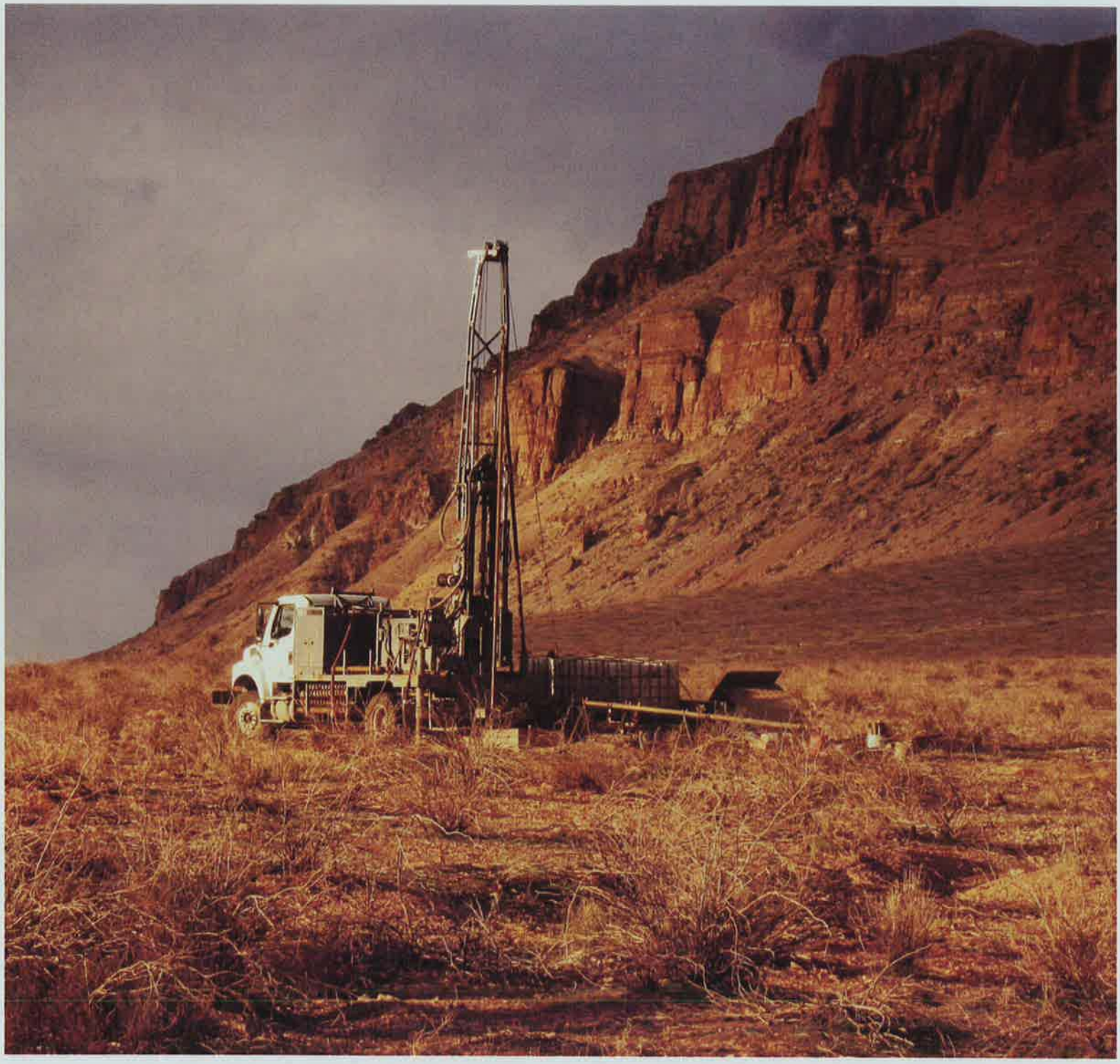
Core Photos

Core Photos
AB-1 & AB-1A

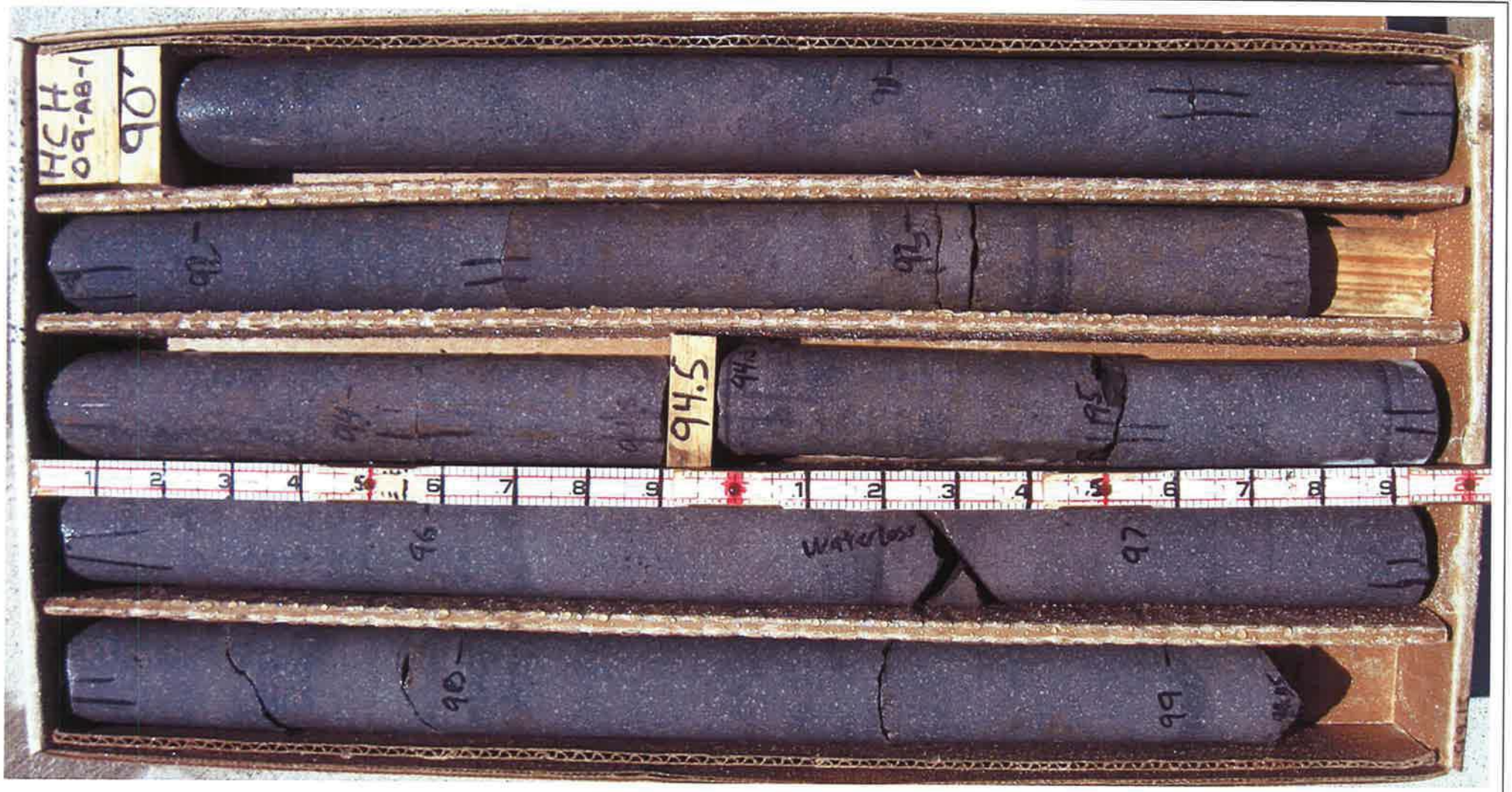


RB&G ENGINEERING, INC.

Figure Drill Hole #09-AB-1 and 09-AB-1A Core Photos Wet 09-AB-1A drilled 8 ft. west of 09-AB-1

Project HCH Afterbay South Dam Site Option 2, WCWCD

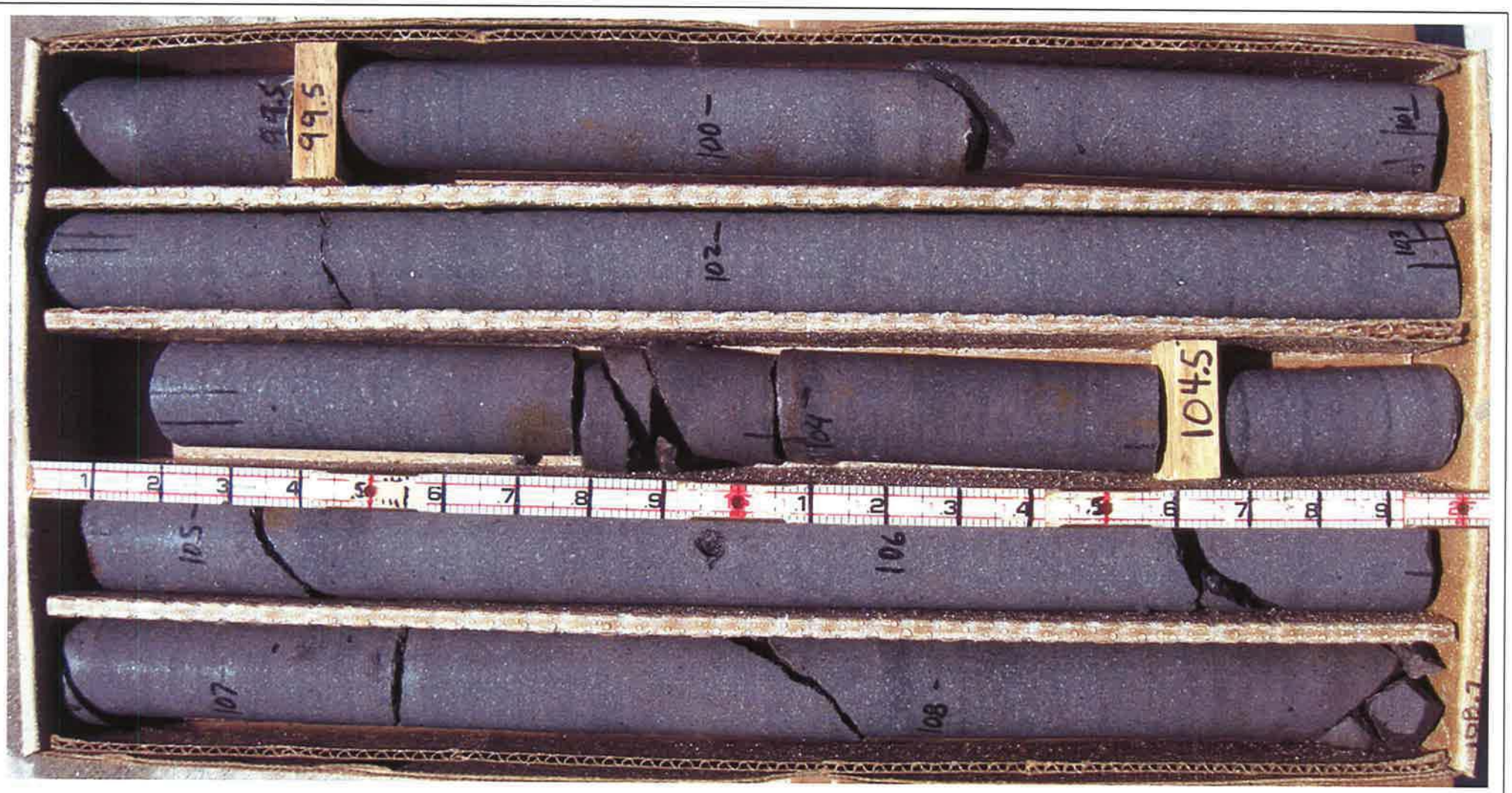
Location Washington County, Utah



RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft

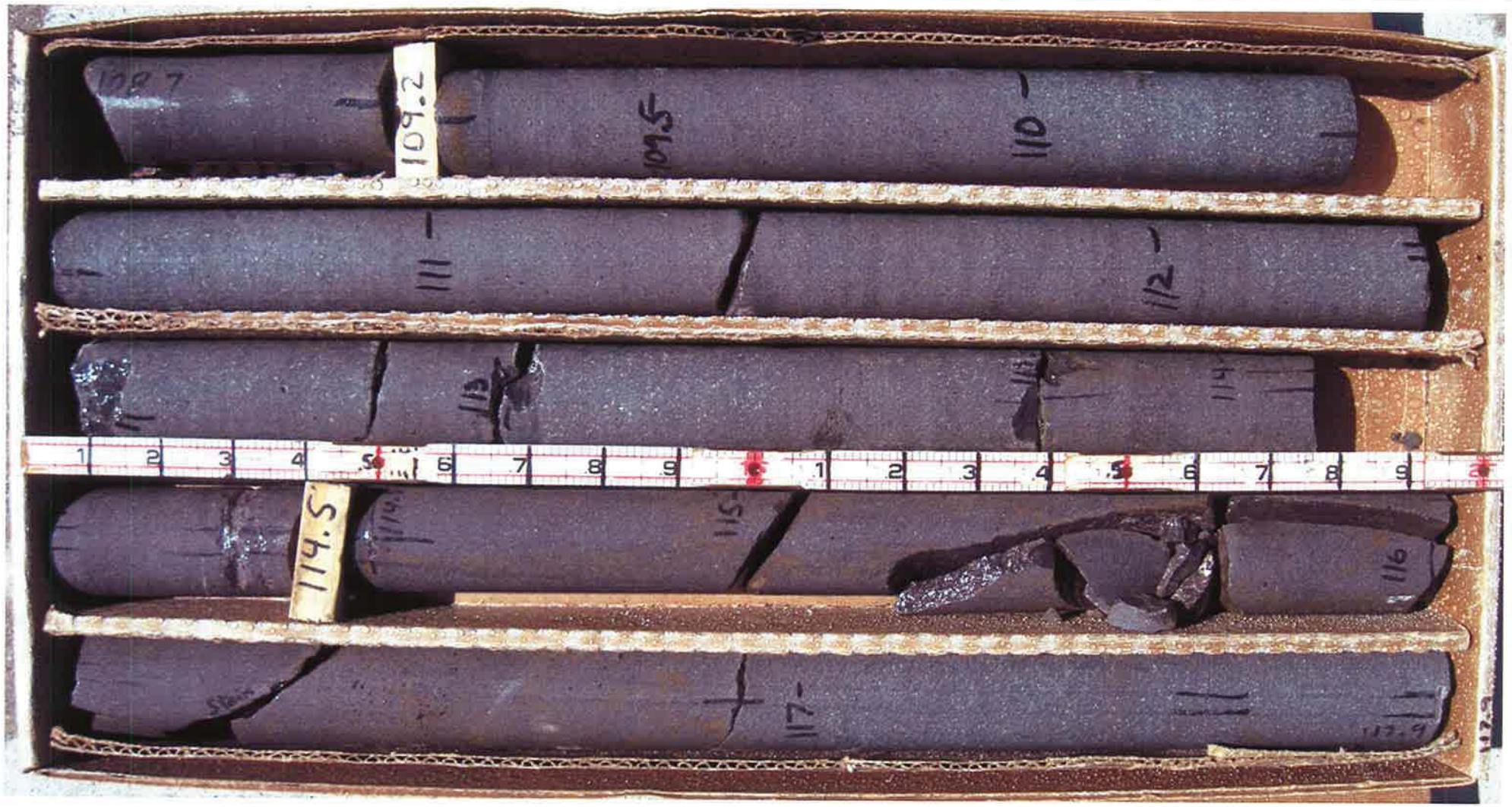
Figure Drill Hole 09-AB-1 Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure Drill Hole 09-AB-1 Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure	Drill Hole 09-AB-1 Core Photos Wet
Project	HCH Afterbay South Dam Site Options1&2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure	Drill Hole 09-AB-1 Core Photos Wet
Project	HCH Afterbay South Dam Site Options1&2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

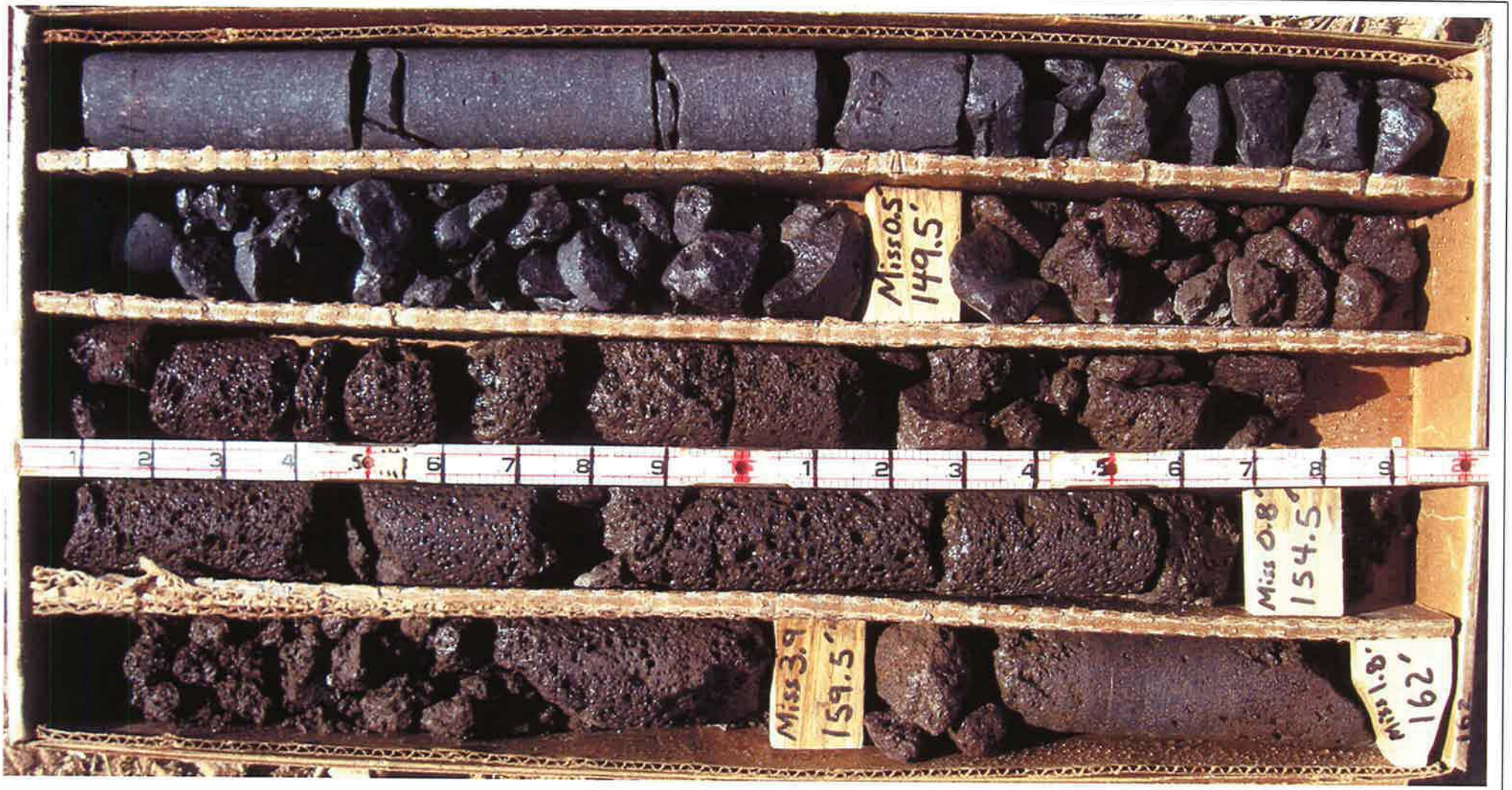
09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft

Figure Drill Hole 09-AB-1 Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft

Figure Drill Hole 09-AB-1 Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft

Figure Drill Hole 09-AB-1 Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole 09-AB-1A Core Photos Wet
HCH Afterbay South Dam Site Options1&2, WCWCD
Washington County, Utah

09-AB-1A drilled 8 ft. west of 09-AB-1

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure Drill Hole 09-AB-1A Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure	Drill Hole 09-AB-1A Core Photos Wet
Project	HCH Afterbay South Dam Site Options1&2, WCWCD
Location	Washington County, Utah

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Top

Bottom

Figure Drill Hole #09-AB-1 and 09-AB-1A Core Photos Wet
Project HCH Afterbay South Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

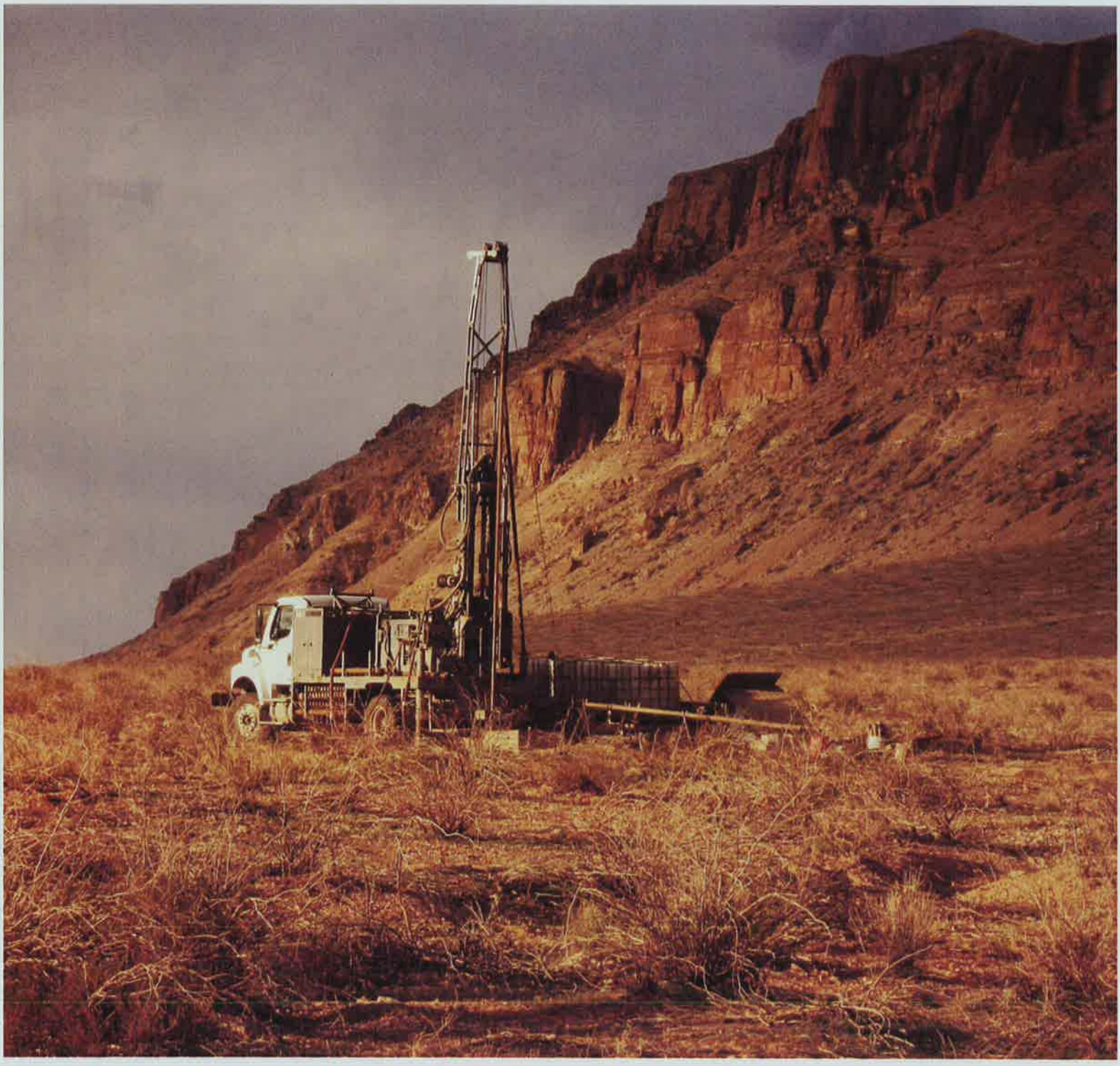
See #09-AB-1A for depth to 199 ft.

RB&G ENGINEERING, INC.

09-AB-1 NQ Core Dia. 1.78 in Length of Core Box 2 ft.

Figure Drill Hole 09-AB-1A Core Photos Wet
Project HCH Afterbay South Dam Site Options1&2, WCWCD
Location Washington County, Utah

Core Photos
AB-2



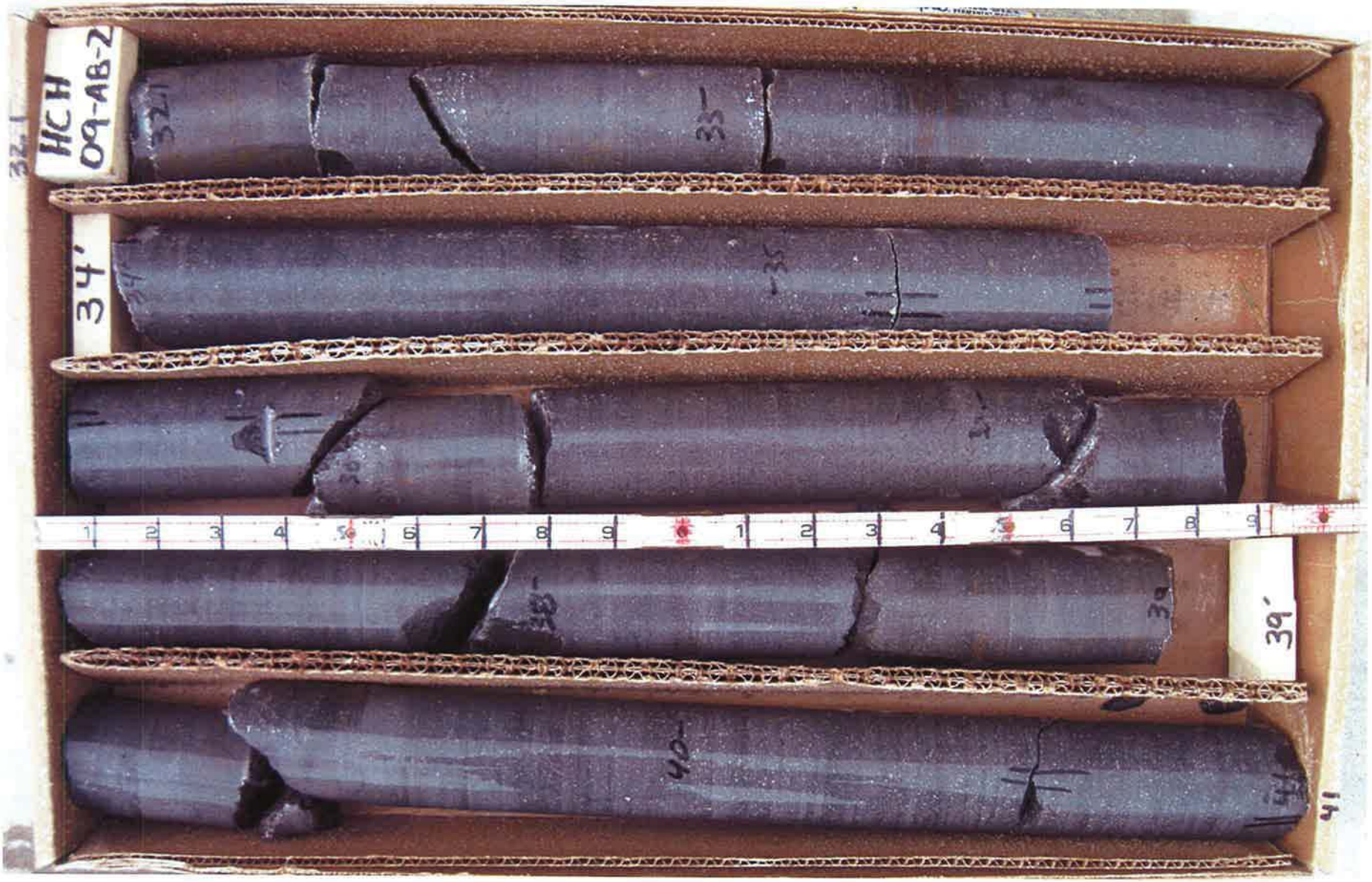
NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Top

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

RB&G ENGINEERING, INC.

Figure Drill Hole #09-AB-2 Core Photos Wet
Project HCH Afterbay South Dam Site Option 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-2 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-2 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-2 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

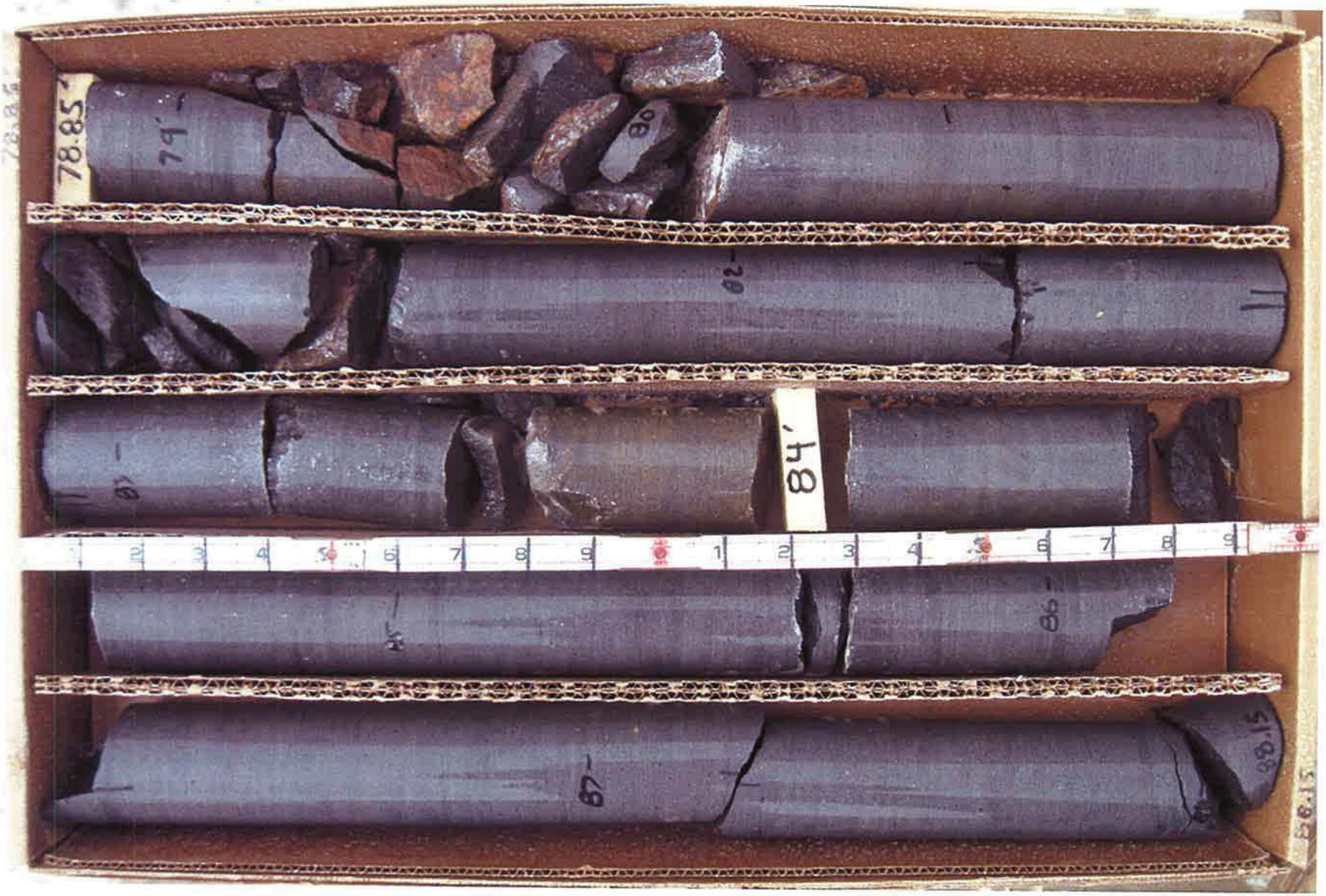
Drill Hole #09-AB-2 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-2 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-2 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

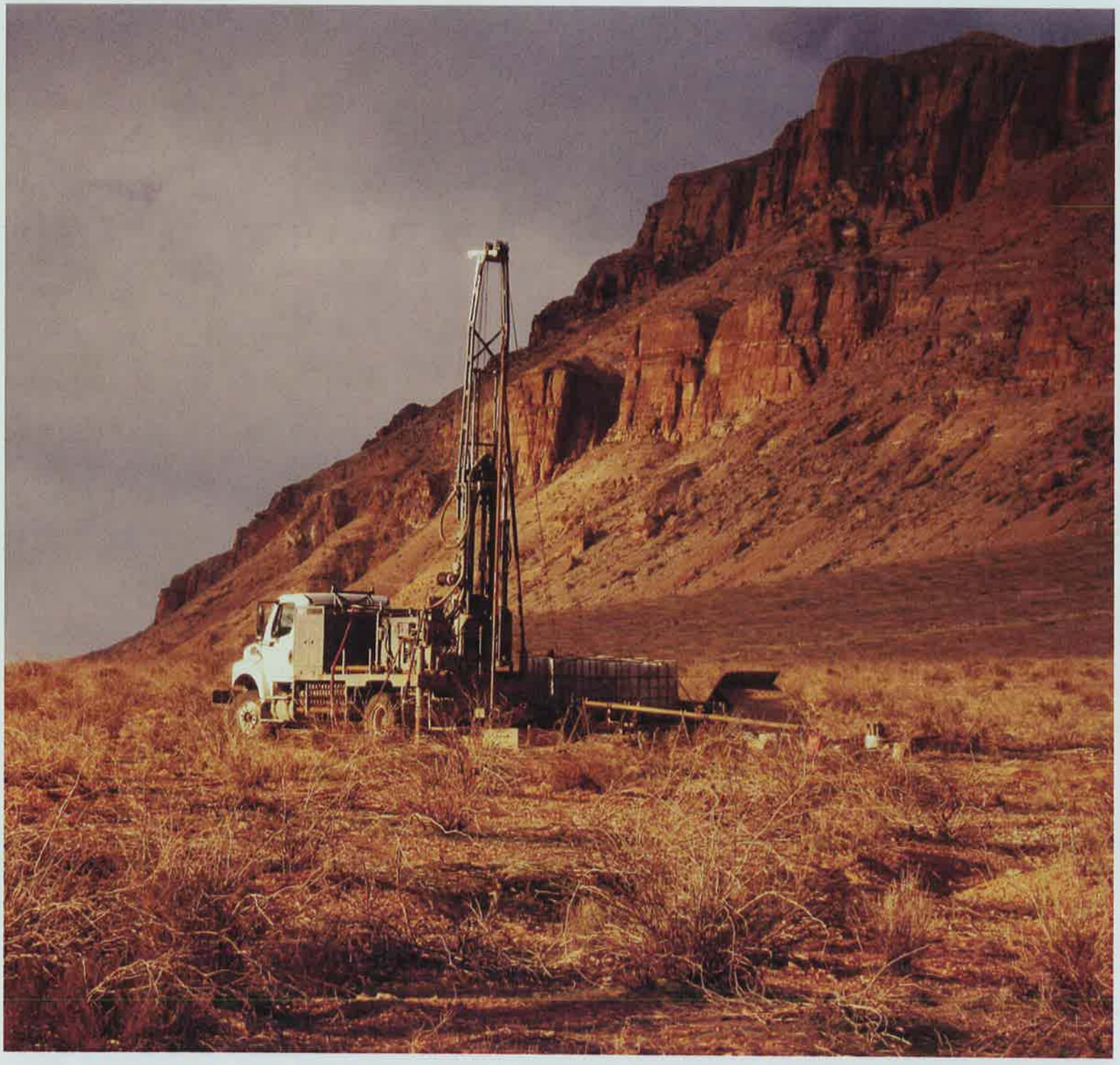
Figure Drill Hole #09-AB-2 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

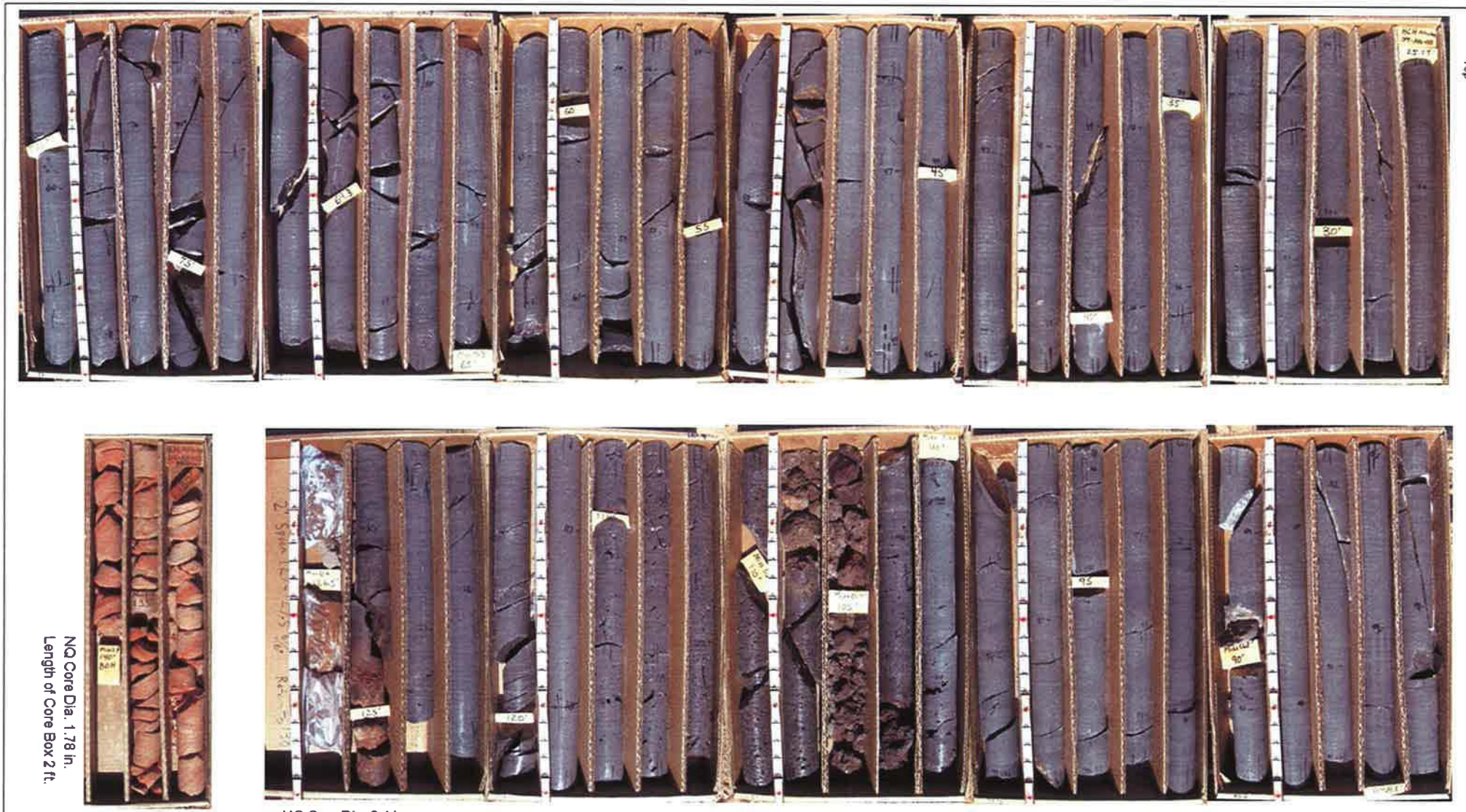
RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-2 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

Core Photos
AB-3





RB&G ENGINEERING, INC.

Figure	Drill Hole #09-AB-03 Core Photos Wet,
Project	HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

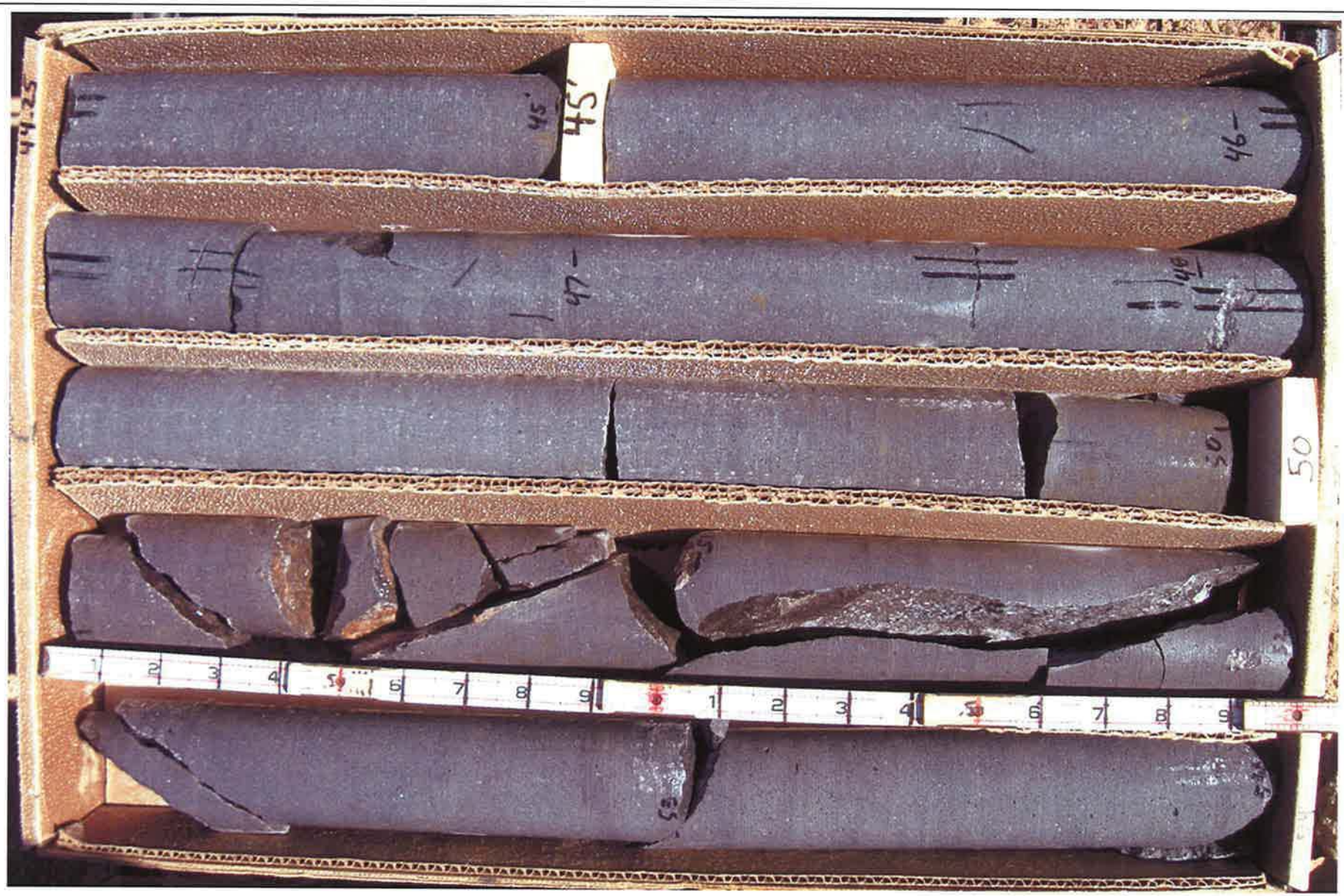
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-03 Core Photos Wet,
Project	HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-03 Core Photos Wet,
Project HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

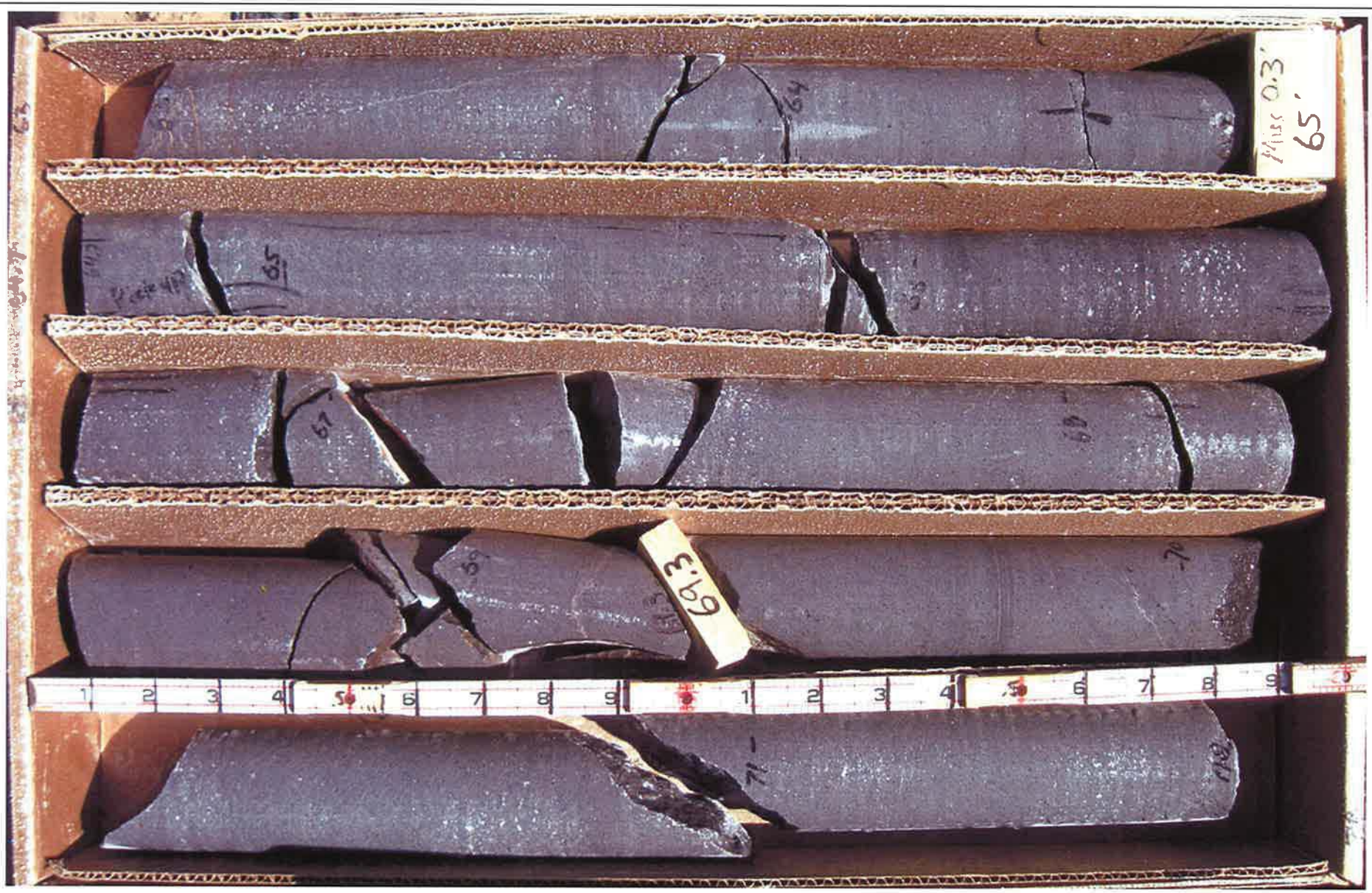
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-03 Core Photos Wet,
Project	HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

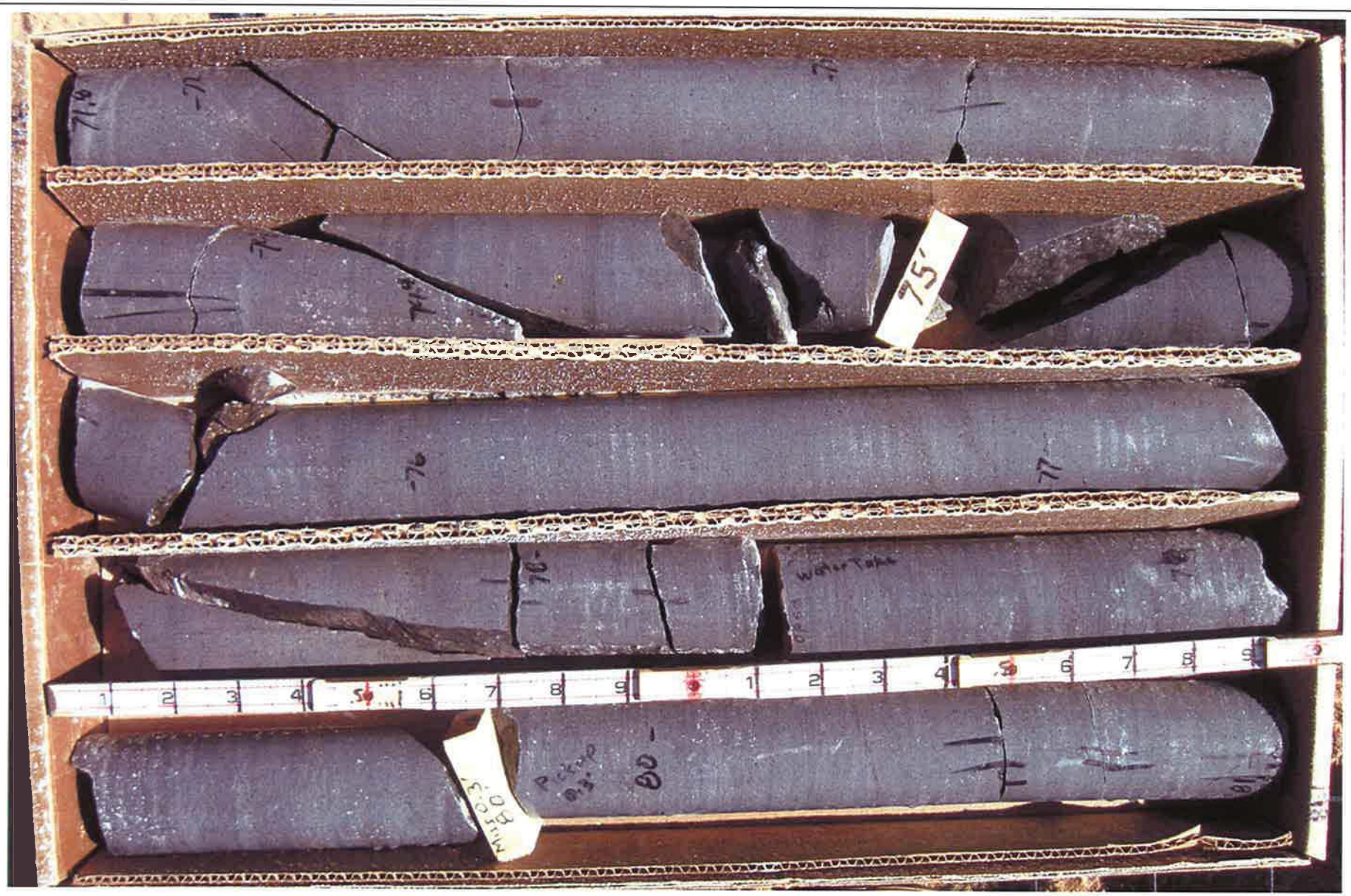
Figure Drill Hole #09-AB-03 Core Photos Wet,
Project HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-03 Core Photos Wet,
Project	HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location	Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

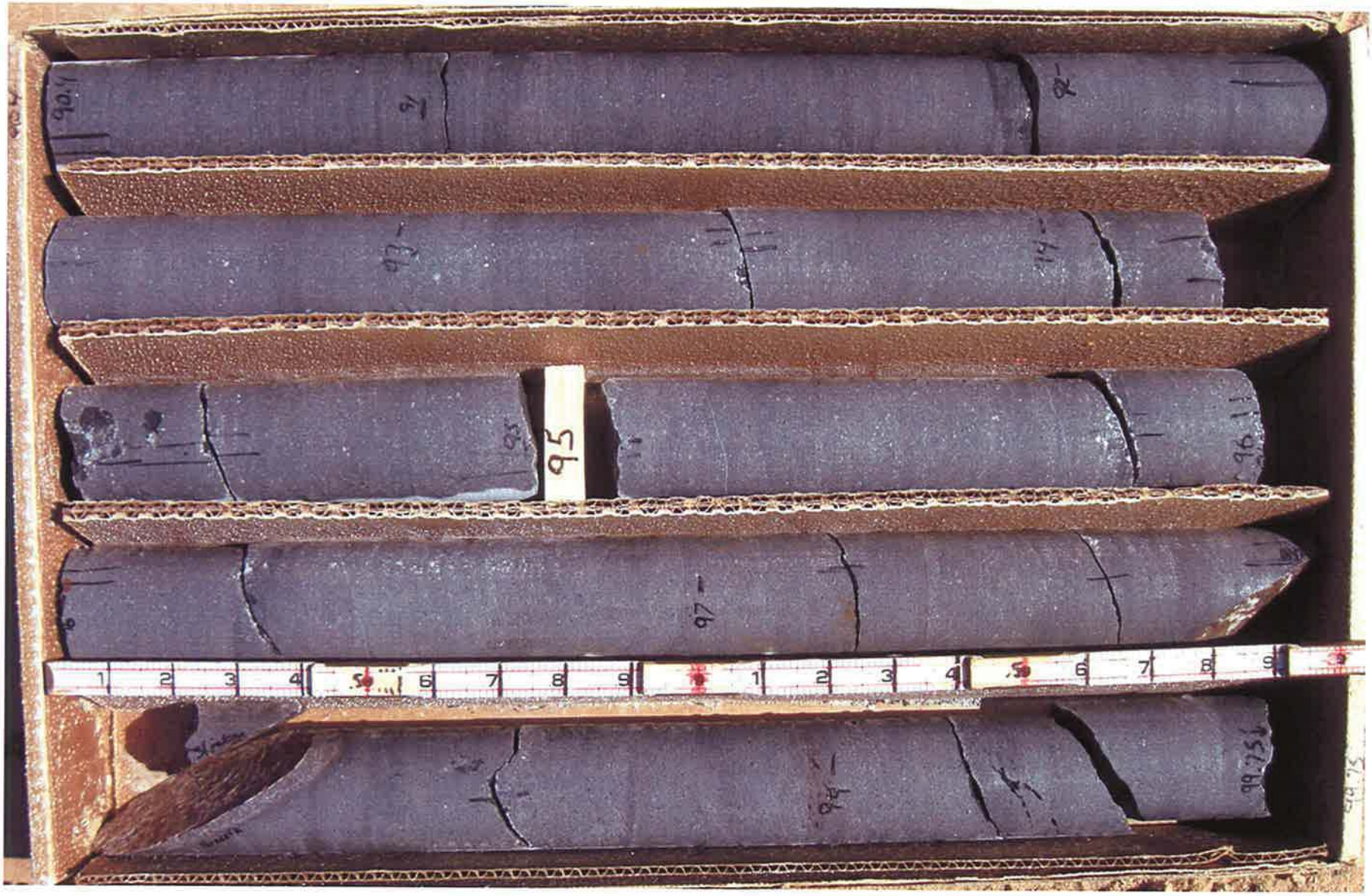
Figure	Drill Hole #09-AB-03 Core Photos Wet,
Project	HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-03 Core Photos Wet,
HCH Afterbay South Dam Site Options1 & 2, WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

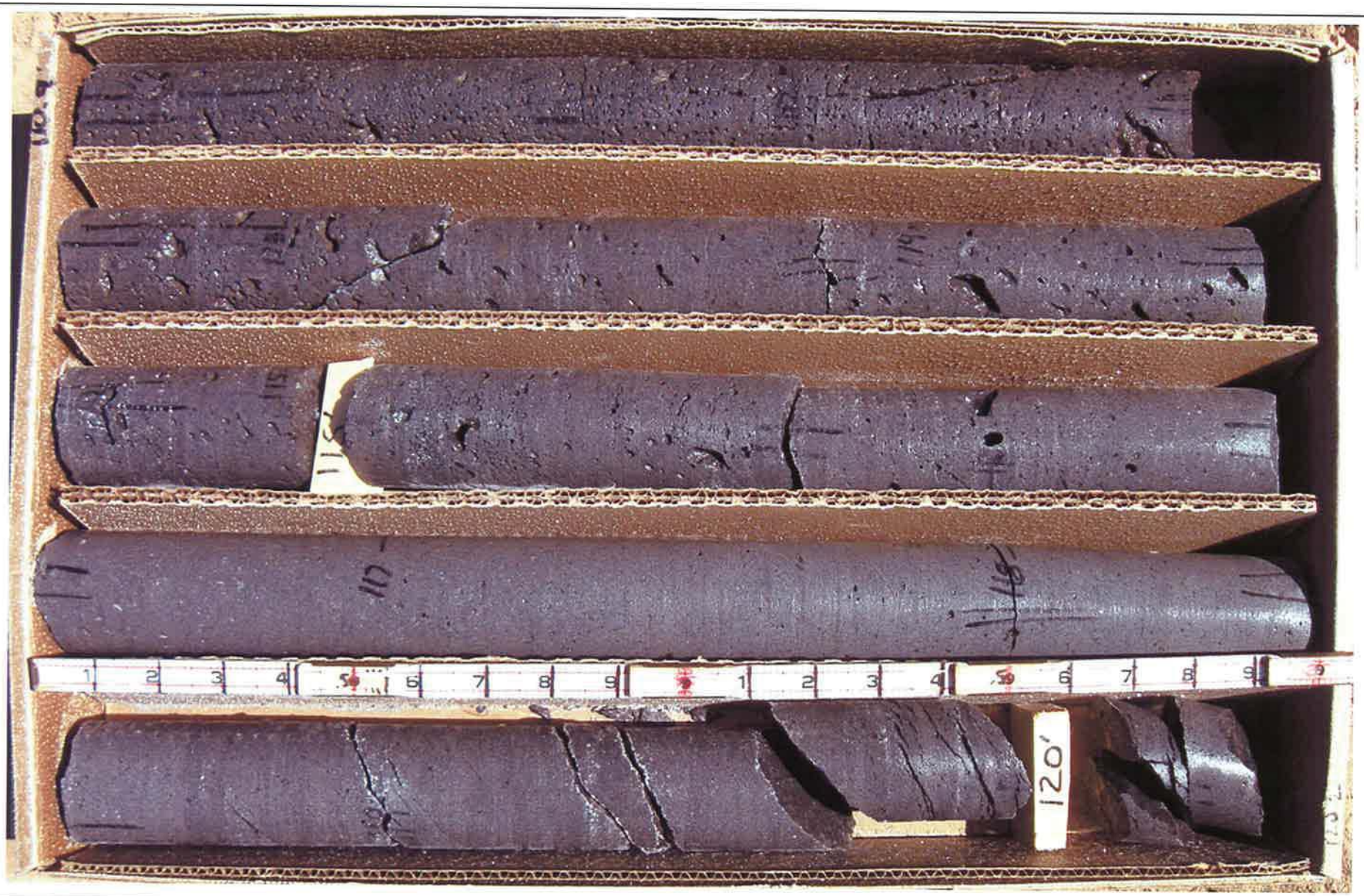
Figure
Project
Location

Drill Hole #09-AB-03 Core Photos Wet,
HCH Afterbay South Dam Site Options1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-03 Core Photos Wet,
Project HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location Washington County, Utah

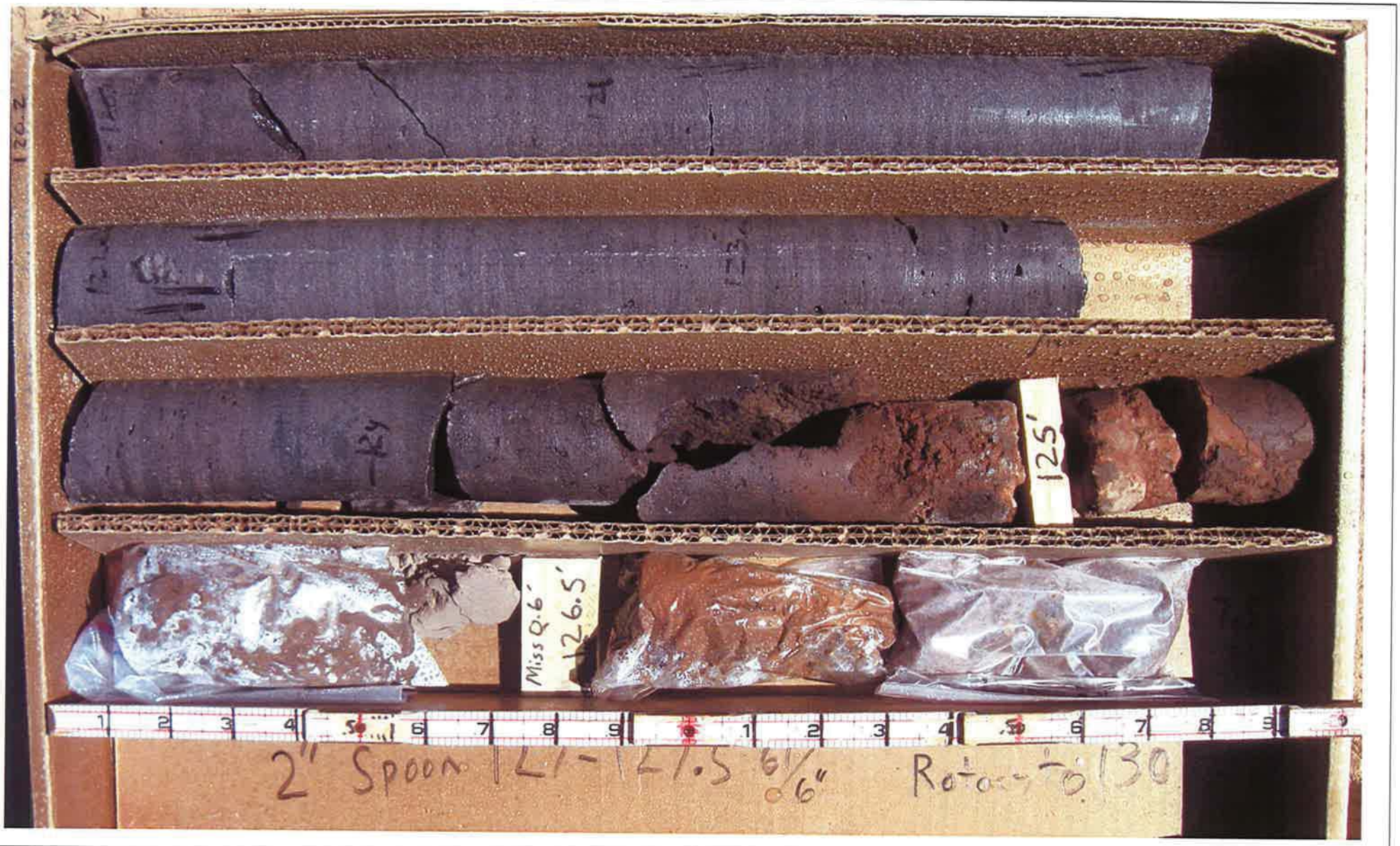


RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-03 Core Photos Wet,
HCH Afterbay South Dam Site Options1 & 2, WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

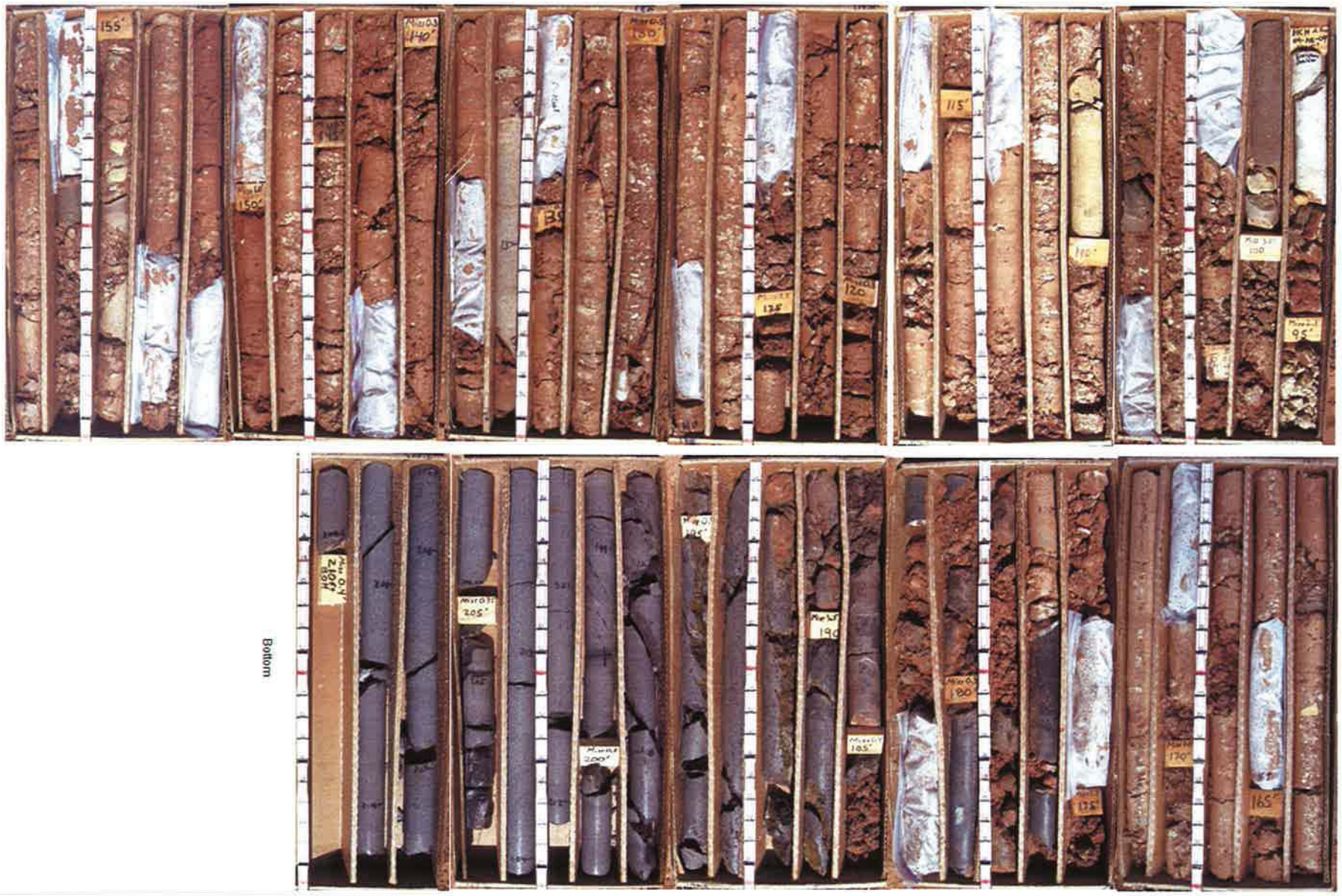
Figure Drill Hole #09-AB-03 Core Photos Wet,
Project HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location Washington County, Utah

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

RB&G ENGINEERING, INC.

Figure Drill Hole #09-AB-03 Core Photos Wet,
Project HCH Afterbay South Dam Site Options1 & 2, WCWCD
Location Washington County, Utah

Core Photos
AB-4



RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-4 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-4 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-4 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

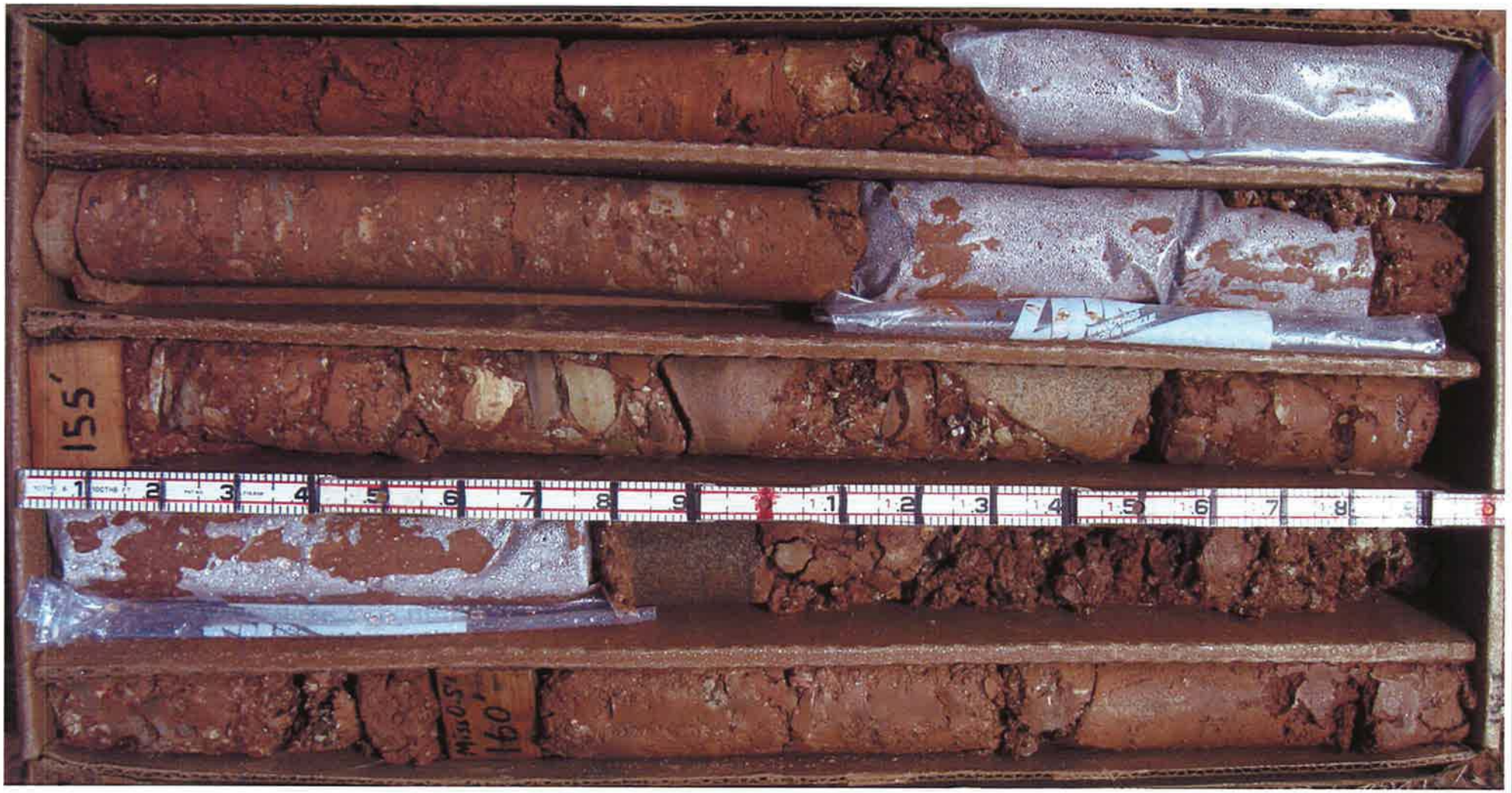
Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-4 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft

Figure Drill Hole #09-AB-4 Core Photos Wet
Project HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

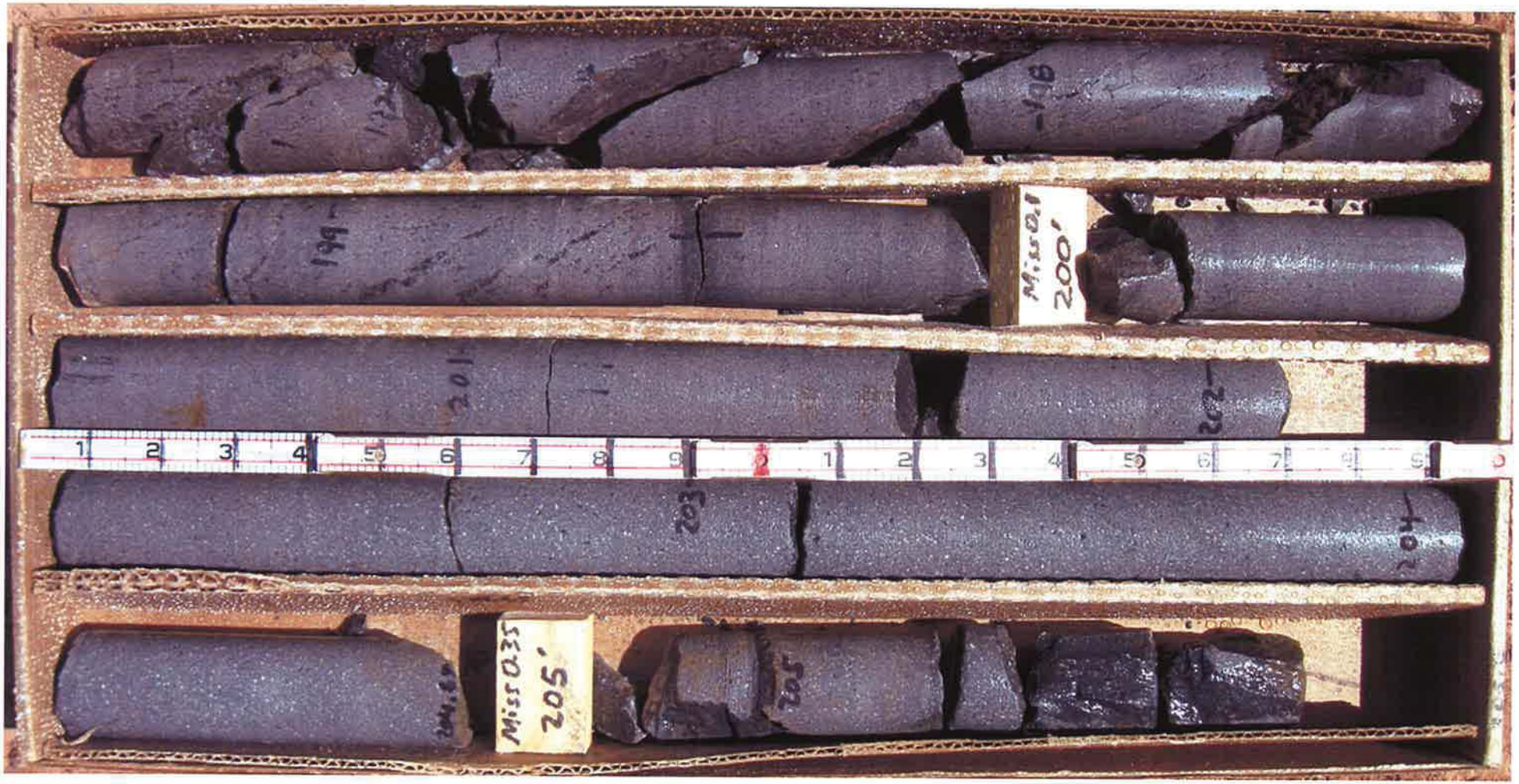
Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-4 Core Photos Wet
Project	HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Location	Washington County, Utah

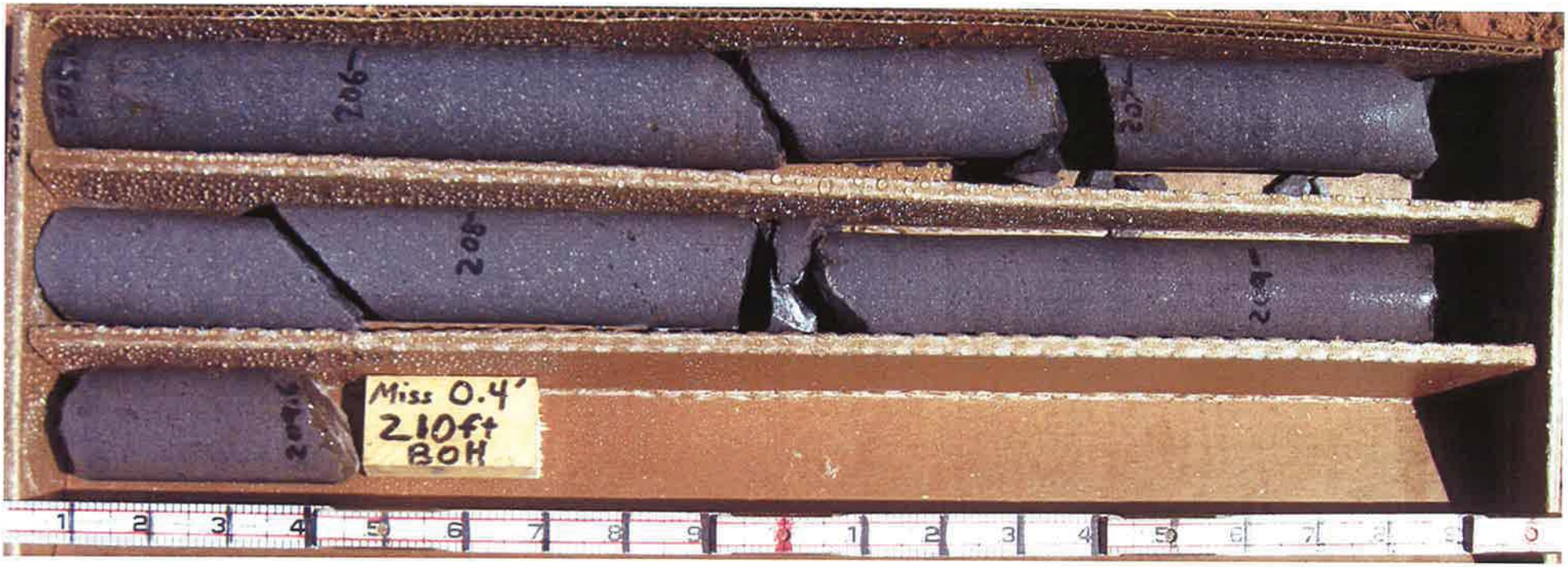


RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

NQ Core Dia. 1.78 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-4 Core Photos Wet
HCH Afterbay South Dam Site Options 1 & 2, WCWCD
Washington County, Utah

Core Photos
AB-5

Continued

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

Continued

Top

Bottom

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

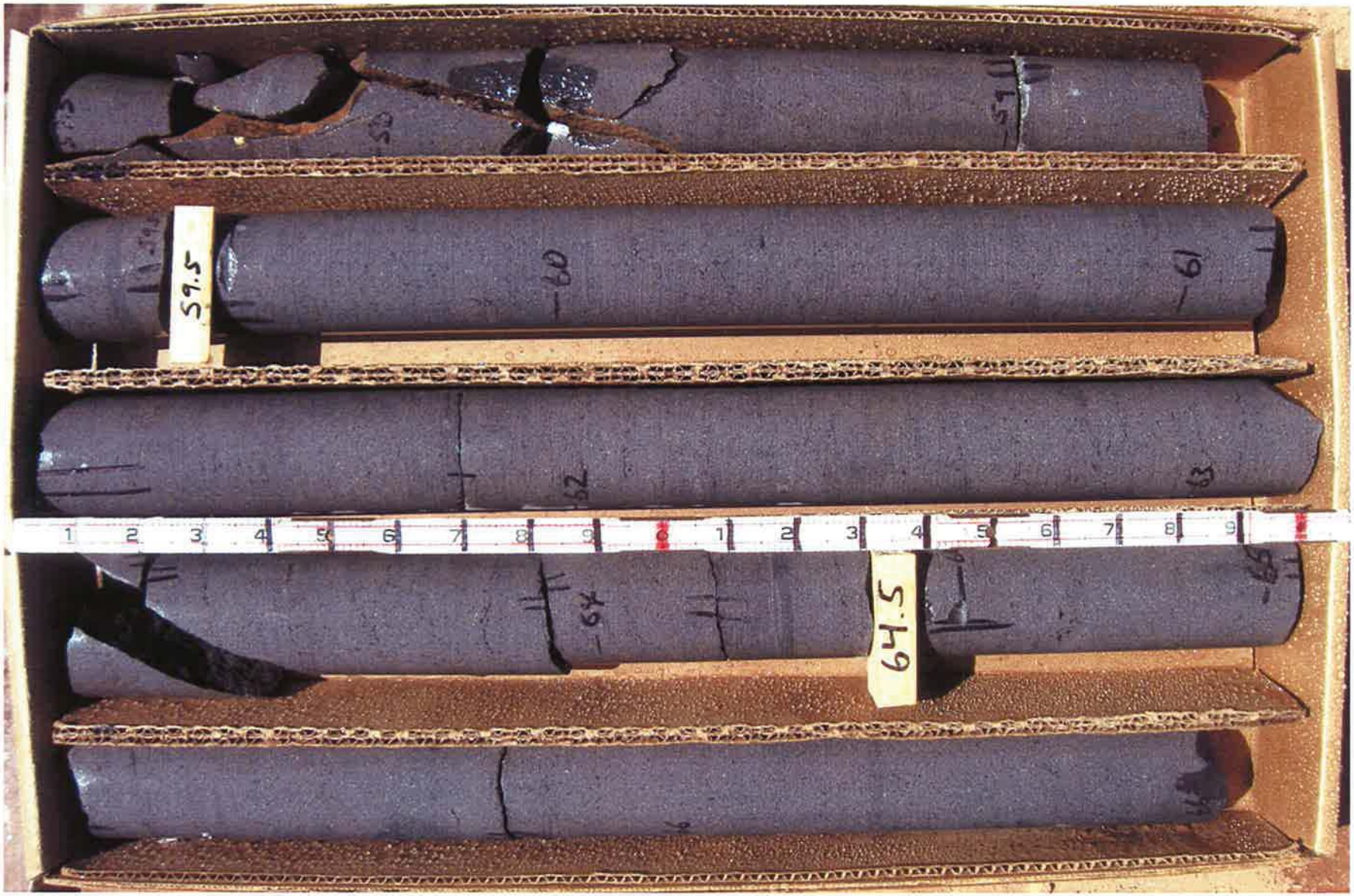
Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

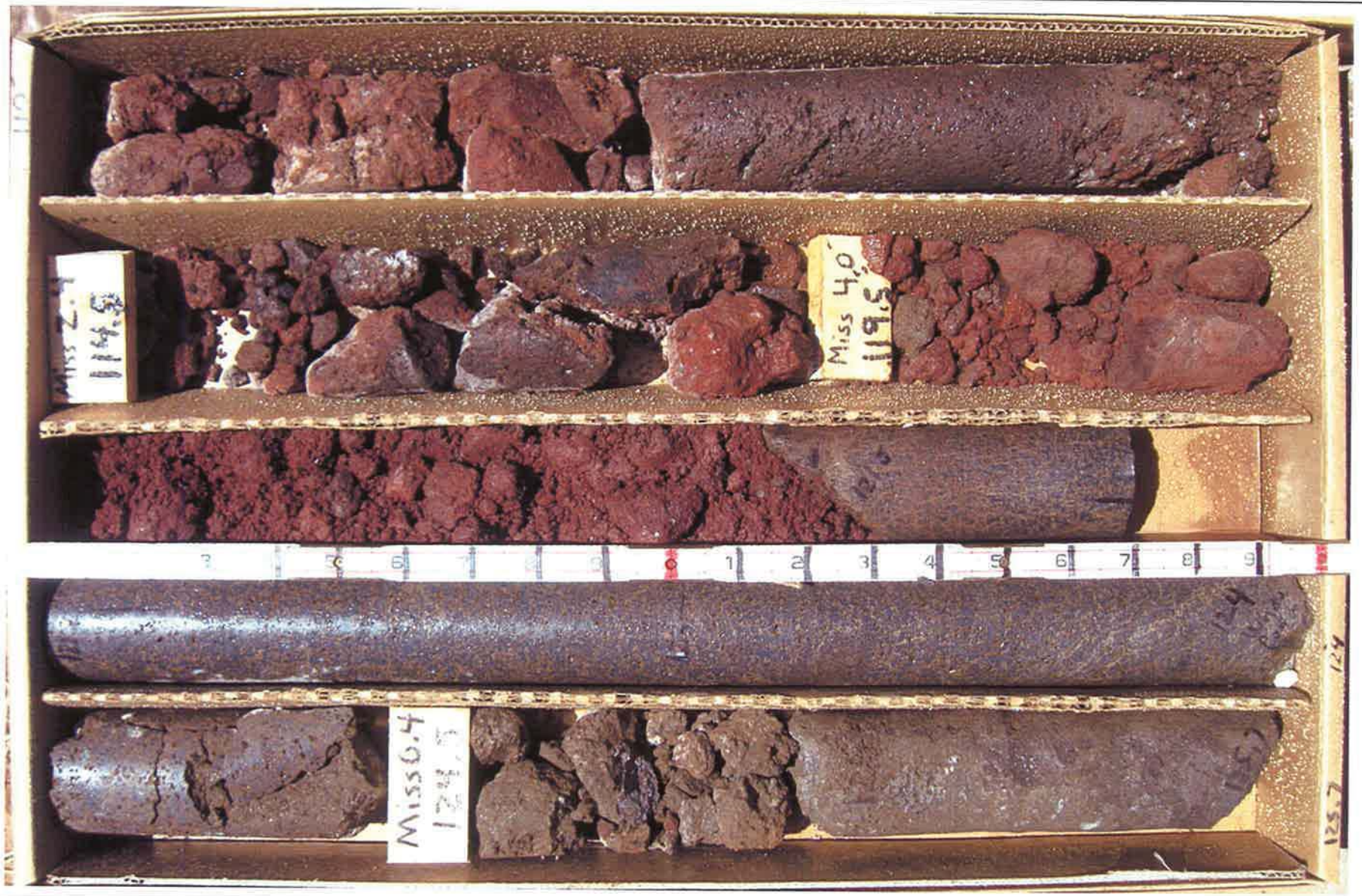
Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

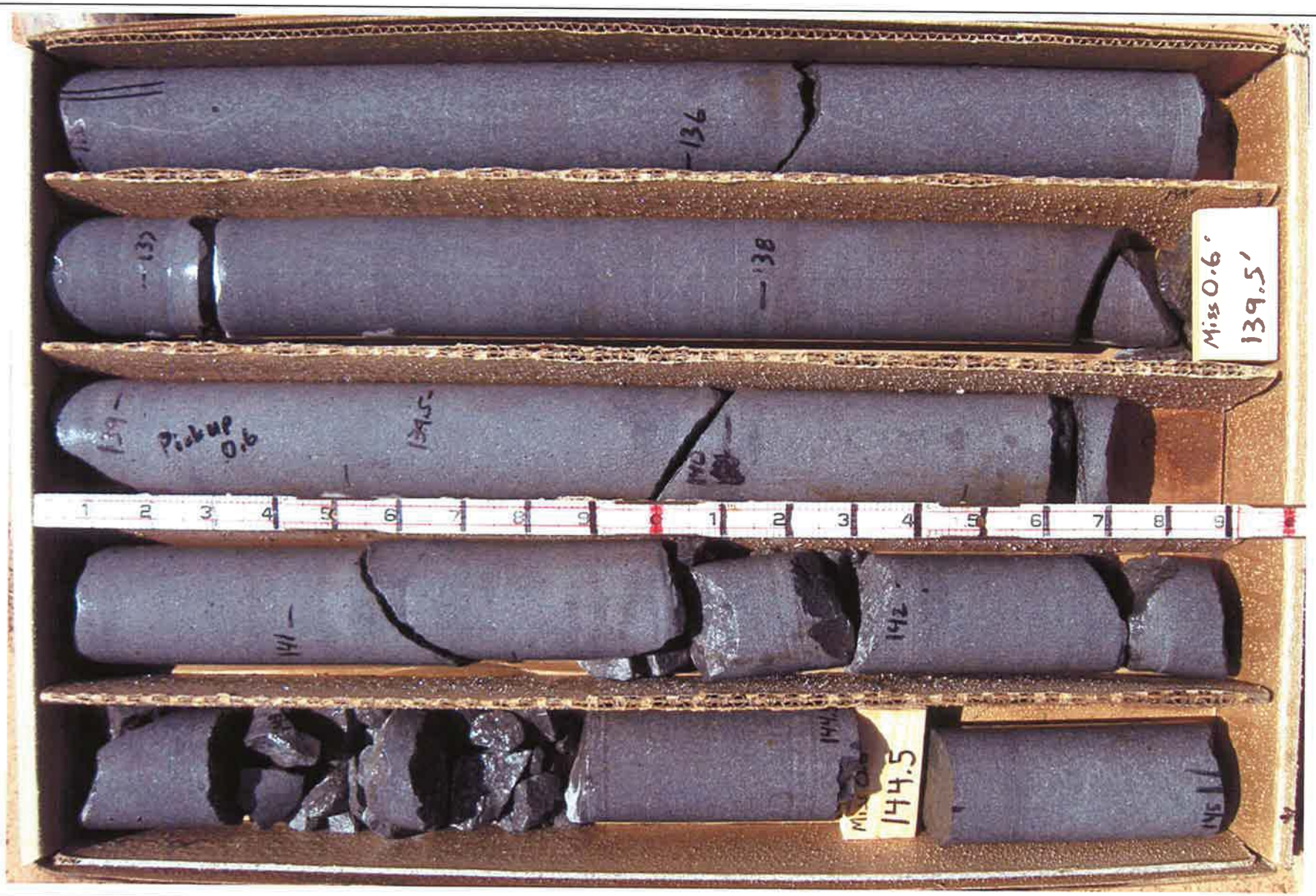
Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

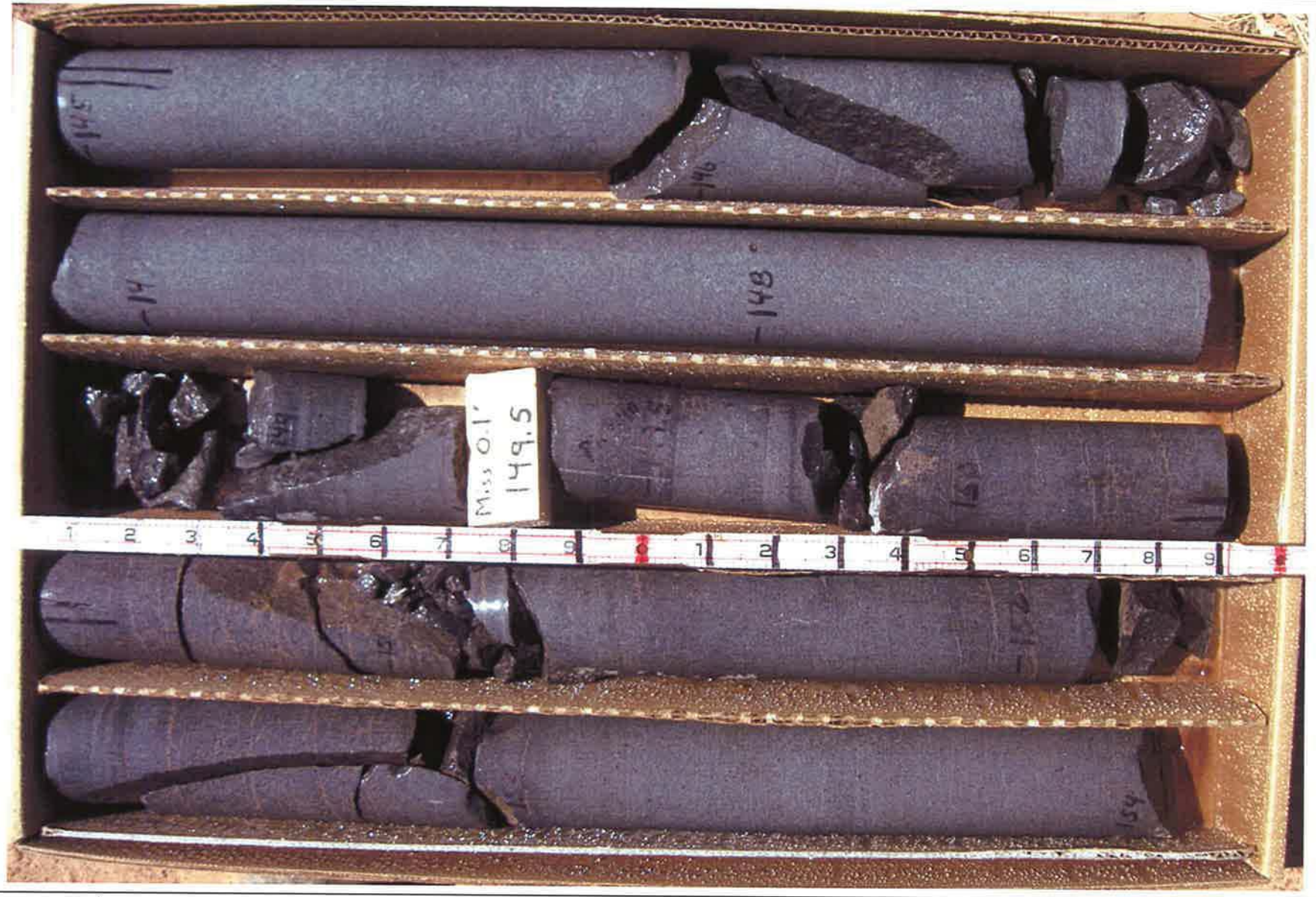


RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

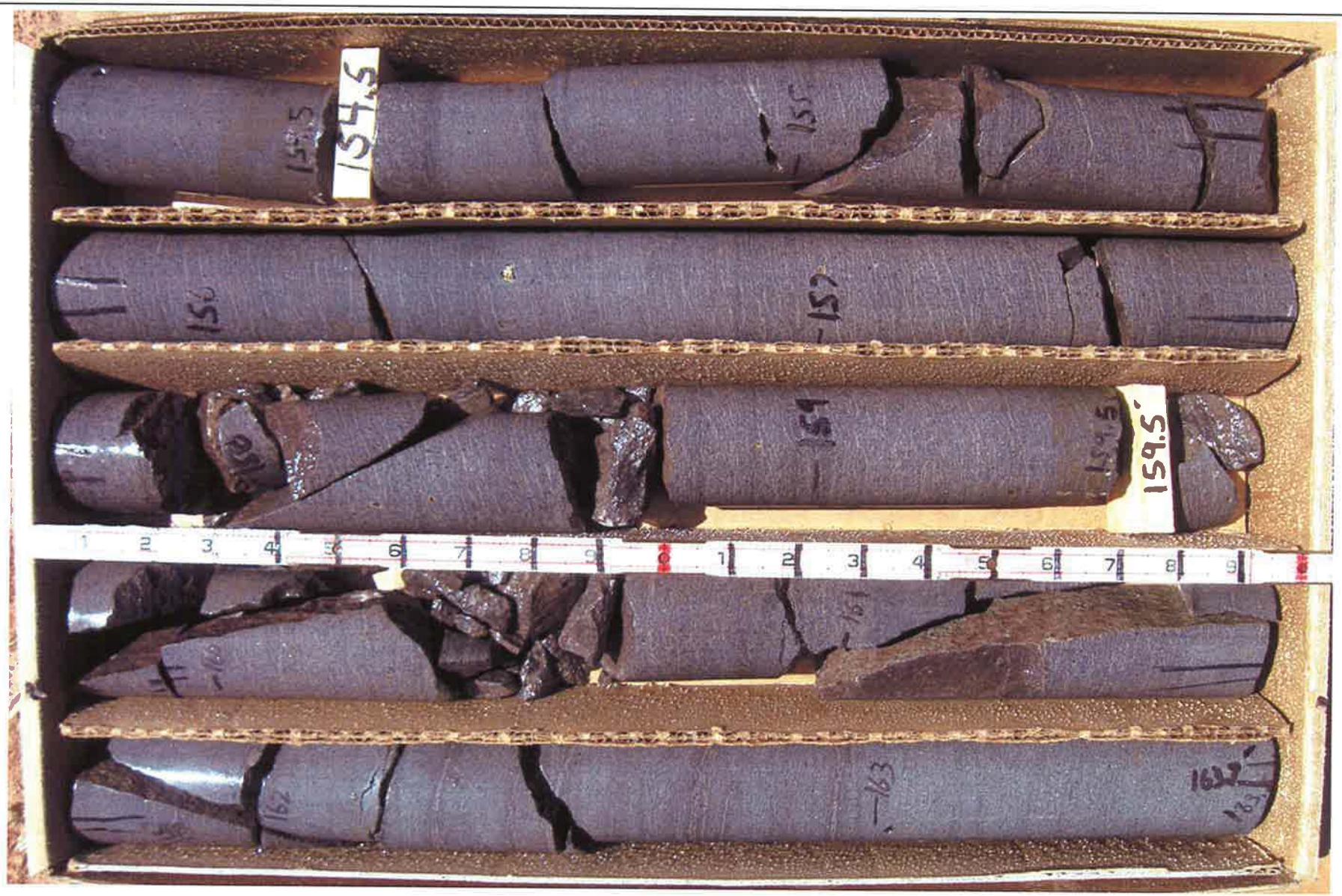


RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

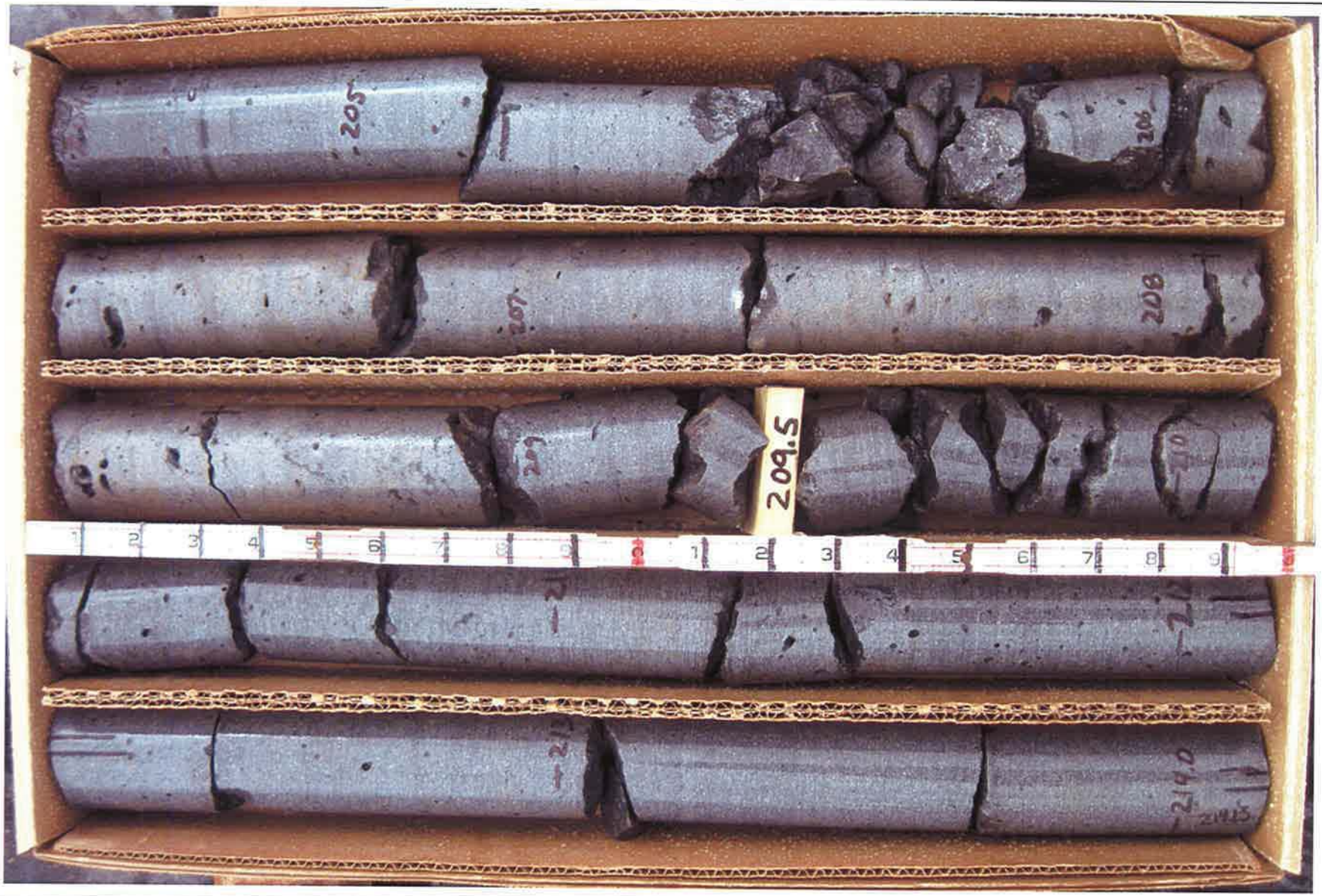
Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure
Project
Location

Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
HCH Afterbay North Dam Site Option 1 , WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-5 Core Photos Wet, (Vertical)
Project HCH Afterbay North Dam Site Option 1 , WCWCD
Location Washington County, Utah

Core Photos
AB-6

RB&G ENGINEERING, INC.

HQ Core Dia. 2 4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-6 Core Photos Wet (Vertical)
HCH Afterbay North Dam Site Option 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

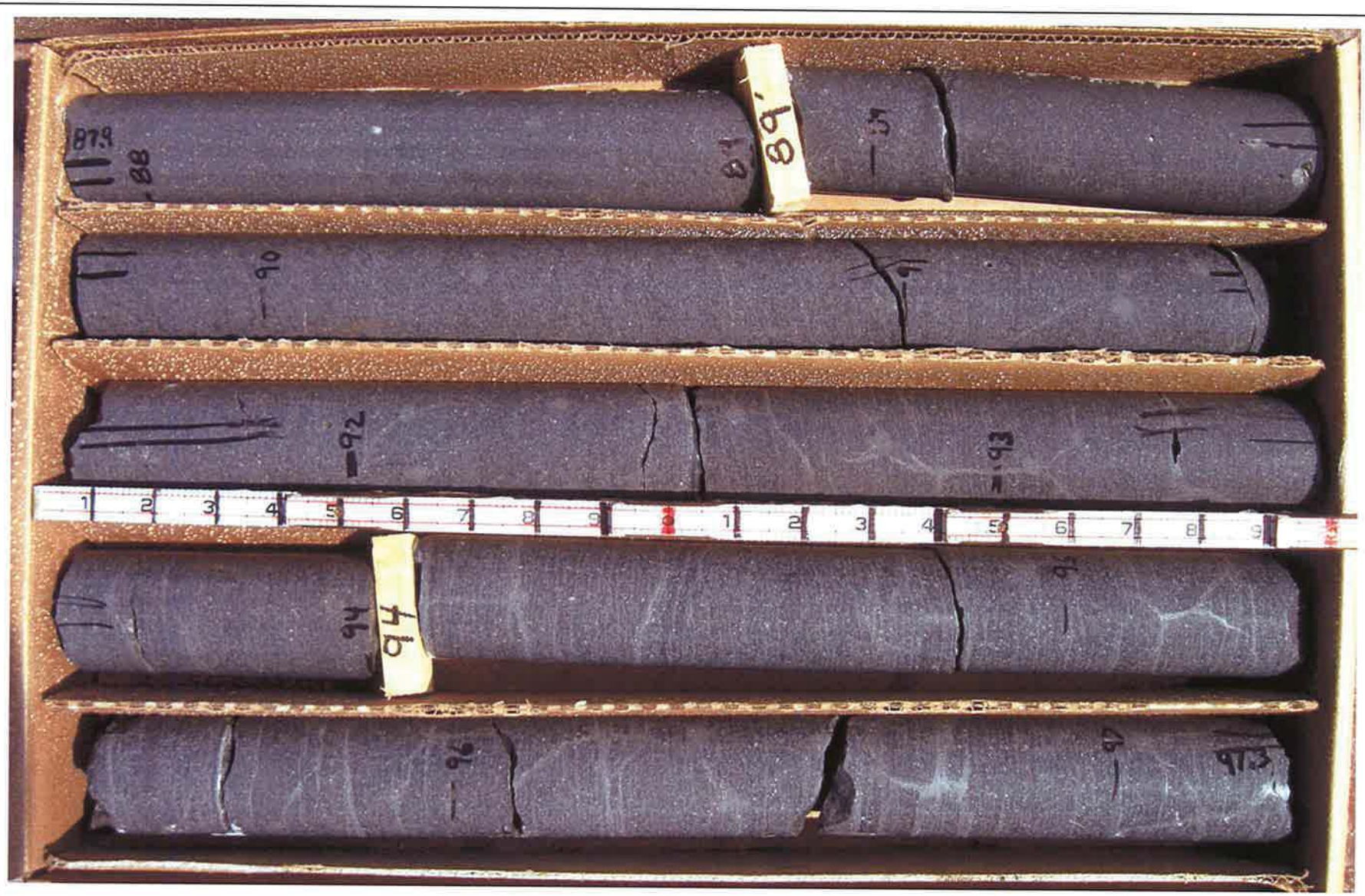
Figure
Project
Location

Drill Hole #09-AB-6 Core Photos Wet (Vertical)
HCH Afterbay North Dam Site Option 2, WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

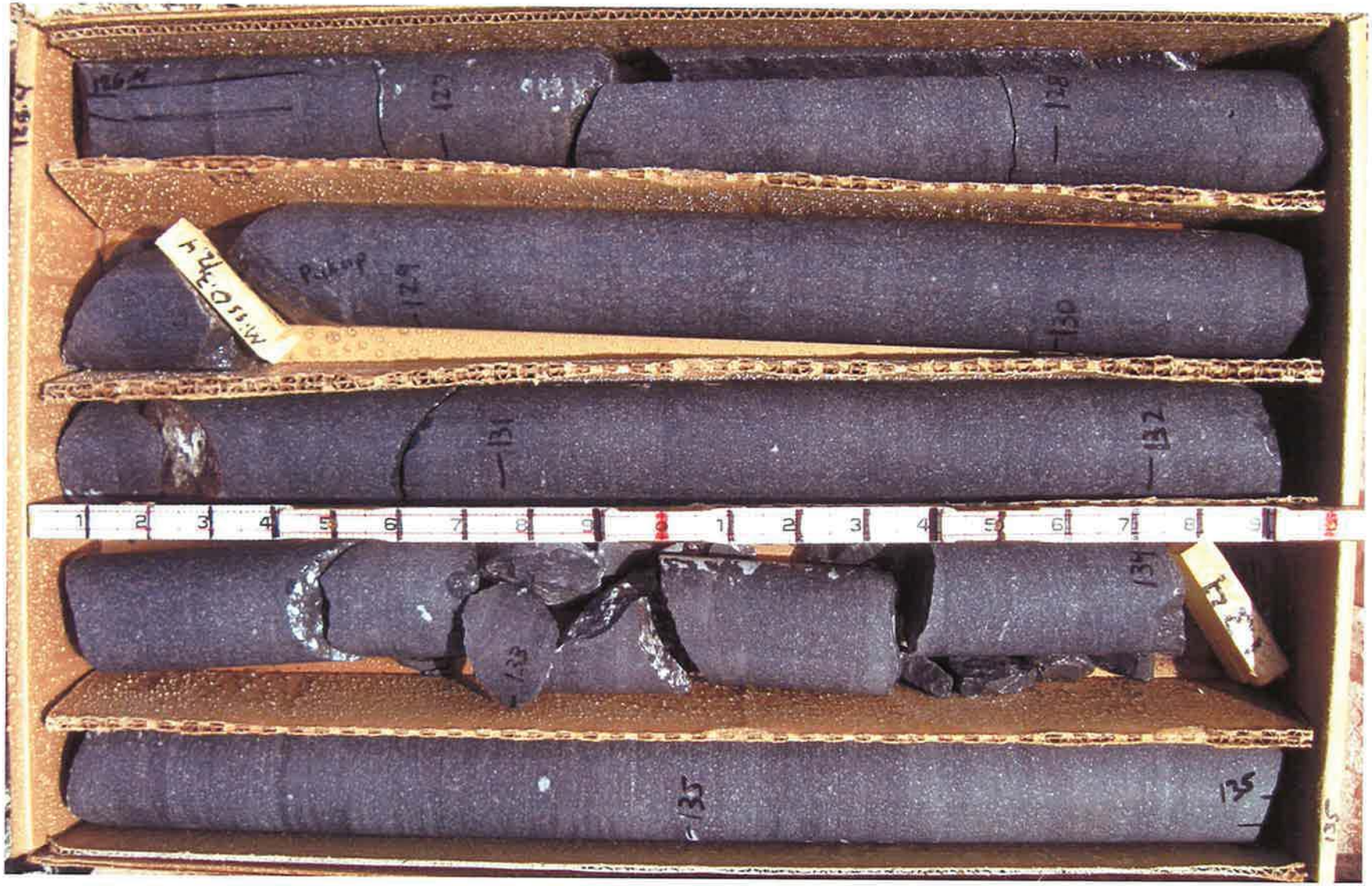
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

Figure	Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project	HCH Afterbay North Dam Site Option 2, WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

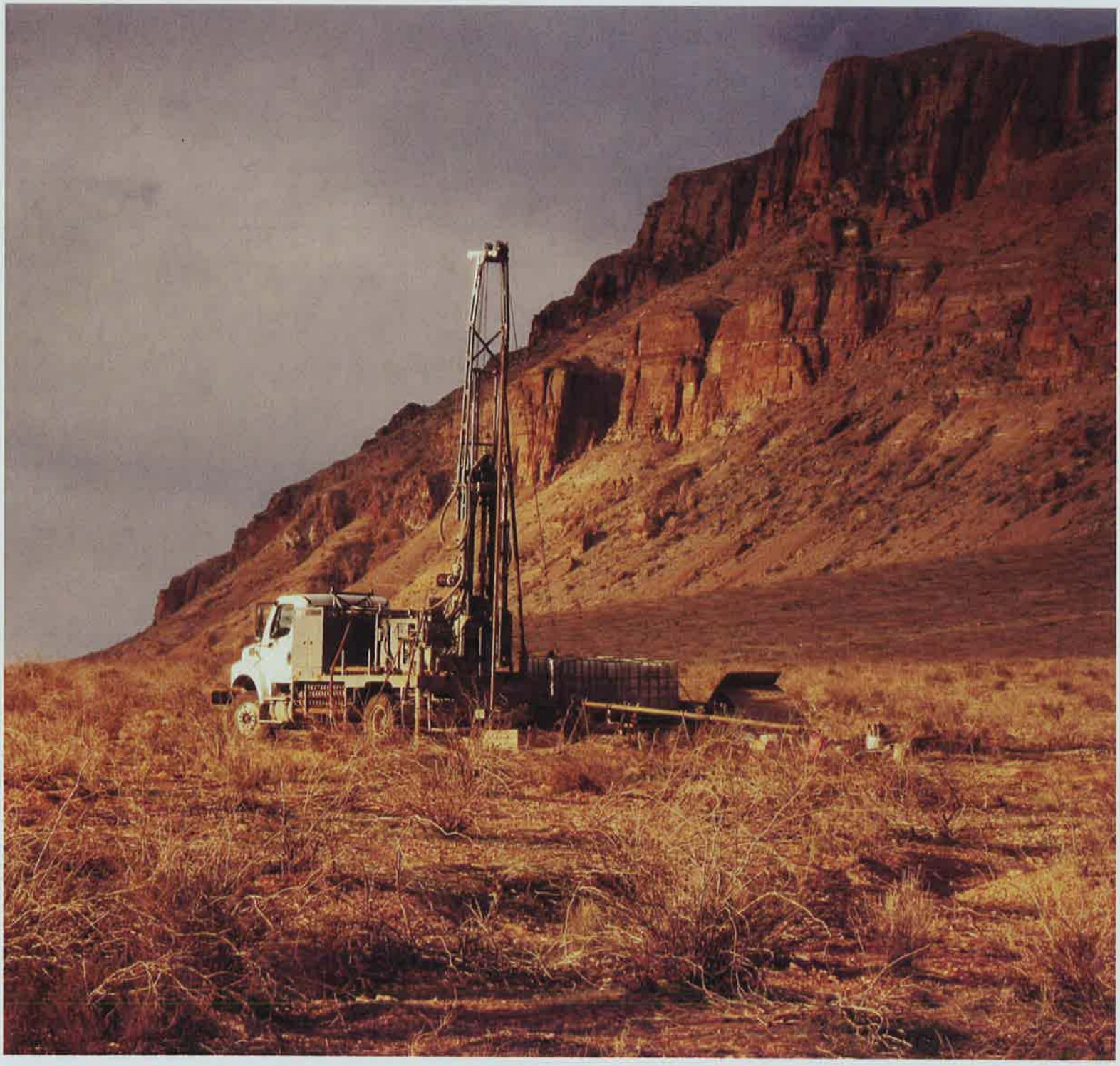
Figure	Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project	HCH Afterbay North Dam Site Option 2, WCWCD
Location	Washington County, Utah

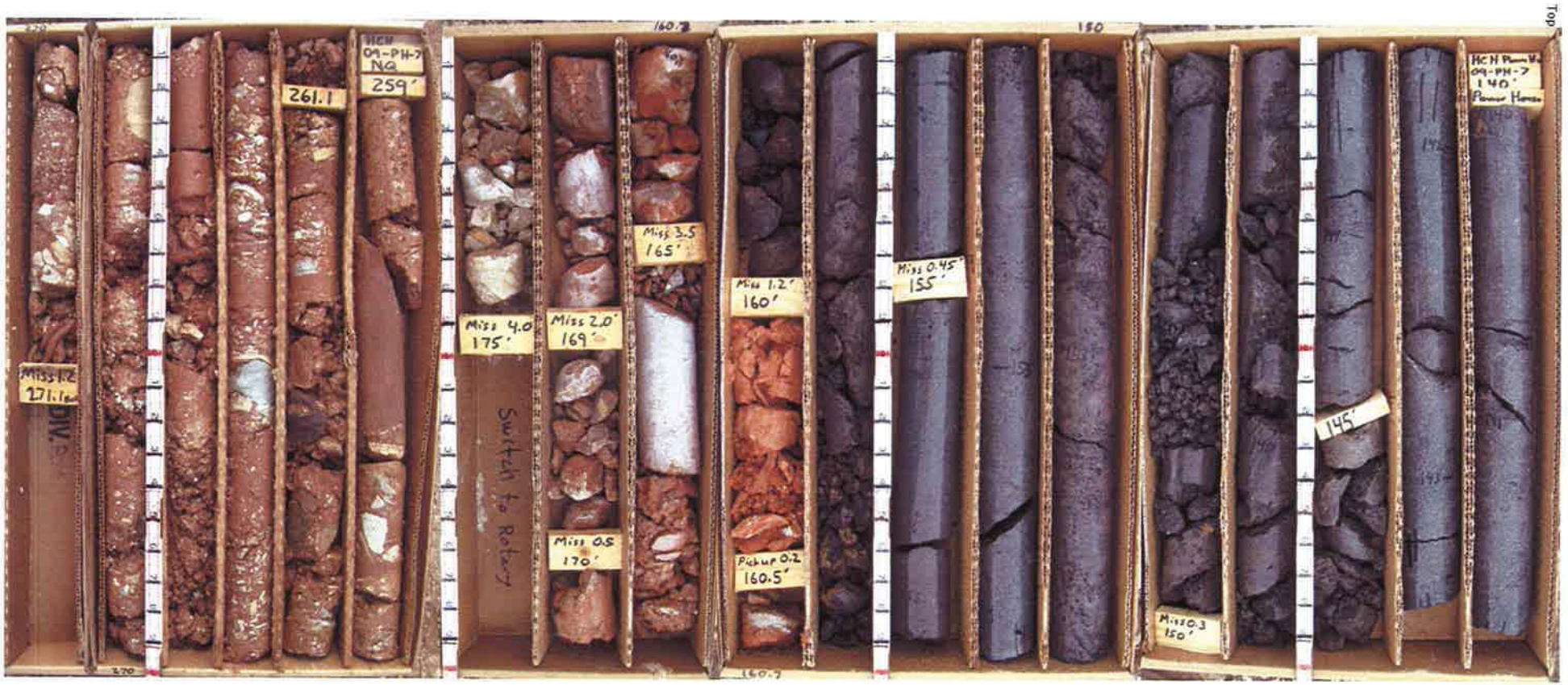
RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-6 Core Photos Wet (Vertical)
Project HCH Afterbay North Dam Site Option 2, WCWCD
Location Washington County, Utah

Core Photos
AB-7





Power House

RB&G ENGINEERING, INC.

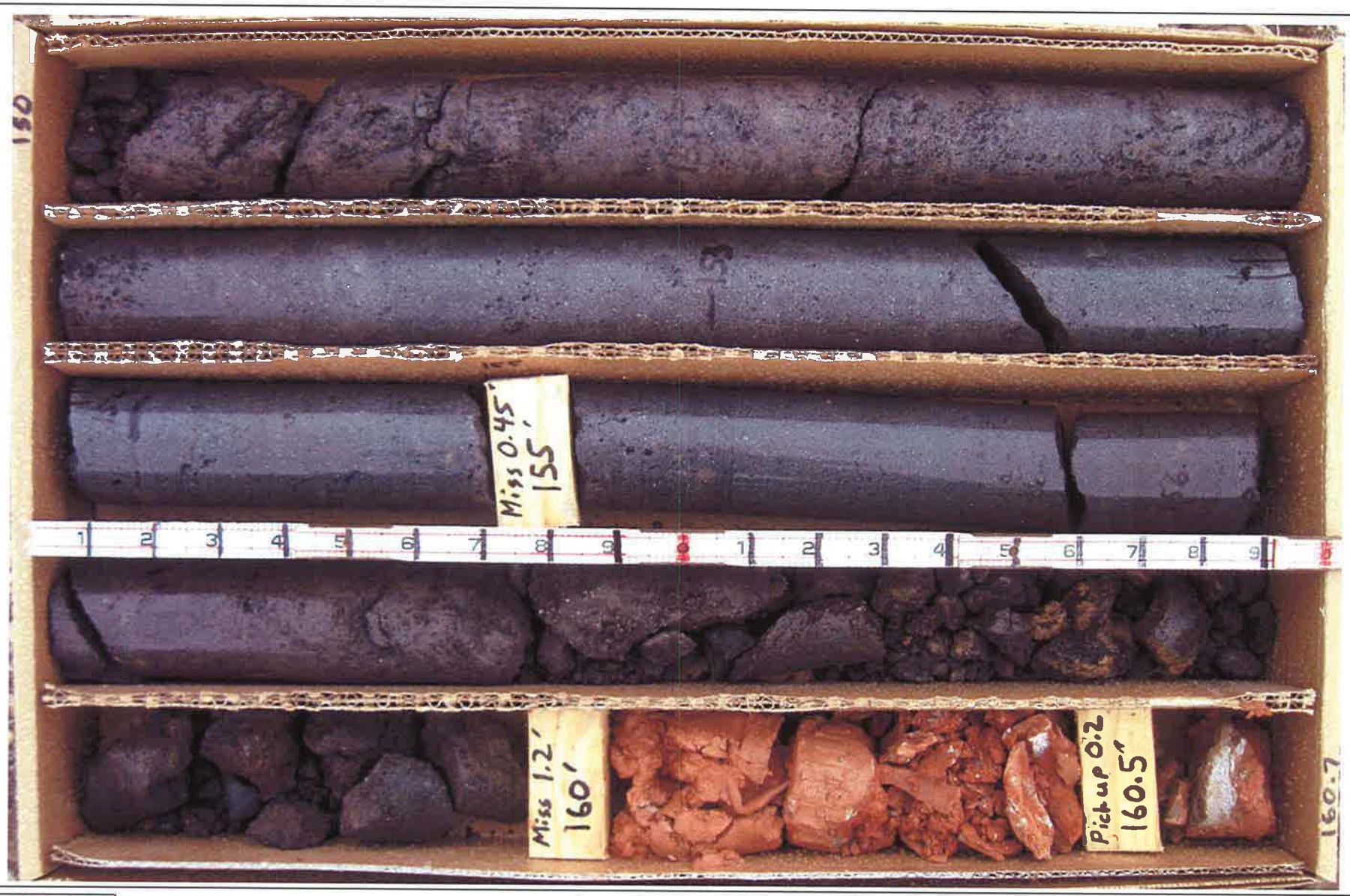
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
Project HCH Afterbay Power House, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
Project HCH Afterbay Power House, WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft

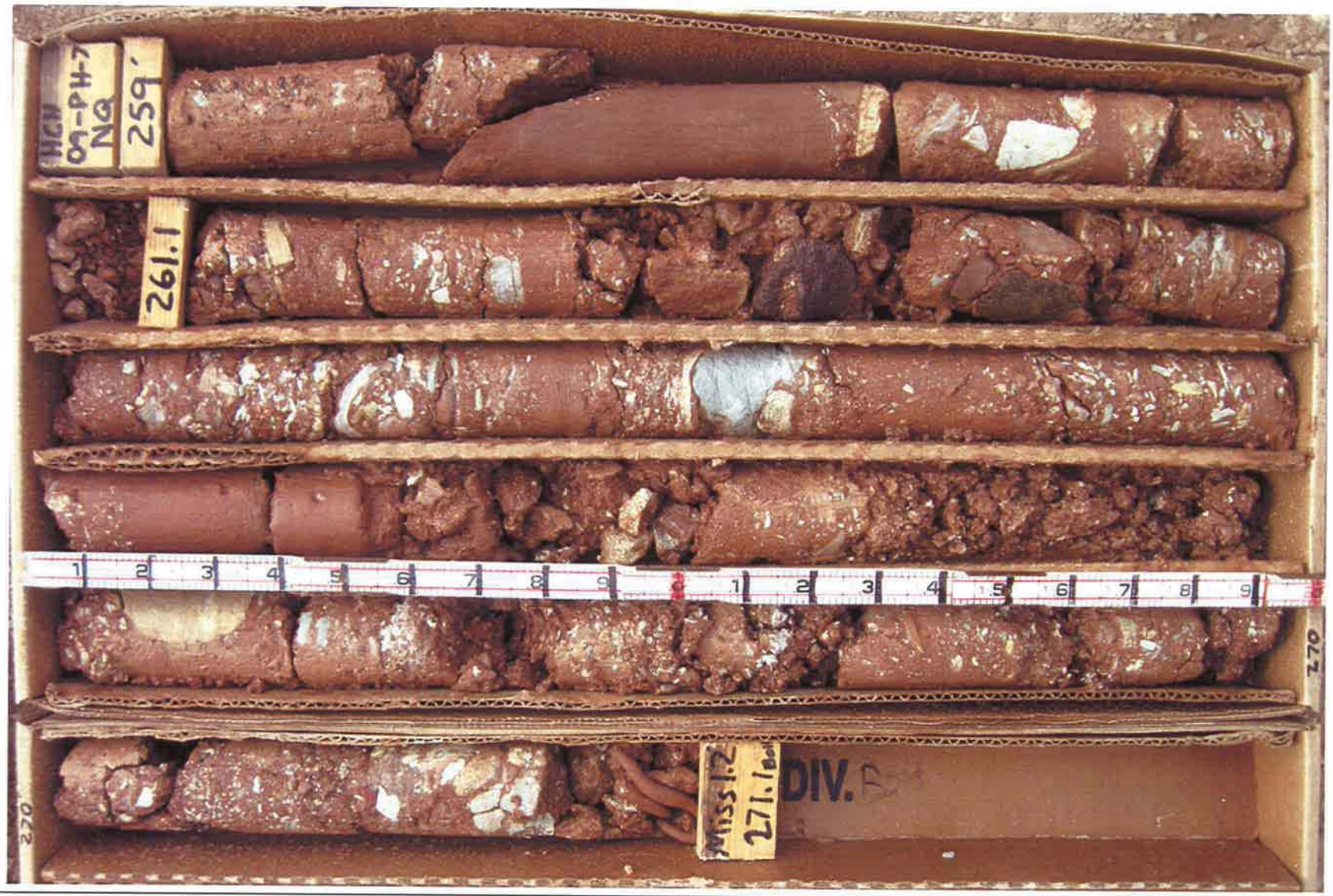
Figure Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
Project HCH Afterbay Power House, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
HCH Afterbay Power House, WCWCD
Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
Project HCH Afterbay Power House, WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

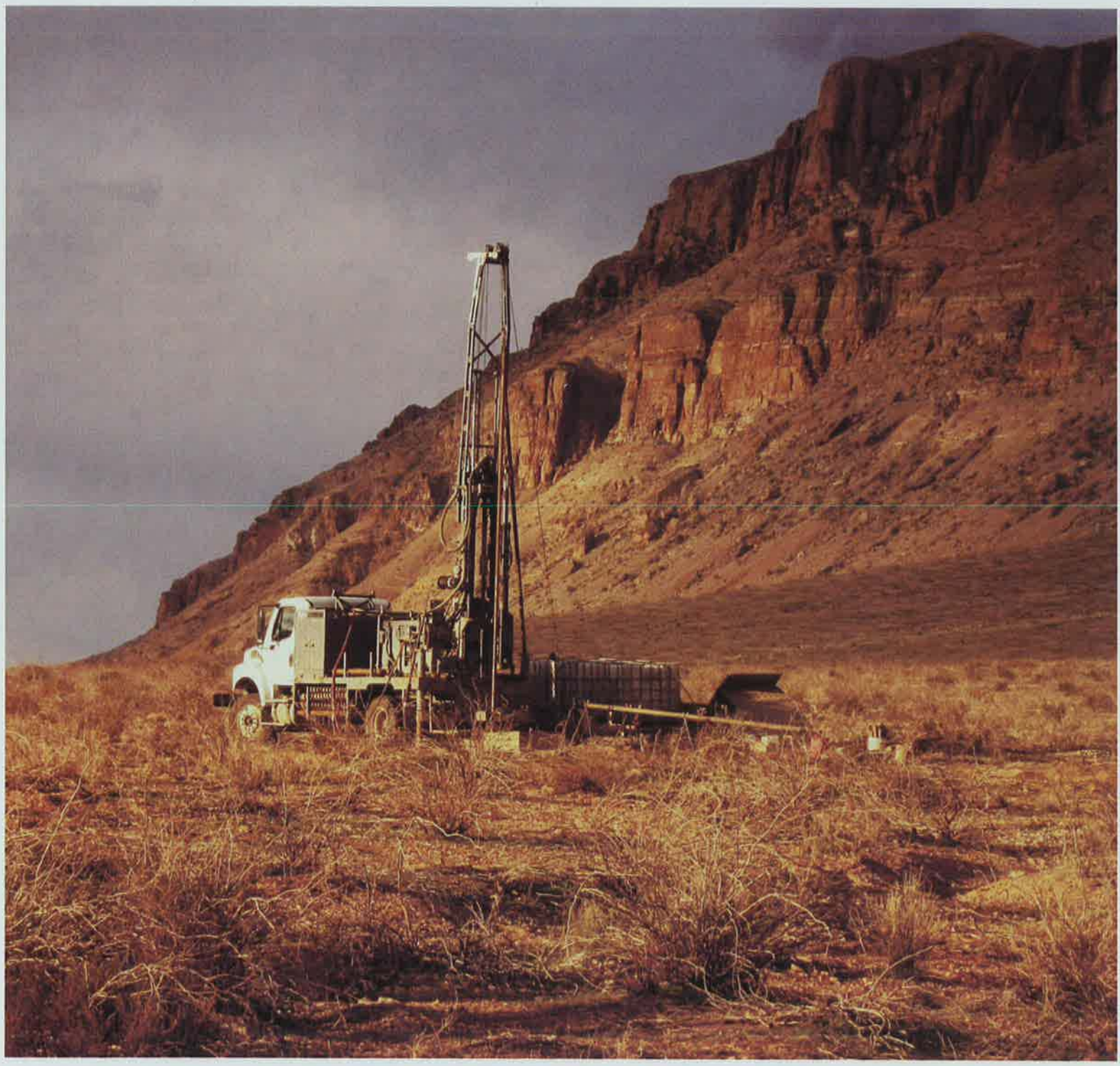
Figure Drill Hole #09-AB-7 Core Photos Wet, (Vertical)
Project HCH Afterbay Power House, WCWCD
Location Washington County, Utah

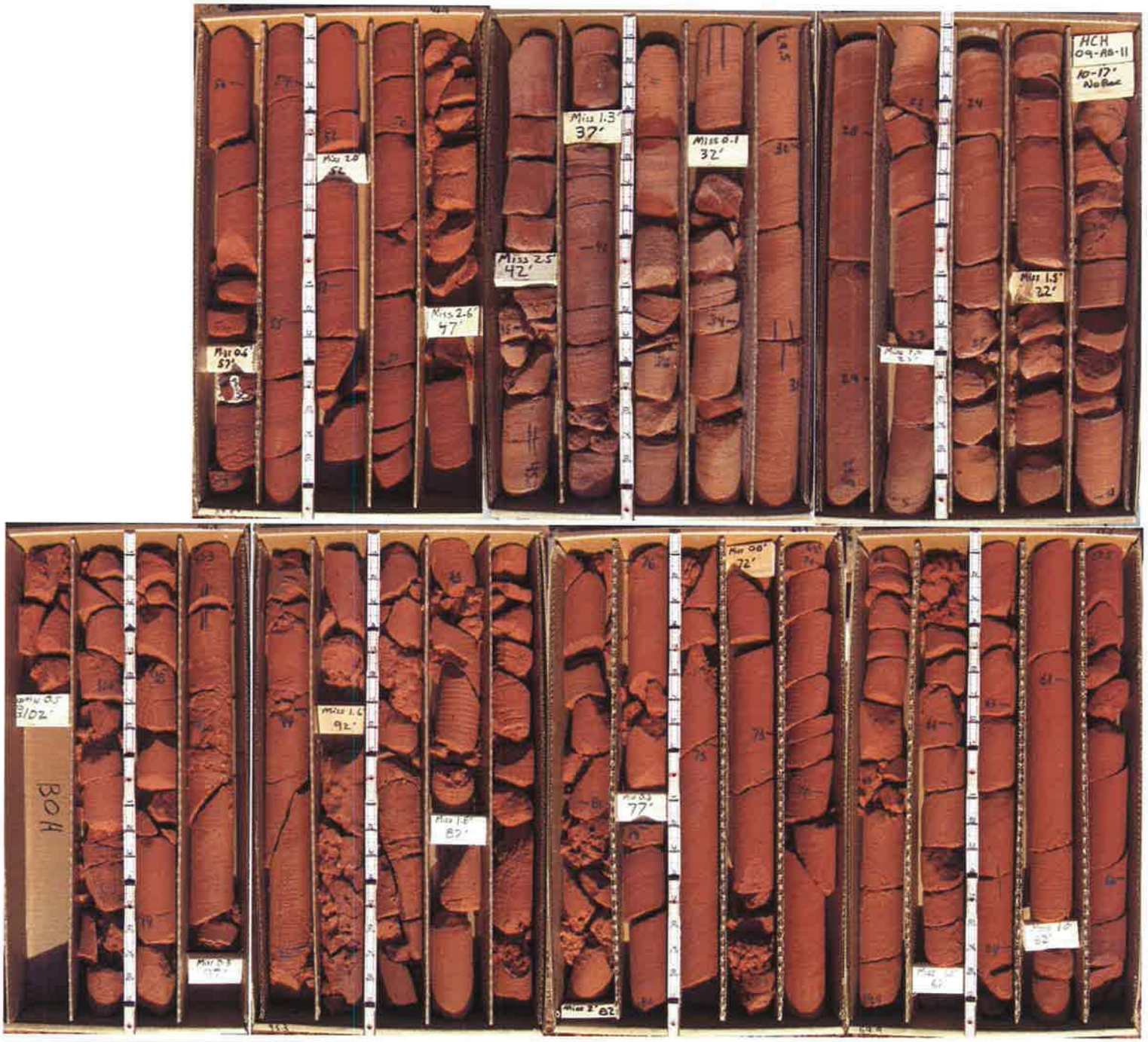
Core Photos
AB-8

RB&G ENGINEERING, INC.

Figure	Drill Hole #09-AB-8 Core Photos Wet (Vertical)
Project	HCH Afterbay Option 4, WCWCD
Location	Washington County, Utah

Core Photos
AB-11





RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project	HCH Afterbay South Dam Site Option 4 WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project	HCH Afterbay South Dam Site Option 4 WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project	HCH Afterbay South Dam Site Option 4 WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project	HCH Afterbay South Dam Site Option 4 WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure	Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project	HCH Afterbay South Dam Site Option 4 WCWCD
Location	Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-11 Core Photos Wet Drilled at 60° dip, Trend N75° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

Core Photos
AB-12

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
HCH Afterbay South Dam Site Option 4 WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

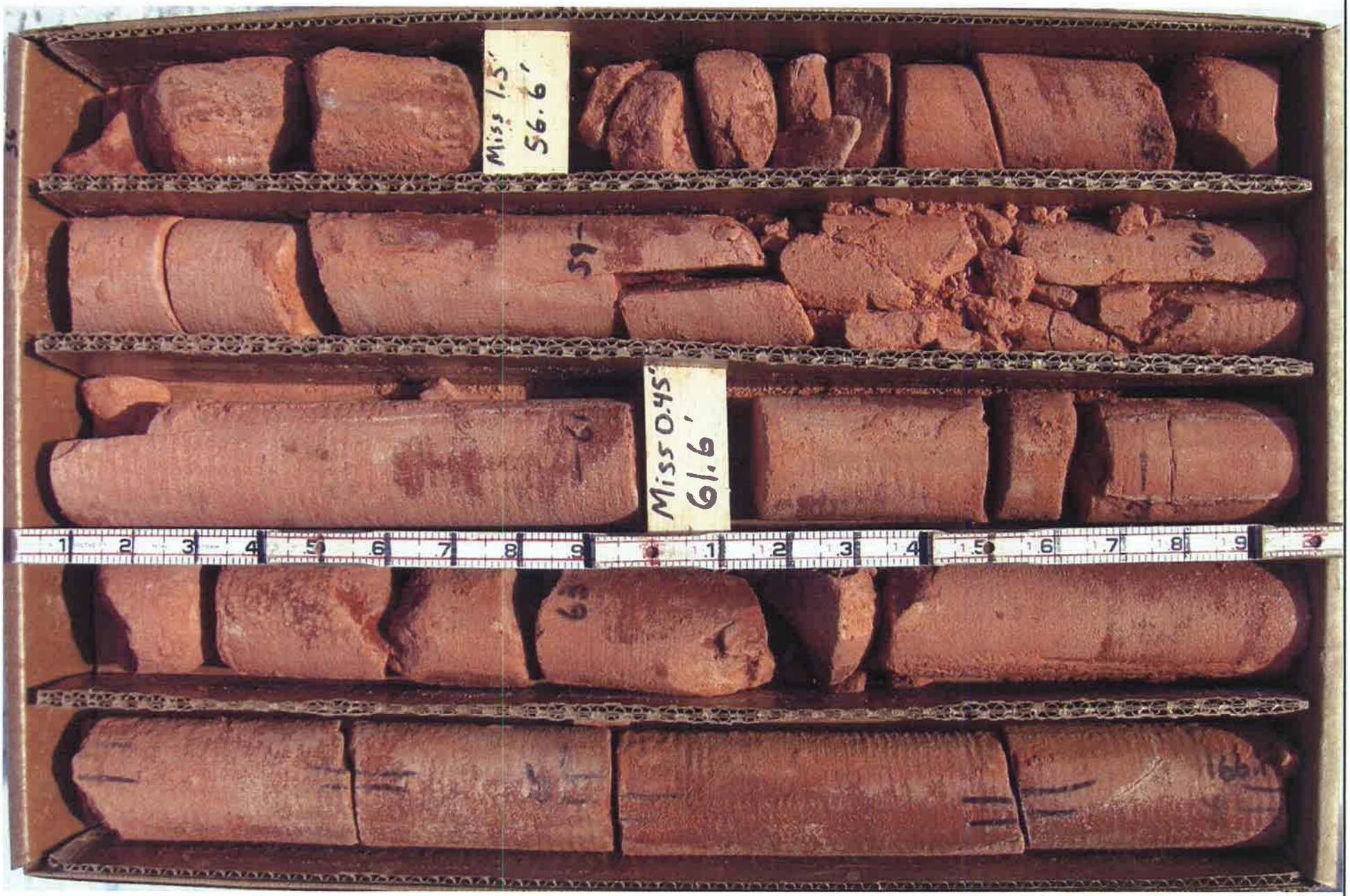
Figure
Project
Location

Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
HCH Afterbay South Dam Site Option 4 WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
HCH Afterbay South Dam Site Option 4 WCWCD
Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

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Length of Core Box 2 ft.

Figure Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure
Project
Location

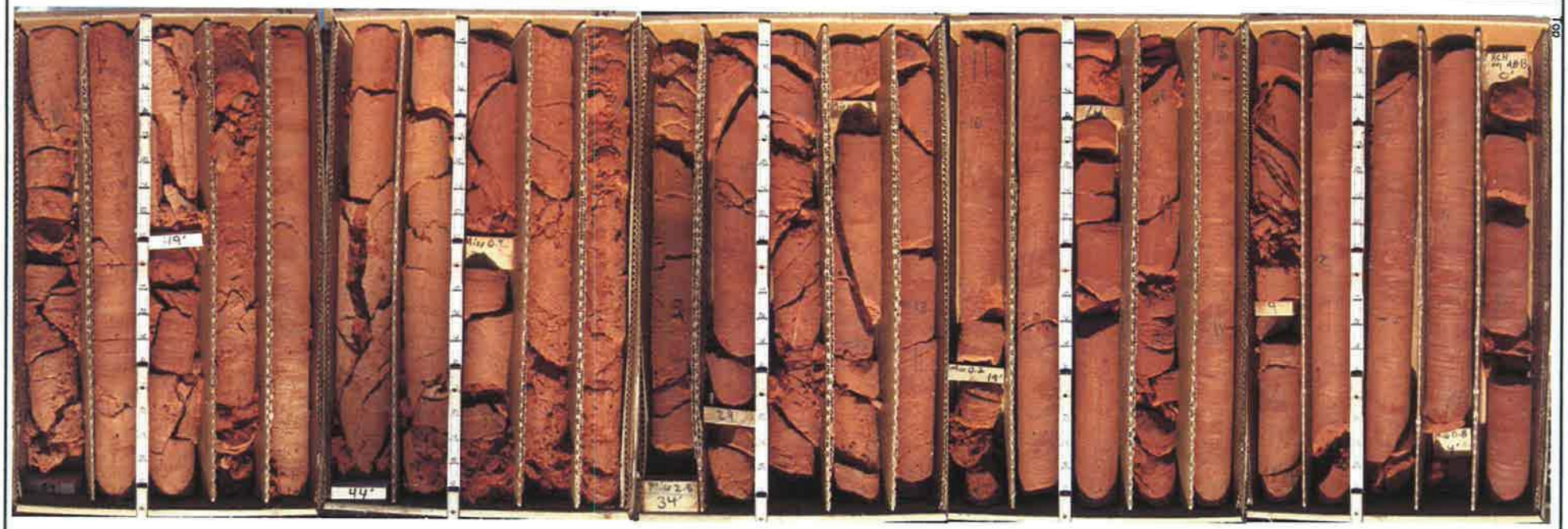
Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
HCH Afterbay South Dam Site Option 4 WCWCD
Washington County, Utah

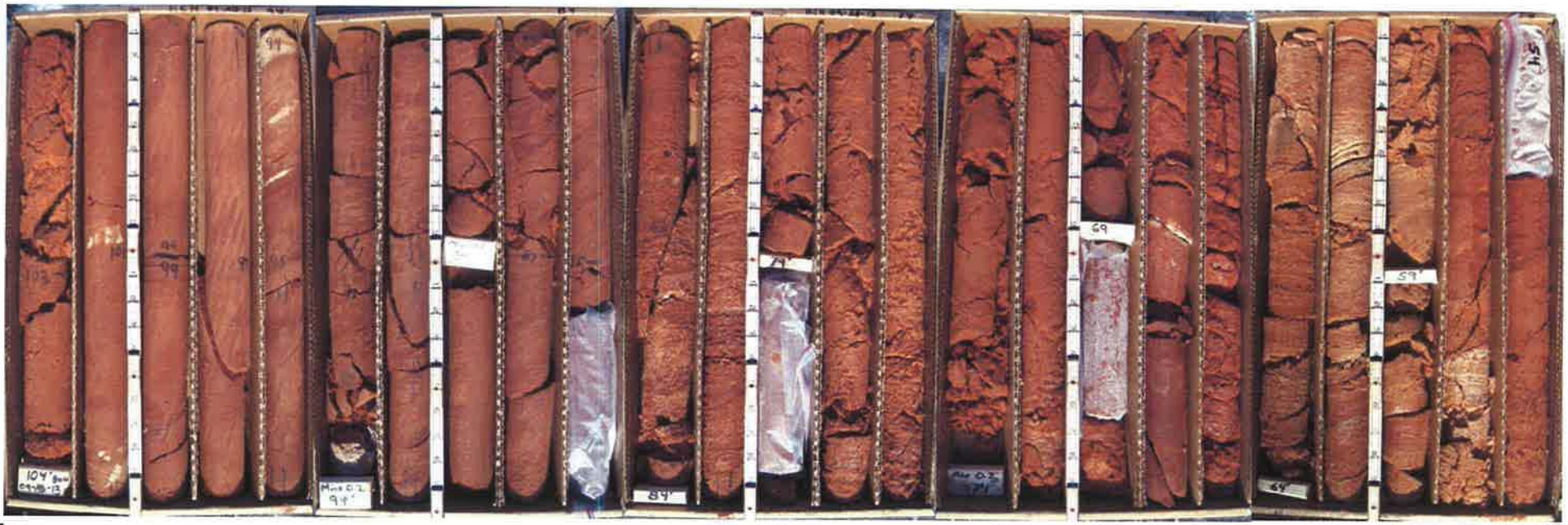
RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-12 Core Photos Damp Drilled at 60 degrees form Horizontal, Trend N 50° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

Core Photos
AB-13





Bottom

RB&G ENGINEERING, INC.

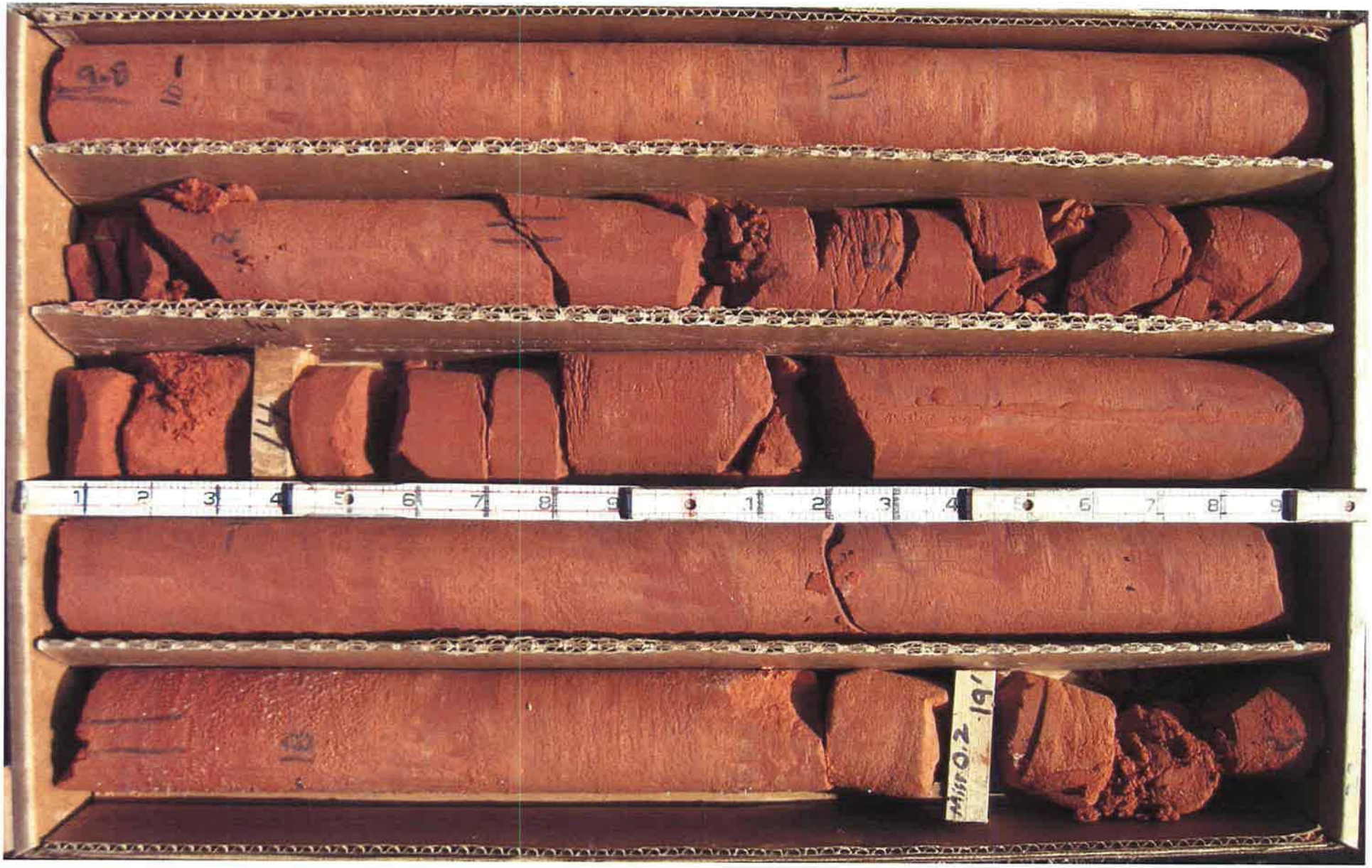
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

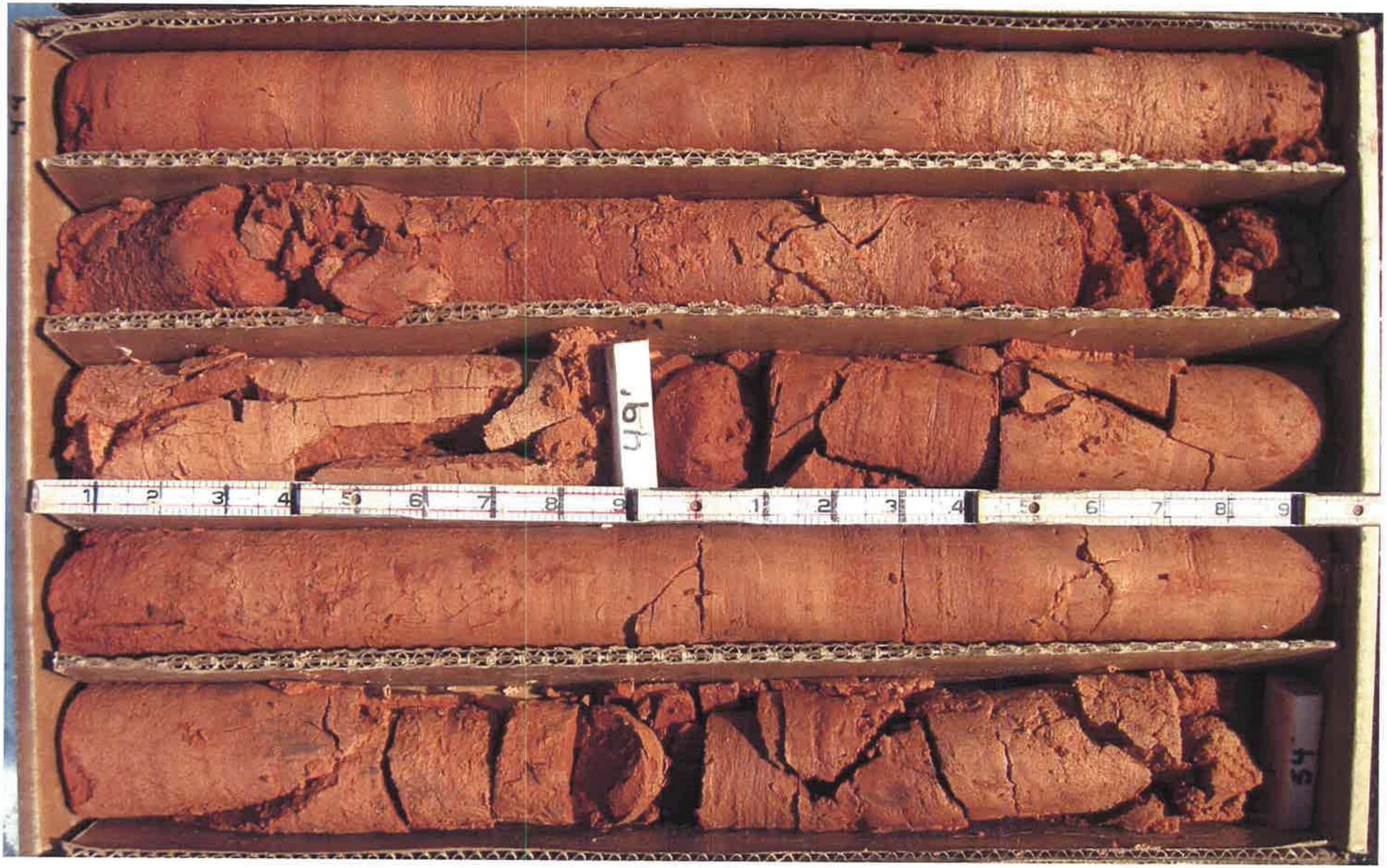
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

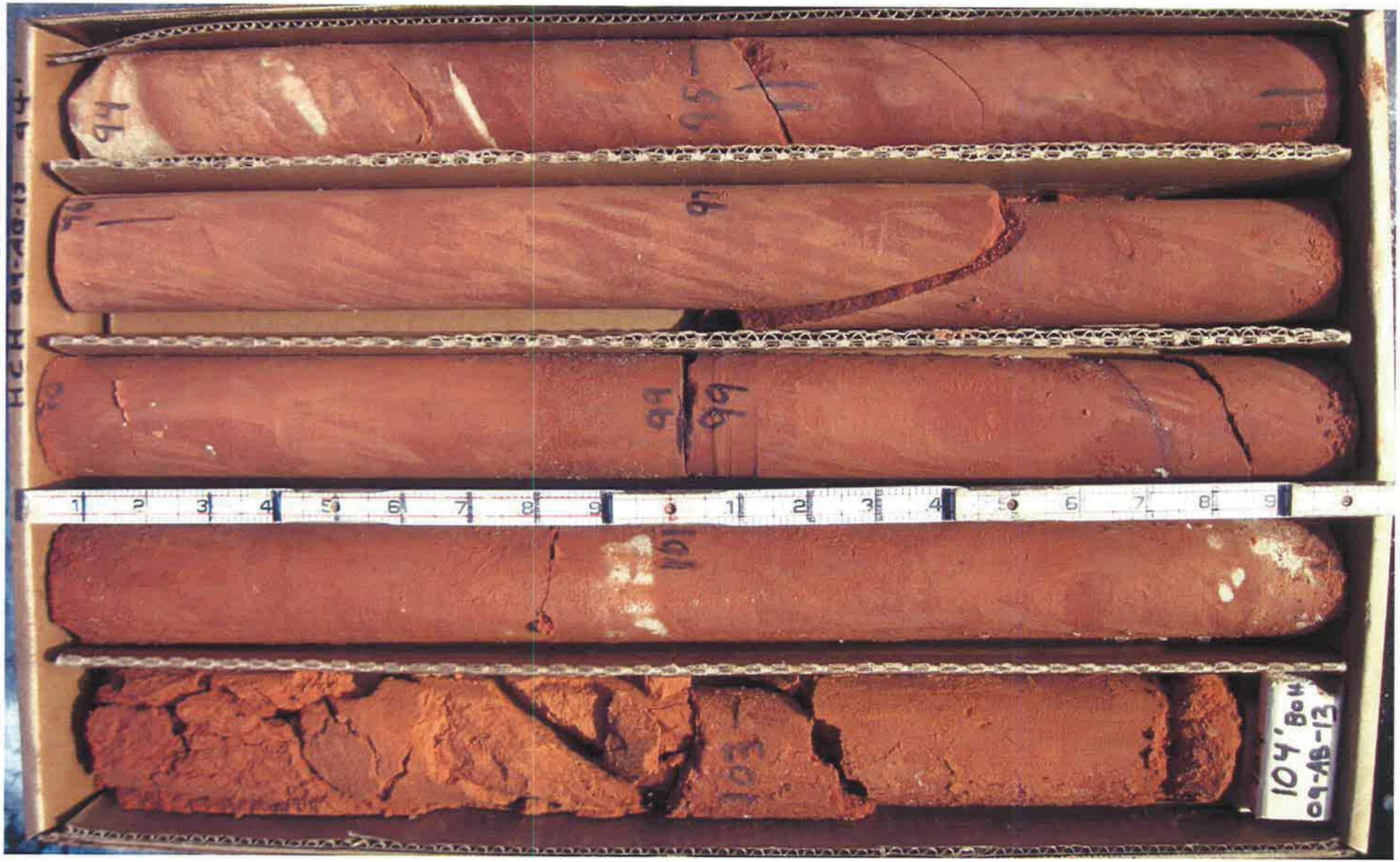
HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

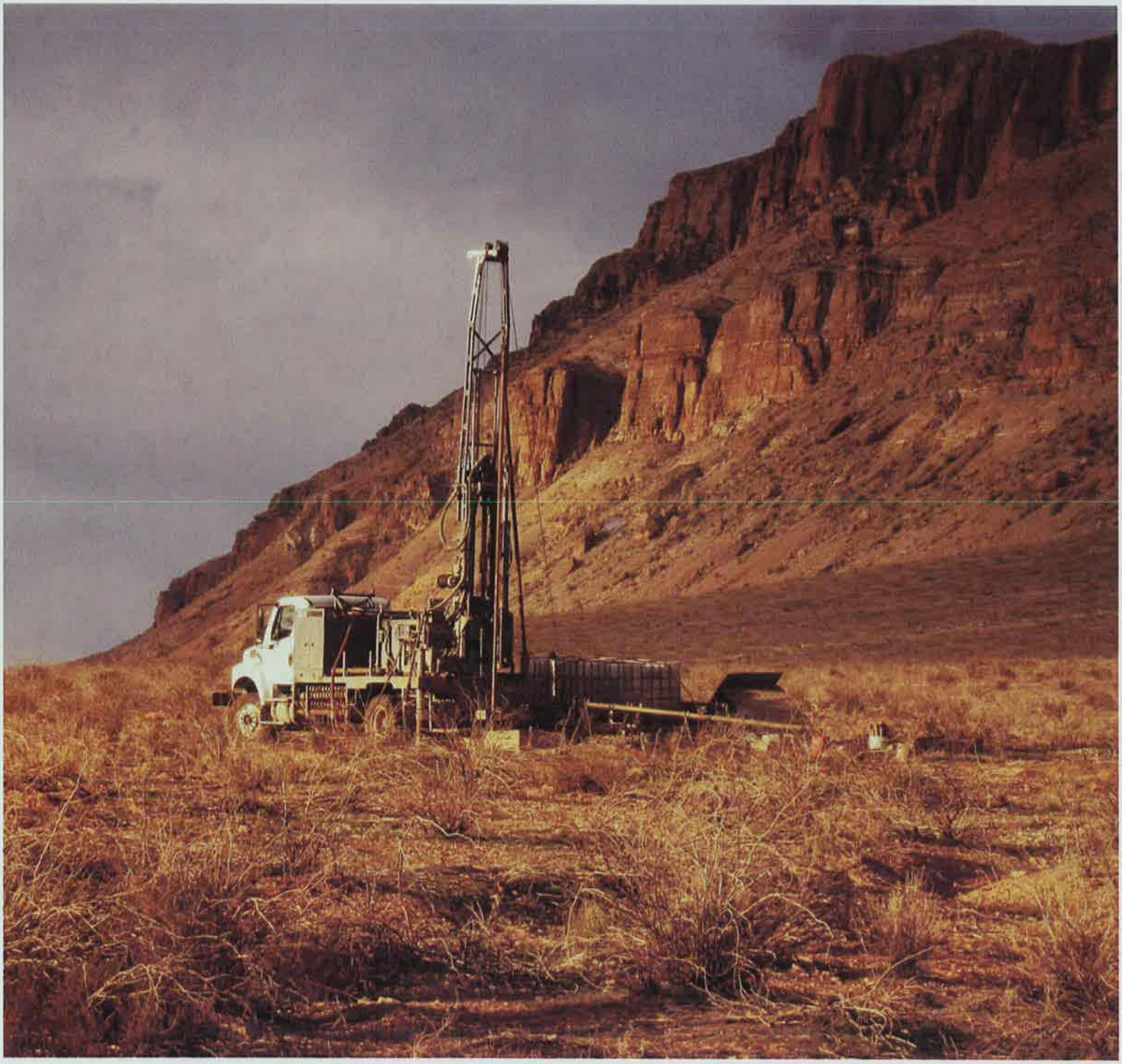


RB&G ENGINEERING, INC.

HQ Core Dia. 2.4 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-13 Core Photos Wet Drilled at 60° dip, Trend N52° W
Project HCH Afterbay South Dam Site Option 4 WCWCD
Location Washington County, Utah

Core Photos
AB-14



RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

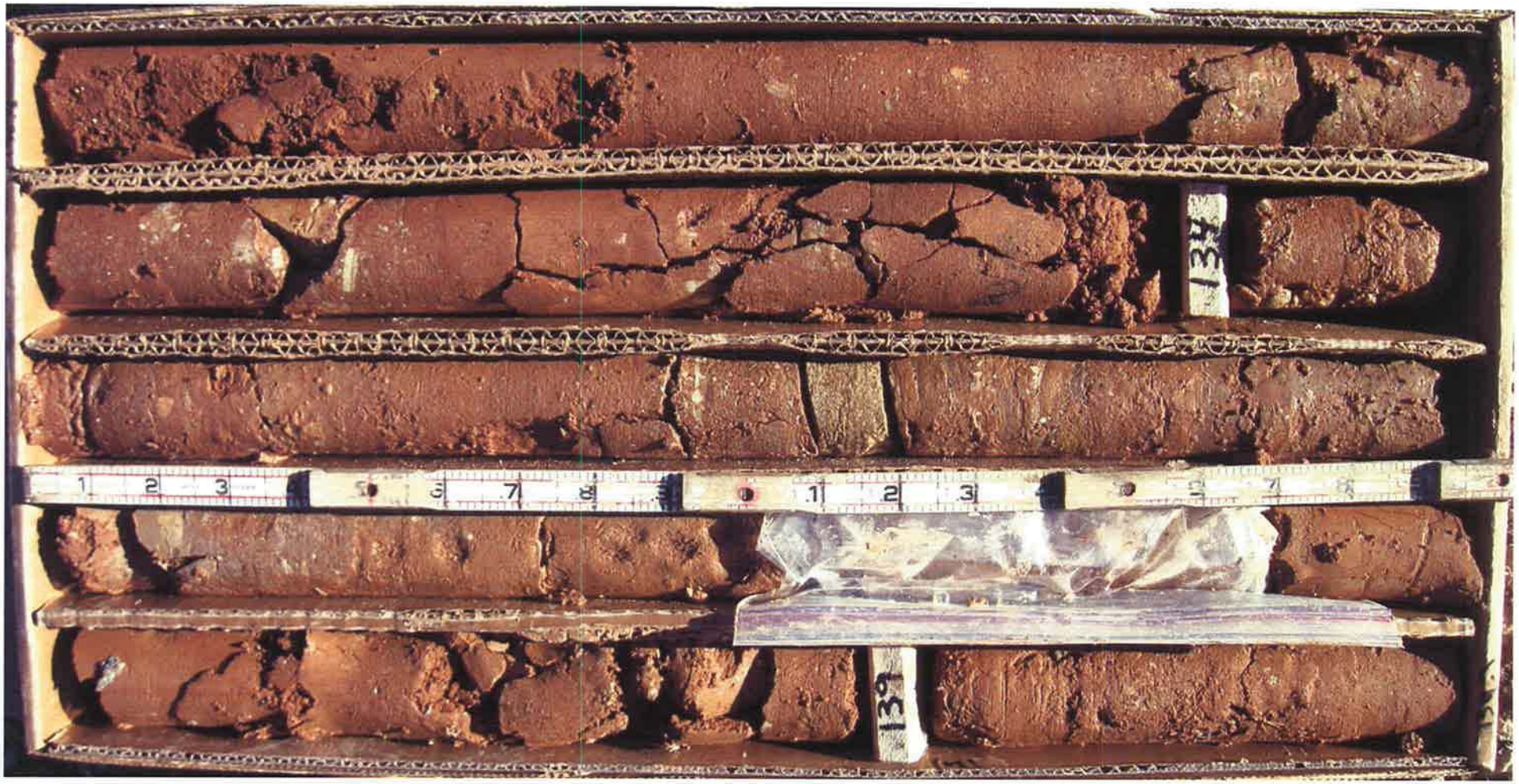
NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

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Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

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Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 A Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

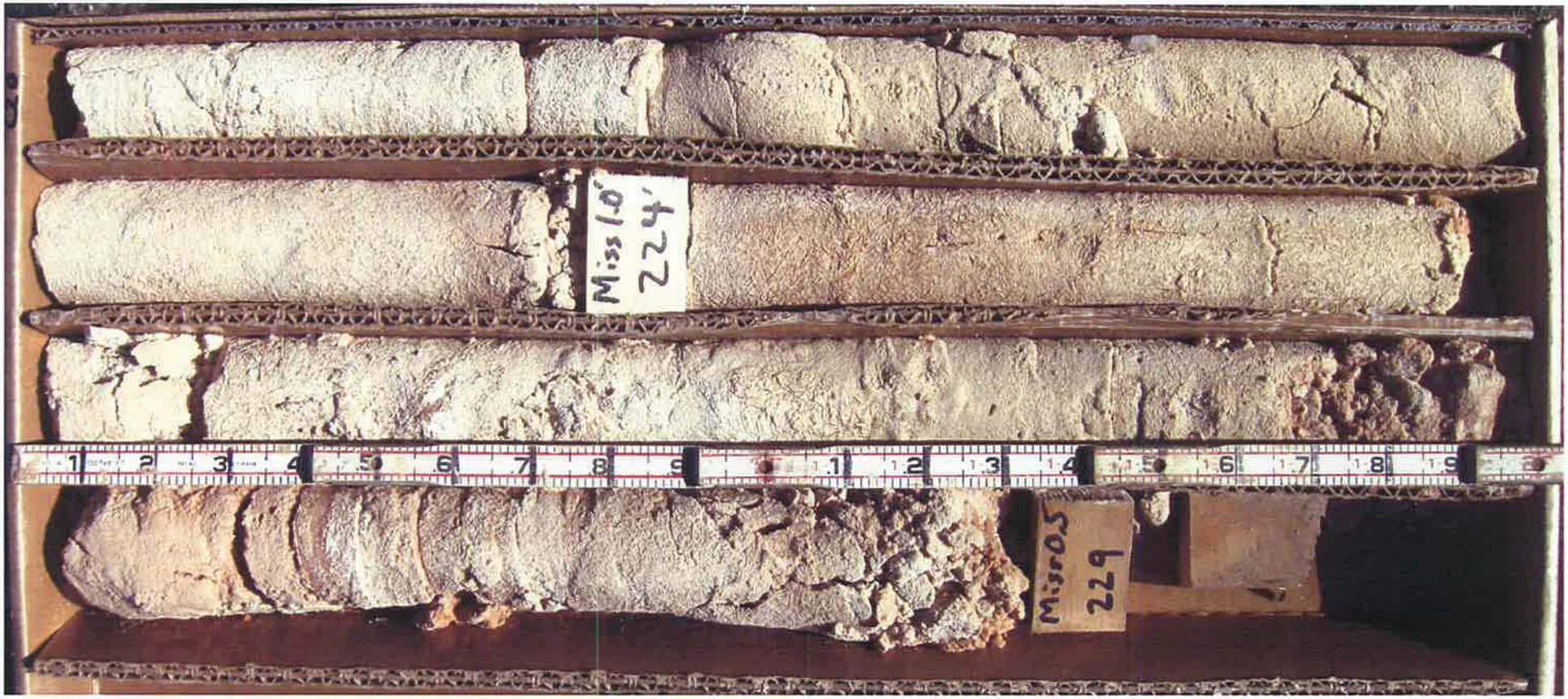
14A

Redrill

RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 A Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah



RB&G ENGINEERING, INC.

NQ Core Dia. 1.875 in.
Length of Core Box 2 ft.

Figure Drill Hole #09-AB-14 A Core Photos Damp
Project HCH Afterbay Power House Location for Option 4 WCWCD
Location Washington County, Utah

Laboratory Testing

RB&G ENGINEERING, INC.

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY Id(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX Is(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		*51*	*108*	*1*	*0*	*51*	*2*	*83*	*1*	*44*	*0*	*0*	*0*	*0*			*67*				*14*	*45*
09-AB-01	5-6.5		5.9			13.0									24	18	6	36	26	38		GC-GM
09-AB-01	10-11.5		3.5														NP	33	49	18		SM
09-AB-01	25-26.5		13.8			12.0									30	21	9	0	4	97		CL
09-AB-01	40-41		12.3			13.4											NP	13	35	52		ML
09-AB-01	55-56.5		11.6			4.5											NP	11	48	41		SM
09-AB-01	70-71.5		6.7														NP	46	46	8		SP-SM
09-AB-01	90.5-91.5	172.7	0.4					1889		12390												
09-AB-01	95.5-96							2360														
09-AB-01	104-105	177.7	0.6					1712		20540												
09-AB-01	108-109							2437														
09-AB-01	113-114	177.4	0.6					1799		18930												
09-AB-01	117-118							1979														
09-AB-01	120-121	174.6	0.9					1539		16910												
09-AB-01	126-127							1594														
09-AB-01	129.5-130.5							1594														
09-AB-01	133.5-134.5	177.3	0.6					1677		7800												
09-AB-01	138.5-139.5	178.2	0.8					1620		15870												
09-AB-01	143-144							1812														
09-AB-01	147-148	162.4	0.2					1894		11950												
09-AB-01	153.5-154.5	132.7	0.2					661		4720												
09-AB-01A	164-165	161.6	0.3					1284		10520												
09-AB-01A	166-168							1926														
09-AB-01A	171.5-172.5	165.4	0.5					1342		8430												
09-AB-01A	175-176	117.1	7.7					18							30	19	11					
09-AB-01A	184-185	167.2	0.8					1070		6900												
09-AB-01A	192-193	132.8	8.1					10									NP	8	88	4		SP

NP=Non-Plastic

RB&G ENGINEERING INC.

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY Id(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX Is(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		51	108	1	0	51	2	83	1	44	0	0	0	0			67				14	45
09-AB-02	5-6.5		10.0														NP	4	50	46		SM
09-AB-02	15-16.5		9.1														NP	62	31	7		GP-GM
09-AB-02	25-26.5		4.3														NP	66	26	8		GP-GM
09-AB-02	32.5-33.5	177.5	0.3					1783		19200												
09-AB-02	39-40							1858														
09-AB-02	41-42	178.5	0.3					1923		13140												
09-AB-02	45-46							1866														
09-AB-02	50-51							2018														
09-AB-02	52-53	176.4	0.2					1990		17690												
09-AB-02	56-57							2064														
09-AB-02	62-63	178.0	0.4					1580		13700												
09-AB-02	68-69							1588														
09-AB-02	73-74	175.5	0.4					1551		10220												
09-AB-02	78-79							1612														
09-AB-02	80-81	180.0	0.7					2086		9790												
09-AB-02	85-86							2103														
09-AB-02	92-93	178.3	0.3					2006		13940												
09-AB-02	95-96							2273														
09-AB-02	129-129.5		11.2														NP	3	92	5		SP-SM
09-AB-03	10-11.5		4.6			3.3											NP	46	38	16		GM
09-AB-03	15-16.5		13.3												33	16	17	11	35	54		CL
09-AB-03	25.5-26.5	170.1	0.5					1634	2452	12310												
09-AB-03	35-37							2043														
09-AB-03	47-48	176.7	0.2					2102		14240												
09-AB-03	55-56							1586														
09-AB-03	65-66	174.5	0.2					1720		19310												

NP=Non-Plastic

RB&G ENGINEERING INC

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY $I_d(2)$, (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX $I_S(50)$	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		51	108	1	0	51	2	83	1	44	0	0	0	0			67				14	45
09-AB-03	75.5-77.5							1586														
09-AB-03	86-87	177	0.3					1662		10850												
09-AB-03	95-96							1681														
09-AB-03	109-110	155.1	0.6					1013		8690												
09-AB-03	113-114							1567														
09-AB-03	121-122	175.1	0.2					1529		8850												
09-AB-03	130-132		0.4							3680							NP	28	68	4		SP
09-AB-04	5-6.5		7.4														NP	39	43	18		SM
09-AB-04	10-10.75					3.9																
09-AB-04	20-20.9					6.0																
09-AB-04	25-26.5		5.8														NP	38	43	19		SM
09-AB-04	30-31					9.3																
09-AB-04	35.0					13.4																
09-AB-04	40-40.5		9.9			11.1											NP	61	32	7		GP-GM
09-AB-04	60-61		10.3														NP	4	53	43		SM
09-AB-04	62.5-64					10.9																
09-AB-04	80-80.9					12.4																
09-AB-04	90.0					14.7																
09-AB-04	100.0					12.5																
09-AB-04	103-104		17.5												29	22	7	17	40	43		SC-SM
09-AB-04	110-111	113.2	14.0			11.3									25	18	7	26	35	40		SC-SM
09-AB-04	111-112					12.8																
09-AB-04	115.5-116.5	105.1	16.2														NP	44	27	30		GM
09-AB-04	118-119					6.1																
09-AB-04	120.0					14.2																
09-AB-04	130.0					13.7																

NP=Non-Plastic

RB&G ENGINEERING INC

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY I_d(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX I_s(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		*51*	*108*	*1*	*0*	*51*	*2*	*83*	*1*	*44*	*0*	*0*	*0*	*0*			*67*				*14*	*45*
09-AB-04	132-133					12.6																
09-AB-04	133-134	117.5	12.1					5							25	21	4	29	46	25		SC-SM
09-AB-04	140.0					12.9																
09-AB-04	150-151	103.0	17.8			10.9											NP	0	54	46		SM
09-AB-04	160-161	108.0	15.3			8.8		5							40	24	16	27	45	28		SC
09-AB-04	170.0					11.1																
09-AB-04	180.0					2.3																
09-AB-04	190-191	149.1	3.3					645		6720												
09-AB-04	198-199							826														
09-AB-04	204-205	177.0	0.4					877		9260												
09-AB-05	0-1.5		17.6												18	15	3	30	41	29	14.5	SM
09-AB-05	5-6.5		5.9												40	32	8	62	17	21	0.7	GM
09-AB-05	20-21.5		8.5														NP	56	31	13		GM
09-AB-05	26-27	183.8	0.1					399		5900												
09-AB-05	44-45.5							2027														
09-AB-05	50-51	188.1	0.2					1925		9550												
09-AB-05	68-69.5							1733														
09-AB-05	75-76	143.8	10.5					347		1360												
09-AB-05	80-82							59														
09-AB-05	94-95							979														
09-AB-05	95-100		15.4												22	18	4	24	40	36	8.1	SC-SM
09-AB-05	111-112	135.7	1.2					903		5110												
09-AB-05	124-125.5							2497														
09-AB-05	131.5-132.5	176.0	0.6					1935		14260												
09-AB-05	145.5-146.5							2420														
09-AB-05	161-162							1598		11070												

NP=Non-Plastic

RB&G ENGINEERING INC.

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY $I_d(2)$, (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX $I_s(50)$	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		*51*	*108*	*1*	*0*	*51*	*2*	*83*	*1*	*44*	*0*	*0*	*0*	*0*			*67*				*14*	*45*
09-AB-05	167-167.5	175.2	1.0																			
09-AB-05	175-176							1536														
09-AB-05	191-192	164.0	0.8					2305		8550												
09-AB-05	206.5-207	171.9	0.6					346		4050												
09-AB-05	215-216	177.1	0.3					2113		12060												
09-AB5	230.5-231.5							2299														
09-AB-05	245-250		7.5														NP	0	97	3		SP
09-AB-06	5-6.5	99.7	6.7	x											21	18	3	0	26	75		ML
09-AB-06	15-16.5		6.2												28	17	11	36	36	28		GC
09-AB-06	25-26.5		11.3												29	28	1	20	42	38	2.9	SM
09-AB-06	30-31.5					12.7																
09-AB-06	35-36		11.6														NP	41	45	14	3.3	SM
09-AB-06	50-51.5		29.7														NP	46	48	6	1.6	SP-SM
09-AB-06	60-61	158.4	0.2				99.2	960		4090												
09-AB-06	77-78	173.7	0.2					1628		7580												
09-AB-06	80-81.5							1724														
09-AB-06	87-89							1916														
09-AB-06	102-103	175.3	0.3				99.1	1935		7160												
09-AB-06	107-107.5	165.7	0.7					479		6600												
09-AB-06	118-119.5							1149														
09-AB-06	122-122.5	164.3	1.3					1724		9530												
09-AB-06	1325-134							1911														
09-AB-06	140.5-141	176.5	0.6					1786		7240												
09-AB-06	155-160		23.5												39	19	20	4	55	41		SC
09-AB-06	165-166	117.7	6.7					32		1670							NP	0	84	16		SM
09-AB-07	5-6.5		12.0												36	25	11	48	33	19	1.5	GM

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RB&G ENGINEERING INC

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY I_d(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX I_s(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		51	108	1	0	51	2	83	1	44	0	0	0	0			67				14	45
09-AB-07	15-16.5		10.8												34	15	19	32	33	35	1.1	SC
09-AB-07	25-26.5		9.4												40	28	12	36	30	34	1.2	GM
09-AB-07	45-46		8.1												28	28	0	45	39	16	1.6	GM
09-AB-07	50.0					11.6																
09-AB-07	60.0					15.5																
09-AB-07	70.0					15.8																
09-AB-07	75-76		13.4												43	29	14	34	33	33	1.8	GM
09-AB-07	85.0					20.7																
09-AB-07	95.0					15.0																
09-AB-07	105.0					15.3																
09-AB-07	125.0					11.1																
09-AB-07	142-142.5									3100												
09-AB-07	143.4-143.6							396														
09-AB-07	155.9-156.1							342														
09-AB-07	160-160.5		14.1			0.7									21	13	8	22	26	52	16.5	CL
09-AB-07	165.5-166		7.3												20	17	3	69	23	8	4	GP-GM
09-AB-07	170.0					1.6																
09-AB-07	185.0					0.7																
09-AB-07	200.0					2.1																
09-AB-07	260-260.5		5.3												27	19	8	44	25	31		GC
09-AB-07	270-270.5		8.1												26	20	6	20	40	40	5.9	SC-SM
09-AB-08	2.5-4		11.6												28	27	1	30	52	18		SM
09-AB-08	5-6.5					13.2																
09-AB-08	7.5-9		7.0			15.1											NP	32	34	34		SM
09-AB-08	15-16.5		5.6			11.5									18	15	3	26	44	30		SM
09-AB-08	25-26.5		4.4														NP	32	31	37		GM

NP=Non-Plastic

RB&G ENGINEERING INC.

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY Id(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX Is(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		51	108	1	0	51	2	83	1	44	0	0	0	0			67				14	45
09-AB-08	30-31.5		9.0			0.5											NP	2	87	11		SP-SM
09-AB-08	57-58		0.1					39									NP	1	80	19		SM
09-AB-09	0-1.5		0.8														NP	28	33	39		SM
09-AB-09	2.5-4					7.6																
09-AB-09	5-6.5		10.1												39	25	14	25	38	37		SM
09-AB-09	12.5-14		7.1														NP	28	51	21		SM
09-AB-09	15-16					4.8																
09-AB-09	20-21.5		6.6														NP	24	53	23		SM
09-AB-09	25-26.5		8.7												37	20	17	28	42	30		SC
09-AB-09	30-31					14.0																
09-AB-09	35-36.5		4.6														NP	18	49	33		SM
09-AB-09	45-46.5		5.1			11.0											NP	19	46	35		SM
09-AB-09	55-56.5		13.0												23	17	6	4	39	57		CL-ML
09-AB-10	2.5-4		8.0			14.4											NP	48	27	25		GM
09-AB-10	7.5-9		8.2			15.0											NP	23	37	40		SM
09-AB-10	10-11.5		6.2			9.4											NP	49	32	19		GM
09-AB-10	20-21.5		5.7			6.1											NP	36	38	26		SM
09-AB-10	30-31		7.4			7.8											NP	34	43	23		SM
09-AB-10	40-41		5.9														NP	28	45	27		SM
08-AB-10	45-46					8.6																
09-AB-11	20-24	120.7	5.4					10									NP					SP-SM
09-AB-11	29.5-31	125.5	5.8				1.54x10-4			uc 1634							NP					SP-SM
09-AB-11	40-45	129.7	4.4					15									NP					SP-SM
09-AB-11	51-52	128.9	5.2							uc 2037							NP					SP-SM
09-AB-11	61-63	131.7	7.7				2.38x10-5	8									NP					SP-SM
09-AB-11	70-72	122.1	5.3							uc 1362							NP					SM

NP=Non-Plastic

RB&G ENGINEERING INC

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY Id(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX Is(50)	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		51	108	1	0	51	2	83	1	44	0	0	0	0			67				14	45
09-AB-11	80-85	132.3	3.3					11									NP					SM
09-AB-11	91-92	117.3	8.0							uc 900							NP					SP-SM
09-AB-11	98-102	115.0	9.5					4									NP					SP-SM
09-AB-12	5-6.5		5.4														NP					GM
09-AB-12	19-21	126.4	5.7														NP					SM
09-AB-12	20-30							5														
09-AB-12	33-36	113.2	8.4				1.07x10-4	4		uc 920							NP					SP-SM
09-AB-12	44-46							4														
09-AB-12	54-56	115.7	6.7					27		uc 1020							NP					SM
09-AB-12	63-66						2.41x10-5	25														
09-AB-12	74-77	120.9	6.0					37		uc 2620							NP					SM
09-AB-12	85-87							17														
09-AB-12	95-97	124.0	5.5					39		uc 2360							NP					SM
09-AB-13	0-4	133.2	5.9					90									NP					SM
09-AB-13	10-11	129.1	7.1							uc 3600							NP					SM
09-AB-13	22-25	121.5	10.7				6.57x10-6	5									NP					SM
09-AB-13	29-30									uc 870												
09-AB-13	34-35	111.2	20.5														NP					SM
09-AB-13	39-44	117.7	14.0					3									NP					SM
09-AB-13	53-55	135.0	8.2				5.20x10-6			uc 1740							NP					ML
09-AB-13	60-64	125.2	9.7					6									NP					SM
09-AB-13	69-72	112.6	17.7							uc 3240							NP					SM
09-AB-13	80-84	126.1	10.4					3									NP					SM
09-AB-13	90-91	130.7	7.8							uc 670							NP					SM
09-AB-13	100-103	126.9	8.7				4.72x10-6	3									NP					ML
09-AB-14	5-6.5		12.5														NP					SM

NP=Non-Plastic

RB&G ENGINEERING INC

Table 1

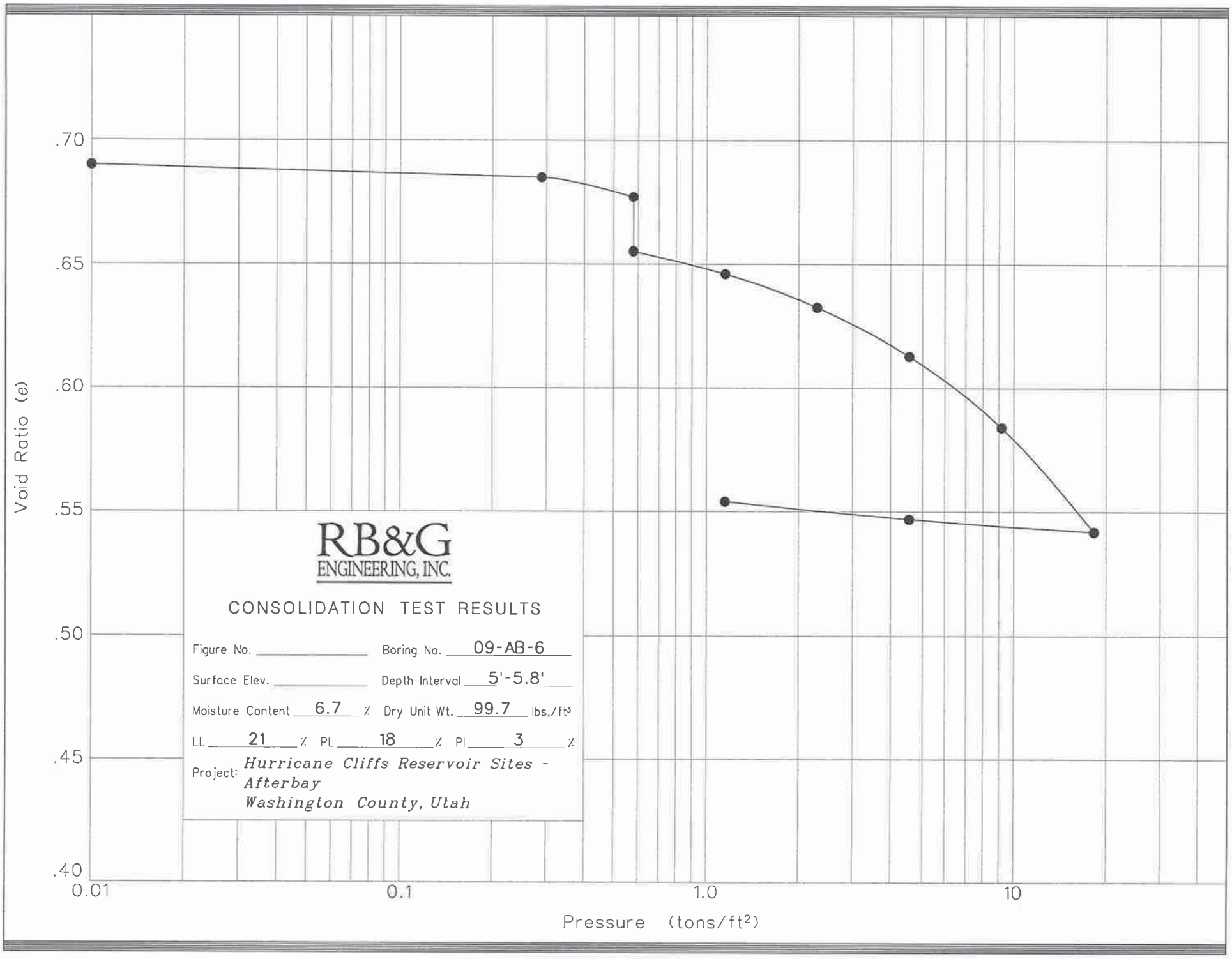
SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites / Afterbay

PROJECT: 200804.007.2 / Foundation Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY I_d(2), (%) / PERMEABILITY (cm/sec)	POINT LOAD INDEX (I_s(50))	INDIRECT TENSILE STRENGTH (psi)	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		*51*	*108*	*1*	*0*	*51*	*2*	*83*	*1*	*44*	*0*	*0*	*0*	*0*	*67*						*14*	*45*
09-AB-14	15-16.5		5.2												21	19	2					GM
09-AB-14	50-51.5		6.9												24	19	5					SC-SM
09-AB-14	91-94	113.8	13.2							uc 250					30	17	13					SC
09-AB-14	101-105	114.4	12.3					23							44	32	12					ML
09-AB-14	109-110	108.1	18.1												38	23	15					SC
09-AB-14	114-115									uc 180												
09-AB-14	121-124	111.7	18.3					3							43	29	14					ML
09-AB-14	131-133	105.3	18.9							uc 220					34	18	16					CL
09-AB-14	140-144	109.8	19.8					2							40	25	15					CL
09-AB-14	150-151	112.7	16.3							uc 120					38	19	19					CL
09-AB-14	160-164	117.6	11.4					2							37	26	11					SM
09-AB-14	170-172	122.7	12.0							uc 320					33	20	13					SC
09-AB-14	180-185	115.0	15.5					3		uu 361					41	24	17					CL
09-AB-14	190-192	124.9	12.3							uc 380					48	27	21					SC
09-AB-14	200-204	126.6	10.4					4							53	25	28					SC
09-AB-14	211-212	119.7	14.1														NP					SP-SM
09-AB-14	221-222	118.3	9.3														NP					SP-SM

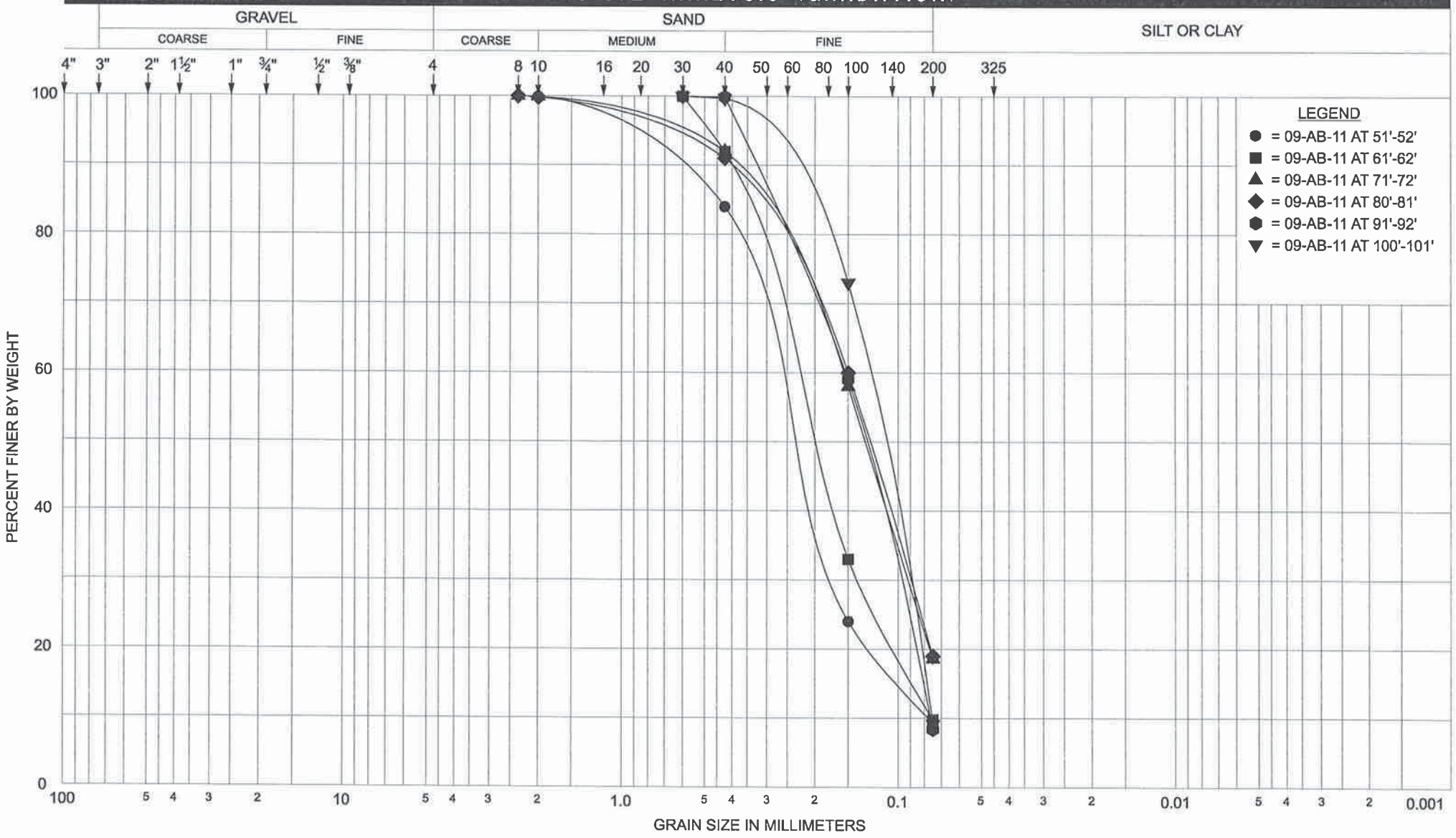
NP=Non-Plastic


.70
.65
.60
.55
.50
.45
.40
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. 09-AB-6
Surface Elev. _____ Depth Interval 5'-5.8'
Moisture Content 6.7 % Dry Unit Wt. 99.7 lbs./ft³
LL 21 % PL 18 % PI 3 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200804.007		

SIEVE ANALYSIS (GRADATION)



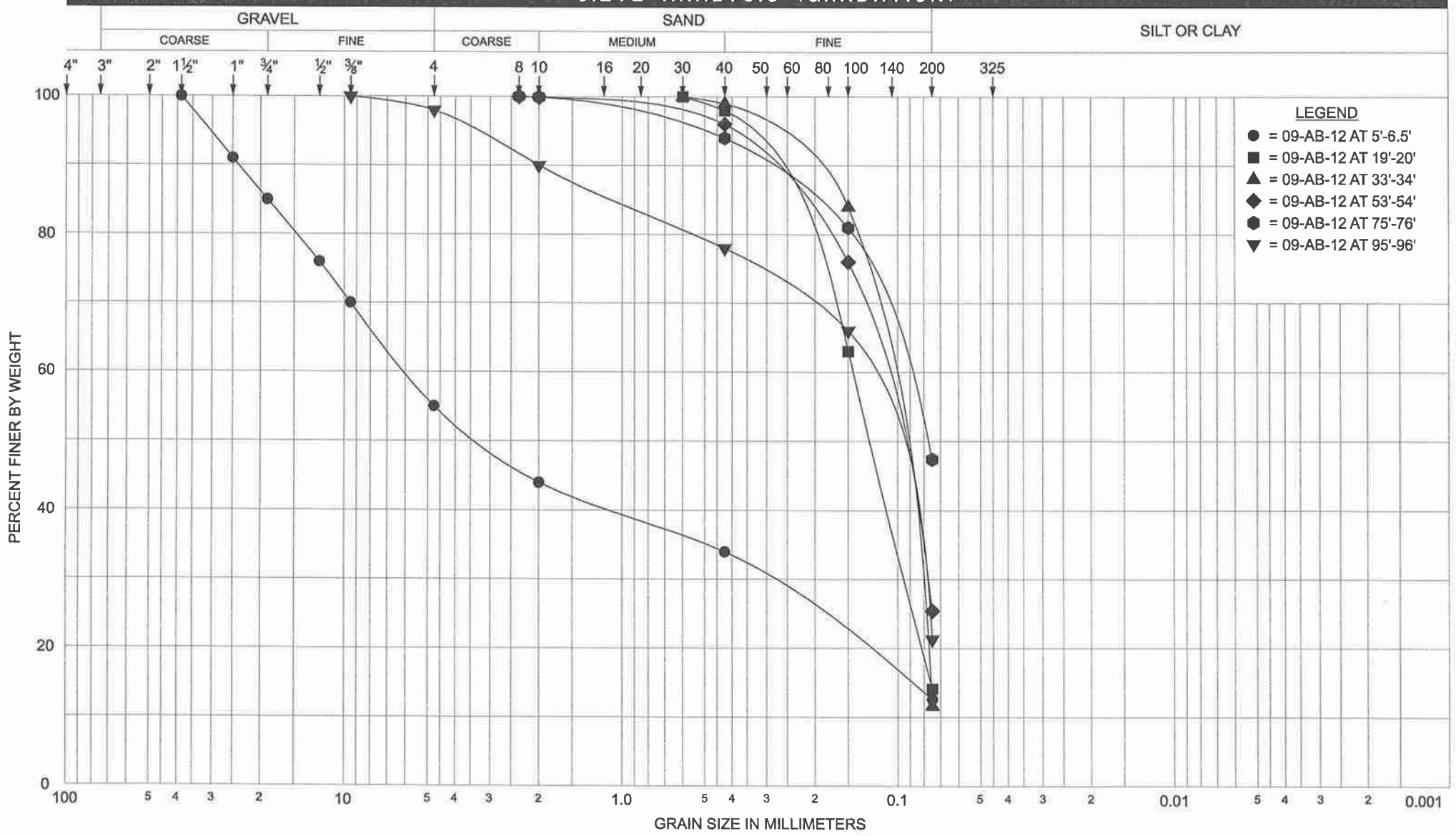
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	BORING 09-AB-11 (SEE LEGEND)		
Material Description	-	USCS	-

Date	01/11/10
Technician	K. MARTINEZ
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200804.007

SIEVE ANALYSIS (GRADATION)



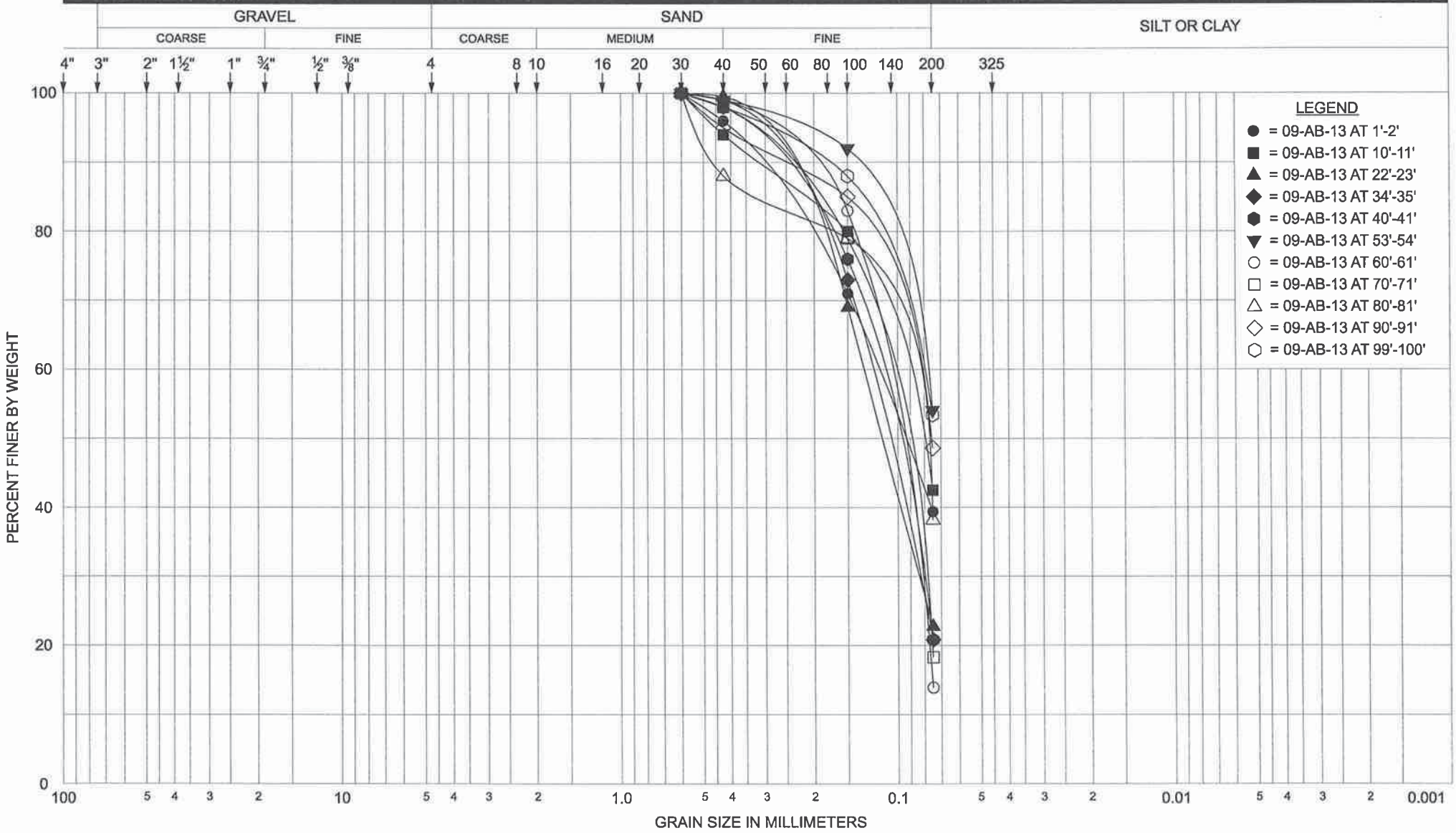
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	BORING 09-AB-12 (SEE LEGEND)		
Material Description	-	USCS	-

Date	01/04/10 TO 01/05/10
Technician	S. CHAFFIN, K. MARTINEZ
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200804.007		

SIEVE ANALYSIS (GRADATION)



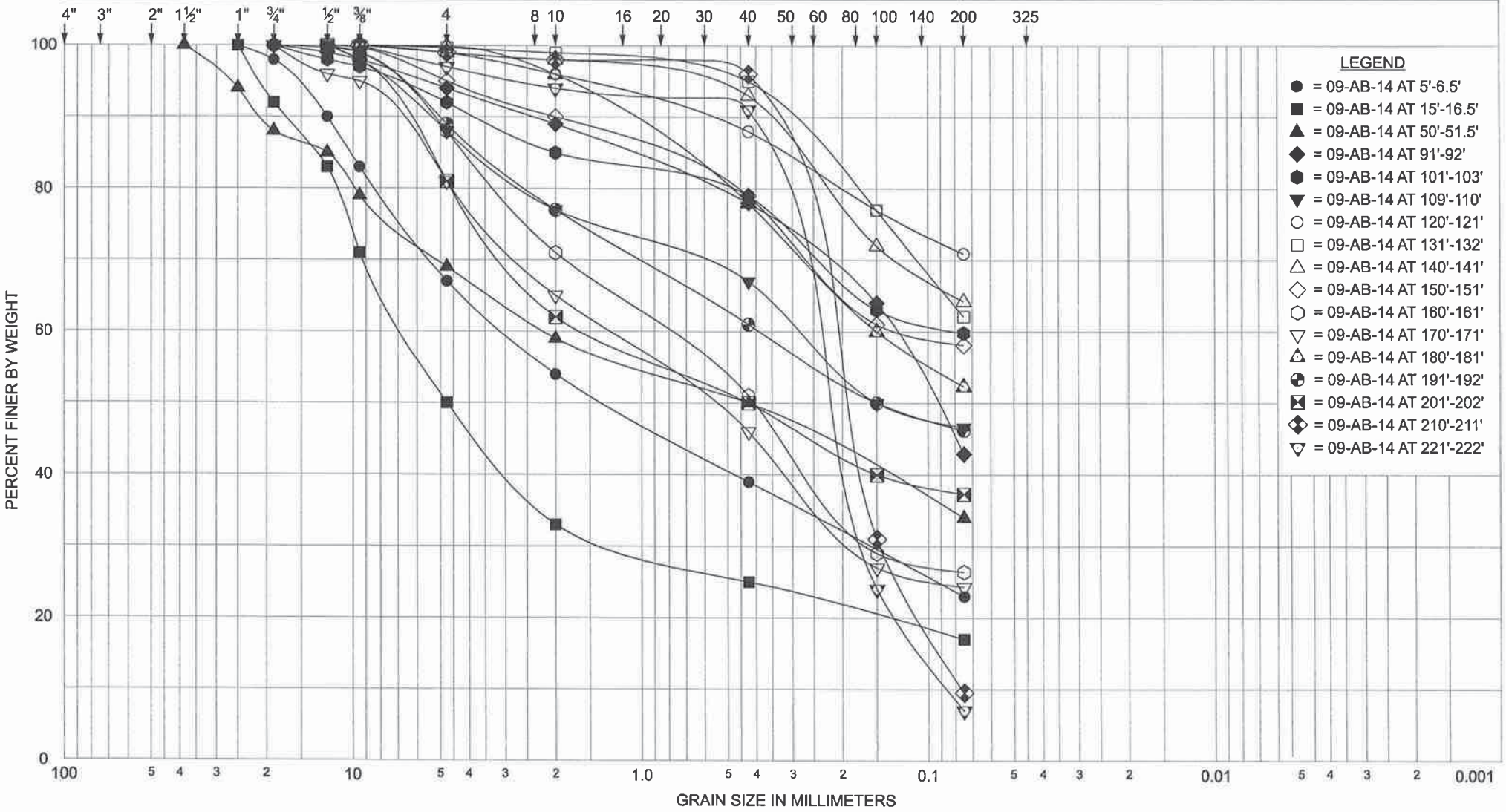
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	BORING 09-AB-13 (SEE LEGEND)		
Material Description	-	USCS	-

Date	01/12/10 TO 01/13/10
Technician	K. MARTINEZ
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566

1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200804.007		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	BORING 09-AB-14 (SEE LEGEND)		
Material Description	-	USCS	-

Date	01/14/10 TO 03/11/10
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566

Test Pits

TEST PIT LOG

TEST PIT NO. AB-01

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,131 E:4,104,843
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/8/09
DATE COMPLETED: 6/8/09
GROUND ELEVATION: 3671.1'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3670	0					GM	lt. red-brown, slightly moist, dense	112.3	4.3		NP	50	29	21	Proct. SS - 12.9%
	5						SILTY GRAVEL W/SAND approx. 15% cobbles								
3665															
	10					GM	lt. red-brown, slightly moist, dense	112.5	5.3						
3660															
	15					GM	red-brown, slightly moist, very dense		6.5						
3655							SILTY GRAVEL W/SAND slightly cemented								
	20					GM	red-brown, slightly moist, very dense		5.1		NP	63	17	20	SS - 15.0%
3650															
	25														
3645															

TP 200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-02

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,121 E:4,104,593
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/8/09
DATE COMPLETED: 6/8/09
GROUND ELEVATION: 3651.1'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3650															
	5					GM	SILTY GRAVEL W/SAND approx. 15%-20% cobbles lt. red-brown, dry, very dense	108.3	2.5		NP	41	30	29	SS - 4.5%
3645															
	10					GP-GM	red-brown, dry, very dense	120.8	3.3						
3640															
	15					GP-GM	GRAVEL W/SILT & SAND approx. 25% cobbles, slightly cemented red-brown, dry, very dense		1.9		NP	74	15	11	Proct, SS - 8.5%
3635															
	20					GP-GM	red-brown, dry, very dense		2.3						
3630															
	25														
3625															

TP_200804.007.2_HURRICANECLIFFSAFTERBAY_TP.GPJ_US_EVAL.GDT_11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-03

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,872 E:4,104,572
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/8/09
DATE COMPLETED: 6/8/09
GROUND ELEVATION: 3578.2'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3575	0					CL-ML	SANDY SILTY CLAY W/GRAVEL lt. red-brown, dry	110.1	6.1	22	4	16	34	50	
	5														
3570															
	10					GP-GM	GRAVEL W/SILT & SAND slightly plastic, less than 10% cobbles lt. red-brown, dry, dense	123.8	2.5	21	3	63	27	10	SS - 7.3%
3565															
	15														
3560															
	20					GM	lt. red-brown, dry, very dense SILTY GRAVEL W/SAND carbonate stringers throughout, slightly cemented, few cobbles		5.0						SS - 13.1%
3555															
	25					GM	lt. brown, dry, very dense		7.1						SS - 13.1%
3550															

TP_200804.007.2_HURRICANECLIFFSAFTERBAY_TP.GPJ_US EVAL.GDT_11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample
0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-04

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,577 E:4,104,543
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3639.9'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						SC-SM	SILTY CLAYEY SAND gypsum, gravel seams, pinhole structure lt. red-brown, slightly moist	79.8	10.0	21	4	3	51	46	CT SS - 11.9%
3635	5					-	BASALT COBBLES & BOULDERS IN SANDY CLAY W/GRAVEL MATRIX abundant gypsum red-brown & black, dry, very dense		5.8						
3630	10					-	FRACTURED BASALT BEDROCK red lean clay infilling, less fractured w/depth, small vugs in basalt								
							Trackhoe refusal at 13'								
3625	15														
3620	20														
3615	25														

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-05

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,971 E:4,104,681
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3609.4'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3605	5					GM	lt. red-brown, dry, dense — SILTY GRAVEL W/SAND slightly plastic	118.7	4.0	21	2	60	22	18	SS - 10.9%
3600	10					SM	red-brown, dry, dense — SILTY SAND W/GRAVEL slightly plastic	110.5	4.0	20	2	22	60	18	
3595	15						SILTY GRAVEL W/SAND slightly plastic, less than 10% cobbles, very dense at 14'								
3590	20					GM	red-brown, dry, dense to very dense		2.2	21	3	55	30	15	SS - 3.6%
3585	25														
3580															

TP 200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-06

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,008 E:4,104,787
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3631.0'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3630	0					GC-GM	lt. red-brown, slightly moist, dense — SILTY CLAYEY GRAVEL W/SAND greater than 25% cobbles								
3625	5					GM	lt. red-brown, slightly moist, dense — SILTY GRAVEL W/SAND slightly plastic, less than 15% cobbles	123.9	6.4	21	3	43	34	23	SS - 9.4%
3620	10					SM	brown, slightly moist, dense — SILTY SAND W/GRAVEL	104.0	7.3		NP	34	39	27	Proct. SS - 16.8%
3615	15					GM	red-brown, dry, very dense — SILTY GRAVEL W/SAND slightly cemented, cobbles increasing w/depth		3.1						
3610	20														
3605	25														

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-07

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,011 E:4,105,004
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3651.0'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3650															
	5					GM	lt. red-brown, dry, dense SILTY GRAVEL W/SAND slightly plastic, greater than 20% cobbles	109.8	3.4	21	1	53	28	19	SS - 6.0%
3645															
	10					GM	red-brown, dry, dense	121.0	4.4		NP	52	29	19	SS - 2.3% SS - 0.5%
3640															
	15						SILTY GRAVEL W/SAND few cobbles								
3635															
	20					GM	red-brown, dry, dense		2.9						
3630															
	25														
3625															

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-08

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,996 E:4,105,170
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3664.2'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						SC-SM	lt. red-brown, dry, dense — SILTY CLAYEY SAND W/GRAVEL	107.2	1.5						
3660	5					GC	red-brown, dry, dense	121.1	3.1	27	10	44	34	22	SS - 1.3%
3655	10					GC	red-brown, dry, dense — CLAYEY GRAVEL W/SAND	119.2	1.9						
3650	15														
3645	20					GP-GM	lt. red-brown, dry, very dense — GRAVEL W/SILT & SAND less than 20% cobbles		3.4		NP	54	34	12	SS - 10.3%
3640	25														
3635															

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-09

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,775 E:4,105,118
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3606.7'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
					SC-SM	red-brown, dry, med. dense — SILTY CLAYEY SAND W/GRAVEL								
3605					GC	red, dry, dense								
	5				GC	lt. red-brown, dry, dense — CLAYEY GRAVEL W/SAND, less than 15% cobbles	110.4	2.9	24	9	48	33	19	SS - 6.0%
3600														
	10				SM	red-brown, dry, very dense	107.0	5.0	22	3	31	43	26	Proct. SS - 7.8%
3595														
	15				SM	red-brown, dry, very dense — SILTY SAND W/GRAVEL, some layers w/more gravel, slightly cemented, slightly plastic		6.4						
3590														
	20				SM	red-brown, dry, very dense		4.9						
3585														
	25													
3580														

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-10

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,420 E:4,105,110
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3648.7'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						CL	SANDY LEAN CLAY W/GRAVEL cobbles & boulders, pinhole structure red, dry, stiff	92.5	2.6						
3645	5					-	COBBLES & BOULDERS IN SILTY CLAYEY SAND MATRIX gypsum pockets lt. brown, dry, very dense								
						GP-GM	red-brown, dry, dense	106.7	4.2						
3640	10					GP-GM	red-brown, dry, dense GRAVEL W/SILT & SAND cobbles & occasional boulders		3.5		NP	49	39	12	Proct. SS - 0.5%
3635	15														
3630	20					GP	BASALT GRAVELS 1" minus, scoria? black, dry, dense		1.9						
						-	BASALT COBBLES & BOULDERS gypsum pockets								
3625	25														
3620															

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-11

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,758 E:4,104,998
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3599.9'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						ML	SANDY SILT slightly plastic, pinhole structure red-brown, dry, dense	81.2	4.6	21	3	12	35	53	CT SS - 19.4%
3595	5					GC-GM	lt. red-brown, dry, dense	117.7	4.4	24	5	47	39	14	
							SILTY CLAYEY GRAVEL W/SAND few cobbles								
3590	10					GC-GM	red-brown, dry, dense	122.6	3.3						
3585	15					GC	lt. red-brown, dry, dense CLAYEY GRAVEL W/SAND carbonate stringers		4.0	27	11	61	22	17	SS - 8.2%
3580	20					SC	lt. red-brown, dry, dense CLAYEY SAND W/GRAVEL		3.6						
3575	25														

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-12

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,562 E:4,104,996
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3611.0'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3610						SC-SM	SILTY CLAYEY SAND W/GRAVEL cobbles & boulders red, dry, very stiff	100.7	5.0	17	4	20	52	28	
	5					GC-GM	SILTY CLAYEY GRAVEL W/SAND approx. 40% cobbles & boulders lt. red-brown, dry, dense	114.3	3.5	20	5	45	38	17	SS - 10.0%
3605															SS - 2.1%
	10						COBBLES & BOULDERS IN SILTY CLAYEY SAND MATRIX numerous white carbonate stringers								
3600						SC-SM	lt. brown & black, dry, very dense		2.4						SS - 1.3%
	15														
3595							GRAVEL W/SILT & SAND								
						GP-GM	brown, dry, dense		3.1		NP	62	31	7	
3590	20														
	25														
3585															

TP_200804.007.2_HURRICANECLIFFSAFTERBAY_TP.GPJ_US_EVAL.GDT_11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-13

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,759 E:4,104,790
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3587.3'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3585	0					SM	lt. brown, dry, stiff — SILTY SAND W/GRAVEL, slightly plastic, slight pinhole structure	82.0	2.9	19	3	14	43	43	CT
	5					CL-ML	red-brown, dry, stiff — SANDY SILTY CLAY, pinhole structure	79.3	4.3	24	5	5	39	56	CT SS - 11.2%
3580								115.0	5.3						
	10					GC-GM	red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND, few cobbles	122.8	4.0						
3575															
	15					GM	lt. red-brown, dry, very dense — SILTY GRAVEL W/SAND, few cobbles, slightly cemented		5.3		NP	49	35	16	SS - 9.1%
3570															
	20					GM	lt. red-brown, dry, very dense		4.6						
3565															
	25														
3560															

TP_200804.007.2_HURRICANECLIFFSAFTERBAY_TP.GPJ_US_EVAL.GDT_11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-14

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,664 E:4,104,652
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: 3589.7'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						CL	lt. red-brown, dry, stiff — SANDY LEAN CLAY W/GRAVEL pinhole structure								
						GC	lt. brown, dry, stiff — CLAYEY GRAVEL W/SAND pinhole structure		8.4	45	23	38	16	46	SS - 0.8%
3585	5					GP	black, dry — BASALT GRAVELS & COBBLES abundant gypsum, scoria?, test performed on -4" material		2.0		NP	62	33	5	SS - 6.3%
3580	10					-	BASALT BEDROCK more competent w/depth								
							Trackhoe refusal at 12'								
3575	15														
3570	20														
3565	25														
3560															

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-15

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,817 E:4,105,397
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3628.3'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3625	5					GM	lt. red-brown, dry, dense — SILTY GRAVEL W/SAND	116.8	1.9		NP	54	29	17	SS - 3.7%
3620	10					GC-GM	red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND approx. 25% cobbles	125.3	2.7	20	5	48	34	18	SS - 1.0%
3615	15					GM	lt. red-brown, dry, very dense — SILTY GRAVEL W/SAND slightly cemented, greater than 15% cobbles								
3610	20														
3605	25														
3600															

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-16

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,816 E:4,105,720
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3637.7'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3635	0					GM	lt. red-brown, dry, dense — SILTY GRAVEL W/SAND greater than 25% cobbles		3.7		NP	49	26	15	
	5					GC-GM	red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND	114.2	4.4	25	7	51	23	26	SS - 9.5%
3630															
	10					SC-SM	red-brown, dry, dense — SILTY CLAYEY SAND W/GRAVEL	102.5	5.7	19	6	20	46	34	
3625															
	15					GC-GM	red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND cobble layers								
3620															
	20														
3615															
	25														
3610															

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-17

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,292 E:4,105,551
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3632.7'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
							COBBLES & BOULDERS IN SILTY SAND MATRIX								
3630	5						BASALT GRAVELS, COBBLES & BOULDERS many gypsum deposits, basalt is very vuggy & easily fractured w/trackhoe								
3625	10														
3620	15						Trackhoe refusal at 16'								
3615	20														
3610	25														
3605															

TP_200804.007.2 HURRICANECLIFFSAFTERBAY_TP.GPJ US EVAL.GDT 11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-18

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,547 E:4,105,662
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY **AFTER 24 HOURS:** ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: 3584.5'
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
3580	5					SM	red-brown, dry SILTY SAND slightly plastic, gravelly layers, pinhole structure	92.7	2.7	19	3	12	60	28	CT SS - 5.2%
3575	10					SM	red-brown, dry	101.7	5.6						
						SC-SM	lt. red-brown, dry, dense SILTY CLAYEY SAND W/GRAVEL less than 20% cobbles, gravels increasing w/depth, gypsum		4.2	22	4	31	46	23	SS - 3.3%
3570	15														
3565	20					GM/GC-GM	lt. brown, dry, very dense SILTY GRAVEL W/SAND TO SILTY CLAYEY GRAVEL W/SAND abundant gypsum								
3560	25														
3555															

TP_200804.007.2_HURRICANECLIFFSAFTERBAY_TP.GPJ_US_EVAL.GDT_11/4/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
DC = Dispersive Clay
SS = Soluble Salts
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

Photographs

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Figure	Test Pit HCH-TP-01
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-02
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-03
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-04
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-05
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-06
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-07
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-08
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-09
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-11
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-12
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-13
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-14
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-14
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-15
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-16
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-17
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

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Figure	Test Pit HCH-TP-18
Project	HCH Afterbay North Dam Site Option 1 , WCWCD
Location	Washington County, Utah

Laboratory Testing

Table 1C

SUMMARY OF TEST DATA

PROJECT	Hurricane Cliffs Reservoir Sites – Afterbay	PROJECT NO.	200804-007
LOCATION	Washington County, Utah	FEATURE	Afterbay Reservoir Basin

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	IN-PLACE		PROCTOR ASTM D 698 MAXIMUM DENSITY (pcf) AT OPTIMUM MOISTURE (%)	Soluble Salts (%)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM (modified)
			DRY UNIT WEIGHT (pcf)	MOISTURE (%)			LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY	
AB-TP1	4	Grab	112.4	4.3	127.9@10.2	12.9			NP	50	21	21	GM
	10	Grab	112.5	5.3									
	15	Grab		6.5									
	20	Grab		5.1		15			NP	63	17	20	GM
AB-TP2	5	Grab	108.3	2.5		4.5			NP	41	30	29	GM
	10	Grab	120.8	3.3									
	15	Grab		1.9	138.9 @ 6.8	8.5			NP	74	15	11	GP-GM
	20	Grab		2.3									
AB-TP3	2.5	Grab	110.1	6.1			22	18	4	16	34	50	CL-ML
	10	Grab	123.8	2.5		7.3	21	18	3	63	27	10	GP-GM
	20	Grab		5.0		13.1							
	25	Grab		7.1		13.1							
AB-TP4	3					11.9							
	4	Undisturbed	79.8	10.0			21	17	4	3	51	46	SC-SM
	6	Grab		5.8									
AB-TP5	4	Grab	118.7	4.0		10.9	21	19	2	60	22	18	GM
	10	Grab	110.5	4.0			20	18	2	22	60	18	SM
	18	Grab		2.2		3.6	21	18	3	55	30	15	GM
AB-TP6	6	Grab	123.9	6.4		9.4	21	18	3	43	34	23	GM
	11	Grab	104.0	7.3	122.2@11.1	16.8			NP	34	39	27	SM
	17	Grab		3.1									
AB-TP7	5	Grab	109.8	3.4		6.0	21	20	1	53	28	19	GM
	10	Grab	121.0	4.4		2.3			NP	52	29	19	GM
	11					0.5							
	20	Grab		2.9									
AB-TP8	1		107.2	1.5									
	4	Grab	121.1	3.1		1.3	27	17	10	44	34	22	GC
	10	Grab	119.2	1.9									
	18	Grab		3.4		10.3			NP	54	34	12	GP-GM
AB-TP9	5	Grab	110.4	2.9		6.0	24	15	9	48	33	19	GC
	10	Grab	107.0	5.0	126.6@10.9	7.8	22	19	3	31	43	26	SM
	15	Grab		6.4									
	20	Grab		4.9									

NP=Non-Plastic

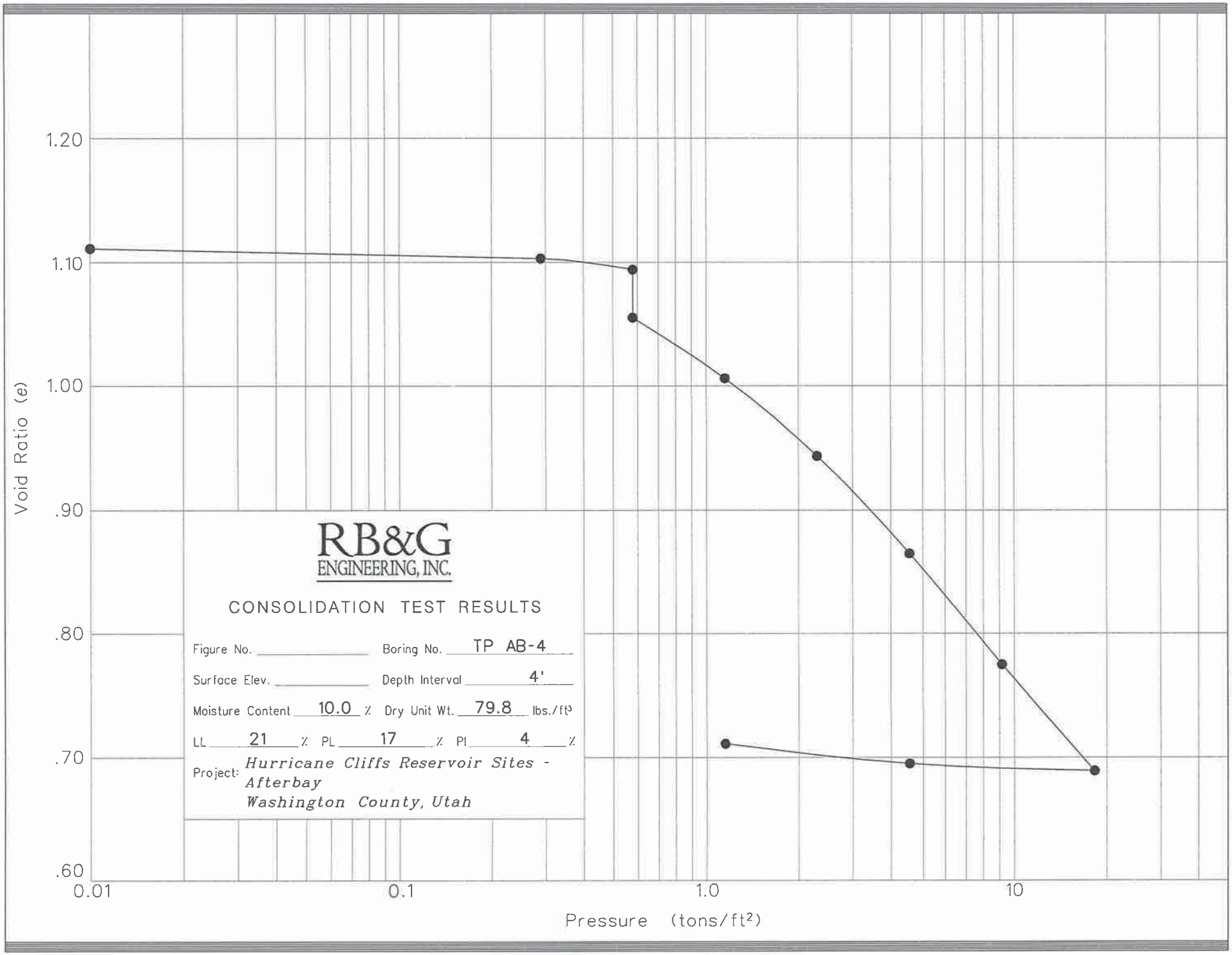
Table 1

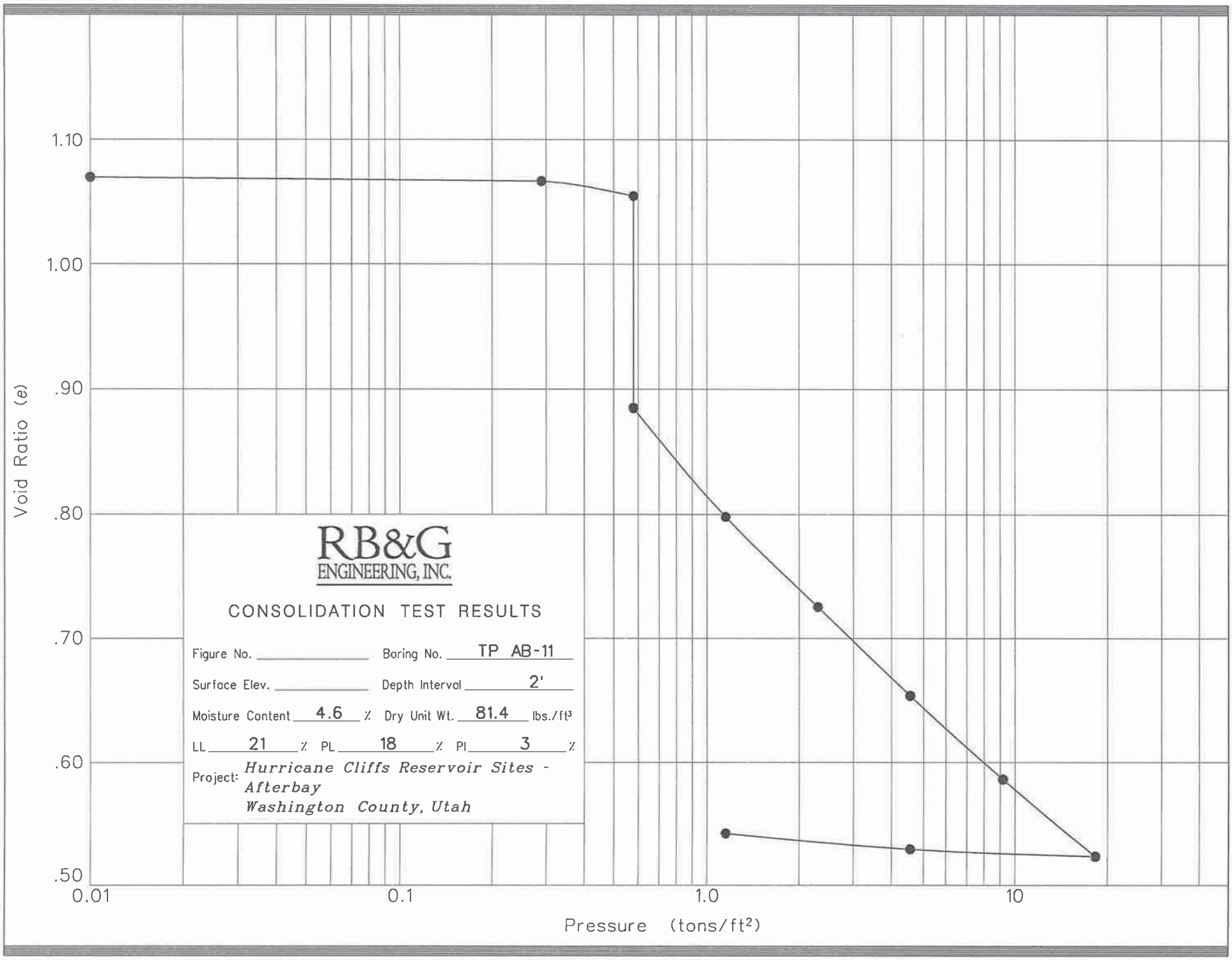
SUMMARY OF TEST DATA

PROJECT Hurricane Cliffs Reservoir Sites – Afterbay PROJECT NO. 200804-007
LOCATION Washington County, Utah FEATURE Afterbay Reservoir Basin

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	SAMPLE TYPE	IN-PLACE		PROCTOR ASTM D 698 MAXIMUM DENSITY (pcf) AT OPTIMUM MOISTURE (%)	Soluble Salts (%)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM (modified)
			DRY UNIT WEIGHT (pcf)	MOISTURE (%)			LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY	
AB-TP10	1	Grab	92.5	2.6									
	6	Grab	106.7	4.2									
	10	Grab		3.5	128.3@9.7	0.5			NP	49	39	12	GP-GM
	18	Grab		1.9									
AB-TP11	2	Undisturbed	81.4	4.6		19.4	21	18	3	12	35	53	ML
	4.5	Grab	117.7	4.4			24	19	5	47	39	14	GC-GM
	9	Grab	122.6	3.3									
	15	Grab		4.0		8.2	27	16	11	61	22	17	GC
	20	Grab		3.6									
AB-TP12	1	Undisturbed	100.7	5.0			17	13	4	20	52	28	SC-SM
	4	Grab	114.3	3.5		10.0	20	15	5	45	38	17	GC-GM
	8					2.1							
	12	Grab		2.4		1.3							
	18	Grab		3.1					NP	62	31	7	GP-GM
AB-TP13	3	Undisturbed	82.0	2.9			19	16	3	14	43	43	SM
	6	Undisturbed	79.3	4.3		11.2	24	19	5	5	39	56	CL-ML
	8	Grab	115.0	5.3									
	11		122.8	4.0									
	15	Grab		5.3		9.1			NP	49	35	16	GM
	20			4.6									
AB-TP14	2	Grab		8.4		0.8	45	22	23	38	16	46	GC
	6	Grab		2.0		6.3			NP	62	33	5	GP
AB-TP15	4	Grab	116.8	1.9		3.7			NP	54	29	17	GM
	9	Grab	125.3	2.7		1.0	20	15	5	48	34	18	GC-GM
AB-TP16	4	Grab		3.7					NP	49	26	15	GM
	6	Grab	114.0	4.4		9.5	25	18	7	51	23	26	GC-GM
	10	Grab	102.5	5.7			19	13	6	20	46	34	SC-SM
AB-TP18	3	Undisturbed	92.7	2.7		5.2	19	16	3	12	60	28	SM
	8	Grab	101.7	5.6									
	10	Grab		4.2		3.3	22	18	4	31	46	23	SC-SM

NP=Nonplastic


1.20
1.10
1.00
.90
.80
.70
.60
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. TP AB-4
Surface Elev. _____ Depth Interval 4'
Moisture Content 10.0 % Dry Unit Wt. 79.8 lbs./ft³
LL 21 % PL 17 % PI 4 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah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Void Ratio (e)
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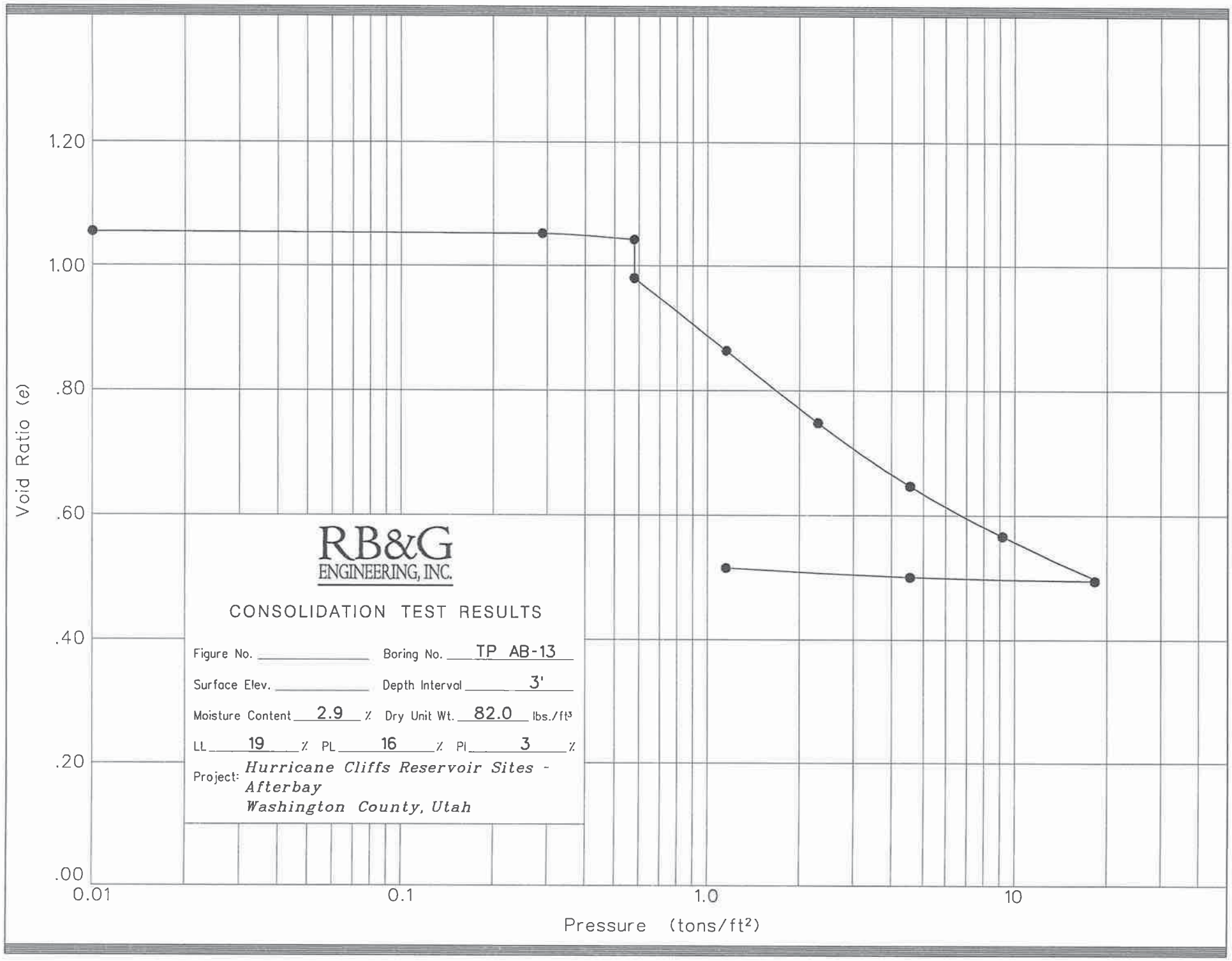
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. TP AB-11
Surface Elev. _____ Depth Interval 2'
Moisture Content 4.6 % Dry Unit Wt. 81.4 lbs./ft³
LL 21 % PL 18 % PI 3 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah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.40
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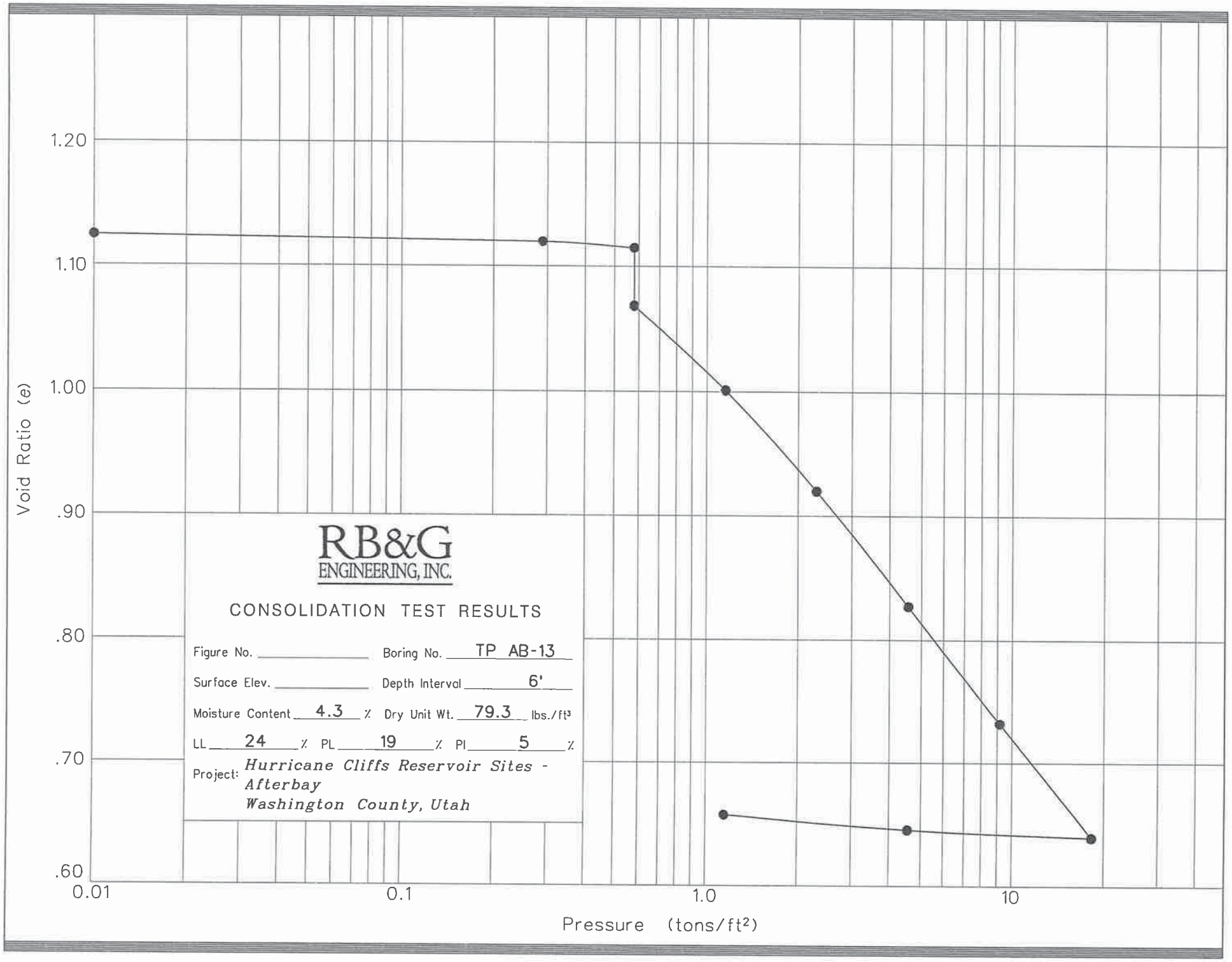
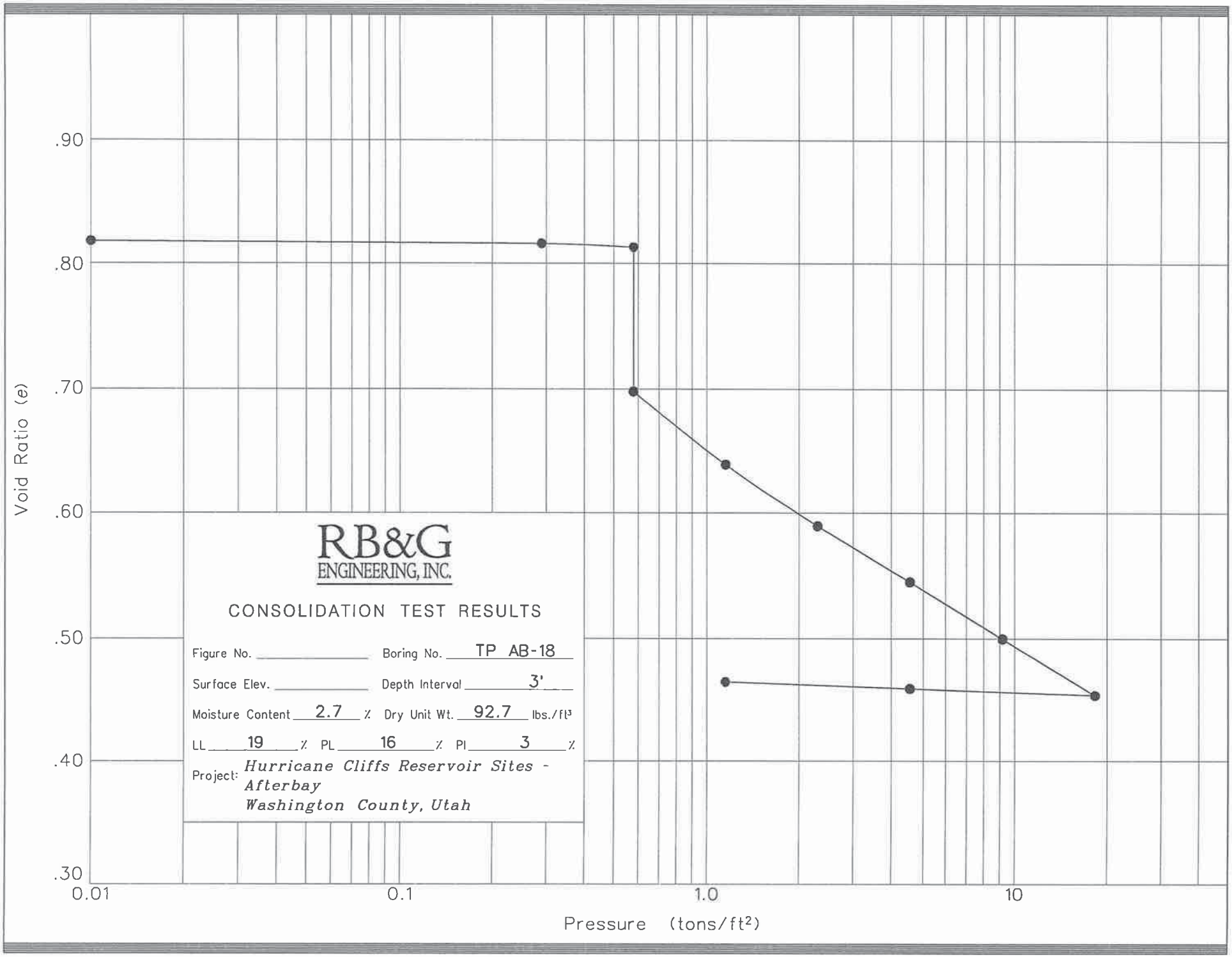
.00
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. TP AB-13
Surface Elev. _____ Depth Interval 3'
Moisture Content 2.9 % Dry Unit Wt. 82.0 lbs./ft³
LL 19 % PL 16 % PI 3 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah


1.20
1.10
1.00
.90
.80
.70
.60
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. TP AB-13
Surface Elev. _____ Depth Interval 6'
Moisture Content 4.3 % Dry Unit Wt. 79.3 lbs./ft³
LL 24 % PL 19 % PI 5 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah


.90
.80
.70
.60
.50
.40
.30
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING, INC.
CONSOLIDATION TEST RESULTS
Figure No. _____ Boring No. TP AB-18
Surface Elev. _____ Depth Interval 3'
Moisture Content 2.7 % Dry Unit Wt. 92.7 lbs./ft³
LL 19 % PL 16 % PI 3 %
Project: Hurricane Cliffs Reservoir Sites - Afterbay
Washington County, Utah

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PROJECT NO.	200804.007.2

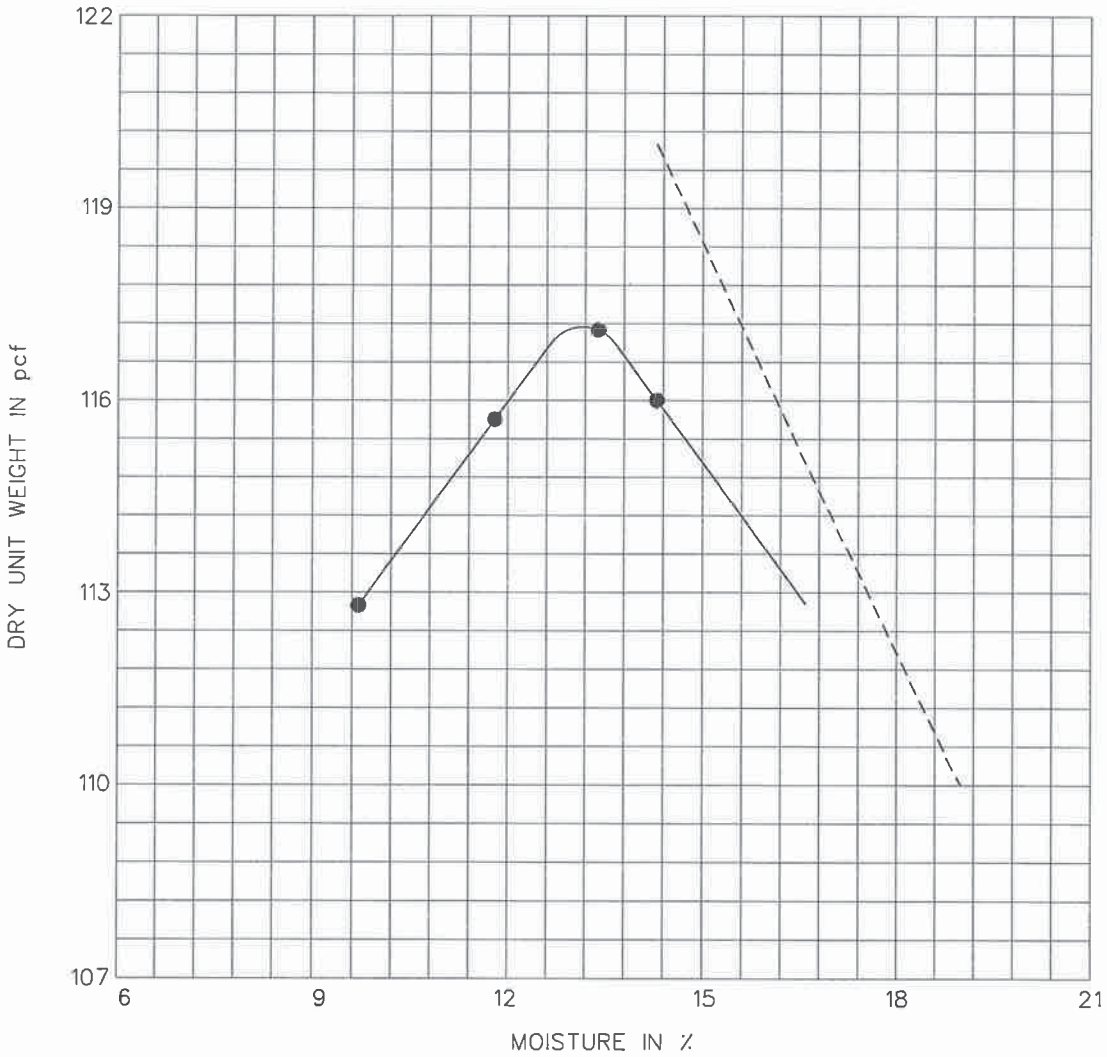
MOISTURE-DENSITY RELATION (PROCTOR)

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY			Date	6/18/2009
Location / No.	TEST PIT AB-1 AT 4'			Technician	K. MARTINEZ
Material Description	LT. RED-BROWN SILTY GRAVEL W/SAND	USCS	GM	Method	ASTM D 698

Procedure Used[1]	C
Classification Procedure[2]	Test

[1] A-No. 4 Sieve, B-3/8" Sieve, C-3/4" Sieve
[2] Visual as per ASTM D 2488, Test as per ASTM D 2487

Preparation Method	Moist
Rammer Used	Manual
As-Received Moisture Content (%)	8.0



Maximum Dry Density (pcf)	117.1
Optimum Moisture Content (%)	13.5
Corrected Maximum Density (pcf)	**127.9**
Corrected Optimum Moisture Content (%)	**10.2**

– – – – – 100% Saturation Curve

Specific Gravity of Soil	2.65	Est.

OVERSIZE CORRECTION-ASTM D 4718

Specific Gravity of Soil +3/4	2.65	Est.
Percent Oversize	29.0	

Type of Specific Gravity is BULK Unless Otherwise Indicated

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PROJECT NO.	200804.007.2

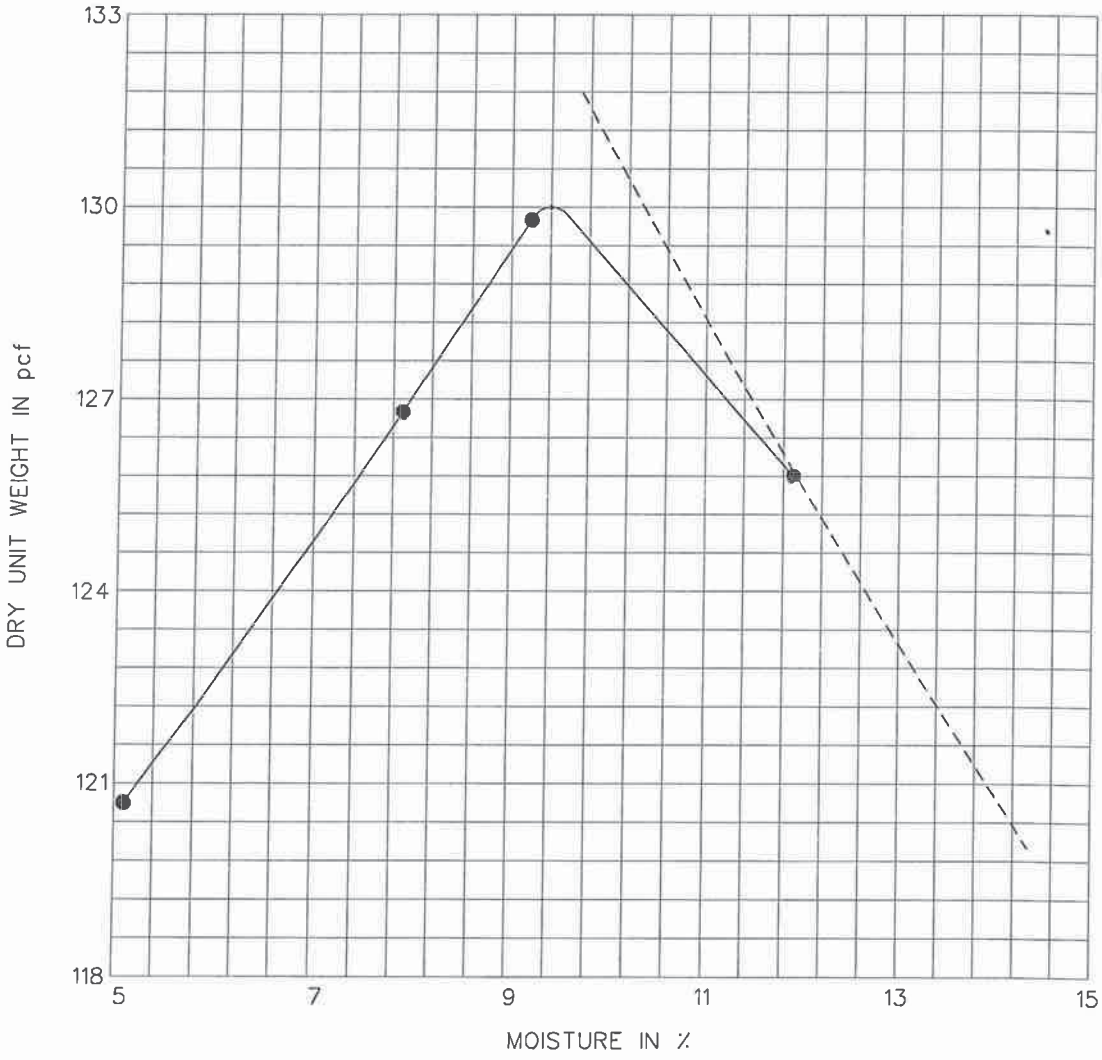
MOISTURE-DENSITY RELATION (PROCTOR)

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY			Date	6/16/2009
Location / No.	TEST PIT AB-2 AT 15'			Technician	M. JOHNSON, T. HENDRICKS
Material Description	RED-BROWN GRAVEL W/SILT & SAND	USCS	GP-GM	Method	ASTM D 698

Procedure Used[1]	C
Classification Procedure[2]	Test

[1] A-No. 4 Sieve, B-3/8" Sieve, C-3/4" Sieve
[2] Visual as per ASTM D 2488, Test as per ASTM D 2487

Preparation Method	Moist
Rammer Used	Manual
As-Received Moisture Content (%)	3.5



Maximum Dry Density (pcf)	130.0
Optimum Moisture Content (%)	9.4
Corrected Maximum Density (pcf)	**138.9**
Corrected Optimum Moisture Content (%)	**6.8**

– – – – – 100% Saturation Curve

Specific Gravity of Soil	2.65	Est.

OVERSIZE CORRECTION-ASTM D 4718

Specific Gravity of Soil +3/4	2.65	Est.
Percent Oversize	30.0+	

Type of Specific Gravity is BULK Unless Otherwise Indicated

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PROJECT NO.	200804.007.2

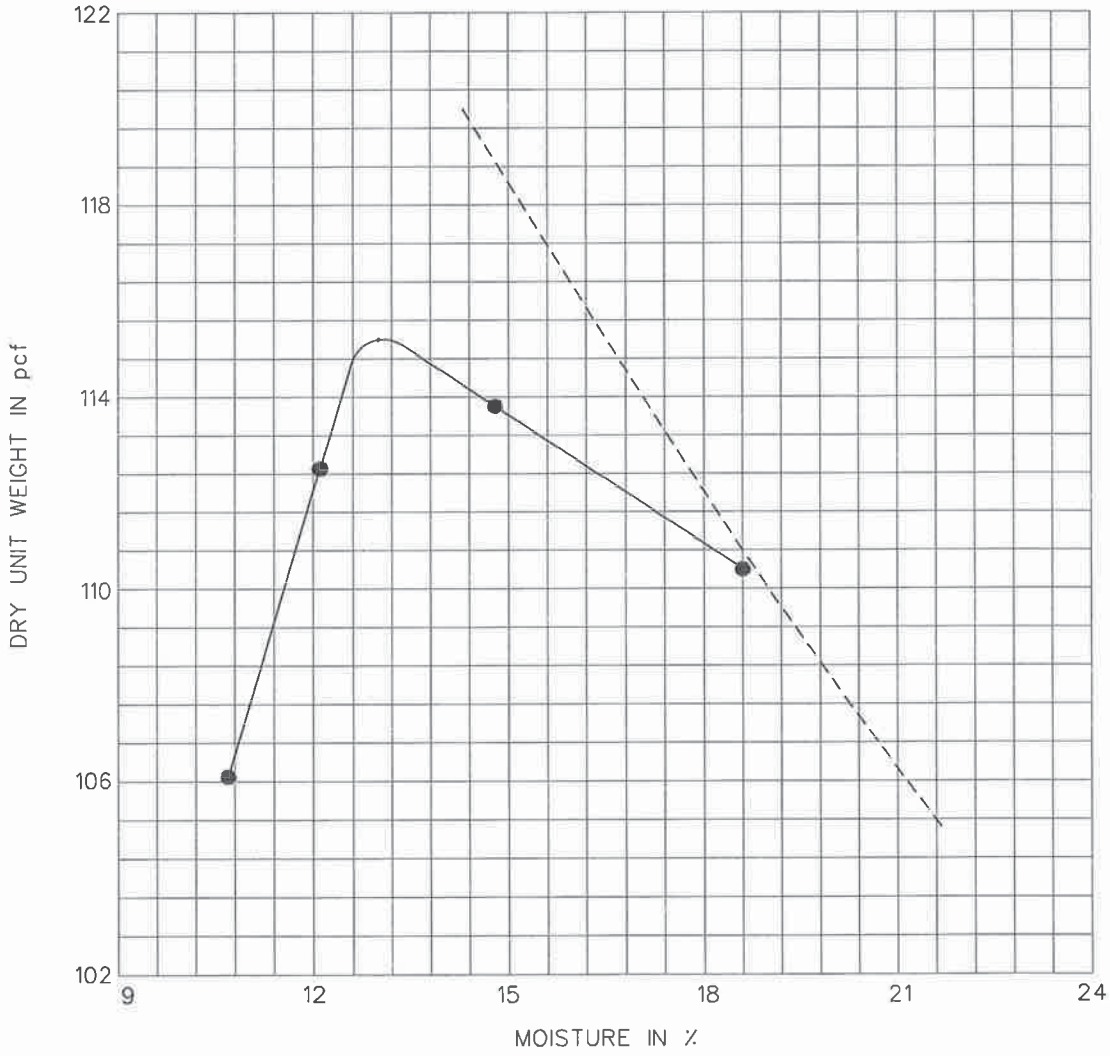
MOISTURE-DENSITY RELATION (PROCTOR)

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY			Date	6/16/2009
Location / No.	TEST PIT AB-6 AT 11'			Technician	J. LINDO
Material Description	LT. BROWN SILTY SAND	USCS	SM	Method	ASTM D 698

Procedure Used[1]	C
Classification Procedure[2]	Test

[1] A-No. 4 Sieve, B-3/8" Sieve, C-3/4" Sieve
[2] Visual as per ASTM D 2488, Test as per ASTM D 2487

Preparation Method	Moist
Rammer Used	Manual
As-Received Moisture Content (%)	9.1



Maximum Dry Density (pcf)	115.2
Optimum Moisture Content (%)	13.0
Corrected Maximum Density (pcf)	122.2
Corrected Optimum Moisture Content (%)	11.1

----- 100% Saturation Curve

Specific Gravity of Soil	2.65	Est.

OVERSIZE CORRECTION-ASTM D 4718

Specific Gravity of Soil +3/4	2.65	Est.
Percent Oversize	19.0	

Type of Specific Gravity is BULK Unless Otherwise Indicated

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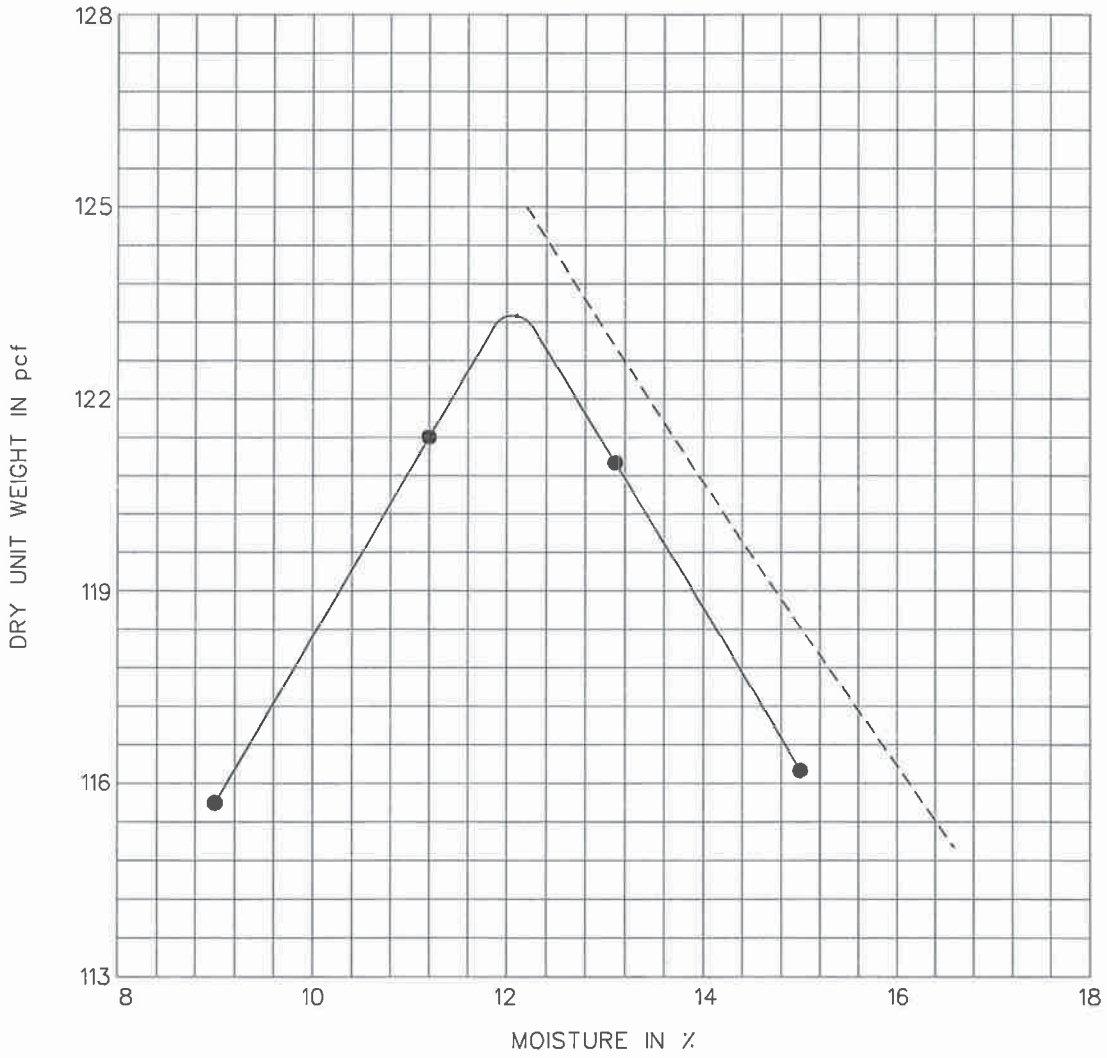
MOISTURE-DENSITY RELATION (PROCTOR)

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY			Date	6/19/2009
Location / No.	TEST PIT AB-9 AT 10'			Technician	D. WALKER
Material Description	RED-BROWN SILTY SAND W/GRAVEL	USCS	SM	Method	ASTM D 698

Procedure Used[1]	B
Classification Procedure[2]	Test

[1] A-No. 4 Sieve, B-3/8" Sieve, C-3/4" Sieve
[2] Visual as per ASTM D 2488, Test as per ASTM D 2487

Preparation Method	Moist
Rammer Used	Manual
As-Received Moisture Content (%)	3.5



Maximum Dry Density (pcf)	123.3
Optimum Moisture Content (%)	12.1
Corrected Maximum Density (pcf)	**126.6**
Corrected Optimum Moisture Content (%)	**10.9**

----- 100% Saturation Curve

Specific Gravity of Soil	2.65	Est.

OVERSIZE CORRECTION-ASTM D 4718

Specific Gravity of Soil +3/4	2.65	Est.
Percent Oversize	10.8	

Type of Specific Gravity is BULK Unless Otherwise Indicated

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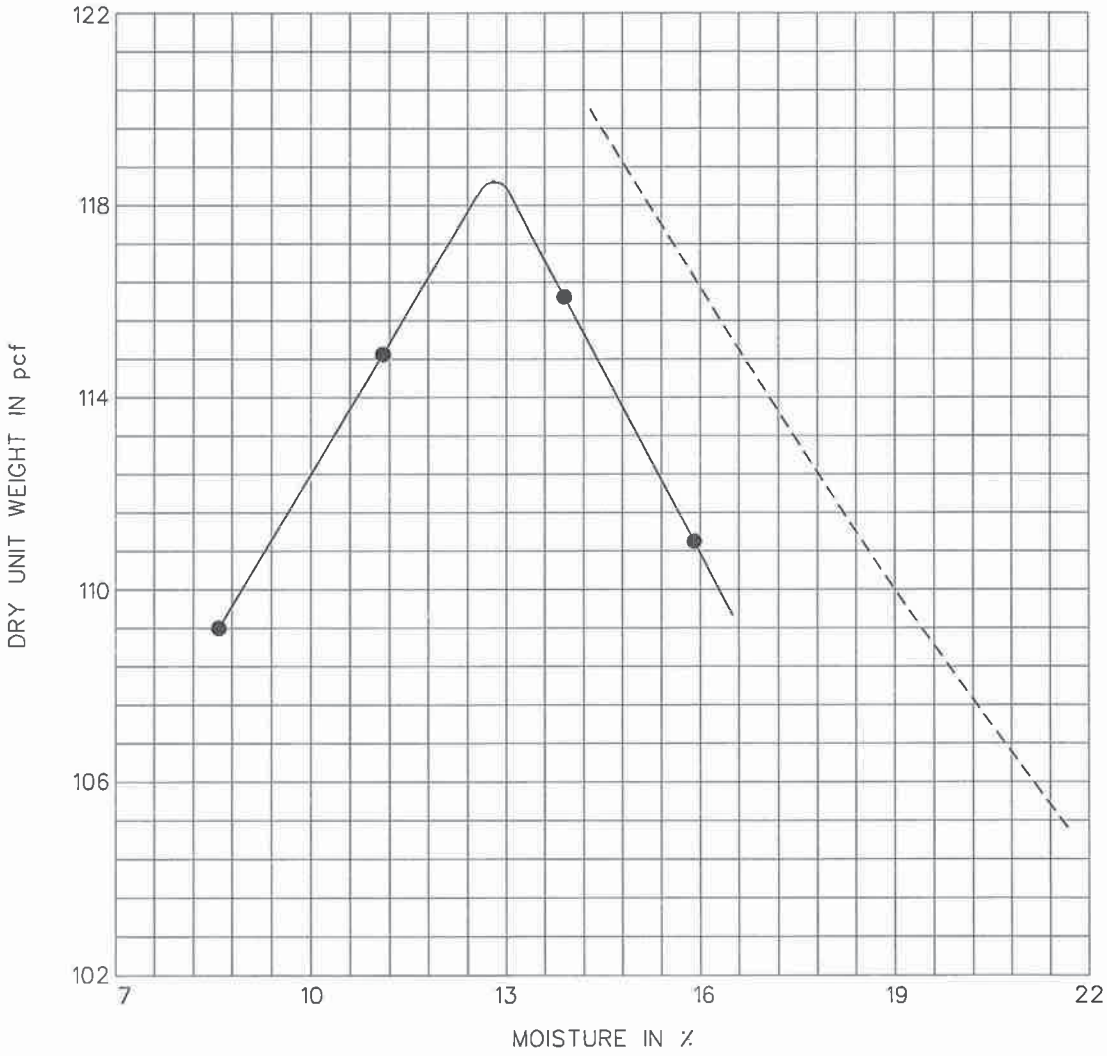
MOISTURE-DENSITY RELATION (PROCTOR)

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY			Date	6/18/2009
Location / No.	TEST PIT AB-10 AT 10'			Technician	J. LINDO
Material Description	RED-BROWN GRAVEL W/SILT & SAND	USCS	GP-GM	Method	ASTM D 698

Procedure Used[1]	C
Classification Procedure[2]	Test

[1] A-No. 4 Sieve, B-3/8" Sieve, C-3/4" Sieve
[2] Visual as per ASTM D 2488, Test as per ASTM D 2487

Preparation Method	Moist
Rammer Used	Manual
As-Received Moisture Content (%)	3.5



Maximum Dry Density (pcf)	118.5
Optimum Moisture Content (%)	12.8
Corrected Maximum Density (pcf)	**128.3**
Corrected Optimum Moisture Content (%)	**9.7**

– – – – – 100% Saturation Curve

Specific Gravity of Soil	2.65	Est.

OVERSIZE CORRECTION-ASTM D 4718

Specific Gravity of Soil +3/4	2.65	Est.
Percent Oversize	27.0	

Type of Specific Gravity is BULK Unless Otherwise Indicated

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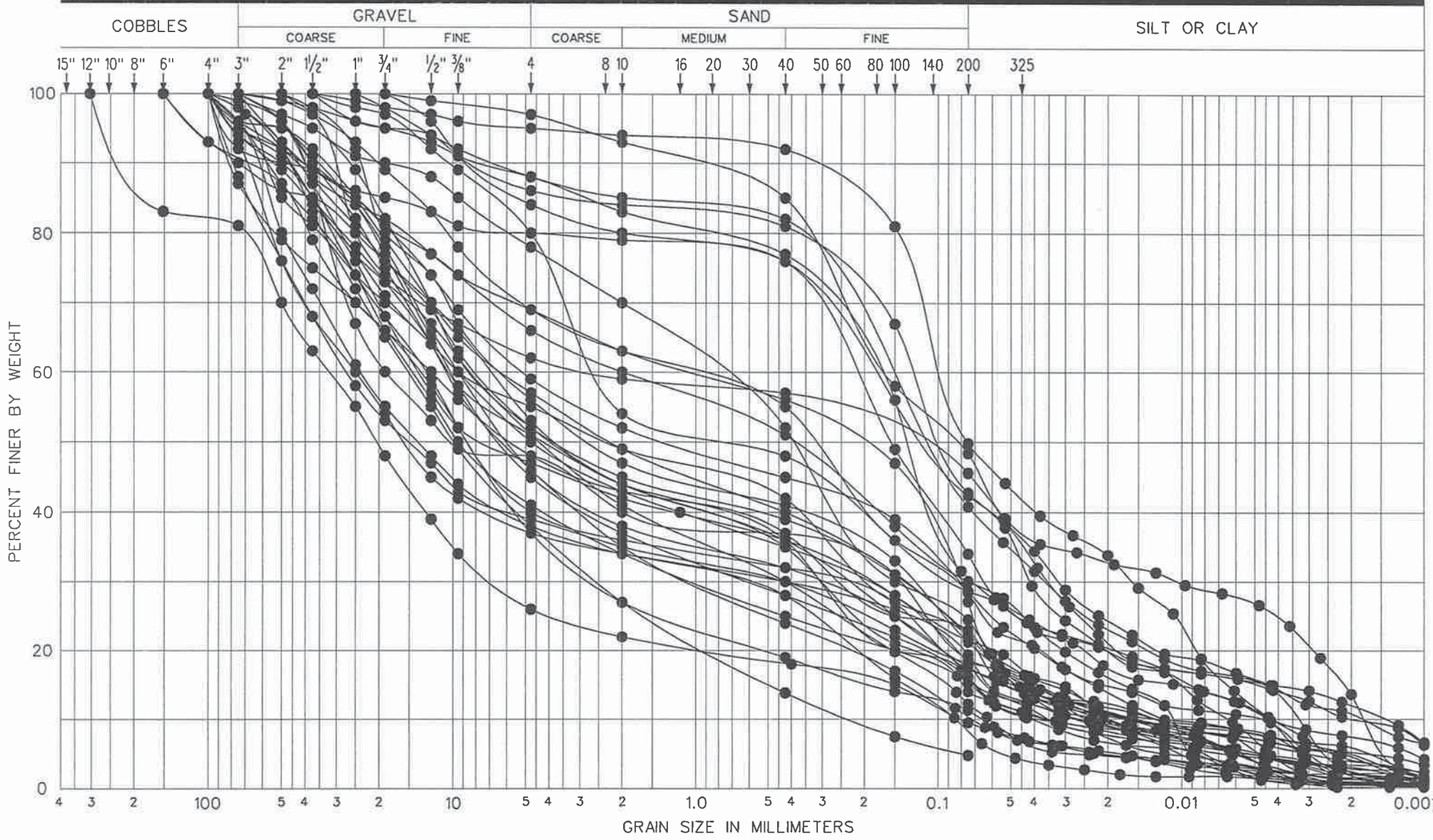
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	ALL TEST PIT SAMPLES COMBINED		
Material Description	-	USCS	-

Date	6/2009
Technician	VARIOUS
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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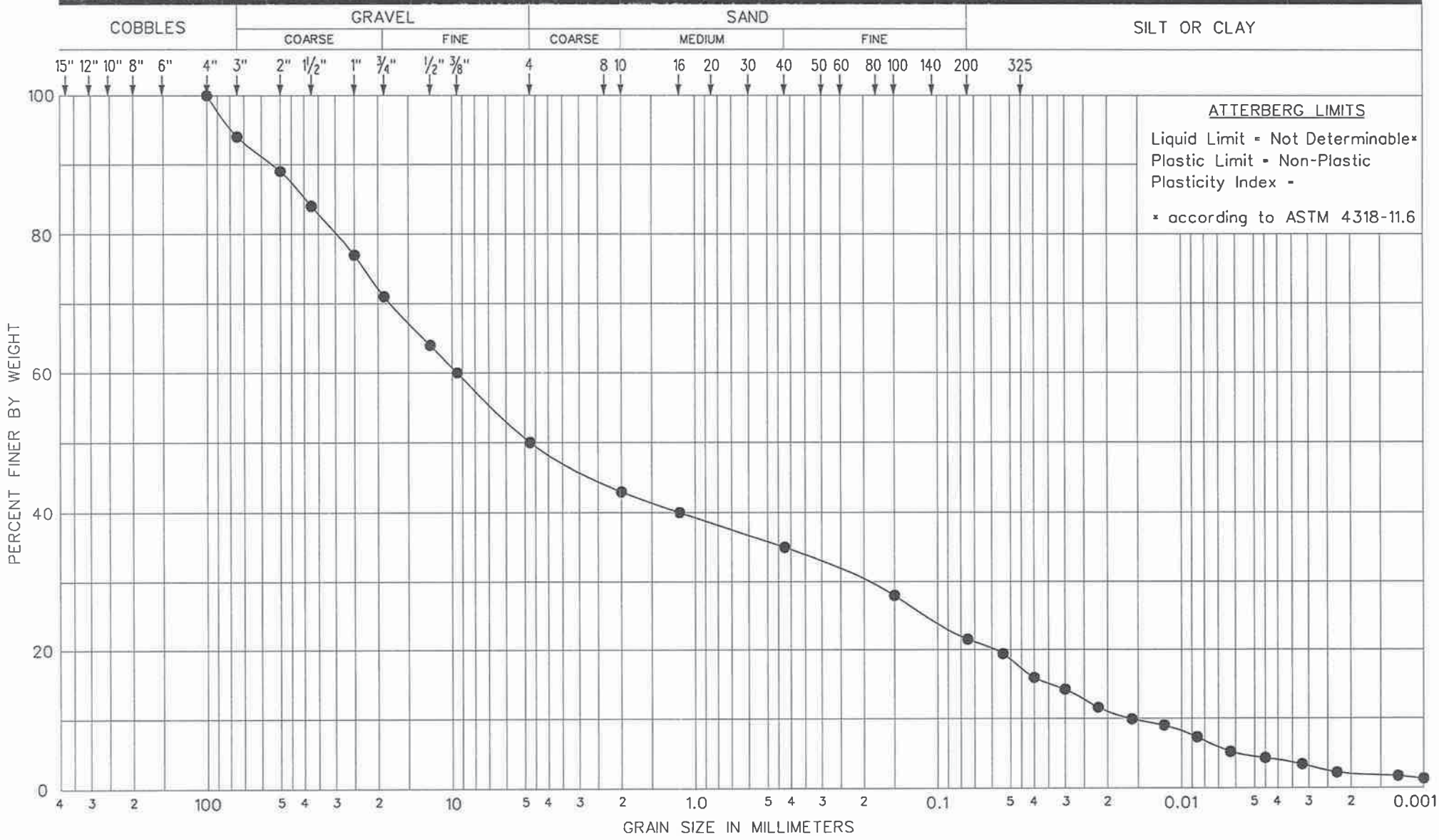
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-1 AT 4'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/18/09 TO 6/22/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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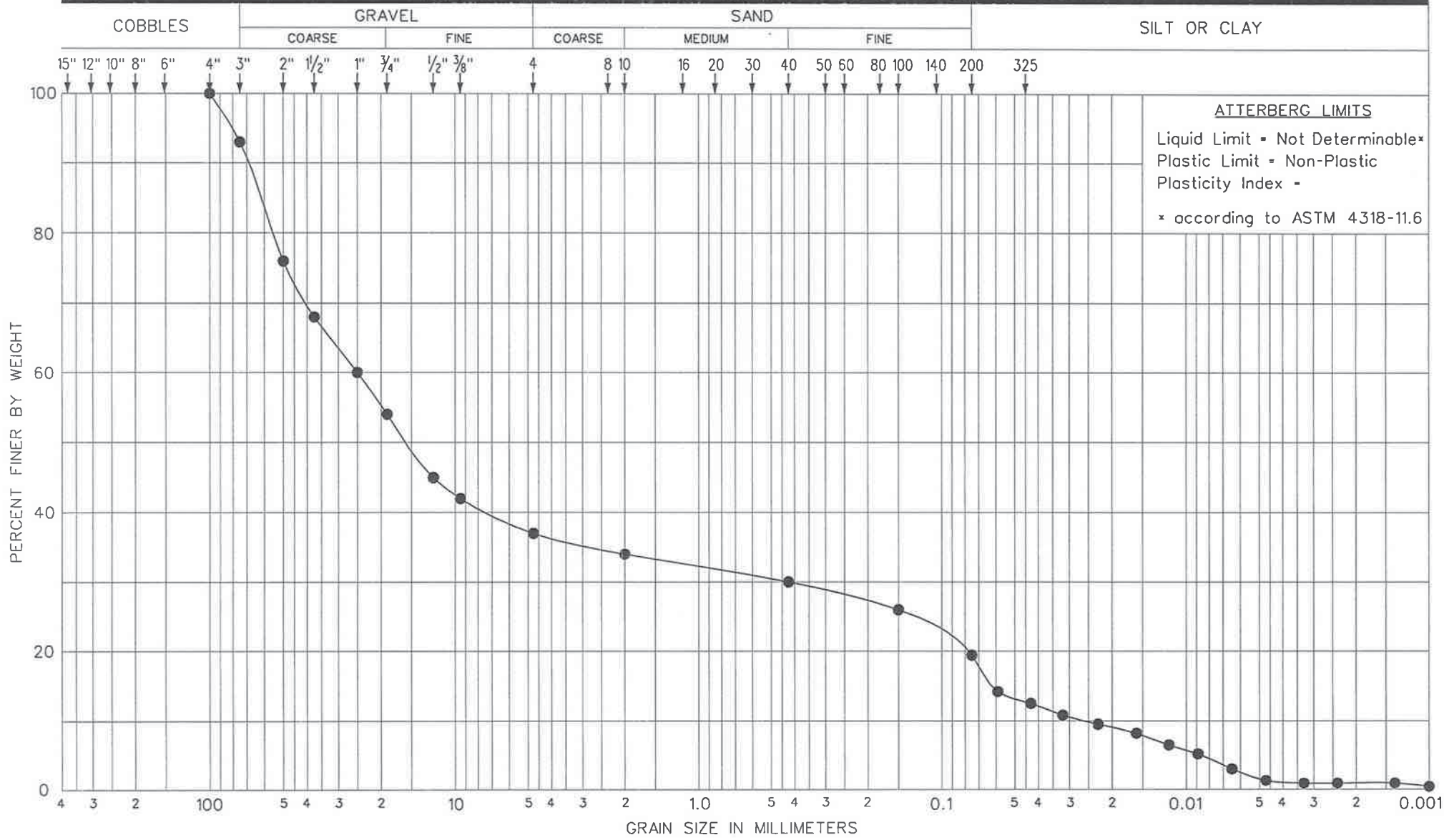
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-1 AT 20'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/18/09 TO 6/22/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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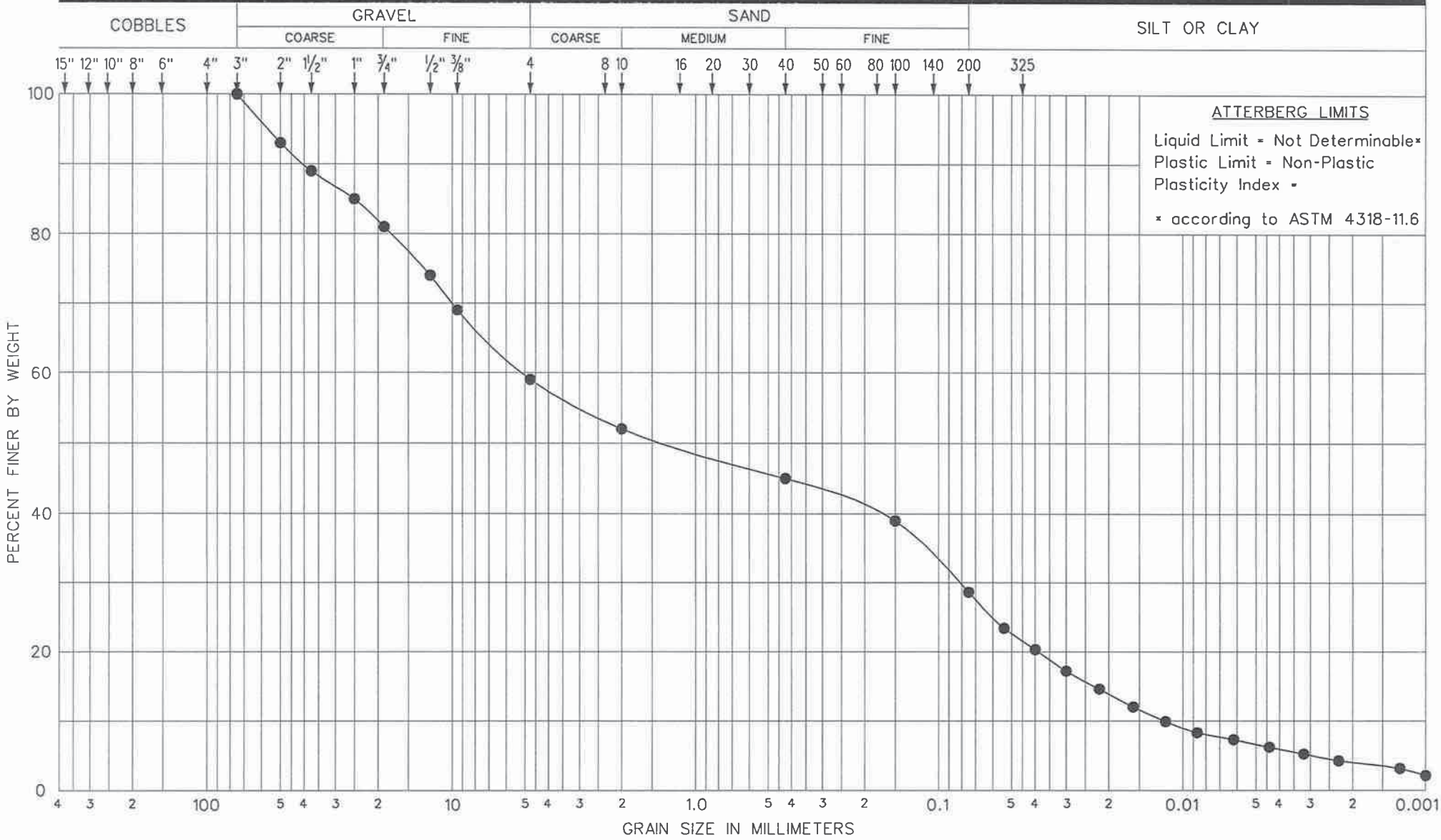
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-2 AT 5'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/16/09 TO 6/22/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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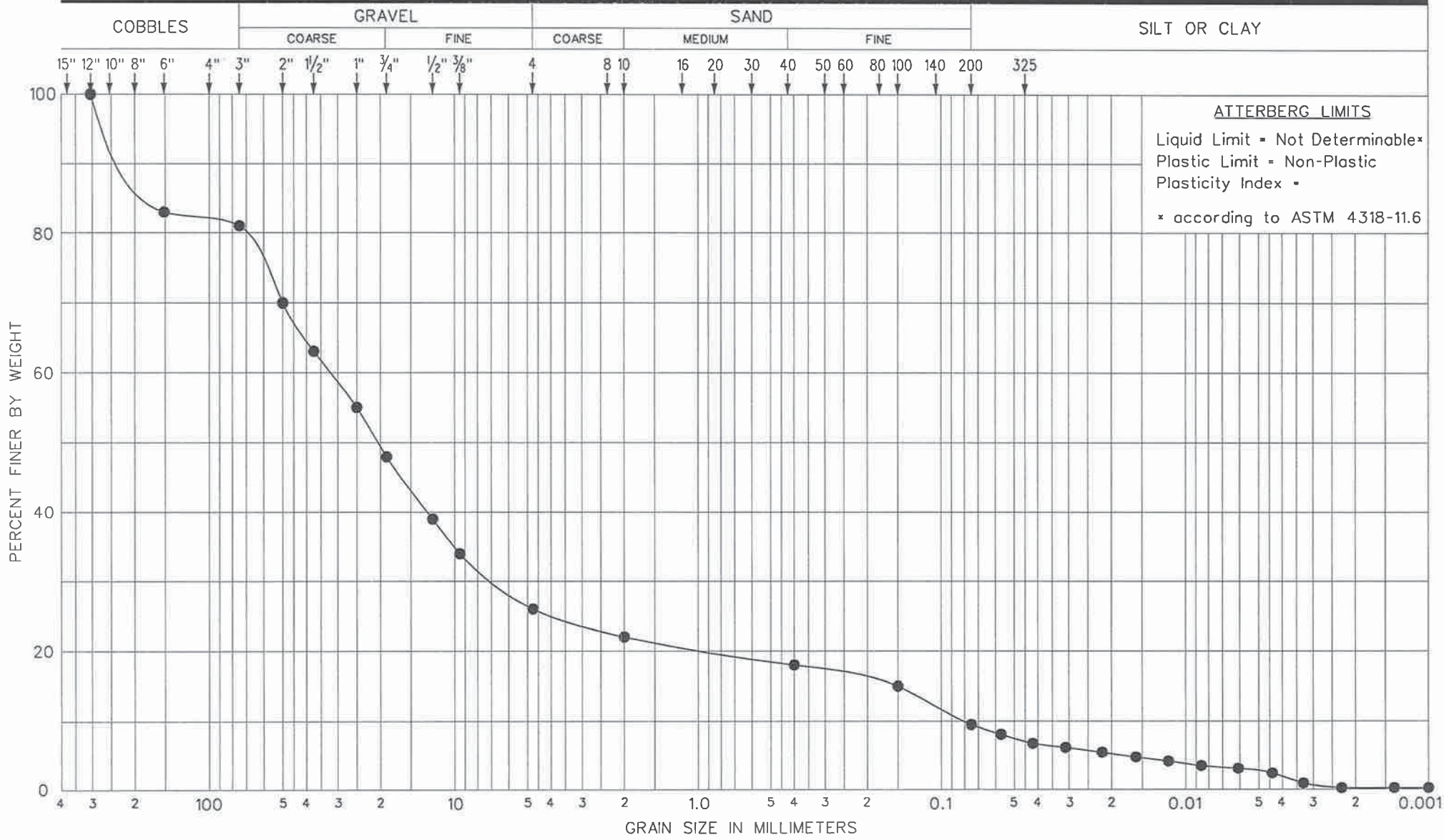
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-2 AT 15'		
Material Description	GRAVEL W/SILT & SAND	USCS	GP-GM

Date	6/16/09 TO 6/25/09
Technician	M. JOHNSON, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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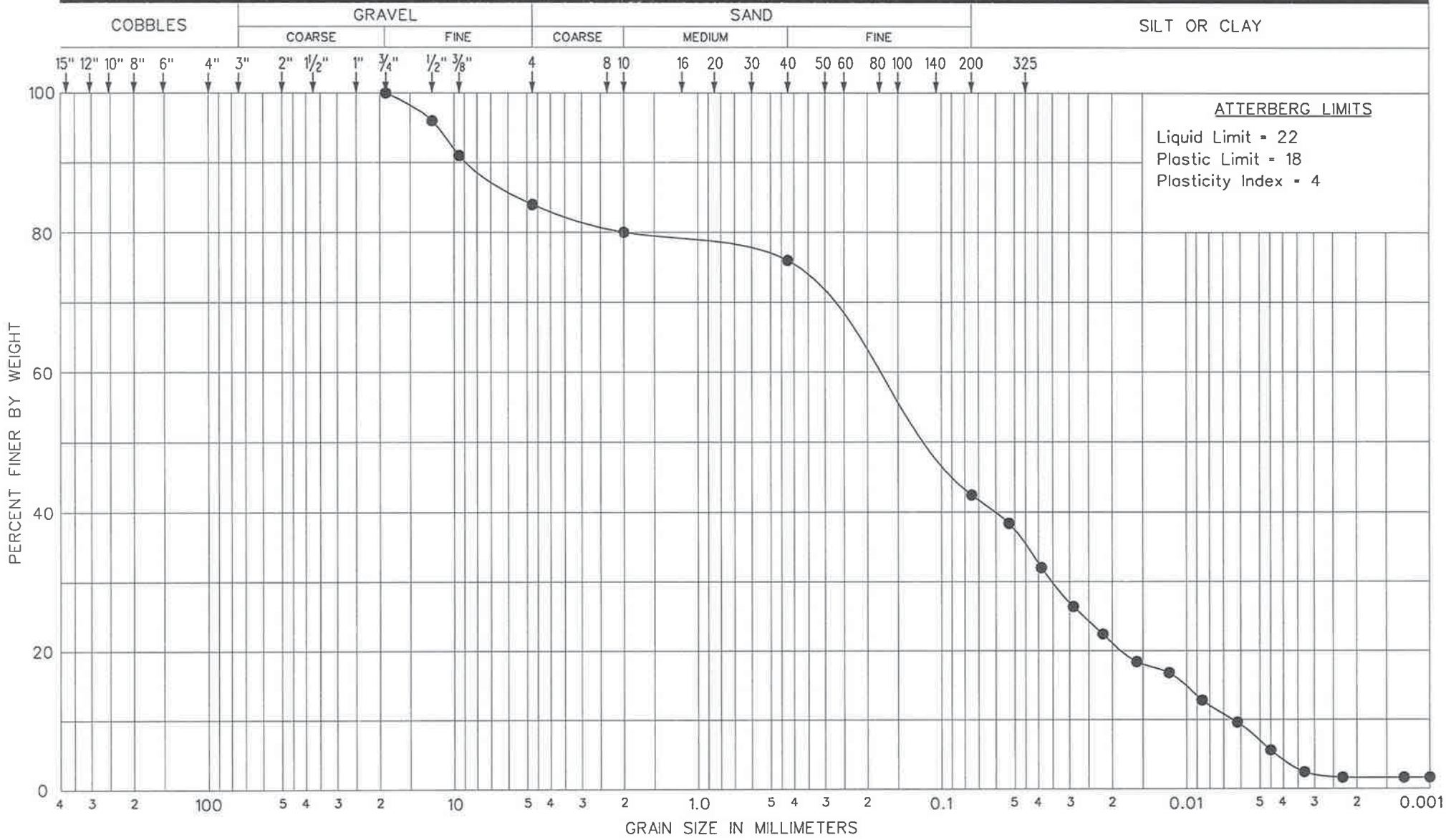
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-3 AT 2.5'		
Material Description	SANDY SILTY CLAY W/GRAVEL	USCS	CL-ML

Date	6/22/09 TO 6/25/09
Technician	S.C., S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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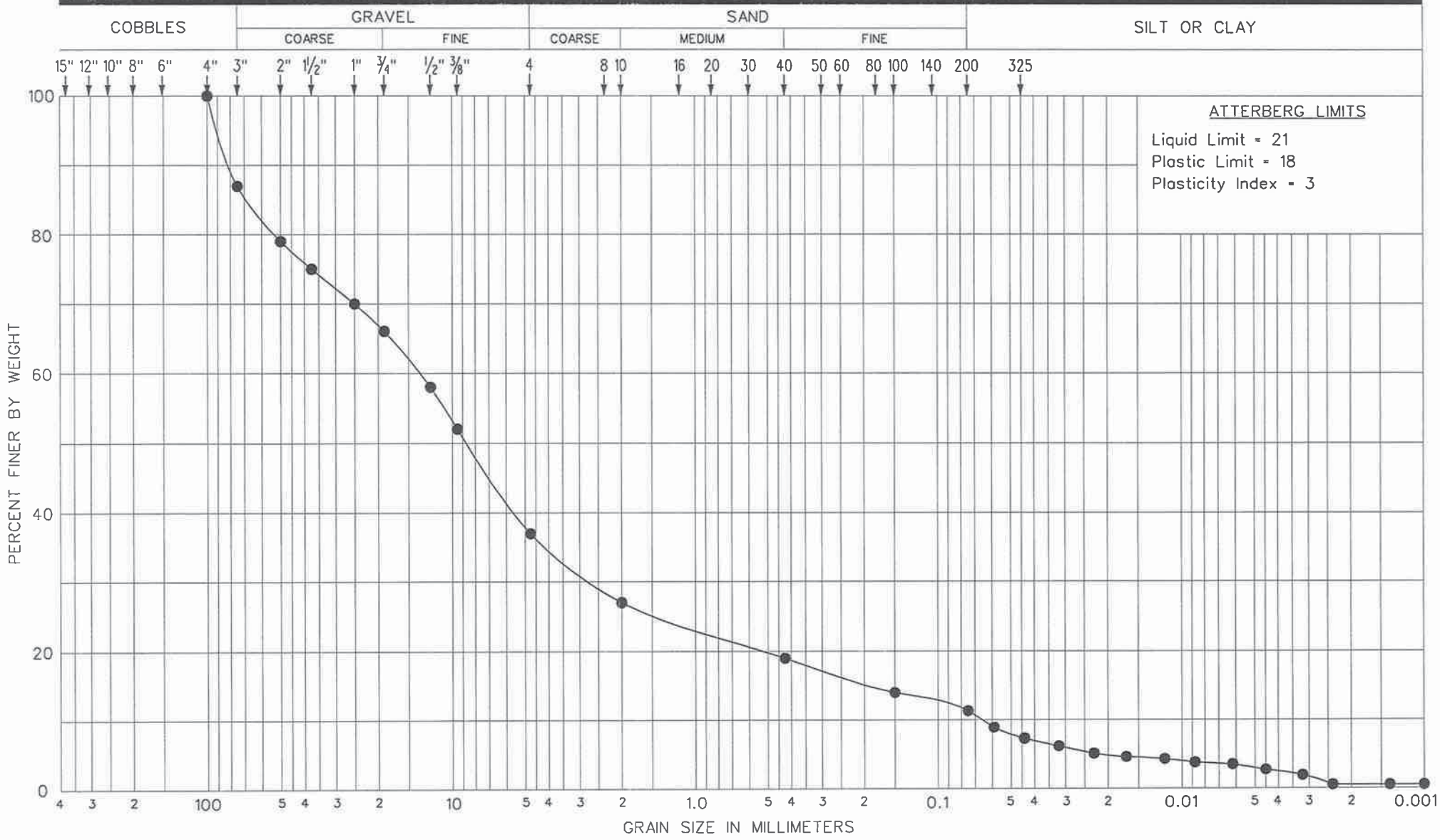
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



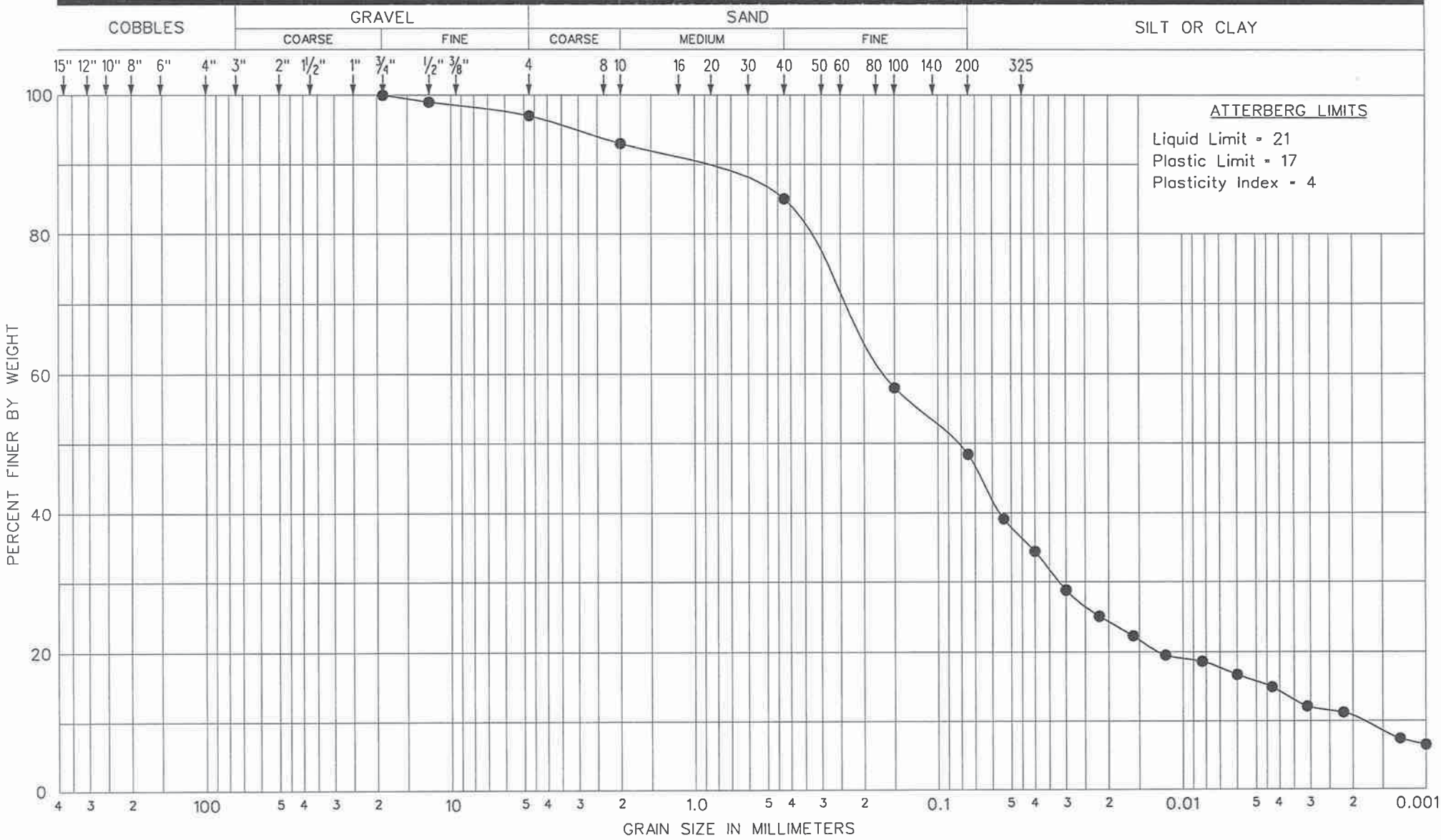
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-3 AT 10'		
Material Description	GRAVEL W/SILT & SAND	USCS	GP-GM

Date	6/17/09 TO 6/22/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-4 AT 4'		
Material Description	SILTY CLAYEY SAND	USCS	SC-SM

Date	6/16/09 TO 6/25/09
Technician	S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
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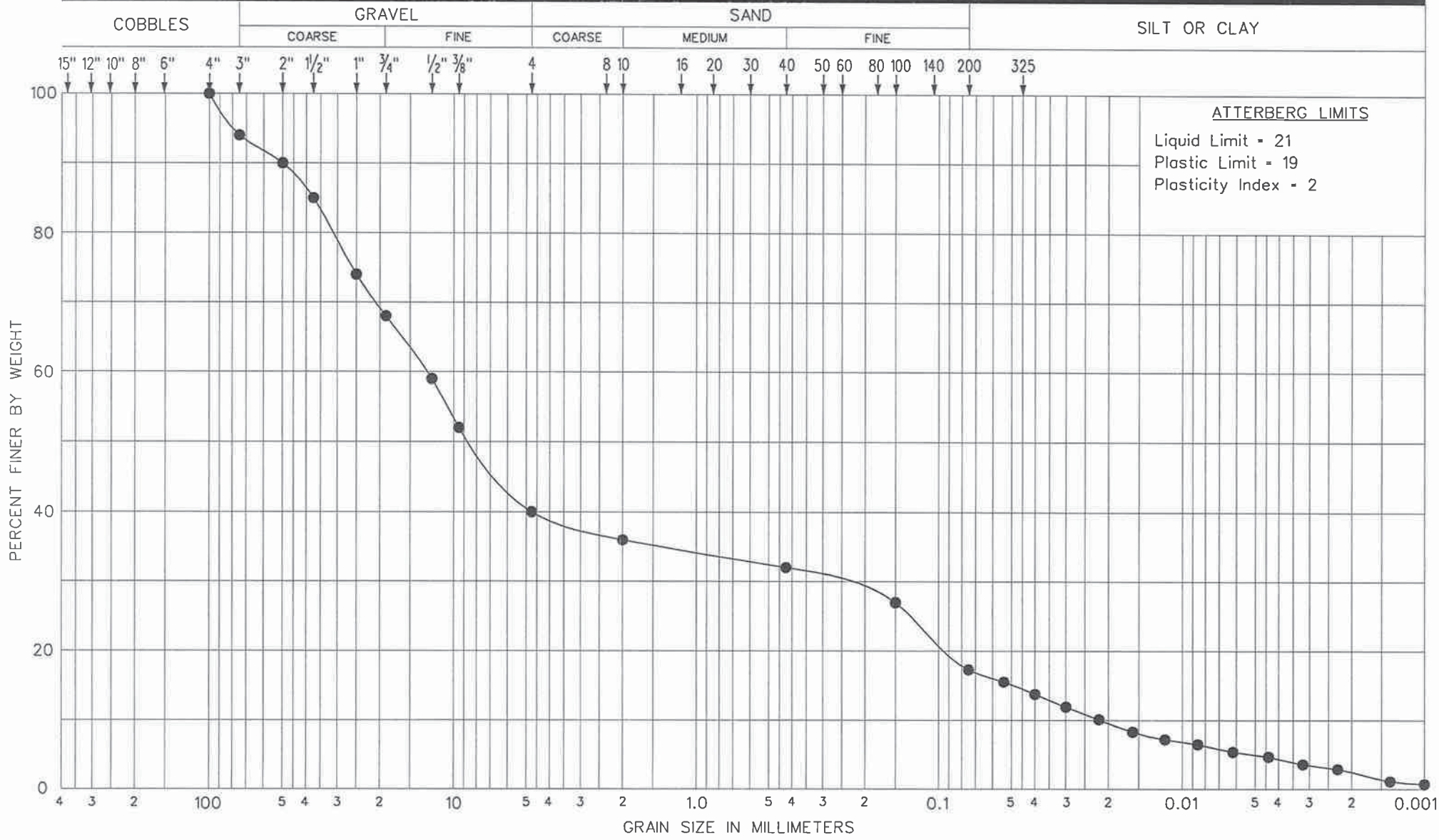
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-5 AT 4'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/18/09 TO 6/23/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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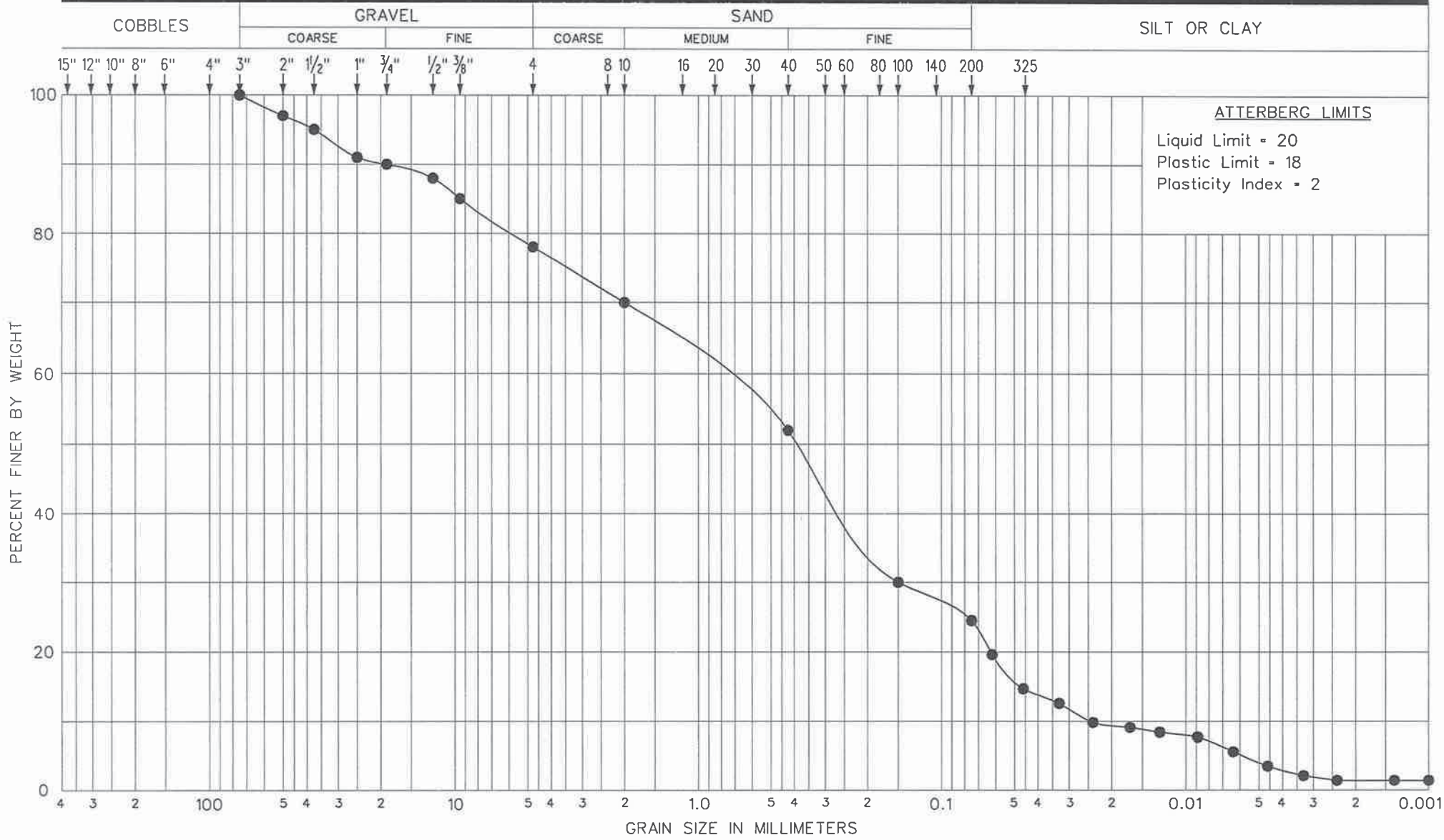
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-5 AT 10'		
Material Description	SILTY SAND W/GRAVEL	USCS	SM

Date	6/16/09 TO 6/25/09
Technician	M. JOHNSON, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
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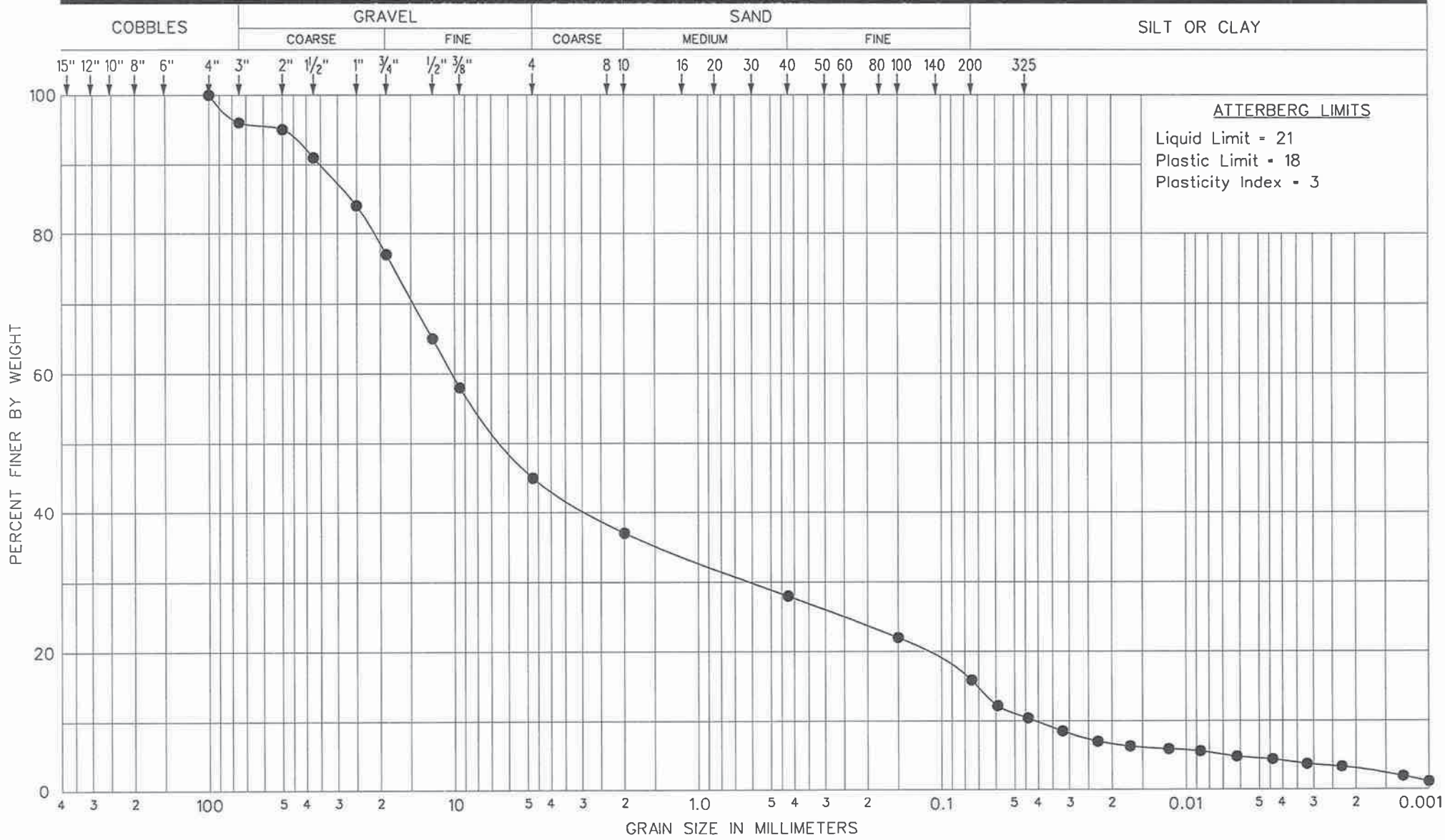
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-5 AT 18'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/17/09 TO 6/23/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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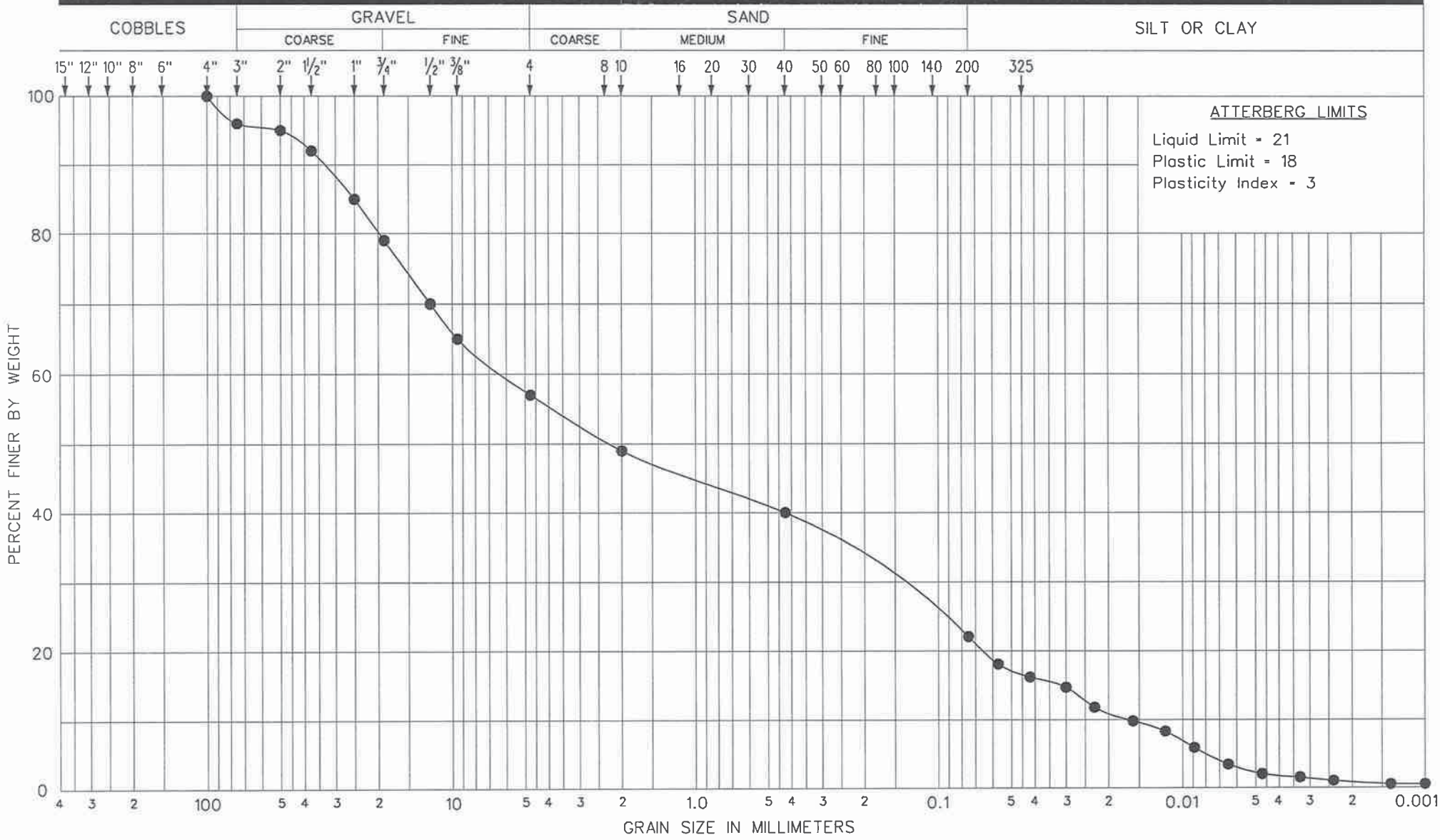
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-6 AT 6'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/16/09 TO 6/25/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
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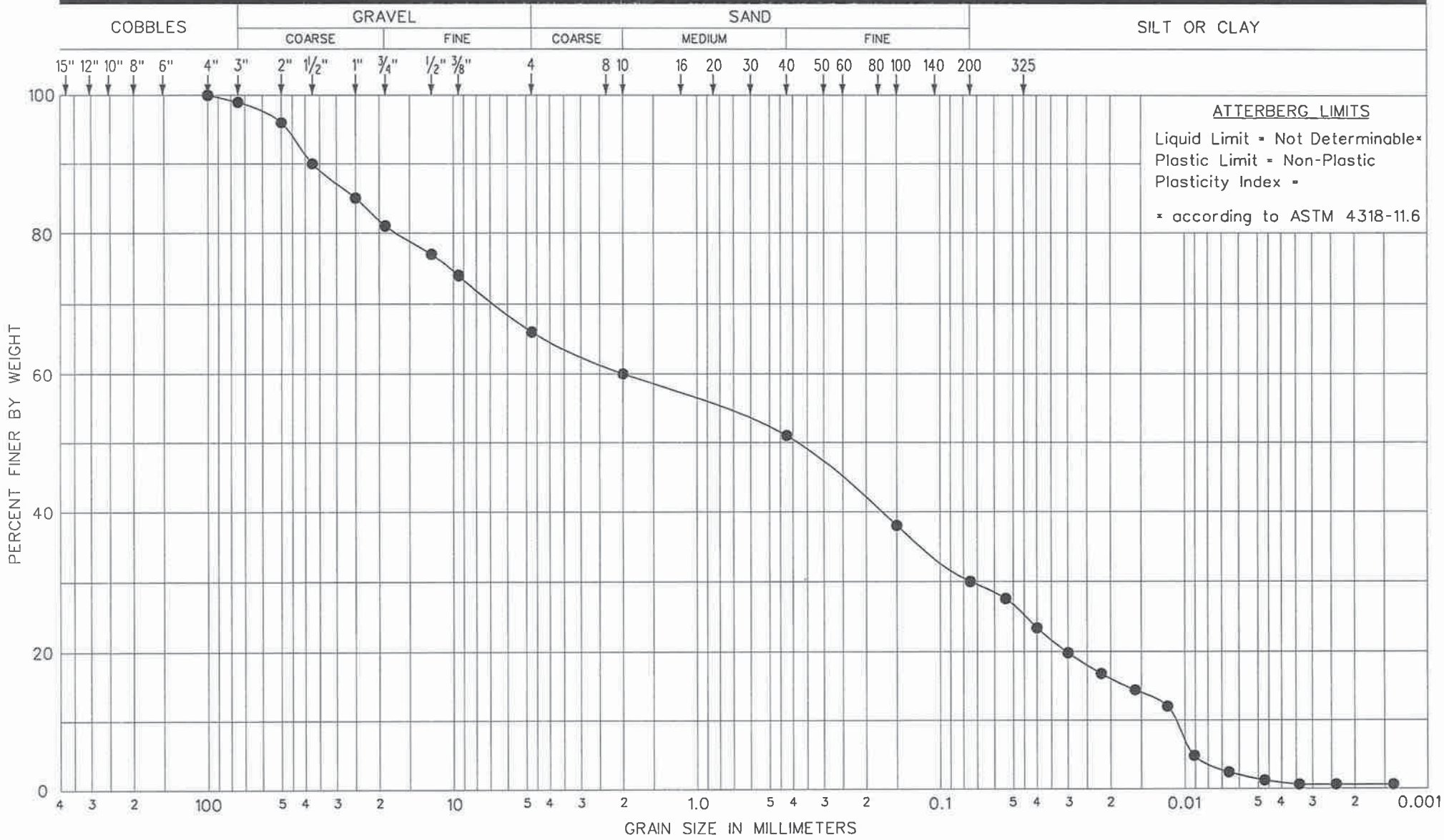
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-6 AT 11'		
Material Description	SILTY SAND	USCS	SM

Date	6/16/09 TO 6/23/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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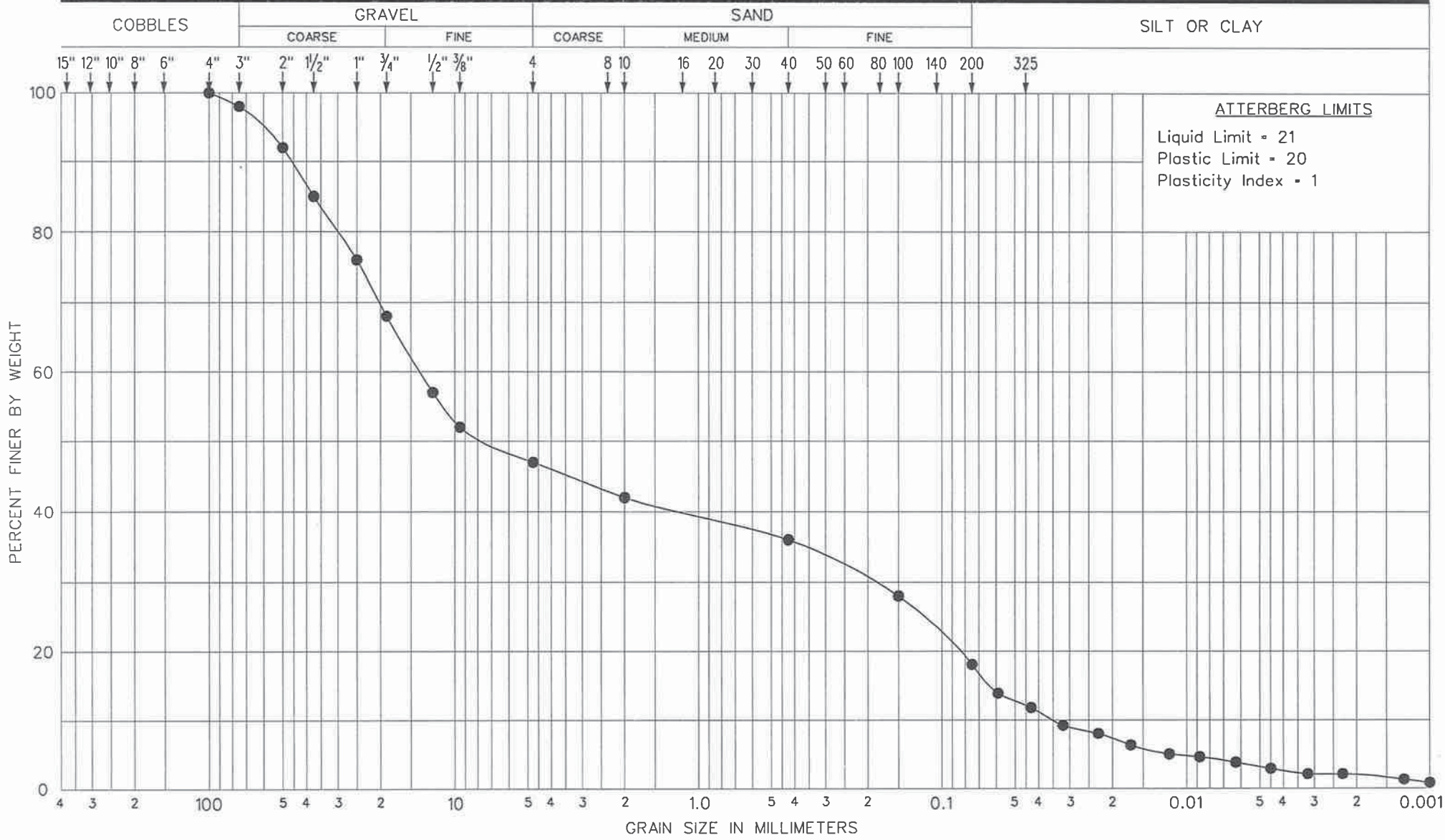
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-7 AT 5'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/16/09 TO 6/26/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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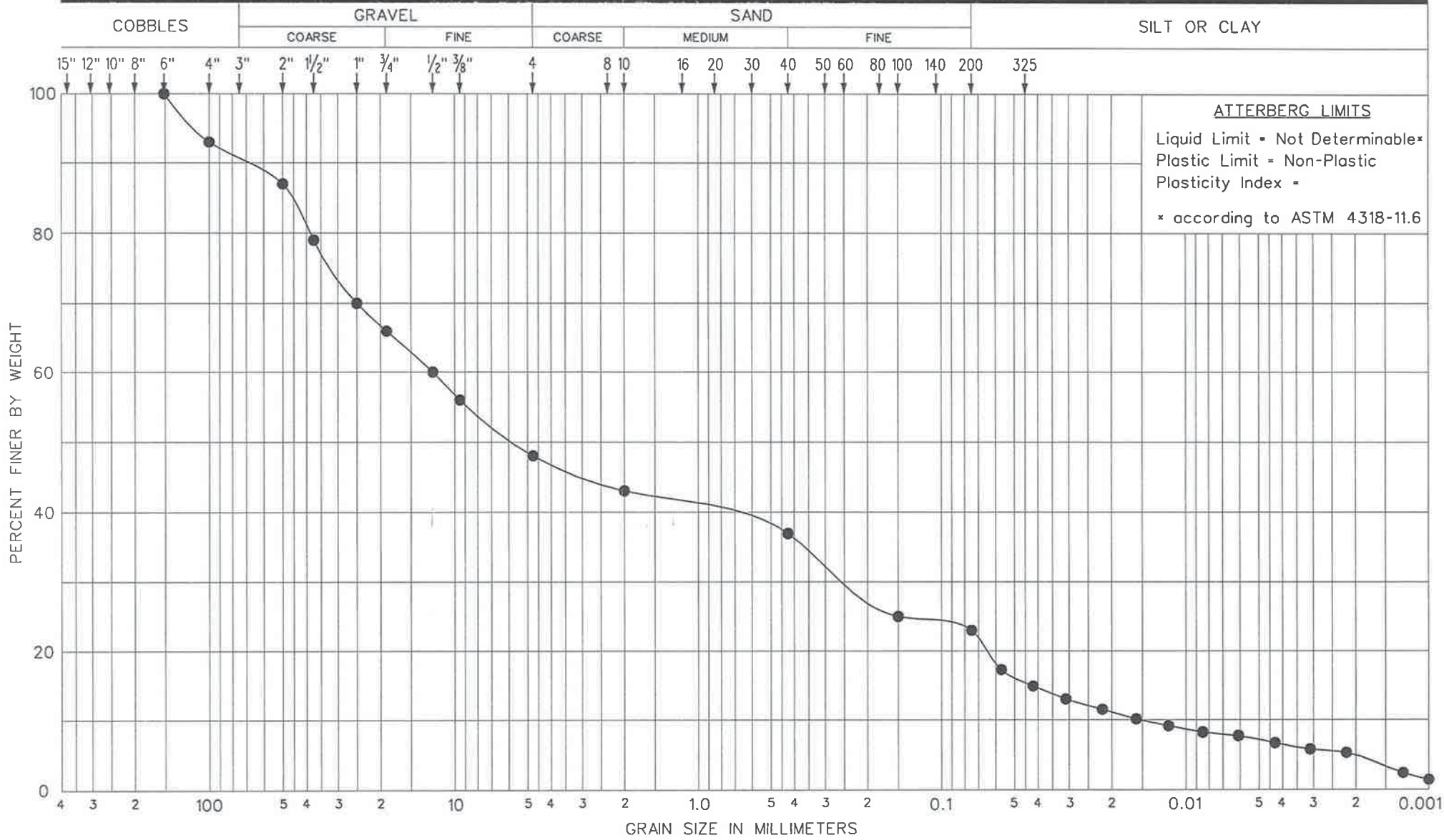
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-7 AT 10'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/16/09 TO 6/24/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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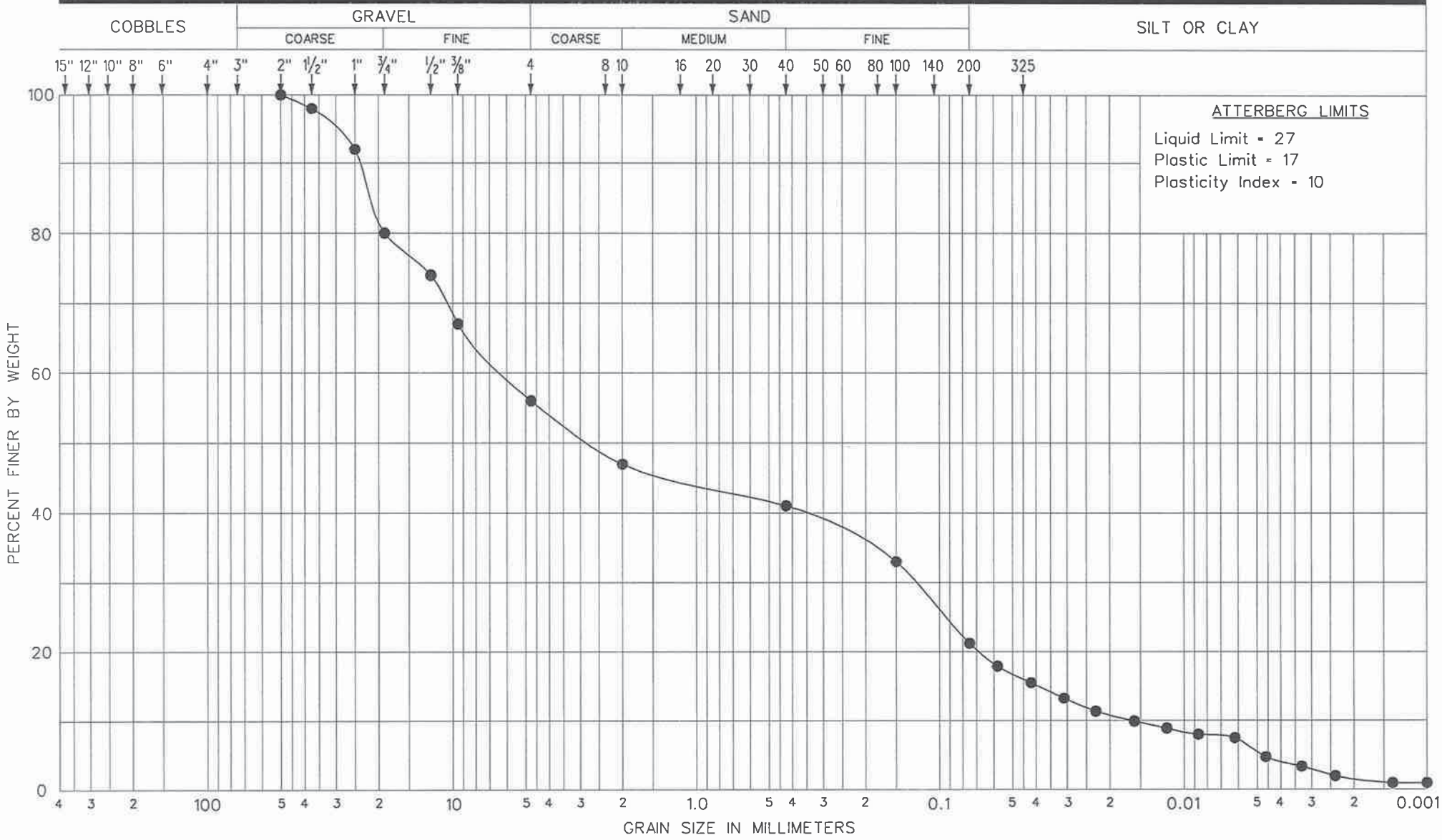
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-8 AT 4'		
Material Description	CLAYEY GRAVEL W/SAND	USCS	GC

Date	6/17/09 TO 6/22/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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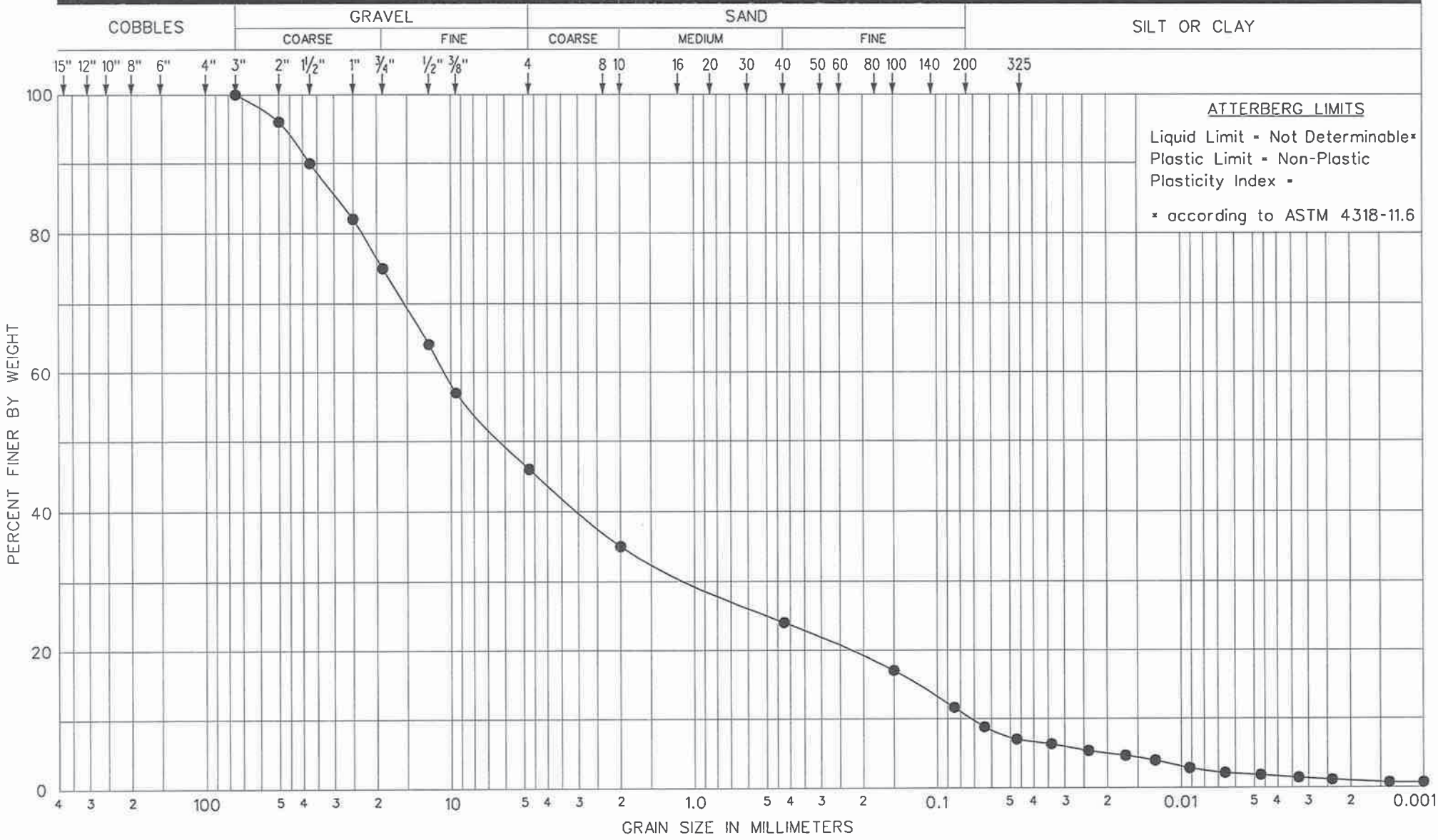
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-8 AT 18'		
Material Description	GRAVEL W/SILT & SAND	USCS	GP-GM

Date	6/17/09 TO 6/22/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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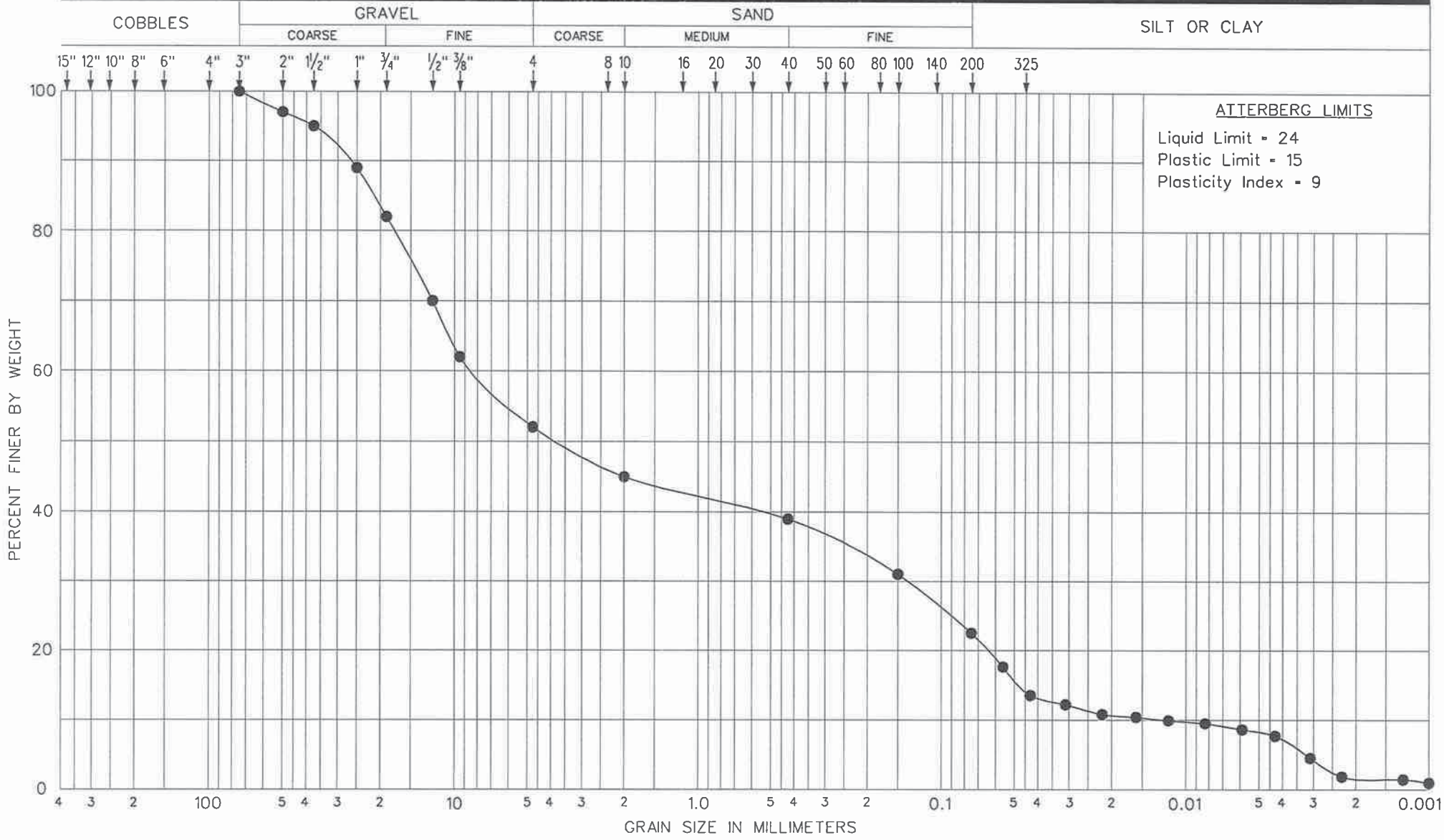
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-9 AT 5'		
Material Description	CLAYEY GRAVEL W/SAND	USCS	GC

Date	6/18/09 TO 6/24/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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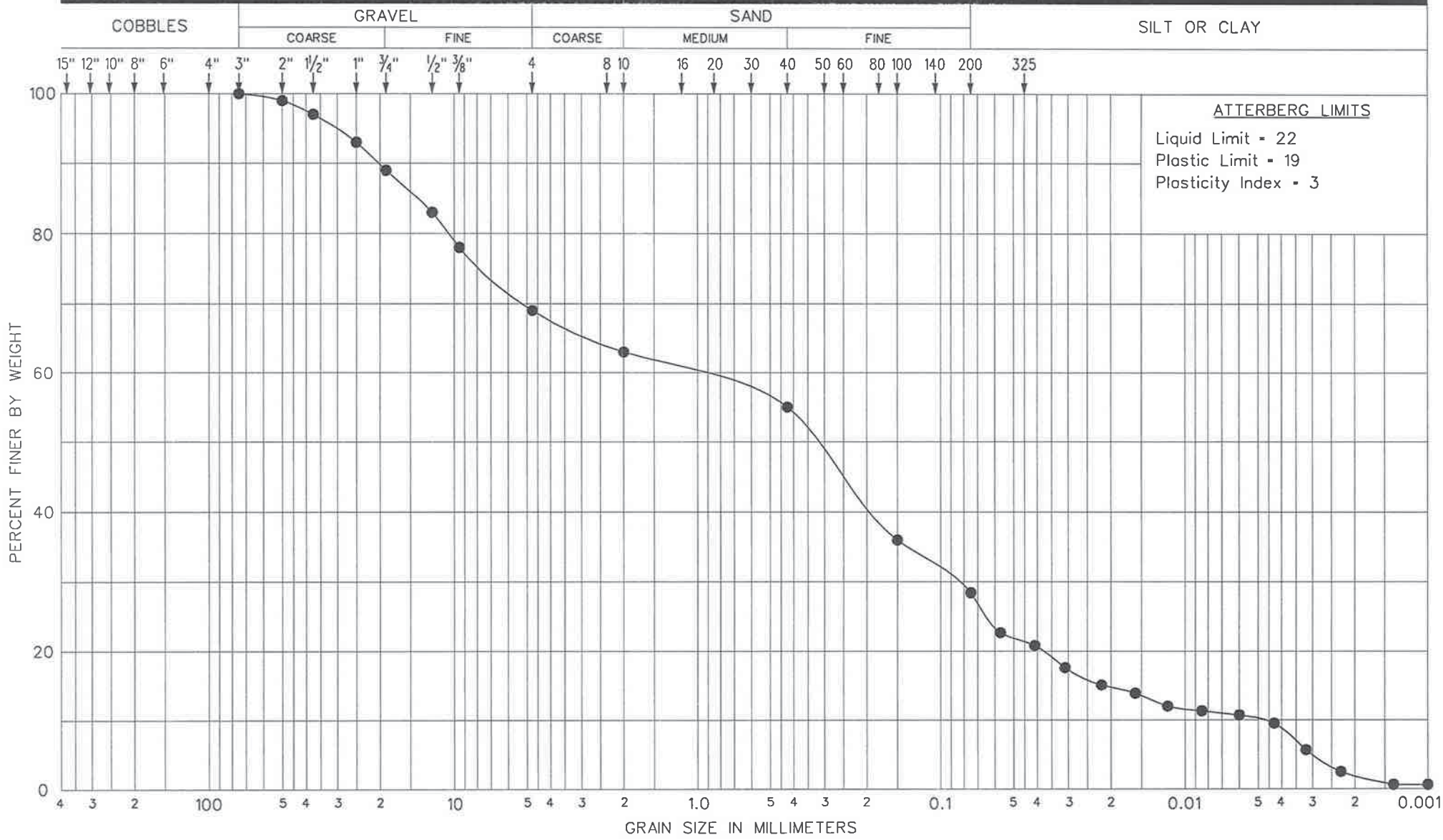
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-9 AT 10'		
Material Description	SILTY SAND W/GRAVEL	USCS	SM

Date	6/16/09 TO 6/29/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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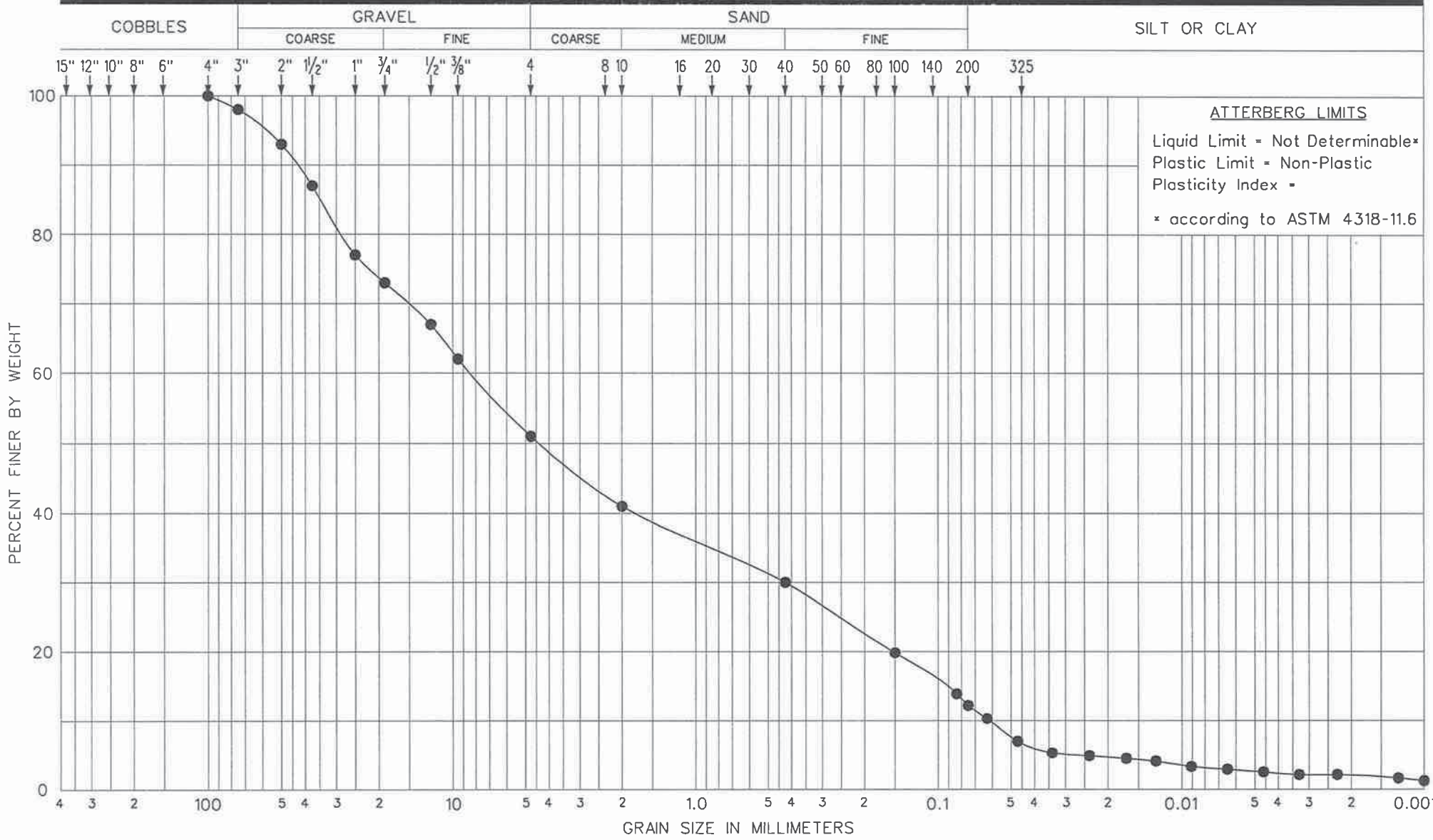
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-10 AT 10'		
Material Description	GRAVEL W/SILT & SAND	USCS	GP-GM

Date	6/18/09 TO 6/23/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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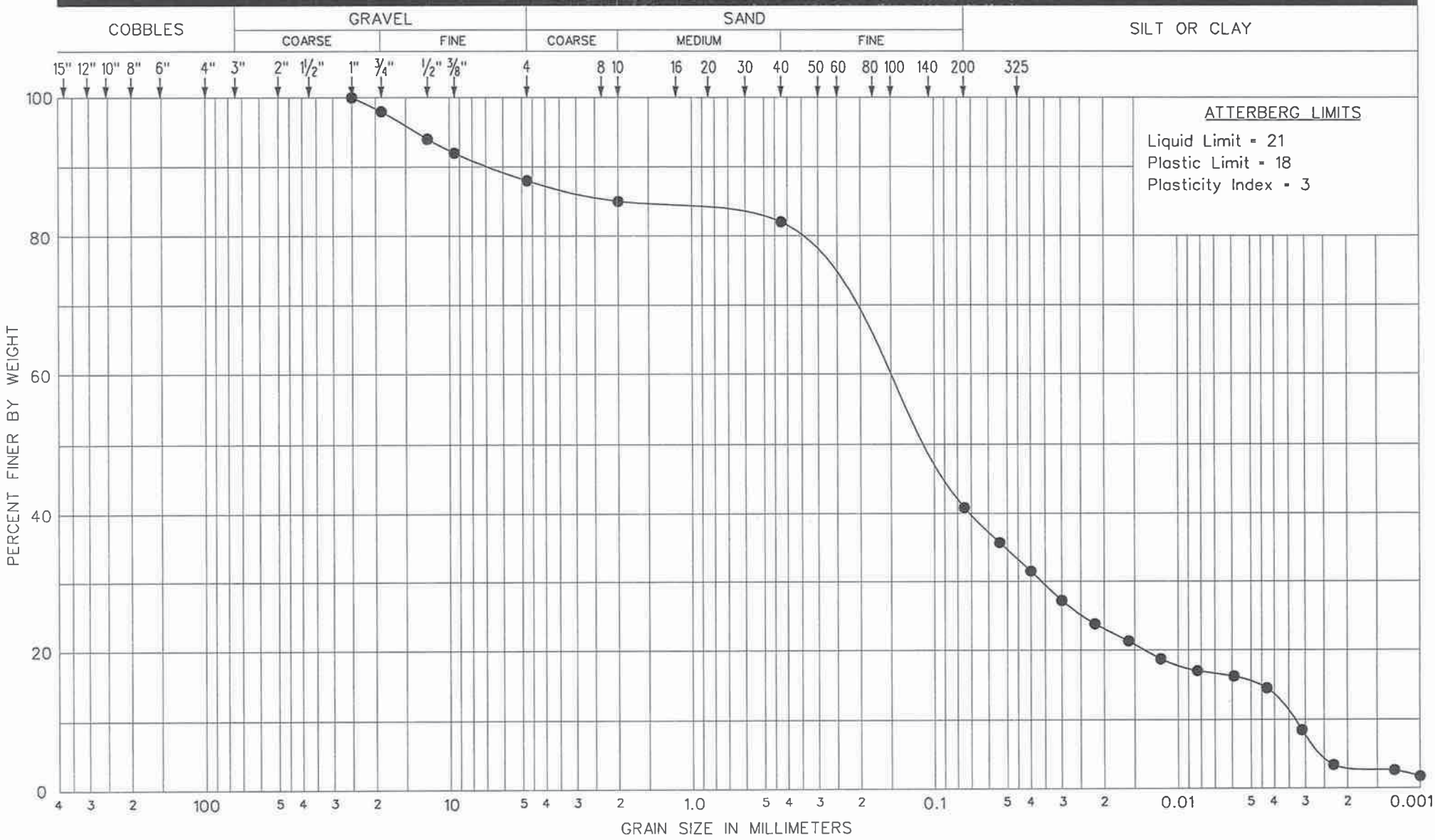
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-11 AT 2'		
Material Description	SANDY SILTY	USCS	ML

Date	6/16/09 TO 6/26/09
Technician	S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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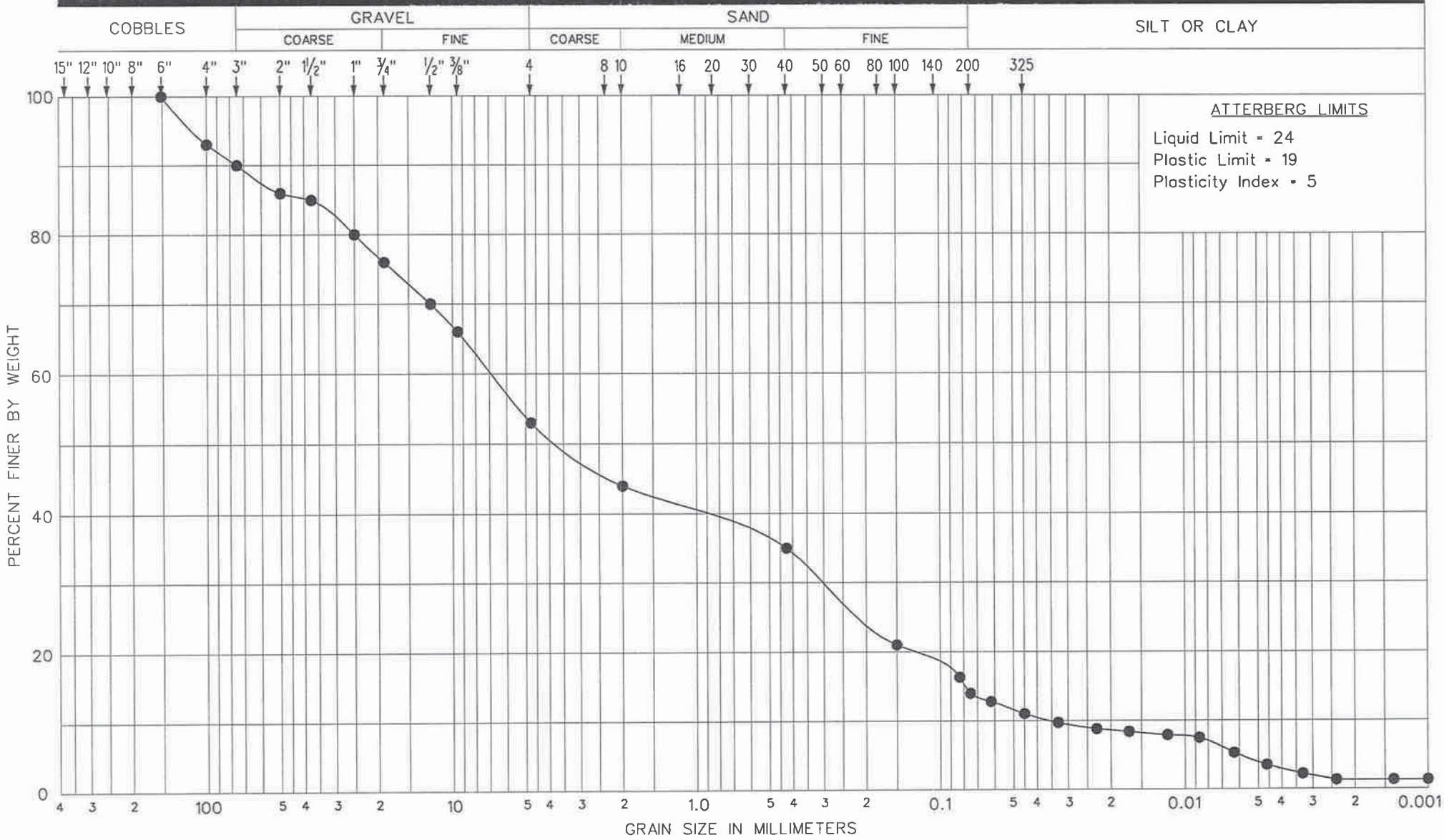
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-11 AT 4.5'		
Material Description	SILTY CLAYEY GRAVEL W/SAND	USCS	GC-GM

Date	6/16/09 TO 6/22/09
Technician	M. JOHNSON, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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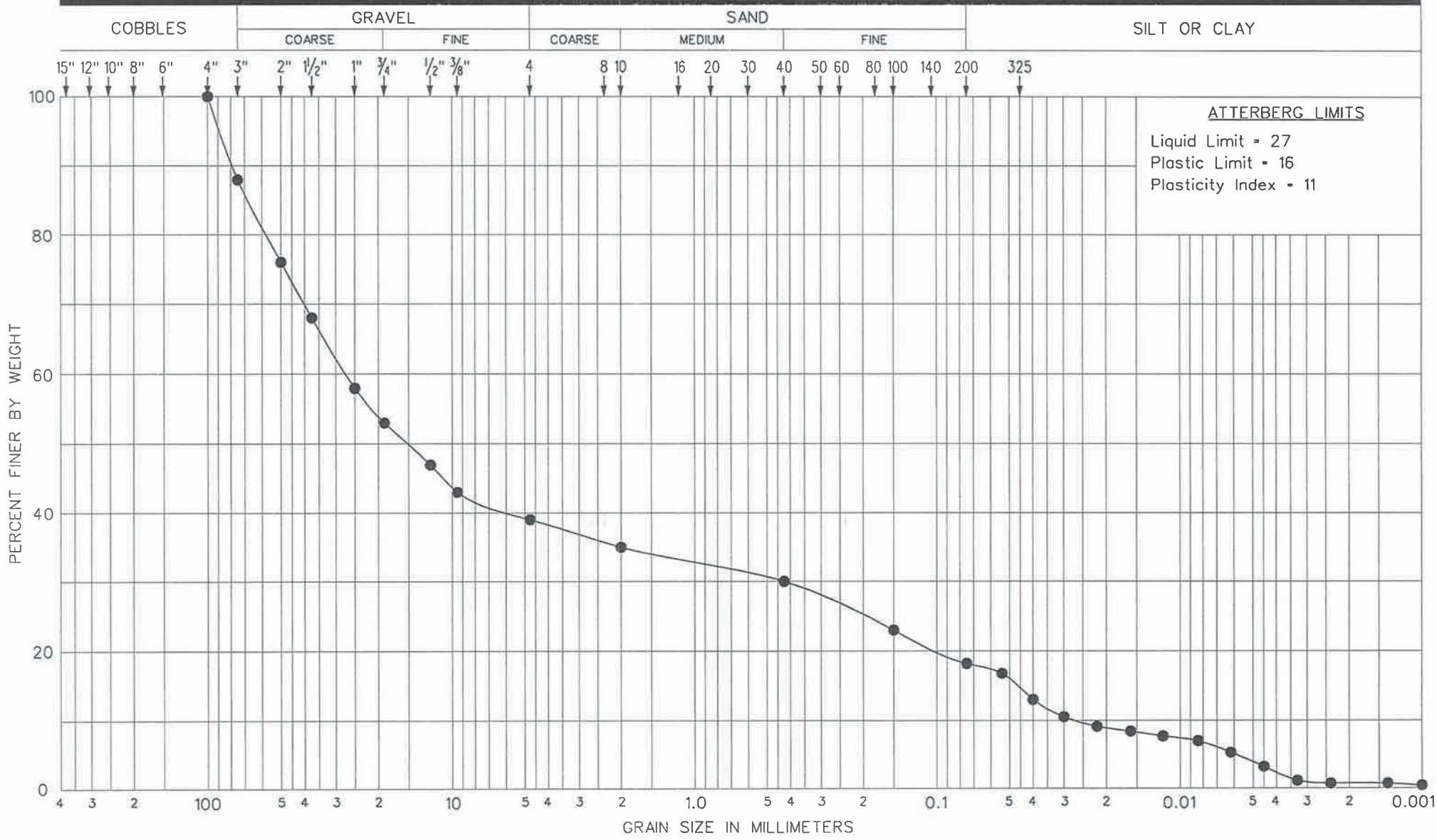
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-11 AT 15'		
Material Description	CLAYEY GRAVEL W/SAND	USCS	GC

Date	6/17/09 TO 6/22/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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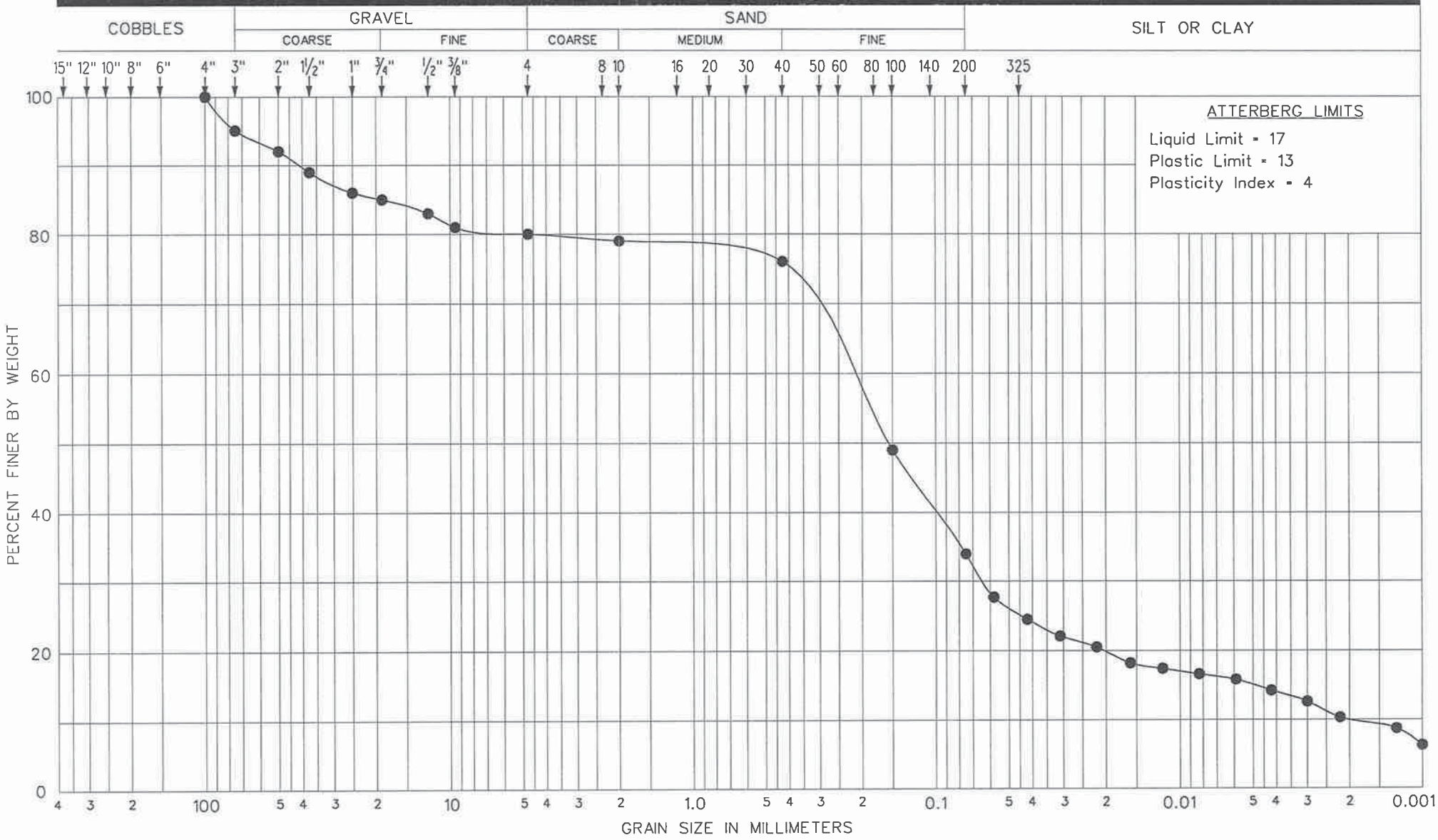
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-12 AT 1'		
Material Description	SILTY CLAYEY SAND W/GRAVEL	USCS	SC-SM

Date	6/18/09 TO 6/24/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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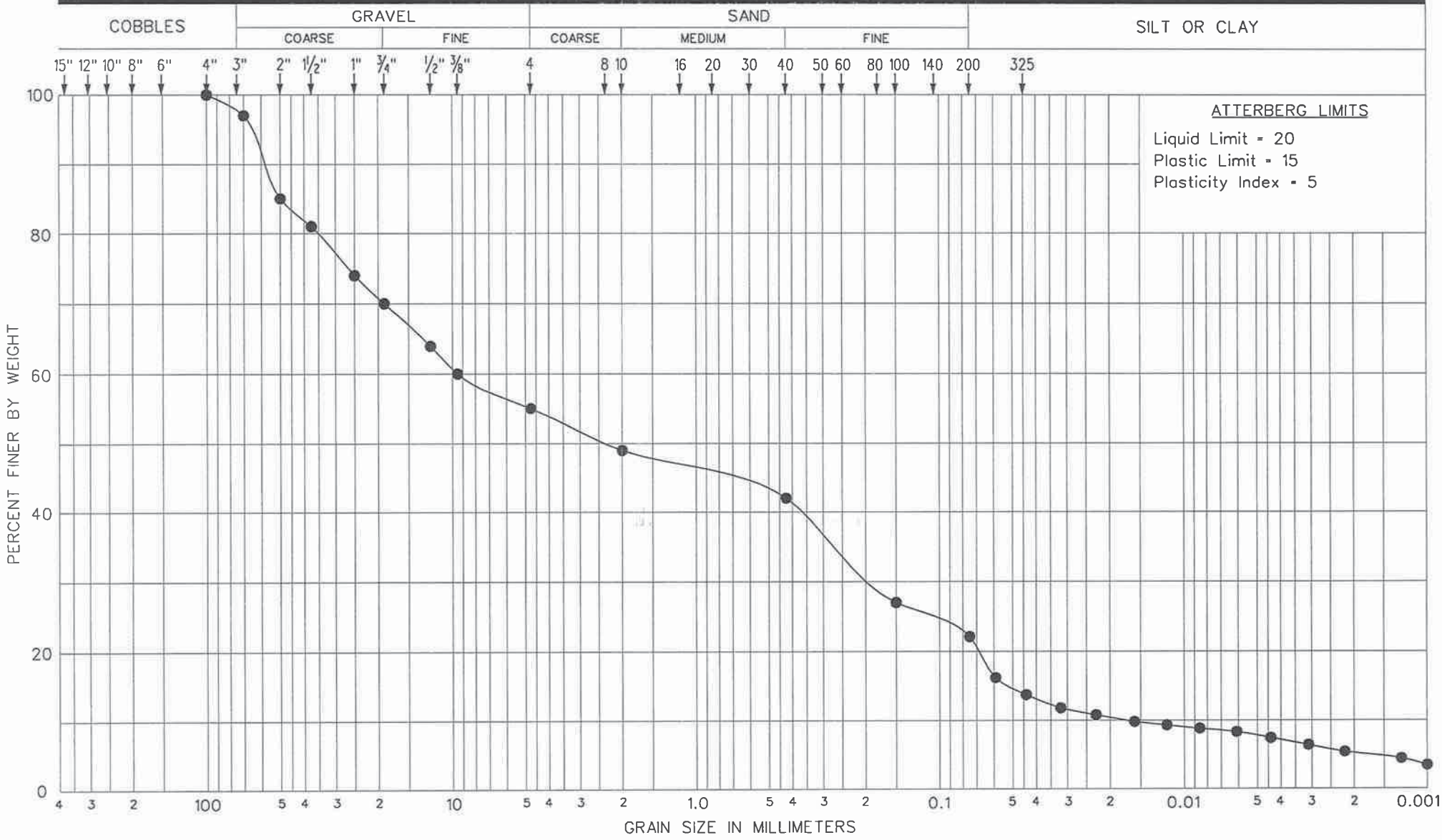
PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-12 AT 4'		
Material Description	SILTY CLAYEY GRAVEL W/SAND	USCS	GC-GM

Date	6/18/09 TO 6/23/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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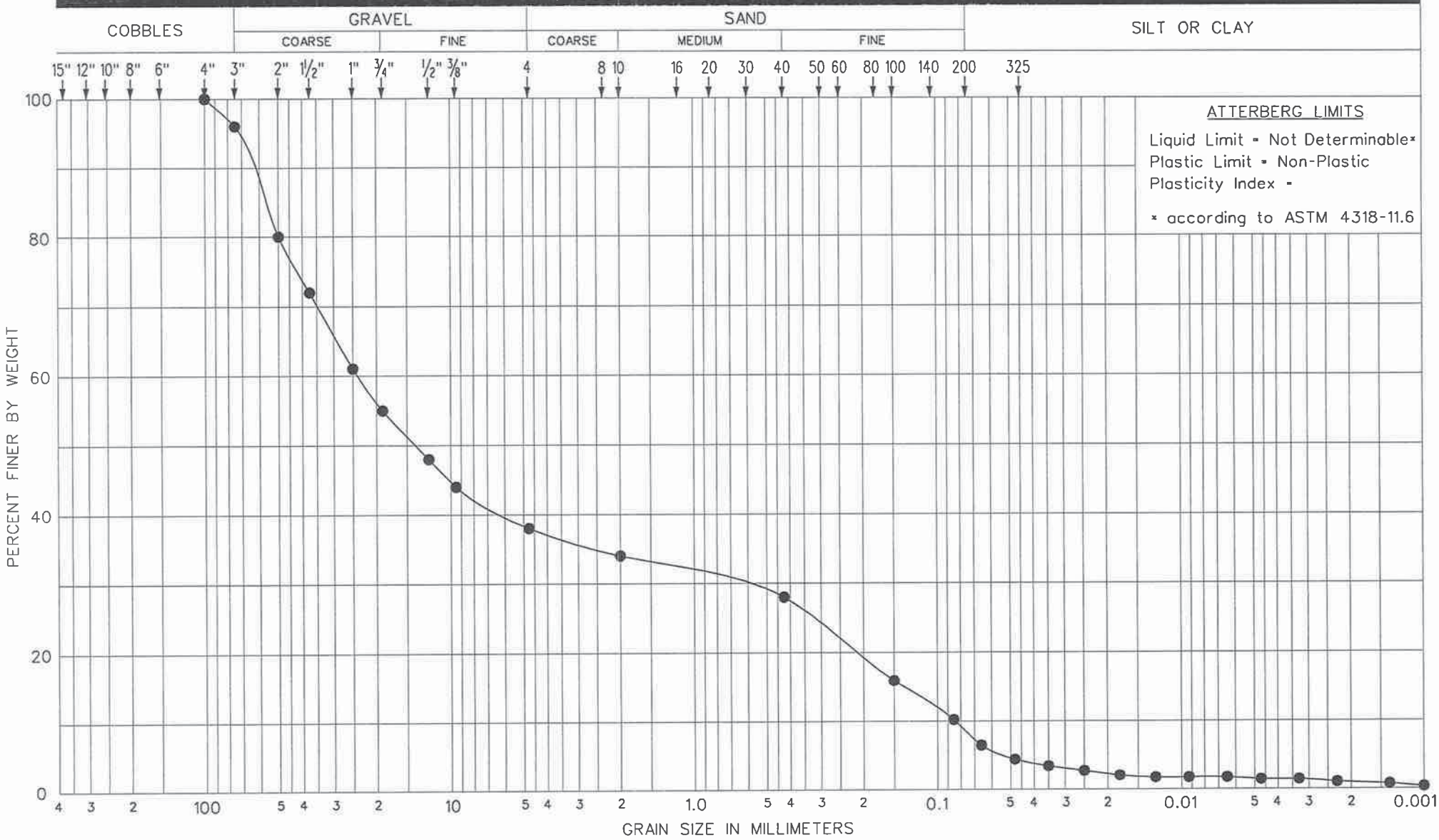

Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-12 AT 18'		
Material Description	GRAVEL W/SILT & SAND	USCS	GP-GM

Date	6/18/09 TO 6/24/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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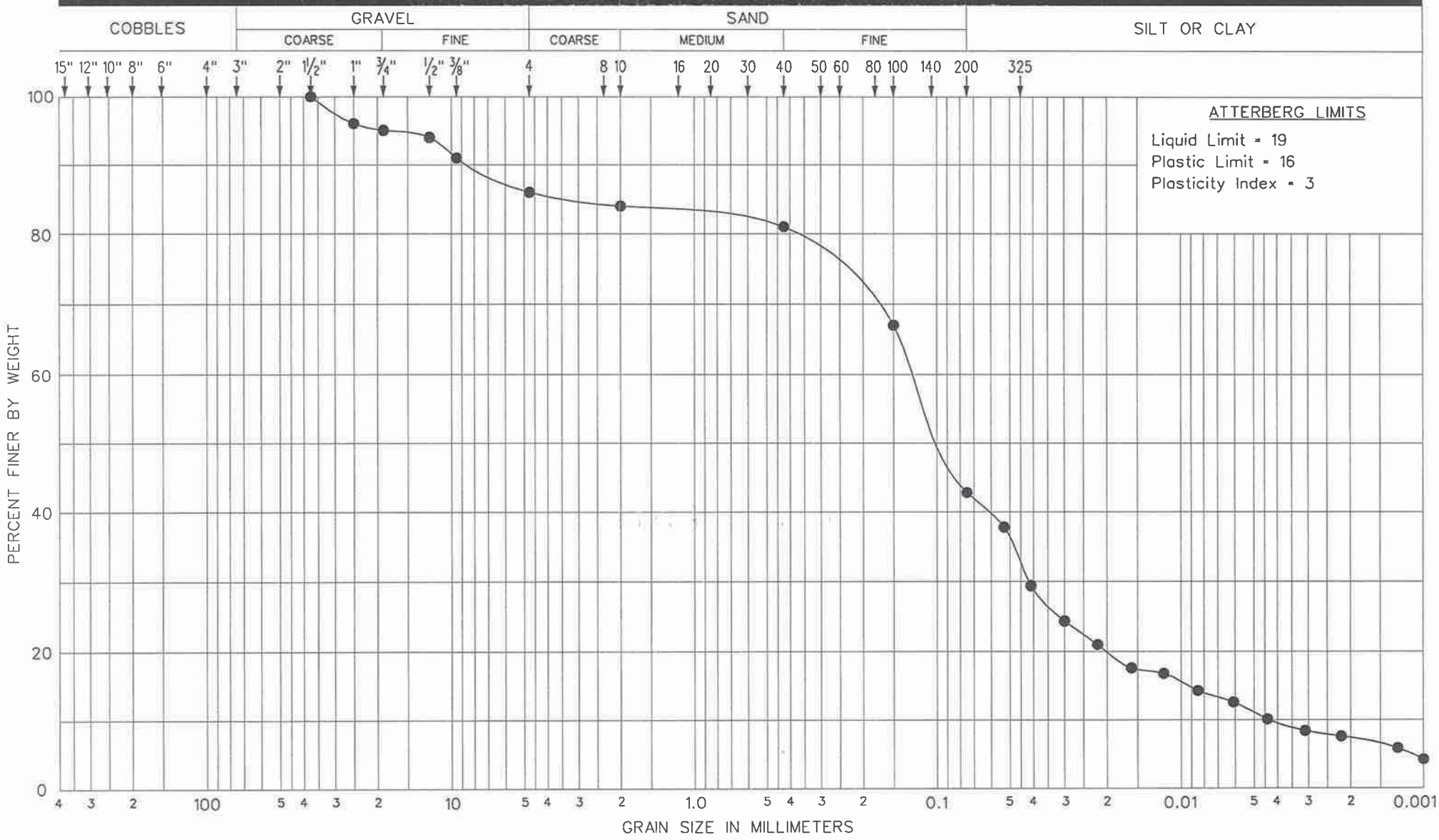
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-13 AT 3'		
Material Description	SILTY SAND	USCS	SM

Date	6/16/09 TO 6/26/09
Technician	S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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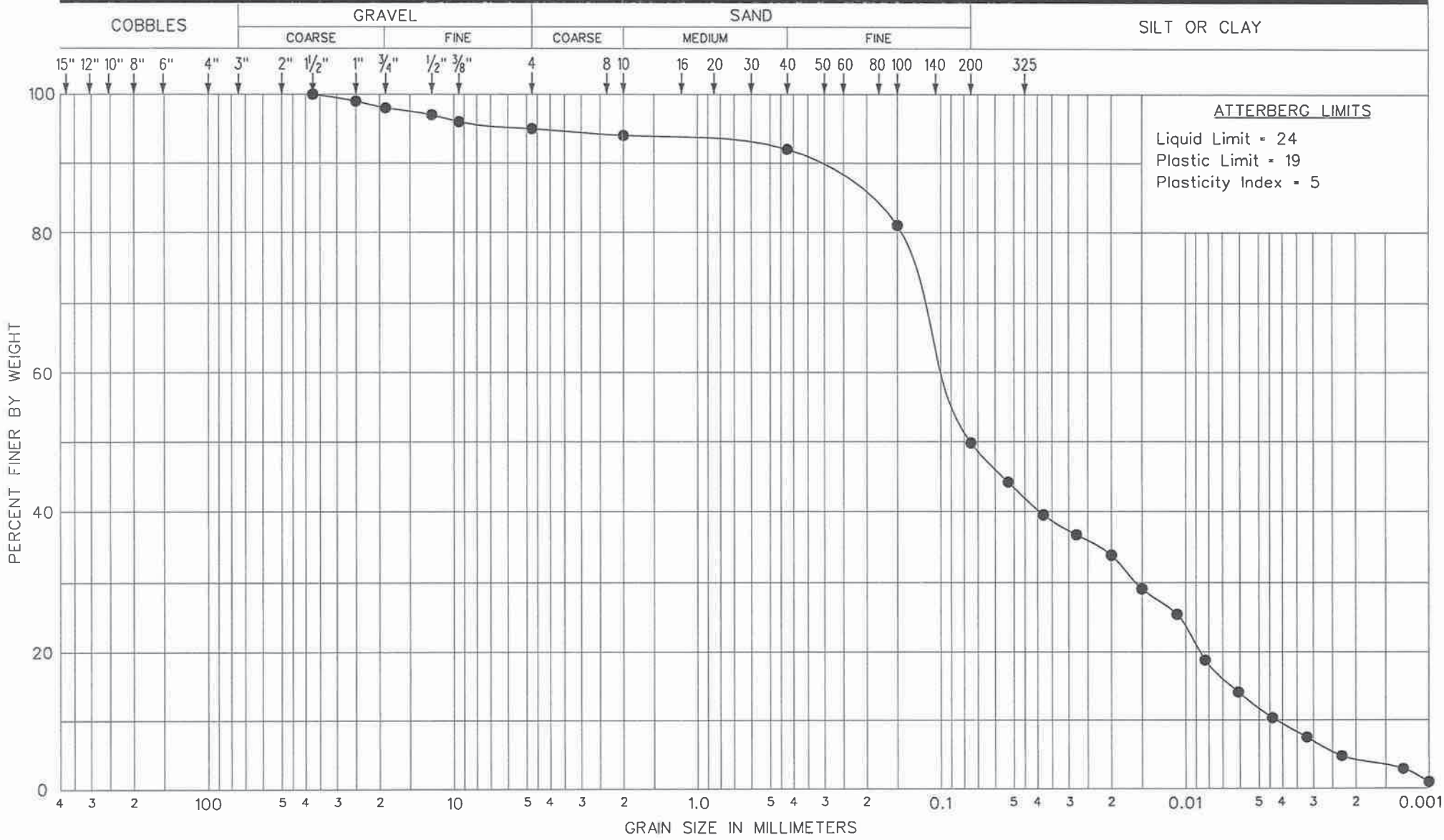
PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-13 AT 6'		
Material Description	SANDY SILTY CLAY	USCS	CL-ML

Date	6/18/09 TO 6/26/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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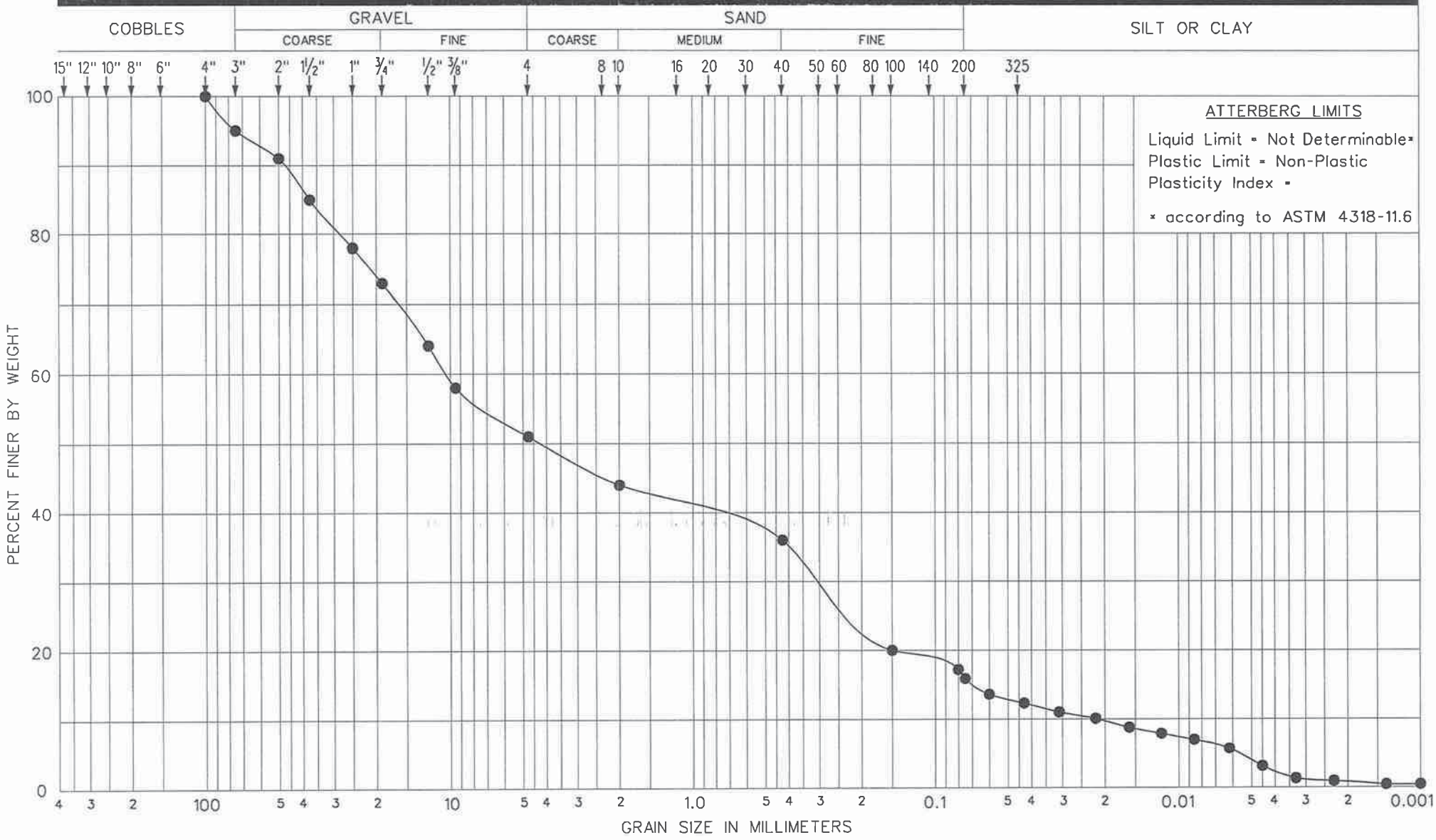
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-13 AT 15'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/18/09 TO 6/24/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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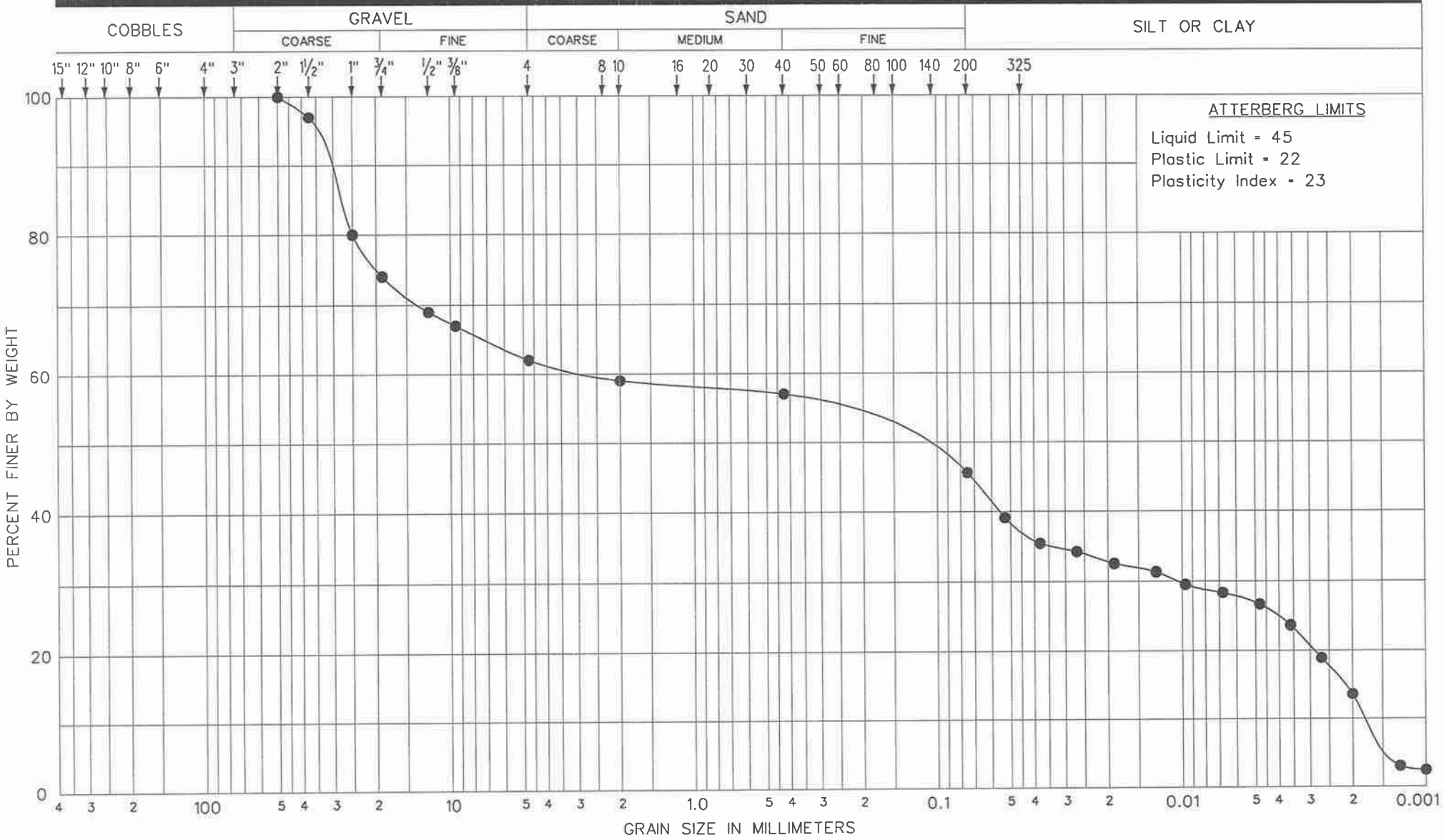
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-14 AT 2'		
Material Description	CLAYEY GRAVEL W/SAND	USCS	GC

Date	6/16/09 TO 6/25/09
Technician	S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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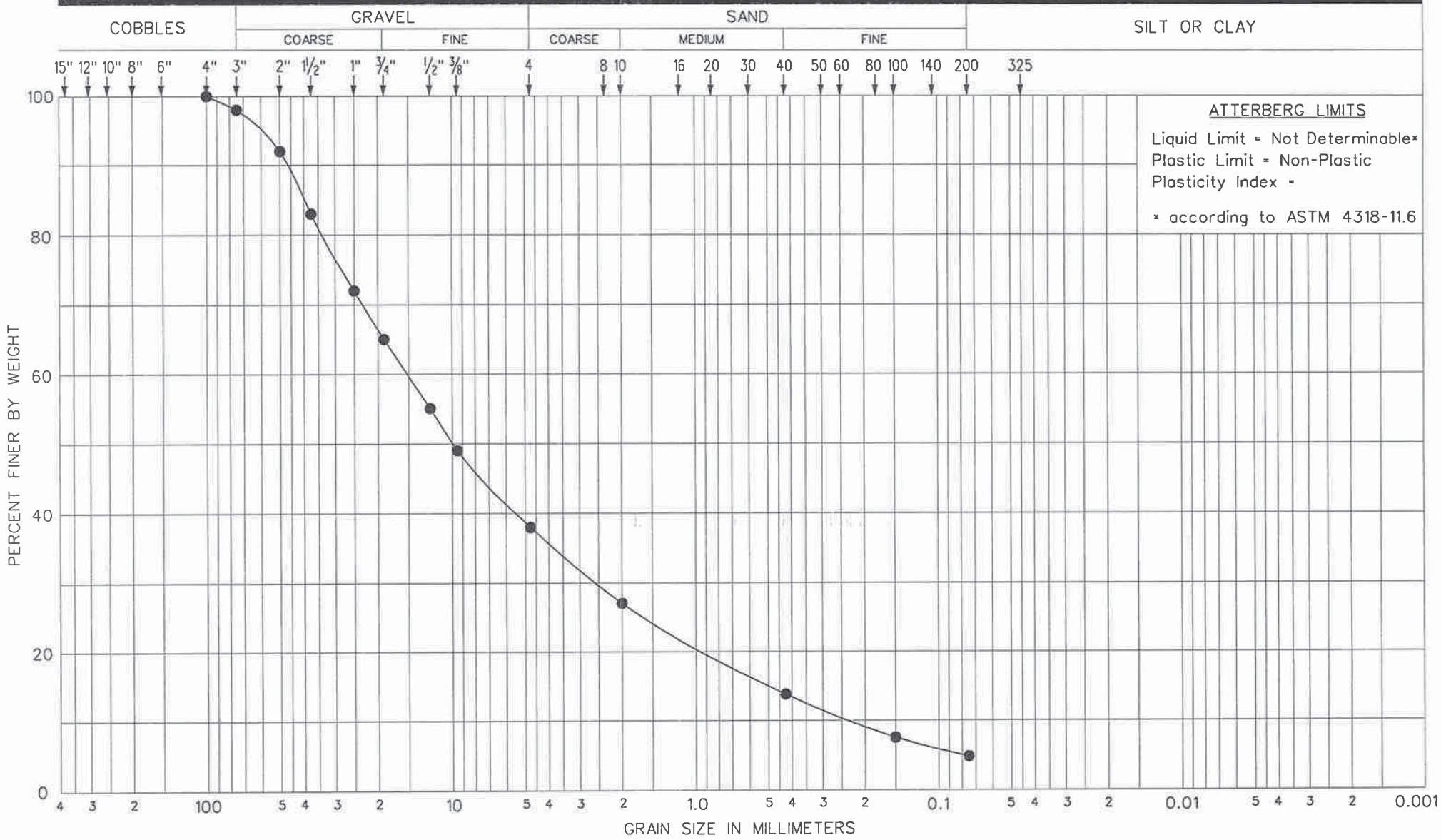
SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-14 AT 6'		
Material Description	BASALT GRAVELS & COBBLES	USCS	GP

Date	6/18/09
Technician	J. LINDO
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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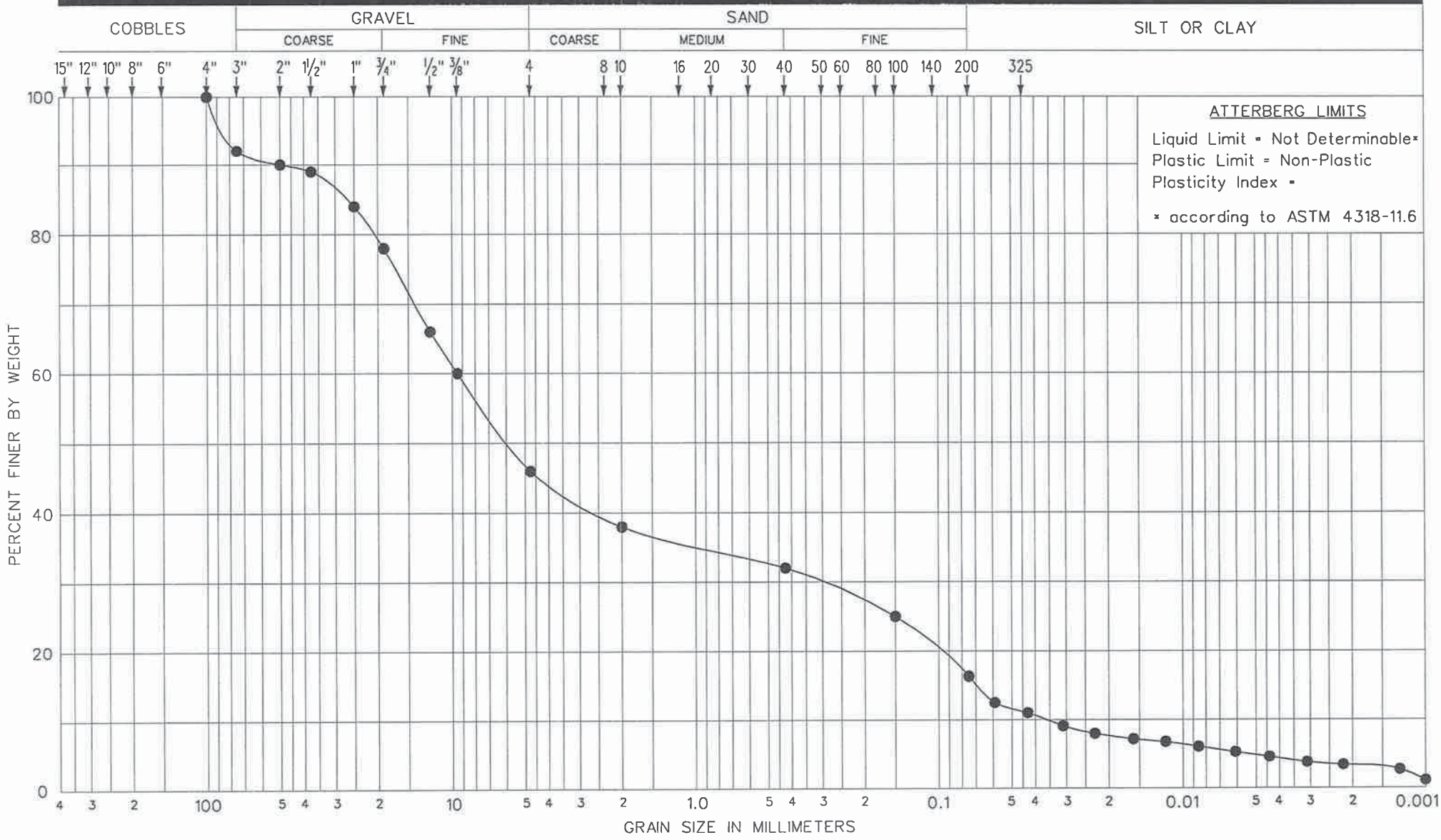
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



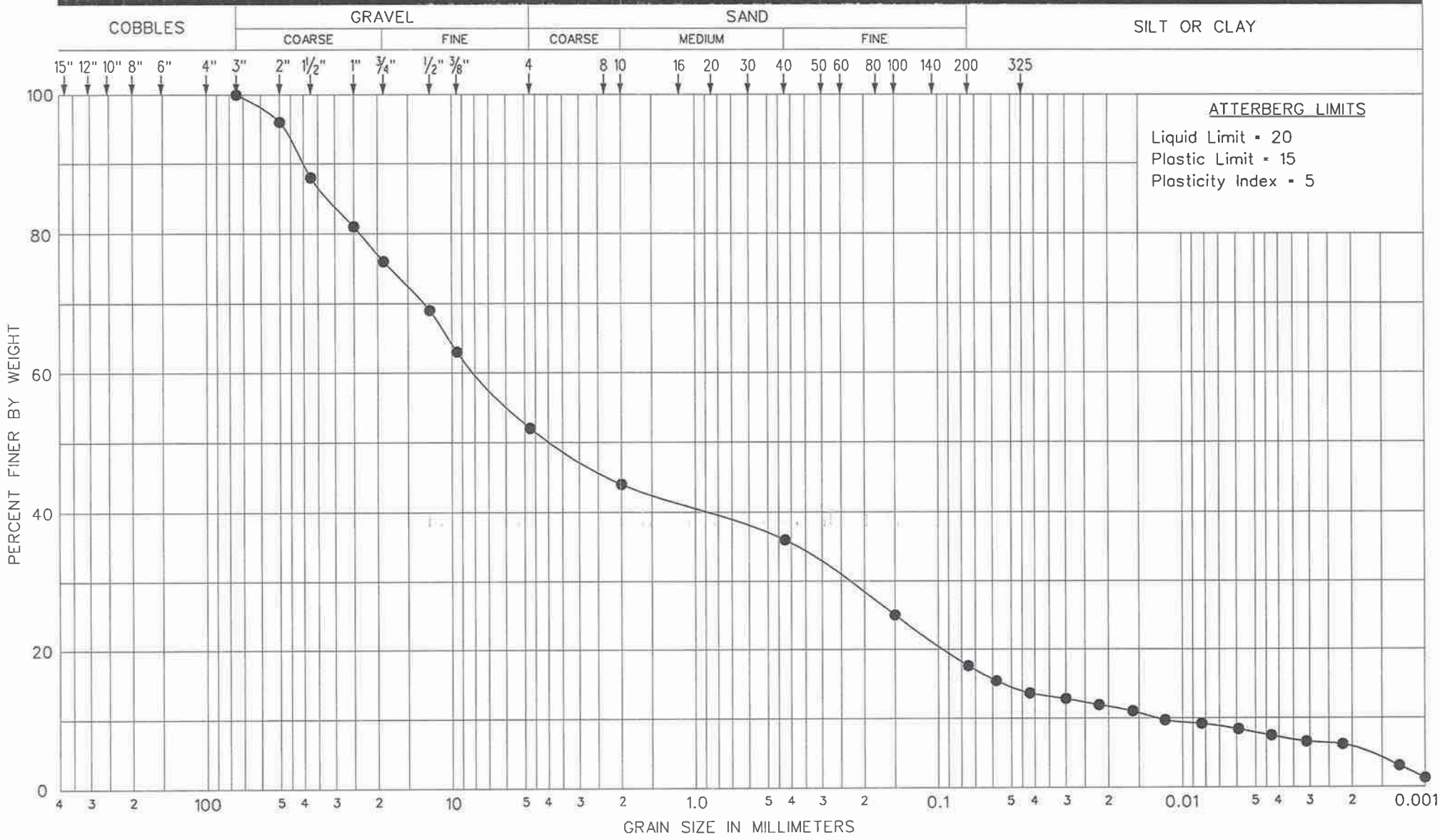
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-15 AT 4'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/16/09 TO 6/26/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



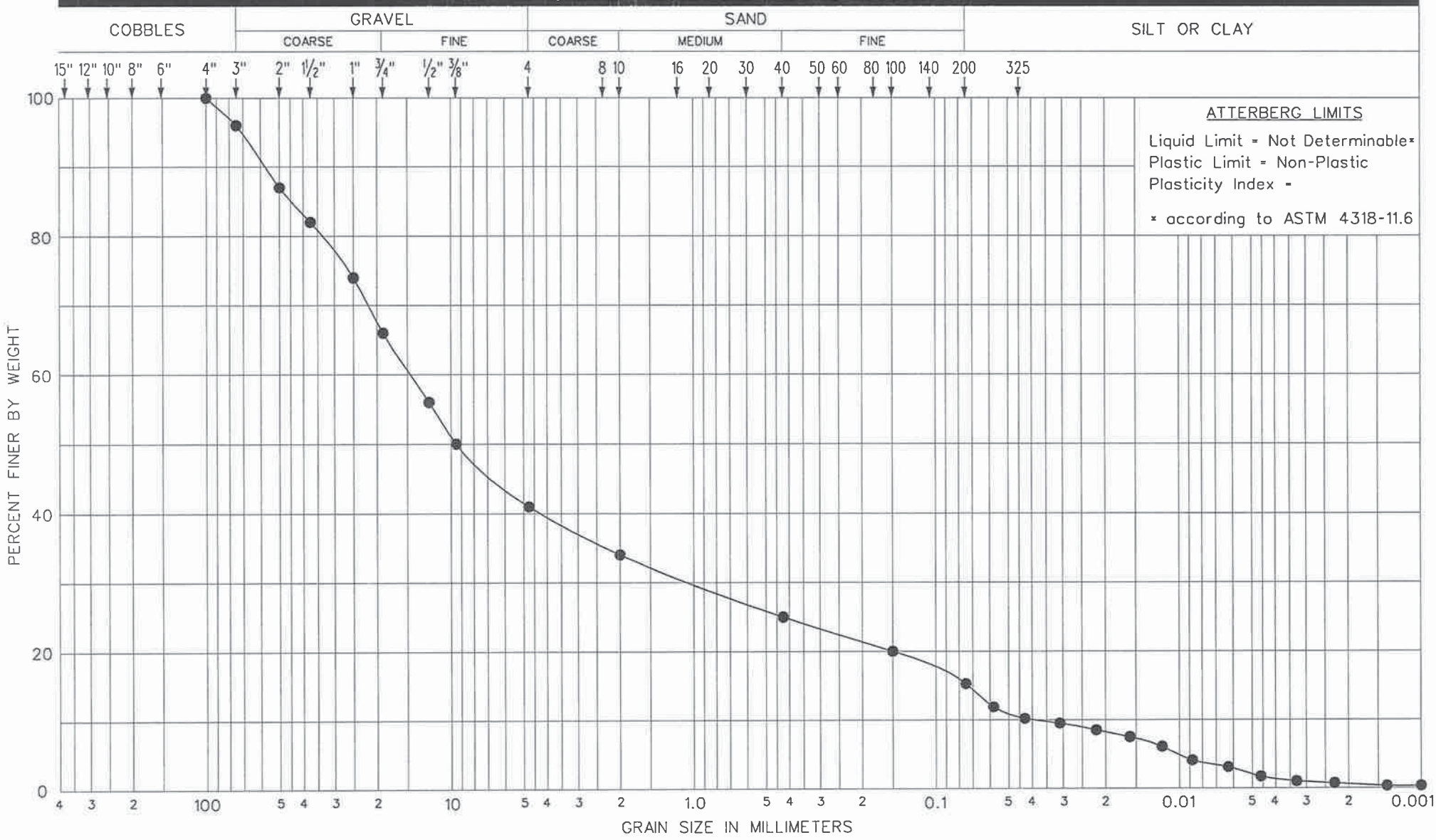
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-15 AT 9'		
Material Description	SILTY CLAYEY GRAVEL W/SAND	USCS	GC-GM

Date	6/17/09 TO 6/26/09
Technician	M. JOHNSON, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-16 AT 4'		
Material Description	SILTY GRAVEL W/SAND	USCS	GM

Date	6/17/09 TO 6/25/09
Technician	K. MARTINEZ, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

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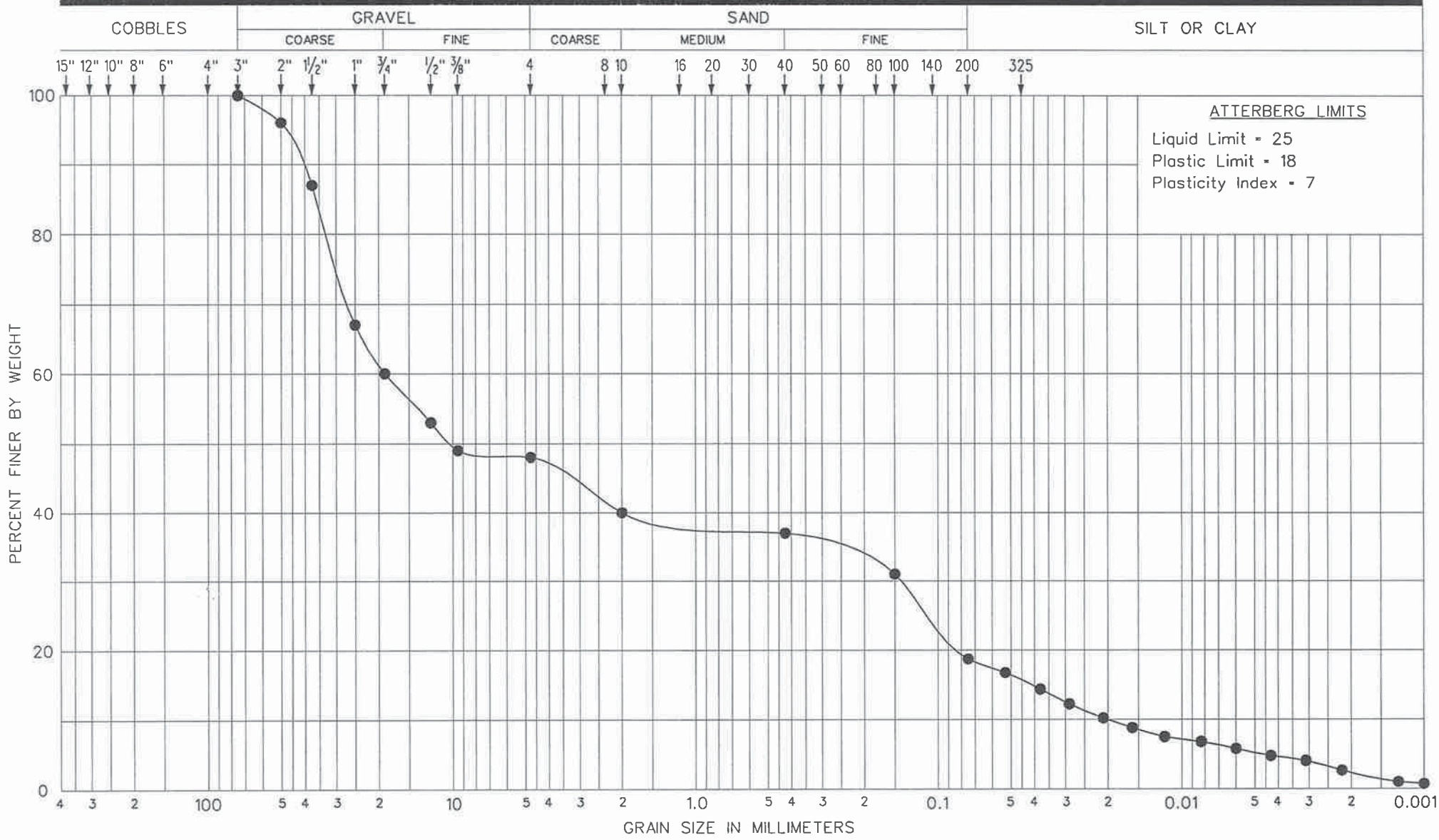
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



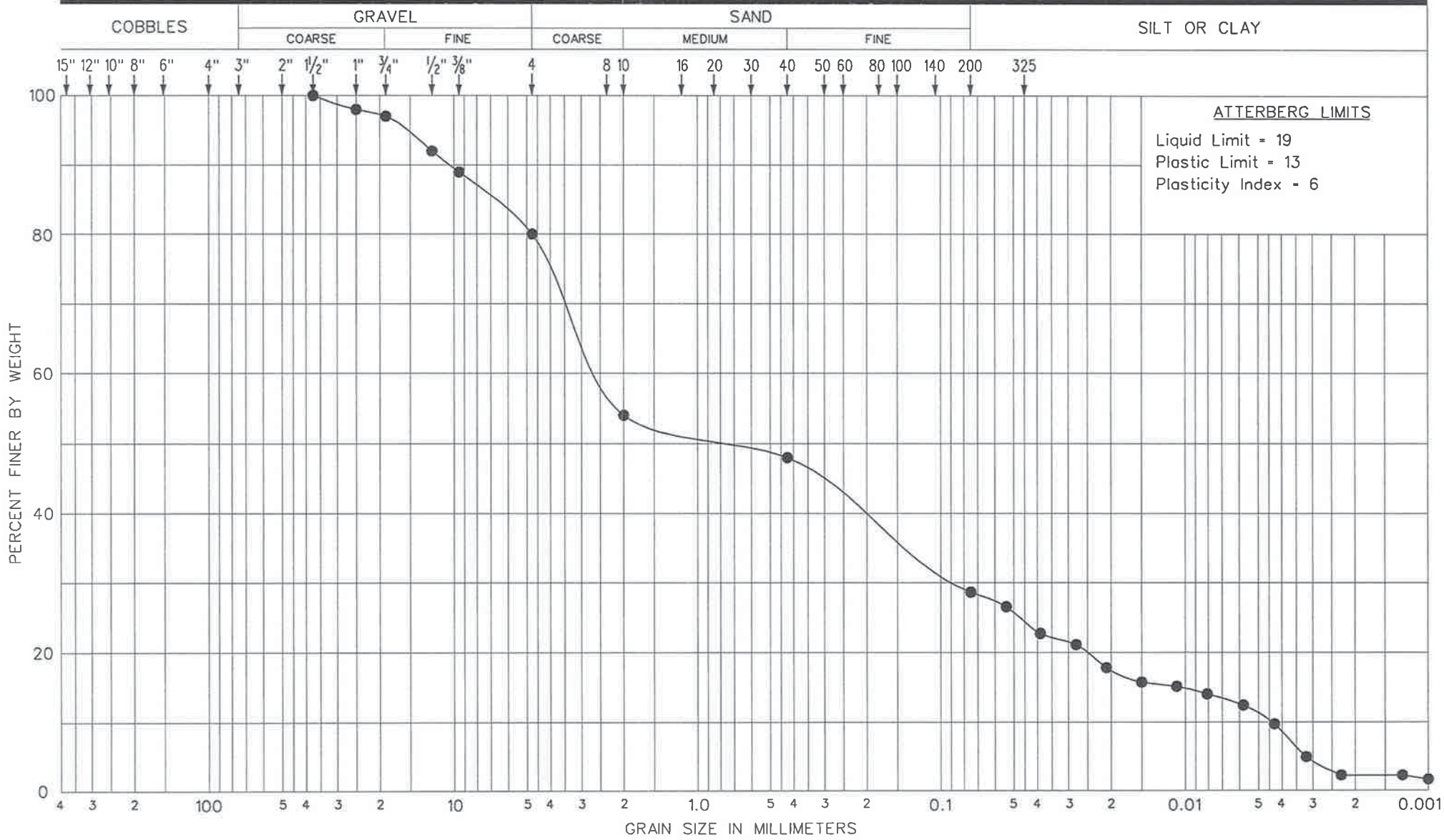
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-16 AT 6'		
Material Description	SILTY CLAYEY GRAVEL W/SAND	USCS	GC-GM

Date	6/17/09 TO 6/24/09
Technician	J. LINDO, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



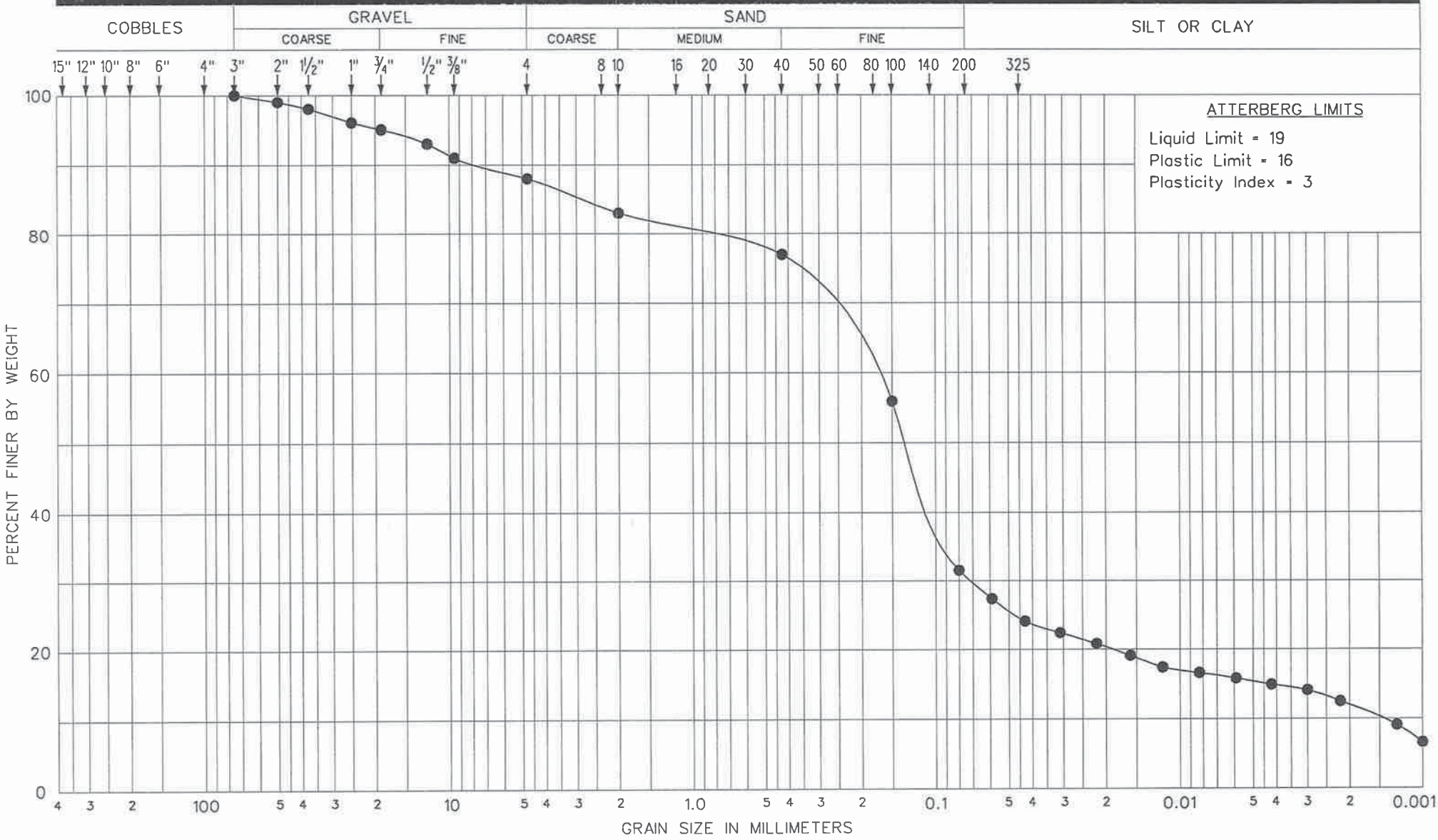
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-16 AT 10'		
Material Description	SILTY CLAYEY SAND W/GRAVEL	USCS	SC-SM

Date	6/16/09 TO 6/22/09
Technician	S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2

SIEVE ANALYSIS (GRADATION)



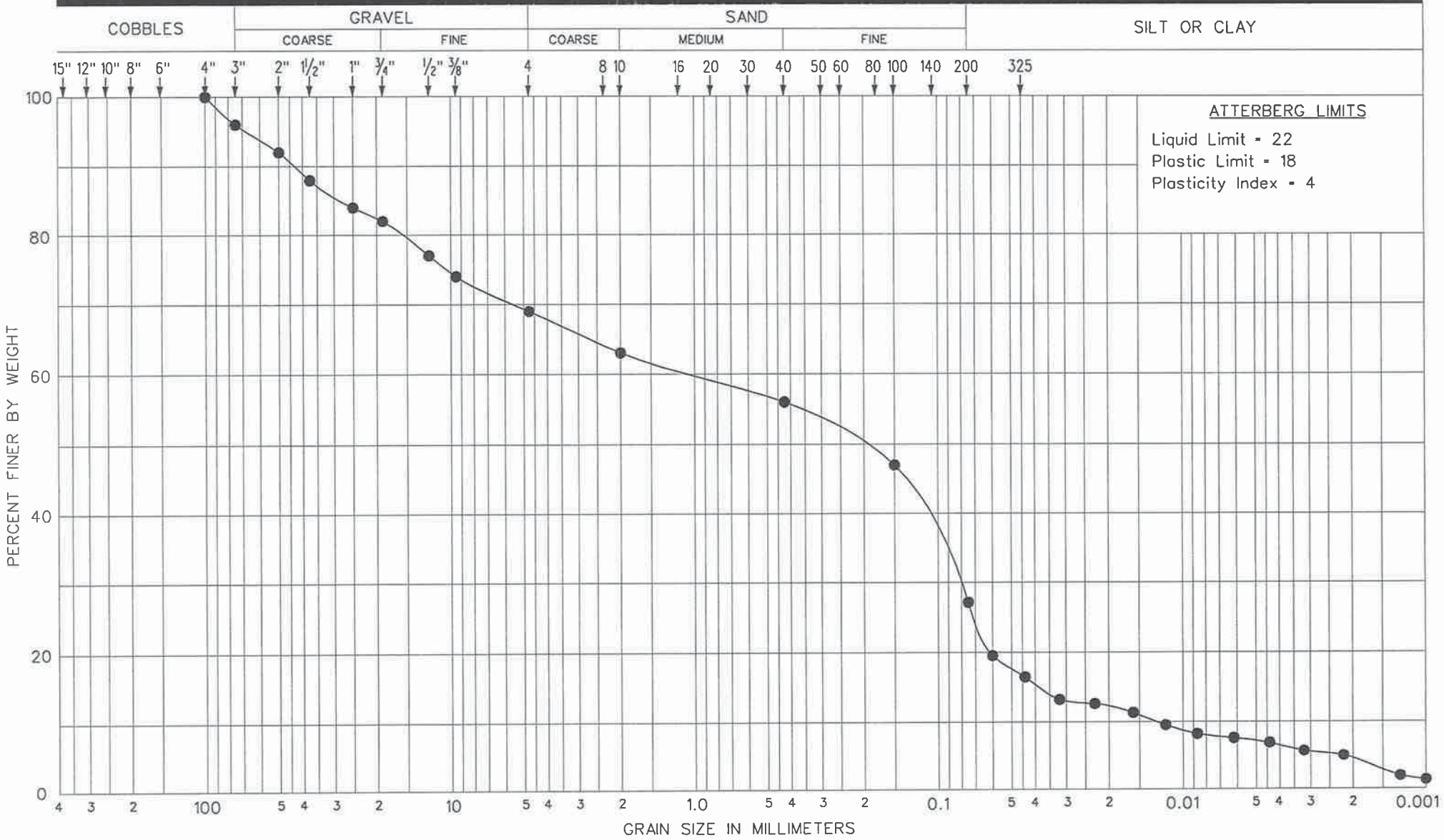
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-18 AT 3'		
Material Description	SILTY SAND	USCS	SM

Date	6/18/09 TO 6/29/09
Technician	G. PEASLEE, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.
1435 West 820 North, Provo, Utah 84601
801 374-5771 Provo
801 521-5771 Salt Lake City

PROJECT NO.	200408.007.2		

SIEVE ANALYSIS (GRADATION)



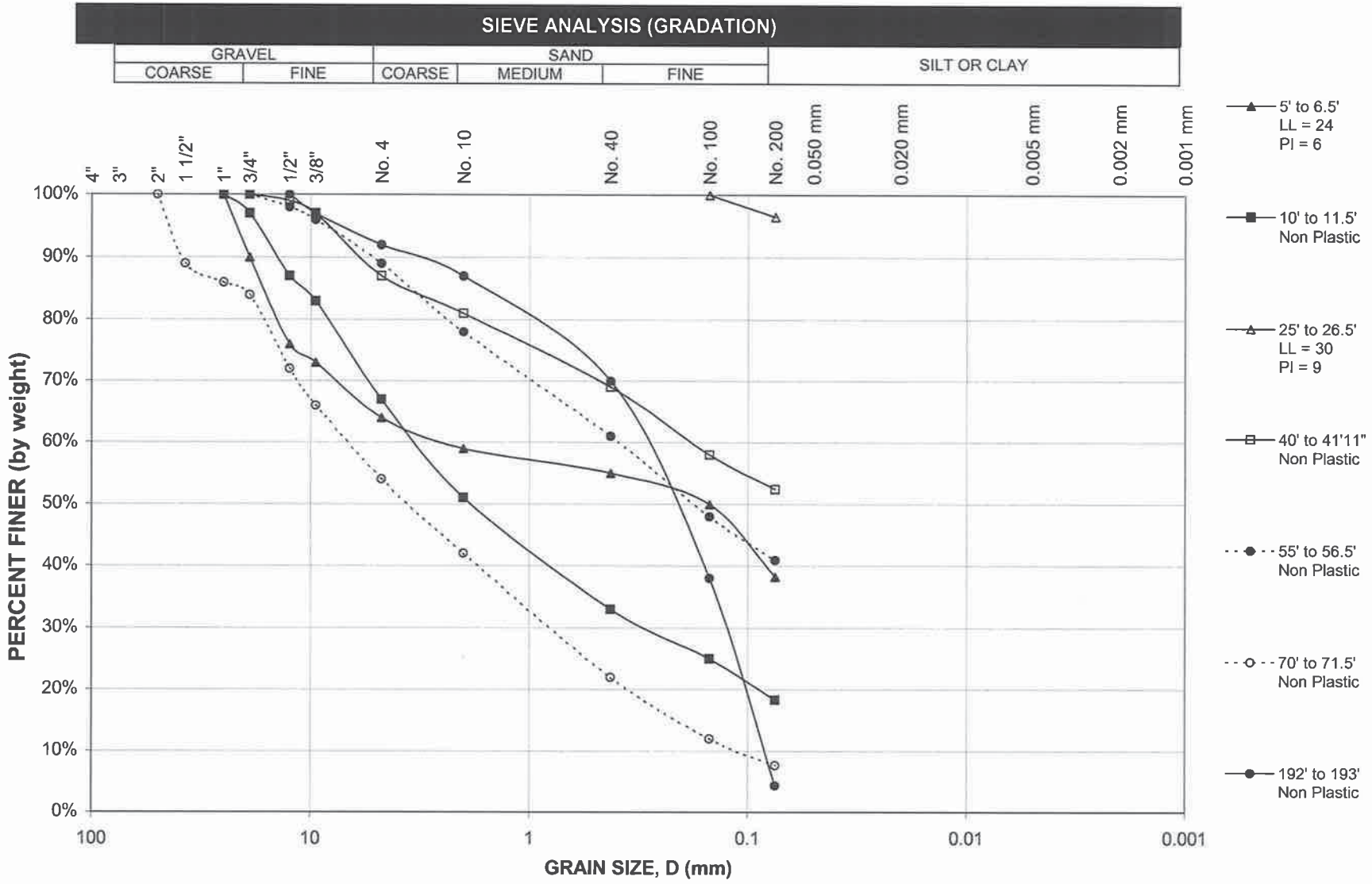
Project	HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY		
Location	WASHINGTON COUNTY, UTAH		
Sample No./Depth	TEST PIT AB-18 AT 10'		
Material Description	SILTY CLAYEY SAND W/GRAVEL	USCS	SC-SM

Date	6/22/09 TO 6/24/09
Technician	D. WALKER, S. NEIL
Procedure	PLAIN WATER
Method	ASTM C117, C136, C566, D422

RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

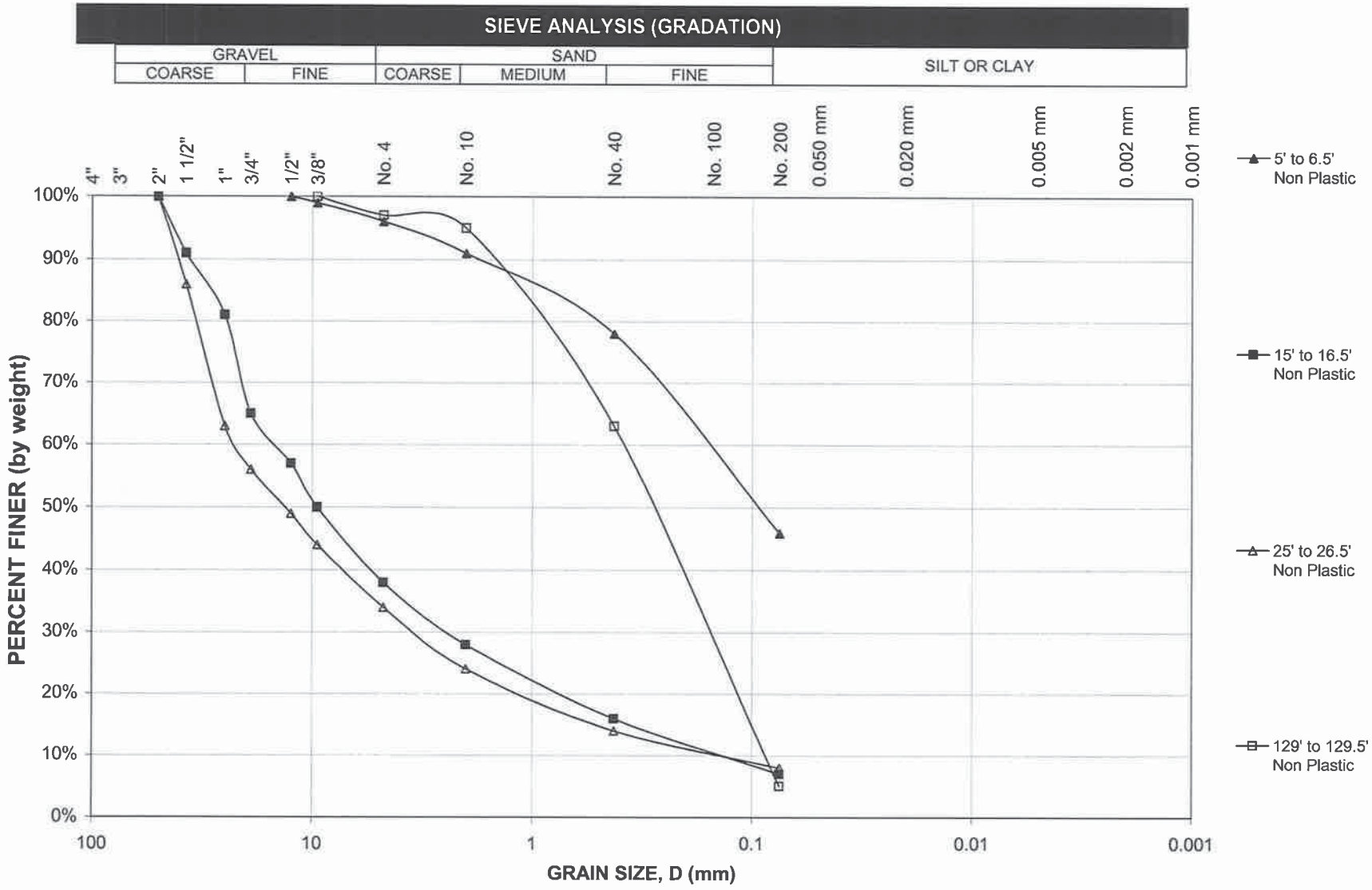
09-AB1



RB&G ENGINEERING, INC

Hurricane Cliffs Reservoir Sites, After Bay

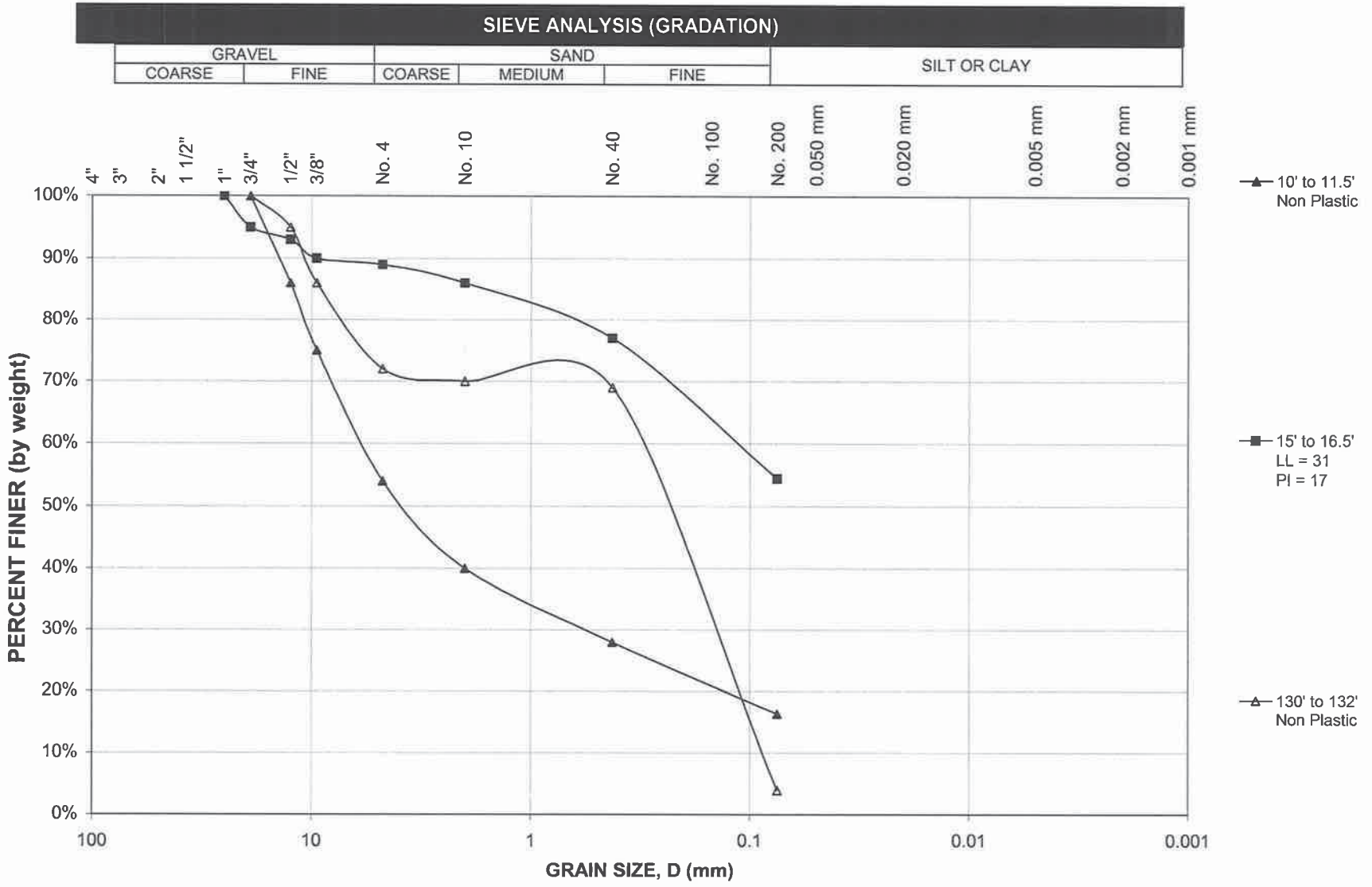
09-AB2



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

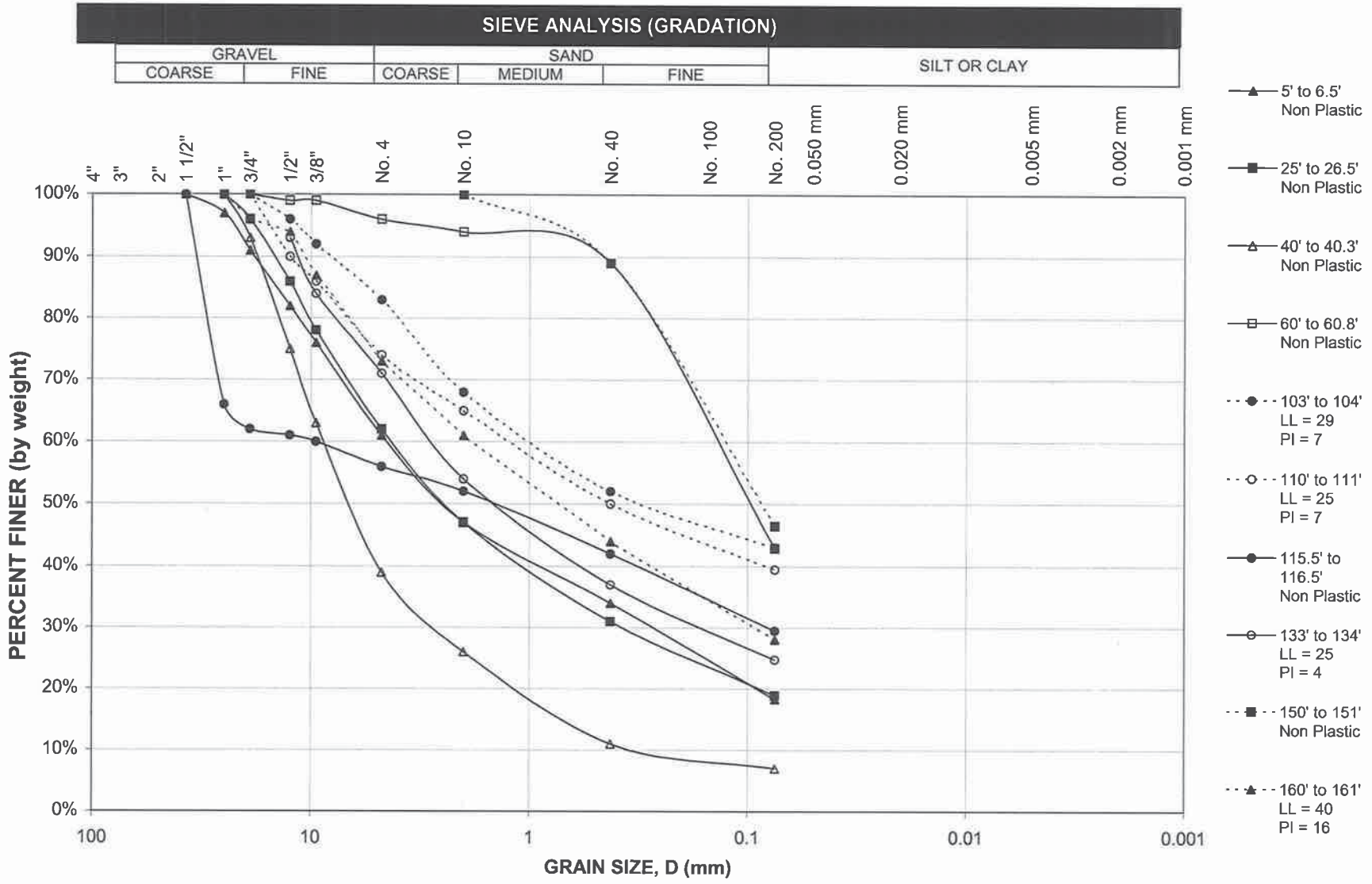
09-AB3



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

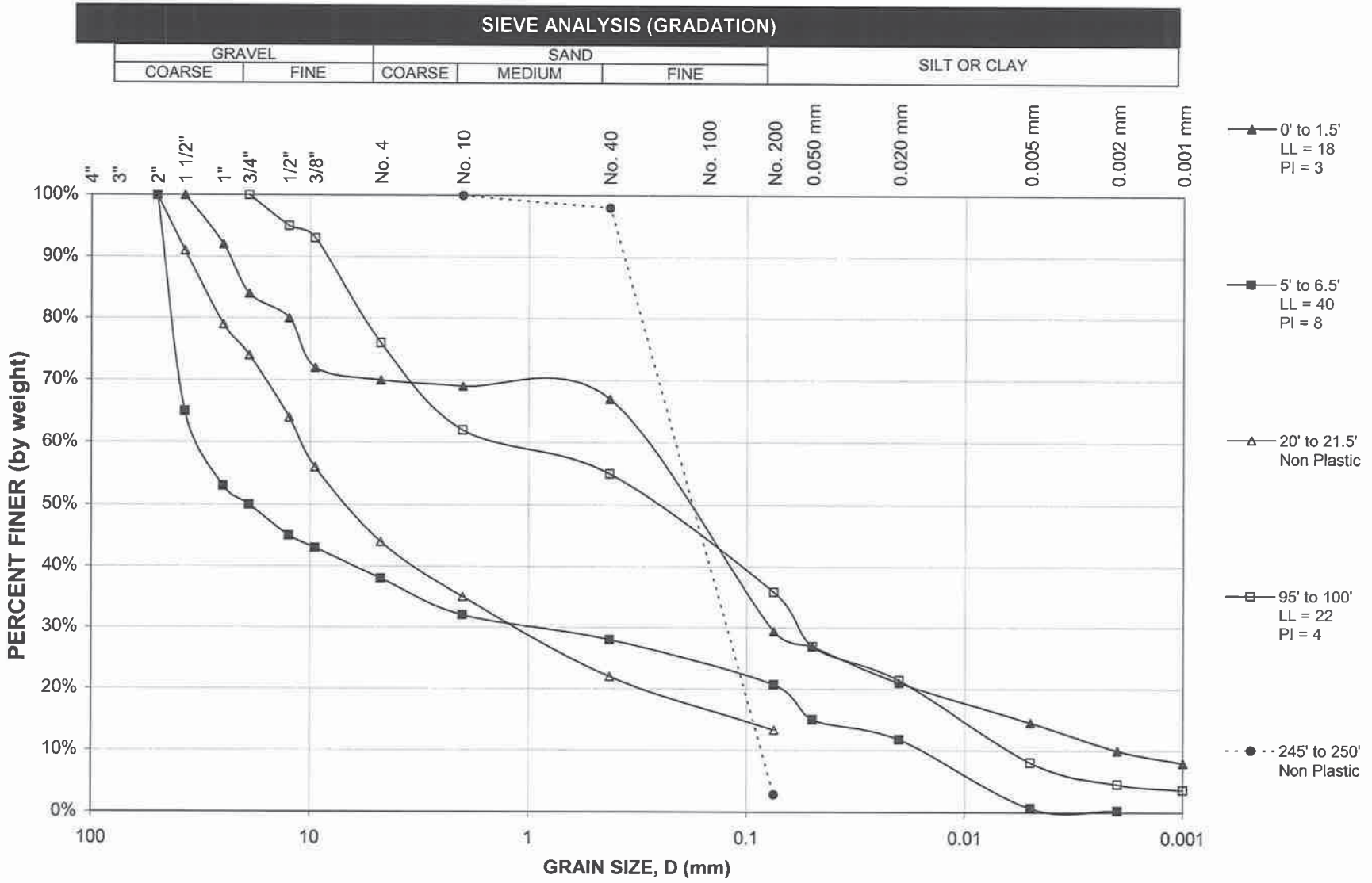
09-AB4



RB&G
ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

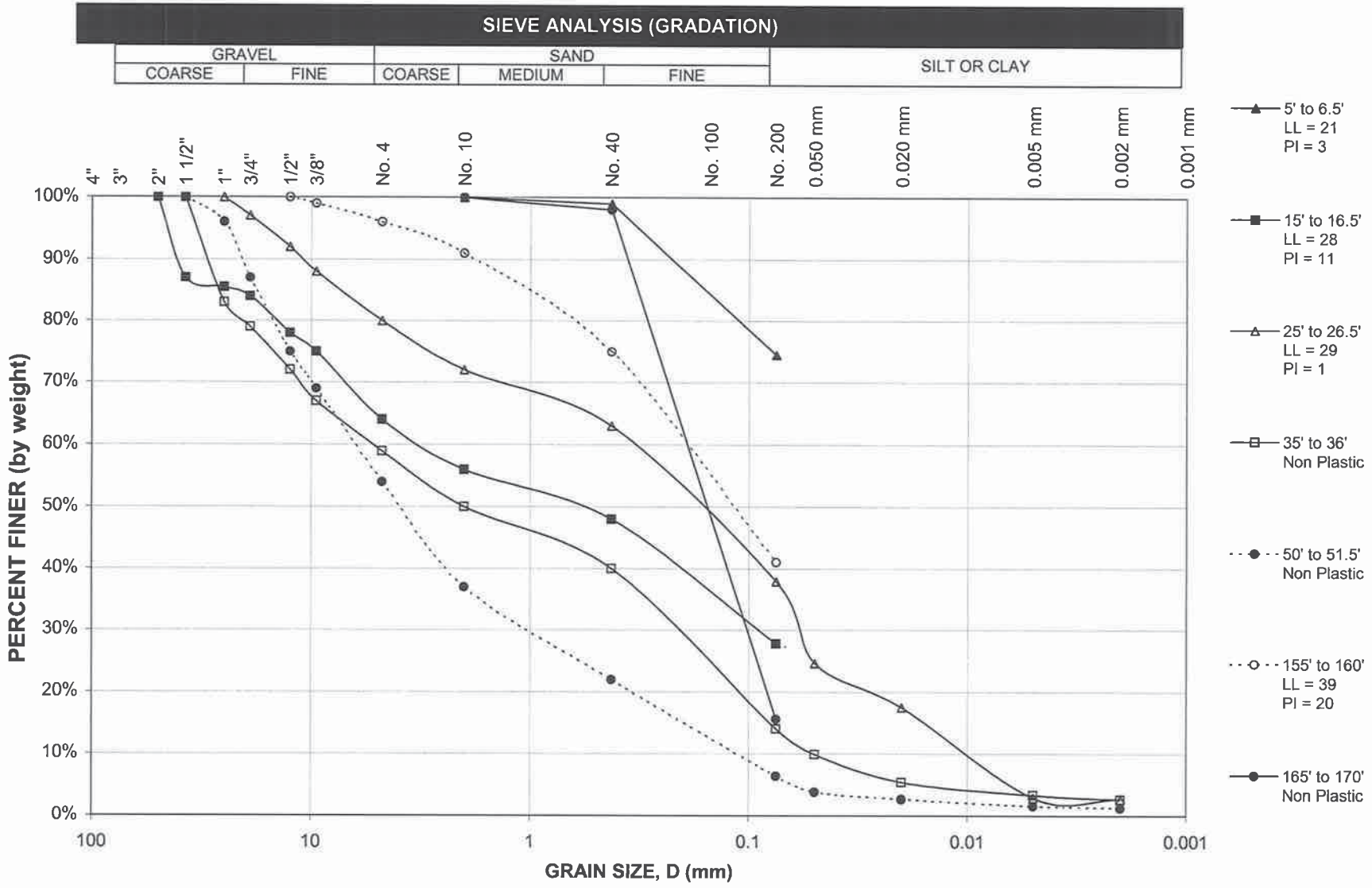
09-AB5



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

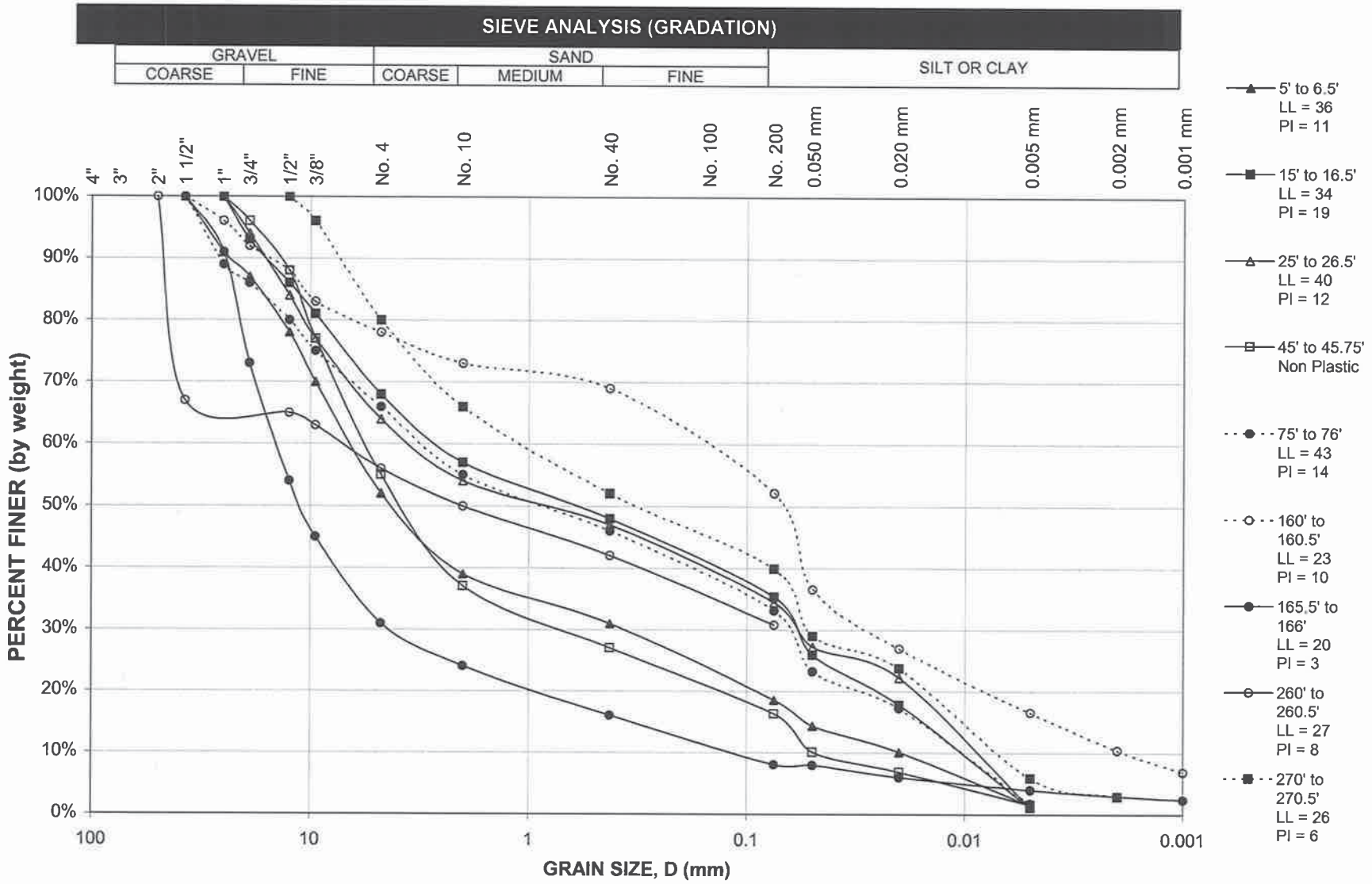
09-AB6



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

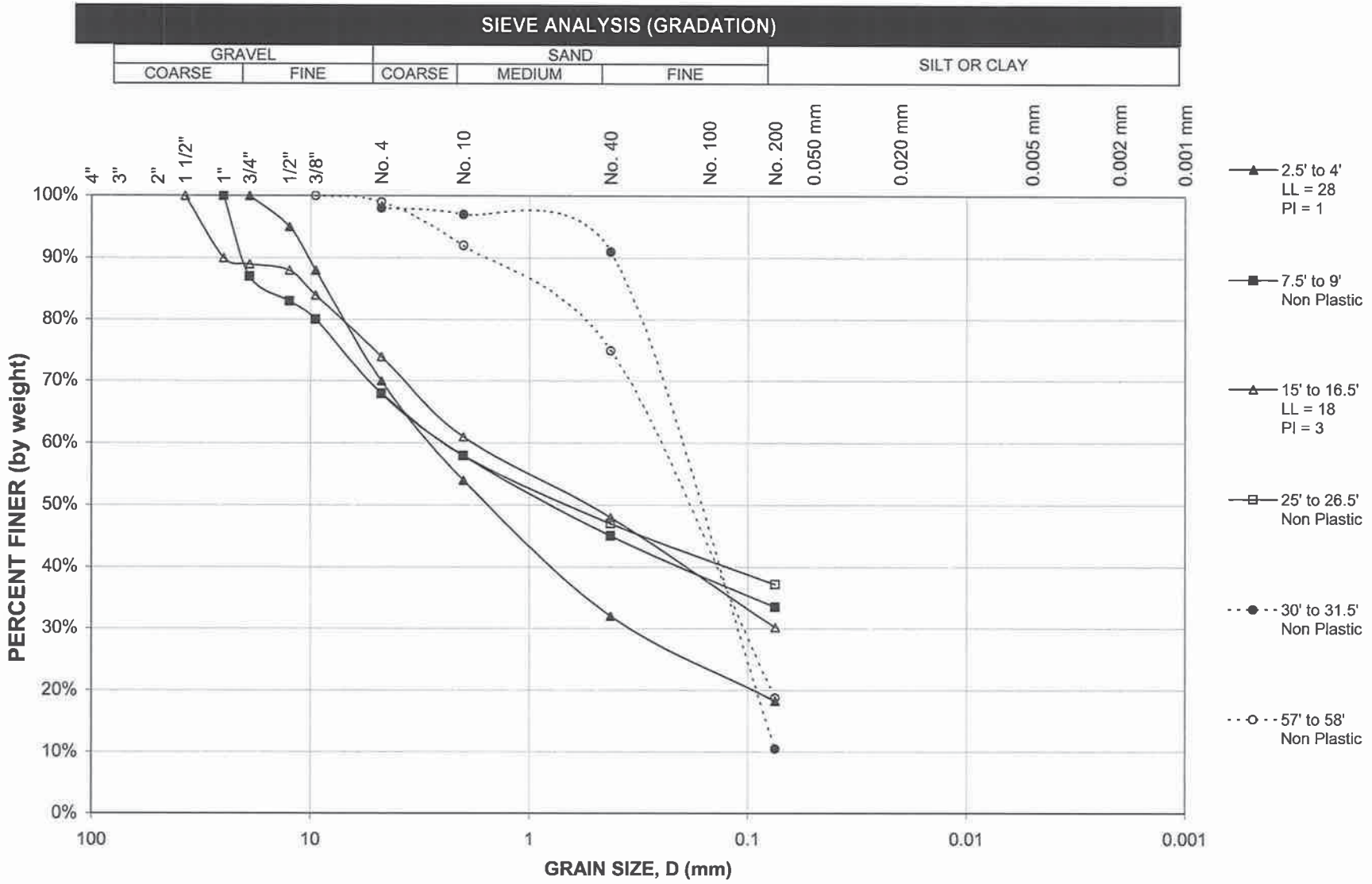
09-AB7



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

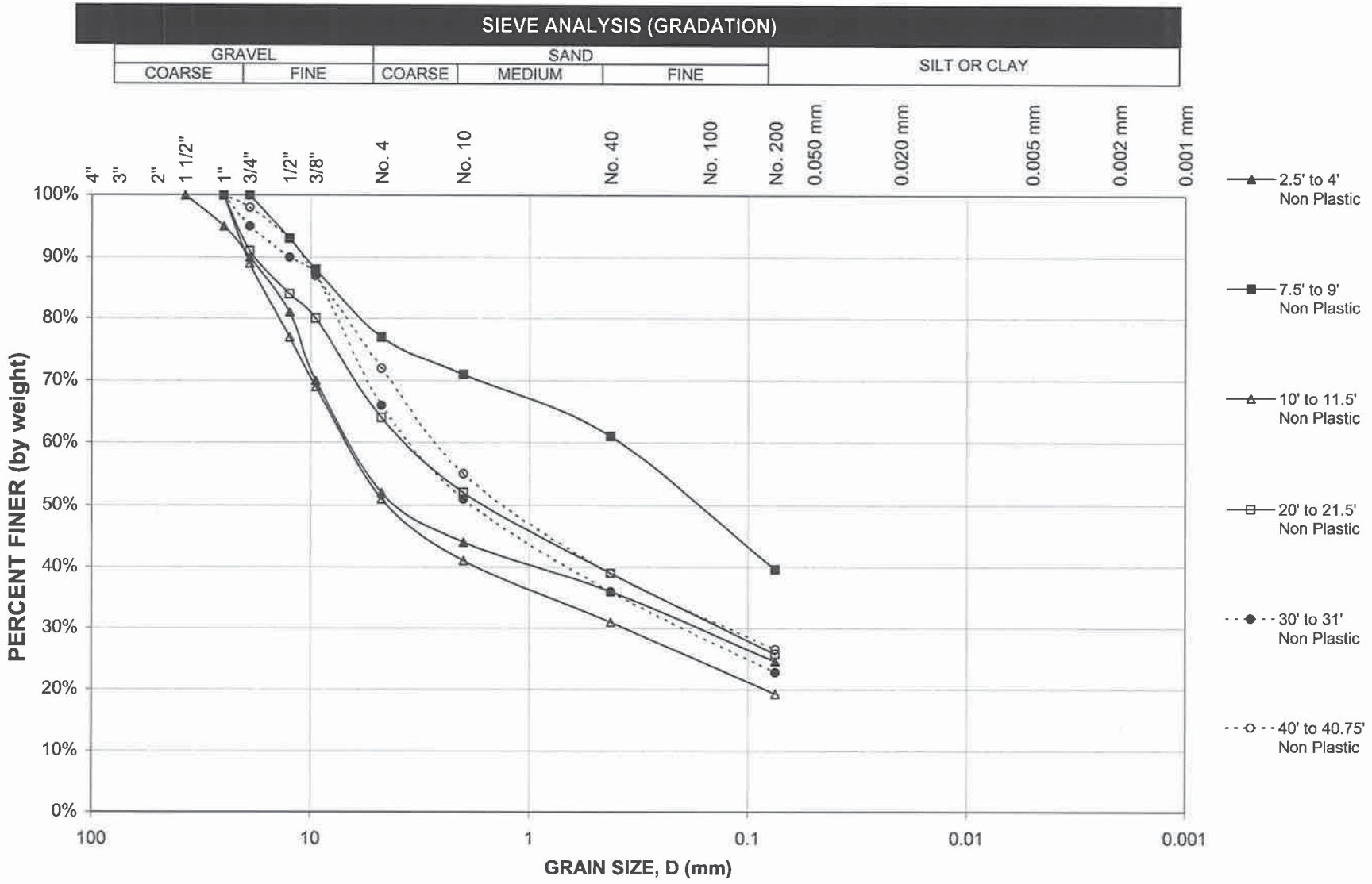
09-AB8



RB&G ENGINEERING, INC.

Hurricane Cliffs Reservoir Sites, After Bay

09-AB10



Appendix

HCH Afterbay Test Pit Notes

7/7 & 8/09

7-1654 (11-94)
Bureau of Reclamation

COMPUTATION SHEET

BY	DATE	PROJECT	SHEET ____ OF ____
CHKD BY	DATE	FEATURE	
DETAILS			

HLA NOTES

Notes: Draft

Active Alluvium (✓Done Fill)

TP-16 ✓ north align · east
TP-7 ✓
TP-1 –, TP-6 ✓✓

Basalt/Scoria (very old soils on rockets)

TP-17 ✓ north alignment*
TP-14 ✓
TP-4 ✓

Divide Deposit Surface (older)? TP-18 * north align

(younger) OSL* TP-13 *6-8ka over 10-20ka!!

6

Late Holocene Fans (Stage I ?

TP 15
* TP-5 → 100-500yrs !! north added OSL ???
TP-2 (?) reactive ✓
TP-3 ✓

Old Basalt Colluvium (west side)

TP-10 ✓
TP-12

Pleistocene fans OSL? * TP9 ✓ → 10-50ka !)
(Stage II ?
TP11 ✓
* TP8 ✓ (Stage I / Stage II)

Power House

TEST PIT LOG

TEST PIT NO. AB-01

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,131 E:4,104,843
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE *Comments: D. Ostenne S. Sundermann (WLA)
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▽

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/8/09
DATE COMPLETED: 6/8/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						ML	Loess, 15-30% gravel	GRAVEL, silty; tan to lt. reddish brown; 60-70% gravel, subangular, 10-20cm diameter, ls. derived; poorly consolidated; well graded (Qay)							
						GM									
	5					GM-ML	lt. red-brown, slightly moist, dense	GRAVEL, silty to SILT, generally ls reddish brown; 50-60% gravel, 10-15cm diameter; mod. consolidated (Debris flow/wash)	112.3	4.3		NP	50	29	21	Proct.
								SILTY GRAVEL W/SAND approx. 15% cobbles							
	10					GM	lt. red-brown, slightly moist, dense	GRAVEL, silty; lt. reddish brown; 60-70% gravel, subangular 10-20cm diameter, limestone derived; mod. consolidated; no induration; well graded; no CaCO3; poorly to slightly cemented; Alluvial Fan deposit (Qaf)	112.5	5.3				7		
	15					GM	red-brown, slightly moist, very dense	GRAVEL, silty, w/ little sand; reddish brown, slightly cemented; mod. consolidated; 50-65% gravel 10-25cm, subangular, ls. derived (Debris flow/wash)		6.5						
								SILTY GRAVEL W/SAND slightly cemented							
	20					GM	red-brown, slightly moist, very dense	GRAVEL, silty, w/ little sand, brownish red; no CaCO3		5.1		NP	63	17	20	
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

R.B&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-02

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,121 E:4,104,593
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▽

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/8/09
DATE COMPLETED: 6/8/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	5					GM	SILTY GRAVEL W/SAND approx. 15%-20% cobbles lt. red-brown, dry, very dense	108.3	2.5		NP	41	30	29	
	10					GP-GM	red-brown, dry, very dense	120.8	3.3						
	15					GP-GM	GRAVEL W/SILT & SAND approx. 25% cobbles, slightly cemented red-brown, dry, very dense GRAVEL, sandy, silty; reddish brown; 40-55% gravel, 10-15% cobbles, subrounded, ls. derived; no basalt; poor to mod. cemented;		1.9		NP	74	15	11	Proct.
	20					GP-GM	red-brown, dry, very dense		2.3						
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

R B&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE
UNDISTURBED SAMPLE
Bucket ← Type of Sample
0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-03

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY

CLIENT: W.C.W.C.D.

LOCATION: N:294,872 E:4,104,572

DIGGING METHOD: CAT 345 TRACKHOE

OPERATOR: INTERSTATE

DEPTH TO WATER - INITIAL: ∇ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2

DATE STARTED: 6/8/09

DATE COMPLETED: 6/8/09

GROUND ELEVATION: NOT MEASURED

LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Rec. (in)	See Legend	USCS		Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	0–3		Bucket			CL-ML	lt. red-brown, dry	SANDY SILTY CLAY W/GRAVEL no $CaCO_3$,	110.1	6.1	22	4	16	34	50	
	3–17		Bucket			GP-GM	lt. red-brown, dry, dense	Potential buried soil horizon w/increase in $CaCO_3$ GRAVEL W/SILT & SAND slightly plastic, less than 10% cobbles $CaCO_3$ rhinds, stage I+ to II; lt red brown; no basalt; subangular cobbles, 10-20% No Basalt no visible ...	123.6	2.5	21	3	63	27	10	
	17–26.5		Bucket			GM	lt. red-brown, dry, very dense	Caved. "a few frag. on top of spoil pile # v silty fine-v fine sand had lots of gyp. like gyp cement" caved SILTY GRAVEL W/SAND gypsum throughout, slightly cemented, few cobbles Likely gyp		5.0						
	25		Bucket			GM	lt. brown, dry, very dense			7.1						

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-04

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,577 E:4,104,543
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
							SILT, gravelly w/ some sand; lt. brown; roadside rockets; some platy structure								
						SC-SM	SILTY CLAYEY SAND gypsum, gravel seams, pinhole structure Volcanic ejecta; red gray to tan; pumice derived sands; lt. red-brown, slightly moist upto 10in diameter basalt ejecta blocks	79.8	10.0	21	4	3	51	46	CT
5							BASALT COBBLES & BOULDERS IN SANDY CLAY W/GRAVEL MATRIX abundant gypsum; well cemented; eolian derived red loess dissolved and recrystallized gypsum; red-brown & black, dry, very dense		5.8						
							clay is mod. plastic								
10							FRACTURED BASALT BEDROCK red lean clay infilling, less fractured w/depth, small vugs in basalt								
							Trackhoe refusal at 13'								
15															
20															
25															

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-05

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,971 E:4,104,681
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
							Very young GRAVEL; minor matrix support, up to 1.2ft thick; undulating basal contact; red brown; mostly fine gravel w/ 10-20% cobble; Channel deposit <100yrs old (Qac)								
	5					GM	lt. red-brown, dry, dense GRAVEL, sandy w/some silt; SILTY GRAVEL W/SAND slightly plastic lt brown; subangular; 50-60% gravel; 2cm to cobble size; mod consolidated; 1-2 weak soil horizons with increased fines; $CaCO_3$ coatings, stage I+; some gypsum; little basalt; Alluvial Fan (Qaf)	118.7	4.0	21	2	60	22	18	
	10					SM	red-brown, dry, dense SILTY SAND W/GRAVEL slightly plastic	110.5	4.0	20	2	22	60	18	
	15						GRAVEL, sandy, w/some silt reddish brown; well consolidated, moderately cemented; pinhole soil structure in matrix; 10% subrounded cobbles, ls. derived; SILTY GRAVEL W/SAND slightly plastic, less than 10% cobbles, very dense at 14' (Debris flow/wash)								
						GM	red-brown, dry, dense to very dense		2.2	21	3	55	30	15	
	20														
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-06

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:295,008 E:4,104,787
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE *Comments: S. Sundermann (WLA) North Wall
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS		Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						GC-GM	lt. red-brown, slightly moist, dense	GRAVEL, matrix supported; 2-10cm diameter, up to 11-inches thick (Channel deposit) SILTY CLAYEY GRAVEL W/SAND greater than 25% cobbles	SILT, gravelly; poorly cemented; (Debris flow/wash)							
	4.5					GM	lt. red-brown, slightly moist, dense	GRAVEL, sandy, silty; 40-60% gravel, subrounded, up to 40cm diameter; $CaCO_3$ coatings pervasive, Stage I+; some gypsum, some basalt (Qaf) SILTY GRAVEL W/SAND slightly plastic, less than 15% cobbles	123.9	6.4	21	3	43	34	23	
						SM	brown, slightly moist, dense	SILTY SAND W/GRAVEL	104.0	7.3		NP	34	39	27	Proct.
								GRAVEL, sandy, silty; 60-70% gravel; subangular, 2-20cm diameter; mod. cemented; lt red brown (Channel deposit)								
						GM	red-brown, dry, very dense	SILTY GRAVEL W/SAND slightly cemented, cobbles increasing w/depth GRAVEL, silty; reddish brown; well consolidated; poor-mod. cemented; minor $CaCO_3$ (Debris flow/wash)		3.1						

Depth scale: 5, 10, 15, 20, 25

Handwritten in margin (alongside 4.5–17 ft): Potentially one heterogeneous unit

TP 200804.007.2 HURRICANECLIFFS AFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-11

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,758 E:4,104,998
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	0		X			ML	SANDY SILT slightly plastic, pinhole structure red-brown, dry, dense	81.2	4.6	21	3	12	35	53	CT
	5					GC-GM	lt. red-brown, dry, dense	117.7	4.4	24	5	47	39	14	
							SILTY CLAYEY GRAVEL W/SAND few cobbles								
	10					GC-GM	red-brown, dry, dense	122.6	3.3						
							Caved @ 12' Didn't see gyp in pile								
	15					GC	CLAYEY GRAVEL W/SAND lt. red-brown, dry, dense abundant gypsum ?		4.0	27	11	61	22	17	
	20					SC	lt. red-brown, dry, dense CLAYEY SAND W/GRAVEL		3.8						
	25														

TP: 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE
UNDISTURBED SAMPLE
Bucket ← Type of Sample
0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-12

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,562 E:4,104,996
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: "
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	0					SC-SM	SILTY CLAYEY SAND W/GRAVEL cobbles & boulders red, dry, very stiff	100.7	5.0	17	4	20	52	28	
						GC-GM	SILTY CLAYEY GRAVEL W/SAND approx. 40% cobbles & boulders Basalt. lt. red-brown, dry, dense many have gyp stringers c. 3ft.	114.3	3.5	20	5	45	38	17	
	5						maybe fine gyp.								
	10						COBBLES & BOULDERS IN SILTY CLAYEY SAND MATRIX abundant gypsum ? may be carb w/ gyp? white stringers.								
						SC-SM	lt. brown & black, dry, very dense likely all Basalt a last many white carb caliche		2.4						
	15														
						GP-GM	GRAVEL W/SILT & SAND brown, dry, dense		3.1		NP	62	31	7	
	20						0 Eolian. w/ gravel								
	25						0.7 No carb cmt carbonate colluvial / alluvial cobbley fan, * Very old soil stage 3-4?								

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket (Type of Sample) — 0.45 (Torvane (tsf))
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-18

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,547 E:4,105,662
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ∇ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample: Type	Sample: Rec. (in)	Sample: See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter.: Liquid Limit	Atter.: Plast. Index	Gradation: Gravel (%)	Gradation: Sand (%)	Gradation: Silt/Clay (%)	Other Tests
			Undisturbed			SM	red-brown, dry	92.7	2.7	19	3	12	60	28	CT
	5						SILTY SAND slightly plastic, gravelly layers, pinhole structure Gravel is Basalt								
			Bucket			SM	red-brown, dry	101.7	5.6						
	10		Bucket			SC-SM	lt. red-brown, dry, dense		4.2	22	4	31	46	23	
							SILTY CLAYEY SAND W/GRAVEL less than 20% cobbles, gravels increasing w/depth, gypsum ? caliche								
	15														
			Bucket			GM/GC-GM	lt. brown, dry, very dense SILTY GRAVEL W/SAND TO SILTY CLAYEY GRAVEL W/SAND abundant gypsum ?, caliche								
	20														
	25														

Basalt Angular to Subrounded

TP-AB-19 Near DH AB-6 ~30' SW

0-.5cm ~½" fine-med sand & silt. No gravel.
.5-20cm No vis. carb. Not observ.
20-75 cm Vfine-fine silt & sand.
75-125cm Dry, carb silt
125-135 slightly hard
135-180cm Vfine sand & silt.
180-320 Top Alluvium
320-330 ~25% gravel. Red silt, some largest 10cm

OSL sample 60 cm
OSL (2) ~155cm

LEGEND:

DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

RB&G ENGINEERING, INC.

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

TEST PIT LOG

TEST PIT NO. AB-13

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,759 E:4,104,790
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	5					ML SM	lt. brown, dry, stiff — SILT, sandy trace ~~SILTY SAND W/GRAVEL~~ (0-5%) slightly plastic, slight pinhole structure; $CaCO_3$ stringers; no gypsum; trace gravel is basalt w/ gypsum rinds; massive; (Grass Valley Derived)	82.0	2.9	19	3	14	43	43	CT
						CL-ML	red-brown, dry, stiff — ~~SANDY SILTY CLAY~~ ~~pinhole structure~~	79.3	4.3	24	5	5	39	56	CT
	10					GC-GM	red-brown, dry, dense — ~~SILTY CLAYEY~~ GRAVEL W/SAND, few cobbles; well cemented; stage II $CaCO_3$; subangular gravel, 40-50%; chert, lst., some basalt derived; no gypsum; (Divide Derived)	115.0 122.8	5.3 4.0						
	15					GM	lt. red-brown, dry, very dense — SILTY GRAVEL W/SAND, few cobbles, slightly cemented		5.3		NP	49	35	16	
	20					GM	lt. red-brown, dry, very dense		4.6						
	25						130 - 150 cm bed gypsum Bed w/ gravels								

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket (Type of Sample)
0.45 — Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-14

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,664 E:4,104,652
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▽

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/9/09
DATE COMPLETED: 6/9/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						CL	lt. red-brown, dry, stiff — SANDY LEAN CLAY W/GRAVEL; minor pinhole structure; rootlets								
						GC	lt. brown, dry, stiff — SILT; gravelly, w/ little sand; CLAYEY GRAVEL W/SAND pinhole structure Stage III + at top grading down to stage I at contact; basalt scoria clasts (loess w/scoria mix)		8.4	45	23	38	18	46	
	5					GP	black, dry — BASALT GRAVELS & COBBLES abundant gypsum, scoria?, test performed on -4" material		2.0		NP	62	33	5	
	10						BASALT BEDROCK more competent w/depth								
							Trackhoe refusal at 12'								
	15						yes. Abundant Gyp.								
	20														
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-15

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,817 E:4,105,397
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▼

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
	5					GM	lt. red-brown, dry, dense — SILTY GRAVEL W/SAND. Stage I $CaCO_3$, coatings on bottom of clasts; poorly cemented; no bleach; lt. brown;	116.8	1.9		NP	54	29	17	
	10					GC-GM	red-brown, dry, dense — GRAVEL, sandy, some fines ~~SILTY CLAYEY GRAVEL W/SAND~~ approx. 25% cobbles; lt. chert derived; mod. cemented; stage II+ carbonate; lt. red brown	125.3	2.7	20	5	48	34	18	
	15					GM	lt. red-brown, dry, very dense — well ~~slightly~~ cemented, greater than 15% cobbles — SILTY GRAVEL W/SAND. laminar solid carbonate, stage V								
	20														
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE — Bucket ← Type of Sample; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

TEST PIT LOG

TEST PIT NO. AB-16

SHEET 1 OF 1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - AFTERBAY
CLIENT: W.C.W.C.D.
LOCATION: N:294,816 E:4,105,720
DIGGING METHOD: CAT 345 TRACKHOE
OPERATOR: INTERSTATE
DEPTH TO WATER - INITIAL: ▽ DRY AFTER 24 HOURS: ▽

PROJECT NUMBER: 200804.007.2
DATE STARTED: 6/10/09
DATE COMPLETED: 6/10/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
						GM	lt. red-brown, dry, dense — SILTY GRAVEL W/SAND greater than 25% cobbles ; no CaCO3 Young fan		3.7		NP	49	26	15	
	5					GC-GM	lt. red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND Young fan ; minor CaCO3	114.2	4.4	25	7	51	23	26	
	10					SC-SM	lt. red-brown, dry, dense — SILTY CLAYEY SAND W/GRAVEL	102.5	5.7	19	6	20	46	34	
	15					GC-GM	red-brown, dry, dense — SILTY CLAYEY GRAVEL W/SAND cobble layers								
	20														
	25														

TP 200804.007.2 HURRICANECLIFFSAFTERBAY TP.GPJ US EVAL.GDT 7/7/09

RB&G ENGINEERING, INC.

LEGEND:
DISTURBED SAMPLE
UNDISTURBED SAMPLE
Bucket ← Type of Sample
0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer

DRAFT 09-AB-1

HCH Dam Site

MNH

Permeability Tests

March, 2009

Size of Hole	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

HCH Dam Site Drill Hole		DEPTH (ft.)		Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
Vertical	09-AB-1				Water table	=	>		135.0			
	NW	0.0	- 5.0	0.3					0	5	2.50	1,037
		5.0	- 10.0	0.2					0	5	7.50	173
		10.0	- 15.0	0.2	1.5				0	5	14.00	106
		15.0	- 20.0	0.1	1.5				0	5	19.00	38
		20.0	- 25.0	0.1	1.5				0	5	24.00	30
		25.0	- 30.0	0.04	1.5				0	5	29.00	11
		25.0	- 35.0	0.1	1.5				0	10	31.50	12
		25.0	- 40.0	0.5	1.5				0	15	34.00	53
		38.5	- 45.0	38.0	1.5				0	6.5	43.25	6,004
		38.5	- 50.0	0.1	1.5				0	11.5	45.75	12
		38.5	- 55.0	0.1	1.5				0	16.5	48.25	7
		38.5	- 60.0	0.6	1.5				0	21.5	50.75	34
		58.5	- 65.0	27.3	1.5				0	6.5	63.25	2,947
		63.5	- 70.0	60.0	1.5				0	6.5	68.25	6,008
		68.5	- 75.0	> 100.0	1.5				0	6.5	73.25	9,330
		73.5	- 80.0	> 100.0	1.5				0	6.5	78.25	8,734
		78.5	- 85.0	> 100.0	1.5				0	6.5	83.25	8,209
		78.5	- 90.0	3.8	1.5				0	11.5	85.75	198
	NQ	90.0	- 99.5	4.3	1.5	0			0	9.5	96.25	227
		99.0	- 109.5	18.0	5.4	0			0	10.5	109.65	776
		99.0	- 109.5	29.0	5.4	59	1		58	10.5	243.50	563
		109.0	- 119.5	7.6	5.4	30			30	10.5	188.88	190
		109.0	- 119.5	8.1	5.4	60			60	10.5	258.11	148
		109.0	- 119.5	14.6	5.4	120			120	10.5	396.57	174
		109.0	- 119.5	9.9	5.4	60			60	10.5	258.11	181

summary

Depth ft.			Permeability ft./yr.
0.0	- 5.0		1,037
5.0	- 10.0		173
10.0	- 15.0		106
15.0	- 20.0		38
20.0	- 25.0		30
25.0	- 30.0		11
25.0	- 35.0		12
25.0	- 40.0		53
38.5	- 45.0		6,004
38.5	- 50.0		12
38.5	- 55.0		7
38.5	- 60.0		34
58.5	- 65.0		2,947
63.5	- 70.0		6,008
68.5	- 75.0		9,330
73.5	- 80.0		8,734
78.5	- 85.0		8,209
78.5	- 90.0		198
90.0	- 99.5		227
99.0	- 109.5		776
99.0	- 109.5		563
109.0	- 119.5		190
109.0	- 119.5		148
109.0	- 119.5		174
109.0	- 119.5		181

DRAFT 09-AB-2 **Permeability Tests**

HCH Dam Site

March, 2009

MNH

Size of Hole	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

HCH Dam Site Drill Hole		DEPTH (ft.)	Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
Vertical	09-AB-2			Water table	-		>	135.0			
	NW	6.0 - 10.0	0.1	0.5				0	4	8.50	127
		9.0 - 15.0	21.4	2.5				0	6	14.50	10,721
		15.0 - 20.0	60.0	1.5				0	5	19.00	26,202
		20.0 - 25.0	42.9	1.5				0	5	24.00	14,817
		25.0 - 30.0	50.0	1.5				0	5	29.00	14,306
		30.0 - 39.0	10.7	0.5				0	9	35.00	1,635
	HQ	39.0 - 49.0	39.0	2.7	10	8		2	10	51.32	3,527
		39.0 - 49.0	47.0	2.7	20	15		5	10	58.24	3,746
		39.0 - 49.0	39.0	2.7	10	8		2	10	51.32	3,527
		49.0 - 59.0	25.5	2.7	30			30	10	125.93	940
		49.0 - 59.0	34.0	2.7	60	4		56	10	185.93	849
		49.0 - 59.0	25.5	2.7	30			30	10	125.93	940
		59.0 - 69.0	13.00	2.7	35			35	10	147.47	409
		59.0 - 69.0	47.00	2.7	70	15		55	10	193.62	1,127
		59.0 - 69.0	37.70	2.7	35	7		28	10	131.32	1,332
		69.0 - 79.0	27.3	2.7	40			40	10	169.01	750
		69.0 - 79.0	21.0	2.7	80			80	10	261.32	373
		69.0 - 79.0	12.9	2.7	40			40	10	169.01	354
		79.0 - 89.0	36.5	2.7	45	5		40	10	179.01	946
		79.0 - 89.0	56.5	2.7	90	20		70	10	248.24	1,056
		79.0 - 89.0	42.5	2.7	45	9		36	10	169.78	1,162
	NQ	122.5 - 134.0	0.1	2.7	50			50	11.5	246.33	2
		122.5 - 134.0	0.1	2.7	75			75	11.5	304.03	1
		122.5 - 134.0	0.1	2.7	90			90	11.5	338.64	1

summary>>

Depth ft.	Permeability ft./yr.	
6.0 - 10.0	127	
9.0 - 15.0	10,721	
15.0 - 20.0	26,202	
20.0 - 25.0	14,817	
25.0 - 30.0	14,306	
30.0 - 39.0	1,635	
39.0 - 49.0	3,527	
39.0 - 49.0	3,746	
39.0 - 49.0	3,527	
49.0 - 59.0	940	
49.0 - 59.0	849	
49.0 - 59.0	940	
59.0 - 69.0	409	
59.0 - 69.0	1,127	
59.0 - 69.0	1,332	opend up
69.0 - 79.0	750	
69.0 - 79.0	373	closing
69.0 - 79.0	354	
79.0 - 89.0	946	
79.0 - 89.0	1,056	
79.0 - 89.0	1,162	
122.5 - 134.0	2	
122.5 - 134.0	1	
122.5 - 134.0	1	

DRAFT 09-AB-3 **Permeability Tests**

HCH Dam Site

March, 2009

MNH Afterbay

Size of Hole	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

HCH Dam Site
Drill Hole 09-AB-3
Vertical
NW

DEPTH (ft.)	Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
		Water table	-		>	127.0			
0.0 - 5.0	0.1					0	5	2.50	259
5.0 - 10.0	0.04					0	5	7.50	43
10.0 - 15.0	0.1					0	5	12.50	73
15.0 - 20.0	0.03					0	5	17.50	15
20.0 - 25.0	0.2					0	5	22.50	81

summary

Depth ft.	Permeability ft./yr.
0.0 - 5.0	259
5.0 - 10.0	43
10.0 - 15.0	73
15.0 - 20.0	15
20.0 - 25.0	81

DRAFT 09-AB-5 **Permeability Tests**

HCH Dam Site

May, 2009

MNH

Radius (in)	NQ	HQ
		1.89

3.782 D HQ3
2.938 rockbit

summary>>

HCH Dam Site Drill Hole		DEPTH (ft.)			Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)	Depth ft.			Permeability ft./yr.	
Vertical	09-AB-5	HQ				Water table	=		>	230.0								
	NW	0.0	-	5.0	0.2	0.0	0			0	5	2.50	568	0.0	-	5.0	568	
		5.0	-	10.0	0.6	1.5	0			0	5	9.00	574	5.0	-	10.0	574	
		10.0	-	15.0	6.7	1.5	0			0	5	14.00	3,936	10.0	-	15.0	3,936	
		15.0	-	20.0	25.0	1.5	0			0	5	19.00	10,875	15.0	-	20.0	10,875	
		22.0	-	25.0	13.0	1.5	0			0	3	25.00	6,194	22.0	-	25.0	6,194	
		24.0	-	34.5	20.0	6.5	0			0	10.5	35.75	2,644	24.0	-	34.5	2,644	
	HQ	34.5	-	44.5	43.5	6.5	10	11		-1	10	43.69	4,621	34.5	-	44.5	4,621	
		44.5	-	54.5	> 50.5	6.5	25	20		5	10	67.54	3,470	44.5	-	54.5	> 3,470	> max flow
		54.5	-	64.5	> 50.0	6.5	20	20		0	10	66.00	3,516	54.5	-	64.5	> 3,516	> max flow
		58.4	-	64.5	0.15	2.5	25			25	6.1	121.64	8	58.4	-	64.5	8	
		58.4	-	64.5	5.8	2.5	55			55	6.1	190.87	204	58.4	-	64.5	204	
		58.4	-	64.5	0.20	2.5	25			25	6.1	121.64	11	58.4	-	64.5	11	
		64.5	-	74.5	4.5	6.4	25			25	10	133.59	156	64.5	-	74.5	156	
		64.5	-	74.5	10.0	6.4	50			50	10	191.28	243	64.5	-	74.5	243	
		64.5	-	74.5	5.0	6.4	25			25	10	133.59	174	64.5	-	74.5	174	
		74.5	-	83.3	10.0	6.4	30			30	8.75	154.51	332	74.5	-	83.3	332	
		74.5	-	83.3	19.5	6.4	60			60	8.75	223.74	447	74.5	-	83.3	447	
		74.5	-	83.3	5.0	6.4	30			30	8.75	154.51	166	74.5	-	83.3	166	
		84.5	-	94.5	1.8	6.4	40			40	10	188.21	44	84.5	-	94.5	44	
		84.5	-	94.5	3.3	6.4	60			60	10	234.36	65	84.5	-	94.5	65	Alluvium
		84.5	-	94.5	2.1	6.4	40			40	10	188.21	52	84.5	-	94.5	52	
		94.5	-	104.5	26.0	6.4	20			20	10	152.05	794	94.5	-	104.5	794	
		94.5	-	104.5	32.5	6.4	30			30	10	175.13	861	94.5	-	104.5	861	
		94.5	-	104.5	26.0	6.4	20			20	10	152.05	794	94.5	-	104.5	794	
		104.5	-	114.5	14.5	6.4	30			30	10	185.13	364	104.5	-	114.5	364	
		104.5	-	114.5	40.0	6.4	60			60	10	254.36	730	104.5	-	114.5	730	opened up
		104.5	-	114.5	28.5	6.4	30			30	10	185.13	714	104.5	-	114.5	714	
		114.5	-	124.5	> 51.5	6.4	20	20		0	10	125.90	1,899	114.5	-	124.5	> 1,899	max flow
		124.5	-	134.5	> 50.0	6.4	20	20		0	10	135.90	1,708	124.5	-	134.5	> 1,708	max flow
		129.0	-	134.5	> 50.5	3.3	20	20		0	5.5	135.05	2,701	129.0	-	134.5	> 2,701	max flow
		134.5	-	145.5	> 50.5	6.4	20	20		0	11	146.40	1,489	134.5	-	145.5	> 1,489	max flow
		145.5	-	154.5	> 51.0	6.4	20	20		0	9	156.40	1,639	145.5	-	154.5	> 1,639	max flow
		154.5	-	164.5	48.0	6.4	30	16		14	10	198.21	1,124	154.5	-	164.5	1,124	
		164.5	-	174.5	22.0	6.4	50			50	10	291.28	351	164.5	-	174.5	351	
		164.5	-	174.5	49.0	6.4	100	17		83	10	367.44	619	164.5	-	174.5	619	
		164.5	-	174.5	22.2	6.4	50			50	10	291.28	354	164.5	-	174.5	354	
		174.5	-	184.5	28.0	6.4	50			50	10	301.28	431	174.5	-	184.5	431	
		174.5	-	184.5	29.2	6.4	100	1		99	10	414.36	327	174.5	-	184.5	327	
		174.5	-	184.5	21.5	6.4	50			50	10	301.28	331	174.5	-	184.5	331	back pressure
		184.5	-	194.5	51.0	6.4	50	20		30	10	265.13	893	184.5	-	194.5	893	
		193.5	-	204.5	> 51.0	6.4	20	20		0	11	205.40	1,072	193.5	-	204.5	> 1,072	max flow

DRAFT 09-AB-5A **Permeability Tests**

HCH Dam Site

April, 2009

MNH

	NQ	HQ
Radius (in)	1.48	1.89

3.782 D HQ3
2.938 rockbit

HCH Dam Site
Drill Hole 09-AB-5A

Vertical		DEPTH (ft.)			Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
		HQ				Water table	=		>	20.0			
	NW	0.0	-	5.0	0.1	0.0	0			0	5	2.50	465
		5.0	-	10.0	0.03	1.5	0			0	5	9.00	29
		10.0	-	15.0	0.6	1.5	0			0	5	14.00	369

summary>>

Depth ft			Permeability ft./yr.
0.0	-	5.0	465
5.0	-	10.0	29
10.0	-	15.0	369

DRAFT 09-AB-6 Option 2 north dam **Permeability Tests**

HCH Dam Site

May, 2009

MNH

	NQ	HQ
Radius (in)	1.48	1.89

3.782 D hq3
2.938 rockbit

HCH Dam Site Drill Hole		DEPTH (ft.)			Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)	summary>> Depth ft			Permeability ft./yr.	
Vertical	09-AB-6	HQ				Water table	-	>	175.0									
	NW	0.0	-	5.0	0.1	0.0	0			0	5	2.50	491	0.0	-	5.0	491	
		5.0	-	10.0	0.1	0.0	0			0	5	7.50	121	5.0	-	10.0	121	
		10.0	-	15.0	1.3	0.0	0			0	5	12.50	773	10.0	-	15.0	773	
		15.0	-	20.0	0.4	0.0	0			0	5	17.50	159	15.0	-	20.0	159	
		20.0	-	25.0	0.3	0.0	0			0	5	22.50	102	20.0	-	25.0	102	
		25.0	-	30.0	0.6	0.0	0			0	5	27.50	171	25.0	-	30.0	171	
		30.0	-	35.0	0.2	0.0	0			0	5	32.50	41	30.0	-	35.0	41	
		35.0	-	40.0	0.1	0.0	0			0	5	37.50	26	35.0	-	40.0	26	
		40.0	-	45.0	5.5	0.0	0			0	5	42.50	992	40.0	-	45.0	992	
		45.0	-	50.0	10.7	0.0	0			0	5	47.50	1,744	45.0	-	50.0	1,744	
		50.0	-	55.0	50.0	0.0	0			0	5	52.50	7,364	50.0	-	55.0	7,364	
	NW	53.5	-	60.0	8.6	0.0	0			0	6.5	56.75	967	53.5	-	60.0	967	
		60.0		65.0										60.0		65.0	no test	
	HQ	65.5	-	74.0	17.0	5.6	18			18	8.5	116.89	763	65.5	-	74.0	763	
		65.0	-	74.0	34.0	5.6	25	4		21	9	123.56	1,383	65.0	-	74.0	1,383	
		65.0	-	74.0	18.0	5.6	18			18	9	116.64	776	65.0	-	74.0	776	
		69.0	-	79.0	1.1	1.9	26			26	10	135.90	38	69.0	-	79.0	38	
		69.0	-	79.0	1.8	1.9	46			46	10	182.05	46	69.0	-	79.0	46	
		69.0	-	79.0	1.1	1.9	26			26	10	135.90	38	69.0	-	79.0	38	
		79.0	-	89.0	0.0	1.9	50			50	10	201.28	0	79.0	-	89.0	0	
		79.0	-	89.0	0.5	1.9	88			88	10	288.98	8	79.0	-	89.0	8	
		79.0	-	89.0	0.0	1.9	50			50	10	201.28	0	79.0	-	89.0	0	
		89.0	-	99.0	0.1	1.9	64			64	10	243.59	2	89.0	-	99.0	2	
		89.0	-	99.0	0.2	1.9	95			95	10	315.13	3	89.0	-	99.0	3	
		89.0	-	99.0	0.1	1.9	64			64	10	243.59	2	89.0	-	99.0	2	
		99.0	-	109.0										99.0	-	109.0		scoria no test
		109.0	-	119.0										109.0	-	119.0		scoria no test
		119.5	-	129.0	> 50.0	1.9	20	20		0	9.5	126.15	1,912	119.5	-	129.0	> 1,912	max flow
		129.0	-	139.0	> 51.5	1.9	20	20		0	10	135.90	1,759	129.0	-	139.0	> 1,759	max flow
		139.0	-	148.8	> 51.5	1.9	20	20		0	9.75	145.78	1,671	139.0	-	148.8	> 1,671	max flow

DRAFT 09-PH-7 Power House **Permeability Tests**

HCH Power House

May, 2009

MNH

	NW	HQ
Radius (in)	1.47	1.89

3.782 D HQ3

2.938 rockbit 2.938 2.98 NQ

HCH Power House

Drill Hole		DEPTH (ft.)	Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
Vertical	09-PH-7			Water table	=		>	275.0	?		
	NW	0.0 - 5.0	0.3	0.0	0			0	5	2.50	882
		5.0 - 10.0	0.1	0.0	0			0	5	7.50	95
		10.0 - 15.0	0.2	0.0	0			0	5	12.50	156
		15.0 - 20.0	0.4	0.0	0			0	5	17.50	211
		20.0 - 25.0	0.1	0.0	0			0	5	22.50	35
		25.0 - 30.0	0.2	0.0	0			0	5	27.50	71
		30.0 - 35.0	0.1	0.0	0			0	5	32.50	34
		35.0 - 40.0	0.7	0.0	0			0	5	37.50	149
		40.0 - 45.0	0.4	0.0	0			0	5	42.50	79
		45.0 - 50.0	5.7	0.0	0			0	5	47.50	989
		50.0 - 55.0	5.0	0.0	0			0	5	52.50	790
		55.0 - 60.0	2.9	0.0	0			0	5	57.50	412
		55.0 - 65.0	27.3	0.0	0			0	10	60.00	2,238
		55.0 - 70.0	25.0	0.0	0			0	15	62.50	1,434
		55.0 - 75.0	23.1	0.0	0			0	20	65.00	1,012

End K tests use drilling Mud

summary>>

Depth ft.	Permeability ft./yr.
0.0 - 5.0	882
5.0 - 10.0	95
10.0 - 15.0	156
15.0 - 20.0	211
20.0 - 25.0	35
25.0 - 30.0	71
30.0 - 35.0	34
35.0 - 40.0	149
40.0 - 45.0	79
45.0 - 50.0	989
50.0 - 55.0	790
55.0 - 60.0	412
55.0 - 65.0	2,238
55.0 - 70.0	1,434
55.0 - 75.0	1,012

DRAFT 09-AB-8

HCH Options 3 & 4

MNH

Permeability Tests

Aug, 2009

	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

NW= rockbit 2 15/16"

HCH Afterbay near options 3 & 4

Drill Hole		DEPTH (ft.)		Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)	summary>> Depth ft.		Permeability ft./yr.	
Vertical	09-AB-8				Water table		-	>	60							
	Size of Hole															
	NW	0.0	- 10.0	3.0	0.0	0			0	10	5.00	2,954	0.0	- 10.0	2,954	
		10.0	- 15.0	3.0	0.0	0			0	5	12.50	1,991	10.0	- 15.0	1,991	
		15.0	- 20.0	0.6	0.0	0			0	5	17.50	266	15.0	- 20.0	266	
		20.0	- 25.0	5.3	0.0	0			0	5	22.50	1,955	20.0	- 25.0	1,955	
		25.0	- 30.0	3.3	0.0	0			0	5	27.50	996	25.0	- 30.0	996	
		30.0	- 35.0	9.1	0.0	0			0	5	32.50	2,323	30.0	- 35.0	2,323	sandstone @ 30'
		33.7	- 40.0	8.9	1.3	0			0	6.3	38.15	1,632	33.7	- 40.0	1,632	
	NQ	33.7	- 49.0	16.7	1.3	0			0	15.3	42.65	1,378	33.7	- 49.0	1,378	
		48.0	- 59.0	11.5	2.8	18			18	11	97.84	536	48.0	- 59.0	536	
		48.0	- 59.0	12.5	2.8	24			24	11	111.68	510	48.0	- 59.0	510	leaking around packer
		48.0	- 59.0	11.5	2.8	18			18	11	97.84	536	48.0	- 59.0	536	lost bit

DRAFT 09-AB-9 **Permeability Tests**

HCH Option 3

Aug, 2009

MNH

	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

NW= rockbit 2 15/16"

HCH Afterbay option 3 NW corner

Drill Hole	DEPTH (ft.)	Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
Vertical 09-AB-9			Water table	-	>	60				
Size of Hole	0.0 - 5.0	0.1	0.0				0	5	2.50	311
NW	5.0 - 10.0	0.3	0.0				0	5	7.50	277
	10.0 - 15.0	1.0	0.0				0	5	12.50	664
	15.0 - 20.0	1.5	0.0				0	5	17.50	711
	20.0 - 25.0	1.0	0.0				0	5	22.50	369
	25.0 - 30.0	1.5	0.0				0	5	27.50	453
	30.0 - 35.0	12.5	0.0				0	5	32.50	3,191
	35.0 - 40.0	20.0	0.0				0	5	37.50	4,425
	40.0 - 45.0	2.8	0.0				0	5	42.50	537
	45.0 - 50.0	37.5	0.0				0	5	47.50	6,551
	50.0 - 55.0	5.8	0.0				0	5	52.50	912
	55.0 - 60.0	50.0	0.0				0	5	57.50	7,215

summary>>

Depth ft.	Permeability ft./yr.	
0.0 - 5.0	311	
5.0 - 10.0	277	
10.0 - 15.0	664	
15.0 - 20.0	711	
20.0 - 25.0	369	
25.0 - 30.0	453	
30.0 - 35.0	3,191	
35.0 - 40.0	4,425	
40.0 - 45.0	537	
45.0 - 50.0	6,551	
50.0 - 55.0	912	sandstone @ 58'
55.0 - 60.0	7,215	casing stuck

DRAFT 09-AB-10 **Permeability Tests**

HCH Option 2

Aug, 2009

MNH

Size of Hole	NW	NQ	HQ
Radius (in)	1.47	1.49	1.89
Diam	2.938	2.98	3.782

NW= rockbit 2 15/16"

HCH Afterbay option 2 NE abutment

Drill Hole	DEPTH (ft.)	Q gpm	Gage Ht Stickup (ft.)	Applied Pressure (psi)	Friction Loss (psi)	Artesian Pressure (ft)	Effective Pressure (psi)	L (ft.)	H (ft)	Perm. K (ft/yr)
Vertical 09-AB-10			Water table	-		>	50			
Size of Hole	0.0 - 5.0	1.5	0.0				0	5	2.50	4,959
NW	5.0 - 7.5	1.0	0.0				0	2.5	6.25	2,149
	7.5 - 10.0	1.15	2.5				0	2.5	11.25	1,373
	10.0 - 15.0	1.25	0.0				0	5	12.50	827
	15.0 - 20.0	1.5	0.0				0	5	17.50	708
	20.0 - 25.0	2.5	0.0				0	5	22.50	918
	25.0 - 30.0	10.0	0.0				0	5	27.50	3,006
	30.0 - 35.0	0.5	0.0				0	5	32.50	127
	35.0 - 40.0	0.3	0.0				0	5	37.50	55
	40.0 - 45.0	12.5	0.0				0	5	42.50	2,431
	45.0 - 50.0	50.0	0.0				0	5	47.50	8,700

summary>>

Depth ft.	Permeability ft./yr.
0.0 - 5.0	4,959
5.0 - 7.5	2,149
7.5 - 10.0	1,373
10.0 - 15.0	827
15.0 - 20.0	708
20.0 - 25.0	918
25.0 - 30.0	3,006
30.0 - 35.0	127
35.0 - 40.0	55
40.0 - 45.0	2,431
45.0 - 50.0	8,700

APPENDIX C – BENCH LAKE
Field & Laboratory Testing

DRILL HOLE LOG

BORING NO. 09-1

SHEET 1 OF 2

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/17/09
DATE COMPLETED: 8/17/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				14	7,11,14,(57)	CL	lt. brown to red-brown, dry, very stiff									
				13	13,20,22,(95)	CL	dk. brown to red-brown, slightly moist, hard									
	5			9	Pushed	CL-2	red-brown, moist			16.8	43	23	0	2	98	DC
				13	11,21,24,(97)	CL	red-brown, moist, hard									
	10			18	7,7,7,(24) *0.88*	CL	red-brown, moist, stiff									
	15			15	Pushed *0.63*	CL-1	red-brown, moist, stiff	LEAN CLAY white stringers, strong HCL reaction	100.7	18.7	29	14	0	5	95	DC SS - 3.6%
	20			18	6,13,18,(38) *0.88*	CL	red-brown, moist, stiff									
	25			12	Pushed *1.63*	CL-2	red-brown, moist, very stiff		115.1	14.9	37	21	0	12	88	DC SS - 3.7%
	30			17	7,17,24,(42) *1.60*	CL	red-brown, moist, very stiff									
	35			9	Pushed *1.08*	CL-2	red-brown, moist, very stiff	LEAN CLAY possible very highly weathered mudstone, hard & soft layers (driller's observation)	111.6	16.7	36	19	0	2	98	DC SS - 3.3%
	40			18	11,18,21,(35) *1.38*	CL	red-brown, moist, very stiff									
	45			18	Pushed *0.51*	CL-2	red-brown, moist, stiff	SANDY LEAN CLAY	101.4	18.6	34	19	1	32	67	DC SS - 2.8%
						CL	red-brown, moist									

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; *0.45* ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; *0.45* ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-1

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/17/09
DATE COMPLETED: 8/17/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				8	63/6",(REF)	SM	very lt. brown, very moist, very dense SILTY SAND Navajo Sandstone								
	55			0.5	50/1",(REF)	SM	white, very moist, very dense								

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-2

SHEET 1 OF 2

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/18/09
DATE COMPLETED: 8/18/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				13	3,6,9,(34)		lt. brown to red-brown, dry, stiff								
				15	24,34,30,(99+)	CL	red-brown, slightly moist, hard								
	5			9	Pushed	CL-2	red-brown, slightly moist	119.2	12.5	32	17	0	13	87	DC SS - 2.1%
	10			15	13,18,23,(70) *1.25*	CL	red-brown, slightly moist, very stiff								
	15			9	Pushed *1.88*	CL-2	red-brown, moist, very stiff — LEAN CLAY white stringers, lenses & spots; gypsum?	111.6	18.4	38	20	0	2	98	DC SS - 2.8%
	20			15	19,30,34,(79) *1.88*	CL	red-brown, moist, very stiff								
	25			6	Pushed	CL-2	red-brown, moist	112.7	10.7	42	24	0	14	83	DC SS - 3.3%
	30					CL	red-brown, moist								
				13	21,27,28,(56)	SM	red-brown, slightly moist, very dense								
	35			17	Pushed	SM	red-brown, slightly moist — SILTY SAND silty clay layers to 1" thick		4.8		NP	0	64	36	SS - 1.2%
				16	17,30,40,(65)	SM	red-brown, slightly moist, very dense								
	40			6	71/6",(REF)	SC	red-brown, slightly moist, very dense								
	45			8	Pushed	SC	red-brown, slightly moist — CLAYEY SAND		12.0	35	18	5	57	38	DC SS - 3.1%
							LEAN CLAY								

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-2

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/18/09
DATE COMPLETED: 8/18/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				14	26,39,41,(64)	CL	lt. brown, slightly moist, hard — LEAN CLAY								
	55			0 10	Pushed 46,60/4", (REF)	- CL	no recovery red-brown, slightly moist, hard — LEAN CLAY W/GRAVEL clayey gravel layers to 2" thick								
	60			3	60/3",(REF)	GC	red-brown, slightly moist, very dense — CLAYEY GRAVEL W/SAND basalt gravels								
	65			5	60/5",(REF)	CL	red-brown, slightly moist, hard — LEAN CLAY W/GRAVEL weathered mudstone?, basalt/scoria gravels								
	70														
	75														
	80														
	85														
	90														
	95														

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

SHEET 1 OF 3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				13	5,5,5,(23)	CL	lt. brown, dry, stiff									
				9	8,7,9,(36)	CL	lt. brown to red-brown, slightly moist, very stiff									
	5			6	Pushed *1.40*	CL-2	red-brown, moist, very stiff		93.9	15.7	34	16	0	1	99	DC SS - 9.1%
	10			10	6,10,13,(39) *1.53*	CL	red-brown, moist, very stiff	LEAN CLAY white stringers								
	15			12	Pushed *1.13*	CL-1	red-brown, moist, very stiff		109.9	15.2	32	14	0	3	97	DC SS - 5.0%
	20			13	9,8,10,(22) *1.38*	CL	red-brown, moist, very stiff									
	25			10	Pushed	CL-1	dk. red-brown, moist, hard	LEAN CLAY W/SAND white lenses (gypsum?), 100% water loss between 22'-23'	106.0	13.5	26	9	0	25	75	DC SS - 5.1%
	30			12	7,6,8,(14) *0.85* *0.90*	CL	red-brown, moist, stiff									
	35			12	Pushed *2.10*	CL-2	red-brown, moist, hard	LEAN CLAY few sand lenses, white lenses & stringers	108.4	17.7	39	22	0	5	95	DC SS - 4.5%
	40			14	4,6,9,(13) *0.82*	CL	red-brown, moist, stiff									
	45			12	Pushed *0.66*	CL-2	brown, moist, stiff	LEAN CLAY silt lenses	97.2	24.0	40	21	0	4	96	SS - 7.0%

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; *0.45* ← Torvane (tsf)

UNDISTURBED SAMPLE: PUSHED *0.45* ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				15	6,5,7,(10) *0.68*	CL	brown, moist, stiff	LEAN CLAY silt lenses								
	55			11	Pushed *2.25+*	CL-2	red-brown, moist, hard	LEAN CLAY W/SAND white lenses (gypsum)	106.4	16.1	36	21	0	17	83	DC SS - 3.6%
	60			14	15,27,46,(49) *2.25+*	CL	red-brown, moist, hard									
	65			10	Pushed *1.63*	CL-2	red-brown, moist, stiff		107.3	15.2	36	21	0	11	89	DC SS - 1.4%
	70			15	9,20,29,(33) *1.50*	CL	red-brown, moist, very stiff	LEAN CLAY white lenses (gypsum?)								
	75			14	12,18,24,(27) *1.50*	CL	red-brown, moist, very stiff									
	80			17	18,31,41,(46) *2.00*	CL	red-brown, moist, very stiff									
	85			9	Pushed *1.73*	CL-1	red-brown, moist, very stiff	SANDY LEAN CLAY white lenses (gypsum)	119.1	11.7	26	13	0	35	65	DC SS - 2.0%
	90			17	13,19,25,(27)	CL	red-brown, moist, very stiff	SANDY LEAN CLAY gypsum lenses & stringers								
	95			10	Pushed	CL-2	red-brown, moist	LEAN CLAY W/SAND gypsum lenses & stringers	115.7	14.1	39	24	0	28	72	DC SS - 4.7%

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; *0.45* ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; *0.45* ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				17	11,22,34,(34)	CL	red-brown, moist, very stiff								
	105						LEAN CLAY W/SAND gypsum lenses & stringers								
	110						GRAVELS (driller's observation) CLAY (driller's observation)								
	115						CLAYEY GRAVEL W/SAND basalt/scoria gravels								
				9	32,32,35,(38)	GC	black/red-brown, slightly moist, med. dense								
	120														
	125														
	130														
	135														
	140														
	145														

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE: PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

SHEET 1 OF 3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				13	5,5,5,(23)	CL	lt. brown, dry, stiff									
				9	8,7,9,(36)	CL	lt. brown to red-brown, slightly moist, very stiff									
	5			6	Pushed *1.40*	CL-2	red-brown, moist, very stiff		93.9	15.7	34	16	0	1	99	DC
	10			10	6,10,13,(39) *1.53*	CL	red-brown, moist, very stiff	LEAN CLAY white stringers								
	15			12	Pushed *1.13*	CL-1	red-brown, moist, very stiff		109.9	15.2	32	14	0	3	97	DC
	20			13	9,8,10,(22) *1.38*	CL	red-brown, moist, very stiff									
	25			10	Pushed	CL-1	dk. red-brown, moist, hard	LEAN CLAY W/SAND white lenses (gypsum?), 100% water loss between 22'-23'	106.0	13.5	26	9	0	25	75	DC
	30			12	7,6,8,(14) *0.85* *0.90*	CL	red-brown, moist, stiff									
	35			12	Pushed *2.10*	CL-2	red-brown, moist, hard	LEAN CLAY few sand lenses, white lenses & stringers	108.4	17.7	39	22	0	5	95	DC
	40			14	4,6,9,(13) *0.82*	CL	red-brown, moist, stiff									
	45			12	Pushed *0.66*	CL-2	brown, moist, stiff	LEAN CLAY silt lenses	97.2	24.0	40	21	0	4	96	

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; *0.45* ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; *0.45* ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				15	6,5,7,(10) *0.68*	CL	brown, moist, stiff	LEAN CLAY silt lenses								
	55			11	Pushed *2.25+*	CL-2	red-brown, moist, hard	LEAN CLAY W/SAND white lenses (gypsum)	106.4	16.1	36	21	0	17	83	DC
	60			14	15,27,46,(49) *2.25+*	CL	red-brown, moist, hard									
	65			10	Pushed *1.63*	CL-2	red-brown, moist, stiff		107.3	15.2	36	21	0	11	89	DC
	70			15	9,20,29,(33) *1.50*	CL	red-brown, moist, very stiff	LEAN CLAY white lenses (gypsum?)								
	75			14	12,18,24,(27) *1.50*	CL	red-brown, moist, very stiff									
	80			17	18,31,41,(46) *2.00*	CL	red-brown, moist, very stiff									
	85			9	Pushed *1.73*	CL-1	red-brown, moist, very stiff	SANDY LEAN CLAY white lenses (gypsum)	119.1	11.7	26	13	0	35	65	DC SS - 2.0%
	90			17	13,19,25,(27)	CL	red-brown, moist, very stiff	SANDY LEAN CLAY gypsum lenses & stringers								
	95			10	Pushed	CL-2	red-brown, moist	LEAN CLAY W/SAND gypsum lenses & stringers	115.7	14.1	39	24	0	28	72	DC

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; *0.45* ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; *0.45* ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

DRILL HOLE LOG

BORING NO. 09-3

PROJECT: HURRICANE CLIFFS RESERVOIR SITES - BENCH LAKE CLAY BORROW
CLIENT: W.C.W.C.D.
LOCATION: SEE SITE PLAN
DRILLING METHOD: 08-CME-55 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ DRY' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200804.007
DATE STARTED: 8/19/09
DATE COMPLETED: 8/20/09
GROUND ELEVATION: NOT MEASURED
LOGGED BY: M. HANSEN, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests / Fractures/Ft.
				17	11,22,34,(34)	CL	red-brown, moist, very stiff								
	105						LEAN CLAY W/SAND gypsum lenses & stringers								
	110						GRAVELS (driller's observation) CLAY (driller's observation)								
	115						CLAYEY GRAVEL W/SAND basalt/scoria gravels								
				9	32,32,35,(38)	GC	black/red-brown, slightly moist, med. dense								
	120														
	125														
	130														
	135														
	140														
	145														

200804.007.2 BENCHLAKECLAYBORROW.GPJ US EVAL.GDT 10/26/09

RB&G ENGINEERING, INC.

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
HYD = Hydrometer
SS = Soluble Salt
DC = Dispersive Clay
PL = Point Load

RB&G ENGINEERING, INC.

Table 1

SUMMARY OF TEST DATA

PROJECT LOCATION: Hurricane Cliffs Reservoir Sites — Bench Lake Borrow See site plan

PROJECT FEATURE: 200804.007 — Borrow Borings

TEST PIT / BORING NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		CONSOLIDATION	DISPERSIVE CLAY (PINHOLE TESTS)	SOLUBLE SALTS (%)	SLAKE DURABILITY	POINT LOAD INDEX $I_s(50)$	DIRECT SHEAR	UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	CHEMICAL TESTS				ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO CLASSIFICATION)
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)								pH	RESISTIVITY	SULFATE	CHLORIDE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
Total # of Tests		16	19	0	18	18	0	0	0	0	0	0	0	0			19				0	20
09-1	5-6.5		16.8		ND 1										43	20	23	0	2	98		CL (A-7-6 (24))
	15-16.5	100.7	18.7		ND 3	3.6									29	15	14	0	5	95		CL (A-6 (12))
	25-26.5	115.1	14.9		ND 3	3.7									37	16	21	0	12	88		CL (A-6 (18))
	35-36	111.6	16.7		ND 3	3.3									36	17	19	0	2	98		CL (A-6 (19))
	45-46.5	101.4	18.6		ND 1	2.8									34	15	19	1	32	67		CL (A-6 (10))
09-2	5-6	119.2	12.5		ND 3	2.1									32	15	17	0	13	87		CL (A-6 (13))
	15-16.5	111.6	18.4		ND 3	2.8									38	18	20	0	2	98		CL (A-6 (20))
	25-26	112.7	10.7		ND 3	3.3									42	18	24	0	14	86		CL (A-7-6 (21))
	35-36.5		4.8			1.2											NP	0	64	36		SM (A-4 (0))
	45-46		12.0		ND 3	3.1									35	17	18	5	57	38		SC (A-6 (2))
09-3	5-6	93.9	15.7		ND 3	9.1									34	18	16	0	1	99		CL (A-6 (16))
	15-16	109.9	15.2		ND 3	5.0									32	18	14	0	3	97		CL (A-6 (13))
	25-26.5	106.0	13.5		ND 1	5.1									26	17	9	0	25	75		CL (A-4 (5))
	35-36.5	108.4	17.7		ND 3	4.5									39	17	22	0	5	95		CL (A-6 (21))
	45-46	97.2	24.0		ND 3	7.0									40	19	21	0	4	96		CL (A-6 (21))
	55-56	106.4	16.1		ND 1	3.6									36	15	21	0	17	83		CL (A-6 (16))
	65-66	107.3	15.2		ND 3	1.4									36	15	21	0	11	89		CL (A-6 (18))
	85-86	119.1	11.7		ND 3	2.0									26	13	13	0	35	65		CL (A-6 (5))
	95-96	115.7	14.1		ND 2	4.7									39	15	24	0	28	72		CL (A-6 (15))

NP=Non-Plastic