BAE 590-601:DRAINMOD
SPRING 2011

HW# 6A

AUGER HOLE METHOD OF MEASURING LATERAL HYDRAULIC CONDUCTIVITY

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Abstract. *Completed field worksheets and computations of lateral hydraulic conductivity in m/day using field data gathered and Auger Hole method are attached.*

FARM: OLF

HOLE: No. 1

DIGGING DATE: 2/17/2008

TEST DATE 2/17/2008

W.T. (1) = 44.7 cm | D (3) = 12 cm

Depth (2) = 93.0 cm | T = °C

PROFILE OBSERVATIONS

DEPTH (cm)

0-15 cm Loam

15-40 Silty Clay Loam

40-71 Clay Loam

71-89 Silt Loam

89-148+ Loamy Sand

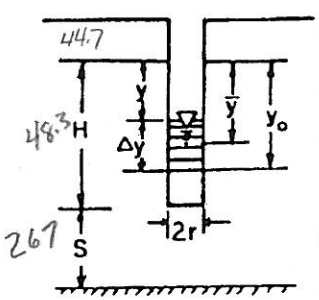
HOLE DEPTH: cm

IMPERMEABLE LAYER: 360 cm

PERFORMED BY: Phillips, Smith

TIME (SEC)	WATER LEVEL (cm)	REMARKS
0	87.5 (4)	
5	87.3	
15	87.1	
30	86.6	
45	86.2	
60	85.8	
75	85.4	
90	85.0	
120	84.1	
150	83.4	
180	82.7	
210	82.0	
240	81.3	
270	80.7	
300	80.1	Use $\Delta Y = 7.4$

PERFORMED BY:



D = diameter = 2 r

W.T.: water table

T = temperature

CALCULATIONS

CALCULATION	LIMITS	O.K.
$H = (2) - (1)$ $= 93 - 44.7$ cm $= 48.3$ cm	$H \geq 40$ cm $H \leq 200$ cm	OK
$Y_o = (4) - (1)$ $= 87.5 - 44.7$ $= 42.8$ cm ⊛ Y_o is OK ⊛	$Y_o \geq 0.2\,H$ $Y_o \geq 20$ cm $Y_o \leq 0.8\,H$	OK OK OK
$\Delta Y_{max} = \frac{Y_o}{4} = \frac{42.8}{4}$ $\Delta Y_{max} = 10.7$ use 7.4	$\Delta Y_{max} \leq \frac{1}{4} Y_o$ Last Reading $\leq (4) - \Delta Y_{max}$ =	OK
$\bar{Y} = Y_o - \frac{\Delta Y}{2}$ $= 42.8 - \frac{7.4}{2} = 39.1$ cm	$S > H/2$ ⊗ or $S = 0$ ⊘	
$X = \frac{D}{D_o} = \frac{(3)}{10\text{ cm}} = \frac{12}{10}$ 1.2	$6\text{ cm} \leq D \leq 14$ cm	OK
$H' = \frac{H}{X} = \frac{48.3}{1.2} = 40.3$	$\bar{Y}' = \frac{\bar{Y}}{X} = \frac{39.1}{1.2} = 32.6$	
C ($H' = 40.3$, $\bar{Y}' = 32.6$ S = 267) = 20		
$K = C \frac{\Delta Y}{\Delta T} = 20 \frac{7.4}{300} =$	0.49 m/day	

FARM: OLF

HOLE: No. 2

DIGGING DATE: 2/17/08

TEST DATE 2/17/08

W.T. (1) = 41.5 cm

D (3) = 12 cm

Depth (2) = 82 cm

T = °C

PROFILE OBSERVATIONS

DEPTH (cm)

0-15 cm Loam

15-40 Clay Loam

40-53 Sandy Clay Loam

53-84 Clay Loam

84-133 Loamy Sand

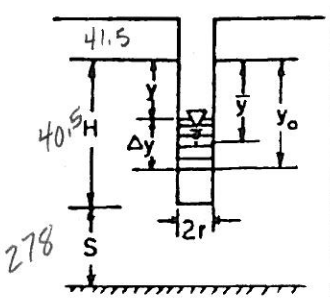
133+ Sandy Loam

TIME (SEC)	WATER LEVEL (cm)	REMARKS
0	73.0 (4)	600 sec 67.1 cm
5	72.9	660 sec 66.5 cm
10	72.9	720 sec 66.1 cm
15	72.8	
30	72.7	
45	72.5	
60	72.4	
90	72	
120	71.8	
150	71.3	
180	71.1	
240	71.0	
300	70.8	
360	69.4	
420	68.9	
480	68.3	
540	67.7	

PERFORMED BY:

CALCULATIONS

CALCULATION	LIMITS	O.K.
$H = (2) - (1)$ $= 82 - 41.5$ cm $= 40.5$ cm	$H \geq 40$ cm $H \leq 200$ cm	OK
$Y_o = (4) - (1)$ $= 73 - 41.5$ $= 31.5$ cm	$Y_o \geq 0.2\ H$ $Y_o \geq 20$ cm $Y_o \leq 0.8\ H$	OK OK OK
$\Delta Y_{max} = \frac{Y_o}{4} = \frac{31.5}{4}$ $\Delta Y = 7.9$ cm Use 6.9	$\Delta Y_{max} \leq \frac{1}{4}\ Y_o$ Last Reading $\leq (4) - \Delta Y_{max}$ =	OK
$\bar{Y} = Y_o - \frac{\Delta Y}{2}$ $= 31.5 - \frac{6.9}{2} = 28.1$ cm	$S > H/2$ ⊗ or $S = 0$ ○	
$X = \frac{D}{D_o} = \frac{(3)}{10\ cm} = \frac{12}{10} = 1.2$	$6\ cm \leq D \leq 14$ cm	OK
$H' = \frac{H}{X} = \frac{40.5}{1.2} = 33.8$	$\bar{Y}' = \frac{\bar{Y}}{X} = \frac{28.1}{1.2} = 23.4$	
C (H' = 33.8, $\bar{Y}'$ = 5.8, S = 278) = 2.8		
$K = C\ \frac{\Delta Y}{\Delta T} = 28\ \frac{6.9}{720} =$	0.27 m/day	



D = diameter = 2 r

W.T.: water table

T = temperature

HOLE DEPTH: cm

IMPERMEABLE LAYER: 360 cm

PERFORMED BY: Phillips, Smith

FARM: Dredge Pit - Corps Engineers

HOLE: No. 3

DIGGING DATE: 12/20/06

TEST DATE 12/20/06

W.T. (1) = 39.7 cm | D (3) = 11.4 cm

Depth (2) = 155.5 cm | T = °C

PROFILE OBSERVATIONS

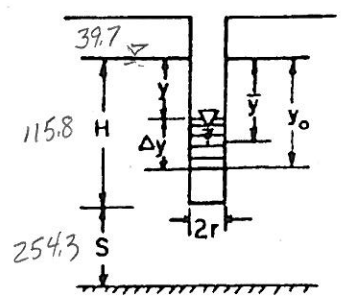
DEPTH (cm)

0 - 161+ cm Silt Loam

Dredge Material

TIME (SEC)	WATER LEVEL (cm)	REMARKS
0	110.9 (4)	
30	110.1	
60	109.6	
120	109.1	
300	108.2	
1500	105.7	

PERFORMED BY:



D = diameter = 2 r

W.T.: water table

T = temperature

HOLE DEPTH: cm

IMPERMEABLE LAYER: 360+ cm

PERFORMED BY: Phillips, Huntley

CALCULATIONS

CALCULATION	LIMITS	O.K.
$H = (2) - (1)$ $= 155.5 - 39.7$ cm 115.8 cm	$H \geq 40$ cm $H \leq 200$ cm	OK
$Y_o = (4) - (1)$ $= 110.9 - 39.7$ $= 71.2$ cm	$Y_o \geq 0.2\ H$ $Y_o \geq 20$ cm $Y_o \leq 0.8\ H$	OK OK OK
$\Delta Y_{max} = \frac{Y_o}{4} = \frac{71.2}{4}$ $= 17.8$ cm $\Delta Y = 5.2$ cm	$\Delta Y_{max} \leq \frac{1}{4}\ Y_o$ Last Reading $\leq (4) - \Delta Y_{max}$ =	OK
$\bar{Y} = Y_o - \frac{\Delta Y}{2}$ $= 71.2 - \frac{5.2}{2} = 68.6$ cm	$S > H/2$ ⊗ or $S = 0$ ○	
$X = \frac{D}{D_o} = \frac{(3)}{10\ cm} = \frac{11.4}{10} = 1.14$	$6\ cm \leq D \leq 14$ cm	OK
$H' = \frac{H}{X} = \frac{115.8}{1.14} = 101.6$	$\bar{Y}' = \frac{\bar{Y}}{X} = \frac{68.6}{1.14} = 60.2$	
C (H' = 101.6, $\bar{Y}'$ = 60.2, S = 204) = 6.0		
$K = C\ \frac{\Delta Y}{\Delta T} = 6.0\ \frac{5.2}{1500} = 0.02$ m/day		

FARM: Hell Swamp - Arapahoe
HOLE: No. 4
DIGGING DATE: 9/23/2007

TEST DATE 9/23/2007

W.T. (1) = 43.6 cm | D (3) = 12 cm
Depth (2) = 95.8 cm | T = °C

PROFILE OBSERVATIONS

DEPTH (cm)

0 - 30 Fine Sandy Loam

30 - 110 Fine Sandy Loam

110 + Loamy Sand

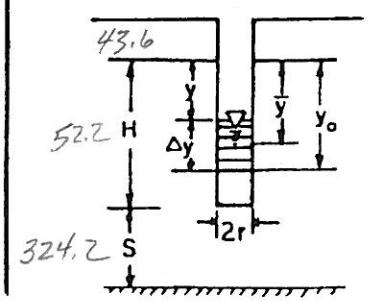
TIME (SEC)	WATER LEVEL (cm)	REMARKS
0	80.2 (4)	
5	79.3	
10	78.4	
15	77.4	
20	76.5	
25	75.5	
30	74.6	
35	73.7	
40	72.8	
45	71.9	ΔY = 8.3cm

PERFORMED BY:

HOLE DEPTH: cm

IMPERMEABLE LAYER: 420 cm

PERFORMED BY: Phillips, Smith



D = diameter = 2 r
W.T.: water table
T = temperature

CALCULATIONS

CALCULATION	LIMITS	O.K.
H = (2) - (1) = 95.8 - 43.6 cm = 52.2 cm	H ≥ 40 cm H ≤ 200 cm	OK
Y_o = (4) - (1) = 80.2 - 43.6 = 36.6 cm	$Y_o \geq 0.2$ H $Y_o \geq 20$ cm $Y_o \leq 0.8$ H	OK OK OK
$\Delta Y_{max} = \frac{Y_o}{4} = \frac{36.6}{4}$ = 9.15 cm ΔY = USE 8.3 cm	$\Delta Y_{max} \leq \frac{1}{4} Y_o$ Last Reading ≤ (4) - ΔY_{max} =	OK
$\bar{Y} = Y_o - \frac{\Delta Y}{2}$ = 36.6 - 4.2 = 32.4 cm	S > H/2 ⊗ or S = 0 ○	
$X = \frac{D}{D_o} = \frac{(3)}{10 \text{ cm}} = \frac{12}{10}$ = 1.2	6 cm ≤ D ≤ 14 cm	OK
$H' = \frac{H}{X} = \frac{52.2}{1.2}$ = 43.5	$\bar{Y}' = \frac{\bar{Y}}{X} = \frac{32.4}{1.2}$ = 27	
C (H' = 43.5, $\bar{Y}'$ = 27, S = 324) = 21		
$K = C \frac{\Delta Y}{\Delta T} = 21 \frac{8.3}{45} = 3.9$ m/day		

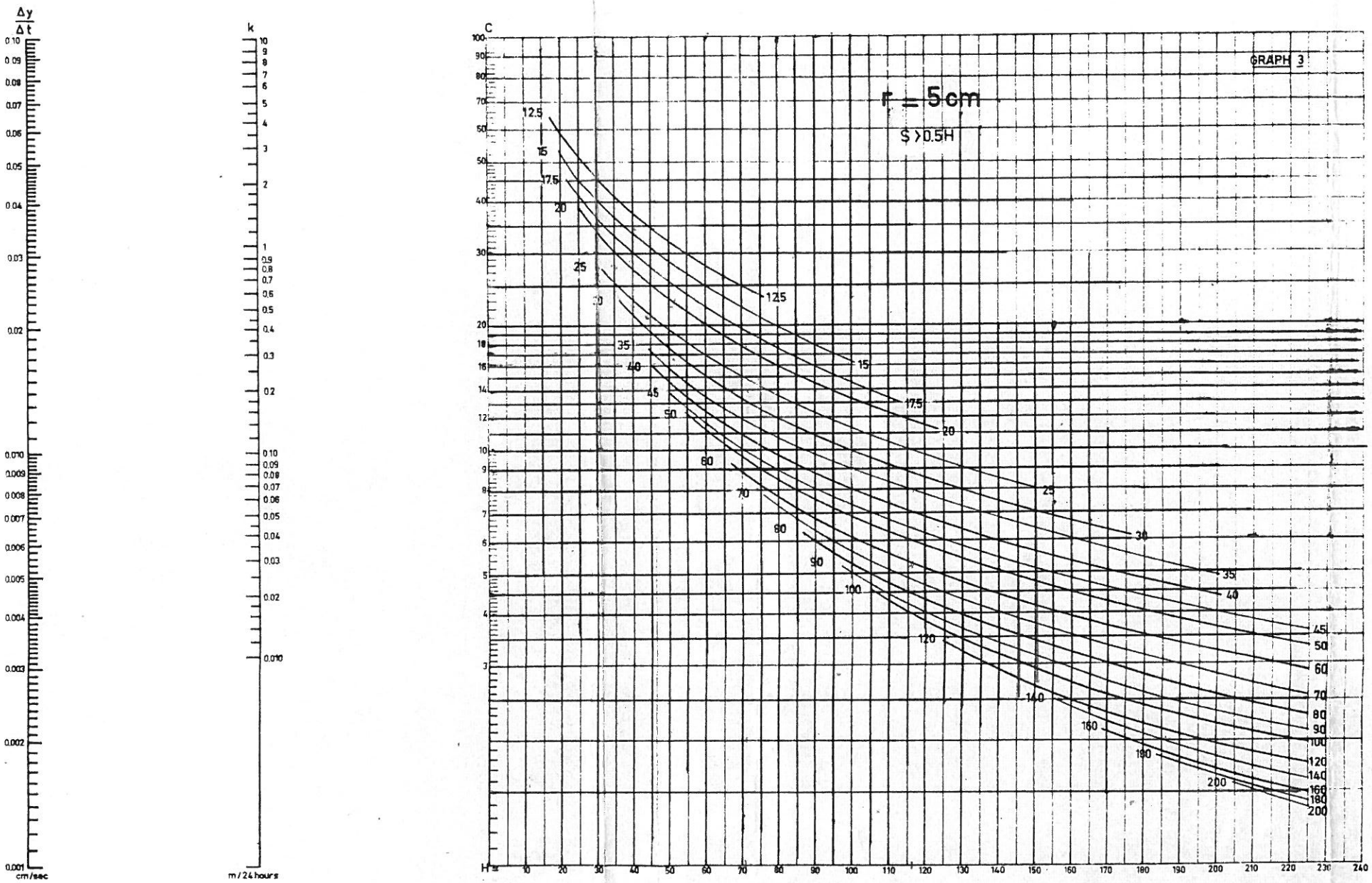
INTERNATIONAL INSTITUTE FOR LAND RECLAMATION AND IMPROVEMENT

BULLETIN 1

THE AUGER HOLE METHOD

A FIELD MEASUREMENT OF THE HYDRAULIC CONDUCTIVITY OF SOIL BELOW THE WATERTABLE

WAGENINGEN / THE NETHERLANDS / 1970



Bulletin No 1 THE AUGER HOLE METHOD;
International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, 1958.