APPENDIX E. NOTATION

$1/K$ double layer thickness in Gouy-Chapman theory

α Bjerrum et al. (1972) parameter (see Eq. 5-19), *or* dimensionless parameter used in Cooper et al. (1967) method (see Eq. 6-3), *or* level of significance (Section 7.3), *or* $P_e / 2$ (Section 7.4)

β Bjerrum et al. (1972) parameter (see Eq. 5-20) *or* dimensionless time parameter used in Cooper et al. (1967) method (see Eq. 6-2)

ε_0 permittivity of vacuum

ϕ' effective friction angle

γ unit weight of soil

γ_d dry unit weight of soil

γ_m moist unit weight of soil

γ_w unit weight of water

φ_{fc} permittivity of filter cakes in cutoff wall

φ_{sb} permittivity of soil-bentonite in cutoff wall

μ average of negative logarithm of k values

ν ionic valence *or* Poisson's ratio

ν' Poisson's ratio of soil skeleton

σ standard deviation of negative logarithm of k values

σ_c' circumferential effective stress

σ_h' horizontal effective stress

σ_{h0}' initial horizontal effective stress (e.g., prior to piezometer installation)

σ_r' radial effective stress

σ_v' vertical effective stress

σ_{v0}' initial vertical effective stress

API   American Petroleum Institute

A   material parameter equal to the negative slope of a log k vs. log p plot, *or* inside area of cell in breakthrough experiment (Section 7.2), *or* total area under pdf (Section 7.4)

A_s	cross-sectional area of soil specimen
a	cross-sectional area of burette in falling head tests
a_i	incremental area under pdf
B	cutoff wall width *or* material parameter equal to $k_0 \, p_0 \, A \, / \, [\gamma_w \, (1 - A)]$
B_k	piezocone parameter from Manassero (1994)
CCL	Compacted Clay Liner
COV	Coefficient Of Variation
cpf	cumulative probability function
C	dimensionless contaminant concentration, c/c_0
C_B	NaCl concentration in bottom reservoir in breakthrough experiment
C_{NaCl}	NaCl concentration
$C_{0,NaCl}$	initial NaCl concentration
C_T	NaCl concentration in top reservoir in breakthrough experiment
$C_{T,initial}$	initial NaCl concentration in top reservoir
c	contaminant concentration
c_0	constant contaminant concentration inside cutoff wall
c_h	coefficient of consolidation in horizontal direction
D	diameter of well or piezometer filter element, *or* Kolmogorov-Smirnov test statistic, *or* dielectric constant
D_1	difference between volumes of water added to/removed from each side of cutoff wall during measurement of background flow rates
D_2	difference between volumes of water added to/removed from each side of cutoff wall during measurement of flow rate through wall
D_α	critical value of test statistic, D
D^*	effective diffusion coefficient in soil
d_1	difference between background flow rates on each side of cutoff wall
d_2	difference between flow rates necessary to maintain water levels on each side of cutoff wall with a hydraulic gradient across the wall
E	evaporation rate in height of water per time
E'	Young's modulus of soil skeleton
e	electronic charge

F	shape factor for single-well test
F_{2D}	two-dimensional single-well shape factor from SEEP2D
f_s	sleeve friction from piezocone
G	shear modulus of soil
G_s	specific gravity of solids
H	applied head, above equilibrium head, in constant head single-well test
H_0	head at time zero, above equilibrium head, in variable head single-well test
H_c	upgradient height of water above CCL
H_t	head at time t, above equilibrium head, in variable head single-well test
h_e	excess head
h_{fc}	filter cake formation head
$h_{l,t}$	head loss across soil specimen at time t
h	height of top reservoir in breakthrough experiment
h_w	distance variable defined in Figure 2-1
Δh	head drop (across cutoff wall, between piezometer and trench wall, etc.)
I_r	rigidity index
i	hydraulic gradient
i_g	gross hydraulic gradient across API test specimen
J	flux through cutoff wall in mass per area per time
J_{D*}	flux through cutoff wall due to diffusion only
$J_{steady\ state}$	steady state flux through cutoff wall
j	flux in mass per time
K_0	at-rest earth pressure coefficient
K_h	horizontal earth pressure coefficient
KR	ratio of CCL k to soil-bentonite k
k	hydraulic conductivity or Boltzmann constant
k_0	a reference hydraulic conductivity
k_{ave}	average hydraulic conductivity
k_{CCL}	CCL hydraulic conductivity
k_{eq}	equivalent hydraulic conductivity of cutoff wall

k_{fc}	filter cake hydraulic conductivity
$k_{formation}$	formation soil hydraulic conductivity
k_g	gross hydraulic conductivity of API test specimen
k_h	hydraulic conductivity in horizontal direction
k_{sb}	soil-bentonite hydraulic conductivity
k_v	hydraulic conductivity in vertical direction
LCS	Light Castle Sand
L	length of well or piezometer filter element *or* length of specimen in breakthrough experiment
L_{fc}	filter cake thickness
L_s	length of soil specimen
L_w	length of cutoff wall
$\Delta L_{w,i}$	incremental length of cutoff wall
m_v	coefficient of volume compressibility
N	number of samples or values in a summation
n	soil porosity
n_d	number of head drops in a flow net
n_f	number of flow channels in a flow net
n_{fc}	filter cake porosity
n_s	slurry porosity
n_0	reference ion concentration
OCR	overconsolidation ratio
PFW	Price's Fork Water
pdf	probability density function
P_e	Peclet number $= v_s B / D^*$
p	effective major principal stress
p_0	a reference effective major principal stress
p_{air}	air pressure applied in API tests
p_b	effective major principal stress at bottom of API specimen
p_g	gross effective major principal stress corresponding to k_g
p_t	effective major principal stress at top of API specimen

Q_x	volume of water added to/removed from x, where x is defined in text
q	effective surcharge pressure
q_t	tip resistance from piezocone
q_x	volumetric flow rate at/through x, where x is defined in text
q_{2D}	two-dimensional flow rate, i.e., volumetric flow rate per incremental length
R	retardation factor
RR	recompression ratio
R_e	equivalent radius in single-well tests
r	radius of piezocone
r_c	radius of well or piezometer standpipe
r_w	radius of well or piezometer filter element
SBTF	Subsurface Barrier Test Facility
S	shape factor for cutoff wall for given water levels on each side of wall
S_u	undrained shear strength
s	shape factor for incremental length of cutoff wall
T	dimensionless time, $t\,D^* / (R\,B^2)$, or temperature
$T_{0.95}$	dimensionless time to reach 95% of steady state flux through cutoff wall
T^*	time factor in Houlsby and Teh (1988) piezocone model
t	time variable
Δt	time interval between two times, t_1 and t_2
t_{50}	time for 50% of excess pore pressure to dissipate
u_2	pore pressure measured just above conical tip of piezocone
u_e	excess pore water pressure
V	top reservoir volume in breakthrough experiment
v	discharge velocity
v_s	seepage velocity
ΔWL	change in water level in monitoring well in barrier pit
X	dimensionless position along width of cutoff wall, x / B
x	position along width of cutoff wall
z	vertical distance variable