DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
5500 Alhambra Drive . Orlando, Florida 32808
Phone: (407) 290-2371 . Fax: (407) 298-9011
E-Mail address: devo@devoeng.com
Website: http://www.devoeng.com

PONDS 3.2 TECHNICAL MEMO

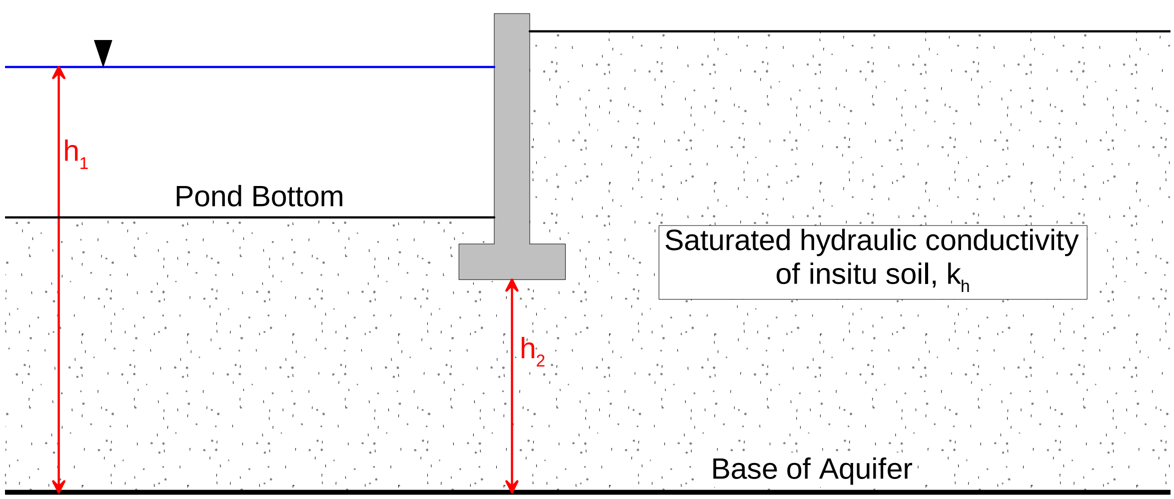
Date: January 28, 2009 (revised)

Re: **How To Modify The Horizontal Hydraulic Conductivity Value To Model The Effect Of A Partially Penetrating or Completely Penetrating Retaining Wall (or Clay Core) Around A Retention Pond**

In some real-world cases, there is a retaining wall or clay core which partially or completely circumscribes a stormwater pond. The retaining wall or clay core may fully or partially penetrate the full depth of the aquifer. Such a barrier reduces the lateral seepage of ground water through the perimeter of the pond. If the wall completely surrounds the pond and the barrier fully penetrates the aquifer, then there is no theoretical lateral seepage and the horizontal hydraulic conductivity is zero.

This memo describes how to manually adjust the horizontal hydraulic conductivity to account for such barriers which do not completely cut off the lateral flow of ground water.

Use a weighted average horizontal hydraulic conductivity. Consider the following figure...



$$k_{avg} = \left(\frac{L_{unwalled}}{L_{total}} \times k_h \right) + \left(\frac{L_{walled}}{L_{total}} \times \frac{h_2}{h_1} \times k_h \right)$$

where

$L_{unwalled}$ is the length of perimeter with no wall
L_{walled} is the length of permiter with wall
L_{total} is the total perimeter length

<u>Example #1</u> - Partially penetrating wall around entire perimeter

Effective perimeter of pond = 200 ft
Length of wall = 200 ft
Average water level in pond = +100 ft NGVD
Base of aquifer= +90 ft NGVD
Bottom elevation of wall = +95 ft NGVD
Horizontal hydraulic conductivity = 20 ft/day

Use a weighted average horizontal hydraulic conductivity of....

Segment of pond perimeter with no wall	+	Segment of pond perimeter with wall	=	Weighted k_h
0% × 20 ft/day	+	100% × [(95-90)/(100-90)] × 20	=	10 ft/day

<u>Example #2</u> - Fully penetrating wall around half of perimeter

Effective perimeter of pond = 200 ft
Length of wall = 100 ft
Average water level in pond = +100 ft NGVD
Base of aquifer= +90 ft NGVD
Bottom elevation of wall = +90 ft NGVD
Horizontal hydraulic conductivity = 20 ft/day

Use a weighted average horizontal hydraulic conductivity of....

Segment of pond perimeter with no wall	+	Segment of pond perimeter with wall	=	Weighted k_h
50% × 20 ft/day	+	50% × 0 ft/day	=	10 ft/day

Example #3 - Partially penetrating wall around half of perimeter

Effective perimeter of pond = 200 ft
Length of wall = 100 ft
Average water level in pond = +100 ft NGVD
Base of aquifer= +90 ft NGVD
Bottom elevation of wall = +95 ft NGVD
Horizontal hydraulic conductivity = 20 ft/day

Use a weighted average horizontal hydraulic conductivity of....

Segment of pond perimeter with no wall	+	Segment of pond perimeter with wall	=	Weighted k_h
50% × 20 ft/day = 10	+	50% × [(95-90)/(100-90)] × 20 = 5	=	15 ft/day