MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT: GEOPRO, INC.

TERRACON JOB #: 02096303.0003B
DATE: 3/25/2009

SAMPLE ID: GEOPRO'S THERMAL GROUT SELECT 1.00

DESCR.: BENTONITE ("THERMAL GROUT SELECT"): 11.11%
SAND (SHORT MOUNTAIN GLASS): 55.56% DEIONIZED WATER: 33.32%

Durham Perm Cell
BURETTE Area 0.317 cm^2

INITIAL

MOISTURE%	DENSITY			
W & T, g	WET WT, g	124.5		
D & T, g	DIA, in	2.415	6.13	cm
T, g	HT, in	1.002	2.54	cm
	AREA		29.55	cm^2
MOIST-	DENSITY:	103.4	PCF WET	
URE, %	DENSITY:		PCF DRY	

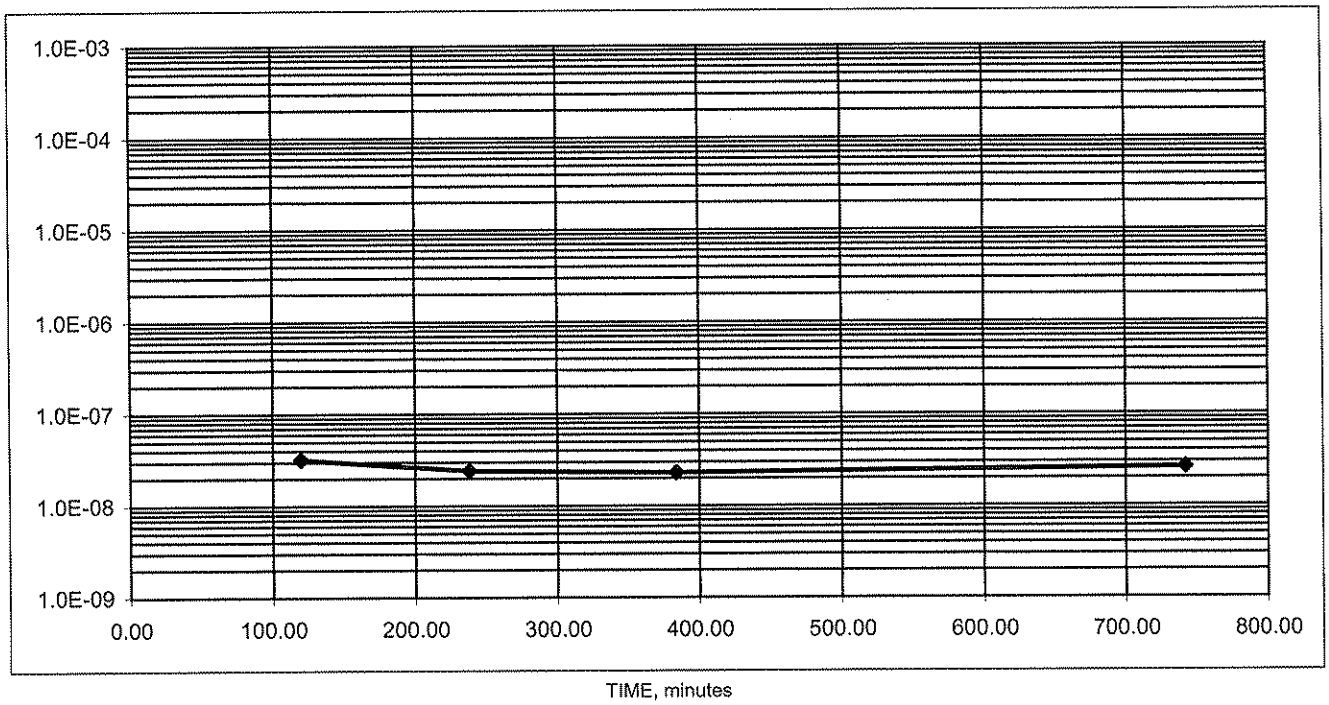
SPECIFIC GRAVITY:	2.70	REMOLDED?:	YES
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	NA	OPTIMUM, %:	NA
SATURATION, %:	NA	COMPACTION, %:	NA
VOID RATIO:	NA	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.:	105.0	psi	BACK PRESSURE (=UPPER=LOWER):	100.0	psi	
TEST:	LATERAL PRESS.:	105.0	psi	UPPER: 100.0 psi	LOWER:	100.0	psi
				BIAS PRESSURE (=LOWER-UPPER)		0.0	psi

Upper cm^3	Lower cm^3	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
8.6	65.6	0.00	57.0									
9.2	65.1	120.00	55.9	0.019487	3.21E-08	0.6	0.5	1.20	22.0	22	25.5	0.870
9.6	64.7	238.00	55.1	0.014415	2.42E-08	0.4	0.4	1.00	21.7	8	25.5	0.870
10.0	64.2	384.00	54.2	0.016469	2.29E-08	0.4	0.5	0.80	21.3	13	24.5	0.894
11.2	63.0	742.00	51.8	0.045291	2.60E-08	1.2	1.2	1.00	20.4	1	24.1	0.904

HYDRAULIC CONDUCTIVITY (k) = **AVERAGE 2.6E-08 cm/sec**

MAXIMUM	1.0E-03 TO	1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO	1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO	1.0E-06	10	<1.25	HYD	OR
	1.0E-06 TO	1.0E-07	20		GRAD	% < 50 AT
	less than	1.0E-07	30		ALLOWED	< 1.0E-8



Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT: GEOPRO, INC.

TERRACON JOB #: 02096303.0004
DATE: 2/16/2009

SAMPLE ID: GEOPRO'S THERMAL GROUT SELECT 1.20

DESCR.: BENTONITE ("THERMAL GROUT SELECT"): 7.94%
SAND (SHORT MOUNTAIN GLASS): 63.5% DEIONIZED WATER: 28.56%

Durham Perm Cell
BURETTE Area 0.317 cm^2

INITIAL

MOISTURE%	DENSITY			
W & T, g	WET WT, g	136.7		
D & T, g	DIA, in	2.426	6.16	cm
T, g	HT, in	1.003	2.55	cm
	AREA		29.81	cm^2
MOIST-	DENSITY:	112.4	PCF WET	
URE, %	DENSITY:		PCF DRY	

SPECIFIC GRAVITY:	2.70	REMOLDED?:	YES
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	NA	OPTIMUM, %:	NA
SATURATION, %:	NA	COMPACTION, %:	NA
VOID RATIO:	NA	OVER OPTIMUM, %:	NA

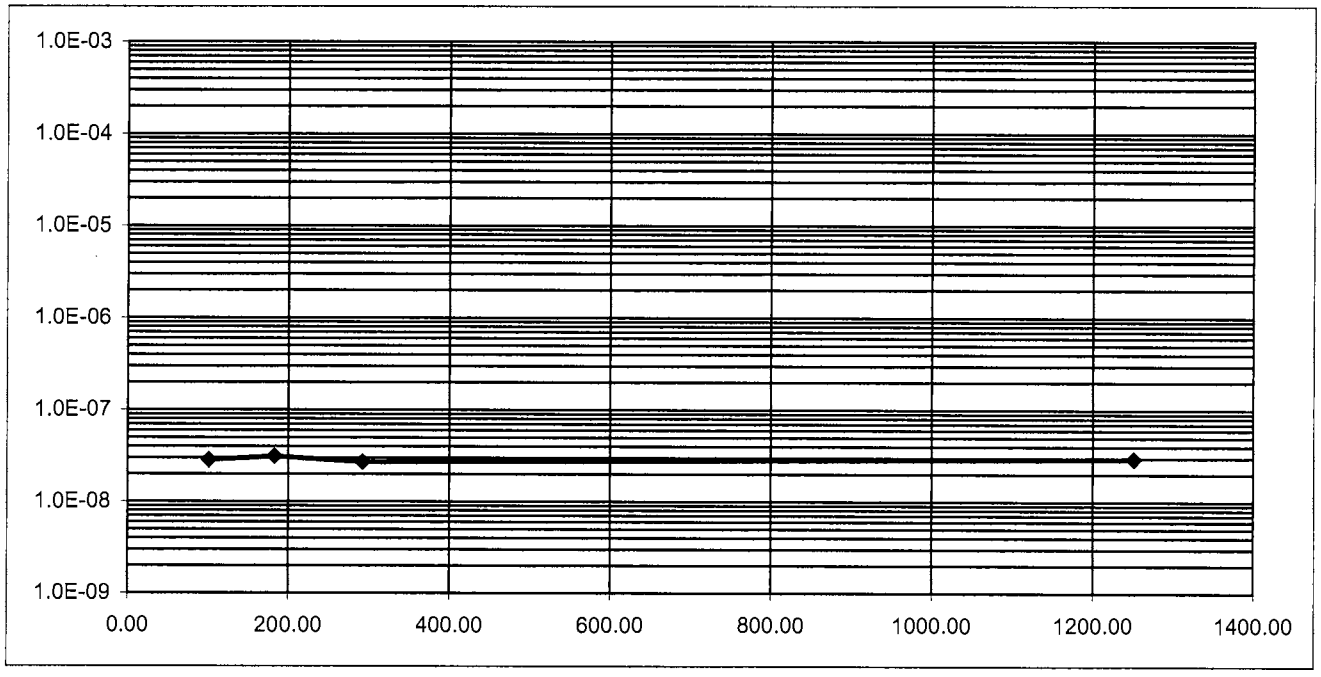
SATURATION:	LATERAL PRESS.:	105.0	psi	BACK PRESSURE (=UPPER=LOWER):	100.0	psi	
TEST:	LATERAL PRESS.:	105.0	psi	UPPER: 100.0 psi	LOWER:	100.0	psi
				BIAS PRESSURE (=LOWER-UPPER)		0.0	psi

Upper cm^3	Lower cm^3	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
9.4	65.0	0.00	55.6									
9.8	64.6	101.00	54.8	0.014493	2.86E-08	0.4	0.4	1.00	21.5	2	25.0	0.882
10.1	64.2	183.00	54.1	0.012856	3.12E-08	0.3	0.4	0.75	21.2	7	25.0	0.882
10.5	63.8	292.00	53.3	0.014898	2.71E-08	0.4	0.4	1.00	20.9	7	25.1	0.880
14.1	60.6	1251.00	46.5	0.136484	2.94E-08	3.6	3.2	1.13	18.3	1	23.6	0.916

HYDRAULIC CONDUCTIVITY (k) = AVERAGE 2.9E-08 cm/sec

MAXIMUM	1.0E-03 TO	1.0E-04	2	0.75<	30
HYDRAULIC	1.0E-04 TO	1.0E-05	5	RATIO	MAX
GRADIENT	1.0E-05 TO	1.0E-06	10	<1.25	HYD
	1.0E-06 TO	1.0E-07	20		GRAD
	less than	1.0E-07	30		ALLOWED

% < 25 AT > 1.0E-8 OR % < 50 AT < 1.0E-8



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