

A14.3 Historical change of sand bars in the Red River, Hanoi segment

(1) Old maps

Comparison of old maps from 1901 to 1958 is shown in **Figure 14.3.1**. There were drastic changes of sand bars in the past.

A list of available maps prepared in the past is shown in **Table 14.3.1**.

(2) Aero-photographs

Aero-photographs taken in the following three eras are compared referring to the digital map made in 1985 and supplemented in 1993 with a scale of 1/10,000:

- 1) 21 photographs with a scale of 1/40,000 to 1/43,000 taken in 1952 (STE-1952),
- 2) 141 photographs with a scale of 1/5,000 taken in 1977 (HN 1977), and
- 3) 83 photographs with a scale of 1/7,300 taken in 1992 to 1993 (Fi 92).

The topographic survey by the Study Team is also compared with them. The works are conducted by the following method.

- 1) The aerial photographs are scanned by a scanner;
- 2) The photographs taken into a computer and treated by "Microsoft-SE" to superimpose it on the digital map, reducing the scale to 1/25,000;
- 3) Riverbanks indicated in three (3) sets of topographic maps of chronologically different years and aerial photographs are traced in one (1) sheet, taking into account necessary adjustment of water levels;
- 4) waterlines are expressed in different lines by the eras and compared each other.

The result is shown in **Figure A14.3.2**. The past changes of sand banks and bars are quite drastic accompanied by meandering of corners. The change of areas of sand banks and bars are summarized in **Table A14.3.2**.

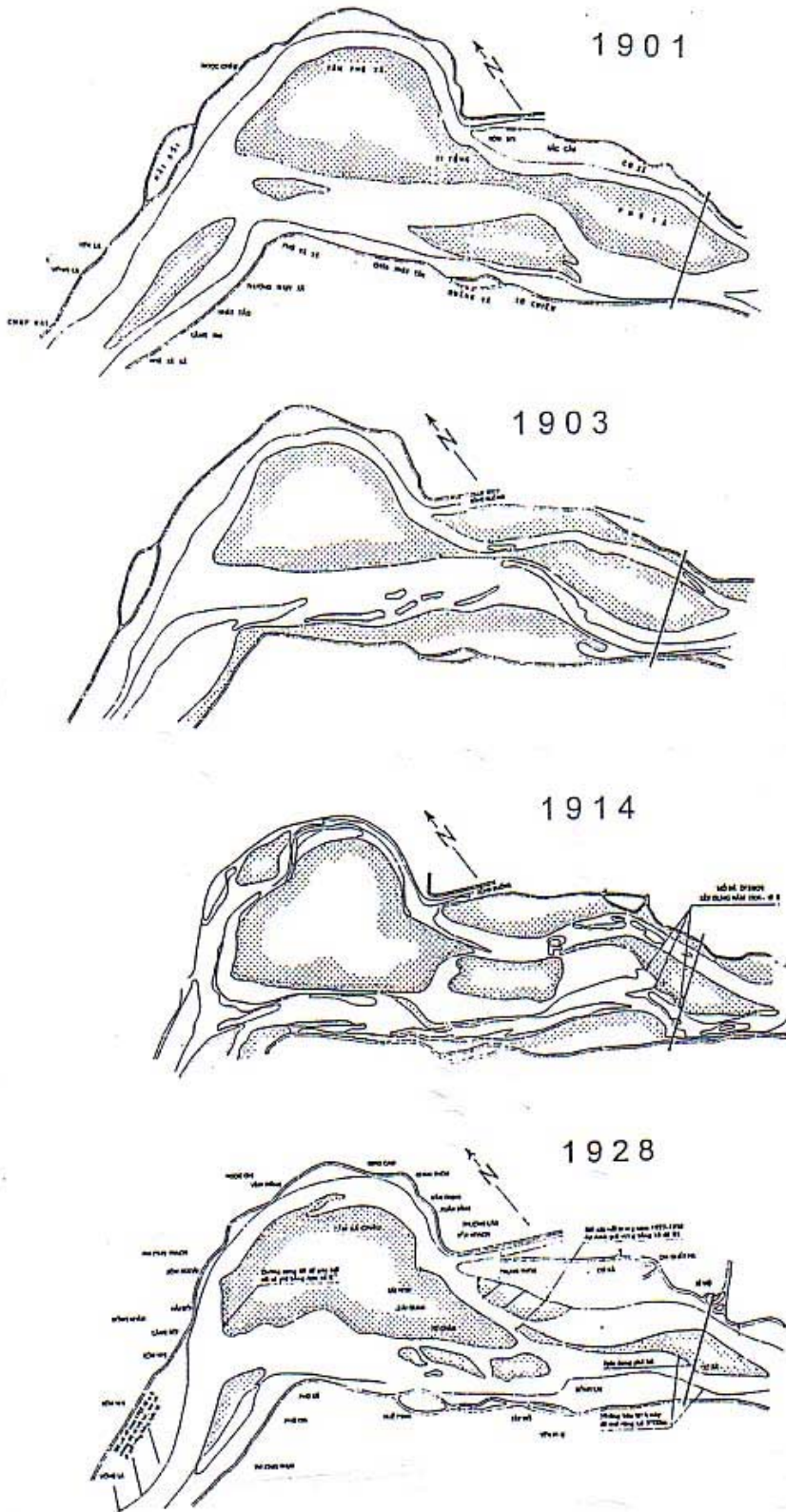


Figure A14.3.1 (1) Historical Change of Red River Banks in Hanoi

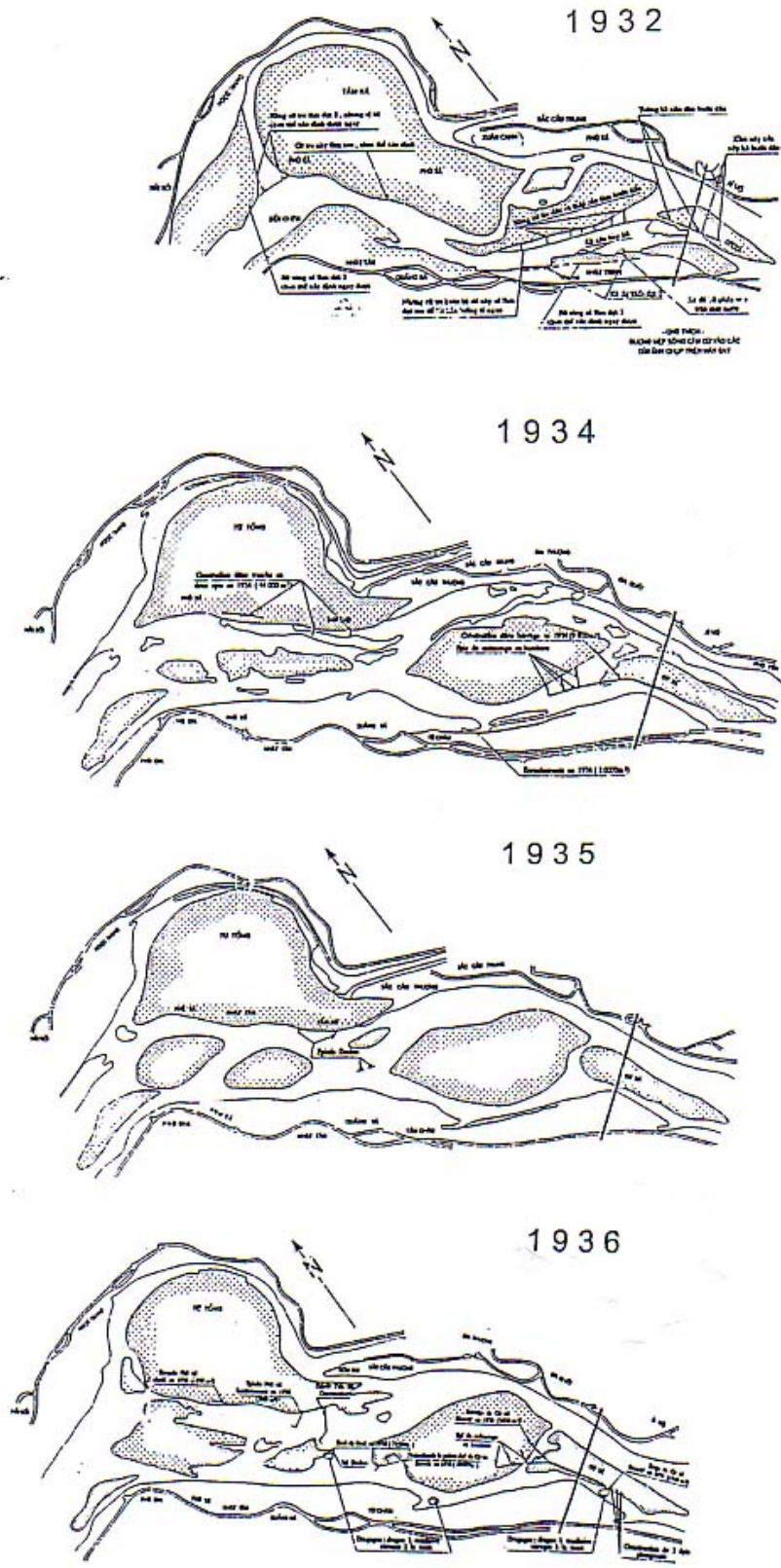


Figure A14.3.1 (2) Historical Change of Red River Banks in Hanoi

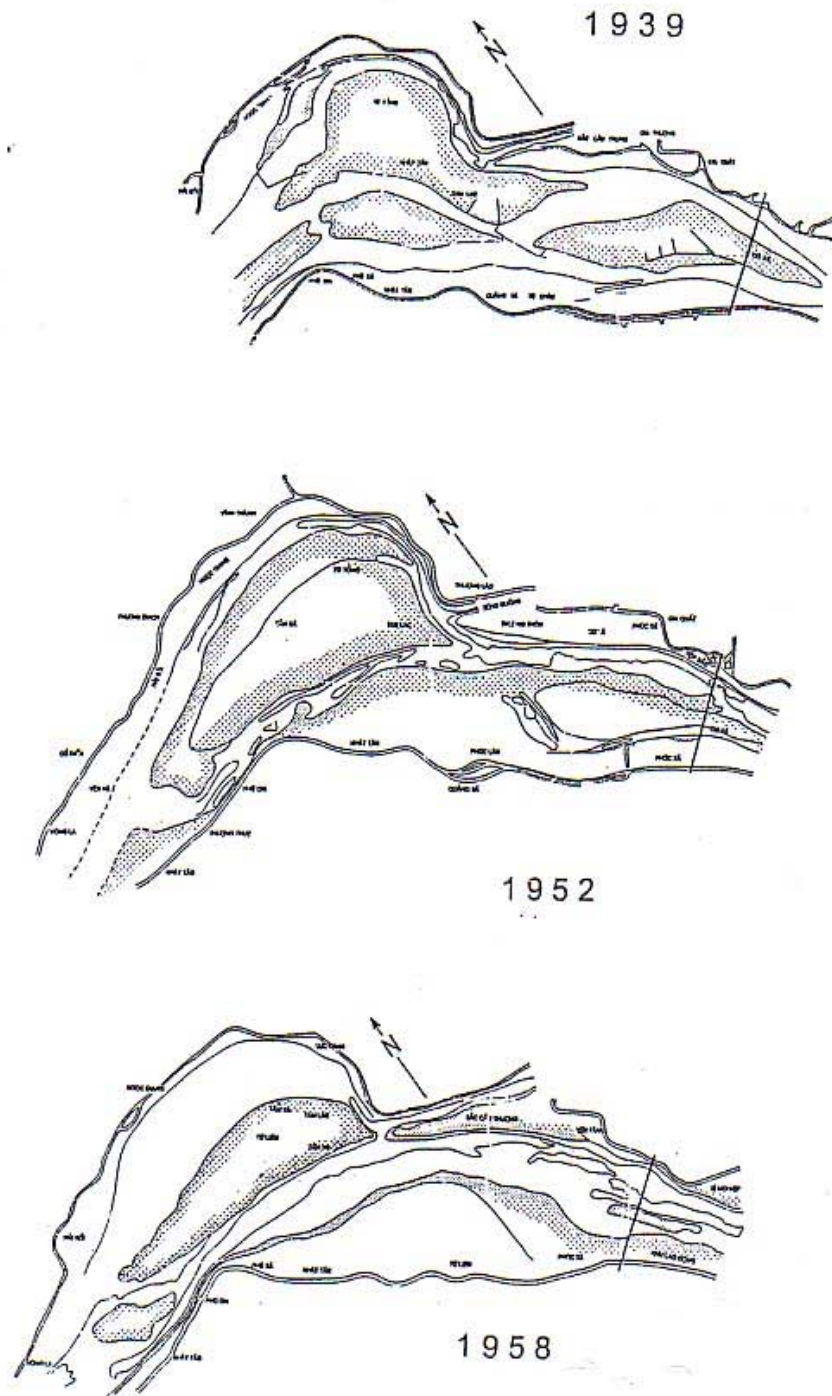


Figure A14.3.1 (3) Historical Change of Red River Banks in Hanoi

Table A14.3.1 Overview of Historical Bathymetric /Topographic Surveys

Survey (mm/yy)	Scale 1/...	No. of Maps	Horizontal Ref. System	Grid Indication	Vertical Ref. System	Section		Range	
						Initial	Final		
1901	No Scale	1	Not Shown	No	Not Shown		Initial	Location Initial	Location Final
1903	No Scale	1	Not Shown	No	Not Shown			Chap Mai	Long Bien Bridge
1914	No Scale	1	Not Shown	No	Not Shown			Chap Mai	Long Bien Bridge
1928	No Scale	1	Not Shown	No	Not Shown			Yong La	Long Bien Bridge
1932	No Scale	1	Not Shown	No	Not Shown			Hai Boi	Long Bien Bridge
1934	No Scale	1	Not Shown	No	Not Shown			Phu Gia	Long Bien Bridge
1935	No Scale	1	Not Shown	No	Not Shown			Phu Gia	Long Bien Bridge
1036	No Scale	1	Not Shown	No	Not Shown			Phu Gia	Long Bien Bridge
1939	No Scale	1	Not Shown	No	Not Shown			Phu Gia	Long Bien Bridge
1952	No Scale	1	Not Shown	No	Not Shown			Yong La	Long Bien Bridge
1958	No Scale	1	Not Shown	No	Not Shown			Yong La	Long Bien Bridge
1975	5000	1	National Sys. HN-72	No	RRLS 10,800			Long Bien	Thanh Tri
7 & 8/1976	5000	22	National Sys. HN-72	No	RRLS 10,800			Thuong Cap Port	Khuyen Luong Port
1980	10000	1	National Sys. HN-72	No	RRLS 10,800			Thang Long	Thanh Tri
10/1980	5000	1	National Sys. HN-72	No	RRLS 10,800			Long Bien	Thanh Tri
1/1982	5000	1	National Sys. HN-72	No	RRLS 10,800			Tu Liem	Phu Vien
6/1983	10000	1	National Sys. HN-72	No	RRLS 10,800			TN 1	TN 27
12/1983	10000	1	National Sys. HN-72	No	RRLS 10,800			TN 1	TN-27
2/1984	10000	1	National Sys. HN-72	No	RRLS 10,800			TN 1	TN-27
1984	10000	1	National Sys. HN-72	No	RRLS 10,800			Thang Long	Thanh Tri
5/1985	10000	1	National Sys. HN-72	No	RRLS 10,800			Thang Long	Thanh Tri
2&3/1986	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Thanh Tri
7/1986	10000	1	National Sys. HN-72	No	RRLS 10,800			Thang Long	Thanh Tri
10&11/1986	10000	1	National Sys. HN-72	No	RRLS 10,800			TN 6	TN-27
5/1987	10000	1	National Sys. HN-72	No	RRLS 10,800			Thang Long	Thanh Tri
8/1989	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
9/1989	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
10/1989	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
11/1989	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
12/1989	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
10/1990	10000	1	National Sys. HN-72	No	RRLS 10,800			Duong River	Hanoi Port
9/1991	10000	1	National Sys. HN-72	No	RRLS 10,800			Long Bien	Thanh Tri
9/1995	10000	3 x A1	National Sys. HN-72	No	National Level			Thang Long	Thanh Tri
10&11/1996	10000	3 x A1	National Sys. HN-72	No	National Level			Thang Long	Thanh Tri
10&12/1999	10000	4 x A0	National Sys. HN-72	Yes	National Level			Thuong Cat Port	Khuyen Luong Port
1/2002	10000	4 x A0	National Sys. HN-72	Yes	National Level			Thuong Cat Port	Khuyen Luong Port



Figure A14.3.2 Change of Sand Banks and Bars by Aero-photograph Analysis

Table A14.3.2 Change in Sand Banks and Bars in the Red River Hanoi Segment

(Aero-photograph Analysis)

No.	Place	1952		1977		1992	
		Dimension LengthxWidth (mxm)	Area (ha)	Dimension LengthxWidth (mxm)	Area (ha)	Dimension LengthxWidth (mxm)	Area (ha)
1	Vong La Bar	1,750x625	109	2,375x450	107	0	0
	Thuong Cat	2,00x500	100				
2	Phu Thuong Bar	450x175	7.9	-	-	2,750x625	172
	Phu Gia Bar	500x125	6.2				
		375x225	8.5				
3	Tu Lien Bar	4,000x625	250	3,000x250	75	4,875x750	366
	Trung Ha Bar						
4	Tam Xa Bank	3,875x1,875	727	0	0	0	0
5	Dong Nhan Bar	0	0	0	0	1,750x450	79
6	Thach Cau Bank (Left side)	0	0	4,625x750	220	2,625x325	85
7	Thanh Tri Bank (Right side)	0	0	3,000x650	103	2,250x575	66

Source) JICA Study Team

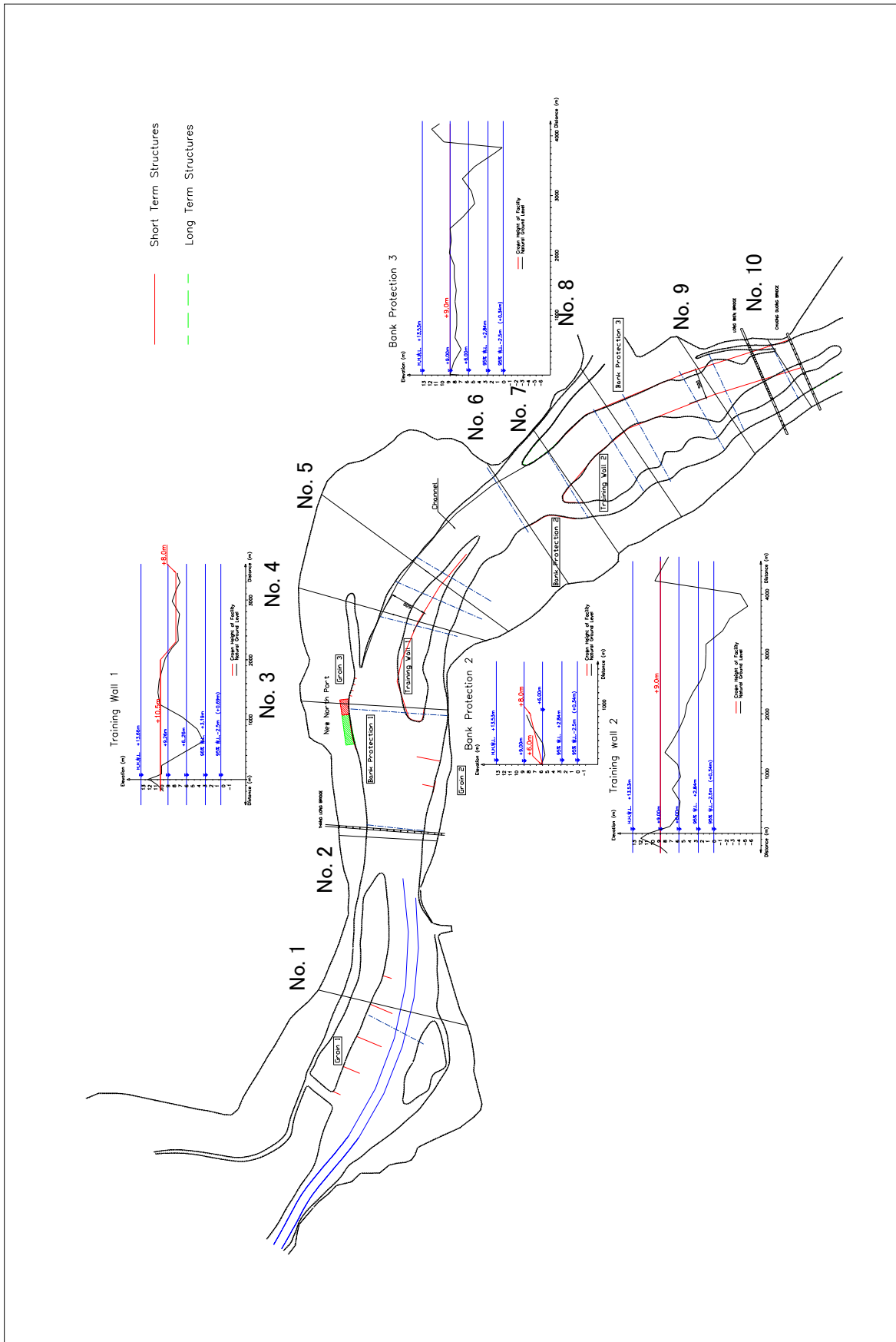


Figure A14.3.3(1) Location of Cross Sections measured in January and August, 2002

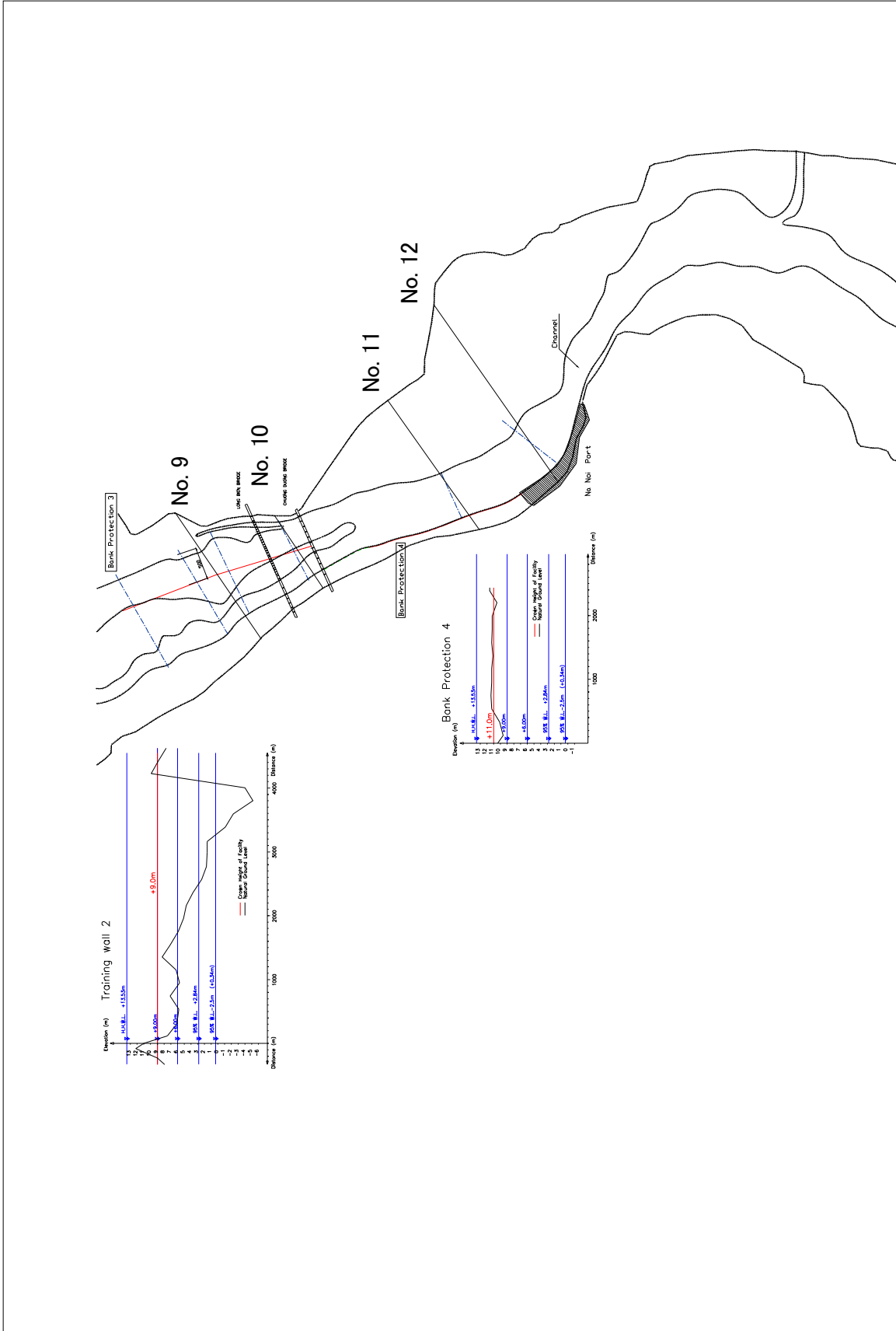


Figure A14.3.3(1) Location of Cross Sections measured in January and August, 2002 (Continuation)

CROSS — SECTION No. 1

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)
 - - - Rainy Season (August 2002)

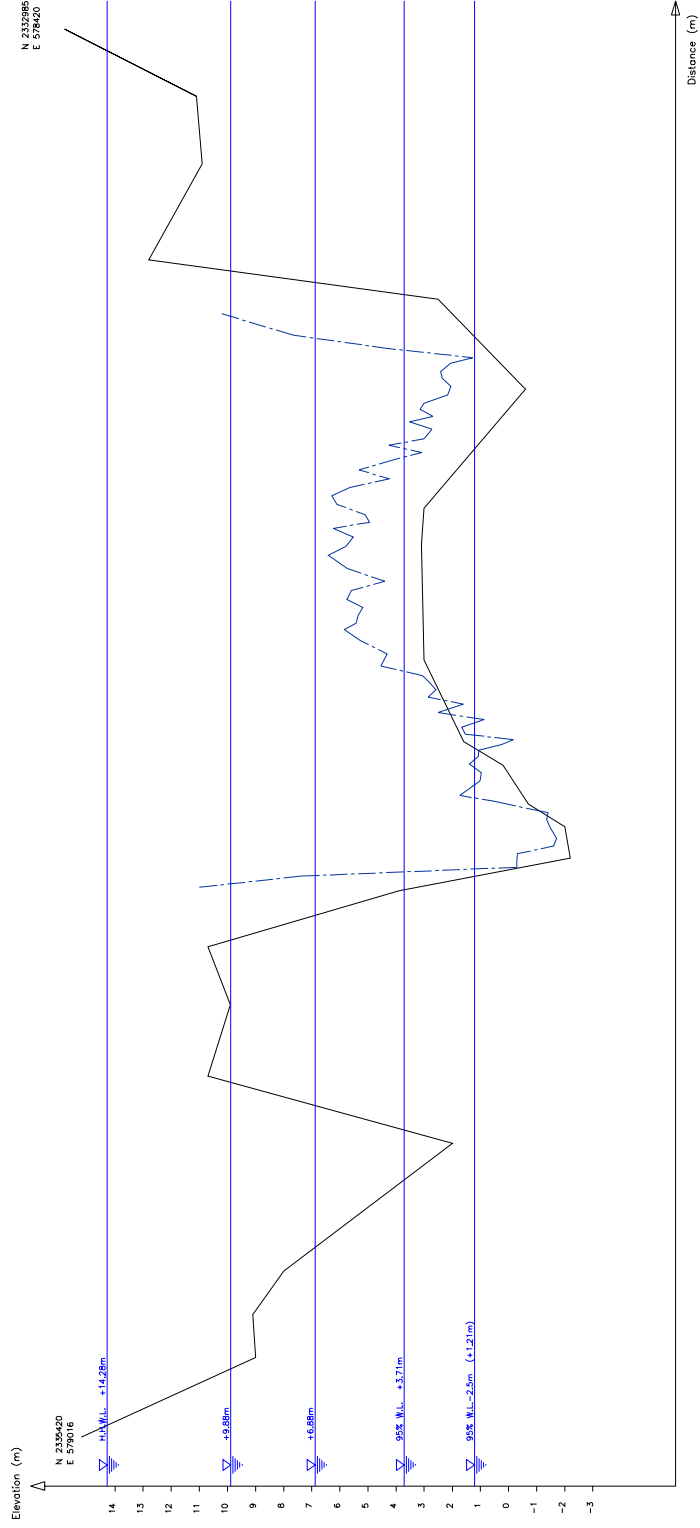


Figure A14.3.3(2) Comparison of Cross Sections between January and August, 2002

CROSS - SECTION No. 2

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)
 - - - Rainy Season (August 2002)

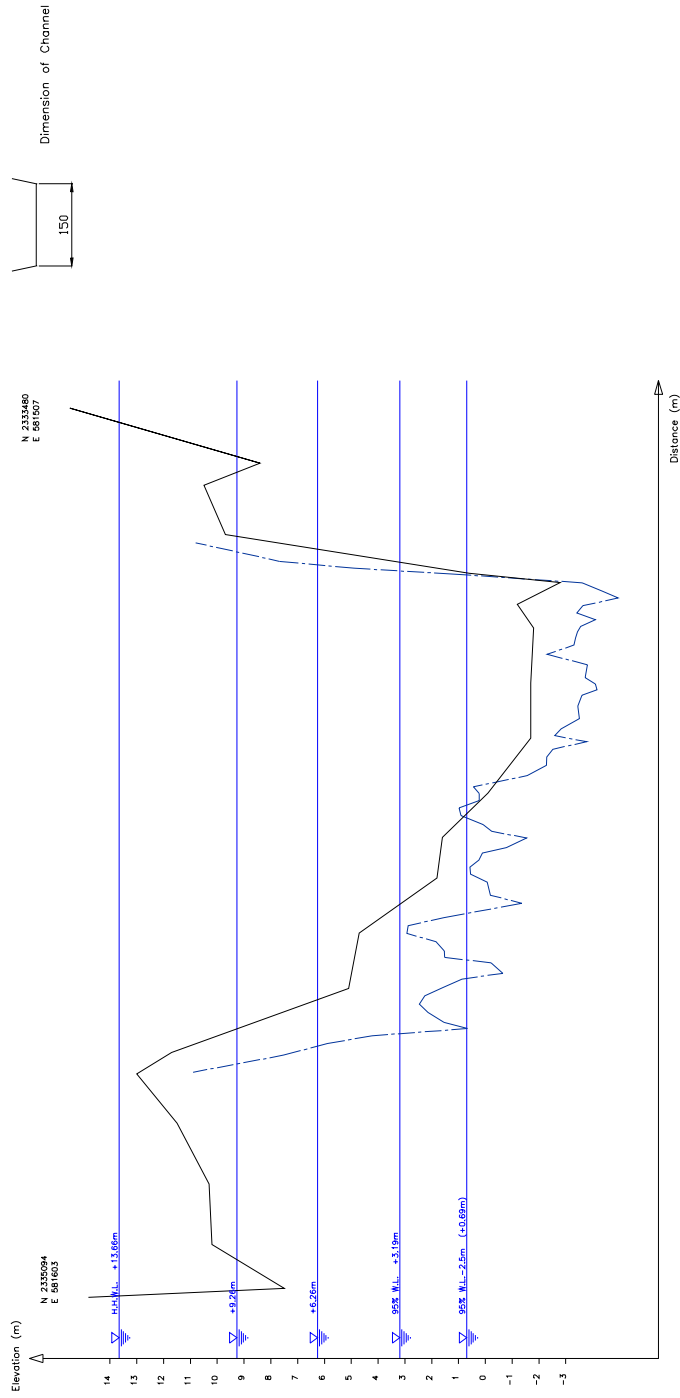


Figure A14.3.3(3) Comparison of Cross Sections between January and August, 2002

CROSS – SECTION No. 3

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)
 - - - Rainy Season (August 2002)

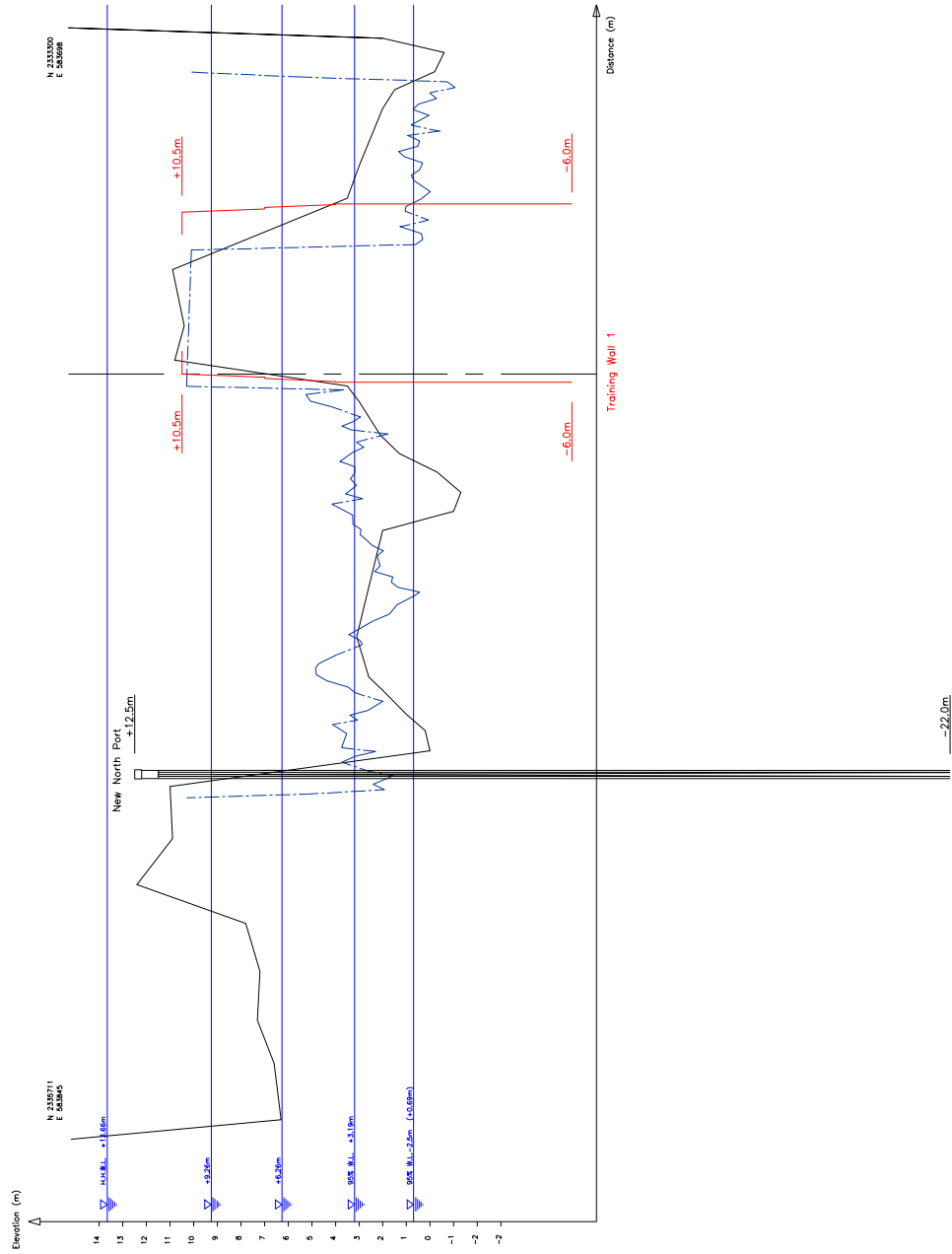


Figure A14.3.3(4) Comparison of Cross Sections between January and August, 2002

CROSS — SECTION No. 4

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)

- - - Rainy Season (August 2002)

Dimension of Channel

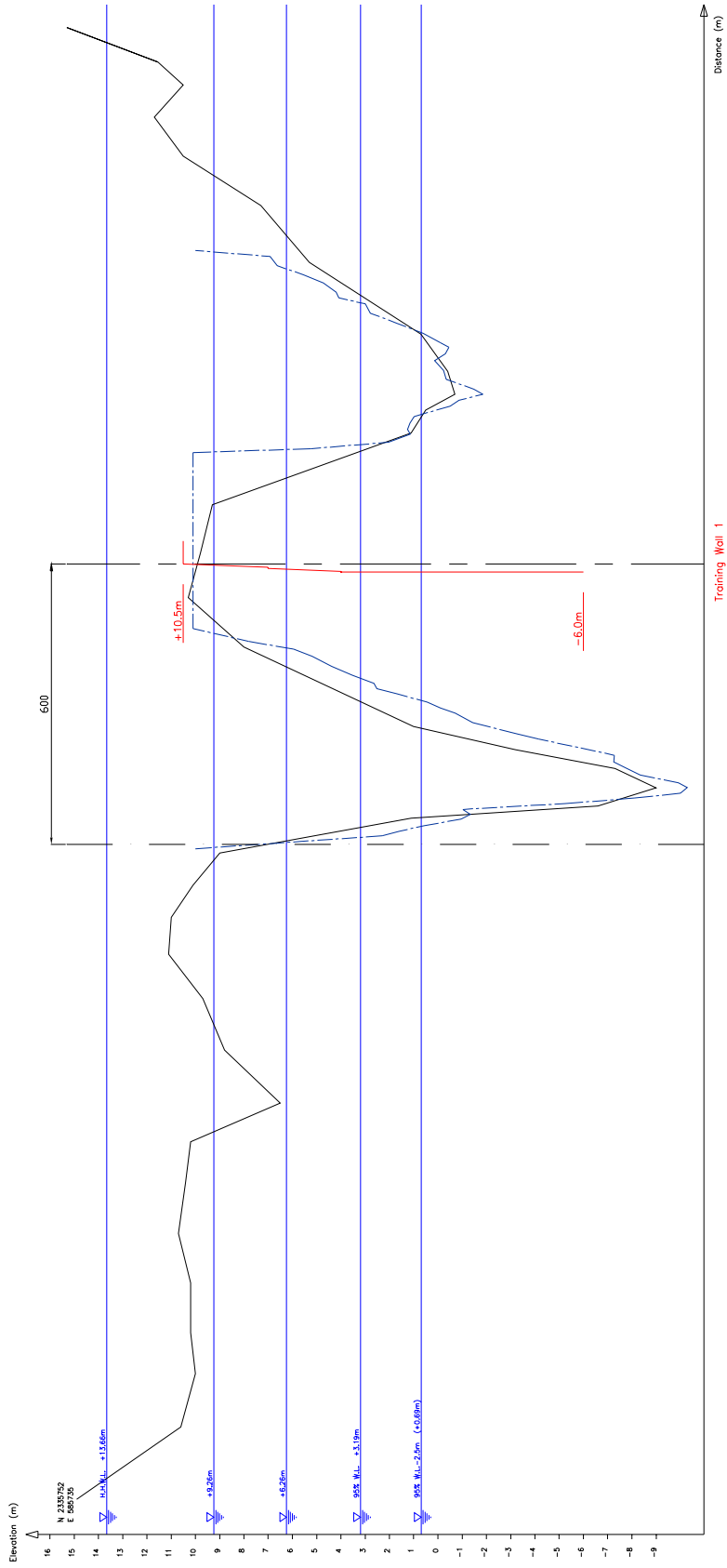




Figure A14.3.3(5) Comparison of Cross Sections between January and August, 2002

CROSS - SECTION No. 5

Horizontal scale 1 : 10000

Vertical scale 1 : 200

-  Dry Season (January 2002)
-  Rainy Season (August 2002)
-  Rainy Season (August 2002)

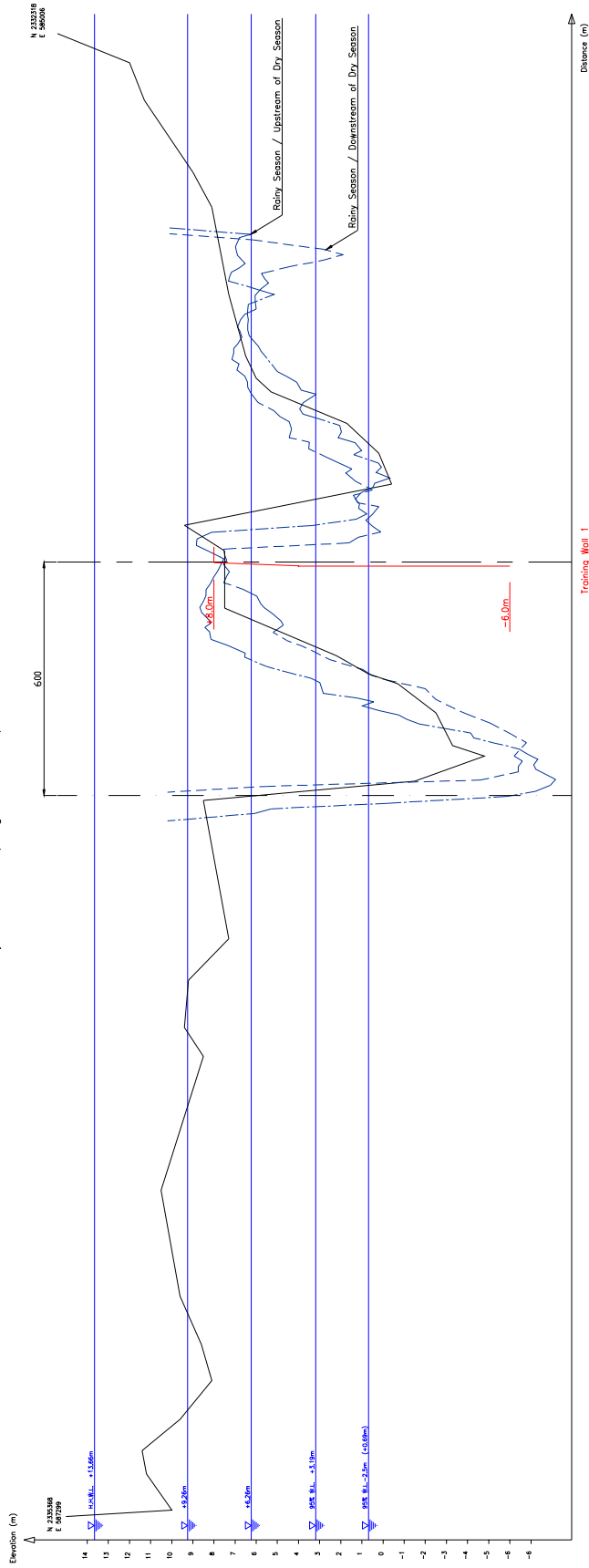


Figure A14.3.3(6) Comparison of Cross Sections between January and August, 2002

CROSS — SECTION No. 6

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)
 - - - Rainy Season (August 2002)

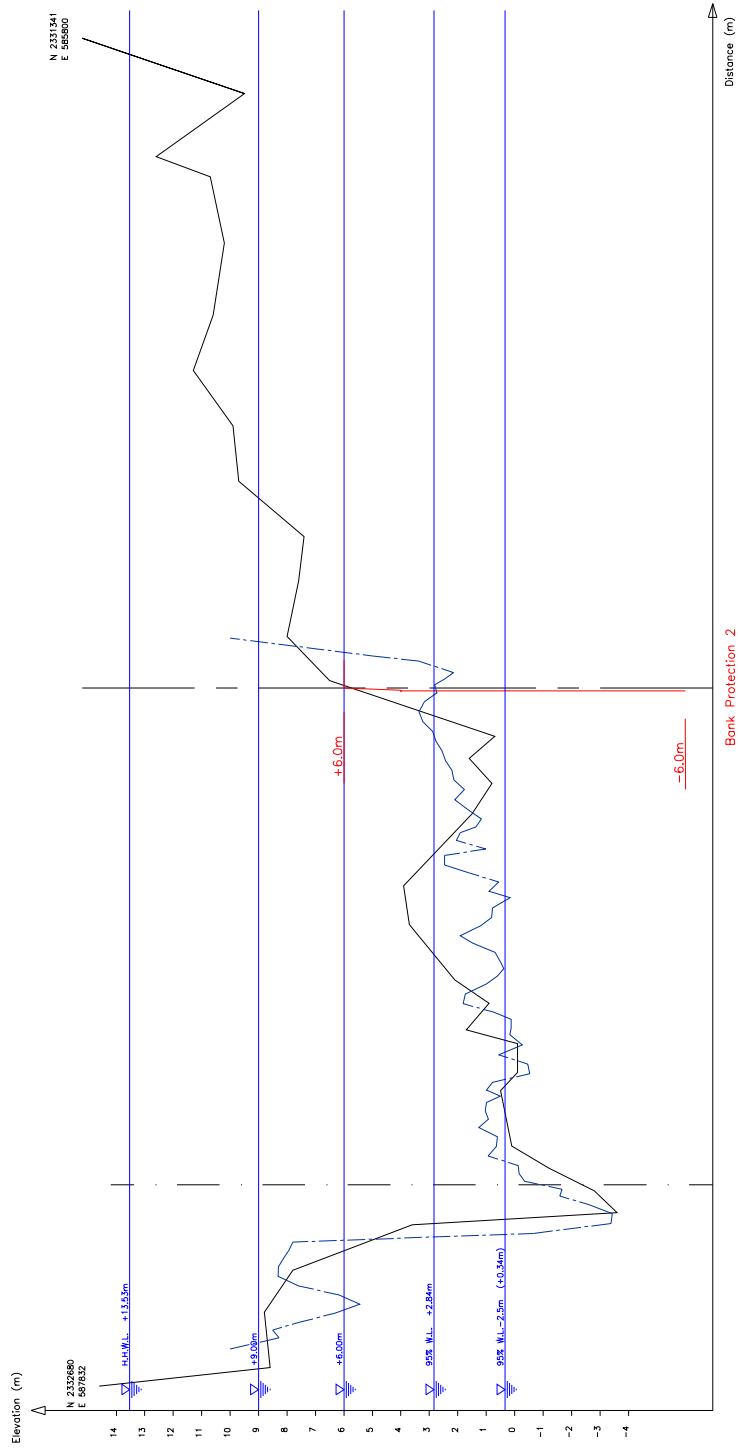


Figure A14.3.3(7) Comparison of Cross Sections between January and August, 2002

CROSS – SECTION No. 7

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)

- - - Rainy Season (August 2002)

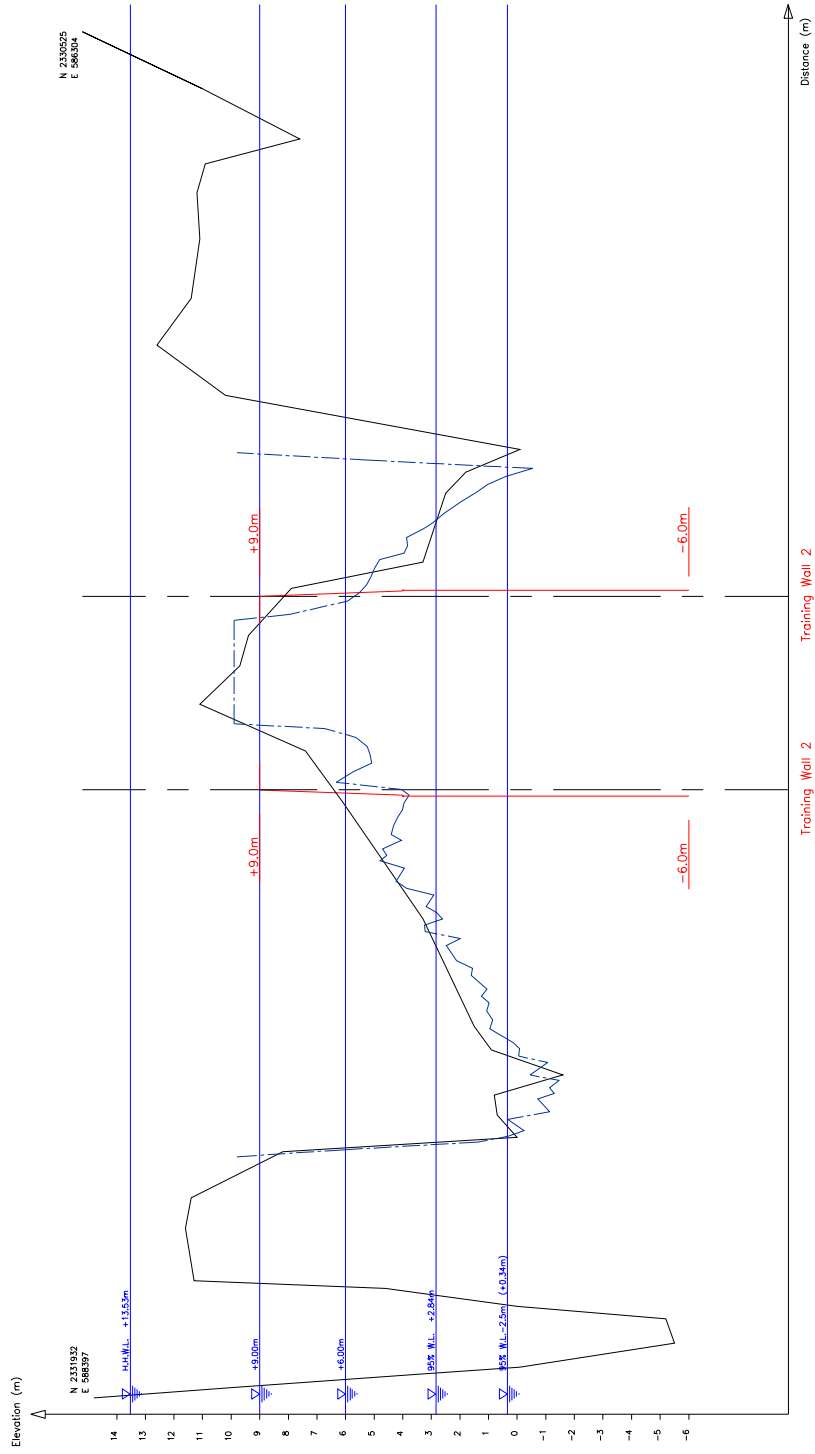


Figure A14.3.3(8) Comparison of Cross Sections between January and August, 2002

CROSS - SECTION No. 8

Horizontal scale 1 : 10000

Vertical scale 1 : 200

- Dry Season (January 2002)
- - - Rainy Season (August 2002)
- - - Rainy Season (August 2002)

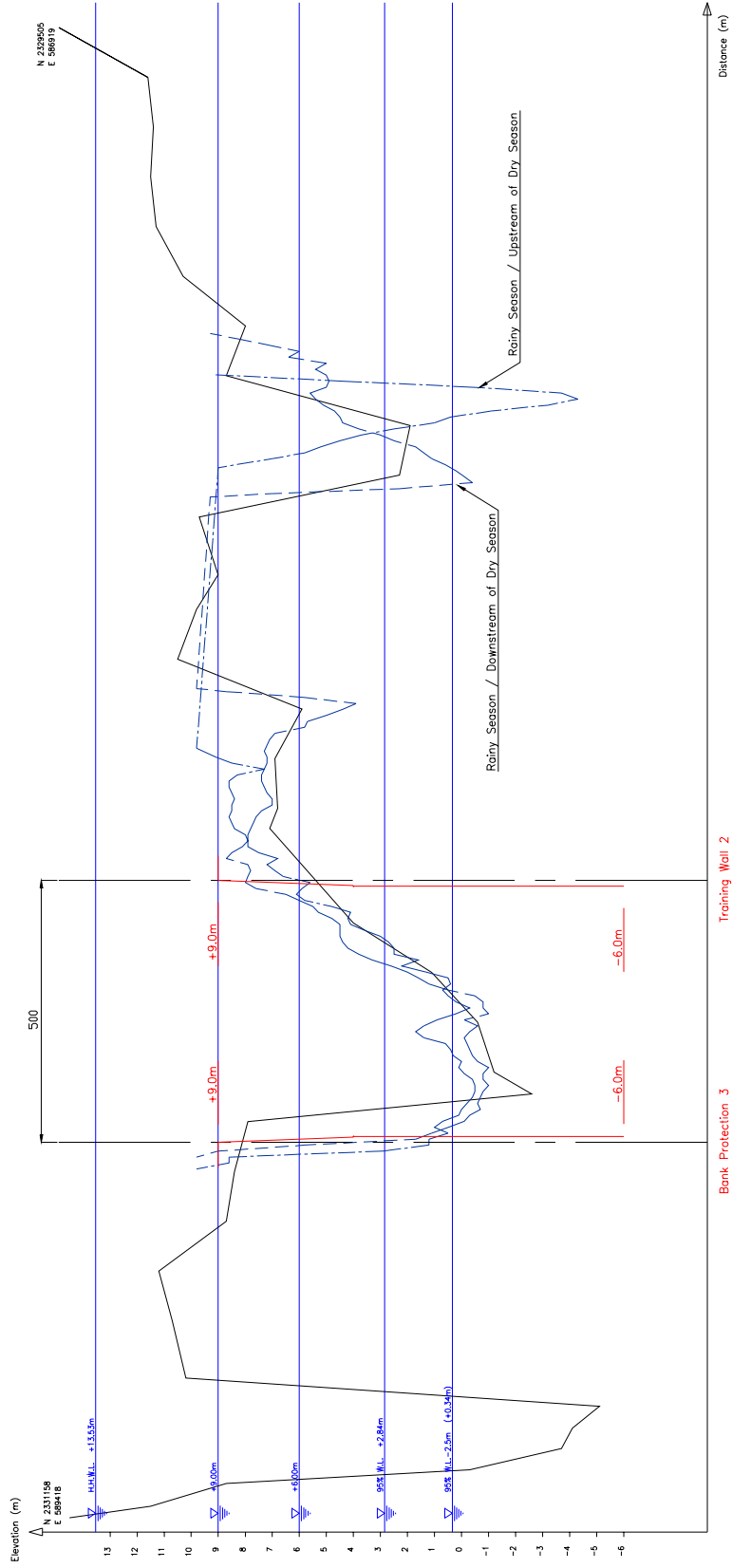


Figure A14.3.3(9) Comparison of Cross Sections between January and August, 2002

CROSS – SECTION No. 9
 Horizontal scale 1 : 10000
 Vertical scale 1 : 200

Dimension of Channel



— Dry Season (January 2002)
 - - - Rainy Season (August 2002)
 - - - Rainy Season (August 2002)

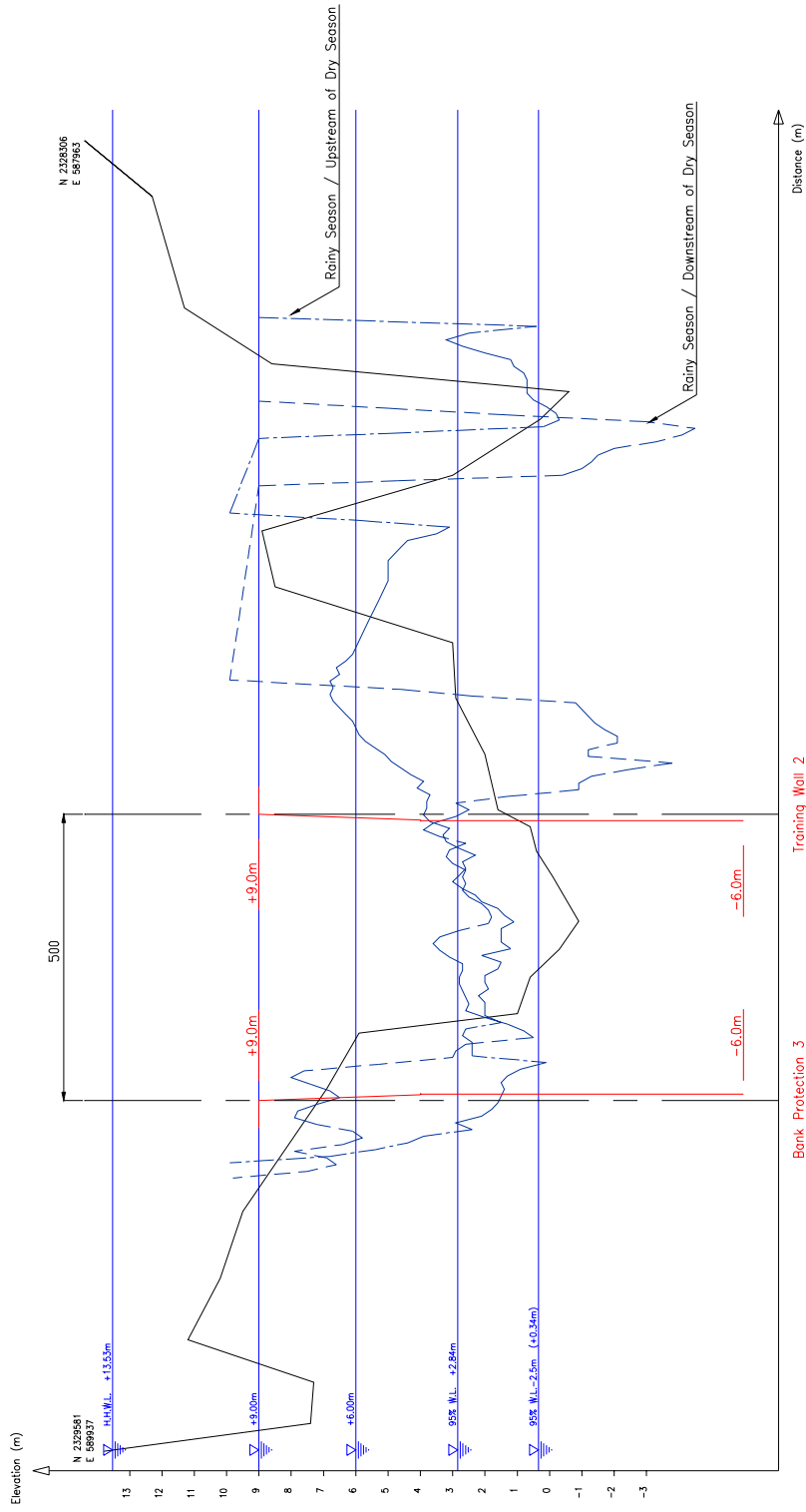


Figure A14.3.3(10) Comparison of Cross Sections between January and August, 2002

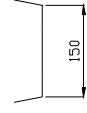
CROSS - SECTION No. 10

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)

- - - Rainy Season (August 2002)



Dimension of Channel

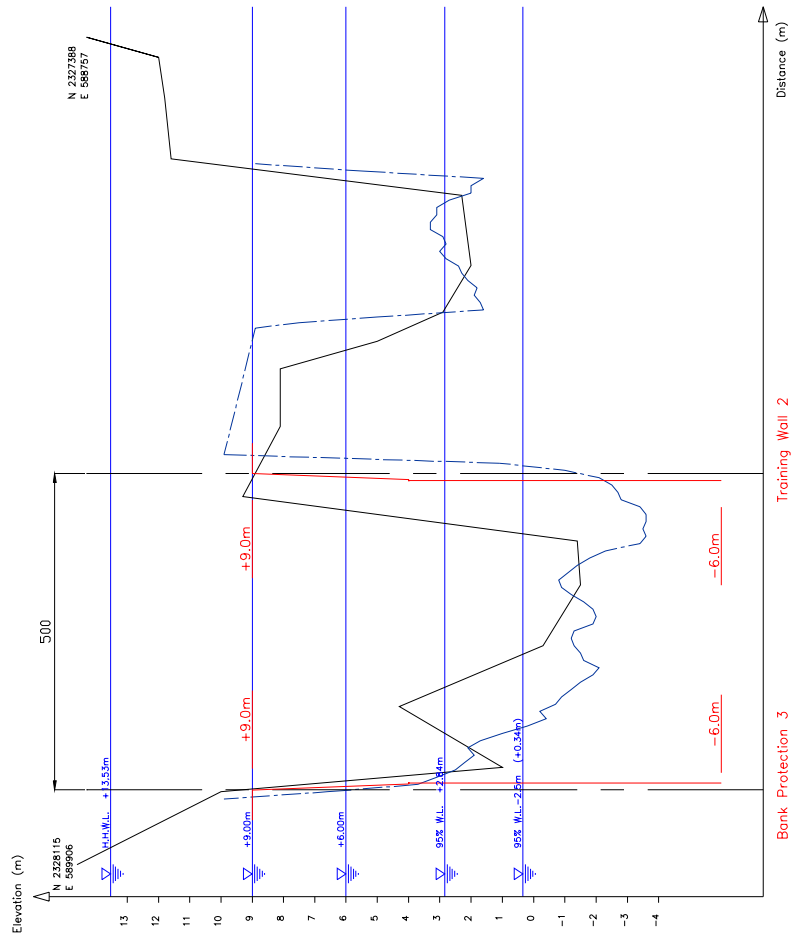


Figure A14.3.3(11) Comparison of Cross Sections between January and August, 2002

CROSS – SECTION No. 11

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)

- - - - - Rainy Season (August 2002)

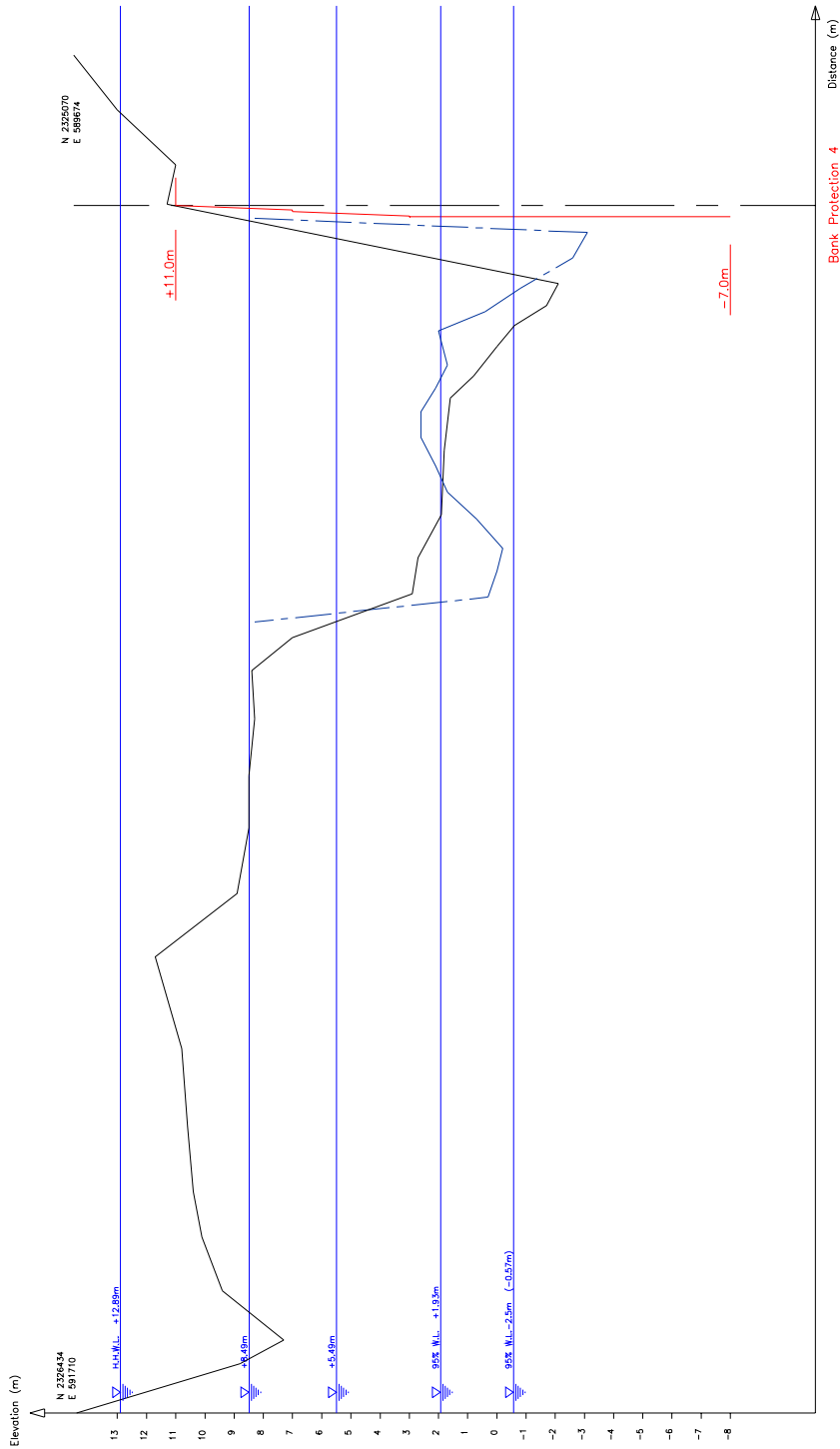


Figure A14.3.3(12) Comparison of Cross Sections between January and August, 2002

CROSS - SECTION No. 12

Horizontal scale 1 : 10000

Vertical scale 1 : 200

— Dry Season (January 2002)

- - - - Rainy Season (August 2002)

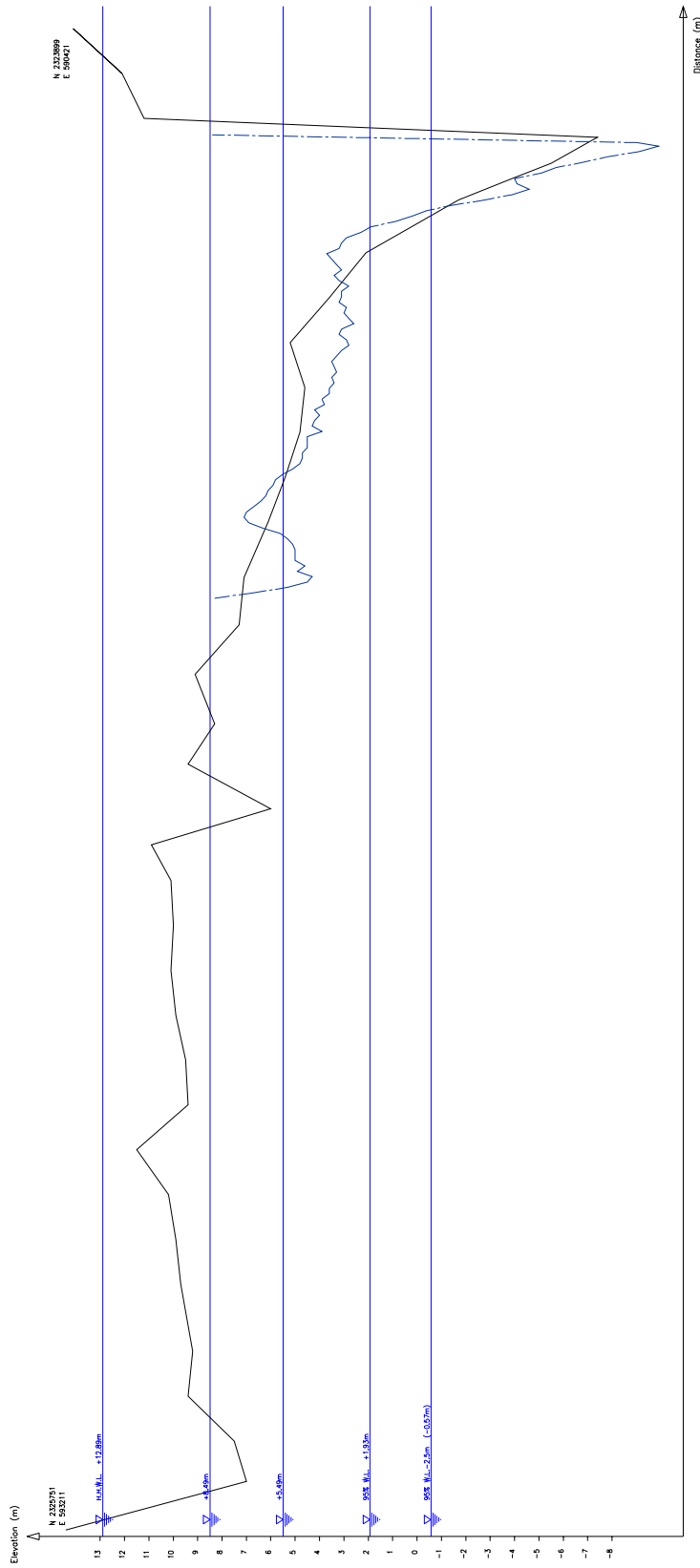


Figure A14.3.3(13) Comparison of Cross Sections between January and August, 2002