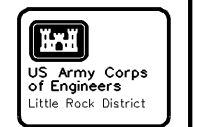


INDEX OF DRAWINGS

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F-2	EXISTING SITE PLAN
F-3	TYPICAL CROSS SECTIONS
F-4	GEOLOGIC PROFILE ALONG CENTERLINE OF DAM
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Symbol	Description	Date	Appr.

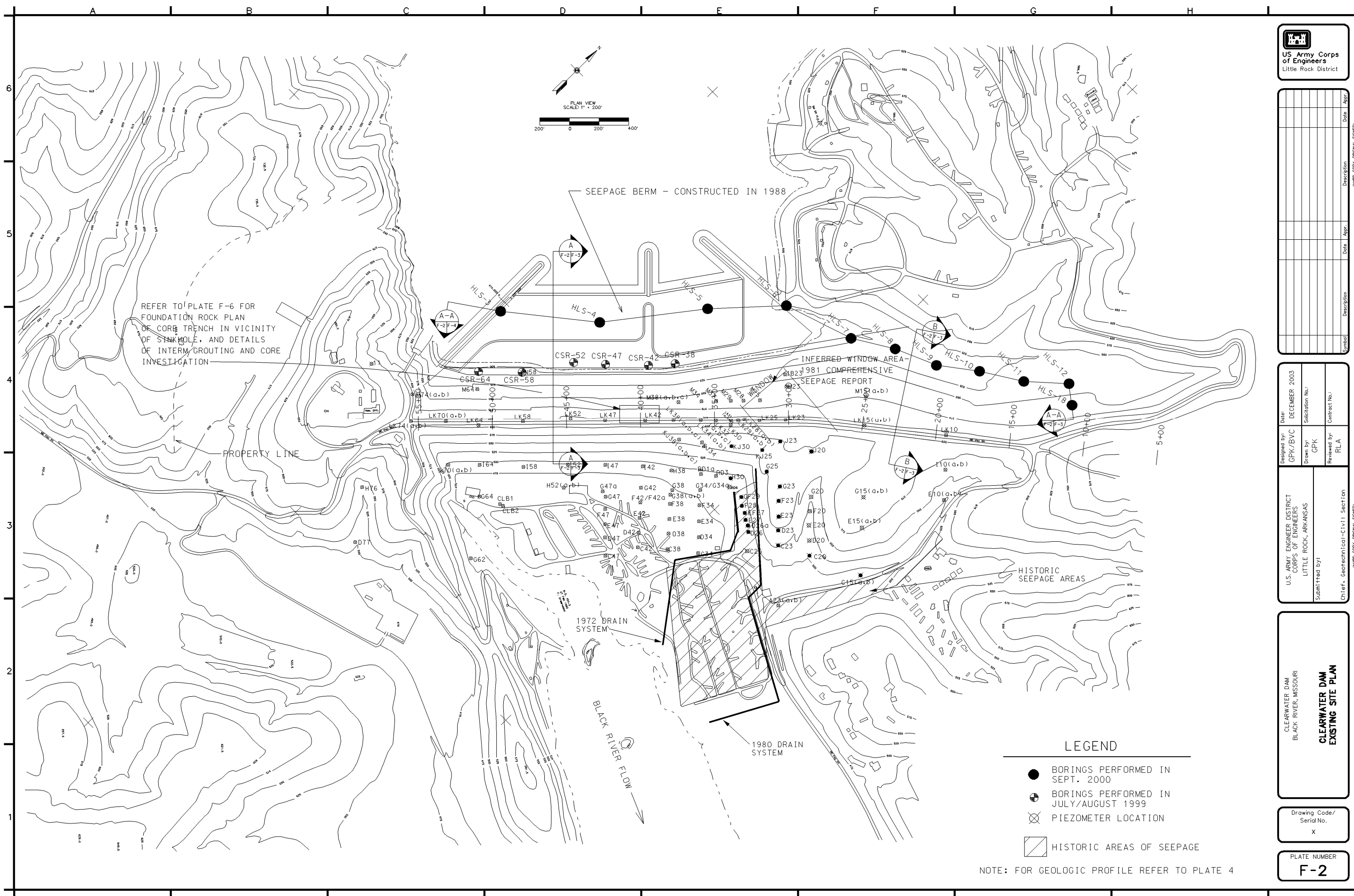
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Drawn by:	MSB	Salutation No.:	
Reviewed by:	RLA	Contract No.:	10672-131/1941
Submitted by:	Chief, Geotechnical-Civil Section		

PROJECT LOCATION, VICINITY AND INDEX

CLEARWATER DAM
BLACK RIVER, MISSOURI

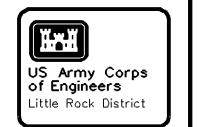
Drawing Code/
Serial No.

PLATE NUMBER
F-1



- LEGEND**
- BORINGS PERFORMED IN SEPT. 2000
 - ⊕ BORINGS PERFORMED IN JULY/AUGUST 1999
 - ⊗ PIEZOMETER LOCATION
 - ▨ HISTORIC AREAS OF SEEPAGE

NOTE: FOR GEOLOGIC PROFILE REFER TO PLATE 4



Symbol	Description	Date	Appr.	Date	Appr.

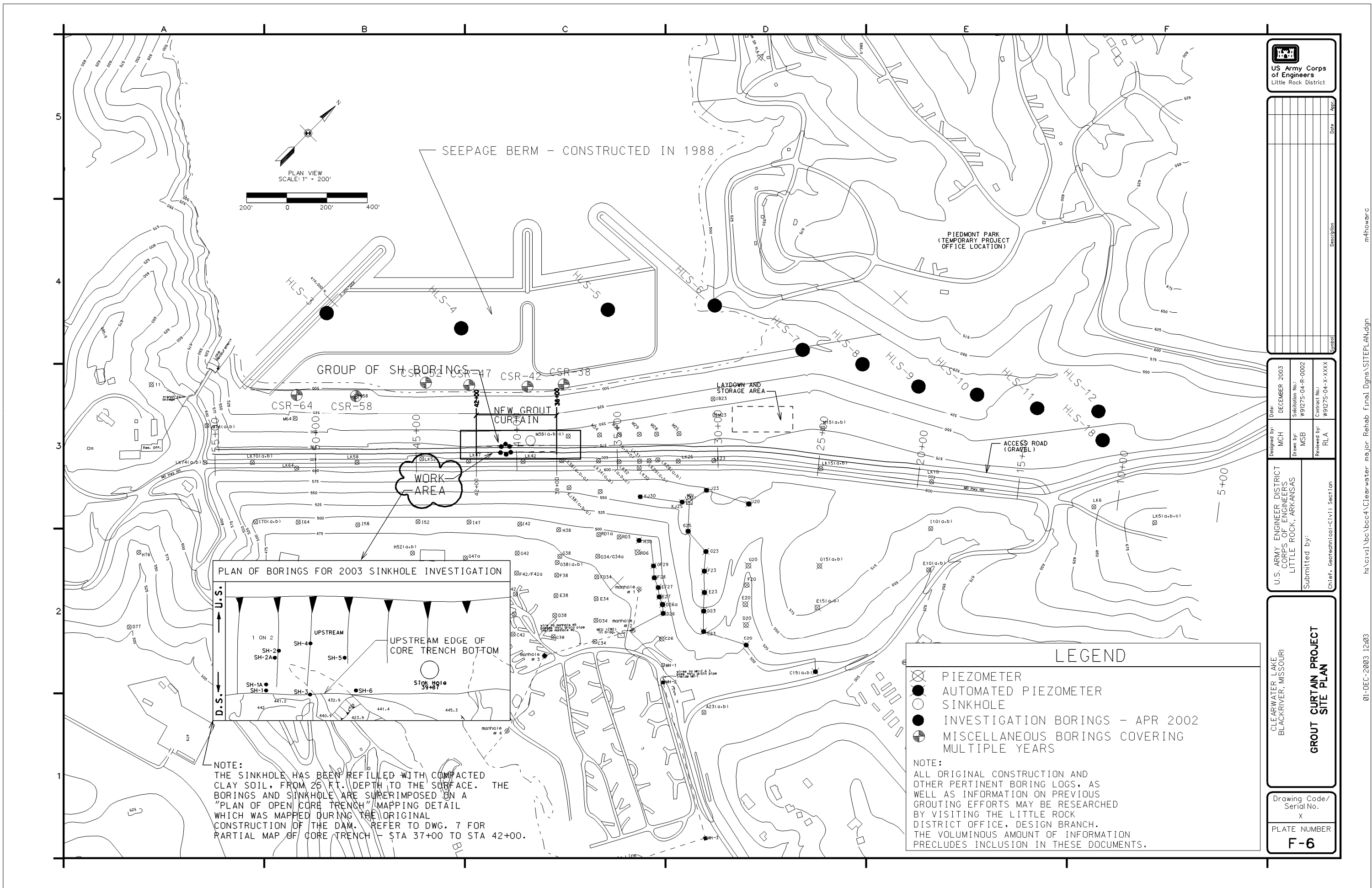
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Drawn by: GPK	Salutation No.:
Reviewed by: RLA	Contract No.:
Submitted by: Chief, Geotechnical-Civil Section	

CLEARWATER DAM
BLACK RIVER, MISSOURI

**CLEARWATER DAM
EXISTING SITE PLAN**

Drawing Code/
Serial No.
X

PLATE NUMBER
F-2



**US Army Corps
of Engineers**
Little Rock District

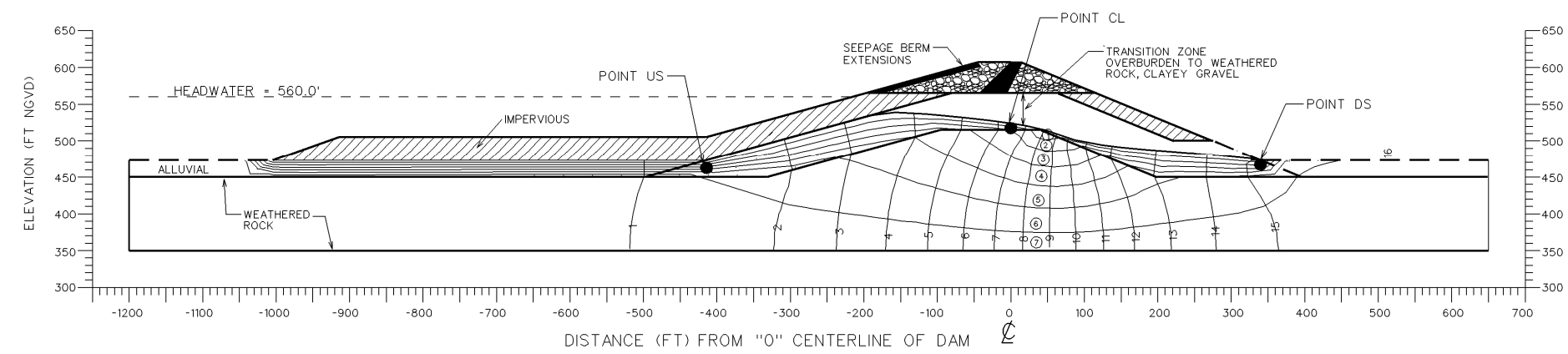
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Date: DECEMBER 2003
Designed by: MCH
Drawn by: MSB
Reviewed by: RLA
Submitted by:
Chief, Geotechnical - Civil Section

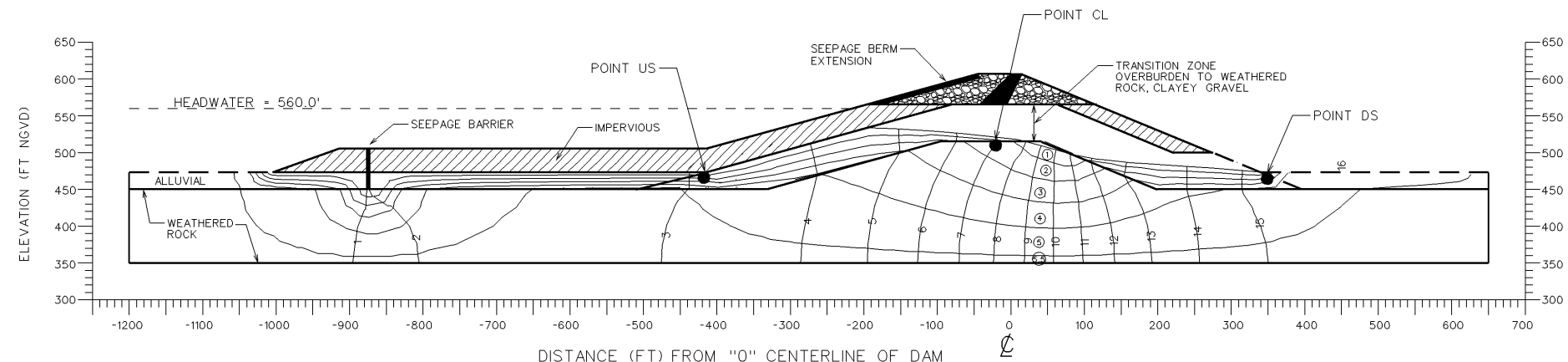
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

**GROUT CURTAIN PROJECT
SITE PLAN**

Drawing Code/
Serial No.
X
Plate Number
F-6



CASE 1A TYPICAL SECTION (STA 31+00 - 34+00)
EXISTING CONDITION WITH BERM EXTENSION; NO CUTOFF WALL SCALE AS SHOWN



CASE 1B TYPICAL SECTION (STA 31+00 - 34+00)
EXISTING CONDITION WITH BERM EXTENSION; CUTOFF WALL TO TOP OF ROCK SCALE AS SHOWN

CASE DESCRIPTIONS:

- CASE 1A - WEATHERED ROCK PERMEABILITY IS ASSUMED TO BE 0.28 FT/DAY. THERE IS NOT A CUTOFF THROUGH ALLUVIAL.
- CASE 1B - THE SAME AS 1A WITH A CUTOFF TO TOP OF ROCK THROUGH ALLUVIAL.

CASE	HYDRAULIC GRADIENT - i			
	POINTS	US	CL	DS
1A	NO CUTOFF WALL	0.082	0.156	0.428
1B	CUTOFF WALL TO TOP OF ROCK	0.029	0.139	0.218

MATERIALS

- ALLUVIAL - PERVIOUS RIVER DEPOSIT (k=42.5 FT/D)
 TRANSITION ZONE, CLAYEY GRAVEL (k=2.83 FT/D)
 WEATHERED ROCK (k=0.28 FT/D)
 IMPERVIOUS CEMENT BENTONITE SLURRY SEEPAGE CUTOFF WALL
 IMPERVIOUS CLAY EMBANKMENT FILL OR SEPAGE BERM

NOTES:

- GRADIENTS SHOWN ARE FOR LAKE LEVEL 567 ± = i.e. THE POOL OF RECORD = 567.6 ON 20 MAY 2001.
- MULTIPLY i BY (611/567) = 1.08, TO GET i MAX AT MAX LAKE.

Symbol	Description	Date	Appr.

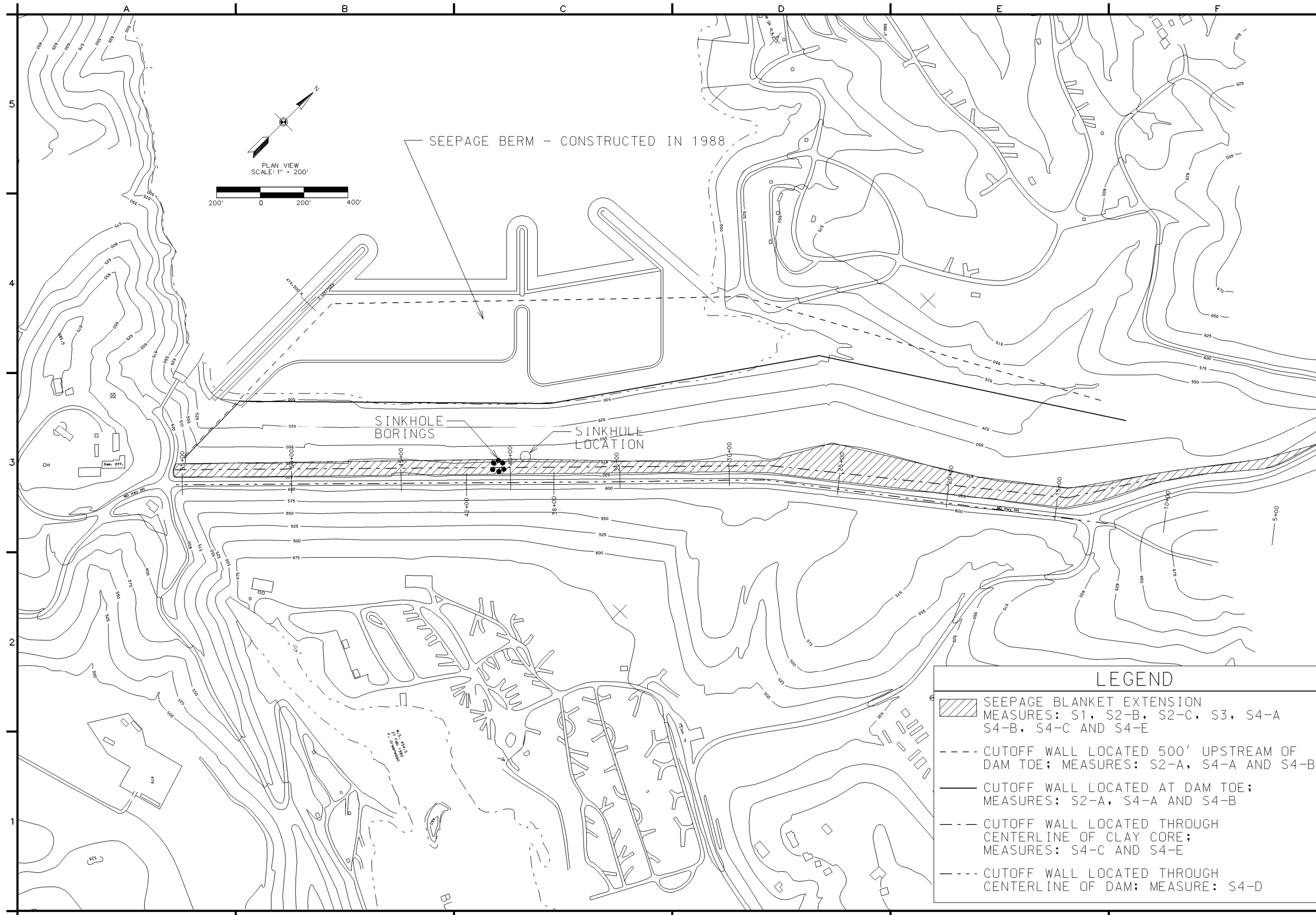
Designed by: GPK	Date: DECEMBER 2003
Drawn by: GPK	Solicitation No.:
Reviewed by: RLA	Contract No.:
Submitted by: Chief, Geotechnical-Civil Section	

CLEARWATER DAM
BLACK RIVER, MISSOURI

ANALYSIS OF SEEPAGE REDUCTION FROM CUTOFF WALL

Drawing Code/
Serial No.
XXXX

PLATE NUMBER
F-7



LEGEND	
	SEEPAGE BLANKET EXTENSION MEASURES: S1, S2-B, S2-C, S3, S4-A S4-B, S4-C AND S4-E
	CUTOFF WALL LOCATED 500' UPSTREAM OF DAM TOE; MEASURES: S2-A, S4-A AND S4-B
	CUTOFF WALL LOCATED AT DAM TOE; MEASURES: S2-A, S4-A AND S4-B
	CUTOFF WALL LOCATED THROUGH CENTERLINE OF CLAY CORE; MEASURES: S4-C AND S4-E
	CUTOFF WALL LOCATED THROUGH CENTERLINE OF DAM; MEASURE: S4-D

**US Army Corps
of Engineers**
Little Rock District

Symbol	Description	Date	Appr.

Designed by:	OCTOBER 2003
BYC	
Drawn by:	MSB
MSB	
Reviewed by:	RLA
RLA	

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CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

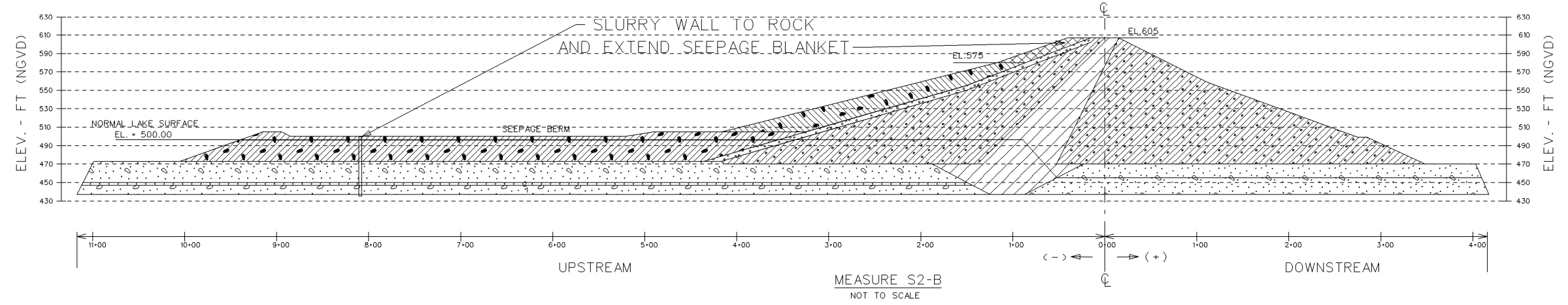
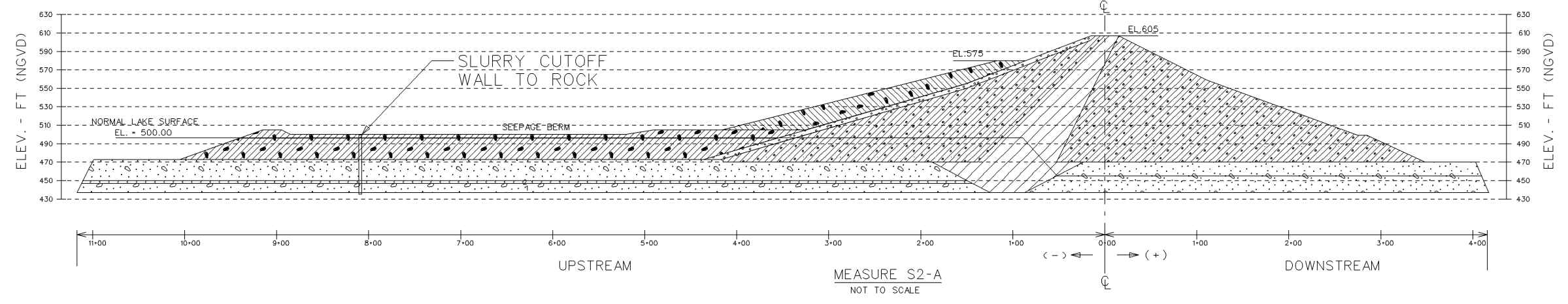
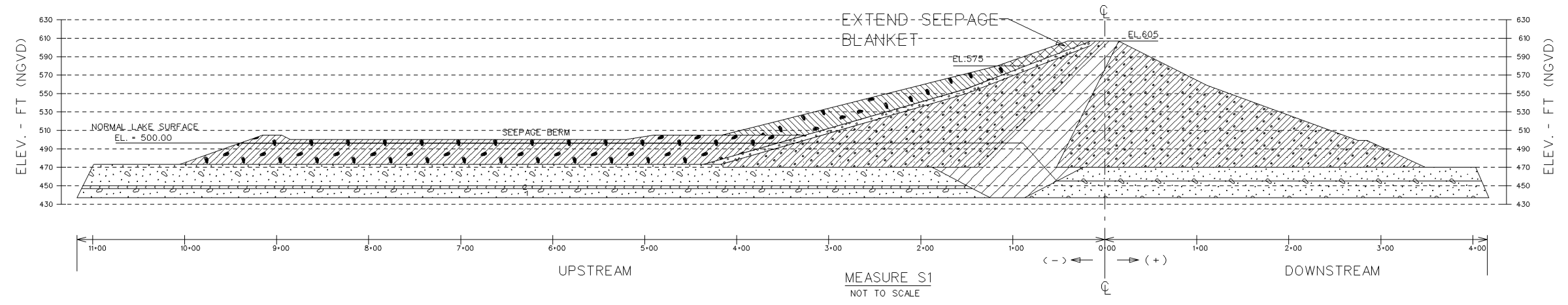
Submitted by:
Chief, Geotechnical-Civil Section

CLEARWATER LAKE
BLACKRIVER, MISSOURI

**CLEARWATER MAJOR
REHABILITATION STUDY
PLAN OF SEEPAGE
REMEDIAL MEASURES**

Drawing Code/ Serial No.	X
Drawing Ref. No.	03

Symbol	Legend
	Alluvial/Natural Soil
	Liquefaction Zone
	Impervious Core
	Stone Protection
	Pervious Fill
	Unconsolidated Berm Fill
	Compacted Berm Fill
	Rock



US Army Corps of Engineers
Little Rock District

Date	Appr.
Description	

Designed by: DECEMBER 2003
BVC

Drawn by: MSB

Reviewed by: RLA

Submitted by: Center, Geotechnical-Civil Section

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

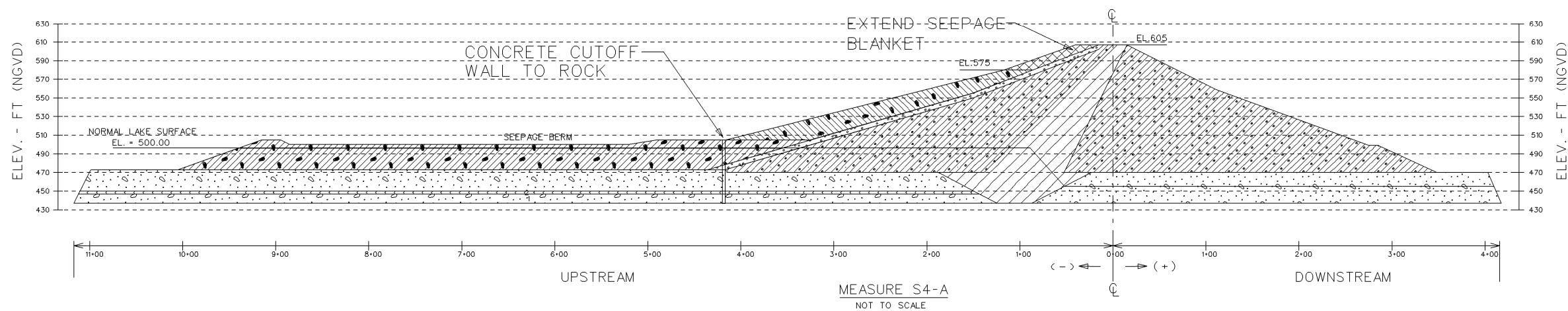
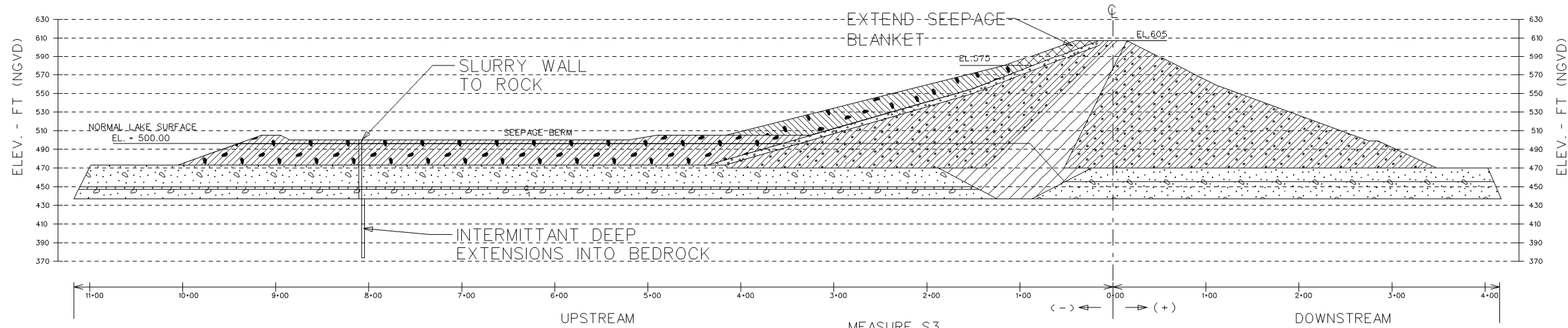
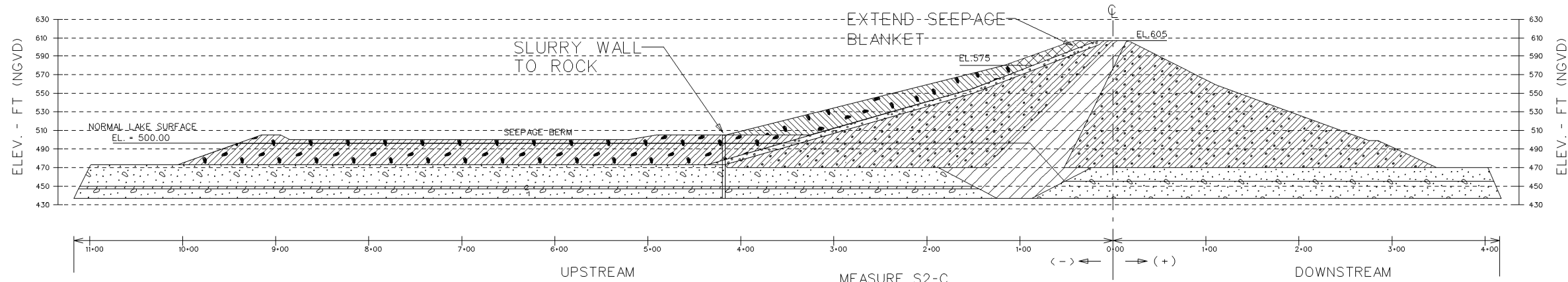
CLEARWATER LAKE
BLACKRIVER, MISSOURI

SEEPAGE REMEDIATION MEASURES I

Drawing Code/
Serial No.
X

PLATE NUMBER
F-8A

Symbol	Legend
	Alluvial/Natural Soil
	Liquefaction Zone
	Impervious Core
	Stone Protection
	Pervious Fill
	Unconsolidated Berm Fill
	Compacted Berm Fill
	Rock



US Army Corps of Engineers
Little Rock District

Description	Date

Designed by: BYC	Date: DECEMBER 2003	
Drawn by: MSB	Salutation No.:	Contract No.:
Reviewed by: RLA		

Submitted by: Center, Geotechnical-Civil Section

SEEPAGE REMEDIATION MEASURES II

CLEARWATER LAKE
BLACKRIVER, MISSOURI

Drawing Code/ Serial No. X	
F-8B	



Date	Description

Designed by: BYC	Date: DECEMBER 2003
Drawn by: MSB	Salutation No.:
Reviewed by: RLA	Contract No.:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

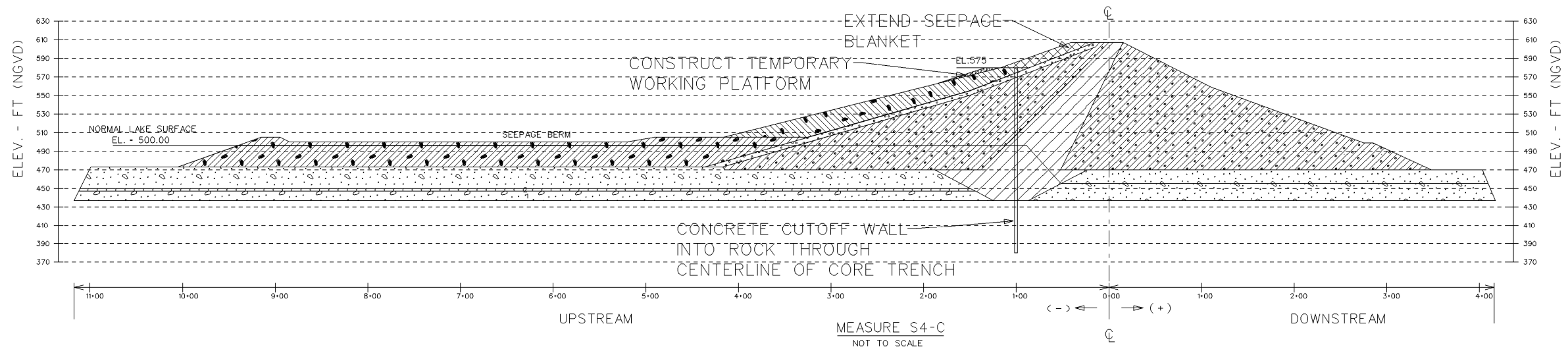
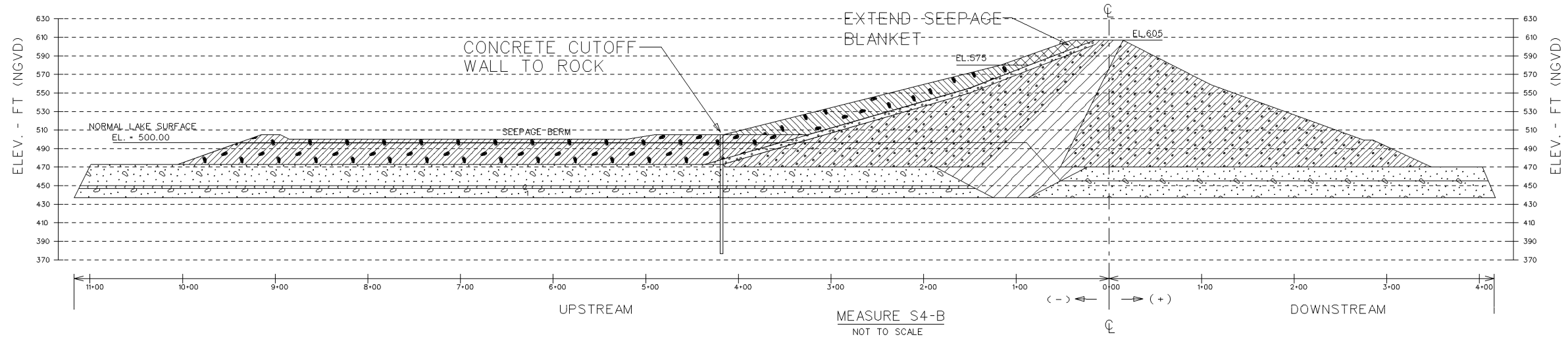
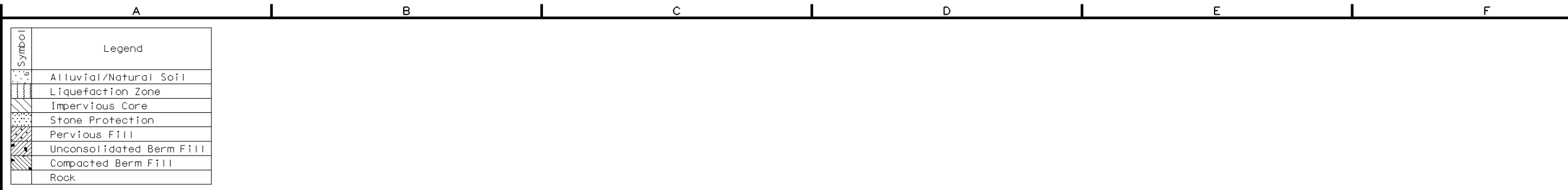
Submitted by:
Chief, Geotechnical-Civil Section

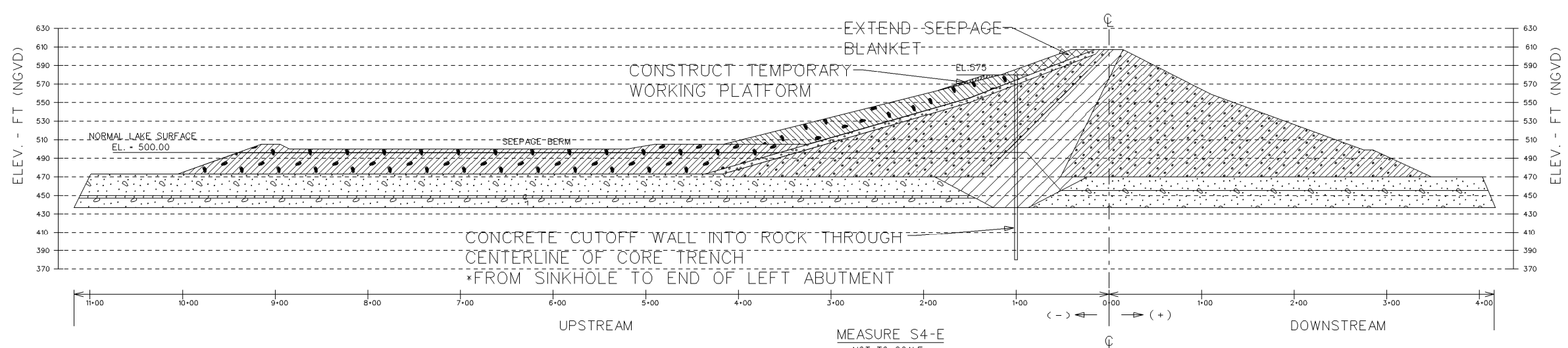
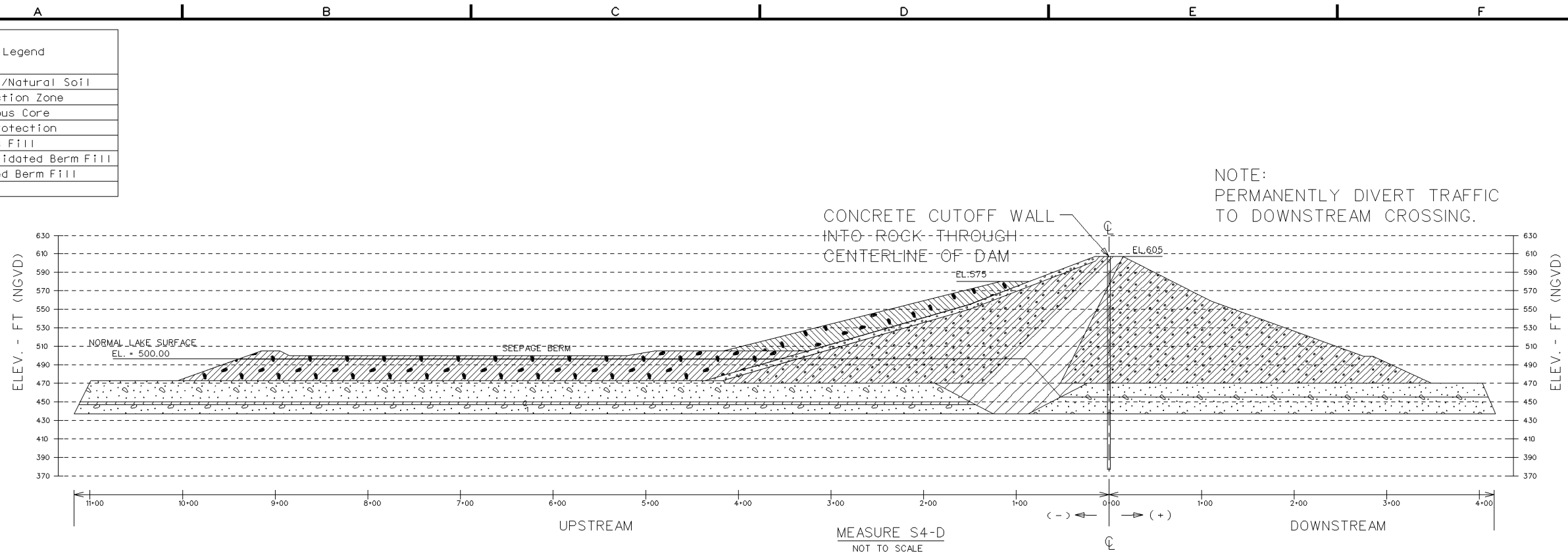
CLEARWATER LAKE
BLACKRIVER, MISSOURI

SEEPAGE REMEDIATION MEASURES III

Drawing Code/
Serial No.
X

PLATE NUMBER
F-8C





Symbol	Legend
[Symbol]	Alluvial/Natural Soil
[Symbol]	Liquefaction Zone
[Symbol]	Impervious Core
[Symbol]	Stone Protection
[Symbol]	Pervious Fill
[Symbol]	Unconsolidated Berm Fill
[Symbol]	Compacted Berm Fill
[Symbol]	Rock



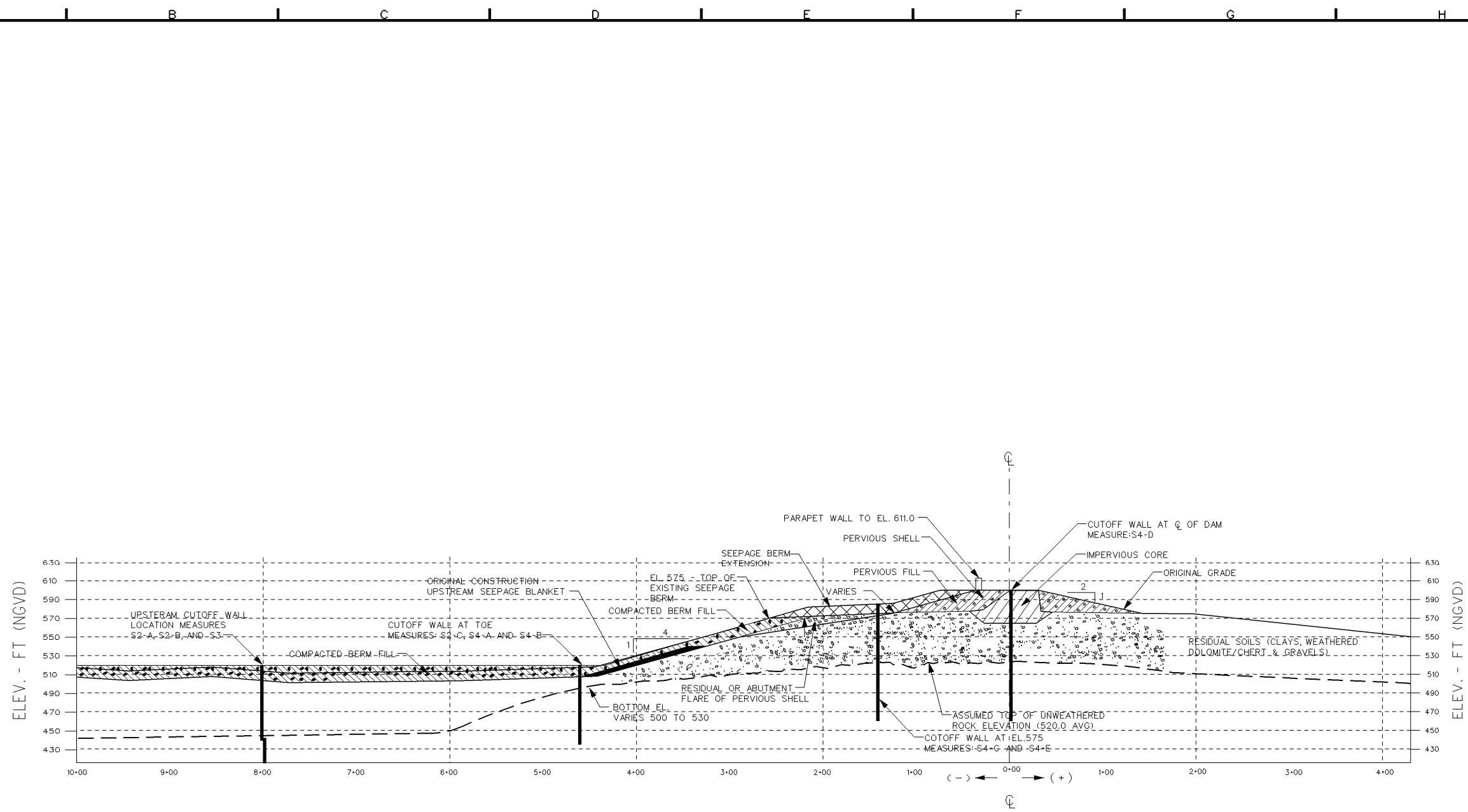
Date	Description

Designed by: DECEMBER 2003	Date:
Drawn by: MSB	Submission No.:
Reviewed by: RLA	Contract No.:

Submitted by: [Name]
 U.S. ARMY ENGINEER DISTRICT
 CORPS OF ENGINEERS
 LITTLE ROCK, ARKANSAS

SEEPAGE REMEDIATION MEASURES IV

Drawing Code/
 Serial No.
 x
 PLATE NUMBER
F-8D



SECTION B
SEEPAGE REMEDIATION MEASURES AS INDICATED AT LEFT ABUTMENT
(STATIONS 15 TO 33 +/-)
(SCALE: AS SHOWN)



Symbol	Description	Date	Appr.

Designed by:	BYC	Date:	DECEMBER 2003
Drawn by:	CMH	Solicitation No.:	
Reviewed by:	RLA	Contract No.:	
Submitted by:	Chief, Geotechnical-Envtl Section		

CLEARWATER DAM
BLACK RIVER, MISSOURI

SEEPAGE REMEDIATION MEASURES V

Drawing Code/
Serial No.
x

PLATE NUMBER
F-8E