BORING LOG NO. 09-B102

CLIENT:	USACE Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
BORING LOCATION:	N: 687845.698 E: 3280400.146	SITE:	Atkinson Island PA16 Texas

Approx. Surface Elevation: 8.3 feet

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	RECOVERY, IN	SPT, BLOWS/FT	CALIBRATED HAND PENETROM., TSF	TORVANE, TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	FILL: CLAYEY SAND brown, light brown and gray, very loose to medium dense, fine grain, with shell, medium to high plasticity - with roots and dry 0 to 4 feet		SC														
		1		SS	8	4			11								
		2															
		3		SS	10	16			11					36			
		4															
	▼	5		SS	11	13			17								
		6															
		7		SS	15	9			19					23			
		8															
		9		SS	14	0			35								
		10															
		11		SS	16	14			20		50	17	33	39			
		12															
		13		SS	9	12			21								
		14															
	-7.7 16.0	15		SS	5	9			26								
	FILL: SANDY FAT CLAY dark gray, very soft, with shell, wet, very high plasticity -9.7 18.0	16	CH														
		17		SS	9	0			37		62	19	43	56			
	FILL: SILTY SAND gray, loose to medium dense, fine grain, with clay seams, wet, slight to medium plasticity	18	SM														
		19		SS	2	5			34								
		20															
	-13.7 22.0	21		SS	9	10			22								
	FAT CLAY dark gray, medium stiff, homegeneous, moist, very high plasticity -15.7 24.0	22	CH														
		23		SS	12	7			49								
		24	SC														
		25		SS	7	13			33		70	21	49	44			
		26															

Continued Next Page

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: **Dry augered to 6 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
▽ 5 ft	WS	▼ 5 ft	at 5 min
▼ 5 ft	at 10 min	▼ 5 ft	at 5 min

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DATE DRILLED	Page 1 of 2
3/24/2010	09-B102
PROJECT NUMBER	EXHIBIT A-
92105186-B	

BORING LOG NO. 09-B102

CLIENT:	USACE Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
BORING LOCATION:	N: 687845.698 E: 3280400.146	SITE:	Atkinson Island PA16 Texas

Approx. Surface Elevation: 8.3 feet

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	RECOVERY, IN	SPT, BLOWS/FT	CALIBRATED HAND PENETROM., TSF	TORVANE, TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	CLAYEY SAND dark gray, loose to medium dense, fine grain, with broken shell and clay seams and layers, wet, high plasticity	27		SS	12	6			39		45	15	30	43			
		28															
		29		SS	10	9			24								
		30															
		31		SS	6	5			31								
	-23.7 32.0	32															
	SILTY SAND gray, medium dense, fine grain, with broken shell, wet, none to slight plasticity	33	SM	SS	5	17			18								
		34															
		35		SS	8	27			18					13			
		36															
		37		SS	10	12			19								
		38															
		39		SS	9	13			20								
	-31.7 40.0	40															
	CLAYEY SAND dark gray and light gray, medium dense, fine grain, with finely broken shell, wet, slight to medium plasticity	41	SC	SS	9	12			23								
		42															
		43		SS	11	25			24								
		44															
		45		SS	8	13			27					37			
		46															
		47		SS	11	14			26								
		48															
		49		SS	10	14			26								
	-41.7 50.0	50															
	Boring terminated at 50 feet.																

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: **Dry augered to 6 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
▽ 5 ft	WS	▼ 5 ft	at 5 min
▼ 5 ft	at 10 min	▼ 5 ft	at 5 min

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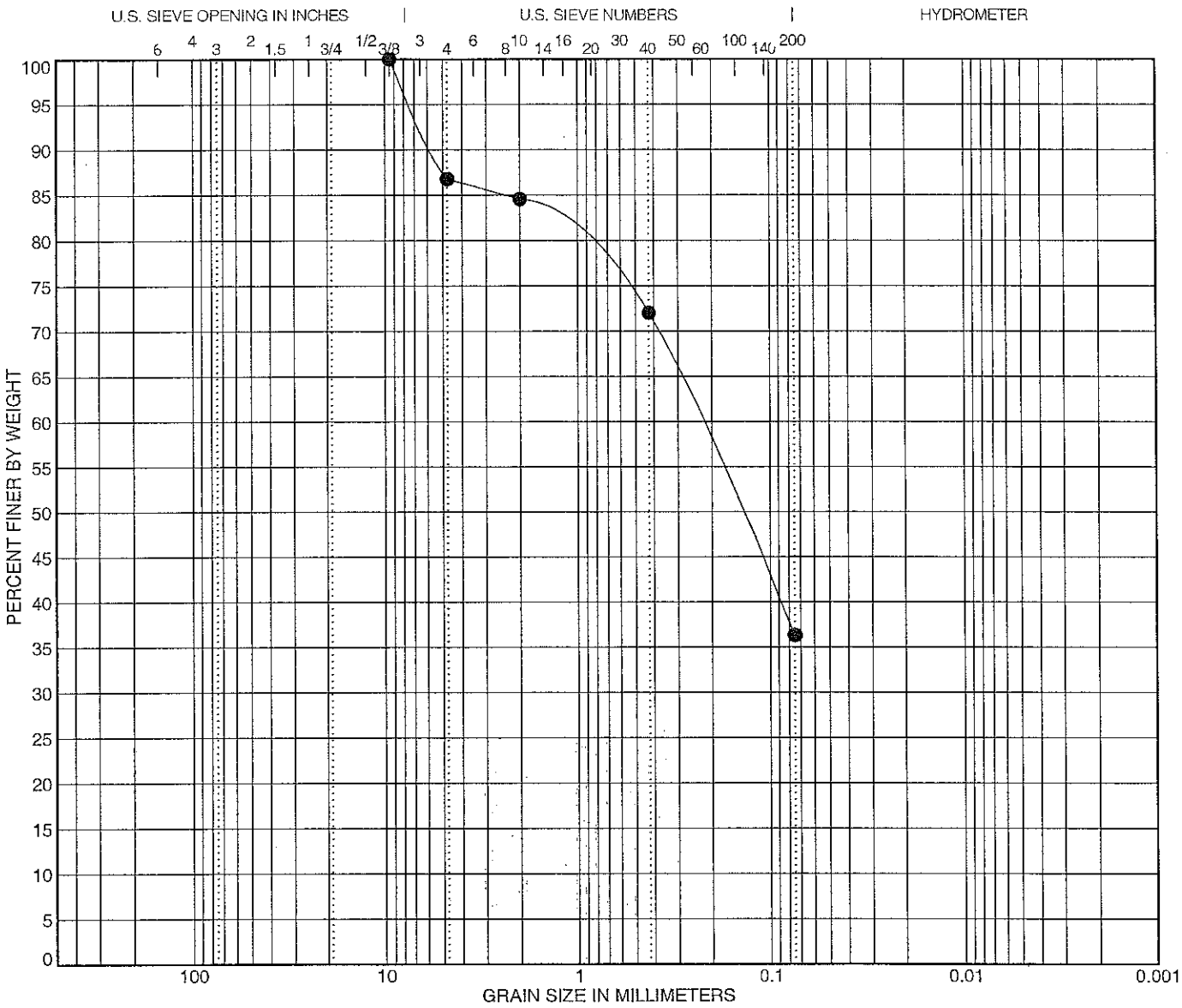
DATE DRILLED	Page 2 of 2
3/24/2010	09-B102
PROJECT NUMBER 92105186-B	EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B102**	**2.5**						

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5	**0.146**			**13.2**	**50.5**	**36.3**	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	**86.8**		**84.5**				**72**					**36.3**

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

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Terracon Consultants, Inc.
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Fax: 713-690-8787

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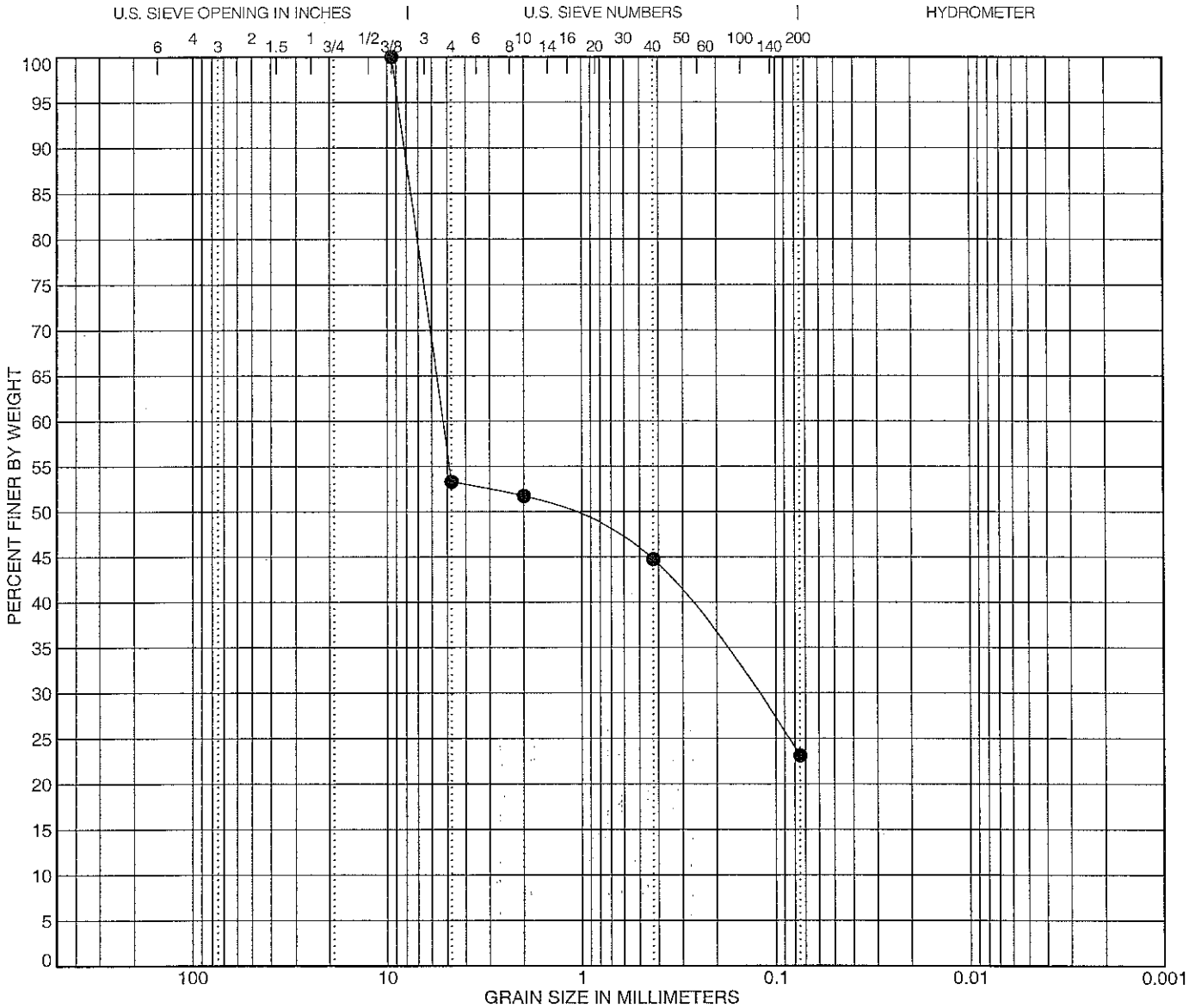

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B102**	**6.5**						

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5	**1.368**	**0.13**		**46.7**	**30.2**	**23.1**	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	**53.3**		**51.7**				**44.7**					**23.1**

GRAIN SIZE DISTRIBUTION

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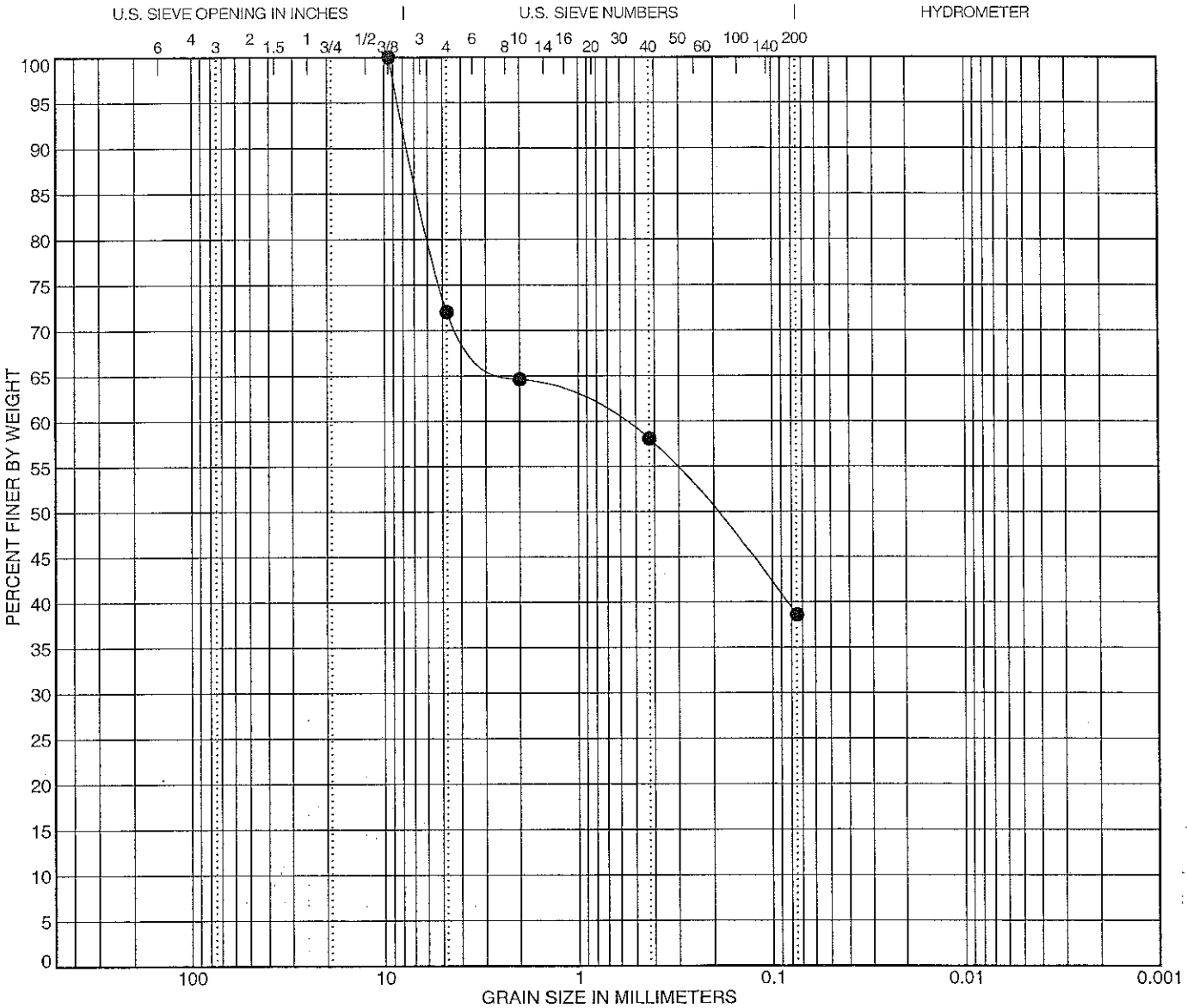

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B102	10.5	**CLAYEY SAND with GRAVEL(SC)**	**50**	**17**	**33**		

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5	**0.207**			**28.0**	**33.4**	**38.6**	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	**72**		**64.6**				**58**					**38.6**

GRAIN SIZE DISTRIBUTION

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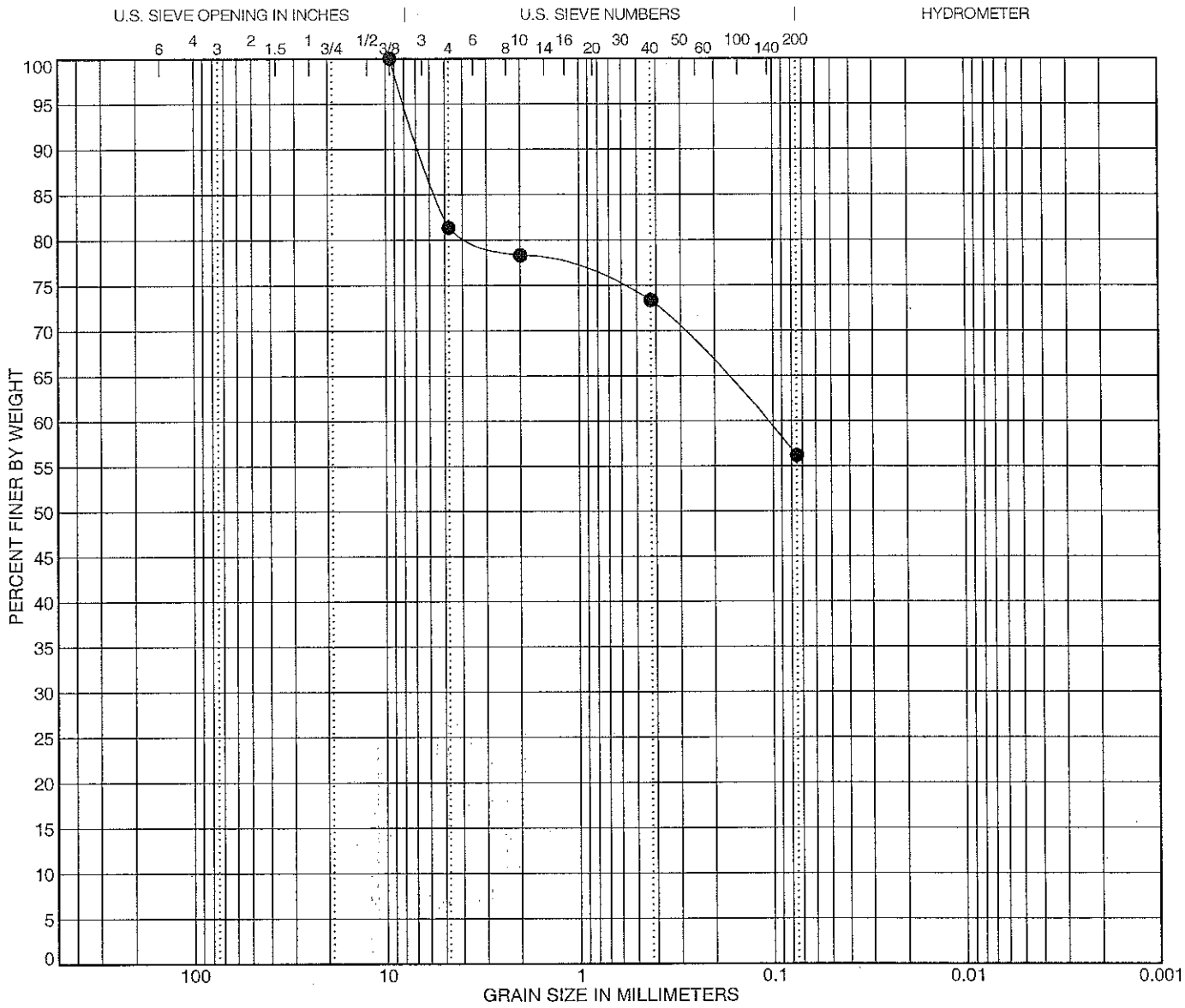

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B102**	**16.5**	**SANDY FAT CLAY with GRAVEL(CH)**	**62**	**19**	**43**		

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5				**18.7**	**25.2**	**56.2**	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	**81.3**		**78.3**				**73.4**					**56.2**

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

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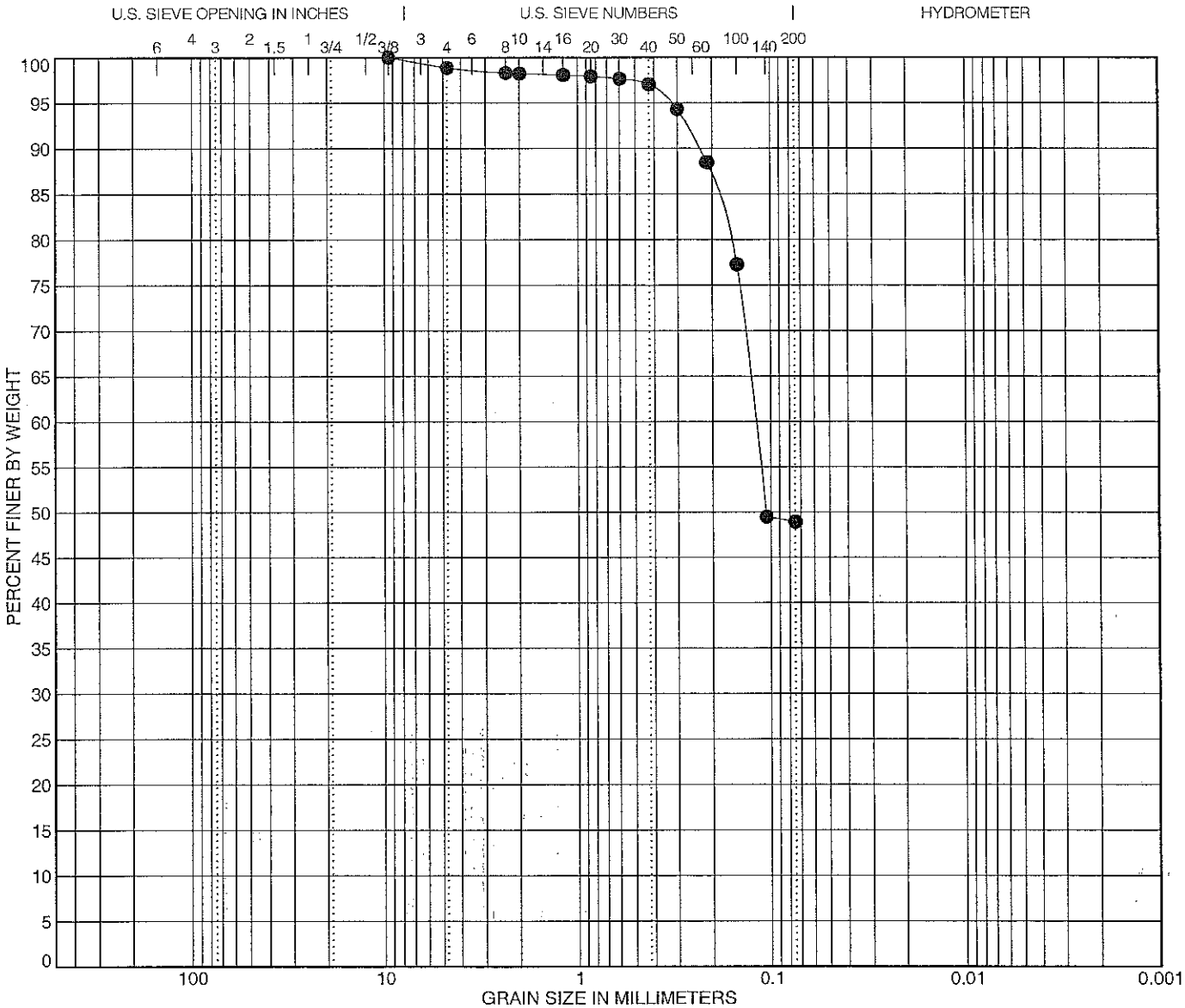

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B102	18.5						

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5	0.107			1.1	49.9	48.9	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	98.9	98.3	98.2	98	97.9	97.6	97	94.3	88.5	77.3	49.5	48.9

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

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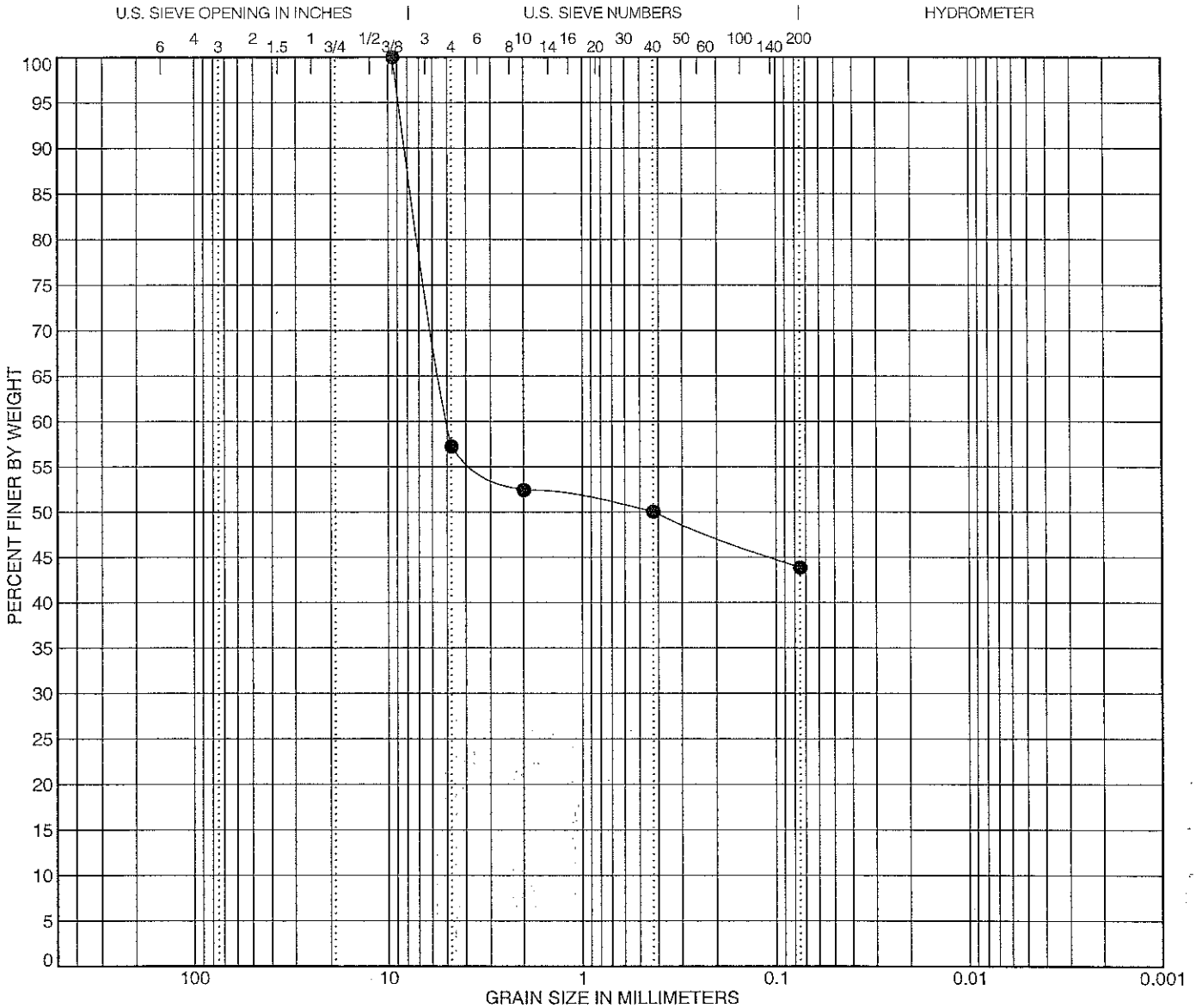

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	09-B102	24.5	**CLAYEY GRAVEL(GC)**	**70**	**21**	**49**		

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
9.5	**0.423**			**42.8**	**13.4**	**43.9**	

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
				100	**57.2**		**52.4**				**50**					**43.9**

GRAIN SIZE DISTRIBUTION

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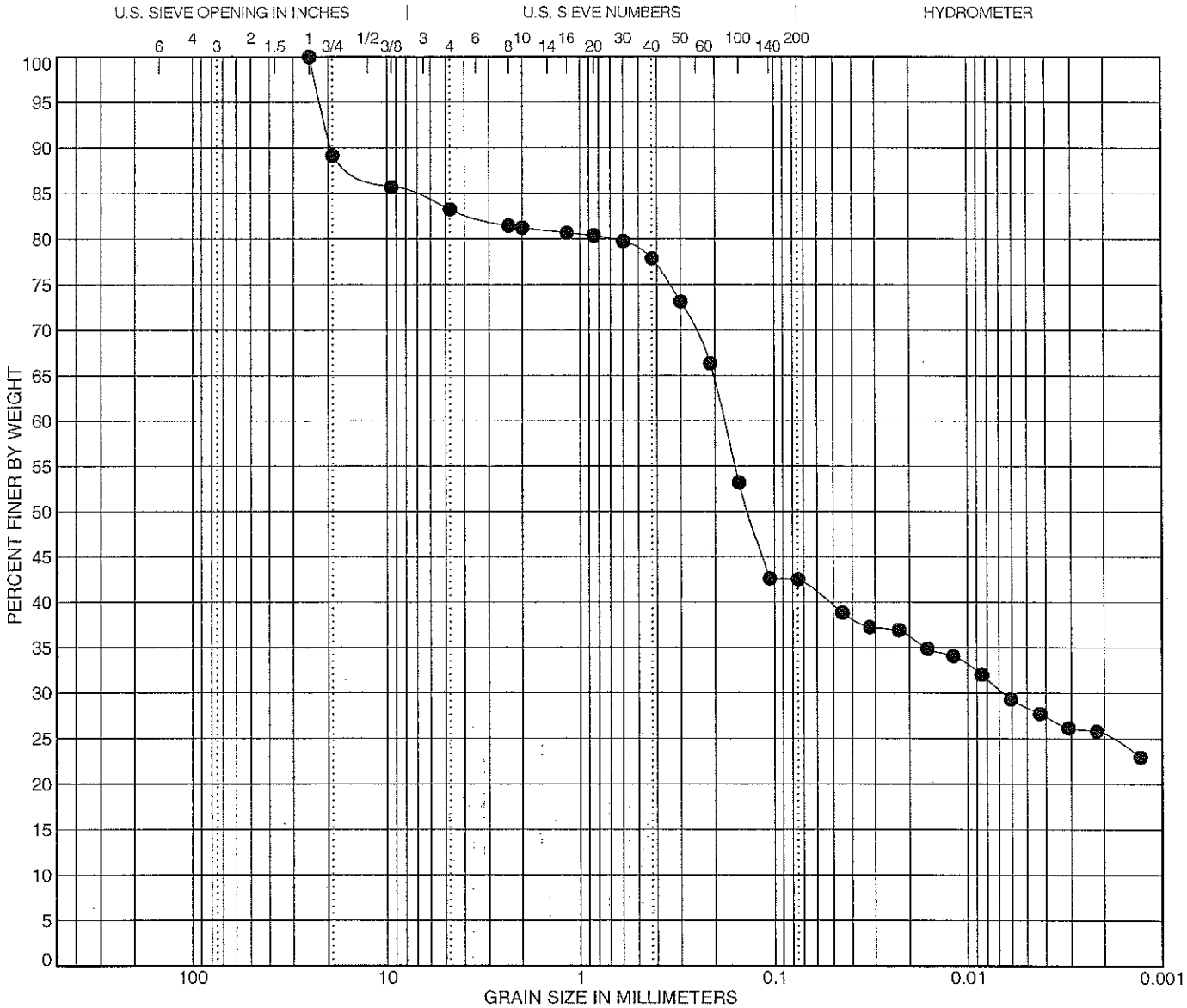

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B102**	**26.5**	**CLAYEY SAND with GRAVEL(SC)**	**45**	**15**	**30**		

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
25	**0.135**	**0.007**		**16.8**	**40.7**	**17.2**	**25.3**

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
		100	**89.1**	**85.7**	**83.2**	**81.4**	**81.2**	**80.7**	**80.4**	**79.7**	**77.8**	**73.1**	**66.3**	**53.2**	**42.6**	**42.5**

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

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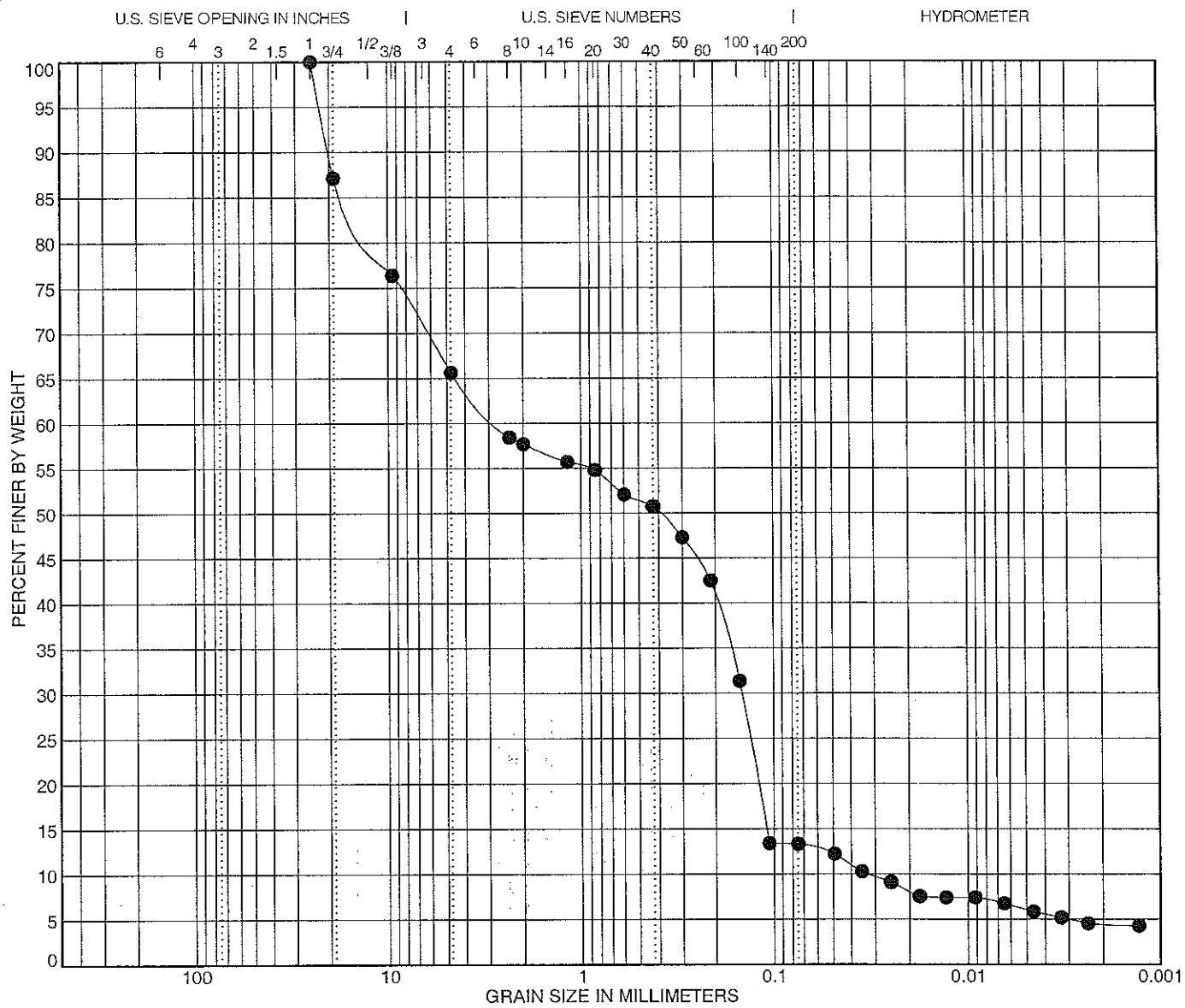

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	09-B102	34.5					0.24	84.48

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
25	0.395	0.146	0.033	34.4	52.3	8.9	4.5

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
		100	87.1	76.4	65.6	58.4	57.7	55.7	54.8	52.1	50.7	47.3	42.5	31.3	13.4	13.3

GRAIN SIZE DISTRIBUTION

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, Texas
Project Number 92105186-B

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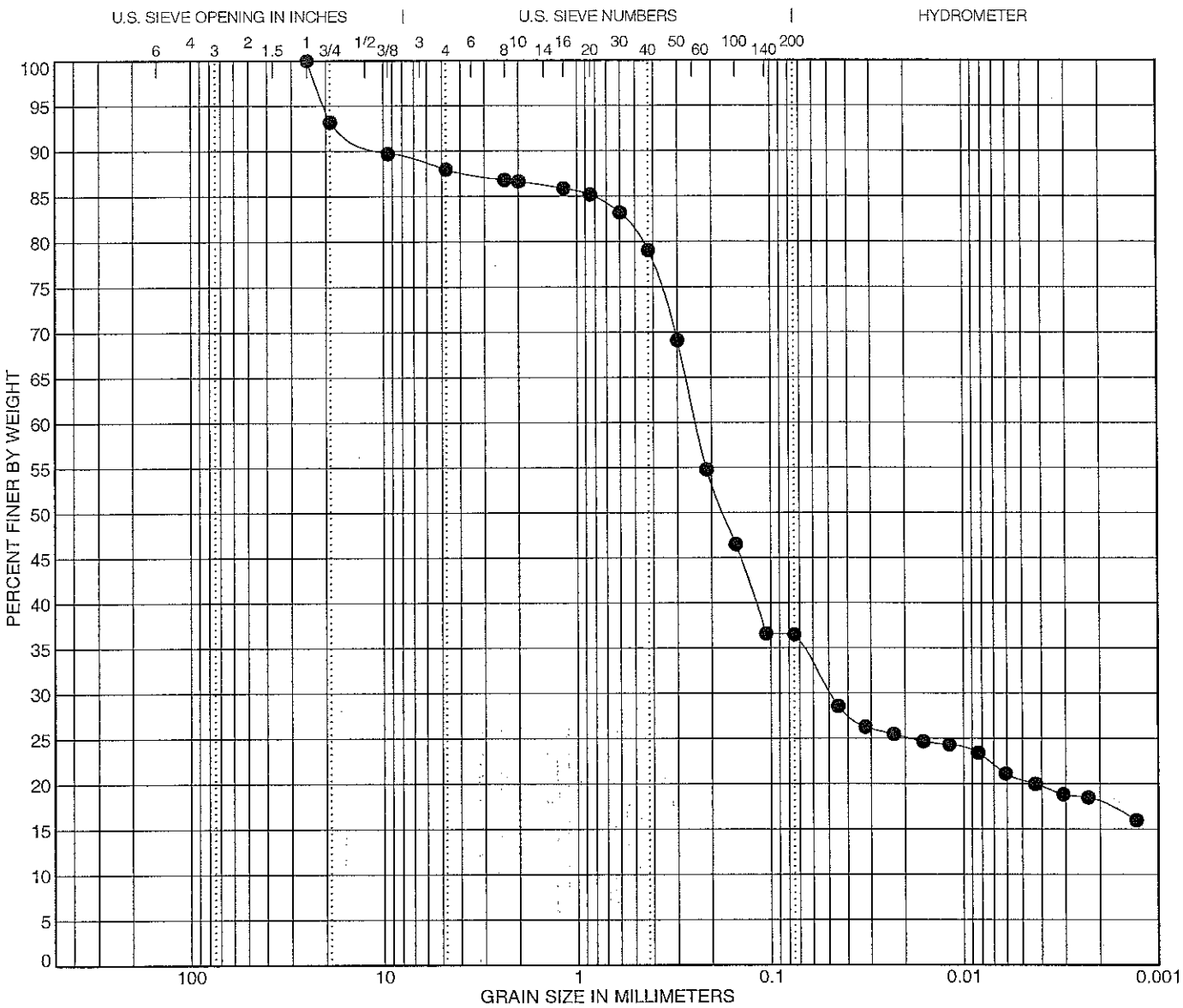

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B102**	**44.5**						

D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
25	**0.174**	**0.049**		**12.0**	**51.5**	**18.6**	**17.9**

Percent Passing the Indicated Sieve

2"	1-1/2"	1"	3/4"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#70	#100	#140	#200
		100	**93.2**	**89.7**	**88**	**86.8**	**86.6**	**85.8**	**85.2**	**83.2**	**79**	**69.1**	**54.8**	**46.5**	**36.6**	**36.5**

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

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Project name: TO-0012 Pipeline Dredging, Volume II, Atkinson Island, PA 16 | Client: USACE, Galveston District | Terracon Project # : 92105186-B

Boring	Depth	Field tests			Atterberg Limits			Grain Size Analysis														USCS Symbol (ASTM 2487)	Wc	γd
		PP	TV	SPTn	LL	PL	PI	Percent Pasing Sieve																
								3/4"	3/8"	4	8	10	16	20	30	40	50	70	100	140	200			
	ft	tsf	tsf	bl/ft	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	pcf
09-B102	0-2			4																		SC**	11	
	2-4			16					100	87		85				72					36	SC*	11	
	4-6			13																		SC**	17	
	6-8			9					100	53		52				45					23	SC*	19	
	8-10			0																		SC**	35	
	10-12			14	50	17	33		100	72		65				58					39	SC	20	
	12-14			12																		SC**	21	
	14-16			9																		SC**	26	
	16-18			0	62	19	43		100	81		78				73					56	CH	37	
	18-20			5																		SM**	34	
	20-22			10																		SM**	22	
	22-24			7																		CH**	49	
	24-26			13	70	21	49		100	57		52				50					44	SC	33	
	26-28			6	45	15	30	89	86	83	81	81	81	80	80	78	73	66	53	43	43	SC	39	
	28-30			9																		SC**	24	
	30-32			5																		SC**	31	
	32-34			17																		SM**	18	
	34-36			27				87	76	66	58	58	56	55	52	51	47	43	31	13	13	SM*	18	
	36-38			12																		SM**	19	
	38-40			13																		SM**	20	
	40-42			12																		SC**	23	
	42-44			25																		SC**	24	
	44-46			13				93	90	88	87	87	86	83	79	69	55	47	37	37		SC*	27	
	46-48			14																		SC**	26	
	48-50			14																		SC**	26	
09-B103	0-2			29																		SM	3	
	2-4			49	24	17	7		100	95		93				88					54	CL-ML	9	
	4-6			50/4																		CL-ML**	10	
	6-8			15																		ML**	21	
	8-10			15					100	99		98				96					86	ML	30	
	10-12			7																		CH**	41	
	12-14			3					100	100		100				99					60	CL*	25	
	14-16			5																		CL**	26	
	16-18			22																		CH**	40	
	18-20			37					100	99	98	98	98	98	98	97	94	89	77	50	49	SC*	24	
	20-22			19																		SC**	28	
	22-24			17																		CL**	38	
	24-26			6	47	18	29			100		100				100					98	CL	41	
	26-28			8																		CL**	39	
	28-30			6																		SC**	21	
	30-32			4																		SC**	19	
	32-34			10	22	14	8			100		81				74					40	SC	20	
	34-36			7																		SC**	21	
	36-38			8																		SC**	22	
	38-40			14	39	13	26			100		100				88					60	CL	32	
	40-42			10																		CL**	22	
	42-44			14																		CL**	24	
	44-46			15																		CL**	43	
	46-48			27	39	13	26		100	87		85				72					41	SC	27	
	48-50			42																		SC**	34	

Boring	Depth	Strength tests: Direct Shear Test					Unconfined Compression				UU Triaxial Test				CU Triaxial Test						
		C	φ	Wc	γd	Symbol	C	Wc	γd	Symbol	C	Wc	γd	Symbol	C	φ	c'	φ'	Wc	γd	Symbol
	ft	ksf	°	%	pcf		ksf	%	pcf		ksf	%	pcf		ksf	°	ksf	°	%	pcf	
09-B102	0-2																				
	2-4																				
	4-6																				
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