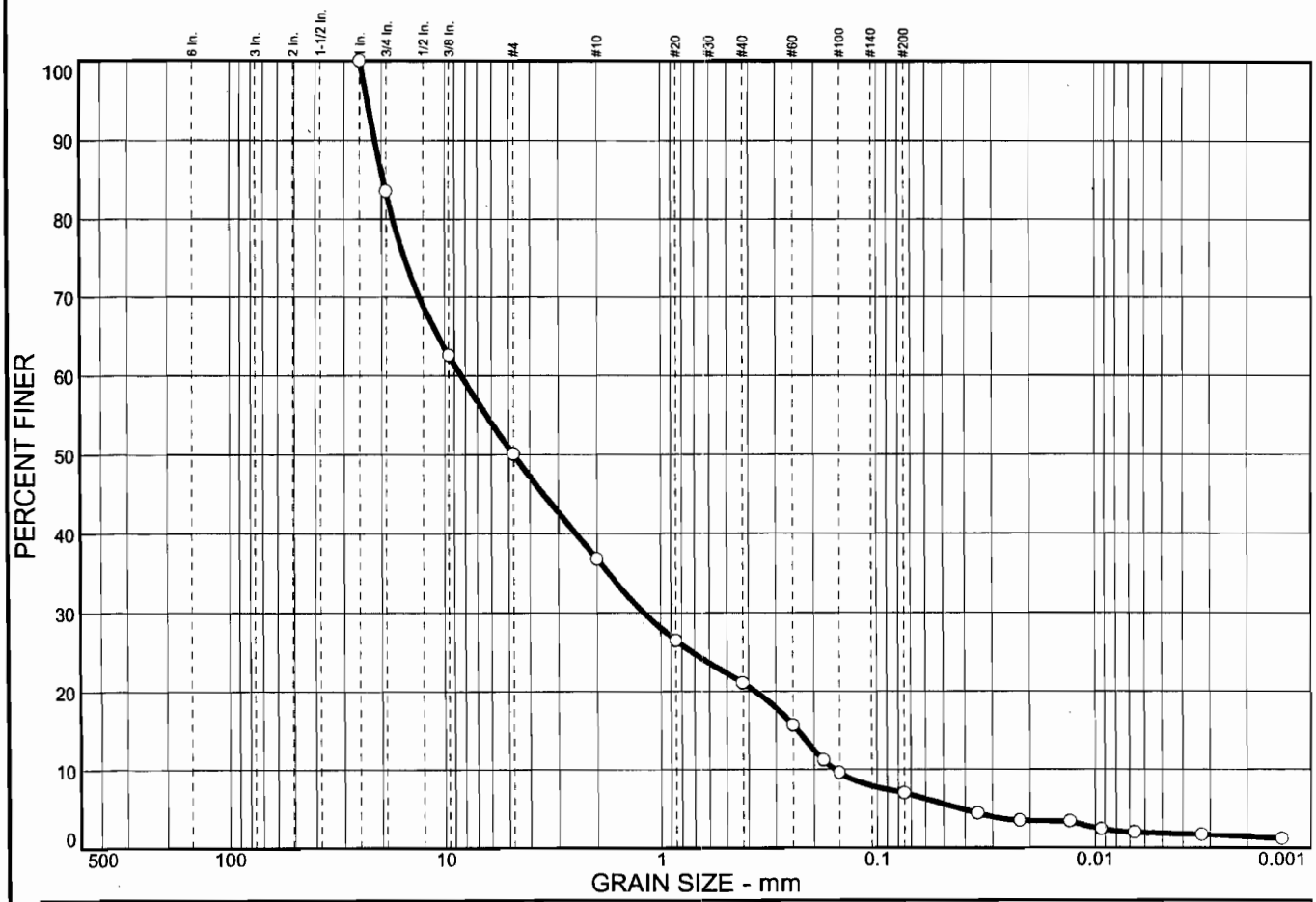
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	49.9	43.1	5.1	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	83.6		
0.375 in.	62.6		
#4	50.1		
#10	36.8		
#20	26.5		
#40	21.1		
#60	15.7		
#80	11.2		
#100	9.6		
#200	7.0		

* (no specification provided)

Soil Description

Brown well graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 19.6 D_{60}= 8.32 D_{50}= 4.72
D_{30}= 1.19 D_{15}= 0.238 D_{10}= 0.158
C_u= 52.56 C_c= 1.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 16 **Source of Sample:** C-04-13 **Date:** 07/05/05
Location: **Elev./Depth:** 45.5'-47.0'

H. C. NUTTING COMPANY
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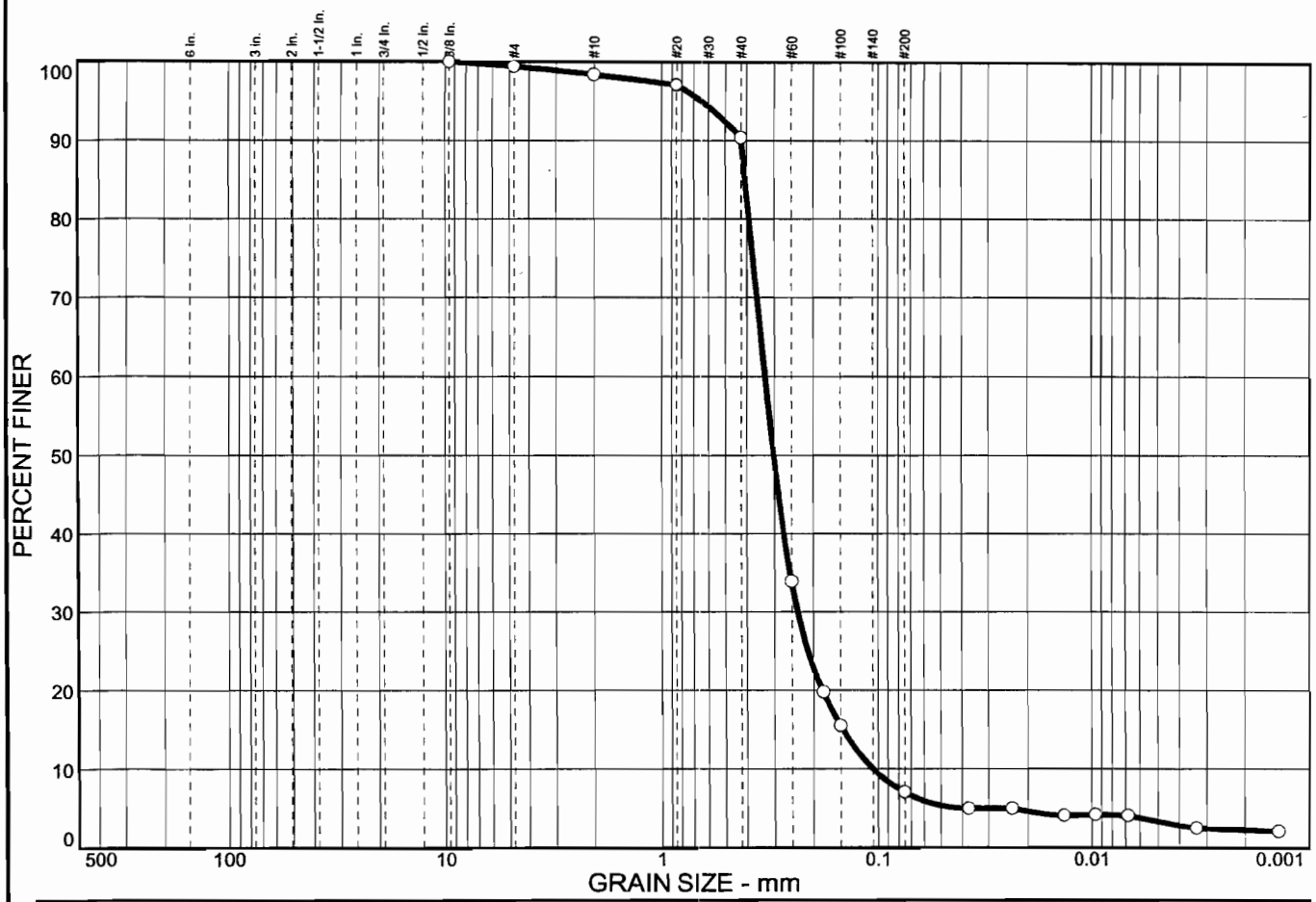
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	92.3	3.8	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.4		
#10	98.4		
#20	97.1		
#40	90.4		
#60	33.9		
#80	19.8		
#100	15.5		
#200	7.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.407 D_{60}= 0.330 D_{50}= 0.301
D_{30}= 0.235 D_{15}= 0.146 D_{10}= 0.106
C_u= 3.13 C_c= 1.58

Classification

USCS= AASHTO=

Remarks

Sample No.: 20 **Source of Sample:** C-04-13 **Date:** 06/30/05
Location: **Elev./Depth:** 53.0'-56.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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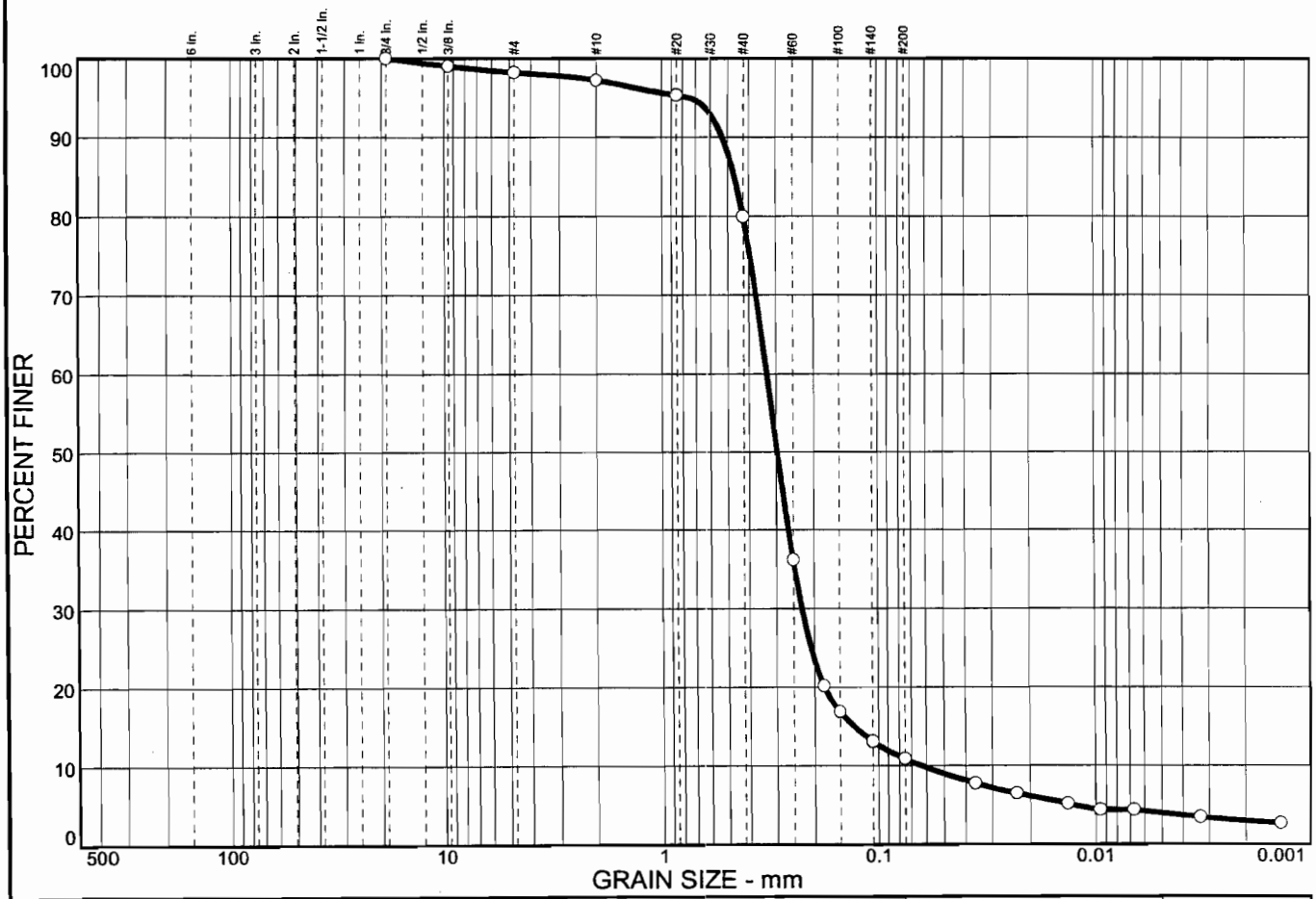
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.8	87.3	6.9	4.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.0		
#4	98.2		
#10	97.2		
#20	95.3		
#40	80.0		
#60	36.2		
#80	20.2		
#100	16.9		
#140	13.1		
#200	10.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.465 D_{60}= 0.331 D_{50}= 0.296
D_{30}= 0.227 D_{15}= 0.129 D_{10}= 0.0624
C_u= 5.30 C_c= 2.50

Classification

USCS= AASHTO=

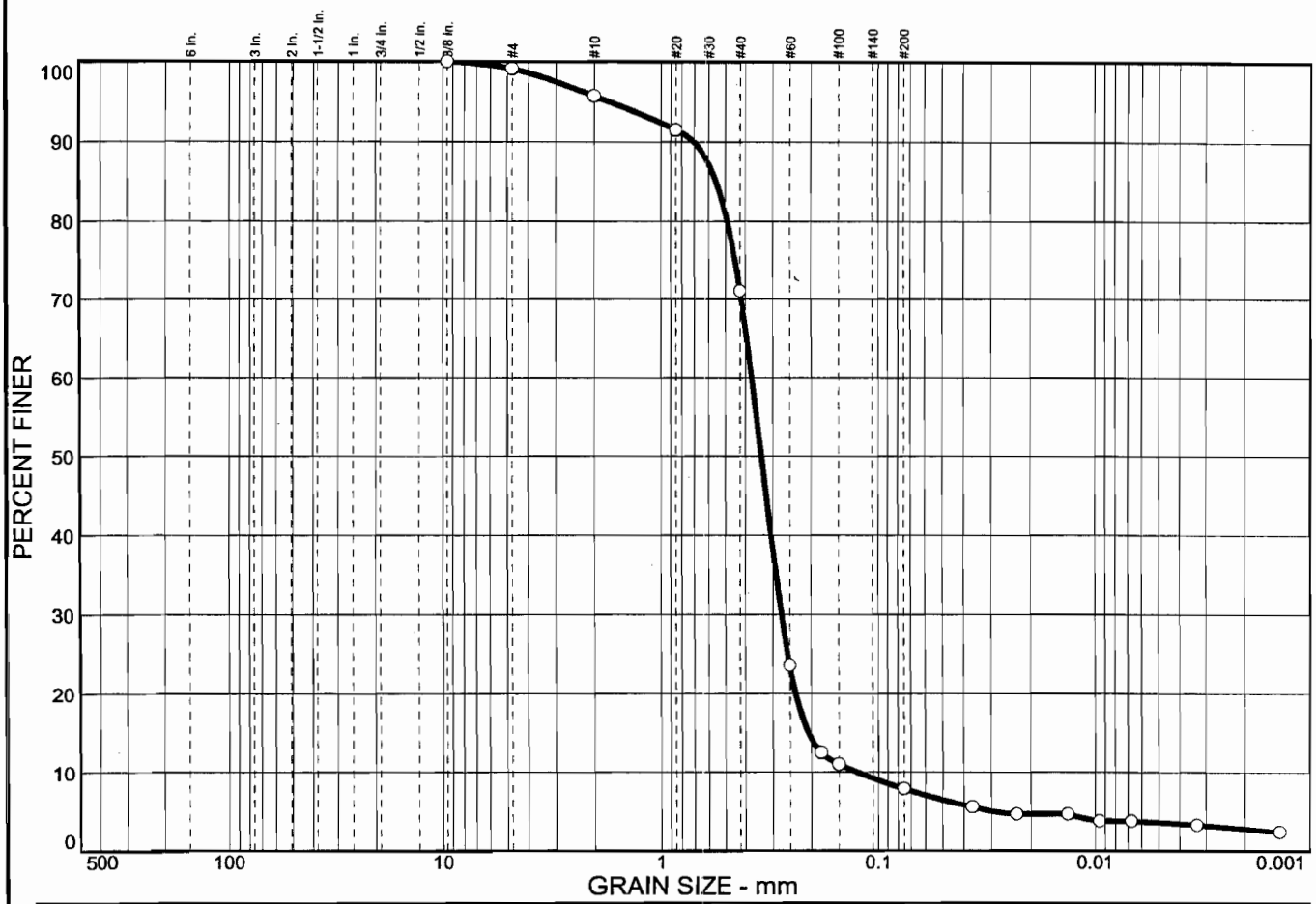
Remarks

Sample No.: 29 **Source of Sample:** C-04-13 **Date:** 06/30/05
Location: **Elev./Depth:** 80.0'-83.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	91.2	4.3	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.1		
#10	95.7		
#20	91.5		
#40	71.1		
#60	23.6		
#80	12.5		
#100	11.0		
#200	7.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.553 D_{60}= 0.374 D_{50}= 0.337
D_{30}= 0.273 D_{15}= 0.205 D_{10}= 0.124
C_u= 3.01 C_c= 1.60

Classification

USCS= AASHTO=

Remarks

Sample No.: 40 **Source of Sample:** C-04-13 **Date:** 06/30/05
Location: **Elev./Depth:** 113.0'-116.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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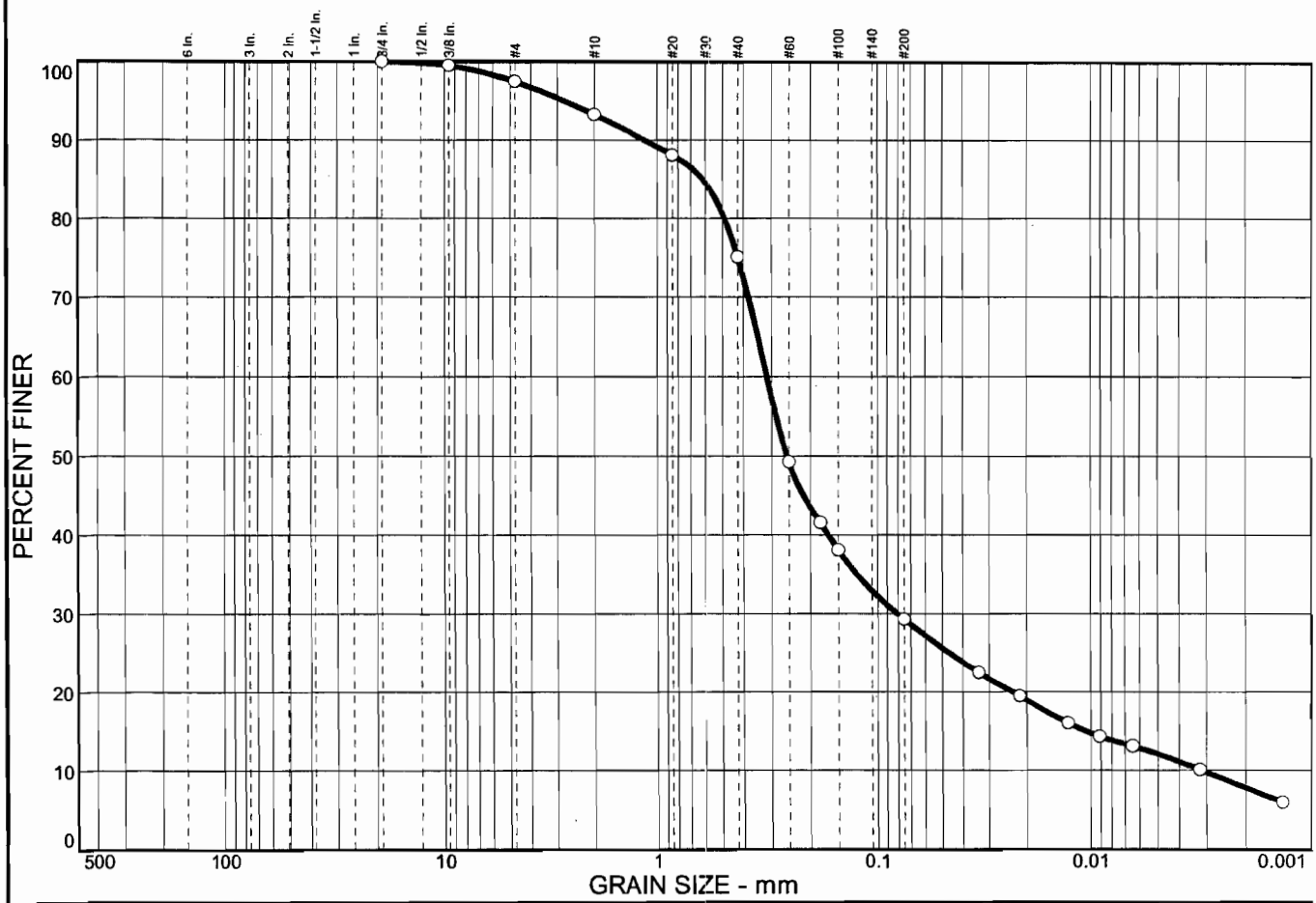
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.5	68.2	17.2	12.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	97.5		
#10	93.3		
#20	88.1		
#40	75.1		
#60	49.3		
#80	41.6		
#100	38.1		
#200	29.3		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.615 D_{60}= 0.315 D_{50}= 0.255
D_{30}= 0.0807 D_{15}= 0.0106 D_{10}= 0.0031
C_u= 100.39 C_c= 6.58

Classification

USCS= AASHTO=

Remarks

Sample No.: 56 **Source of Sample:** C-04-13 **Date:** 06/30/05
Location: **Elev./Depth:** 190.0'-191.5'

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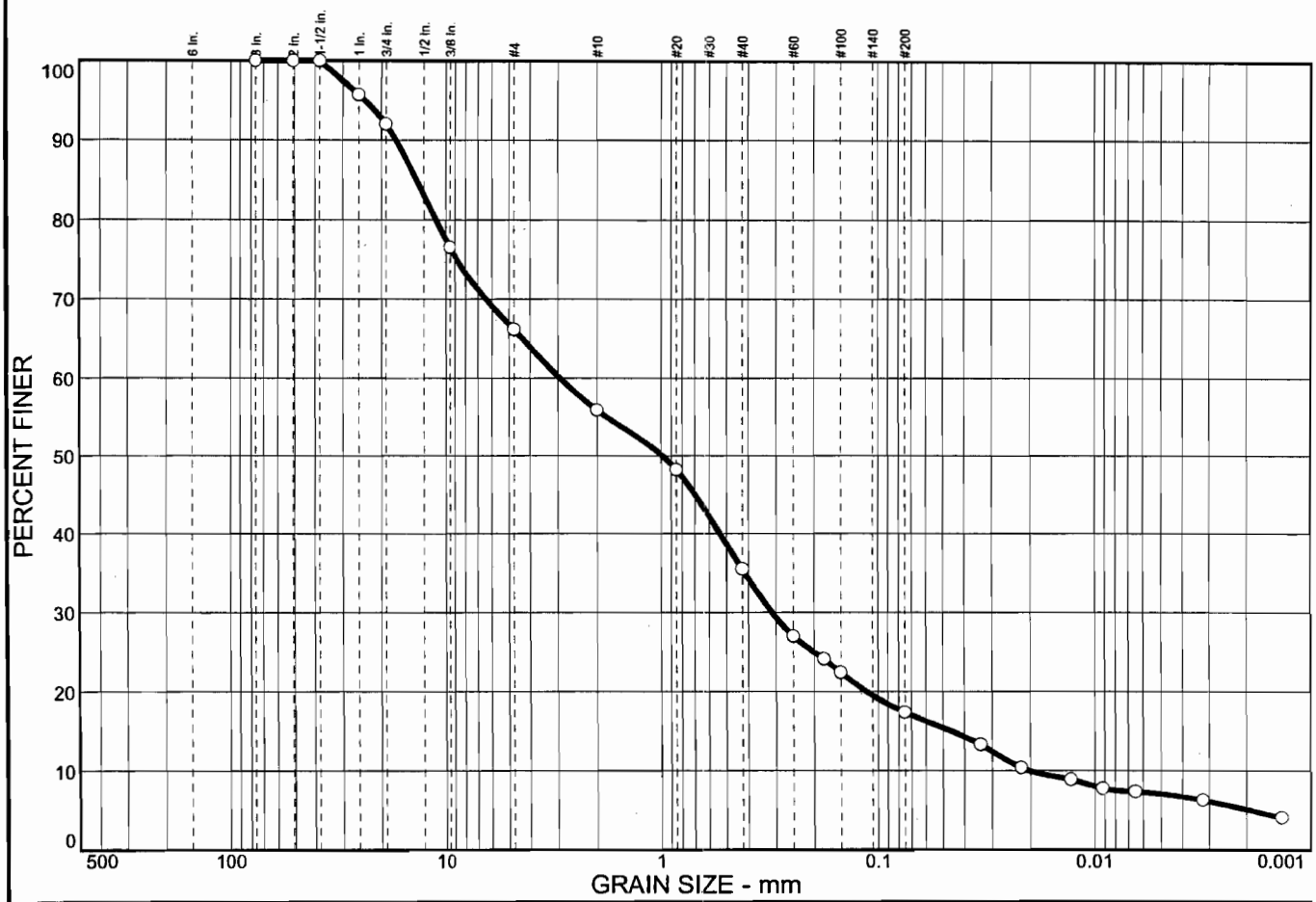
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.8	48.8	10.3	7.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	95.7		
0.75 in.	92.0		
0.375 in.	76.6		
#4	66.2		
#10	55.9		
#20	48.2		
#40	35.5		
#60	27.0		
#80	24.1		
#100	22.4		
#200	17.4		

* (no specification provided)

Soil Description

Dark brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.7 D_{60}= 2.92 D_{50}= 0.984
D_{30}= 0.312 D_{15}= 0.0456 D_{10}= 0.0200
C_u= 146.27 C_c= 1.67

Classification

USCS= AASHTO=

Remarks

Sample No.: 3 **Source of Sample:** C-04-14 **Date:** 04-29-05
Location: **Elev./Depth:** 6.0'-9.0'

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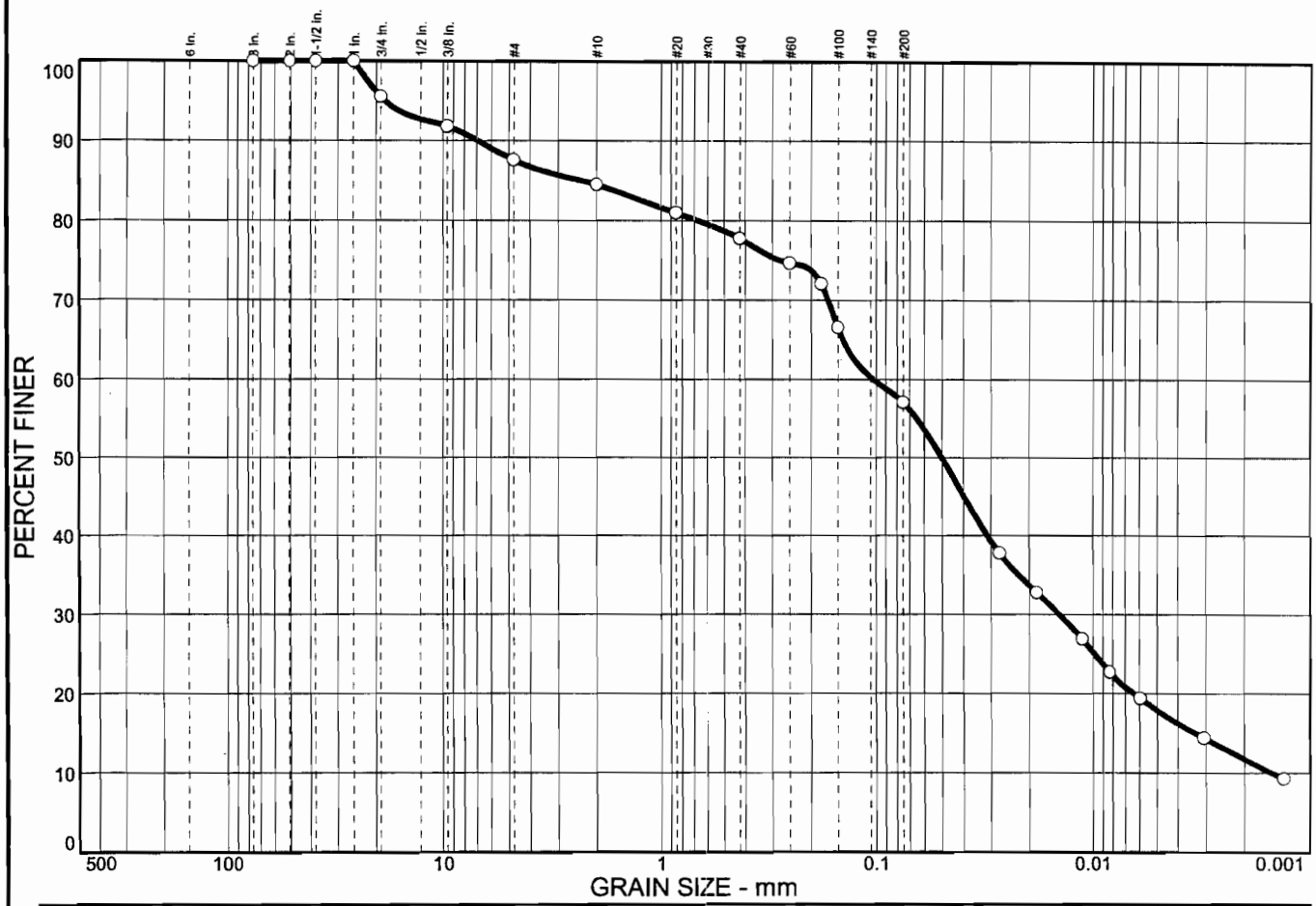
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.4	30.5	39.2	17.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
0.75 in.	95.5		
0.375 in.	91.8		
#4	87.6		
#10	84.5		
#20	81.0		
#40	77.8		
#60	74.7		
#80	72.1		
#100	66.6		
#200	57.1		

* (no specification provided)

Soil Description

Brown to gray sandy silt/lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.34 D_{60}= 0.103 D_{50}= 0.0499
D_{30}= 0.0144 D_{15}= 0.0033 D_{10}= 0.0015
C_u= 69.08 C_c= 1.35

Classification

USCS= AASHTO=

Remarks

Sample No.: 6 **Source of Sample:** C-04-14 **Date:** 04-29-05
Location: **Elev./Depth:** 12.0'-15.0'

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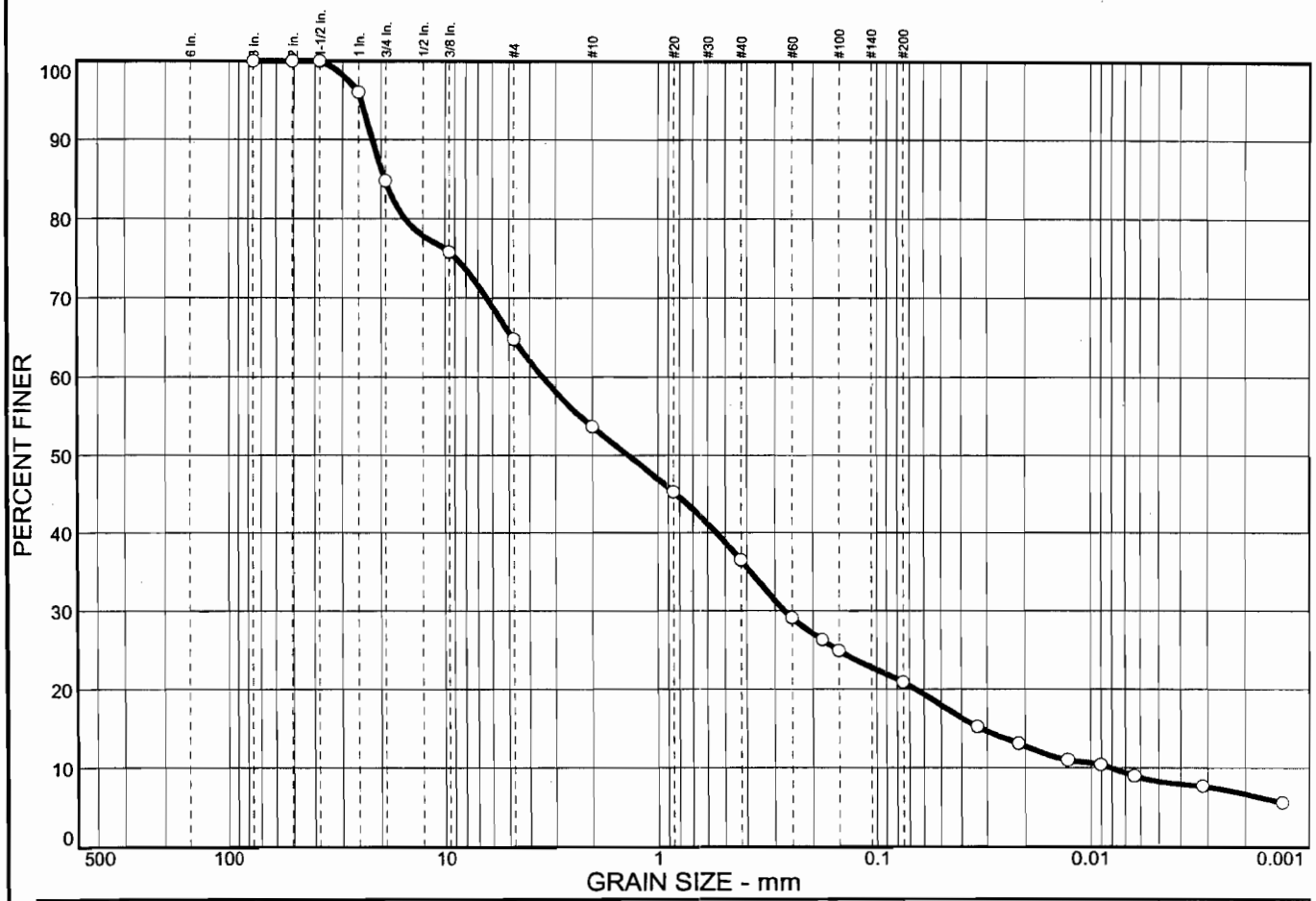
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	35.2	43.9	12.6	8.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	96.0		
0.75 in.	84.8		
0.375 in.	75.8		
#4	64.8		
#10	53.7		
#20	45.3		
#40	36.5		
#60	29.1		
#80	26.3		
#100	24.9		
#200	20.9		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 19.2 D_{60}= 3.45 D_{50}= 1.36
D_{30}= 0.270 D_{15}= 0.0320 D_{10}= 0.0080
C_u= 429.70 C_c= 2.63

Classification

USCS= AASHTO=

Remarks

Sample No.: 11 **Source of Sample:** C-04-14 **Date:** 04-29-05
Location: **Elev./Depth:** 25.5'-28.5'

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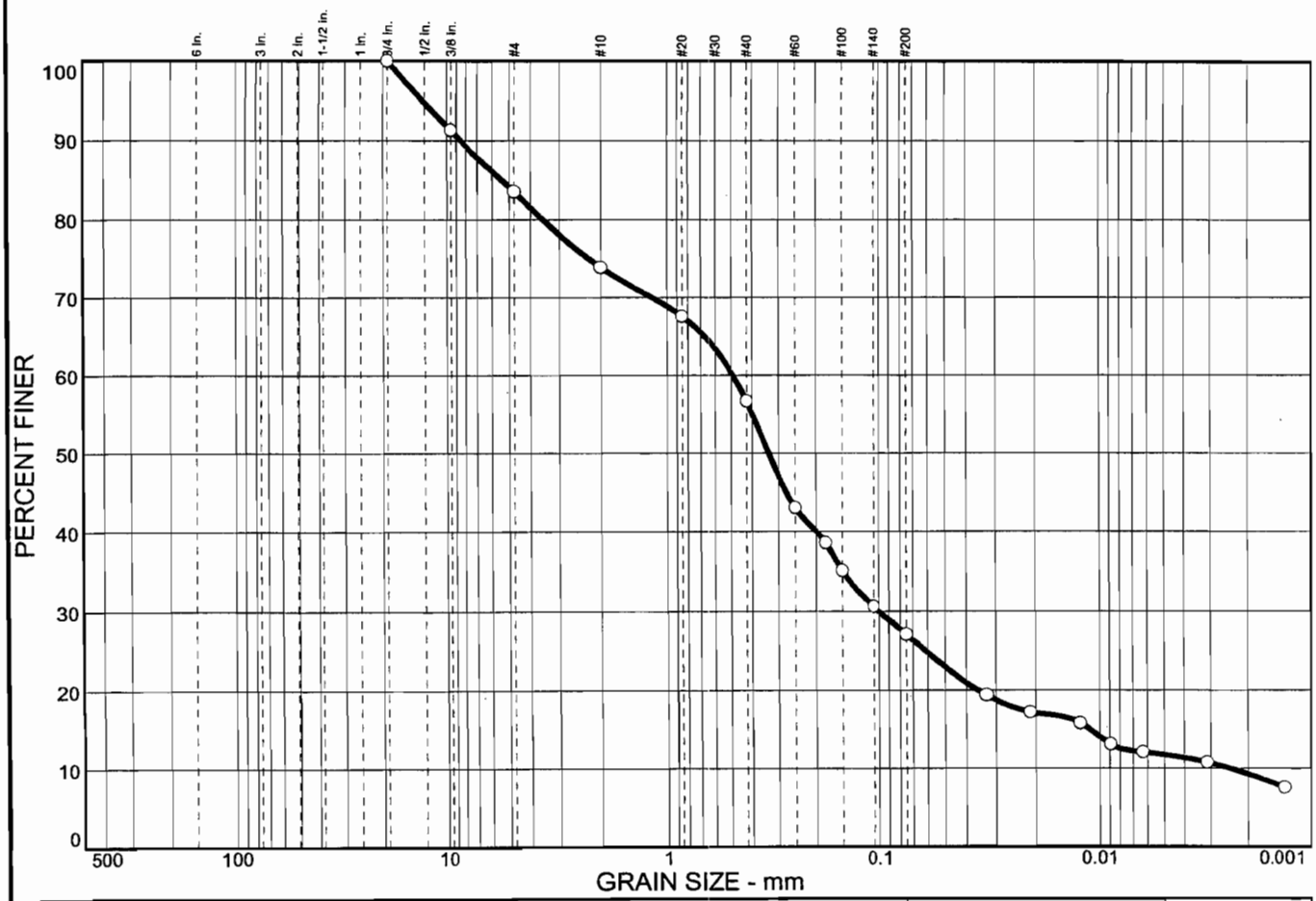
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	16.4	56.5	15.3	11.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.3		
#4	83.6		
#10	73.9		
#20	67.6		
#40	56.7		
#60	43.1		
#80	38.6		
#100	35.1		
#140	30.6		
#200	27.1		

* (no specification provided)

Soil Description

Dark gray clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.38 D_{60}= 0.492 D_{50}= 0.333
D_{30}= 0.0999 D_{15}= 0.0111 D_{10}= 0.0024
C_u= 203.13 C_c= 8.39

Classification

USCS= AASHTO=

Remarks

Sample No.: 3 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 3.0'-4.5'

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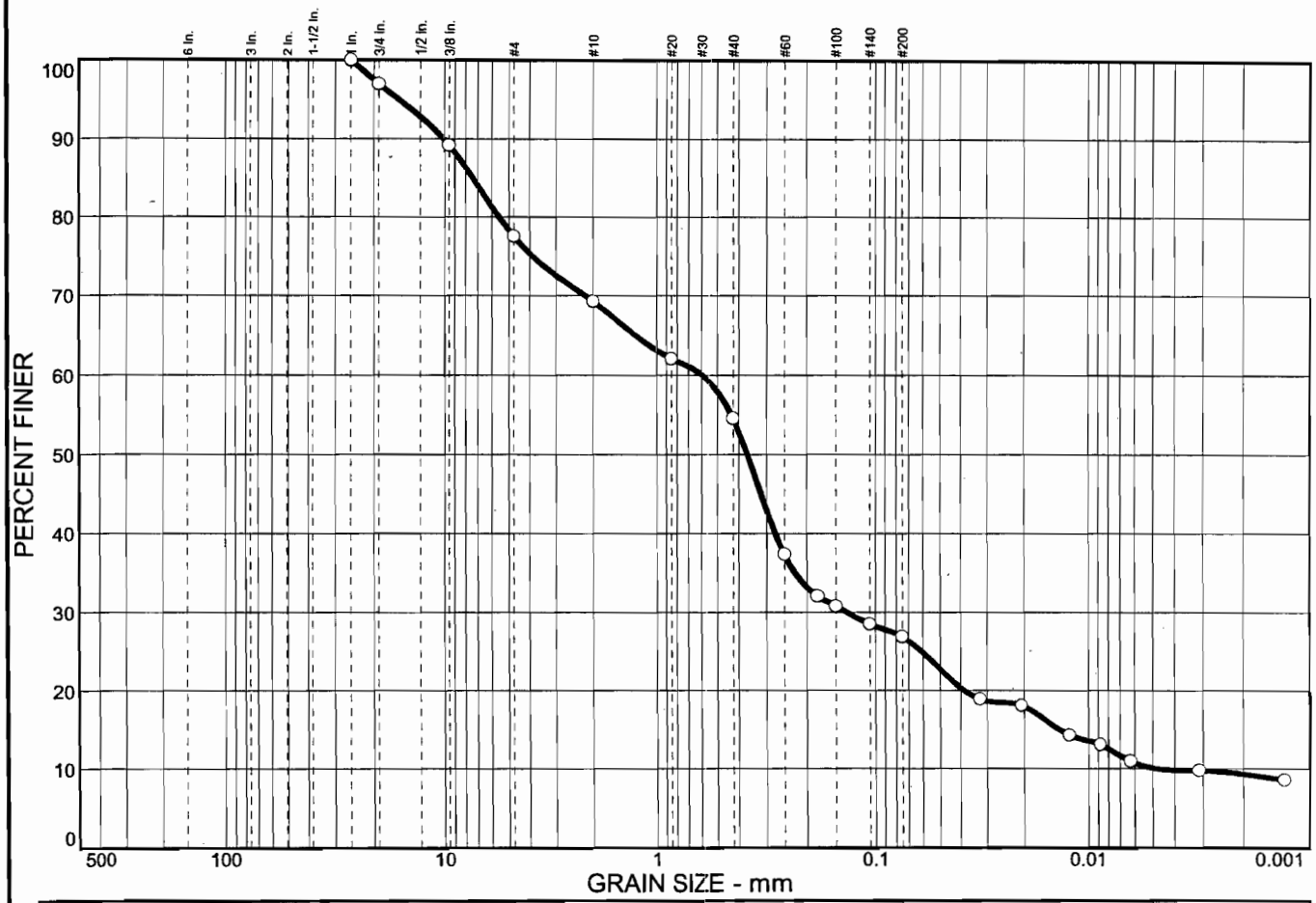
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.4	50.7	16.8	10.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.0		
0.375 in.	89.2		
#4	77.6		
#10	69.3		
#20	62.1		
#40	54.6		
#60	37.4		
#80	32.1		
#100	30.8		
#140	28.5		
#200	26.9		

* (no specification provided)

Soil Description

Brown clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.38 D_{60}= 0.592 D_{50}= 0.365
D_{30}= 0.134 D_{15}= 0.0137 D_{10}= 0.0047
C_u= 127.13 C_c= 6.50

Classification

USCS= AASHTO=

Remarks

Sample No.: 8 **Source of Sample:** C-04-15 **Date:** 07/05/05
Location: **Elev./Depth:** 9.0'-10.3'

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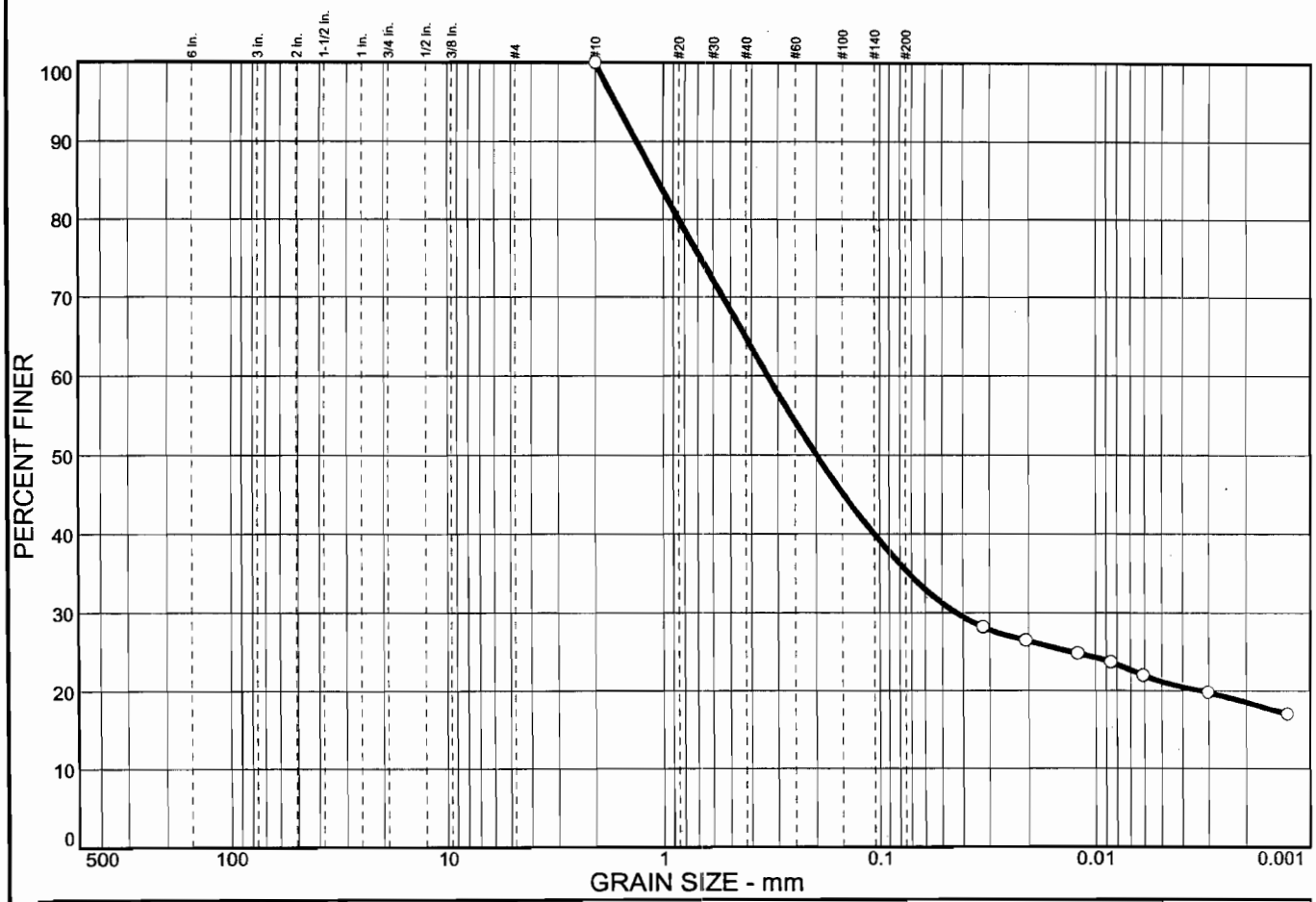
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.5	14.3	21.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		

* (no specification provided)

Soil Description

Brown clayey sand with gravel

Atterberg Limits

PL= 16 LL= 34 PI= 18

Coefficients

D_{85}= 1.05 D_{60}= 0.335 D_{50}= 0.198
D_{30}= 0.0427 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sieve analysis was flawed.

Sample No.: 12 **Source of Sample:** C-04-15 **Date:** 7-9-05
Location: **Elev./Depth:** 13.0'-15.5'

H. C. NUTTING COMPANY
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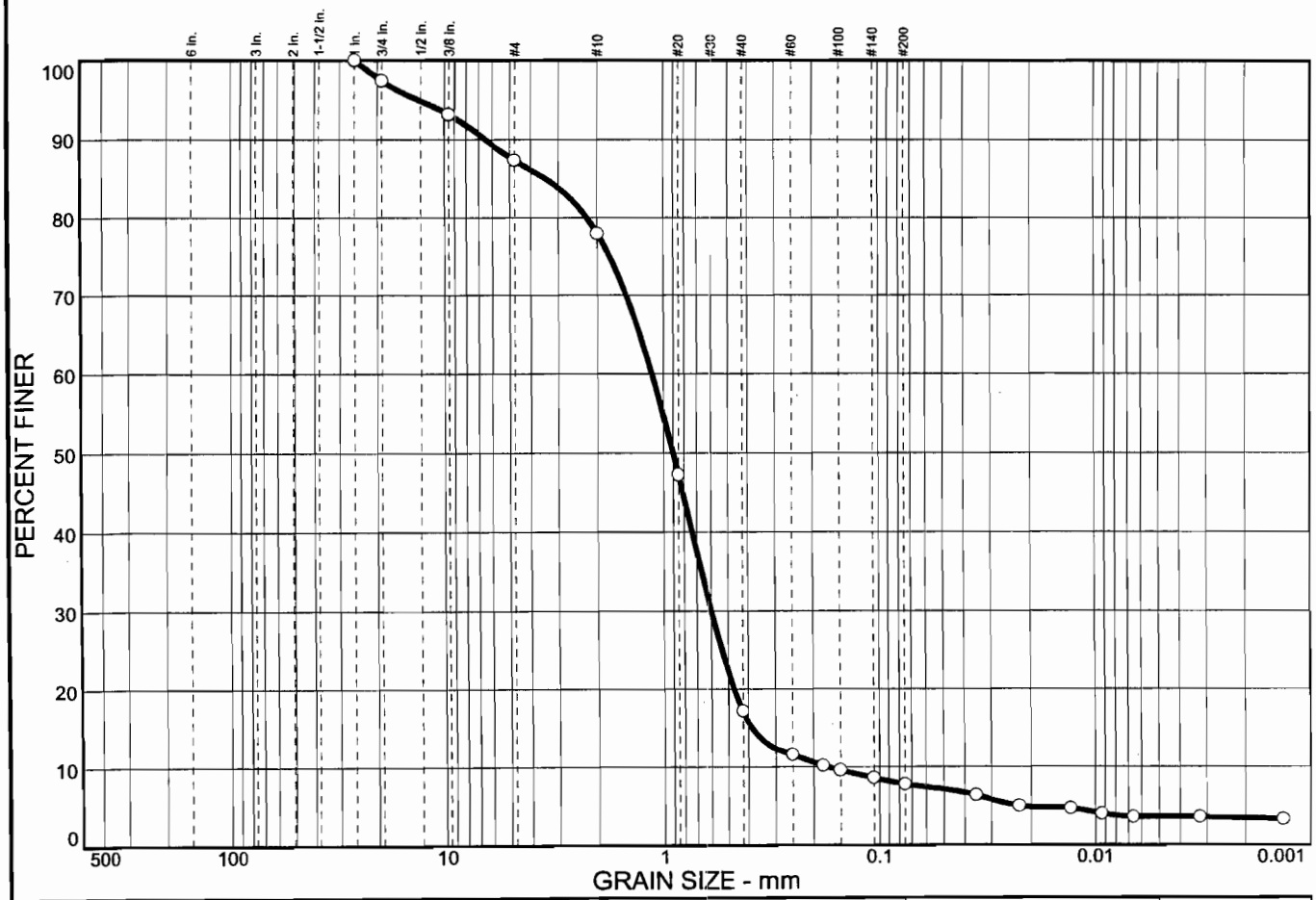
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.6	79.6	4.2	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.4		
0.375 in.	93.2		
#4	87.4		
#10	78.0		
#20	47.3		
#40	17.2		
#60	11.6		
#80	10.2		
#100	9.6		
#140	8.6		
#200	7.8		

* (no specification provided)

Soil Description

Brown well-graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.40 D_{60}= 1.13 D_{50}= 0.900
D_{30}= 0.597 D_{15}= 0.383 D_{10}= 0.170
C_u= 6.64 C_c= 1.86

Classification

USCS= AASHTO=

Remarks

Sample No.: 15 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 20.0'-21.5'

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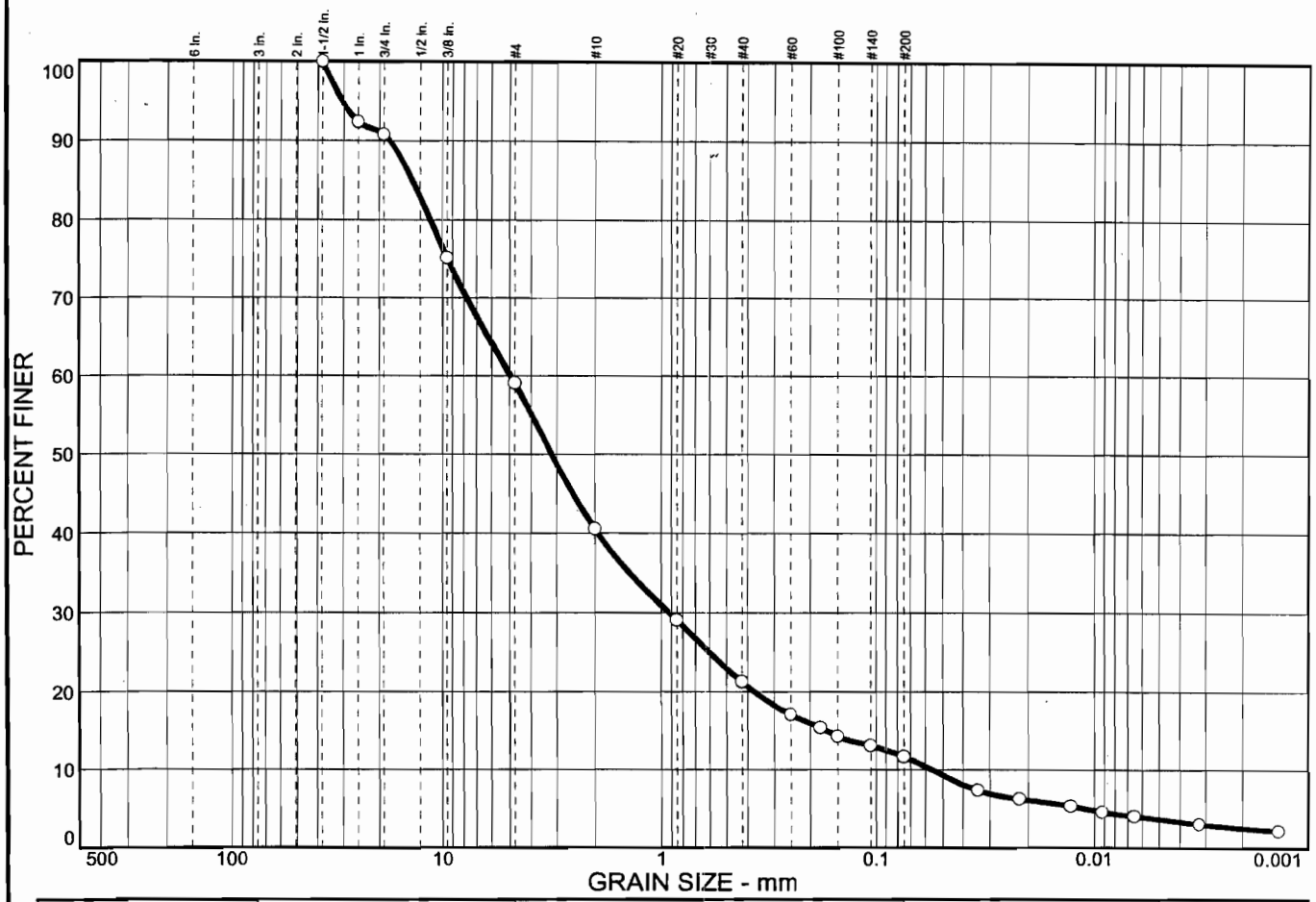
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	40.9	47.4	8.0	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	92.4		
0.75 in.	90.8		
0.375 in.	75.2		
#4	59.1		
#10	40.6		
#20	29.1		
#40	21.3		
#60	17.1		
#80	15.4		
#100	14.3		
#140	13.1		
#200	11.7		

* (no specification provided)

Soil Description

Light brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.7 D_{60}= 4.95 D_{50}= 3.17
D_{30}= 0.918 D_{15}= 0.169 D_{10}= 0.0556
C_u= 88.98 C_c= 3.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 17 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 24.6'-27.0'

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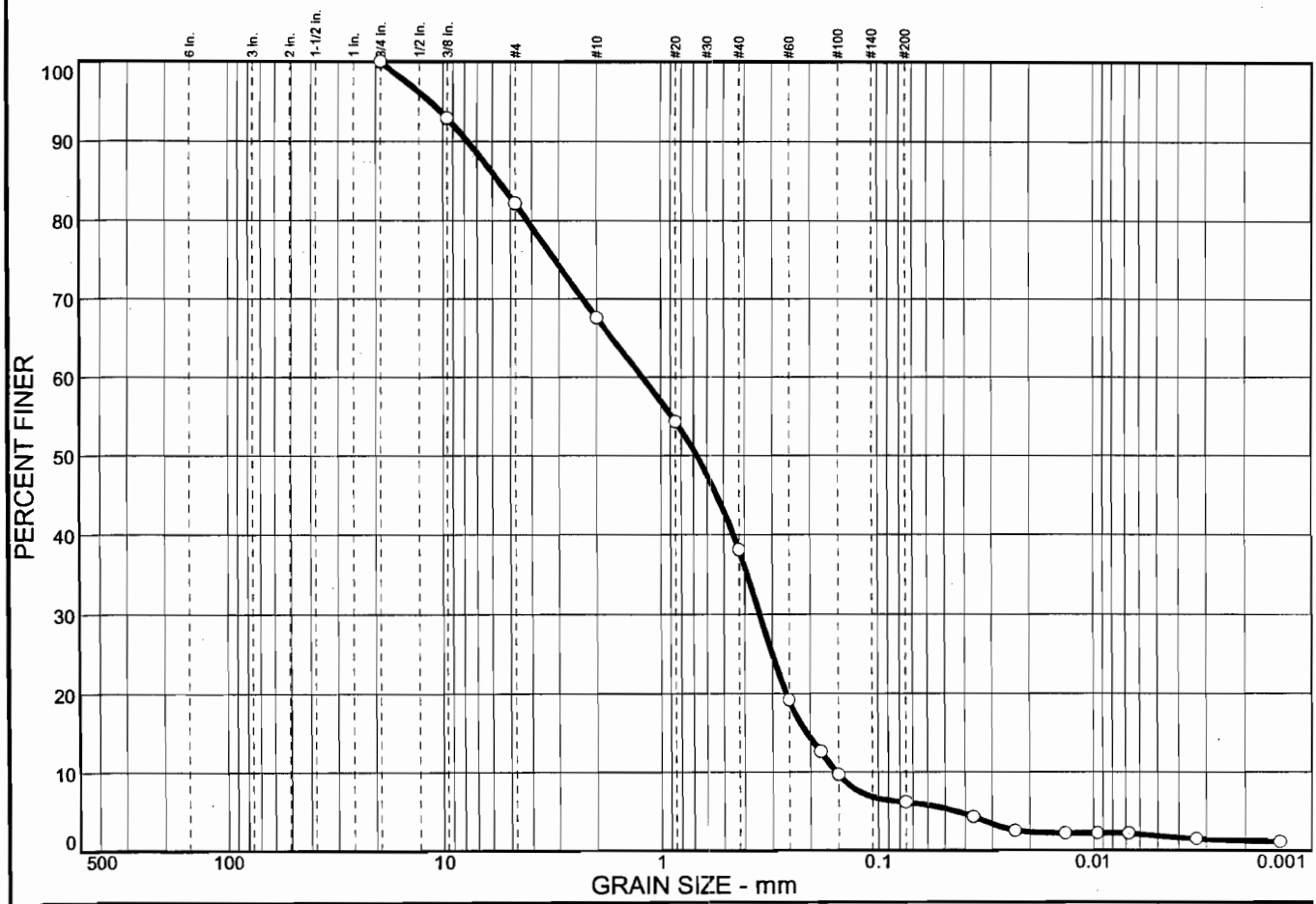
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.8	76.0	4.3	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.9		
#4	82.2		
#10	67.6		
#20	54.3		
#40	38.1		
#60	19.2		
#80	12.6		
#100	9.7		
#200	6.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.61 D_{60}= 1.22 D_{50}= 0.671
D_{30}= 0.342 D_{15}= 0.207 D_{10}= 0.153
C_u= 7.94 C_c= 0.63

Classification

USCS= AASHTO=

Remarks

Sample No.: 20 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 34.5'-37.5'

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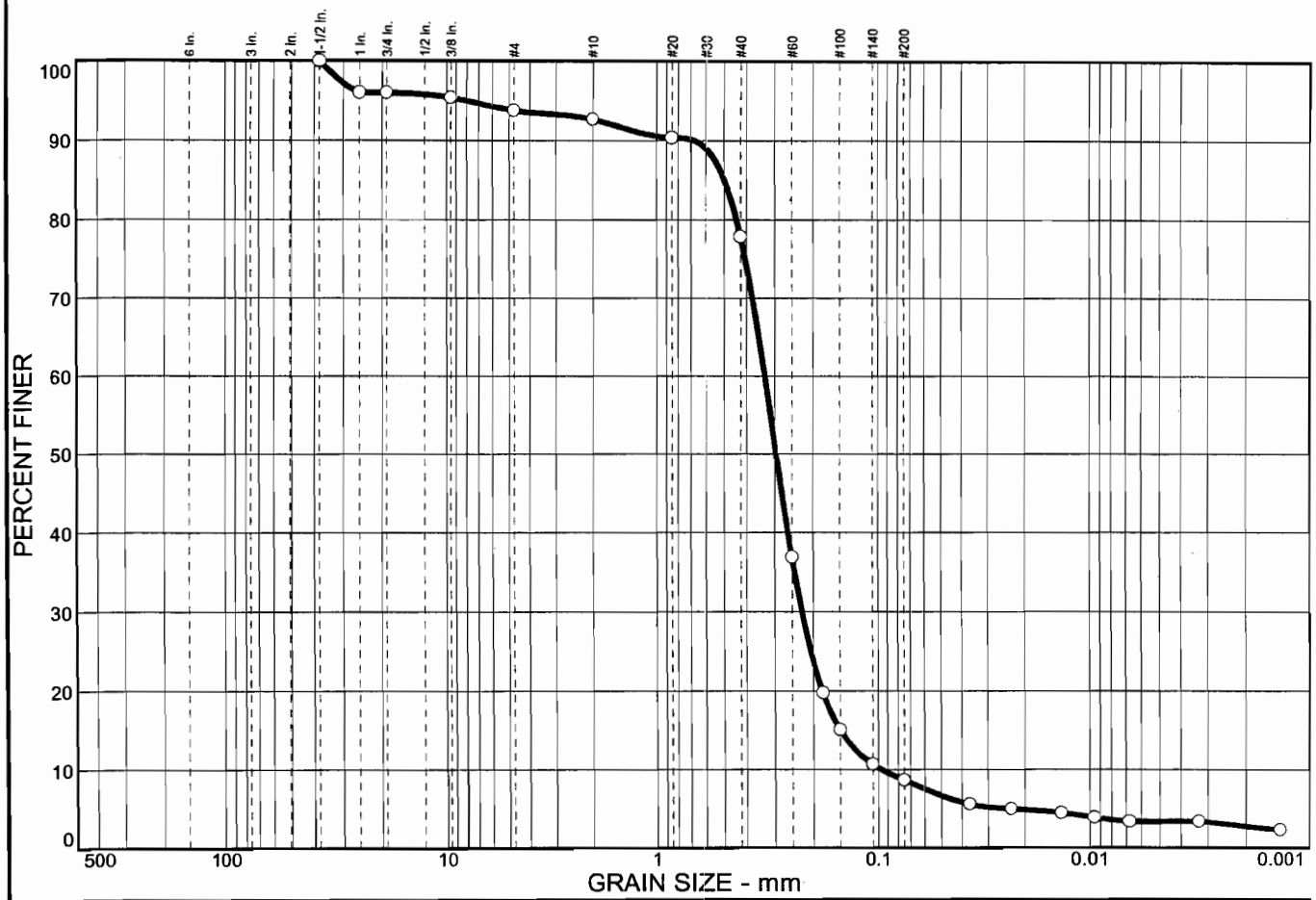
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.2	85.1	5.3	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.0		
0.75 in.	96.0		
0.375 in.	95.4		
#4	93.8		
#10	92.7		
#20	90.4		
#40	77.9		
#60	36.9		
#80	19.8		
#100	15.1		
#140	10.7		
#200	8.7		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.499 D_{60}= 0.333 D_{50}= 0.295
D_{30}= 0.225 D_{15}= 0.149 D_{10}= 0.0958
C_u= 3.47 C_c= 1.59

Classification

USCS= AASHTO=

Remarks

Sample No.: 24 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 45.0'-48.0'

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EMPLOYEE OWNED
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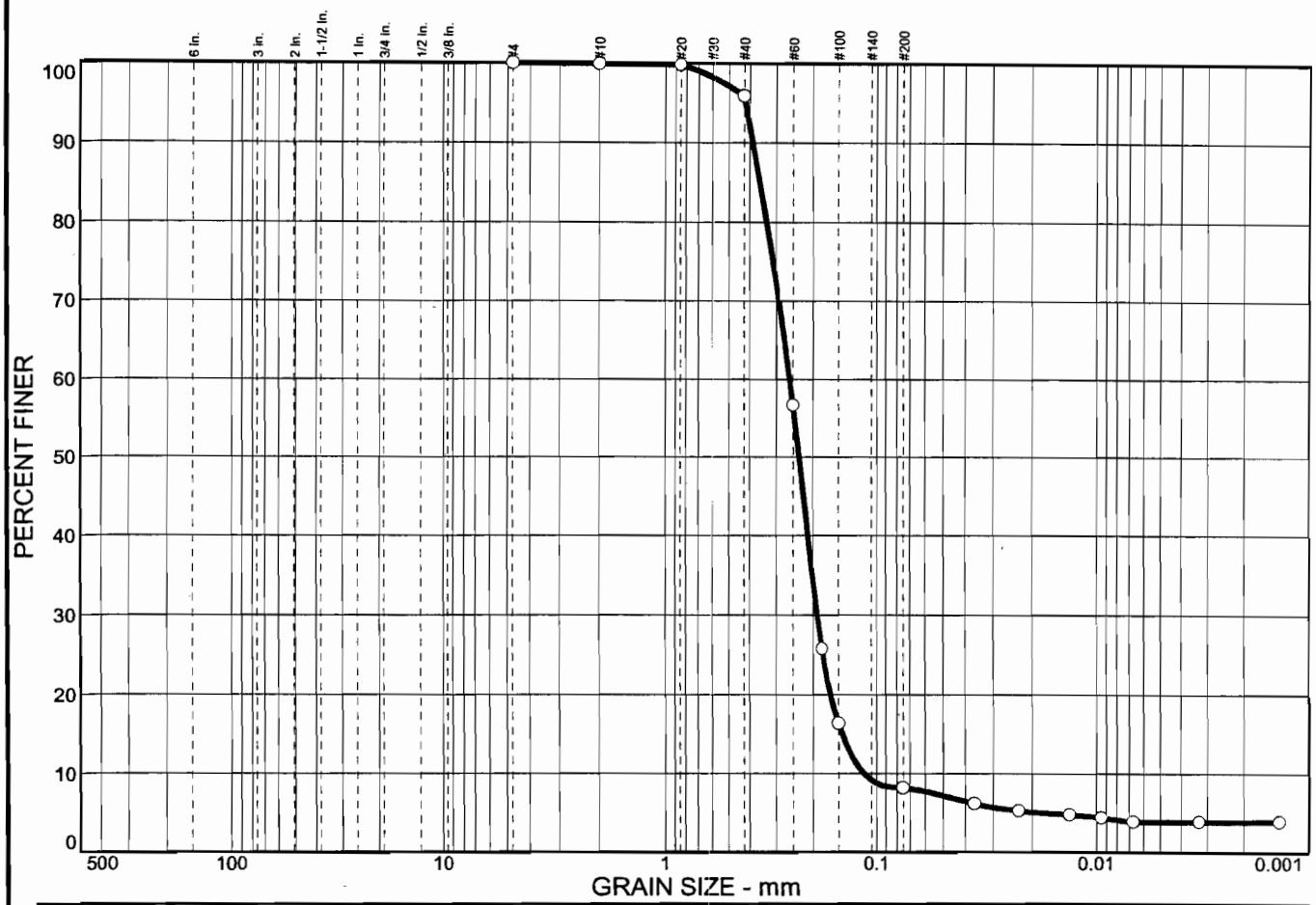
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	91.8	4.3	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.8		
#40	95.9		
#60	56.7		
#80	25.8		
#100	16.4		
#200	8.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.358 D_{60}= 0.259 D_{50}= 0.234
D_{30}= 0.190 D_{15}= 0.144 D_{10}= 0.114
C_u= 2.27 C_c= 1.22

Classification

USCS= AASHTO=

Remarks

Sample No.: 28 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 57.0'-60.0'

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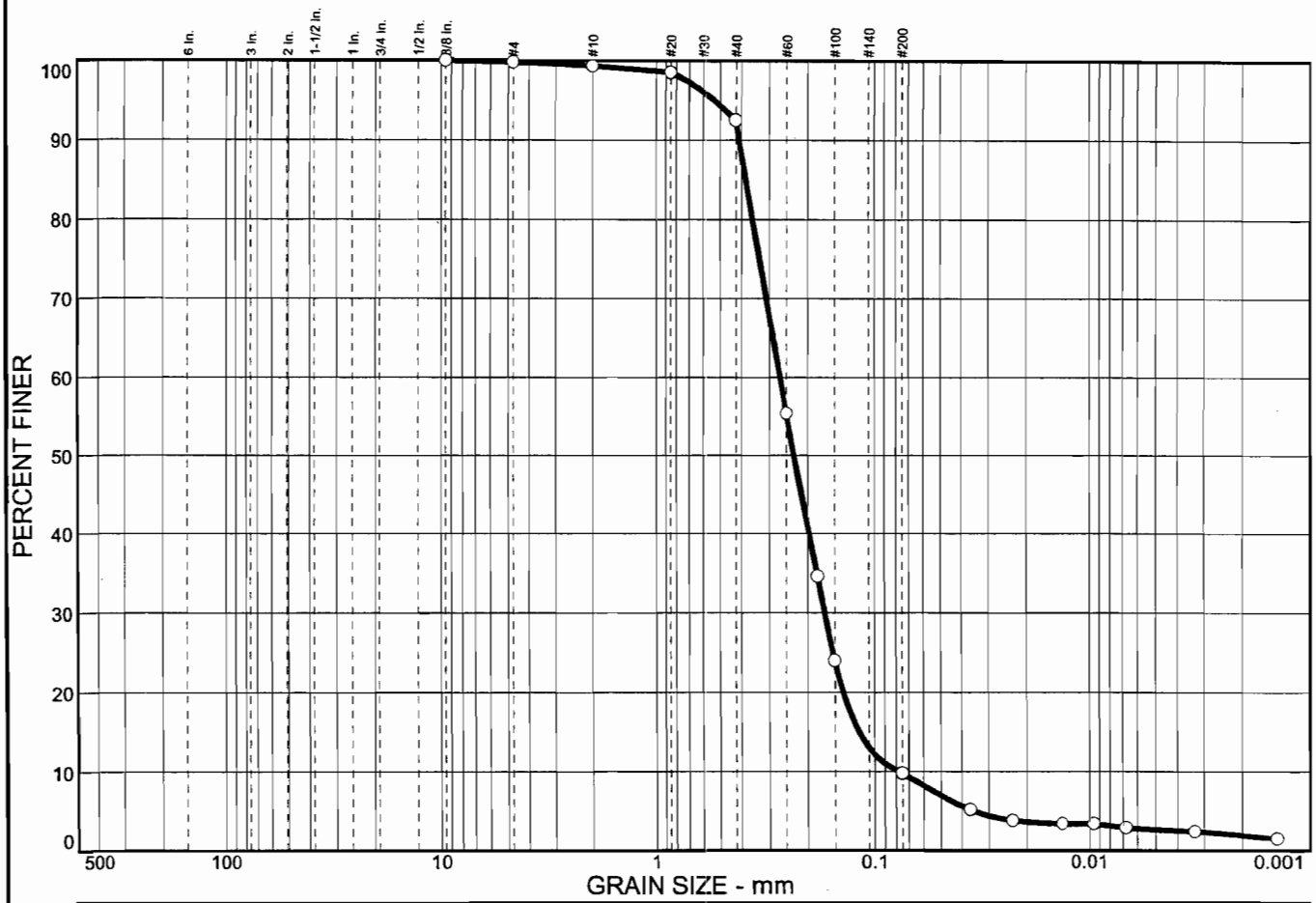
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	90.0	7.2	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.3		
#20	98.5		
#40	92.5		
#60	55.4		
#80	34.6		
#100	24.0		
#200	9.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.382 D_{60}= 0.268 D_{50}= 0.230
D_{30}= 0.167 D_{15}= 0.117 D_{10}= 0.0774
C_u= 3.46 C_c= 1.35

Classification

USCS= AASHTO=

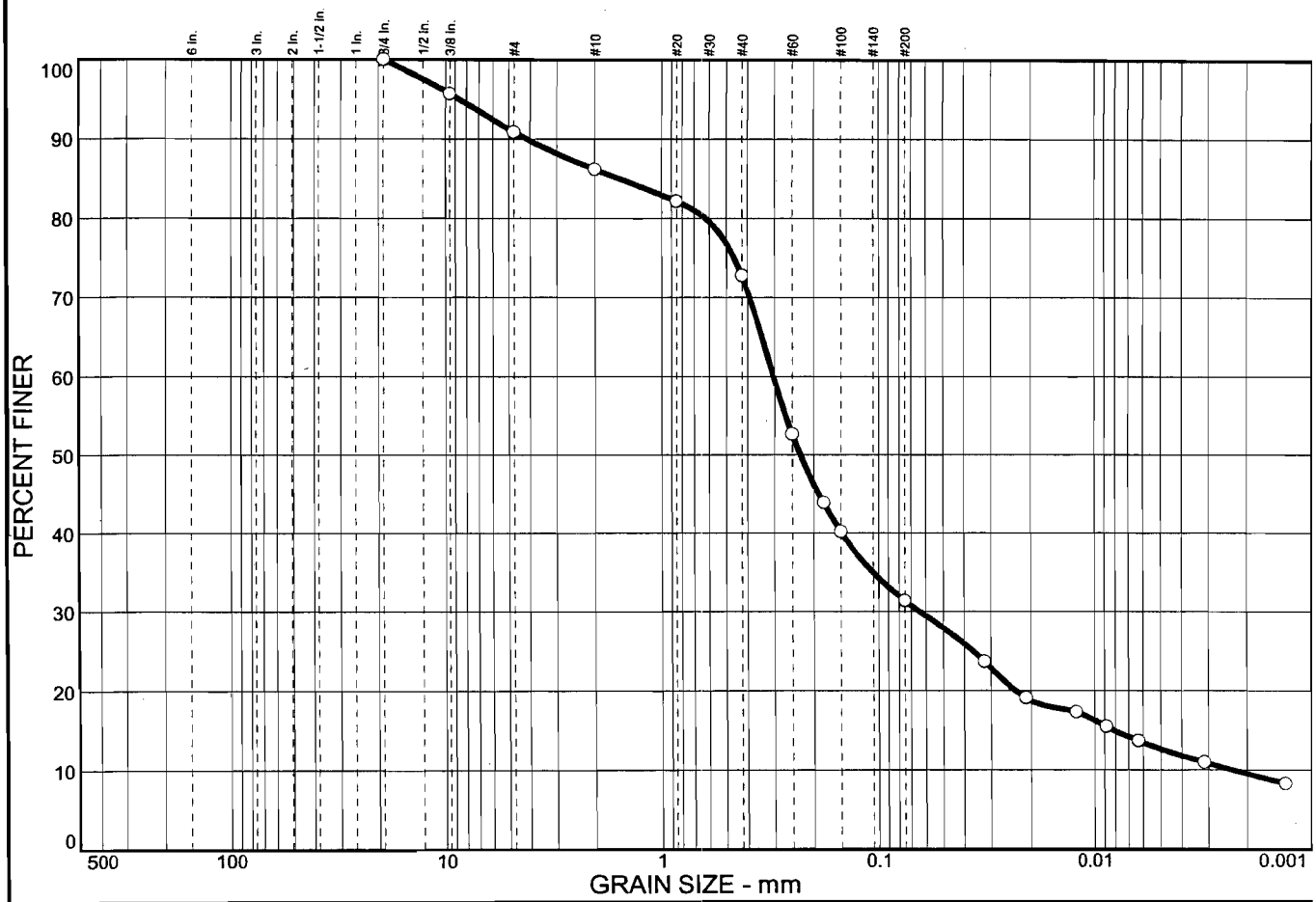
Remarks

Sample No.: 32 **Source of Sample:** C-04-15 **Date:** 06/30/05
Location: **Elev./Depth:** 69.0'-72.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.1	59.5	18.7	12.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.7		
#4	90.9		
#10	86.2		
#20	82.2		
#40	72.8		
#60	52.7		
#80	43.9		
#100	40.2		
#200	31.4		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.54 D_{60}= 0.303 D_{50}= 0.230
D_{30}= 0.0638 D_{15}= 0.0081 D_{10}= 0.0023
C_u= 131.45 C_c= 5.83

Classification

USCS= AASHTO=

Remarks

Sample No.: 3 **Source of Sample:** C-04-16 **Date:** 06/30/05
Location: **Elev./Depth:** 6.0'-9.0'

H. C. NUTTING COMPANY
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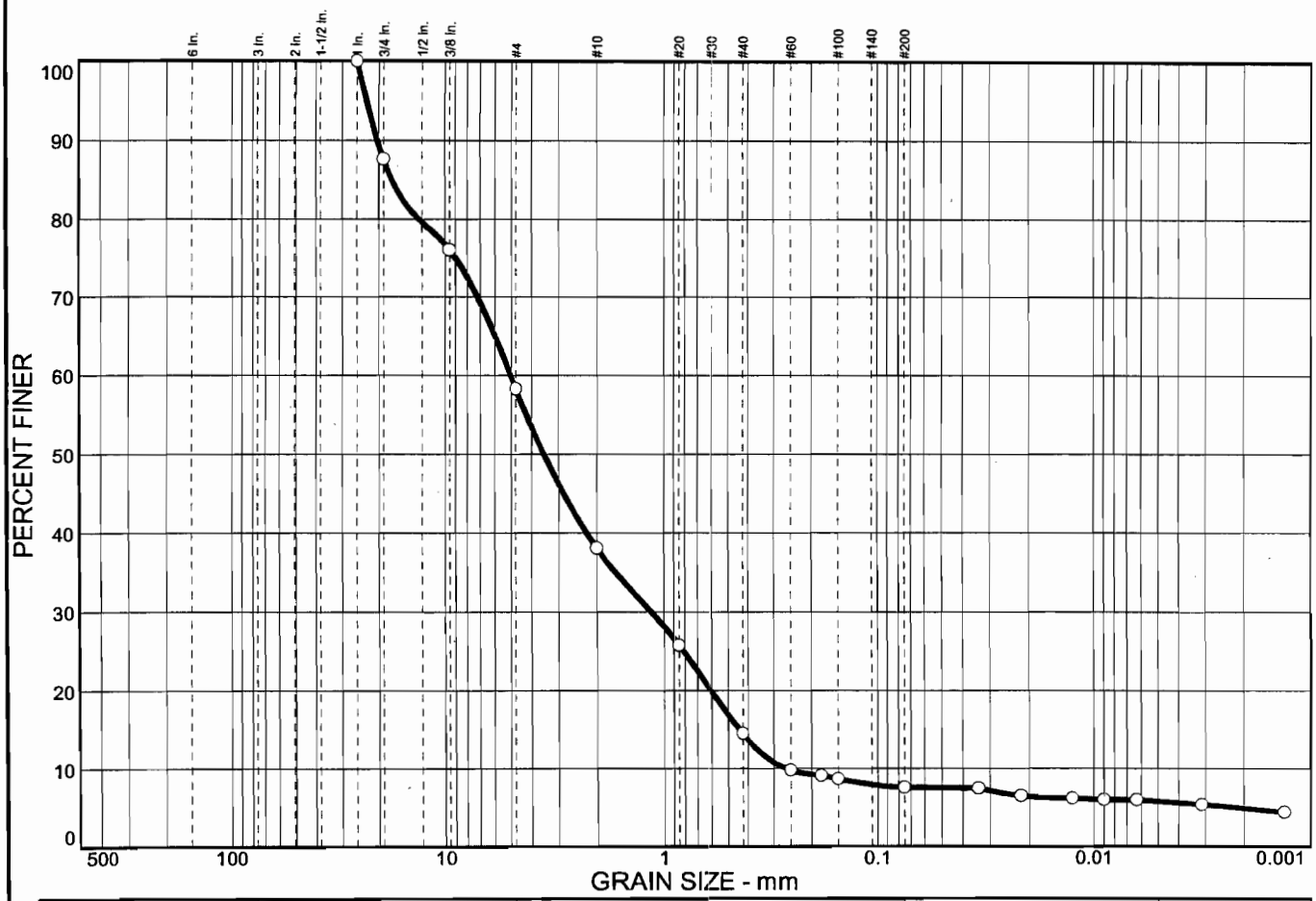
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	41.7	50.7	1.8	5.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	87.7		
0.375 in.	76.1		
#4	58.3		
#10	38.1		
#20	25.8		
#40	14.5		
#60	9.8		
#80	9.1		
#100	8.7		
#200	7.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.4 D_{60}= 5.04 D_{50}= 3.49
D_{30}= 1.14 D_{15}= 0.440 D_{10}= 0.262
C_u= 19.25 C_c= 0.99

Classification

USCS= AASHTO=

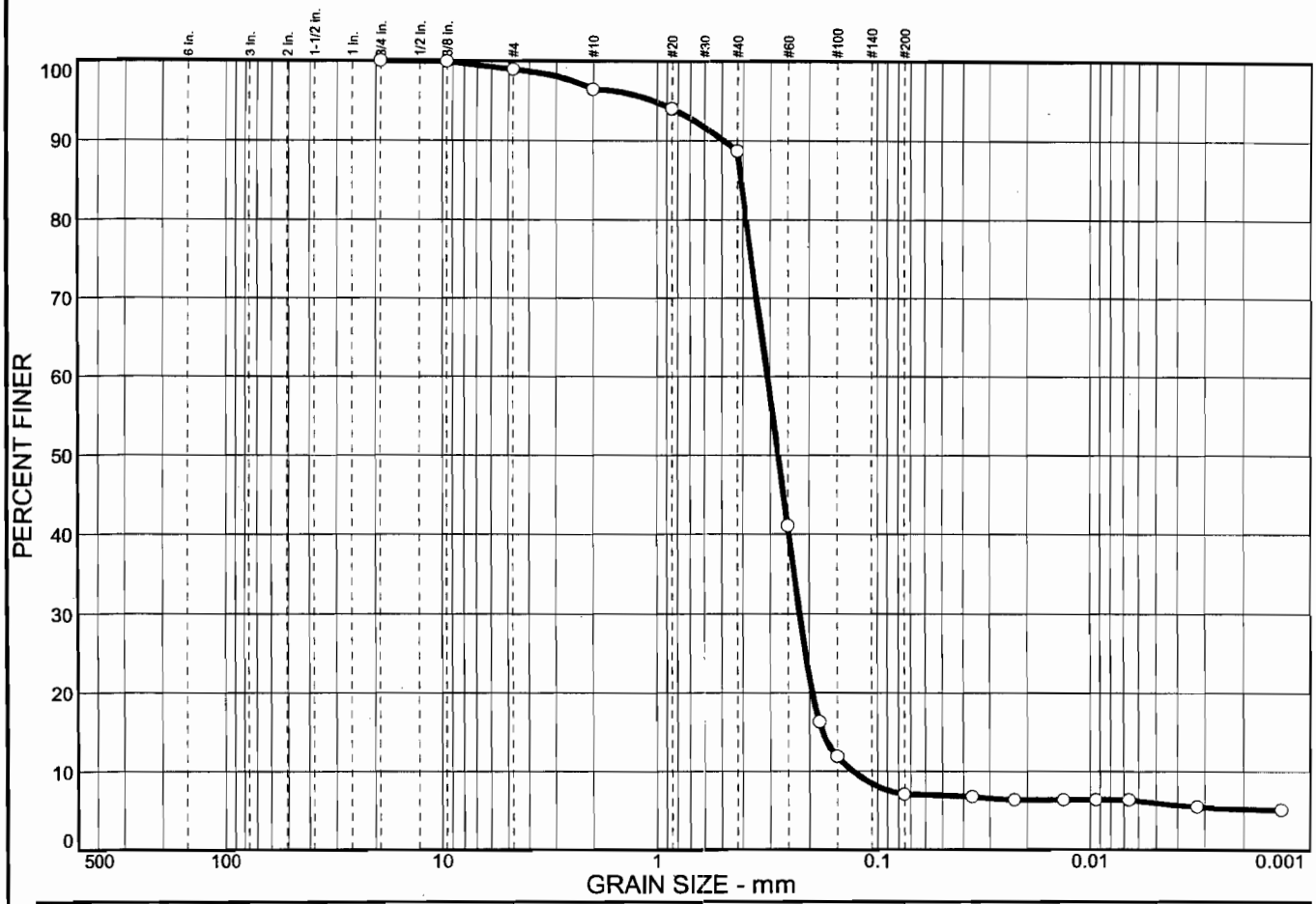
Remarks

Sample No.: 5 **Source of Sample:** C-04-16 **Date:** 06/30/05
Location: **Elev./Depth:** 12.0'-15.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	91.8	1.1	6.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.9		
#4	98.9		
#10	96.4		
#20	94.0		
#40	88.7		
#60	41.1		
#80	16.3		
#100	11.9		
#200	7.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.408 D_{60}= 0.308 D_{50}= 0.276
D_{30}= 0.221 D_{15}= 0.174 D_{10}= 0.128
C_u= 2.42 C_c= 1.24

Classification

USCS= AASHTO=

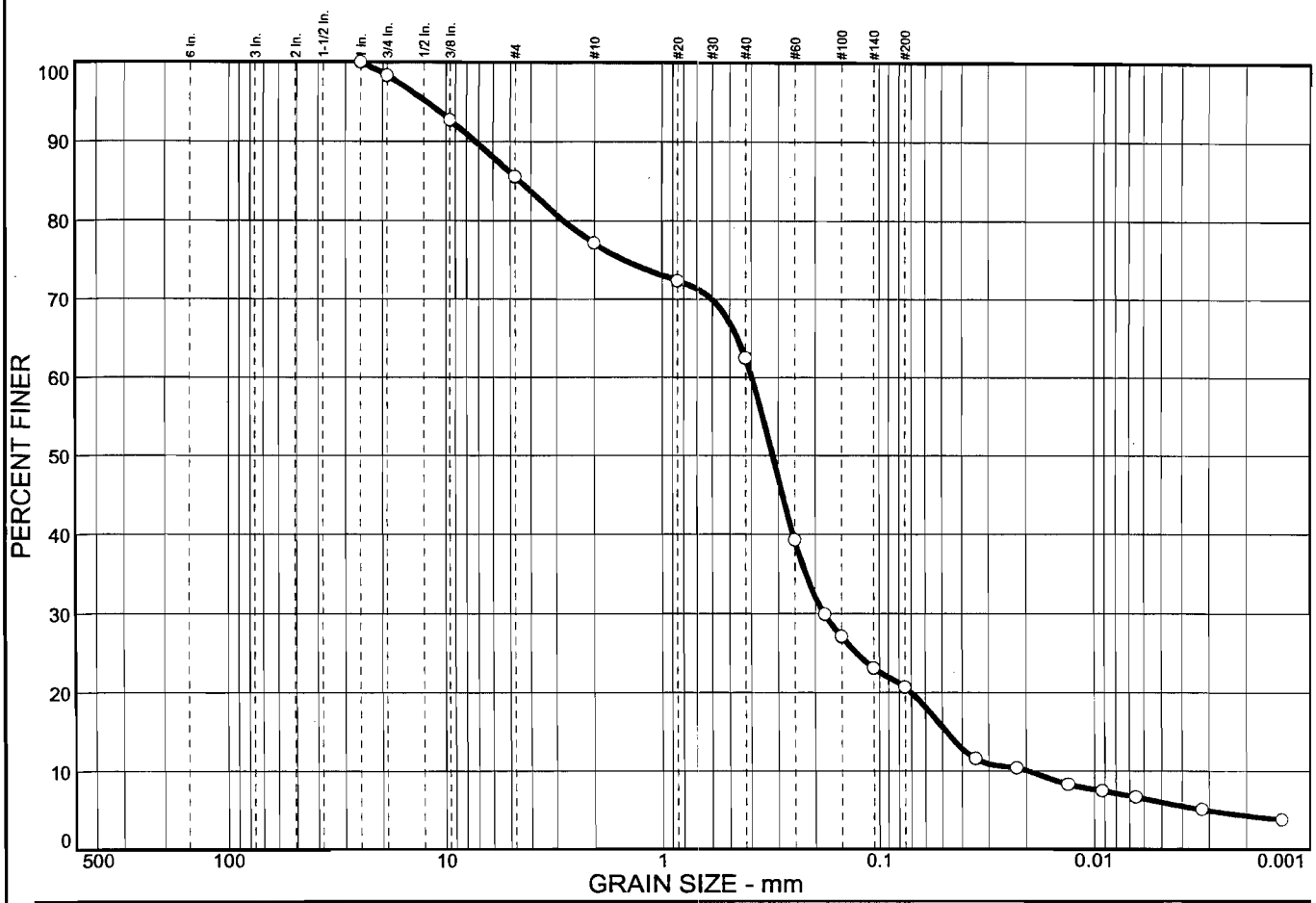
Remarks

Sample No.: 9 **Source of Sample:** C-04-16 **Date:** 06/30/05
Location: **Elev./Depth:** 21.0'-24.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.4	64.9	14.7	6.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	98.3		
.375 in.	92.7		
#4	85.6		
#10	77.2		
#20	72.4		
#40	62.5		
#60	39.3		
#80	29.9		
#100	27.1		
#140	23.1		
#200	20.7		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.49 D_{60}= 0.397 D_{50}= 0.318
D_{30}= 0.181 D_{15}= 0.0475 D_{10}= 0.0194
C_u= 20.50 C_c= 4.25

Classification

USCS= AASHTO=

Remarks

Sample No.: 4 **Source of Sample:** C-04-17 **Date:** 7-9-05
Location: **Elev./Depth:** 6.0'-7.3'

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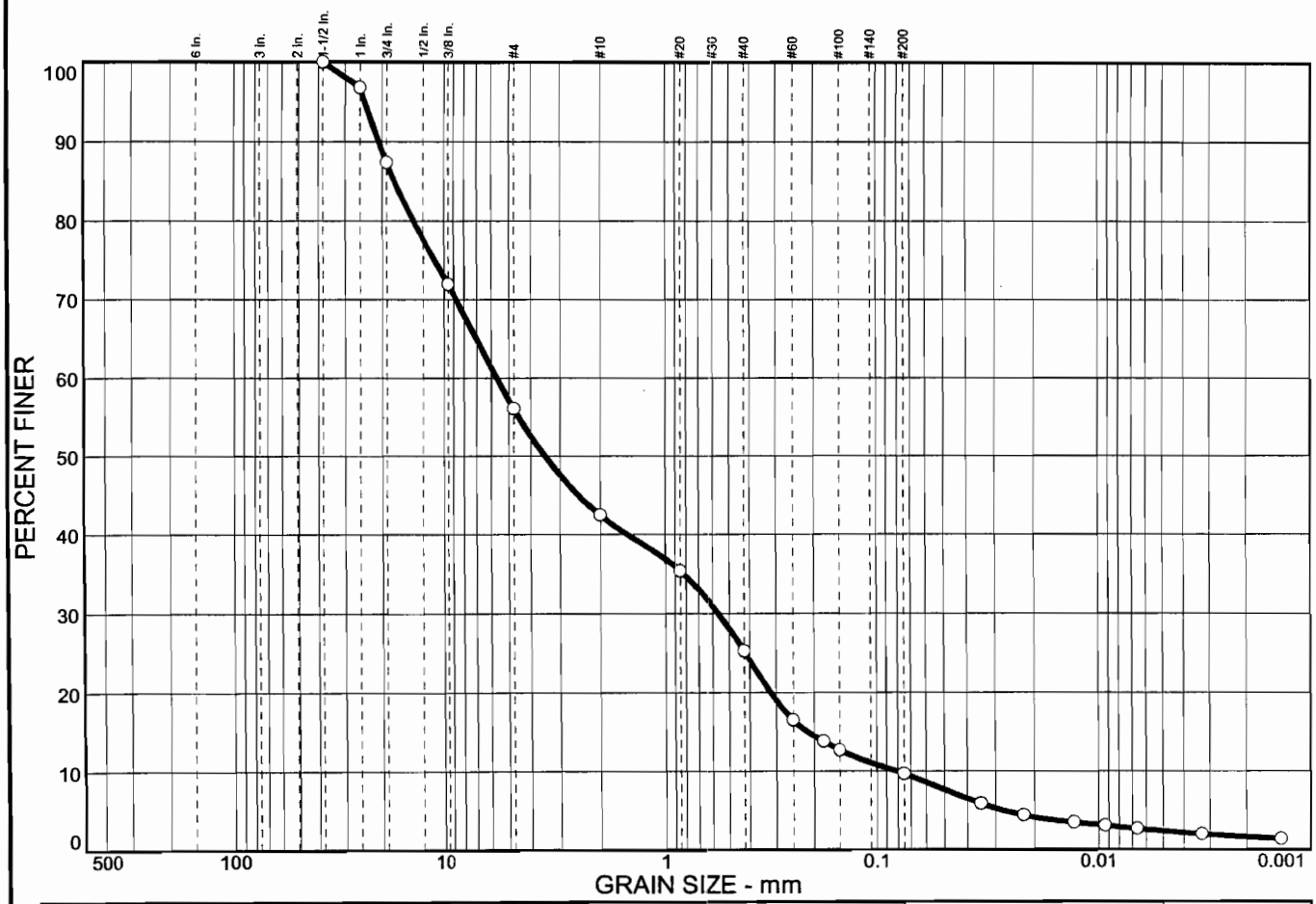
Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	43.9	46.4	7.3	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.8		
0.75 in.	87.4		
0.375 in.	72.0		
#4	56.1		
#10	42.5		
#20	35.4		
#40	25.3		
#60	16.5		
#80	13.8		
#100	12.7		
#200	9.7		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.5 D_{60}= 5.66 D_{50}= 3.46
D_{30}= 0.562 D_{15}= 0.214 D_{10}= 0.0804
C_u= 70.31 C_c= 0.70

Classification

USCS= AASHTO=

Remarks

Sample No.: 7 **Source of Sample:** C-04-17 **Date:** 06/30/05
Location: **Elev./Depth:** 10.5'-13.5'

H. C. NUTTING COMPANY
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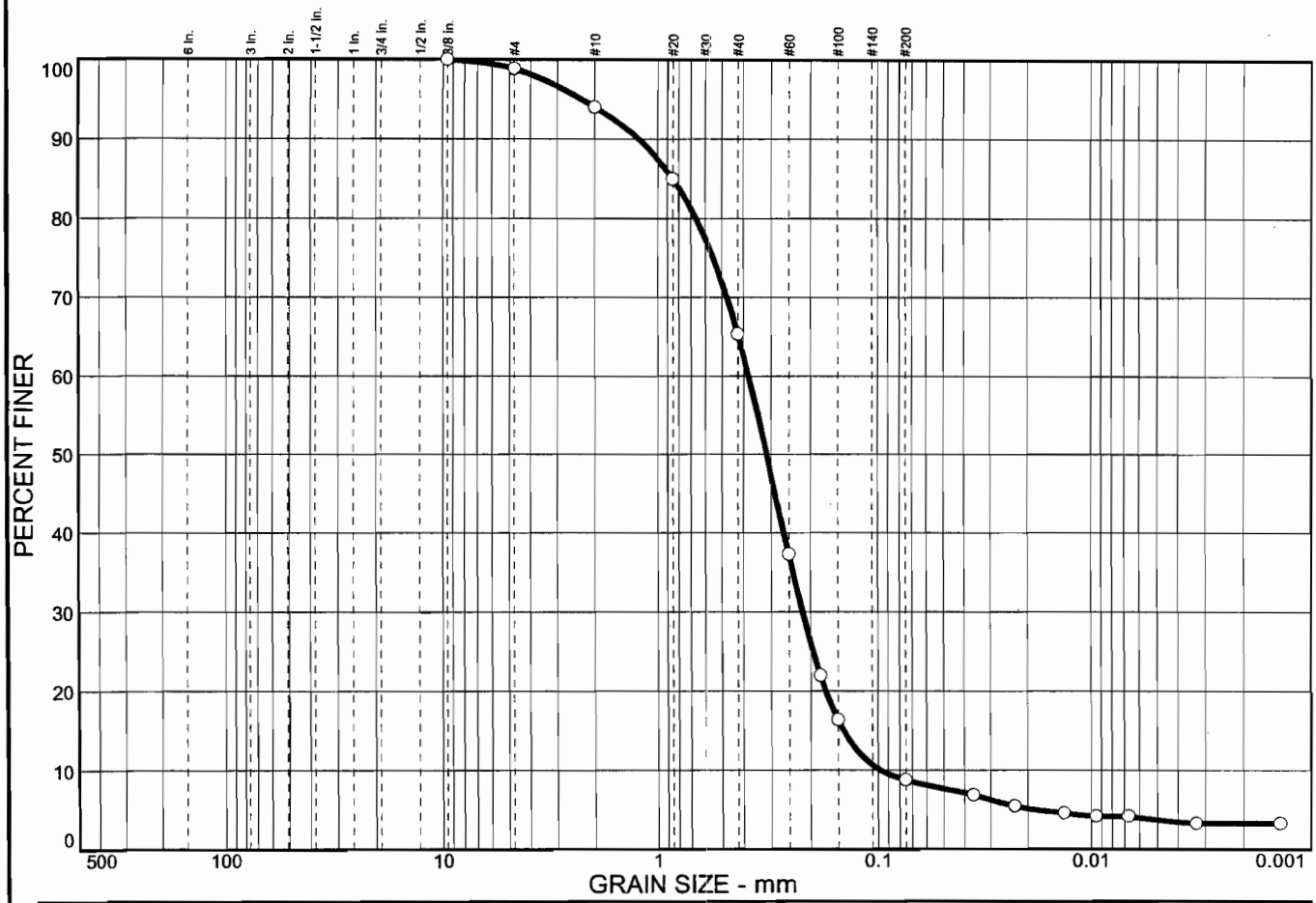
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	90.0	5.0	3.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.8		
#10	94.0		
#20	85.0		
#40	65.4		
#60	37.3		
#80	22.0		
#100	16.4		
#200	8.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.850 D_{60}= 0.380 D_{50}= 0.315
D_{30}= 0.217 D_{15}= 0.141 D_{10}= 0.0971
C_u= 3.91 C_c= 1.28

Classification

USCS= AASHTO=

Remarks

Sample No.: 15 **Source of Sample:** C-04-17 **Date:** 06/30/05
Location: **Elev./Depth:** 24.0'-27.0'

H. C. NUTTING COMPANY
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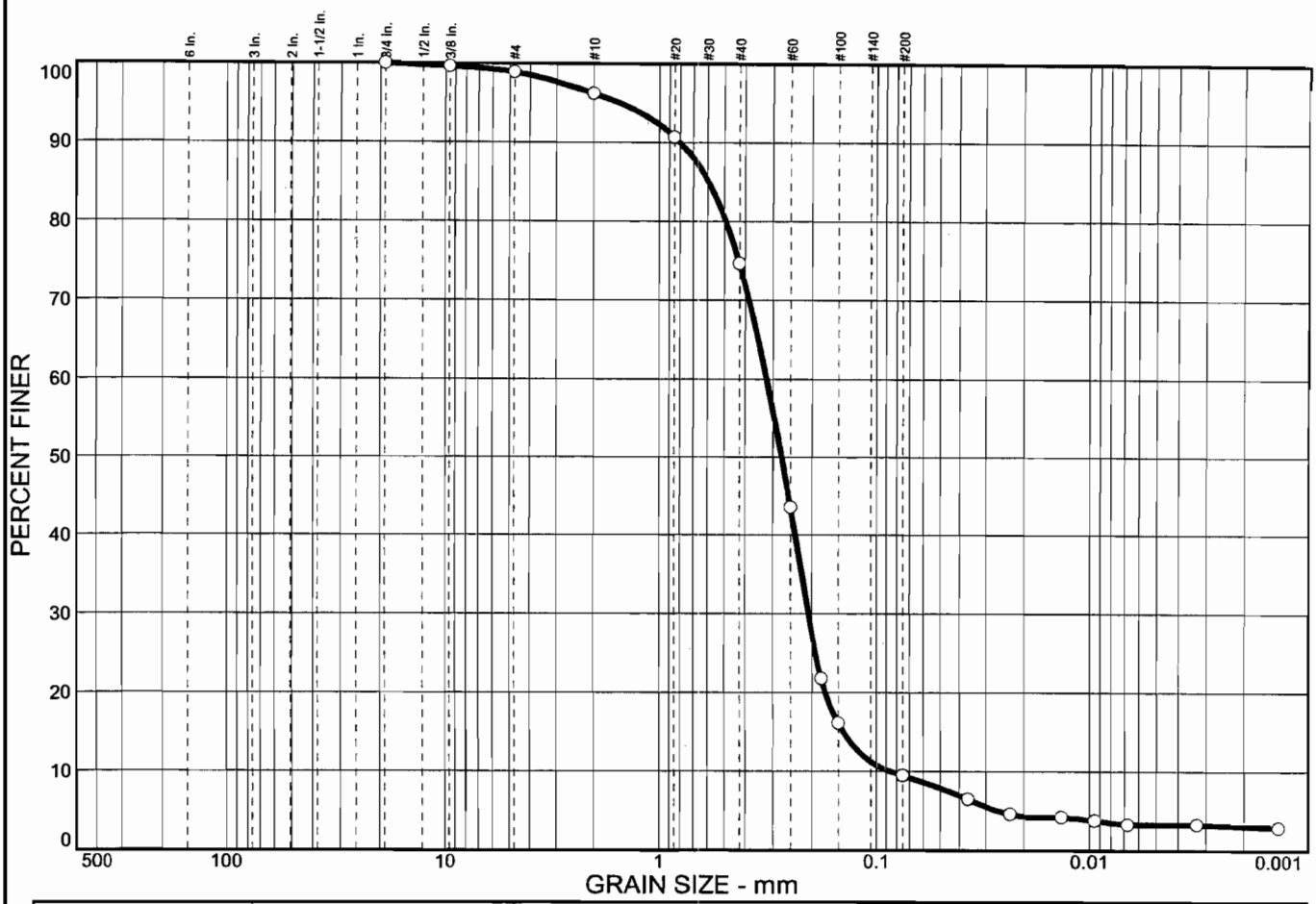
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	89.4	6.2	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.6		
#4	98.9		
#10	96.2		
#20	90.7		
#40	74.7		
#60	43.6		
#80	21.8		
#100	16.1		
#200	9.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.591 D_{60}= 0.319 D_{50}= 0.274
D_{30}= 0.207 D_{15}= 0.142 D_{10}= 0.0856
C_u= 3.73 C_c= 1.57

Classification

USCS= AASHTO=

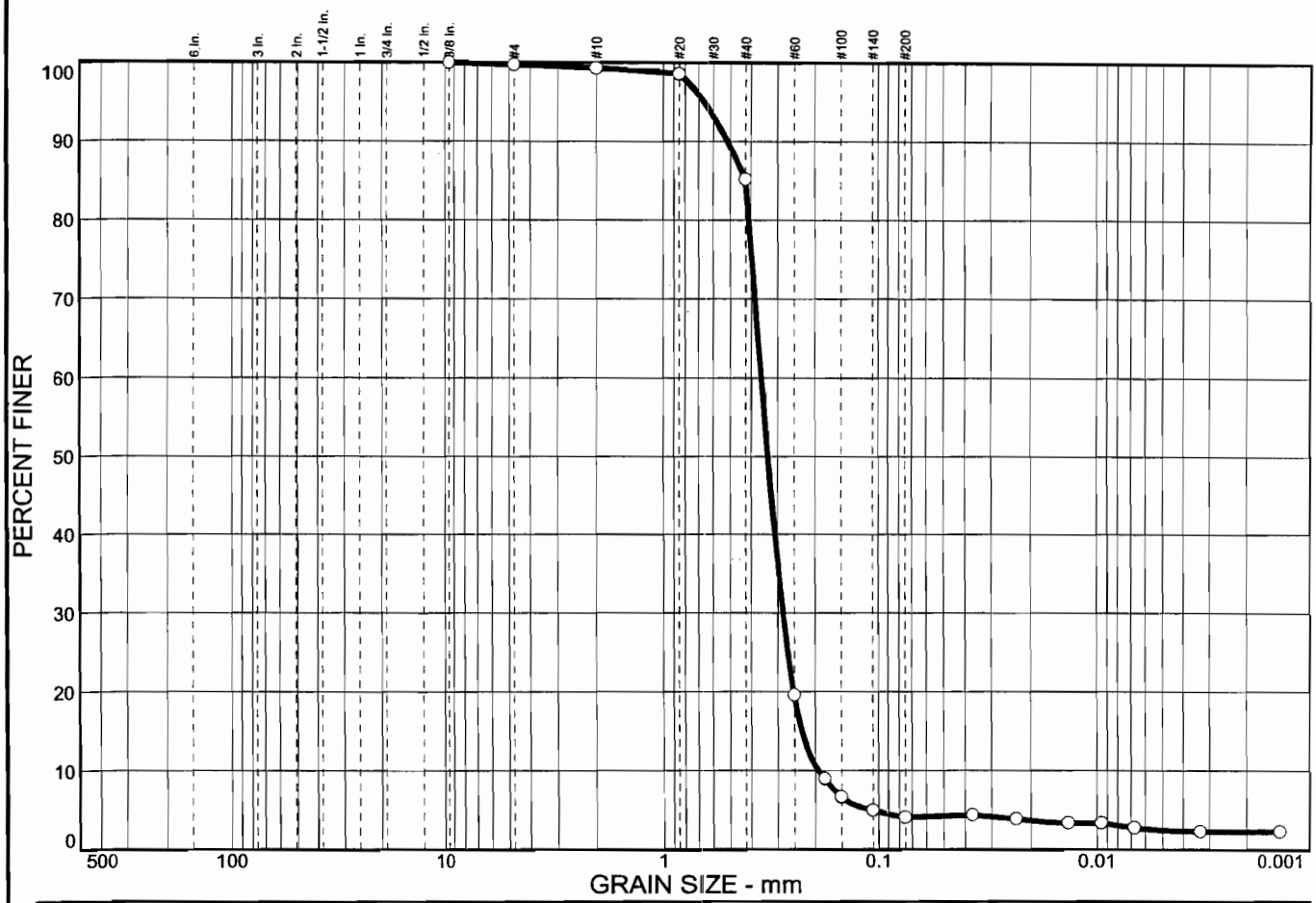
Remarks

Sample No.: 24 **Source of Sample:** C-04-17 **Date:** 06/30/05
Location: **Elev./Depth:** 42.0'-43.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	95.6	1.6	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.7		
#10	99.3		
#20	98.6		
#40	85.2		
#60	19.6		
#80	9.0		
#100	6.7		
#140	5.0		
#200	4.1		

* (no specification provided)

Soil Description

Brown poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.424 D_{60}= 0.358 D_{50}= 0.333
D_{30}= 0.282 D_{15}= 0.230 D_{10}= 0.192
C_u= 1.86 C_c= 1.15

Classification

USCS= AASHTO=

Remarks

Sample No.: 29 **Source of Sample:** C-04-17 **Date:** 06/30/05
Location: **Elev./Depth:** 52.5'-54.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.4	17.3	37.4	31.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	89.6		
#4	86.6		
#10	83.3		
#20	79.5		
#40	77.4		
#60	75.3		
#80	74.0		
#100	73.4		
#200	69.3		

* (no specification provided)

Soil Description

Brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.94 D_{60}= 0.0331 D_{50}= 0.0138
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 2 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 3.5'-5.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	20.3	24.7	29.9	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.7		
#4	79.7		
#10	70.4		
#20	66.0		
#40	63.1		
#60	61.1		
#80	59.8		
#100	59.1		
#140	57.3		
#200	55.0		

* (no specification provided)

Soil Description

Brown sandy lean clay with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.46 D_{60}= 0.190 D_{50}= 0.0519
D_{30}= 0.0079 D_{15}= 0.0018 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 6 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 15.5'-17.9'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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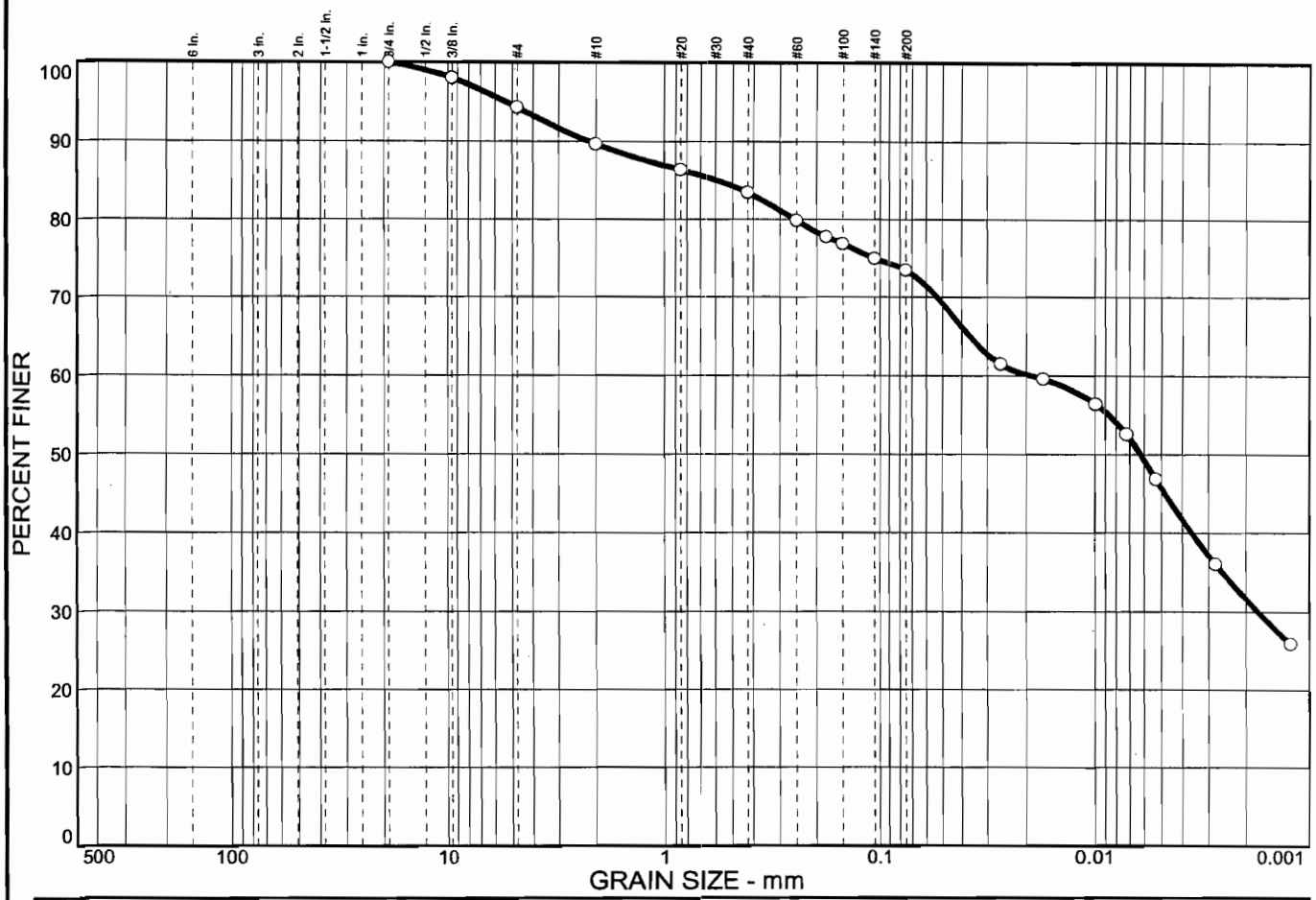
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.7	20.8	27.8	45.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.0		
#4	94.3		
#10	89.7		
#20	86.4		
#40	83.5		
#60	79.9		
#80	77.8		
#100	76.9		
#140	75.0		
#200	73.5		

* (no specification provided)

Soil Description

Brown lean clay with sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.580 D_{60}= 0.0189 D_{50}= 0.0062
D_{30}= 0.0017 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

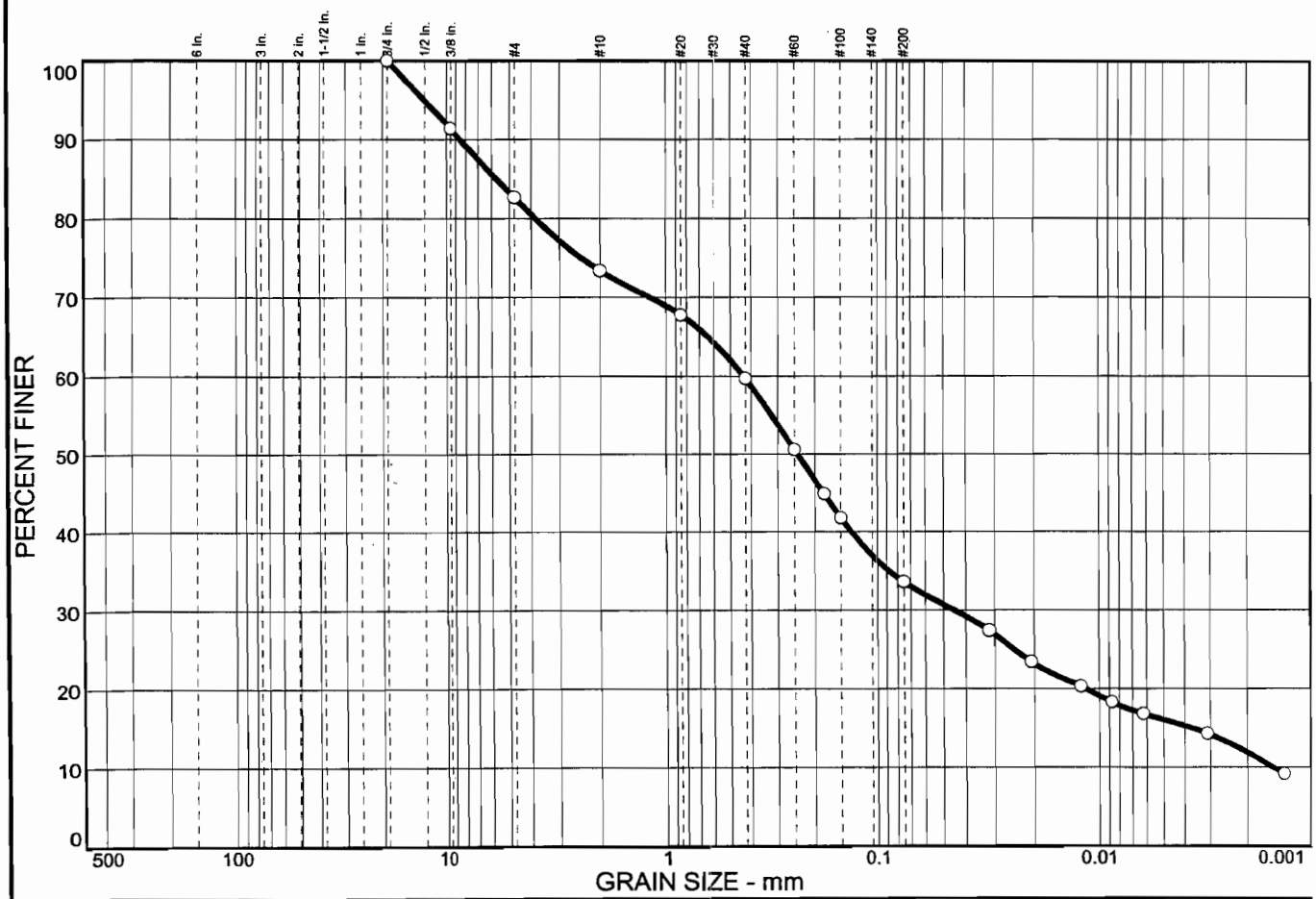
Remarks

Sample No.: 10 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 24.5'-27.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.3	49.1	17.5	16.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.4		
#4	82.7		
#10	73.4		
#20	67.8		
#40	59.7		
#60	50.6		
#80	44.9		
#100	41.8		
#200	33.6		

* (no specification provided)

Soil Description

Brown silty/clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.72 D_{60}= 0.433 D_{50}= 0.242
D_{30}= 0.0446 D_{15}= 0.0037 D_{10}= 0.0015
C_u= 289.89 C_c= 3.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 14 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 35.5'-38.7'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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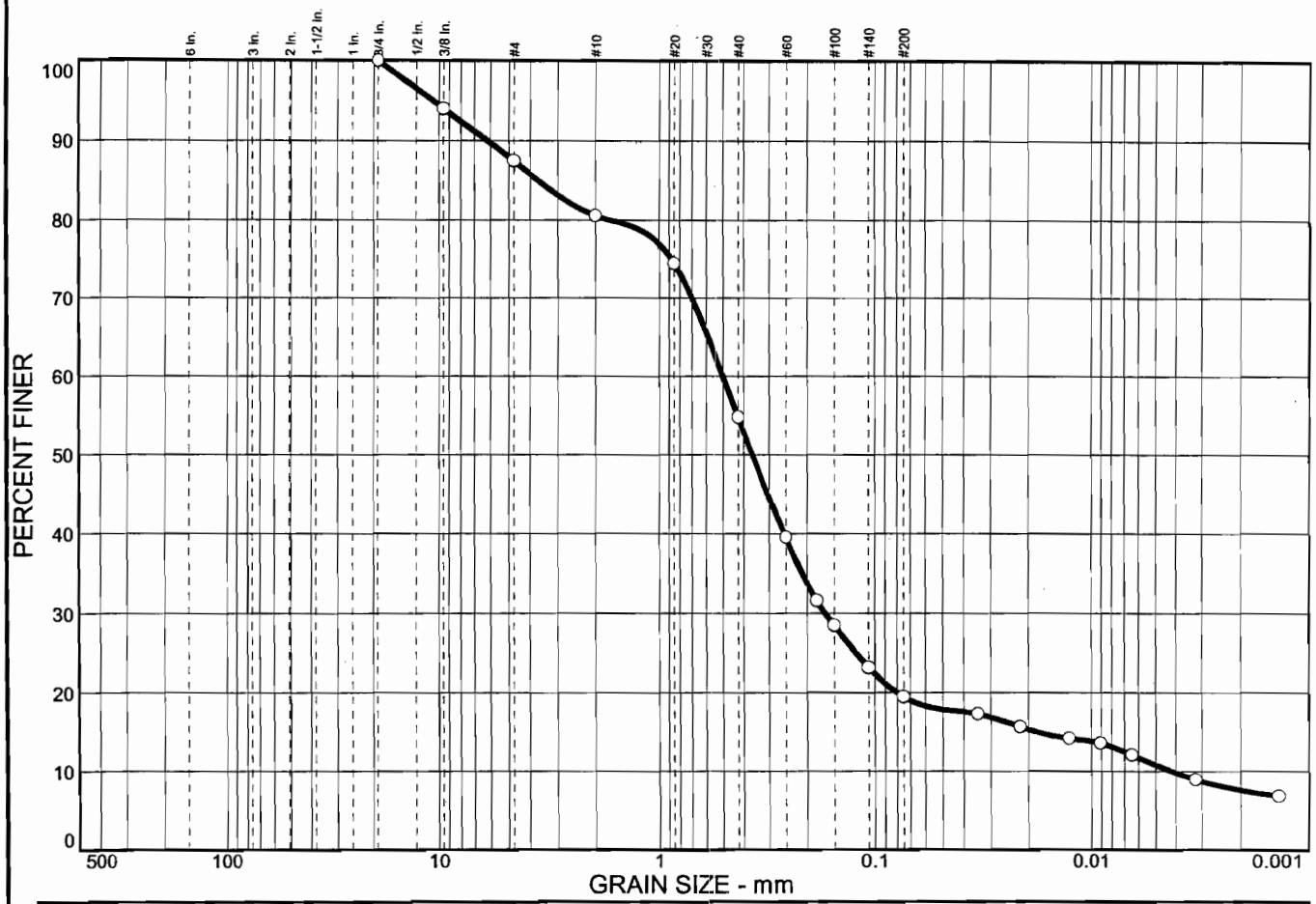
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.5	68.0	8.7	10.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.0		
#4	87.5		
#10	80.6		
#20	74.5		
#40	54.8		
#60	39.6		
#80	31.6		
#100	28.5		
#140	23.2		
#200	19.5		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.66 D_{60}= 0.501 D_{50}= 0.363
D_{30}= 0.165 D_{15}= 0.0179 D_{10}= 0.0041
C_u= 120.73 C_c= 13.05

Classification

USCS= AASHTO=

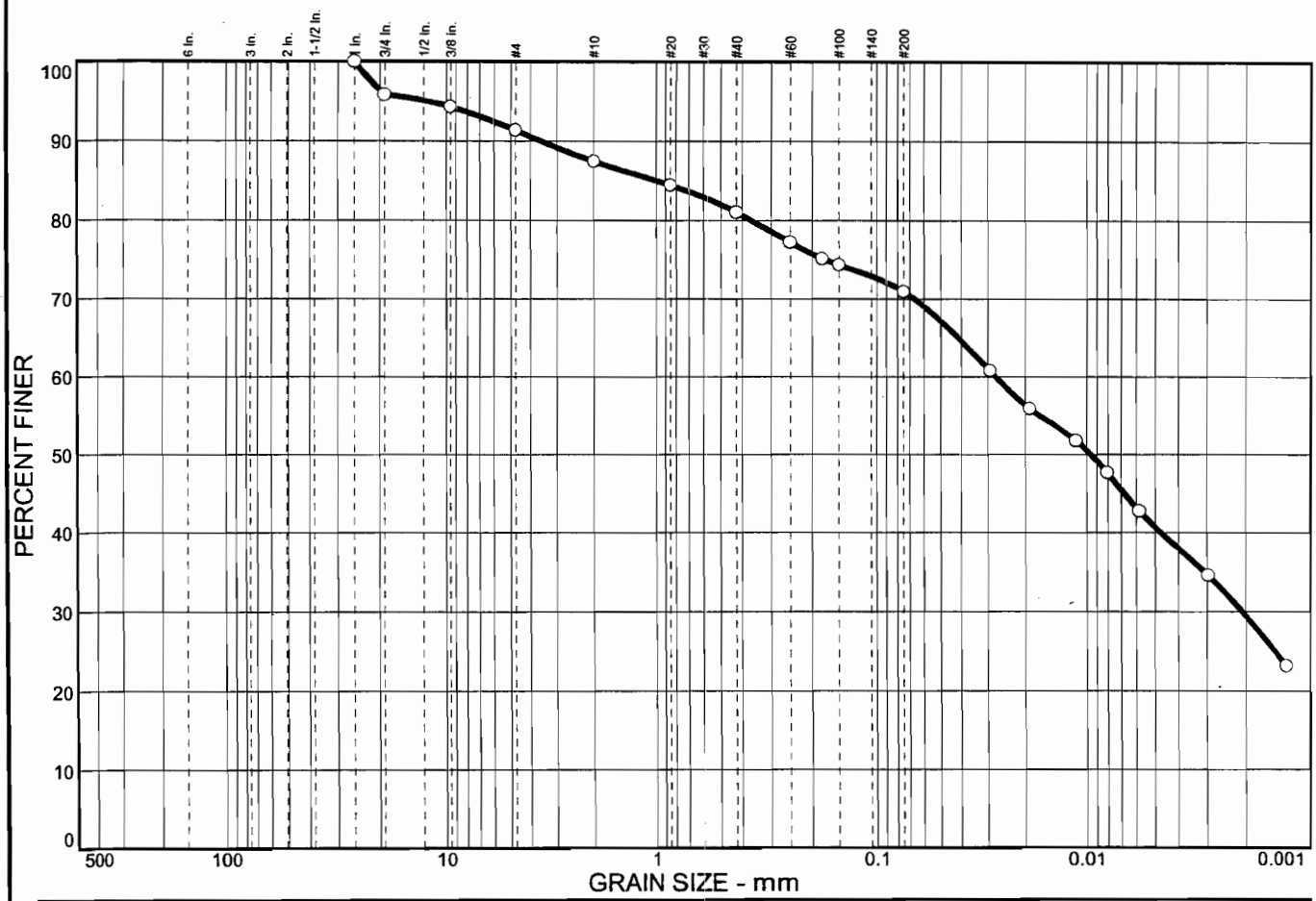
Remarks

Sample No.: 18 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 45.5'-48.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.6	20.4	30.3	40.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	95.8		
0.375 in.	94.3		
#4	91.4		
#10	87.5		
#20	84.5		
#40	81.1		
#60	77.3		
#80	75.2		
#100	74.4		
#200	71.0		

* (no specification provided)

Soil Description

Brown silt/lean clay with sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.975 D_{60}= 0.0275 D_{50}= 0.0095
D_{30}= 0.0021 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

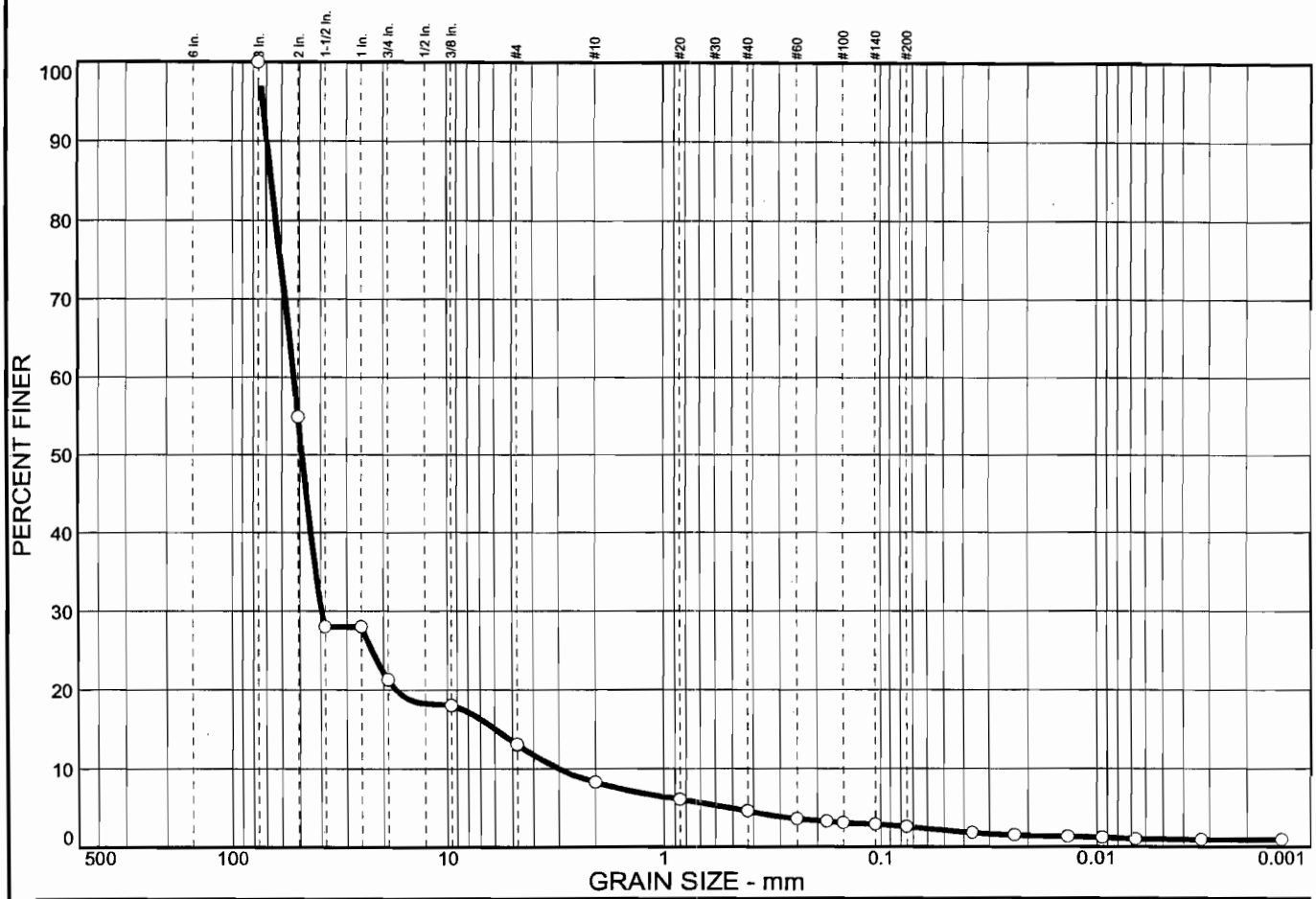
Remarks

Sample No.: 22 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 54.5'-55.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	86.9	10.5	1.6	1.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	54.9		
1.5 in.	28.0		
1 in.	28.0		
0.75 in.	21.3		
0.375 in.	18.0		
#4	13.1		
#10	8.3		
#20	6.1		
#40	4.6		
#60	3.6		
#80	3.3		
#100	3.1		
#140	2.9		
#200	2.6		

* (no specification provided)

Soil Description

Light brown poorly graded gravel, few sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 66.5 D_{60}= 53.1 D_{50}= 48.7
D_{30}= 39.5 D_{15}= 5.94 D_{10}= 2.96
C_u= 17.93 C_c= 9.90

Classification

USCS= AASHTO=

Remarks

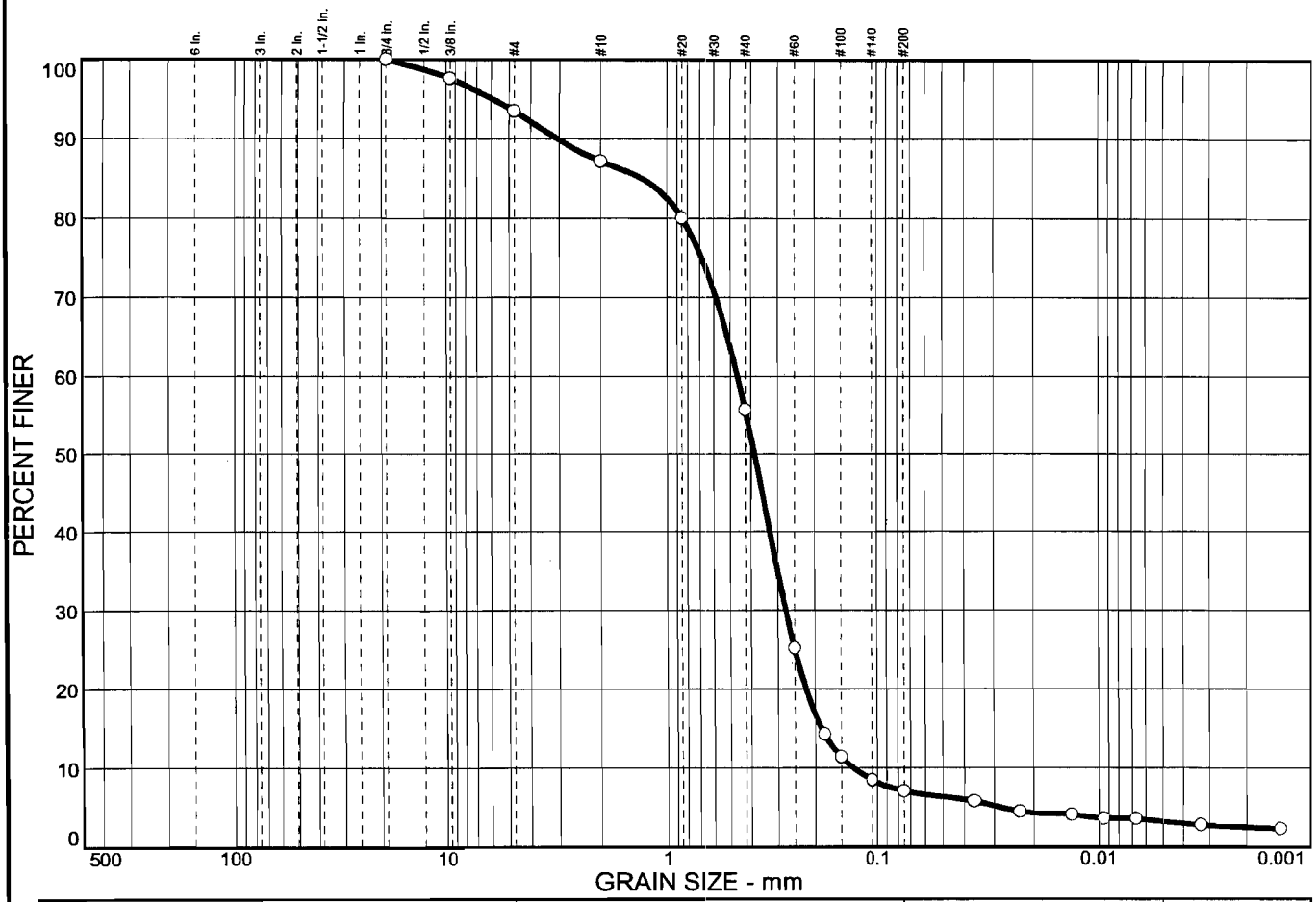
Zero retained on the 1 inch sieve

Sample No.: 25 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 60.5'-63.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.5	86.4	3.9	3.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.6		
#4	93.5		
#10	87.2		
#20	80.1		
#40	55.7		
#60	25.2		
#80	14.3		
#100	11.4		
#140	8.5		
#200	7.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.29 D_{60}= 0.462 D_{50}= 0.385
D_{30}= 0.275 D_{15}= 0.186 D_{10}= 0.131
C_u= 3.52 C_c= 1.25

Classification

USCS= AASHTO=

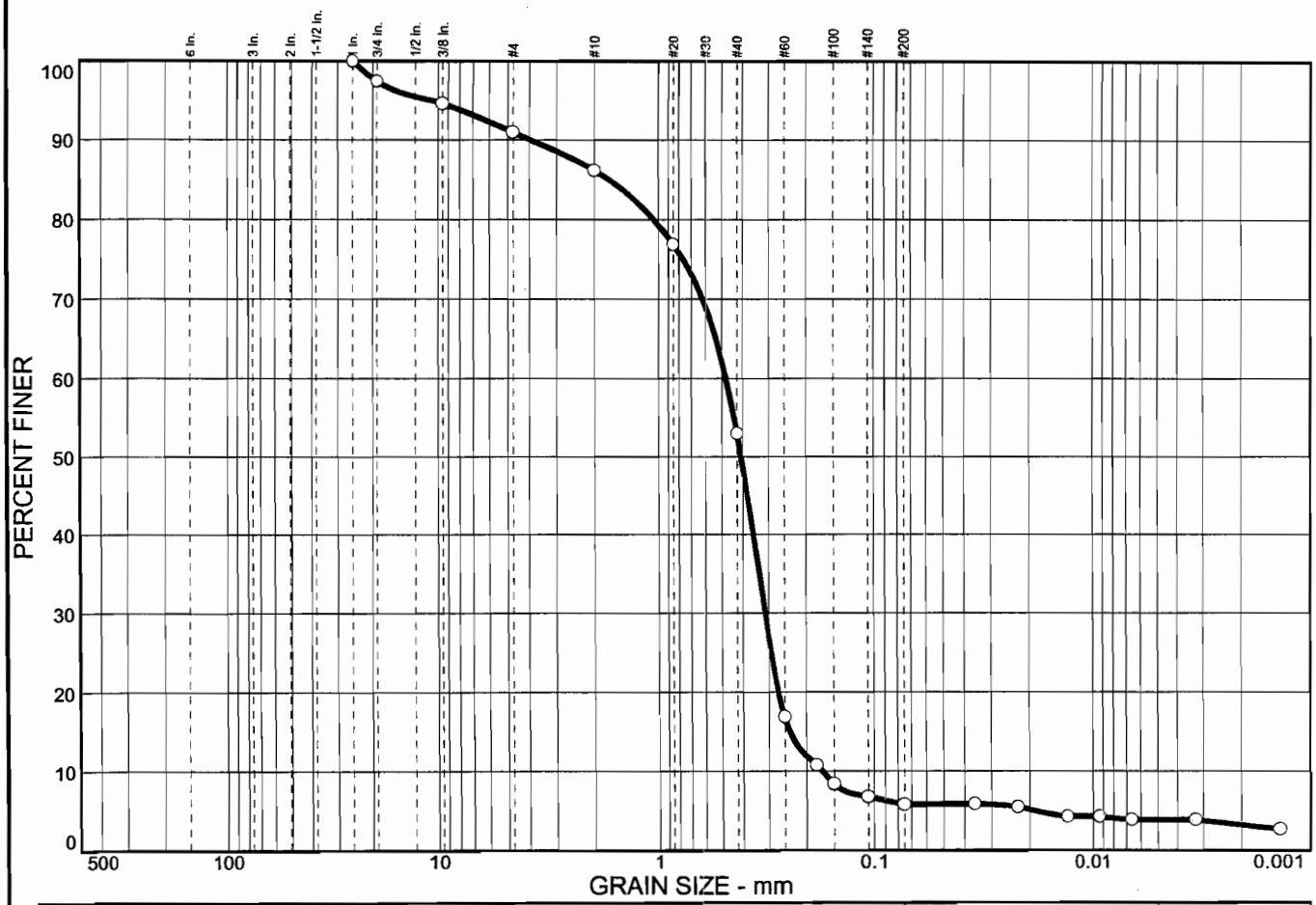
Remarks

Sample No.: 27 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 68.0'-71.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.0	85.2	1.9	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.4		
0.375 in.	94.6		
#4	91.0		
#10	86.2		
#20	76.9		
#40	53.0		
#60	16.9		
#80	10.8		
#100	8.4		
#140	6.8		
#200	5.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.70 D_{60}= 0.479 D_{50}= 0.407
D_{30}= 0.312 D_{15}= 0.237 D_{10}= 0.169
C_u= 2.83 C_c= 1.20

Classification

USCS= AASHTO=

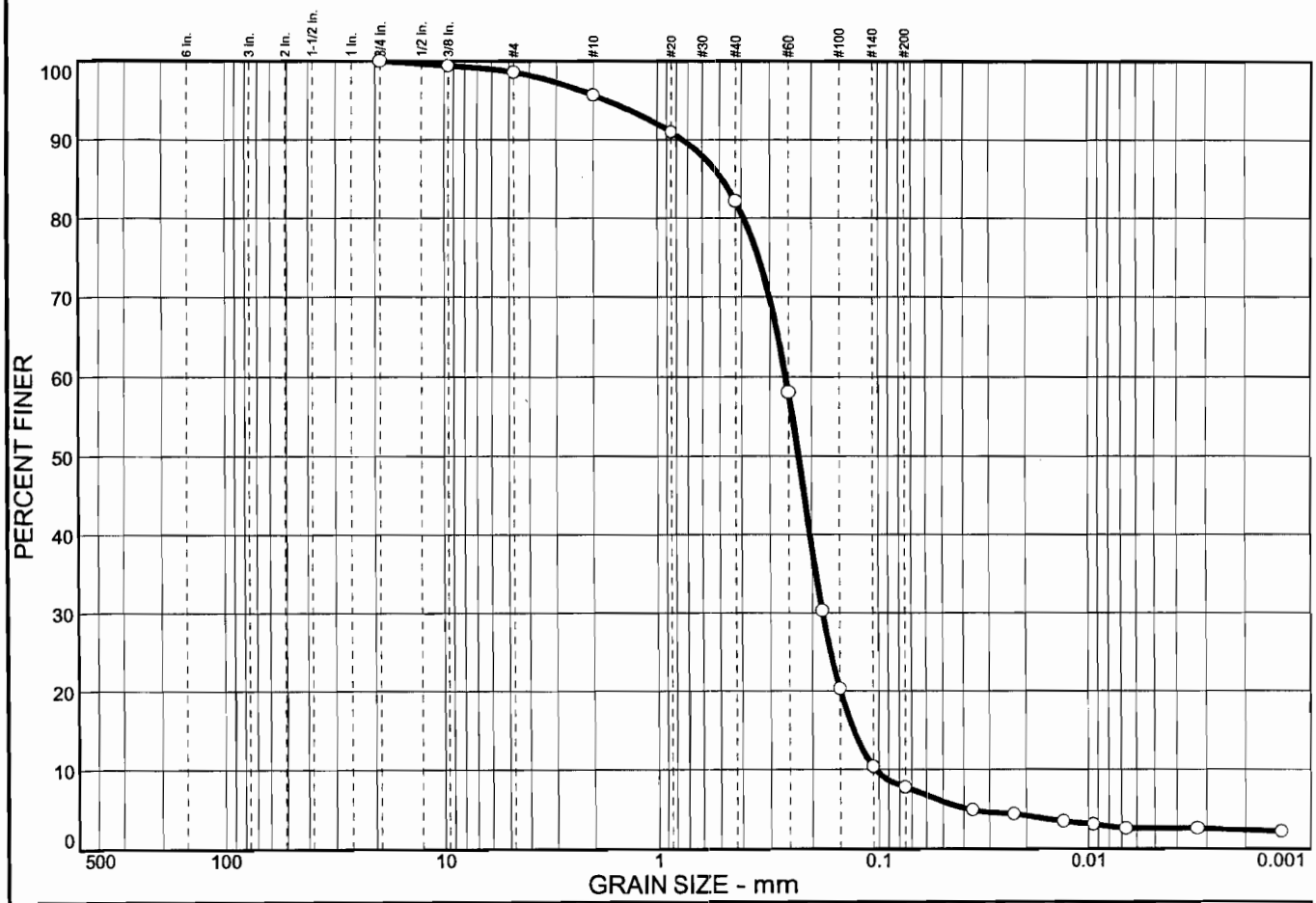
Remarks

Sample No.: 29 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 74.0'-77.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	90.8	5.2	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.4		
#4	98.6		
#10	95.7		
#20	91.0		
#40	82.2		
#60	58.1		
#80	30.3		
#100	20.3		
#140	10.4		
#200	7.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.488 D_{60}= 0.256 D_{50}= 0.227
D_{30}= 0.179 D_{15}= 0.130 D_{10}= 0.103
C_u= 2.49 C_c= 1.22

Classification

USCS= AASHTO=

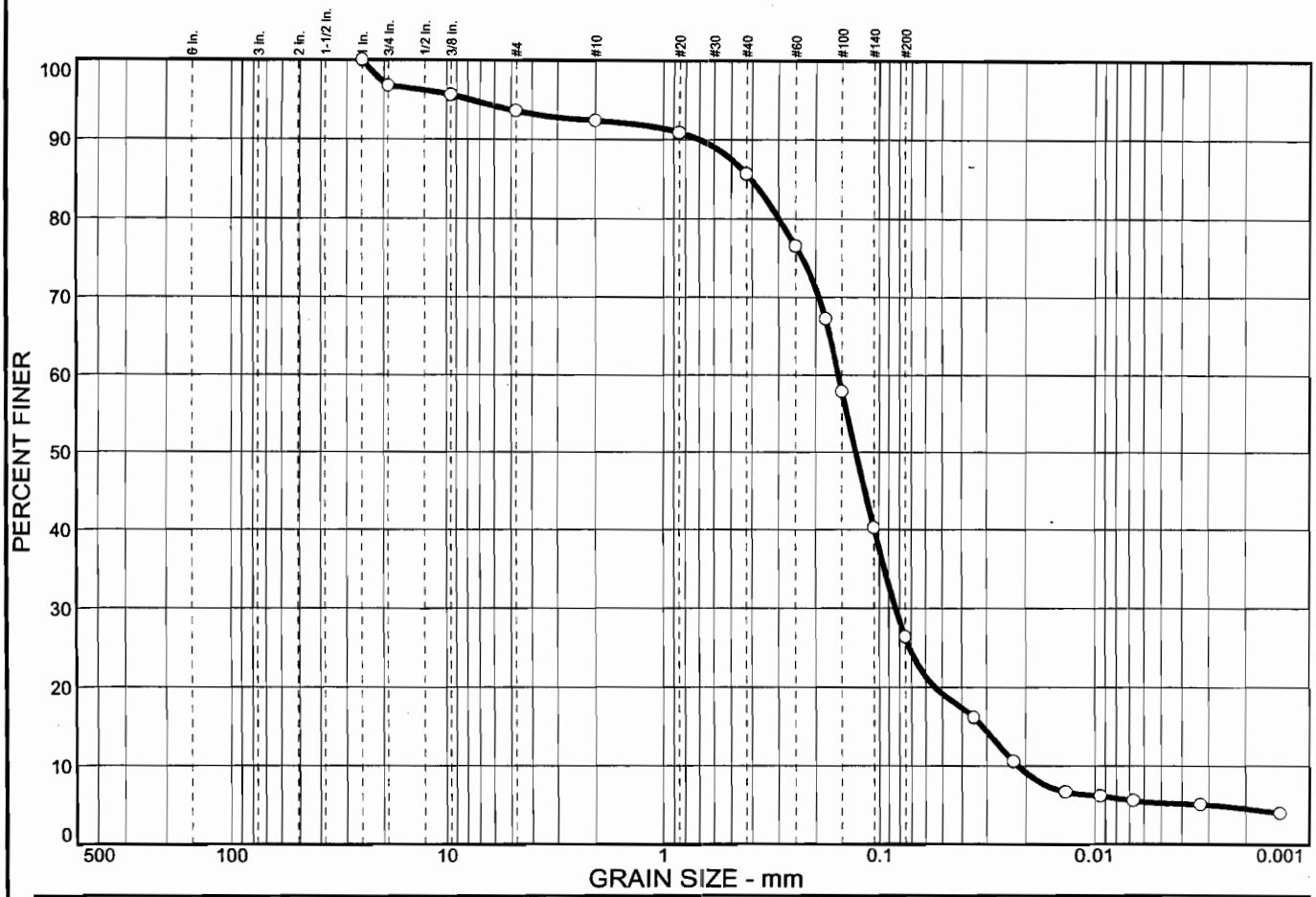
Remarks

Sample No.: 34 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 89.0'-92.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.4	67.2	21.1	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.7		
0.375 in.	95.6		
#4	93.6		
#10	92.4		
#20	90.9		
#40	85.7		
#60	76.6		
#80	67.3		
#100	57.9		
#140	40.3		
#200	26.4		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.404 D_{60}= 0.156 D_{50}= 0.129
D_{30}= 0.0834 D_{15}= 0.0314 D_{10}= 0.0216
C_u= 7.23 C_c= 2.07

Classification

USCS= AASHTO=

Remarks

Sample No.: 40 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 107.0'-110.0'

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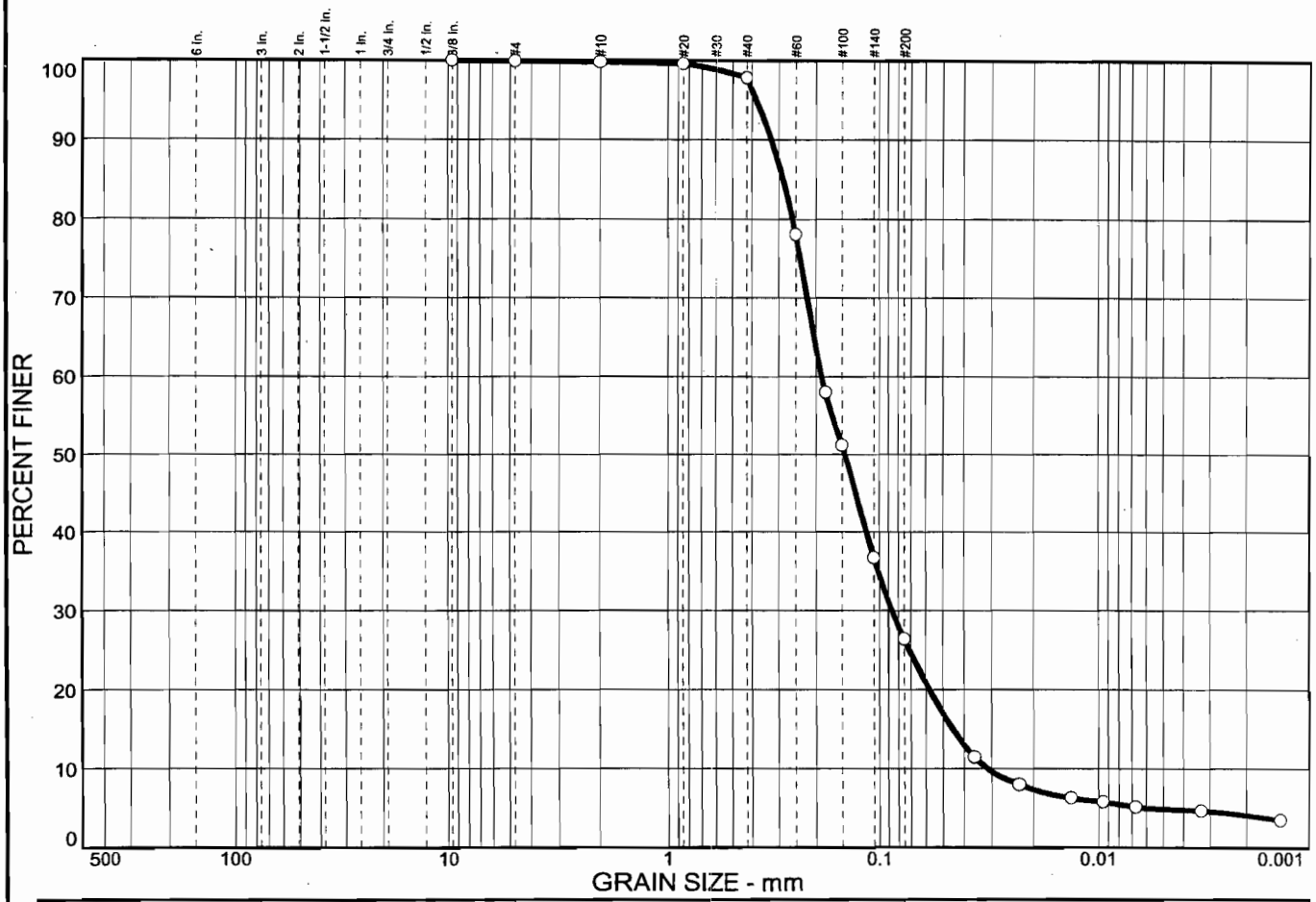
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	73.5	21.5	4.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.9		
#10	99.8		
#20	99.6		
#40	97.8		
#60	78.1		
#80	58.0		
#100	51.2		
#140	36.7		
#200	26.4		

* (no specification provided)

Soil Description

Brown to gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.286 D_{60}= 0.187 D_{50}= 0.145
D_{30}= 0.0861 D_{15}= 0.0449 D_{10}= 0.0311
C_u= 6.02 C_c= 1.27

Classification

USCS= AASHTO=

Remarks

Sample No.: 46 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 125.0'-128.0'

H. C. NUTTING COMPANY
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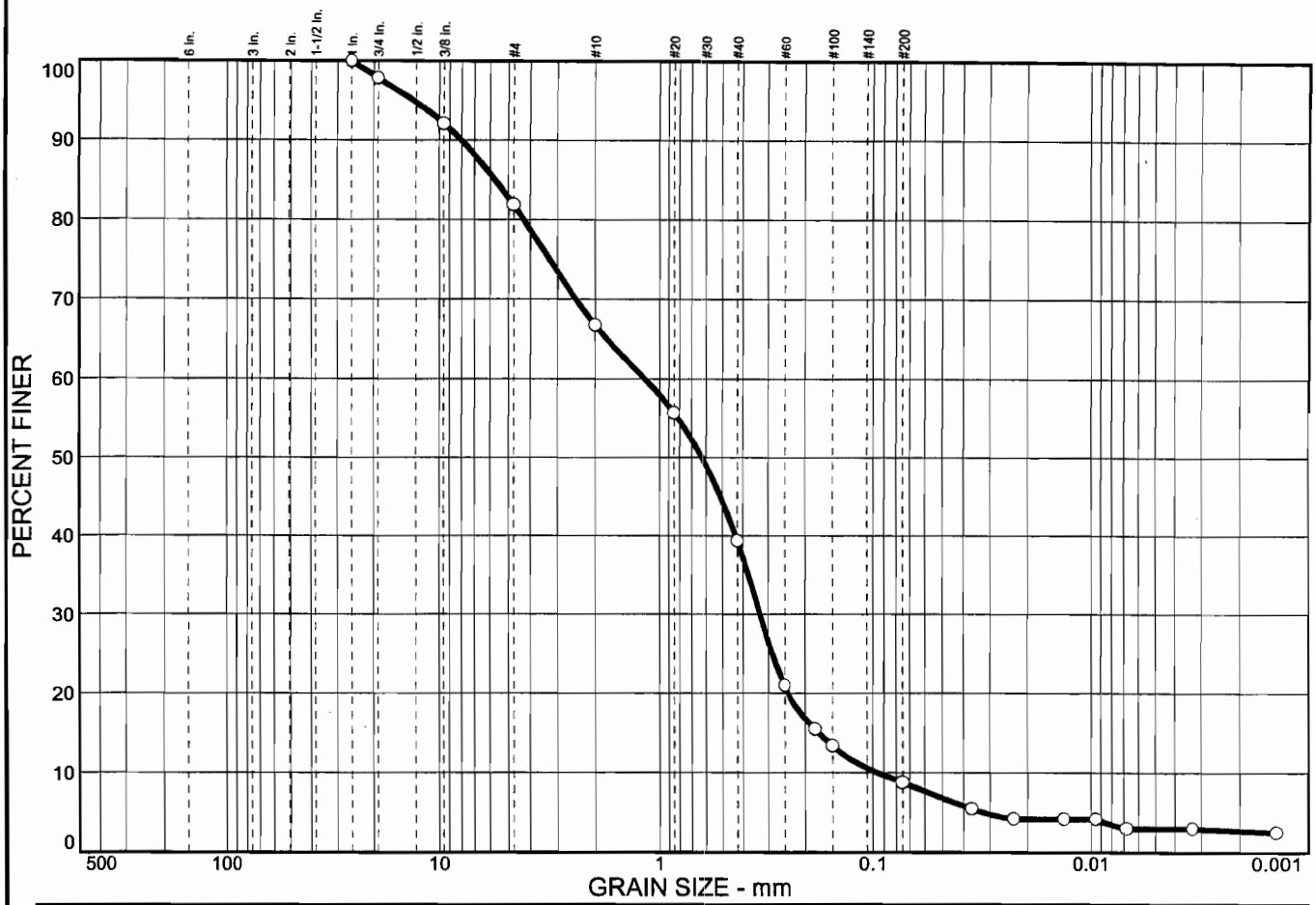
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.1	73.1	5.8	3.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.8		
0.375 in.	92.1		
#4	81.9		
#10	66.8		
#20	55.7		
#40	39.4		
#60	21.0		
#80	15.5		
#100	13.4		
#200	8.8		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.70 D_{60}= 1.17 D_{50}= 0.623
D_{30}= 0.330 D_{15}= 0.173 D_{10}= 0.0953
C_u= 12.24 C_c= 0.98

Classification

USCS= AASHTO=

Remarks

Sample No.: 52 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 143.0'-146.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	28.6	51.9	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.6		
#60	98.7		
#80	96.1		
#100	92.7		
#200	71.4		

* (no specification provided)

Soil Description

Gray silt/lean clay with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.113 D_{60}= 0.0520 D_{50}= 0.0372
D_{30}= 0.0165 D_{15}= 0.0029 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 55 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 170.0'-171.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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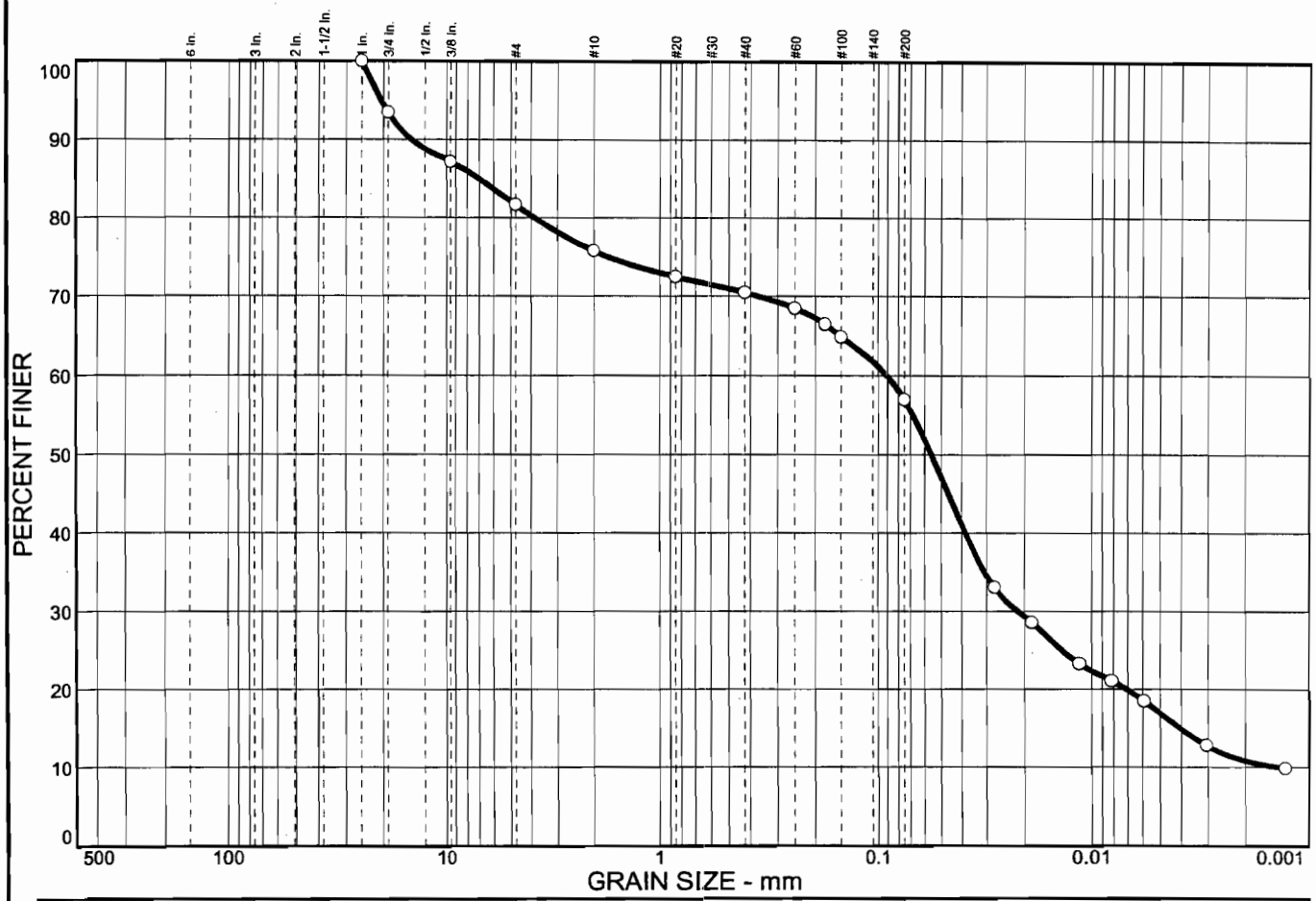
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.3	24.7	40.1	16.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	93.5		
0.375 in.	87.2		
#4	81.7		
#10	75.8		
#20	72.5		
#40	70.5		
#60	68.5		
#80	66.5		
#100	64.9		
#200	57.0		

* (no specification provided)

Soil Description

Gray sandy silt with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.03 D_{60}= 0.0906 D_{50}= 0.0555
D_{30}= 0.0213 D_{15}= 0.0041 D_{10}= 0.0014
C_u= 65.85 C_c= 3.66

Classification

USCS= AASHTO=

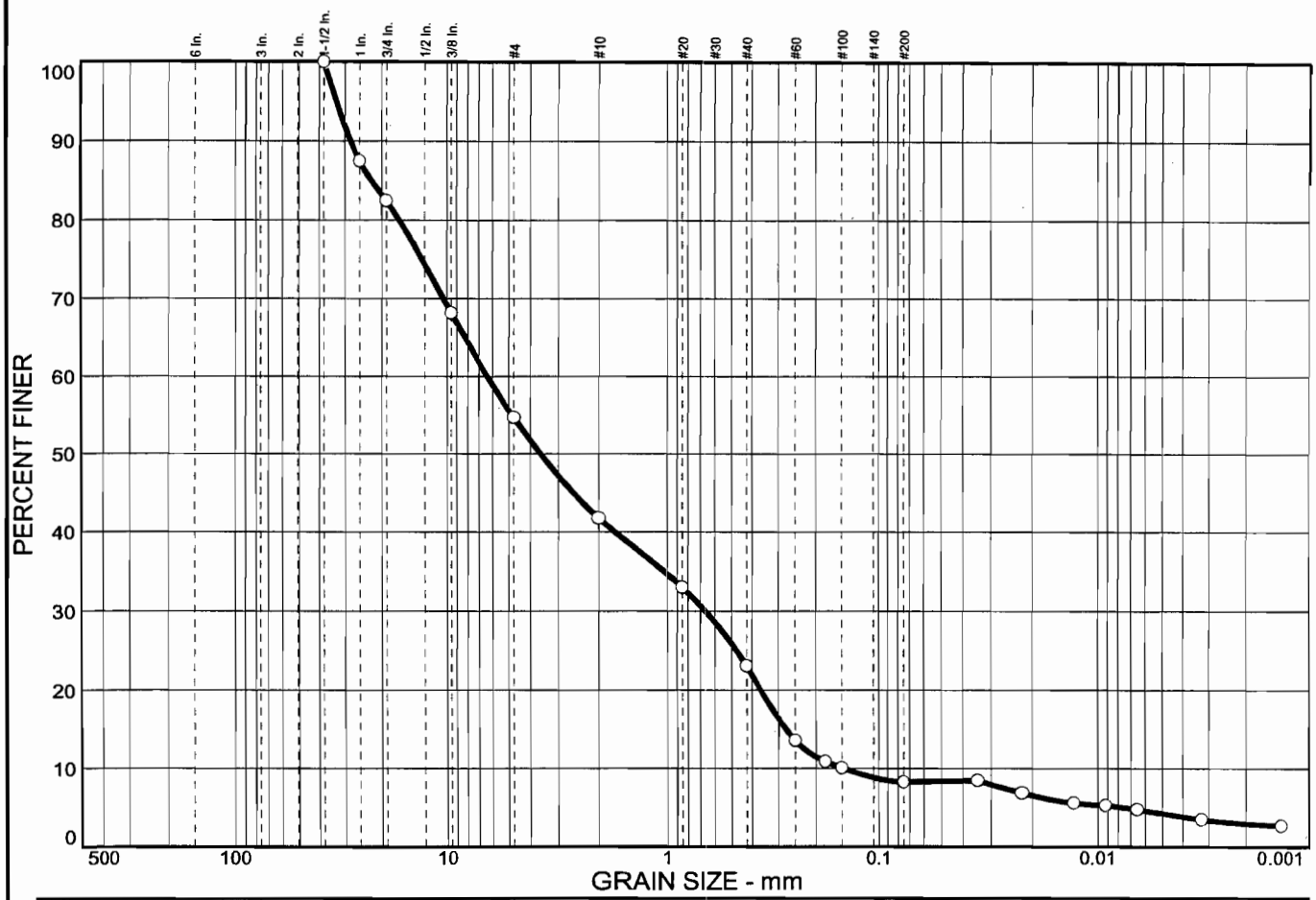
Remarks

Sample No.: 60 **Source of Sample:** C-04-18 **Date:** 06/30/05
Location: **Elev./Depth:** 220.0'-221.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	45.3	46.4	4.0	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	87.5		
0.75 in.	82.5		
0.375 in.	68.2		
#4	54.7		
#10	41.8		
#20	33.0		
#40	23.1		
#60	13.6		
#80	10.9		
#100	10.1		
#200	8.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.3 D_{60}= 6.35 D_{50}= 3.59
D_{30}= 0.662 D_{15}= 0.276 D_{10}= 0.146
C_u= 43.43 C_c= 0.47

Classification

USCS= AASHTO=

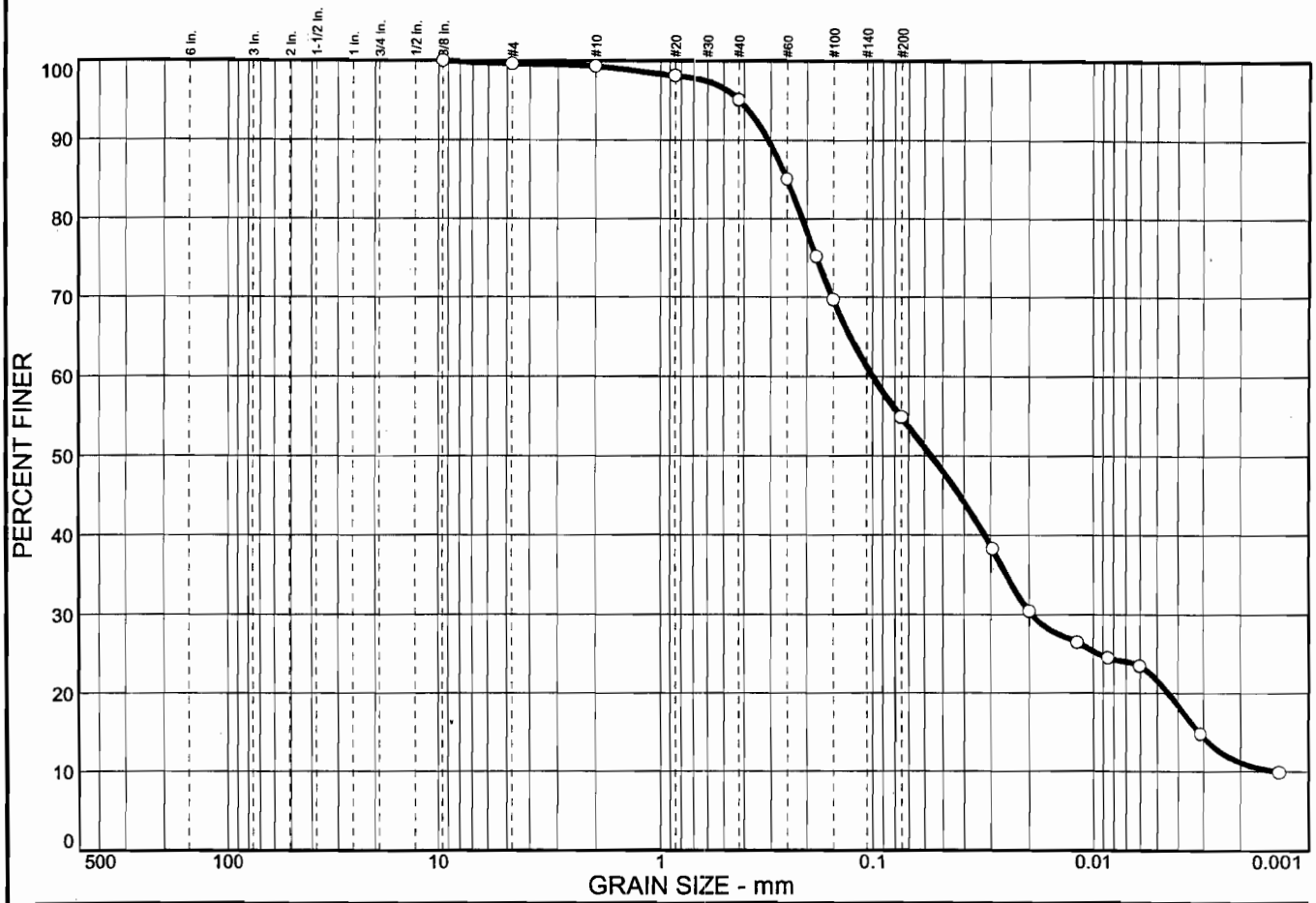
Remarks

Sample No.: 3 **Source of Sample:** C-04-19 **Date:** 07/01/05
Location: **Elev./Depth:** 2.3'-4.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	44.7	33.2	21.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.3		
#20	98.1		
#40	95.1		
#60	85.1		
#80	75.2		
#100	69.7		
#200	54.9		

* (no specification provided)

Soil Description

Brown sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.249 D_{60}= 0.0993 D_{50}= 0.0558
D_{30}= 0.0194 D_{15}= 0.0032 D_{10}= 0.0014
C_u= 71.38 C_c= 2.72

Classification

USCS= AASHTO=

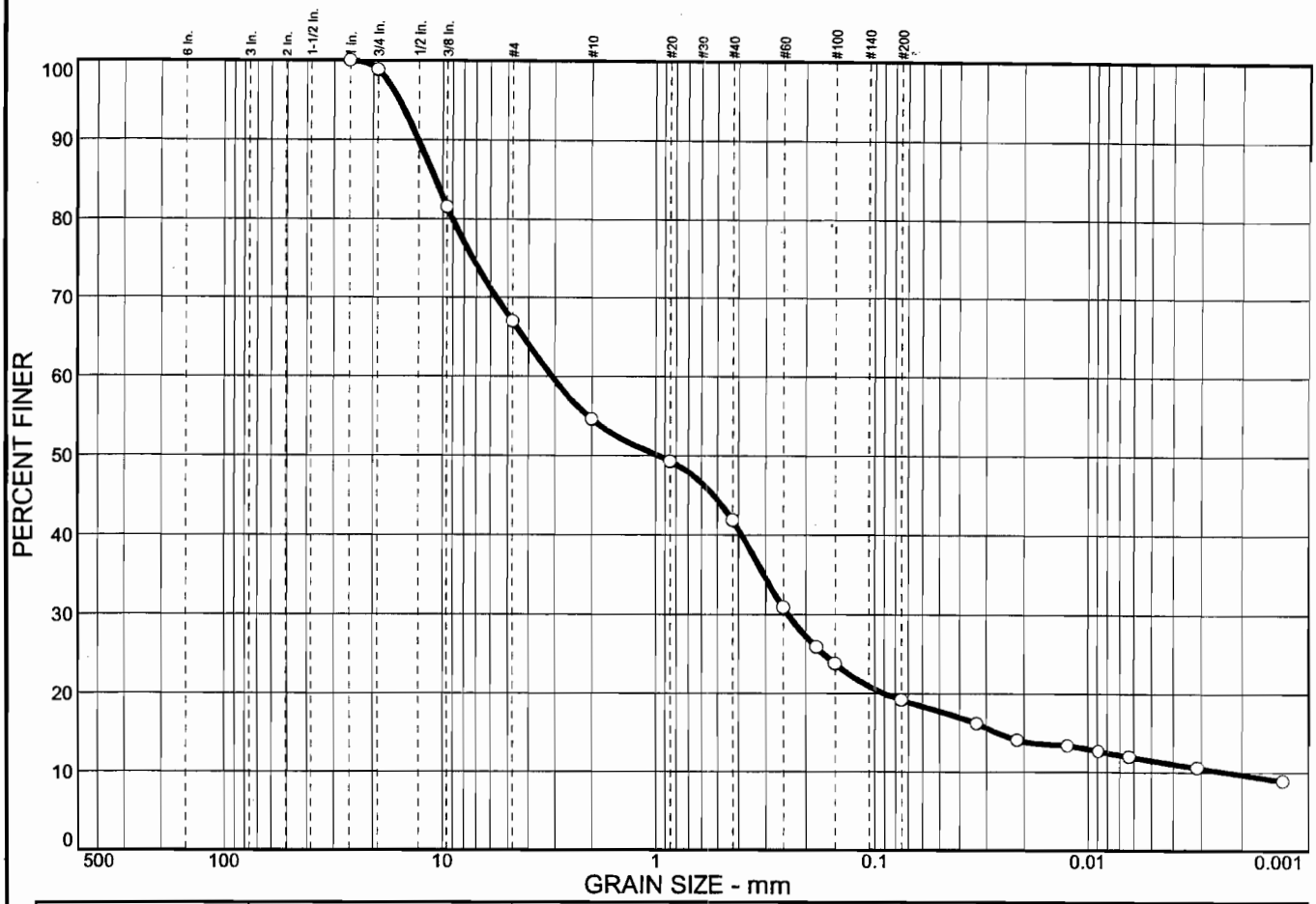
Remarks

Sample No.: 8 **Source of Sample:** C-04-19 **Date:** 07/01/05
Location: **Elev./Depth:** 14.5'-17.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.0	47.8	7.7	11.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	98.8		
0.375 in.	81.6		
#4	67.0		
#10	54.6		
#20	49.3		
#40	41.9		
#60	30.9		
#80	25.9		
#100	23.8		
#200	19.2		

* (no specification provided)

Soil Description

Brown silty/clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.7 D_{60}= 3.09 D_{50}= 0.964
D_{30}= 0.238 D_{15}= 0.0265 D_{10}= 0.0023
C_u= 1337.21 C_c= 7.92

Classification

USCS= AASHTO=

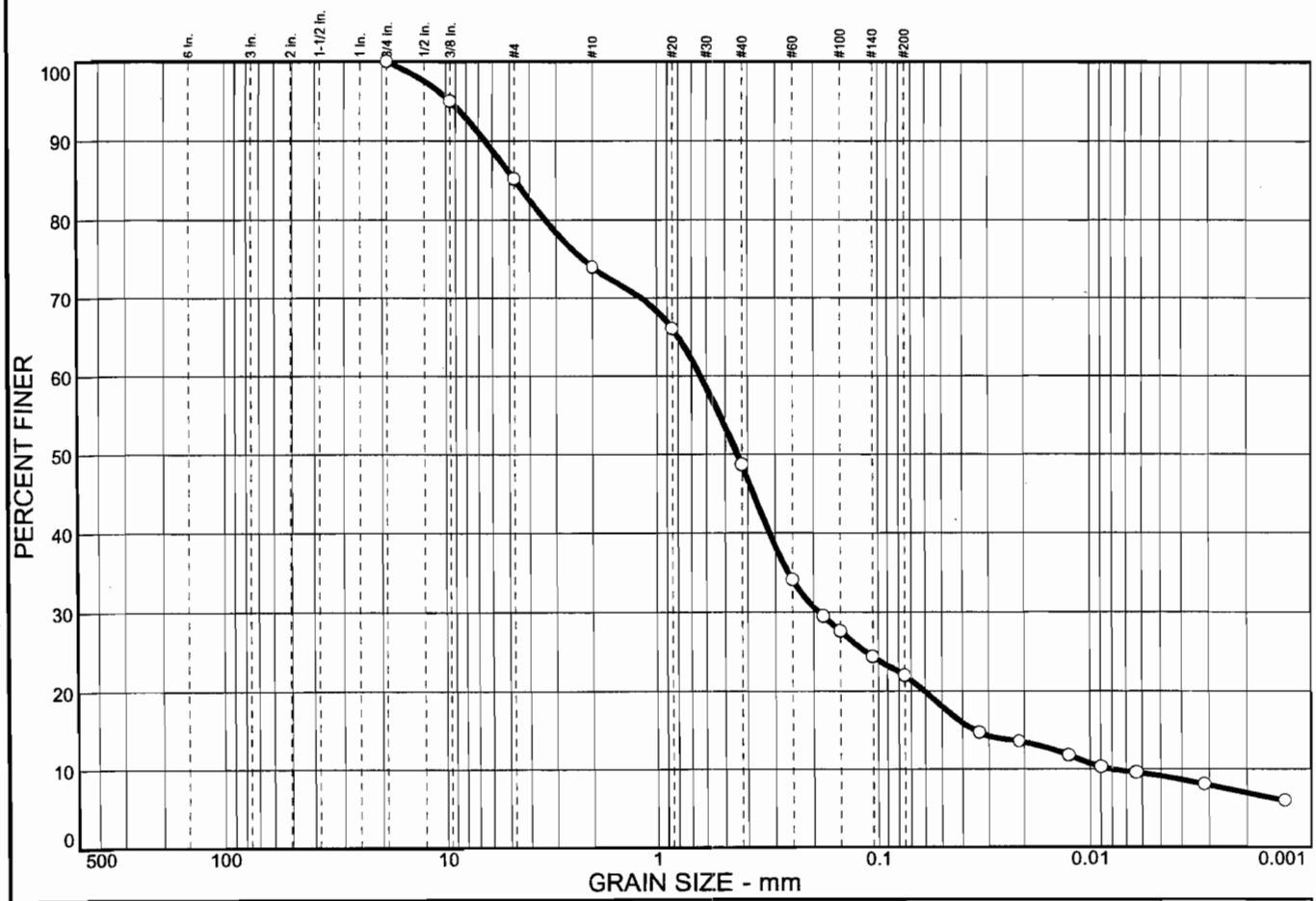
Remarks

Sample No.: 12 **Source of Sample:** C-04-19 **Date:** 07/01/05
Location: **Elev./Depth:** 25.0'-28.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.8	63.2	12.8	9.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	95.0		
#4	85.2		
#10	74.0		
#20	66.1		
#40	48.7		
#60	34.1		
#80	29.5		
#100	27.6		
#140	24.4		
#200	22.0		

* (no specification provided)

Soil Description

Dark brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.69 D_{60}= 0.635 D_{50}= 0.444
D_{30}= 0.188 D_{15}= 0.0350 D_{10}= 0.0080
C_u= 79.40 C_c= 6.99

Classification

USCS= AASHTO=

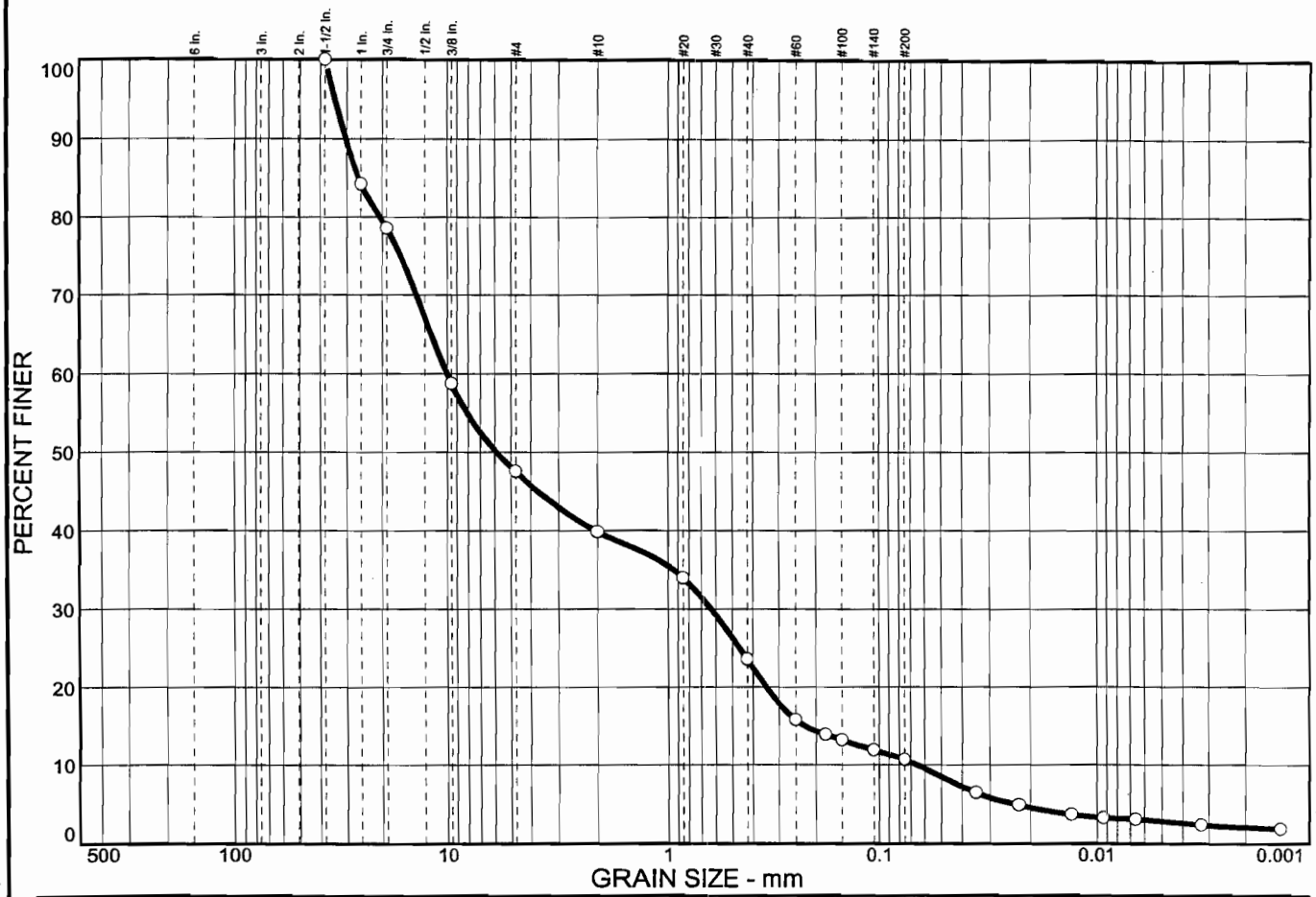
Remarks

Sample No.: 4 **Source of Sample:** C-04-20 **Date:** 7-9-05
Location: **Elev./Depth:** 4.5'-7.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	52.4	36.9	7.8	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	84.3		
.75 in.	78.6		
.375 in.	58.8		
#4	47.6		
#10	39.9		
#20	34.0		
#40	23.6		
#60	15.8		
#80	13.9		
#100	13.2		
#140	11.9		
#200	10.7		

* (no specification provided)

Soil Description

Brown to gray poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 26.1 D_{60}= 9.97 D_{50}= 5.85
D_{30}= 0.627 D_{15}= 0.226 D_{10}= 0.0647
C_u= 154.09 C_c= 0.61

Classification

USCS= AASHTO=

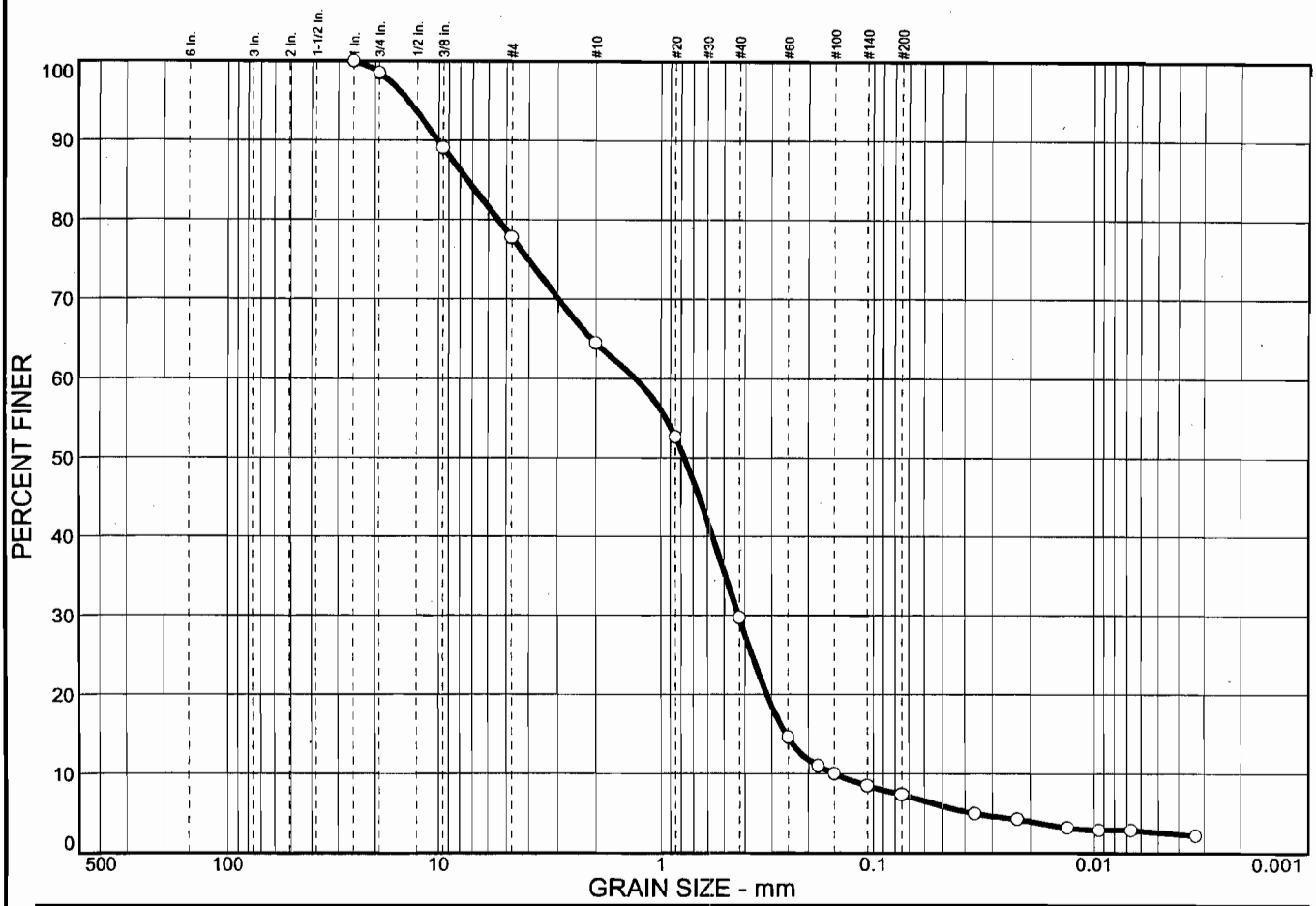
Remarks

Sample No.: 9 **Source of Sample:** C-04-20 **Date:** 7-9-05
Location: **Elev./Depth:** 18.0'-21.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.2	70.4	4.8	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	98.5		
.375 in.	89.1		
#4	77.8		
#10	64.5		
#20	52.7		
#40	29.7		
#60	14.6		
#80	11.0		
#100	10.0		
#140	8.5		
#200	7.4		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.39 D_{60}= 1.31 D_{50}= 0.768
D_{30}= 0.429 D_{15}= 0.256 D_{10}= 0.150
C_u= 8.72 C_c= 0.94

Classification

USCS= AASHTO=

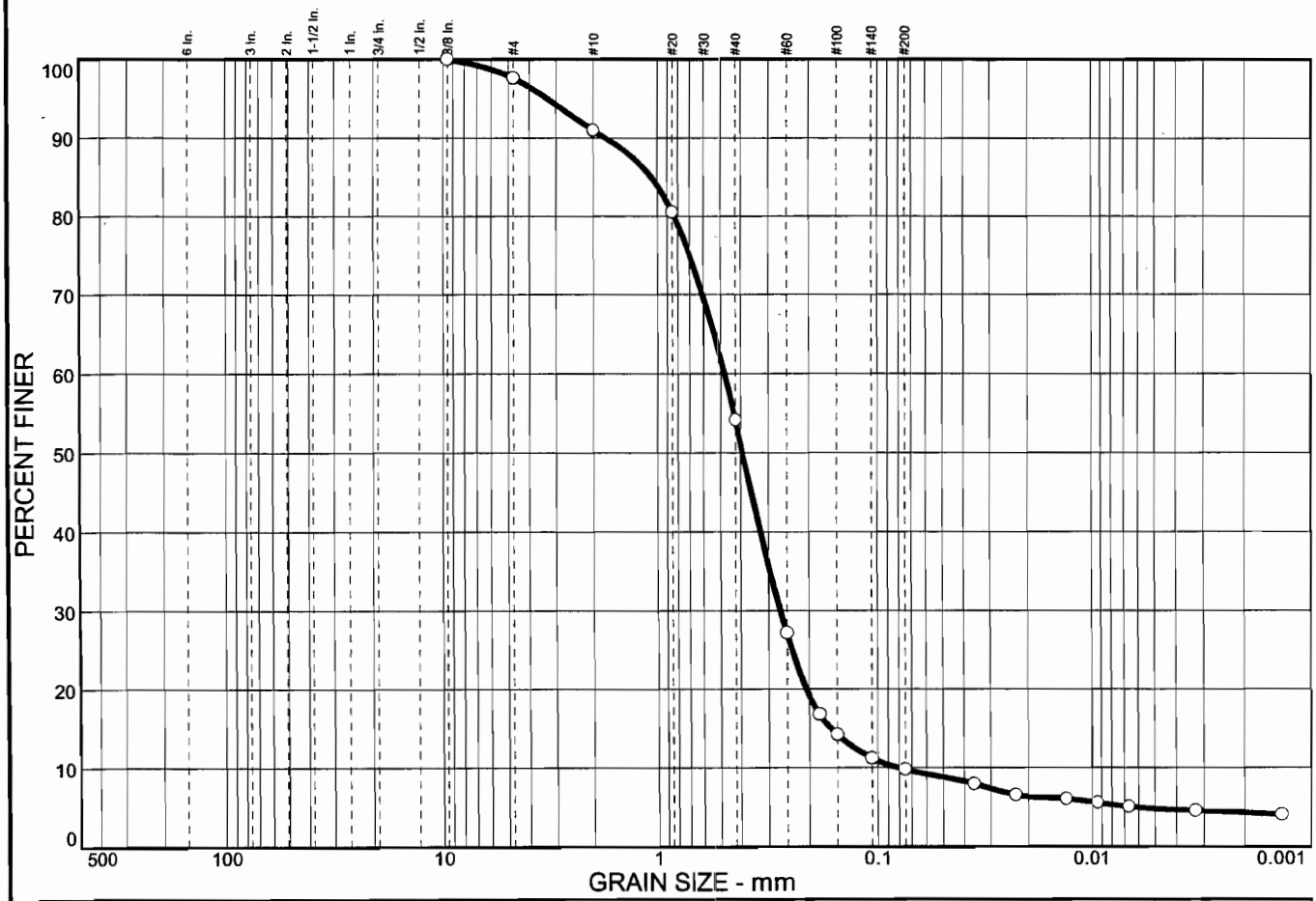
Remarks

Sample No.: 14 **Source of Sample:** C-04-20 **Date:** 07/05/05
Location: **Elev./Depth:** 31.5'-34.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.4	87.8	5.0	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.6		
#10	91.0		
#20	80.6		
#40	54.2		
#60	27.2		
#80	16.8		
#100	14.2		
#140	11.2		
#200	9.8		

* (no specification provided)

Soil Description

Gray to black poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.06 D_{60}= 0.479 D_{50}= 0.392
D_{30}= 0.266 D_{15}= 0.161 D_{10}= 0.0804
C_u= 5.96 C_c= 1.84

Classification

USCS= AASHTO=

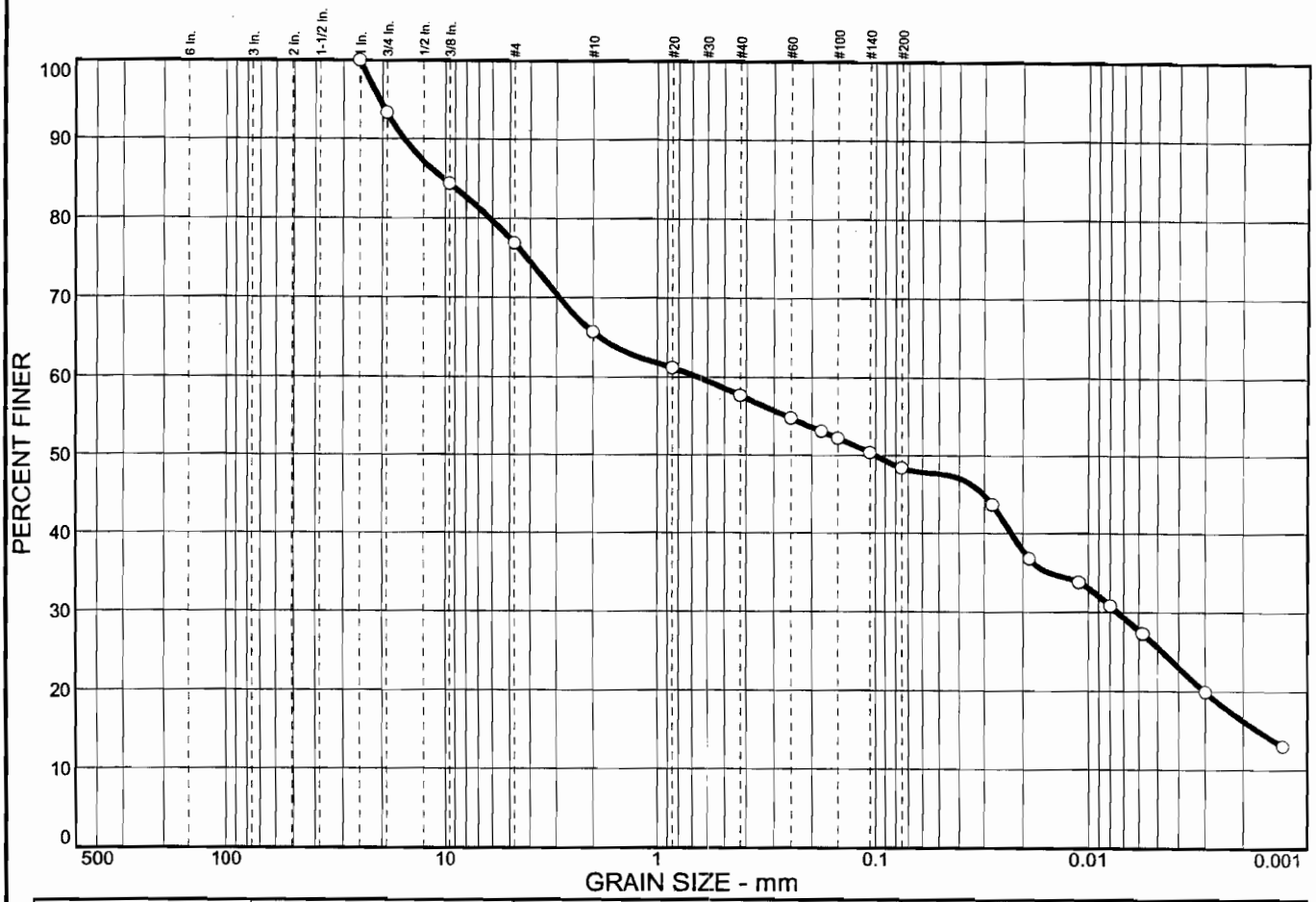
Remarks

Sample No.: 19 **Source of Sample:** C-04-20 **Date:** 7-9-05
Location: **Elev./Depth:** 46.5'-49.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	23.1	28.5	22.8	25.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	93.3		
0.375 in.	84.4		
#4	76.9		
#10	65.7		
#20	61.2		
#40	57.7		
#60	54.8		
#80	53.1		
#100	52.2		
#140	50.4		
#200	48.4		

* (no specification provided)

Soil Description

Brown clayey sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.2 D_{60}= 0.653 D_{50}= 0.0994
D_{30}= 0.0074 D_{15}= 0.0017 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 1 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 1.5'-4.5'

H. C. NUTTING COMPANY
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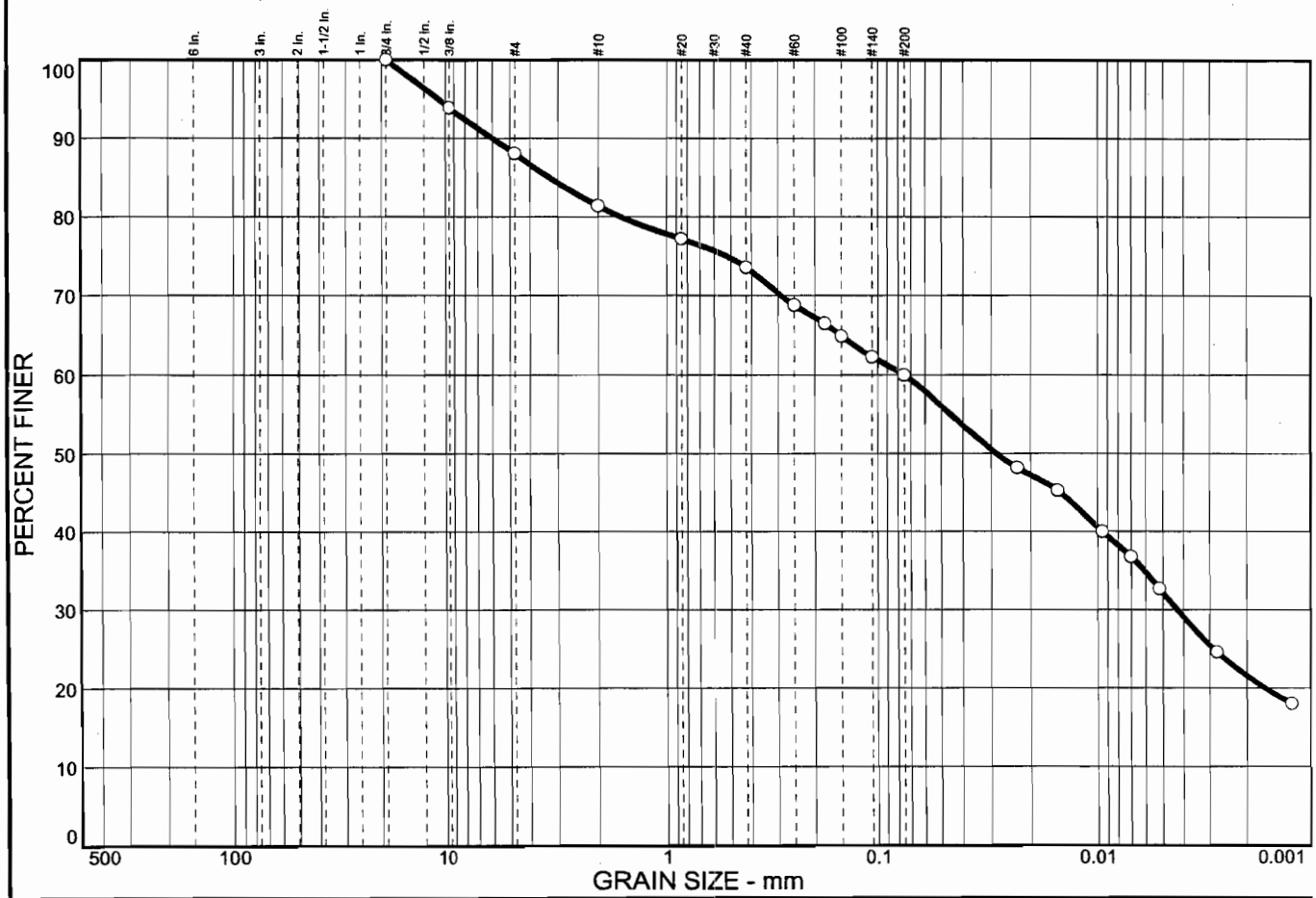
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.9	28.1	27.9	32.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.9		
#4	88.1		
#10	81.4		
#20	77.2		
#40	73.6		
#60	68.8		
#80	66.5		
#100	64.9		
#140	62.3		
#200	60.0		

Soil Description

Brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.26 D_{60}= 0.0750 D_{50}= 0.0283
D_{30}= 0.0043 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

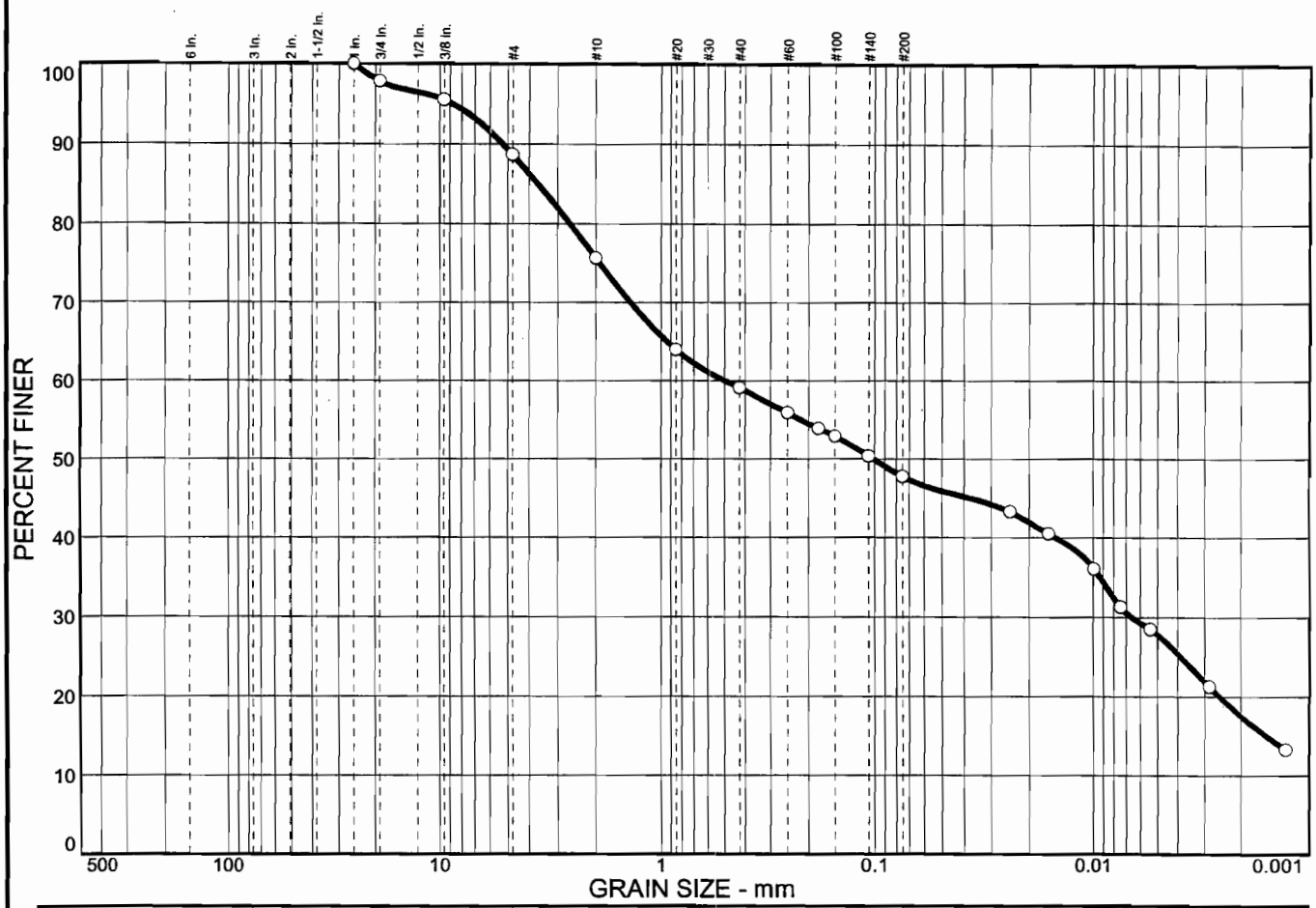
* (no specification provided)

Sample No.: 5 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 13.5'-16.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.3	40.9	20.0	27.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.8		
0.375 in.	95.5		
#4	88.7		
#10	75.7		
#20	64.0		
#40	59.1		
#60	55.9		
#80	53.9		
#100	52.9		
#140	50.4		
#200	47.8		

* (no specification provided)

Soil Description

Brown clayey sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.65 D_{60}= 0.496 D_{50}= 0.101
D_{30}= 0.0066 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 8 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 22.5'-25.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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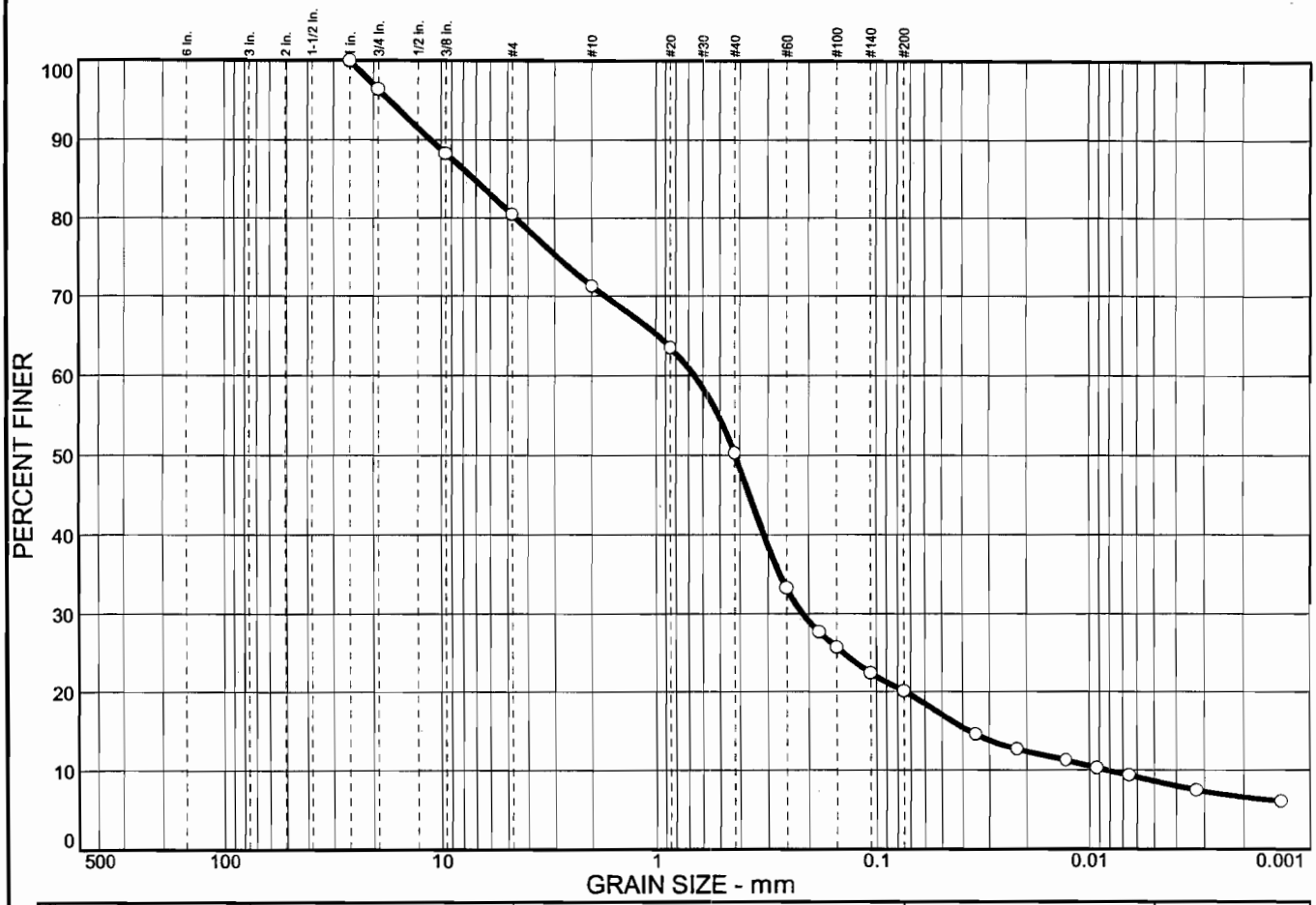
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	19.5	60.4	11.5	8.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.4		
0.375 in.	88.3		
#4	80.5		
#10	71.3		
#20	63.5		
#40	50.3		
#60	33.3		
#80	27.7		
#100	25.7		
#140	22.4		
#200	20.1		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.10 D_{60}= 0.656 D_{50}= 0.421
D_{30}= 0.212 D_{15}= 0.0371 D_{10}= 0.0083
C_u= 79.42 C_c= 8.33

Classification

USCS= AASHTO=

Remarks

Sample No.: 11 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 30.0'-33.0'

H. C. NUTTING COMPANY
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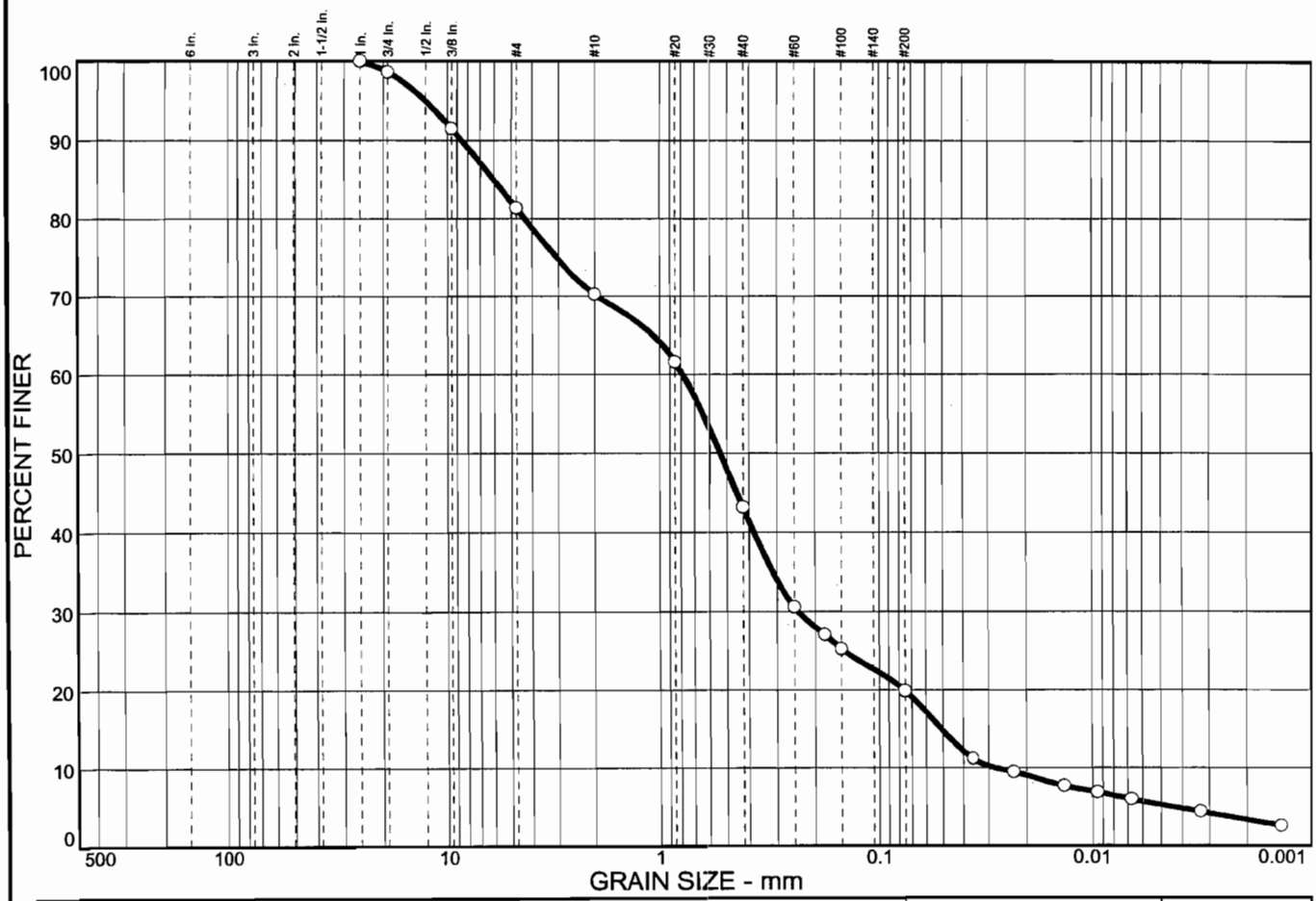
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.6	61.5	14.6	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	98.6		
0.375 in.	91.5		
#4	81.4		
#10	70.3		
#20	61.6		
#40	43.2		
#60	30.6		
#80	27.1		
#100	25.3		
#200	19.9		

* (no specification provided)

Soil Description

Dark brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.04 D_{60}= 0.785 D_{50}= 0.536
D_{30}= 0.240 D_{15}= 0.0507 D_{10}= 0.0278
C_u= 28.30 C_c= 2.63

Classification

USCS= AASHTO=

Remarks

Sample No.: 14 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 39.0'-42.0'

H. C. NUTTING COMPANY
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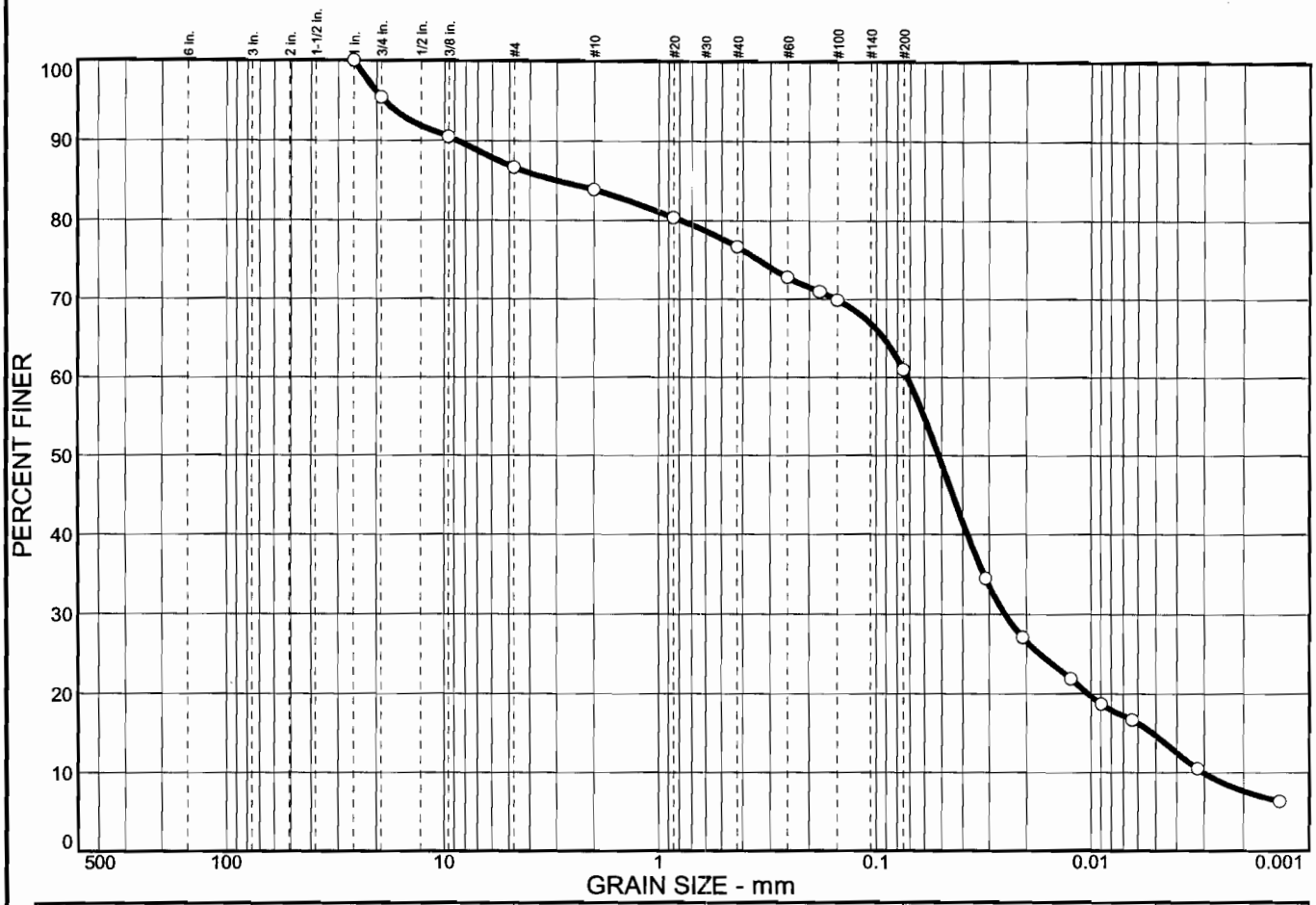
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.3	25.7	46.3	14.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	95.4		
0.375 in.	90.5		
#4	86.7		
#10	83.9		
#20	80.4		
#40	76.7		
#60	72.8		
#80	71.0		
#100	69.9		
#200	61.0		

* (no specification provided)

Soil Description

Brown to gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.93 D_{60}= 0.0720 D_{50}= 0.0515
D_{30}= 0.0252 D_{15}= 0.0052 D_{10}= 0.0030
C_u= 23.85 C_c= 2.92

Classification

USCS= AASHTO=

Remarks

Sample No.: 17 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 48.0'-51.6'

H. C. NUTTING COMPANY
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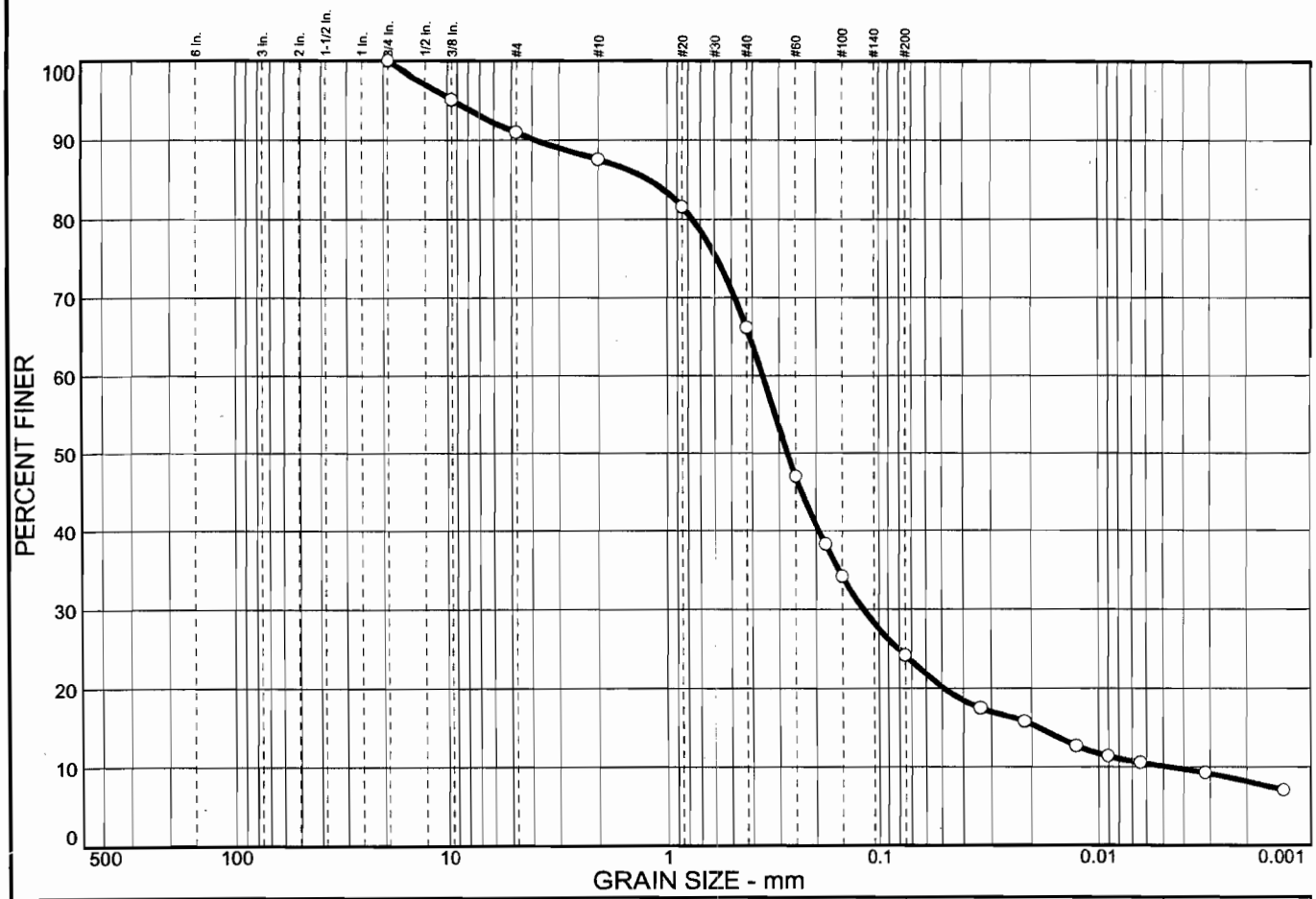
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.0	66.8	14.1	10.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.1		
#4	91.0		
#10	87.6		
#20	81.6		
#40	66.2		
#60	47.0		
#80	38.3		
#100	34.2		
#200	24.2		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.19 D_{60}= 0.358 D_{50}= 0.273
D_{30}= 0.119 D_{15}= 0.0185 D_{10}= 0.0046
C_u= 77.42 C_c= 8.55

Classification

USCS= AASHTO=

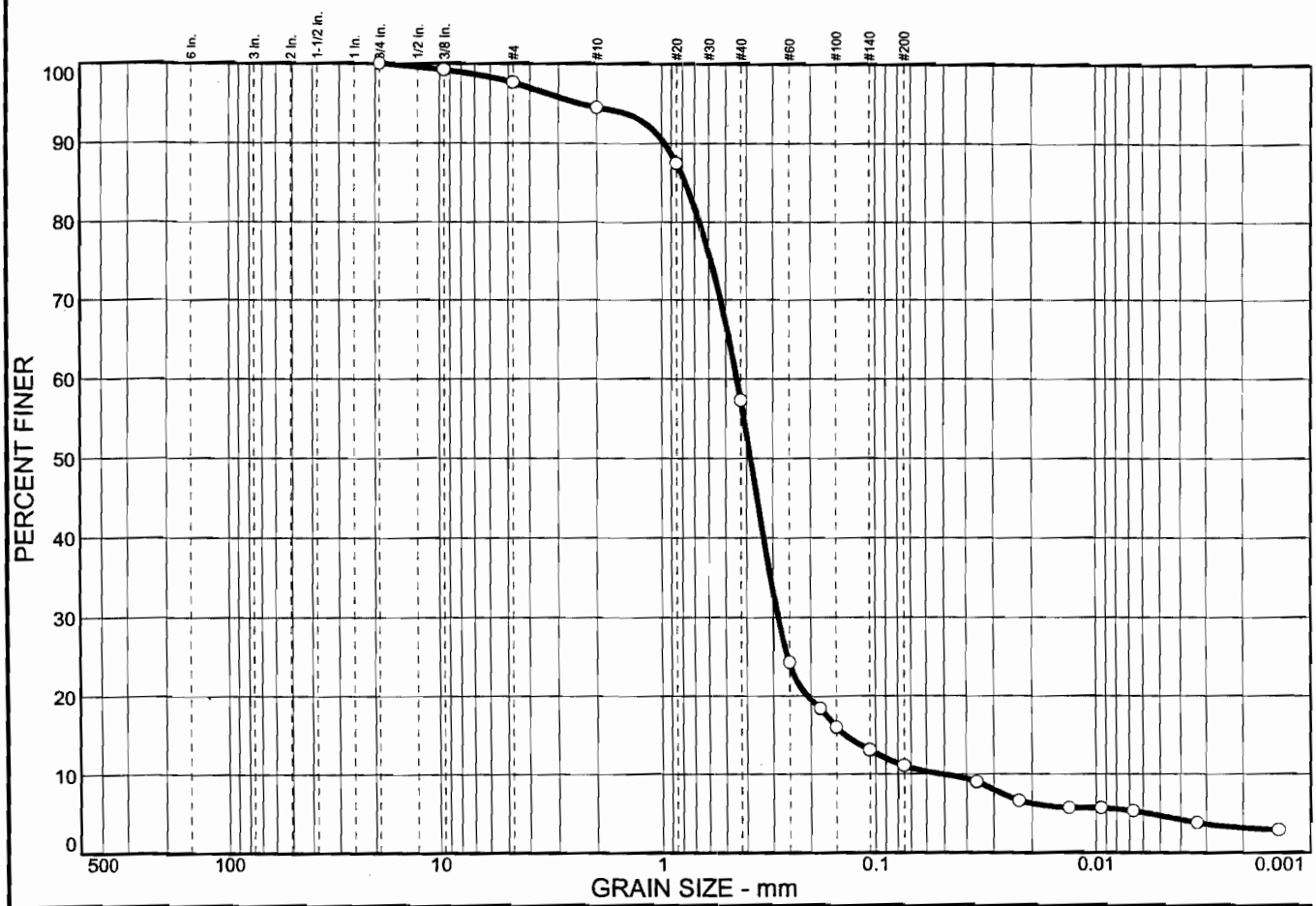
Remarks

Sample No.: 18 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 51.6'-54.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.4	86.5	6.4	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.2		
#4	97.6		
#10	94.5		
#20	87.5		
#40	57.3		
#60	24.3		
#80	18.4		
#100	16.0		
#140	13.1		
#200	11.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.771 D_{60}= 0.443 D_{50}= 0.382
D_{30}= 0.283 D_{15}= 0.137 D_{10}= 0.0503
C_u= 8.82 C_c= 3.59

Classification

USCS= AASHTO=

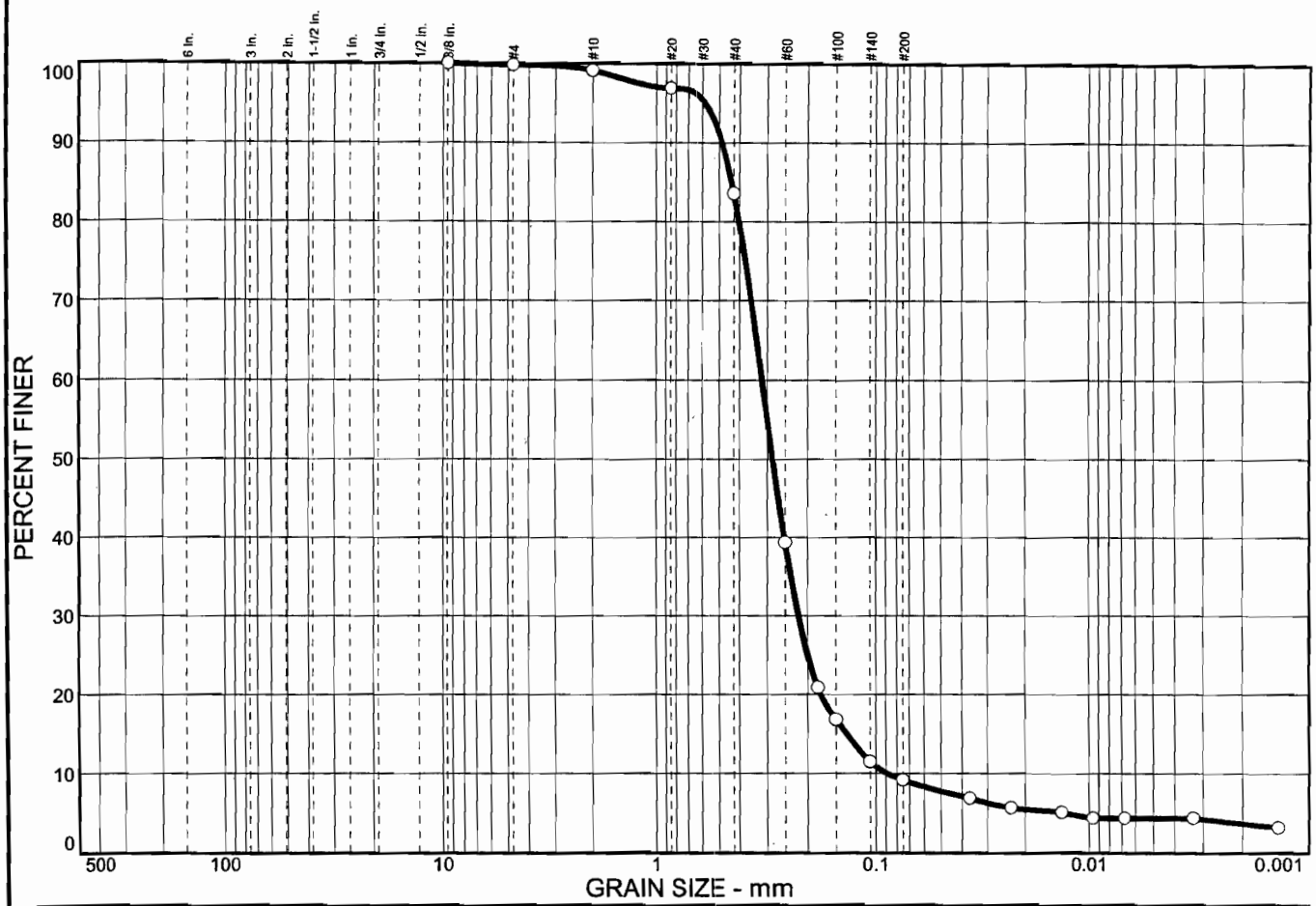
Remarks

Sample No.: 28 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 76.0'-79.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	90.6	4.8	4.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.1		
#20	96.9		
#40	83.6		
#60	39.4		
#80	20.9		
#100	16.8		
#140	11.5		
#200	9.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.435 D_{60}= 0.317 D_{50}= 0.283
D_{30}= 0.219 D_{15}= 0.135 D_{10}= 0.0884
C_u= 3.58 C_c= 1.71

Classification

USCS= AASHTO=

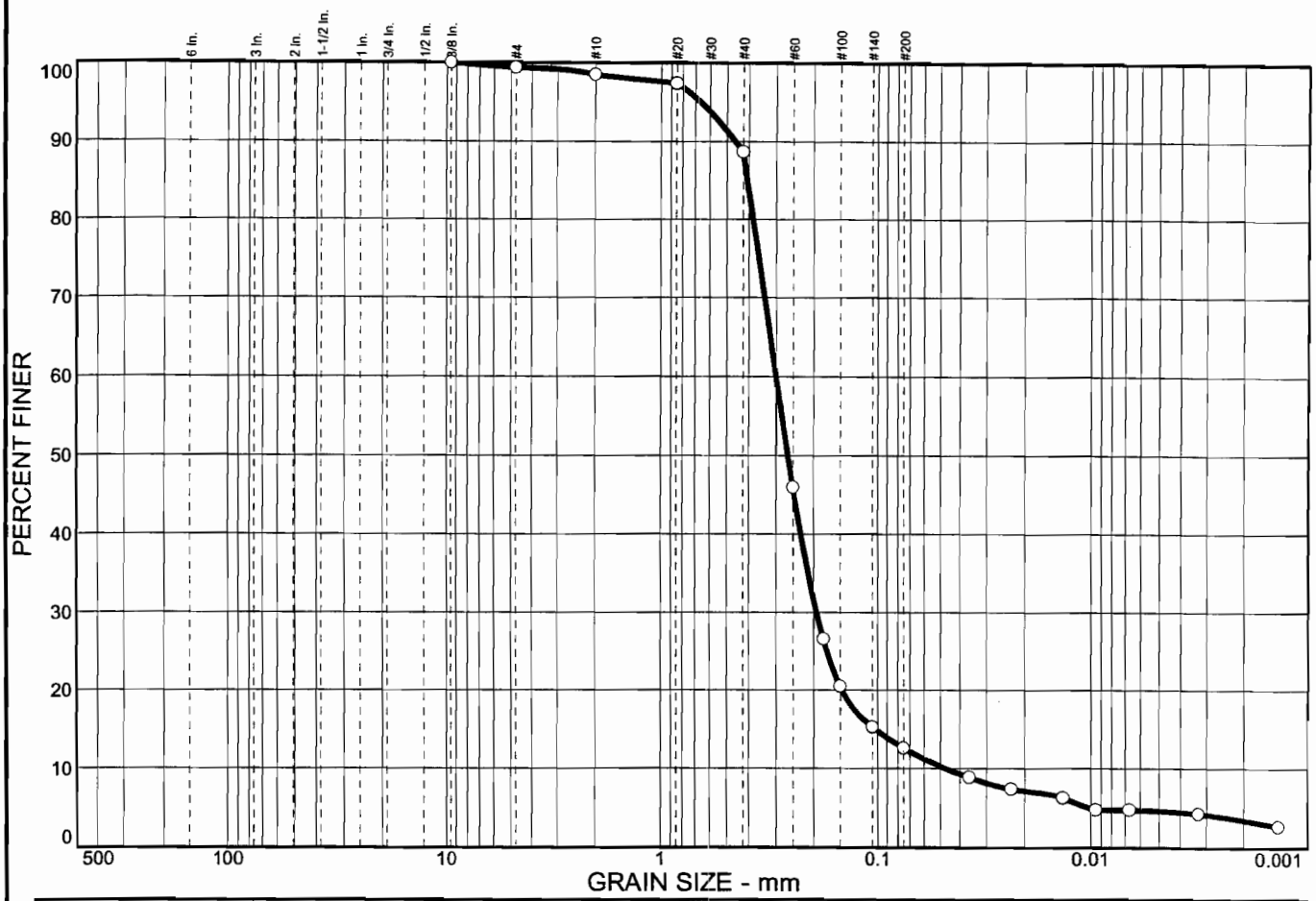
Remarks

Sample No.: 31 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 85.0'-88.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.6	86.8	7.9	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.4		
#10	98.5		
#20	97.4		
#40	88.7		
#60	46.0		
#80	26.6		
#100	20.5		
#140	15.3		
#200	12.6		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.407 D_{60}= 0.300 D_{50}= 0.264
D_{30}= 0.193 D_{15}= 0.103 D_{10}= 0.0466
C_u= 6.45 C_c= 2.67

Classification

USCS= AASHTO=

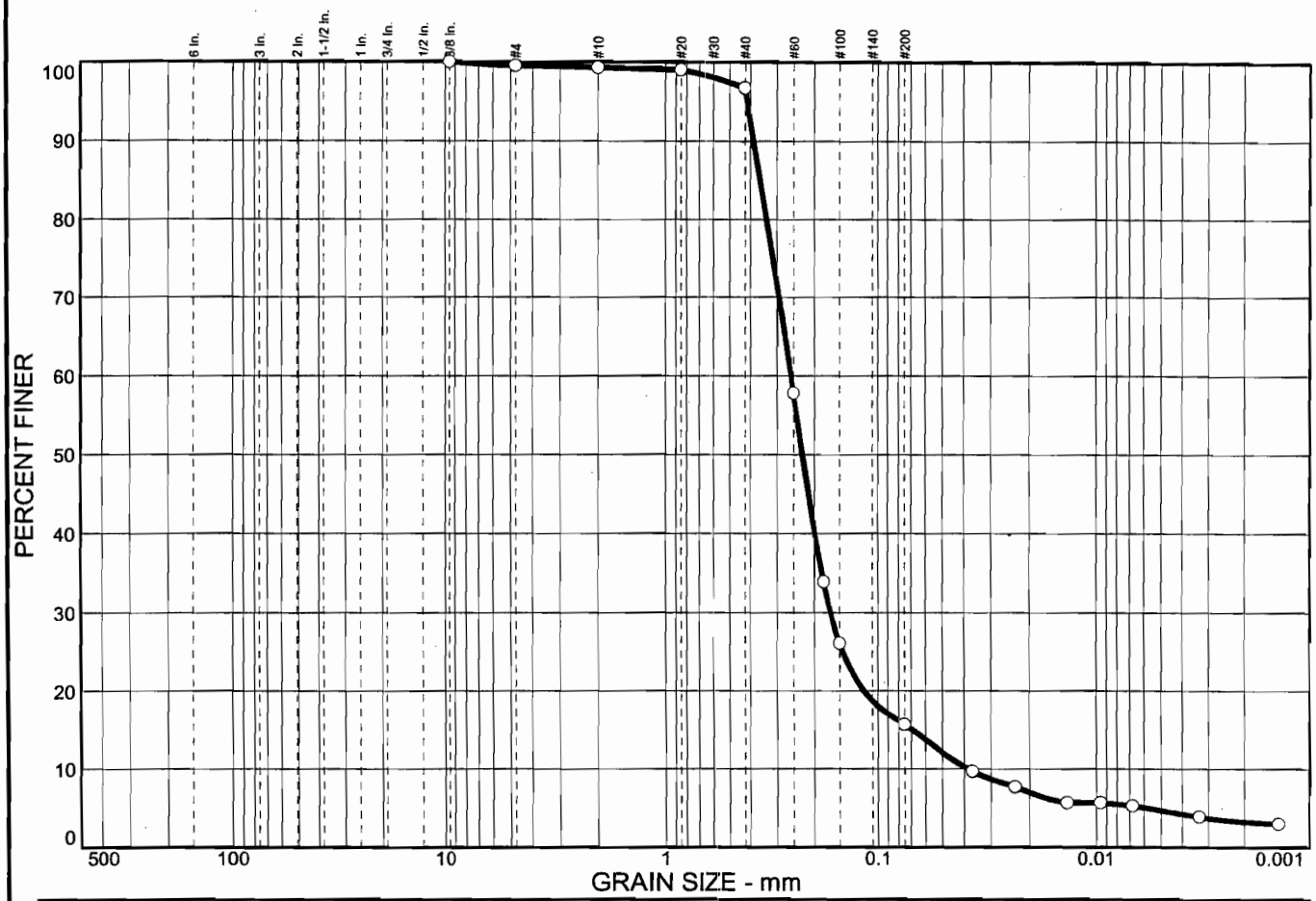
Remarks

Sample No.: 35 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 97.00'-100.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	83.8	11.0	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.5		
#10	99.3		
#20	99.0		
#40	96.7		
#60	57.8		
#80	33.9		
#100	26.1		
#200	15.7		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.360 D_{60}= 0.257 D_{50}= 0.227
D_{30}= 0.166 D_{15}= 0.0688 D_{10}= 0.0381
C_u= 6.74 C_c= 2.82

Classification

USCS= AASHTO=

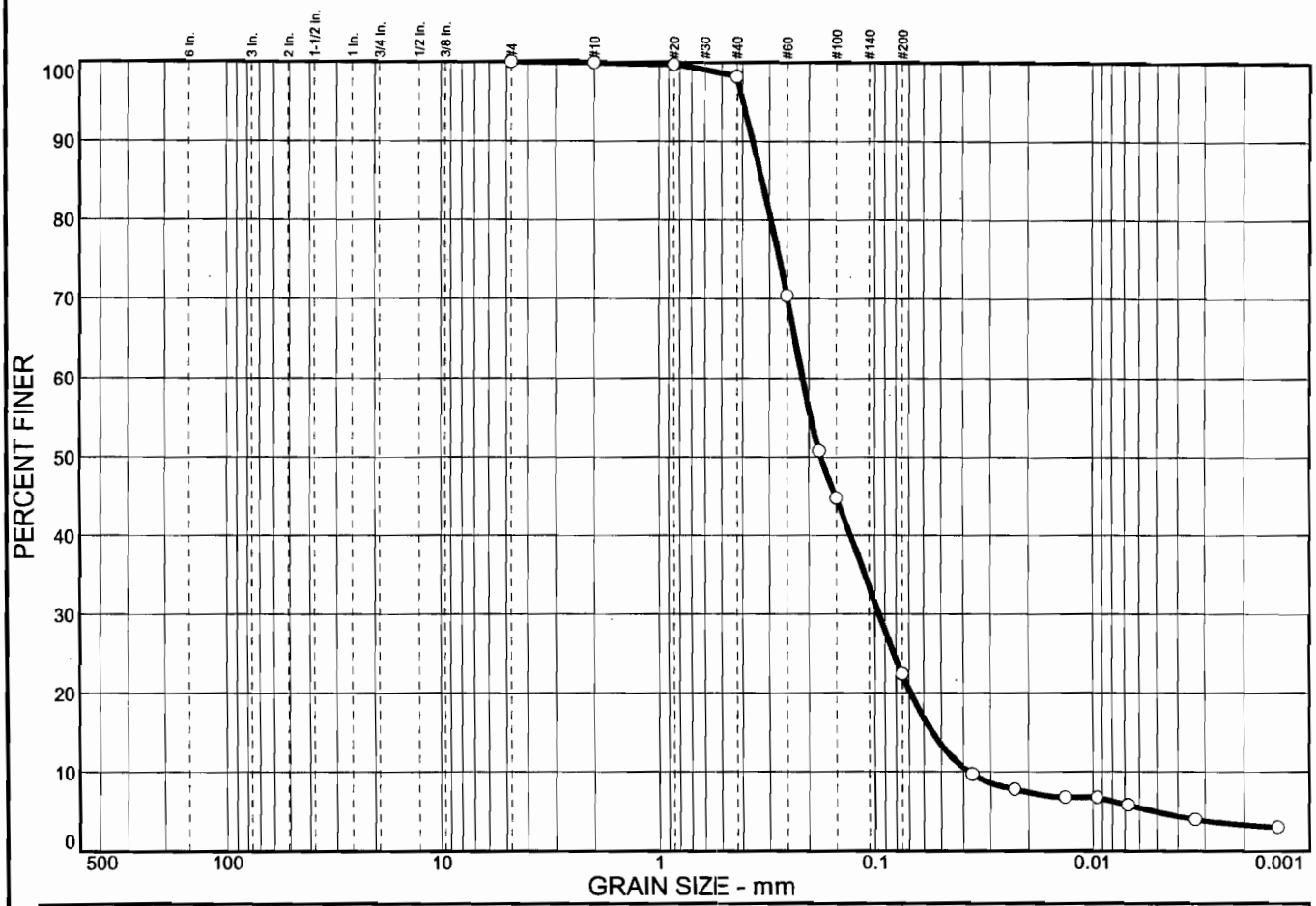
Remarks

Sample No.: 39 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 109.0'-112.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	77.6	17.4	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	98.2		
#60	70.4		
#80	50.8		
#100	44.8		
#200	22.4		

* (no specification provided)

Soil Description

Brown to gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.324 D_{60}= 0.213 D_{50}= 0.177
D_{30}= 0.0956 D_{15}= 0.0546 D_{10}= 0.0376
C_u= 5.65 C_c= 1.14

Classification

USCS= AASHTO=

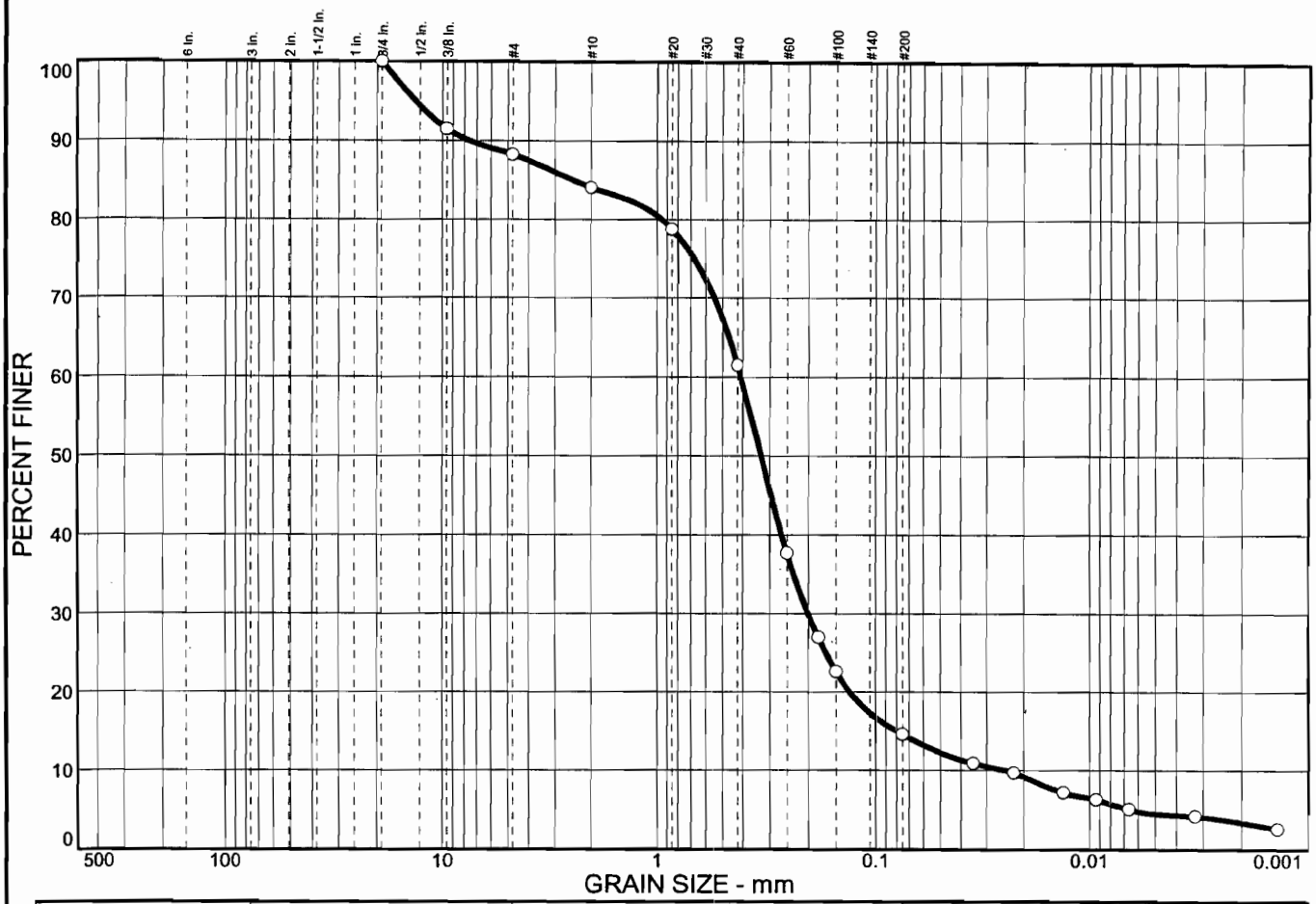
Remarks

Sample No.: 43 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 121.0'-124.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.7	73.7	10.1	4.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.5		
#4	88.3		
#10	84.1		
#20	78.8		
#40	61.5		
#60	37.7		
#80	27.0		
#100	22.6		
#200	14.6		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.44 D_{60}= 0.410 D_{50}= 0.329
D_{30}= 0.200 D_{15}= 0.0798 D_{10}= 0.0244
C_u= 16.82 C_c= 4.01

Classification

USCS= AASHTO=

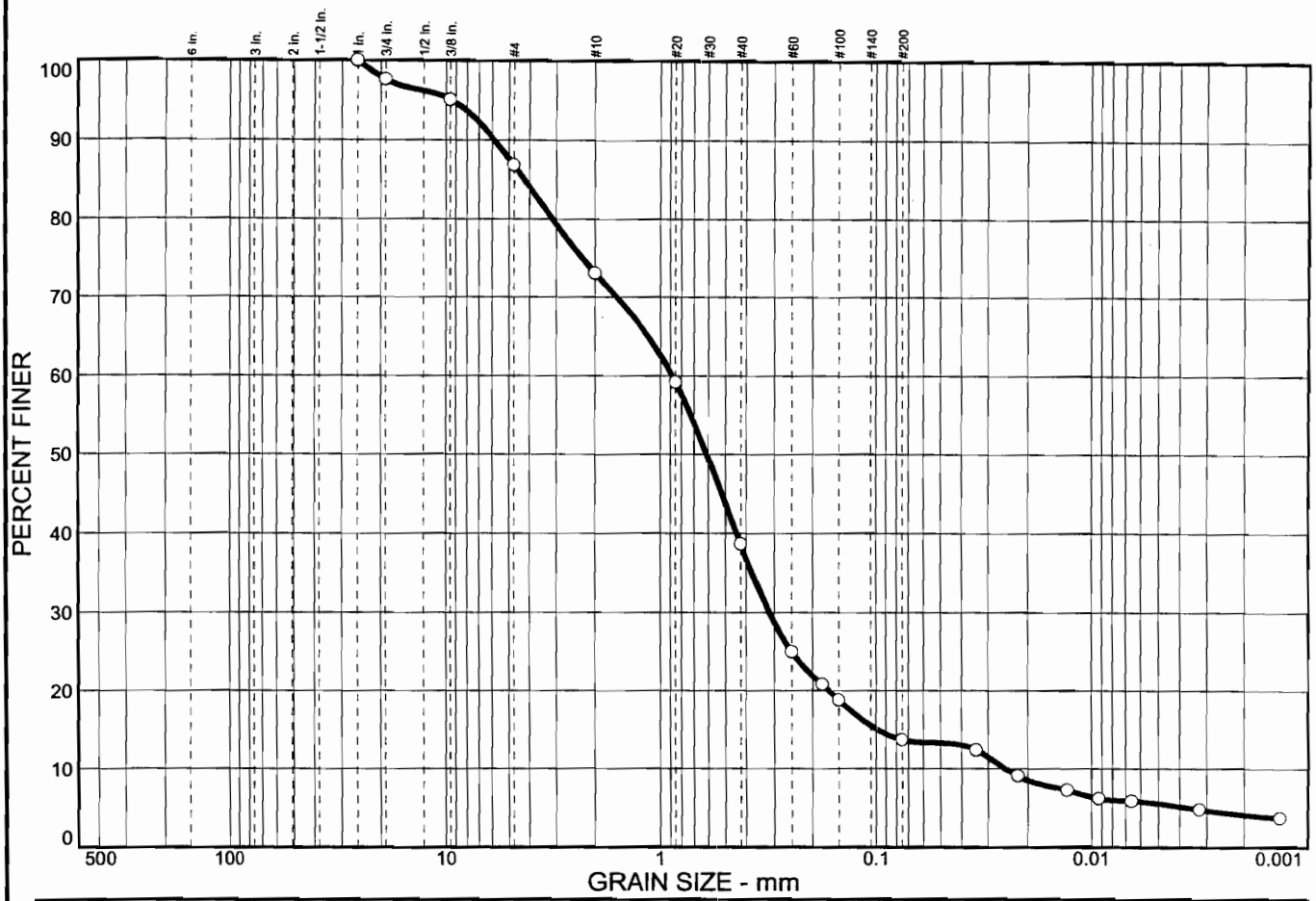
Remarks

Sample No.: 46 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 140.0'-141.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.1	73.2	8.1	5.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.6		
0.375 in.	95.1		
#4	86.9		
#10	73.1		
#20	59.2		
#40	38.7		
#60	25.0		
#80	20.8		
#100	18.8		
#200	13.7		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.21 D_{60}= 0.880 D_{50}= 0.609
D_{30}= 0.315 D_{15}= 0.0980 D_{10}= 0.0250
C_u= 35.14 C_c= 4.49

Classification

USCS= AASHTO=

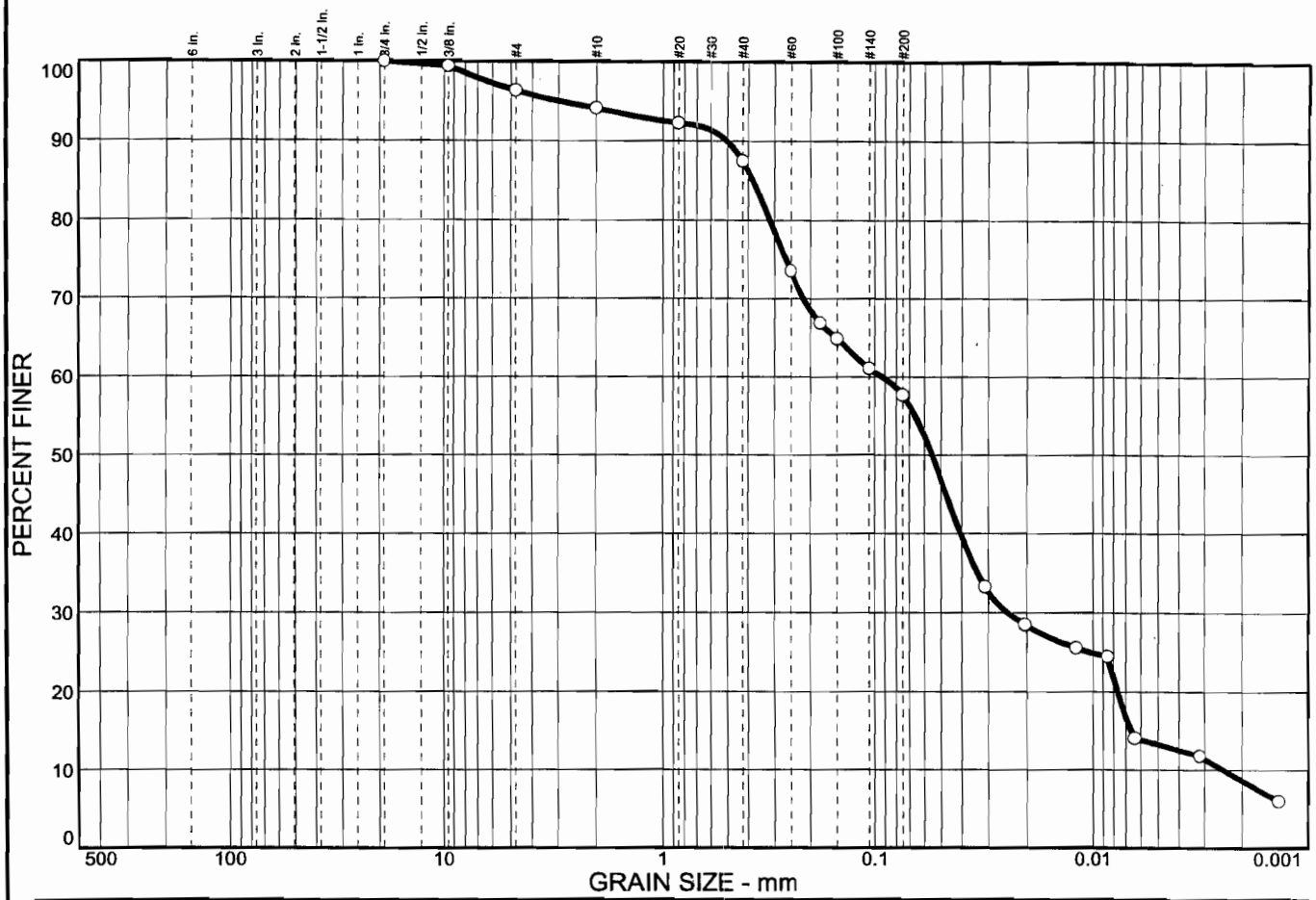
Remarks

Sample No.: 48 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 160.0'-161.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.7	38.6	44.4	13.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.4		
#4	96.3		
#10	94.1		
#20	92.3		
#40	87.5		
#60	73.6		
#80	66.9		
#100	64.9		
#140	61.1		
#200	57.7		

* (no specification provided)

Soil Description

Brown sandy lean clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.379 D_{60}= 0.0922 D_{50}= 0.0550
D_{30}= 0.0244 D_{15}= 0.0066 D_{10}= 0.0024
C_u= 37.83 C_c= 2.65

Classification

USCS= AASHTO=

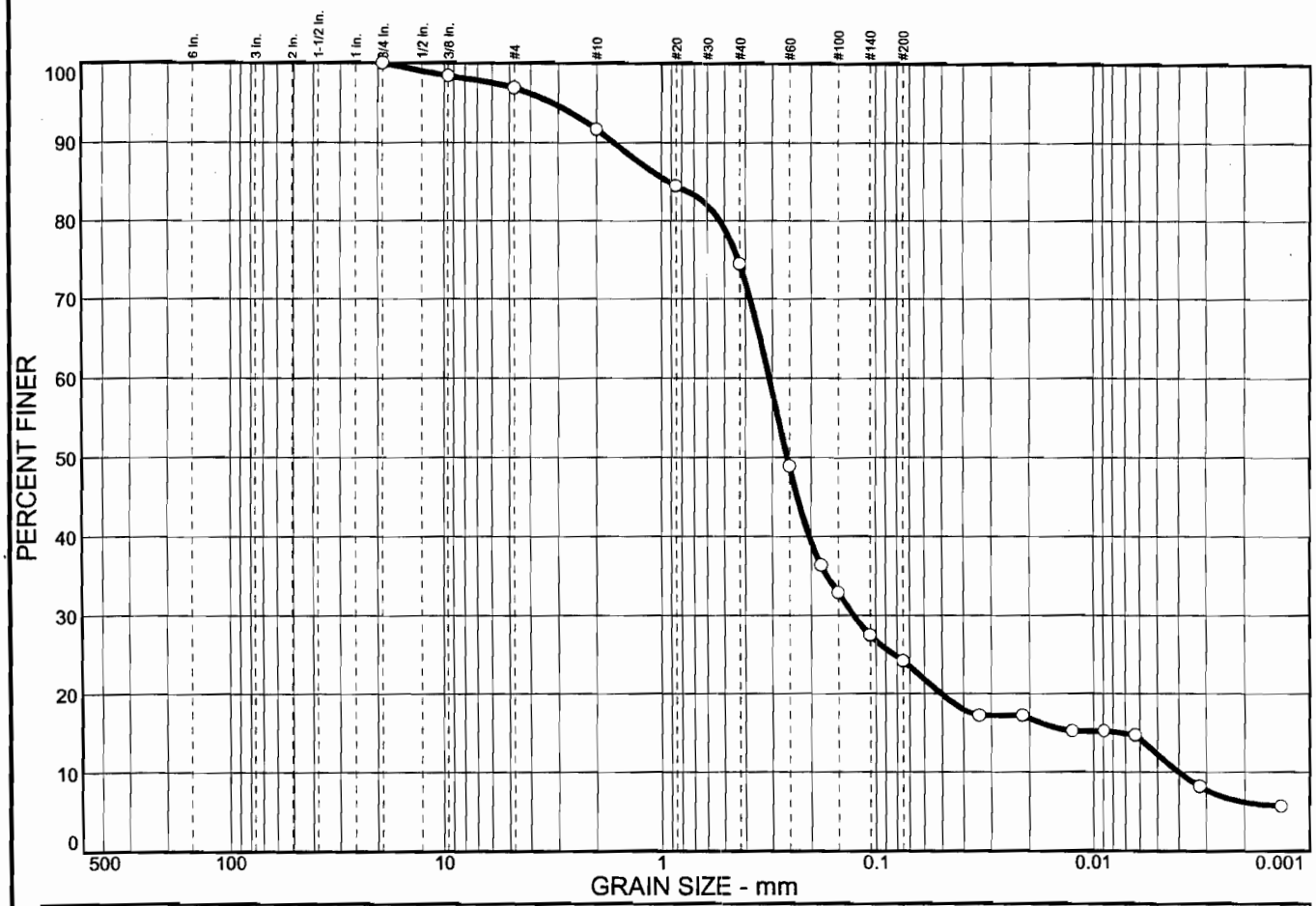
Remarks

Sample No.: 49 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 170.0'-171.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.1	72.7	11.9	12.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.4		
#4	96.9		
#10	91.7		
#20	84.5		
#40	74.5		
#60	48.9		
#80	36.4		
#100	32.9		
#140	27.5		
#200	24.2		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.919 D_{60}= 0.310 D_{50}= 0.256
D_{30}= 0.126 D_{15}= 0.0074 D_{10}= 0.0040
C_u= 77.78 C_c= 12.83

Classification

USCS= AASHTO=

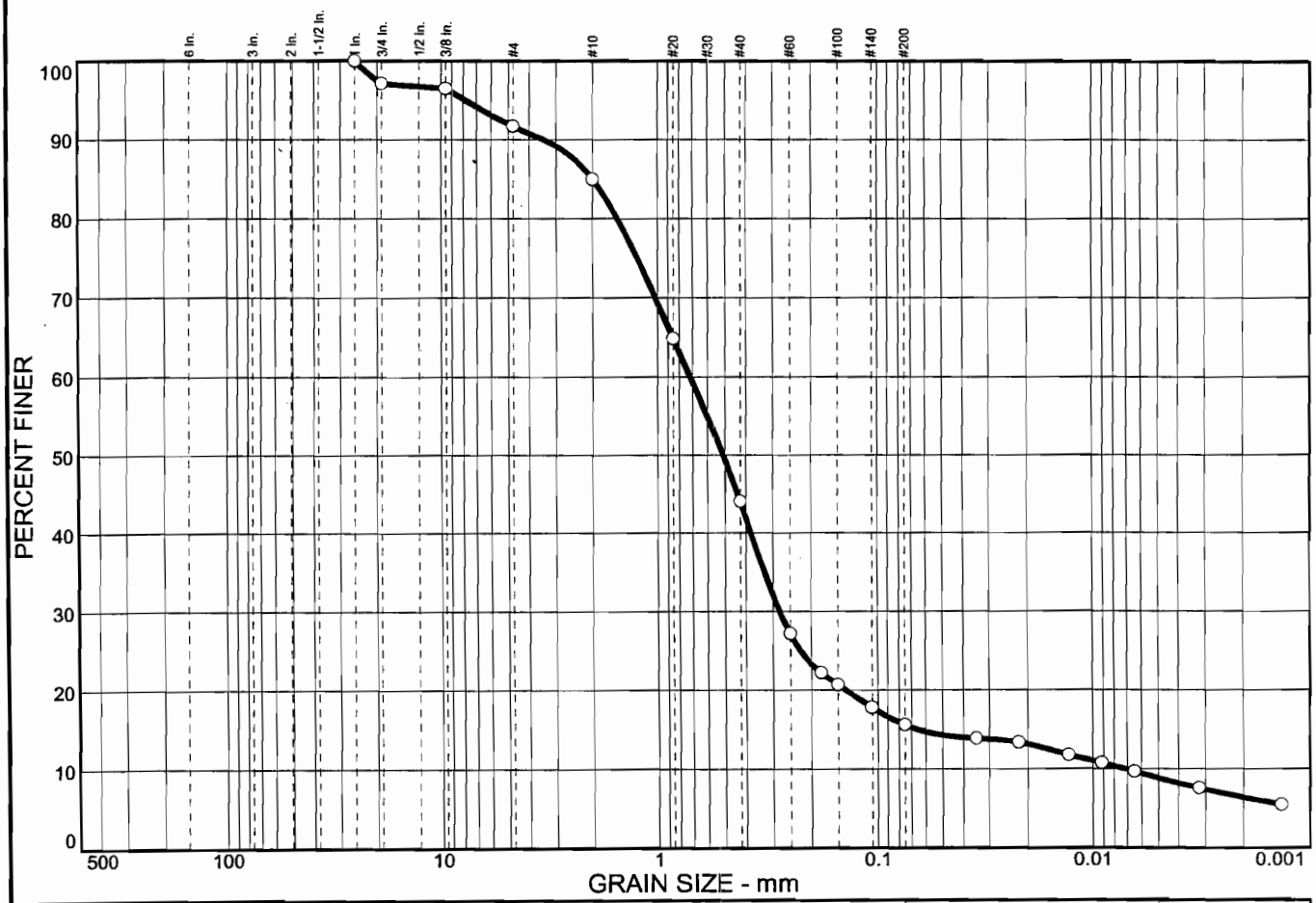
Remarks

Sample No.: 51 **Source of Sample:** C-04-21 **Date:** 07/01/05
Location: **Elev./Depth:** 190.0'-191.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.3	76.1	6.7	8.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.1		
0.375 in.	96.5		
#4	91.7		
#10	85.0		
#20	64.9		
#40	44.1		
#60	27.2		
#80	22.2		
#100	20.7		
#140	17.8		
#200	15.6		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.00 D_{60}= 0.714 D_{50}= 0.509
D_{30}= 0.279 D_{15}= 0.0649 D_{10}= 0.0071
C_u= 100.69 C_c= 15.34

Classification

USCS= AASHTO=

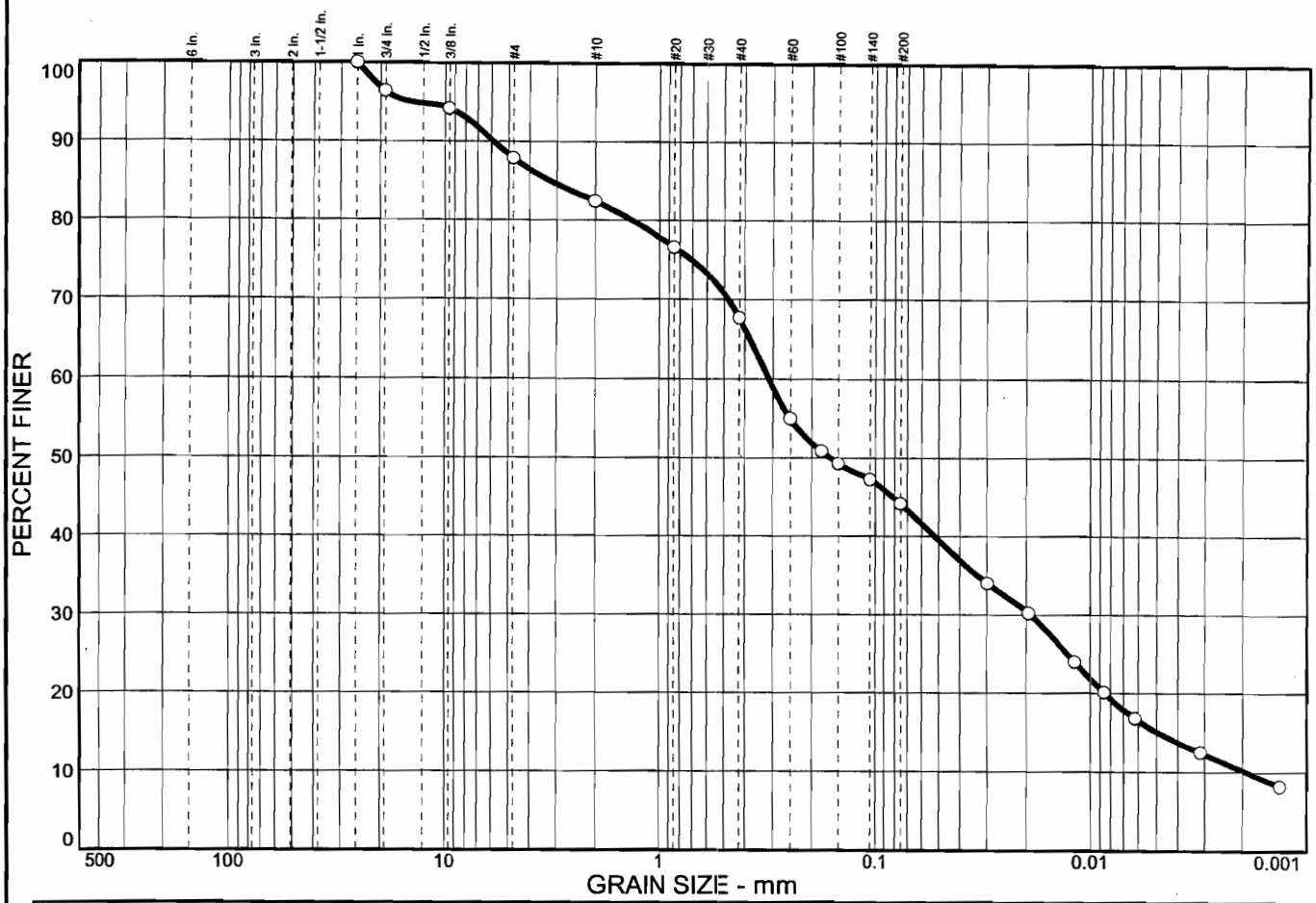
Remarks

Sample No.: 52 **Source of Sample:** C-04-21 **Date:** 07/06/05
Location: **Elev./Depth:** 200.0'-201.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.1	43.7	29.1	15.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	96.4		
.375 in.	94.2		
#4	87.9		
#10	82.4		
#20	76.6		
#40	67.7		
#60	55.0		
#80	50.9		
#100	49.3		
#140	47.3		
#200	44.2		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.21 D_{60}= 0.312 D_{50}= 0.163
D_{30}= 0.0191 D_{15}= 0.0049 D_{10}= 0.0019
C_u= 163.27 C_c= 0.61

Classification

USCS= AASHTO=

Remarks

Sample No.: 2 **Source of Sample:** C-04-22 **Date:** 7-10-05
Location: **Elev./Depth:** 0.5'-2.7'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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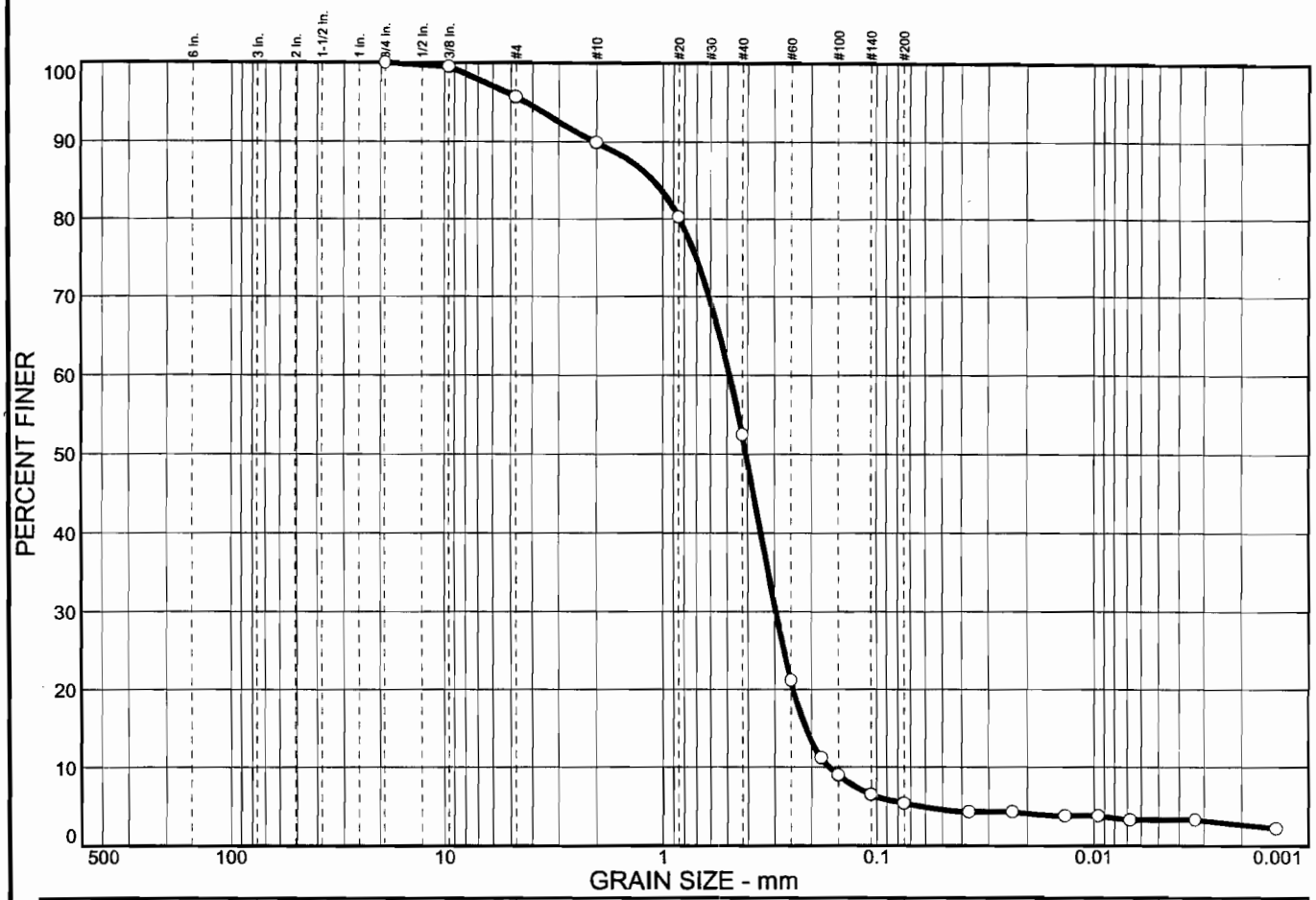
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.3	90.3	2.1	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	95.7		
#10	89.9		
#20	80.3		
#40	52.5		
#60	21.2		
#80	11.2		
#100	9.0		
#140	6.5		
#200	5.4		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.10 D_{60}= 0.488 D_{50}= 0.407
D_{30}= 0.295 D_{15}= 0.212 D_{10}= 0.165
C_u= 2.95 C_c= 1.08

Classification

USCS= AASHTO=

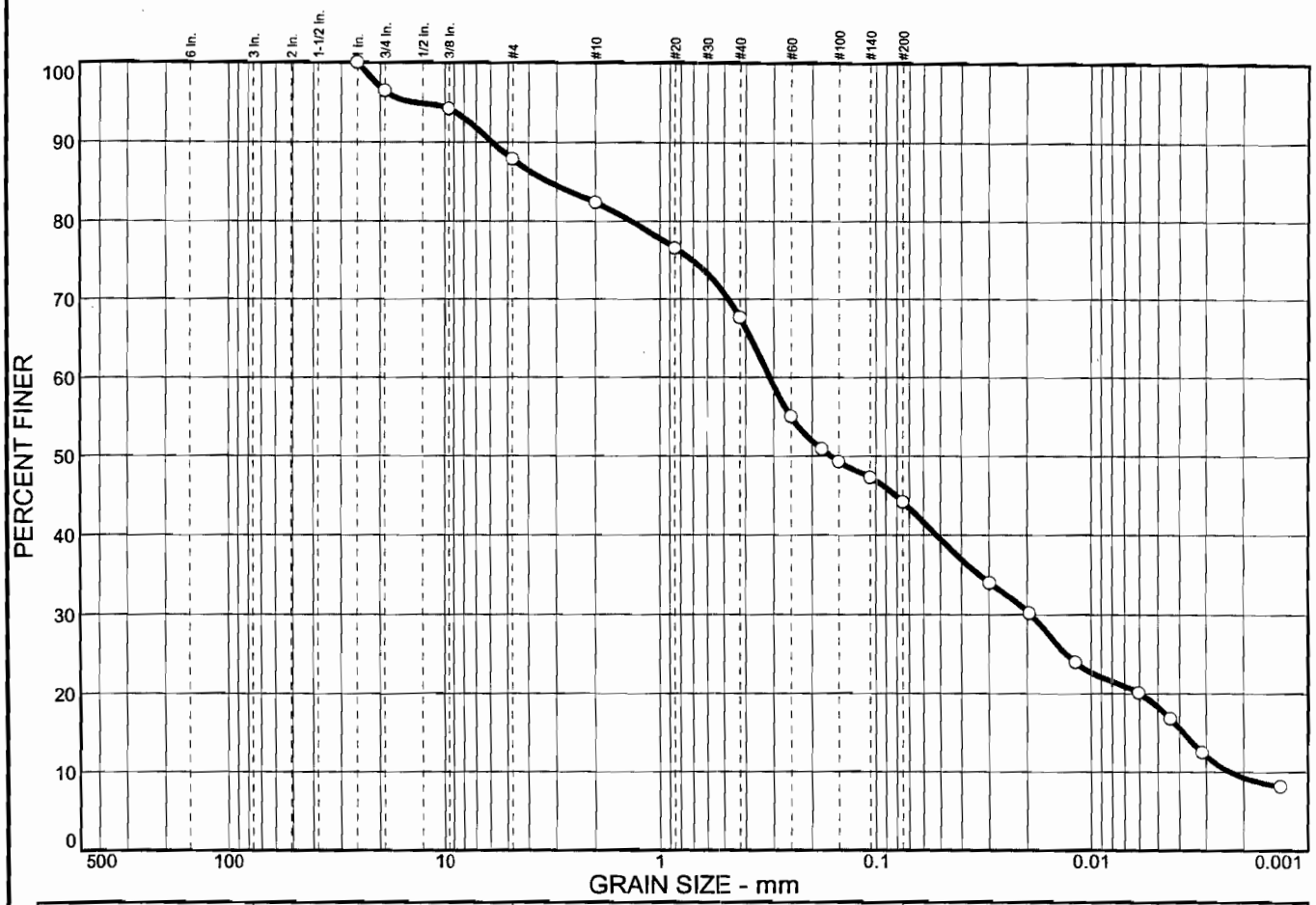
Remarks

Sample No.: 10 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 24.5'-27.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.1	43.7	25.9	18.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.4		
0.375 in.	94.2		
#4	87.9		
#10	82.4		
#20	76.6		
#40	67.7		
#60	55.0		
#80	50.9		
#100	49.3		
#140	47.3		
#200	44.2		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.21 D_{60}= 0.312 D_{50}= 0.163
D_{30}= 0.0191 D_{15}= 0.0038 D_{10}= 0.0023
C_u= 136.00 C_c= 0.51

Classification

USCS= AASHTO=

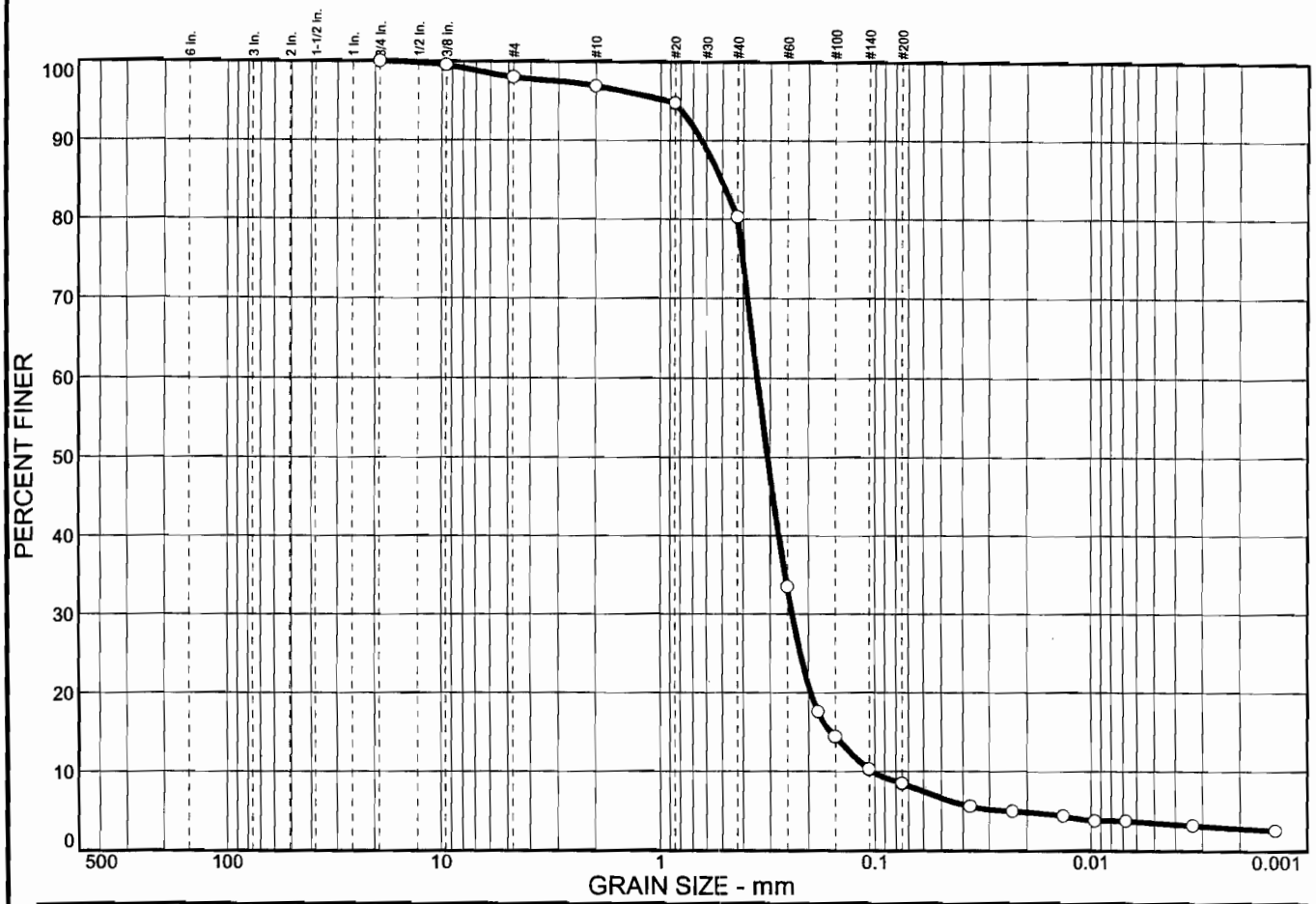
Remarks

Sample No.: 12 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 30.5'-33.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.0	89.5	5.0	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	98.0		
#10	96.9		
#20	94.8		
#40	80.3		
#60	33.5		
#80	17.6		
#100	14.4		
#140	10.3		
#200	8.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.505 D_{60}= 0.343 D_{50}= 0.308
D_{30}= 0.237 D_{15}= 0.157 D_{10}= 0.102
C_u= 3.36 C_c= 1.61

Classification

USCS= AASHTO=

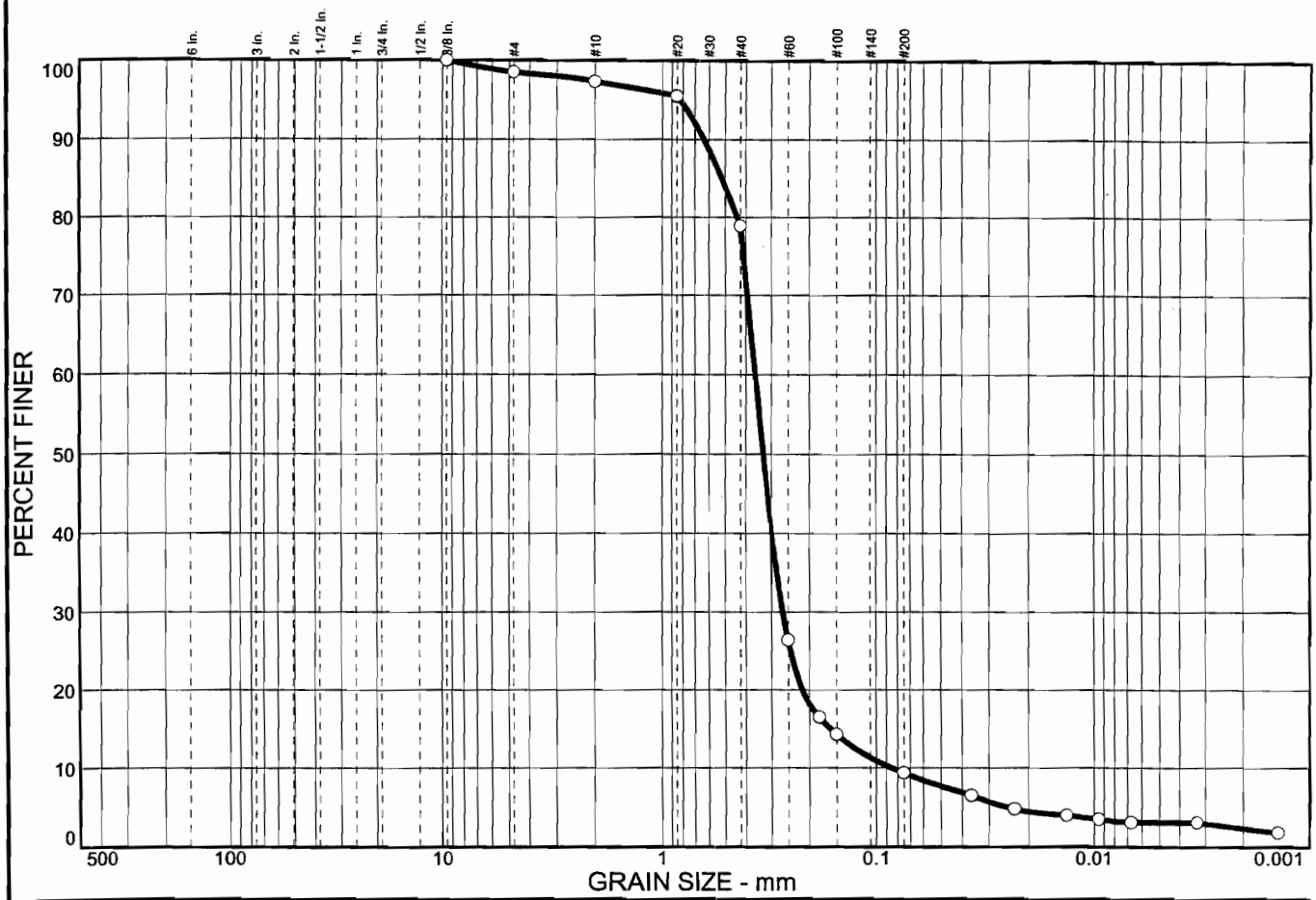
Remarks

Sample No.: 16 **Source of Sample:** C-04-22 **Date:** 07/05/05
Location: **Elev./Depth:** 42.5'-45.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.5	89.1	6.3	3.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.5		
#10	97.3		
#20	95.5		
#40	78.9		
#60	26.4		
#80	16.5		
#100	14.3		
#200	9.4		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.518 D_{60}= 0.361 D_{50}= 0.330
D_{30}= 0.264 D_{15}= 0.160 D_{10}= 0.0847
C_u= 4.26 C_c= 2.28

Classification

USCS= AASHTO=

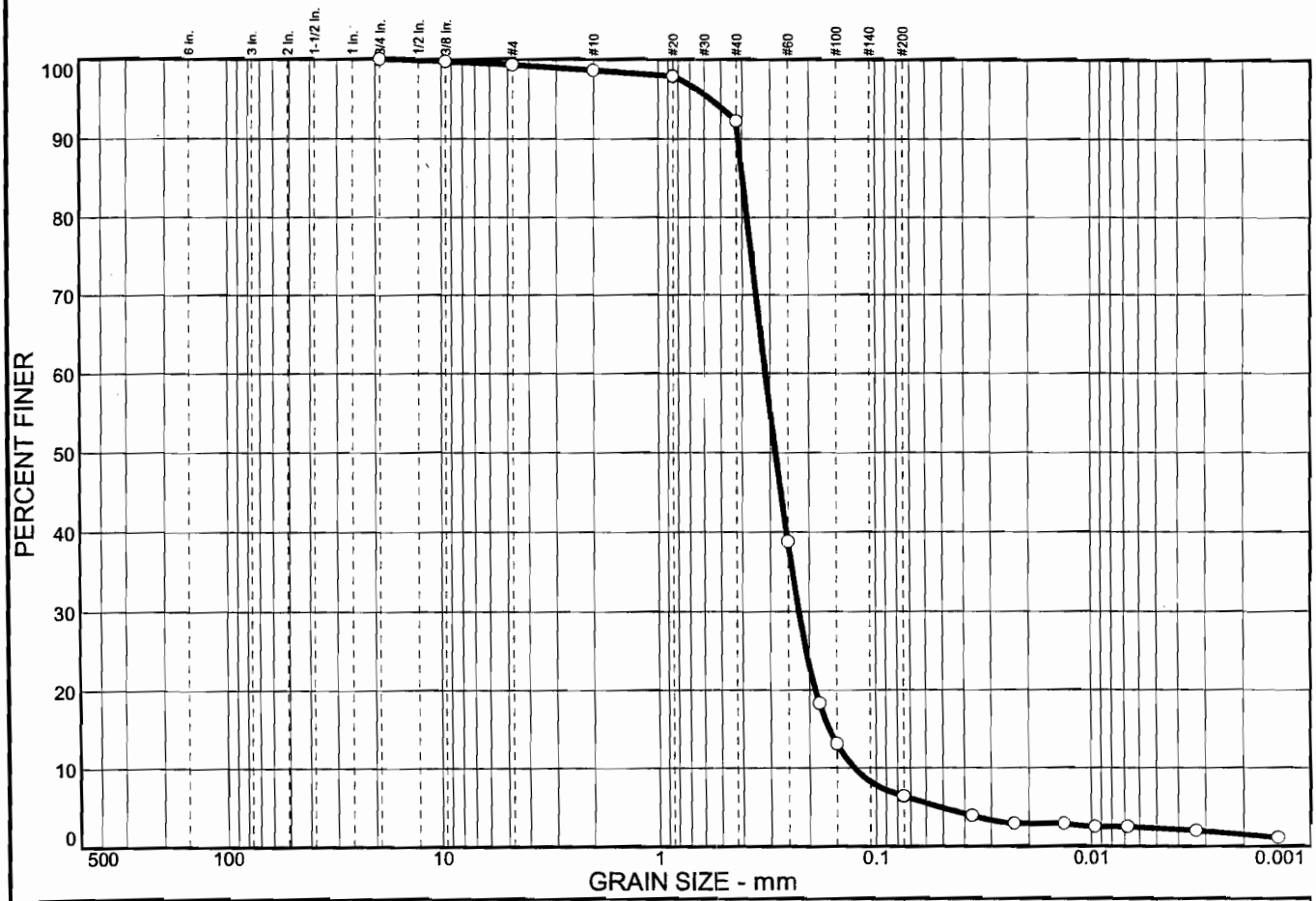
Remarks

Sample No.: 20 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 54.5'-57.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	92.9	4.1	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.7		
#4	99.3		
#10	98.6		
#20	97.9		
#40	92.3		
#60	38.8		
#80	18.3		
#100	13.1		
#200	6.4		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.397 D_{60}= 0.314 D_{50}= 0.284
D_{30}= 0.223 D_{15}= 0.163 D_{10}= 0.125
C_u= 2.52 C_c= 1.27

Classification

USCS= AASHTO=

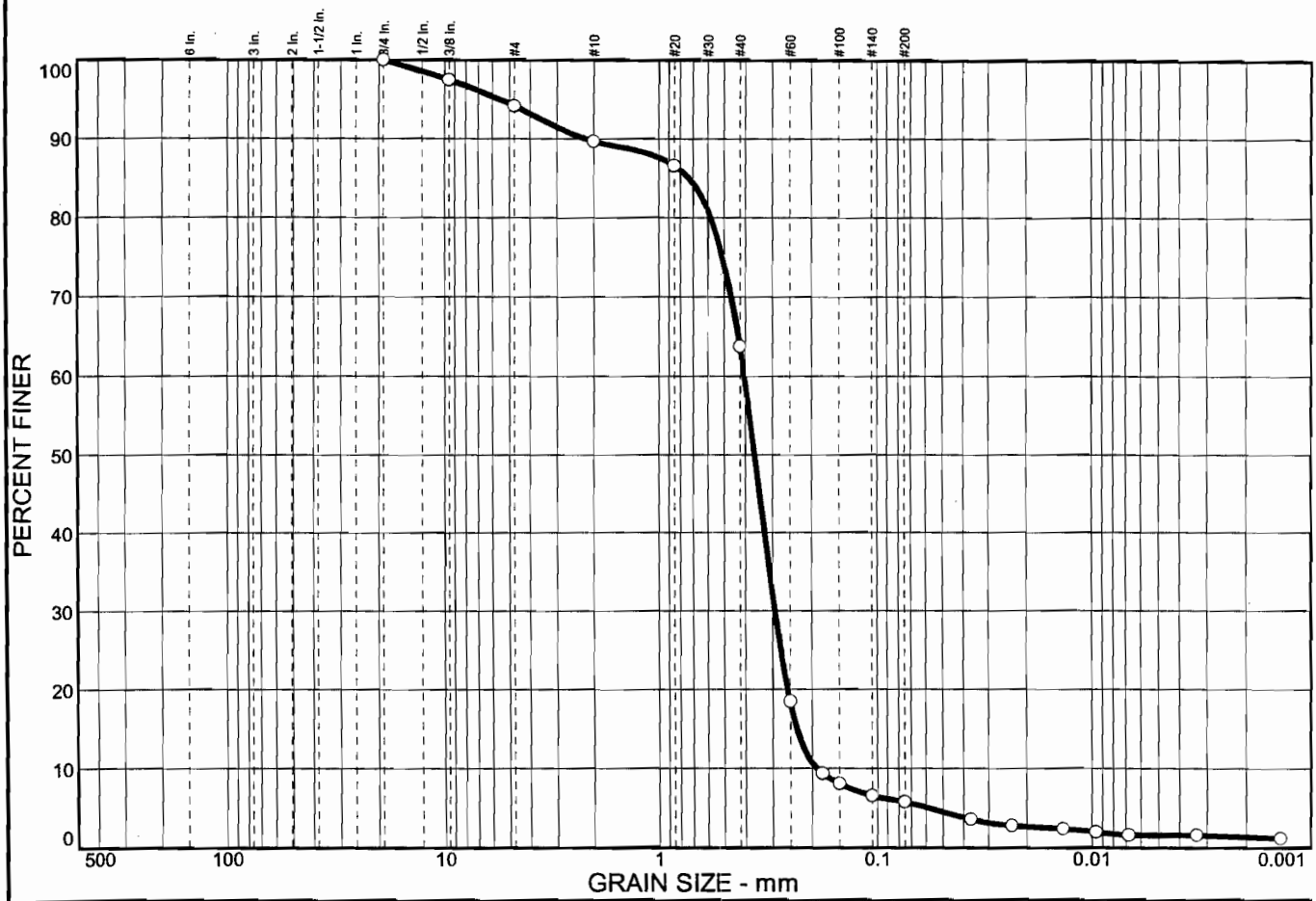
Remarks

Sample No.: 24 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 66.5'-69.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.8	88.4	4.2	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.5		
#4	94.2		
#10	89.7		
#20	86.6		
#40	63.8		
#60	18.5		
#80	9.4		
#100	8.1		
#140	6.6		
#200	5.8		

* (no specification provided)

Soil Description

Light brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.728 D_{60}= 0.405 D_{50}= 0.362
D_{30}= 0.292 D_{15}= 0.233 D_{10}= 0.190
C_u= 2.13 C_c= 1.11

Classification

USCS= AASHTO=

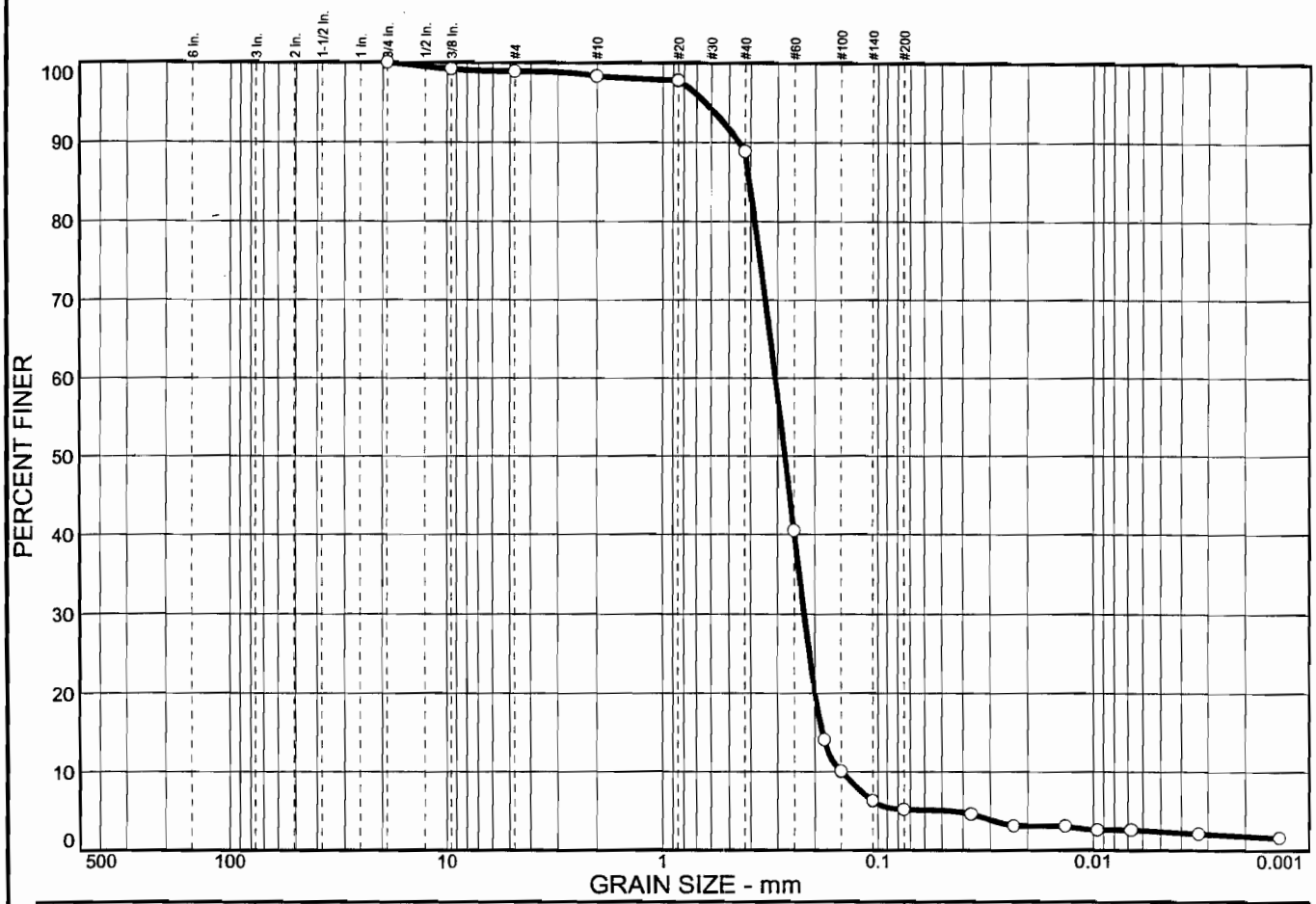
Remarks

Sample No.: 28 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 78.5'-81.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	93.7	2.8	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.2		
#4	98.9		
#10	98.3		
#20	97.8		
#40	88.9		
#60	40.5		
#80	14.1		
#100	10.1		
#140	6.3		
#200	5.2		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.406 D_{60}= 0.307 D_{50}= 0.276
D_{30}= 0.224 D_{15}= 0.184 D_{10}= 0.149
C_u= 2.07 C_c= 1.10

Classification

USCS= AASHTO=

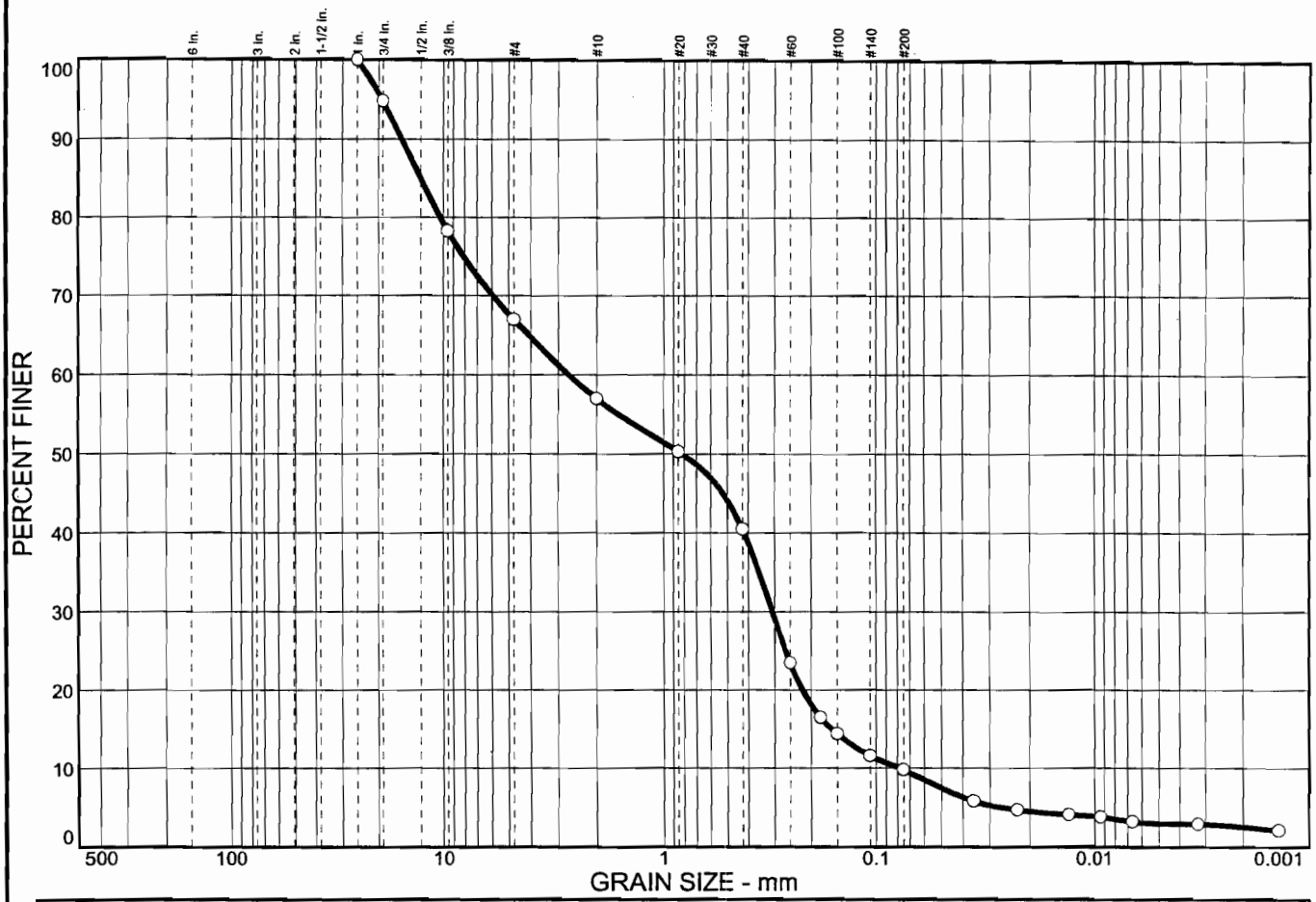
Remarks

Sample No.: 32 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 90.5'-93.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.0	57.2	6.8	3.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	94.8		
0.375 in.	78.3		
#4	67.0		
#10	57.0		
#20	50.3		
#40	40.5		
#60	23.5		
#80	16.5		
#100	14.4		
#140	11.6		
#200	9.8		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.6 D_{60}= 2.68 D_{50}= 0.817
D_{30}= 0.306 D_{15}= 0.159 D_{10}= 0.0780
C_u= 34.35 C_c= 0.45

Classification

USCS= AASHTO=

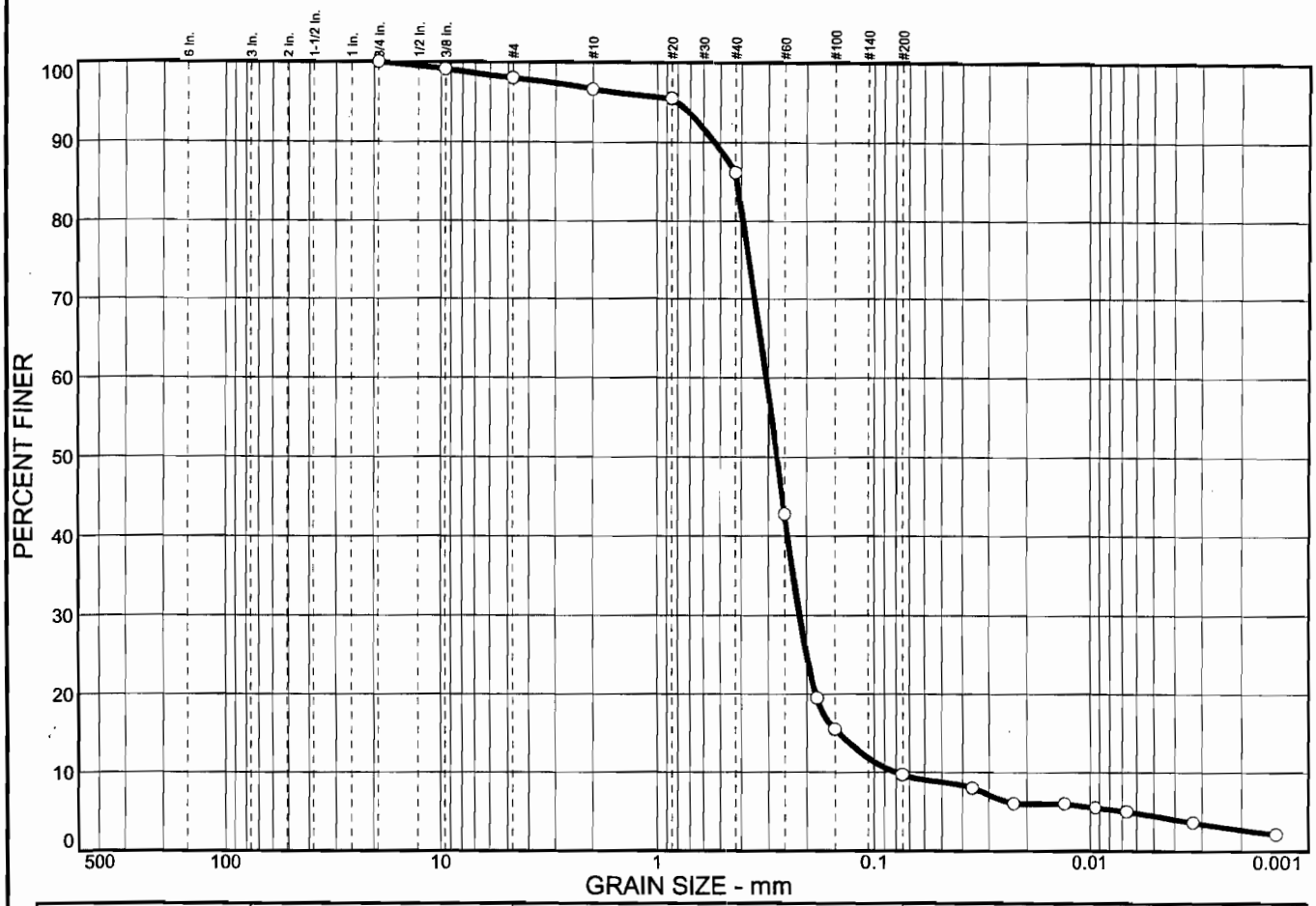
Remarks

Sample No.: 34 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 96.5'-99.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.0	88.3	5.2	4.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.1		
#4	98.0		
#10	96.6		
#20	95.5		
#40	86.2		
#60	42.8		
#80	19.5		
#100	15.5		
#200	9.7		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.419 D_{60}= 0.307 D_{50}= 0.272
D_{30}= 0.214 D_{15}= 0.144 D_{10}= 0.0803
C_u= 3.82 C_c= 1.86

Classification

USCS= AASHTO=

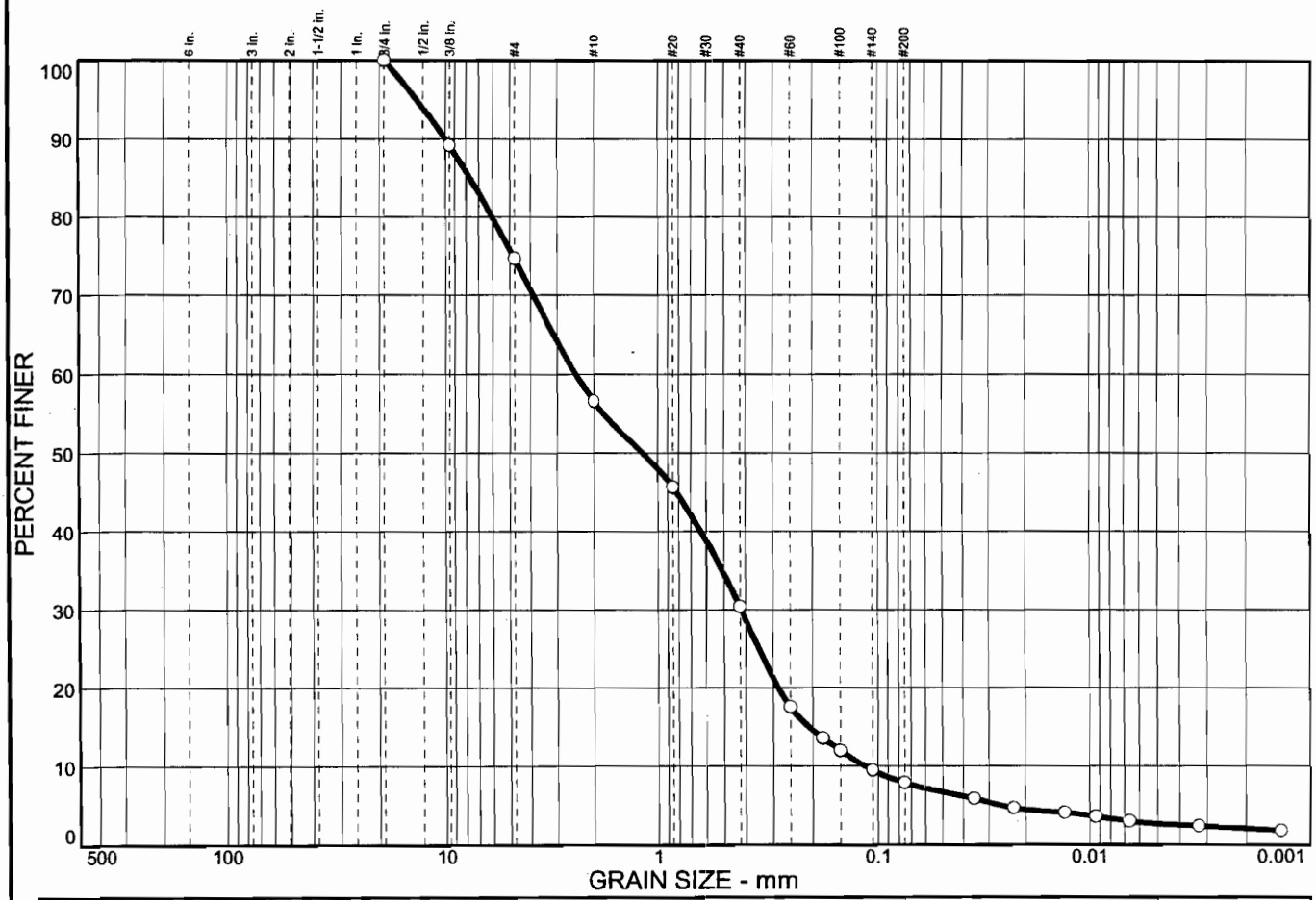
Remarks

Sample No.: 36 **Source of Sample:** C-04-22 **Date:** 07/01/05
Location: **Elev./Depth:** 101.0'-104.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.3	66.8	5.2	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	89.2		
#4	74.7		
#10	56.6		
#20	45.7		
#40	30.4		
#60	17.6		
#80	13.6		
#100	12.0		
#140	9.5		
#200	7.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.64 D_{60}= 2.43 D_{50}= 1.17
D_{30}= 0.419 D_{15}= 0.207 D_{10}= 0.115
C_u= 21.19 C_c= 0.63

Classification

USCS= AASHTO=

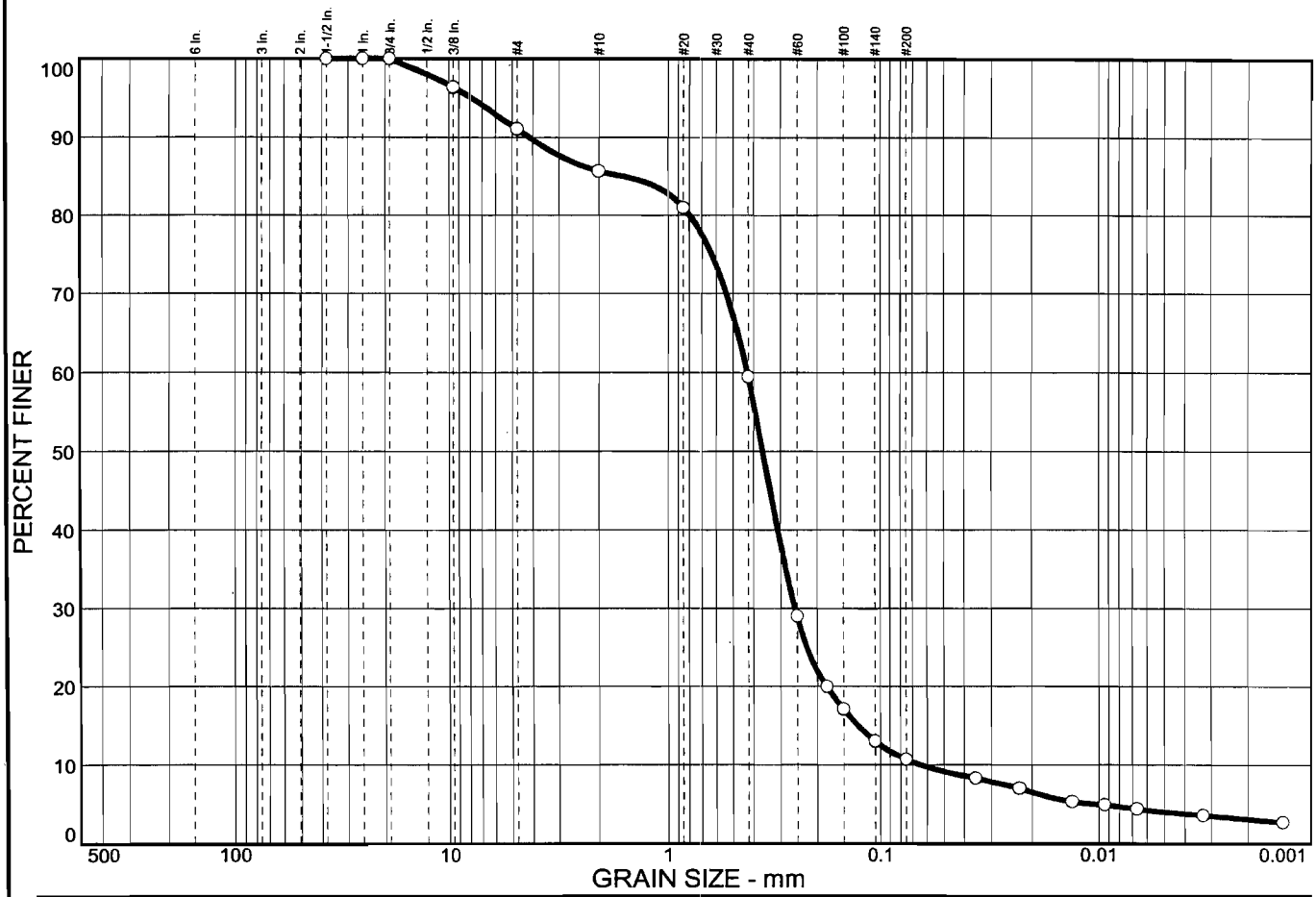
Remarks

Sample No.: 39 **Source of Sample:** C-04-22 **Date:** 7-9-05
Location: **Elev./Depth:** 110.0'-113.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.9	80.4	6.7	4.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	100.0		
.75 in.	100.0		
.375 in.	96.4		
#4	91.1		
#10	85.7		
#20	81.0		
#40	59.5		
#60	29.0		
#80	20.0		
#100	17.1		
#140	13.0		
#200	10.7		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.55 D_{60}= 0.429 D_{50}= 0.362
D_{30}= 0.256 D_{15}= 0.128 D_{10}= 0.0638
C_u= 6.72 C_c= 2.39

Classification

USCS= AASHTO=

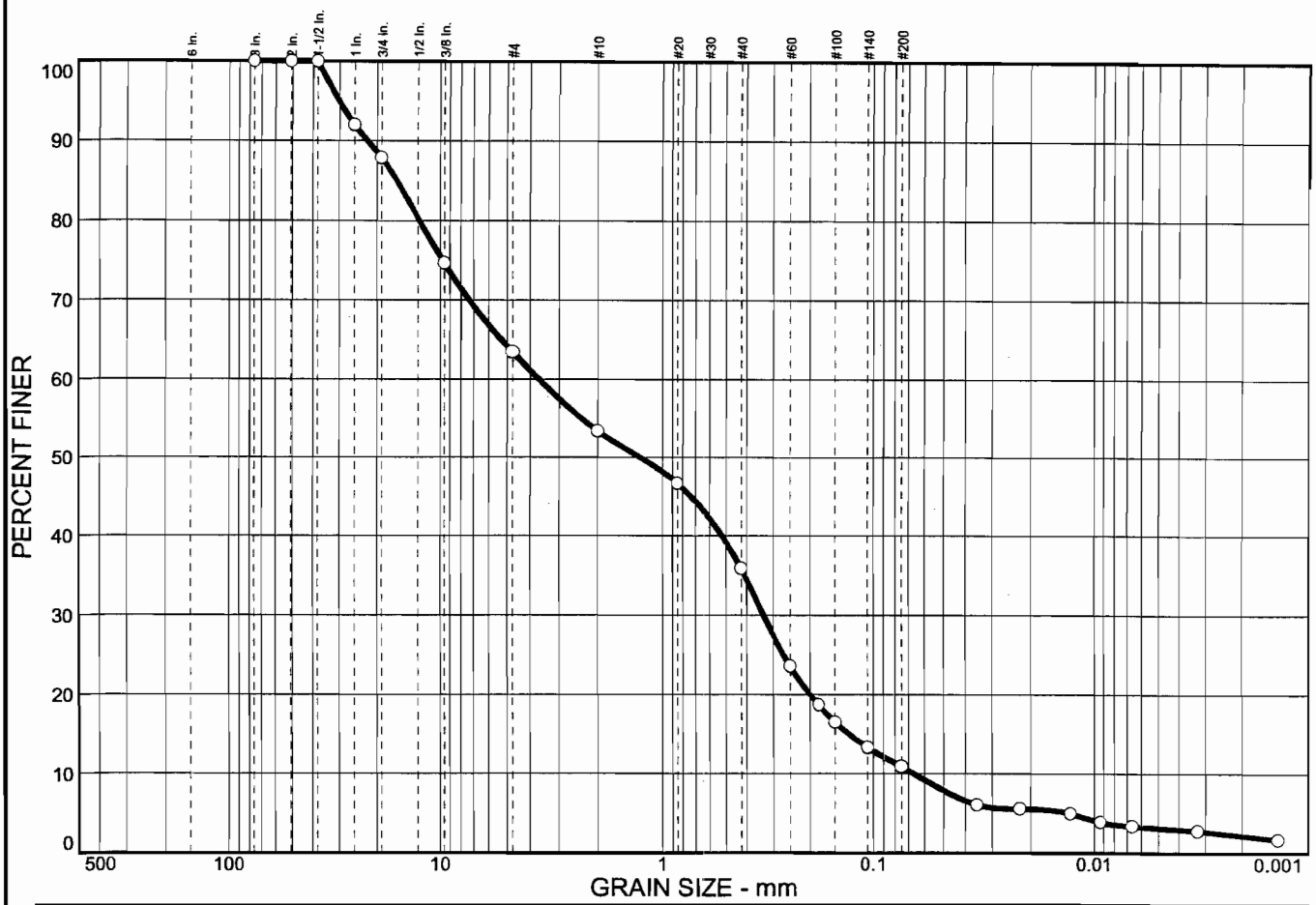
Remarks

Sample No.: 42 **Source of Sample:** C-04-22 **Date:** 7-9-05
Location: **Elev./Depth:** 119.0'-122.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	36.5	52.6	7.7	3.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.00 in.	100.0		
2.00 in.	100.0		
1.50 in.	100.0		
1.0 in.	92.0		
.75 in.	87.9		
.375 in.	74.7		
#4	63.5		
#10	53.4		
#20	46.7		
#40	35.9		
#60	23.6		
#80	18.7		
#100	16.5		
#140	13.3		
#200	10.9		

* (no specification provided)

Soil Description

Brown to gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.0 D_{60}= 3.66 D_{50}= 1.27
D_{30}= 0.332 D_{15}= 0.130 D_{10}= 0.0663
C_u= 55.27 C_c= 0.46

Classification

USCS= AASHTO=

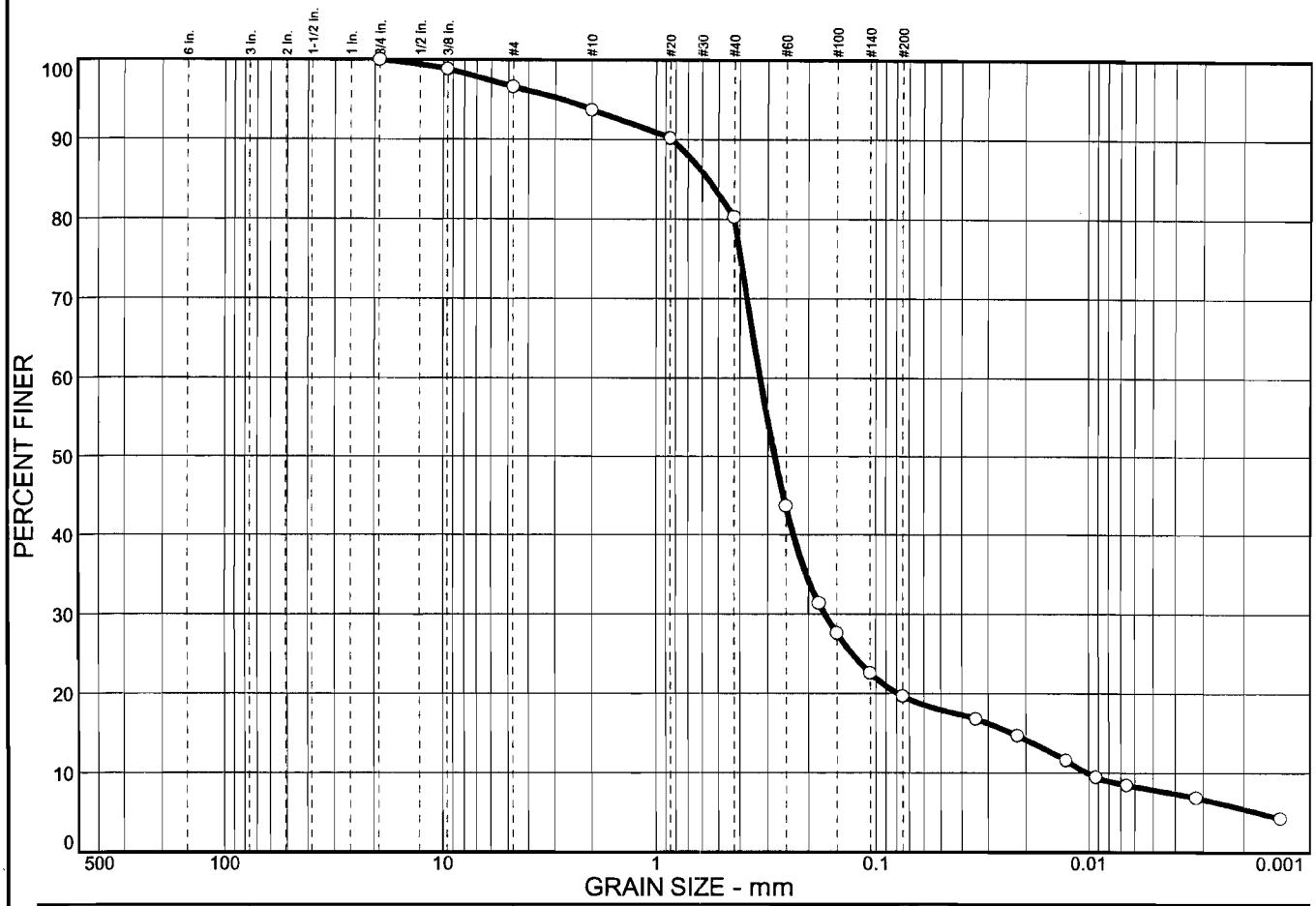
Remarks

Sample No.: 46 **Source of Sample:** C-04-22 **Date:** 7-8-05
Location: **Elev./Depth:** 140.0'-141.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.4	76.9	11.8	7.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	98.8		
#4	96.6		
#10	93.7		
#20	90.2		
#40	80.3		
#60	43.7		
#80	31.4		
#100	27.6		
#140	22.6		
#200	19.7		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.560 D_{60}= 0.324 D_{50}= 0.279
D_{30}= 0.170 D_{15}= 0.0232 D_{10}= 0.0101
C_u= 32.04 C_c= 8.77

Classification

USCS= AASHTO=

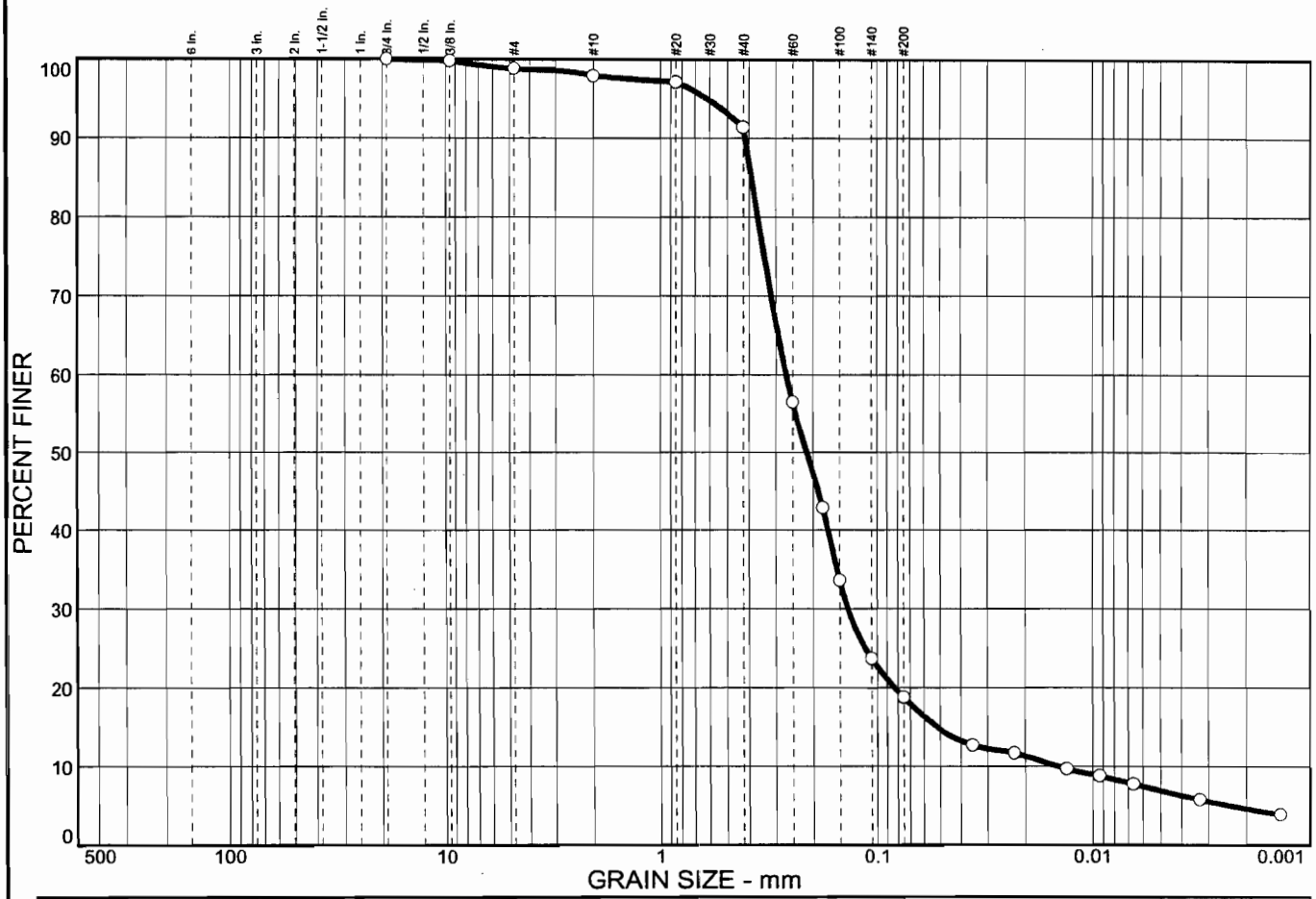
Remarks

Sample No.: 48 **Source of Sample:** C-04-22 **Date:** 7-9-05
Location: **Elev./Depth:** 160.0'-161.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	80.0	11.8	7.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.8		
#4	98.8		
#10	97.9		
#20	97.1		
#40	91.4		
#60	56.5		
#80	42.9		
#100	33.6		
#140	23.7		
#200	18.8		

* (no specification provided)

Soil Description

Dark gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.390 D_{60}= 0.268 D_{50}= 0.214
D_{30}= 0.137 D_{15}= 0.0516 D_{10}= 0.0142
C_u= 18.81 C_c= 4.93

Classification

USCS= AASHTO=

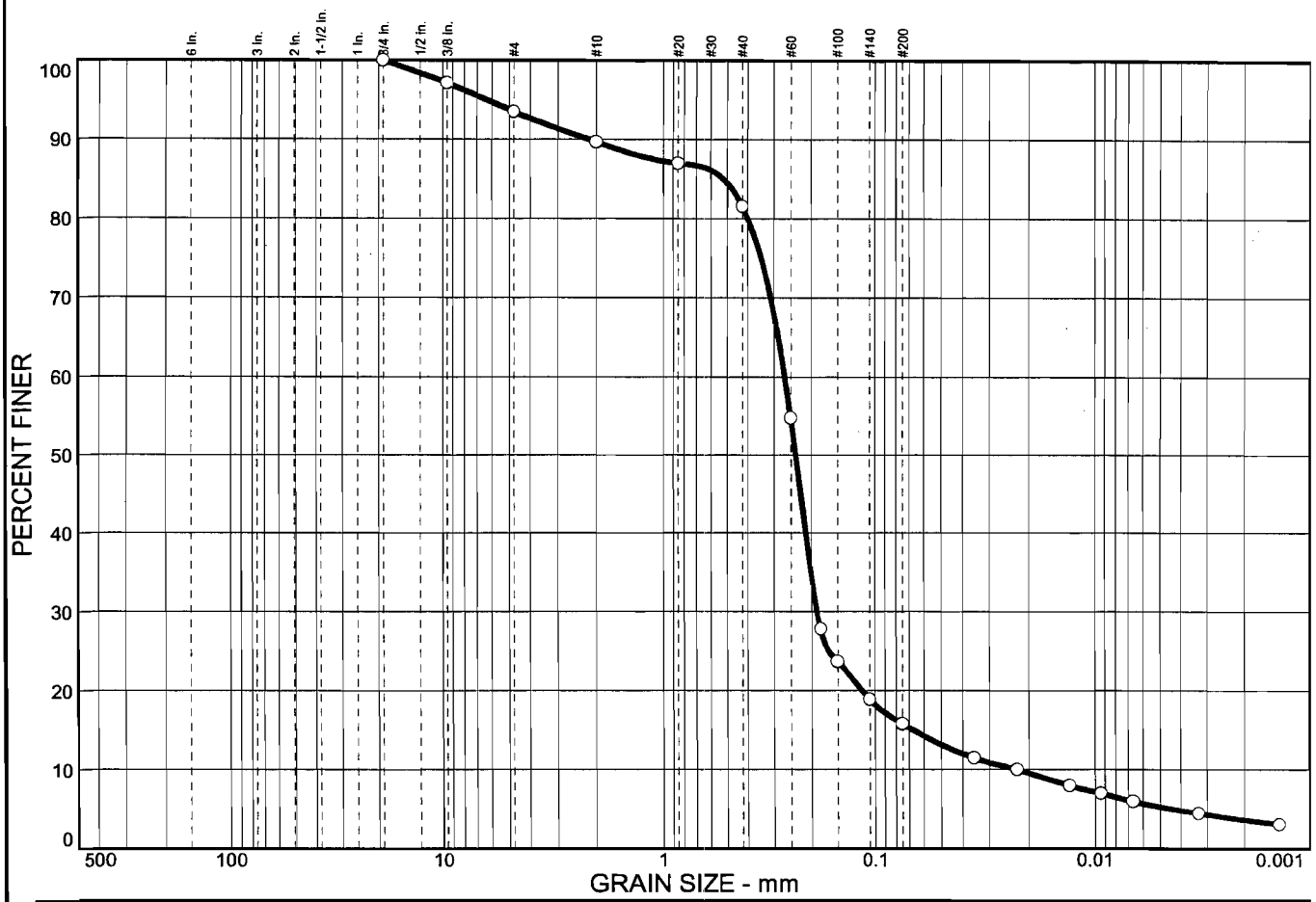
Remarks

Sample No.: 50 **Source of Sample:** C-04-22 **Date:** 07/05/05
Location: **Elev./Depth:** 180.0'-181.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.5	77.7	10.5	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.1		
#4	93.5		
#10	89.7		
#20	87.0		
#40	81.6		
#60	54.8		
#80	27.8		
#100	23.7		
#140	18.9		
#200	15.8		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.519 D_{60}= 0.267 D_{50}= 0.237
D_{30}= 0.187 D_{15}= 0.0668 D_{10}= 0.0226
C_u= 11.82 C_c= 5.84

Classification

USCS= AASHTO=

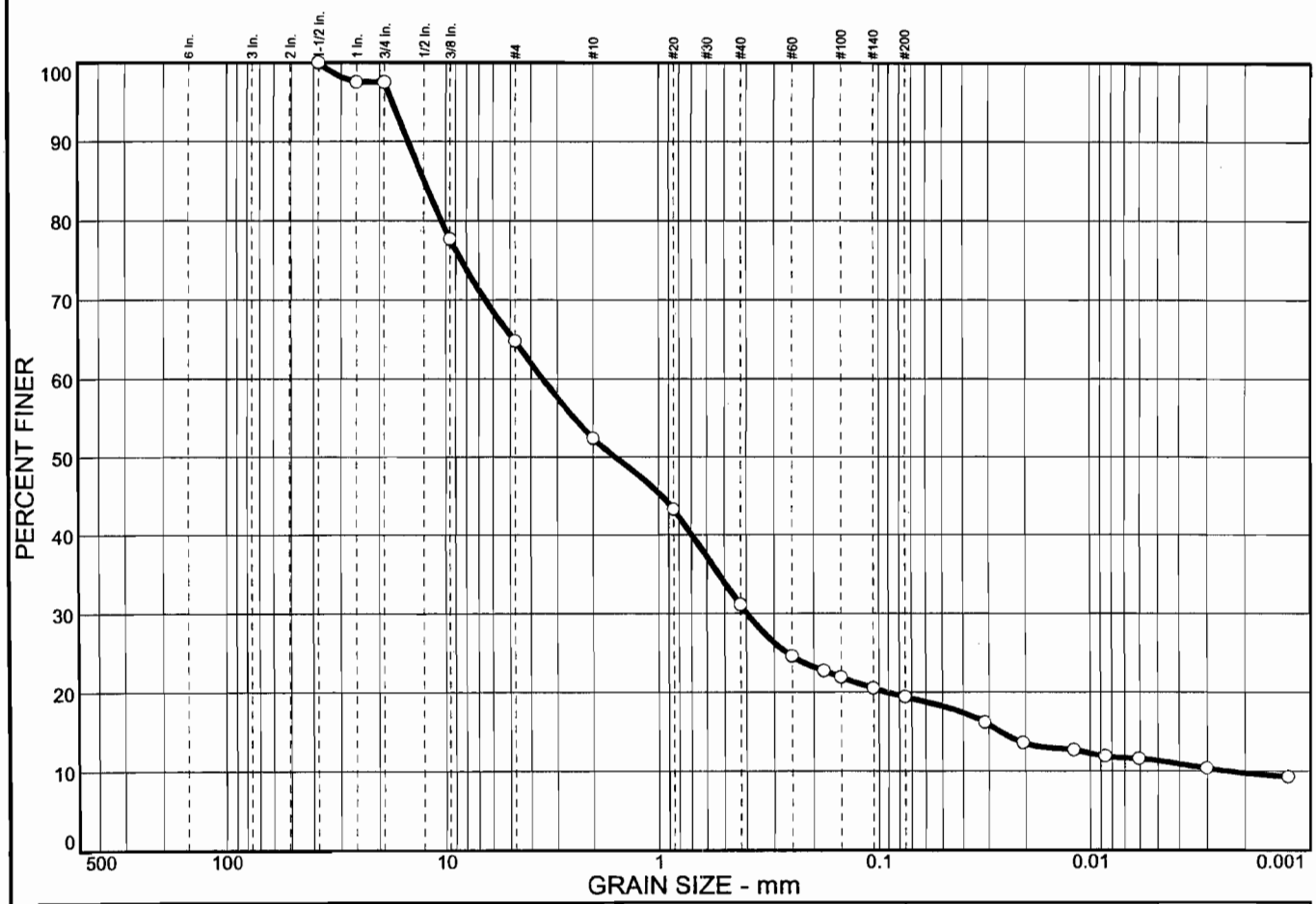
Remarks

Sample No.: 51 **Source of Sample:** C-04-22 **Date:** 07/05/05
Location: **Elev./Depth:** 190.0'-191.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	35.2	45.4	8.0	11.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	97.5		
0.75 in.	97.5		
0.375 in.	77.7		
#4	64.8		
#10	52.4		
#20	43.3		
#40	31.1		
#60	24.6		
#80	22.7		
#100	21.9		
#140	20.5		
#200	19.4		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.6 D_{60}= 3.50 D_{50}= 1.57
D_{30}= 0.397 D_{15}= 0.0262 D_{10}= 0.0023
C_u= 1493.28 C_c= 19.12

Classification

USCS= AASHTO=

Remarks

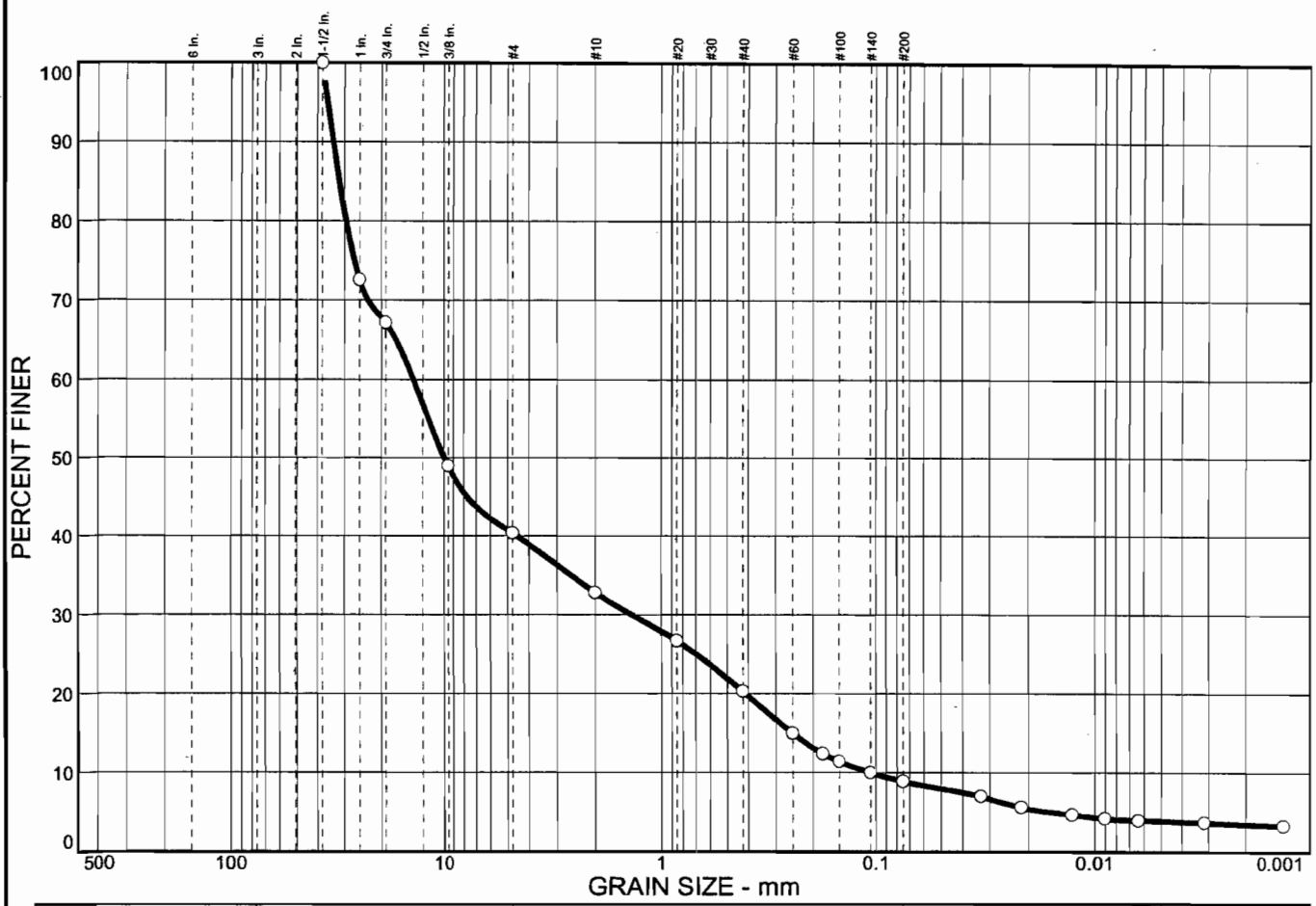
Zero retained on the 3/4 inch sieve.

Sample No.: 2 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 0.5'-3.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	59.6	31.5	5.0	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	72.6		
0.75 in.	67.2		
0.375 in.	49.0		
#4	40.4		
#10	32.8		
#20	26.7		
#40	20.3		
#60	15.0		
#80	12.4		
#100	11.4		
#140	10.0		
#200	8.9		

* (no specification provided)

Soil Description

Brown well graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 31.6 D_{60}= 14.0 D_{50}= 9.93
D_{30}= 1.36 D_{15}= 0.250 D_{10}= 0.106
C_u= 132.27 C_c= 1.24

Classification

USCS= AASHTO=

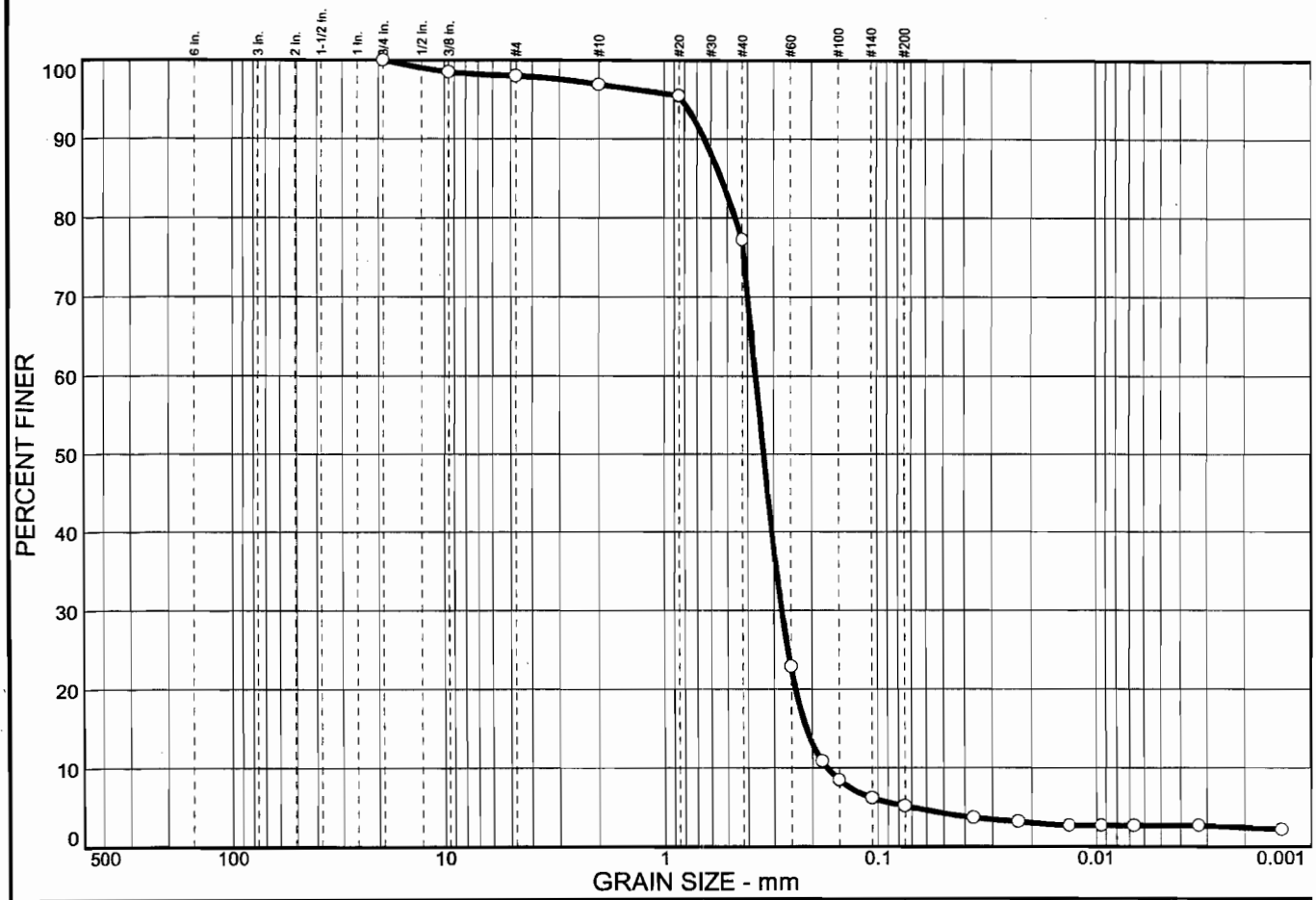
Remarks

Sample No.: 3 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 3.0'-6.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.0	92.8	2.5	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.5		
#4	98.0		
#10	96.9		
#20	95.5		
#40	77.3		
#60	22.9		
#80	10.9		
#100	8.5		
#140	6.2		
#200	5.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.534 D_{60}= 0.367 D_{50}= 0.336
D_{30}= 0.275 D_{15}= 0.212 D_{10}= 0.170
C_u= 2.16 C_c= 1.21

Classification

USCS= AASHTO=

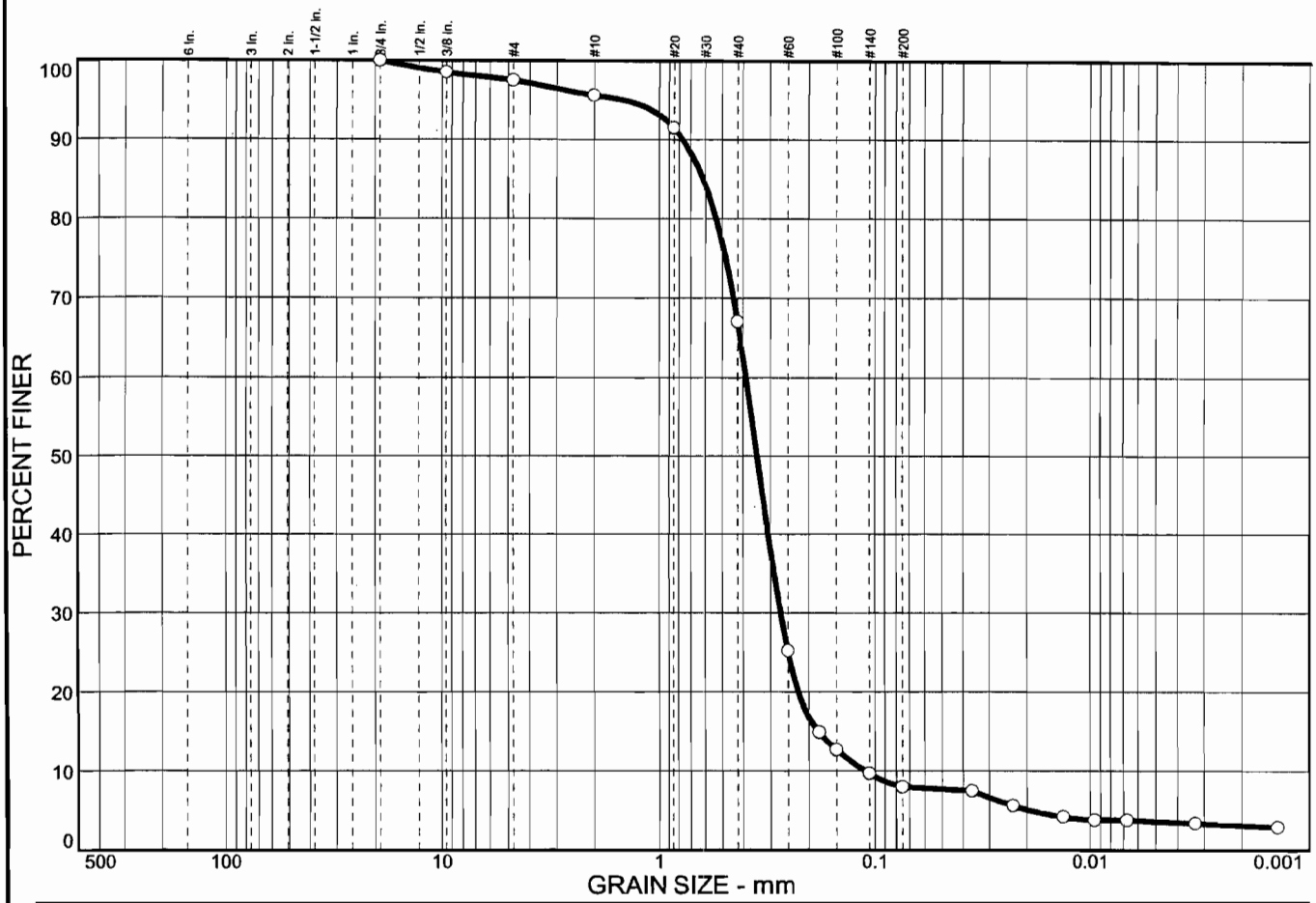
Remarks

Sample No.: 12 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 27.0'-30.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.5	89.5	4.4	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.5		
#4	97.5		
#10	95.6		
#20	91.5		
#40	67.1		
#60	25.2		
#80	14.9		
#100	12.7		
#140	9.7		
#200	8.0		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.612 D_{60}= 0.388 D_{50}= 0.345
D_{30}= 0.270 D_{15}= 0.181 D_{10}= 0.111
C_u= 3.51 C_c= 1.70

Classification

USCS= AASHTO=

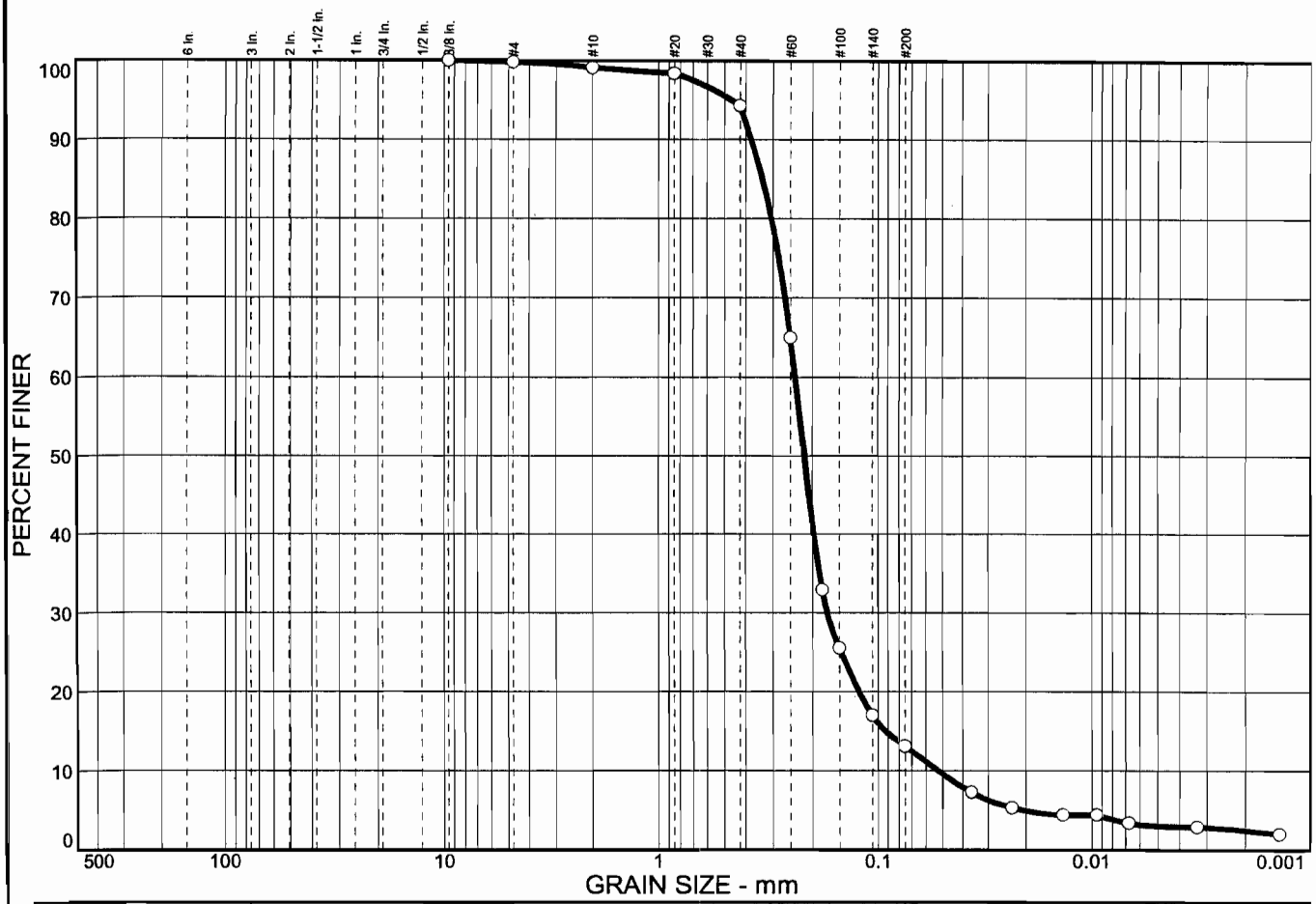
Remarks

Sample No.: 16 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 39.0'-42.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	86.7	10.1	3.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.1		
#20	98.4		
#40	94.3		
#60	65.0		
#80	32.9		
#100	25.5		
#140	17.0		
#200	13.1		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.335 D_{60}= 0.238 D_{50}= 0.217
D_{30}= 0.171 D_{15}= 0.0921 D_{10}= 0.0521
C_u= 4.57 C_c= 2.36

Classification

USCS= AASHTO=

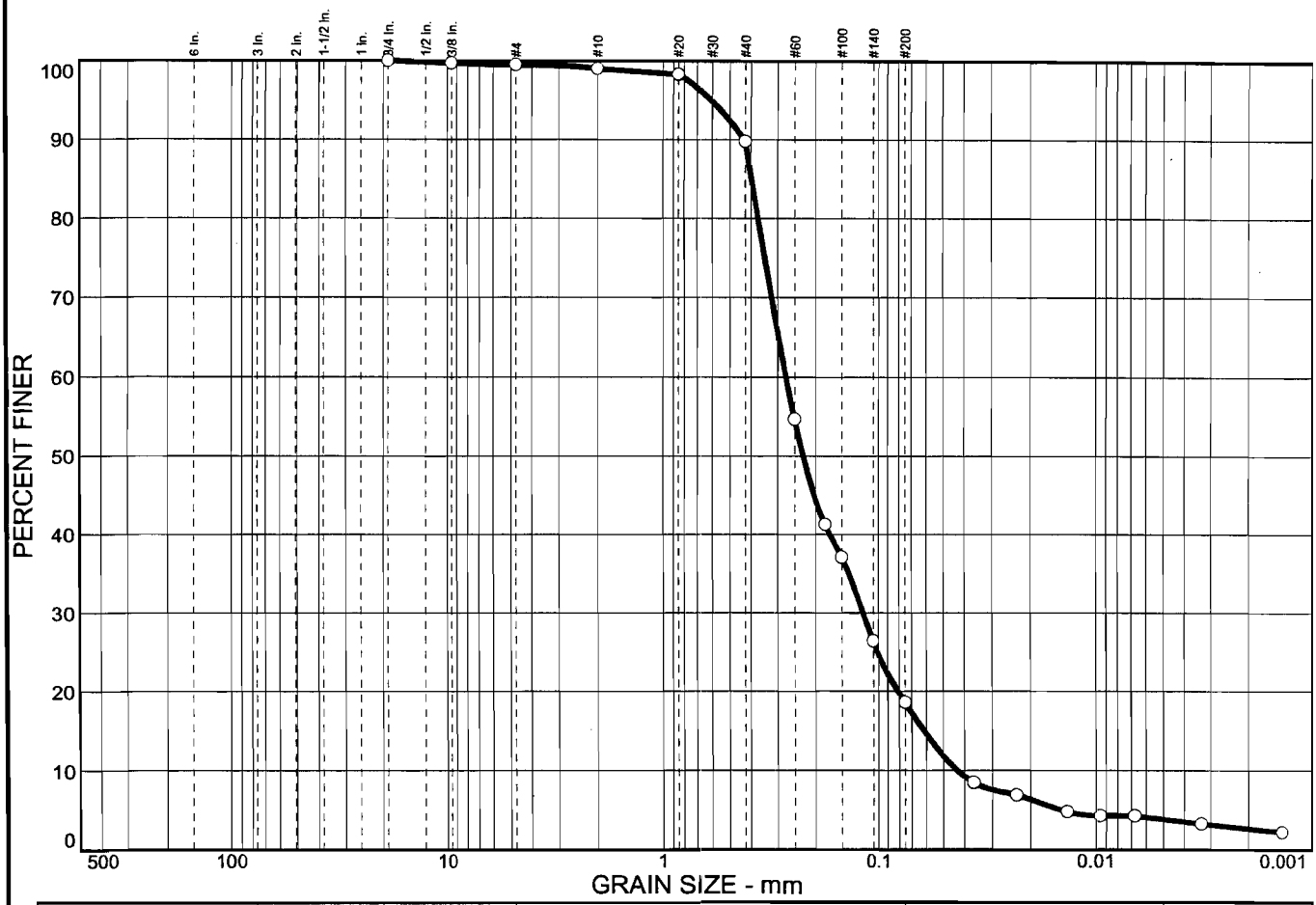
Remarks

Sample No.: 20 **Source of Sample:** C-04-23 **Date:**
Location: **Elev./Depth:** 51.0'-54.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	80.9	14.7	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.7		
#4	99.5		
#10	99.0		
#20	98.3		
#40	89.8		
#60	54.7		
#80	41.3		
#100	37.1		
#140	26.4		
#200	18.6		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.397 D_{60}= 0.274 D_{50}= 0.228
D_{30}= 0.119 D_{15}= 0.0613 D_{10}= 0.0429
C_u= 6.39 C_c= 1.20

Classification

USCS= AASHTO=

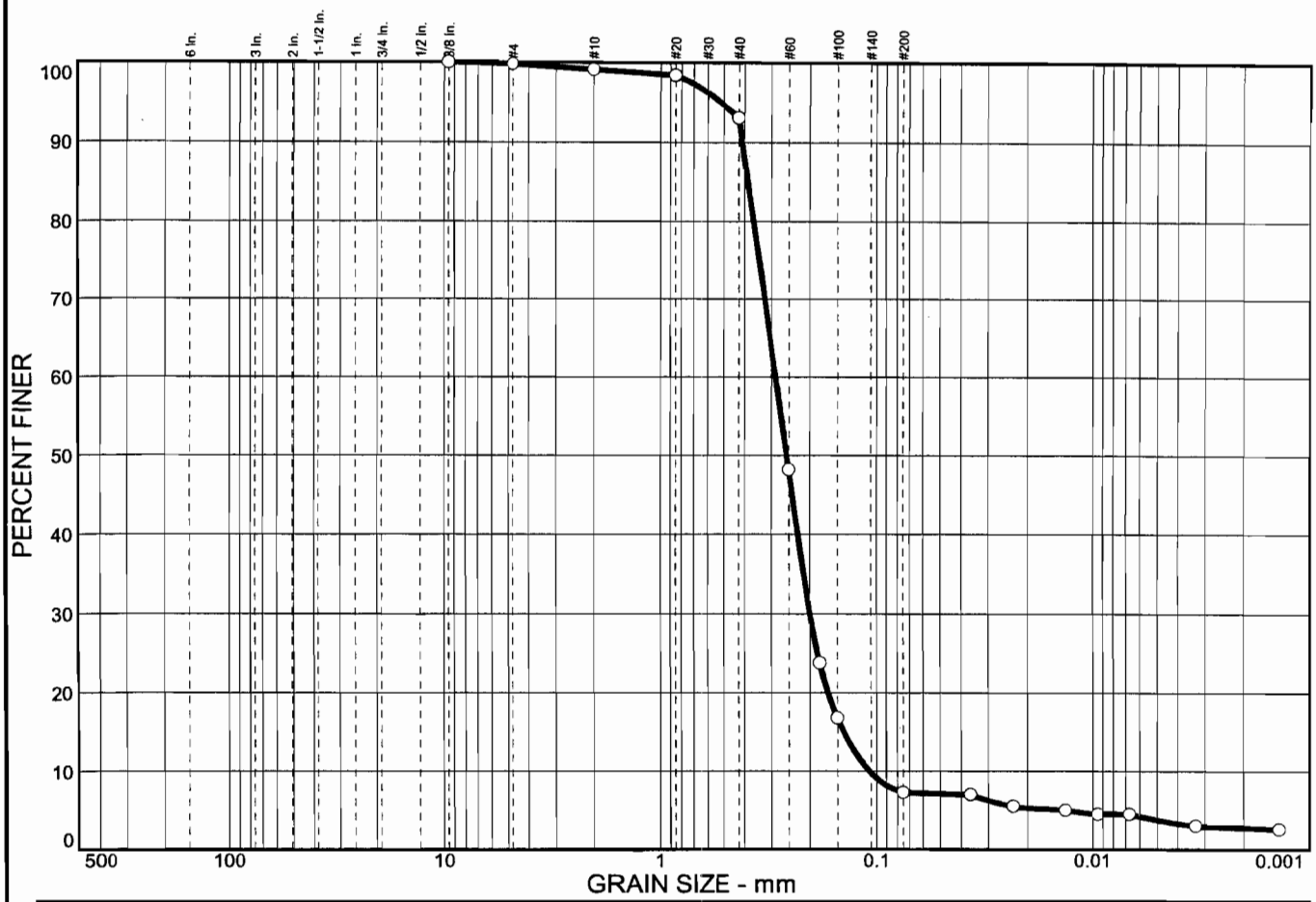
Remarks

Sample No.: 23 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 60.0'-63.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	92.5	3.5	3.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.1		
#20	98.4		
#40	93.1		
#60	48.2		
#80	23.8		
#100	16.8		
#200	7.3		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.386 D_{60}= 0.287 D_{50}= 0.255
D_{30}= 0.199 D_{15}= 0.140 D_{10}= 0.108
C_u= 2.67 C_c= 1.28

Classification

USCS= AASHTO=

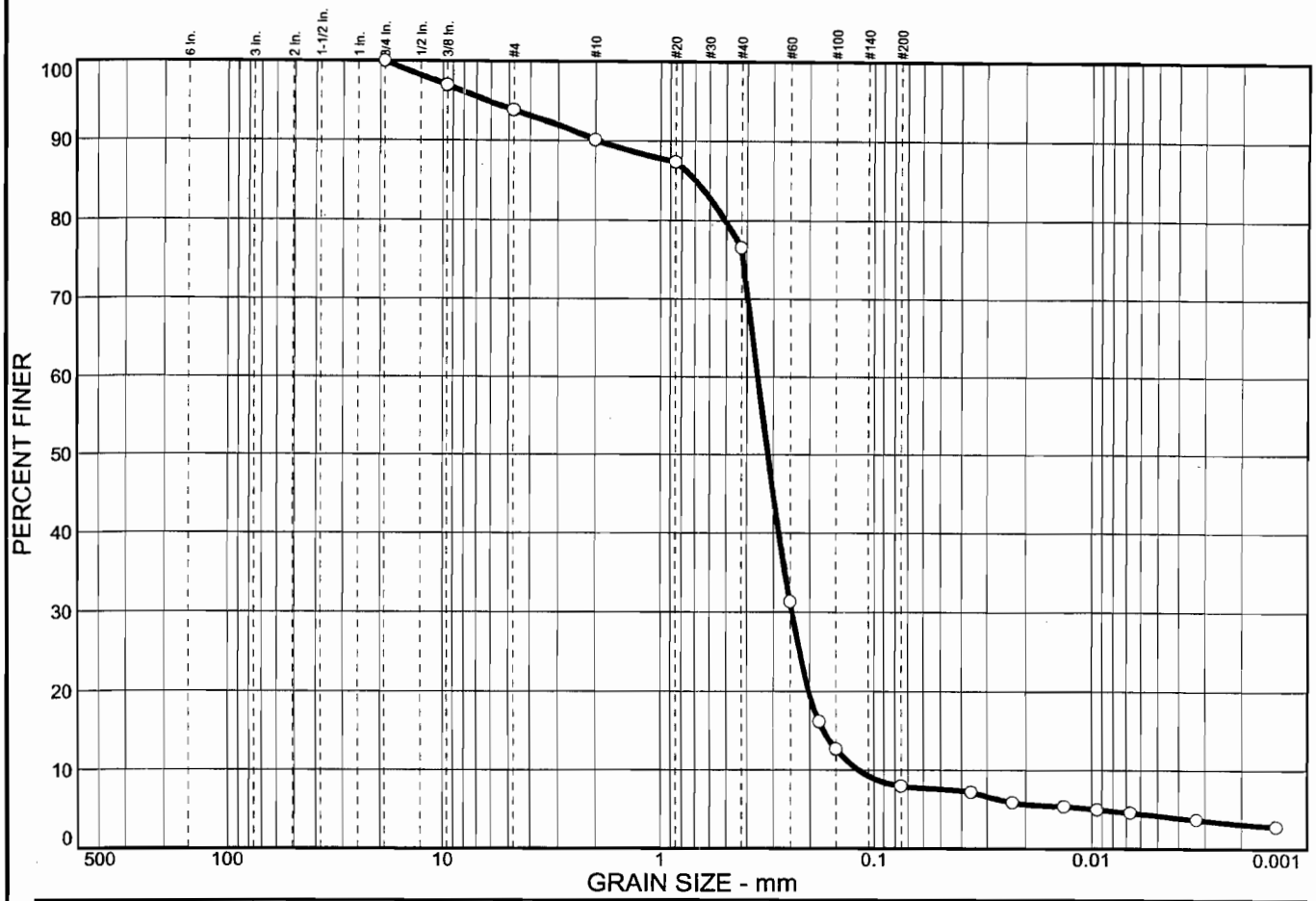
Remarks

Sample No.: 26 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 69.0'-72.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.2	85.8	3.8	4.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.9		
#4	93.8		
#10	90.1		
#20	87.4		
#40	76.6		
#60	31.3		
#80	16.2		
#100	12.7		
#200	8.0		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.692 D_{60}= 0.356 D_{50}= 0.318
D_{30}= 0.245 D_{15}= 0.171 D_{10}= 0.117
C_u= 3.04 C_c= 1.44

Classification

USCS= AASHTO=

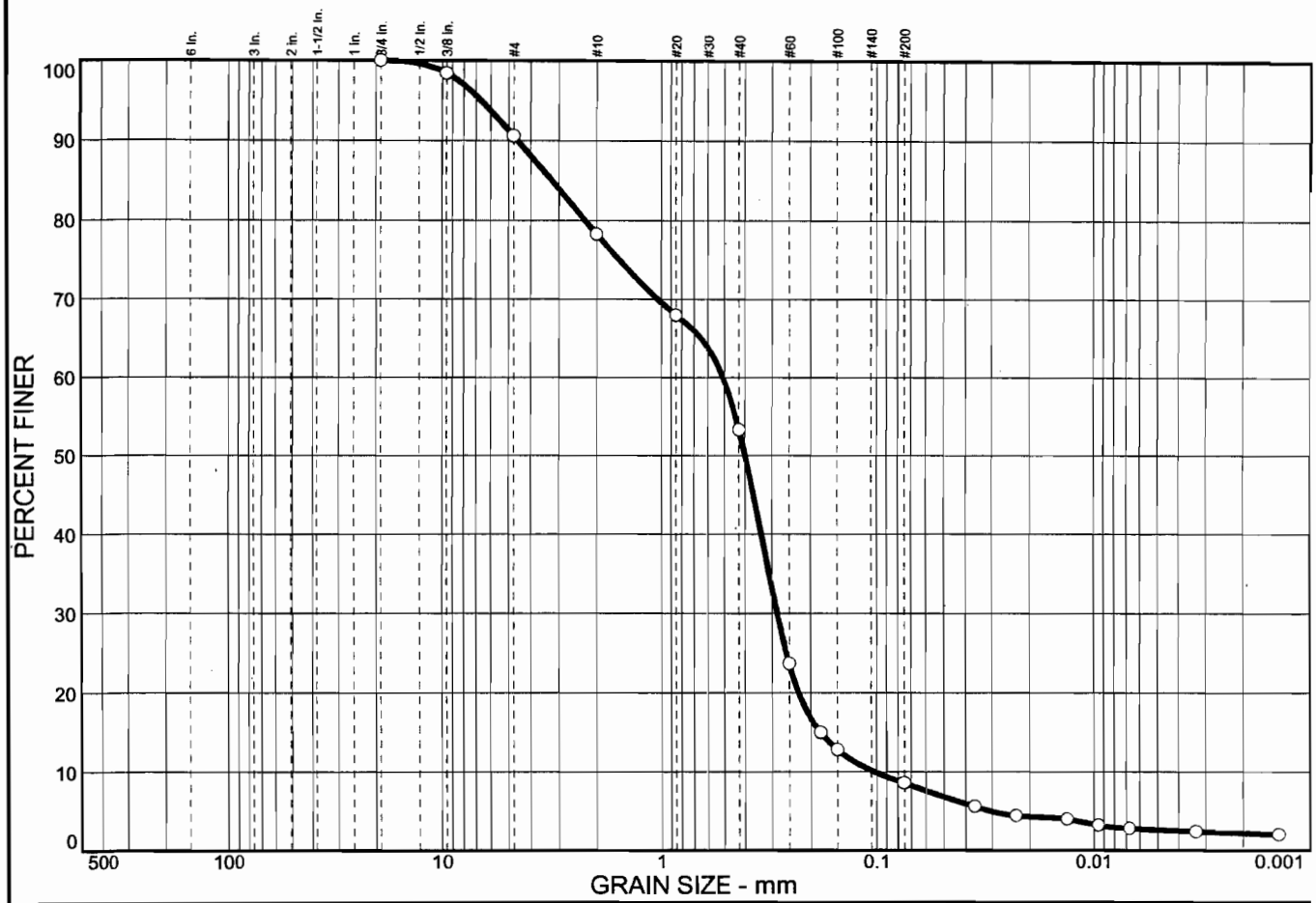
Remarks

Sample No.: 30 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 81.0'-82.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.4	82.0	6.0	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.4		
#4	90.6		
#10	78.3		
#20	68.0		
#40	53.3		
#60	23.7		
#80	15.0		
#100	12.8		
#200	8.6		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.20 D_{60}= 0.508 D_{50}= 0.398
D_{30}= 0.284 D_{15}= 0.180 D_{10}= 0.102
C_u= 4.98 C_c= 1.55

Classification

USCS= AASHTO=

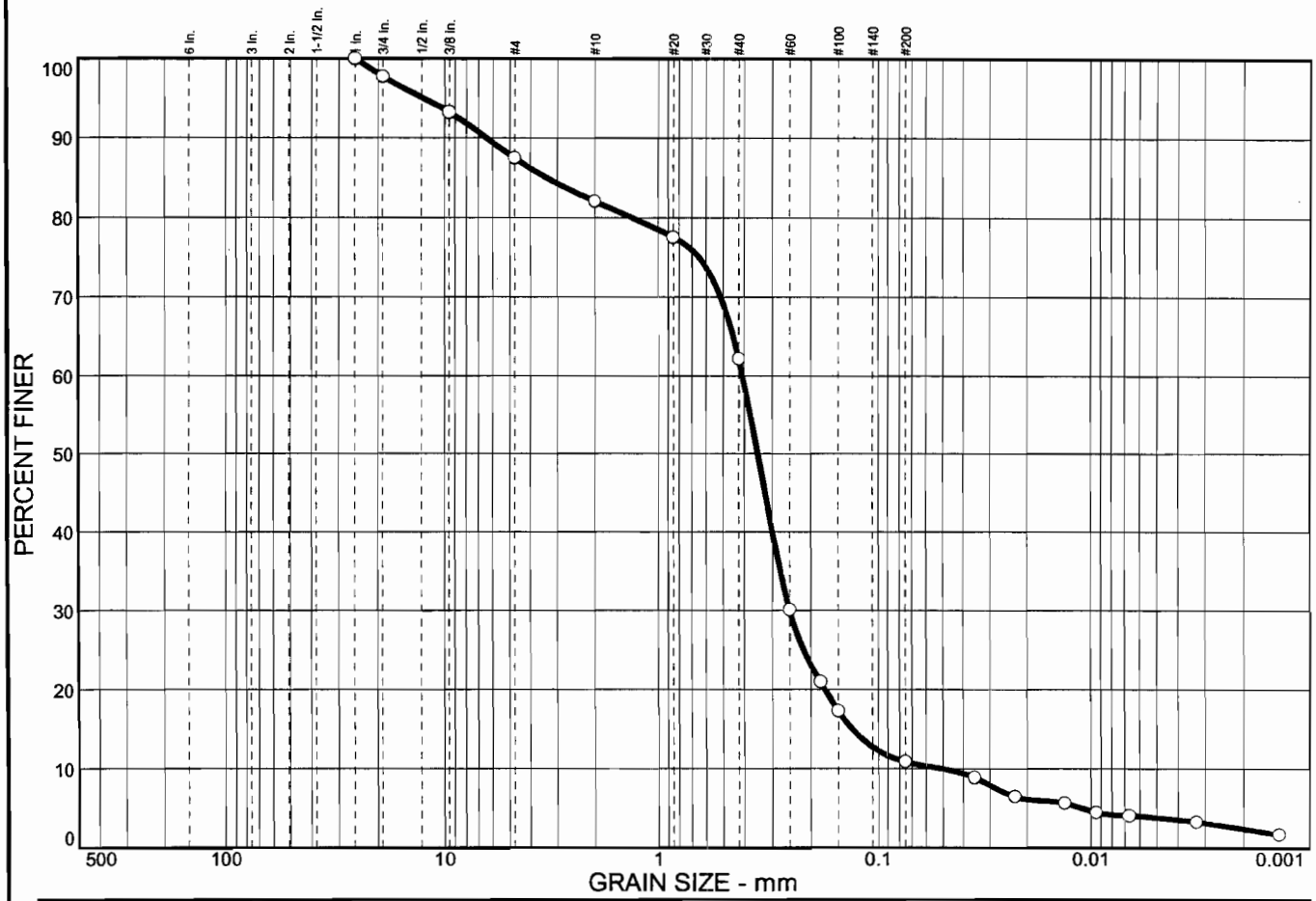
Remarks

Sample No.: 31 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 82.5'-85.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.5	76.6	7.0	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.7		
0.375 in.	93.2		
#4	87.5		
#10	82.1		
#20	77.6		
#40	62.2		
#60	30.1		
#80	21.0		
#100	17.3		
#200	10.9		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.34 D_{60}= 0.408 D_{50}= 0.348
D_{30}= 0.249 D_{15}= 0.130 D_{10}= 0.0498
C_u= 8.20 C_c= 3.06

Classification

USCS= AASHTO=

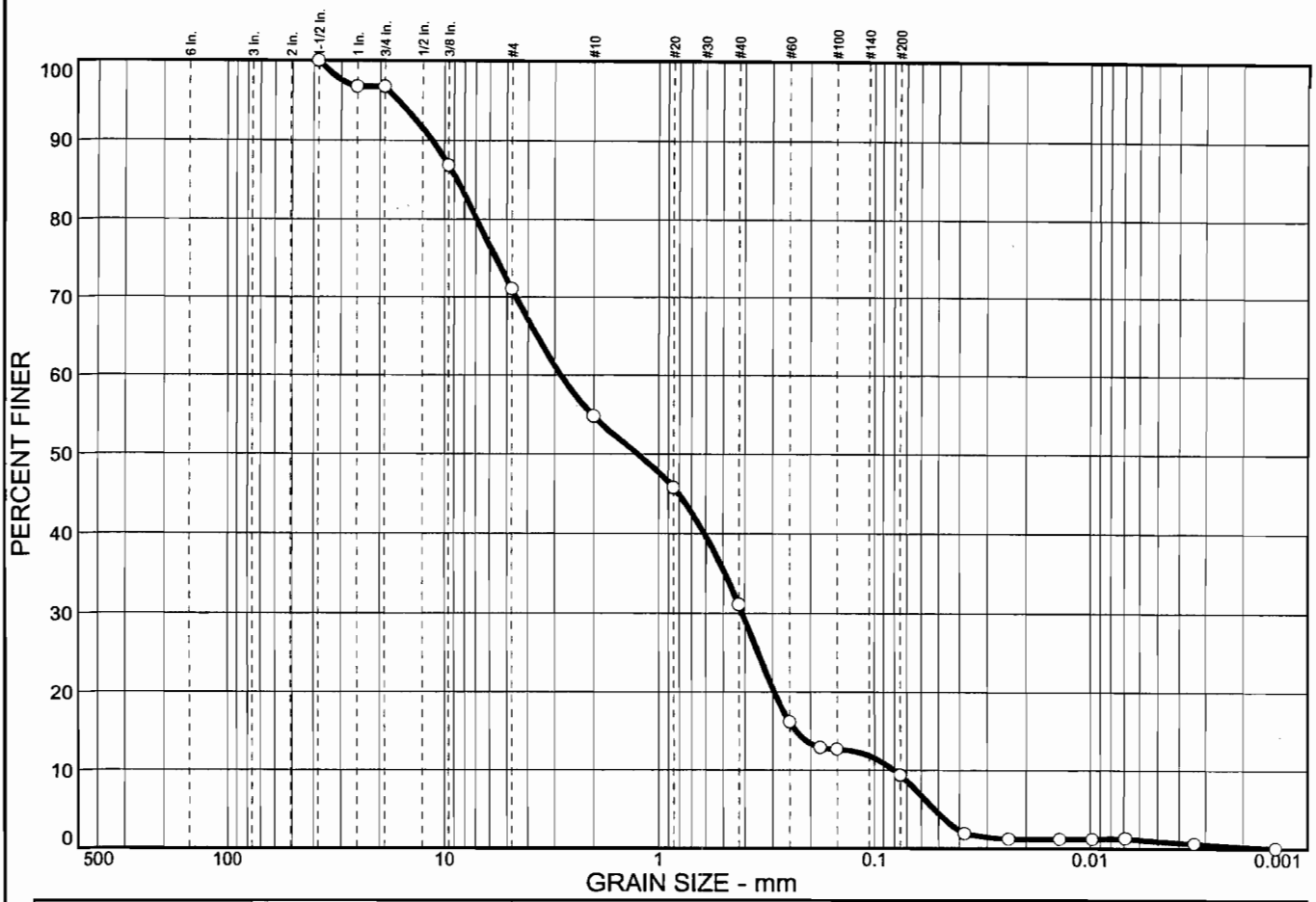
Remarks

Sample No.: 34 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 91.5'-94.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	28.9	61.7	8.5	0.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.7		
0.75 in.	96.7		
0.375 in.	86.9		
#4	71.1		
#10	54.8		
#20	45.8		
#40	31.1		
#60	16.2		
#80	12.9		
#100	12.7		
#200	9.4		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.65 D_{60}= 2.80 D_{50}= 1.25
D_{30}= 0.410 D_{15}= 0.233 D_{10}= 0.0799
C_u= 35.05 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

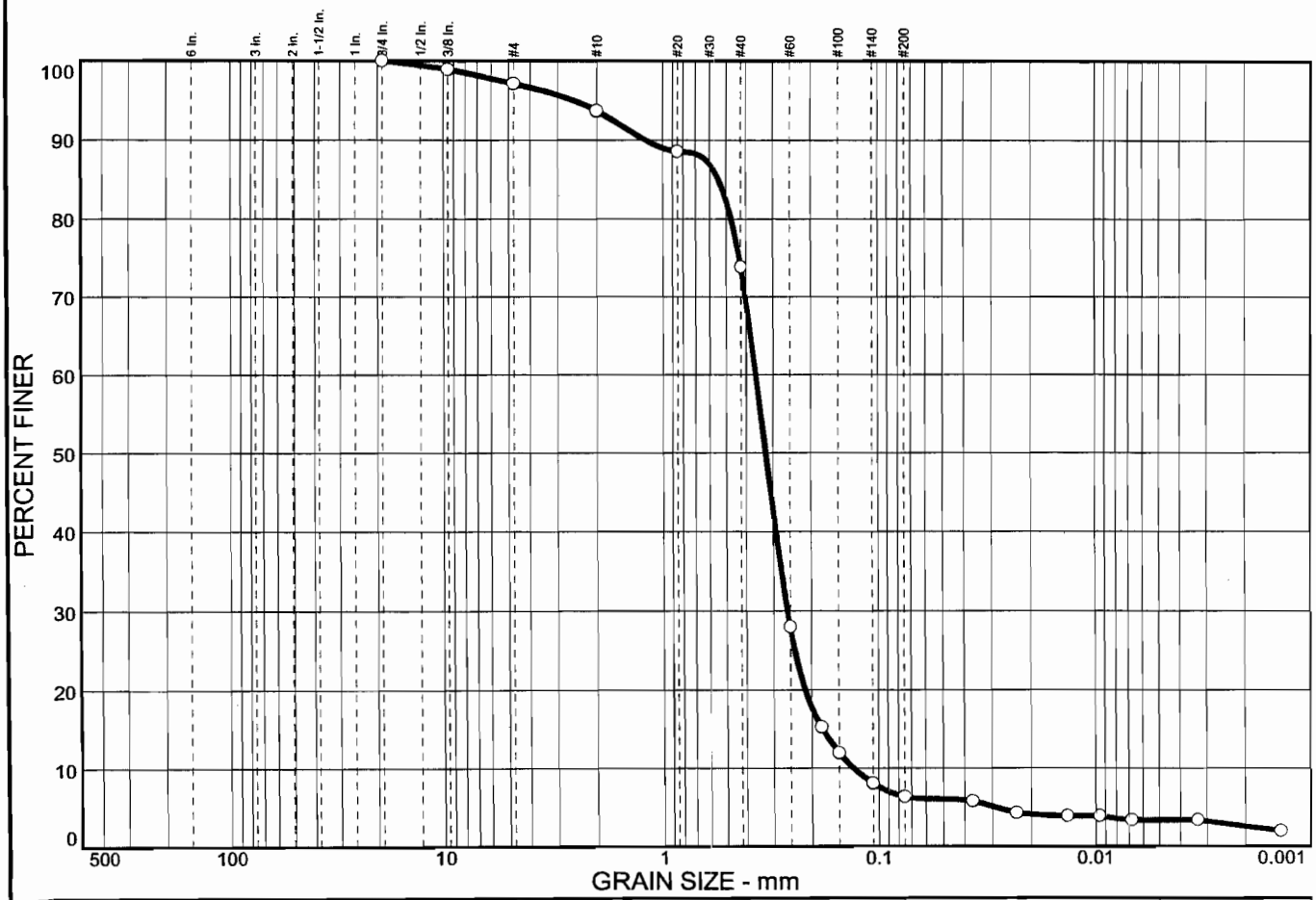
Zero retained on 3/4 inch sieve.

Sample No.: 35 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 94.5'-97.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.9	90.7	3.0	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.9		
#4	97.1		
#10	93.7		
#20	88.6		
#40	73.9		
#60	28.0		
#80	15.3		
#100	12.0		
#140	8.1		
#200	6.4		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.542 D_{60}= 0.359 D_{50}= 0.323
D_{30}= 0.257 D_{15}= 0.177 D_{10}= 0.129
C_u= 2.78 C_c= 1.43

Classification

USCS= AASHTO=

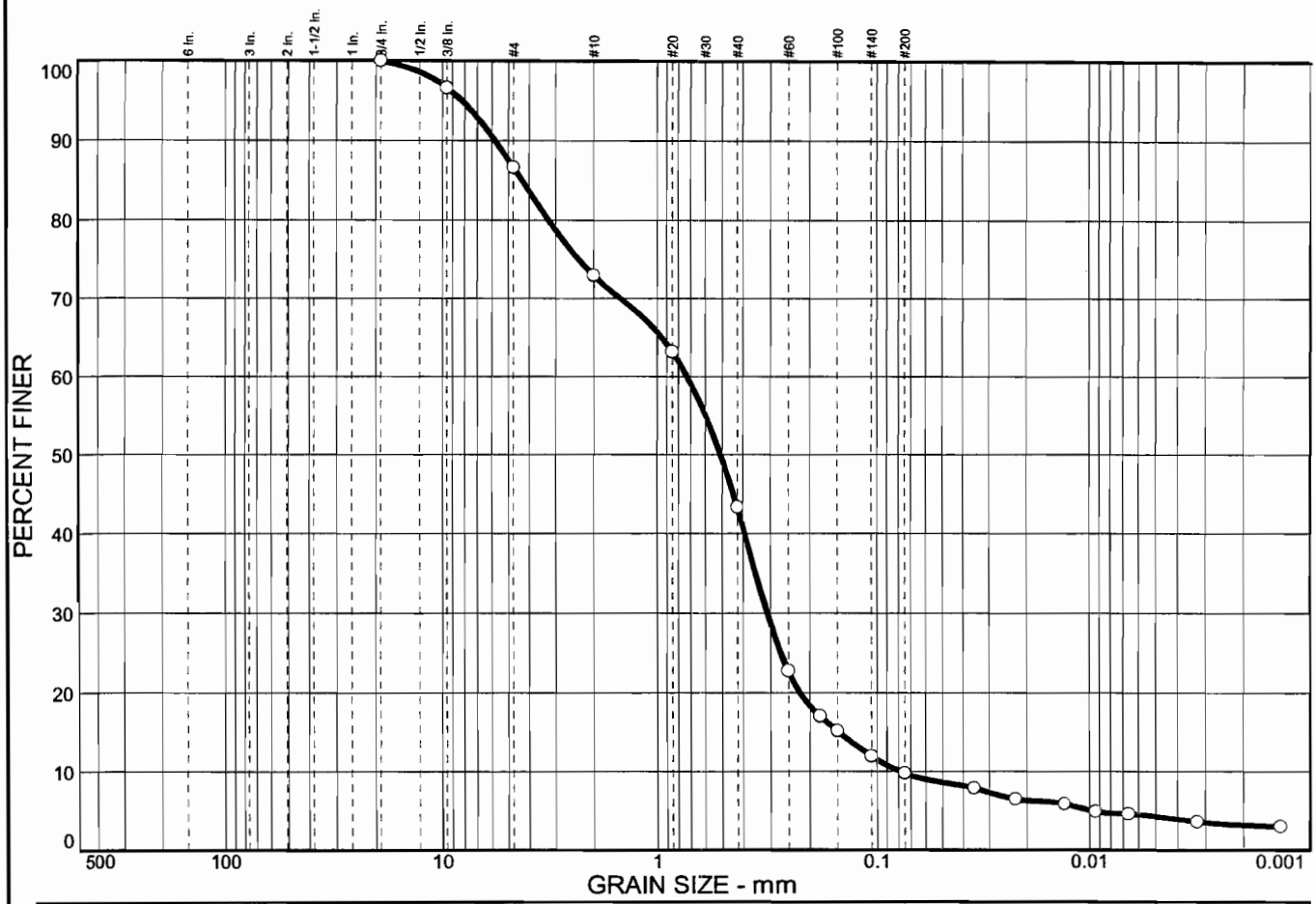
Remarks

Sample No.: 38 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 102.0'-105.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.3	76.9	5.5	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.6		
#4	86.7		
#10	73.0		
#20	63.2		
#40	43.4		
#60	22.8		
#80	17.1		
#100	15.2		
#140	12.0		
#200	9.8		

* (no specification provided)

Soil Description

Brown well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.31 D_{60}= 0.725 D_{50}= 0.508
D_{30}= 0.308 D_{15}= 0.147 D_{10}= 0.0782
C_u= 9.27 C_c= 1.68

Classification

USCS= AASHTO=

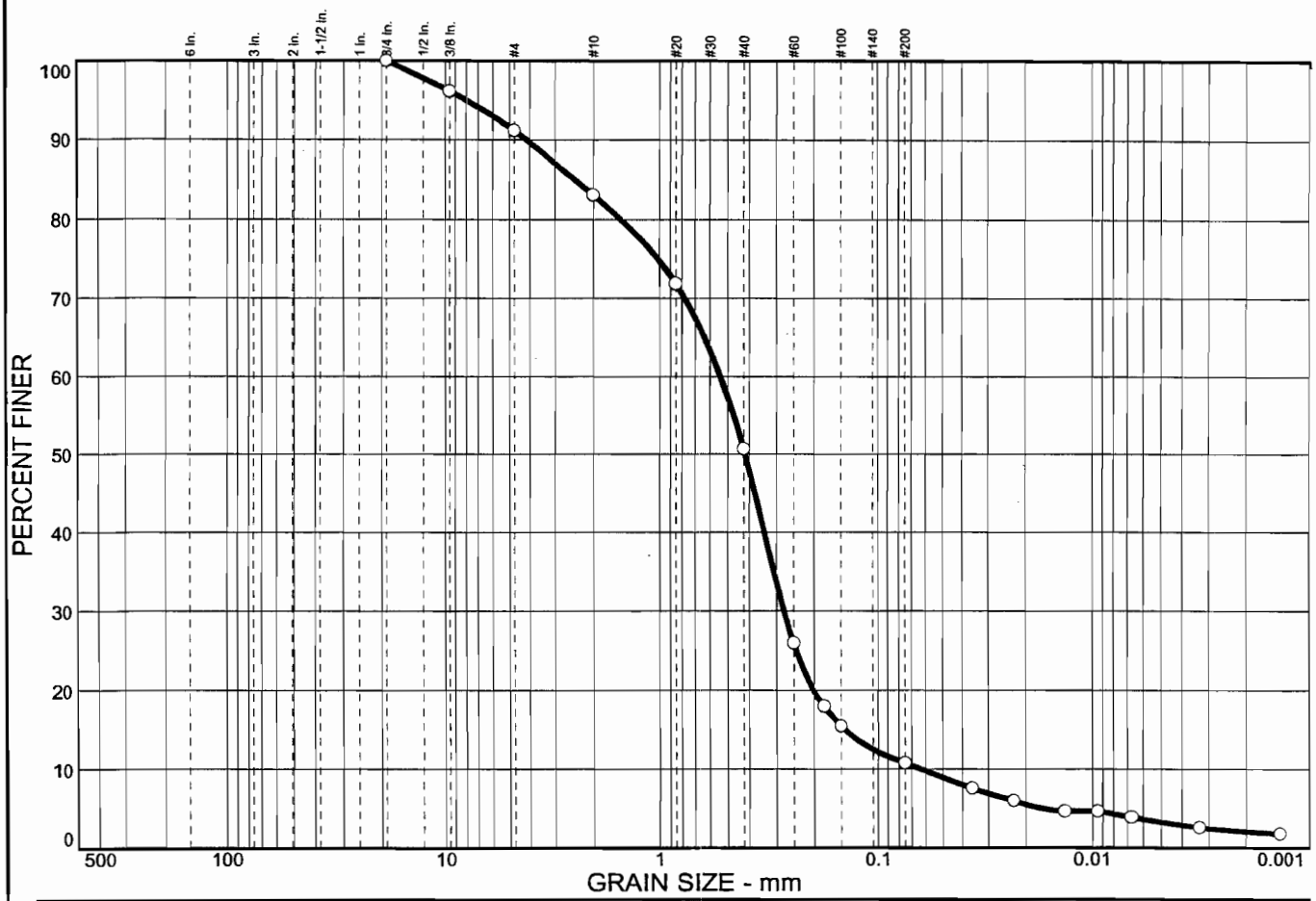
Remarks

Sample No.: 40 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 108.0'-111.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.8	80.4	7.5	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.1		
#4	91.2		
#10	83.1		
#20	71.9		
#40	50.7		
#60	26.0		
#80	18.0		
#100	15.5		
#200	10.8		

* (no specification provided)

Soil Description

Brown well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.42 D_{60}= 0.538 D_{50}= 0.419
D_{30}= 0.277 D_{15}= 0.143 D_{10}= 0.0628
C_u= 8.57 C_c= 2.26

Classification

USCS= AASHTO=

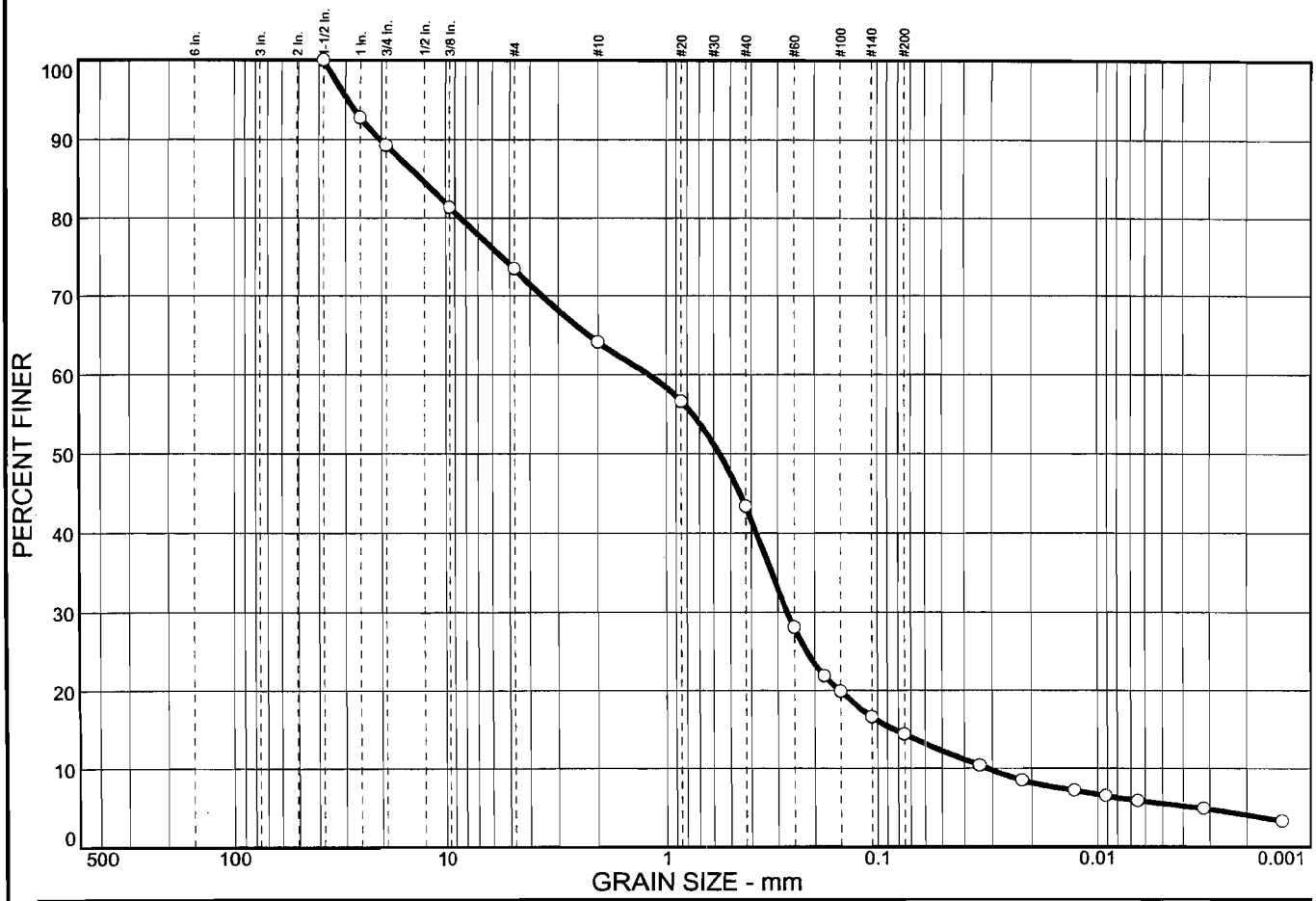
Remarks

Sample No.: 44 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 120.0'-123.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	26.5	59.1	8.9	5.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	92.8		
0.75 in.	89.3		
0.375 in.	81.4		
#4	73.5		
#10	64.1		
#20	56.6		
#40	43.4		
#60	28.1		
#80	21.9		
#100	19.9		
#140	16.6		
#200	14.4		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.0 D_{60}= 1.19 D_{50}= 0.562
D_{30}= 0.269 D_{15}= 0.0835 D_{10}= 0.0314
C_u= 38.04 C_c= 1.93

Classification

USCS= AASHTO=

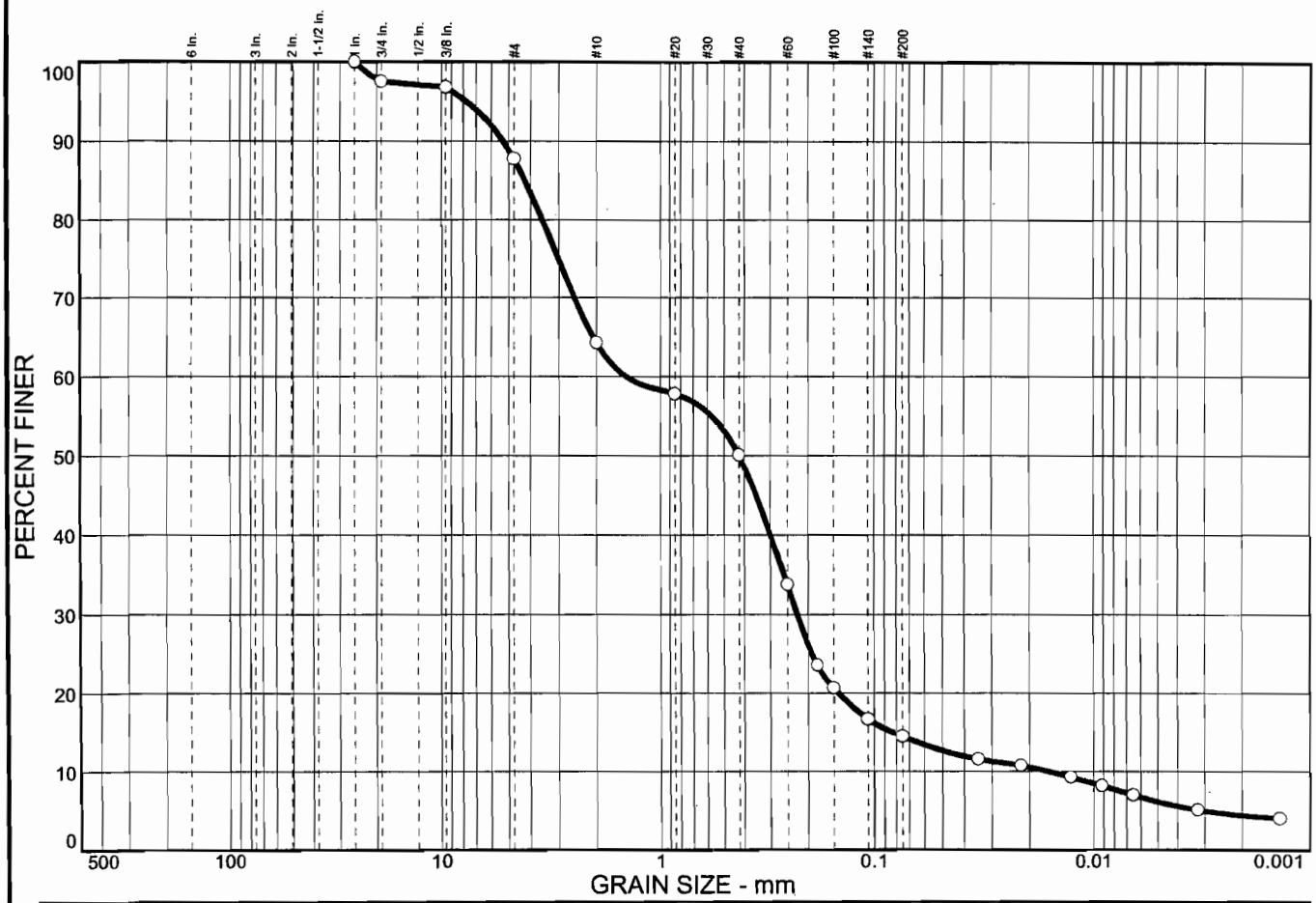
Remarks

Sample No.: 47 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 129.0'-130.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.2	73.3	8.3	6.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.5		
0.375 in.	96.8		
#4	87.8		
#10	64.3		
#20	57.8		
#40	50.1		
#60	33.8		
#80	23.6		
#100	20.7		
#140	16.7		
#200	14.5		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.23 D_{60}= 1.44 D_{50}= 0.423
D_{30}= 0.224 D_{15}= 0.0827 D_{10}= 0.0161
C_u= 89.50 C_c= 2.18

Classification

USCS= AASHTO=

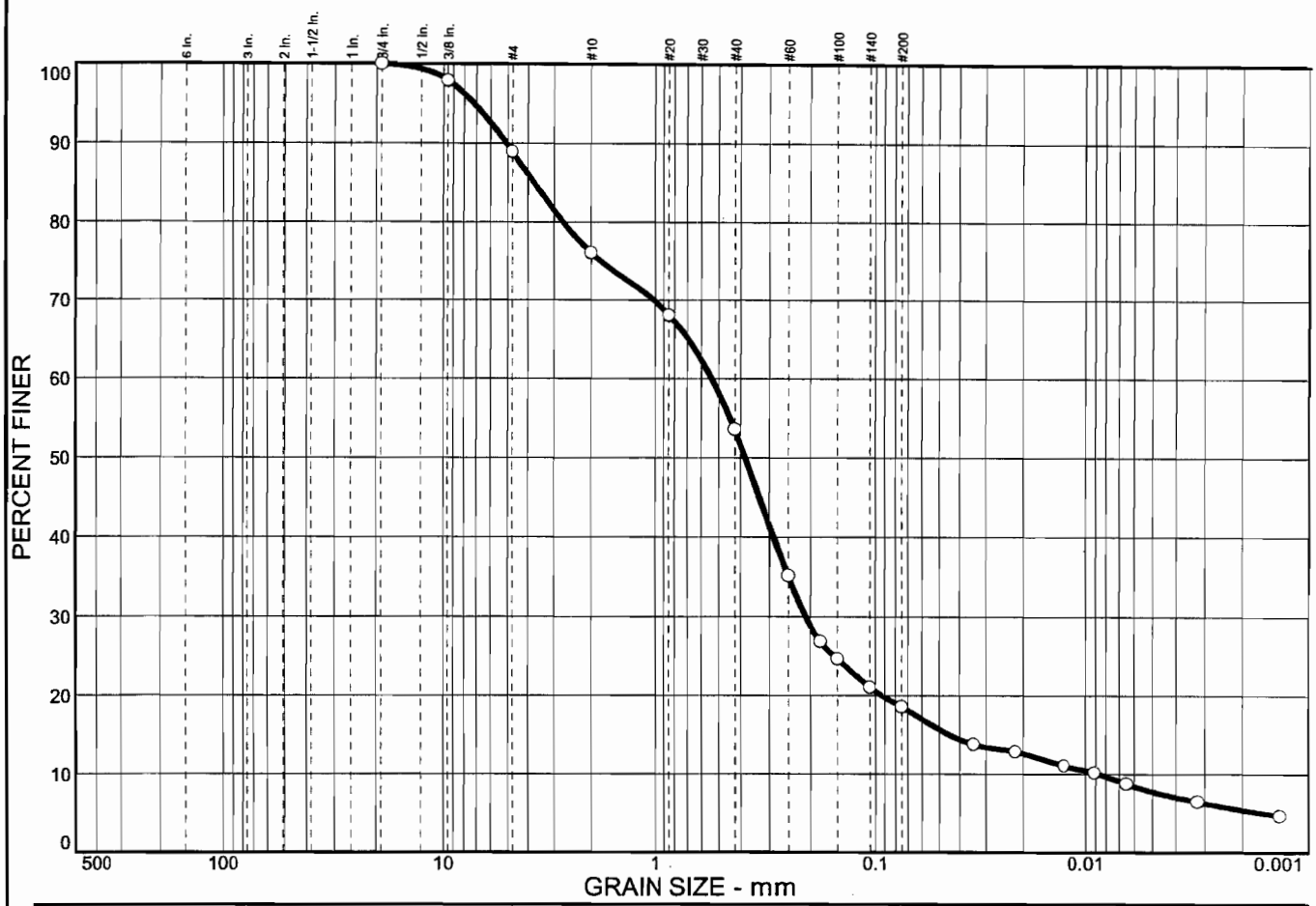
Remarks

Sample No.: 48 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 140.0'-141.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.0	70.4	10.8	7.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.9		
#4	89.0		
#10	76.1		
#20	68.1		
#40	53.6		
#60	35.2		
#80	26.9		
#100	24.7		
#140	21.1		
#200	18.6		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.71 D_{60}= 0.537 D_{50}= 0.381
D_{30}= 0.209 D_{15}= 0.0443 D_{10}= 0.0086
C_u= 62.49 C_c= 9.45

Classification

USCS= AASHTO=

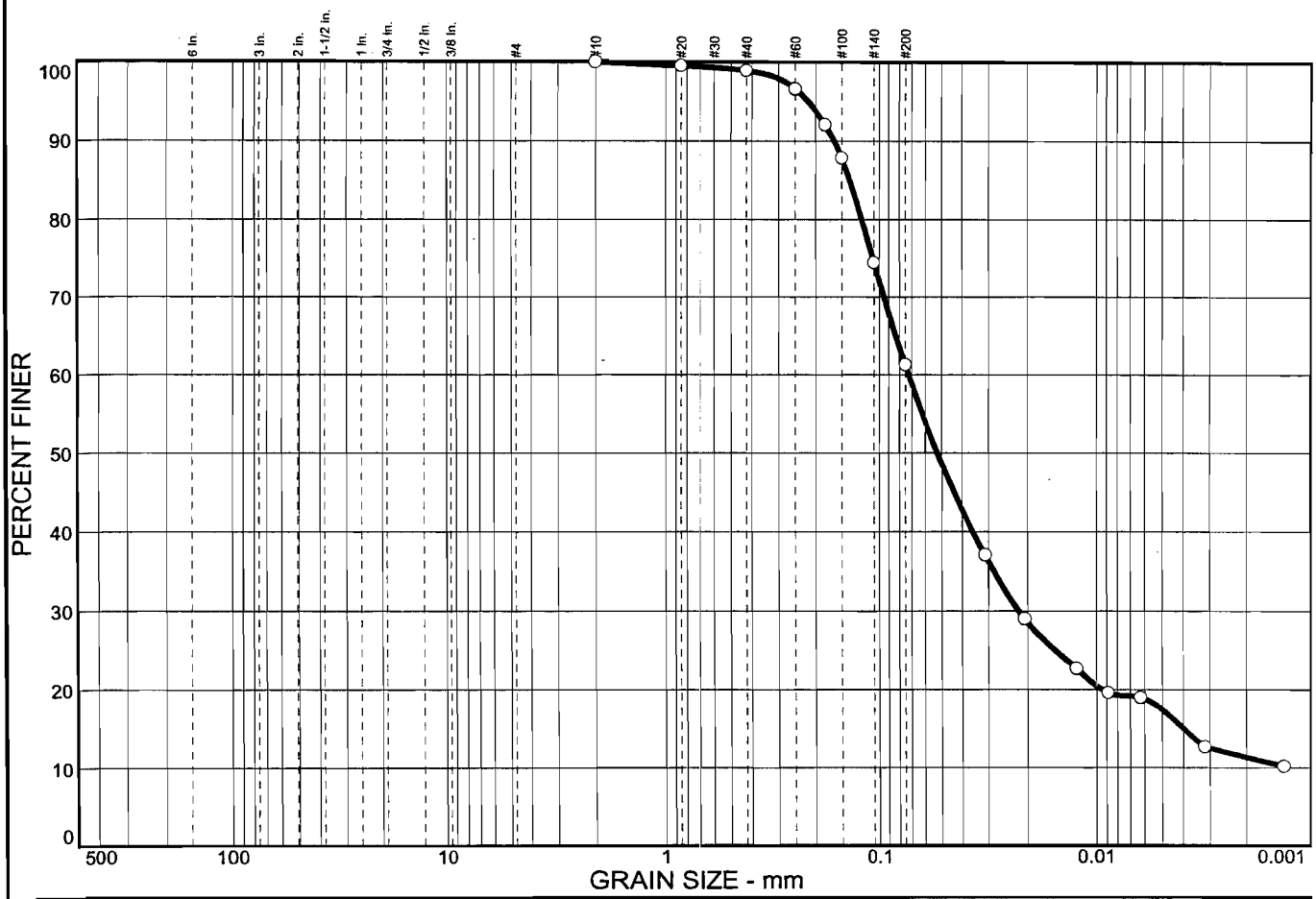
Remarks

Sample No.: 49 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 150.0'-151.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	38.7	43.8	17.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	98.9		
#60	96.6		
#80	92.1		
#100	87.9		
#140	74.5		
#200	61.3		

* (no specification provided)

Soil Description

Gray sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.137 D_{60}= 0.0722 D_{50}= 0.0522
D_{30}= 0.0219 D_{15}= 0.0040 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

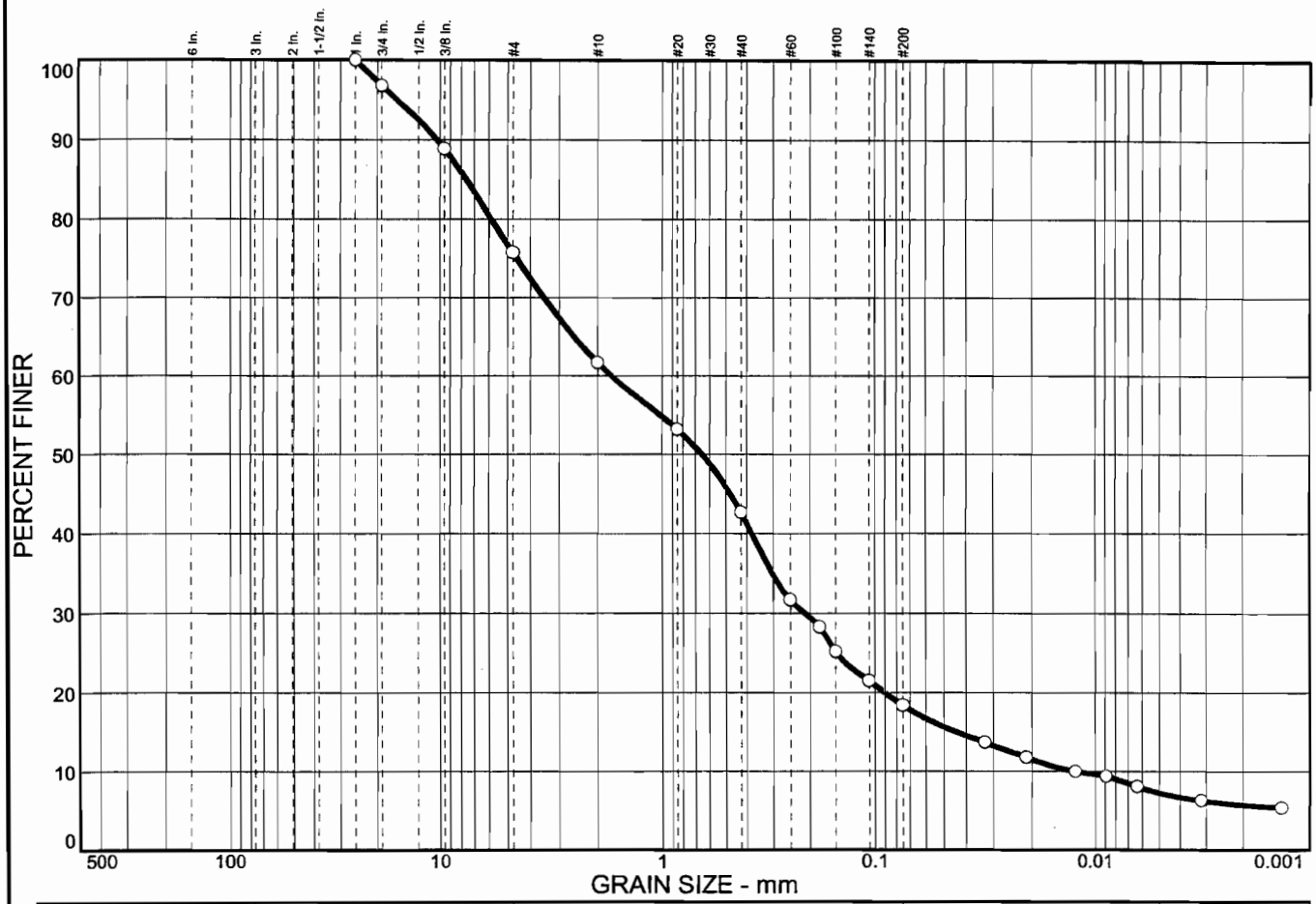
Remarks

Sample No.: 51 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 170.0'-171.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	24.2	57.4	11.1	7.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.8		
0.375 in.	88.9		
#4	75.8		
#10	61.7		
#20	53.2		
#40	42.7		
#60	31.7		
#80	28.3		
#100	25.2		
#140	21.5		
#200	18.4		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.57 D_{60}= 1.72 D_{50}= 0.650
D_{30}= 0.211 D_{15}= 0.0437 D_{10}= 0.0125
C_u= 137.96 C_c= 2.06

Classification

USCS= AASHTO=

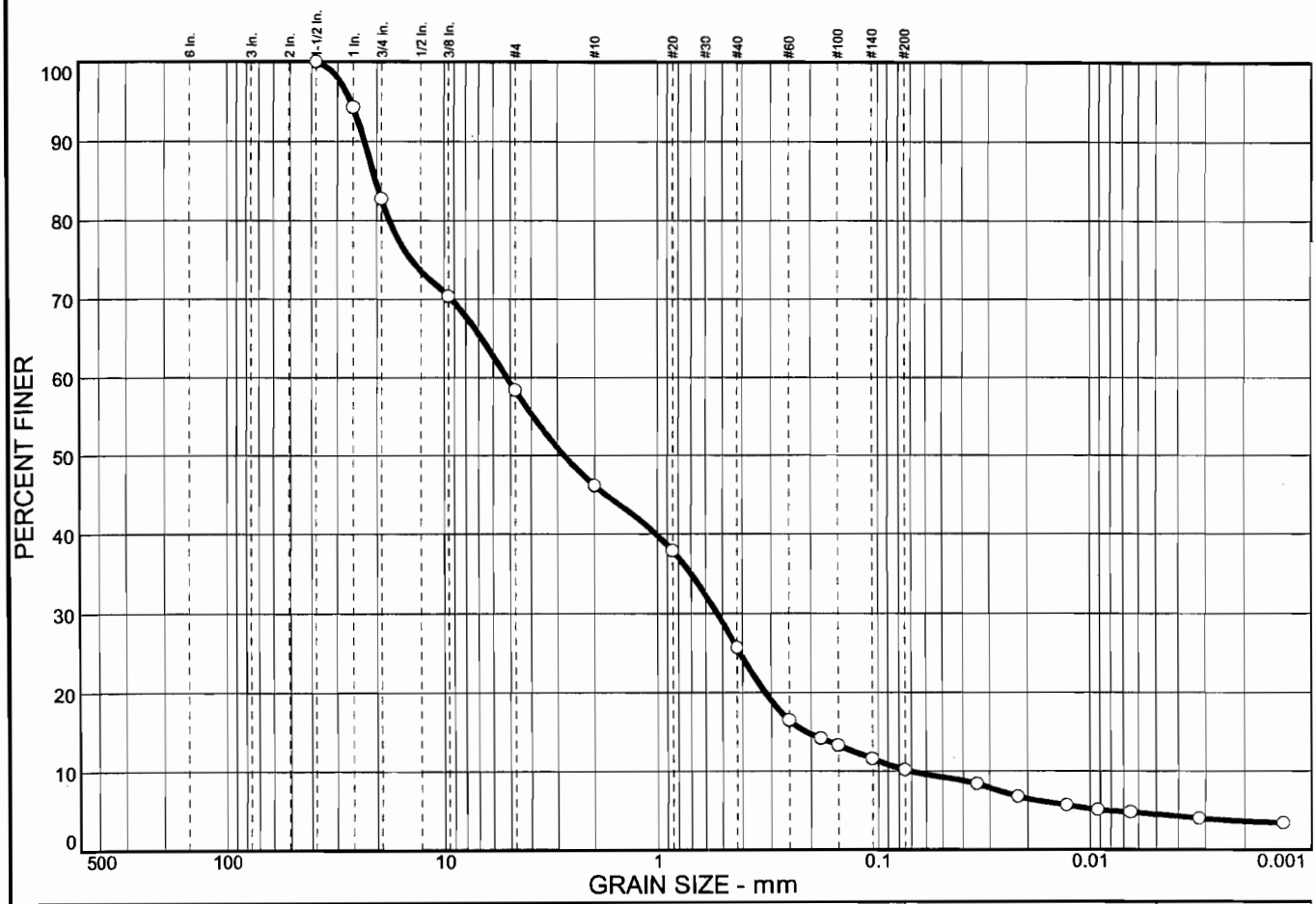
Remarks

Sample No.: 52 **Source of Sample:** C-04-23 **Date:** 07/05/05
Location: **Elev./Depth:** 180.0'-180.3'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	41.6	48.2	5.7	4.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	94.3		
.75 in.	82.8		
.375 in.	70.4		
#4	58.4		
#10	46.2		
#20	37.9		
#40	25.7		
#60	16.5		
#80	14.2		
#100	13.3		
#140	11.6		
#200	10.2		

* (no specification provided)

Soil Description

Dark brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.1 D_{60}= 5.18 D_{50}= 2.78
D_{30}= 0.528 D_{15}= 0.209 D_{10}= 0.0701
C_u= 73.94 C_c= 0.77

Classification

USCS= AASHTO=

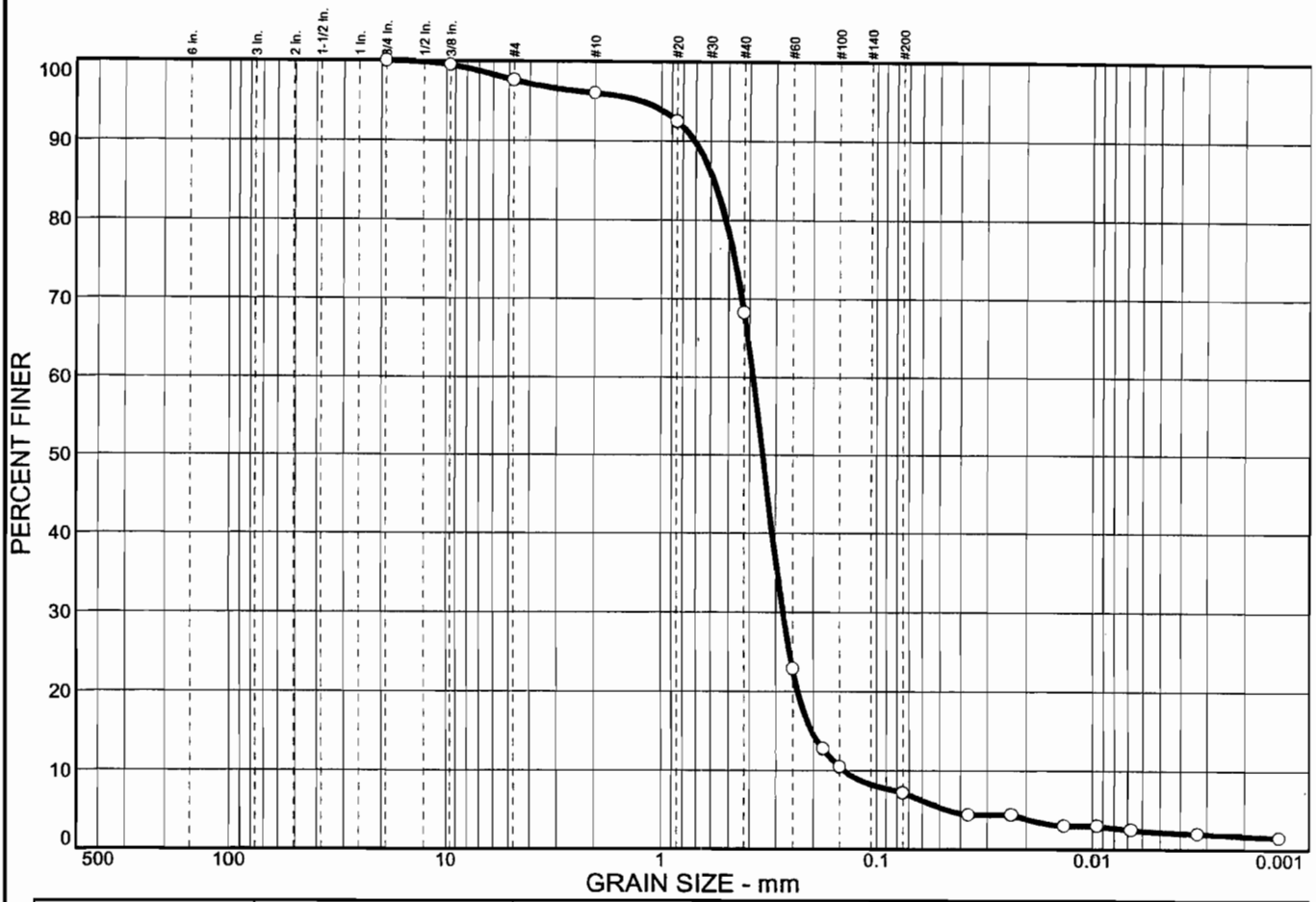
Remarks

Sample No.: 2 **Source of Sample:** C-04-24 **Date:** 7-9-05
Location: **Elev./Depth:** 0.3'-3.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.4	90.4	5.0	2.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	97.6		
#10	96.0		
#20	92.5		
#40	68.3		
#60	22.9		
#80	12.8		
#100	10.5		
#200	7.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.580 D_{60}= 0.385 D_{50}= 0.346
D_{30}= 0.277 D_{15}= 0.203 D_{10}= 0.142
C_u= 2.71 C_c= 1.40

Classification

USCS= AASHTO=

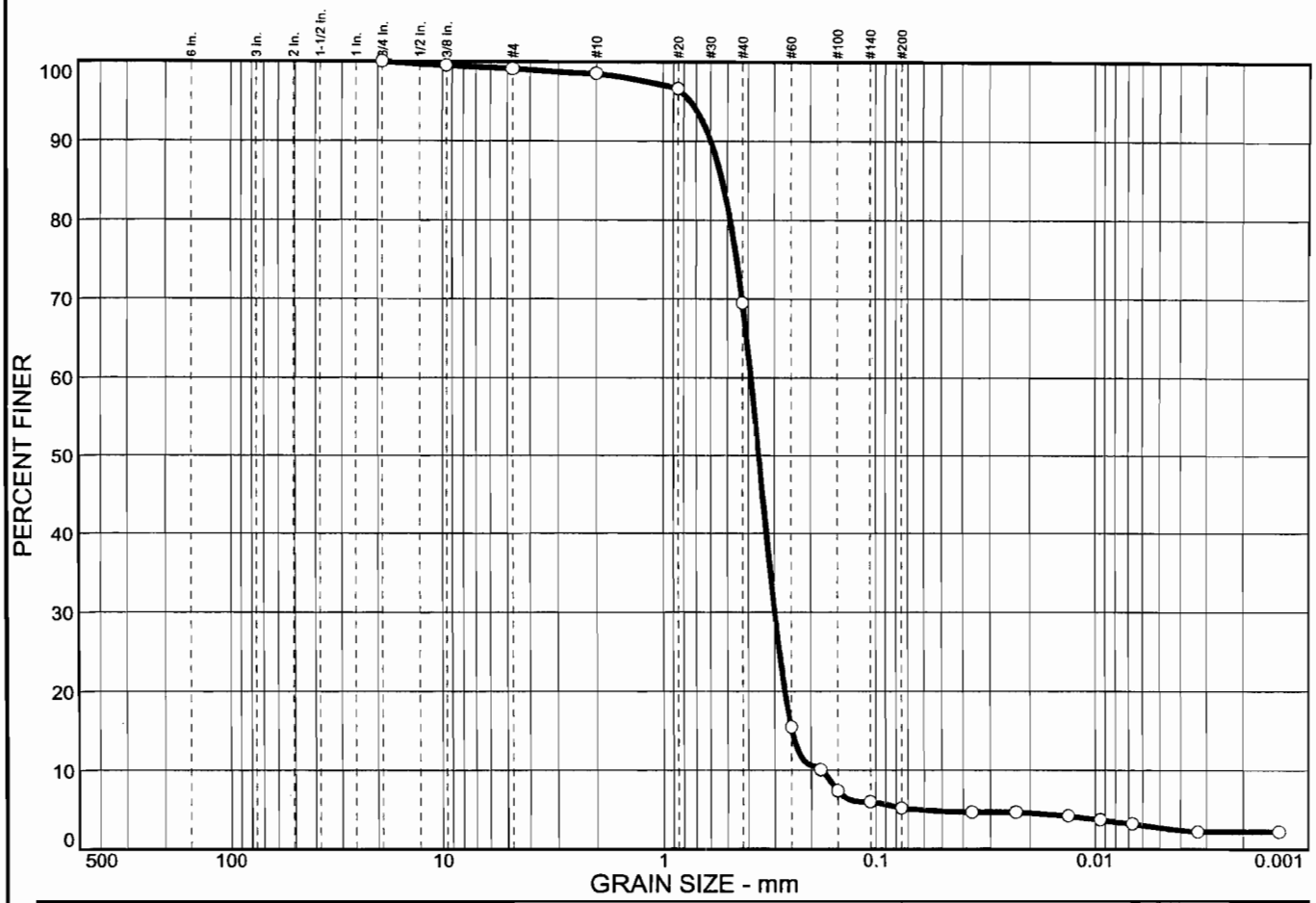
Remarks

Sample No.: 13 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 28.5'-31.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	93.9	2.5	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	99.1		
#10	98.5		
#20	96.6		
#40	69.5		
#60	15.5		
#80	10.1		
#100	7.4		
#140	6.0		
#200	5.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.528 D_{60}= 0.388 D_{50}= 0.356
D_{30}= 0.299 D_{15}= 0.248 D_{10}= 0.178
C_u= 2.18 C_c= 1.29

Classification

USCS= AASHTO=

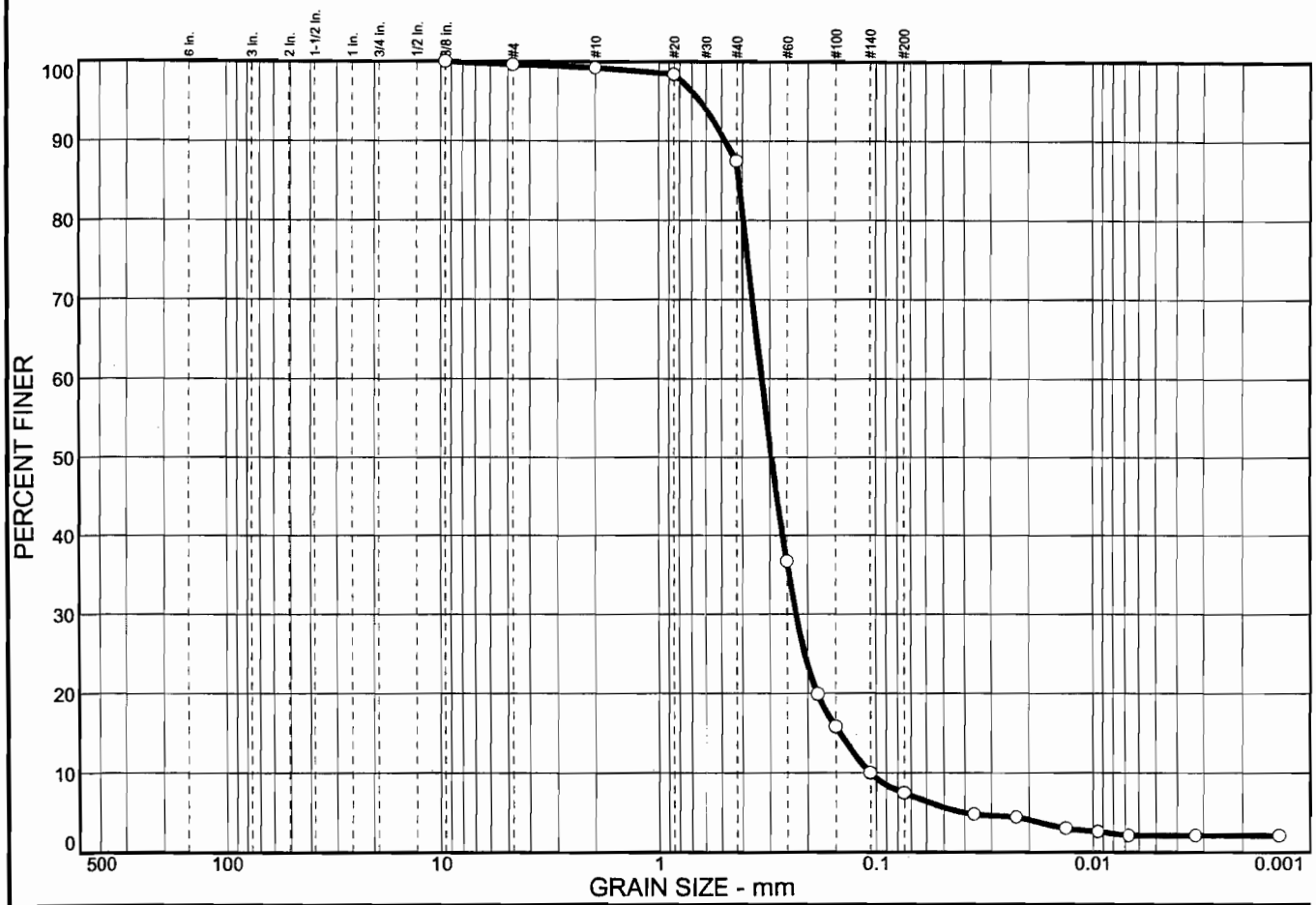
Remarks

Sample No.: 16 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 37.5'-40.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	92.1	5.4	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.2		
#20	98.4		
#40	87.5		
#60	36.7		
#80	19.9		
#100	15.8		
#140	10.0		
#200	7.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.415 D_{60}= 0.326 D_{50}= 0.294
D_{30}= 0.226 D_{15}= 0.144 D_{10}= 0.106
C_u= 3.07 C_c= 1.48

Classification

USCS= AASHTO=

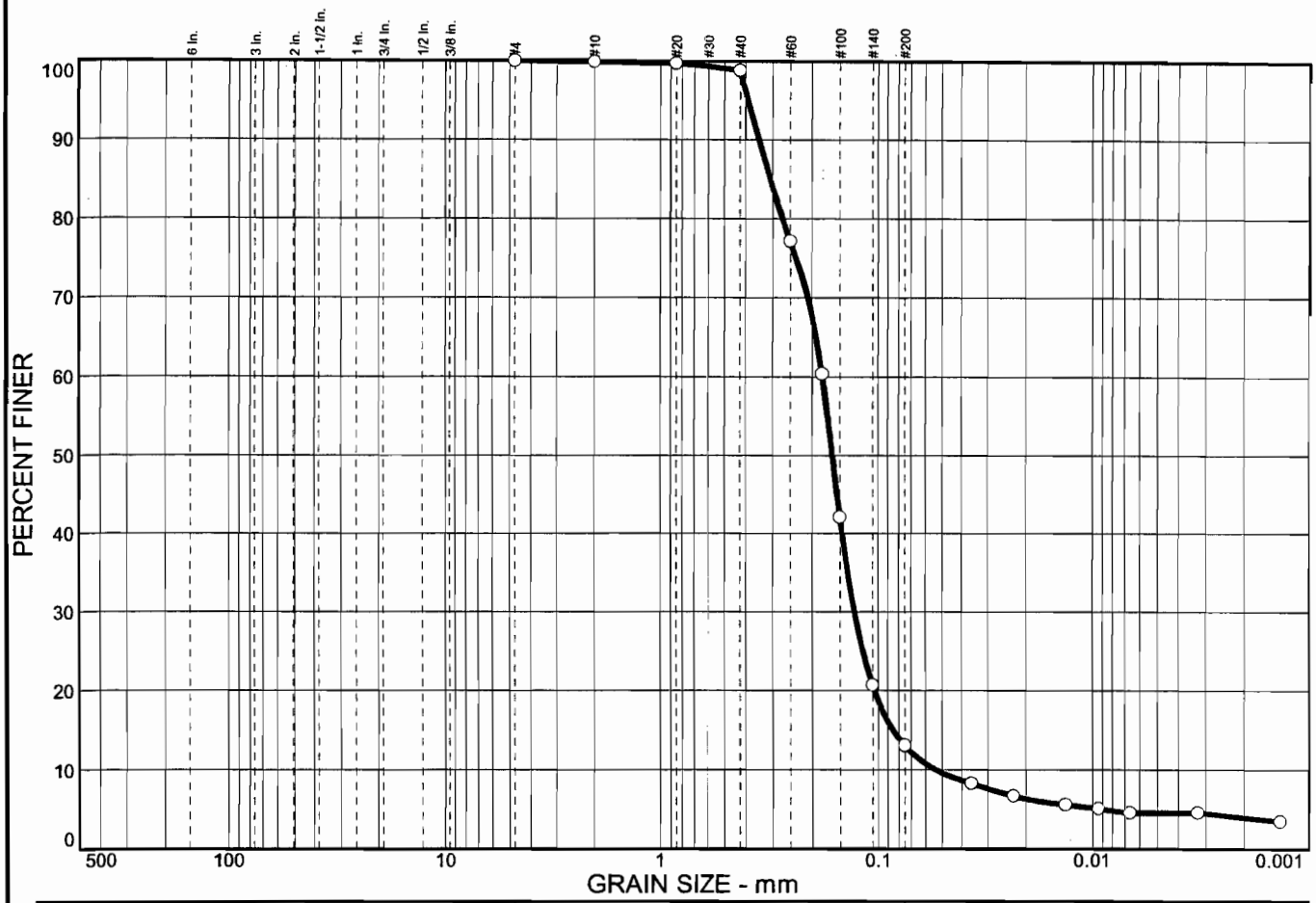
Remarks

Sample No.: 20 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 49.5'-52.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	86.9	8.5	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	98.8		
#60	77.2		
#80	60.4		
#100	42.1		
#140	20.7		
#200	13.1		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.307 D_{60}= 0.179 D_{50}= 0.162
D_{30}= 0.129 D_{15}= 0.0850 D_{10}= 0.0532
C_u= 3.37 C_c= 1.74

Classification

USCS= AASHTO=

Remarks

Sample No.: 24 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 61.5'-64.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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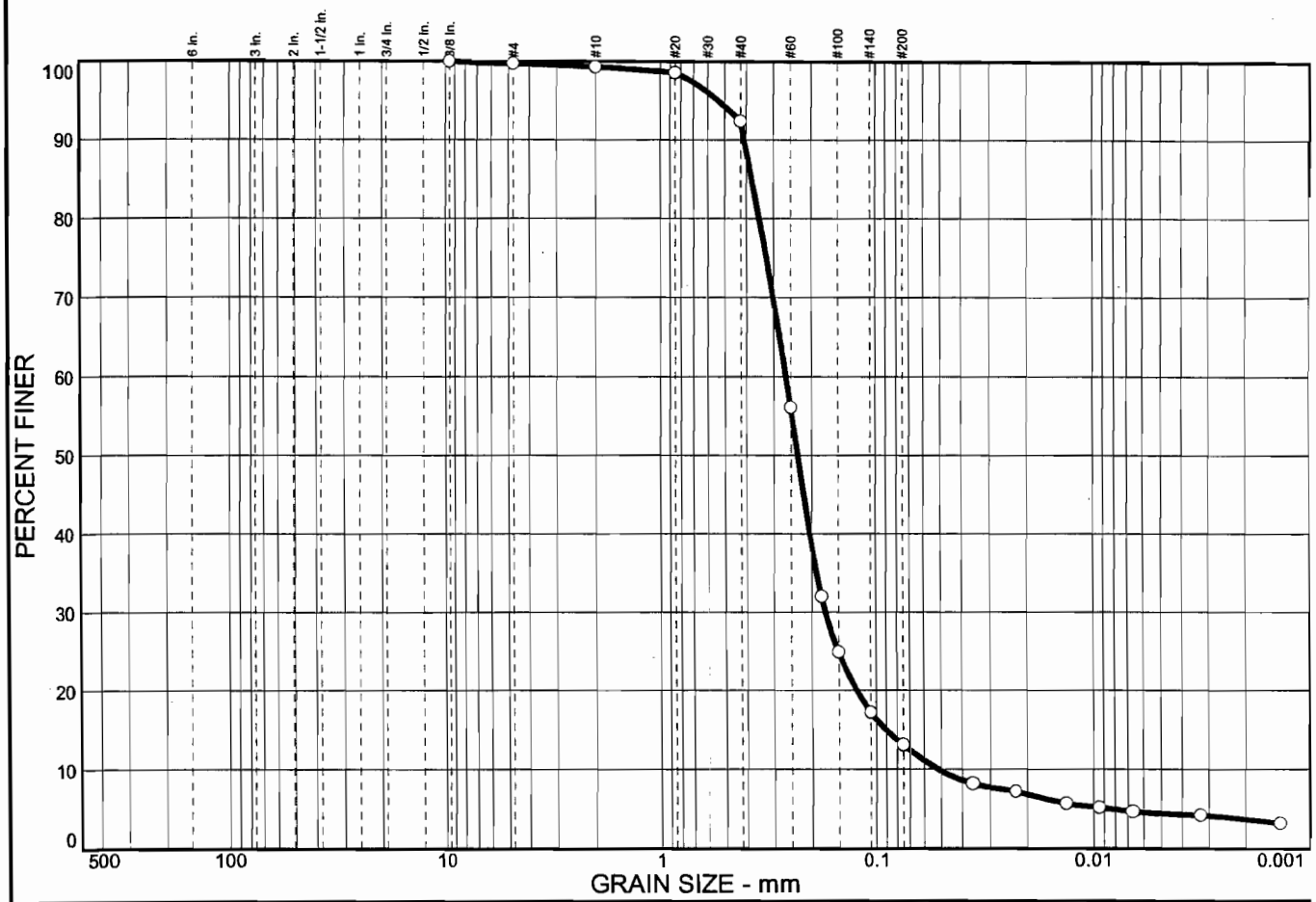
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	86.6	8.7	4.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.7		
#10	99.3		
#20	98.6		
#40	92.4		
#60	56.1		
#80	32.0		
#100	24.9		
#140	17.2		
#200	13.1		

* (no specification provided)

Soil Description

Brown to gray silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.378 D_{60}= 0.263 D_{50}= 0.232
D_{30}= 0.173 D_{15}= 0.0901 D_{10}= 0.0511
C_u= 5.14 C_c= 2.22

Classification

USCS= AASHTO=

Remarks

Sample No.: 28 **Source of Sample:** C-04-24 **Date:** 7-9-05
Location: **Elev./Depth:** 73.5'-76.5'

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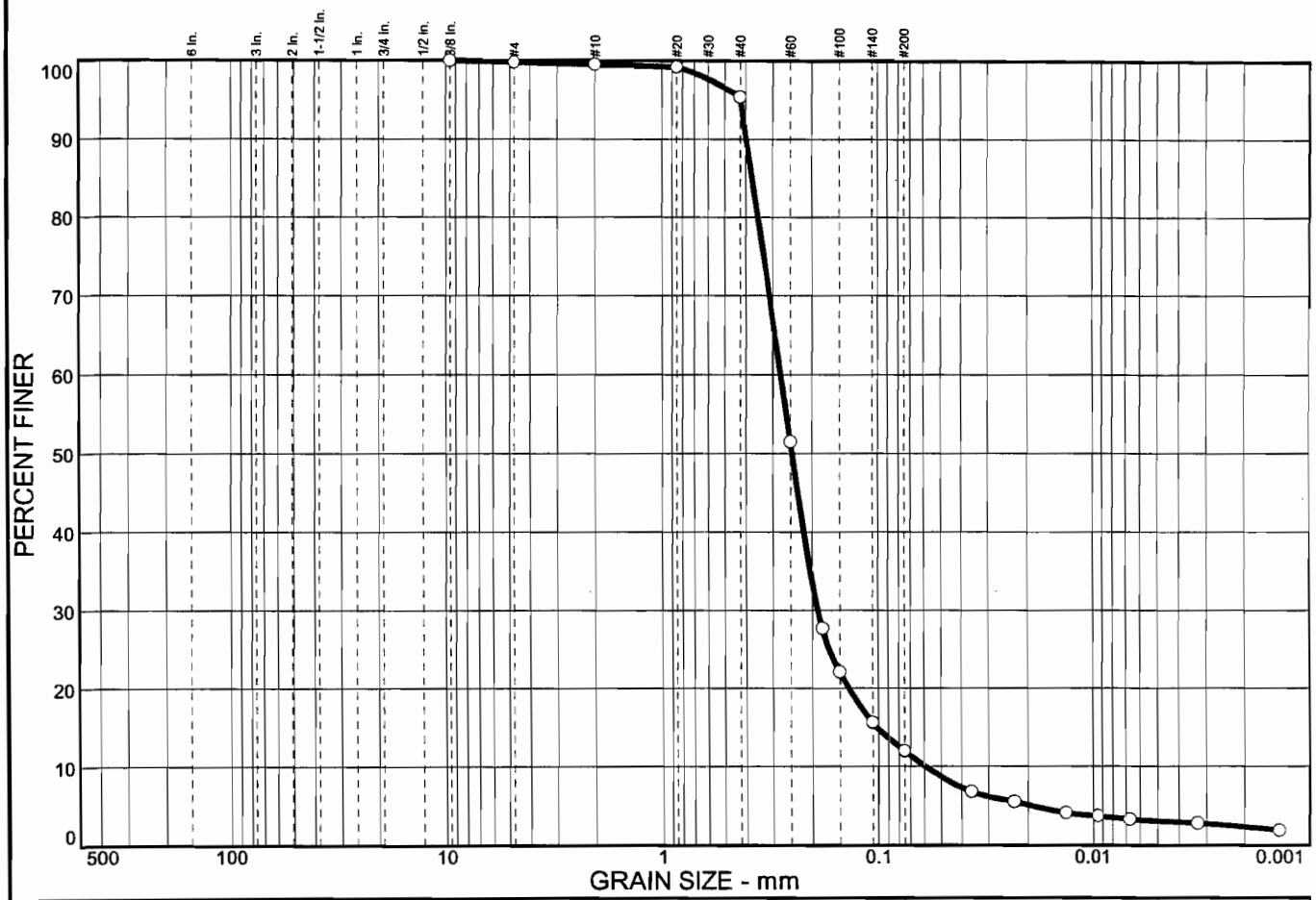
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	87.8	8.9	3.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.8		
#10	99.5		
#20	99.2		
#40	95.4		
#60	51.5		
#80	27.7		
#100	22.1		
#140	15.6		
#200	12.0		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.374 D_{60}= 0.276 D_{50}= 0.246
D_{30}= 0.188 D_{15}= 0.101 D_{10}= 0.0590
C_u= 4.69 C_c= 2.17

Classification

USCS= AASHTO=

Remarks

Sample No.: 30 **Source of Sample:** C-04-24 **Date:** 7-9-05
Location: **Elev./Depth:** 79.0'-82.5'

H. C. NUTTING COMPANY
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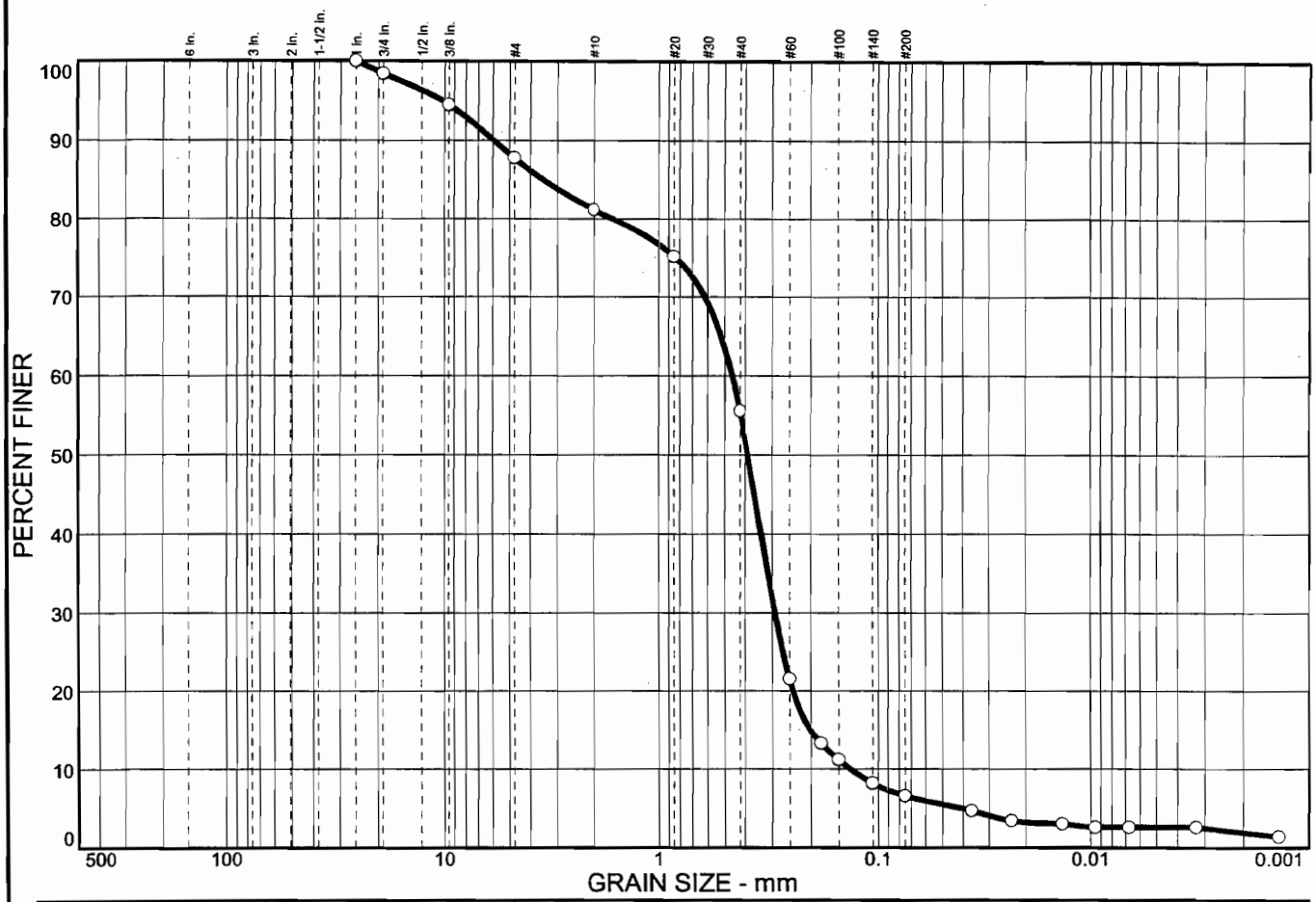
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.2	81.2	4.0	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	98.4		
.375 in.	94.5		
#4	87.8		
#10	81.2		
#20	75.2		
#40	55.6		
#60	21.6		
#80	13.3		
#100	11.2		
#140	8.2		
#200	6.6		

* (no specification provided)

Soil Description

Gray poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.46 D_{60}= 0.462 D_{50}= 0.389
D_{30}= 0.291 D_{15}= 0.201 D_{10}= 0.133
C_u= 3.48 C_c= 1.38

Classification

USCS= AASHTO=

Remarks

Sample No.: 32 **Source of Sample:** C-04-24 **Date:** 7-9-05
Location: **Elev./Depth:** 85.5'-88.5'

H. C. NUTTING COMPANY
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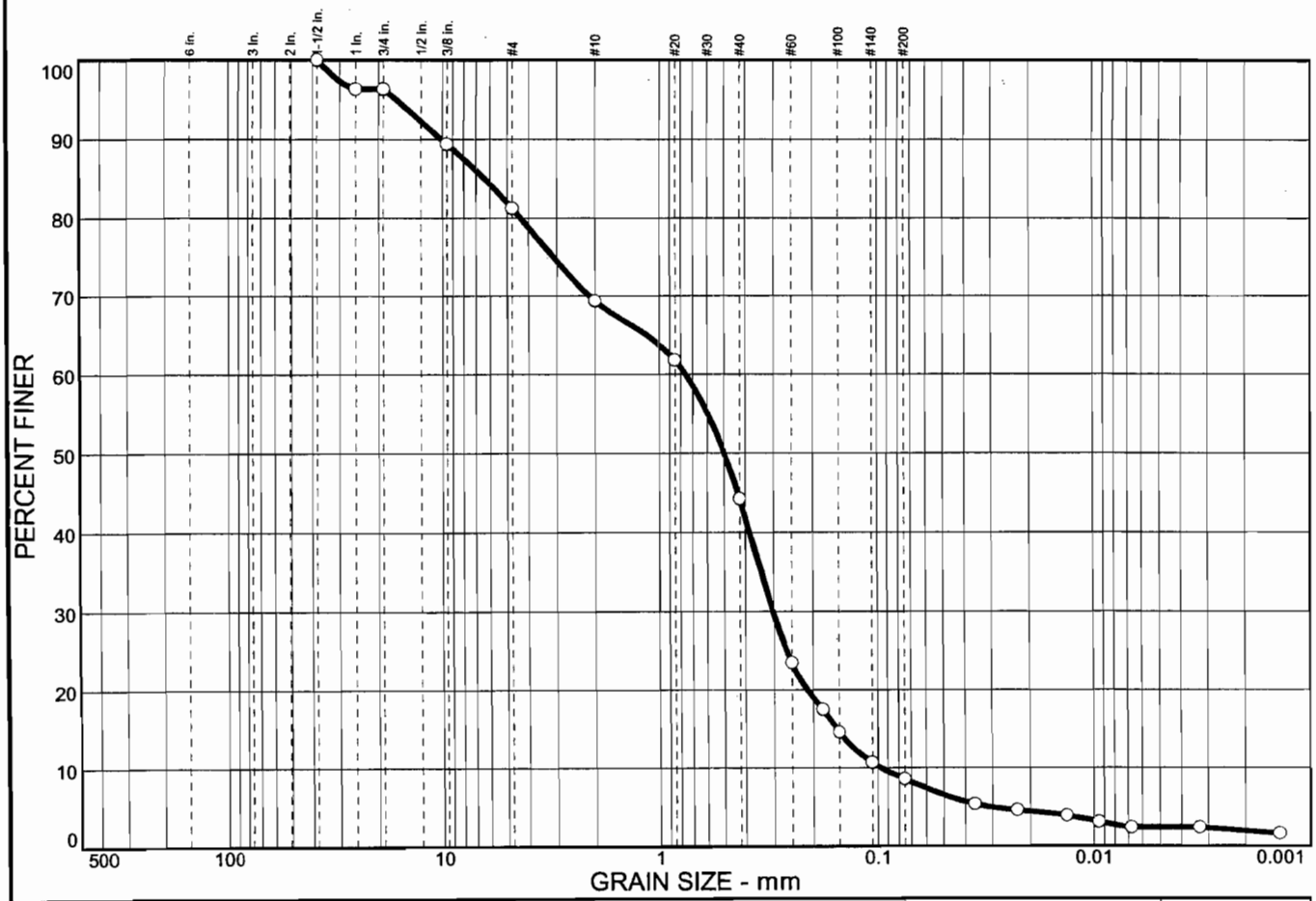
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.7	72.7	6.2	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50 in.	100.0		
1.0 in.	96.3		
.75 in.	96.3		
.375 in.	89.4		
#4	81.3		
#10	69.4		
#20	61.8		
#40	44.3		
#60	23.5		
#80	17.5		
#100	14.6		
#140	10.7		
#200	8.6		

* (no specification provided)

Soil Description

Gray well-graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.36 D_{60}= 0.756 D_{50}= 0.499
D_{30}= 0.302 D_{15}= 0.154 D_{10}= 0.0962
C_u= 7.86 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

Zero retained on the 3/4 inch sieve.

Sample No.: 36 **Source of Sample:** C-04-24 **Date:** 7-9-05
Location: **Elev./Depth:** 97.5'-100.5'

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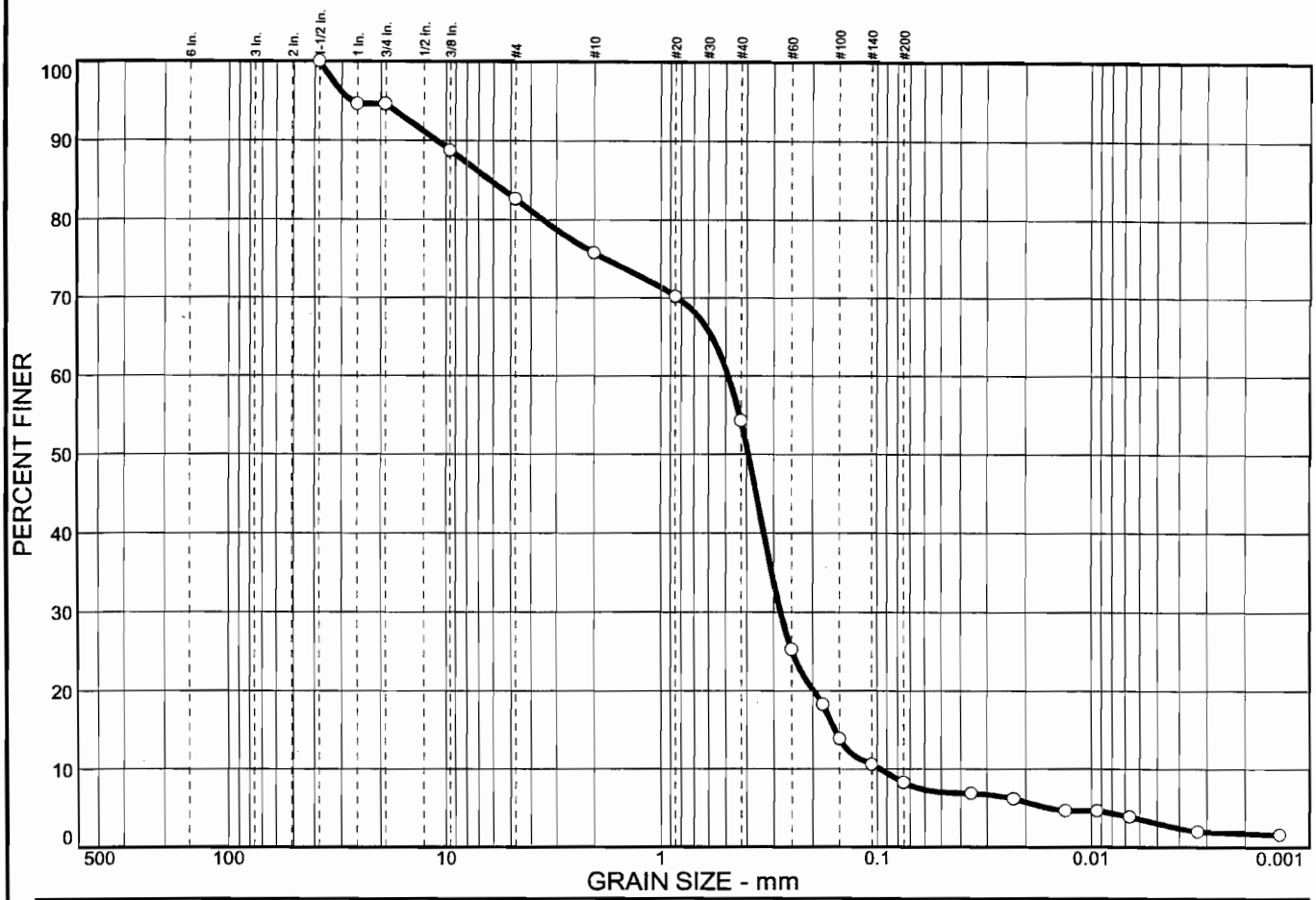
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.3	74.4	5.2	3.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	94.6		
0.75 in.	94.6		
0.375 in.	88.8		
#4	82.7		
#10	75.8		
#20	70.2		
#40	54.3		
#60	25.3		
#80	18.3		
#100	13.9		
#140	10.6		
#200	8.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.17 D_{60}= 0.486 D_{50}= 0.392
D_{30}= 0.279 D_{15}= 0.157 D_{10}= 0.0963
C_u= 5.04 C_c= 1.66

Classification

USCS= AASHTO=

Remarks

Zero retained on the 3/4 inch sieve

Sample No.: 40 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 109.5'-112.5'

H. C. NUTTING COMPANY
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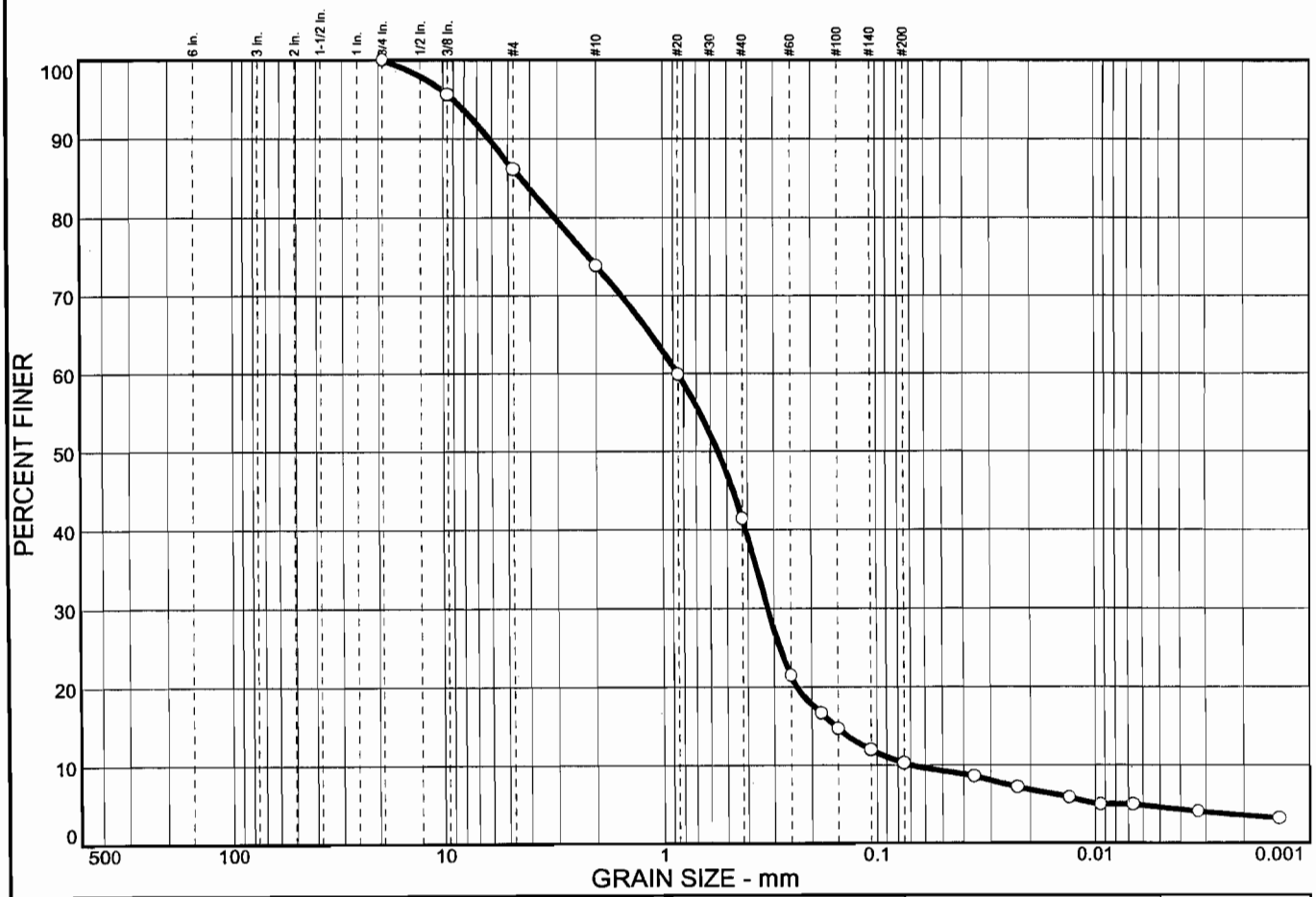
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.8	75.9	5.7	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.6		
#4	86.2		
#10	73.9		
#20	59.9		
#40	41.5		
#60	21.5		
#80	16.7		
#100	14.7		
#140	12.0		
#200	10.3		

* (no specification provided)

Soil Description

Brown well graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.38 D_{60}= 0.854 D_{50}= 0.551
D_{30}= 0.321 D_{15}= 0.154 D_{10}= 0.0685
C_u= 12.48 C_c= 1.76

Classification

USCS= AASHTO=

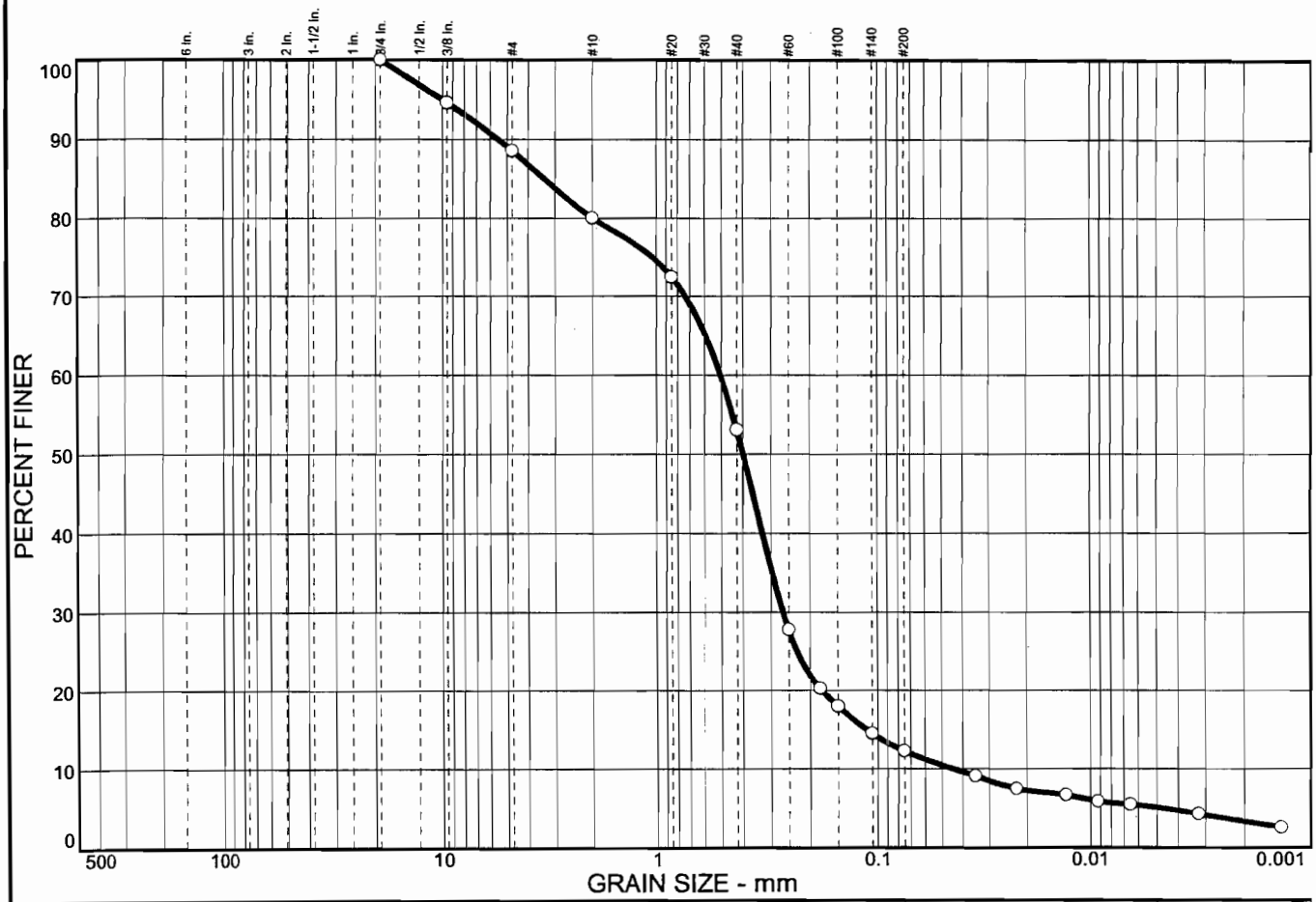
Remarks

Sample No.: 41 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 112.5'-115.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.4	76.3	7.2	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.6		
#4	88.6		
#10	80.1		
#20	72.5		
#40	53.1		
#60	27.8		
#80	20.3		
#100	18.0		
#140	14.5		
#200	12.3		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.35 D_{60}= 0.504 D_{50}= 0.398
D_{30}= 0.265 D_{15}= 0.112 D_{10}= 0.0439
C_u= 11.48 C_c= 3.17

Classification

USCS= AASHTO=

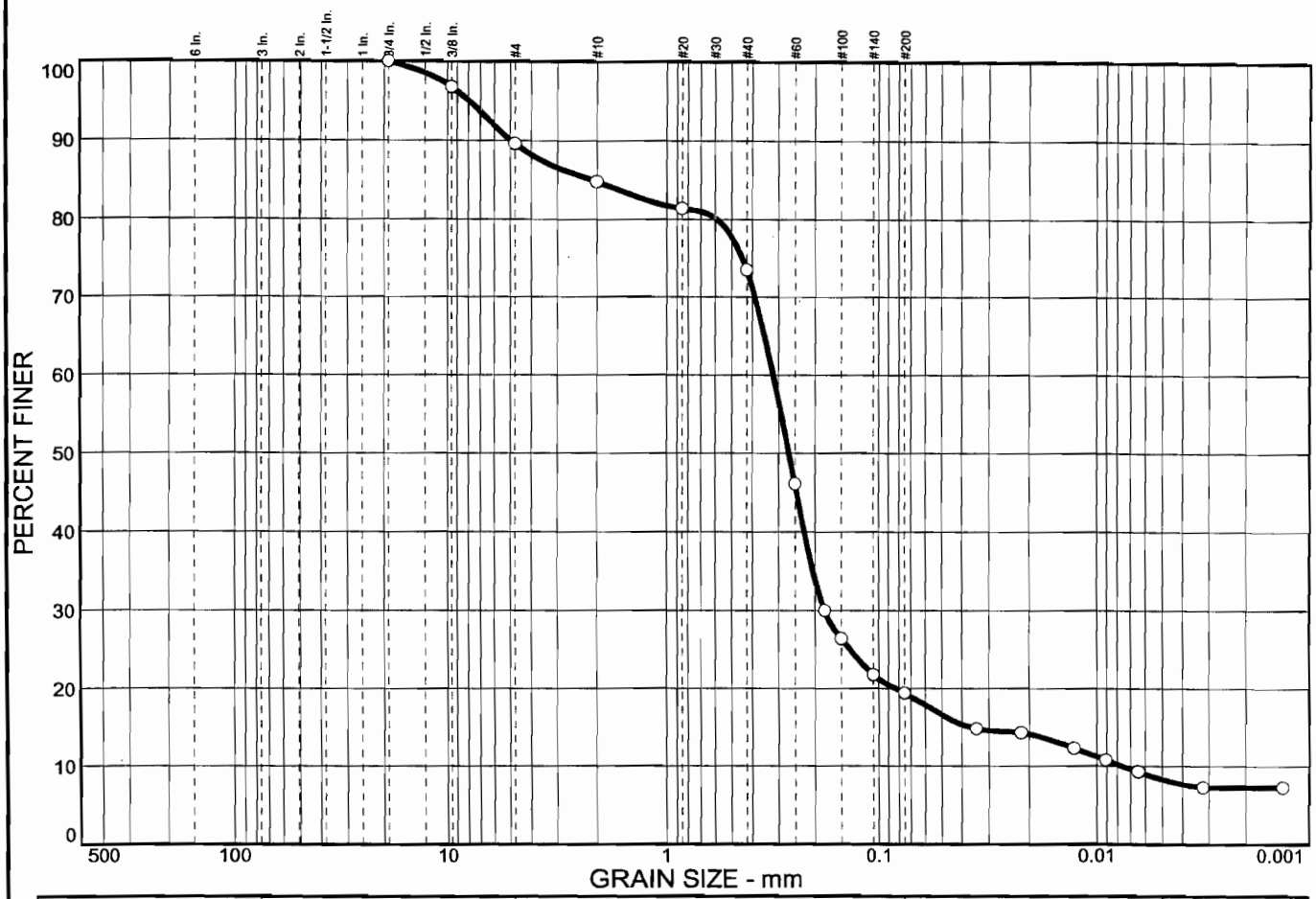
Remarks

Sample No.: 44 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 121.5'-124.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.4	70.2	11.0	8.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.7		
#4	89.6		
#10	84.8		
#20	81.4		
#40	73.5		
#60	46.1		
#80	30.0		
#100	26.4		
#140	21.8		
#200	19.4		

* (no specification provided)

Soil Description

Brown silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.09 D_{60}= 0.317 D_{50}= 0.267
D_{30}= 0.180 D_{15}= 0.0364 D_{10}= 0.0076
C_u= 41.91 C_c= 13.48

Classification

USCS= AASHTO=

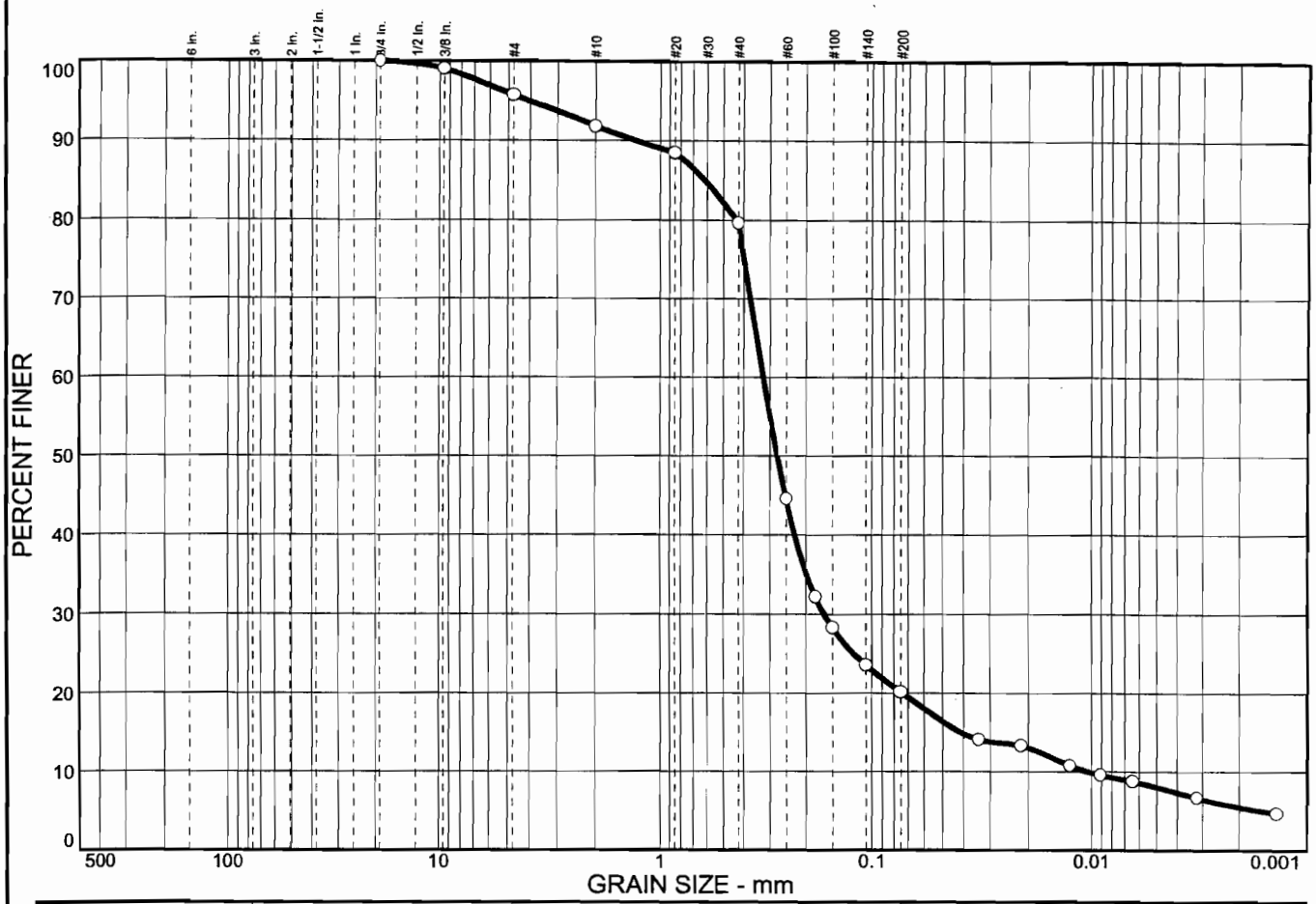
Remarks

Sample No.: 47 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 140.0'-141.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.3	75.5	12.1	8.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.0		
#4	95.7		
#10	91.8		
#20	88.5		
#40	79.7		
#60	44.6		
#80	32.2		
#100	28.3		
#140	23.6		
#200	20.2		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.611 D_{60}= 0.322 D_{50}= 0.276
D_{30}= 0.164 D_{15}= 0.0410 D_{10}= 0.0104
C_u= 31.05 C_c= 8.02

Classification

USCS= AASHTO=

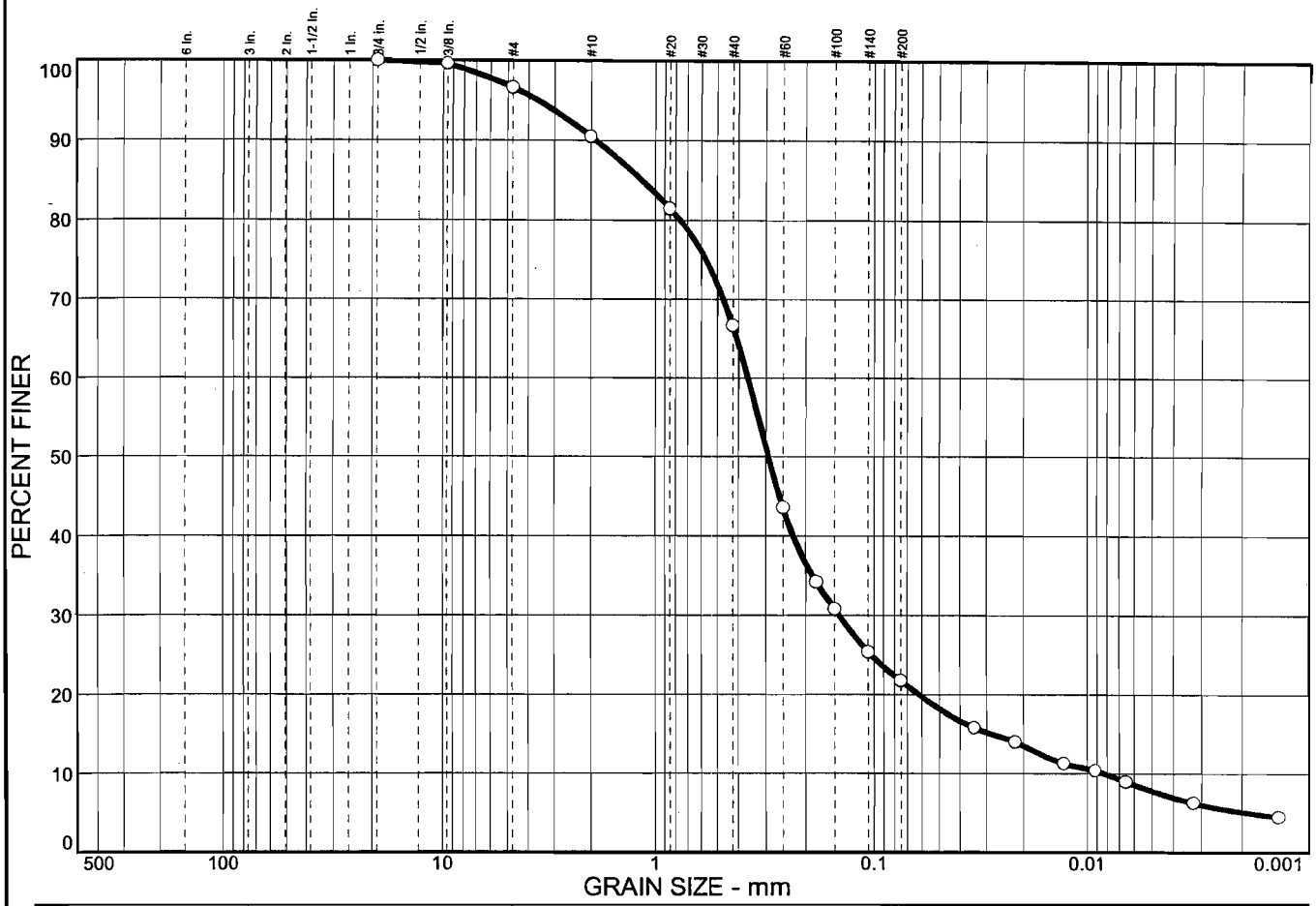
Remarks

Sample No.: 48 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 150.0'-151.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.4	74.8	14.0	7.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.6		
#4	96.6		
#10	90.5		
#20	81.5		
#40	66.7		
#60	43.6		
#80	34.2		
#100	30.8		
#140	25.4		
#200	21.8		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.15 D_{60}= 0.362 D_{50}= 0.291
D_{30}= 0.143 D_{15}= 0.0282 D_{10}= 0.0082
C_u= 44.15 C_c= 6.90

Classification

USCS= AASHTO=

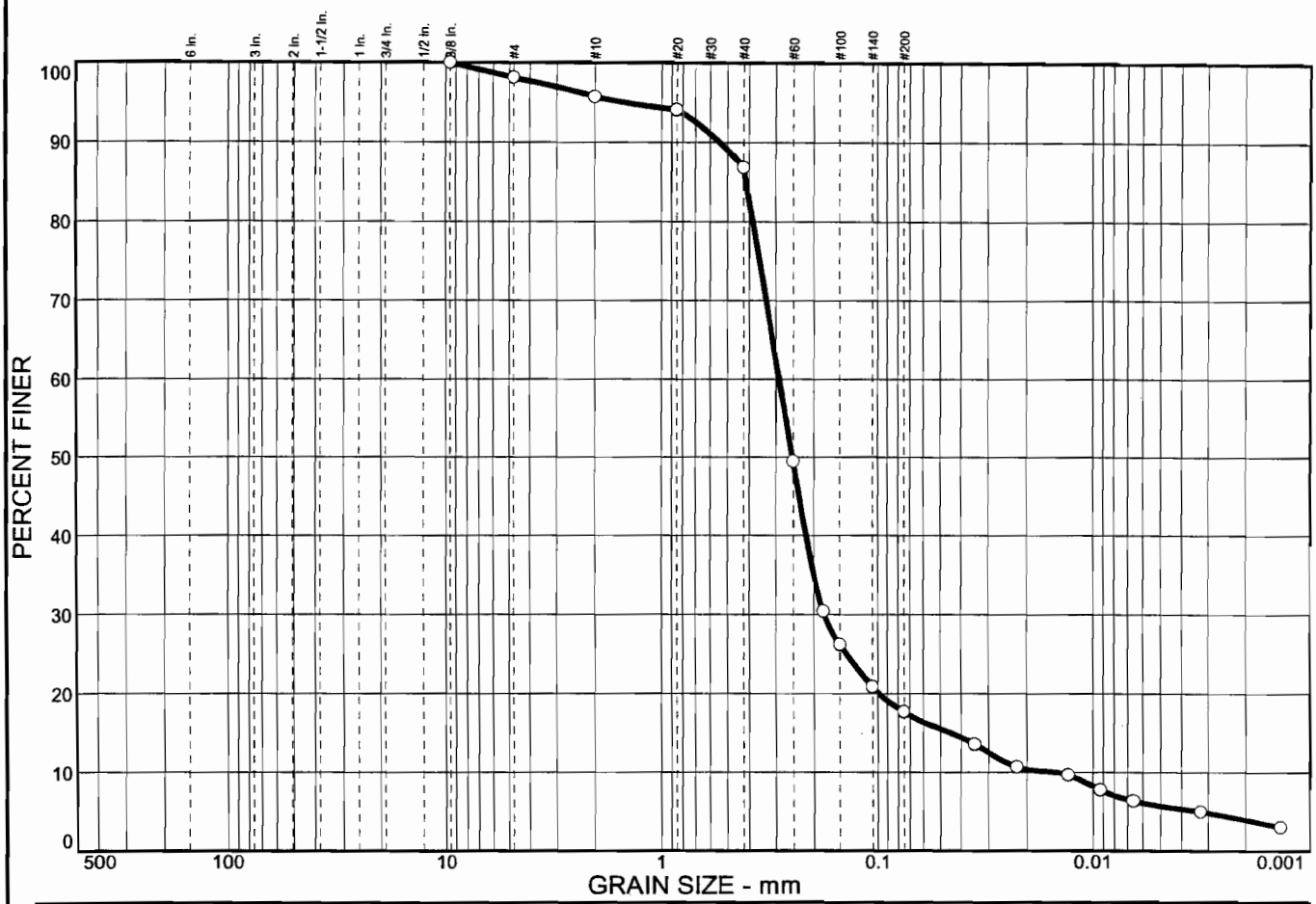
Remarks

Sample No.: 49 **Source of Sample:** C-04-24 **Date:** 07/06/05
Location: **Elev./Depth:** 160.0'-161.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.9	80.4	12.0	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.1		
#10	95.7		
#20	94.1		
#40	86.9		
#60	49.5		
#80	30.4		
#100	26.2		
#140	20.9		
#200	17.7		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.414 D_{60}= 0.290 D_{50}= 0.252
D_{30}= 0.178 D_{15}= 0.0443 D_{10}= 0.0144
C_u= 20.09 C_c= 7.56

Classification

USCS= AASHTO=

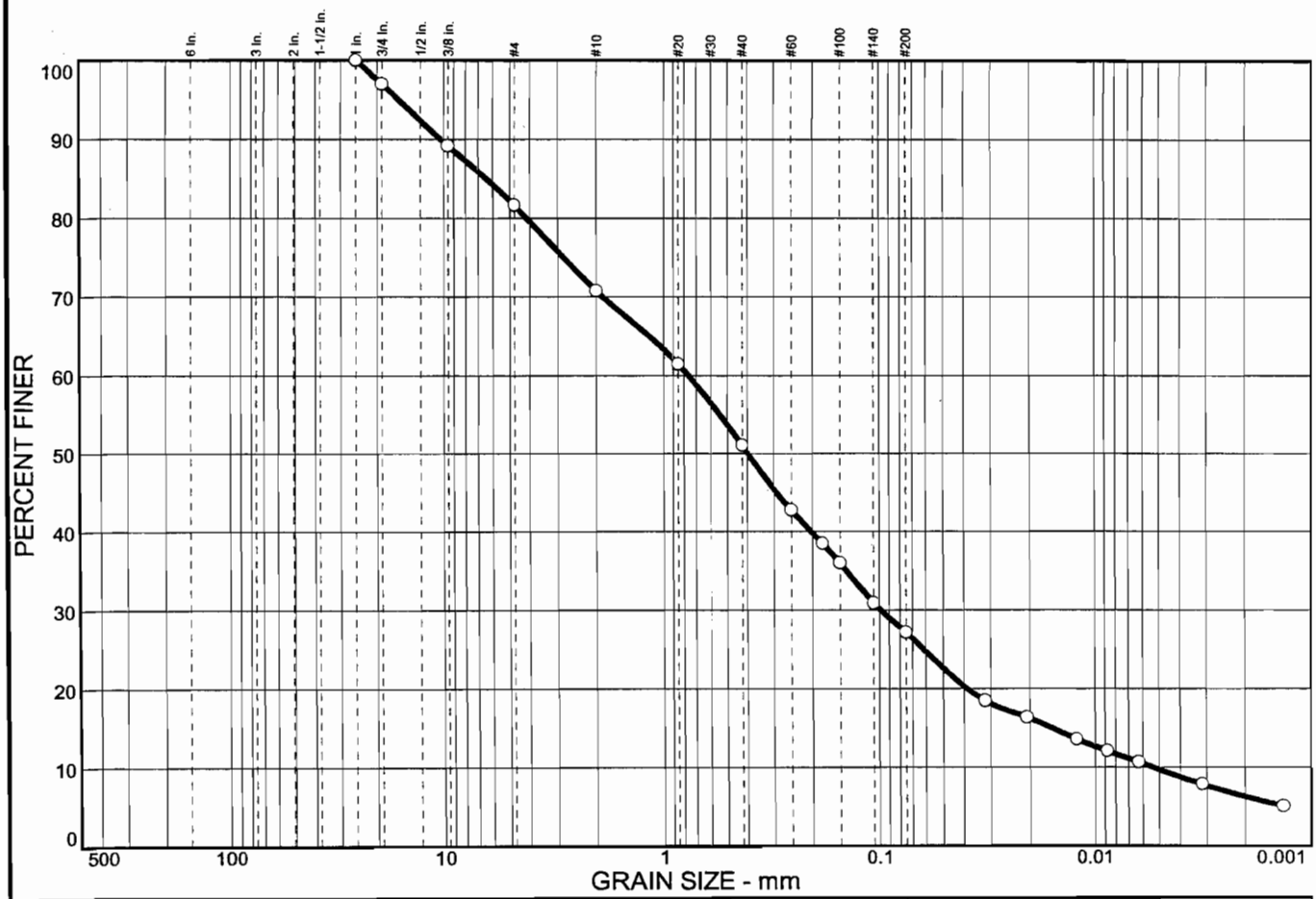
Remarks

Sample No.: 50 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 170.0'-171.6'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.3	54.5	17.5	9.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.0		
0.375 in.	89.2		
#4	81.7		
#10	70.8		
#20	61.5		
#40	51.1		
#60	42.8		
#80	38.5		
#100	36.0		
#140	30.9		
#200	27.2		

* (no specification provided)

Soil Description

Brown to gray silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.40 D_{60}= 0.758 D_{50}= 0.397
D_{30}= 0.0984 D_{15}= 0.0158 D_{10}= 0.0053
C_u= 142.71 C_c= 2.40

Classification

USCS= AASHTO=

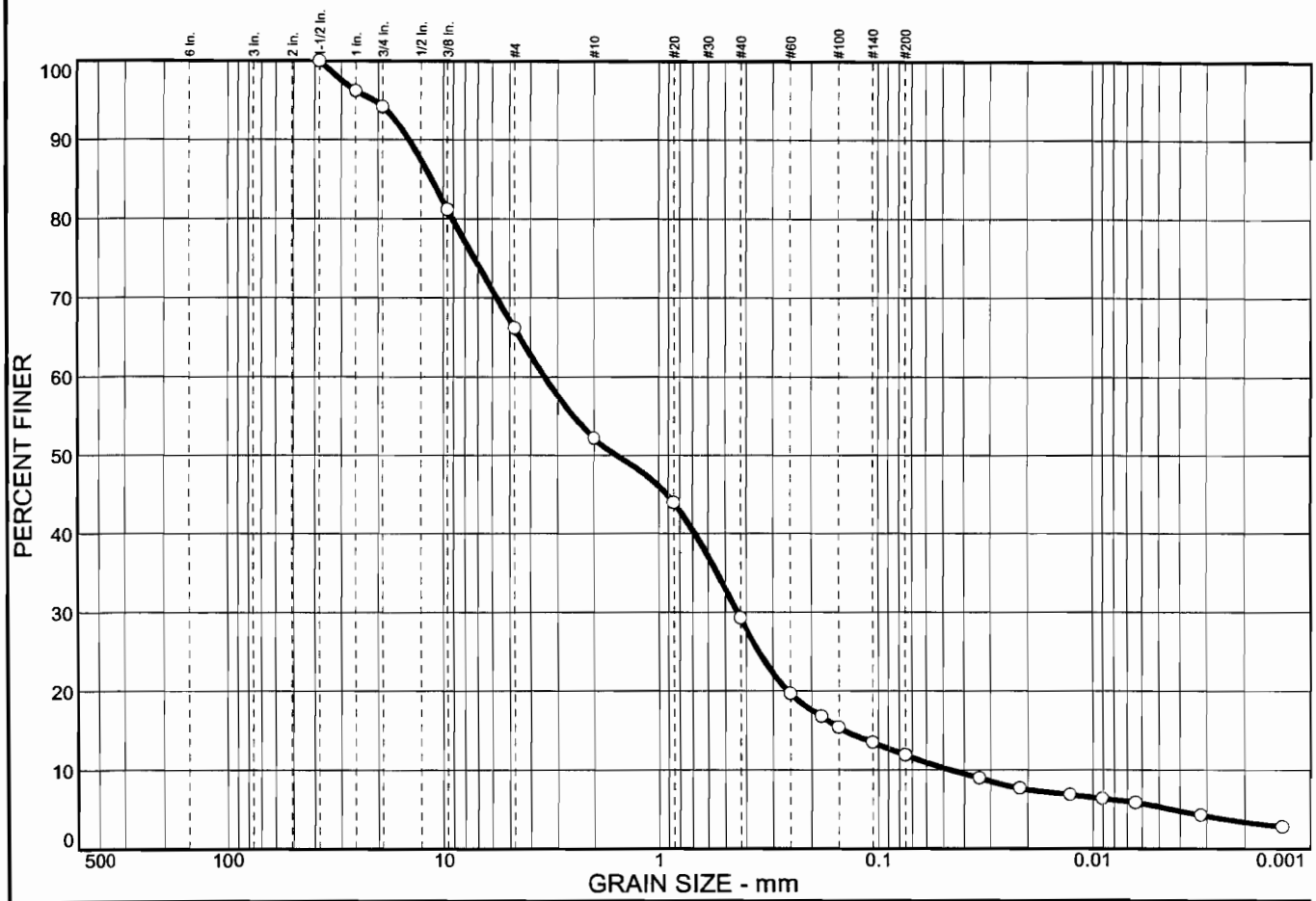
Remarks

Sample No.: 51 **Source of Sample:** C-04-24 **Date:** 07/01/05
Location: **Elev./Depth:** 180.0'-181.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.8	54.3	6.5	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.2		
0.75 in.	94.2		
0.375 in.	81.2		
#4	66.2		
#10	52.2		
#20	44.0		
#40	29.3		
#60	19.7		
#80	16.8		
#100	15.4		
#140	13.5		
#200	11.9		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.3 D_{60}= 3.43 D_{50}= 1.56
D_{30}= 0.438 D_{15}= 0.141 D_{10}= 0.0457
C_u= 75.07 C_c= 1.22

Classification

USCS= AASHTO=

Remarks

Sample No.: 2 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 0.2'-3.0'

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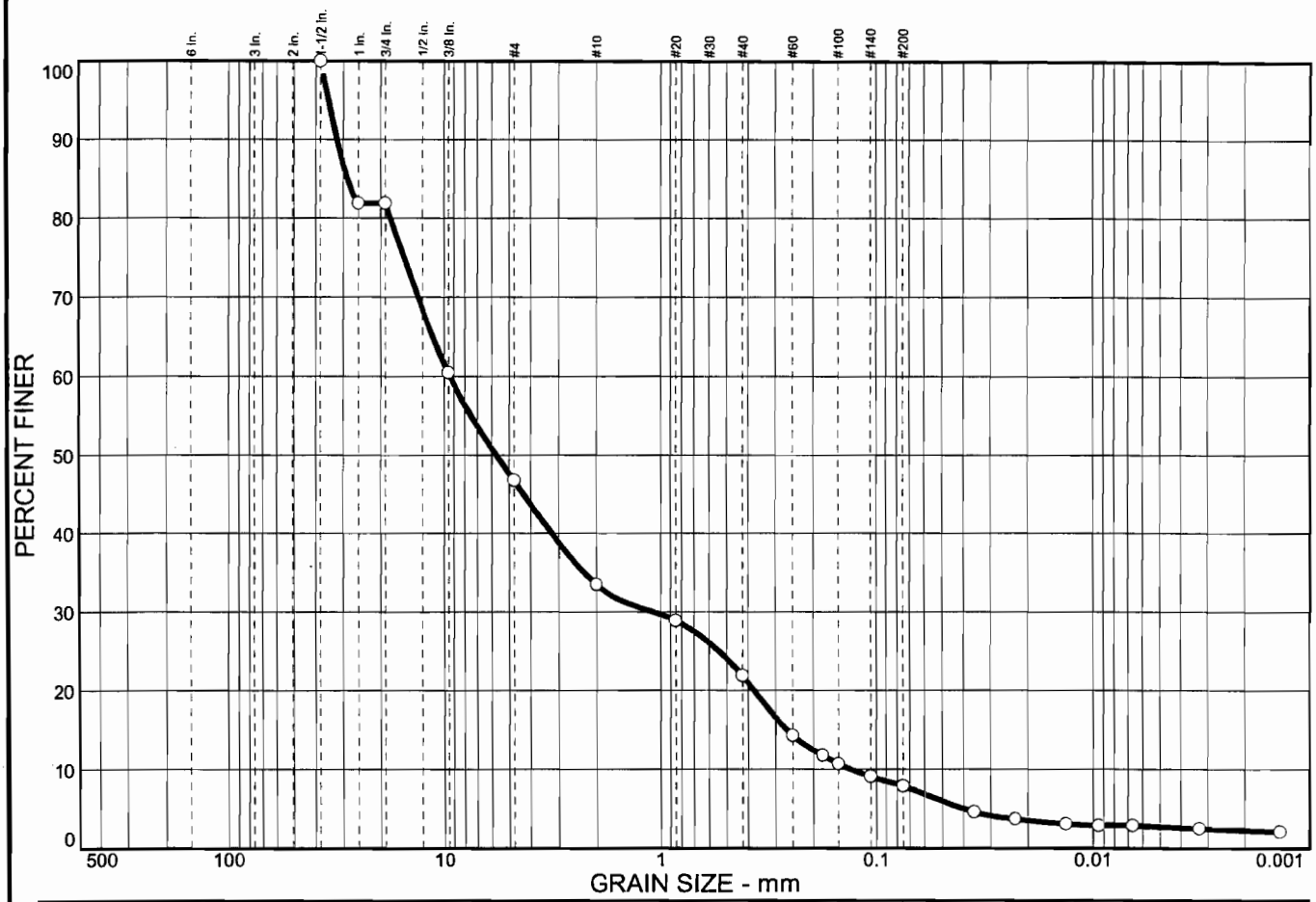
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	53.2	38.9	5.2	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	81.9		
0.75 in.	81.9		
0.375 in.	60.5		
#4	46.8		
#10	33.5		
#20	28.9		
#40	21.9		
#60	14.3		
#80	11.8		
#100	10.7		
#140	9.1		
#200	7.9		

* (no specification provided)

Soil Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 28.6 D_{60}= 9.34 D_{50}= 5.71
D_{30}= 1.07 D_{15}= 0.266 D_{10}= 0.131
C_u= 71.16 C_c= 0.94

Classification

USCS= AASHTO=

Remarks

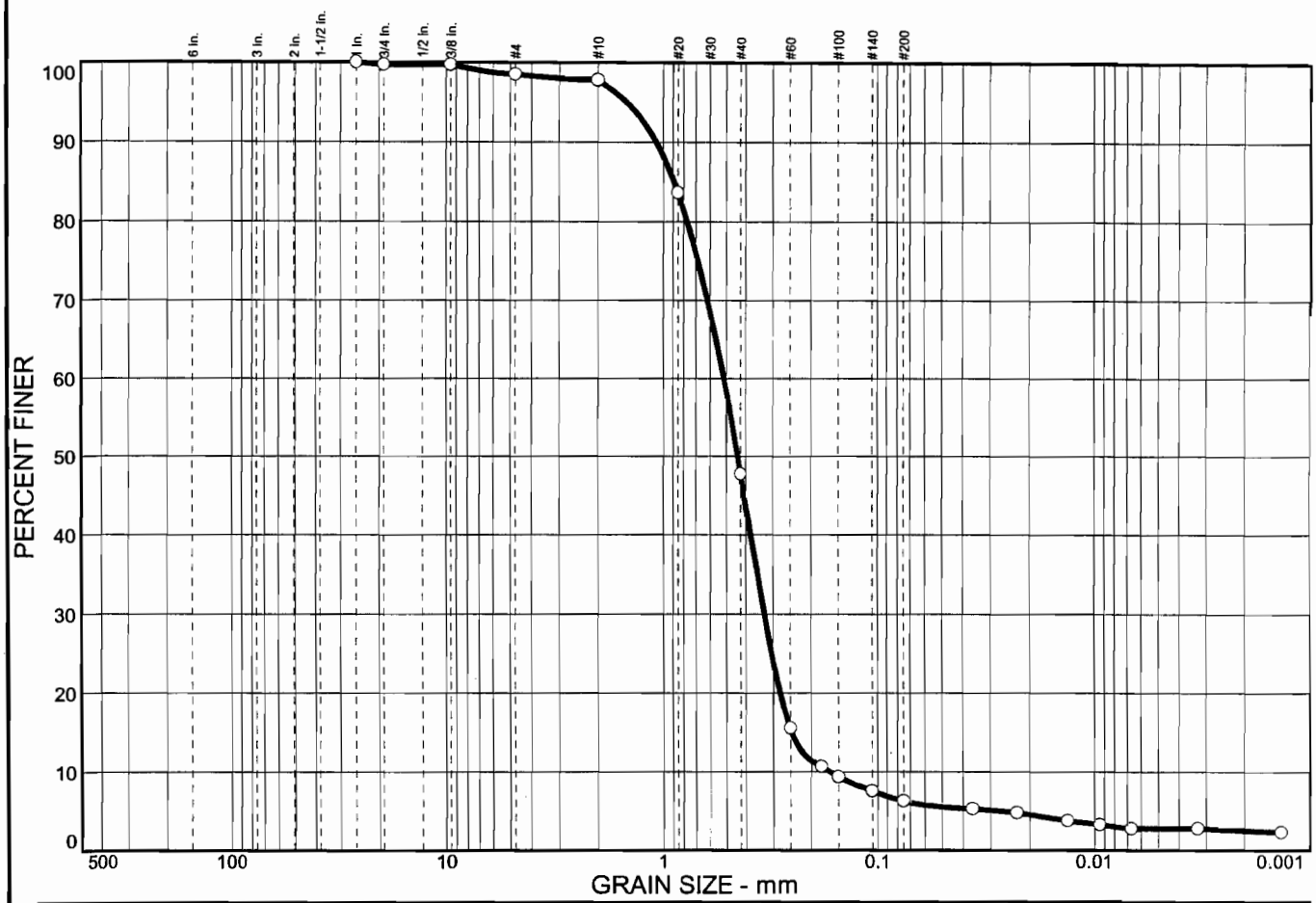
Zero retained on 3/4 inch sieve.

Sample No.: 5 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 7.5'-10.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.5	92.2	3.5	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	99.7		
0.375 in.	99.7		
#4	98.5		
#10	97.8		
#20	83.7		
#40	47.8		
#60	15.6		
#80	10.7		
#100	9.4		
#140	7.6		
#200	6.3		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.885 D_{60}= 0.514 D_{50}= 0.439
D_{30}= 0.329 D_{15}= 0.245 D_{10}= 0.163
C_u= 3.15 C_c= 1.29

Classification

USCS= AASHTO=

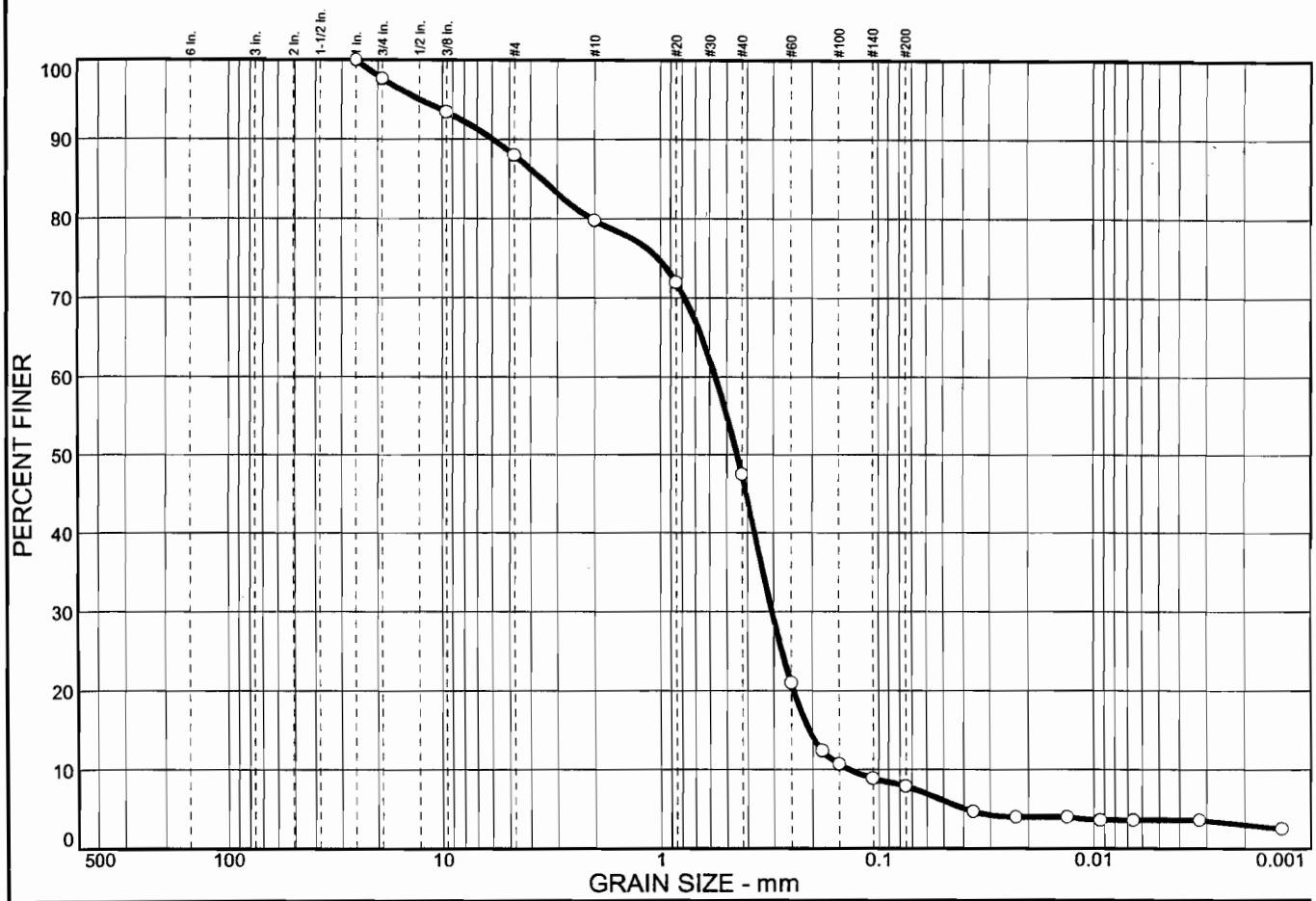
Remarks

Sample No.: 7 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 12.5'-15.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.0	80.1	4.3	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	97.6		
0.375 in.	93.4		
#4	88.0		
#10	79.8		
#20	72.0		
#40	47.5		
#60	21.0		
#80	12.4		
#100	10.7		
#140	8.9		
#200	7.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.54 D_{60}= 0.564 D_{50}= 0.447
D_{30}= 0.305 D_{15}= 0.207 D_{10}= 0.134
C_u= 4.21 C_c= 1.23

Classification

USCS= AASHTO=

Remarks

Sample No.: 10 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 21.0'-24.0'

H. C. NUTTING COMPANY
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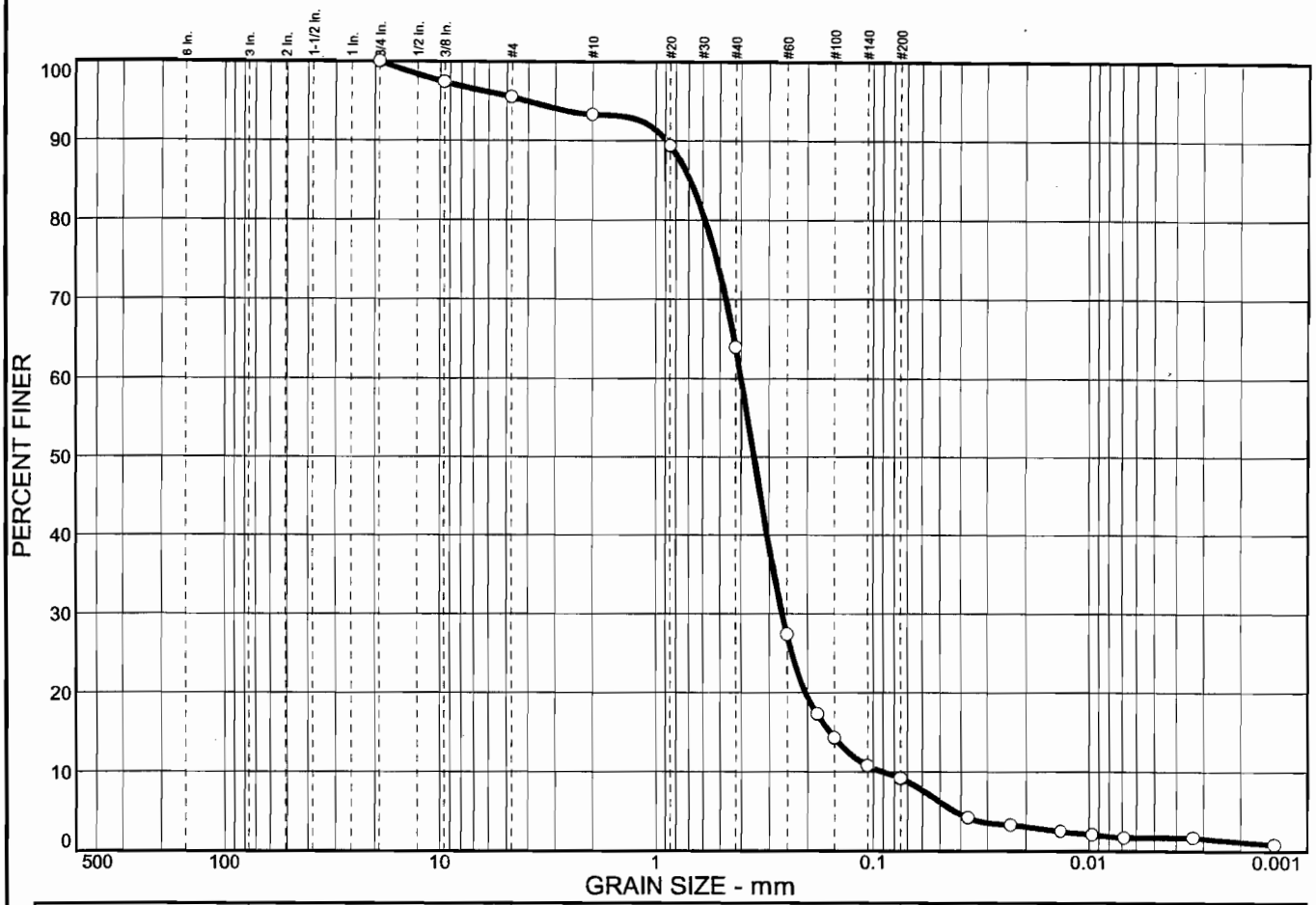
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	86.3	7.5	1.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.4		
#4	95.5		
#10	93.3		
#20	89.4		
#40	64.0		
#60	27.4		
#80	17.3		
#100	14.3		
#140	10.8		
#200	9.2		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt, trace gravel

Atterberg Limits

PL= 16 LL= PI= 18

Coefficients

D_{85}= 0.685 D_{60}= 0.401 D_{50}= 0.350
D_{30}= 0.262 D_{15}= 0.157 D_{10}= 0.0900
C_u= 4.45 C_c= 1.91

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Sample No.: 14 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 33.0'-36.0'

H. C. NUTTING COMPANY
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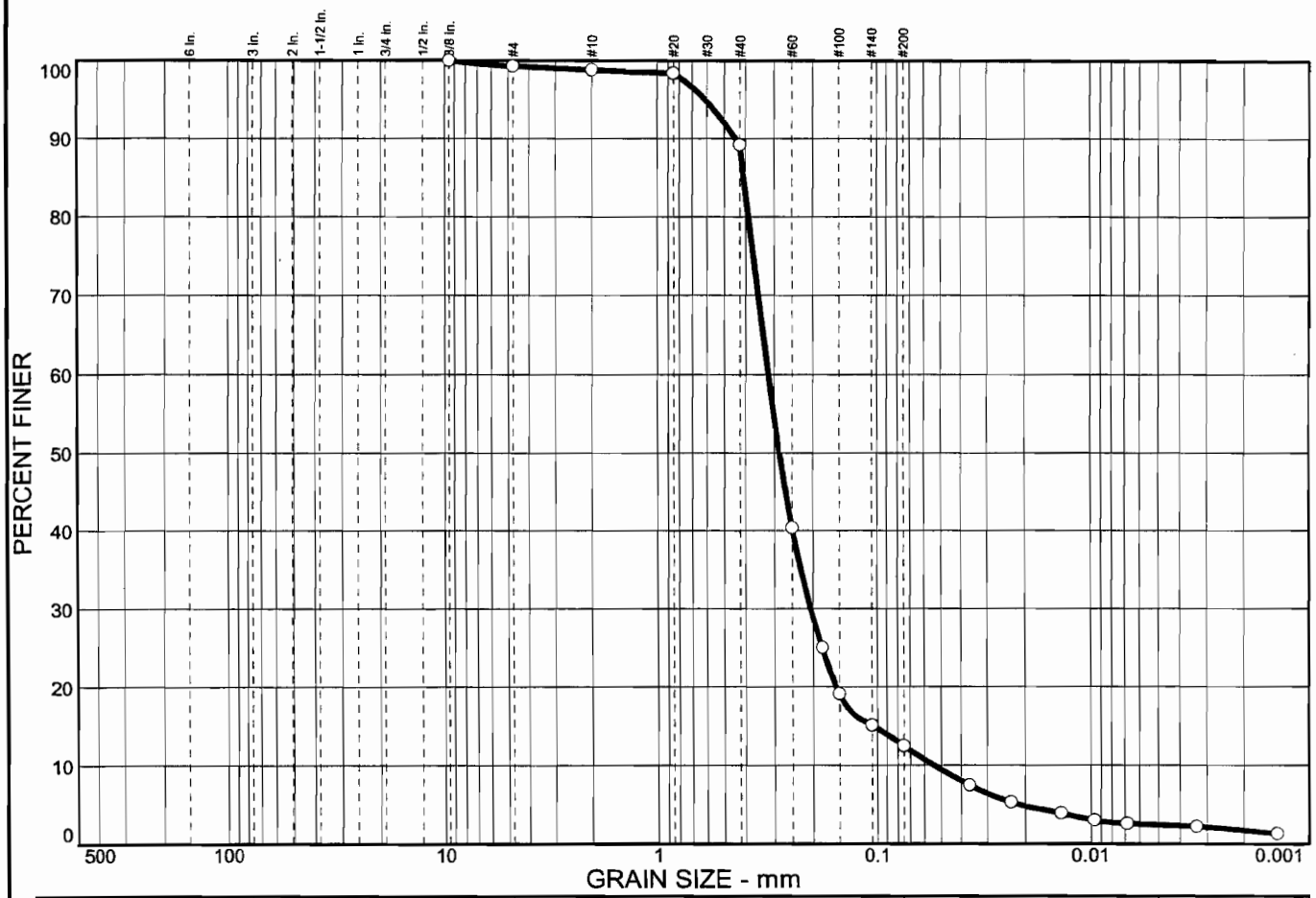
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	86.8	10.1	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.3		
#10	98.8		
#20	98.4		
#40	89.2		
#60	40.4		
#80	25.0		
#100	19.1		
#140	15.1		
#200	12.5		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.408 D_{60}= 0.318 D_{50}= 0.284
D_{30}= 0.205 D_{15}= 0.104 D_{10}= 0.0536
C_u= 5.94 C_c= 2.46

Classification

USCS= AASHTO=

Remarks

Sample No.: 17 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 42.0'-45.0'

H. C. NUTTING COMPANY
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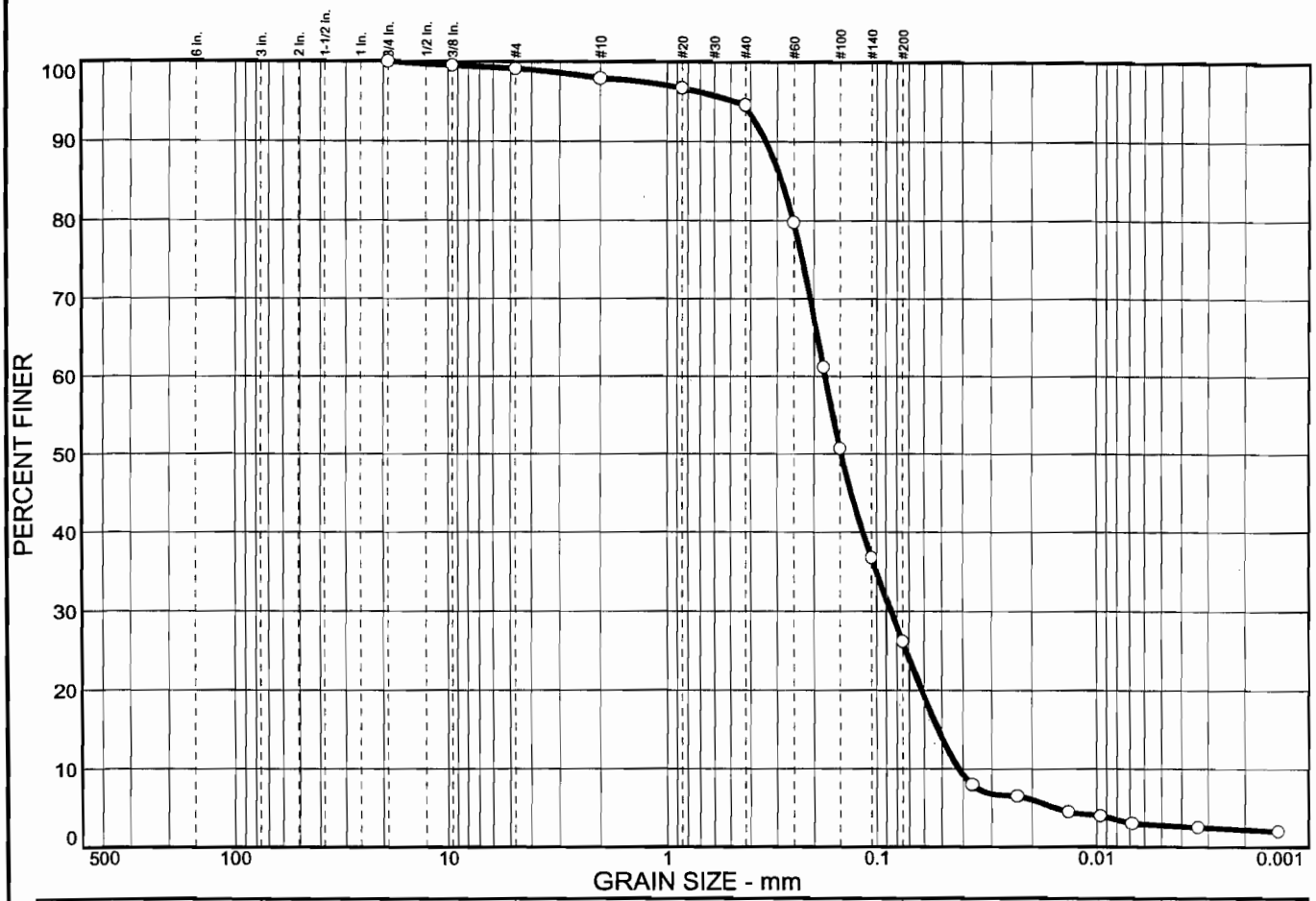
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	72.9	23.4	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	99.1		
#10	97.9		
#20	96.7		
#40	94.6		
#60	79.8		
#80	61.2		
#100	50.7		
#140	36.8		
#200	26.2		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.285 D_{60}= 0.176 D_{50}= 0.148
D_{30}= 0.0851 D_{15}= 0.0515 D_{10}= 0.0415
C_u= 4.25 C_c= 0.99

Classification

USCS= AASHTO=

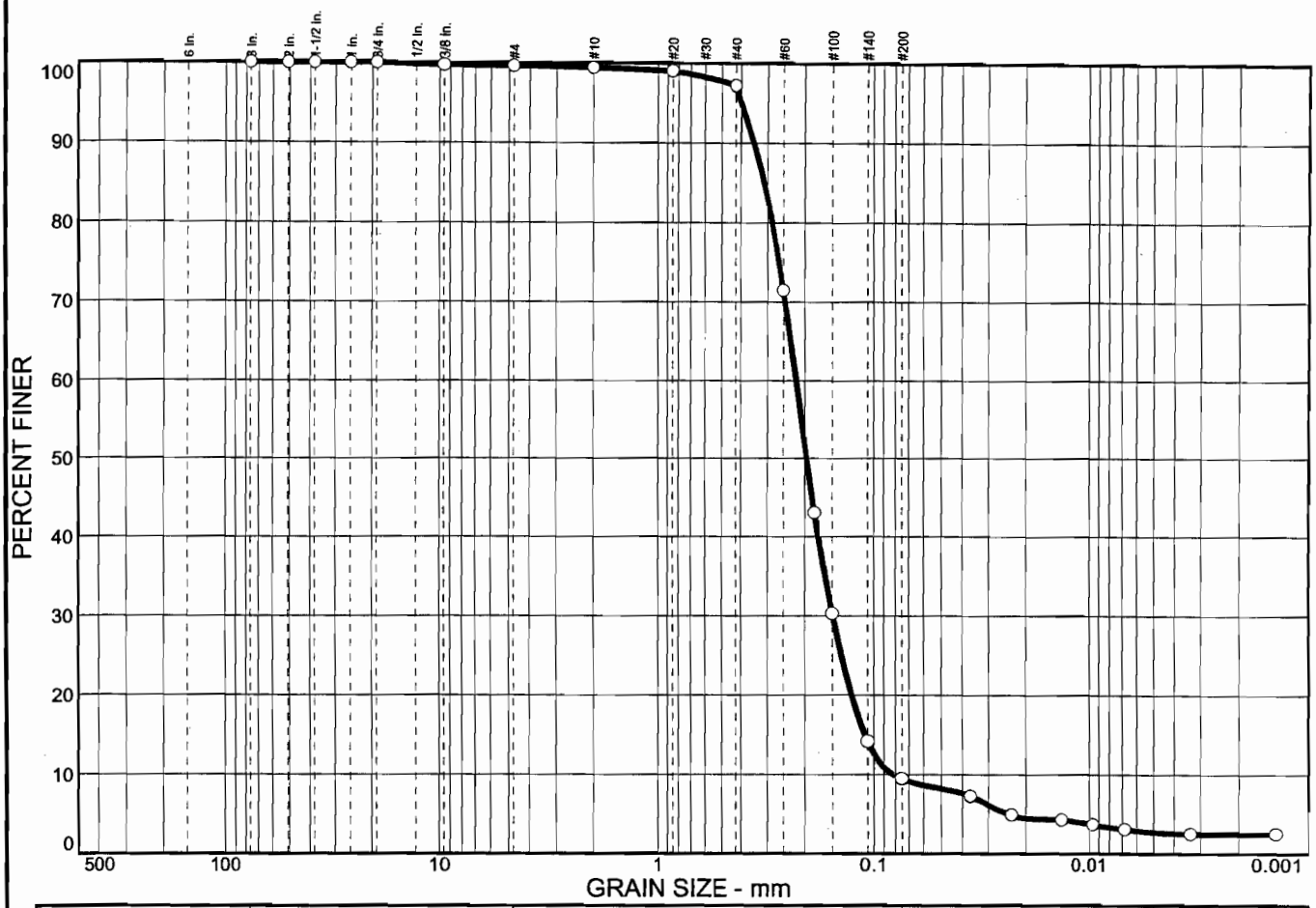
Remarks

Sample No.: 18 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 45.0'-48.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	90.1	6.8	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2 in.	100.0		
1.5 in.	100.0		
1 in.	100.0		
.75 in.	100.0		
.375 in.	99.7		
#4	99.6		
#10	99.4		
#20	99.0		
#40	97.2		
#60	71.5		
#80	43.1		
#100	30.3		
#140	14.2		
#200	9.5		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.311 D_{60}= 0.218 D_{50}= 0.195
D_{30}= 0.149 D_{15}= 0.109 D_{10}= 0.0816
C_u= 2.67 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

Sample No.: 21 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 54.0'-55.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
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SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	17.1	75.4	7.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	98.7		
#80	97.8		
#100	97.3		
#140	93.3		
#200	82.9		

* (no specification provided)

Soil Description

Brown silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0781 D_{60}= 0.0564 D_{50}= 0.0508
D_{30}= 0.0404 D_{15}= 0.0129 D_{10}= 0.0108
C_u= 5.24 C_c= 2.70

Classification

USCS= AASHTO=

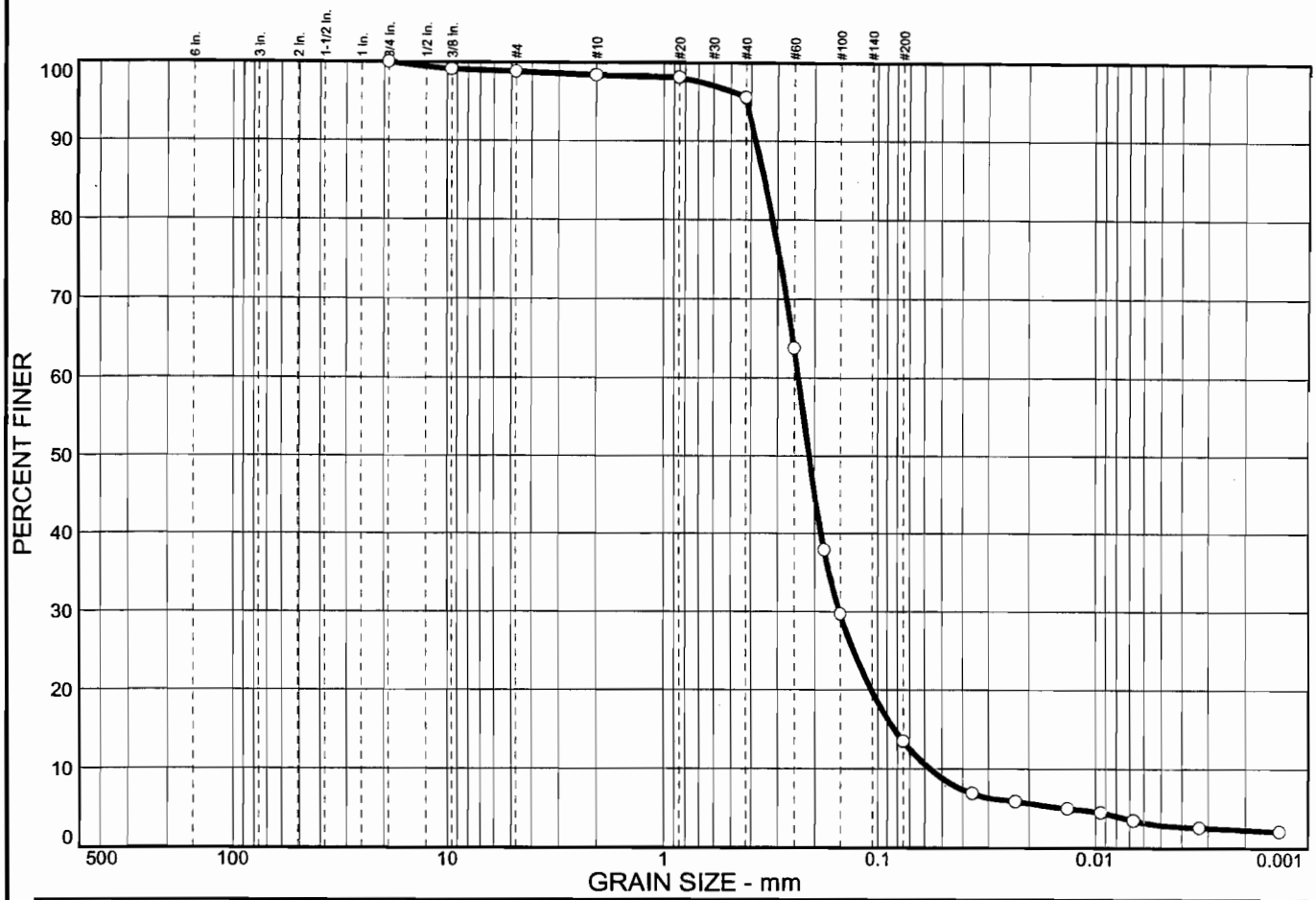
Remarks

Sample No.: 22 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 55.5'-58.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.2	85.3	10.6	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.1		
#4	98.8		
#10	98.4		
#20	98.1		
#40	95.6		
#60	63.8		
#80	37.9		
#100	29.7		
#200	13.5		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.346 D_{60}= 0.239 D_{50}= 0.212
D_{30}= 0.151 D_{15}= 0.0827 D_{10}= 0.0564
C_u= 4.23 C_c= 1.70

Classification

USCS= AASHTO=

Remarks

Sample No.: 26 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 67.5'-70.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.7	81.1	8.3	5.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	95.3		
#10	90.8		
#20	85.8		
#40	66.2		
#60	36.6		
#80	24.0		
#100	20.9		
#140	16.7		
#200	14.2		

* (no specification provided)

Soil Description

Brown silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.803 D_{60}= 0.377 D_{50}= 0.317
D_{30}= 0.217 D_{15}= 0.0854 D_{10}= 0.0325
C_u= 11.62 C_c= 3.83

Classification

USCS= AASHTO=

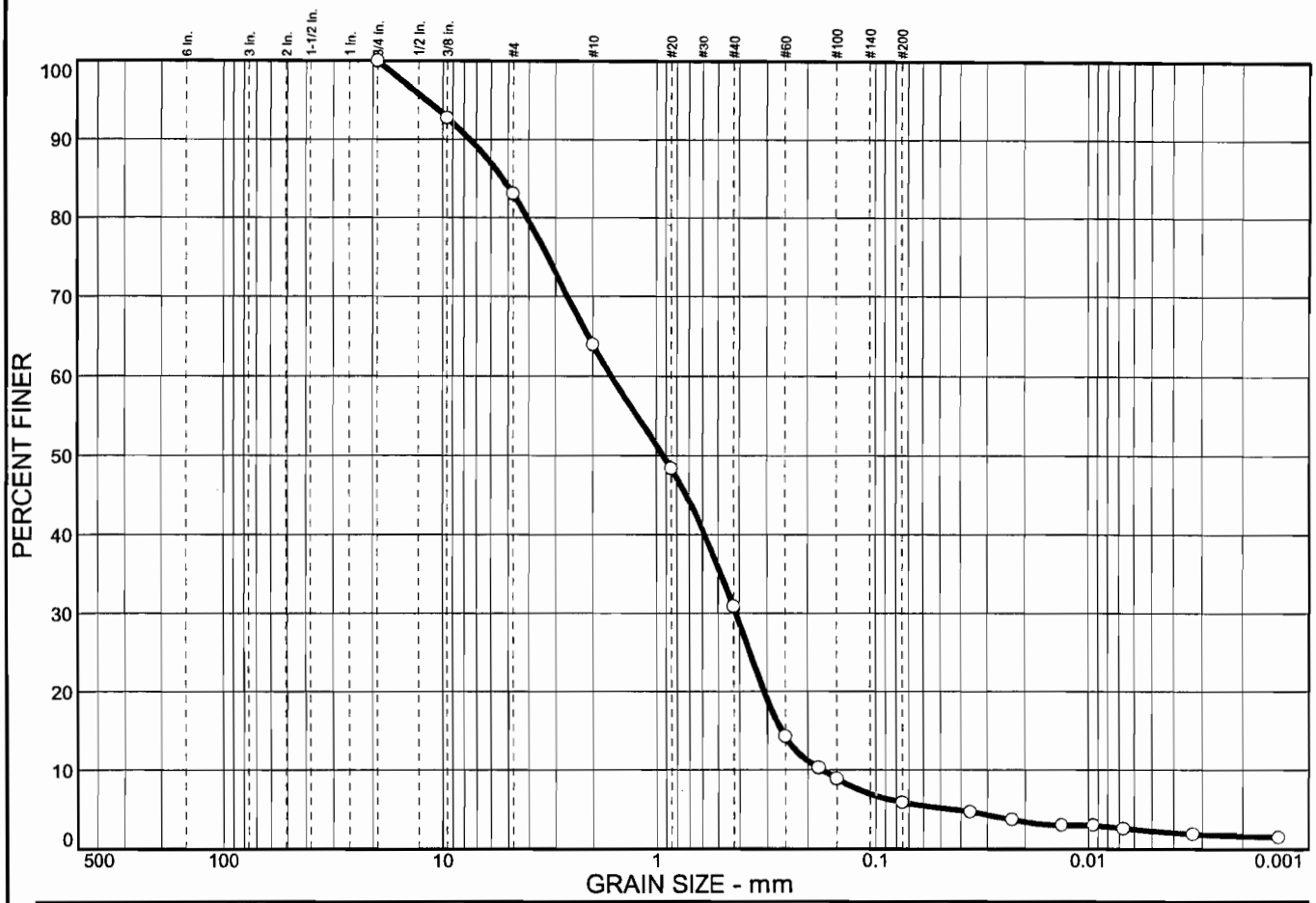
Remarks

Sample No.: 30 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 79.5'-82.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	16.9	77.2	3.6	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.8		
#4	83.1		
#10	64.0		
#20	48.4		
#40	30.9		
#60	14.3		
#80	10.3		
#100	8.9		
#200	5.9		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.29 D_{60}= 1.63 D_{50}= 0.925
D_{30}= 0.414 D_{15}= 0.258 D_{10}= 0.173
C_u= 9.39 C_c= 0.61

Classification

USCS= AASHTO=

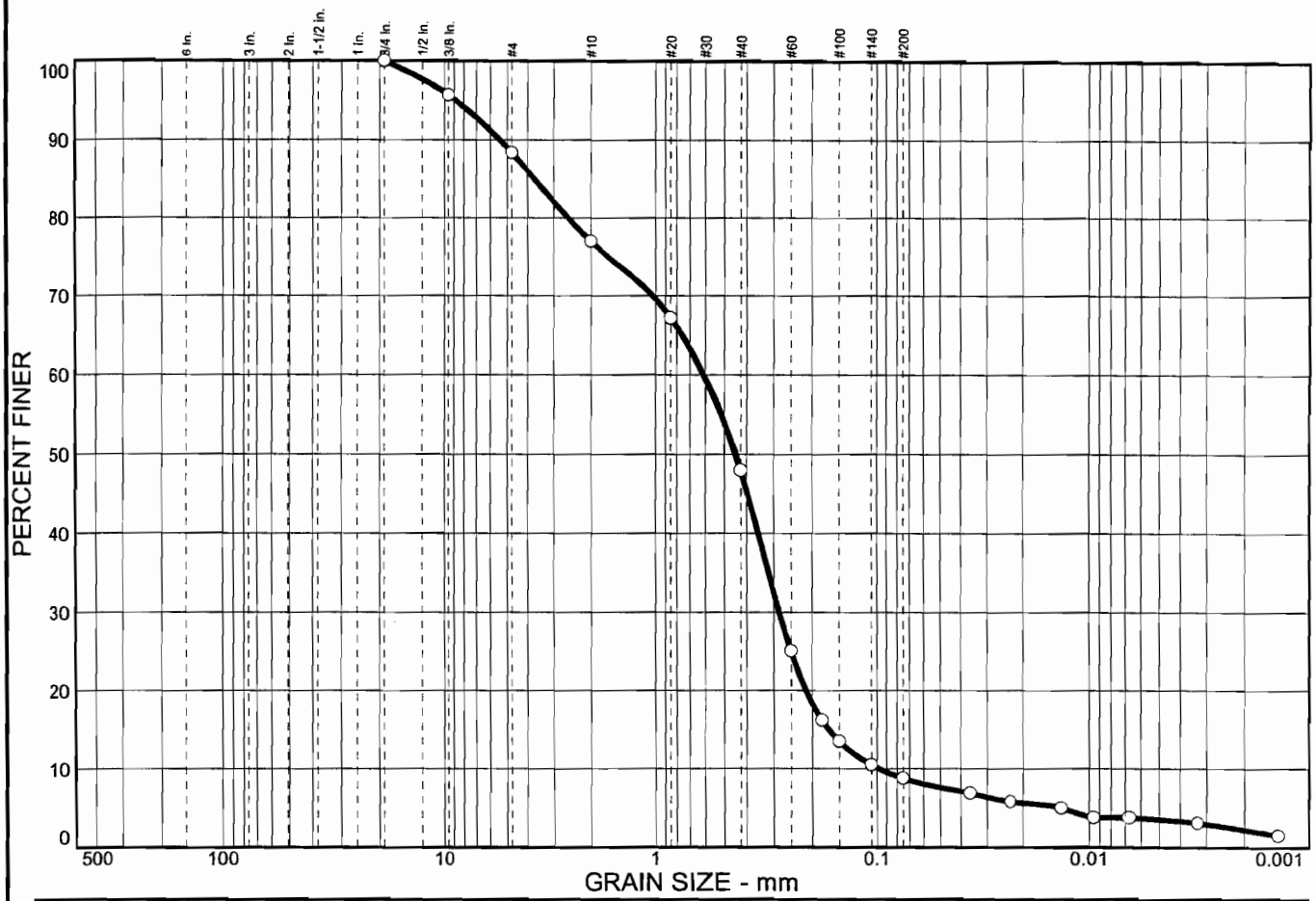
Remarks

Sample No.: 34 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 91.5'-94.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.6	79.6	5.2	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.7		
#4	88.4		
#10	77.0		
#20	67.2		
#40	48.0		
#60	25.1		
#80	16.2		
#100	13.5		
#140	10.5		
#200	8.8		

* (no specification provided)

Soil Description

Brown well-graded sand with silt, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.69 D_{60}= 0.609 D_{50}= 0.447
D_{30}= 0.283 D_{15}= 0.168 D_{10}= 0.0974
C_u= 6.25 C_c= 1.35

Classification

USCS= AASHTO=

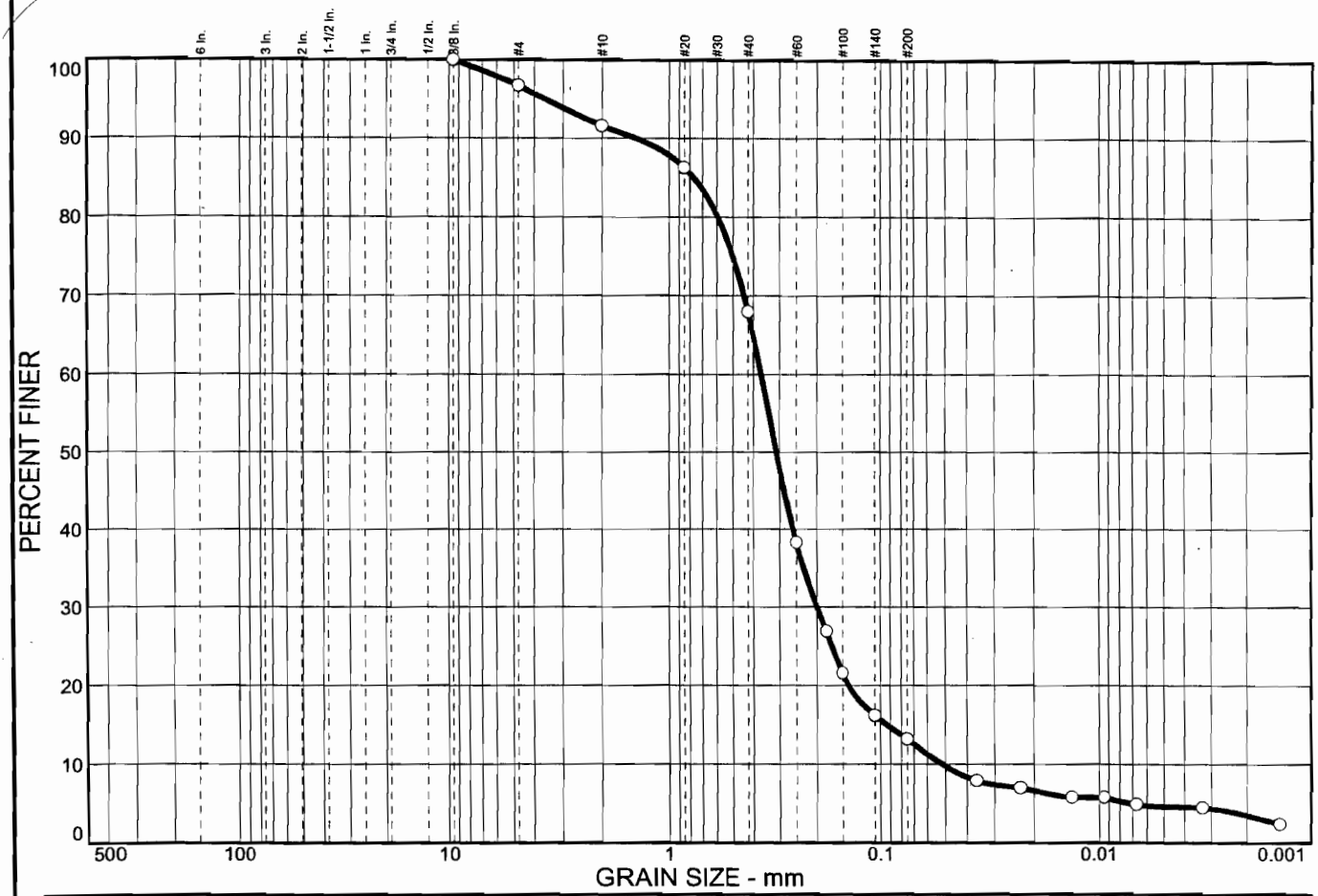
Remarks

Sample No.: 38 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 103.5'-106.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.3	83.5	8.6	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	96.7		
#10	91.6		
#20	86.3		
#40	68.0		
#60	38.3		
#80	26.9		
#100	21.6		
#140	16.2		
#200	13.2		

* (no specification provided)

Soil Description

Brown to gray silty sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.766 D_{60}= 0.367 D_{50}= 0.311
D_{30}= 0.199 D_{15}= 0.0930 D_{10}= 0.0511
C_u= 7.18 C_c= 2.12

Classification

USCS= AASHTO=

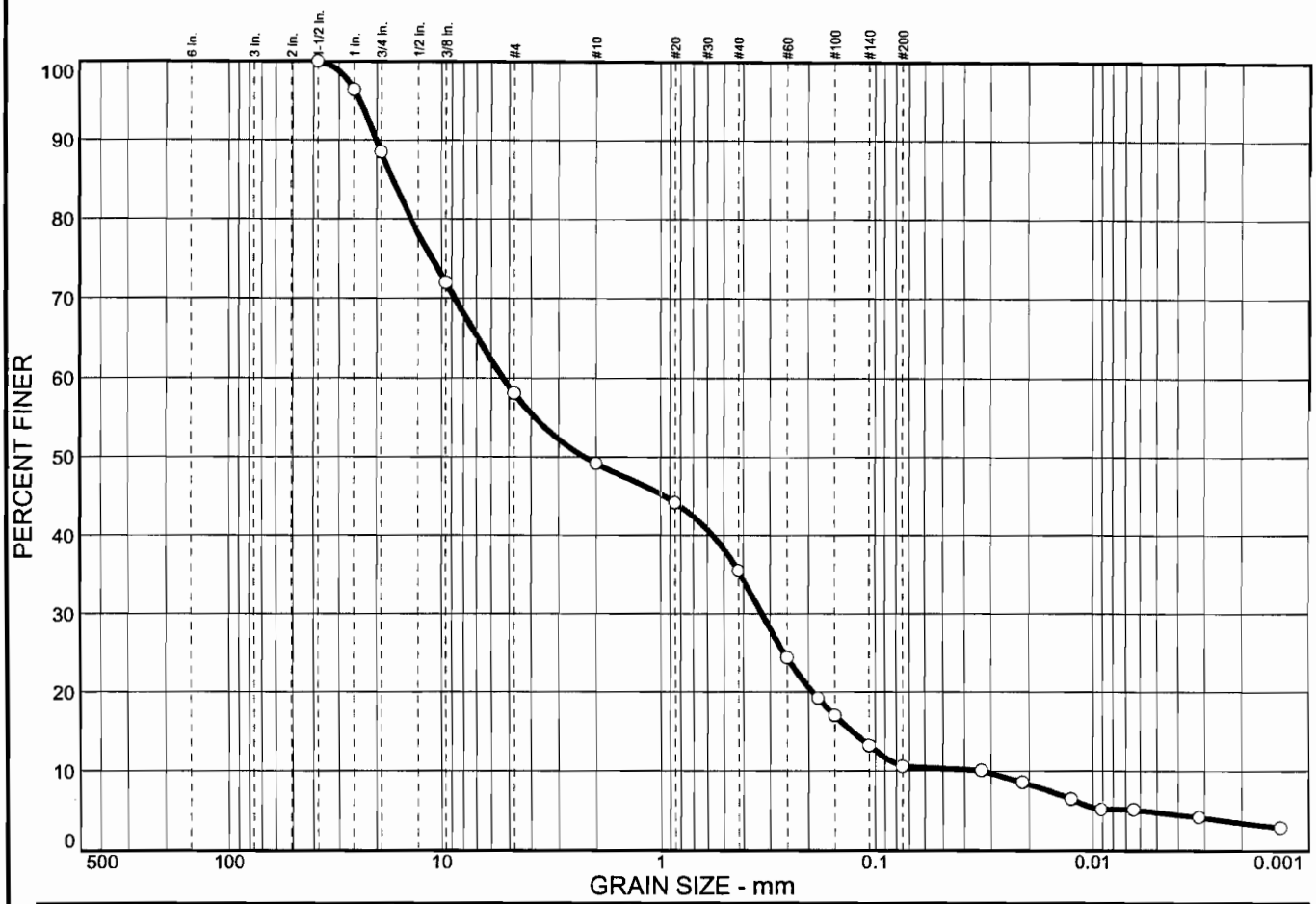
Remarks

Sample No.: 41 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 112.5'-115.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	41.9	47.5	5.8	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	96.4		
0.75 in.	88.5		
0.375 in.	72.0		
#4	58.1		
#10	49.2		
#20	44.2		
#40	35.5		
#60	24.4		
#80	19.2		
#100	17.0		
#140	13.2		
#200	10.6		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.8 D_{60}= 5.31 D_{50}= 2.26
D_{30}= 0.327 D_{15}= 0.126 D_{10}= 0.0323
C_u= 164.60 C_c= 0.62

Classification

USCS= AASHTO=

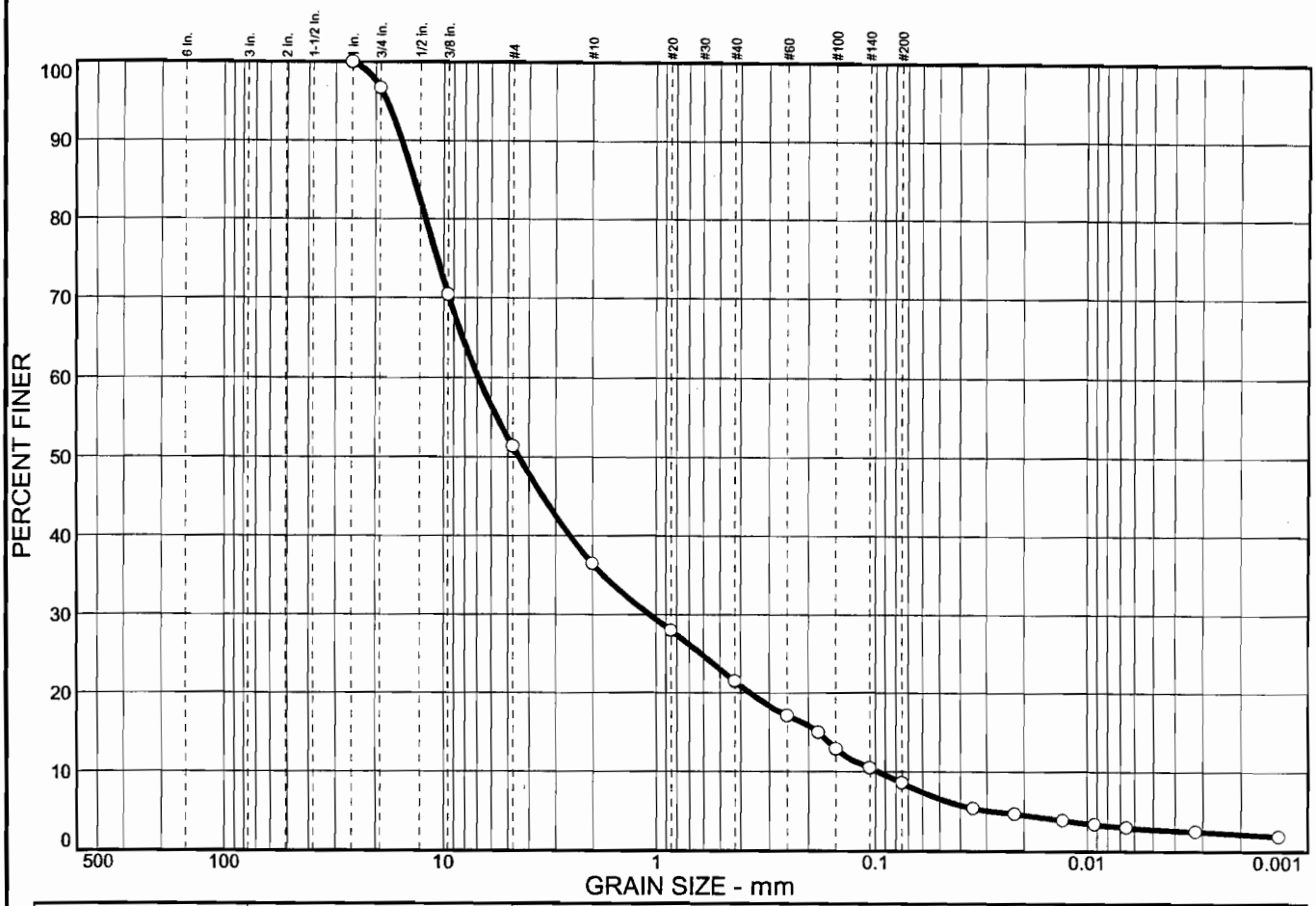
Remarks

Sample No.: 44 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 120.5'-123.0'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	48.6	42.8	5.8	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	96.7		
0.375 in.	70.5		
#4	51.4		
#10	36.5		
#20	28.0		
#40	21.5		
#60	17.1		
#80	15.0		
#100	12.9		
#140	10.5		
#200	8.6		

* (no specification provided)

Soil Description

Brown well-graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.4 D_{60}= 6.88 D_{50}= 4.44
D_{30}= 1.07 D_{15}= 0.180 D_{10}= 0.0966
C_u= 71.21 C_c= 1.71

Classification

USCS= AASHTO=

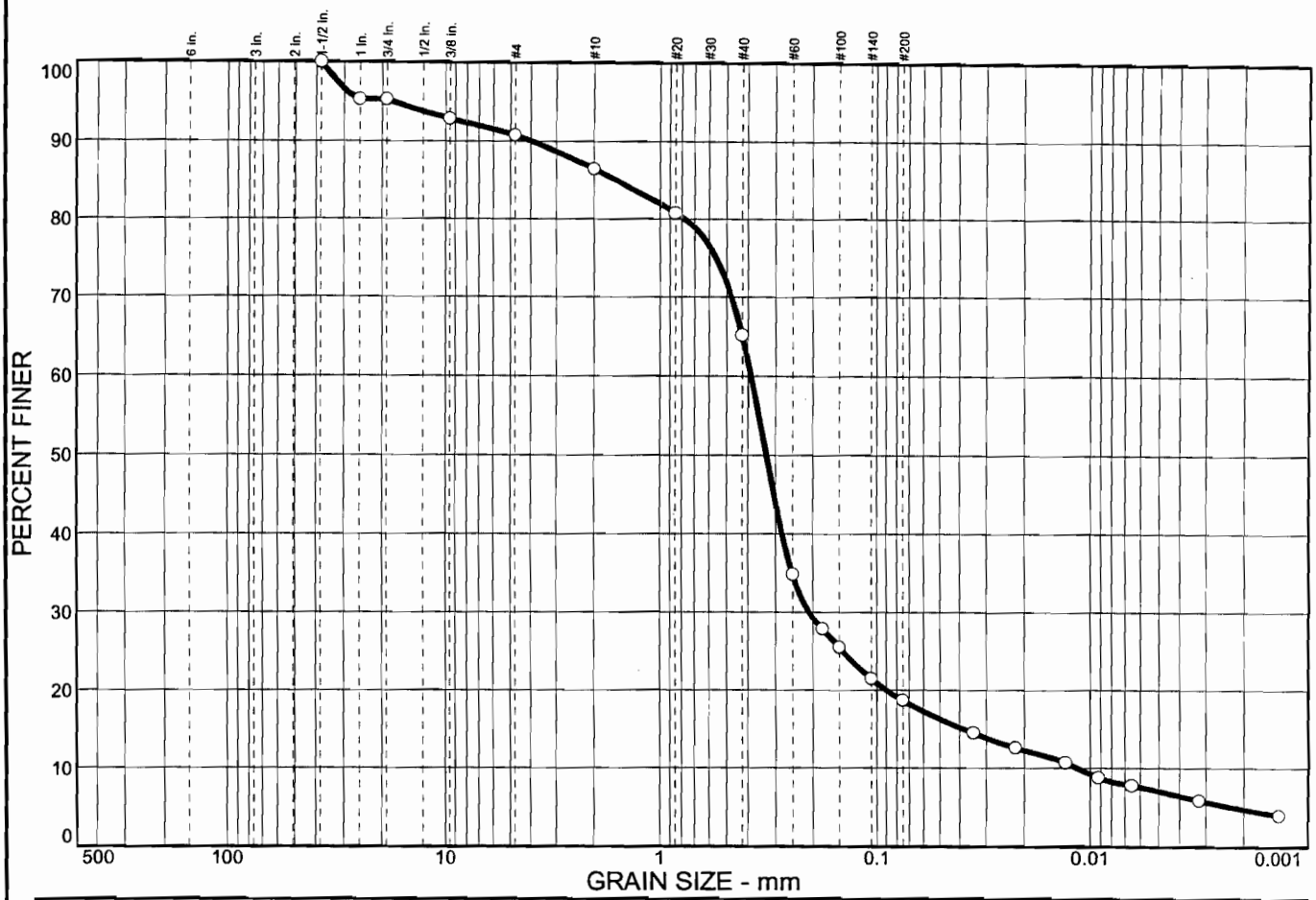
Remarks

Sample No.: 47 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 129.0'-130.5

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.2	72.1	11.6	7.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	95.3		
.75 in.	95.3		
.375 in.	92.9		
#4	90.8		
#10	86.5		
#20	80.8		
#40	65.2		
#60	34.9		
#80	27.9		
#100	25.5		
#140	21.5		
#200	18.7		

* (no specification provided)

Soil Description

Brown to gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.56 D_{60}= 0.387 D_{50}= 0.330
D_{30}= 0.208 D_{15}= 0.0382 D_{10}= 0.0114
C_u= 34.01 C_c= 9.85

Classification

USCS= AASHTO=

Remarks

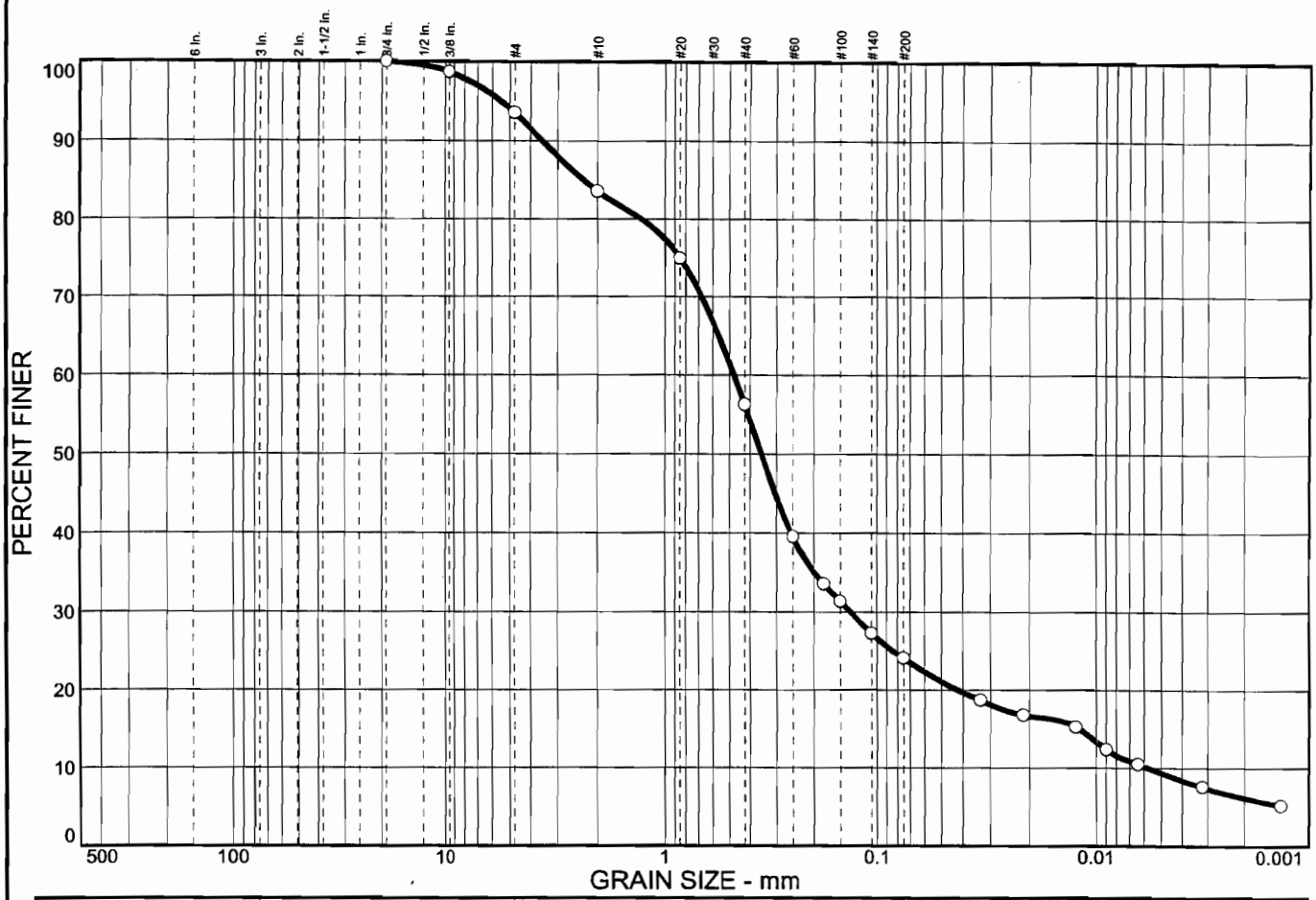
Zero retained on 3/4 inch sieve.

Sample No.: 48 **Source of Sample:** C-04-25 **Date:** 7-9-05
Location: **Elev./Depth:** 140.0'-141.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.4	69.5	14.7	9.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.7		
#4	93.6		
#10	83.6		
#20	75.0		
#40	56.3		
#60	39.6		
#80	33.6		
#100	31.4		
#140	27.3		
#200	24.1		

* (no specification provided)

Soil Description

Gray silty sand, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.30 D_{60}= 0.476 D_{50}= 0.353
D_{30}= 0.133 D_{15}= 0.0119 D_{10}= 0.0057
C_u= 83.07 C_c= 6.54

Classification

USCS= AASHTO=

Remarks

Sample No.: 49 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 150.0'-151.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.0	36.8	42.4	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.5		
#4	94.0		
#10	93.4		
#20	93.1		
#40	92.5		
#60	90.0		
#80	84.1		
#100	79.3		
#140	67.4		
#200	57.2		

* (no specification provided)

Soil Description

Gray sandy lean clay, few gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.187 D_{60}= 0.0827 D_{50}= 0.0594
D_{30}= 0.0291 D_{15}= 0.0052 D_{10}= 0.0021
C_u= 38.91 C_c= 4.82

Classification

USCS= AASHTO=

Remarks

Sample No.: 50 **Source of Sample:** C-04-25 **Date:** 07/01/05
Location: **Elev./Depth:** 160.0'-161.5'

H. C. NUTTING COMPANY
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS
SINCE 1921

Client: US Army Corps of Engineers
Project: Bolivar Dam DSA-Seepage Study
DACW69-03-D-0023 (Task #20)
Project No: 92528.020 **Plate**

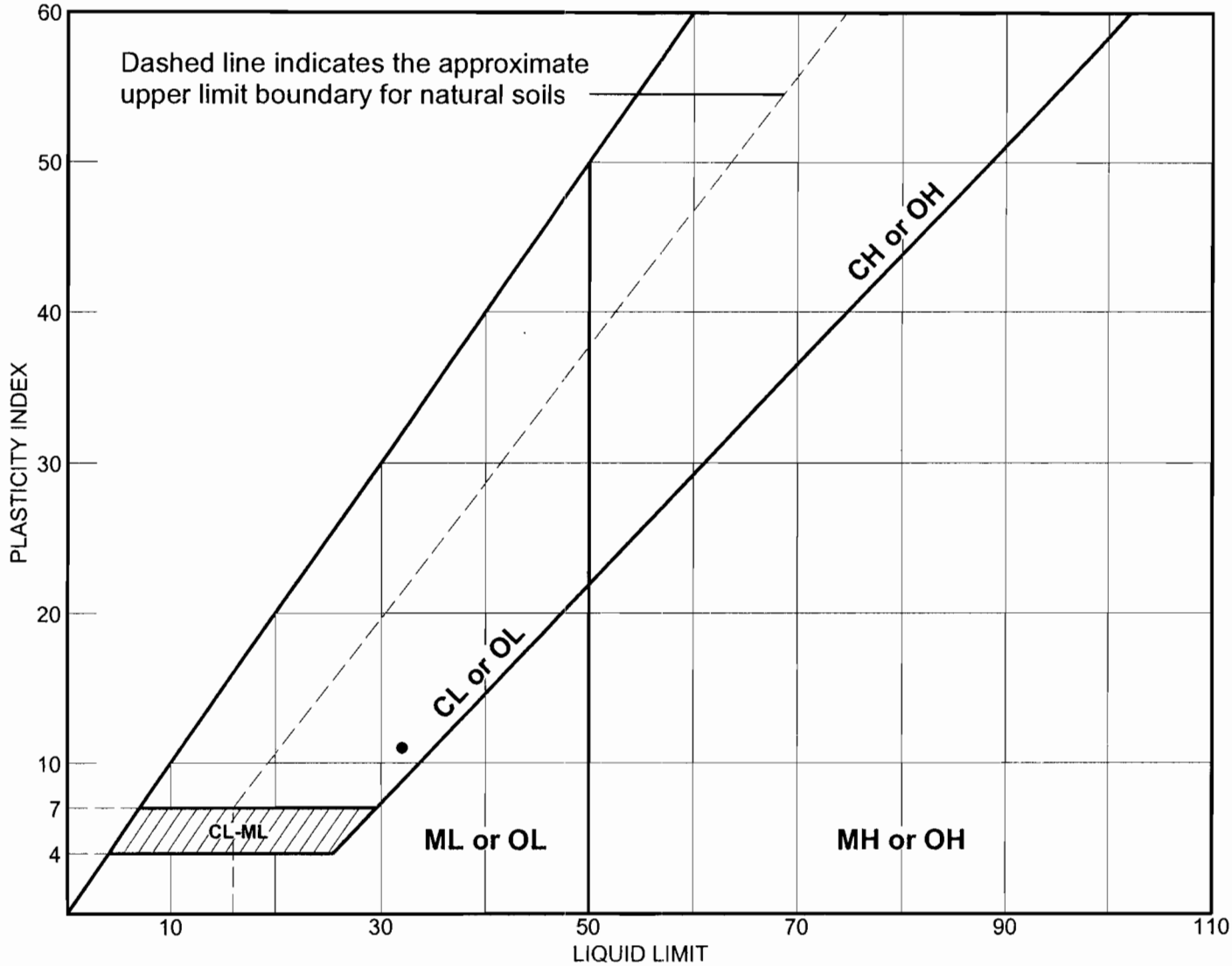
H.C. Nutting Company
611 Lunken Park Dr.
Cincinnati, Ohio 45226

U.S. Army Corps of Engineers
Bolivar Dam DSA
Cont. No. DACW69-03-D-0023
Kanawha Charleston, WV
HCN W.O. #92528.025

TABLE I: CLASSIFICATION TEST DATA

Lab No.	Hole No.	Sample No.	Depth (Ft.)	Mechanical Analysis				Moisture Content (%)	Atterberg Limits			U.S.C.S. Classification
				% Gravel	% Sand	% Silt	% Clay		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	
1520	TT-05-01	1	6-11	3.8	69.1	17.1	10.0					SM
1521		2	11-14	11.0	70.3	13.3	5.4					SM
1522	TP-05-02	1	2.0	40.6	46.1	10.9	2.4					SM
1523		2	3.0	12.6	40.7	24.8	21.9		32	21	11	SC
1524		3	5.0	22.9	50.8	17.8	8.5					SM
1525	TP-05-03	1	3.0	22.5	57.4	13.7	6.4					SM
1526		2	5.0	30.2	25.2	24.7	19.9		31	19	12	SC
1527	TP-05-04	1	2.0	10.6	79.4	6.5	3.5					SW-SM
1528		2	4.0	11.5	60.7	14.4	13.4		32	21	11	SC
1529		3	6.0	25.9	33.7	29.1	11.3					SM
1530	TP-05-05	1	4.0	18.4	40.6	19.8	21.2		35	21	14	SC
1531		2	11.0	14.1	63.2	19.1	3.6					SM
1532	TP-05-06	1	15.0	60.0	36.6	3.4						GW
1533	TP-05-07	1	10.0	4.6	80.9	8.0	6.5					SM
1534	TP-05-08	1	12.0	2.5	95.6	0.4	1.5					SP-SM
1535	TP-05-09	1	2.0	1.0	39.6	37.1	22.3		35	22	13	CL
1536		2	5.0	22.3	68.2	5.9	3.6					SP-SM
1537	TP-05-10	1	2.0	0.3	28.1	49.1	22.5					ML

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

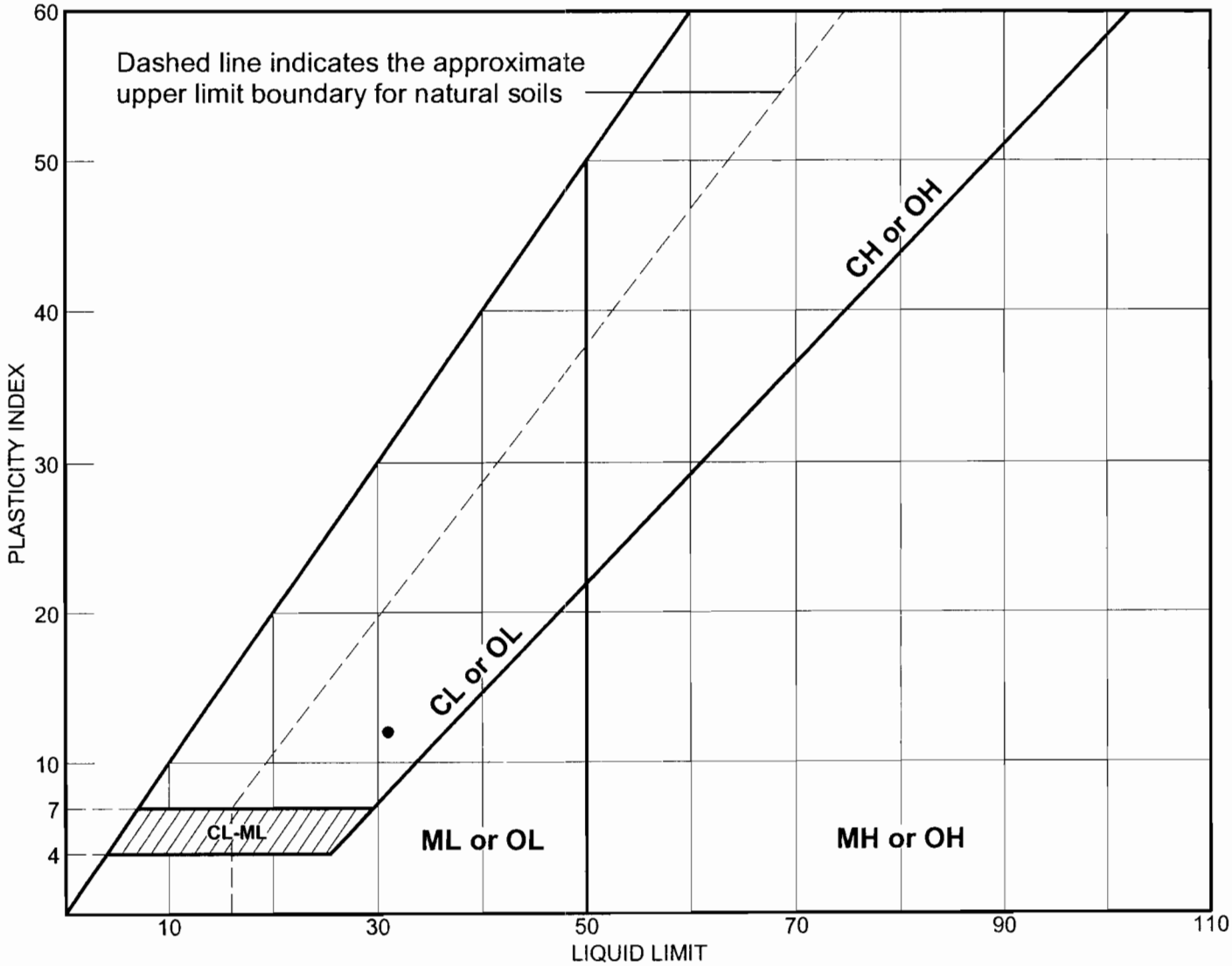
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-05-02	2	3.0'		21	32	11	SC

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
KANAWHA, CHARLESTON, WV
Project No.: 92528.025
Figure 1523

LIQUID AND PLASTIC LIMITS TEST REPORT



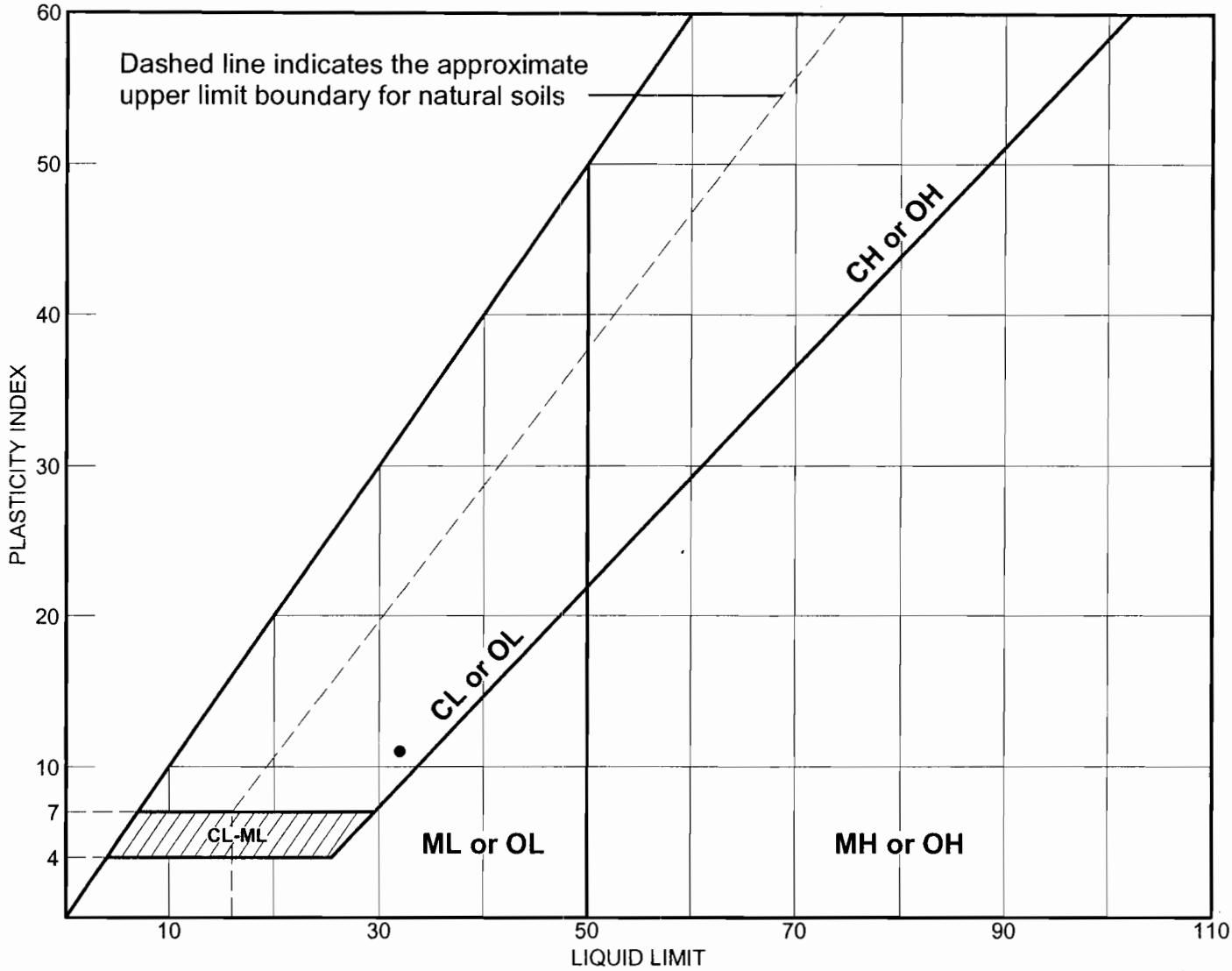
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-05-03	2	5.0'		19	31	12	SC

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
KANAWHA, CHARLESTON, WV
Project No.: 92528.025 **Figure** 1526

LIQUID AND PLASTIC LIMITS TEST REPORT



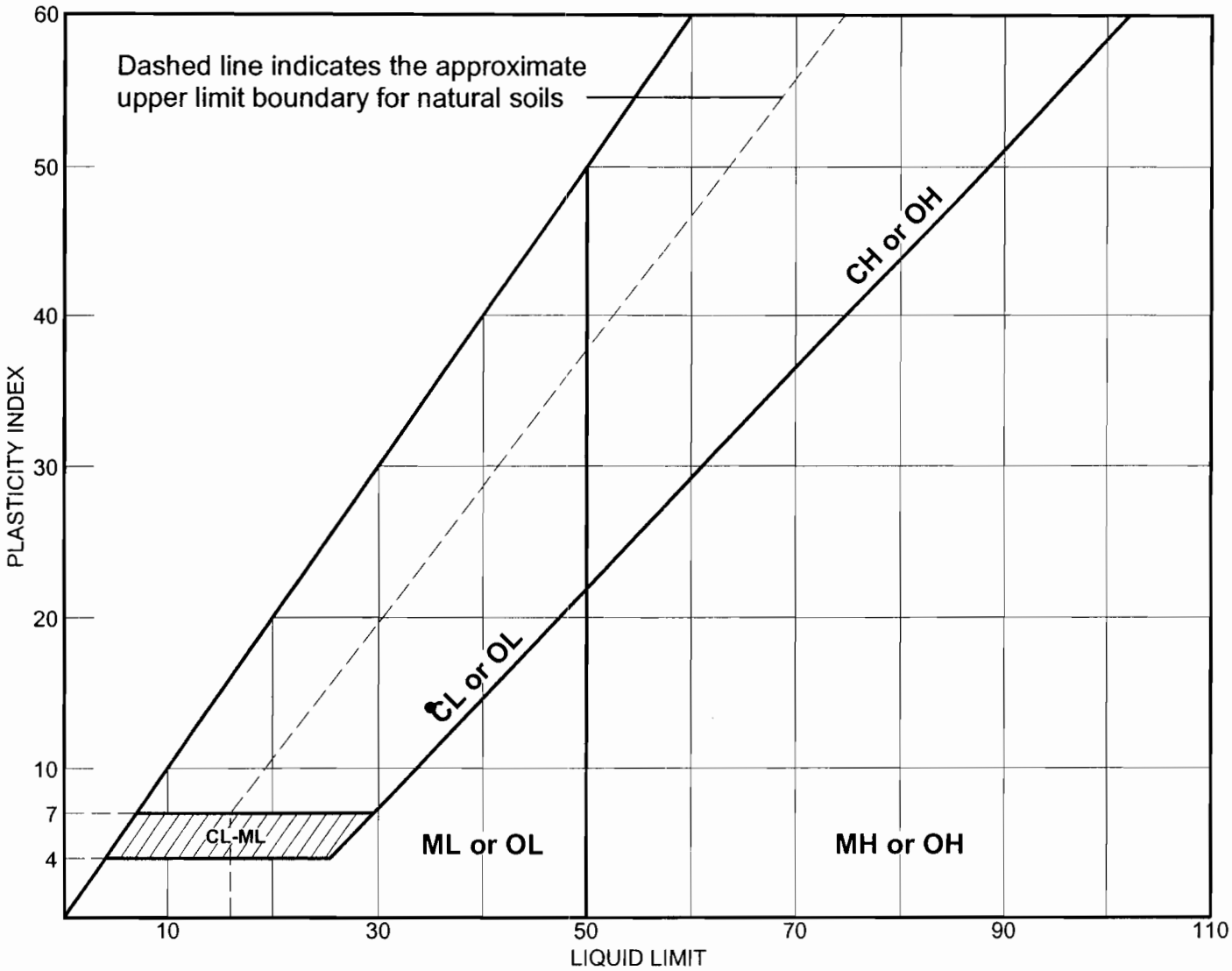
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-05-04	2	4.0'		21	32	11	SC

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
KANAWHA, CHARLESTON, WV
Project No.: 92528.025 **Figure** 1528

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

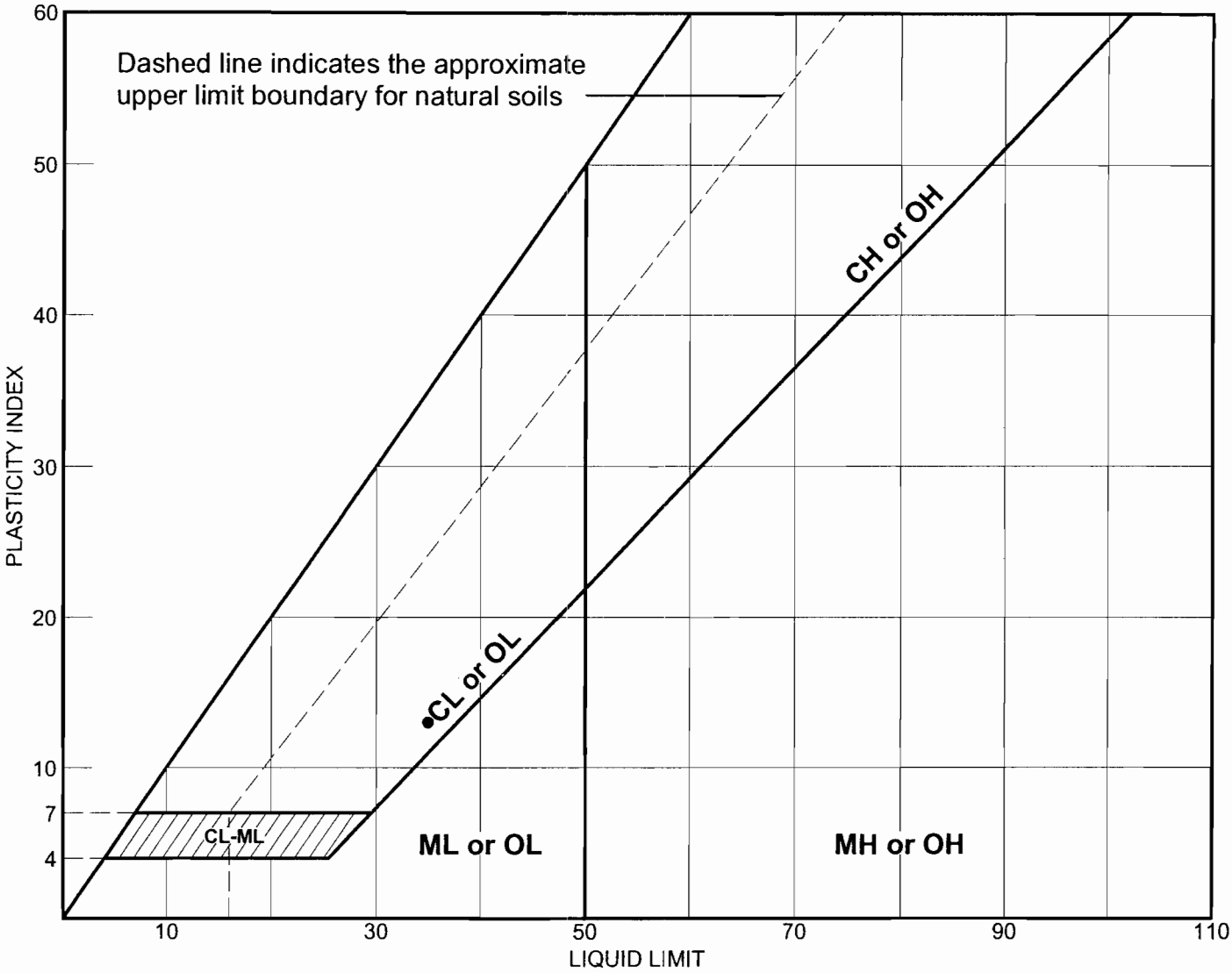
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-05-05	1	4.0		21	35	14	SC

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
KANAWHA, CHARLESTON, WV
Project No.: 92528.025 **Figure** 1530

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

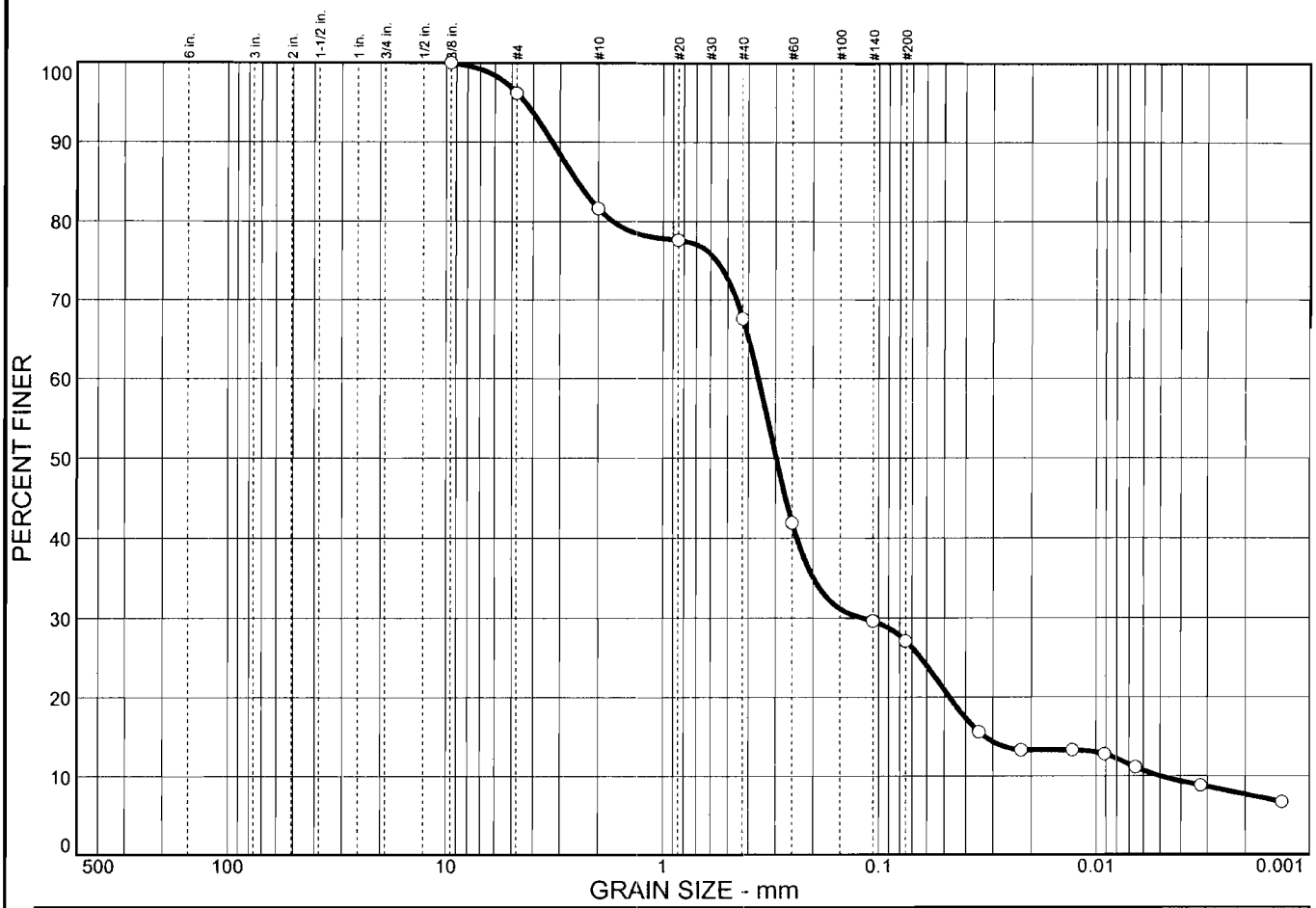
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-05-09	1	2.0'		22	35	13	CL

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
KANAWHA, CHARLESTON, WV
Project No.: 92528.025 **Figure** 1535

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.8	69.1	17.1	10.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	96.2		
#10	81.6		
#20	77.6		
#40	67.6		
#60	41.9		
#140	29.6		
#200	27.1		

* (no specification provided)

Material Description

Dark brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.50 D_{60}= 0.360 D_{50}= 0.297
D_{30}= 0.118 D_{15}= 0.0327 D_{10}= 0.0050
C_u= 71.78 C_c= 7.78

Classification

USCS= SM AASHTO=

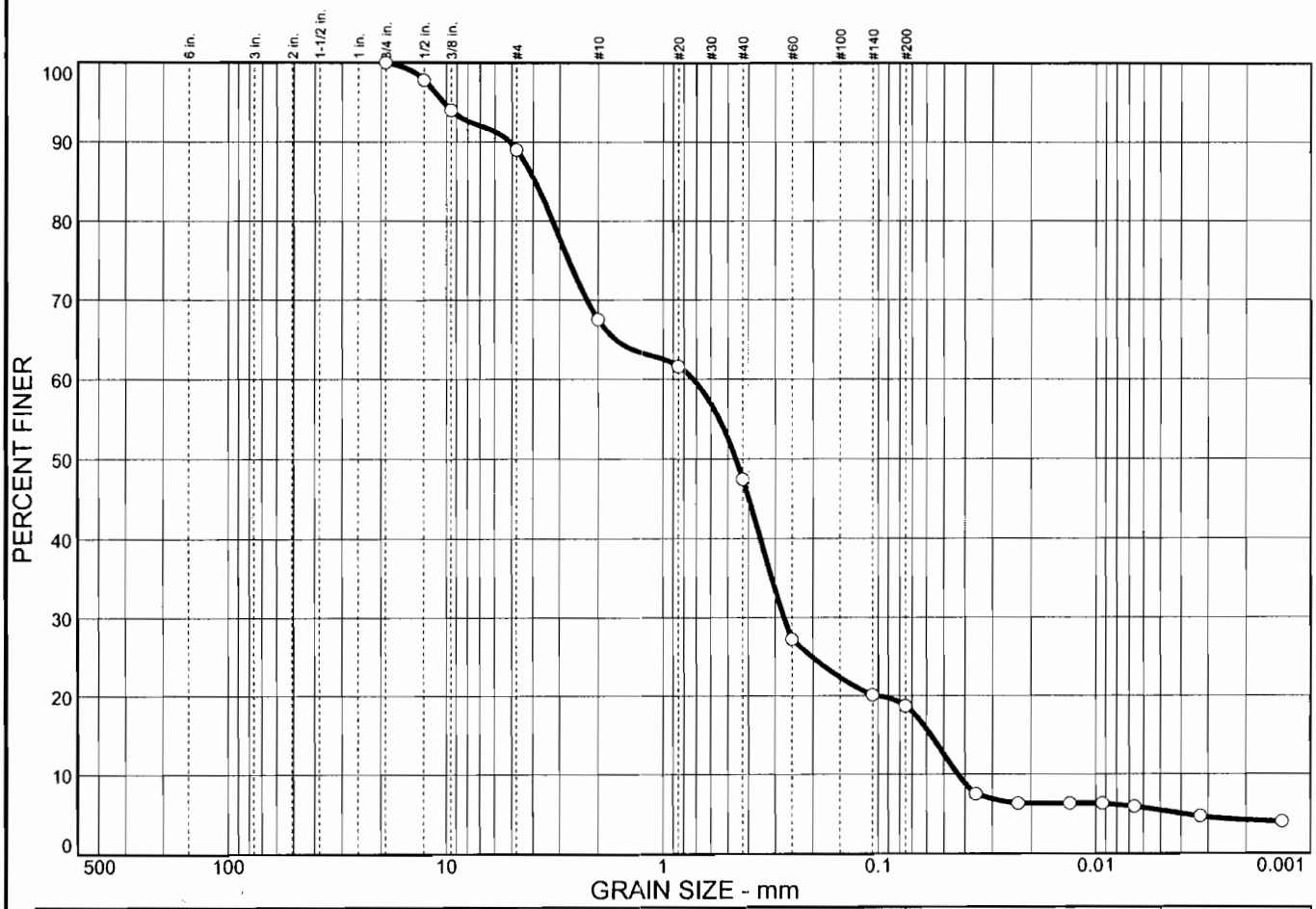
Remarks

Sample No.: 1 **Source of Sample:** TT-05-01 **Date:** 3/3/06
Location: **Elev./Depth:** 6-11'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1520

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.0	70.3	13.3	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.8		
.375 in.	94.0		
#4	89.0		
#10	67.5		
#20	61.6		
#40	47.4		
#60	27.2		
#140	20.1		
#200	18.7		

* (no specification provided)

Material Description

Brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.91 D_{60}= 0.726 D_{50}= 0.459
D_{30}= 0.273 D_{15}= 0.0575 D_{10}= 0.0432
C_u= 16.80 C_c= 2.37

Classification

USCS= SM AASHTO=

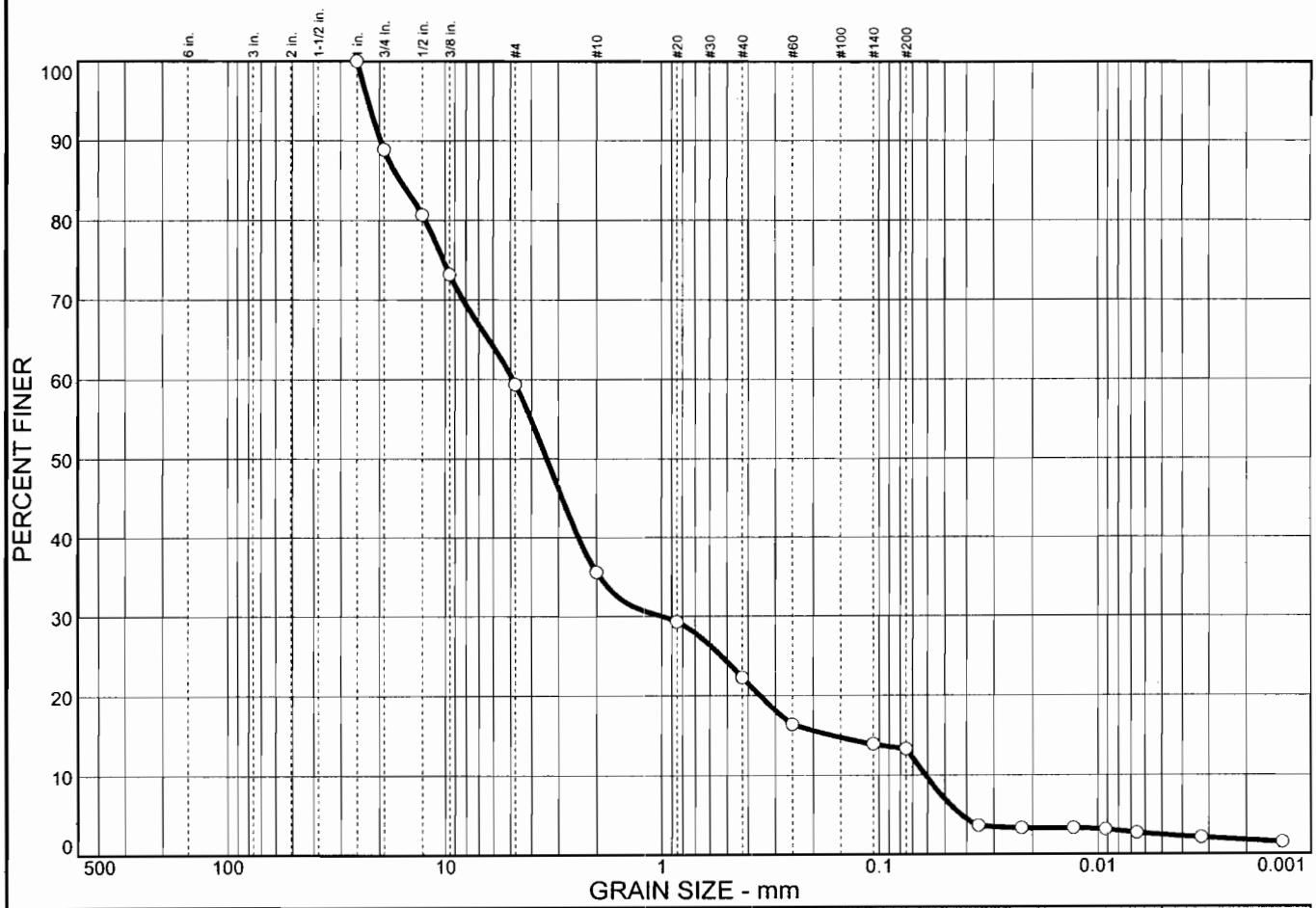
Remarks

Sample No.: 2 **Source of Sample:** TT-05-01 **Date:** 3/3/06
Location: **Elev./Depth:** 11-14'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1521

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	40.6	46.1	10.9	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	88.9		
.5 in.	80.7		
.375 in.	73.2		
#4	59.4		
#10	35.6		
#20	29.3		
#40	22.3		
#60	16.4		
#140	13.9		
#200	13.3		

* (no specification provided)

Material Description

Brown Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.1 D_{60}= 4.87 D_{50}= 3.40
D_{30}= 0.992 D_{15}= 0.200 D_{10}= 0.0496
C_u= 98.17 C_c= 4.06

Classification

USCS= SM AASHTO=

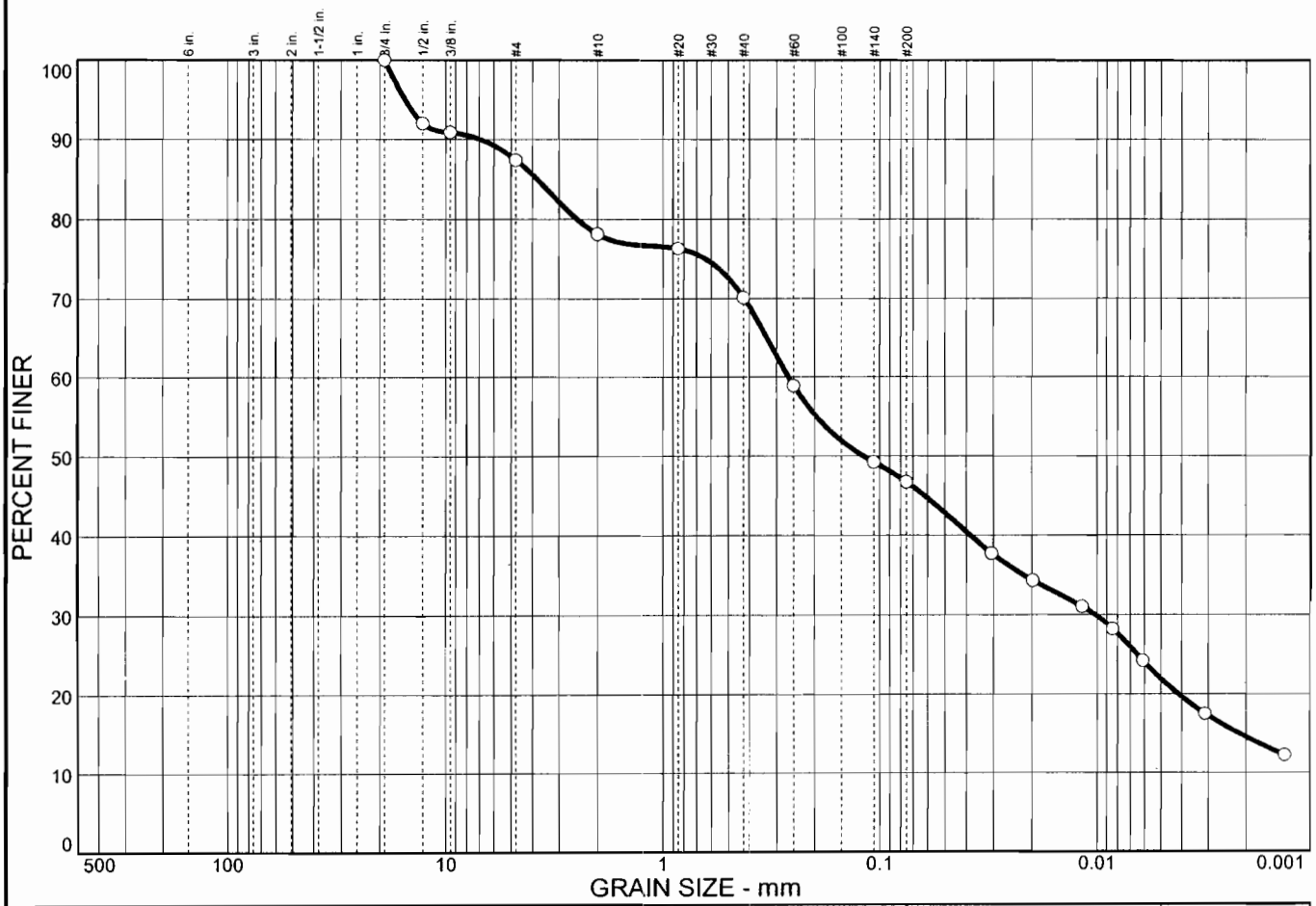
Remarks

Sample No.: 1 **Source of Sample:** TP-05-02 **Date:** 3/3/06
Location: **Elev./Depth:** 2.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1522

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.6	40.7	24.8	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	92.0		
.375 in.	90.9		
#4	87.4		
#10	78.1		
#20	76.3		
#40	70.1		
#60	58.9		
#140	49.2		
#200	46.7		

* (no specification provided)

Material Description

Brown Clayey sand

Atterberg Limits

PL= 21 LL= 32 PI= 11

Coefficients

D_{85}= 3.81 D_{60}= 0.264 D_{50}= 0.119
D_{30}= 0.0102 D_{15}= 0.0022 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

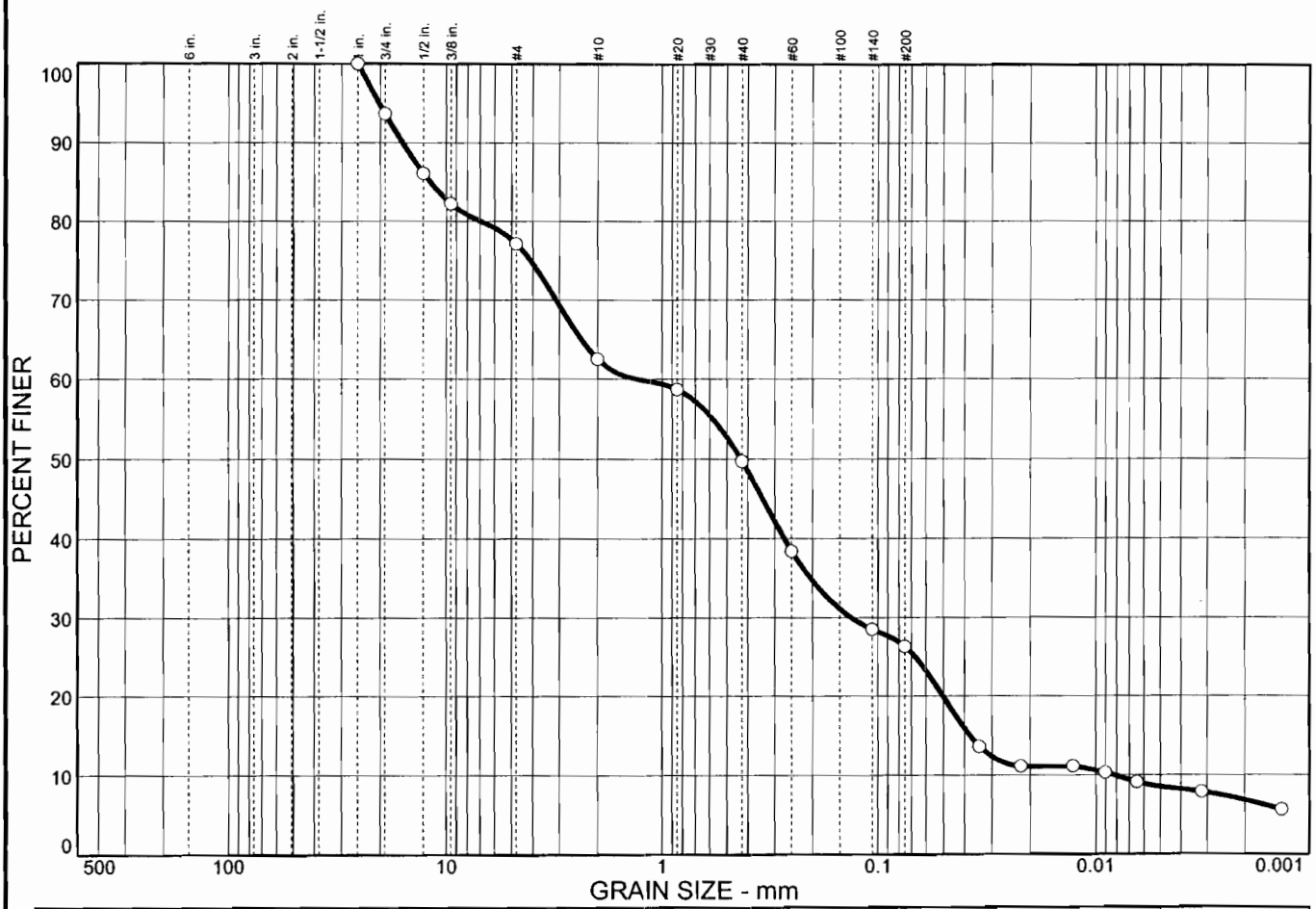
Remarks

Sample No.: 2 **Source of Sample:** TP-05-02 **Date:** 3/3/06
Location: **Elev./Depth:** 3.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1523

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.9	50.8	17.8	8.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	93.7		
.5 in.	86.1		
.375 in.	82.2		
#4	77.1		
#10	62.5		
#20	58.7		
#40	49.7		
#60	38.4		
#140	28.5		
#200	26.3		

* (no specification provided)

Material Description

Brown Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.8 D_{60}= 1.32 D_{50}= 0.432
D_{30}= 0.133 D_{15}= 0.0378 D_{10}= 0.0083
C_u= 159.20 C_c= 1.61

Classification

USCS= SM AASHTO=

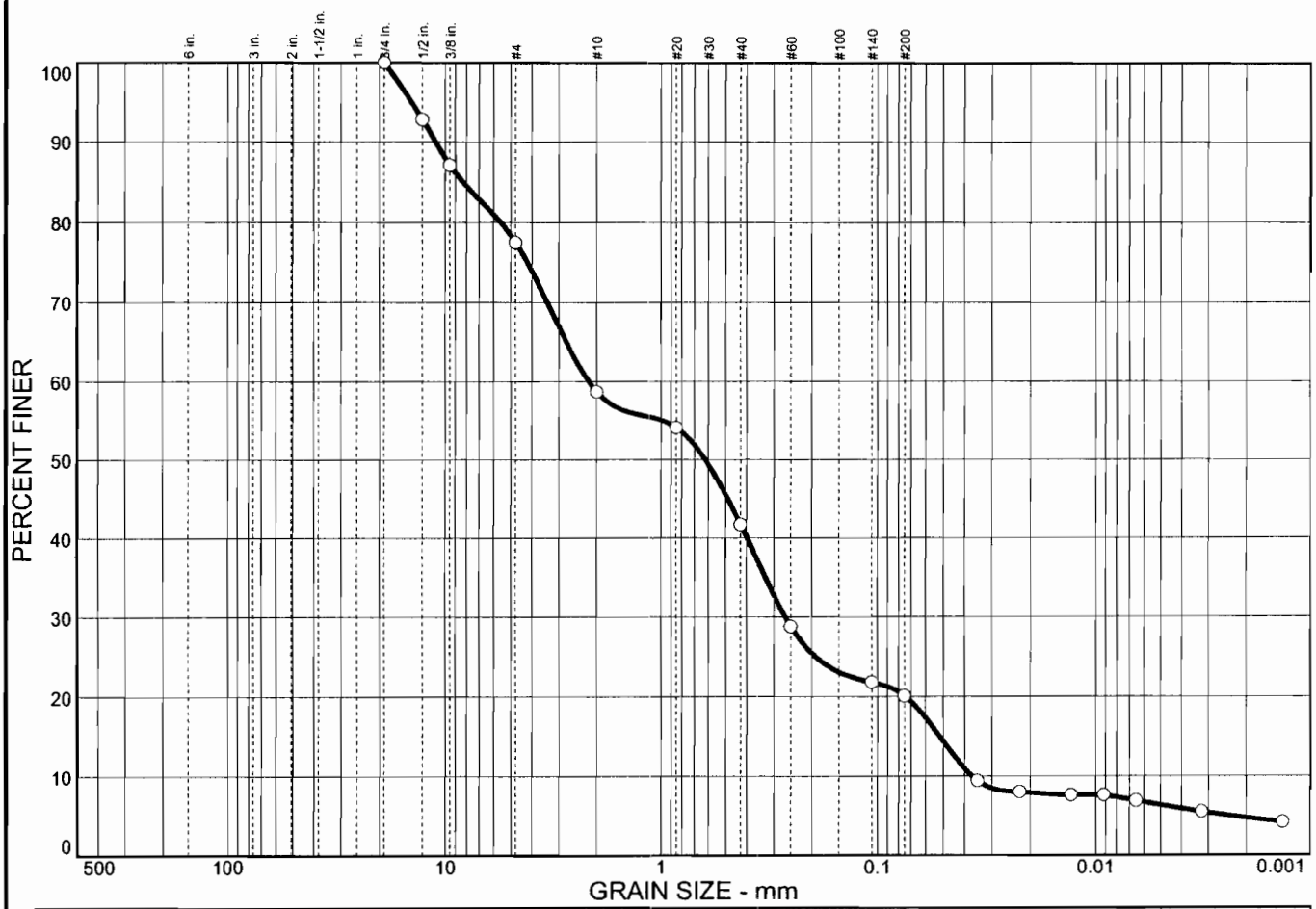
Remarks

Sample No.: 3 **Source of Sample:** TP-05-02 **Date:** 3/3/06
Location: **Elev./Depth:** 5.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1524

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.5	57.4	13.7	6.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	92.8		
.375 in.	87.1		
#4	77.5		
#10	58.7		
#20	54.1		
#40	41.7		
#60	28.8		
#140	21.8		
#200	20.1		

* (no specification provided)

Material Description

Brown and gray Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.31 D_{60}= 2.18 D_{50}= 0.623
D_{30}= 0.265 D_{15}= 0.0521 D_{10}= 0.0371
C_u= 58.70 C_c= 0.87

Classification

USCS= SM AASHTO=

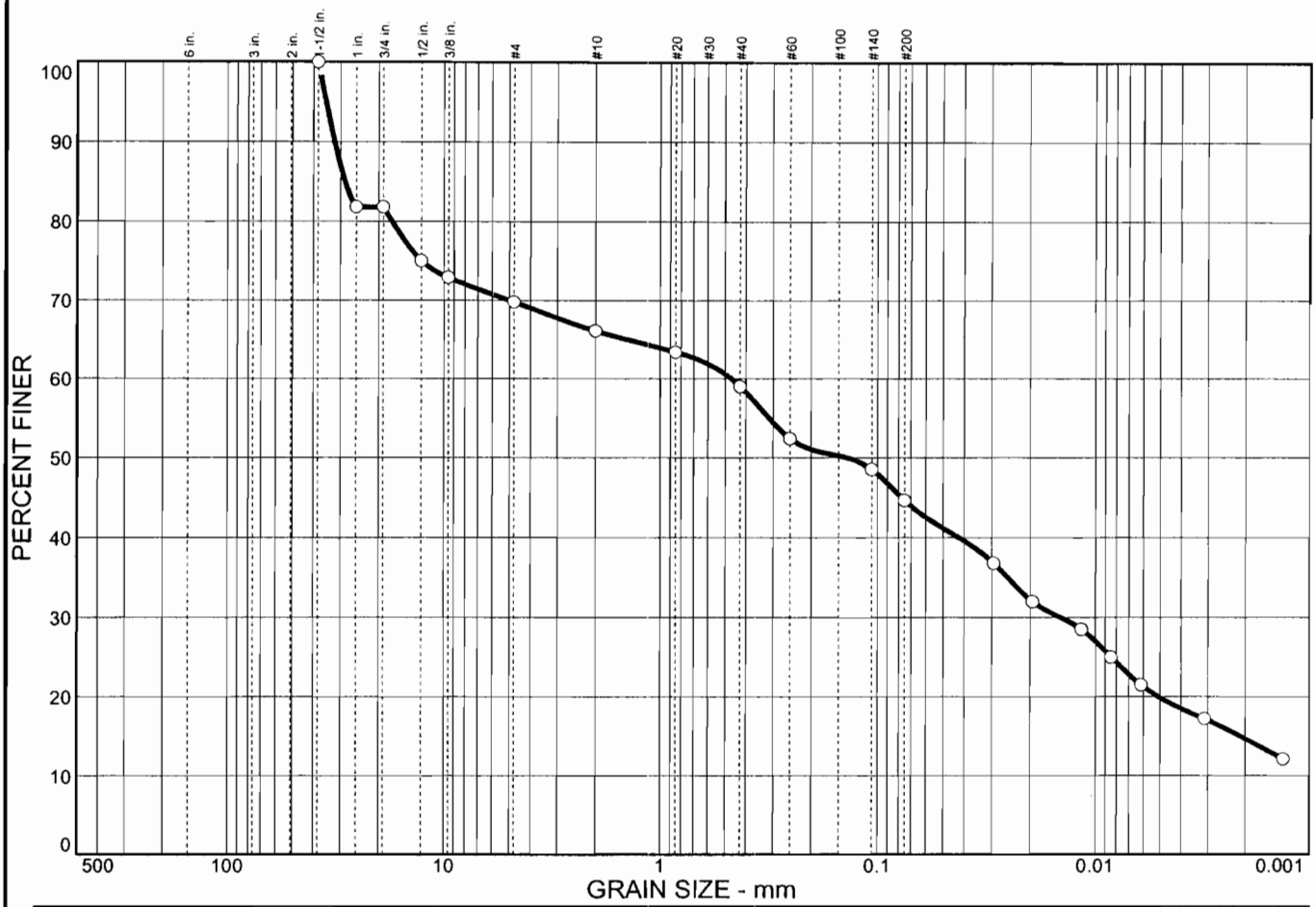
Remarks

Sample No.: 1 **Source of Sample:** TP-05-03 **Date:** 3/3/06
Location: **Elev./Depth:** 3.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1525

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	30.2	25.2	24.7	19.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	81.8		
.75 in.	81.8		
.5 in.	75.0		
.375 in.	72.9		
#4	69.8		
#10	66.1		
#20	63.4		
#40	59.0		
#60	52.4		
#140	48.5		
#200	44.6		

* (no specification provided)

Material Description

Tan Brown and gray Clayey sand with gravel

Atterberg Limits

PL= 19 LL= 31 PI= 12

Coefficients

D_{85}= 28.6 D_{60}= 0.468 D_{50}= 0.138
D_{30}= 0.0145 D_{15}= 0.0021 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

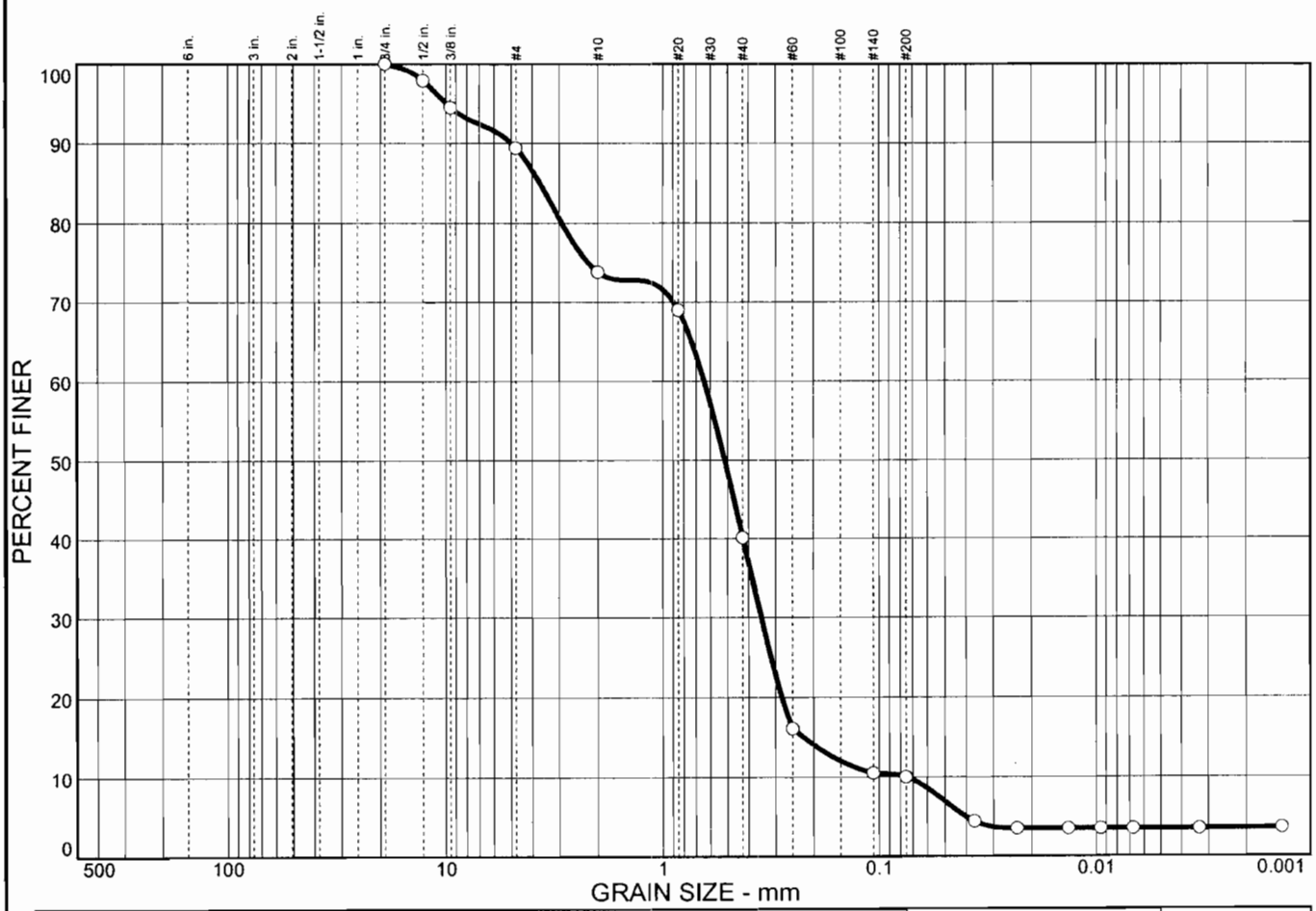
Remarks

Sample No.: 2 **Source of Sample:** TP-05-03 **Date:** 3/3/06
Location: **Elev./Depth:** 5.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1526

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.6	79.4	6.5	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.9		
.375 in.	94.5		
#4	89.4		
#10	73.8		
#20	69.0		
#40	40.1		
#60	16.1		
#140	10.5		
#200	10.0		

* (no specification provided)

Material Description

Brown Well-graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.70 D_{60}= 0.642 D_{50}= 0.516
D_{30}= 0.350 D_{15}= 0.223 D_{10}= 0.0750
C_u= 8.56 C_c= 2.54

Classification

USCS= SW-SM AASHTO=

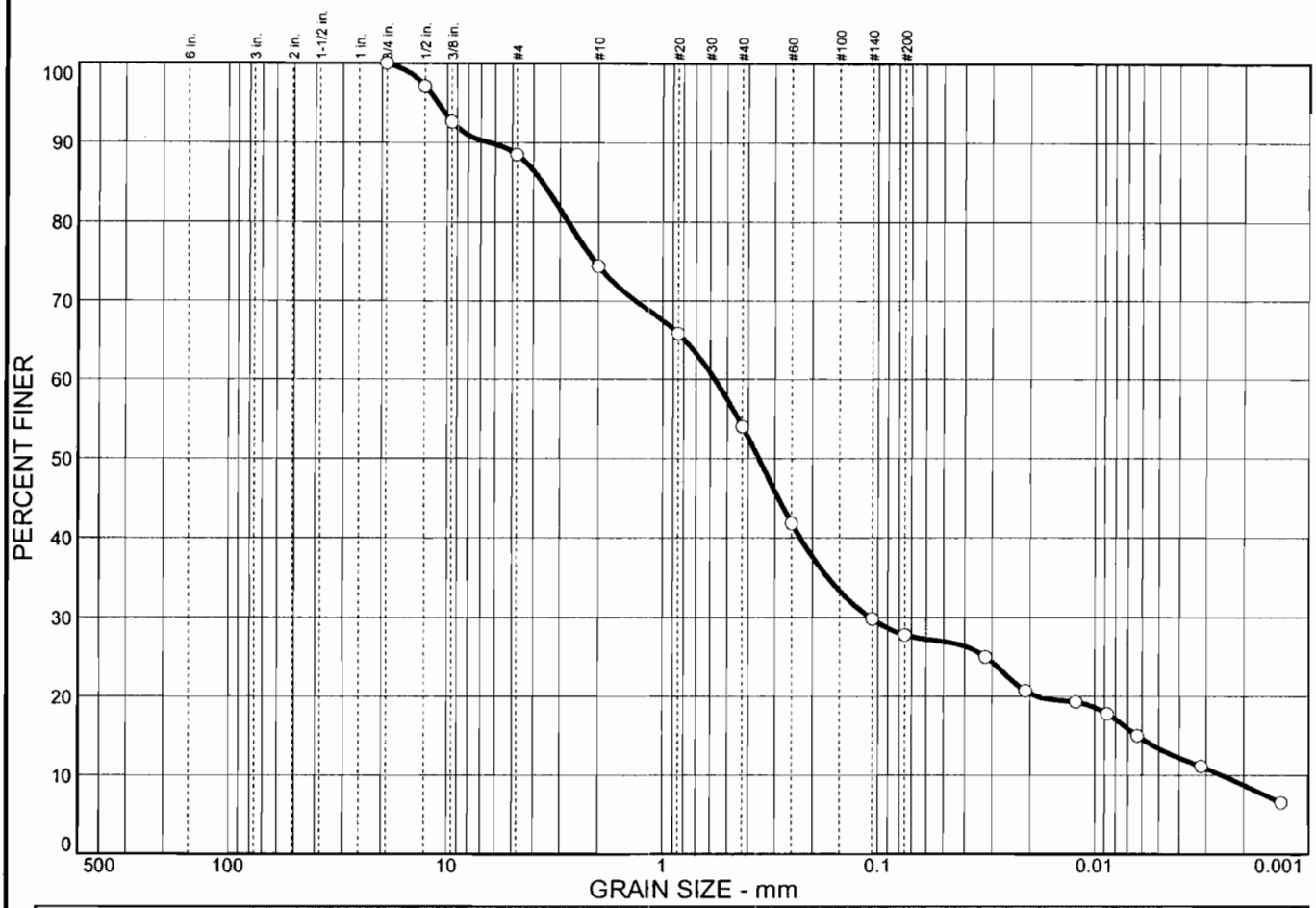
Remarks

Sample No.: 1 **Source of Sample:** TP-05-04 **Date:** 3/3/06
Location: **Elev./Depth:** 2.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1527

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	11.5	60.7	14.4	13.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.1		
.375 in.	92.6		
#4	88.5		
#10	74.4		
#20	65.8		
#40	54.0		
#60	41.8		
#140	29.8		
#200	27.8		

* (no specification provided)

Material Description

Dark brown Clayey sand

Atterberg Limits

PL= 21 LL= 32 PI= 11

Coefficients

D_{85}= 3.64 D_{60}= 0.573 D_{50}= 0.357
D_{30}= 0.109 D_{15}= 0.0063 D_{10}= 0.0025
C_u= 225.97 C_c= 8.12

Classification

USCS= SC AASHTO=

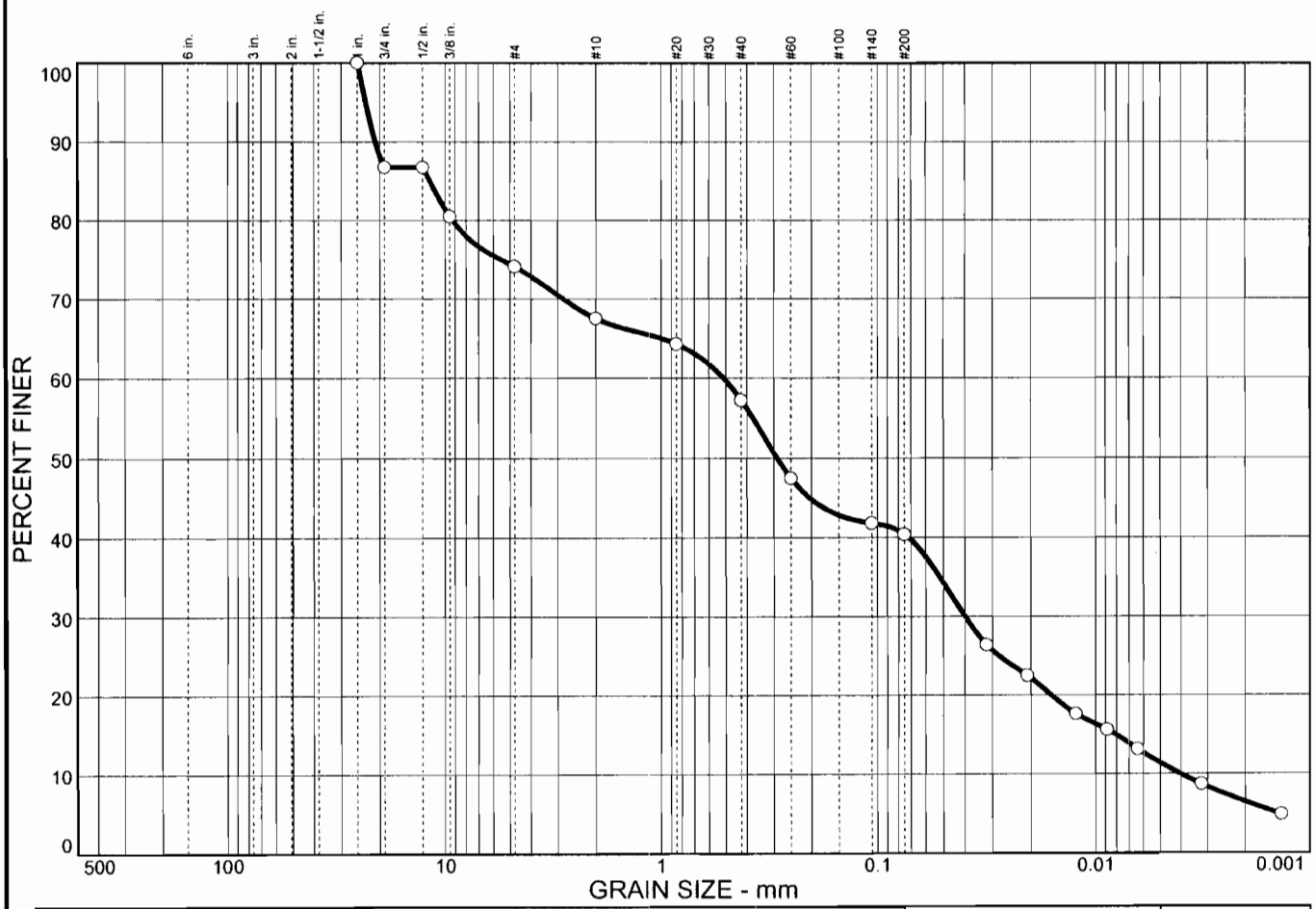
Remarks

Sample No.: 2 **Source of Sample:** TP-05-04 **Date:** 3/3/06
Location: **Elev./Depth:** 4.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1528

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.9	33.7	29.1	11.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	86.8		
.5 in.	86.8		
.375 in.	80.5		
#4	74.1		
#10	67.5		
#20	64.3		
#40	57.2		
#60	47.5		
#140	41.8		
#200	40.4		

* (no specification provided)

Material Description

Dark gray Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.8 D_{60}= 0.514 D_{50}= 0.290
D_{30}= 0.0400 D_{15}= 0.0081 D_{10}= 0.0040
C_u= 127.13 C_c= 0.77

Classification

USCS= SM AASHTO=

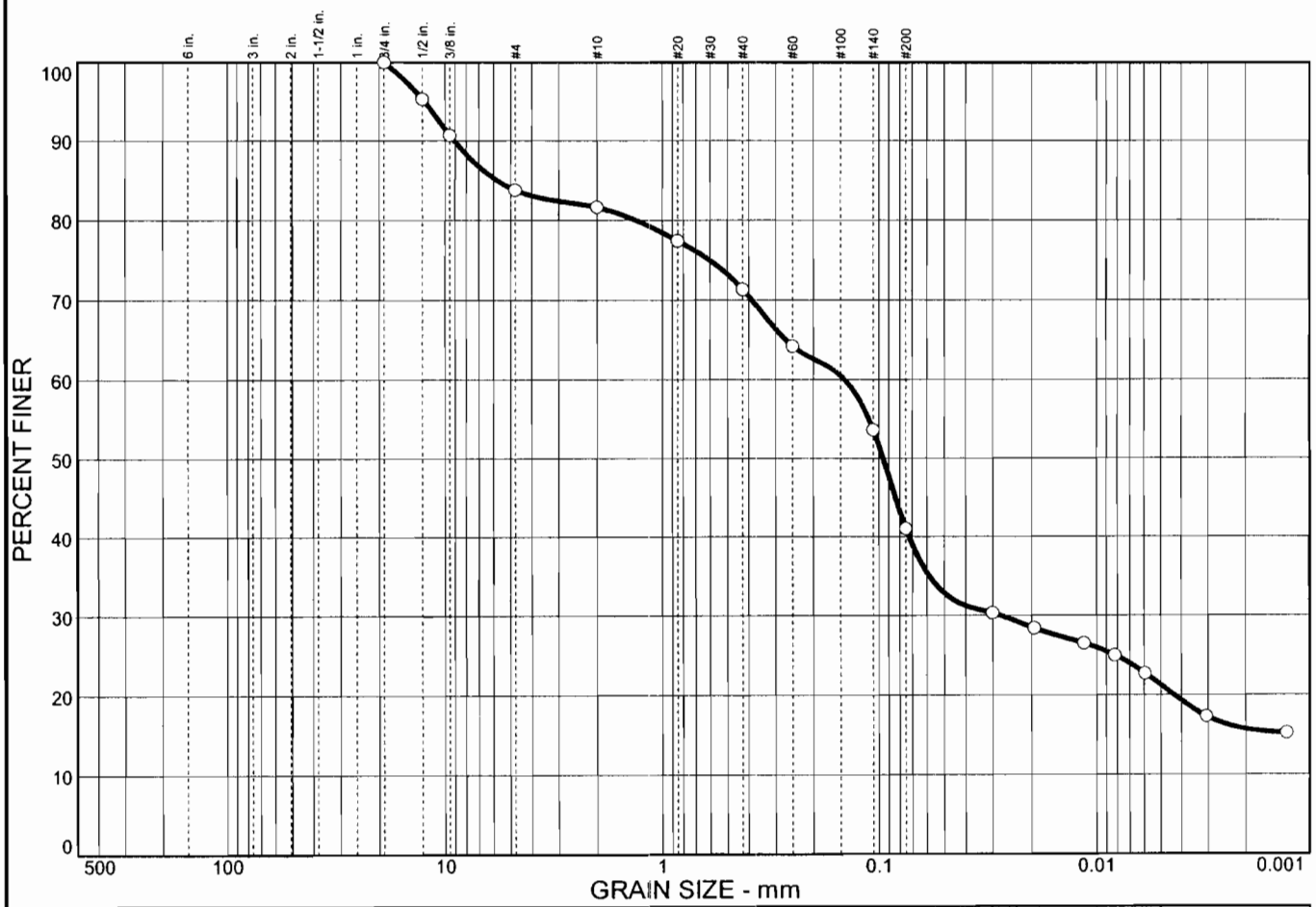
Remarks

Sample No.: 3 **Source of Sample:** TP-05-04 **Date:** 3/3/06
Location: **Elev./Depth:** 6.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1529

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.4	40.6	19.8	21.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	95.3		
.375 in.	90.7		
#4	83.8		
#10	81.6		
#20	77.4		
#40	71.3		
#60	64.2		
#140	53.6		
#200	41.0		

* (no specification provided)

Material Description

Brown Clayey sand with gravel

Atterberg Limits

PL= 21 LL= 35 PI= 14

Coefficients

D_{85}= 5.75 D_{60}= 0.144 D_{50}= 0.0955
D_{30}= 0.0277 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

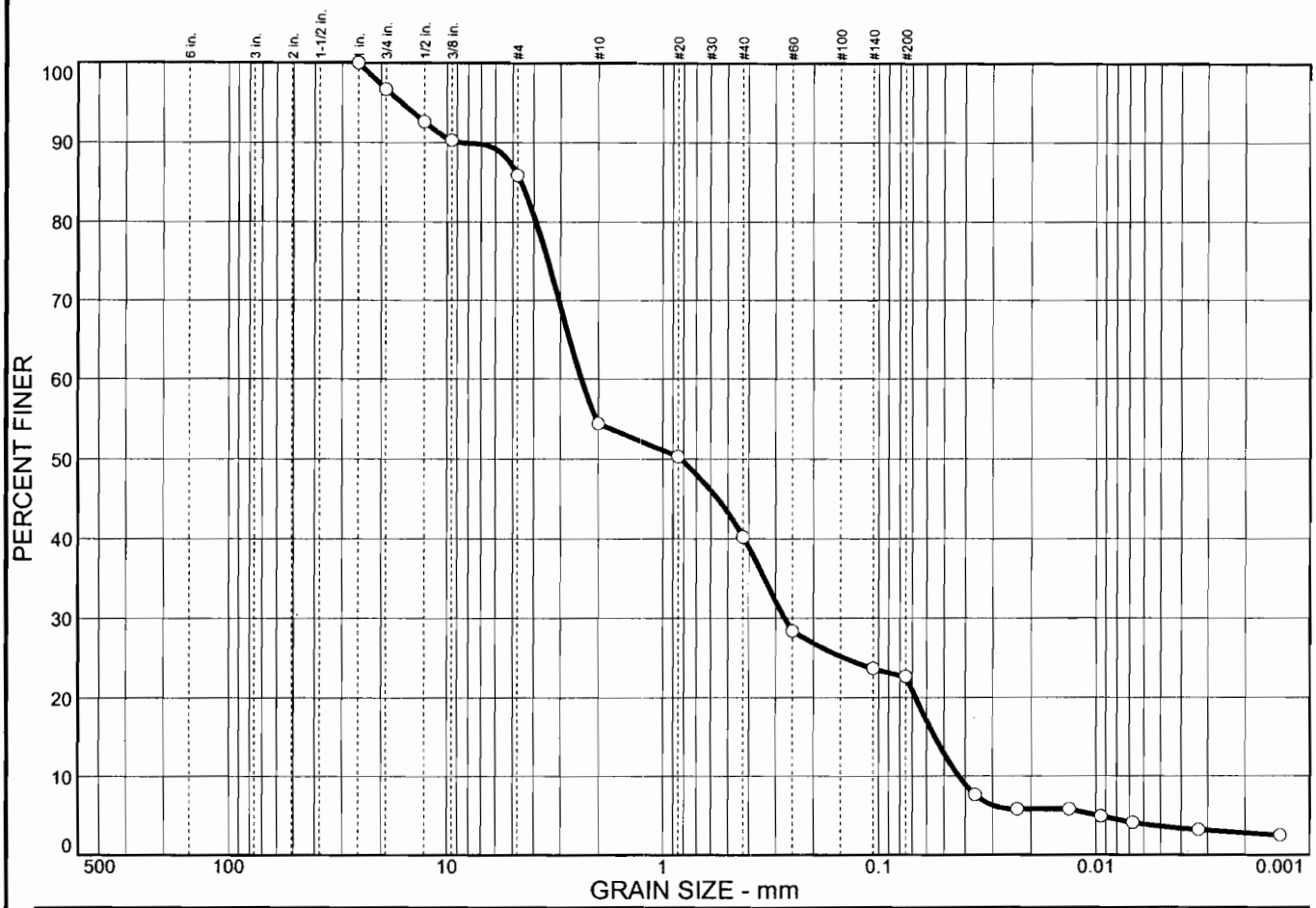
Remarks

Sample No.: 1 **Source of Sample:** TP-05-05 **Date:** 3/9/06
Location: **Elev./Depth:** 4.0

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1530

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.1	63.2	19.1	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	96.7		
.5 in.	92.6		
.375 in.	90.3		
#4	85.9		
#10	54.4		
#20	50.3		
#40	40.2		
#60	28.4		
#140	23.7		
#200	22.7		

* (no specification provided)

Material Description

Brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.58 D_{60}= 2.40 D_{50}= 0.828
D_{30}= 0.272 D_{15}= 0.0552 D_{10}= 0.0430
C_u= 55.78 C_c= 0.72

Classification

USCS= SM AASHTO=

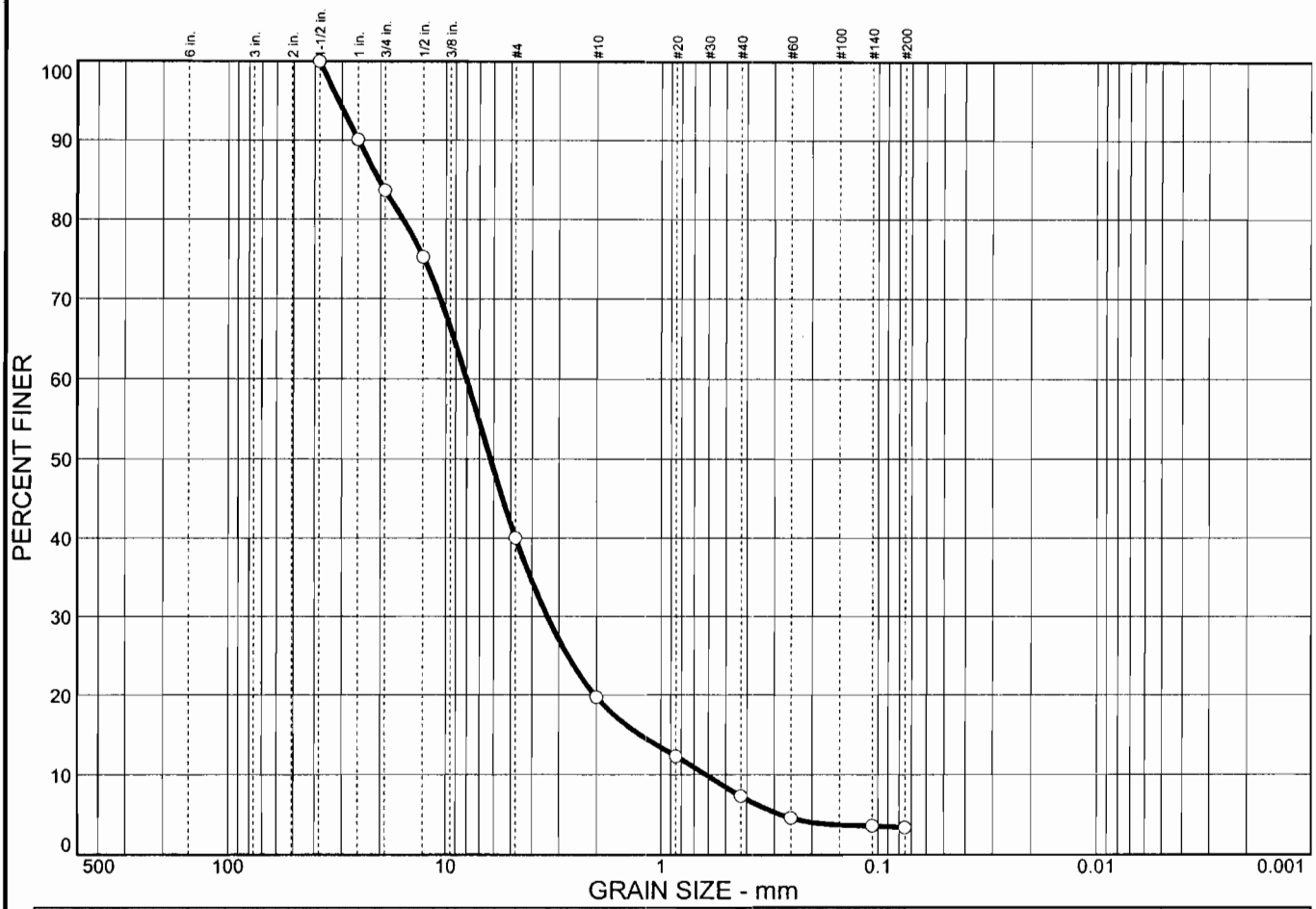
Remarks

Sample No.: 2 **Source of Sample:** TP-05-05 **Date:** 3/3/06
Location: **Elev./Depth:** 11.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1531

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	60.0	36.6	3.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	90.1		
.75 in.	83.6		
.5 in.	75.2		
#4	40.0		
#10	19.7		
#20	12.3		
#40	7.3		
#60	4.6		
#140	3.6		
#200	3.4		

* (no specification provided)

Material Description

Brown Well-graded gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.4 D_{60}= 8.04 D_{50}= 6.22
D_{30}= 3.40 D_{15}= 1.26 D_{10}= 0.619
C_u= 12.98 C_c= 2.32

Classification

USCS= GW AASHTO=

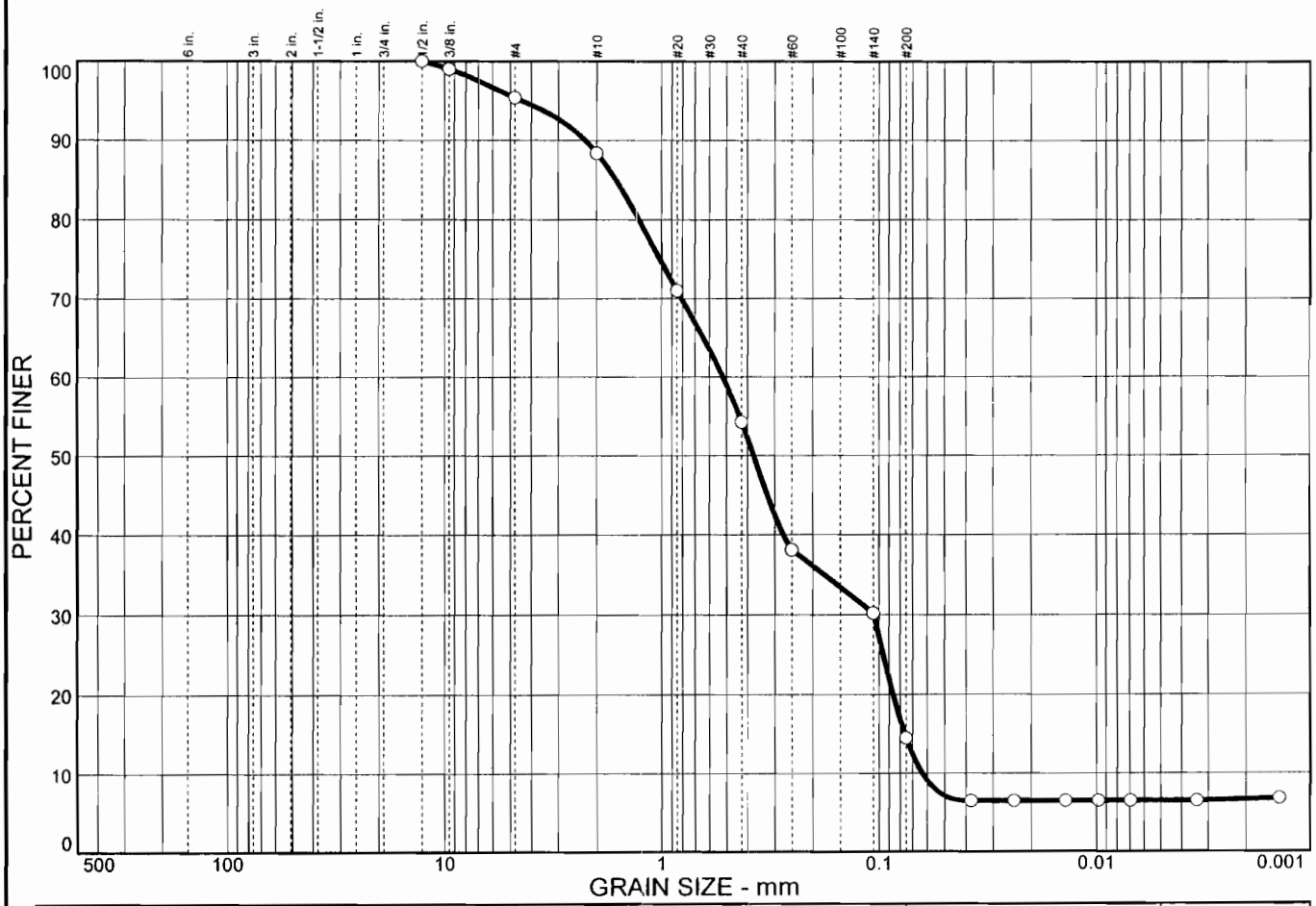
Remarks

Sample No.: 1 **Source of Sample:** TP-05-06 **Date:** 2/28/06
Location: **Elev./Depth:** 15.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1532

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.6	80.9	8.0	6.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	99.0		
#4	95.4		
#10	88.4		
#20	71.0		
#40	54.2		
#60	38.1		
#140	30.2		
#200	14.5		

* (no specification provided)

Material Description

Brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.63 D_{60}= 0.520 D_{50}= 0.375
D_{30}= 0.106 D_{15}= 0.0761 D_{10}= 0.0633
C_u= 8.21 C_c= 0.34

Classification

USCS= SM AASHTO=

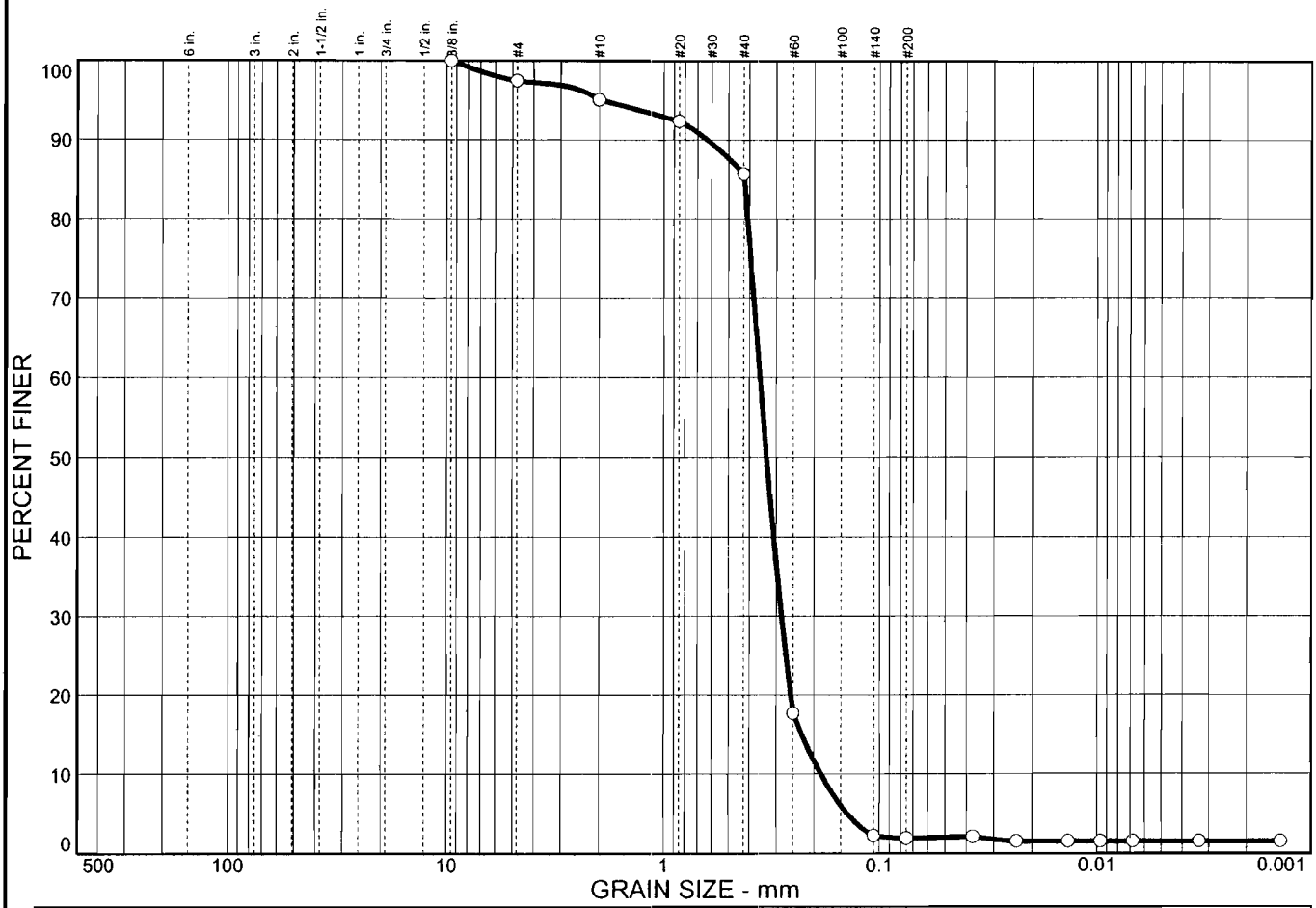
Remarks

Sample No.: 1 **Source of Sample:** TP-05-07 **Date:** 3/3/06
Location: **Elev./Depth:** 10.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1533

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.5	95.6	0.4	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.5		
#10	95.1		
#20	92.4		
#40	85.7		
#60	17.7		
#140	2.2		
#200	1.9		

* (no specification provided)

Material Description

Tan Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.423 D_{60}= 0.357 D_{50}= 0.332
D_{30}= 0.283 D_{15}= 0.228 D_{10}= 0.186
C_u= 1.92 C_c= 1.21

Classification

USCS= SP AASHTO=

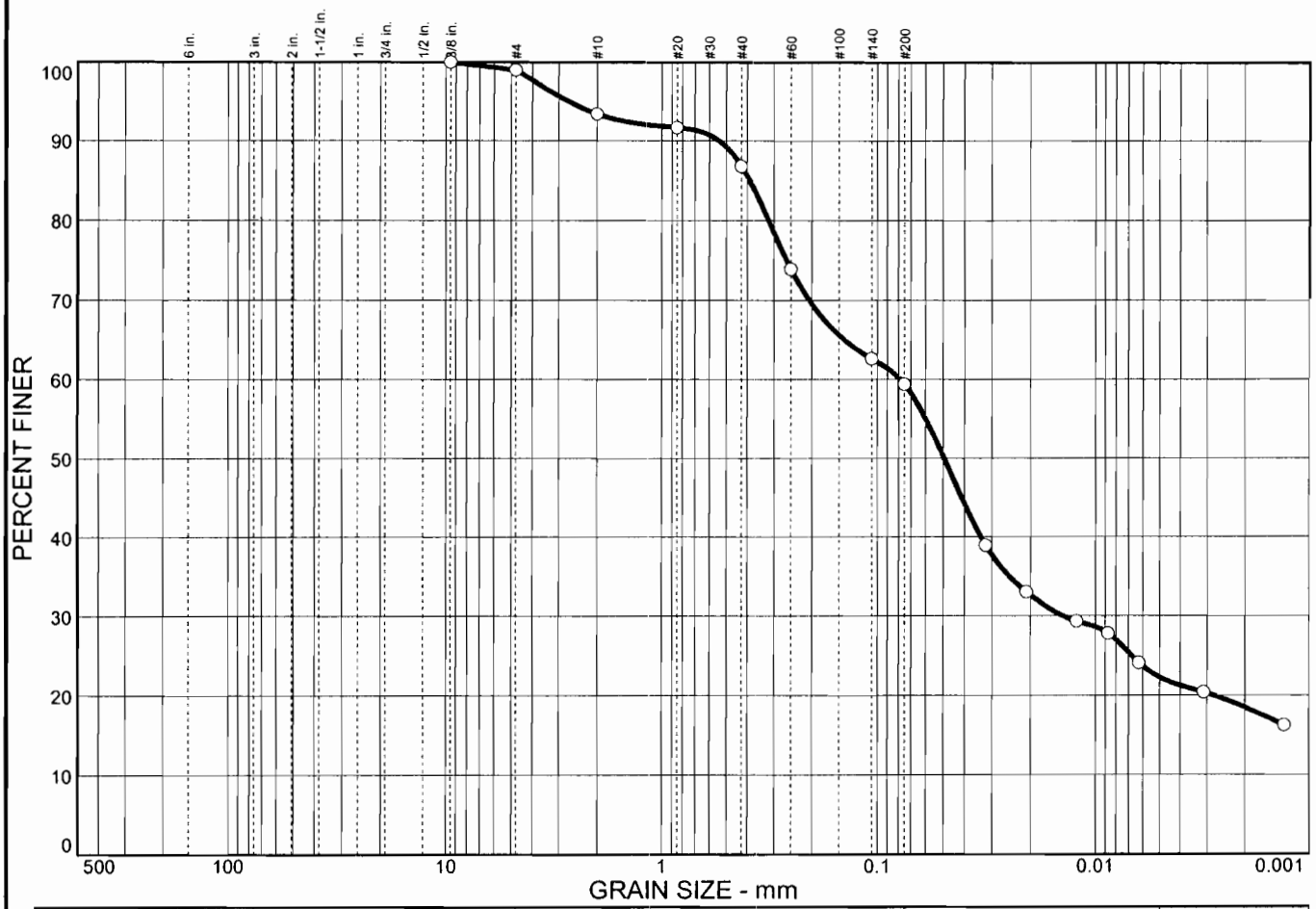
Remarks

Sample No.: 1 **Source of Sample:** TP-05-08 **Date:** 3/3/06
Location: **Elev./Depth:** 12.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1534

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.0	39.6	37.1	22.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.0		
#10	93.4		
#20	91.7		
#40	86.8		
#60	73.9		
#140	62.6		
#200	59.4		

* (no specification provided)

Material Description

Brown Sandy lean clay

Atterberg Limits

PL= 22 LL= 35 PI= 13

Coefficients

D_{85}= 0.389 D_{60}= 0.0783 D_{50}= 0.0495
D_{30}= 0.0142 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

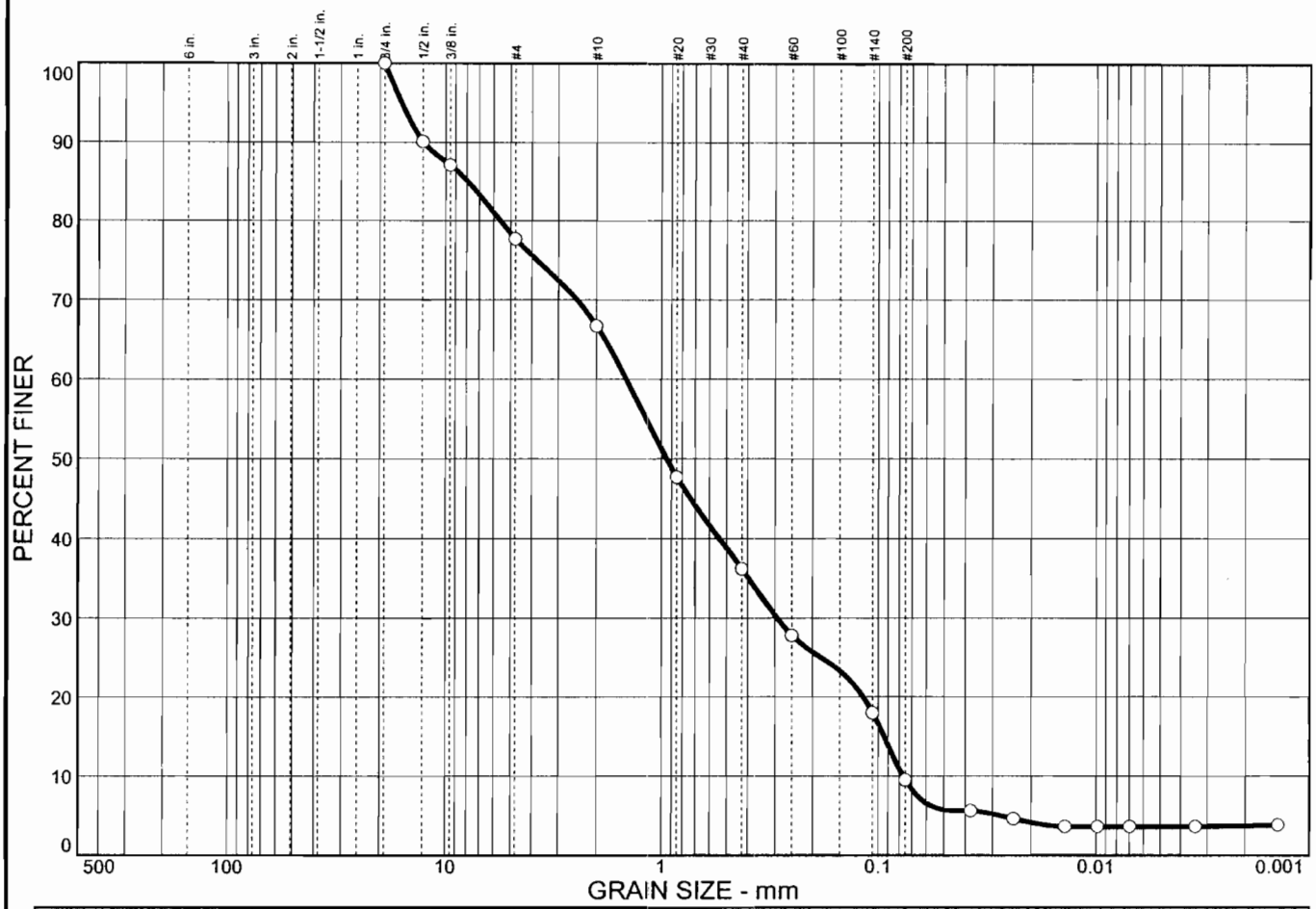
Remarks

Sample No.: 1 **Source of Sample:** TP-05-09 **Date:** 3/3/06
Location: **Elev./Depth:** 2.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1535

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	22.3	68.2	5.9	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	90.1		
.375 in.	87.1		
#4	77.7		
#10	66.7		
#20	47.7		
#40	36.2		
#60	27.8		
#140	18.0		
#200	9.5		

* (no specification provided)

Material Description

Brown sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.93 D_{60}= 1.45 D_{50}= 0.948
D_{30}= 0.293 D_{15}= 0.0939 D_{10}= 0.0768
C_u= 18.92 C_c= 0.77

Classification

USCS= SP-SM AASHTO=

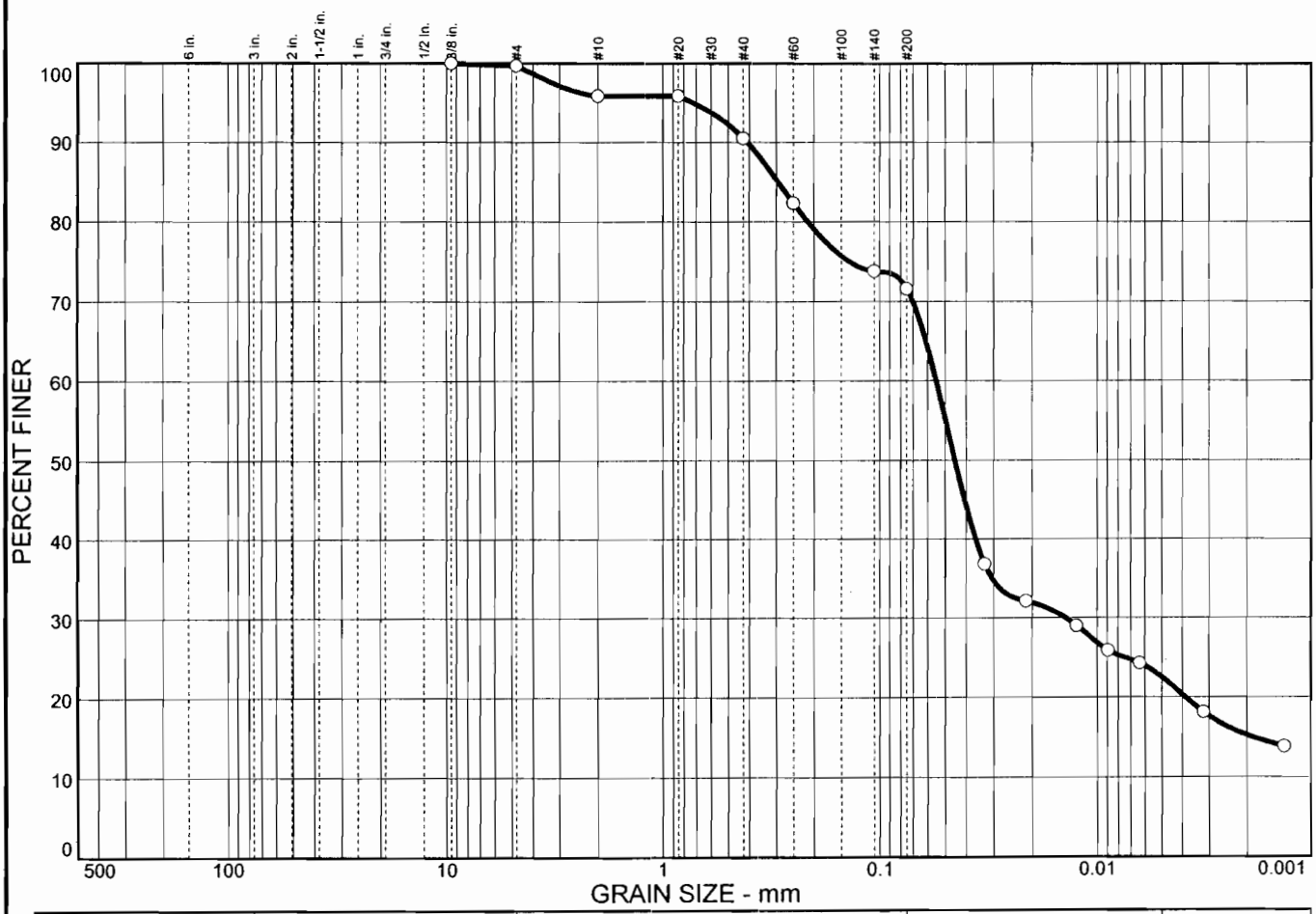
Remarks

Sample No.: 2 **Source of Sample:** TP-05-09 **Date:** 3/3/06
Location: **Elev./Depth:** 5.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1536

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	28.1	49.1	22.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.7		
#10	95.9		
#20	95.9		
#40	90.5		
#60	82.3		
#140	73.8		
#200	71.6		

* (no specification provided)

Material Description

Brown Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.295 D_{60}= 0.0550 D_{50}= 0.0451
D_{30}= 0.0140 D_{15}= 0.0019 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

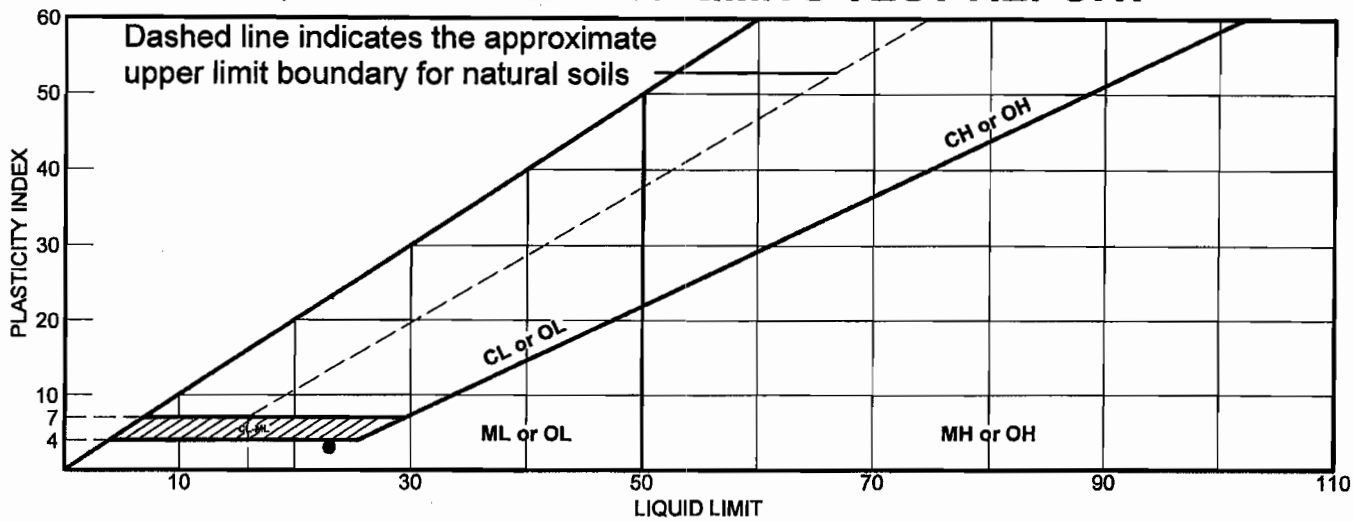
Remarks

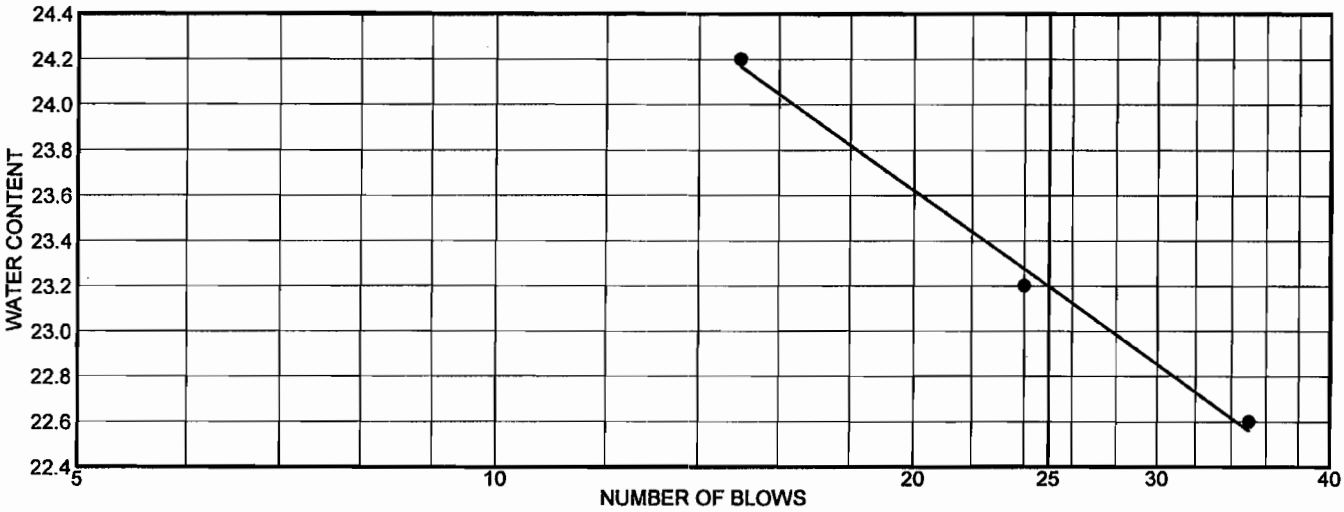
Sample No.: 1 **Source of Sample:** TP-05-10 **Date:** 3/3/06
Location: **Elev./Depth:** 2.0'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: Bolivar Dam DSA
Contract No. DACW69-03-D-0023
Project No: 92528.025 **Figure** 1537

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown,black & gray Silty gravel with sand	23	20	3	24.2	12.3	GM

Project No. 92528.031 **Client:** US ARMY CORPS OF ENGINEERS

Project: BOLIVAR DAM

DACW69-03-D-0023 WO#0030

● **Source:** D-06-26 **Sample No.:** 6 **Elev./Depth:** 7.5-9'

Remarks:

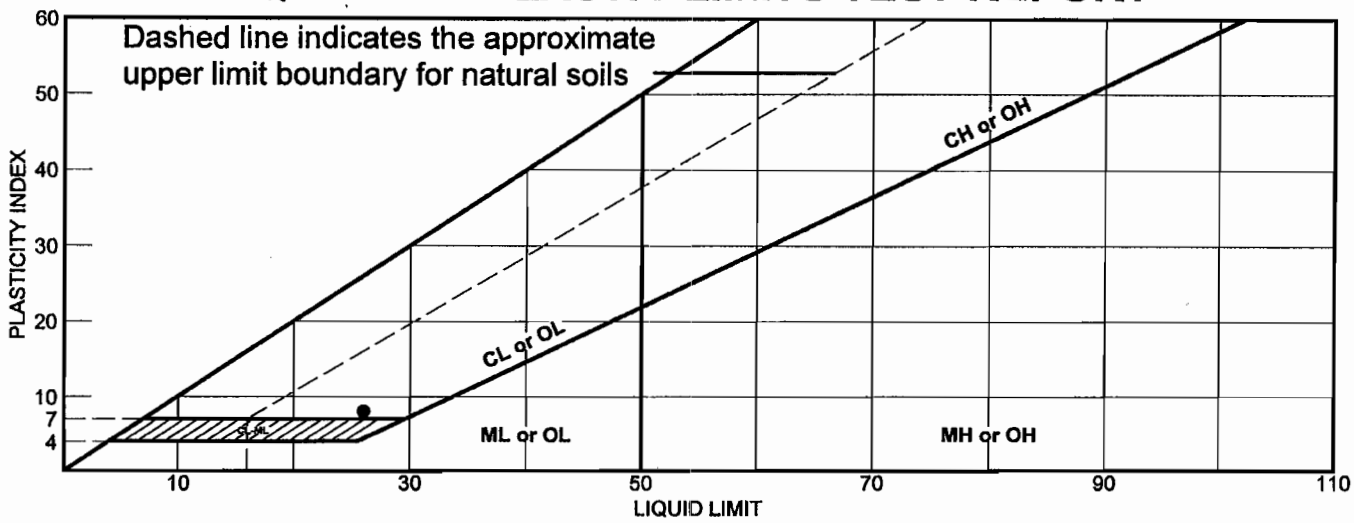
● WATER CONTENT=8.6%

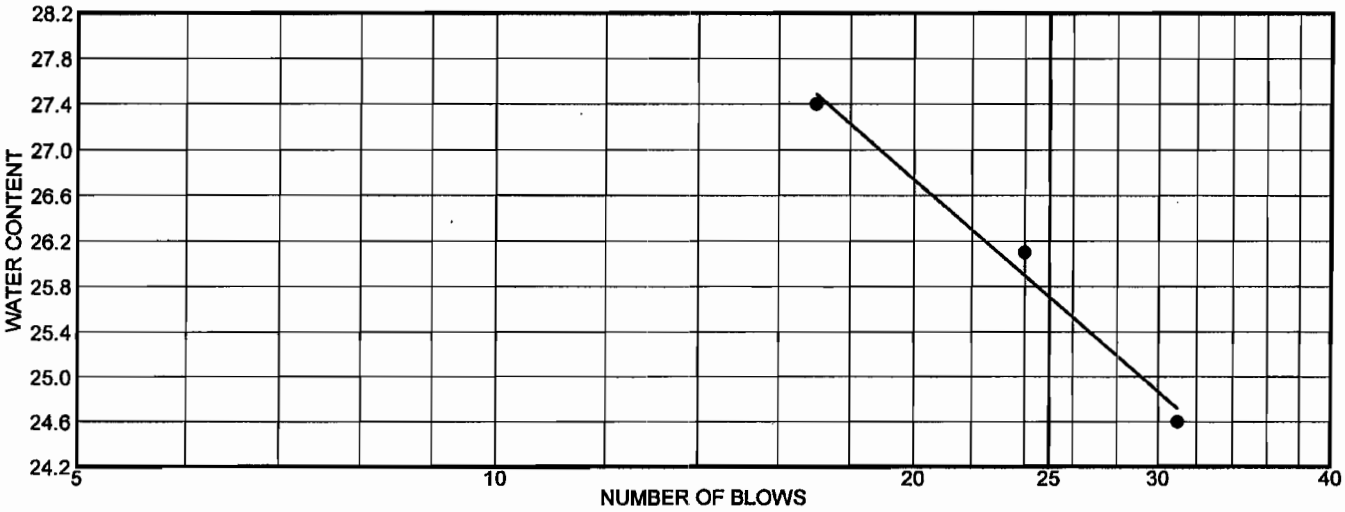
LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Figure 12365

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown	26	18	8			

Project No. 92528.031 **Client:** US ARMY CORPS OF ENGINEERS

Project: BOLIVAR DAM

DACW69-03-D-0023 WO#0030

● **Source:** D-06-27 **Sample No.:** 6 **Elev./Depth:** 6.5-7.5'

Remarks:

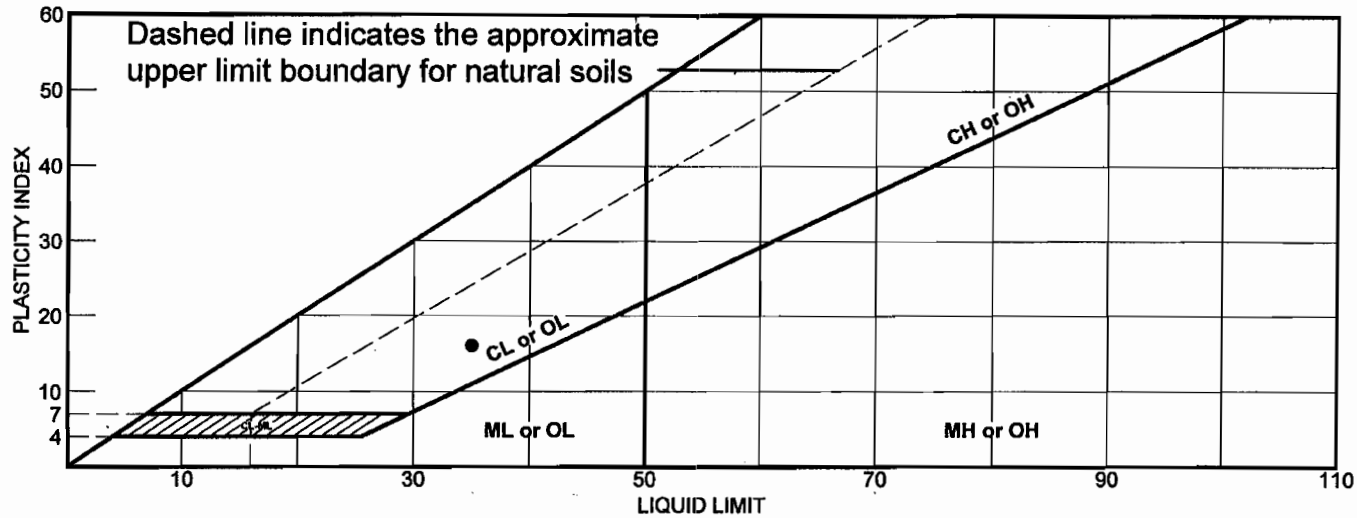
● WATER CONTENT=16.1%

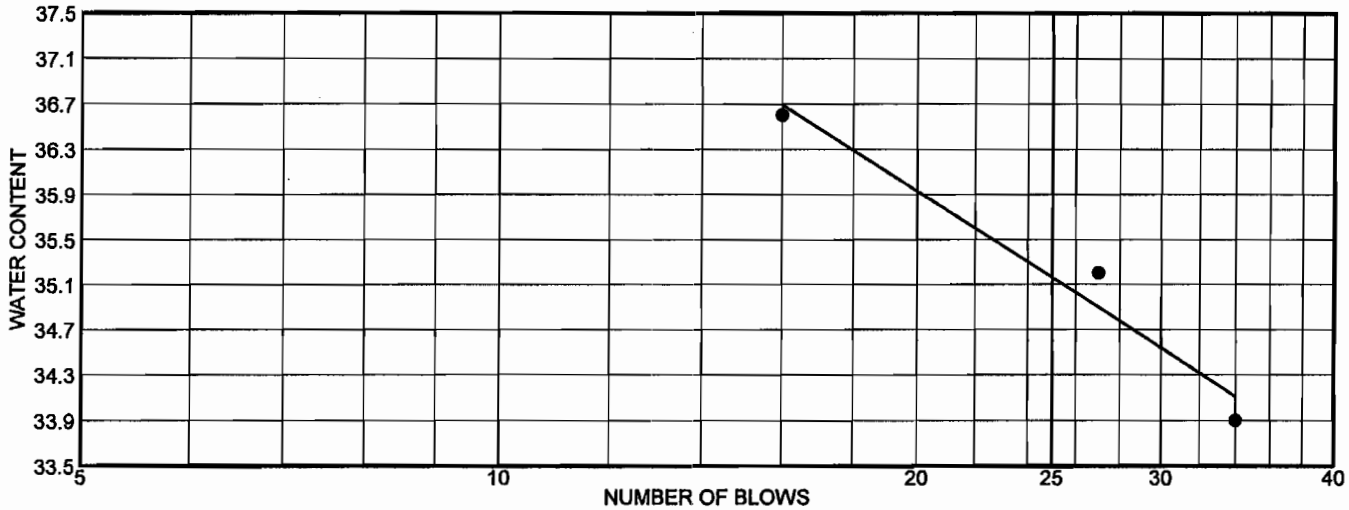
LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Figure 12405

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown and gray	35	19	16			

Project No. 92528.031 **Client:** US ARMY CORPS OF ENGINEERS

Project: BOLIVAR DAM

DACW69-03-D-0023 WO#0030

● **Source:** D-06-28 **Sample No.:** 1 **Elev./Depth:** 75-76.5'

Remarks:

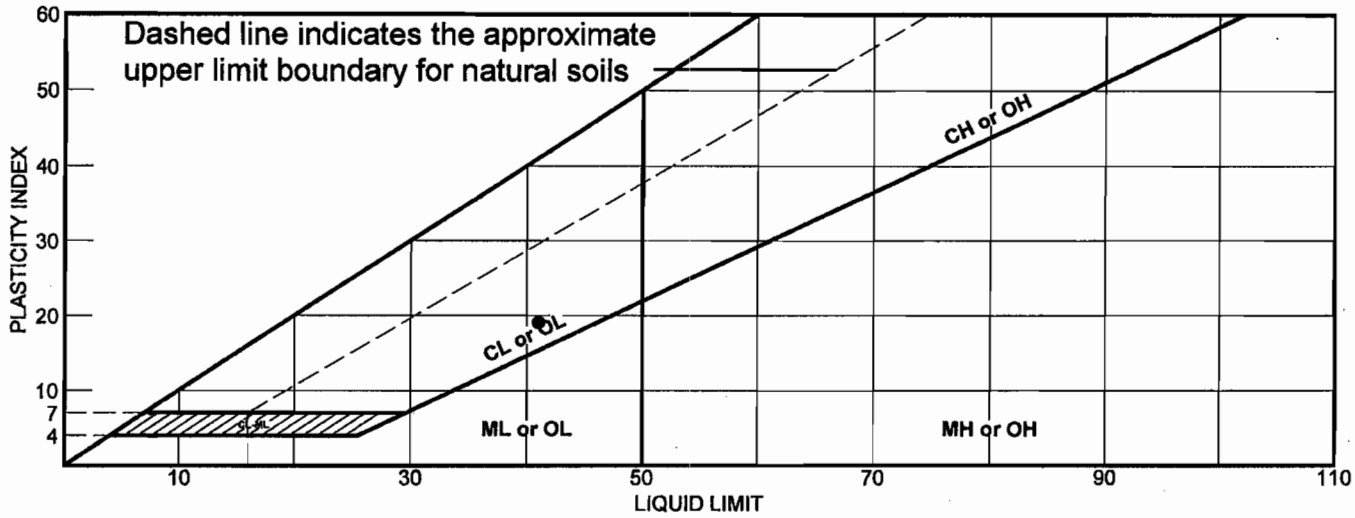
● WATER CONTENT=17.8%

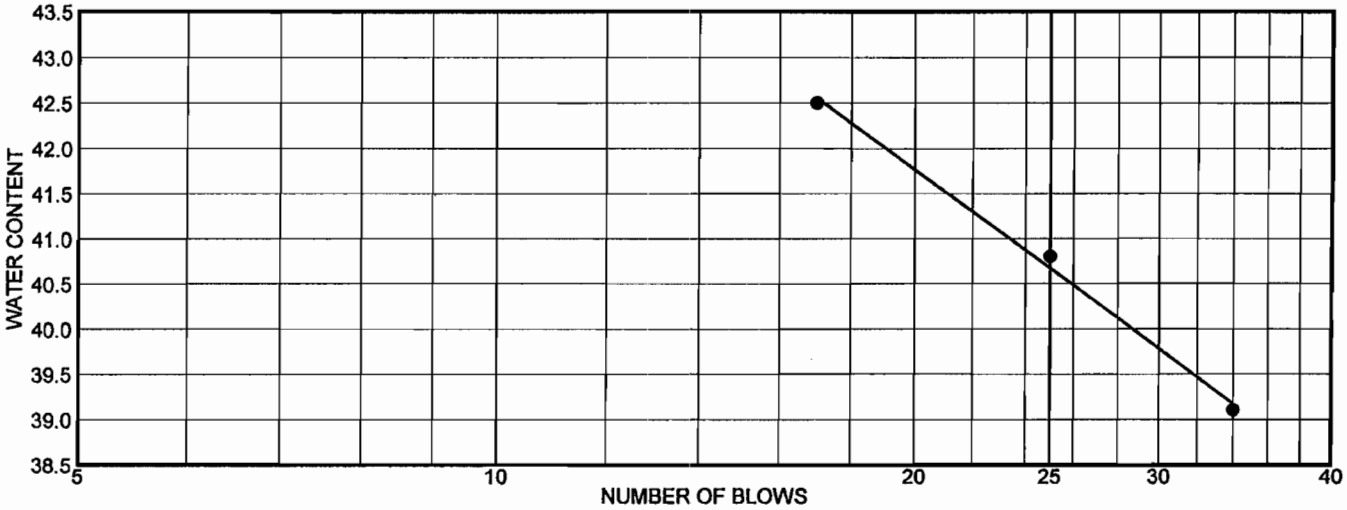
LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Figure 12431

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown and gray	41	22	19			

Project No. 92528.031 **Client:** US ARMY CORPS OF ENGINEERS

Project: BOLIVAR DAM

DACW69-03-D-0023 WO#0030

● **Source:** D-06-29 **Sample No.:** 8 **Elev./Depth:** 9.5-10.5'

Remarks:

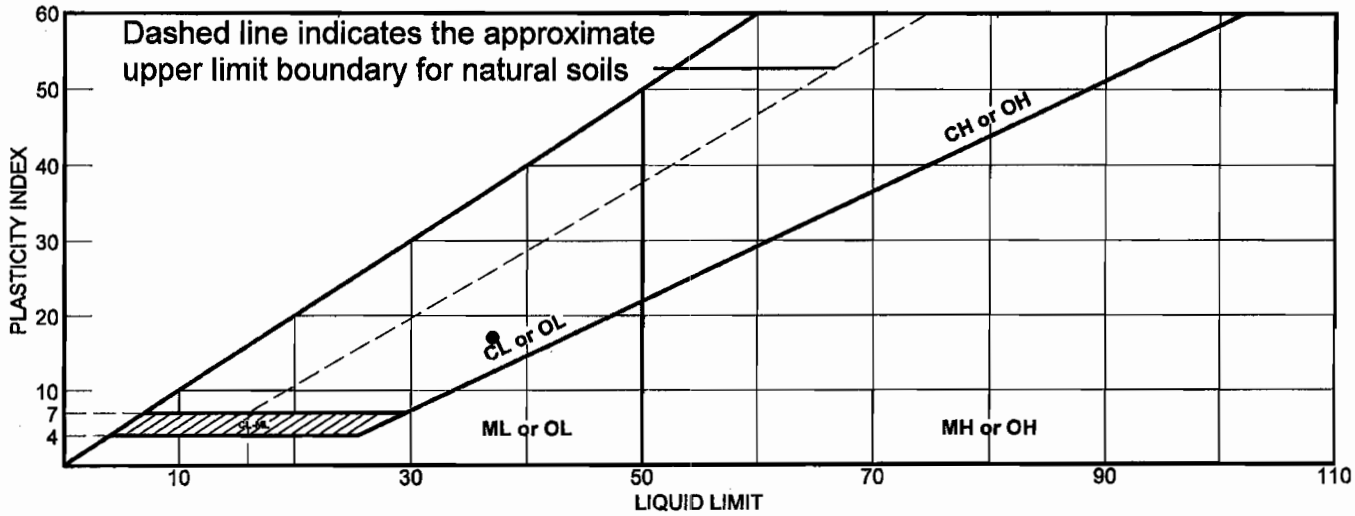
● WATER CONTENT=19.9%

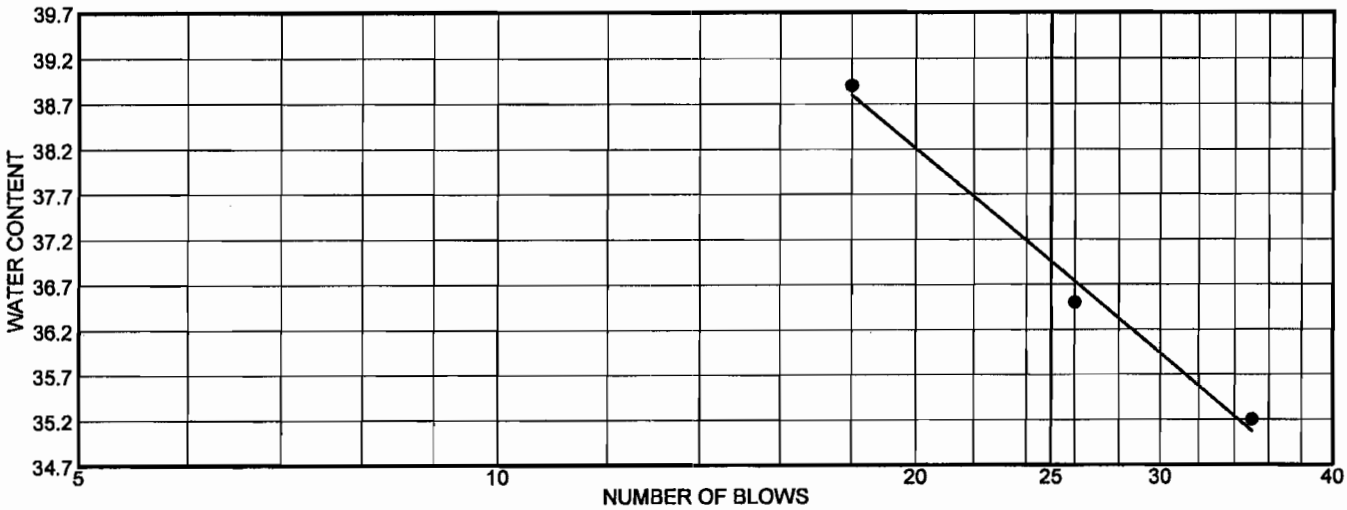
LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Figure 12456

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown and gray Clayey gravel with sand	37	20	17	27.3	19.5	GC

Project No. 92528.031 **Client:** US ARMY CORPS OF ENGINEERS

Project: BOLIVAR DAM

DACW69-03-D-0023 WO#0030

● **Source:** D-06-29 **Sample No.:** 11 **Elev./Depth:** 13.5-15'

Remarks:

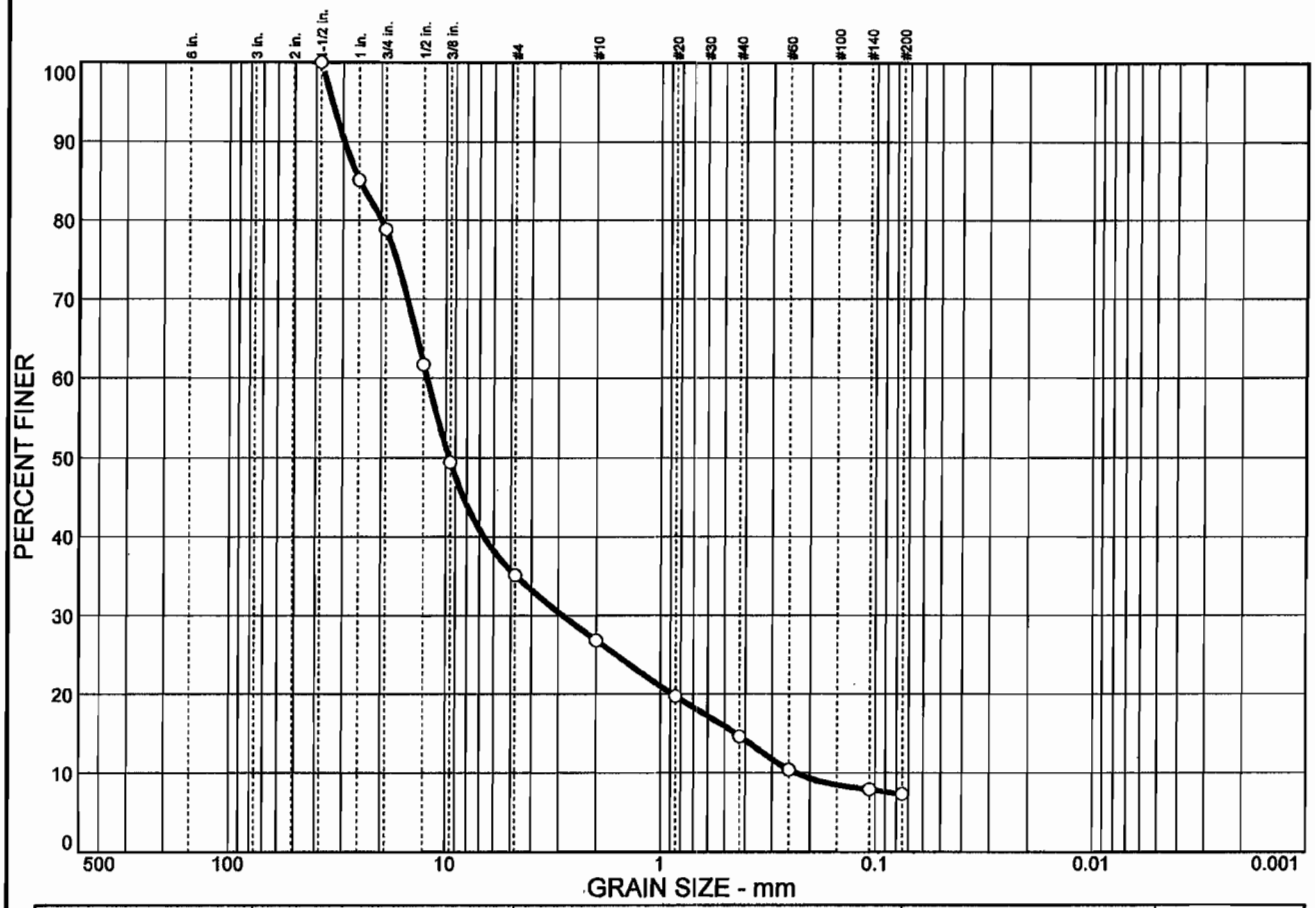
●

LIQUID AND PLASTIC LIMITS TEST REPORT

H. C. NUTTING COMPANY

Figure 12459

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	64.9	27.8	7.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	85.1		
.75 in.	78.8		
.5 in.	61.7		
.375 in.	49.4		
#4	35.1		
#10	26.8		
#20	19.7		
#40	14.6		
#60	10.4		
#140	7.9		
#200	7.3		

* (no specification provided)

Material Description

Brown Well-graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 25.3 D_{60}= 12.2 D_{50}= 9.68
D_{30}= 2.88 D_{15}= 0.447 D_{10}= 0.233
C_u= 52.50 C_c= 2.90

Classification

USCS= GW-GM AASHTO=

Remarks

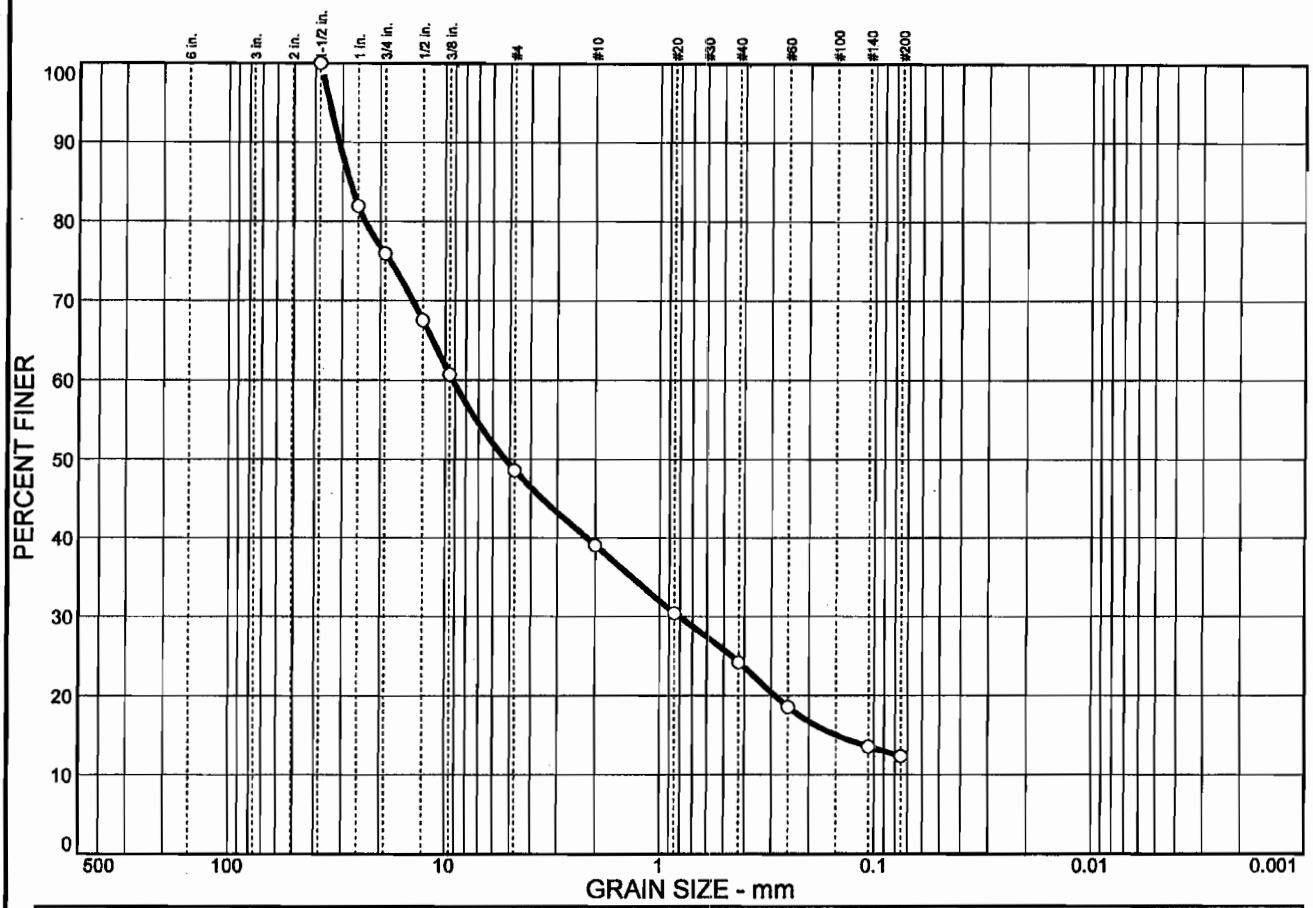
WATER CONTENT=5.9%

Sample No.: 4 **Source of Sample:** D-06-26 **Date:** 12-12-07
Location: **Elev./Depth:** 4.5-6'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12363

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	51.4	36.3	12.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	81.9		
.75 in.	75.9		
.5 in.	67.5		
.375 in.	60.7		
#4	48.6		
#10	39.0		
#20	30.4		
#40	24.2		
#60	18.5		
#140	13.5		
#200	12.3		

* (no specification provided)

Material Description

Brown,black & gray Silty gravel with sand

Atterberg Limits

PL= 20 LL= 23 PI= 3

Coefficients

D_{85}= 27.8 D_{60}= 9.23 D_{50}= 5.26
D_{30}= 0.813 D_{15}= 0.151 D_{10}=
C_u= C_c=

Classification

USCS= GM AASHTO=

Remarks

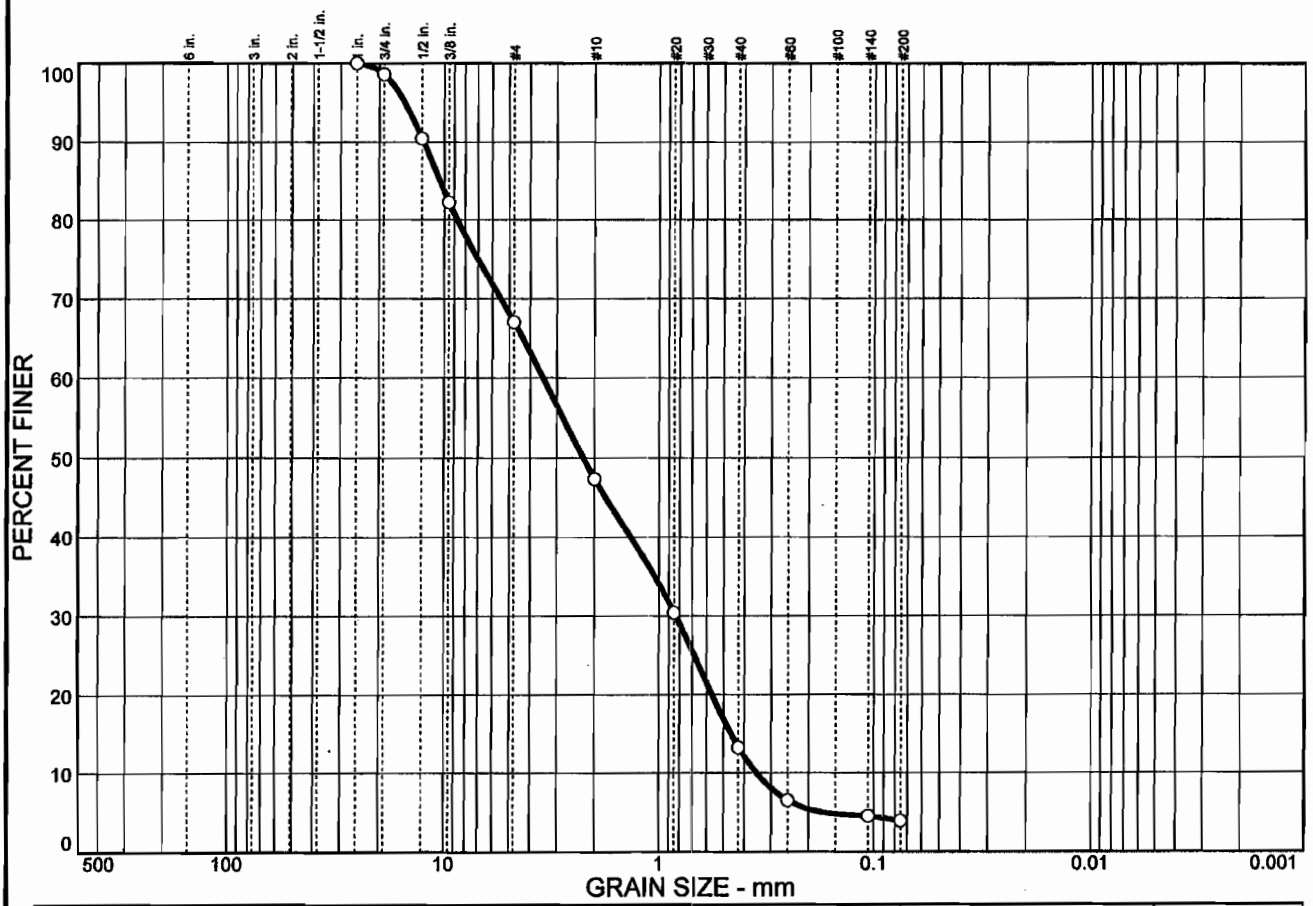
WATER CONTENT=8.6%

Sample No.: 6 **Source of Sample:** D-06-26 **Date:** 12-13-07
Location: **Elev./Depth:** 7.5-9'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12365

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	33.0	63.1	3.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	98.6		
.5 in.	90.4		
.375 in.	82.2		
#4	67.0		
#10	47.3		
#20	30.4		
#40	13.2		
#60	6.5		
#140	4.5		
#200	3.9		

* (no specification provided)

Material Description

Brown Poorly graded sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.5 D_{60}= 3.49 D_{50}= 2.27
D_{30}= 0.836 D_{15}= 0.463 D_{10}= 0.352
C_u= 9.91 C_c= 0.57

Classification

USCS= SP AASHTO=

Remarks

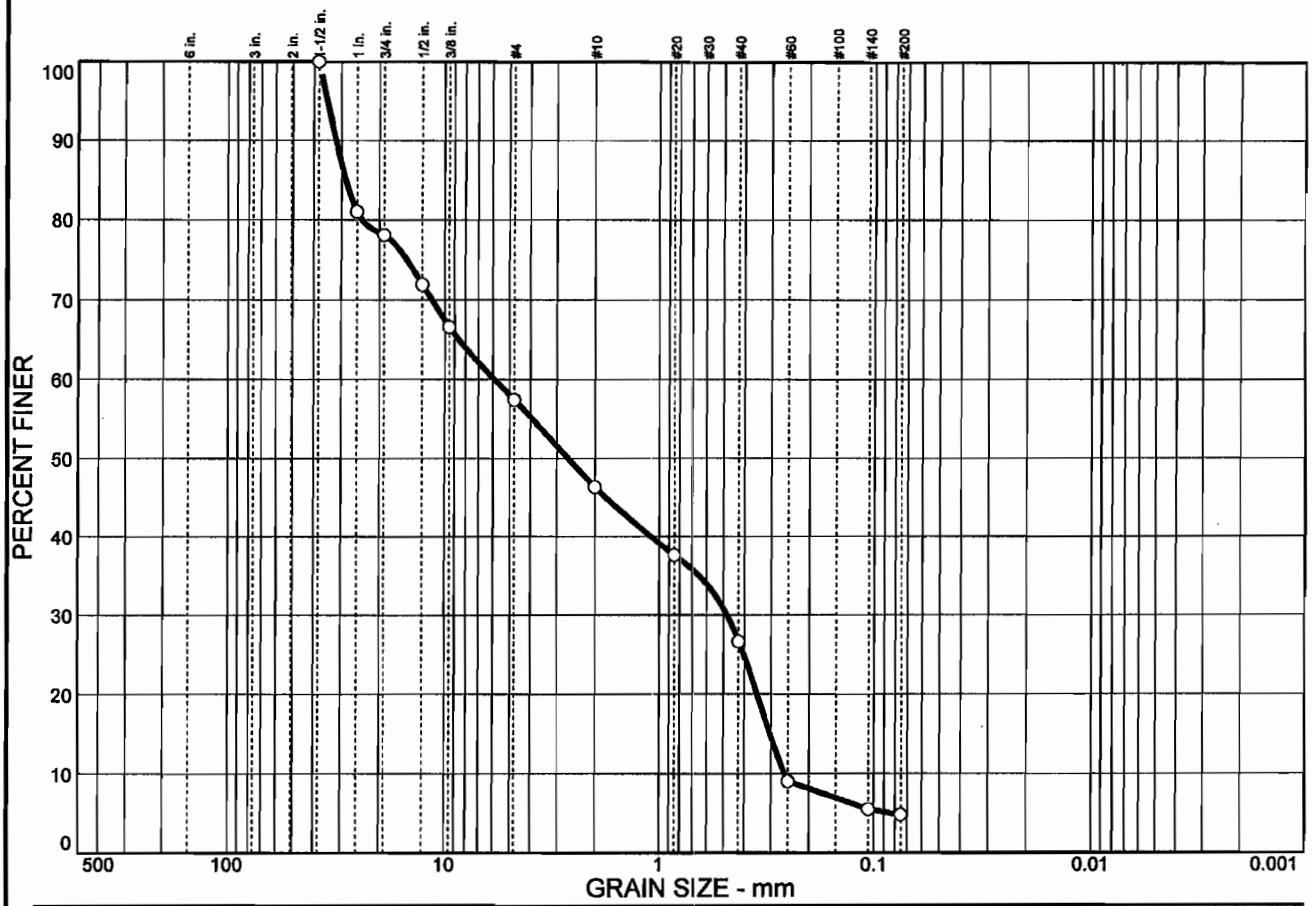
WATER CONTENT=5.3%

Sample No.: 13 **Source of Sample:** D-06-26 **Date:** 12-12-07
Location: **Elev./Depth:** 18-19.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12372

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	42.6	52.6	4.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	81.0		
.75 in.	78.1		
.5 in.	71.9		
.375 in.	66.6		
#4	57.4		
#10	46.3		
#20	37.6		
#40	26.6		
#60	9.0		
#140	5.5		
#200	4.8		

* (no specification provided)

Material Description

Brown Poorly graded sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 28.7 D_{60}= 5.90 D_{50}= 2.69
D_{30}= 0.484 D_{15}= 0.305 D_{10}= 0.260
C_u= 22.68 C_c= 0.15

Classification

USCS= SP AASHTO=

Remarks

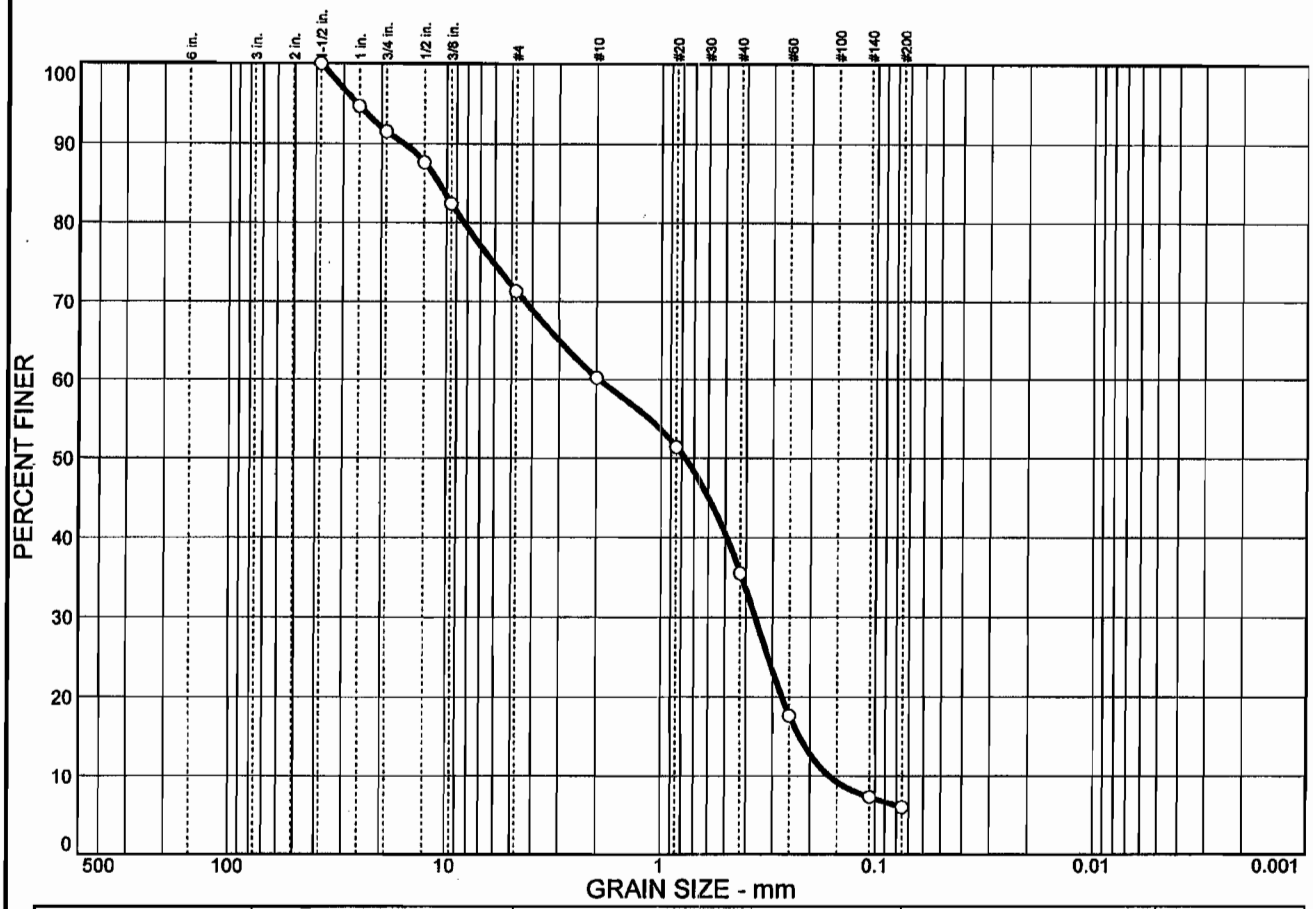
WATER CONTENT=12.8%

Sample No.: 30 **Source of Sample:** D-06-26 **Date:** 12-12-07
Location: **Elev./Depth:** 43.5-45'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12389

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	28.7	65.3	6.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	94.7		
.75 in.	91.5		
.5 in.	87.6		
.375 in.	82.4		
#4	71.3		
#10	60.2		
#20	51.4		
#40	35.5		
#60	17.6		
#140	7.3		
#200	6.0		

* (no specification provided)

Material Description

Brown Poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.9 D_{60}= 1.96 D_{50}= 0.777
D_{30}= 0.362 D_{15}= 0.225 D_{10}= 0.164
C_u= 11.98 C_c= 0.41

Classification

USCS= SP-SM AASHTO=

Remarks

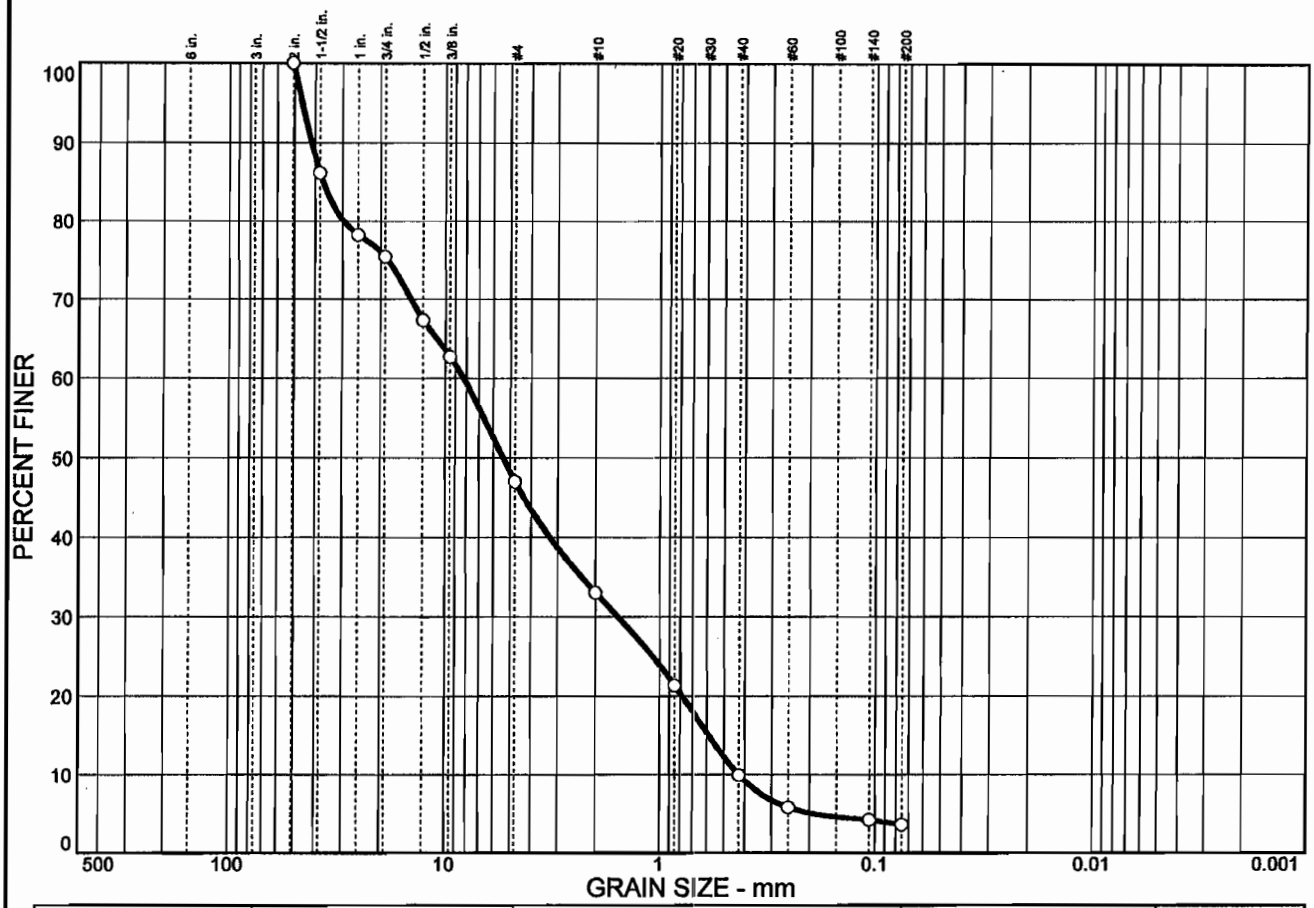
WATER CONTENT=5.8%

Sample No.: 3 **Source of Sample:** D-06-27 **Date:** 12-12-07
Location: **Elev./Depth:** 3-4.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12402

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	53.0	43.4	3.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	86.1		
1 in.	78.2		
.75 in.	75.4		
.5 in.	67.3		
.375 in.	62.7		
#4	47.0		
#10	33.0		
#20	21.3		
#40	9.9		
#60	5.8		
#140	4.2		
#200	3.6		

* (no specification provided)

Material Description

Brown Poorly graded gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 36.9 D_{60}= 8.28 D_{50}= 5.41
D_{30}= 1.58 D_{15}= 0.592 D_{10}= 0.428
C_u= 19.32 C_c= 0.70

Classification

USCS= GP AASHTO=

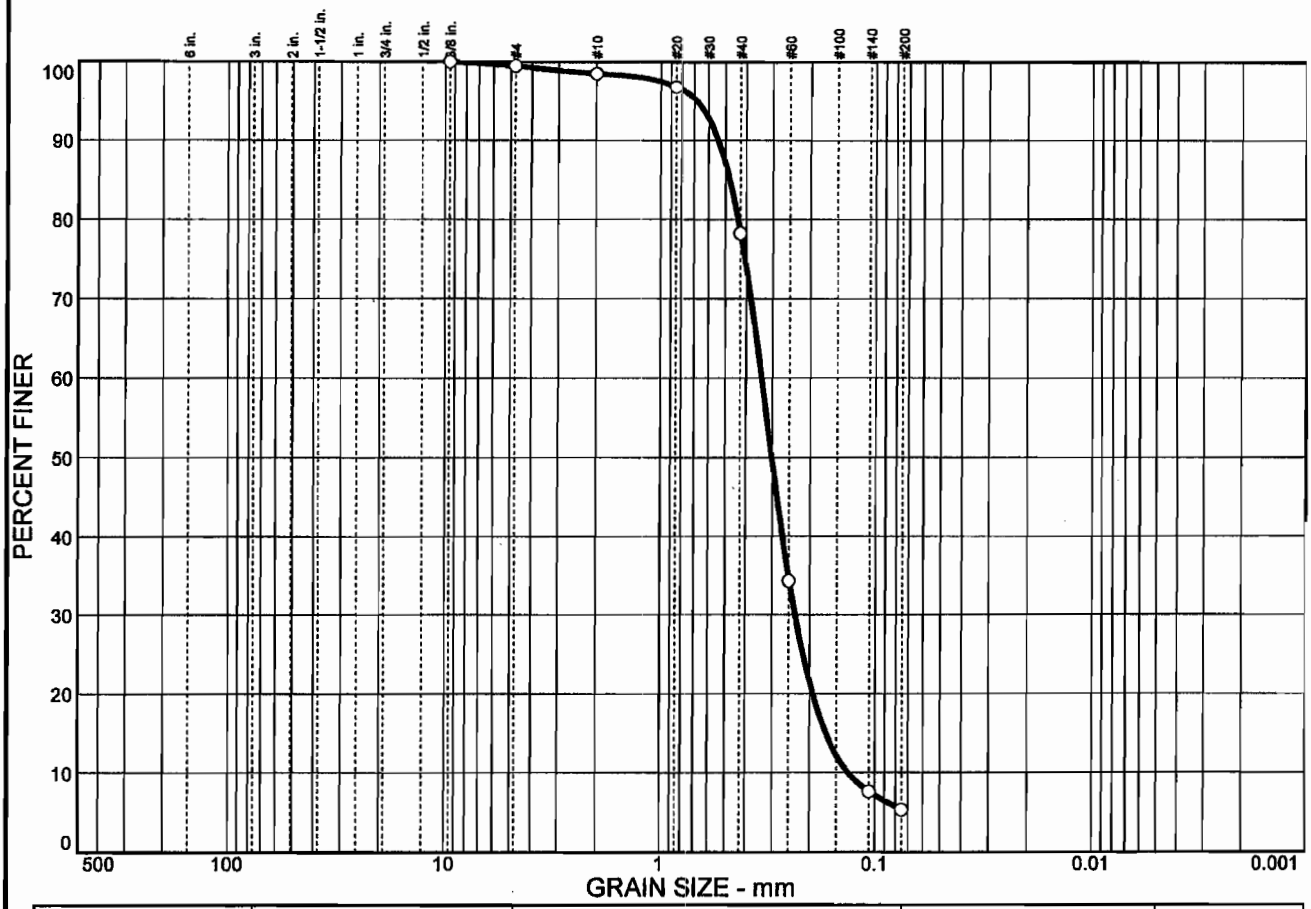
Remarks

Sample No.: 12 **Source of Sample:** D-06-27 **Date:** 12-12-07
Location: **Elev./Depth:** 15-16.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12411

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	94.2	5.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.5		
#10	98.5		
#20	96.8		
#40	78.2		
#60	34.3		
#140	7.6		
#200	5.3		

* (no specification provided)

Material Description

Brown Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.479 D_{60}= 0.338 D_{50}= 0.302
D_{30}= 0.235 D_{15}= 0.169 D_{10}= 0.133
C_u= 2.54 C_c= 1.22

Classification

USCS= SP-SM AASHTO=

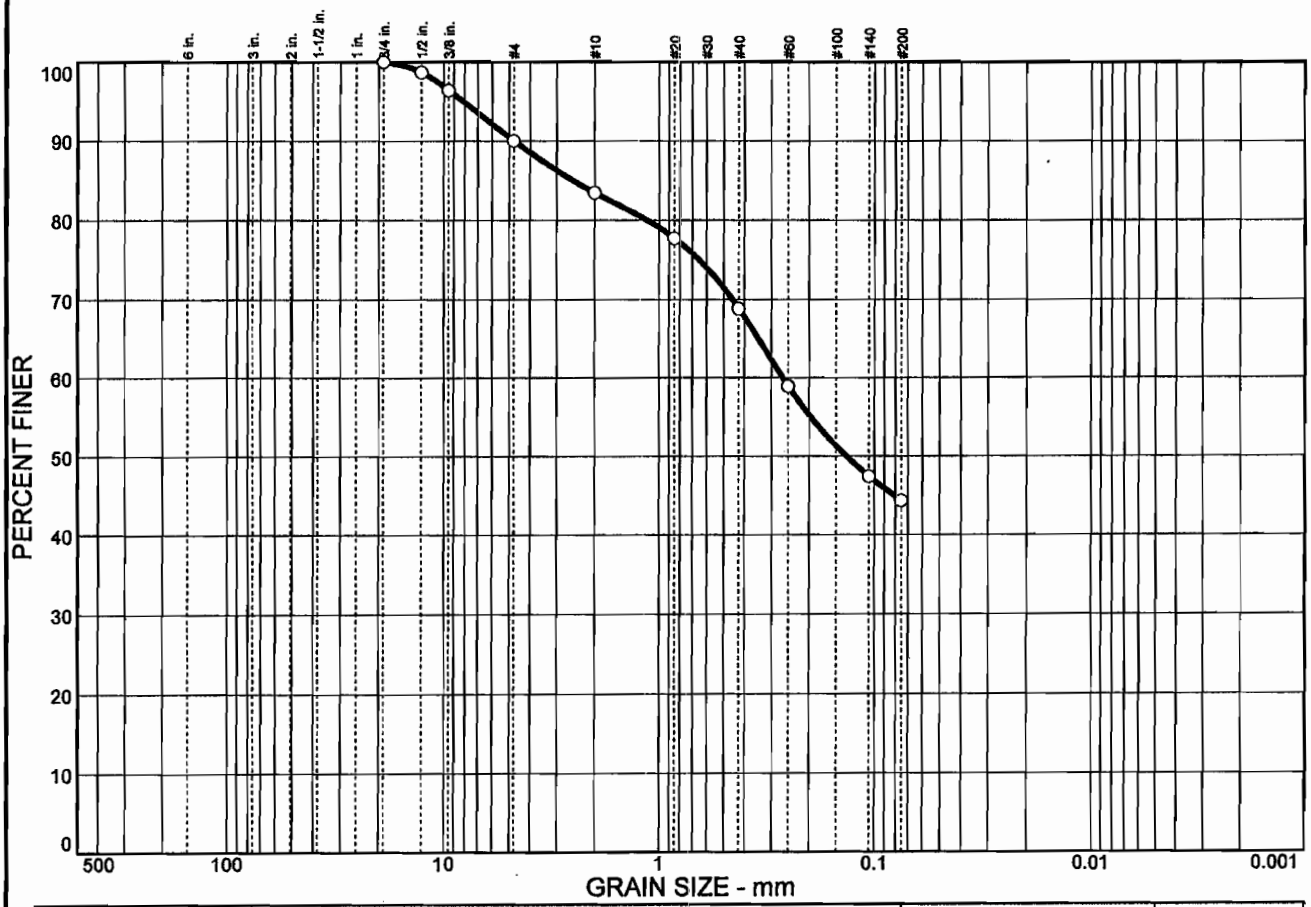
Remarks

Sample No.: 26 **Source of Sample:** D-06-27 **Date:** 12-12-07
Location: **Elev./Depth:** 36-37.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12425

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.0	45.7	44.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	98.7		
.375 in.	96.4		
#4	90.0		
#10	83.4		
#20	77.7		
#40	68.8		
#60	58.9		
#140	47.4		
#200	44.3		

* (no specification provided)

Material Description

Brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.54 D_{60}= 0.266 D_{50}= 0.135
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

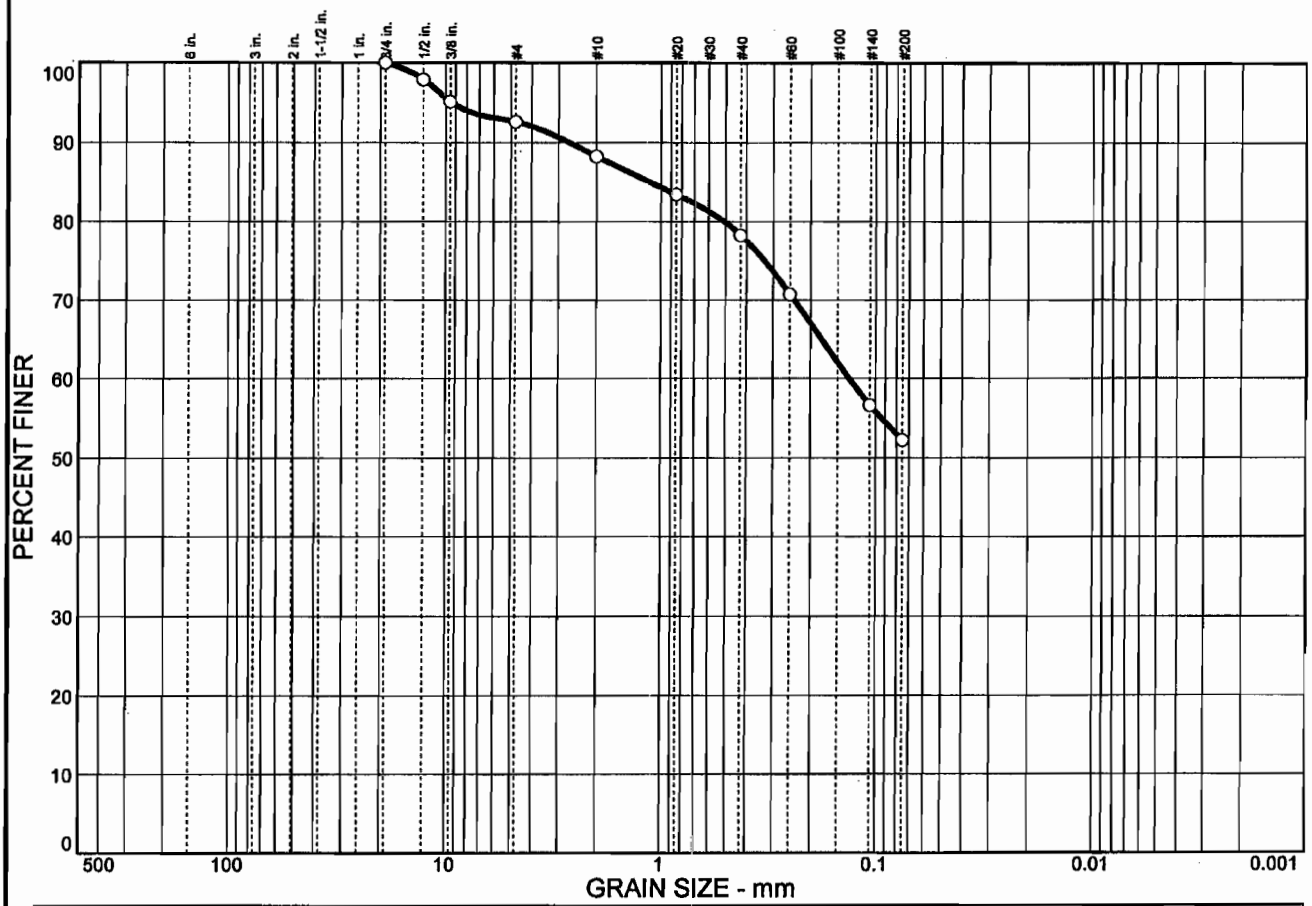
WATER CONTENT=16.7%

Sample No.: 4 **Source of Sample:** D-06-28 **Date:** 12-12-07
Location: **Elev./Depth:** 78-79.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12434

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.4	40.4	52.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	97.9		
.375 in.	95.1		
#4	92.6		
#10	88.2		
#20	83.4		
#40	78.2		
#60	70.7		
#140	56.6		
#200	52.2		

* (no specification provided)

Material Description

Brown Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.13 D_{60}= 0.133 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

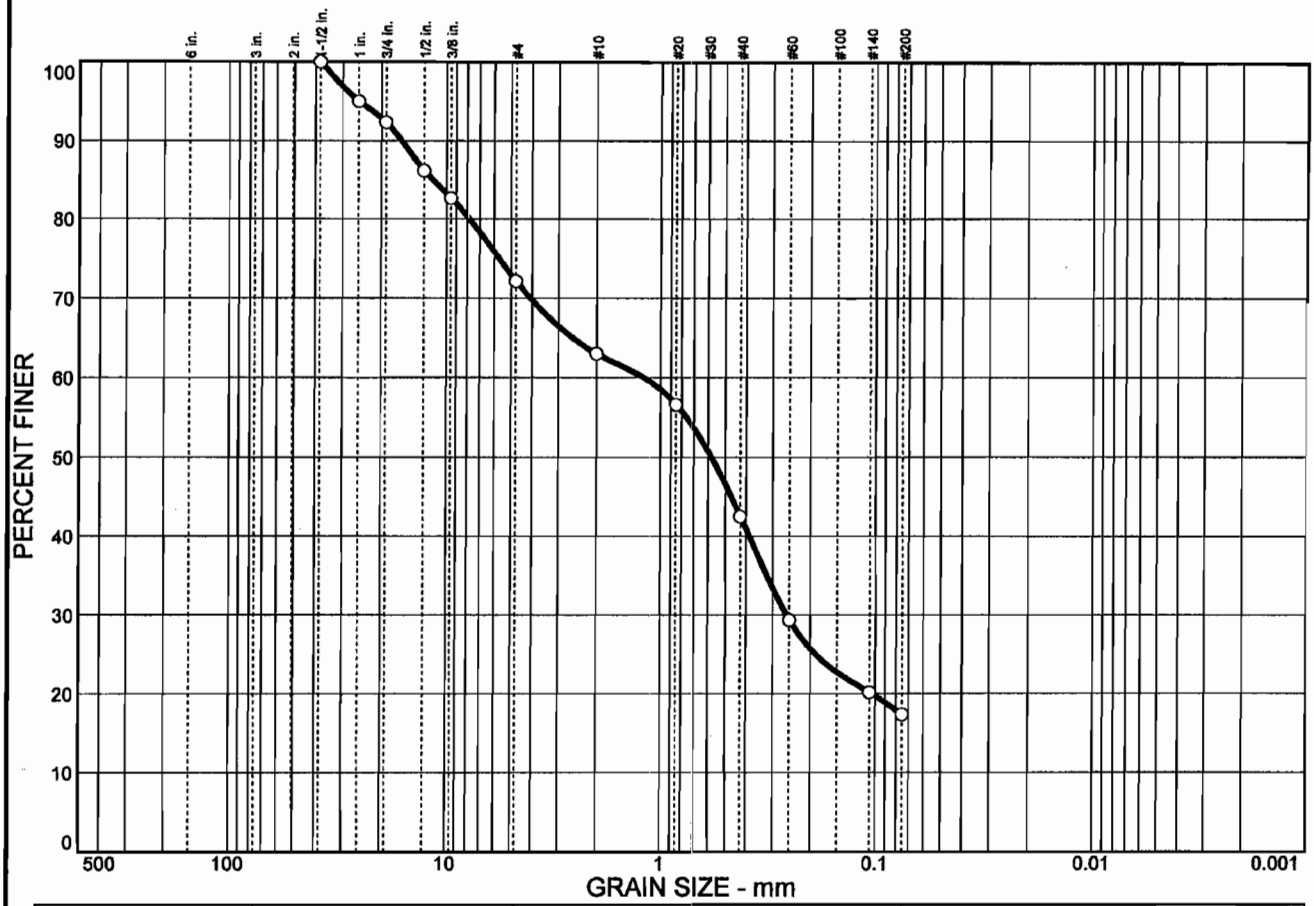
WATER CONTENT=14.5%

Sample No.: 9 **Source of Sample:** D-06-28 **Date:** 12-12-07
Location: **Elev./Depth:** 84-85.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12439

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	27.9	54.8	17.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	95.0		
.75 in.	92.3		
.5 in.	86.1		
.375 in.	82.6		
#4	72.1		
#10	63.0		
#20	56.6		
#40	42.5		
#60	29.3		
#140	20.1		
#200	17.3		

* (no specification provided)

Material Description

Brown Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.7 D_{60}= 1.20 D_{50}= 0.583
D_{30}= 0.259 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

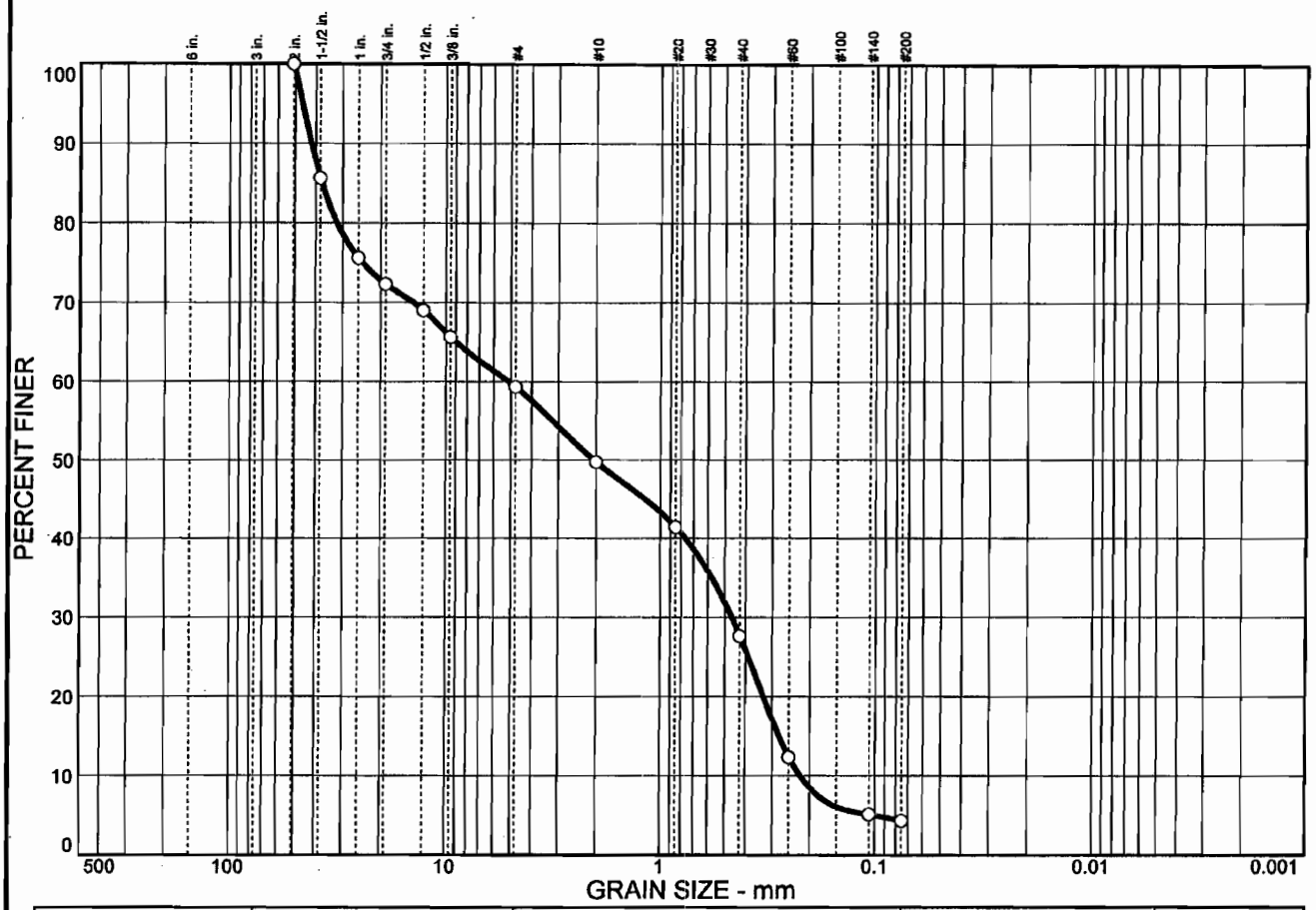
Remarks

Sample No.: 16 **Source of Sample:** D-06-28 **Date:** 12-12-07
Location: **Elev./Depth:** 93-94.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12446

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	40.7	55.0	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	85.6		
1 in.	75.6		
.75 in.	72.3		
.5 in.	69.0		
.375 in.	65.6		
#4	59.3		
#10	49.7		
#20	41.4		
#40	27.6		
#60	12.3		
#140	5.1		
#200	4.3		

* (no specification provided)

Material Description

Brown Poorly graded sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 37.5 D_{60}= 5.13 D_{50}= 2.06
D_{30}= 0.464 D_{15}= 0.279 D_{10}= 0.222
C_u= 23.05 C_c= 0.19

Classification

USCS= SP AASHTO=

Remarks

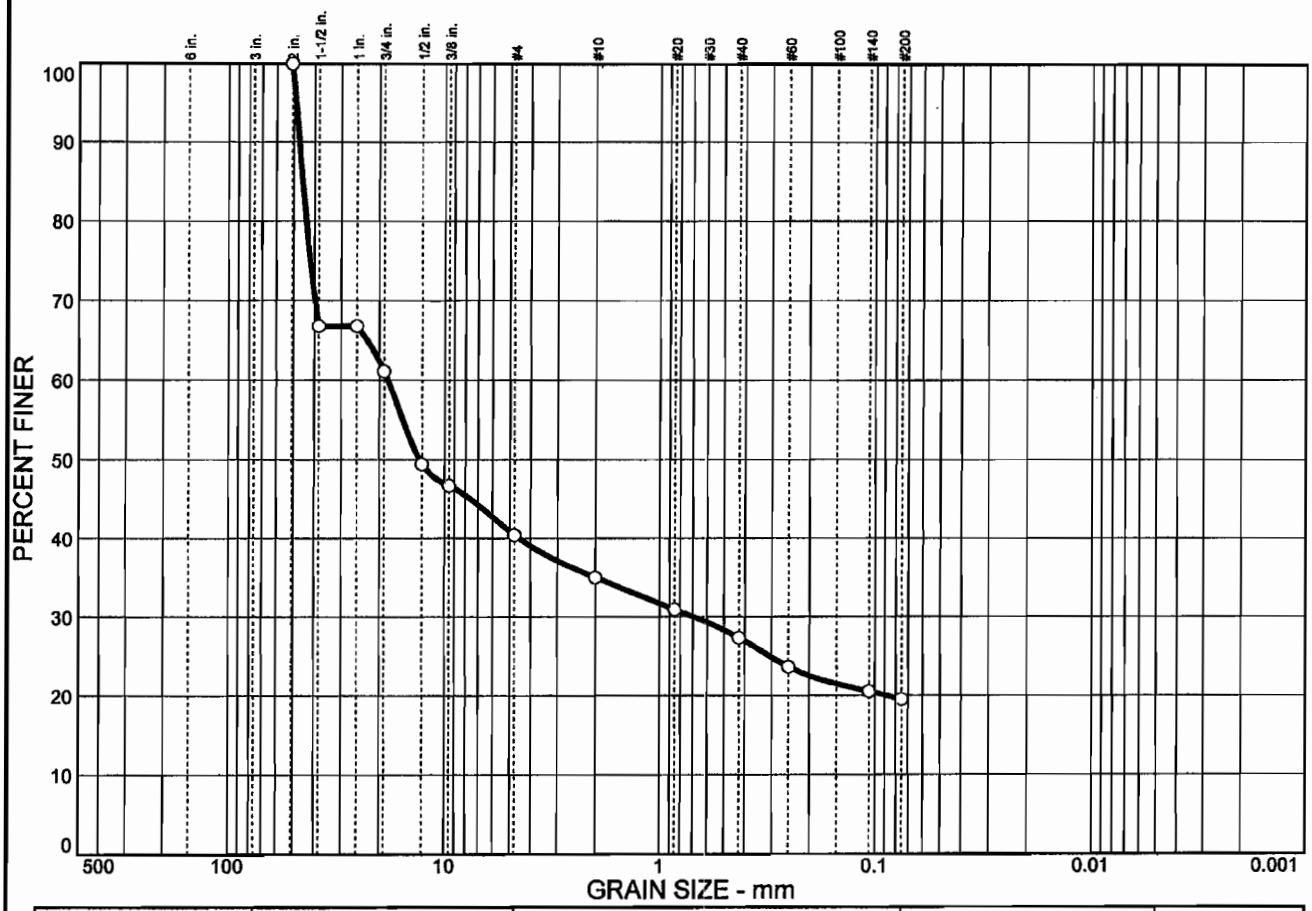
WATER CONTENT=5.1%

Sample No.: 3 **Source of Sample:** D-06-29 **Date:** 12-12-07
Location: **Elev./Depth:** 3-4.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12451

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	59.6	20.9	19.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	66.8		
1 in.	66.8		
.75 in.	61.1		
.5 in.	49.4		
.375 in.	46.7		
#4	40.4		
#10	35.0		
#20	30.9		
#40	27.3		
#60	23.6		
#140	20.5		
#200	19.5		

* (no specification provided)

Material Description

Brown and gray Clayey gravel with sand

Atterberg Limits

PL= 20 LL= 37 PI= 17

Coefficients

D_{85}= 45.6 D_{60}= 18.3 D_{50}= 13.1
D_{30}= 0.699 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO=

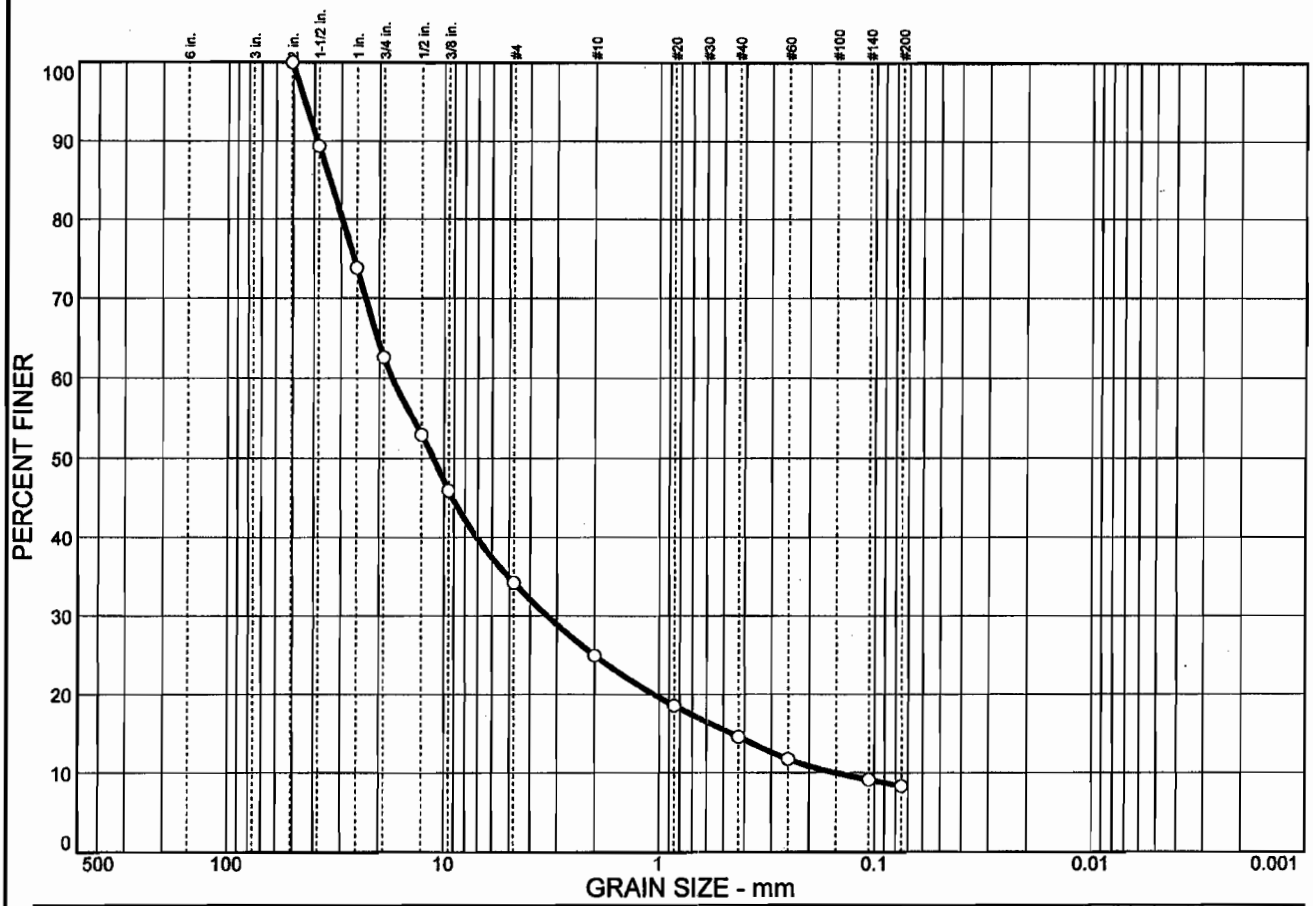
Remarks

Sample No.: 11 **Source of Sample:** D-06-29 **Date:** 12-13-07
Location: **Elev./Depth:** 13.5-15'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12459

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	65.8	25.9	8.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	89.3		
1 in.	73.8		
.75 in.	62.6		
.5 in.	52.9		
.375 in.	45.9		
#4	34.2		
#10	24.9		
#20	18.5		
#40	14.5		
#60	11.7		
#140	9.1		
#200	8.3		

* (no specification provided)

Material Description

Brown Poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 33.9 D_{60}= 17.4 D_{50}= 11.3
D_{30}= 3.34 D_{15}= 0.465 D_{10}= 0.153
C_u= 113.89 C_c= 4.17

Classification

USCS= GP-GM AASHTO=

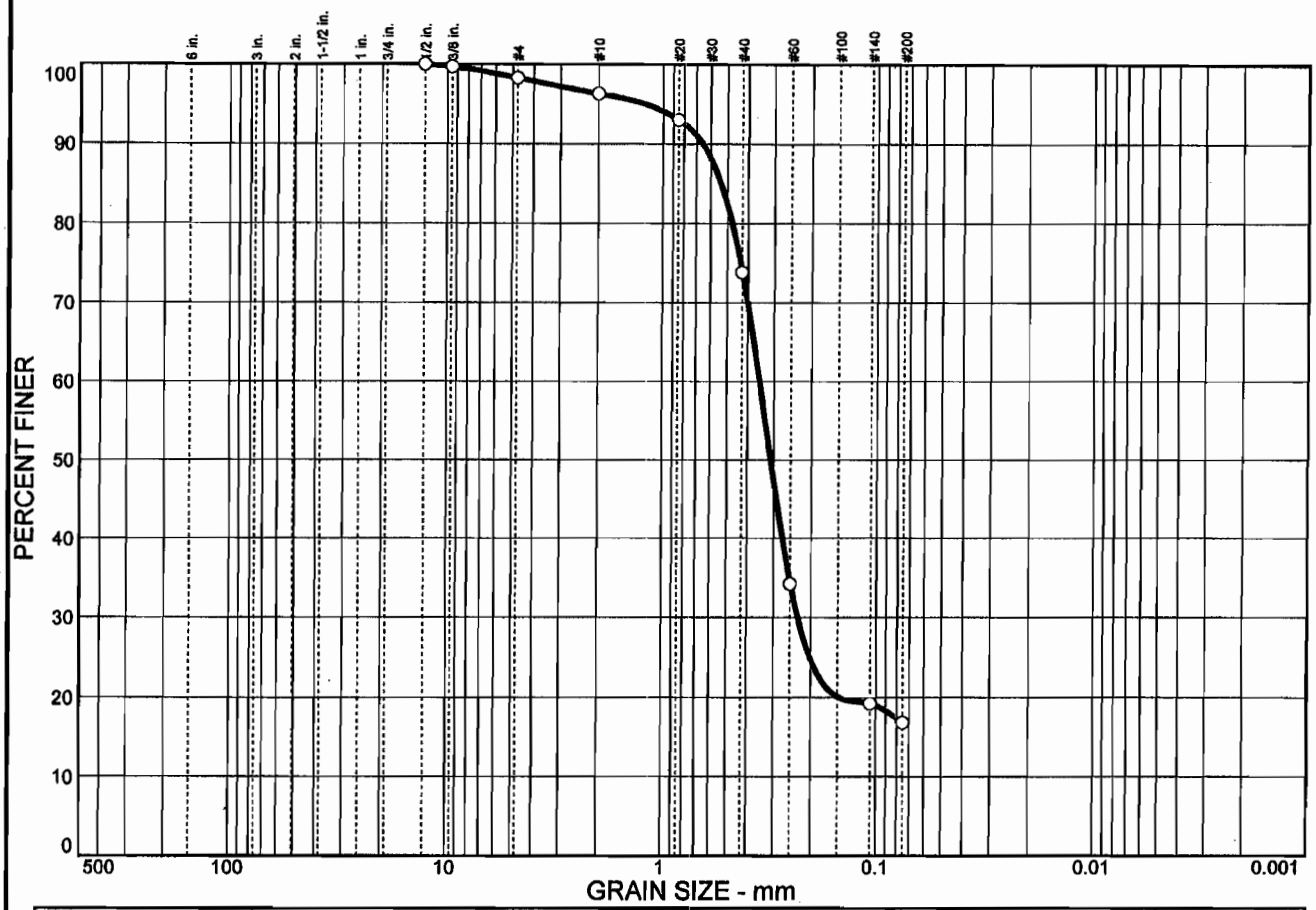
Remarks

Sample No.: 13 **Source of Sample:** D-06-29 **Date:** 12-12-07
Location: **Elev./Depth:** 16.5-18'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
DACW69-03-D-0023 WO#0030
Project No: 92528.031 **Figure** 12461

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.7	81.5	16.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	99.7		
#4	98.3		
#10	96.3		
#20	93.0		
#40	73.8		
#60	34.2		
#140	19.2		
#200	16.8		

* (no specification provided)

Material Description

Brown Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.538 D_{60}= 0.352 D_{50}= 0.311
D_{30}= 0.231 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: 19 **Source of Sample:** D-06-29 **Date:** 12-12-07
Location: **Elev./Depth:** 25.5-27'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
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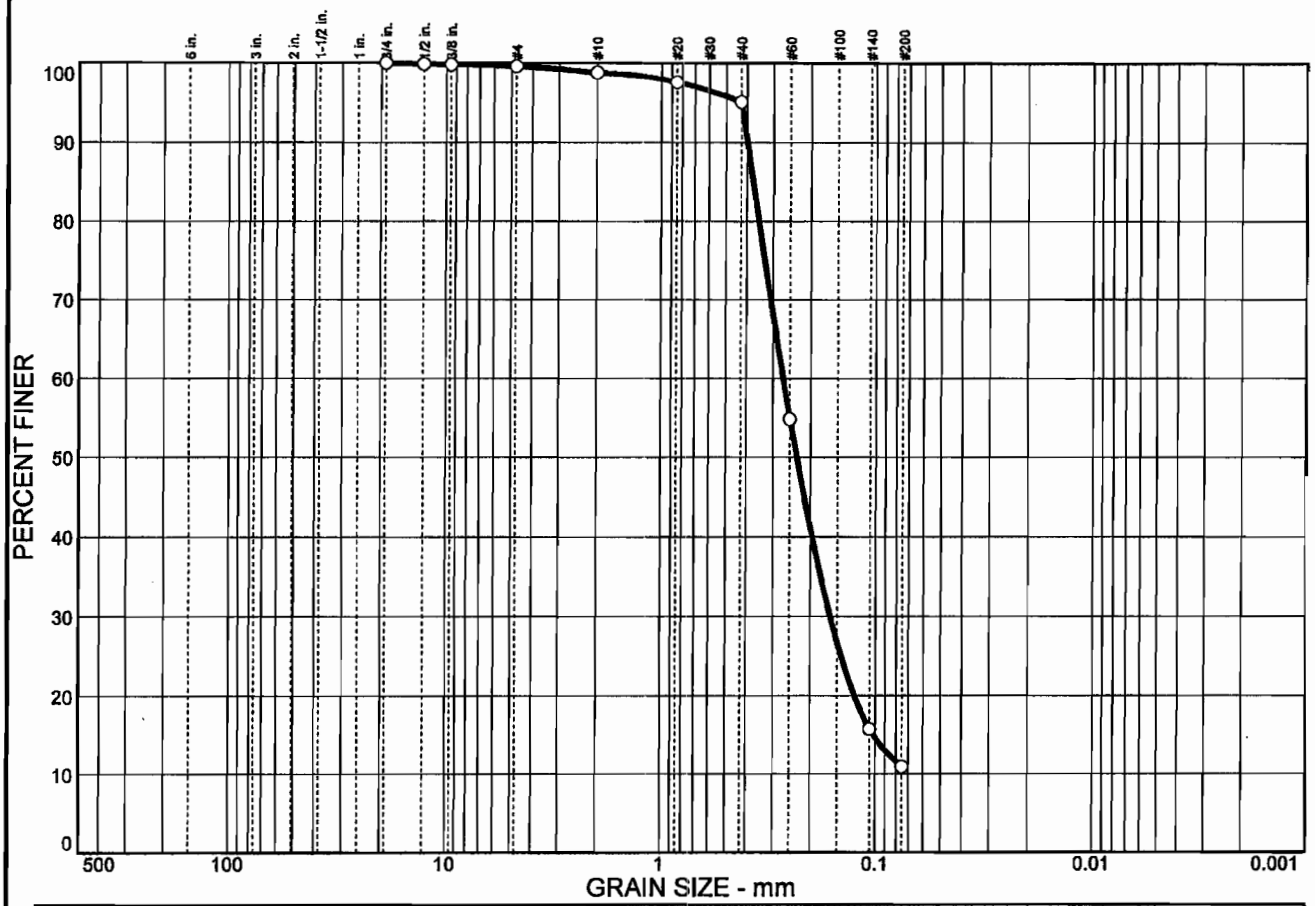
Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	88.7	10.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	99.9		
.375 in.	99.8		
#4	99.6		
#10	98.8		
#20	97.6		
#40	95.1		
#60	54.8		
#140	15.7		
#200	10.9		

* (no specification provided)

Material Description

Brown Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.374 D_{60}= 0.269 D_{50}= 0.233
D_{30}= 0.162 D_{15}= 0.102 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO=

Remarks

Sample No.: 22 **Source of Sample:** D-06-29 **Date:** 12-12-07
Location: **Elev./Depth:** 30-31.5'

H. C. NUTTING COMPANY

Client: US ARMY CORPS OF ENGINEERS
Project: BOLIVAR DAM
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Project No: 92528.031 **Figure** 12470