TENNESSEE VALLEY AUTHORITY
RIVER SYSTEM OPERATIONS & ENVIRONMENT
RIVER OPERATIONS

FONTANA DAM

DISCHARGE TABLES FOR SPILLWAY TUNNEL AND LOW-LEVEL OUTLET (HOWELL-BUNGER VALVE)

SEPTEMBER 2005

CONTENTS

PART 1

SPILLWAY TUNNEL DISCHARGE TABLES

SEPTEMBER 2005

INSTRUCTIONS FOR USE OF TABLES

1. Tables Update

These tables supersede the tables dated March 1999. The tables were revised to remove discharges over the emergency spillway for headwater elevations above its crest elevation of 1715 feet. Because of concrete growth issues, the emergency spillway was taken out of service in 2003. The computer code SPILLQ generated the tabulated discharges.

The March 1999 tables were issued after new spillway gate indicators were installed, which required re-measurement of the gate opening heights. Whenever the spillway gate indicators are replaced or their zero indicator positions are reset, the opening heights under the spillway gates at every indicator position must be re-measured and the spillway tables must be re-computed. When the zero indicator positions are reset, the opening heights under the gates may change for every indicator position and discharges computed assuming the previous opening heights may no longer be correct. The gate openings on which these tables are based were measured in 1997.

2. Purpose of Tables

These tables provide a means for setting required spillway tunnel discharges (including emergency spillway discharge) and for determining the discharge when a specific arrangement of spillway and sluice gates is in use. At Fontana Dam, the spillway gates and sluices are operated together.

The specific gate arrangements in the tables were determined by considering erosion data obtained from spillway model studies together with incremental discharge values required for satisfactory operation of the spillway tunnels.

Because model data are not available for discharges over the gated spillways at Fontana Dam, the spillway gate discharges included in these tables are based on estimated discharge coefficients obtained from ratings of other spillways that are not identical to Fontana Dam spillway. The sluice gate discharges included in these tables are based on an assumed friction coefficient for the sluice tunnel along with loss coefficients for the entrance and gate slots as determined for the similar sluices at Cherokee Dam.

3. Range of Tables

The tables cover a discharge range from 0 to 184,960 cubic feet per second. Headwater elevations range from 1600 feet to 1720 feet.

The tabulated discharges include flow over the tops of one or more of the spillway gates, which occurs for some arrangements when the headwater elevation exceeds 1710 feet. Overflow is permitted at Fontana because the spillway gates were designed for it. The overflow discharge was calculated using an estimating method similar to that used to compute discharge over the spillway crest.

4. Arrangement of Tables

The tables show spillway tunnel discharges in cubic feet per second. Headwater elevations for each 0.1 foot of headwater elevation are shown at the top of each column. The headwater range is shown at the bottom of each page.

The discharge is tabulated under the headwater elevations for specific arrangements of spillway and sluice gate openings, which are indicated by number in the left and right columns of each page. The numbered arrangements are defined in the table of Spillway and Sluice Gate Arrangements on page 5. Reference to this table and to the drawing showing the location of the gates on page 4 will determine the gate opening to which each spillway and sluice gate is to be set for any particular discharge given in the tables.

Because 1675 feet is the crest elevation, only arrangements 1 through 6 (sluices only) are specified for headwater elevations below 1675 feet.

5. Discharge Intervals

The tables have been prepared so that the incremental discharge between the tabulated values for consecutive gate arrangements is generally less than 4000 cubic feet per second. The incremental discharge between tabulated values of consecutive headwater elevations is generally less than 1 percent. These increments are exceeded in some cases at the higher headwater elevations and near the extreme ends of the tables. These tolerances are considered to be acceptable and therefore it will not be necessary to interpolate between values given in these tables.

When the exact headwater elevation does not appear in the tables, the discharge for the headwater elevation closest to it should be used. For example, the column headed 1680.2 should be used for actual headwater elevations between 1680.15 feet and 1680.24 feet inclusive. When the actual headwater elevation is exactly halfway between tabular values, the larger value is to be used.

6. Raising and Lowering Gates

The operating mechanism for raising and lowering the spillway gates is located on the deck of the dam. The gates are raised individually by operating an electrical switch attached to the operating mechanism. As the gate is raised or lowered, the gate opening is indicated on a dial that is visible from the control switch. The gates may be stopped at any opening, but only the openings shown in the spillway gate arrangement table on page 5 may be used. The operating mechanism for opening the sluice gates is located in the gallery at elevation 1605 feet. Only the fully opened sluice gate position is used in these tables.

7. Use of Tables

The tables can be used in two ways: (1) to determine the arrangement of gates needed to pass a required discharge at a given headwater elevation, and (2) to determine the discharge for a given arrangement of gates and headwater elevation.

Example 1 -- What gate arrangement is necessary to pass a discharge of 24,490 cubic feet per second with the headwater at elevation 1690.83 feet?

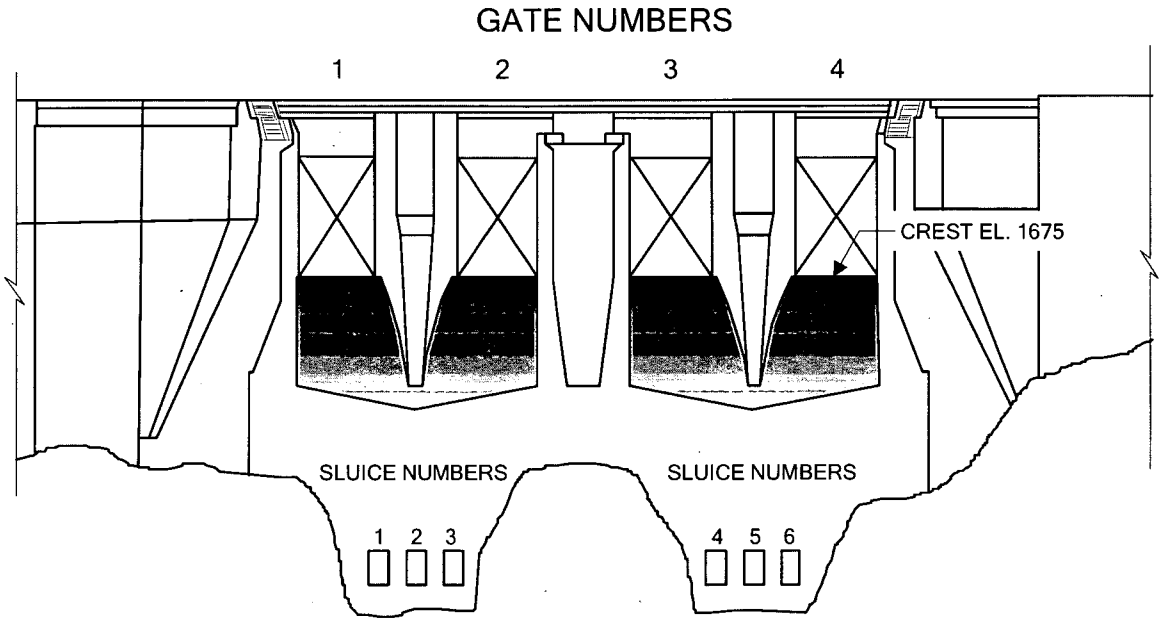
The first step is to find the table in which the headwater elevation appears. Referring to the contents page, we find that headwater elevations between 1690 feet and 1692 feet are found on page 18. The headwater elevation closest to 1690.83 feet is 1690.8 feet. In the column headed 1690.8 the discharge nearest to the required 24,490 cubic feet per second is 24,590 cubic feet per second located near the top of the page. By tracing the horizontal line in which 24,590 cubic feet per second appears, to either side of the page, we find that gate arrangement 7 is the one for producing the discharge closest to 24,490 cubic feet per second at headwater elevation 1690.83 feet. Referring to page 5 it is found that the gates should be set at the following gate openings: spillway gates 1 and 2 at indicator reading 1; spillway gates 3 and 4 closed; and sluice gates 1, 2, 3, 4, 5, and 6 fully open.

After all the gates are set, changes in the headwater elevation may require changes in the gate arrangement to maintain the desired discharge. For example, if the headwater should fall to 1685.08 feet, the discharge will be found in the column headed 1685.1 on page 15. In this column the discharge closest to 24,490 cubic feet per second is 24,710 cubic feet per second for gate arrangement 8. To change to gate arrangement 8 from gate arrangement 7, spillway gates 3 and 4 would be opened to an indicator reading of 1.

Example 2 -- Suppose the operating records show that the headwater is at elevation 1716.25 feet, and gate arrangement 39 is in use. The headwater is found on page 31, which is marked "Headwater 1716 to 1718." The elevation given is exactly halfway between elevation 1716.2 feet and 1716.3 feet. The larger value, 1716.3 feet, is used. In the column headed 1716.3 opposite gate arrangement 39, the discharge is found to be 85,180 cubic feet per second.

FONTANA DAM

LOCATION OF SPILLWAY AND SLUICE GATES



DOWNSTREAM ELEVATION

FONTANA DAM

SPILLWAY AND SLUICE GATE ARRANGEMENTS

Arrangement Number	Spillway Gate Number				Sluice Gate Number					
	Tunnel No. 1		Tunnel No. 2		Tunnel No. 1			Tunnel No. 2		
	1	2	3	4	1	2	3	4	5	6
1	-	-	-	-	-	-	-	-	Open	-
2	-	-	-	-	-	-	-	Open	-	Open
3	-	-	-	-	Open	Open	Open	-	-	-
4	-	-	-	-	Open	Open	Open	-	Open	-
5	-	-	-	-	Open	Open	Open	Open	-	Open
6	-	-	-	-	Open	Open	Open	Open	Open	Open
7	1	1	-	-	Open	Open	Open	Open	Open	Open
8	1	1	1	1	Open	Open	Open	Open	Open	Open
9	1.5	1.5	1	1	Open	Open	Open	Open	Open	Open
10	1.5	1.5	1.5	1.5	Open	Open	Open	Open	Open	Open
11	2	2	1.5	1.5	Open	Open	Open	Open	Open	Open
12	2	2	2	2	Open	Open	Open	Open	Open	Open
13	2.5	2.5	2	2	Open	Open	Open	Open	Open	Open
14	2.5	2.5	2.5	2.5	Open	Open	Open	Open	Open	Open
15	3	3	2.5	2.5	Open	Open	Open	Open	Open	Open
16	3	3	3	3	Open	Open	Open	Open	Open	Open
17	3.5	3.5	3	3	Open	Open	Open	Open	Open	Open
18	3.5	3.5	3.5	3.5	Open	Open	Open	Open	Open	Open
19	4	4	3.5	3.5	Open	Open	Open	Open	Open	Open
20	4	4	4	4	Open	Open	Open	Open	Open	Open
21	4.5	4.5	4	4	Open	Open	Open	Open	Open	Open
22	4.5	4.5	4.5	4.5	Open	Open	Open	Open	Open	Open
23	5	5	4.5	4.5	Open	Open	Open	Open	Open	Open
24	5	5	5	5	Open	Open	Open	Open	Open	Open
25	6	6	5	5	Open	Open	Open	Open	Open	Open
26	6	6	6	6	Open	Open	Open	Open	Open	Open
27	7	7	6	6	Open	Open	Open	Open	Open	Open
28	7	7	7	7	Open	Open	Open	Open	Open	Open
29	8	8	7	7	Open	Open	Open	Open	Open	Open
30	8	8	8	8	Open	Open	Open	Open	Open	Open

Arrangement Number	Spillway Gate Number				Sluice Gate Number					
	Tunnel No. 1		Tunnel No. 2		Tunnel No. 1			Tunnel No. 2		
	1	2	3	4	1	2	3	4	5	6
31	9	9	8	8	Open	Open	Open	Open	Open	Open
32	9	9	9	9	Open	Open	Open	Open	Open	Open
33	10	10	9	9	Open	Open	Open	Open	Open	Open
34	10	10	10	10	Open	Open	Open	Open	Open	Open
35	12	12	10	10	Open	Open	Open	Open	Open	Open
36	12	12	12	12	Open	Open	Open	Open	Open	Open
37	14	14	12	12	Open	Open	Open	Open	Open	Open
38	14	14	14	14	Open	Open	Open	Open	Open	Open
39	16	16	14	14	Open	Open	Open	Open	Open	Open
40	16	16	16	16	Open	Open	Open	Open	Open	Open
41	18	18	16	16	Open	Open	Open	Open	Open	Open
42	18	18	18	18	Open	Open	Open	Open	Open	Open
43	20	20	18	18	Open	Open	Open	Open	Open	Open
44	20	20	20	20	Open	Open	Open	Open	Open	Open
45	22	22	20	20	Open	Open	Open	Open	Open	Open
46	22	22	22	22	Open	Open	Open	Open	Open	Open
47	24	24	22	22	Open	Open	Open	Open	Open	Open
48	24	24	24	24	Open	Open	Open	Open	Open	Open
49	26	26	24	24	Open	Open	Open	Open	Open	Open
50	26	26	26	26	Open	Open	Open	Open	Open	Open
51	28	28	26	26	Open	Open	Open	Open	Open	Open
52	28	28	28	28	Open	Open	Open	Open	Open	Open
53	30	30	28	28	Open	Open	Open	Open	Open	Open
54	30	30	30	30	Open	Open	Open	Open	Open	Open
55	32	32	30	30	Open	Open	Open	Open	Open	Open
56	32	32	32	32	Open	Open	Open	Open	Open	Open
57	34	34	32	32	Open	Open	Open	Open	Open	Open
58	34	34	34	34	Open	Open	Open	Open	Open	Open
59	UP	34	34	34	Open	Open	Open	Open	Open	Open
60	UP	UP	34	34	Open	Open	Open	Open	Open	Open
61	UP	UP	UP	34	Open	Open	Open	Open	Open	Open
62	UP	UP	UP	UP	Open	Open	Open	Open	Open	Open

Figures in columns under each spillway gate number refer to gate opening indicator readings.
dash (-) indicates closed gate, "Open" indicates gate fully opened, "UP" indicates gate raised above water surface

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1600.0	1600.1	1600.2	1600.3	1600.4	1600.5	1600.6	1600.7	1600.8	1600.9	1601.0	1601.1	1601.2	1601.3	1601.4	1601.5	1601.6	1601.7	1601.8	1601.9	1602.0	
1	920	930	940	950	960	960	970	980	990	1,000	1,010	1,020	1,020	1,030	1,040	1,050	1,060	1,060	1,070	1,080	1,090	1
2	1,840	1,860	1,870	1,890	1,910	1,930	1,950	1,960	1,980	2,000	2,010	2,030	2,050	2,060	2,080	2,100	2,110	2,130	2,140	2,160	2,170	2
3	2,760	2,780	2,810	2,840	2,870	2,890	2,920	2,940	2,970	2,990	3,020	3,050	3,070	3,090	3,120	3,140	3,170	3,190	3,220	3,240	3,260	3
4	3,680	3,710	3,750	3,780	3,820	3,860	3,890	3,920	3,960	3,990	4,030	4,060	4,090	4,130	4,160	4,190	4,220	4,260	4,290	4,320	4,350	4
5	4,600	4,640	4,690	4,730	4,780	4,820	4,860	4,910	4,950	4,990	5,030	5,080	5,120	5,160	5,200	5,240	5,280	5,320	5,360	5,400	5,440	5
6	5,510	5,570	5,620	5,680	5,730	5,780	5,840	5,890	5,940	5,990	6,040	6,090	6,140	6,190	6,240	6,290	6,340	6,380	6,430	6,480	6,520	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1602.0	1602.1	1602.2	1602.3	1602.4	1602.5	1602.6	1602.7	1602.8	1602.9	1603.0	1603.1	1603.2	1603.3	1603.4	1603.5	1603.6	1603.7	1603.8	1603.9	1604.0	
1	1,090	1,100	1,100	1,110	1,120	1,130	1,130	1,140	1,150	1,160	1,160	1,170	1,180	1,180	1,190	1,200	1,210	1,210	1,220	1,230	1,230	1
2	2,170	2,190	2,210	2,220	2,240	2,250	2,270	2,280	2,300	2,310	2,320	2,340	2,350	2,370	2,380	2,400	2,410	2,420	2,440	2,450	2,470	2
3	3,260	3,290	3,310	3,330	3,350	3,380	3,400	3,420	3,440	3,470	3,490	3,510	3,530	3,550	3,570	3,590	3,620	3,640	3,660	3,680	3,700	3
4	4,350	4,380	4,410	4,440	4,470	4,500	4,530	4,560	4,590	4,620	4,650	4,680	4,710	4,740	4,760	4,790	4,820	4,850	4,880	4,900	4,930	4
5	5,440	5,480	5,510	5,550	5,590	5,630	5,670	5,700	5,740	5,780	5,810	5,850	5,880	5,920	5,960	5,990	6,030	6,060	6,100	6,130	6,160	5
6	6,520	6,570	6,620	6,660	6,710	6,750	6,800	6,840	6,890	6,930	6,970	7,020	7,060	7,100	7,150	7,190	7,230	7,270	7,320	7,360	7,400	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1604.0	1604.1	1604.2	1604.3	1604.4	1604.5	1604.6	1604.7	1604.8	1604.9	1605.0	1605.1	1605.2	1605.3	1605.4	1605.5	1605.6	1605.7	1605.8	1605.9	1606.0	
1	1,230	1,240	1,250	1,250	1,260	1,270	1,270	1,280	1,290	1,290	1,300	1,310	1,310	1,320	1,330	1,330	1,340	1,340	1,350	1,360	1,360	1
2	2,470	2,480	2,490	2,510	2,520	2,530	2,550	2,560	2,570	2,590	2,600	2,610	2,630	2,640	2,650	2,660	2,680	2,690	2,700	2,710	2,730	2
3	3,700	3,720	3,740	3,760	3,780	3,800	3,820	3,840	3,860	3,880	3,900	3,920	3,940	3,960	3,980	4,000	4,010	4,030	4,050	4,070	4,090	3
4	4,930	4,960	4,990	5,010	5,040	5,070	5,090	5,120	5,150	5,170	5,200	5,220	5,250	5,280	5,300	5,330	5,350	5,380	5,400	5,430	5,450	4
5	6,160	6,200	6,230	6,270	6,300	6,330	6,370	6,400	6,430	6,470	6,500	6,530	6,560	6,600	6,630	6,660	6,690	6,720	6,750	6,780	6,820	5
6	7,400	7,440	7,480	7,520	7,560	7,600	7,640	7,680	7,720	7,760	7,800	7,840	7,880	7,910	7,950	7,990	8,030	8,070	8,100	8,140	8,180	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1606.0	1606.1	1606.2	1606.3	1606.4	1606.5	1606.6	1606.7	1606.8	1606.9	1607.0	1607.1	1607.2	1607.3	1607.4	1607.5	1607.6	1607.7	1607.8	1607.9	1608.0	
1	1,360	1,370	1,380	1,380	1,390	1,390	1,400	1,410	1,410	1,420	1,420	1,430	1,440	1,440	1,450	1,450	1,460	1,460	1,470	1,480	1,480	1
2	2,730	2,740	2,750	2,760	2,780	2,790	2,800	2,810	2,820	2,840	2,850	2,860	2,870	2,880	2,890	2,910	2,920	2,930	2,940	2,950	2,960	2
3	4,090	4,110	4,130	4,140	4,160	4,180	4,200	4,220	4,240	4,250	4,270	4,290	4,310	4,320	4,340	4,360	4,380	4,390	4,410	4,430	4,450	3
4	5,450	5,480	5,500	5,530	5,550	5,580	5,600	5,620	5,650	5,670	5,690	5,720	5,740	5,770	5,790	5,810	5,840	5,860	5,880	5,900	5,930	4
5	6,820	6,850	6,880	6,910	6,940	6,970	7,000	7,030	7,060	7,090	7,120	7,150	7,180	7,210	7,240	7,270	7,290	7,320	7,350	7,380	7,410	5
6	8,180	8,220	8,250	8,290	8,330	8,360	8,400	8,430	8,470	8,510	8,540	8,580	8,610	8,650	8,680	8,720	8,750	8,790	8,820	8,860	8,890	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1608.0	1608.1	1608.2	1608.3	1608.4	1608.5	1608.6	1608.7	1608.8	1608.9	1609.0	1609.1	1609.2	1609.3	1609.4	1609.5	1609.6	1609.7	1609.8	1609.9	1610.0	
1	1,480	1,490	1,490	1,500	1,500	1,510	1,520	1,520	1,530	1,530	1,540	1,540	1,550	1,550	1,560	1,570	1,570	1,580	1,580	1,590	1,590	1
2	2,960	2,980	2,990	3,000	3,010	3,020	3,030	3,040	3,050	3,060	3,080	3,090	3,100	3,110	3,120	3,130	3,140	3,150	3,160	3,170	3,180	2
3	4,450	4,460	4,480	4,500	4,510	4,530	4,550	4,560	4,580	4,600	4,610	4,630	4,650	4,660	4,680	4,700	4,710	4,730	4,740	4,760	4,780	3
4	5,930	5,950	5,970	6,000	6,020	6,040	6,060	6,080	6,110	6,130	6,150	6,170	6,200	6,220	6,240	6,260	6,280	6,300	6,320	6,350	6,370	4
5	7,410	7,440	7,470	7,490	7,520	7,550	7,580	7,610	7,630	7,660	7,690	7,720	7,740	7,770	7,800	7,830	7,850	7,880	7,910	7,930	7,960	5
6	8,890	8,930	8,960	8,990	9,030	9,060	9,090	9,130	9,160	9,190	9,230	9,260	9,290	9,330	9,360	9,390	9,420	9,450	9,490	9,520	9,550	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1610.0	1610.1	1610.2	1610.3	1610.4	1610.5	1610.6	1610.7	1610.8	1610.9	1611.0	1611.1	1611.2	1611.3	1611.4	1611.5	1611.6	1611.7	1611.8	1611.9	1612.0	
1	1,590	1,600	1,600	1,610	1,610	1,620	1,620	1,630	1,630	1,640	1,640	1,650	1,650	1,660	1,660	1,670	1,670	1,680	1,680	1,690	1,690	1
2	3,180	3,190	3,200	3,220	3,230	3,240	3,250	3,260	3,270	3,280	3,290	3,300	3,310	3,320	3,330	3,340	3,350	3,360	3,370	3,380	3,390	2
3	4,780	4,790	4,810	4,820	4,840	4,850	4,870	4,890	4,900	4,920	4,930	4,950	4,960	4,980	4,990	5,010	5,020	5,040	5,050	5,070	5,080	3
4	6,370	6,390	6,410	6,430	6,450	6,470	6,490	6,510	6,530	6,560	6,580	6,600	6,620	6,640	6,660	6,680	6,700	6,720	6,740	6,760	6,780	4
5	7,960	7,990	8,010	8,040	8,060	8,090	8,120	8,140	8,170	8,190	8,220	8,250	8,270	8,300	8,320	8,350	8,370	8,400	8,420	8,450	8,470	5
6	9,550	9,580	9,610	9,650	9,680	9,710	9,740	9,770	9,800	9,830	9,860	9,890	9,930	9,960	9,990	10,020	10,050	10,080	10,110	10,140	10,170	6
GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1612.0	1612.1	1612.2	1612.3	1612.4	1612.5	1612.6	1612.7	1612.8	1612.9	1613.0	1613.1	1613.2	1613.3	1613.4	1613.5	1613.6	1613.7	1613.8	1613.9	1614.0	
1	1,690	1,700	1,700	1,710	1,710	1,720	1,720	1,730	1,730	1,740	1,740	1,750	1,750	1,760	1,760	1,770	1,770	1,780	1,780	1,790	1,790	1
2	3,390	3,400	3,410	3,420	3,430	3,440	3,450	3,460	3,470	3,480	3,490	3,500	3,510	3,520	3,530	3,540	3,550	3,550	3,560	3,570	3,580	2
3	5,080	5,100	5,110	5,130	5,140	5,160	5,170	5,190	5,200	5,220	5,230	5,250	5,260	5,270	5,290	5,300	5,320	5,330	5,350	5,360	5,370	3
4	6,780	6,800	6,820	6,840	6,860	6,880	6,900	6,920	6,940	6,960	6,970	6,990	7,010	7,030	7,050	7,070	7,090	7,110	7,130	7,150	7,170	4
5	8,470	8,500	8,520	8,550	8,570	8,600	8,620	8,650	8,670	8,690	8,720	8,740	8,770	8,790	8,810	8,840	8,860	8,890	8,910	8,930	8,960	5
6	10,170	10,200	10,230	10,260	10,290	10,320	10,350	10,370	10,400	10,430	10,460	10,490	10,520	10,550	10,580	10,610	10,640	10,660	10,690	10,720	10,750	6
GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1614.0	1614.1	1614.2	1614.3	1614.4	1614.5	1614.6	1614.7	1614.8	1614.9	1615.0	1615.1	1615.2	1615.3	1615.4	1615.5	1615.6	1615.7	1615.8	1615.9	1616.0	
1	1,790	1,800	1,800	1,810	1,810	1,810	1,820	1,820	1,830	1,830	1,840	1,840	1,850	1,850	1,860	1,860	1,870	1,870	1,870	1,880	1,880	1
2	3,580	3,590	3,600	3,610	3,620	3,630	3,640	3,650	3,660	3,670	3,680	3,690	3,690	3,700	3,710	3,720	3,730	3,740	3,750	3,760	3,770	2
3	5,370	5,390	5,400	5,420	5,430	5,440	5,460	5,470	5,490	5,500	5,510	5,530	5,540	5,560	5,570	5,580	5,600	5,610	5,620	5,640	5,650	3
4	7,170	7,180	7,200	7,220	7,240	7,260	7,280	7,300	7,320	7,330	7,350	7,370	7,390	7,410	7,430	7,440	7,460	7,480	7,500	7,520	7,530	4
5	8,960	8,980	9,000	9,030	9,050	9,070	9,100	9,120	9,140	9,170	9,190	9,210	9,240	9,260	9,280	9,300	9,330	9,350	9,370	9,390	9,420	5
6	10,750	10,780	10,810	10,830	10,860	10,890	10,920	10,950	10,970	11,000	11,030	11,060	11,080	11,110	11,140	11,170	11,190	11,220	11,250	11,270	11,300	6
GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1616.0	1616.1	1616.2	1616.3	1616.4	1616.5	1616.6	1616.7	1616.8	1616.9	1617.0	1617.1	1617.2	1617.3	1617.4	1617.5	1617.6	1617.7	1617.8	1617.9	1618.0	
1	1,880	1,890	1,890	1,900	1,900	1,910	1,910	1,910	1,920	1,920	1,930	1,930	1,940	1,940	1,950	1,950	1,950	1,960	1,960	1,970	1,970	1
2	3,770	3,780	3,780	3,790	3,800	3,810	3,820	3,830	3,840	3,850	3,860	3,860	3,870	3,880	3,890	3,900	3,910	3,920	3,920	3,930	3,940	2
3	5,650	5,660	5,680	5,690	5,700	5,720	5,730	5,740	5,760	5,770	5,780	5,800	5,810	5,820	5,840	5,850	5,860	5,870	5,890	5,900	5,910	3
4	7,530	7,550	7,570	7,590	7,610	7,620	7,640	7,660	7,680	7,690	7,710	7,730	7,750	7,760	7,780	7,800	7,820	7,830	7,850	7,870	7,880	4
5	9,420	9,440	9,460	9,480	9,510	9,530	9,550	9,570	9,590	9,620	9,640	9,660	9,680	9,700	9,730	9,750	9,770	9,790	9,810	9,830	9,860	5
6	11,300	11,330	11,350	11,380	11,410	11,430	11,460	11,490	11,510	11,540	11,570	11,590	11,620	11,650	11,670	11,700	11,720	11,750	11,770	11,800	11,830	6
GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1618.0	1618.1	1618.2	1618.3	1618.4	1618.5	1618.6	1618.7	1618.8	1618.9	1619.0	1619.1	1619.2	1619.3	1619.4	1619.5	1619.6	1619.7	1619.8	1619.9	1620.0	
1	1,970	1,980	1,980	1,980	1,990	1,990	2,000	2,000	2,010	2,010	2,010	2,020	2,020	2,030	2,030	2,030	2,040	2,040	2,050	2,050	2,050	1
2	3,940	3,950	3,960	3,970	3,980	3,980	3,990	4,000	4,010	4,020	4,030	4,040	4,040	4,050	4,060	4,070	4,080	4,090	4,090	4,100	4,110	2
3	5,910	5,930	5,940	5,950	5,960	5,980	5,990	6,000	6,020	6,030	6,040	6,050	6,070	6,080	6,090	6,100	6,120	6,130	6,140	6,150	6,160	3
4	7,880	7,900	7,920	7,940	7,950	7,970	7,990	8,000	8,020	8,040	8,050	8,070	8,090	8,100	8,120	8,140	8,150	8,170	8,190	8,200	8,220	4
5	9,860	9,880	9,900	9,920	9,940	9,960	9,980	10,000	10,030	10,050	10,070	10,090	10,110	10,130	10,150	10,170	10,190	10,210	10,230	10,250	10,270	5
6	11,830	11,850	11,880	11,900	11,930	11,950	11,980	12,010	12,030	12,060	12,080	12,110	12,130	12,160	12,180	12,210	12,230	12,260	12,280	12,310	12,330	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1620.0	1620.1	1620.2	1620.3	1620.4	1620.5	1620.6	1620.7	1620.8	1620.9	1621.0	1621.1	1621.2	1621.3	1621.4	1621.5	1621.6	1621.7	1621.8	1621.9	1622.0	
1	2,050	2,060	2,060	2,070	2,070	2,080	2,080	2,080	2,090	2,090	2,100	2,100	2,100	2,110	2,110	2,120	2,120	2,120	2,130	2,130	2,140	1
2	4,110	4,120	4,130	4,130	4,140	4,150	4,160	4,170	4,180	4,180	4,190	4,200	4,210	4,220	4,230	4,240	4,250	4,260	4,260	4,260	4,270	2
3	6,160	6,180	6,190	6,200	6,210	6,230	6,240	6,250	6,260	6,270	6,290	6,300	6,310	6,320	6,340	6,350	6,360	6,370	6,380	6,390	6,410	3
4	8,220	8,240	8,250	8,270	8,290	8,300	8,320	8,330	8,350	8,370	8,380	8,400	8,410	8,430	8,450	8,460	8,480	8,490	8,510	8,530	8,540	4
5	10,270	10,300	10,320	10,340	10,360	10,380	10,400	10,420	10,440	10,460	10,480	10,500	10,520	10,540	10,560	10,580	10,600	10,620	10,640	10,660	10,680	5
6	12,330	12,350	12,380	12,400	12,430	12,450	12,480	12,500	12,530	12,550	12,570	12,600	12,620	12,650	12,670	12,690	12,720	12,740	12,770	12,790	12,810	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1622.0	1622.1	1622.2	1622.3	1622.4	1622.5	1622.6	1622.7	1622.8	1622.9	1623.0	1623.1	1623.2	1623.3	1623.4	1623.5	1623.6	1623.7	1623.8	1623.9	1624.0	
1	2,140	2,140	2,140	2,150	2,150	2,160	2,160	2,160	2,170	2,170	2,170	2,180	2,180	2,190	2,190	2,190	2,200	2,200	2,210	2,210	2,210	1
2	4,270	4,280	4,290	4,290	4,300	4,310	4,320	4,330	4,330	4,340	4,350	4,360	4,370	4,370	4,380	4,390	4,400	4,400	4,410	4,420	4,430	2
3	6,410	6,420	6,430	6,440	6,450	6,470	6,480	6,490	6,500	6,510	6,520	6,540	6,550	6,560	6,570	6,580	6,590	6,610	6,620	6,630	6,640	3
4	8,540	8,560	8,570	8,590	8,610	8,620	8,640	8,650	8,670	8,680	8,700	8,710	8,730	8,750	8,760	8,780	8,790	8,810	8,820	8,840	8,850	4
5	10,680	10,700	10,720	10,740	10,760	10,780	10,800	10,820	10,840	10,850	10,870	10,890	10,910	10,930	10,950	10,970	10,990	11,010	11,030	11,050	11,070	5
6	12,810	12,840	12,860	12,880	12,910	12,930	12,960	12,980	13,000	13,030	13,050	13,070	13,100	13,120	13,140	13,160	13,190	13,210	13,230	13,260	13,280	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1624.0	1624.1	1624.2	1624.3	1624.4	1624.5	1624.6	1624.7	1624.8	1624.9	1625.0	1625.1	1625.2	1625.3	1625.4	1625.5	1625.6	1625.7	1625.8	1625.9	1626.0	
1	2,210	2,220	2,220	2,220	2,230	2,230	2,240	2,240	2,240	2,250	2,250	2,250	2,260	2,260	2,270	2,270	2,270	2,280	2,280	2,280	2,290	1
2	4,430	4,430	4,440	4,450	4,460	4,460	4,470	4,480	4,490	4,490	4,500	4,510	4,520	4,520	4,530	4,540	4,550	4,550	4,560	4,570	4,580	2
3	6,640	6,650	6,660	6,670	6,690	6,700	6,710	6,720	6,730	6,740	6,750	6,760	6,780	6,790	6,800	6,810	6,820	6,830	6,840	6,850	6,870	3
4	8,850	8,870	8,880	8,900	8,910	8,930	8,940	8,960	8,970	8,990	9,000	9,020	9,030	9,050	9,060	9,080	9,090	9,110	9,120	9,140	9,150	4
5	11,070	11,090	11,100	11,120	11,140	11,160	11,180	11,200	11,220	11,240	11,260	11,270	11,290	11,310	11,330	11,350	11,370	11,390	11,400	11,420	11,440	5
6	13,280	13,300	13,330	13,350	13,370	13,390	13,420	13,440	13,460	13,480	13,510	13,530	13,550	13,570	13,600	13,620	13,640	13,660	13,690	13,710	13,730	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1626.0	1626.1	1626.2	1626.3	1626.4	1626.5	1626.6	1626.7	1626.8	1626.9	1627.0	1627.1	1627.2	1627.3	1627.4	1627.5	1627.6	1627.7	1627.8	1627.9	1628.0	
1	2,290	2,290	2,300	2,300	2,300	2,310	2,310	2,310	2,320	2,320	2,320	2,330	2,330	2,340	2,340	2,340	2,350	2,350	2,350	2,360	2,360	1
2	4,580	4,580	4,590	4,600	4,610	4,610	4,620	4,630	4,640	4,640	4,650	4,660	4,660	4,670	4,680	4,690	4,690	4,700	4,710	4,710	4,720	2
3	6,870	6,880	6,890	6,900	6,910	6,920	6,930	6,940	6,950	6,960	6,970	6,990	7,000	7,010	7,020	7,030	7,040	7,050	7,060	7,070	7,080	3
4	9,150	9,170	9,180	9,200	9,210	9,230	9,240	9,260	9,270	9,290	9,300	9,310	9,330	9,340	9,360	9,370	9,390	9,400	9,420	9,430	9,440	4
5	11,440	11,460	11,480	11,500	11,520	11,530	11,550	11,570	11,590	11,610	11,620	11,640	11,660	11,680	11,700	11,720	11,730	11,750	11,770	11,790	11,810	5
6	13,730	13,750	13,770	13,800	13,820	13,840	13,860	13,880	13,910	13,930	13,950	13,970	13,990	14,010	14,040	14,060	14,080	14,100	14,120	14,140	14,170	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1628.0	1628.1	1628.2	1628.3	1628.4	1628.5	1628.6	1628.7	1628.8	1628.9	1629.0	1629.1	1629.2	1629.3	1629.4	1629.5	1629.6	1629.7	1629.8	1629.9	1630.0	
1	2,360	2,360	2,370	2,370	2,380	2,380	2,380	2,390	2,390	2,390	2,400	2,400	2,400	2,410	2,410	2,410	2,420	2,420	2,420	2,430	2,430	1
2	4,720	4,730	4,740	4,740	4,750	4,760	4,760	4,770	4,780	4,790	4,790	4,800	4,810	4,810	4,820	4,830	4,840	4,840	4,850	4,860	4,860	2
3	7,080	7,090	7,100	7,120	7,130	7,140	7,150	7,160	7,170	7,180	7,190	7,200	7,210	7,220	7,230	7,240	7,250	7,260	7,270	7,280	7,290	3
4	9,440	9,460	9,470	9,490	9,500	9,520	9,530	9,540	9,560	9,570	9,590	9,600	9,610	9,630	9,640	9,660	9,670	9,680	9,700	9,710	9,730	4
5	11,810	11,820	11,840	11,860	11,880	11,890	11,910	11,930	11,950	11,960	11,980	12,000	12,020	12,040	12,050	12,070	12,090	12,110	12,120	12,140	12,160	5
6	14,170	14,190	14,210	14,230	14,250	14,270	14,290	14,320	14,340	14,360	14,380	14,400	14,420	14,440	14,460	14,480	14,510	14,530	14,550	14,570	14,590	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1630.0	1630.1	1630.2	1630.3	1630.4	1630.5	1630.6	1630.7	1630.8	1630.9	1631.0	1631.1	1631.2	1631.3	1631.4	1631.5	1631.6	1631.7	1631.8	1631.9	1632.0	
1	2,430	2,430	2,440	2,440	2,450	2,450	2,450	2,460	2,460	2,460	2,470	2,470	2,470	2,480	2,480	2,480	2,490	2,490	2,490	2,500	2,500	1
2	4,860	4,870	4,880	4,880	4,890	4,900	4,900	4,910	4,920	4,930	4,930	4,940	4,950	4,950	4,960	4,970	4,970	4,980	4,990	4,990	5,000	2
3	7,290	7,300	7,320	7,330	7,340	7,350	7,360	7,370	7,380	7,390	7,400	7,410	7,420	7,430	7,440	7,450	7,460	7,470	7,480	7,490	7,500	3
4	9,730	9,740	9,750	9,770	9,780	9,800	9,810	9,820	9,840	9,850	9,860	9,880	9,890	9,900	9,920	9,930	9,950	9,960	9,970	9,990	10,000	4
5	12,160	12,170	12,190	12,210	12,230	12,240	12,260	12,280	12,300	12,310	12,330	12,350	12,360	12,380	12,400	12,420	12,430	12,450	12,470	12,480	12,500	5
6	14,590	14,610	14,630	14,650	14,670	14,690	14,710	14,730	14,750	14,780	14,800	14,820	14,840	14,860	14,880	14,900	14,920	14,940	14,960	14,980	15,000	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1632.0	1632.1	1632.2	1632.3	1632.4	1632.5	1632.6	1632.7	1632.8	1632.9	1633.0	1633.1	1633.2	1633.3	1633.4	1633.5	1633.6	1633.7	1633.8	1633.9	1634.0	
1	2,500	2,500	2,510	2,510	2,510	2,520	2,520	2,520	2,530	2,530	2,530	2,540	2,540	2,540	2,550	2,550	2,550	2,560	2,560	2,560	2,570	1
2	5,000	5,010	5,010	5,020	5,030	5,030	5,040	5,050	5,050	5,060	5,070	5,070	5,080	5,090	5,090	5,100	5,110	5,110	5,120	5,130	5,130	2
3	7,500	7,510	7,520	7,530	7,540	7,550	7,560	7,570	7,580	7,590	7,600	7,610	7,620	7,630	7,640	7,650	7,660	7,670	7,680	7,690	7,700	3
4	10,000	10,010	10,030	10,040	10,050	10,070	10,080	10,090	10,110	10,120	10,130	10,150	10,160	10,170	10,190	10,200	10,210	10,230	10,240	10,250	10,270	4
5	12,500	12,520	12,530	12,550	12,570	12,580	12,600	12,620	12,630	12,650	12,670	12,680	12,700	12,720	12,730	12,750	12,770	12,780	12,800	12,820	12,830	5
6	15,000	15,020	15,040	15,060	15,080	15,100	15,120	15,140	15,160	15,180	15,200	15,220	15,240	15,260	15,280	15,300	15,320	15,340	15,360	15,380	15,400	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1634.0	1634.1	1634.2	1634.3	1634.4	1634.5	1634.6	1634.7	1634.8	1634.9	1635.0	1635.1	1635.2	1635.3	1635.4	1635.5	1635.6	1635.7	1635.8	1635.9	1636.0	
1	2,570	2,570	2,570	2,580	2,580	2,580	2,590	2,590	2,590	2,600	2,600	2,600	2,610	2,610	2,610	2,620	2,620	2,620	2,630	2,630	2,630	1
2	5,130	5,140	5,150	5,150	5,160	5,170	5,170	5,180	5,190	5,190	5,200	5,210	5,210	5,220	5,220	5,230	5,240	5,240	5,250	5,260	5,260	2
3	7,700	7,710	7,720	7,730	7,740	7,750	7,760	7,770	7,780	7,790	7,800	7,810	7,820	7,830	7,840	7,850	7,860	7,870	7,880	7,890	7,900	3
4	10,270	10,280	10,290	10,310	10,320	10,330	10,350	10,360	10,370	10,380	10,400	10,410	10,420	10,440	10,450	10,460	10,480	10,490	10,500	10,510	10,530	4
5	12,830	12,850	12,870	12,880	12,900	12,920	12,930	12,950	12,960	12,980	13,000	13,010	13,030	13,050	13,060	13,080	13,090	13,110	13,130	13,140	13,160	5
6	15,400	15,420	15,440	15,460	15,480	15,500	15,520	15,540	15,560	15,580	15,600	15,620	15,640	15,650	15,670	15,690	15,710	15,730	15,750	15,770	15,790	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1636.0	1636.1	1636.2	1636.3	1636.4	1636.5	1636.6	1636.7	1636.8	1636.9	1637.0	1637.1	1637.2	1637.3	1637.4	1637.5	1637.6	1637.7	1637.8	1637.9	1638.0	
1	2,630	2,630	2,640	2,640	2,640	2,650	2,650	2,650	2,660	2,660	2,660	2,670	2,670	2,670	2,680	2,680	2,680	2,690	2,690	2,690	2,700	1
2	5,260	5,270	5,280	5,280	5,290	5,300	5,300	5,310	5,310	5,320	5,330	5,330	5,340	5,350	5,350	5,360	5,370	5,370	5,380	5,380	5,390	2
3	7,900	7,900	7,910	7,920	7,930	7,940	7,950	7,960	7,970	7,980	7,990	8,000	8,010	8,020	8,030	8,040	8,050	8,060	8,070	8,080	8,090	3
4	10,530	10,540	10,550	10,570	10,580	10,590	10,600	10,620	10,630	10,640	10,650	10,670	10,680	10,690	10,700	10,720	10,730	10,740	10,760	10,770	10,780	4
5	13,160	13,170	13,190	13,210	13,220	13,240	13,250	13,270	13,290	13,300	13,320	13,330	13,350	13,370	13,380	13,400	13,410	13,430	13,440	13,460	13,480	5
6	15,790	15,810	15,830	15,850	15,870	15,890	15,910	15,920	15,940	15,960	15,980	16,000	16,020	16,040	16,060	16,080	16,100	16,110	16,130	16,150	16,170	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1638.0	1638.1	1638.2	1638.3	1638.4	1638.5	1638.6	1638.7	1638.8	1638.9	1639.0	1639.1	1639.2	1639.3	1639.4	1639.5	1639.6	1639.7	1639.8	1639.9	1640.0	
1	2,700	2,700	2,700	2,700	2,710	2,710	2,710	2,720	2,720	2,720	2,730	2,730	2,730	2,740	2,740	2,740	2,740	2,750	2,750	2,750	2,760	1
2	5,390	5,400	5,400	5,410	5,420	5,420	5,430	5,430	5,440	5,450	5,450	5,460	5,460	5,470	5,480	5,480	5,490	5,500	5,500	5,510	5,510	2
3	8,090	8,090	8,100	8,110	8,120	8,130	8,140	8,150	8,160	8,170	8,180	8,190	8,200	8,210	8,220	8,230	8,230	8,240	8,250	8,260	8,270	3
4	10,780	10,790	10,810	10,820	10,830	10,840	10,860	10,870	10,880	10,890	10,910	10,920	10,930	10,940	10,950	10,970	10,980	10,990	11,000	11,020	11,030	4
5	13,480	13,490	13,510	13,520	13,540	13,550	13,570	13,580	13,600	13,620	13,630	13,650	13,660	13,680	13,690	13,710	13,720	13,740	13,750	13,770	13,790	5
6	16,170	16,190	16,210	16,230	16,250	16,260	16,280	16,300	16,320	16,340	16,360	16,380	16,390	16,410	16,430	16,450	16,470	16,490	16,510	16,520	16,540	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1640.0	1640.1	1640.2	1640.3	1640.4	1640.5	1640.6	1640.7	1640.8	1640.9	1641.0	1641.1	1641.2	1641.3	1641.4	1641.5	1641.6	1641.7	1641.8	1641.9	1642.0	
1	2,760	2,760	2,760	2,770	2,770	2,770	2,780	2,780	2,780	2,780	2,790	2,790	2,790	2,800	2,800	2,800	2,810	2,810	2,810	2,810	2,820	1
2	5,510	5,520	5,530	5,530	5,540	5,540	5,550	5,560	5,560	5,570	5,580	5,580	5,590	5,590	5,600	5,610	5,610	5,620	5,620	5,630	5,640	2
3	8,270	8,280	8,290	8,300	8,310	8,320	8,330	8,340	8,340	8,350	8,360	8,370	8,380	8,390	8,400	8,410	8,420	8,430	8,430	8,440	8,450	3
4	11,030	11,040	11,050	11,060	11,080	11,090	11,100	11,110	11,130	11,140	11,150	11,160	11,170	11,190	11,200	11,210	11,220	11,230	11,250	11,260	11,270	4
5	13,790	13,800	13,820	13,830	13,850	13,860	13,880	13,890	13,910	13,920	13,940	13,950	13,970	13,980	14,000	14,010	14,030	14,040	14,060	14,070	14,090	5
6	16,540	16,560	16,580	16,600	16,620	16,630	16,650	16,670	16,690	16,710	16,730	16,740	16,760	16,780	16,800	16,820	16,830	16,850	16,870	16,890	16,910	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1642.0	1642.1	1642.2	1642.3	1642.4	1642.5	1642.6	1642.7	1642.8	1642.9	1643.0	1643.1	1643.2	1643.3	1643.4	1643.5	1643.6	1643.7	1643.8	1643.9	1644.0	
1	2,820	2,820	2,820	2,830	2,830	2,830	2,840	2,840	2,840	2,840	2,850	2,850	2,850	2,860	2,860	2,860	2,870	2,870	2,870	2,870	2,880	1
2	5,640	5,640	5,650	5,650	5,660	5,670	5,670	5,680	5,680	5,690	5,690	5,700	5,710	5,710	5,720	5,720	5,730	5,740	5,740	5,750	5,750	2
3	8,450	8,460	8,470	8,480	8,490	8,500	8,510	8,520	8,520	8,530	8,540	8,550	8,560	8,570	8,580	8,590	8,600	8,600	8,610	8,620	8,630	3
4	11,270	11,280	11,290	11,310	11,320	11,330	11,340	11,350	11,370	11,380	11,390	11,400	11,410	11,430	11,440	11,450	11,460	11,470	11,480	11,500	11,510	4
5	14,090	14,100	14,120	14,130	14,150	14,160	14,180	14,190	14,210	14,220	14,240	14,250	14,270	14,280	14,300	14,310	14,330	14,340	14,360	14,370	14,380	5
6	16,910	16,920	16,940	16,960	16,980	17,000	17,010	17,030	17,050	17,070	17,080	17,100	17,120	17,140	17,160	17,170	17,190	17,210	17,230	17,240	17,260	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1644.0	1644.1	1644.2	1644.3	1644.4	1644.5	1644.6	1644.7	1644.8	1644.9	1645.0	1645.1	1645.2	1645.3	1645.4	1645.5	1645.6	1645.7	1645.8	1645.9	1646.0	
1	2,880	2,880	2,880	2,890	2,890	2,890	2,890	2,900	2,900	2,900	2,910	2,910	2,910	2,910	2,920	2,920	2,920	2,930	2,930	2,930	2,940	1
2	5,750	5,760	5,770	5,770	5,780	5,780	5,790	5,790	5,800	5,810	5,810	5,820	5,820	5,830	5,840	5,840	5,850	5,850	5,860	5,860	5,870	2
3	8,630	8,640	8,650	8,660	8,670	8,670	8,680	8,690	8,700	8,710	8,720	8,730	8,740	8,740	8,750	8,760	8,770	8,780	8,790	8,800	8,810	3
4	11,510	11,520	11,530	11,540	11,550	11,570	11,580	11,590	11,600	11,610	11,620	11,640	11,650	11,660	11,670	11,680	11,690	11,710	11,720	11,730	11,740	4
5	14,380	14,400	14,410	14,430	14,440	14,460	14,470	14,490	14,500	14,520	14,530	14,550	14,560	14,570	14,590	14,600	14,620	14,630	14,650	14,660	14,680	5
6	17,260	17,280	17,300	17,310	17,330	17,350	17,370	17,380	17,400	17,420	17,440	17,450	17,470	17,490	17,510	17,520	17,540	17,560	17,580	17,590	17,610	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1646.0	1646.1	1646.2	1646.3	1646.4	1646.5	1646.6	1646.7	1646.8	1646.9	1647.0	1647.1	1647.2	1647.3	1647.4	1647.5	1647.6	1647.7	1647.8	1647.9	1648.0	
1	2,940	2,940	2,940	2,940	2,950	2,950	2,950	2,960	2,960	2,960	2,960	2,970	2,970	2,970	2,980	2,980	2,980	2,980	2,990	2,990	2,990	1
2	5,870	5,880	5,880	5,890	5,890	5,900	5,900	5,910	5,920	5,920	5,930	5,930	5,940	5,940	5,950	5,960	5,960	5,970	5,970	5,980	5,980	2
3	8,810	8,810	8,820	8,830	8,840	8,850	8,860	8,870	8,870	8,880	8,890	8,900	8,910	8,920	8,930	8,930	8,940	8,950	8,960	8,970	8,980	3
4	11,740	11,750	11,760	11,770	11,790	11,800	11,810	11,820	11,830	11,840	11,850	11,870	11,880	11,890	11,900	11,910	11,920	11,930	11,950	11,960	11,970	4
5	14,680	14,690	14,700	14,720	14,730	14,750	14,760	14,780	14,790	14,800	14,820	14,830	14,850	14,860	14,880	14,890	14,900	14,920	14,930	14,950	14,960	5
6	17,610	17,630	17,650	17,660	17,680	17,700	17,710	17,730	17,750	17,770	17,780	17,800	17,820	17,830	17,850	17,870	17,880	17,900	17,920	17,940	17,950	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1648.0	1648.1	1648.2	1648.3	1648.4	1648.5	1648.6	1648.7	1648.8	1648.9	1649.0	1649.1	1649.2	1649.3	1649.4	1649.5	1649.6	1649.7	1649.8	1649.9	1650.0	
1	2,990	2,990	3,000	3,000	3,000	3,010	3,010	3,010	3,010	3,020	3,020	3,020	3,030	3,030	3,030	3,030	3,040	3,040	3,040	3,050	3,050	1
2	5,980	5,990	6,000	6,000	6,010	6,010	6,020	6,020	6,030	6,030	6,040	6,050	6,050	6,060	6,060	6,070	6,070	6,080	6,080	6,090	6,100	2
3	8,980	8,980	8,990	9,000	9,010	9,020	9,030	9,040	9,040	9,050	9,060	9,070	9,080	9,090	9,090	9,100	9,110	9,120	9,130	9,140	9,140	3
4	11,970	11,980	11,990	12,000	12,010	12,020	12,040	12,050	12,060	12,070	12,080	12,090	12,100	12,110	12,130	12,140	12,150	12,160	12,170	12,180	12,190	4
5	14,960	14,970	14,990	15,000	15,020	15,030	15,040	15,060	15,070	15,090	15,100	15,120	15,130	15,140	15,160	15,170	15,180	15,200	15,210	15,230	15,240	5
6	17,950	17,970	17,990	18,000	18,020	18,040	18,050	18,070	18,090	18,100	18,120	18,140	18,150	18,170	18,190	18,200	18,220	18,240	18,250	18,270	18,290	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1650.0	1650.1	1650.2	1650.3	1650.4	1650.5	1650.6	1650.7	1650.8	1650.9	1651.0	1651.1	1651.2	1651.3	1651.4	1651.5	1651.6	1651.7	1651.8	1651.9	1652.0	
1	3,050	3,050	3,050	3,060	3,060	3,060	3,060	3,070	3,070	3,070	3,080	3,080	3,080	3,080	3,090	3,090	3,090	3,090	3,100	3,100	3,100	1
2	6,100	6,100	6,110	6,110	6,120	6,120	6,130	6,130	6,140	6,150	6,150	6,160	6,160	6,170	6,170	6,180	6,180	6,190	6,200	6,200	6,210	2
3	9,140	9,150	9,160	9,170	9,180	9,190	9,190	9,200	9,210	9,220	9,230	9,240	9,240	9,250	9,260	9,270	9,280	9,280	9,290	9,300	9,310	3
4	12,190	12,200	12,210	12,230	12,240	12,250	12,260	12,270	12,280	12,290	12,300	12,310	12,320	12,340	12,350	12,360	12,370	12,380	12,390	12,400	12,410	4
5	15,240	15,250	15,270	15,280	15,300	15,310	15,320	15,340	15,350	15,360	15,380	15,390	15,410	15,420	15,430	15,450	15,460	15,470	15,490	15,500	15,510	5
6	18,290	18,300	18,320	18,340	18,350	18,370	18,390	18,400	18,420	18,440	18,450	18,470	18,490	18,500	18,520	18,540	18,550	18,570	18,590	18,600	18,620	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1652.0	1652.1	1652.2	1652.3	1652.4	1652.5	1652.6	1652.7	1652.8	1652.9	1653.0	1653.1	1653.2	1653.3	1653.4	1653.5	1653.6	1653.7	1653.8	1653.9	1654.0	
1	3,100	3,110	3,110	3,110	3,110	3,120	3,120	3,120	3,120	3,130	3,130	3,130	3,140	3,140	3,140	3,140	3,150	3,150	3,150	3,150	3,160	1
2	6,210	6,210	6,220	6,220	6,230	6,230	6,240	6,240	6,250	6,250	6,260	6,270	6,270	6,280	6,280	6,290	6,290	6,300	6,300	6,310	6,310	2
3	9,310	9,320	9,330	9,330	9,340	9,350	9,360	9,370	9,370	9,380	9,390	9,400	9,410	9,410	9,420	9,430	9,440	9,450	9,450	9,460	9,470	3
4	12,410	12,420	12,430	12,440	12,460	12,470	12,480	12,490	12,500	12,510	12,520	12,530	12,540	12,550	12,560	12,570	12,580	12,600	12,610	12,620	12,630	4
5	15,510	15,530	15,540	15,560	15,570	15,580	15,600	15,610	15,620	15,640	15,650	15,660	15,680	15,690	15,700	15,720	15,730	15,740	15,760	15,770	15,780	5
6	18,620	18,630	18,650	18,670	18,680	18,700	18,720	18,730	18,750	18,760	18,780	18,800	18,810	18,830	18,850	18,860	18,880	18,890	18,910	18,930	18,940	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1654.0	1654.1	1654.2	1654.3	1654.4	1654.5	1654.6	1654.7	1654.8	1654.9	1655.0	1655.1	1655.2	1655.3	1655.4	1655.5	1655.6	1655.7	1655.8	1655.9	1656.0	
1	3,160	3,160	3,160	3,160	3,170	3,170	3,170	3,180	3,180	3,180	3,180	3,190	3,190	3,190	3,190	3,200	3,200	3,200	3,200	3,210	3,210	1
2	6,310	6,320	6,320	6,330	6,340	6,340	6,350	6,350	6,360	6,360	6,370	6,370	6,380	6,380	6,390	6,390	6,400	6,400	6,410	6,410	6,420	2
3	9,470	9,480	9,490	9,490	9,500	9,510	9,520	9,530	9,530	9,540	9,550	9,560	9,570	9,570	9,580	9,590	9,600	9,610	9,610	9,620	9,630	3
4	12,630	12,640	12,650	12,660	12,670	12,680	12,690	12,700	12,710	12,720	12,730	12,740	12,760	12,770	12,780	12,790	12,800	12,810	12,820	12,830	12,840	4
5	15,780	15,800	15,810	15,820	15,840	15,850	15,860	15,880	15,890	15,900	15,920	15,930	15,940	15,960	15,970	15,980	16,000	16,010	16,020	16,040	16,050	5
6	18,940	18,960	18,970	18,990	19,010	19,020	19,040	19,050	19,070	19,090	19,100	19,120	19,130	19,150	19,170	19,180	19,200	19,210	19,230	19,240	19,260	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1656.0	1656.1	1656.2	1656.3	1656.4	1656.5	1656.6	1656.7	1656.8	1656.9	1657.0	1657.1	1657.2	1657.3	1657.4	1657.5	1657.6	1657.7	1657.8	1657.9	1658.0	
1	3,210	3,210	3,220	3,220	3,220	3,220	3,230	3,230	3,230	3,230	3,240	3,240	3,240	3,240	3,250	3,250	3,250	3,250	3,260	3,260	3,260	1
2	6,420	6,430	6,430	6,440	6,440	6,450	6,450	6,460	6,460	6,470	6,470	6,480	6,480	6,490	6,490	6,500	6,500	6,510	6,510	6,520	6,520	2
3	9,630	9,640	9,650	9,650	9,660	9,670	9,680	9,690	9,690	9,700	9,710	9,720	9,720	9,730	9,740	9,750	9,760	9,760	9,770	9,780	9,790	3
4	12,840	12,850	12,860	12,870	12,880	12,890	12,900	12,910	12,920	12,930	12,940	12,960	12,970	12,980	12,990	13,000	13,010	13,020	13,030	13,040	13,050	4
5	16,050	16,060	16,080	16,090	16,100	16,120	16,130	16,140	16,150	16,170	16,180	16,190	16,210	16,220	16,230	16,250	16,260	16,270	16,290	16,300	16,310	5
6	19,260	19,280	19,290	19,310	19,320	19,340	19,350	19,370	19,390	19,400	19,420	19,430	19,450	19,460	19,480	19,500	19,510	19,530	19,540	19,560	19,570	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1658.0	1658.1	1658.2	1658.3	1658.4	1658.5	1658.6	1658.7	1658.8	1658.9	1659.0	1659.1	1659.2	1659.3	1659.4	1659.5	1659.6	1659.7	1659.8	1659.9	1660.0	
1	3,260	3,260	3,270	3,270	3,270	3,280	3,280	3,280	3,280	3,290	3,290	3,290	3,290	3,300	3,300	3,300	3,300	3,310	3,310	3,310	3,310	1
2	6,520	6,530	6,530	6,540	6,550	6,550	6,560	6,560	6,570	6,570	6,580	6,580	6,590	6,590	6,600	6,600	6,610	6,610	6,620	6,620	6,630	2
3	9,790	9,790	9,800	9,810	9,820	9,830	9,830	9,840	9,850	9,860	9,860	9,870	9,880	9,890	9,890	9,900	9,910	9,920	9,930	9,930	9,940	3
4	13,050	13,060	13,070	13,080	13,090	13,100	13,110	13,120	13,130	13,140	13,150	13,160	13,170	13,180	13,190	13,200	13,210	13,220	13,230	13,240	13,250	4
5	16,310	16,320	16,340	16,350	16,360	16,380	16,390	16,400	16,410	16,430	16,440	16,450	16,470	16,480	16,490	16,500	16,520	16,530	16,540	16,560	16,570	5
6	19,570	19,590	19,600	19,620	19,640	19,650	19,670	19,680	19,700	19,710	19,730	19,740	19,760	19,770	19,790	19,800	19,820	19,840	19,850	19,870	19,880	6

FONTANA DAM
SPILLWAY TUNNEL DISCHARGE
IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1660.0	1660.1	1660.2	1660.3	1660.4	1660.5	1660.6	1660.7	1660.8	1660.9	1661.0	1661.1	1661.2	1661.3	1661.4	1661.5	1661.6	1661.7	1661.8	1661.9	1662.0	
1	3,310	3,320	3,320	3,320	3,320	3,330	3,330	3,330	3,330	3,340	3,340	3,340	3,340	3,350	3,350	3,350	3,350	3,360	3,360	3,360	3,360	1
2	6,630	6,630	6,640	6,640	6,650	6,650	6,660	6,660	6,670	6,670	6,680	6,680	6,690	6,690	6,700	6,700	6,710	6,710	6,720	6,720	6,730	2
3	9,940	9,950	9,960	9,960	9,970	9,980	9,990	9,990	10,000	10,010	10,020	10,020	10,030	10,040	10,050	10,050	10,060	10,070	10,080	10,080	10,090	3
4	13,250	13,260	13,270	13,280	13,300	13,310	13,320	13,330	13,340	13,350	13,360	13,370	13,380	13,390	13,400	13,410	13,420	13,430	13,440	13,450	13,460	4
5	16,570	16,580	16,590	16,610	16,620	16,630	16,640	16,660	16,670	16,680	16,690	16,710	16,720	16,730	16,750	16,760	16,770	16,780	16,800	16,810	16,820	5
6	19,880	19,900	19,910	19,930	19,940	19,960	19,970	19,990	20,000	20,020	20,030	20,050	20,060	20,080	20,090	20,110	20,120	20,140	20,150	20,170	20,180	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1662.0	1662.1	1662.2	1662.3	1662.4	1662.5	1662.6	1662.7	1662.8	1662.9	1663.0	1663.1	1663.2	1663.3	1663.4	1663.5	1663.6	1663.7	1663.8	1663.9	1664.0	
1	3,360	3,370	3,370	3,370	3,370	3,380	3,380	3,380	3,380	3,390	3,390	3,390	3,390	3,400	3,400	3,400	3,400	3,410	3,410	3,410	3,410	1
2	6,730	6,730	6,740	6,740	6,750	6,750	6,760	6,760	6,770	6,770	6,780	6,780	6,790	6,790	6,800	6,800	6,810	6,810	6,820	6,820	6,830	2
3	10,090	10,100	10,110	10,120	10,120	10,130	10,140	10,150	10,150	10,160	10,170	10,180	10,180	10,190	10,200	10,200	10,210	10,220	10,230	10,230	10,240	3
4	13,460	13,470	13,480	13,490	13,500	13,510	13,520	13,530	13,540	13,550	13,560	13,570	13,580	13,590	13,600	13,610	13,620	13,630	13,640	13,650	13,660	4
5	16,820	16,830	16,850	16,860	16,870	16,880	16,900	16,910	16,920	16,930	16,950	16,960	16,970	16,980	17,000	17,010	17,020	17,030	17,050	17,060	17,070	5
6	20,180	20,200	20,220	20,230	20,250	20,260	20,280	20,290	20,310	20,320	20,340	20,350	20,360	20,380	20,390	20,410	20,420	20,440	20,450	20,470	20,480	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1664.0	1664.1	1664.2	1664.3	1664.4	1664.5	1664.6	1664.7	1664.8	1664.9	1665.0	1665.1	1665.2	1665.3	1665.4	1665.5	1665.6	1665.7	1665.8	1665.9	1666.0	
1	3,410	3,420	3,420	3,420	3,420	3,430	3,430	3,430	3,430	3,440	3,440	3,440	3,440	3,450	3,450	3,450	3,450	3,460	3,460	3,460	3,460	1
2	6,830	6,830	6,840	6,840	6,850	6,850	6,860	6,860	6,870	6,870	6,880	6,880	6,890	6,890	6,900	6,900	6,910	6,910	6,920	6,920	6,930	2
3	10,240	10,250	10,260	10,260	10,270	10,280	10,290	10,290	10,300	10,310	10,320	10,320	10,330	10,340	10,350	10,350	10,360	10,370	10,370	10,380	10,390	3
4	13,660	13,670	13,680	13,690	13,700	13,710	13,720	13,730	13,730	13,740	13,750	13,760	13,770	13,780	13,790	13,800	13,810	13,820	13,830	13,840	13,850	4
5	17,070	17,080	17,090	17,110	17,120	17,130	17,140	17,160	17,170	17,180	17,190	17,210	17,220	17,230	17,240	17,250	17,270	17,280	17,290	17,300	17,320	5
6	20,480	20,500	20,510	20,530	20,540	20,560	20,570	20,590	20,600	20,620	20,630	20,650	20,660	20,680	20,690	20,710	20,720	20,730	20,750	20,760	20,780	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1666.0	1666.1	1666.2	1666.3	1666.4	1666.5	1666.6	1666.7	1666.8	1666.9	1667.0	1667.1	1667.2	1667.3	1667.4	1667.5	1667.6	1667.7	1667.8	1667.9	1668.0	
1	3,460	3,470	3,470	3,470	3,470	3,480	3,480	3,480	3,480	3,490	3,490	3,490	3,490	3,490	3,500	3,500	3,500	3,500	3,510	3,510	3,510	1
2	6,930	6,930	6,940	6,940	6,950	6,950	6,960	6,960	6,970	6,970	6,970	6,980	6,980	6,990	6,990	7,000	7,000	7,010	7,010	7,020	7,020	2
3	10,390	10,400	10,400	10,410	10,420	10,430	10,430	10,440	10,450	10,460	10,460	10,470	10,480	10,480	10,490	10,500	10,510	10,510	10,520	10,530	10,530	3
4	13,850	13,860	13,870	13,880	13,890	13,900	13,910	13,920	13,930	13,940	13,950	13,960	13,970	13,980	13,990	14,000	14,010	14,020	14,030	14,040	14,050	4
5	17,320	17,330	17,340	17,350	17,360	17,380	17,390	17,400	17,410	17,430	17,440	17,450	17,460	17,470	17,490	17,500	17,510	17,520	17,530	17,550	17,560	5
6	20,780	20,790	20,810	20,820	20,840	20,850	20,870	20,880	20,900	20,910	20,920	20,940	20,950	20,970	20,980	21,000	21,010	21,030	21,040	21,050	21,070	6
GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1668.0	1668.1	1668.2	1668.3	1668.4	1668.5	1668.6	1668.7	1668.8	1668.9	1669.0	1669.1	1669.2	1669.3	1669.4	1669.5	1669.6	1669.7	1669.8	1669.9	1670.0	
1	3,510	3,510	3,520	3,520	3,520	3,520	3,530	3,530	3,530	3,530	3,540	3,540	3,540	3,540	3,550	3,550	3,550	3,550	3,550	3,560	3,560	1
2	7,020	7,030	7,030	7,040	7,040	7,050	7,050	7,060	7,060	7,070	7,070	7,080	7,080	7,090	7,090	7,090	7,100	7,100	7,110	7,110	7,120	2
3	10,530	10,540	10,550	10,560	10,560	10,570	10,580	10,590	10,590	10,600	10,610	10,610	10,620	10,630	10,640	10,640	10,650	10,660	10,660	10,670	10,680	3
4	14,050	14,060	14,070	14,080	14,080	14,090	14,100	14,110	14,120	14,130	14,140	14,150	14,160	14,170	14,180	14,190	14,200	14,210	14,220	14,230	14,240	4
5	17,560	17,570	17,580	17,590	17,610	17,620	17,630	17,640	17,650	17,670	17,680	17,690	17,700	17,710	17,730	17,740	17,750	17,760	17,770	17,780	17,800	5
6	21,070	21,080	21,100	21,110	21,130	21,140	21,160	21,170	21,180	21,200	21,210	21,230	21,240	21,260	21,270	21,280	21,300	21,310	21,330	21,340	21,360	6

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1670.0	1670.1	1670.2	1670.3	1670.4	1670.5	1670.6	1670.7	1670.8	1670.9	1671.0	1671.1	1671.2	1671.3	1671.4	1671.5	1671.6	1671.7	1671.8	1671.9	1672.0	
1	3,560	3,560	3,560	3,570	3,570	3,570	3,570	3,580	3,580	3,580	3,580	3,590	3,590	3,590	3,590	3,590	3,600	3,600	3,600	3,600	3,610	1
2	7,120	7,120	7,130	7,130	7,140	7,140	7,150	7,150	7,160	7,160	7,170	7,170	7,180	7,180	7,180	7,190	7,190	7,200	7,200	7,210	7,210	2
3	10,680	10,690	10,690	10,700	10,710	10,710	10,720	10,730	10,730	10,740	10,750	10,760	10,760	10,770	10,780	10,780	10,790	10,800	10,810	10,810	10,820	3
4	14,240	14,250	14,260	14,270	14,280	14,280	14,290	14,300	14,310	14,320	14,330	14,340	14,350	14,360	14,370	14,380	14,390	14,400	14,410	14,420	14,430	4
5	17,800	17,810	17,820	17,830	17,840	17,860	17,870	17,880	17,890	17,900	17,910	17,930	17,940	17,950	17,960	17,970	17,990	18,000	18,010	18,020	18,030	5
6	21,360	21,370	21,380	21,400	21,410	21,430	21,440	21,460	21,470	21,480	21,500	21,510	21,530	21,540	21,550	21,570	21,580	21,600	21,610	21,620	21,640	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1672.0	1672.1	1672.2	1672.3	1672.4	1672.5	1672.6	1672.7	1672.8	1672.9	1673.0	1673.1	1673.2	1673.3	1673.4	1673.5	1673.6	1673.7	1673.8	1673.9	1674.0	
1	3,610	3,610	3,610	3,610	3,620	3,620	3,620	3,620	3,630	3,630	3,630	3,630	3,630	3,640	3,640	3,640	3,640	3,650	3,650	3,650	3,650	1
2	7,210	7,220	7,220	7,230	7,230	7,240	7,240	7,250	7,250	7,260	7,260	7,260	7,270	7,270	7,280	7,280	7,290	7,290	7,300	7,300	7,300	2
3	10,820	10,830	10,830	10,840	10,850	10,850	10,860	10,870	10,880	10,880	10,890	10,900	10,900	10,910	10,920	10,920	10,930	10,940	10,940	10,950	10,950	3
4	14,430	14,440	14,440	14,450	14,460	14,470	14,480	14,490	14,500	14,510	14,520	14,530	14,540	14,550	14,560	14,570	14,580	14,580	14,590	14,600	14,610	4
5	18,030	18,040	18,060	18,070	18,080	18,090	18,100	18,110	18,130	18,140	18,150	18,160	18,170	18,180	18,200	18,210	18,220	18,230	18,240	18,250	18,260	5
6	21,640	21,650	21,670	21,680	21,700	21,710	21,720	21,740	21,750	21,770	21,780	21,790	21,810	21,820	21,830	21,850	21,860	21,880	21,890	21,900	21,910	6

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1674.0	1674.1	1674.2	1674.3	1674.4	1674.5	1674.6	1674.7	1674.8	1674.9	1675.0	1675.1	1675.2	1675.3	1675.4	1675.5	1675.6	1675.7	1675.8	1675.9	1676.0	
1	3,650	3,650	3,650	3,660	3,660	3,660	3,660	3,660	3,660	3,670	3,670	3,670	3,670	3,670	3,670	3,680	3,680	3,680	3,680	3,680	3,680	1
2	7,300	7,310	7,310	7,310	7,320	7,320	7,320	7,330	7,330	7,330	7,340	7,340	7,340	7,340	7,350	7,350	7,350	7,360	7,360	7,360	7,370	2
3	10,950	10,960	10,960	10,970	10,970	10,980	10,980	10,990	10,990	11,000	11,000	11,010	11,010	11,020	11,020	11,030	11,030	11,040	11,040	11,050	11,050	3
4	14,610	14,610	14,620	14,630	14,630	14,640	14,640	14,650	14,660	14,660	14,670	14,680	14,680	14,690	14,700	14,700	14,710	14,710	14,720	14,730	14,730	4
5	18,260	18,270	18,270	18,280	18,290	18,300	18,310	18,310	18,320	18,330	18,340	18,350	18,350	18,360	18,370	18,380	18,390	18,390	18,400	18,410	18,420	5
6	21,910	21,920	21,930	21,940	21,950	21,960	21,970	21,980	21,990	22,000	22,010	22,010	22,020	22,030	22,040	22,050	22,060	22,070	22,080	22,090	22,100	6
7	21,910	21,920	21,930	21,940	21,950	21,960	21,970	21,980	21,990	22,000	22,010	22,015	22,040	22,065	22,090	22,120	22,155	22,190	22,230	22,270	22,310	7
8	21,910	21,920	21,930	21,940	21,950	21,960	21,970	21,980	21,990	22,000	22,010	22,025	22,055	22,095	22,140	22,190	22,250	22,310	22,370	22,440	22,510	8
9	21,910	21,920	21,930	21,940	21,950	21,960	21,970	21,980	21,990	22,000	22,010	22,025	22,055	22,095	22,140	22,190	22,250	22,310	22,370	22,440	22,510	9

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1676.0	1676.1	1676.2	1676.3	1676.4	1676.5	1676.6	1676.7	1676.8	1676.9	1677.0	1677.1	1677.2	1677.3	1677.4	1677.5	1677.6	1677.7	1677.8	1677.9	1678.0	
1	3,680	3,690	3,690	3,690	3,690	3,690	3,690	3,690	3,700	3,700	3,700	3,700	3,700	3,700	3,710	3,710	3,710	3,710	3,710	3,710	3,720	1
2	7,370	7,370	7,370	7,380	7,380	7,380	7,390	7,390	7,390	7,400	7,400	7,400	7,400	7,410	7,410	7,410	7,420	7,420	7,420	7,430	7,430	2
3	11,050	11,060	11,060	11,060	11,070	11,070	11,080	11,080	11,090	11,090	11,100	11,100	11,110	11,110	11,120	11,120	11,130	11,130	11,140	11,140	11,150	3
4	14,730	14,740	14,750	14,750	14,760	14,770	14,770	14,780	14,780	14,790	14,800	14,800	14,810	14,820	14,820	14,830	14,840	14,840	14,850	14,850	14,860	4
5	18,420	18,430	18,430	18,440	18,450	18,460	18,460	18,470	18,480	18,490	18,500	18,500	18,510	18,520	18,530	18,540	18,540	18,550	18,560	18,570	18,580	5
6	22,100	22,110	22,120	22,130	22,140	22,150	22,160	22,170	22,180	22,190	22,200	22,210	22,210	22,220	22,230	22,240	22,250	22,260	22,270	22,280	22,290	6
7	22,310	22,350	22,380	22,400	22,430	22,450	22,480	22,500	22,530	22,550	22,580	22,600	22,620	22,640	22,660	22,690	22,710	22,730	22,750	22,760	22,780	7
8	22,510	22,580	22,630	22,670	22,710	22,750	22,790	22,820	22,860	22,900	22,940	22,980	23,010	23,050	23,090	23,120	23,150	23,180	23,210	23,230	23,260	8
9	22,510	22,580	22,640	22,700	22,760	22,830	22,890	22,960	23,010	23,060	23,100	23,140	23,180	23,220	23,260	23,300	23,340	23,380	23,410	23,450	23,490	9
10	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,090	23,170	23,230	23,280	23,320	23,360	23,410	23,460	23,500	23,550	23,600	23,640	23,690	23,740	10
11	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,090	23,180	23,260	23,340	23,410	23,480	23,550	23,630	23,690	23,740	23,790	23,840	23,890	23,940	11
12	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,100	23,190	23,290	23,390	23,490	23,580	23,690	23,800	23,870	23,940	24,000	24,050	24,100	24,150	12
13	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,100	23,190	23,290	23,390	23,490	23,580	23,690	23,800	23,900	24,000	24,080	24,170	24,250	24,340	13
14	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,100	23,190	23,290	23,390	23,490	23,580	23,690	23,800	23,910	24,030	24,140	24,260	24,380	24,510	14
15	22,510	22,590	22,670	22,750	22,830	22,920	23,000	23,100	23,190	23,290	23,390	23,490	23,580	23,690	23,800	23,910	24,030	24,140	24,260	24,380	24,510	15

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

HEADWATER ELEVATION

GATE ARRANGEMENT	1678.0	1678.1	1678.2	1678.3	1678.4	1678.5	1678.6	1678.7	1678.8	1678.9	1679.0	1679.1	1679.2	1679.3	1679.4	1679.5	1679.6	1679.7	1679.8	1679.9	1680.0	GATE ARRANGEMENT
1	3,720	3,720	3,720	3,720	3,720	3,720	3,720	3,730	3,730	3,730	3,730	3,730	3,730	3,740	3,740	3,740	3,740	3,740	3,740	3,740	3,750	1
2	7,430	7,430	7,440	7,440	7,440	7,450	7,450	7,450	7,460	7,460	7,460	7,460	7,470	7,470	7,470	7,480	7,480	7,480	7,490	7,490	7,490	2
3	11,150	11,150	11,150	11,160	11,160	11,170	11,170	11,180	11,180	11,190	11,190	11,200	11,200	11,210	11,210	11,220	11,220	11,230	11,230	11,230	11,240	3
4	14,860	14,870	14,870	14,880	14,890	14,890	14,900	14,900	14,910	14,920	14,920	14,930	14,940	14,940	14,950	14,950	14,960	14,970	14,970	14,980	14,990	4
5	18,580	18,580	18,590	18,600	18,610	18,610	18,620	18,630	18,640	18,650	18,650	18,660	18,670	18,680	18,690	18,690	18,700	18,710	18,720	18,720	18,730	5
6	22,290	22,300	22,310	22,320	22,330	22,340	22,350	22,360	22,370	22,380	22,380	22,390	22,400	22,410	22,420	22,430	22,440	22,450	22,460	22,470	22,480	6
7	22,780	22,800	22,820	22,840	22,850	22,870	22,890	22,910	22,920	22,940	22,950	22,960	22,980	23,000	23,010	23,030	23,050	23,060	23,080	23,100	23,110	7
8	23,260	23,280	23,310	23,330	23,360	23,380	23,410	23,430	23,460	23,480	23,490	23,520	23,540	23,560	23,590	23,610	23,630	23,660	23,680	23,700	23,720	8
9	23,490	23,520	23,550	23,580	23,610	23,640	23,670	23,700	23,730	23,760	23,770	23,800	23,830	23,860	23,880	23,910	23,940	23,960	23,990	24,020	24,040	9
10	23,740	23,780	23,820	23,860	23,890	23,930	23,960	23,990	24,030	24,060	24,080	24,110	24,140	24,180	24,210	24,240	24,270	24,300	24,330	24,360	24,390	10
11	23,940	23,980	24,030	24,070	24,110	24,160	24,200	24,240	24,280	24,310	24,340	24,380	24,410	24,450	24,480	24,520	24,550	24,590	24,620	24,660	24,690	11
12	24,150	24,200	24,250	24,300	24,350	24,400	24,450	24,500	24,550	24,590	24,620	24,660	24,700	24,740	24,780	24,820	24,860	24,900	24,940	24,980	25,010	12
13	24,340	24,430	24,490	24,540	24,590	24,650	24,700	24,750	24,790	24,840	24,880	24,920	24,970	25,010	25,050	25,100	25,140	25,180	25,220	25,270	25,310	13
14	24,510	24,620	24,710	24,770	24,830	24,880	24,930	24,980	25,030	25,080	25,120	25,170	25,210	25,260	25,310	25,350	25,400	25,450	25,490	25,540	25,580	14
15	24,510	24,620	24,730	24,840	24,930	25,020	25,120	25,210	25,310	25,390	25,430	25,480	25,520	25,570	25,620	25,660	25,710	25,750	25,800	25,840	25,890	15
16	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,560	25,660	25,720	25,770	25,820	25,870	25,910	25,960	26,010	26,050	26,090	26,140	26,180	16
17	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,560	25,680	25,780	25,880	25,980	26,080	26,170	26,270	26,370	26,430	26,470	26,520	26,560	17
18	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,570	25,710	25,840	25,990	26,130	26,280	26,430	26,580	26,710	26,790	26,840	26,880	26,920	18
19	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,570	25,710	25,840	25,990	26,130	26,280	26,430	26,580	26,710	26,840	26,940	27,040	27,140	19
20	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,570	25,710	25,840	25,990	26,130	26,280	26,430	26,590	26,740	26,900	27,060	27,220	27,380	20
21	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,570	25,710	25,840	25,990	26,130	26,280	26,430	26,590	26,740	26,900	27,060	27,220	27,380	21
22	24,510	24,630	24,760	24,890	25,020	25,150	25,290	25,430	25,570	25,710	25,840	25,990	26,130	26,280	26,430	26,590	26,740	26,900	27,060	27,220	27,380	22

HEADWATER ELEVATION

GATE ARRANGEMENT	1680.0	1680.1	1680.2	1680.3	1680.4	1680.5	1680.6	1680.7	1680.8	1680.9	1681.0	1681.1	1681.2	1681.3	1681.4	1681.5	1681.6	1681.7	1681.8	1681.9	1682.0	GATE ARRANGEMENT
1	3,750	3,750	3,750	3,750	3,750	3,750	3,760	3,760	3,760	3,760	3,760	3,760	3,770	3,770	3,770	3,770	3,770	3,770	3,770	3,780	3,780	1
2	7,490	7,500	7,500	7,500	7,510	7,510	7,510	7,510	7,520	7,520	7,520	7,530	7,530	7,530	7,540	7,540	7,540	7,550	7,550	7,550	7,560	2
3	11,240	11,240	11,250	11,250	11,260	11,260	11,270	11,270	11,280	11,280	11,290	11,290	11,300	11,300	11,300	11,310	11,310	11,320	11,320	11,330	11,330	3
4	14,990	14,990	15,000	15,000	15,010	15,020	15,020	15,030	15,040	15,040	15,050	15,050	15,060	15,070	15,070	15,080	15,090	15,090	15,100	15,100	15,110	4
5	18,730	18,740	18,750	18,760	18,760	18,770	18,780	18,790	18,790	18,800	18,810	18,820	18,830	18,830	18,840	18,850	18,860	18,860	18,870	18,880	18,890	5
6	22,480	22,490	22,500	22,510	22,520	22,530	22,530	22,540	22,550	22,560	22,570	22,580	22,590	22,600	22,610	22,620	22,630	22,640	22,650	22,660	22,670	6
7	23,110	23,130	23,140	23,160	23,180	23,190	23,200	23,210	23,230	23,250	23,260	23,280	23,290	23,310	23,320	23,340	23,360	23,370	23,390	23,400	23,420	7
8	23,720	23,750	23,770	23,790	23,810	23,830	23,850	23,870	23,890	23,910	23,930	23,950	23,970	23,990	24,010	24,040	24,060	24,080	24,100	24,120	24,140	8
9	24,040	24,070	24,090	24,120	24,140	24,170	24,180	24,210	24,230	24,260	24,280	24,310	24,330	24,350	24,380	24,400	24,430	24,450	24,470	24,500	24,520	9
10	24,390	24,420	24,450	24,480	24,510	24,530	24,550	24,580	24,610	24,640	24,670	24,690	24,720	24,750	24,780	24,800	24,830	24,860	24,890	24,910	24,940	10
11	24,690	24,720	24,760	24,790	24,820	24,850	24,880	24,910	24,940	24,970	25,000	25,030	25,070	25,100	25,130	25,160	25,190	25,220	25,250	25,280	25,310	11
12	25,010	25,050	25,090	25,130	25,160	25,200	25,220	25,260	25,300	25,330	25,370	25,400	25,440	25,470	25,500	25,540	25,570	25,610	25,640	25,670	25,710	12
13	25,310	25,350	25,390	25,430	25,470	25,510	25,540	25,580	25,620	25,660	25,700	25,740	25,770	25,810	25,850	25,890	25,930	25,960	26,000	26,040	26,070	13
14	25,580	25,630	25,670	25,720	25,760	25,810	25,840	25,880	25,930	25,970	26,010	26,050	26,090	26,140	26,180	26,220	26,260	26,300	26,340	26,380	26,420	14
15	25,890	25,930	25,970	26,020	26,070	26,120	26,150	26,200	26,250	26,290	26,340	26,390	26,430	26,480	26,520	26,570	26,610	26,650	26,700	26,740	26,780	15
16	26,180	26,220	26,260	26,300	26,360	26,410	26,450	26,500	26,550	26,600	26,650	26,700	26,750	26,800	26,850	26,900	26,940	26,990	27,040	27,090	27,130	16
17	26,560	26,600	26,640	26,680	26,720	26,770	26,800	26,840	26,880	26,920	26,960	27,020	27,070	27,120	27,170	27,230	27,280	27,330	27,380	27,430	27,480	17
18	26,920	26,960	27,000	27,040	27,070	27,110	27,130	27,170	27,200	27,230	27,270	27,320	27,380	27,430	27,490	27,550	27,600	27,660	27,710	27,770	27,820	18
19	27,140	27,250	27,350	27,450	27,510	27,550	27,570	27,600	27,640	27,670	27,700	27,740	27,780	27,820	27,860	27,890	27,930	27,970	28,020	28,080	28,140	19
20	27,380	27,540	27,710	27,850	27,940	27,970	28,000	28,030	28,060	28,090	28,110	28,140	28,160	28,190	28,210	28,230	28,240	28,270	28,320	28,390	28,450	20
21	27,380	27,540	27,710	27,850	27,980	28,080	28,170	28,280	28,380	28,480	28,590	28,660	28,690	28,710	28,730	28,750	28,770	28,790	28,820	28,860	28,890	21
22	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,060	29,180	29,200	29,220	29,240	29,260	29,270	29,290	29,300	29,310	29,310	22
23	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,060	29,200	29,310	29,410	29,510	29,610	29,720	29,820	29,920	29,940	29,950	23
24	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,090	29,270	29,450	29,640	29,820	30,010	30,200	30,380	30,530	30,560	30,570	24
25	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,090	29,270	29,450	29,640	29,820	30,010	30,200	30,380	30,530	30,640	30,750	25
26	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,090	29,270	29,450	29,640	29,820	30,010	30,200	30,390	30,590	30,780	30,980	26
27	27,380	27,540	27,710	27,880	28,050	28,220	28,380	28,550	28,730	28,910	29,090	29,270	29,450	29,640	29,820	30,010	30,200	30,390	30,590	30,780	30,980	27

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

HEADWATER ELEVATION

GATE ARRANGEMENT	1682.0	1682.1	1682.2	1682.3	1682.4	1682.5	1682.6	1682.7	1682.8	1682.9	1683.0	1683.1	1683.2	1683.3	1683.4	1683.5	1683.6	1683.7	1683.8	1683.9	1684.0	GATE ARRANGEMENT
1	3,780	3,780	3,780	3,780	3,780	3,790	3,790	3,790	3,790	3,790	3,790	3,790	3,800	3,800	3,800	3,800	3,800	3,800	3,810	3,810	3,810	1
2	7,560	7,560	7,560	7,560	7,570	7,570	7,570	7,580	7,580	7,580	7,590	7,590	7,590	7,600	7,600	7,600	7,600	7,610	7,610	7,610	7,620	2
3	11,330	11,340	11,340	11,350	11,350	11,360	11,360	11,360	11,370	11,370	11,380	11,380	11,390	11,390	11,400	11,400	11,410	11,410	11,420	11,420	11,430	3
4	15,110	15,120	15,120	15,130	15,130	15,140	15,150	15,150	15,160	15,170	15,170	15,180	15,180	15,190	15,200	15,200	15,210	15,210	15,220	15,230	15,230	4
5	18,890	18,900	18,900	18,910	18,920	18,930	18,930	18,940	18,950	18,960	18,960	18,970	18,980	18,990	19,000	19,000	19,010	19,020	19,030	19,030	19,040	5
6	22,670	22,670	22,680	22,690	22,700	22,710	22,720	22,730	22,740	22,750	22,760	22,770	22,780	22,790	22,790	22,800	22,810	22,820	22,830	22,840	22,850	6
7	23,420	23,420	23,440	23,450	23,470	23,480	23,500	23,510	23,530	23,540	23,560	23,570	23,590	23,600	23,610	23,620	23,640	23,650	23,670	23,680	23,700	7
8	24,140	24,150	24,170	24,190	24,210	24,230	24,250	24,270	24,290	24,310	24,330	24,350	24,370	24,390	24,400	24,420	24,440	24,460	24,470	24,490	24,510	8
9	24,520	24,530	24,560	24,580	24,600	24,630	24,650	24,670	24,690	24,720	24,740	24,760	24,780	24,810	24,820	24,840	24,860	24,880	24,910	24,930	24,950	9
10	24,940	24,960	24,980	25,010	25,030	25,060	25,090	25,110	25,140	25,160	25,190	25,210	25,240	25,260	25,280	25,310	25,330	25,360	25,380	25,400	25,430	10
11	25,310	25,330	25,360	25,390	25,410	25,440	25,470	25,500	25,530	25,560	25,590	25,620	25,640	25,670	25,690	25,720	25,750	25,770	25,800	25,830	25,850	11
12	25,710	25,730	25,760	25,790	25,830	25,860	25,890	25,920	25,950	25,990	26,020	26,050	26,080	26,110	26,130	26,160	26,190	26,220	26,250	26,280	26,310	12
13	26,070	26,100	26,130	26,170	26,210	26,240	26,280	26,310	26,350	26,380	26,420	26,450	26,480	26,520	26,540	26,580	26,610	26,640	26,680	26,710	26,740	13
14	26,420	26,450	26,490	26,520	26,560	26,600	26,640	26,680	26,720	26,750	26,790	26,830	26,870	26,900	26,930	26,970	27,000	27,040	27,070	27,110	27,150	14
15	26,780	26,820	26,860	26,900	26,940	26,990	27,030	27,070	27,110	27,150	27,190	27,230	27,270	27,310	27,340	27,380	27,420	27,460	27,500	27,540	27,580	15
16	27,130	27,170	27,210	27,260	27,310	27,350	27,400	27,440	27,480	27,530	27,570	27,620	27,660	27,700	27,740	27,780	27,820	27,860	27,910	27,950	27,990	16
17	27,480	27,520	27,570	27,620	27,670	27,720	27,770	27,820	27,860	27,910	27,960	28,010	28,050	28,100	28,140	28,180	28,230	28,270	28,320	28,360	28,410	17
18	27,820	27,860	27,920	27,970	28,020	28,070	28,130	28,180	28,230	28,280	28,330	28,380	28,430	28,480	28,520	28,570	28,620	28,670	28,720	28,760	28,810	18
19	28,140	28,180	28,240	28,300	28,350	28,410	28,460	28,520	28,570	28,630	28,680	28,740	28,790	28,840	28,890	28,940	28,990	29,040	29,090	29,150	29,200	19
20	28,450	28,500	28,560	28,620	28,680	28,740	28,800	28,860	28,910	28,970	29,030	29,090	29,140	29,200	29,250	29,300	29,360	29,410	29,470	29,520	29,570	20
21	28,890	28,920	28,950	28,980	29,010	29,060	29,120	29,180	29,240	29,300	29,370	29,430	29,490	29,550	29,600	29,650	29,710	29,770	29,830	29,890	29,940	21
22	29,310	29,310	29,310	29,320	29,330	29,370	29,440	29,510	29,570	29,640	29,700	29,760	29,830	29,890	29,940	30,000	30,070	30,130	30,190	30,250	30,310	22
23	29,950	29,940	29,950	29,950	29,960	29,990	30,020	30,050	30,070	30,100	30,130	30,150	30,180	30,240	30,300	30,370	30,430	30,490	30,560	30,620	30,680	23
24	30,570	30,560	30,570	30,570	30,570	30,570	30,560	30,550	30,550	30,530	30,520	30,520	30,530	30,600	30,650	30,720	30,790	30,850	30,920	30,990	31,050	24
25	30,750	30,840	30,940	31,040	31,140	31,240	31,340	31,440	31,540	31,640	31,740	31,850	31,970	32,030	32,050	32,070	32,090	32,110	32,130	32,150	32,160	25
26	30,980	31,160	31,360	31,560	31,770	31,970	32,170	32,380	32,590	32,800	33,010	33,220	33,410	33,450	33,420	33,400	33,380	33,350	33,320	33,290	33,250	26
27	30,980	31,160	31,360	31,560	31,770	31,970	32,170	32,380	32,590	32,800	33,010	33,220	33,410	33,530	33,620	33,710	33,810	33,910	34,010	34,100	34,200	27
28	30,980	31,160	31,360	31,560	31,770	31,970	32,170	32,380	32,590	32,800	33,010	33,220	33,440	33,650	33,860	34,080	34,300	34,520	34,740	34,970	35,190	28
29	30,980	31,160	31,360	31,560	31,770	31,970	32,170	32,380	32,590	32,800	33,010	33,220	33,440	33,650	33,860	34,080	34,300	34,520	34,740	34,970	35,190	29

HEADWATER ELEVATION

GATE ARRANGEMENT	1684.0	1684.1	1684.2	1684.3	1684.4	1684.5	1684.6	1684.7	1684.8	1684.9	1685.0	1685.1	1685.2	1685.3	1685.4	1685.5	1685.6	1685.7	1685.8	1685.9	1686.0	GATE ARRANGEMENT
1	3,810	3,810	3,810	3,810	3,810	3,820	3,820	3,820	3,820	3,820	3,820	3,830	3,830	3,830	3,830	3,830	3,830	3,830	3,840	3,840	3,840	1
2	7,620	7,620	7,620	7,630	7,630	7,630	7,640	7,640	7,640	7,640	7,650	7,650	7,650	7,660	7,660	7,660	7,670	7,670	7,670	7,670	7,680	2
3	11,430	11,430	11,430	11,440	11,440	11,450	11,450	11,460	11,460	11,470	11,470	11,480	11,480	11,480	11,490	11,490	11,500	11,500	11,510	11,510	11,520	3
4	15,230	15,240	15,250	15,250	15,260	15,260	15,270	15,280	15,280	15,290	15,290	15,300	15,310	15,310	15,320	15,330	15,330	15,340	15,340	15,350	15,360	4
5	19,040	19,050	19,060	19,060	19,070	19,080	19,090	19,100	19,100	19,110	19,120	19,130	19,130	19,140	19,150	19,160	19,160	19,170	19,180	19,190	19,190	5
6	22,850	22,860	22,870	22,880	22,890	22,900	22,910	22,910	22,920	22,930	22,940	22,950	22,960	22,970	22,980	22,990	23,000	23,010	23,020	23,020	23,030	6
7	23,700	23,710	23,720	23,740	23,750	23,770	23,780	23,790	23,800	23,820	23,830	23,850	23,860	23,870	23,890	23,900	23,920	23,930	23,950	23,950	23,960	7
8	24,510	24,530	24,550	24,570	24,590	24,610	24,630	24,640	24,650	24,670	24,690	24,710	24,730	24,750	24,770	24,790	24,800	24,820	24,840	24,850	24,870	8
9	24,950	24,970	24,990	25,020	25,040	25,060	25,080	25,090	25,110	25,130	25,150	25,180	25,200	25,220	25,240	25,260	25,280	25,300	25,320	25,330	25,350	9
10	25,430	25,450	25,480	25,500	25,530	25,550	25,580	25,590	25,610	25,640	25,660	25,680	25,710	25,730	25,760	25,780	25,800	25,830	25,850	25,860	25,890	10
11	25,850	25,880	25,910	25,940	25,960	25,990	26,020	26,030	26,060	26,090	26,110	26,140	26,170	26,190	26,220	26,240	26,270	26,300	26,320	26,340	26,360	11
12	26,310	26,340	26,370	26,400	26,430	26,460	26,490	26,510	26,540	26,570	26,600	26,630	26,660	26,690	26,720	26,740	26,770	26,800	26,830	26,850	26,880	12
13	26,740	26,780	26,810	26,840	26,870	26,910	26,940	26,960	26,990	27,020	27,060	27,090	27,120	27,150	27,180	27,210	27,240	27,270	27,310	27,330	27,360	13
14	27,150	27,180	27,220	27,250	27,290	27,320	27,360	27,380	27,420	27,450	27,490	27,520	27,550	27,590	27,620	27,650	27,690	27,720	27,760	27,780	27,810	14
15	27,580	27,620	27,660	27,690	27,730	27,770	27,810	27,840	27,870	27,910	27,950	27,990	28,020	28,060	28,100	28,130	28,170	28,200	28,240	28,270	28,300	15
16	27,990	28,030	28,070	28,110	28,150	28,200	28,240	28,270	28,310	28,350	28,390	28,430	28,470	28,510	28,540	28,580	28,620	28,660	28,700	28,730	28,770	16
17	28,410	28,450	28,500	28,540	28,590	28,630	28,670	28,710	28,750	28,790	28,840	28,880	28,920	28,960	29,010	29,050	29,090	29,130	29,170	29,200	29,250	17
18	28,810	28,860	28,910	28,950	29,000	29,050	29,090	29,130	29,180	29,220	29,270	29,310	29,360	29,400	29,450	29,490	29,540	29,580	29,630	29,660	29,710	18
19	29,200	29,250	29,300	29,350	29,400	29,450	29,500	29,540	29,590	29,640	29,680	29,730	29,780	29,830	29,880	29,920	29,970	30,020	30,070	30,100	30,150	19
20	29,570	29,630	29,680	29,740	29,790	29,840	29,890	29,940	29,990	30,040	30,090	30,140	30,190	30,240	30,300	30,350	30,400	30,450	30,500	30,530	30,580	20
21	29,940	30,000	30,060	30,110	30,170	30,230	30,280	30,330	30,380	30,440	30,490	30,550	30,600	30,650	30,710	30,760	30,810	30,870	30,920	30,960	31,010	21
22	30,310	30,370	30,430	30,490	30,550	30,610	30,670	30,720	30,770	30,830	30,890	30,950	31,000	31,060	31,120	31,170	31,230	31,280	31,340	31,380	31,440	22
23	30,680	30,750	30,810	30,870	30,930	30,990	31,050	31,100	31,170	31,230	31,290	31,350	31,410	31,470	31,530	31,590	31,640	31,700	31,760	31,810	31,870	23
24	31,050	31,120	31,180	31,240	31,310	31,370	31,430	31,490	31,550	31,620	31,680	31,740	31,810	31,870	31,930	32,000	32,060	32,120	32,180	32,230	32,290	24
25	32,160	32,180	32,190	32,200	32,210	32,220	32,230	32,280	32,350	32,420	32,490	32,550	32,620	32,690	32,750	32,820	32,880	32,950	33,010	33,060	33,130	25
26	33,250	33,220	33,180	33,140	33,090	33,050	33,020	33,080	33,150	33,220	33,290	33,360	33,430	33,500	33,570	33,640	33,710	33,780	33,840	33,900	33,970	26
27	34,200	34,290	34,390	34,480	34,490	34,460	34,450	34,460	34,480	34,500	34,520	34,540	34,560	34,570	34,580	34,600	34,610	34,620	34,680	34,750	34,820	27
28	35,190	35,420	35,650	35,850	35,900	35,880	35,860	35,820	35,800	35,760	35,730	35,700	35,660	35,620	35,580	35,530	35,490	35,460	35,530	35,600	35,680	28
29	35,190	35,420	35,650	35,850	35,980	36,090	36,190	36,290	36,390	36,500	36,600	36,700	36,800	36,910	37,010	37,010	36,970	36,960	36,980	37,000	37,020	29
30	35,190	35,420	35,650	35,880	36,110	36,340	36,580	36,800	37,040	37,280	37,520	37,760	38,000	38,240	38,450	38,480	38,460	38,430	38,400	38,370	38,330	30
31	35,190	35,420	35,650	35,880	36,110	36,340	36,580	36,800	37,040	37,280	37,520	37,760	38,000	38,240	38,450	38,580	38,690	38,800	38,910	39,020	39,120	31
32	35,190	35,420	35,650	35,880	36,110	36,340	36,580	36,800	37,040	37,280	37,520	37,760	38,000	38,240	38,490	38,730	38,980	39,230	39,480	39,720	39,970	32
33	35,190	35,420	35,650	35,880	36,110	36,340	36,580	36,800	37,040	37,280	37,520	37,760	38,000	38,240	38,490	38,730	38,980	39,230	39,480	39,720	39,970	33

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1686.0	1686.1	1686.2	1686.3	1686.4	1686.5	1686.6	1686.7	1686.8	1686.9	1687.0	1687.1	1687.2	1687.3	1687.4	1687.5	1687.6	1687.7	1687.8	1687.9	1688.0	
1	3,840	3,840	3,840	3,840	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,870	3,870	3,870	1
2	7,680	7,680	7,680	7,690	7,690	7,690	7,700	7,700	7,700	7,710	7,710	7,710	7,710	7,720	7,720	7,720	7,730	7,730	7,730	7,740	7,740	2
3	11,520	11,520	11,530	11,530	11,540	11,540	11,540	11,550	11,550	11,560	11,560	11,570	11,570	11,580	11,580	11,590	11,590	11,590	11,600	11,600	11,610	3
4	15,360	15,360	15,370	15,370	15,380	15,390	15,390	15,400	15,400	15,410	15,420	15,420	15,430	15,430	15,440	15,450	15,450	15,460	15,470	15,470	15,480	4
5	19,190	19,200	19,210	19,220	19,230	19,230	19,240	19,250	19,260	19,260	19,270	19,280	19,290	19,290	19,300	19,310	19,320	19,320	19,330	19,340	19,350	5
6	23,030	23,040	23,050	23,060	23,070	23,080	23,090	23,100	23,110	23,120	23,120	23,130	23,140	23,150	23,160	23,170	23,180	23,190	23,200	23,210	23,220	6
7	23,960	23,980	23,990	24,010	24,020	24,040	24,050	24,060	24,080	24,090	24,100	24,110	24,120	24,140	24,150	24,170	24,180	24,190	24,210	24,220	24,240	7
8	24,870	24,890	24,900	24,920	24,940	24,960	24,980	24,990	25,010	25,030	25,040	25,060	25,070	25,090	25,110	25,130	25,150	25,160	25,180	25,200	25,220	8
9	25,350	25,370	25,390	25,420	25,440	25,460	25,480	25,500	25,520	25,540	25,550	25,570	25,590	25,610	25,630	25,650	25,670	25,690	25,710	25,730	25,750	9
10	25,890	25,910	25,930	25,960	25,980	26,000	26,020	26,050	26,070	26,090	26,100	26,130	26,150	26,170	26,190	26,220	26,240	26,260	26,280	26,310	26,330	10
11	26,360	26,390	26,410	26,440	26,460	26,490	26,510	26,540	26,560	26,590	26,600	26,630	26,650	26,680	26,700	26,730	26,750	26,780	26,800	26,830	26,850	11
12	26,880	26,900	26,930	26,960	26,990	27,020	27,040	27,070	27,100	27,130	27,140	27,170	27,200	27,230	27,250	27,280	27,310	27,330	27,360	27,390	27,410	12
13	27,360	27,390	27,420	27,450	27,480	27,510	27,540	27,570	27,600	27,630	27,650	27,680	27,710	27,740	27,770	27,800	27,830	27,860	27,880	27,910	27,940	13
14	27,810	27,840	27,880	27,910	27,940	27,980	28,010	28,040	28,070	28,100	28,130	28,160	28,190	28,220	28,250	28,290	28,320	28,350	28,380	28,410	28,440	14
15	28,300	28,340	28,370	28,410	28,440	28,480	28,510	28,550	28,580	28,620	28,640	28,680	28,710	28,750	28,780	28,820	28,850	28,880	28,920	28,950	28,980	15
16	28,770	28,810	28,840	28,880	28,920	28,960	28,990	29,030	29,070	29,110	29,130	29,170	29,210	29,240	29,280	29,320	29,350	29,390	29,430	29,460	29,500	16
17	29,250	29,290	29,330	29,370	29,410	29,450	29,490	29,530	29,570	29,610	29,640	29,680	29,720	29,760	29,800	29,840	29,880	29,910	29,950	29,990	30,030	17
18	29,710	29,750	29,790	29,840	29,880	29,920	29,970	30,010	30,050	30,090	30,130	30,170	30,210	30,250	30,290	30,340	30,380	30,420	30,460	30,500	30,540	18
19	30,150	30,200	30,240	30,290	30,330	30,380	30,430	30,470	30,520	30,560	30,600	30,640	30,690	30,730	30,770	30,820	30,860	30,910	30,950	30,990	31,040	19
20	30,580	30,630	30,680	30,730	30,780	30,830	30,880	30,920	30,970	31,020	31,060	31,100	31,150	31,200	31,240	31,290	31,340	31,380	31,430	31,480	31,520	20
21	31,010	31,070	31,120	31,170	31,220	31,270	31,320	31,370	31,420	31,470	31,510	31,560	31,610	31,660	31,710	31,760	31,810	31,860	31,910	31,960	32,000	21
22	31,440	31,490	31,550	31,600	31,660	31,710	31,760	31,820	31,870	31,920	31,970	32,020	32,070	32,120	32,170	32,230	32,280	32,330	32,380	32,430	32,480	22
23	31,870	31,920	31,980	32,040	32,100	32,150	32,210	32,270	32,320	32,380	32,420	32,480	32,530	32,590	32,640	32,700	32,750	32,800	32,860	32,910	32,960	23
24	32,290	32,350	32,410	32,470	32,530	32,590	32,650	32,710	32,770	32,830	32,880	32,930	32,990	33,050	33,110	33,160	33,220	33,280	33,330	33,390	33,440	24
25	33,130	33,200	33,260	33,330	33,390	33,460	33,520	33,590	33,650	33,720	33,770	33,840	33,900	33,960	34,030	34,090	34,150	34,210	34,280	34,340	34,400	25
26	33,970	34,040	34,110	34,190	34,260	34,330	34,400	34,470	34,540	34,610	34,670	34,740	34,810	34,880	34,950	35,020	35,090	35,150	35,220	35,290	35,360	26
27	34,820	34,900	34,970	35,050	35,120	35,190	35,270	35,340	35,410	35,490	35,550	35,620	35,690	35,770	35,840	35,920	35,990	36,060	36,140	36,210	36,280	27
28	35,680	35,760	35,830	35,910	35,990	36,060	36,140	36,210	36,290	36,360	36,420	36,500	36,580	36,660	36,740	36,820	36,900	36,980	37,060	37,130	37,210	28
29	37,020	37,040	37,060	37,080	37,100	37,110	37,130	37,140	37,150	37,230	37,300	37,390	37,470	37,550	37,640	37,720	37,800	37,880	37,960	38,040	38,120	29
30	38,330	38,300	38,260	38,220	38,180	38,130	38,090	38,040	38,020	38,110	38,180	38,270	38,360	38,440	38,530	38,620	38,700	38,780	38,870	38,950	39,030	30
31	39,120	39,230	39,340	39,450	39,560	39,660	39,680	39,640	39,630	39,660	39,680	39,710	39,730	39,760	39,780	39,800	39,820	39,840	39,850	39,870	39,950	31
32	39,970	40,230	40,480	40,740	40,990	41,220	41,270	41,250	41,220	41,200	41,160	41,120	41,090	41,050	41,010	40,960	40,920	40,870	40,820	40,790	40,880	32
33	39,970	40,230	40,480	40,740	40,990	41,220	41,370	41,490	41,600	41,720	41,830	41,940	42,060	42,170	42,290	42,400	42,510	42,570	42,530	42,520	42,540	33
34	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,150	44,270	44,250	44,220	44,190	34
35	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,150	44,330	44,450	44,570	44,700	35
36	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,160	44,430	44,700	44,980	45,250	36
37	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,160	44,430	44,700	44,980	45,250	37
38	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,160	44,430	44,700	44,980	45,250	38
39	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,160	44,430	44,700	44,980	45,250	39
40	39,970	40,230	40,480	40,740	40,990	41,250	41,510	41,770	42,030	42,300	42,550	42,820	43,080	43,350	43,620	43,890	44,160	44,430	44,700	44,980	45,250	40

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1688.0	1688.1	1688.2	1688.3	1688.4	1688.5	1688.6	1688.7	1688.8	1688.9	1689.0	1689.1	1689.2	1689.3	1689.4	1689.5	1689.6	1689.7	1689.8	1689.9	1690.0	
1	3,870	3,870	3,870	3,870	3,880	3,880	3,880	3,880	3,880	3,880	3,880	3,890	3,890	3,890	3,890	3,890	3,890	3,890	3,900	3,900	3,900	1
2	7,740	7,740	7,740	7,750	7,750	7,750	7,760	7,760	7,760	7,770	7,770	7,770	7,770	7,780	7,780	7,780	7,790	7,790	7,790	7,800	7,800	2
3	11,610	11,610	11,620	11,620	11,630	11,630	11,640	11,640	11,640	11,650	11,650	11,660	11,660	11,670	11,670	11,680	11,680	11,680	11,690	11,690	11,700	3
4	15,480	15,480	15,490	15,500	15,500	15,510	15,510	15,520	15,530	15,530	15,540	15,540	15,550	15,560	15,560	15,570	15,570	15,580	15,590	15,590	15,600	4
5	19,350	19,350	19,360	19,370	19,380	19,380	19,390	19,400	19,410	19,410	19,420	19,430	19,440	19,440	19,450	19,460	19,470	19,470	19,480	19,490	19,500	5
6	23,220	23,220	23,230	23,240	23,250	23,260	23,270	23,280	23,290	23,300	23,310	23,320	23,320	23,330	23,340	23,350	23,360	23,370	23,380	23,390	23,400	6
7	24,240	24,240	24,250	24,270	24,280	24,290	24,310	24,320	24,340	24,350	24,360	24,380	24,380	24,390	24,410	24,420	24,440	24,450	24,460	24,480	24,490	7
8	25,220	25,220	25,240	25,260	25,280	25,290	25,310	25,330	25,350	25,360	25,380	25,400	25,410	25,420	25,440	25,460	25,470	25,490	25,510	25,530	25,540	8
9	25,750	25,760	25,780	25,800	25,820	25,840	25,850	25,870	25,890	25,910	25,930	25,950	25,960	25,980	26,000	26,020	26,040	26,060	26,080	26,100	26,120	9
10	26,330	26,340	26,360	26,380	26,410	26,430	26,450	26,470	26,490	26,520	26,540	26,560	26,570	26,590	26,610	26,630	26,660	26,680	26,700	26,720	26,740	10
11	26,850	26,860	26,890	26,910	26,940	26,960	26,980	27,010	27,030	27,060	27,080	27,100	27,120	27,140	27,160	27,190	27,210	27,230	27,260	27,280	27,300	11
12	27,410	27,430	27,460	27,480	27,510	27,540	27,560	27,590	27,610	27,640	27,670	27,690	27,710	27,730	27,760	27,790	27,810	27,840	27,860	27,890	27,910	12
13	27,940	27,960	27,990	28,020	28,050	28,080	28,100	28,130	28,160	28,190	28,220	28,250	28,260	28,290	28,320	28,350	28,380	28,400	28,430	28,460	28,490	13
14	28,440	28,460	28,490	28,530	28,560	28,590	28,620	28,650	28,680	28,710	28,740	28,770	28,790	28,820	28,850	28,880	28,910	28,940	28,970	29,000	29,030	14
15	28,980	29,010	29,040	29,070	29,110	29,140	29,170	29,210	29,240	29,270	29,310	29,340	29,360	29,390	29,430	29,460	29,490	29,520	29,550	29,590	29,620	15
16	29,500	29,520	29,560	29,600	29,630	29,670	29,700	29,740	29,770	29,810	29,840	29,880	29,900	29,940	29,970	30,010	30,040	30,070	30,110	30,140	30,180	16
17	30,030	30,060	30,100	30,130	30,170	30,210	30,250	30,290	30,320	30,360	30,400	30,440	30,460	30,500	30,540	30,570	30,610	30,650	30,680	30,720	30,760	17
18	30,540	30,570	30,610	30,650	30,690	30,730	30,770	30,810	30,850	30,890	30,930	30,970	31,000	31,040	31,080	31,120	31,160	31,200	31,240	31,270	31,310	18
19	31,040	31,070	31,110	31,160	31,200	31,240	31,280	31,330	31,370	31,410	31,450	31,490	31,530	31,570	31,610	31,650	31,690	31,730	31,770	31,810	31,860	19
20	31,520	31,560	31,600	31,650	31,690	31,740	31,780	31,830	31,870	31,920	31,960	32,000	32,040	32,080	32,130	32,170	32,210	32,260	32,300	32,340	32,390	20
21	32,000	32,040	32,090	32,140	32,180	32,230	32,280	32,330	32,370	32,420	32,470	32,510	32,550	32,600	32,640	32,690	32,730	32,780	32,830	32,870	32,920	21
22	32,480	32,520	32,570	32,620	32,670	32,720	32,770	32,820	32,870	32,920	32,970	33,020	33,060	33,110	33,150	33,200	33,250	33,300	33,350	33,390	33,440	22
23	32,960	33,010	33,060	33,110	33,170	33,220	33,270	33,320	33,370	33,430	33,480	33,530	33,570	33,620	33,670	33,720	33,770	33,820	33,870	33,920	33,970	23
24	33,440	33,490	33,550	33,600	33,660	33,710	33,770	33,820	33,870	33,930	33,980	34,040	34,080	34,130	34,190	34,240	34,290	34,350	34,400	34,450	34,500	24
25	34,400	34,450	34,510	34,570	34,630	34,690	34,750	34,810	34,870	34,930	34,990	35,050	35,100	35,160	35,220	35,280	35,330	35,390	35,450	35,510	35,560	25
26	35,360	35,410	35,480	35,550	35,610	35,680	35,740	35,810	35,870	35,940	36,000	36,070	36,120	36,190	36,250	36,310	36,380	36,440	36,500	36,560	36,630	26
27	36,280	36,340	36,420	36,490	36,560	36,630	36,700	36,770	36,840	36,910	36,980	37,050	37,110	37,180	37,250	37,320	37,390	37,460	37,530	37,590	37,660	27
28	37,210	37,280	37,360	37,430	37,510	37,590	37,660	37,740	37,820	37,890	37,970	38,040	38,110	38,180	38,260	38,330	38,410	38,480	38,550	38,630	38,700	28
29	38,120	38,190	38,270	38,350	38,430	38,520	38,600	38,680	38,760	38,840	38,920	38,990	39,060	39,140	39,220	39,300	39,370	39,450	39,530	39,610	39,690	29
30	39,030	39,100	39,190	39,270	39,360	39,440	39,530	39,610	39,700	39,780	39,860	39,940	40,020	40,100	40,180	40,260	40,340	40,430	40,510	40,600	40,680	30
31	39,950	40,030	40,120	40,210	40,300	40,390	40,480	40,560	40,650	40,740	40,820	40,910	40,980	41,070	41,150	41,240	41,330	41,410	41,500	41,590	41,670	31
32	40,880	40,960	41,050	41,150	41,240	41,330	41,430	41,520	41,610	41,700	41,790	41,880	41,960	42,040	42,130	42,220	42,310	42,400	42,490	42,580	42,660	32
33	42,540	42,560	42,590	42,620	42,650	42,680	42,700	42,720	42,740	42,760	42,780	42,850	42,930	43,030	43,120	43,220	43,310	43,400	43,500	43,590	43,680	33
34	44,190	44,150	44,110	44,080	44,040	43,990	43,950	43,900	43,850	43,800	43,760	43,820	43,910	44,010	44,110	44,210	44,310	44,410	44,510	44,600	44,700	34
35	44,700	44,810	44,930	45,050	45,170	45,290	45,410	45,520	45,640	45,760	45,890	46,060	46,250	46,440	46,640	46,830	47,030	47,220	47,420	47,620	47,770	35
36	45,250	45,520	45,800	46,080	46,360	46,640	46,920	47,200	47,480	47,770	48,050	48,340	48,620	48,910	49,200	49,490	49,780	50,070	50,360	50,650	50,830	36
37	45,250	45,520	45,800	46,080	46,360	46,640	46,920	47,200	47,480	47,770	48,050	48,340	48,620	48,910	49,200	49,490	49,780	50,070	50,360	50,650	50,870	37
38	45,250	45,520	45,800	46,080	46,360	46,640	46,920	47,200	47,480	47,770	48,050	48,340	48,620	48,910	49,200	49,490	49,780	50,070	50,360	50,660	50,950	38
39	45,250	45,520	45,800	46,080	46,360	46,640	46,920	47,200	47,480	47,770	48,050	48,340	48,620	48,910	49,200	49,490	49,780	50,070	50,360	50,660	50,950	39
40	45,250	45,520	45,800	46,080	46,360	46,640	46,920	47,200	47,480	47,770	48,050	48,340	48,620	48,910	49,200	49,490	49,780	50,070	50,360	50,660	50,950	40

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1690.0	1690.1	1690.2	1690.3	1690.4	1690.5	1690.6	1690.7	1690.8	1690.9	1691.0	1691.1	1691.2	1691.3	1691.4	1691.5	1691.6	1691.7	1691.8	1691.9	1692.0	
1	3,900	3,900	3,900	3,900	3,910	3,910	3,910	3,910	3,910	3,910	3,910	3,920	3,920	3,920	3,920	3,920	3,920	3,920	3,930	3,930	3,930	1
2	7,800	7,800	7,800	7,810	7,810	7,810	7,820	7,820	7,820	7,830	7,830	7,830	7,830	7,840	7,840	7,840	7,850	7,850	7,850	7,860	7,860	2
3	11,700	11,700	11,710	11,710	11,720	11,720	11,730	11,730	11,730	11,740	11,740	11,750	11,750	11,760	11,760	11,770	11,770	11,770	11,780	11,780	11,790	3
4	15,600	15,600	15,610	15,620	15,620	15,630	15,630	15,640	15,650	15,650	15,660	15,660	15,670	15,680	15,680	15,690	15,690	15,700	15,710	15,710	15,720	4
5	19,500	19,500	19,510	19,520	19,530	19,530	19,540	19,550	19,560	19,560	19,570	19,580	19,590	19,590	19,600	19,610	19,620	19,620	19,630	19,640	19,650	5
6	23,400	23,410	23,410	23,420	23,430	23,440	23,450	23,460	23,470	23,480	23,490	23,500	23,500	23,510	23,520	23,530	23,540	23,550	23,560	23,570	23,580	6
7	24,490	24,500	24,510	24,520	24,530	24,550	24,560	24,580	24,590	24,600	24,620	24,630	24,630	24,650	24,660	24,670	24,690	24,700	24,710	24,730	24,740	7
8	25,540	25,560	25,570	25,580	25,600	25,620	25,640	25,650	25,670	25,690	25,700	25,720	25,730	25,740	25,760	25,780	25,790	25,810	25,830	25,840	25,860	8
9	26,120	26,130	26,140	26,160	26,180	26,200	26,220	26,240	26,260	26,280	26,290	26,310	26,320	26,340	26,360	26,380	26,400	26,420	26,430	26,450	26,470	9
10	26,740	26,760	26,770	26,800	26,820	26,840	26,860	26,880	26,900	26,920	26,940	26,960	26,970	26,990	27,020	27,040	27,060	27,080	27,100	27,120	27,140	10
11	27,300	27,330	27,340	27,360	27,390	27,410	27,430	27,460	27,480	27,500	27,530	27,550	27,560	27,580	27,610	27,630	27,650	27,670	27,700	27,720	27,740	11
12	27,910	27,940	27,950	27,980	28,010	28,030	28,060	28,080	28,110	28,130	28,160	28,180	28,200	28,220	28,250	28,270	28,290	28,320	28,340	28,370	28,390	12
13	28,490	28,510	28,530	28,560	28,590	28,610	28,640	28,670	28,700	28,720	28,750	28,780	28,790	28,820	28,850	28,870	28,900	28,930	28,950	28,980	29,010	13
14	29,030	29,060	29,080	29,110	29,140	29,170	29,190	29,220	29,250	29,280	29,310	29,340	29,360	29,390	29,420	29,450	29,470	29,500	29,530	29,560	29,590	14
15	29,620	29,650	29,670	29,700	29,730	29,770	29,800	29,830	29,860	29,890	29,920	29,950	29,970	30,010	30,040	30,070	30,100	30,130	30,160	30,190	30,220	15
16	30,180	30,210	30,230	30,270	30,300	30,340	30,370	30,400	30,440	30,470	30,500	30,540	30,560	30,590	30,620	30,660	30,690	30,720	30,760	30,790	30,820	16
17	30,760	30,790	30,820	30,850	30,890	30,930	30,960	31,000	31,030	31,070	31,100	31,140	31,170	31,200	31,240	31,270	31,310	31,340	31,380	31,410	31,440	17
18	31,310	31,350	31,380	31,420	31,460	31,490	31,530	31,570	31,610	31,650	31,680	31,720	31,750	31,790	31,820	31,860	31,900	31,930	31,970	32,010	32,040	18
19	31,860	31,900	31,930	31,970	32,010	32,050	32,090	32,130	32,170	32,210	32,250	32,290	32,320	32,360	32,400	32,430	32,470	32,510	32,550	32,590	32,630	19
20	32,390	32,430	32,460	32,500	32,550	32,590	32,630	32,670	32,720	32,760	32,800	32,840	32,870	32,920	32,960	33,000	33,040	33,080	33,120	33,160	33,200	20
21	32,920	32,960	33,000	33,040	33,090	33,130	33,180	33,220	33,260	33,310	33,350	33,400	33,430	33,470	33,520	33,560	33,600	33,650	33,690	33,730	33,780	21
22	33,440	33,490	33,530	33,570	33,620	33,670	33,710	33,760	33,810	33,850	33,900	33,950	33,980	34,030	34,070	34,120	34,160	34,210	34,250	34,300	34,340	22
23	33,970	34,020	34,060	34,110	34,160	34,210	34,260	34,310	34,360	34,410	34,460	34,500	34,540	34,590	34,640	34,690	34,730	34,780	34,830	34,880	34,920	23
24	34,500	34,560	34,600	34,650	34,700	34,750	34,800	34,860	34,910	34,960	35,010	35,060	35,100	35,150	35,200	35,250	35,300	35,350	35,400	35,450	35,500	24
25	35,560	35,620	35,670	35,720	35,780	35,840	35,890	35,950	36,010	36,060	36,120	36,170	36,220	36,270	36,330	36,380	36,440	36,490	36,550	36,600	36,650	25
26	36,630	36,690	36,740	36,800	36,860	36,930	36,990	37,050	37,110	37,170	37,230	37,290	37,340	37,400	37,460	37,520	37,580	37,640	37,700	37,750	37,810	26
27	37,660	37,730	37,790	37,850	37,920	37,990	38,050	38,120	38,180	38,250	38,320	38,380	38,440	38,500	38,570	38,630	38,690	38,760	38,820	38,890	38,950	27
28	38,700	38,770	38,840	38,910	38,980	39,050	39,120	39,200	39,270	39,340	39,410	39,480	39,540	39,610	39,680	39,750	39,820	39,890	39,950	40,020	40,090	28
29	39,690	39,770	39,840	39,920	39,990	40,070	40,150	40,220	40,300	40,380	40,450	40,530	40,590	40,670	40,740	40,820	40,890	40,970	41,040	41,110	41,190	29
30	40,680	40,760	40,840	40,920	41,000	41,090	41,170	41,250	41,330	41,410	41,500	41,580	41,650	41,730	41,810	41,890	41,970	42,050	42,130	42,200	42,280	30
31	41,670	41,760	41,830	41,920	42,000	42,080	42,170	42,250	42,340	42,430	42,510	42,600	42,670	42,760	42,850	42,930	43,020	43,100	43,180	43,270	43,350	31
32	42,660	42,750	42,830	42,910	43,000	43,080	43,170	43,260	43,350	43,440	43,530	43,630	43,710	43,800	43,890	43,980	44,070	44,160	44,250	44,340	44,430	32
33	43,680	43,770	43,850	43,940	44,030	44,120	44,210	44,310	44,400	44,500	44,590	44,680	44,760	44,860	44,950	45,040	45,130	45,220	45,310	45,410	45,500	33
34	44,700	44,800	44,880	44,980	45,070	45,170	45,270	45,360	45,460	45,550	45,650	45,740	45,820	45,920	46,010	46,100	46,190	46,280	46,380	46,480	46,570	34
35	47,770	47,810	47,830	47,870	47,900	47,930	47,960	47,990	48,020	48,040	48,070	48,090	48,100	48,120	48,180	48,290	48,390	48,490	48,590	48,690	48,800	35
36	50,830	50,800	50,770	50,740	50,710	50,670	50,640	50,600	50,560	50,520	50,470	50,420	50,360	50,320	50,360	50,480	50,590	50,700	50,810	50,920	51,020	36
37	50,870	51,000	51,130	51,260	51,390	51,530	51,660	51,790	51,920	52,050	52,180	52,310	52,430	52,560	52,740	52,950	53,160	53,370	53,580	53,790	54,000	37
38	50,950	51,250	51,530	51,830	52,130	52,430	52,730	53,030	53,330	53,640	53,940	54,240	54,540	54,840	55,150	55,460	55,770	56,080	56,390	56,700	57,010	38
39	50,950	51,250	51,530	51,830	52,130	52,430	52,730	53,030	53,330	53,640	53,940	54,240	54,540	54,840	55,150	55,460	55,770	56,080	56,390	56,700	57,010	39
40	50,950	51,250	51,530	51,830	52,130	52,430	52,730	53,030	53,330	53,640	53,940	54,240	54,540	54,840	55,150	55,460	55,770	56,080	56,390	56,700	57,010	40

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1692.0	1692.1	1692.2	1692.3	1692.4	1692.5	1692.6	1692.7	1692.8	1692.9	1693.0	1693.1	1693.2	1693.3	1693.4	1693.5	1693.6	1693.7	1693.8	1693.9	1694.0	
1	3,930	3,930	3,930	3,930	3,940	3,940	3,940	3,940	3,940	3,940	3,940	3,950	3,950	3,950	3,950	3,950	3,950	3,950	3,960	3,960	3,960	1
2	7,860	7,860	7,860	7,870	7,870	7,870	7,880	7,880	7,880	7,890	7,890	7,890	7,890	7,900	7,900	7,900	7,910	7,910	7,910	7,910	7,920	2
3	11,790	11,790	11,800	11,800	11,810	11,810	11,810	11,820	11,820	11,830	11,830	11,840	11,840	11,850	11,850	11,850	11,860	11,860	11,870	11,870	11,880	3
4	15,720	15,720	15,730	15,730	15,740	15,750	15,750	15,760	15,760	15,770	15,780	15,780	15,790	15,790	15,800	15,810	15,810	15,820	15,820	15,830	15,840	4
5	19,650	19,650	19,660	19,670	19,680	19,680	19,690	19,700	19,710	19,710	19,720	19,730	19,740	19,740	19,750	19,760	19,770	19,770	19,780	19,790	19,790	5
6	23,580	23,580	23,590	23,600	23,610	23,620	23,630	23,640	23,650	23,660	23,660	23,670	23,680	23,690	23,700	23,710	23,720	23,730	23,740	23,740	23,750	6
7	24,740	24,740	24,760	24,770	24,780	24,800	24,810	24,820	24,840	24,850	24,850	24,870	24,880	24,890	24,910	24,920	24,930	24,950	24,960	24,960	24,980	7
8	25,860	25,870	25,880	25,900	25,920	25,930	25,950	25,970	25,980	26,000	26,010	26,020	26,040	26,060	26,070	26,090	26,110	26,120	26,140	26,140	26,160	8
9	26,470	26,480	26,500	26,520	26,540	26,550	26,570	26,590	26,610	26,630	26,640	26,650	26,670	26,690	26,710	26,730	26,740	26,760	26,780	26,790	26,810	9
10	27,140	27,150	27,170	27,190	27,210	27,230	27,250	27,270	27,290	27,310	27,320	27,340	27,360	27,380	27,400	27,420	27,440	27,470	27,490	27,500	27,520	10
11	27,740	27,750	27,780	27,800	27,820	27,840	27,870	27,890	27,910	27,930	27,940	27,970	27,990	28,010	28,030	28,050	28,080	28,100	28,120	28,130	28,150	11
12	28,390	28,410	28,430	28,460	28,480	28,500	28,530	28,550	28,580	28,600	28,620	28,640	28,660	28,690	28,710	28,740	28,760	28,780	28,810	28,820	28,840	12
13	29,010	29,020	29,050	29,080	29,100	29,130	29,160	29,180	29,210	29,230	29,250	29,280	29,300	29,330	29,350	29,380	29,400	29,430	29,460	29,470	29,500	13
14	29,590	29,610	29,630	29,660	29,690	29,720	29,750	29,770	29,800	29,830	29,850	29,880	29,900	29,930	29,960	29,990	30,010	30,040	30,070	30,090	30,110	14
15	30,220	30,240	30,270	30,300	30,330	30,360	30,390	30,420	30,450	30,480	30,500	30,530	30,560	30,590	30,620	30,650	30,680	30,710	30,740	30,760	30,790	15
16	30,820	30,840	30,880	30,910	30,940	30,970	31,000	31,040	31,070	31,100	31,120	31,150	31,190	31,220	31,250	31,280	31,310	31,340	31,370	31,400	31,430	16
17	31,440	31,470	31,500	31,540	31,570	31,610	31,640	31,680	31,710	31,740	31,770	31,800	31,830	31,870	31,900	31,940	31,970	32,000	32,040	32,060	32,090	17
18	32,040	32,070	32,110	32,140	32,180	32,220	32,250	32,290	32,330	32,360	32,390	32,420	32,460	32,490	32,530	32,570	32,600	32,640	32,670	32,700	32,730	18
19	32,630	32,660	32,700	32,740	32,770	32,810	32,850	32,890	32,930	32,960	32,990	33,030	33,070	33,110	33,140	33,180	33,220	33,260	33,290	33,320	33,360	19
20	33,200	33,230	33,270	33,310	33,360	33,400	33,440	33,480	33,520	33,560	33,590	33,630	33,670	33,710	33,740	33,780	33,820	33,860	33,900	33,930	33,970	20
21	33,780	33,810	33,850	33,890	33,940	33,980	34,020	34,060	34,110	34,150	34,180	34,220	34,260	34,310	34,350	34,390	34,430	34,470	34,510	34,540	34,580	21
22	34,340	34,380	34,420	34,470	34,510	34,560	34,600	34,650	34,690	34,730	34,770	34,810	34,860	34,900	34,940	34,990	35,030	35,070	35,120	35,150	35,190	22
23	34,920	34,960	35,010	35,050	35,100	35,150	35,190	35,240	35,290	35,330	35,370	35,420	35,460	35,510	35,550	35,600	35,640	35,690	35,730	35,770	35,810	23
24	35,500	35,540	35,590	35,640	35,680	35,730	35,780	35,830	35,880	35,930	35,960	36,010	36,060	36,110	36,160	36,200	36,250	36,300	36,350	36,380	36,430	24
25	36,650	36,700	36,750	36,810	36,860	36,910	36,970	37,020	37,070	37,120	37,170	37,220	37,270	37,320	37,380	37,430	37,480	37,530	37,580	37,620	37,680	25
26	37,810	37,860	37,920	37,980	38,040	38,090	38,150	38,210	38,270	38,320	38,370	38,430	38,480	38,540	38,600	38,650	38,710	38,770	38,820	38,870	38,920	26
27	38,950	39,000	39,070	39,130	39,190	39,250	39,320	39,380	39,440	39,500	39,560	39,620	39,680	39,740	39,800	39,860	39,920	39,980	40,040	40,090	40,150	27
28	40,090	40,150	40,220	40,290	40,350	40,420	40,490	40,560	40,620	40,690	40,740	40,810	40,880	40,940	41,010	41,070	41,140	41,210	41,270	41,320	41,390	28
29	41,190	41,250	41,320	41,400	41,470	41,540	41,610	41,690	41,760	41,830	41,890	41,960	42,030	42,100	42,170	42,240	42,310	42,380	42,450	42,510	42,580	29
30	42,280	42,350	42,430	42,510	42,580	42,660	42,740	42,820	42,890	42,970	43,030	43,110	43,190	43,260	43,340	43,410	43,490	43,560	43,640	43,700	43,770	30
31	43,350	43,430	43,510	43,590	43,680	43,760	43,840	43,920	44,000	44,090	44,160	44,240	44,320	44,400	44,480	44,560	44,640	44,720	44,800	44,870	44,950	31
32	44,430	44,510	44,590	44,680	44,770	44,860	44,950	45,030	45,120	45,210	45,280	45,370	45,460	45,540	45,630	45,710	45,800	45,880	45,960	46,040	46,120	32
33	45,500	45,580	45,670	45,770	45,860	45,950	46,040	46,130	46,230	46,320	46,400	46,490	46,580	46,670	46,760	46,850	46,940	47,030	47,120	47,200	47,290	33
34	46,570	46,660	46,760	46,860	46,950	47,050	47,140	47,240	47,330	47,430	47,510	47,610	47,700	47,800	47,890	47,990	48,090	48,180	48,280	48,360	48,450	34
35	48,800	48,890	48,990	49,090	49,190	49,290	49,390	49,490	49,590	49,700	49,790	49,890	49,990	50,090	50,190	50,290	50,390	50,490	50,590	50,680	50,770	35
36	51,020	51,120	51,230	51,330	51,440	51,540	51,650	51,750	51,860	51,970	52,070	52,170	52,280	52,380	52,490	52,590	52,700	52,800	52,900	53,000	53,100	36
37	54,000	54,200	54,410	54,620	54,680	54,730	54,770	54,810	54,850	54,890	54,920	54,960	55,000	55,030	55,070	55,100	55,130	55,170	55,280	55,380	55,490	37
38	57,010	57,310	57,620	57,880	57,920	57,900	57,880	57,860	57,830	57,800	57,770	57,730	57,700	57,670	57,630	57,590	57,550	57,550	57,670	57,770	57,890	38
39	57,010	57,310	57,620	57,880	58,060	58,210	58,360	58,510	58,660	58,810	58,950	59,090	59,240	59,390	59,540	59,680	59,830	60,010	60,230	60,450	60,680	39
40	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	40
41	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	41
42	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	42
43	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	43
44	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	44
45	57,010	57,310	57,620	57,940	58,250	58,560	58,880	59,200	59,530	59,850	60,170	60,500	60,830	61,160	61,490	61,830	62,160	62,490	62,830	63,160	63,500	45

FONTANA DAM
SPILLWAY TUNNEL DISCHARGE
IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1694.0	1694.1	1694.2	1694.3	1694.4	1694.5	1694.6	1694.7	1694.8	1694.9	1695.0	1695.1	1695.2	1695.3	1695.4	1695.5	1695.6	1695.7	1695.8	1695.9	1696.0	
1	3,960	3,960	3,960	3,960	3,960	3,970	3,970	3,970	3,970	3,970	3,970	3,980	3,980	3,980	3,980	3,980	3,980	3,980	3,990	3,990	3,990	1
2	7,920	7,920	7,920	7,930	7,930	7,930	7,940	7,940	7,940	7,940	7,950	7,950	7,950	7,960	7,960	7,960	7,960	7,970	7,970	7,970	7,980	2
3	11,880	11,880	11,890	11,890	11,890	11,900	11,900	11,910	11,910	11,920	11,920	11,930	11,930	11,930	11,940	11,940	11,950	11,950	11,960	11,960	11,970	3
4	15,840	15,840	15,850	15,850	15,860	15,870	15,870	15,880	15,880	15,890	15,890	15,900	15,910	15,910	15,920	15,920	15,930	15,940	15,940	15,950	15,950	4
5	19,790	19,800	19,810	19,820	19,820	19,830	19,840	19,850	19,850	19,860	19,870	19,880	19,880	19,890	19,900	19,910	19,910	19,920	19,930	19,930	19,940	5
6	23,750	23,760	23,770	23,780	23,790	23,800	23,810	23,820	23,820	23,830	23,840	23,850	23,860	23,870	23,880	23,890	23,890	23,900	23,910	23,920	23,930	6
7	24,980	24,990	25,000	25,020	25,030	25,040	25,060	25,070	25,070	25,080	25,100	25,110	25,120	25,140	25,150	25,160	25,170	25,180	25,190	25,210	25,220	7
8	26,160	26,180	26,190	26,210	26,230	26,240	26,260	26,280	26,280	26,300	26,310	26,330	26,350	26,360	26,380	26,390	26,400	26,420	26,430	26,450	26,460	8
9	26,810	26,830	26,840	26,860	26,880	26,900	26,920	26,930	26,940	26,960	26,980	26,990	27,010	27,030	27,050	27,070	27,070	27,090	27,110	27,130	27,140	9
10	27,520	27,540	27,560	27,570	27,590	27,610	27,630	27,650	27,660	27,680	27,700	27,720	27,740	27,760	27,780	27,800	27,810	27,830	27,850	27,870	27,890	10
11	28,150	28,180	28,200	28,220	28,240	28,260	28,280	28,310	28,320	28,340	28,360	28,380	28,400	28,420	28,450	28,470	28,480	28,500	28,520	28,540	28,560	11
12	28,840	28,870	28,890	28,920	28,940	28,960	28,990	29,010	29,020	29,050	29,070	29,090	29,120	29,140	29,160	29,190	29,200	29,220	29,250	29,270	29,290	12
13	29,500	29,520	29,550	29,570	29,600	29,620	29,650	29,680	29,690	29,720	29,740	29,770	29,790	29,820	29,840	29,870	29,880	29,910	29,930	29,960	29,980	13
14	30,110	30,140	30,170	30,200	30,220	30,250	30,280	30,300	30,320	30,350	30,370	30,400	30,430	30,460	30,480	30,510	30,530	30,550	30,580	30,600	30,630	14
15	30,790	30,820	30,850	30,880	30,900	30,930	30,960	30,990	31,010	31,040	31,070	31,100	31,130	31,150	31,180	31,210	31,230	31,260	31,290	31,320	31,340	15
16	31,430	31,460	31,490	31,520	31,550	31,580	31,610	31,640	31,660	31,690	31,730	31,760	31,790	31,820	31,850	31,880	31,900	31,930	31,960	31,990	32,020	16
17	32,090	32,130	32,160	32,190	32,220	32,260	32,290	32,320	32,350	32,380	32,410	32,440	32,480	32,510	32,540	32,570	32,600	32,630	32,660	32,690	32,720	17
18	32,730	32,770	32,800	32,840	32,870	32,910	32,940	32,980	33,000	33,040	33,070	33,100	33,140	33,170	33,210	33,240	33,270	33,300	33,330	33,370	33,400	18
19	33,360	33,390	33,430	33,470	33,510	33,540	33,580	33,620	33,640	33,680	33,710	33,750	33,790	33,820	33,860	33,900	33,920	33,960	33,990	34,030	34,060	19
20	33,970	34,010	34,050	34,090	34,130	34,160	34,200	34,240	34,270	34,310	34,350	34,380	34,420	34,460	34,500	34,540	34,560	34,600	34,640	34,680	34,710	20
21	34,580	34,630	34,670	34,710	34,750	34,790	34,830	34,870	34,900	34,940	34,980	35,020	35,060	35,100	35,140	35,180	35,210	35,250	35,290	35,330	35,370	21
22	35,190	35,240	35,280	35,320	35,360	35,410	35,450	35,490	35,520	35,560	35,610	35,650	35,690	35,730	35,770	35,820	35,850	35,890	35,930	35,970	36,010	22
23	35,810	35,860	35,900	35,950	35,990	36,040	36,080	36,130	36,160	36,200	36,250	36,290	36,340	36,380	36,420	36,470	36,500	36,540	36,590	36,630	36,670	23
24	36,430	36,480	36,520	36,570	36,620	36,660	36,710	36,760	36,790	36,840	36,880	36,930	36,980	37,020	37,070	37,110	37,150	37,190	37,240	37,280	37,330	24
25	37,680	37,730	37,780	37,830	37,880	37,930	37,980	38,030	38,070	38,120	38,170	38,220	38,270	38,320	38,370	38,420	38,460	38,510	38,560	38,610	38,660	25
26	38,920	38,980	39,030	39,090	39,140	39,200	39,250	39,310	39,350	39,410	39,460	39,520	39,570	39,620	39,680	39,730	39,780	39,830	39,880	39,940	39,990	26
27	40,150	40,210	40,270	40,330	40,390	40,450	40,510	40,570	40,620	40,680	40,740	40,800	40,850	40,910	40,970	41,030	41,080	41,130	41,190	41,250	41,310	27
28	41,390	41,450	41,520	41,580	41,650	41,710	41,770	41,840	41,890	41,950	42,020	42,080	42,140	42,210	42,270	42,330	42,380	42,440	42,510	42,570	42,630	28
29	42,580	42,650	42,720	42,790	42,860	42,930	42,990	43,060	43,120	43,190	43,260	43,320	43,390	43,460	43,520	43,590	43,650	43,710	43,780	43,850	43,910	29
30	43,770	43,850	43,920	43,990	44,070	44,140	44,210	44,290	44,350	44,420	44,490	44,570	44,640	44,710	44,780	44,850	44,910	44,980	45,050	45,120	45,190	30
31	44,950	45,020	45,100	45,180	45,260	45,340	45,410	45,490	45,560	45,640	45,710	45,790	45,870	45,940	46,020	46,090	46,160	46,230	46,310	46,380	46,460	31
32	46,120	46,210	46,290	46,370	46,460	46,540	46,620	46,700	46,770	46,860	46,940	47,020	47,100	47,180	47,260	47,340	47,410	47,490	47,570	47,650	47,730	32
33	47,290	47,380	47,460	47,550	47,640	47,730	47,820	47,900	47,980	48,070	48,150	48,240	48,320	48,410	48,500	48,580	48,660	48,740	48,830	48,910	48,990	33
34	48,450	48,550	48,640	48,740	48,830	48,920	49,010	49,110	49,190	49,280	49,370	49,460	49,550	49,640	49,740	49,830	49,910	50,000	50,080	50,170	50,260	34
35	50,770	50,870	50,970	51,070	51,170	51,270	51,370	51,470	51,560	51,660	51,760	51,860	51,950	52,050	52,150	52,250	52,340	52,440	52,540	52,640	52,740	35
36	53,100	53,200	53,310	53,420	53,530	53,630	53,740	53,850	53,940	54,050	54,150	54,260	54,360	54,460	54,570	54,670	54,780	54,890	55,000	55,110	55,220	36
37	55,490	55,600	55,720	55,830	55,940	56,050	56,160	56,270	56,370	56,470	56,580	56,690	56,800	56,910	57,020	57,130	57,240	57,350	57,460	57,570	57,680	37
38	57,890	58,010	58,120	58,240	58,350	58,470	58,580	58,690	58,790	58,900	59,010	59,130	59,250	59,360	59,480	59,590	59,700	59,810	59,930	60,040	60,150	38
39	60,680	60,910	61,140	61,360	61,590	61,820	62,050	62,230	62,270	62,320	62,360	62,410	62,460	62,500	62,550	62,590	62,630	62,670	62,710	62,750	62,780	39
40	63,500	63,830	64,170	64,520	64,860	65,200	65,530	65,720	65,700	65,680	65,670	65,650	65,620	65,600	65,570	65,550	65,510	65,470	65,440	65,400	65,380	40
41	63,500	63,830	64,170	64,520	64,860	65,200	65,530	65,770	65,930	66,090	66,260	66,420	66,590	66,750	66,910	67,080	67,230	67,390	67,550	67,710	67,890	41
42	63,500	63,830	64,170	64,520	64,860	65,200	65,550	65,890	66,230	66,580	66,920	67,270	67,630	67,980	68,330	68,680	69,030	69,380	69,740	70,100	70,460	42
43	63,500	63,830	64,170	64,520	64,860	65,200	65,550	65,890	66,230	66,580	66,920	67,270	67,630	67,980	68,330	68,680	69,030	69,380	69,740	70,100	70,460	43
44	63,500	63,830	64,170	64,520	64,860	65,200	65,550	65,890	66,230	66,580	66,920	67,270	67,630	67,980	68,330	68,680	69,030	69,380	69,740	70,100	70,460	44
45	63,500	63,830	64,170	64,520	64,860	65,200	65,550	65,890	66,230	66,580	66,920	67,270	67,630	67,980	68,330	68,680	69,030	69,380	69,740	70,100	70,460	45

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1696.0	1696.1	1696.2	1696.3	1696.4	1696.5	1696.6	1696.7	1696.8	1696.9	1697.0	1697.1	1697.2	1697.3	1697.4	1697.5	1697.6	1697.7	1697.8	1697.9	1698.0	
1	3,990	3,990	3,990	3,990	3,990	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,010	4,010	4,010	4,010	4,010	4,010	4,010	4,020	4,020	1
2	7,980	7,980	7,980	7,990	7,990	7,990	7,990	8,000	8,000	8,000	8,010	8,010	8,010	8,010	8,020	8,020	8,020	8,030	8,030	8,030	8,040	2
3	11,970	11,970	11,970	11,980	11,980	11,990	11,990	12,000	12,000	12,000	12,010	12,010	12,020	12,020	12,030	12,030	12,040	12,040	12,040	12,050	12,050	3
4	15,950	15,960	15,970	15,970	15,980	15,980	15,990	15,990	16,000	16,010	16,010	16,020	16,020	16,030	16,040	16,040	16,050	16,050	16,060	16,060	16,070	4
5	19,940	19,950	19,960	19,960	19,970	19,980	19,990	19,990	20,000	20,010	20,020	20,020	20,030	20,040	20,040	20,050	20,060	20,070	20,070	20,080	20,090	5
6	23,930	23,940	23,950	23,960	23,970	23,970	23,980	23,990	24,000	24,010	24,020	24,030	24,040	24,040	24,050	24,060	24,070	24,080	24,090	24,100	24,110	6
7	25,220	25,230	25,250	25,260	25,270	25,270	25,290	25,300	25,310	25,330	25,340	25,350	25,370	25,370	25,380	25,390	25,410	25,420	25,430	25,450	25,460	7
8	26,460	26,480	26,500	26,510	26,530	26,530	26,550	26,570	26,580	26,600	26,610	26,630	26,650	26,650	26,670	26,680	26,700	26,710	26,730	26,750	26,760	8
9	27,140	27,160	27,180	27,200	27,220	27,220	27,240	27,260	27,280	27,290	27,310	27,330	27,350	27,350	27,370	27,390	27,410	27,420	27,440	27,460	27,470	9
10	27,890	27,910	27,930	27,950	27,970	27,980	28,000	28,020	28,040	28,050	28,070	28,090	28,110	28,120	28,140	28,160	28,180	28,200	28,220	28,240	28,260	10
11	28,560	28,580	28,610	28,630	28,650	28,660	28,680	28,700	28,720	28,740	28,760	28,780	28,810	28,820	28,840	28,860	28,880	28,900	28,920	28,940	28,960	11
12	29,290	29,310	29,340	29,360	29,380	29,400	29,420	29,440	29,460	29,490	29,510	29,530	29,560	29,570	29,590	29,610	29,640	29,660	29,680	29,700	29,730	12
13	29,980	30,010	30,030	30,050	30,080	30,090	30,120	30,140	30,170	30,190	30,220	30,240	30,270	30,280	30,300	30,330	30,350	30,380	30,400	30,420	30,450	13
14	30,630	30,660	30,680	30,710	30,740	30,750	30,780	30,810	30,830	30,860	30,880	30,910	30,940	30,950	30,980	31,000	31,030	31,060	31,080	31,110	31,130	14
15	31,340	31,370	31,400	31,430	31,460	31,470	31,500	31,530	31,560	31,590	31,610	31,640	31,670	31,690	31,720	31,740	31,770	31,800	31,830	31,850	31,880	15
16	32,020	32,050	32,080	32,110	32,140	32,160	32,190	32,220	32,250	32,280	32,310	32,340	32,370	32,390	32,420	32,450	32,470	32,500	32,530	32,560	32,590	16
17	32,720	32,760	32,790	32,820	32,850	32,870	32,900	32,940	32,970	33,000	33,030	33,060	33,090	33,120	33,150	33,180	33,210	33,240	33,270	33,300	33,330	17
18	33,400	33,430	33,470	33,500	33,540	33,560	33,590	33,630	33,660	33,690	33,730	33,760	33,790	33,820	33,850	33,880	33,910	33,950	33,980	34,010	34,050	18
19	34,060	34,100	34,140	34,170	34,210	34,230	34,270	34,300	34,340	34,370	34,410	34,440	34,480	34,500	34,540	34,570	34,610	34,640	34,680	34,710	34,750	19
20	34,710	34,750	34,790	34,830	34,860	34,890	34,930	34,960	35,000	35,040	35,080	35,110	35,150	35,180	35,210	35,250	35,280	35,320	35,360	35,390	35,430	20
21	35,370	35,410	35,440	35,480	35,520	35,550	35,590	35,630	35,670	35,710	35,750	35,780	35,820	35,850	35,890	35,930	35,970	36,000	36,040	36,080	36,120	21
22	36,010	36,050	36,090	36,140	36,180	36,210	36,250	36,290	36,330	36,370	36,410	36,450	36,490	36,520	36,560	36,600	36,640	36,680	36,720	36,760	36,800	22
23	36,670	36,720	36,760	36,800	36,850	36,880	36,920	36,960	37,010	37,050	37,090	37,130	37,170	37,210	37,250	37,290	37,330	37,370	37,420	37,460	37,500	23
24	37,330	37,370	37,420	37,460	37,510	37,540	37,590	37,630	37,680	37,720	37,760	37,810	37,850	37,890	37,930	37,970	38,020	38,060	38,100	38,150	38,190	24
25	38,660	38,710	38,760	38,800	38,850	38,890	38,940	38,990	39,040	39,080	39,130	39,180	39,230	39,270	39,310	39,360	39,410	39,460	39,500	39,550	39,600	25
26	39,990	40,040	40,090	40,150	40,200	40,240	40,300	40,350	40,400	40,450	40,500	40,560	40,610	40,650	40,700	40,750	40,800	40,850	40,910	40,960	41,010	26
27	41,310	41,360	41,420	41,480	41,530	41,580	41,640	41,690	41,750	41,810	41,860	41,920	41,970	42,020	42,080	42,130	42,190	42,240	42,300	42,350	42,410	27
28	42,630	42,690	42,750	42,810	42,870	42,930	42,990	43,050	43,110	43,170	43,230	43,290	43,350	43,400	43,460	43,520	43,580	43,640	43,690	43,750	43,810	28
29	43,910	43,980	44,040	44,110	44,170	44,230	44,290	44,360	44,420	44,490	44,550	44,620	44,680	44,740	44,800	44,860	44,930	44,990	45,050	45,120	45,180	29
30	45,190	45,260	45,330	45,400	45,470	45,530	45,600	45,670	45,740	45,810	45,880	45,950	46,010	46,070	46,140	46,210	46,280	46,340	46,410	46,480	46,540	30
31	46,460	46,530	46,610	46,680	46,760	46,820	46,890	46,970	47,040	47,110	47,190	47,260	47,330	47,400	47,470	47,540	47,610	47,680	47,760	47,830	47,900	31
32	47,730	47,810	47,890	47,970	48,050	48,110	48,190	48,270	48,350	48,430	48,500	48,580	48,660	48,720	48,800	48,880	48,950	49,030	49,110	49,180	49,260	32
33	48,990	49,080	49,160	49,250	49,330	49,400	49,490	49,570	49,650	49,730	49,820	49,900	49,980	50,050	50,130	50,210	50,290	50,370	50,450	50,530	50,620	33
34	50,260	50,350	50,440	50,530	50,620	50,690	50,780	50,870	50,960	51,040	51,130	51,220	51,300	51,380	51,470	51,550	51,640	51,720	51,810	51,890	51,980	34
35	52,740	52,840	52,940	53,030	53,130	53,220	53,320	53,420	53,510	53,610	53,710	53,800	53,900	53,990	54,080	54,180	54,270	54,370	54,460	54,560	54,650	35
36	55,220	55,330	55,440	55,550	55,650	55,750	55,860	55,970	56,080	56,180	56,290	56,400	56,500	56,600	56,700	56,810	56,910	57,020	57,120	57,230	57,330	36
37	57,680	57,800	57,910	58,020	58,130	58,230	58,340	58,450	58,570	58,680	58,790	58,900	59,010	59,110	59,220	59,330	59,440	59,550	59,660	59,780	59,890	37
38	60,150	60,270	60,380	60,490	60,600	60,710	60,830	60,940	61,060	61,180	61,290	61,410	61,530	61,630	61,750	61,860	61,970	62,090	62,200	62,330	62,450	38
39	62,780	62,860	62,980	63,100	63,210	63,320	63,440	63,560	63,680	63,790	63,910	64,030	64,140	64,250	64,360	64,480	64,600	64,720	64,840	64,960	65,080	39
40	65,380	65,440	65,560	65,690	65,810	65,920	66,040	66,160	66,270	66,390	66,510	66,620	66,740	66,840	66,960	67,080	67,210	67,330	67,450	67,580	67,700	40
41	67,890	68,110	68,350	68,590	68,830	69,070	69,310	69,550	69,790	70,040	70,280	70,420	70,470	70,510	70,560	70,610	70,660	70,710	70,760	70,810	70,850	41
42	70,460	70,820	71,180	71,540	71,910	72,260	72,630	72,990	73,360	73,730	74,060	74,190	74,180	74,150	74,130	74,110	74,090	74,070	74,040	74,010	73,980	42
43	70,460	70,820	71,180	71,540	71,910	72,260	72,630	72,990	73,360	73,730	74,060	74,300	74,480	74,640	74,820	75,000	75,170	75,350	75,530	75,700	75,880	43
44	70,460	70,820	71,180	71,540	71,910	72,260	72,630	72,990	73,360	73,730	74,100	74,470	74,840	75,200	75,580	75,950	76,330	76,700	77,080	77,460	77,840	44
45	70,460	70,820	71,180	71,540	71,910	72,260	72,630	72,990	73,360	73,730	74,100	74,470	74,840	75,200	75,580	75,950	76,330	76,700	77,080	77,460	77,840	45

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1698.0	1698.1	1698.2	1698.3	1698.4	1698.5	1698.6	1698.7	1698.8	1698.9	1699.0	1699.1	1699.2	1699.3	1699.4	1699.5	1699.6	1699.7	1699.8	1699.9	1700.0	
1	4,020	4,020	4,020	4,020	4,020	4,020	4,030	4,030	4,030	4,030	4,030	4,030	4,040	4,040	4,040	4,040	4,040	4,040	4,040	4,050	4,050	1
2	8,040	8,040	8,040	8,040	8,050	8,050	8,050	8,060	8,060	8,060	8,060	8,070	8,070	8,070	8,080	8,080	8,080	8,080	8,090	8,090	8,090	2
3	12,050	12,060	12,060	12,070	12,070	12,070	12,080	12,080	12,090	12,090	12,100	12,100	12,110	12,110	12,110	12,120	12,120	12,130	12,130	12,140	12,140	3
4	16,070	16,080	16,080	16,090	16,090	16,100	16,110	16,110	16,120	16,120	16,130	16,130	16,140	16,150	16,150	16,160	16,160	16,170	16,170	16,180	16,190	4
5	20,090	20,100	20,100	20,110	20,120	20,120	20,130	20,140	20,150	20,150	20,160	20,170	20,180	20,180	20,190	20,200	20,200	20,210	20,220	20,230	20,230	5
6	24,110	24,110	24,120	24,130	24,140	24,150	24,160	24,170	24,180	24,180	24,190	24,200	24,210	24,220	24,230	24,240	24,240	24,250	24,260	24,270	24,280	6
7	25,460	25,460	25,470	25,490	25,500	25,510	25,530	25,540	25,550	25,550	25,570	25,580	25,590	25,610	25,620	25,630	25,630	25,650	25,660	25,670	25,690	7
8	26,760	26,770	26,780	26,800	26,810	26,830	26,850	26,860	26,880	26,880	26,900	26,910	26,930	26,950	26,960	26,980	26,980	27,000	27,010	27,030	27,040	8
9	27,470	27,480	27,500	27,520	27,530	27,550	27,570	27,590	27,600	27,610	27,630	27,640	27,660	27,680	27,700	27,710	27,720	27,740	27,750	27,770	27,790	9
10	28,260	28,260	28,280	28,300	28,320	28,340	28,360	28,380	28,400	28,410	28,430	28,440	28,460	28,480	28,500	28,520	28,530	28,550	28,570	28,580	28,600	10
11	28,960	28,970	28,990	29,010	29,030	29,050	29,080	29,100	29,120	29,130	29,150	29,170	29,190	29,210	29,230	29,250	29,260	29,280	29,300	29,320	29,340	11
12	29,730	29,740	29,760	29,780	29,800	29,830	29,850	29,870	29,890	29,910	29,930	29,950	29,970	29,990	30,020	30,040	30,050	30,070	30,090	30,120	30,140	12
13	30,450	30,460	30,490	30,510	30,540	30,560	30,580	30,610	30,630	30,640	30,670	30,690	30,720	30,740	30,760	30,790	30,800	30,820	30,850	30,870	30,900	13
14	31,130	31,150	31,170	31,200	31,230	31,250	31,280	31,300	31,330	31,340	31,370	31,390	31,420	31,440	31,470	31,490	31,510	31,530	31,560	31,580	31,610	14
15	31,880	31,900	31,930	31,950	31,980	32,010	32,040	32,060	32,090	32,110	32,130	32,160	32,190	32,220	32,240	32,270	32,290	32,310	32,340	32,370	32,390	15
16	32,590	32,610	32,640	32,670	32,700	32,730	32,760	32,780	32,810	32,830	32,860	32,890	32,920	32,950	32,980	33,000	33,020	33,050	33,080	33,110	33,140	16
17	33,330	33,350	33,390	33,420	33,450	33,480	33,510	33,540	33,570	33,590	33,620	33,650	33,680	33,710	33,740	33,770	33,790	33,820	33,850	33,880	33,910	17
18	34,050	34,070	34,100	34,130	34,170	34,200	34,230	34,260	34,300	34,320	34,350	34,380	34,420	34,450	34,480	34,510	34,530	34,570	34,600	34,630	34,660	18
19	34,750	34,770	34,800	34,840	34,870	34,910	34,940	34,980	35,010	35,030	35,070	35,100	35,130	35,170	35,200	35,240	35,260	35,290	35,330	35,360	35,390	19
20	35,430	35,460	35,490	35,530	35,560	35,600	35,640	35,670	35,710	35,730	35,770	35,800	35,840	35,870	35,910	35,950	35,970	36,010	36,040	36,080	36,110	20
21	36,120	36,150	36,180	36,220	36,260	36,300	36,330	36,370	36,410	36,440	36,470	36,510	36,550	36,590	36,620	36,660	36,690	36,720	36,760	36,800	36,830	21
22	36,800	36,830	36,870	36,910	36,950	36,990	37,030	37,070	37,110	37,130	37,170	37,210	37,250	37,290	37,330	37,370	37,400	37,430	37,470	37,510	37,550	22
23	37,500	37,530	37,570	37,610	37,650	37,700	37,740	37,780	37,820	37,850	37,890	37,930	37,970	38,010	38,050	38,090	38,120	38,160	38,200	38,240	38,280	23
24	38,190	38,220	38,270	38,310	38,350	38,400	38,440	38,480	38,530	38,560	38,600	38,640	38,690	38,730	38,770	38,810	38,840	38,890	38,930	38,970	39,010	24
25	39,600	39,640	39,680	39,730	39,780	39,820	39,870	39,920	39,960	40,000	40,050	40,090	40,140	40,180	40,230	40,280	40,310	40,360	40,400	40,450	40,490	25
26	41,010	41,050	41,100	41,150	41,200	41,250	41,300	41,350	41,400	41,440	41,490	41,540	41,590	41,640	41,690	41,740	41,780	41,830	41,880	41,930	41,980	26
27	42,410	42,450	42,510	42,560	42,620	42,670	42,720	42,780	42,830	42,880	42,930	42,980	43,040	43,090	43,150	43,200	43,240	43,300	43,350	43,400	43,450	27
28	43,810	43,860	43,920	43,980	44,040	44,100	44,150	44,210	44,270	44,320	44,380	44,430	44,490	44,550	44,610	44,660	44,710	44,770	44,820	44,880	44,940	28
29	45,180	45,230	45,300	45,360	45,420	45,480	45,540	45,610	45,670	45,720	45,780	45,840	45,910	45,970	46,030	46,090	46,140	46,200	46,260	46,320	46,380	29
30	46,540	46,600	46,670	46,740	46,800	46,870	46,930	47,000	47,070	47,120	47,190	47,250	47,320	47,380	47,450	47,510	47,570	47,630	47,700	47,760	47,830	30
31	47,900	47,960	48,030	48,100	48,170	48,240	48,310	48,380	48,450	48,510	48,580	48,650	48,720	48,790	48,860	48,930	48,990	49,060	49,130	49,200	49,260	31
32	49,260	49,320	49,400	49,470	49,550	49,620	49,700	49,770	49,850	49,910	49,990	50,060	50,130	50,210	50,280	50,350	50,420	50,490	50,560	50,630	50,710	32
33	50,620	50,690	50,760	50,840	50,920	51,000	51,080	51,160	51,240	51,310	51,390	51,460	51,540	51,620	51,700	51,780	51,840	51,920	52,000	52,070	52,150	33
34	51,980	52,050	52,140	52,220	52,300	52,390	52,470	52,550	52,640	52,710	52,790	52,880	52,960	53,040	53,120	53,200	53,280	53,360	53,440	53,520	53,600	34
35	54,650	54,740	54,830	54,920	55,020	55,110	55,200	55,300	55,390	55,470	55,560	55,650	55,750	55,840	55,930	56,020	56,100	56,190	56,280	56,370	56,460	35
36	57,330	57,430	57,530	57,630	57,740	57,840	57,940	58,040	58,150	58,240	58,340	58,440	58,540	58,640	58,740	58,840	58,930	59,030	59,130	59,230	59,330	36
37	59,890	59,990	60,110	60,220	60,340	60,450	60,560	60,670	60,790	60,890	61,000	61,110	61,220	61,330	61,440	61,550	61,650	61,760	61,870	61,980	62,090	37
38	62,450	62,570	62,690	62,820	62,940	63,060	63,190	63,310	63,430	63,540	63,660	63,790	63,910	64,030	64,150	64,270	64,380	64,500	64,620	64,740	64,860	38
39	65,080	65,200	65,320	65,440	65,560	65,680	65,810	65,930	66,050	66,160	66,290	66,410	66,530	66,660	66,780	66,900	67,010	67,130	67,250	67,380	67,500	39
40	67,700	67,810	67,930	68,050	68,170	68,290	68,410	68,530	68,650	68,760	68,890	69,020	69,140	69,270	69,390	69,520	69,630	69,750	69,880	70,000	70,120	40
41	70,850	70,890	70,930	70,970	71,010	71,120	71,240	71,360	71,480	71,600	71,720	71,840	71,970	72,090	72,210	72,330	72,440	72,560	72,680	72,800	72,930	41
42	73,980	73,940	73,910	73,870	73,860	73,950	74,070	74,200	74,320	74,430	74,550	74,670	74,790	74,910	75,030	75,140	75,250	75,360	75,480	75,610	75,740	42
43	75,880	76,040	76,210	76,390	76,580	76,830	77,080	77,340	77,590	77,840	78,090	78,350	78,600	78,860	79,110	79,200	79,240	79,290	79,340	79,400	79,450	43
44	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,180	83,260	83,230	83,210	83,190	83,170	83,140	44
45	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,180	83,420	83,600	83,790	83,980	84,170	84,350	45
46	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,240	83,640	84,020	84,420	84,820	85,220	85,620	46
47	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,240	83,640	84,020	84,420	84,820	85,220	85,620	47
48	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,240	83,640	84,020	84,420	84,820	85,220	85,620	48
49	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,240	83,640	84,020	84,420	84,820	85,220	85,620	49
50	77,840	78,210	78,590	78,970	79,360	79,740	80,130	80,510	80,900	81,280	81,670	82,060	82,450	82,850	83,240	83,640	84,020	84,420	84,820	85,220	85,620	50

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE OPENING	HEADWATER ELEVATION																					GATE OPENING
	1700.0	1700.1	1700.2	1700.3	1700.4	1700.5	1700.6	1700.7	1700.8	1700.9	1701.0	1701.1	1701.2	1701.3	1701.4	1701.5	1701.6	1701.7	1701.8	1701.9	1702.0	
1	4,050	4,050	4,050	4,050	4,050	4,050	4,060	4,060	4,060	4,060	4,060	4,060	4,060	4,070	4,070	4,070	4,070	4,070	4,070	4,070	4,080	1
2	8,090	8,100	8,100	8,100	8,100	8,110	8,110	8,110	8,120	8,120	8,120	8,120	8,130	8,130	8,130	8,140	8,140	8,140	8,150	8,150	8,150	2
3	12,140	12,140	12,150	12,150	12,160	12,160	12,170	12,170	12,170	12,180	12,180	12,190	12,190	12,200	12,200	12,200	12,210	12,210	12,220	12,220	12,230	3
4	16,190	16,190	16,200	16,200	16,210	16,220	16,220	16,230	16,230	16,240	16,240	16,250	16,260	16,260	16,270	16,270	16,280	16,280	16,290	16,300	16,300	4
5	20,230	20,240	20,250	20,250	20,260	20,270	20,280	20,280	20,290	20,300	20,310	20,310	20,320	20,330	20,330	20,340	20,350	20,360	20,360	20,370	20,380	5
6	24,280	24,290	24,300	24,310	24,310	24,320	24,330	24,340	24,350	24,360	24,370	24,370	24,380	24,390	24,400	24,410	24,420	24,430	24,440	24,440	24,450	6
7	25,690	25,700	25,710	25,720	25,730	25,740	25,750	25,770	25,780	25,790	25,800	25,810	25,820	25,830	25,840	25,860	25,870	25,880	25,900	25,900	25,910	7
8	27,040	27,060	27,080	27,090	27,100	27,110	27,130	27,140	27,160	27,170	27,190	27,190	27,210	27,230	27,240	27,260	27,270	27,290	27,300	27,310	27,320	8
9	27,790	27,810	27,820	27,840	27,850	27,860	27,880	27,900	27,910	27,930	27,950	27,950	27,970	27,990	28,010	28,020	28,040	28,060	28,070	28,080	28,100	9
10	28,600	28,620	28,640	28,660	28,670	28,690	28,710	28,720	28,740	28,760	28,780	28,790	28,810	28,820	28,840	28,860	28,880	28,900	28,920	28,930	28,940	10
11	29,340	29,360	29,380	29,400	29,410	29,430	29,450	29,470	29,490	29,510	29,530	29,540	29,560	29,580	29,600	29,620	29,640	29,660	29,680	29,690	29,710	11
12	30,140	30,160	30,180	30,200	30,220	30,240	30,260	30,280	30,300	30,320	30,350	30,360	30,380	30,400	30,420	30,440	30,470	30,490	30,510	30,520	30,540	12
13	30,900	30,920	30,940	30,970	30,980	31,000	31,030	31,050	31,070	31,100	31,120	31,130	31,160	31,180	31,200	31,220	31,250	31,270	31,290	31,310	31,330	13
14	31,610	31,630	31,660	31,680	31,700	31,720	31,750	31,770	31,800	31,820	31,850	31,860	31,890	31,910	31,940	31,960	31,990	32,010	32,040	32,050	32,070	14
15	32,390	32,420	32,450	32,470	32,490	32,520	32,540	32,570	32,600	32,620	32,650	32,670	32,690	32,720	32,740	32,770	32,800	32,820	32,850	32,870	32,890	15
16	33,140	33,160	33,190	33,220	33,240	33,270	33,300	33,320	33,350	33,380	33,410	33,430	33,450	33,480	33,510	33,540	33,570	33,590	33,620	33,640	33,670	16
17	33,910	33,940	33,970	34,000	34,020	34,050	34,080	34,110	34,140	34,170	34,200	34,220	34,250	34,280	34,310	34,340	34,370	34,400	34,430	34,450	34,480	17
18	34,660	34,690	34,720	34,760	34,780	34,810	34,840	34,870	34,900	34,930	34,970	34,990	35,020	35,050	35,080	35,110	35,140	35,170	35,200	35,230	35,260	18
19	35,390	35,430	35,460	35,490	35,520	35,550	35,580	35,620	35,650	35,680	35,720	35,740	35,770	35,800	35,840	35,870	35,900	35,930	35,970	35,990	36,020	19
20	36,110	36,150	36,180	36,220	36,240	36,280	36,310	36,350	36,380	36,410	36,450	36,470	36,510	36,540	36,580	36,610	36,650	36,680	36,710	36,740	36,770	20
21	36,830	36,870	36,910	36,940	36,970	37,010	37,040	37,080	37,120	37,150	37,190	37,210	37,250	37,290	37,320	37,360	37,390	37,430	37,470	37,490	37,530	21
22	37,550	37,590	37,630	37,660	37,690	37,730	37,770	37,810	37,850	37,880	37,920	37,950	37,990	38,020	38,060	38,100	38,140	38,170	38,210	38,240	38,280	22
23	38,280	38,320	38,360	38,400	38,430	38,470	38,510	38,550	38,590	38,630	38,670	38,700	38,740	38,780	38,820	38,860	38,900	38,940	38,980	39,000	39,040	23
24	39,010	39,050	39,100	39,140	39,170	39,210	39,250	39,290	39,330	39,380	39,420	39,450	39,490	39,530	39,570	39,610	39,650	39,690	39,730	39,760	39,810	24
25	40,490	40,540	40,580	40,630	40,660	40,710	40,750	40,800	40,840	40,890	40,930	40,970	41,010	41,060	41,100	41,150	41,190	41,240	41,280	41,310	41,360	25
26	41,980	42,030	42,080	42,120	42,160	42,210	42,260	42,310	42,360	42,410	42,450	42,490	42,540	42,590	42,640	42,680	42,730	42,780	42,830	42,860	42,910	26
27	43,450	43,510	43,560	43,610	43,650	43,710	43,760	43,810	43,860	43,920	43,970	44,010	44,060	44,110	44,160	44,220	44,270	44,320	44,370	44,410	44,460	27
28	44,940	44,990	45,050	45,110	45,150	45,210	45,260	45,320	45,380	45,430	45,490	45,530	45,590	45,640	45,700	45,750	45,810	45,860	45,920	45,960	46,020	28
29	46,380	46,440	46,500	46,560	46,610	46,670	46,730	46,790	46,850	46,910	46,970	47,020	47,080	47,140	47,200	47,260	47,320	47,380	47,430	47,480	47,540	29
30	47,830	47,890	47,960	48,020	48,070	48,140	48,200	48,260	48,330	48,390	48,450	48,510	48,570	48,630	48,700	48,760	48,820	48,880	48,950	49,000	49,060	30
31	49,260	49,330	49,400	49,470	49,530	49,590	49,660	49,730	49,800	49,860	49,930	49,990	50,060	50,120	50,190	50,250	50,320	50,390	50,450	50,510	50,580	31
32	50,710	50,780	50,850	50,920	50,990	51,060	51,130	51,200	51,270	51,340	51,410	51,470	51,550	51,620	51,690	51,760	51,830	51,900	51,970	52,030	52,100	32
33	52,150	52,230	52,300	52,380	52,450	52,520	52,600	52,670	52,750	52,820	52,900	52,960	53,040	53,110	53,190	53,260	53,340	53,410	53,490	53,550	53,620	33
34	53,600	53,680	53,760	53,840	53,910	53,990	54,070	54,150	54,230	54,310	54,390	54,460	54,540	54,620	54,700	54,770	54,850	54,930	55,010	55,080	55,150	34
35	56,460	56,550	56,640	56,730	56,810	56,900	56,990	57,080	57,170	57,250	57,340	57,420	57,510	57,600	57,680	57,770	57,860	57,940	58,030	58,110	58,190	35
36	59,330	59,430	59,530	59,630	59,720	59,810	59,910	60,010	60,110	60,200	60,300	60,390	60,480	60,580	60,680	60,770	60,870	60,960	61,060	61,140	61,240	36
37	62,090	62,200	62,310	62,420	62,510	62,620	62,730	62,840	62,940	63,050	63,160	63,250	63,360	63,460	63,570	63,680	63,780	63,890	63,990	64,080	64,190	37
38	64,860	64,970	65,090	65,210	65,320	65,440	65,550	65,670	65,790	65,900	66,020	66,120	66,240	66,350	66,470	66,580	66,700	66,810	66,930	67,030	67,140	38
39	67,500	67,620	67,740	67,870	67,980	68,110	68,240	68,370	68,490	68,620	68,750	68,860	68,990	69,110	69,240	69,360	69,490	69,610	69,730	69,850	69,970	39
40	70,120	70,240	70,370	70,510	70,640	70,780	70,910	71,050	71,190	71,320	71,460	71,590	71,720	71,860	71,990	72,130	72,260	72,400	72,530	72,650	72,790	40
41	72,930	73,060	73,190	73,320	73,440	73,570	73,710	73,840	73,970	74,100	74,230	74,350	74,480	74,610	74,750	74,880	75,010	75,150	75,280	75,400	75,530	41
42	75,740	75,870	76,000	76,130	76,250	76,370	76,500	76,630	76,750	76,880	77,000	77,110	77,240	77,370	77,510	77,640	77,770	77,900	78,040	78,160	78,290	42
43	79,450	79,500	79,550	79,600	79,640	79,680	79,730	79,770	79,820	79,940	80,070	80,180	80,300	80,430	80,560	80,680	80,810	80,930	81,050	81,170	81,290	43
44	83,140	83,120	83,090	83,060	83,020	82,980	82,950	82,910	82,910	83,020	83,140	83,260	83,380	83,500	83,620	83,730	83,850	83,970	84,080	84,190	84,300	44
45	84,350	84,540	84,730	84,910	85,090	85,280	85,460	85,640	85,860	86,120	86,390	86,640	86,910	87,180	87,440	87,710	87,970	88,240	88,490	88,530	88,580	45
46	85,620	86,020	86,420	86,820	87,220	87,620	88,030	88,430	88,840	89,250	89,660	90,060	90,470	90,890	91,300	91,720	92,130	92,550	92,860	92,850	92,830	46
47	85,620	86,020	86,420	86,820	87,220	87,620	88,030	88,430	88,840	89,250	89,660	90,060	90,470	90,890	91,300	91,720	92,130	92,550	92,870	93,080	93,280	47
48	85,620	86,020	86,420	86,820	87,220	87,620	88,030	88,430	88,840	89,250	89,660	90,060	90,470	90,890	91,300	91,720	92,130	92,550	92,970	93,380	93,800	48
49	85,620	86,020	86,420	86,820	87,220	87,620	88,030	88,430	88,840	89,250	89,660	90,060	90,470	90,890	91,300	91,720	92,130	92,550	92,970	93,380	93,800	49
50	85,620	86,020	86,420	86,820	87,220	87,620	88,030	88,430	88,840	89,250	89,660	90,060	90,470	90,890	91,300	91,720	92,130	92,550	92,970	93,380	93,800	50

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1702.0	1702.1	1702.2	1702.3	1702.4	1702.5	1702.6	1702.7	1702.8	1702.9	1703.0	1703.1	1703.2	1703.3	1703.4	1703.5	1703.6	1703.7	1703.8	1703.9	1704.0	
1	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,090	4,090	4,090	4,090	4,090	4,090	4,090	4,100	4,100	4,100	4,100	4,100	4,100	4,100	1
2	8,150	8,150	8,160	8,160	8,160	8,170	8,170	8,170	8,170	8,180	8,180	8,180	8,190	8,190	8,190	8,190	8,200	8,200	8,200	8,210	8,210	2
3	12,230	12,230	12,230	12,240	12,240	12,250	12,250	12,260	12,260	12,260	12,270	12,270	12,280	12,280	12,290	12,290	12,290	12,300	12,300	12,310	12,310	3
4	16,300	16,310	16,310	16,320	16,320	16,330	16,340	16,340	16,350	16,350	16,360	16,360	16,370	16,380	16,380	16,390	16,390	16,400	16,400	16,410	16,420	4
5	20,380	20,380	20,390	20,400	20,410	20,410	20,420	20,430	20,430	20,440	20,450	20,460	20,460	20,470	20,480	20,480	20,490	20,500	20,510	20,510	20,520	5
6	24,450	24,460	24,470	24,480	24,490	24,500	24,500	24,510	24,520	24,530	24,540	24,550	24,560	24,560	24,570	24,580	24,590	24,600	24,610	24,620	24,620	6
7	25,910	25,920	25,940	25,950	25,960	25,970	25,980	25,990	26,000	26,020	26,030	26,040	26,050	26,060	26,070	26,080	26,090	26,110	26,120	26,130	26,130	7
8	27,320	27,340	27,350	27,370	27,380	27,400	27,400	27,420	27,430	27,450	27,470	27,480	27,500	27,500	27,520	27,530	27,550	27,560	27,580	27,590	27,600	8
9	28,100	28,110	28,130	28,150	28,160	28,180	28,190	28,200	28,220	28,240	28,250	28,270	28,290	28,290	28,310	28,330	28,340	28,360	28,380	28,390	28,400	9
10	28,940	28,960	28,980	29,000	29,020	29,040	29,040	29,060	29,080	29,100	29,120	29,140	29,150	29,160	29,180	29,200	29,220	29,230	29,250	29,270	29,280	10
11	29,710	29,730	29,750	29,770	29,790	29,810	29,820	29,840	29,860	29,880	29,900	29,920	29,940	29,950	29,970	29,990	30,010	30,030	30,050	30,070	30,080	11
12	30,540	30,560	30,590	30,610	30,630	30,650	30,660	30,680	30,700	30,720	30,750	30,770	30,790	30,800	30,820	30,840	30,860	30,880	30,900	30,930	30,940	12
13	31,330	31,350	31,380	31,400	31,420	31,440	31,460	31,480	31,500	31,530	31,550	31,570	31,590	31,610	31,630	31,650	31,680	31,700	31,720	31,740	31,760	13
14	32,070	32,100	32,120	32,150	32,170	32,200	32,210	32,240	32,260	32,280	32,310	32,330	32,360	32,370	32,390	32,420	32,440	32,470	32,490	32,510	32,530	14
15	32,890	32,920	32,940	32,970	33,000	33,020	33,040	33,060	33,090	33,120	33,140	33,170	33,190	33,210	33,230	33,260	33,290	33,310	33,340	33,360	33,380	15
16	33,670	33,690	33,720	33,750	33,780	33,800	33,820	33,850	33,880	33,900	33,930	33,960	33,990	34,000	34,030	34,060	34,080	34,110	34,140	34,170	34,180	16
17	34,480	34,510	34,540	34,560	34,590	34,620	34,640	34,670	34,700	34,730	34,760	34,790	34,820	34,830	34,860	34,890	34,920	34,950	34,980	35,010	35,030	17
18	35,260	35,290	35,320	35,350	35,380	35,410	35,430	35,460	35,490	35,520	35,550	35,580	35,610	35,630	35,660	35,700	35,730	35,760	35,790	35,820	35,840	18
19	36,020	36,050	36,090	36,120	36,150	36,180	36,210	36,240	36,270	36,300	36,330	36,370	36,400	36,420	36,450	36,480	36,520	36,550	36,580	36,610	36,630	19
20	36,770	36,810	36,840	36,870	36,910	36,940	36,970	37,000	37,030	37,070	37,100	37,130	37,170	37,190	37,220	37,260	37,290	37,320	37,360	37,390	37,410	20
21	37,530	37,560	37,600	37,630	37,670	37,710	37,730	37,770	37,800	37,840	37,870	37,910	37,940	37,970	38,000	38,040	38,070	38,110	38,140	38,180	38,200	21
22	38,280	38,310	38,350	38,390	38,420	38,460	38,490	38,520	38,560	38,600	38,640	38,670	38,710	38,740	38,770	38,810	38,840	38,880	38,920	38,950	38,980	22
23	39,040	39,080	39,120	39,160	39,200	39,240	39,270	39,300	39,340	39,380	39,420	39,460	39,500	39,520	39,560	39,600	39,640	39,680	39,710	39,750	39,780	23
24	39,810	39,850	39,890	39,930	39,970	40,010	40,040	40,080	40,120	40,160	40,200	40,240	40,280	40,310	40,350	40,390	40,430	40,470	40,510	40,540	40,570	24
25	41,360	41,400	41,450	41,490	41,530	41,580	41,610	41,650	41,700	41,740	41,780	41,830	41,870	41,900	41,950	41,990	42,030	42,080	42,120	42,160	42,190	25
26	42,910	42,960	43,010	43,050	43,100	43,150	43,190	43,230	43,280	43,330	43,370	43,420	43,470	43,500	43,550	43,600	43,640	43,690	43,730	43,780	43,820	26
27	44,460	44,510	44,560	44,620	44,670	44,720	44,760	44,810	44,860	44,910	44,960	45,010	45,060	45,100	45,150	45,200	45,250	45,300	45,350	45,400	45,440	27
28	46,020	46,070	46,130	46,180	46,240	46,290	46,340	46,390	46,440	46,500	46,550	46,600	46,660	46,700	46,760	46,810	46,860	46,920	46,970	47,020	47,060	28
29	47,540	47,600	47,660	47,720	47,770	47,830	47,880	47,940	47,990	48,050	48,110	48,170	48,220	48,270	48,330	48,380	48,440	48,500	48,550	48,610	48,660	29
30	49,060	49,120	49,180	49,250	49,310	49,370	49,420	49,480	49,540	49,600	49,660	49,730	49,790	49,840	49,900	49,960	50,020	50,080	50,140	50,200	50,250	30
31	50,580	50,640	50,710	50,770	50,840	50,900	50,960	51,020	51,090	51,150	51,220	51,280	51,350	51,400	51,470	51,530	51,590	51,660	51,720	51,780	51,840	31
32	52,100	52,170	52,240	52,300	52,370	52,440	52,500	52,570	52,640	52,710	52,780	52,840	52,910	52,970	53,040	53,110	53,170	53,240	53,310	53,380	53,430	32
33	53,620	53,700	53,770	53,840	53,920	53,990	54,050	54,130	54,200	54,270	54,340	54,420	54,490	54,550	54,620	54,690	54,760	54,840	54,910	54,980	55,040	33
34	55,150	55,230	55,310	55,390	55,460	55,540	55,610	55,680	55,760	55,840	55,910	55,990	56,070	56,130	56,210	56,280	56,360	56,430	56,510	56,580	56,650	34
35	58,190	58,280	58,370	58,450	58,540	58,620	58,700	58,780	58,870	58,950	59,040	59,120	59,210	59,280	59,360	59,450	59,530	59,620	59,700	59,780	59,860	35
36	61,240	61,330	61,430	61,520	61,620	61,710	61,790	61,890	61,980	62,070	62,170	62,260	62,350	62,440	62,530	62,620	62,710	62,800	62,900	62,990	63,070	36
37	64,190	64,290	64,400	64,500	64,600	64,710	64,800	64,900	65,000	65,110	65,210	65,310	65,410	65,500	65,600	65,700	65,810	65,910	66,010	66,110	66,200	37
38	67,140	67,260	67,370	67,480	67,590	67,710	67,810	67,920	68,030	68,140	68,250	68,360	68,470	68,570	68,680	68,790	68,900	69,010	69,120	69,230	69,330	38
39	69,970	70,090	70,220	70,340	70,460	70,580	70,690	70,820	70,940	71,060	71,180	71,300	71,420	71,530	71,650	71,770	71,890	72,000	72,120	72,240	72,350	39
40	72,790	72,920	73,050	73,180	73,310	73,450	73,570	73,700	73,830	73,960	74,090	74,220	74,350	74,470	74,600	74,720	74,850	74,980	75,110	75,240	75,350	40
41	75,530	75,660	75,800	75,930	76,060	76,180	76,310	76,450	76,590	76,730	76,870	77,010	77,150	77,280	77,420	77,560	77,700	77,830	77,970	78,110	78,240	41
42	78,290	78,420	78,540	78,670	78,800	78,930	79,060	79,210	79,370	79,520	79,670	79,820	79,970	80,110	80,250	80,400	80,550	80,700	80,850	80,990	81,130	42
43	81,290	81,410	81,530	81,670	81,800	81,930	82,060	82,200	82,340	82,480	82,620	82,760	82,900	83,030	83,170	83,300	83,450	83,590	83,730	83,870	84,000	43
44	84,300	84,410	84,540	84,670	84,800	84,940	85,060	85,190	85,320	85,450	85,580	85,710	85,840	85,960	86,090	86,210	86,350	86,490	86,620	86,760	86,890	44
45	88,580	88,620	88,670	88,730	88,780	88,830	88,870	88,920	88,970	89,020	89,060	89,110	89,170	89,290	89,410	89,530	89,660	89,790	89,910	90,040	90,150	45
46	92,830	92,810	92,790	92,760	92,730	92,700	92,660	92,620	92,590	92,550	92,510	92,470	92,500	92,610	92,720	92,840	92,960	93,070	93,190	93,300	93,400	46
47	93,280	93,480	93,680	93,880	94,080	94,280	94,460	94,660	94,850	95,050	95,240	95,440	95,680	95,950	96,220	96,500	96,770	97,050	97,330	97,600	97,870	47
48	93,800	94,220	94,640	95,060	95,490	95,910	96,330	96,750	97,180	97,610	98,040	98,470	98,900	99,330	99,760	100,190	100,630	101,070	101,500	101,940	102,370	48
49	93,800	94,220	94,640	95,060	95,490	95,910	96,330	96,750	97,180	97,610	98,040	98,470	98,900	99,330	99,760	100,190	100,630	101,070	101,500	101,940	102,370	49
50	93,800	94,220	94,640	95,060	95,490	95,910	96,330	96,750	97,180	97,610	98,040	98,470	98,900	99,330	99,760	100,190	100,630	101,070	101,500	101,940	102,370	50

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGE-MENT	HEADWATER ELEVATION																					GATE ARRANGE-MENT
	1704.0	1704.1	1704.2	1704.3	1704.4	1704.5	1704.6	1704.7	1704.8	1704.9	1705.0	1705.1	1705.2	1705.3	1705.4	1705.5	1705.6	1705.7	1705.8	1705.9	1706.0	
1	4, 100	4, 110	4, 110	4, 110	4, 110	4, 110	4, 110	4, 110	4, 120	4, 120	4, 120	4, 120	4, 120	4, 120	4, 120	4, 130	4, 130	4, 130	4, 130	4, 130	4, 130	1
2	8, 210	8, 210	8, 210	8, 220	8, 220	8, 220	8, 230	8, 230	8, 230	8, 230	8, 240	8, 240	8, 240	8, 240	8, 250	8, 250	8, 250	8, 260	8, 260	8, 260	8, 260	2
3	12, 310	12, 320	12, 320	12, 320	12, 330	12, 330	12, 340	12, 340	12, 350	12, 350	12, 350	12, 360	12, 360	12, 370	12, 370	12, 380	12, 380	12, 380	12, 390	12, 390	12, 400	3
4	16, 420	16, 420	16, 430	16, 430	16, 440	16, 440	16, 450	16, 460	16, 460	16, 470	16, 470	16, 480	16, 480	16, 490	16, 500	16, 500	16, 510	16, 510	16, 520	16, 520	16, 530	4
5	20, 520	20, 530	20, 530	20, 540	20, 550	20, 560	20, 560	20, 570	20, 580	20, 580	20, 590	20, 600	20, 610	20, 610	20, 620	20, 630	20, 630	20, 640	20, 650	20, 650	20, 660	5
6	24, 620	24, 630	24, 640	24, 650	24, 660	24, 670	24, 680	24, 680	24, 690	24, 700	24, 710	24, 720	24, 730	24, 730	24, 740	24, 750	24, 760	24, 770	24, 780	24, 790	24, 790	6
7	26, 130	26, 150	26, 160	26, 170	26, 180	26, 200	26, 210	26, 210	26, 220	26, 240	26, 250	26, 260	26, 280	26, 280	26, 290	26, 300	26, 320	26, 330	26, 340	26, 350	26, 360	7
8	27, 600	27, 610	27, 630	27, 640	27, 660	27, 670	27, 690	27, 690	27, 710	27, 720	27, 740	27, 750	27, 770	27, 770	27, 790	27, 800	27, 820	27, 830	27, 850	27, 860	27, 870	8
9	28, 400	28, 420	28, 430	28, 450	28, 470	28, 480	28, 500	28, 500	28, 520	28, 540	28, 550	28, 570	28, 590	28, 590	28, 610	28, 630	28, 640	28, 660	28, 680	28, 690	28, 700	9
10	29, 280	29, 300	29, 310	29, 330	29, 350	29, 370	29, 390	29, 390	29, 410	29, 430	29, 450	29, 470	29, 480	29, 490	29, 510	29, 530	29, 550	29, 560	29, 580	29, 600	29, 610	10
11	30, 080	30, 090	30, 110	30, 130	30, 150	30, 170	30, 190	30, 200	30, 220	30, 240	30, 260	30, 280	30, 300	30, 310	30, 330	30, 350	30, 370	30, 380	30, 400	30, 420	30, 430	11
12	30, 940	30, 960	30, 980	31, 000	31, 020	31, 040	31, 060	31, 070	31, 090	31, 120	31, 140	31, 160	31, 180	31, 190	31, 210	31, 230	31, 250	31, 270	31, 290	31, 310	31, 320	12
13	31, 760	31, 780	31, 800	31, 820	31, 850	31, 870	31, 890	31, 900	31, 920	31, 950	31, 970	31, 990	32, 010	32, 030	32, 050	32, 070	32, 090	32, 120	32, 140	32, 160	32, 170	13
14	32, 530	32, 550	32, 580	32, 600	32, 620	32, 650	32, 670	32, 690	32, 710	32, 730	32, 760	32, 780	32, 800	32, 820	32, 840	32, 860	32, 890	32, 910	32, 940	32, 960	32, 970	14
15	33, 380	33, 400	33, 430	33, 450	33, 480	33, 500	33, 530	33, 550	33, 570	33, 600	33, 620	33, 650	33, 670	33, 690	33, 710	33, 740	33, 760	33, 790	33, 810	33, 840	33, 850	15
16	34, 180	34, 210	34, 240	34, 260	34, 290	34, 320	34, 340	34, 360	34, 390	34, 410	34, 440	34, 470	34, 490	34, 510	34, 540	34, 560	34, 590	34, 620	34, 640	34, 670	34, 690	16
17	35, 030	35, 050	35, 080	35, 110	35, 140	35, 170	35, 200	35, 220	35, 240	35, 270	35, 300	35, 330	35, 360	35, 370	35, 400	35, 430	35, 460	35, 490	35, 520	35, 540	35, 560	17
18	35, 840	35, 870	35, 900	35, 930	35, 960	35, 990	36, 020	36, 040	36, 070	36, 100	36, 130	36, 160	36, 190	36, 200	36, 230	36, 260	36, 290	36, 320	36, 350	36, 380	36, 400	18
19	36, 630	36, 670	36, 700	36, 730	36, 760	36, 790	36, 820	36, 840	36, 880	36, 910	36, 940	36, 970	37, 000	37, 020	37, 050	37, 080	37, 110	37, 150	37, 180	37, 210	37, 230	19
20	37, 410	37, 450	37, 480	37, 510	37, 550	37, 580	37, 610	37, 630	37, 670	37, 700	37, 730	37, 770	37, 800	37, 820	37, 850	37, 890	37, 920	37, 950	37, 980	38, 020	38, 040	20
21	38, 200	38, 240	38, 270	38, 300	38, 340	38, 370	38, 410	38, 430	38, 470	38, 500	38, 540	38, 570	38, 600	38, 630	38, 660	38, 700	38, 730	38, 760	38, 800	38, 830	38, 860	21
22	38, 980	39, 020	39, 050	39, 090	39, 120	39, 160	39, 200	39, 220	39, 260	39, 290	39, 330	39, 370	39, 400	39, 430	39, 460	39, 500	39, 530	39, 570	39, 600	39, 640	39, 660	22
23	39, 780	39, 820	39, 860	39, 890	39, 930	39, 970	40, 010	40, 030	40, 070	40, 110	40, 150	40, 180	40, 220	40, 250	40, 280	40, 320	40, 360	40, 400	40, 430	40, 470	40, 500	23
24	40, 570	40, 610	40, 650	40, 690	40, 730	40, 770	40, 810	40, 840	40, 880	40, 920	40, 960	40, 990	41, 030	41, 060	41, 100	41, 140	41, 180	41, 220	41, 250	41, 290	41, 320	24
25	42, 190	42, 240	42, 280	42, 320	42, 360	42, 410	42, 450	42, 480	42, 520	42, 570	42, 610	42, 650	42, 690	42, 720	42, 770	42, 810	42, 850	42, 890	42, 930	42, 970	43, 010	25
26	43, 820	43, 860	43, 910	43, 950	44, 000	44, 050	44, 090	44, 130	44, 170	44, 220	44, 260	44, 310	44, 350	44, 390	44, 430	44, 480	44, 520	44, 570	44, 610	44, 660	44, 690	26
27	45, 440	45, 490	45, 540	45, 590	45, 630	45, 680	45, 730	45, 770	45, 820	45, 870	45, 920	45, 970	46, 020	46, 050	46, 100	46, 150	46, 200	46, 250	46, 300	46, 340	46, 380	27
28	47, 060	47, 120	47, 170	47, 220	47, 280	47, 330	47, 380	47, 420	47, 470	47, 530	47, 580	47, 630	47, 680	47, 730	47, 780	47, 830	47, 880	47, 930	47, 980	48, 040	48, 080	28
29	48, 660	48, 710	48, 770	48, 830	48, 880	48, 940	48, 990	49, 040	49, 100	49, 150	49, 210	49, 260	49, 320	49, 360	49, 420	49, 470	49, 530	49, 580	49, 640	49, 690	49, 740	29
30	50, 250	50, 310	50, 370	50, 430	50, 490	50, 550	50, 610	50, 660	50, 710	50, 770	50, 830	50, 890	50, 950	51, 000	51, 060	51, 120	51, 180	51, 230	51, 290	51, 350	51, 400	30
31	51, 840	51, 900	51, 970	52, 030	52, 090	52, 160	52, 220	52, 270	52, 330	52, 400	52, 460	52, 520	52, 580	52, 640	52, 700	52, 760	52, 820	52, 880	52, 950	53, 010	53, 060	31
32	53, 430	53, 500	53, 570	53, 640	53, 700	53, 770	53, 840	53, 890	53, 960	54, 020	54, 090	54, 160	54, 220	54, 280	54, 340	54, 410	54, 480	54, 540	54, 610	54, 670	54, 730	32
33	55, 040	55, 110	55, 180	55, 250	55, 320	55, 390	55, 460	55, 520	55, 590	55, 660	55, 730	55, 800	55, 870	55, 930	56, 000	56, 070	56, 140	56, 210	56, 280	56, 350	56, 410	33
34	56, 650	56, 720	56, 800	56, 870	56, 950	57, 020	57, 100	57, 160	57, 230	57, 310	57, 380	57, 460	57, 530	57, 590	57, 670	57, 740	57, 810	57, 880	57, 960	58, 030	58, 090	34
35	59, 860	59, 940	60, 020	60, 100	60, 190	60, 270	60, 350	60, 420	60, 500	60, 590	60, 670	60, 750	60, 830	60, 900	60, 980	61, 060	61, 140	61, 230	61, 310	61, 390	61, 460	35
36	63, 070	63, 160	63, 250	63, 340	63, 430	63, 520	63, 610	63, 690	63, 780	63, 870	63, 960	64, 050	64, 140	64, 220	64, 310	64, 400	64, 490	64, 570	64, 660	64, 750	64, 830	36
37	66, 200	66, 300	66, 400	66, 500	66, 590	66, 690	66, 790	66, 880	66, 980	67, 080	67, 180	67, 270	67, 370	67, 460	67, 560	67, 650	67, 750	67, 850	67, 940	68, 040	68, 130	37
38	69, 330	69, 440	69, 550	69, 650	69, 760	69, 870	69, 980	70, 070	70, 180	70, 290	70, 390	70, 500	70, 610	70, 700	70, 810	70, 910	71, 020	71, 130	71, 230	71, 340	71, 430	38
39	72, 350	72, 470	72, 580	72, 700	72, 820	72, 930	73, 050	73, 160	73, 270	73, 390	73, 500	73, 620	73, 740	73, 840	73, 950	74, 070	74, 180	74, 300	74, 410	74, 520	74, 630	39
40	75, 350	75, 480	75, 610	75, 730	75, 860	75, 980	76, 110	76, 220	76, 350	76, 470	76, 600	76, 720	76, 850	76, 960	77, 080	77, 210	77, 330	77, 450	77, 580	77, 700	77, 810	40
41	78, 240	78, 370	78, 510	78, 650	78, 780	78, 920	79, 050	79, 180	79, 310	79, 450	79, 580	79, 710	79, 850	79, 970	80, 100	80, 240	80, 370	80, 500	80, 630	80, 770	80, 890	41
42	81, 130	81, 280	81, 420	81, 570	81, 710	81, 860	82, 000	82, 140	82, 280	82, 430	82, 570	82, 710	82, 860	82, 990	83, 130	83, 280	83, 420	83, 560	83, 700	83, 840	83, 970	42
43	84, 000	84, 150	84, 290	84, 430	84, 570	84, 710	84, 850	84, 980	85, 110	85, 250	85, 400	85, 560	85, 710	85, 850	86, 000	86, 160	86, 310	86, 460	86, 610	86, 760	86, 900	43
44	86, 890	87, 030	87, 160	87, 300	87, 430	87, 560	87, 700	87, 820	87, 950	88, 090	88, 250	88, 410	88, 570	88, 730	88, 890	89, 050	89, 210	89, 370	89, 530	89, 700	89, 850	44
45	90, 150	90, 280	90, 400	90, 520	90, 640	90, 760	90, 890	91, 020	91, 150	91, 290	91, 440	91, 580	91, 730	91, 870	92, 020	92, 160	92, 310	92, 450	92, 600	92, 740	92, 880	45
46	93, 400	93, 520	93, 630	93, 740	93, 850	93, 960	94, 080	94, 210	94, 350	94, 480	94, 610	94, 750	94, 880	95, 000	95, 140	95, 270	95, 400	95, 530	95, 650	95, 790	95, 910	46
47	97, 870	98, 150	98, 350	98, 400	98, 440	98, 480	98, 530	98, 570	98, 620	98, 670	98, 720	98, 770	98, 820	98, 850	98, 890	98, 930	99, 020	99, 140	99, 260	99, 380	99, 500	47
48	102, 370	102, 800	103, 050	103, 020	103, 000	102, 970	102, 940	102, 900	102, 860	102, 830	102, 790	102, 750	102, 710	102, 650	102, 610	102, 580	102, 630	102, 740	102, 850	102, 960	103, 060	48
49	102, 370	102, 800	103, 110	103, 320	103, 530	103, 740	103, 950	104, 140	104, 350	104, 560	104, 760	104, 970	105, 170	105, 370	105, 570	105, 790	106, 050	106, 330	106, 620	106, 900	107, 170	49
50	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	50
51	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	51
52	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	52
53	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	53
54	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	54
55	102, 370	102, 810	103, 260	103, 700	104, 140	104, 590	105, 030	105, 470	105, 920	106, 370	106, 810	107, 270	107, 720	108, 160	108, 610	109, 070	109, 520	109, 980	110, 440	110, 890	111, 340	55

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1706.0	1706.1	1706.2	1706.3	1706.4	1706.5	1706.6	1706.7	1706.8	1706.9	1707.0	1707.1	1707.2	1707.3	1707.4	1707.5	1707.6	1707.7	1707.8	1707.9	1708.0	
1	4,130	4,130	4,140	4,140	4,140	4,140	4,140	4,140	4,140	4,150	4,150	4,150	4,150	4,150	4,150	4,150	4,150	4,160	4,160	4,160	4,160	1
2	8,260	8,270	8,270	8,270	8,280	8,280	8,280	8,280	8,290	8,290	8,290	8,300	8,300	8,300	8,300	8,310	8,310	8,310	8,320	8,320	8,320	2
3	12,400	12,400	12,410	12,410	12,410	12,420	12,420	12,430	12,430	12,440	12,440	12,440	12,450	12,450	12,460	12,460	12,460	12,470	12,470	12,480	12,480	3
4	16,530	16,540	16,540	16,550	16,550	16,560	16,560	16,570	16,570	16,580	16,590	16,590	16,600	16,600	16,610	16,610	16,620	16,630	16,630	16,640	16,640	4
5	20,660	20,670	20,680	20,680	20,690	20,700	20,700	20,710	20,720	20,730	20,730	20,740	20,750	20,750	20,760	20,770	20,770	20,780	20,790	20,800	20,800	5
6	24,790	24,800	24,810	24,820	24,830	24,840	24,850	24,850	24,860	24,870	24,880	24,890	24,900	24,900	24,910	24,920	24,930	24,940	24,950	24,960	24,960	6
7	26,360	26,370	26,380	26,390	26,410	26,420	26,430	26,430	26,450	26,460	26,470	26,480	26,500	26,500	26,510	26,520	26,540	26,550	26,560	26,570	26,570	7
8	27,870	27,880	27,900	27,910	27,930	27,940	27,960	27,960	27,980	27,990	28,010	28,020	28,040	28,040	28,060	28,070	28,090	28,100	28,120	28,130	28,140	8
9	28,700	28,710	28,730	28,750	28,760	28,780	28,800	28,800	28,820	28,830	28,850	28,870	28,880	28,890	28,910	28,920	28,940	28,950	28,970	28,990	28,990	9
10	29,610	29,620	29,640	29,660	29,680	29,700	29,710	29,720	29,740	29,760	29,770	29,790	29,810	29,820	29,840	29,850	29,870	29,890	29,910	29,920	29,930	10
11	30,430	30,450	30,470	30,490	30,510	30,530	30,550	30,560	30,580	30,590	30,610	30,630	30,650	30,660	30,680	30,700	30,720	30,740	30,760	30,770	30,780	11
12	31,320	31,340	31,370	31,390	31,410	31,430	31,450	31,460	31,480	31,500	31,520	31,540	31,560	31,570	31,590	31,610	31,630	31,650	31,670	31,690	31,700	12
13	32,170	32,190	32,220	32,240	32,260	32,280	32,300	32,320	32,340	32,360	32,380	32,400	32,430	32,440	32,460	32,480	32,500	32,520	32,550	32,570	32,580	13
14	32,970	33,000	33,020	33,040	33,070	33,090	33,110	33,130	33,150	33,170	33,200	33,220	33,240	33,260	33,280	33,300	33,330	33,350	33,370	33,390	33,410	14
15	33,850	33,880	33,900	33,930	33,950	33,980	34,000	34,020	34,040	34,070	34,090	34,120	34,140	34,160	34,180	34,200	34,230	34,250	34,280	34,300	34,320	15
16	34,690	34,710	34,740	34,770	34,790	34,820	34,840	34,860	34,890	34,910	34,940	34,970	34,990	35,010	35,030	35,060	35,090	35,110	35,140	35,160	35,180	16
17	35,560	35,590	35,620	35,650	35,670	35,700	35,730	35,750	35,770	35,800	35,830	35,860	35,880	35,900	35,930	35,960	35,990	36,010	36,040	36,070	36,080	17
18	36,400	36,430	36,460	36,490	36,520	36,550	36,580	36,600	36,630	36,660	36,680	36,710	36,740	36,760	36,790	36,820	36,850	36,880	36,910	36,940	36,950	18
19	37,230	37,260	37,290	37,320	37,350	37,380	37,410	37,430	37,470	37,500	37,530	37,560	37,590	37,610	37,640	37,670	37,700	37,730	37,760	37,790	37,810	19
20	38,040	38,070	38,100	38,140	38,170	38,200	38,230	38,250	38,290	38,320	38,350	38,380	38,410	38,440	38,470	38,500	38,530	38,560	38,590	38,630	38,650	20
21	38,860	38,890	38,920	38,960	38,990	39,020	39,060	39,080	39,120	39,150	39,180	39,220	39,250	39,270	39,310	39,340	39,370	39,410	39,440	39,470	39,490	21
22	39,660	39,700	39,740	39,770	39,810	39,840	39,880	39,900	39,940	39,970	40,010	40,040	40,080	40,100	40,130	40,170	40,200	40,240	40,270	40,310	40,330	22
23	40,500	40,530	40,570	40,610	40,640	40,680	40,720	40,740	40,780	40,820	40,850	40,890	40,930	40,950	40,990	41,020	41,060	41,100	41,130	41,170	41,190	23
24	41,320	41,360	41,400	41,440	41,470	41,510	41,550	41,580	41,620	41,650	41,690	41,730	41,770	41,800	41,830	41,870	41,910	41,950	41,980	42,020	42,050	24
25	43,010	43,050	43,090	43,130	43,170	43,210	43,250	43,290	43,330	43,370	43,410	43,450	43,490	43,520	43,560	43,600	43,640	43,680	43,730	43,770	43,800	25
26	44,690	44,740	44,780	44,830	44,870	44,920	44,960	45,000	45,040	45,080	45,130	45,170	45,220	45,250	45,290	45,340	45,380	45,430	45,470	45,510	45,550	26
27	46,380	46,430	46,480	46,530	46,570	46,620	46,670	46,710	46,750	46,800	46,850	46,900	46,940	46,980	47,030	47,080	47,120	47,170	47,220	47,260	47,300	27
28	48,080	48,130	48,180	48,230	48,280	48,330	48,380	48,420	48,480	48,530	48,580	48,630	48,680	48,720	48,770	48,820	48,870	48,920	48,970	49,020	49,060	28
29	49,740	49,790	49,850	49,900	49,960	50,010	50,070	50,110	50,160	50,220	50,270	50,330	50,380	50,420	50,480	50,530	50,580	50,640	50,690	50,740	50,790	29
30	51,400	51,460	51,510	51,570	51,630	51,690	51,750	51,790	51,850	51,910	51,960	52,020	52,080	52,130	52,180	52,240	52,300	52,350	52,410	52,470	52,510	30
31	53,060	53,120	53,180	53,240	53,300	53,370	53,430	53,480	53,540	53,600	53,660	53,720	53,780	53,830	53,890	53,950	54,010	54,070	54,130	54,190	54,240	31
32	54,730	54,790	54,860	54,920	54,990	55,050	55,120	55,170	55,230	55,300	55,360	55,430	55,490	55,540	55,610	55,670	55,740	55,800	55,860	55,930	55,980	32
33	56,410	56,480	56,540	56,610	56,680	56,750	56,820	56,880	56,940	57,010	57,080	57,150	57,210	57,270	57,340	57,410	57,470	57,540	57,610	57,670	57,730	33
34	58,090	58,160	58,240	58,310	58,380	58,450	58,520	58,590	58,660	58,730	58,800	58,870	58,940	59,000	59,070	59,150	59,220	59,290	59,360	59,430	59,490	34
35	61,460	61,540	61,620	61,700	61,780	61,860	61,940	62,000	62,080	62,160	62,240	62,320	62,400	62,470	62,550	62,620	62,700	62,780	62,860	62,940	63,000	35
36	64,830	64,920	65,000	65,090	65,180	65,270	65,350	65,430	65,520	65,600	65,690	65,780	65,860	65,940	66,030	66,110	66,200	66,280	66,370	66,450	66,530	36
37	68,130	68,220	68,320	68,410	68,510	68,610	68,700	68,790	68,880	68,980	69,070	69,160	69,260	69,340	69,440	69,530	69,620	69,720	69,810	69,900	69,990	37
38	71,430	71,530	71,640	71,740	71,850	71,950	72,050	72,150	72,250	72,350	72,460	72,560	72,660	72,750	72,850	72,960	73,060	73,160	73,260	73,360	73,450	38
39	74,630	74,740	74,850	74,970	75,080	75,190	75,300	75,410	75,520	75,630	75,740	75,850	75,960	76,060	76,170	76,280	76,390	76,500	76,610	76,720	76,820	39
40	77,810	77,930	78,050	78,180	78,300	78,420	78,540	78,650	78,770	78,890	79,010	79,130	79,250	79,360	79,480	79,590	79,710	79,830	79,950	80,070	80,180	40
41	80,890	81,020	81,150	81,280	81,410	81,540	81,670	81,790	81,920	82,050	82,180	82,310	82,430	82,550	82,680	82,810	82,930	83,060	83,190	83,320	83,430	41
42	83,970	84,110	84,250	84,390	84,530	84,670	84,810	84,940	85,080	85,210	85,350	85,490	85,630	85,750	85,890	86,030	86,160	86,300	86,440	86,570	86,700	42
43	86,900	87,050	87,200	87,350	87,500	87,650	87,800	87,940	88,080	88,230	88,380	88,530	88,670	88,810	88,960	89,100	89,250	89,390	89,540	89,680	89,820	43
44	89,850	90,010	90,170	90,320	90,480	90,640	90,800	90,950	91,110	91,260	91,420	91,580	91,730	91,880	92,030	92,190	92,350	92,500	92,650	92,810	92,950	44
45	92,880	93,030	93,180	93,330	93,480	93,630	93,780	93,920	94,070	94,210	94,360	94,510	94,650	94,790	94,950	95,120	95,280	95,450	95,610	95,780	95,930	45
46	95,910	96,060	96,200	96,340	96,480	96,620	96,750	96,880	97,020	97,160	97,290	97,430	97,560	97,700	97,870	98,040	98,220	98,390	98,570	98,740	98,900	46
47	99,500	99,620	99,740	99,870	99,990	100,110	100,230	100,340	100,460	100,580	100,710	100,850	100,980	101,120	101,270	101,430	101,580	101,730	101,890	102,040	102,180	47
48	103,060	103,170	103,270	103,380	103,490	103,590	103,690	103,790	103,890	103,990	104,120	104,260	104,400	104,520	104,660	104,790	104,920	105,060	105,190	105,320	105,440	48
49	107,170	107,460	107,740	108,030	108,310	108,600	108,710	108,740	108,770	108,810	108,860	108,910	108,950	108,990	109,030	109,080	109,120	109,160	109,200	109,240	109,340	49
50	111,340	111,800	112,270	112,730	113,190	113,590	113,710	113,670	113,630	113,600	113,560	113,520	113,480	113,430	113,390	113,340	113,290	113,240	113,190	113,160	113,240	50
51	111,340	111,800	112,270	112,730	113,190	113,590	113,880	114,090	114,300	114,520	114,730	114,950	115,160	115,370	115,580	115,800	116,010	116,220	116,430	116,680	116,950	51
52	111,340	111,800	112,270	112,730	113,190	113,660	114,120	114,580	115,040	115,510	115,980	116,450	116,920	117,380	117,860	118,330	118,810	119,280	119,760	120,240	120,710	52
53	111,340	111,800	112,270	112,730	113,190	113,660	114,120	114,580	115,040	115,510	115,980	116,450	116,920	117,380	117,860	118,330	118,810	119,280	119,760	120,240	120,710	53
54	111,340	111,800	112,270	112,730	113,190	113,660	114,120	114,580	115,040	115,510	115,980	116,450	116,920	117,380	117,860	118,330	118,810	119,280	119,760	120,240	120,710	54
55	111,340	111,800	112,270	112,730	113,190	113,660	114,120	114,580	115,040	115,510	115,980	116,450	116,920	117,380	117,860	118,330	118,810	119,280	119,760	120,240	120,710	55

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

HEADWATER ELEVATION

GATE ARRANGE-MENT	1708.0	1708.1	1708.2	1708.3	1708.4	1708.5	1708.6	1708.7	1708.8	1708.9	1709.0	1709.1	1709.2	1709.3	1709.4	1709.5	1709.6	1709.7	1709.8	1709.9	1710.0	GATE ARRANGE-MENT
1	4,160	4,160	4,160	4,160	4,170	4,170	4,170	4,170	4,170	4,170	4,170	4,180	4,180	4,180	4,180	4,180	4,180	4,180	4,190	4,190	4,190	1
2	8,320	8,320	8,330	8,330	8,330	8,340	8,340	8,340	8,340	8,350	8,350	8,350	8,350	8,360	8,360	8,360	8,370	8,370	8,370	8,370	8,380	2
3	12,480	12,490	12,490	12,490	12,500	12,500	12,510	12,510	12,520	12,520	12,520	12,530	12,530	12,540	12,540	12,540	12,550	12,550	12,560	12,560	12,570	3
4	16,640	16,650	16,650	16,660	16,660	16,670	16,680	16,680	16,690	16,690	16,700	16,700	16,710	16,720	16,720	16,730	16,730	16,740	16,740	16,750	16,750	4
5	20,800	20,810	20,820	20,820	20,830	20,840	20,850	20,850	20,860	20,870	20,870	20,880	20,890	20,890	20,900	20,910	20,920	20,920	20,930	20,940	20,940	5
6	24,960	24,970	24,980	24,990	25,000	25,010	25,010	25,020	25,030	25,040	25,050	25,060	25,060	25,070	25,080	25,090	25,100	25,110	25,120	25,120	25,130	6
7	26,570	26,590	26,600	26,610	26,620	26,640	26,640	26,650	26,660	26,680	26,690	26,700	26,700	26,720	26,730	26,740	26,750	26,770	26,780	26,780	26,790	7
8	28,140	28,150	28,160	28,180	28,190	28,210	28,210	28,230	28,240	28,260	28,270	28,290	28,290	28,310	28,320	28,340	28,350	28,370	28,380	28,380	28,400	8
9	28,990	29,010	29,020	29,040	29,060	29,070	29,080	29,090	29,110	29,130	29,140	29,160	29,180	29,200	29,210	29,230	29,240	29,260	29,270	29,280	29,280	9
10	29,930	29,950	29,970	29,980	30,000	30,020	30,030	30,040	30,060	30,080	30,100	30,110	30,120	30,140	30,160	30,170	30,190	30,210	30,230	30,230	30,250	10
11	30,780	30,800	30,820	30,840	30,860	30,880	30,890	30,900	30,920	30,940	30,960	30,980	30,990	31,010	31,030	31,040	31,060	31,080	31,100	31,110	31,130	11
12	31,700	31,720	31,740	31,770	31,790	31,810	31,820	31,840	31,860	31,880	31,900	31,920	31,930	31,950	31,970	31,990	32,010	32,030	32,050	32,060	32,080	12
13	32,580	32,600	32,620	32,650	32,670	32,690	32,700	32,720	32,740	32,760	32,790	32,810	32,820	32,840	32,860	32,880	32,910	32,930	32,950	32,960	32,980	13
14	33,410	33,430	33,450	33,480	33,500	33,520	33,540	33,560	33,580	33,600	33,630	33,650	33,660	33,690	33,710	33,730	33,750	33,780	33,800	33,810	33,830	14
15	34,320	34,340	34,370	34,390	34,420	34,440	34,450	34,480	34,500	34,530	34,550	34,580	34,590	34,610	34,640	34,660	34,690	34,710	34,740	34,750	34,770	15
16	35,180	35,210	35,230	35,260	35,280	35,310	35,330	35,350	35,380	35,400	35,430	35,450	35,470	35,490	35,520	35,550	35,570	35,600	35,620	35,640	35,660	16
17	36,080	36,110	36,140	36,170	36,190	36,220	36,240	36,270	36,290	36,320	36,350	36,370	36,390	36,420	36,450	36,470	36,500	36,530	36,550	36,570	36,600	17
18	36,950	36,980	37,010	37,040	37,070	37,100	37,120	37,150	37,170	37,200	37,230	37,260	37,280	37,310	37,330	37,360	37,390	37,420	37,450	37,470	37,490	18
19	37,810	37,840	37,870	37,900	37,930	37,960	37,980	38,010	38,040	38,070	38,100	38,130	38,150	38,180	38,210	38,240	38,270	38,300	38,330	38,350	38,380	19
20	38,650	38,680	38,710	38,740	38,770	38,810	38,830	38,860	38,890	38,920	38,950	38,980	39,010	39,040	39,070	39,100	39,130	39,160	39,190	39,210	39,240	20
21	39,490	39,530	39,560	39,590	39,630	39,660	39,680	39,720	39,750	39,780	39,810	39,850	39,870	39,900	39,930	39,970	40,000	40,030	40,060	40,090	40,120	21
22	40,330	40,370	40,400	40,440	40,470	40,500	40,530	40,560	40,600	40,630	40,670	40,700	40,720	40,760	40,790	40,830	40,860	40,890	40,930	40,950	40,980	22
23	41,190	41,230	41,270	41,300	41,340	41,370	41,400	41,440	41,470	41,510	41,540	41,580	41,600	41,640	41,670	41,710	41,740	41,780	41,820	41,840	41,880	23
24	42,050	42,090	42,120	42,160	42,200	42,240	42,260	42,300	42,340	42,370	42,410	42,450	42,470	42,510	42,550	42,590	42,620	42,660	42,700	42,720	42,760	24
25	43,800	43,840	43,880	43,920	43,960	44,000	44,030	44,070	44,110	44,150	44,190	44,230	44,260	44,300	44,340	44,380	44,420	44,460	44,500	44,530	44,570	25
26	45,550	45,590	45,630	45,680	45,720	45,760	45,800	45,840	45,880	45,930	45,970	46,010	46,050	46,090	46,130	46,170	46,220	46,260	46,300	46,330	46,380	26
27	47,300	47,350	47,390	47,440	47,490	47,530	47,570	47,620	47,660	47,710	47,750	47,800	47,840	47,880	47,930	47,970	48,020	48,070	48,110	48,150	48,190	27
28	49,060	49,110	49,160	49,210	49,260	49,310	49,350	49,400	49,450	49,500	49,550	49,600	49,630	49,680	49,730	49,780	49,830	49,880	49,930	49,970	50,020	28
29	50,790	50,840	50,890	50,950	51,000	51,050	51,100	51,150	51,200	51,250	51,310	51,360	51,400	51,450	51,510	51,560	51,610	51,660	51,710	51,760	51,810	29
30	52,510	52,570	52,630	52,680	52,740	52,790	52,840	52,900	52,950	53,010	53,060	53,120	53,160	53,220	53,280	53,330	53,390	53,440	53,500	53,540	53,600	30
31	54,240	54,300	54,360	54,420	54,480	54,540	54,590	54,650	54,710	54,770	54,830	54,890	54,930	54,990	55,050	55,110	55,170	55,230	55,290	55,330	55,390	31
32	55,980	56,040	56,100	56,170	56,230	56,290	56,350	56,410	56,470	56,530	56,600	56,660	56,710	56,770	56,830	56,900	56,960	57,020	57,080	57,130	57,190	32
33	57,730	57,800	57,860	57,930	58,000	58,060	58,120	58,180	58,250	58,320	58,380	58,450	58,500	58,570	58,630	58,700	58,760	58,830	58,890	58,950	59,010	33
34	59,490	59,560	59,630	59,700	59,770	59,840	59,900	59,970	60,040	60,100	60,170	60,240	60,300	60,370	60,440	60,510	60,580	60,650	60,710	60,770	60,840	34
35	63,000	63,080	63,160	63,240	63,310	63,390	63,460	63,530	63,610	63,690	63,760	63,840	63,910	63,980	64,060	64,140	64,210	64,290	64,360	64,430	64,500	35
36	66,530	66,610	66,700	66,780	66,870	66,950	67,030	67,110	67,200	67,280	67,360	67,450	67,520	67,600	67,690	67,770	67,850	67,940	68,020	68,090	68,170	36
37	69,990	70,080	70,170	70,270	70,360	70,450	70,530	70,630	70,720	70,810	70,900	70,990	71,070	71,160	71,260	71,350	71,440	71,530	71,620	71,700	71,790	37
38	73,450	73,550	73,650	73,750	73,850	73,960	74,050	74,140	74,240	74,340	74,440	74,540	74,630	74,730	74,830	74,930	75,030	75,120	75,220	75,310	75,410	38
39	76,820	76,930	77,040	77,150	77,260	77,370	77,460	77,570	77,680	77,790	77,900	78,000	78,100	78,210	78,310	78,420	78,530	78,630	78,740	78,830	78,940	39
40	80,180	80,290	80,410	80,530	80,640	80,760	80,870	80,980	81,100	81,210	81,330	81,450	81,550	81,670	81,780	81,900	82,010	82,120	82,240	82,340	82,460	40
41	83,430	83,560	83,680	83,810	83,930	84,060	84,180	84,300	84,420	84,550	84,670	84,800	84,910	85,030	85,160	85,280	85,400	85,530	85,650	85,760	85,880	41
42	86,700	86,830	86,970	87,100	87,240	87,370	87,490	87,630	87,760	87,890	88,030	88,160	88,280	88,410	88,540	88,680	88,810	88,940	89,070	89,190	89,320	42
43	89,820	89,960	90,110	90,250	90,390	90,540	90,670	90,810	90,950	91,100	91,240	91,380	91,510	91,650	91,790	91,930	92,070	92,210	92,350	92,480	92,620	43
44	92,950	93,110	93,260	93,410	93,560	93,720	93,860	94,010	94,160	94,310	94,460	94,610	94,750	94,900	95,050	95,200	95,350	95,500	95,650	95,790	95,940	44
45	95,930	96,090	96,260	96,420	96,580	96,740	96,890	97,050	97,220	97,380	97,540	97,700	97,850	98,010	98,170	98,320	98,480	98,640	98,800	98,950	99,100	45
46	98,900	99,080	99,250	99,420	99,590	99,770	99,930	100,100	100,270	100,440	100,610	100,780	100,940	101,110	101,270	101,440	101,610	101,780	101,940	102,100	102,270	46
47	102,180	102,330	102,480	102,630	102,790	102,950	103,090	103,250	103,400	103,560	103,710	103,870	104,010	104,160	104,320	104,470	104,620	104,780	104,960	105,120	105,300	47
48	105,440	105,570	105,700	105,830	105,970	106,110	106,240	106,390	106,530	106,670	106,810	106,940	107,070	107,210	107,350	107,480	107,620	107,780	107,960	108,140	108,330	48
49	109,340	109,460	109,570	109,690	109,810	109,930	110,040	110,160	110,280	110,390	110,510	110,620	110,730	110,850	110,980	111,120	111,260	111,400	111,560	111,710	111,870	49
50	113,240	113,340	113,440	113,540	113,640	113,740	113,830	113,920	114,020	114,110	114,210	114,300	114,380	114,480	114,620	114,750	114,890	115,020	115,160	115,280	115,410	50
51	116,950	117,240	117,530	117,820	118,110	118,400	118,680	118,970	119,260	119,510	119,530	119,560	119,580	119,610	119,660	119,700	119,740	119,780	119,830	119,850	119,890	51
52	120,710	121,190	121,670	122,150	122,630	123,110	123,590	124,070	124,560	124,870	124,840	124,800	124,750	124,710	124,660	124,620	124,570	124,520	124,470	124,400	124,350	52
53	120,710	121,190	121,670	122,150	122,630	123,110	123,590	124,070	124,560	124,910	125,150	125,360	125,560	125,770	126,080	126,290	126,500	126,710	126,920	127,120	127,330	53
54	120,710	121,190	121,670	122,150	122,630	123,110	123,590	124,070	124,560	125,040	125,550	126,060	126,460	126,970	127,480	127,990	128,500	129,010	129,420	129,920	130,430	54
55	120,710	121,190	121,670	122,150	122,630	123,110	123,590	124,070	124,560	125,040	125,550	126,060	126,460	126,970	127,480	127,990	128,500	129,010	129,420	129,920	130,430	55

FONTANA DAM
SPILLWAY TUNNEL DISCHARGE
IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1710.0	1710.1	1710.2	1710.3	1710.4	1710.5	1710.6	1710.7	1710.8	1710.9	1711.0	1711.1	1711.2	1711.3	1711.4	1711.5	1711.6	1711.7	1711.8	1711.9	1712.0	
0*	0	15	40	70	110	150	210	260	320	390	460	530	610	690	780	870	960	1,050	1,150	1,250	1,360	0*
1	4,190	4,205	4,230	4,260	4,300	4,350	4,410	4,460	4,520	4,590	4,660	4,730	4,820	4,900	4,990	5,080	5,170	5,260	5,360	5,470	5,580	1
2	8,380	8,395	8,420	8,460	8,500	8,540	8,600	8,660	8,720	8,790	8,870	8,940	9,020	9,100	9,200	9,290	9,380	9,470	9,580	9,680	9,790	2
3	12,570	12,585	12,610	12,650	12,690	12,740	12,800	12,860	12,920	12,990	13,070	13,140	13,230	13,310	13,400	13,500	13,590	13,690	13,790	13,900	14,010	3
4	16,750	16,775	16,810	16,840	16,890	16,930	17,000	17,050	17,120	17,190	17,270	17,350	17,430	17,520	17,610	17,710	17,800	17,900	18,000	18,110	18,230	4
5	20,940	20,965	21,000	21,030	21,080	21,130	21,200	21,250	21,320	21,400	21,470	21,550	21,640	21,720	21,820	21,920	22,010	22,110	22,220	22,330	22,440	5
6	25,130	25,155	25,190	25,230	25,280	25,320	25,390	25,450	25,520	25,600	25,680	25,750	25,840	25,930	26,030	26,130	26,230	26,320	26,430	26,540	26,660	6
7	26,790	26,810	26,840	26,870	26,900	26,920	26,960	27,000	27,050	27,100	27,170	27,230	27,300	27,380	27,460	27,550	27,640	27,720	27,820	27,920	28,030	7
8	28,400	28,410	28,430	28,440	28,460	28,460	28,480	28,490	28,520	28,560	28,600	28,650	28,710	28,770	28,840	28,920	29,000	29,070	29,160	29,250	29,350	8
9	29,280	29,300	29,310	29,330	29,350	29,350	29,370	29,390	29,410	29,440	29,470	29,490	29,540	29,590	29,650	29,720	29,790	29,850	29,930	30,020	30,110	9
10	30,250	30,270	30,280	30,300	30,320	30,330	30,340	30,360	30,380	30,400	30,410	30,420	30,450	30,490	30,540	30,590	30,650	30,710	30,780	30,860	30,940	10
11	31,130	31,150	31,170	31,180	31,200	31,210	31,230	31,250	31,270	31,290	31,300	31,310	31,340	31,370	31,400	31,440	31,480	31,530	31,590	31,660	31,730	11
12	32,080	32,100	32,120	32,140	32,160	32,170	32,190	32,210	32,230	32,250	32,270	32,280	32,300	32,320	32,340	32,360	32,390	32,420	32,470	32,520	32,590	12
13	32,980	33,000	33,020	33,050	33,070	33,080	33,100	33,120	33,140	33,160	33,180	33,200	33,220	33,240	33,260	33,280	33,310	33,320	33,360	33,400	33,440	13
14	33,830	33,860	33,880	33,900	33,930	33,940	33,960	33,980	34,010	34,030	34,050	34,060	34,090	34,110	34,130	34,150	34,180	34,190	34,210	34,230	34,260	14
15	34,770	34,800	34,820	34,850	34,870	34,880	34,910	34,930	34,960	34,980	35,000	35,020	35,040	35,060	35,090	35,110	35,140	35,150	35,170	35,200	35,230	15
16	35,660	35,690	35,710	35,740	35,760	35,780	35,810	35,830	35,860	35,880	35,910	35,920	35,950	35,970	36,000	36,020	36,050	36,060	36,090	36,110	36,140	16
17	36,600	36,620	36,650	36,680	36,700	36,720	36,750	36,770	36,800	36,830	36,850	36,870	36,900	36,920	36,950	36,980	37,000	37,020	37,050	37,070	37,100	17
18	37,490	37,520	37,550	37,580	37,610	37,630	37,650	37,680	37,710	37,740	37,770	37,780	37,810	37,840	37,870	37,900	37,920	37,940	37,970	38,000	38,020	18
19	38,380	38,410	38,440	38,470	38,500	38,520	38,550	38,580	38,600	38,630	38,660	38,680	38,710	38,740	38,770	38,800	38,830	38,850	38,880	38,910	38,940	19
20	39,240	39,280	39,310	39,340	39,370	39,390	39,420	39,450	39,480	39,510	39,540	39,560	39,590	39,620	39,650	39,690	39,720	39,740	39,770	39,800	39,830	20
21	40,120	40,150	40,180	40,220	40,250	40,270	40,300	40,330	40,370	40,400	40,430	40,450	40,480	40,520	40,550	40,580	40,610	40,630	40,670	40,700	40,730	21
22	40,980	41,020	41,050	41,090	41,120	41,140	41,180	41,210	41,240	41,280	41,310	41,330	41,370	41,400	41,430	41,470	41,500	41,520	41,560	41,590	41,620	22
23	41,880	41,910	41,950	41,980	42,020	42,040	42,080	42,110	42,150	42,180	42,220	42,240	42,270	42,310	42,340	42,380	42,410	42,440	42,470	42,510	42,540	23
24	42,760	42,800	42,830	42,870	42,900	42,930	42,970	43,000	43,040	43,080	43,110	43,140	43,180	43,210	43,250	43,280	43,320	43,350	43,380	43,420	43,450	24
25	44,570	44,610	44,650	44,690	44,730	44,750	44,790	44,830	44,870	44,910	44,950	44,980	45,020	45,060	45,100	45,140	45,170	45,200	45,240	45,280	45,320	25
26	46,380	46,420	46,460	46,500	46,550	46,580	46,620	46,660	46,710	46,750	46,790	46,820	46,860	46,910	46,950	46,990	47,030	47,060	47,110	47,150	47,190	26
27	48,190	48,240	48,280	48,330	48,380	48,410	48,460	48,500	48,550	48,590	48,640	48,670	48,720	48,760	48,810	48,850	48,900	48,930	48,980	49,020	49,060	27
28	50,020	50,060	50,110	50,160	50,210	50,250	50,300	50,350	50,390	50,440	50,490	50,530	50,580	50,620	50,670	50,720	50,770	50,810	50,850	50,900	50,950	28
29	51,810	51,860	51,910	51,960	52,010	52,060	52,110	52,160	52,210	52,260	52,310	52,350	52,400	52,460	52,510	52,560	52,610	52,650	52,700	52,750	52,800	29
30	53,600	53,650	53,710	53,760	53,820	53,860	53,910	53,970	54,020	54,080	54,130	54,180	54,230	54,280	54,340	54,390	54,450	54,490	54,540	54,600	54,650	30
31	55,390	55,450	55,510	55,570	55,620	55,670	55,730	55,790	55,840	55,900	55,960	56,010	56,060	56,120	56,180	56,240	56,290	56,340	56,400	56,450	56,510	31
32	57,190	57,260	57,320	57,380	57,440	57,490	57,550	57,610	57,670	57,730	57,790	57,840	57,910	57,970	58,030	58,090	58,150	58,200	58,260	58,320	58,380	32
33	59,010	59,080	59,140	59,210	59,270	59,330	59,390	59,460	59,520	59,580	59,650	59,700	59,770	59,830	59,890	59,960	60,020	60,070	60,140	60,200	60,260	33
34	60,840	60,910	60,980	61,040	61,110	61,170	61,240	61,310	61,370	61,440	61,510	61,570	61,630	61,700	61,770	61,830	61,900	61,960	62,020	62,090	62,160	34
35	64,500	64,580	64,650	64,730	64,800	64,870	64,940	65,020	65,090	65,170	65,240	65,310	65,380	65,450	65,530	65,600	65,680	65,740	65,810	65,890	65,960	35
36	68,170	68,260	68,340	68,420	68,500	68,580	68,660	68,740	68,820	68,900	68,980	69,050	69,140	69,220	69,300	69,380	69,460	69,530	69,610	69,690	69,770	36
37	71,790	71,880	71,970	72,060	72,150	72,230	72,320	72,410	72,490	72,580	72,670	72,750	72,840	72,930	73,020	73,100	73,190	73,270	73,360	73,450	73,530	37
38	75,410	75,510	75,600	75,700	75,800	75,880	75,980	76,080	76,170	76,270	76,370	76,450	76,550	76,640	76,740	76,840	76,930	77,020	77,110	77,210	77,300	38
39	78,940	79,050	79,150	79,260	79,360	79,460	79,560	79,670	79,770	79,870	79,980	80,070	80,180	80,280	80,380	80,490	80,590	80,680	80,790	80,890	80,990	39
40	82,460	82,570	82,680	82,800	82,910	83,010	83,120	83,240	83,350	83,460	83,570	83,670	83,790	83,900	84,010	84,120	84,230	84,330	84,440	84,550	84,660	40
41	85,880	86,010	86,130	86,250	86,370	86,480	86,600	86,720	86,840	86,960	87,080	87,190	87,310	87,430	87,550	87,670	87,790	87,900	88,020	88,130	88,250	41
42	89,320	89,450	89,580	89,710	89,840	89,960	90,090	90,220	90,350	90,470	90,600	90,720	90,850	90,980	91,100	91,230	91,360	91,480	91,600	91,730	91,850	42
43	92,620	92,760	92,900	93,040	93,180	93,300	93,440	93,580	93,720	93,850	93,990	94,120	94,250	94,390	94,530	94,660	94,800	94,920	95,060	95,190	95,330	43
44	95,940	96,080	96,230	96,380	96,530	96,660	96,810	96,960	97,100	97,250	97,390	97,530	97,670	97,820	97,960	98,110	98,250	98,380	98,530	98,670	98,810	44
45	99,100	99,260	99,420	99,570	99,730	99,880	100,030	100,190	100,340	100,500	100,650	100,790	100,950	101,100	101,260	101,410	101,560	101,700	101,860	102,010	102,160	45
46	102,270	102,430	102,600	102,770	102,930	103,090	103,250	103,410	103,580	103,740	103,910	104,060	104,220	104,380	104,550	104,710	104,870	105,020	105,180	105,340	105,500	46
47	105,300	105,480	105,650	105,830	106,000	106,170	106,340	106,510	106,690	106,860	107,030	107,200	107,370	107,540	107,710	107,880	108,050	108,210	108,380	108,550	108,720	47
48	108,330	108,510	108,700	108,880	109,070	109,240	109,420	109,610	109,790	109,970	110,150	110,330	110,510	110,690	110,870	111,050	111,230	111,400	111,580	111,760	111,940	48
49	111,870	112,030	112,190	112,340	112,500	112,650	112,800	112,960	113,120	113,280	113,450	113,600	113,760	113,920	114,080	114,240	114,390	114,540	114,700	114,860	115,010	49
50	115,410	115,540	115,670	115,800	115,930	116,040	116,170	116,310	116,450	116,590	116,730	116,860	117,000	117,140	117,280	117,420	117,550	117,680	117,820	117,950	118,090	50
51	119,890	119,930	119,960	120,030	120,140	120,240	120,350	120,460	120,570	120,690	120,800	120,900	121,010	121,120	121,230	121,340	121,440	121,560	121,690	121,830	121,970	51
52	124,350	124,290	124,240	124,250	124,350	124,420	124,510	124,600	124,690	124,770	124,850	124,930	125,010	125,090	125,170	125,250	125,370	125,470	125,580	125,690	125,800	52
53	127,330	127,540	127,850	128,060	128,370	128,670	128,980	129,290	129,500	129,810	130,120	130,420	130,730	130,740	130,750	130,760	130,870	130,870	130,880	130,890	131,000	53
54	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,430	136,440	136,450	136,360	136,270	136,270	136,180	136,190	136,100	54
55	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,430	136,740	136,950	137,160	137,370	137,570	137,880	138,090	138,300	55
56	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,530	137,040	137,550	138,060	138,570	139,070	139,580	140,090	140,600	56
57	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,530	137,040	137,550	138,060	138,570	139,070	139,580	140,090	140,600	57
58	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,530	137,040	137,550	138,060	138,570	139,070	139,580	140,090	140,600	58
59	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,530	137,040	137,550	138,060	138,570	139,070	139,580	140,090	140,600	59
60	130,430	130,940	131,450	131,960	132,470	132,970	133,480	133,990	134,500	135,010	135,520	136,020	136,530	137,040	137,550	138,060	138,570	139,070	139,580	140,090	140,600	60

** Arrangement "0" indicates that all spillway and sluice gates are closed. Discharge is spillway gate overflow.*

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1712.0	1712.1	1712.2	1712.3	1712.4	1712.5	1712.6	1712.7	1712.8	1712.9	1713.0	1713.1	1713.2	1713.3	1713.4	1713.5	1713.6	1713.7	1713.8	1713.9	1714.0	
0*	1,360	1,460	1,570	1,690	1,810	1,930	2,050	2,180	2,310	2,440	2,570	2,710	2,860	3,000	3,150	3,300	3,450	3,610	3,770	3,930	4,100	0*
1	5,580	5,680	5,790	5,910	6,030	6,150	6,270	6,410	6,540	6,670	6,800	6,940	7,090	7,230	7,390	7,540	7,690	7,850	8,010	8,170	8,340	1
2	9,790	9,900	10,010	10,130	10,250	10,380	10,500	10,630	10,770	10,900	11,030	11,170	11,330	11,470	11,620	11,770	11,930	12,090	12,250	12,420	12,590	2
3	14,010	14,110	14,230	14,350	14,480	14,600	14,720	14,860	14,990	15,130	15,260	15,410	15,560	15,700	15,860	16,010	16,170	16,330	16,490	16,660	16,830	3
4	18,230	18,330	18,450	18,570	18,700	18,820	18,950	19,080	19,220	19,360	19,490	19,640	19,790	19,940	20,090	20,250	20,400	20,570	20,740	20,900	21,080	4
5	22,440	22,550	22,670	22,790	22,920	23,050	23,170	23,310	23,450	23,580	23,720	23,870	24,030	24,170	24,330	24,490	24,640	24,810	24,980	25,140	25,320	5
6	26,660	26,770	26,890	27,010	27,140	27,270	27,400	27,540	27,680	27,810	27,950	28,100	28,260	28,410	28,560	28,720	28,880	29,050	29,220	29,390	29,560	6
7	28,030	28,130	28,250	28,350	28,470	28,590	28,710	28,840	28,970	29,100	29,230	29,370	29,520	29,660	29,800	29,950	30,110	30,270	30,430	30,590	30,750	7
8	29,350	29,450	29,550	29,650	29,760	29,870	29,980	30,100	30,220	30,340	30,470	30,600	30,730	30,870	31,000	31,140	31,290	31,440	31,590	31,750	31,900	8
9	30,110	30,200	30,300	30,390	30,490	30,600	30,710	30,820	30,940	31,050	31,170	31,300	31,430	31,560	31,690	31,830	31,970	32,110	32,260	32,410	32,560	9
10	30,940	31,030	31,120	31,200	31,300	31,400	31,510	31,620	31,730	31,830	31,950	32,070	32,190	32,320	32,440	32,570	32,710	32,850	32,990	33,140	33,280	10
11	31,730	31,810	31,890	31,970	32,060	32,160	32,250	32,360	32,460	32,560	32,670	32,790	32,910	33,030	33,150	33,270	33,410	33,540	33,680	33,820	33,950	11
12	32,590	32,650	32,730	32,800	32,880	32,970	33,060	33,160	33,260	33,350	33,460	33,570	33,690	33,800	33,910	34,030	34,160	34,290	34,420	34,560	34,680	12
13	33,440	33,500	33,560	33,620	33,700	33,780	33,860	33,950	34,040	34,130	34,230	34,340	34,440	34,550	34,660	34,780	34,900	35,020	35,150	35,280	35,400	13
14	34,260	34,300	34,360	34,410	34,470	34,540	34,620	34,700	34,790	34,870	34,960	35,060	35,160	35,270	35,370	35,480	35,600	35,720	35,840	35,960	36,080	14
15	35,230	35,260	35,300	35,330	35,370	35,430	35,500	35,570	35,640	35,710	35,800	35,890	35,990	36,080	36,180	36,280	36,390	36,510	36,620	36,740	36,860	15
16	36,140	36,160	36,190	36,200	36,230	36,280	36,330	36,390	36,460	36,520	36,600	36,680	36,770	36,860	36,950	37,050	37,150	37,260	37,370	37,480	37,590	16
17	37,100	37,130	37,150	37,170	37,200	37,230	37,270	37,320	37,360	37,410	37,480	37,550	37,630	37,710	37,790	37,880	37,980	38,080	38,180	38,290	38,390	17
18	38,020	38,050	38,080	38,100	38,130	38,150	38,180	38,210	38,240	38,270	38,330	38,390	38,450	38,530	38,600	38,680	38,770	38,870	38,960	39,070	39,160	18
19	38,940	38,960	38,990	39,010	39,040	39,070	39,100	39,130	39,160	39,190	39,230	39,280	39,320	39,380	39,440	39,520	39,600	39,680	39,770	39,870	39,950	19
20	39,830	39,860	39,890	39,910	39,940	39,970	40,000	40,030	40,060	40,080	40,110	40,140	40,170	40,220	40,270	40,330	40,400	40,480	40,560	40,650	40,730	20
21	40,730	40,760	40,790	40,810	40,850	40,880	40,910	40,940	40,970	40,990	41,030	41,060	41,090	41,130	41,170	41,210	41,270	41,330	41,400	41,480	41,550	21
22	41,620	41,660	41,690	41,710	41,740	41,780	41,810	41,840	41,880	41,900	41,930	41,960	42,000	42,030	42,050	42,080	42,120	42,170	42,230	42,300	42,360	22
23	42,540	42,580	42,610	42,630	42,670	42,700	42,740	42,770	42,810	42,830	42,860	42,900	42,930	42,970	42,990	43,020	43,060	43,100	43,150	43,200	43,250	23
24	43,450	43,490	43,520	43,550	43,590	43,620	43,660	43,690	43,730	43,750	43,790	43,820	43,860	43,900	43,920	43,960	43,990	44,030	44,060	44,100	44,130	24
25	45,320	45,360	45,400	45,430	45,460	45,500	45,540	45,580	45,620	45,650	45,680	45,720	45,760	45,800	45,830	45,870	45,900	45,940	45,980	46,020	46,050	25
26	47,190	47,230	47,270	47,300	47,340	47,390	47,430	47,470	47,510	47,540	47,580	47,620	47,660	47,710	47,740	47,780	47,820	47,860	47,900	47,940	47,970	26
27	49,060	49,110	49,150	49,190	49,230	49,280	49,320	49,370	49,410	49,440	49,490	49,530	49,580	49,620	49,650	49,700	49,740	49,790	49,830	49,870	49,910	27
28	50,950	51,000	51,040	51,080	51,130	51,180	51,220	51,270	51,320	51,350	51,400	51,450	51,490	51,540	51,580	51,630	51,670	51,720	51,770	51,810	51,850	28
29	52,800	52,850	52,900	52,940	52,990	53,040	53,090	53,140	53,190	53,230	53,280	53,330	53,380	53,430	53,470	53,520	53,570	53,620	53,670	53,720	53,760	29
30	54,650	54,710	54,760	54,800	54,860	54,910	54,960	55,020	55,070	55,110	55,160	55,220	55,270	55,320	55,370	55,420	55,470	55,520	55,580	55,630	55,670	30
31	56,510	56,570	56,620	56,670	56,730	56,780	56,840	56,900	56,950	57,000	57,050	57,110	57,170	57,220	57,270	57,320	57,380	57,430	57,490	57,550	57,590	31
32	58,380	58,440	58,500	58,550	58,600	58,660	58,720	58,780	58,840	58,890	58,950	59,010	59,070	59,130	59,180	59,240	59,290	59,350	59,410	59,470	59,520	32
33	60,260	60,330	60,390	60,440	60,510	60,570	60,630	60,690	60,760	60,810	60,870	60,930	60,990	61,060	61,110	61,170	61,230	61,290	61,360	61,420	61,470	33
34	62,160	62,220	62,290	62,340	62,410	62,480	62,540	62,610	62,670	62,730	62,800	62,860	62,930	62,990	63,050	63,110	63,180	63,240	63,310	63,370	63,430	34
35	65,960	66,030	66,110	66,170	66,240	66,310	66,390	66,460	66,530	66,590	66,670	66,740	66,810	66,880	66,950	67,020	67,090	67,160	67,230	67,300	67,370	35
36	69,770	69,850	69,930	70,000	70,080	70,160	70,240	70,320	70,400	70,470	70,550	70,630	70,710	70,780	70,850	70,930	71,010	71,090	71,170	71,240	71,310	36
37	73,530	73,620	73,710	73,780	73,870	73,960	74,050	74,130	74,220	74,300	74,380	74,470	74,550	74,640	74,720	74,800	74,890	74,970	75,060	75,140	75,220	37
38	77,300	77,400	77,490	77,570	77,670	77,760	77,860	77,950	78,040	78,130	78,220	78,320	78,410	78,500	78,580	78,680	78,770	78,860	78,960	79,050	79,130	38
39	80,990	81,090	81,190	81,290	81,390	81,490	81,590	81,690	81,790	81,890	81,990	82,090	82,190	82,290	82,380	82,480	82,580	82,680	82,780	82,880	82,970	39
40	84,660	84,770	84,880	84,980	85,090	85,200	85,310	85,420	85,530	85,620	85,730	85,840	85,950	86,060	86,150	86,260	86,370	86,480	86,580	86,690	86,790	40
41	88,250	88,370	88,490	88,600	88,710	88,830	88,950	89,060	89,180	89,290	89,400	89,520	89,640	89,750	89,860	89,970	90,090	90,200	90,320	90,430	90,540	41
42	91,850	91,980	92,110	92,220	92,350	92,470	92,600	92,720	92,850	92,960	93,090	93,210	93,330	93,460	93,570	93,690	93,820	93,940	94,060	94,180	94,300	42
43	95,330	95,460	95,590	95,720	95,850	95,990	96,120	96,250	96,380	96,510	96,640	96,770	96,900	97,040	97,160	97,290	97,420	97,550	97,680	97,810	97,930	43
44	98,810	98,960	99,100	99,230	99,370	99,520	99,660	99,800	99,940	100,070	100,210	100,350	100,490	100,630	100,760	100,900	101,040	101,180	101,320	101,460	101,580	44
45	102,160	102,310	102,460	102,600	102,750	102,900	103,050	103,200	103,350	103,490	103,640	103,790	103,940	104,090	104,230	104,380	104,520	104,670	104,820	104,970	105,100	45
46	105,500	105,660	105,820	105,970	106,130	106,290	106,450	106,610	106,770	106,920	107,070	107,230	107,390	107,540	107,690	107,850	108,000	108,160	108,320	108,470	108,620	46
47	108,720	108,890	109,060	109,220	109,390	109,560	109,730	109,890	110,060	110,220	110,380	110,550	110,720	110,880	111,040	111,200	111,370	111,530	111,700	111,860	112,020	47
48	111,940	112,120	112,290	112,460	112,640	112,820	112,990	113,170	113,350	113,510	113,690	113,860	114,040	114,210	114,380	114,550	114,730	114,900	115,070	115,250	115,410	48
49	115,010	115,190	115,380	115,560	115,740	115,930	116,120	116,300	116,490	116,660	116,850	117,030	117,220	117,400	117,570	117,760	117,940	118,120	118,310	118,490	118,660	49
50	118,090	118,270	118,470	118,660	118,850	119,050	119,240	119,440	119,630	119,820	120,010	120,210	120,400	120,590	120,780	120,970	121,160	121,350	121,540	121,740	121,920	50
51	121,970	122,120	122,290	122,440	122,600	122,760	122,920	123,080	123,240	123,390	123,550	123,720	123,880	124,050	124,210	124,370	124,540	124,700	124,860	125,030	125,180	51
52	125,800	126,010	126,120	126,220	126,330	126,440	126,550	126,760	126,870	126,970	127,080	127,190	127,400	127,510	127,610	127,720	127,930	128,040	128,150	128,260	128,460	52
53	131,000	131,010	131,020	131,020	131,130	131,140	131,150	131,260	131,370	131,470	131,580	131,690	131,800	131,910	131,910	132,020	132,130	132,240	132,350	132,460	132,560	53
54	136,100	136,010	136,020	135,920	135,830	135,740	135,750	135,860	135,870	135,970	135,980	136,090	136,200	136,210	136,310	136,320	136,430	136,440	136,550	136,660	136,660	54
55	138,300	138,510	138,820	139,020	139,230	139,440	139,750	139,960	140,270	140,570	140,880	141,190	141,500	141,810	142,110	142,420	142,430	142,440	142,450	142,460	142,460	55
56	140,600	141,110	141,620	142,120	142,630	143,140	143,750	144,260	144,770	145,270	145,780	146,290	146,900	147,410	147,910	148,320	148,430	148,440	148,350	148,260	148,260	56
57	140,600	141,110	141,620	142,120	142,630	143,140	143,750	144,260	144,770	145,270	145,780	146,290	146,900	147,410	147,910	148,320	148,630	148,940	149,150	149,360	149,660	57
58	140,600	141,110	141,620	142,120	142,630	143,140	143,750	144,260	144,770	145,270	145,780	146,290	146,900	147,410	147,910	148,420	148,930	149,540	150,050	150,560	151,060	58
59	140,600	141,110	141,620	142,120	142,630	143,140	143,750	144,260	144,770	145,270	145,780	146,290	146,900	147,410	147,910	148,420	148,930	149,540	150,050	150,560	151,060	59
60	140,600	141,110	141,620	142,120	142,630	143,140	143,750	144,260	144,770	145,270	145,780	146,290	146,900	147,410	147,910	148,420	148,930	149,540	150,050	150,560	151,060	60

SEPTEMBER 2005

* *Arrangement "0" indicates that all spillway and sluice gates are closed. Discharge is spillway gate overflow.*

HEADWATER 1712 to 1714

FONTANA DAM
SPILLWAY TUNNEL DISCHARGE
IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1714.0	1714.1	1714.2	1714.3	1714.4	1714.5	1714.6	1714.7	1714.8	1714.9	1715.0	1715.1	1715.2	1715.3	1715.4	1715.5	1715.6	1715.7	1715.8	1715.9	1716.0	
0*	4,100	4,260	4,430	4,610	4,790	4,960	5,150	5,330	5,520	5,710	5,910	6,100	6,300	6,510	6,710	6,920	7,130	7,350	7,560	7,780	8,010	0*
1	8,340	8,510	8,680	8,860	9,040	9,210	9,400	9,580	9,780	9,970	10,170	10,360	10,560	10,770	10,970	11,180	11,400	11,620	11,830	12,050	12,280	1
2	12,590	12,750	12,920	13,110	13,290	13,460	13,650	13,840	14,030	14,220	14,430	14,620	14,820	15,030	15,240	15,450	15,660	15,880	16,100	16,320	16,550	2
3	16,830	17,000	17,170	17,350	17,540	17,710	17,910	18,090	18,290	18,480	18,680	18,880	19,080	19,300	19,500	19,710	19,930	20,150	20,370	20,590	20,820	3
4	21,080	21,240	21,420	21,600	21,790	21,960	22,160	22,340	22,540	22,740	22,940	23,140	23,340	23,560	23,760	23,980	24,190	24,420	24,640	24,860	25,100	4
5	25,320	25,490	25,660	25,850	26,040	26,210	26,410	26,600	26,800	26,990	27,200	27,400	27,600	27,820	28,030	28,240	28,460	28,690	28,900	29,130	29,370	5
6	29,560	29,730	29,910	30,100	30,290	30,470	30,660	30,850	31,050	31,250	31,460	31,660	31,860	32,080	32,290	32,510	32,730	32,950	33,170	33,400	33,640	6
7	30,750	30,920	31,090	31,270	31,440	31,630	31,800	31,990	32,180	32,370	32,570	32,770	32,960	33,160	33,370	33,580	33,790	34,000	34,220	34,440	34,670	7
8	31,900	32,060	32,230	32,390	32,560	32,740	32,900	33,080	33,270	33,450	33,640	33,830	34,010	34,210	34,410	34,610	34,820	35,020	35,230	35,440	35,660	8
9	32,560	32,720	32,880	33,040	33,210	33,370	33,540	33,710	33,890	34,070	34,250	34,440	34,620	34,810	35,010	35,200	35,410	35,600	35,810	36,020	36,230	9
10	33,280	33,430	33,590	33,750	33,910	34,070	34,230	34,400	34,570	34,750	34,920	35,110	35,280	35,470	35,660	35,850	36,050	36,240	36,440	36,640	36,850	10
11	33,950	34,100	34,250	34,410	34,560	34,720	34,870	35,040	35,210	35,380	35,550	35,730	35,900	36,080	36,270	36,460	36,650	36,830	37,030	37,230	37,430	11
12	34,680	34,830	34,970	35,120	35,270	35,430	35,570	35,730	35,900	36,060	36,230	36,400	36,570	36,750	36,930	37,110	37,300	37,480	37,670	37,860	38,060	12
13	35,400	35,540	35,680	35,820	35,970	36,120	36,260	36,410	36,570	36,730	36,900	37,060	37,220	37,400	37,570	37,750	37,930	38,110	38,290	38,480	38,680	13
14	36,080	36,210	36,350	36,480	36,620	36,770	36,910	37,060	37,210	37,370	37,530	37,690	37,840	38,010	38,180	38,360	38,530	38,700	38,890	39,070	39,260	14
15	36,860	36,980	37,110	37,240	37,380	37,520	37,650	37,790	37,940	38,090	38,250	38,400	38,550	38,720	38,880	39,050	39,220	39,390	39,570	39,750	39,930	15
16	37,590	37,710	37,840	37,960	38,090	38,230	38,350	38,490	38,640	38,780	38,930	39,080	39,230	39,390	39,550	39,710	39,880	40,040	40,210	40,390	40,570	16
17	38,390	38,510	38,630	38,750	38,870	39,000	39,120	39,260	39,390	39,530	39,680	39,820	39,960	40,120	40,270	40,430	40,600	40,750	40,920	41,090	41,260	17
18	39,160	39,270	39,390	39,500	39,620	39,750	39,860	39,990	40,120	40,260	40,390	40,540	40,670	40,820	40,970	41,120	41,280	41,430	41,600	41,760	41,930	18
19	39,950	40,060	40,160	40,280	40,390	40,510	40,620	40,740	40,870	41,000	41,130	41,270	41,400	41,540	41,690	41,840	41,990	42,130	42,290	42,450	42,620	19
20	40,730	40,820	40,920	41,030	41,140	41,250	41,360	41,480	41,600	41,720	41,850	41,980	42,110	42,240	42,380	42,530	42,680	42,820	42,970	43,130	43,290	20
21	41,550	41,640	41,730	41,830	41,930	42,030	42,130	42,250	42,360	42,480	42,610	42,730	42,850	42,990	43,120	43,260	43,400	43,540	43,690	43,840	43,990	21
22	42,360	42,440	42,520	42,610	42,710	42,810	42,900	43,010	43,120	43,230	43,350	43,480	43,590	43,720	43,850	43,980	44,120	44,250	44,390	44,540	44,690	22
23	43,250	43,310	43,390	43,470	43,550	43,640	43,730	43,830	43,930	44,040	44,150	44,270	44,380	44,500	44,630	44,760	44,890	45,010	45,150	45,290	45,440	23
24	44,130	44,180	44,240	44,310	44,390	44,470	44,540	44,640	44,730	44,840	44,940	45,050	45,160	45,280	45,400	45,520	45,650	45,770	45,900	46,040	46,180	24
25	46,050	46,100	46,150	46,200	46,260	46,320	46,380	46,450	46,520	46,600	46,680	46,770	46,860	46,970	47,070	47,180	47,300	47,410	47,530	47,650	47,780	25
26	47,970	48,010	48,050	48,090	48,130	48,170	48,200	48,250	48,290	48,350	48,420	48,490	48,560	48,650	48,740	48,840	48,940	49,040	49,150	49,270	49,390	26
27	49,910	49,950	49,990	50,040	50,080	50,120	50,160	50,200	50,250	50,300	50,360	50,420	50,470	50,540	50,610	50,680	50,760	50,840	50,930	51,030	51,130	27
28	51,850	51,890	51,940	51,990	52,030	52,080	52,120	52,160	52,210	52,250	52,300	52,350	52,380	52,430	52,470	52,520	52,570	52,630	52,710	52,790	52,880	28
29	53,760	53,810	53,860	53,910	53,960	54,010	54,050	54,100	54,140	54,190	54,240	54,290	54,330	54,380	54,430	54,480	54,530	54,580	54,640	54,710	54,780	29
30	55,670	55,720	55,780	55,830	55,880	55,930	55,970	56,030	56,080	56,130	56,180	56,230	56,270	56,330	56,380	56,430	56,480	56,520	56,570	56,620	56,680	30
31	57,590	57,650	57,700	57,760	57,810	57,870	57,910	57,970	58,020	58,080	58,130	58,190	58,230	58,290	58,340	58,390	58,450	58,490	58,550	58,600	58,660	31
32	59,520	59,580	59,640	59,690	59,750	59,810	59,860	59,920	59,970	60,030	60,090	60,150	60,190	60,250	60,310	60,370	60,420	60,470	60,530	60,590	60,640	32
33	61,470	61,530	61,590	61,650	61,720	61,780	61,830	61,890	61,950	62,010	62,070	62,130	62,180	62,240	62,300	62,370	62,430	62,480	62,540	62,600	62,660	33
34	63,430	63,490	63,560	63,620	63,690	63,750	63,800	63,870	63,930	64,000	64,060	64,120	64,180	64,240	64,310	64,370	64,430	64,490	64,550	64,610	64,680	34
35	67,370	67,440	67,510	67,580	67,650	67,720	67,780	67,850	67,920	67,990	68,070	68,140	68,200	68,270	68,340	68,410	68,480	68,540	68,610	68,680	68,750	35
36	71,310	71,390	71,470	71,550	71,620	71,700	71,770	71,850	71,920	72,000	72,080	72,160	72,220	72,300	72,380	72,450	72,530	72,600	72,670	72,750	72,820	36
37	75,220	75,300	75,390	75,470	75,560	75,640	75,720	75,800	75,890	75,970	76,050	76,140	76,210	76,300	76,380	76,460	76,550	76,620	76,700	76,790	76,870	37
38	79,130	79,220	79,310	79,410	79,500	79,590	79,670	79,760	79,850	79,940	80,030	80,130	80,210	80,300	80,390	80,480	80,570	80,650	80,740	80,830	80,920	38
39	82,970	83,070	83,170	83,270	83,370	83,460	83,550	83,650	83,750	83,850	83,950	84,040	84,130	84,230	84,330	84,430	84,520	84,610	84,710	84,800	84,900	39
40	86,790	86,900	87,000	87,110	87,210	87,320	87,420	87,520	87,630	87,730	87,840	87,940	88,040	88,140	88,250	88,350	88,460	88,550	88,660	88,760	88,860	40
41	90,540	90,650	90,770	90,880	90,990	91,110	91,210	91,330	91,440	91,550	91,660	91,780	91,880	91,990	92,100	92,220	92,330	92,430	92,540	92,650	92,770	41
42	94,300	94,420	94,540	94,660	94,780	94,910	95,020	95,140	95,260	95,380	95,500	95,620	95,730	95,850	95,970	96,090	96,210	96,320	96,440	96,560	96,680	42
43	97,930	98,060	98,190	98,320	98,450	98,580	98,700	98,830	98,960	99,090	99,220	99,340	99,460	99,590	99,720	99,840	99,970	100,090	100,220	100,340	100,470	43
44	101,580	101,720	101,860	102,000	102,140	102,270	102,400	102,540	102,670	102,810	102,950	103,080	103,210	103,350	103,480	103,620	103,750	103,880	104,010	104,140	104,280	44
45	105,100	105,250	105,390	105,540	105,690	105,830	105,970	106,110	106,260	106,400	106,550	106,690	106,830	106,970	107,110	107,260	107,400	107,530	107,670	107,820	107,960	45
46	108,620	108,770	108,930	109,080	109,230	109,390	109,530	109,690	109,840	109,990	110,140	110,300	110,440	110,590	110,740	110,890	111,050	111,190	111,340	111,490	111,640	46
47	112,020	112,180	112,340	112,510	112,670	112,830	112,980	113,150	113,310	113,470	113,630	113,790	113,940	114,100	114,260	114,420	114,580	114,730	114,890	115,050	115,210	47
48	115,410	115,580	115,750	115,920	116,100	116,270	116,430	116,600	116,770	116,940	117,110	117,280	117,440	117,610	117,770	117,940	118,110	118,270	118,440	118,600	118,770	48
49	118,660	118,840	119,020	119,200	119,380	119,560	119,730	119,910	120,090	120,270	120,450	120,630	120,800	120,970	121,150	121,330	121,500	121,670	121,850	122,020	122,200	49
50	121,920	122,110	122,300	122,490	122,680	122,870	123,040	123,230	123,420	123,610	123,800	123,980	124,160	124,350	124,530	124,720	124,900	125,080	125,260	125,450	125,630	50
51	125,180	125,340	125,480	125,690	125,800	126,010	126,210	126,420	126,630	126,840	127,050	127,160	127,360	127,570	127,780	127,990	128,200	128,400	128,510	128,720	128,930	51
52	128,460	128,570	128,680	128,790	129,000	129,210	129,410	129,620	129,830	130,040	130,250	130,460	130,660	130,870	130,980	131,190	131,400	131,600	131,810	132,020	132,230	52
53	132,560	132,670	132,780	132,990	133,100	133,310	133,410	133,620	133,730	133,940	134,050	134,260	134,360	134,570	134,680	134,890	135,100	135,200	135,410	135,520	135,730	53
54	136,660	136,870	136,980	137,090	137,200	137,310	137,410	137,520	137,730	137,840	137,950	138,060	138,160	138,270	138,380	138,590	138,700	138,800	138,910	139,120	139,230	54
55	142,460	142,570	142,580	142,590	142,600	142,610	142,710	142,720	142,730	142,740	142,850	142,960	142,960	143,070	143,180	143,290	143,400	143,400	143,510	143,620	143,730	55
56	148,260	148,170	148,080	148,090	148,000	147,910	147,810	147,820	147,730	147,640	147,750	147,760	147,860	147,870	147,880	147,990	148,000	148,100	148,110	148,120	148,230	56
57	149,660	149,870	150,080	150,390	150,600	150,810	151,010	151,320	151,530	151,840	152,050	152,360	152,660	152,970	153,280	153,590	153,900	154,200	154,510	154,520	154,530	57
58	151,060	151,670	152,180	152,690	153,300	153,810	154,310	154,820	155,430	155,940	156,550	157,060	157,560	158,170	158,680	159,190	159,800	160,300	160,710	160,820	160,730	58
59	151,060	151,670	152,180	152,690	153,300	153,810	154,310	154,820	155,430	155,940	156,550	157,060	157,560	158,170	158,680	159,190	159,800	160,300	160,710	160,920	161,030	59
60	151,060	151,670	152,180	152,690	153,300	153,810	154,310	154,820	155,430	155,940	156,550	157,060	157,560	158,170	158,680	159,190	159,800	160,300	160,710	161,020	161,330	60
61	151,060	151,670	152,180	152,690	153,300	153,810	154,310	154,820	155,430	155,940	156,550	157,060	157,560	158,170	158,680	159,190	159,800	160,300	160,910	161,420	161,830	61
62	151,060	151,670	152,180	152,690	153,300	153,810	154,310	154,820	155,430	155,940	156,550	157,060	157,560	158,170	158,680	159,190	159,800	160,300	160,910	161,420	162,030	62

HEADWATER 1714 to 1716

* *Arrangement "0" indicates that all spillway and sluice gates are closed. Discharge is spillway gate overflow.*

SEPTEMBER 2005

FONTANA DAM

SPILLWAY TUNNEL DISCHARGE

IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																				GATE ARRANGEMENT
	1716.0	1716.1	1716.2	1716.3	1716.4	1716.5	1716.6	1716.7	1716.8	1716.9	1717.0	1717.1	1717.2	1717.3	1717.4	1717.5	1717.6	1717.7	1717.8	1717.9	1718.0	
0*	8,010	8,230	8,460	8,690	8,930	9,160	9,400	9,650	9,890	10,140	10,390	10,650	10,910	11,170	11,430	11,700	11,970	12,240	12,510	12,790	13,070	0*
1	12,280	12,500	12,730	12,970	13,210	13,440	13,680	13,930	14,170	14,420	14,680	14,940	15,200	15,460	15,720	15,980	16,260	16,530	16,810	17,090	17,370	1
2	16,550	16,780	17,010	17,240	17,480	17,720	17,960	18,210	18,460	18,710	18,960	19,220	19,490	19,750	20,010	20,280	20,560	20,830	21,100	21,390	21,670	2
3	20,820	21,050	21,280	21,520	21,760	22,000	22,240	22,490	22,740	22,990	23,250	23,510	23,770	24,040	24,300	24,580	24,850	25,120	25,400	25,680	25,970	3
4	25,100	25,320	25,560	25,790	26,040	26,270	26,520	26,770	27,020	27,280	27,530	27,800	28,060	28,330	28,590	28,870	29,140	29,420	29,690	29,980	30,270	4
5	29,370	29,590	29,830	30,070	30,320	30,550	30,800	31,060	31,300	31,560	31,820	32,080	32,350	32,620	32,880	33,160	33,440	33,710	33,990	34,280	34,560	5
6	33,640	33,870	34,110	34,340	34,590	34,830	35,080	35,340	35,590	35,840	36,100	36,370	36,640	36,910	37,170	37,450	37,730	38,010	38,290	38,580	38,860	6
7	34,670	34,890	35,120	35,350	35,580	35,820	36,060	36,310	36,560	36,800	37,050	37,310	37,570	37,830	38,080	38,350	38,620	38,900	39,170	39,450	39,730	7
8	35,660	35,880	36,100	36,320	36,550	36,780	37,010	37,250	37,490	37,720	37,970	38,210	38,470	38,720	38,970	39,230	39,490	39,760	40,020	40,300	40,560	8
9	36,230	36,440	36,660	36,870	37,100	37,320	37,550	37,780	38,020	38,250	38,490	38,730	38,980	39,230	39,470	39,730	39,990	40,250	40,510	40,780	41,040	9
10	36,850	37,060	37,270	37,480	37,700	37,920	38,150	38,370	38,600	38,830	39,060	39,300	39,540	39,790	40,030	40,280	40,530	40,790	41,050	41,310	41,560	10
11	37,430	37,640	37,850	38,050	38,260	38,480	38,700	38,920	39,150	39,370	39,600	39,830	40,070	40,310	40,540	40,790	41,040	41,290	41,550	41,800	42,050	11
12	38,060	38,260	38,470	38,660	38,870	39,080	39,300	39,520	39,740	39,950	40,180	40,410	40,640	40,880	41,110	41,350	41,590	41,840	42,090	42,340	42,580	12
13	38,680	38,870	39,070	39,270	39,470	39,680	39,890	40,100	40,320	40,530	40,750	40,970	41,200	41,430	41,660	41,890	42,130	42,370	42,620	42,870	43,110	13
14	39,260	39,450	39,650	39,840	40,040	40,240	40,450	40,650	40,870	41,070	41,290	41,510	41,730	41,960	42,180	42,410	42,640	42,880	43,120	43,360	43,600	14
15	39,930	40,120	40,310	40,490	40,690	40,880	41,090	41,290	41,500	41,700	41,910	42,120	42,340	42,560	42,780	43,000	43,230	43,470	43,700	43,940	44,170	15
16	40,570	40,750	40,930	41,110	41,300	41,500	41,690	41,890	42,090	42,290	42,500	42,710	42,920	43,140	43,350	43,570	43,800	44,020	44,250	44,490	44,710	16
17	41,260	41,440	41,620	41,790	41,980	42,170	42,360	42,550	42,750	42,940	43,140	43,350	43,560	43,770	43,970	44,190	44,410	44,630	44,860	45,090	45,310	17
18	41,930	42,100	42,280	42,450	42,630	42,810	43,000	43,190	43,380	43,570	43,760	43,960	44,170	44,380	44,580	44,790	45,000	45,220	45,440	45,670	45,880	18
19	42,620	42,780	42,950	43,120	43,290	43,470	43,660	43,840	44,030	44,210	44,400	44,600	44,800	45,000	45,200	45,400	45,620	45,830	46,050	46,270	46,480	19
20	43,290	43,450	43,620	43,770	43,950	44,120	44,300	44,480	44,660	44,840	45,030	45,220	45,410	45,610	45,800	46,010	46,210	46,420	46,630	46,850	47,060	20
21	43,990	44,150	44,310	44,470	44,630	44,800	44,980	45,150	45,330	45,500	45,690	45,870	46,060	46,260	46,440	46,640	46,840	47,050	47,260	47,470	47,670	21
22	44,690	44,840	45,000	45,150	45,310	45,480	45,640	45,810	45,990	46,160	46,340	46,520	46,710	46,890	47,080	47,270	47,470	47,670	47,870	48,080	48,280	22
23	45,440	45,590	45,740	45,880	46,040	46,200	46,360	46,530	46,700	46,860	47,040	47,210	47,400	47,580	47,760	47,950	48,140	48,340	48,540	48,740	48,930	23
24	46,180	46,320	46,470	46,610	46,760	46,910	47,070	47,240	47,400	47,560	47,730	47,900	48,080	48,260	48,430	48,620	48,810	49,000	49,190	49,390	49,580	24
25	47,780	47,920	48,050	48,180	48,330	48,470	48,620	48,770	48,930	49,080	49,240	49,400	49,570	49,740	49,900	50,080	50,260	50,440	50,630	50,810	50,990	25
26	49,390	49,510	49,640	49,760	49,890	50,030	50,160	50,310	50,450	50,590	50,740	50,900	51,050	51,220	51,370	51,540	51,710	51,880	52,060	52,230	52,410	26
27	51,130	51,240	51,360	51,460	51,580	51,710	51,840	51,970	52,100	52,230	52,380	52,520	52,670	52,820	52,960	53,120	53,280	53,450	53,610	53,780	53,950	27
28	52,880	52,970	53,070	53,170	53,280	53,390	53,510	53,630	53,760	53,880	54,010	54,150	54,290	54,430	54,560	54,710	54,860	55,020	55,170	55,330	55,490	28
29	54,780	54,860	54,930	55,000	55,090	55,190	55,290	55,400	55,510	55,610	55,730	55,860	55,990	56,120	56,240	56,380	56,530	56,670	56,820	56,970	57,120	29
30	56,680	56,730	56,780	56,820	56,890	56,970	57,060	57,150	57,250	57,340	57,450	57,560	57,680	57,800	57,920	58,050	58,190	58,320	58,460	58,610	58,740	30
31	58,660	58,710	58,760	58,810	58,880	58,940	59,020	59,090	59,170	59,240	59,320	59,410	59,510	59,620	59,720	59,840	59,960	60,090	60,210	60,350	60,470	31
32	60,640	60,700	60,760	60,800	60,860	60,920	60,970	61,030	61,090	61,130	61,190	61,270	61,350	61,440	61,530	61,630	61,740	61,850	61,970	62,090	62,210	32
33	62,660	62,720	62,780	62,830	62,890	62,950	63,010	63,070	63,130	63,180	63,240	63,300	63,380	63,450	63,520	63,610	63,690	63,780	63,880	63,980	64,090	33
34	64,680	64,740	64,800	64,860	64,920	64,980	65,040	65,110	65,170	65,220	65,280	65,350	65,410	65,470	65,520	65,590	65,650	65,710	65,790	65,880	65,960	34
35	68,750	68,820	68,890	68,940	69,010	69,080	69,150	69,220	69,290	69,350	69,420	69,490	69,560	69,620	69,680	69,750	69,820	69,890	69,970	70,050	70,120	35
36	72,820	72,900	72,980	73,040	73,120	73,190	73,270	73,350	73,420	73,490	73,560	73,640	73,710	73,790	73,850	73,930	74,000	74,080	74,150	74,220	74,290	36
37	76,870	76,950	77,030	77,110	77,190	77,270	77,350	77,440	77,520	77,590	77,670	77,750	77,840	77,920	77,990	78,070	78,150	78,230	78,310	78,400	78,470	37
38	80,920	81,010	81,100	81,180	81,270	81,350	81,440	81,530	81,620	81,700	81,790	81,880	81,970	82,050	82,130	82,220	82,310	82,400	82,480	82,570	82,650	38
39	84,900	85,000	85,090	85,180	85,280	85,370	85,470	85,570	85,660	85,750	85,840	85,940	86,030	86,130	86,210	86,310	86,400	86,500	86,590	86,690	86,770	39
40	88,860	88,970	89,070	89,170	89,270	89,370	89,480	89,580	89,680	89,770	89,880	89,980	90,080	90,180	90,280	90,380	90,480	90,580	90,680	90,780	90,880	40
41	92,770	92,880	92,990	93,090	93,200	93,310	93,420	93,530	93,640	93,740	93,850	93,960	94,070	94,180	94,280	94,390	94,500	94,610	94,710	94,820	94,920	41
42	96,680	96,790	96,910	97,020	97,140	97,260	97,380	97,490	97,610	97,720	97,830	97,950	98,070	98,190	98,290	98,410	98,520	98,640	98,760	98,870	98,980	42
43	100,470	100,600	100,720	100,840	100,960	101,090	101,210	101,340	101,460	101,580	101,700	101,830	101,950	102,080	102,190	102,320	102,440	102,560	102,690	102,810	102,920	43
44	104,280	104,410	104,550	104,670	104,800	104,940	105,070	105,200	105,340	105,460	105,590	105,720	105,860	105,990	106,110	106,240	106,370	106,500	106,630	106,760	106,880	44
45	107,960	108,100	108,240	108,380	108,520	108,660	108,800	108,940	109,080	109,210	109,350	109,490	109,630	109,770	109,900	110,040	110,180	110,320	110,460	110,590	110,720	45
46	111,640	111,790	111,940	112,080	112,230	112,380	112,520	112,670	112,820	112,960	113,110	113,260	113,400	113,550	113,690	113,840	113,980	114,130	114,280	114,420	114,560	46
47	115,210	115,370	115,520	115,670	115,830	115,990	116,140	116,300	116,460	116,610	116,760	116,920	117,070	117,230	117,370	117,530	117,680	117,840	117,990	118,150	118,290	47
48	118,770	118,940	119,100	119,260	119,430	119,590	119,760	119,920	120,090	120,240	120,410	120,570	120,730	120,900	121,050	121,210	121,380	121,540	121,700	121,870	122,020	48
49	122,200	122,370	122,550	122,710	122,890	123,060	123,240	123,410	123,580	123,750	123,920	124,090	124,260	124,440	124,600	124,770	124,940	125,110	125,280	125,450	125,610	49
50	125,630	125,840	126,050	126,150	126,360	126,570	126,680	126,890	127,100	127,300	127,410	127,620	127,830	127,940	128,140	128,350	128,560	128,670	128,880	129,090	129,190	50
51	128,930	129,140	129,350	129,450	129,660	129,870	130,080	130,290	130,500	130,600	130,810	131,020	131,230	131,440	131,540	131,750	131,960	132,170	132,280	132,490	132,690	51
52	132,230	132,440	132,650	132,850	133,060	133,270	133,480	133,590	133,800	134,000	134,210	134,420	134,630	134,840	135,040	135,150	135,360	135,570	135,780	135,990	136,190	52
53	135,730	135,840	136,050	136,250	136,360	136,570	136,680	136,890	137,100	137,300	137,510	137,720	137,930	138,140	138,240	138,450	138,660	138,870	139,080	139,290	139,490	53
54	139,230	139,340	139,450	139,550	139,760	139,870	139,980	140,090	140,300	140,500	140,710	140,920	141,130	141,340	141,540	141,850	142,060	142,270	142,480	142,690	142,890	54
55	143,730	143,840	143,850	143,950	144,060	144,270	144,380	144,490	144,600	144,800	145,010	145,120	145,330	145,440	145,640	145,750	145,960	146,070	146,280	146,490	146,590	55
56	148,230	148,240	148,350	148,350	148,460	148,570	148,680	148,890	149,000	149,100	149,210	149,320	149,430	149,540	149,640	149,750	149,860	149,970	150,080	150,190	150,390	56
57	154,530	154,540	154,550	154,550	154,560	154,570	154,580	154,590	154,700	154,700	154,710	154,720	154,730	154,840	154,840	154,950	155,060	155,070	155,180	155,290	155,290	57
58	160,730	160,740	160,650	160,550	160,560	160,470	160,380	160,390	160,300	160,200	160,110	160,120	160,030	160,040	160,040	160,150	160,160	160,170	160,180	160,190	160,290	58
59	161,030	161,140	161,250	161,350	161,460	161,470	161,580	161,690	161,800	161,900	161,910	162,020	162,130	162,340	162,440	162,650	162,860	162,970	163,180	163,290	163,490	59
60	161,330	161,540	161,850	162,050	162,260	162,570	162,780	163,090	163,300	163,500	163,810	164,020	164,330	164,640	164,940	165,250	165,460	165,770	166,080	166,390	166,690	60
61	161,830	162,240	162,550	162,950	163,360	163,770	164,180	164,590	165,000	165,400	165,810	166,220	166,630	167,040	167,440	167,950	168,360	168,770	169,280	169,690	170,090	61
62	162,030	162,540	163,150	163,650	164,260	164,770	165,380	165,890	166,500	167,000	167,610	168,120	168,730	169,240	169,840	170,450	170,960	171,570	172,180	172,690	173,290	62

SEPTEMBER 2005

** Arrangement "0" indicates that all spillway and sluice gates are closed. Discharge is spillway gate overflow.*

HEADWATER 1716 to 1718

FONTANA DAM
SPILLWAY TUNNEL DISCHARGE
IN CUBIC FEET PER SECOND

GATE ARRANGEMENT	HEADWATER ELEVATION																					GATE ARRANGEMENT
	1718.0	1718.1	1718.2	1718.3	1718.4	1718.5	1718.6	1718.7	1718.8	1718.9	1719.0	1719.1	1719.2	1719.3	1719.4	1719.5	1719.6	1719.7	1719.8	1719.9	1720.0	
0*	13,070	13,360	13,640	13,930	14,220	14,520	14,820	15,120	15,420	15,730	16,040	16,360	16,670	16,990	17,310	17,640	17,970	18,300	18,630	18,970	19,310	0*
1	17,370	17,660	17,940	18,230	18,520	18,830	19,130	19,430	19,730	20,040	20,350	20,670	20,990	21,310	21,630	21,960	22,290	22,620	22,950	23,290	23,640	1
2	21,670	21,960	22,240	22,540	22,830	23,130	23,430	23,740	24,040	24,350	24,670	24,990	25,300	25,620	25,950	26,280	26,610	26,940	27,280	27,620	27,960	2
3	25,970	26,260	26,550	26,840	27,130	27,440	27,740	28,050	28,350	28,660	28,980	29,300	29,620	29,940	30,260	30,600	30,930	31,270	31,600	31,940	32,290	3
4	30,270	30,560	30,850	31,140	31,440	31,740	32,050	32,350	32,660	32,970	33,290	33,620	33,930	34,260	34,580	34,920	35,250	35,590	35,920	36,270	36,610	4
5	34,560	34,860	35,150	35,450	35,740	36,050	36,360	36,660	36,970	37,290	37,600	37,930	38,250	38,570	38,900	39,240	39,570	39,910	40,250	40,590	40,940	5
6	38,860	39,160	39,450	39,750	40,050	40,350	40,660	40,970	41,280	41,600	41,920	42,240	42,560	42,890	43,220	43,560	43,890	44,230	44,570	44,920	45,270	6
7	39,730	40,010	40,300	40,590	40,880	41,170	41,470	41,780	42,080	42,390	42,700	43,010	43,320	43,640	43,970	44,300	44,610	44,950	45,280	45,620	45,960	7
8	40,560	40,840	41,120	41,400	41,690	41,970	42,260	42,550	42,850	43,150	43,450	43,750	44,060	44,370	44,690	45,010	45,320	45,640	45,970	46,300	46,630	8
9	41,040	41,310	41,590	41,870	42,150	42,420	42,710	43,000	43,290	43,590	43,890	44,180	44,480	44,790	45,100	45,420	45,720	46,040	46,370	46,690	47,020	9
10	41,560	41,830	42,100	42,380	42,650	42,920	43,200	43,490	43,780	44,070	44,360	44,650	44,950	45,250	45,560	45,870	46,170	46,480	46,800	47,120	47,440	10
11	42,050	42,320	42,580	42,850	43,120	43,390	43,670	43,950	44,230	44,520	44,810	45,090	45,380	45,680	45,980	46,290	46,580	46,890	47,210	47,520	47,840	11
12	42,580	42,840	43,100	43,370	43,640	43,900	44,170	44,440	44,720	45,000	45,290	45,560	45,850	46,150	46,440	46,740	47,030	47,340	47,650	47,960	48,270	12
13	43,110	43,360	43,620	43,880	44,140	44,390	44,660	44,930	45,200	45,480	45,760	46,030	46,320	46,610	46,900	47,190	47,480	47,780	48,080	48,390	48,690	13
14	43,600	43,850	44,100	44,360	44,610	44,860	45,130	45,390	45,660	45,930	46,210	46,480	46,780	47,040	47,330	47,620	47,900	48,190	48,490	48,790	49,100	14
15	44,170	44,420	44,660	44,910	45,160	45,410	45,670	45,930	46,190	46,460	46,730	46,990	47,270	47,550	47,830	48,110	48,390	48,680	48,970	49,270	49,570	15
16	44,710	44,950	45,200	45,440	45,690	45,930	46,180	46,440	46,700	46,960	47,230	47,480	47,760	48,030	48,310	48,580	48,860	49,140	49,430	49,720	50,020	16
17	45,310	45,550	45,780	46,020	46,270	46,500	46,750	47,000	47,260	47,510	47,770	48,030	48,290	48,560	48,830	49,110	49,380	49,660	49,940	50,230	50,510	17
18	45,880	46,110	46,350	46,580	46,820	47,050	47,300	47,540	47,790	48,050	48,300	48,550	48,810	49,070	49,340	49,610	49,870	50,150	50,430	50,710	50,990	18
19	46,480	46,700	46,930	47,160	47,400	47,620	47,860	48,100	48,350	48,600	48,850	49,090	49,350	49,610	49,870	50,140	50,390	50,670	50,940	51,220	51,500	19
20	47,060	47,280	47,500	47,730	47,960	48,180	48,420	48,650	48,890	49,140	49,380	49,620	49,880	50,130	50,390	50,650	50,900	51,170	51,440	51,710	51,990	20
21	47,670	47,890	48,110	48,330	48,550	48,770	49,000	49,240	49,470	49,710	49,950	50,190	50,430	50,690	50,940	51,200	51,440	51,710	51,970	52,240	52,510	21
22	48,280	48,490	48,700	48,920	49,140	49,350	49,580	49,810	50,040	50,280	50,510	50,740	50,990	51,230	51,480	51,730	51,980	52,240	52,500	52,760	53,030	22
23	48,930	49,140	49,350	49,560	49,780	49,990	50,210	50,430	50,660	50,890	51,120	51,350	51,590	51,830	52,070	52,320	52,560	52,810	53,070	53,330	53,590	23
24	49,580	49,780	49,990	50,200	50,410	50,610	50,830	51,050	51,270	51,500	51,730	51,950	52,180	52,420	52,660	52,900	53,140	53,390	53,640	53,890	54,150	24
25	50,990	51,190	51,390	51,580	51,790	51,980	52,190	52,400	52,620	52,830	53,050	53,270	53,490	53,720	53,950	54,190	54,410	54,650	54,890	55,140	55,390	25
26	52,410	52,590	52,780	52,970	53,160	53,350	53,550	53,750	53,960	54,170	54,380	54,580	54,800	55,020	55,240	55,460	55,680	55,910	56,150	56,380	56,620	26
27	53,950	54,120	54,300	54,480	54,670	54,850	55,040	55,230	55,430	55,630	55,830	56,030	56,230	56,450	56,660	56,880	57,090	57,310	57,530	57,760	57,990	27
28	55,490	55,660	55,830	56,000	56,180	56,340	56,530	56,710	56,900	57,090	57,290	57,470	57,670	57,870	58,080	58,290	58,490	58,700	58,920	59,140	59,360	28
29	57,120	57,280	57,440	57,600	57,770	57,930	58,100	58,280	58,460	58,640	58,830	59,010	59,200	59,390	59,590	59,790	59,980	60,190	60,400	60,610	60,830	29
30	58,740	58,890	59,040	59,200	59,360	59,510	59,670	59,840	60,010	60,190	60,370	60,540	60,720	60,910	61,100	61,290	61,470	61,670	61,870	62,080	62,280	30
31	60,470	60,610	60,760	60,900	61,050	61,200	61,350	61,510	61,680	61,840	62,010	62,170	62,350	62,530	62,710	62,890	63,070	63,260	63,450	63,650	63,850	31
32	62,210	62,340	62,470	62,610	62,750	62,890	63,040	63,190	63,340	63,500	63,660	63,810	63,980	64,150	64,320	64,500	64,670	64,850	65,030	65,220	65,410	32
33	64,090	64,200	64,320	64,450	64,580	64,700	64,840	64,980	65,130	65,280	65,430	65,570	65,730	65,900	66,060	66,230	66,390	66,560	66,740	66,920	67,100	33
34	65,960	66,070	66,170	66,290	66,410	66,520	66,650	66,780	66,920	67,060	67,200	67,340	67,490	67,640	67,800	67,960	68,110	68,280	68,440	68,620	68,790	34
35	70,120	70,210	70,300	70,400	70,500	70,580	70,690	70,790	70,890	71,000	71,110	71,210	71,340	71,460	71,600	71,740	71,870	72,010	72,160	72,320	72,480	35
36	74,290	74,360	74,440	74,510	74,590	74,650	74,720	74,800	74,870	74,950	75,020	75,090	75,180	75,290	75,400	75,510	75,630	75,750	75,890	76,020	76,160	36
37	78,470	78,550	78,630	78,710	78,790	78,860	78,940	79,020	79,100	79,180	79,260	79,340	79,430	79,520	79,620	79,720	79,820	79,920	80,030	80,140	80,260	37
38	82,650	82,740	82,820	82,910	83,000	83,080	83,160	83,250	83,340	83,420	83,510	83,590	83,670	83,760	83,840	83,930	84,010	84,090	84,180	84,260	84,350	38
39	86,770	86,870	86,960	87,060	87,150	87,230	87,330	87,420	87,510	87,610	87,700	87,780	87,880	87,970	88,060	88,160	88,240	88,330	88,420	88,520	88,610	39
40	90,880	90,980	91,080	91,180	91,280	91,370	91,470	91,570	91,670	91,770	91,870	91,960	92,060	92,160	92,260	92,360	92,450	92,550	92,650	92,750	92,850	40
41	94,920	95,030	95,140	95,250	95,350	95,450	95,560	95,670	95,770	95,880	95,990	96,090	96,190	96,300	96,410	96,510	96,610	96,710	96,820	96,930	97,030	41
42	98,980	99,090	99,210	99,320	99,440	99,540	99,660	99,770	99,890	100,000	100,120	100,220	100,330	100,450	100,560	100,670	100,780	100,890	101,000	101,120	101,230	42
43	102,920	103,050	103,170	103,290	103,410	103,530	103,650	103,770	103,890	104,010	104,130	104,250	104,370	104,490	104,610	104,730	104,840	104,960	105,080	105,200	105,320	43
44	106,880	107,020	107,150	107,280	107,410	107,520	107,650	107,780	107,910	108,040	108,170	108,290	108,420	108,550	108,670	108,800	108,920	109,050	109,170	109,300	109,430	44
45	110,720	110,860	111,000	111,140	111,270	111,400	111,540	111,680	111,810	111,950	112,080	112,210	112,350	112,480	112,620	112,750	112,880	113,010	113,150	113,280	113,420	45
46	114,560	114,700	114,850	114,990	115,140	115,270	115,420	115,560	115,710	115,850	116,000	116,130	116,270	116,420	116,560	116,700	116,840	116,980	117,120	117,260	117,400	46
47	118,290	118,450	118,600	118,750	118,910	119,050	119,200	119,350	119,510	119,660	119,810	119,950	120,100	120,250	120,400	120,550	120,700	120,850	121,000	121,150	121,300	47
48	122,020	122,180	122,340	122,500	122,660	122,810	122,970	123,130	123,290	123,450	123,610	123,760	123,920	124,080	124,240	124,400	124,550	124,710	124,860	125,020	125,180	48
49	125,610	125,780	125,910	126,120	126,330	126,430	126,640	126,750	126,960	127,170	127,280	127,480	127,590	127,800	127,910	128,120	128,320	128,430	128,640	128,750	128,960	49
50	129,190	129,400	129,610	129,720	129,930	130,130	130,240	130,450	130,660	130,770	130,980	131,180	131,290	131,500	131,710	131,820	132,020	132,230	132,340	132,550	132,660	50
51	132,690	132,900	133,110	133,220	133,430	133,630	133,840	133,950	134,160	134,370	134,580	134,680	134,890	135,100	135,210	135,420	135,620	135,830	135,940	136,150	136,360	51
52	136,190	136,400	136,510	136,720	136,930	137,130	137,340	137,550	137,760	137,870	138,080	138,280	138,490	138,700	138,810	139,020	139,220	139,430	139,640	139,750	139,960	52
53	139,490	139,700	139,910	140,120	140,330	140,530	140,740	140,950	141,160	141,370	141,480	141,680	141,890	142,100	142,310	142,520	142,720	142,930	143,140	143,350	143,460	53
54	142,890	143,100	143,310	143,520	143,730	143,930	144,140	144,350	144,560	144,770	144,980	145,180	145,390	145,600	145,810	146,020	146,220	146,430	146,640	146,850	147,060	54
55	146,590	146,800	147,010	147,120	147,330	147,430	147,640	147,750	147,960	148,170	148,280	148,480	148,690	148,900	149,110	149,320	149,520	149,730	150,040	150,250	150,460	55
56	150,390	150,500	150,610	150,720	150,830	150,930	151,140	151,250	151,360	151,470	151,580	151,780	151,990	152,200	152,510	152,720	152,920	153,130	153,340	153,550	153,760	56
57	155,290	155,400	155,510	155,520	155,630	155,730	155,740	155,950	156,060	156,170	156,280	156,380	156,590	156,700	156,910	157,120	157,220	157,430	157,540	157,750	157,860	57
58	160,290	160,300	160,310	160,320	160,330	160,330	160,440	160,550	160,660	160,770	160,880	160,980	161,090	161,200	161,310	161,420	161,520	161,630	161,740	161,850	161,960	58
59	163,490	163,600	163,810	163,920	164,130	164,330	164,440	164,750	164,960	165,170	165,380	165,580	165,890	166,100	166,310	166,520	166,720	166,930	167,240	167,450	167,660	59
60	166,690	167,000	167,310	167,620	167,930	168,230	168,540	168,850	169,260	169,570	169,880	170,280	170,590	171,000	171,310	171,620	172,020	172,330	172,640	173,050	173,360	60
61	170,090	170,500	171,010	171,420	171,830	172,330	172,740	173,150	173,660	174,070	174,580	175,080	175,490	176,000	176,410	176,920	177,320	177,830	178,340	178,750	179,260	61
62	173,290	173,800	174,410	175,020	175,530	176,130	176,740	177,350	177,860	178,470	179,080	179,680	180,190	180,800	181,410	182,020	182,520	183,130	183,740	184,350	184,960	62

HEADWATER 1718 to 1720

** Arrangement "0" indicates that all spillway and sluice gates are closed. Discharge is spillway gate overflow.*

SEPTEMBER 2005

PART 2

LOW-LEVEL OUTLET DISCHARGE TABLES

SEPTEMBER 2005

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INSTRUCTIONS FOR USE OF TABLES

1. Tables Update

These tables are identical to the March 1999 tables and supersede the tables included in the March 1945 report, "Discharge Ratings, Fontana Project, 84-inch Howell-Bunger Valve. The revised discharges were generated using the computer code SPILLQ and are only slightly different from those in the 1945 tables.

2. Purpose of Tables

These tables provide a means of setting up or determining the discharge through the low-level outlet at Fontana Dam, which is controlled by a Howell-Bunger valve. The tables give the total discharge in cubic feet per second through the Howell-Bunger valve when the headwater elevation and valve position in percent open is known. The discharges are based on the results of field measurements.

3. Range of Tables

The tables cover a discharge range from 0 to 4,360 cubic feet per second. Headwater elevations range from 1350 feet to 1600 feet. Howell-Bunger valve openings range from 0.75 percent, which is the indicator reading when the valve is fully closed, to 98.5 percent, which is the indicator reading when the valve is fully open.

The Howell-Bunger valve should not be operated when the headwater elevation is above 1600 feet because this is the maximum headwater elevation for safe operation of the slide gate that serves as an emergency gate in case the Howell-Bunger valve fails. This operating constraint is acceptable because the primary function of the low-level outlet is to permit drawdown during periods of low reservoir levels.

4. Arrangement of Tables

The low-level discharge tables show discharges in cubic feet per second. Howell-Bunger valve opening positions in 1-percent increments (except for the first and last increments) are listed in the left and right columns. Headwater elevations in 5-foot increments are shown at the top of each column. The headwater range is shown at the bottom of each page.

Discharges are recorded to the nearest 10 cubic feet per second since the accuracy of the field measurements does not warrant greater refinement. For this reason, there should be no interpolation between values given in these tables.

5. Howell-Bunger Valve Opening Indicator

The dial of the valve opening indicator is graduated in 10 equally spaced divisions, each of which represents approximately 10 percent of the valve sleeve travel. The pointer of the indicator is approximately 0.02 foot wide at the end, which makes it difficult to read the valve position accurately. Nevertheless, it is possible to estimate the position of the indicator to within approximately 1 percent of valve sleeve travel.

6. Use of Tables

The use of the tables is best illustrated by an example.

Example 1 -- With the headwater elevation at 1573 feet, what Howell-Bunger valve opening is necessary to pass 3,210 cubic feet per second? The headwater elevation closest to 1573 feet is 1575 feet, which is found on pages 40 and 41. In the column headed 1575 the discharge closest to 3,210 cubic feet per second is found near the middle of the column on page 41 and is 3,200 cubic feet per second. By following the horizontal line containing this discharge to the left or right columns of the page, it is found that the Howell-Bunger valve should be opened to indicator position 69 percent.

FONTANA DAM
LOW-LEVEL OUTLET DISCHARGE
IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1350	1355	1360	1365	1370	1375	1380	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	
0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.75
2	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	15	15	15	15	2
3	10	10	15	15	15	20	20	20	20	20	25	25	25	25	25	30	30	30	30	30	30	3
4	20	20	25	30	30	30	35	35	40	40	40	45	45	45	45	50	50	50	55	55	55	4
5	30	35	40	45	45	50	55	55	60	60	65	65	70	70	75	75	80	80	80	85	85	5
6	40	50	55	60	65	70	75	80	85	85	90	95	100	100	100	110	110	110	120	120	120	6
7	55	65	75	80	85	95	100	110	110	120	120	130	130	130	140	140	150	150	150	160	160	7
8	70	80	90	100	110	120	130	130	140	150	150	160	160	170	180	180	190	190	200	200	200	8
9	85	100	110	120	130	140	150	160	170	180	190	190	200	210	210	220	230	230	240	240	250	9
10	100	120	130	140	160	170	180	190	200	210	220	230	230	240	250	260	260	270	280	280	290	10
11	110	130	150	170	180	190	210	220	230	240	250	260	270	280	290	290	300	310	320	330	330	11
12	130	150	170	190	200	220	230	240	260	270	280	290	300	310	320	330	340	350	360	370	370	12
13	140	160	190	210	220	240	250	270	280	300	310	320	330	340	350	360	380	390	390	400	410	13
14	150	180	200	230	240	260	280	300	310	320	340	350	360	380	390	400	410	420	430	440	450	14
15	170	200	220	250	270	290	300	320	340	350	370	380	400	410	420	440	450	460	470	480	490	15
16	180	210	240	270	290	310	330	350	370	380	400	410	430	440	460	470	480	500	510	520	530	16
17	190	230	260	290	310	330	350	370	390	410	430	450	460	480	490	510	520	540	550	560	580	17
18	210	250	280	310	330	360	380	400	420	440	460	480	500	510	530	540	560	570	590	600	620	18
19	220	260	300	330	360	380	410	430	450	470	490	510	530	550	560	580	600	610	630	640	660	19
20	240	280	310	350	380	410	430	460	480	500	520	540	560	580	600	620	630	650	670	680	700	20
21	250	290	330	370	400	430	460	480	510	530	550	570	590	610	630	650	670	690	700	720	740	21
22	260	310	350	390	420	450	480	510	530	560	580	600	620	650	670	690	700	720	740	760	780	22
23	280	320	370	400	440	470	500	530	560	580	610	630	650	680	700	720	740	760	780	800	810	23
24	290	340	380	420	460	490	520	550	580	610	640	660	680	710	730	750	770	790	810	830	850	24
25	300	350	400	440	480	510	550	580	610	640	660	690	710	740	760	780	810	830	850	870	890	25
26	310	370	420	460	500	540	570	600	630	660	690	720	740	770	790	820	840	860	880	900	920	26
27	320	380	430	480	520	560	590	630	660	690	720	740	770	800	820	850	870	890	920	940	960	27
28	340	400	450	500	540	580	610	650	680	710	740	770	800	830	850	880	900	930	950	970	1,000	28
29	350	410	460	510	560	600	640	670	710	740	770	800	830	860	880	910	940	960	980	1,010	1,030	29
30	360	430	480	530	580	620	660	700	730	760	800	830	860	890	910	940	970	990	1,020	1,040	1,070	30
31	370	440	500	550	600	640	680	720	760	790	820	860	890	920	950	970	1,000	1,030	1,050	1,080	1,100	31
32	390	450	510	570	620	660	700	740	780	820	850	880	920	950	980	1,000	1,030	1,060	1,090	1,110	1,140	32
33	400	470	530	580	630	680	720	760	800	840	880	910	940	980	1,010	1,040	1,070	1,090	1,120	1,150	1,170	33
34	410	480	540	600	650	700	750	790	830	870	900	940	970	1,000	1,040	1,070	1,100	1,130	1,150	1,180	1,210	34
35	420	500	560	620	670	720	770	810	850	890	930	960	1,000	1,030	1,070	1,100	1,130	1,160	1,190	1,220	1,240	35
36	430	510	580	640	690	740	790	830	870	910	950	990	1,030	1,060	1,090	1,130	1,160	1,190	1,220	1,250	1,280	36
37	440	520	590	650	710	760	810	850	900	940	980	1,020	1,050	1,090	1,120	1,160	1,190	1,220	1,250	1,280	1,310	37
38	450	540	610	670	720	780	830	870	920	960	1,000	1,040	1,080	1,120	1,150	1,180	1,220	1,250	1,280	1,310	1,340	38
39	470	550	620	680	740	800	850	900	940	980	1,030	1,070	1,100	1,140	1,180	1,210	1,250	1,280	1,310	1,340	1,370	39
40	480	560	630	700	760	820	870	920	960	1,010	1,050	1,090	1,130	1,170	1,210	1,240	1,280	1,310	1,340	1,370	1,410	40
41	490	570	650	720	780	830	890	940	980	1,030	1,070	1,120	1,160	1,190	1,230	1,270	1,300	1,340	1,370	1,410	1,440	41
42	500	590	660	730	790	850	910	960	1,010	1,050	1,100	1,140	1,180	1,220	1,260	1,300	1,330	1,370	1,400	1,440	1,470	42
43	510	600	680	750	810	870	920	980	1,030	1,070	1,120	1,160	1,210	1,250	1,290	1,320	1,360	1,400	1,430	1,470	1,500	43
44	520	610	690	760	830	890	940	1,000	1,050	1,100	1,140	1,190	1,230	1,270	1,310	1,350	1,390	1,430	1,460	1,500	1,530	44
45	530	620	700	780	840	900	960	1,020	1,070	1,120	1,160	1,210	1,250	1,300	1,340	1,380	1,420	1,450	1,490	1,530	1,560	45
46	540	630	720	790	860	920	980	1,040	1,090	1,140	1,190	1,230	1,280	1,320	1,360	1,400	1,440	1,480	1,520	1,550	1,590	46
47	550	650	730	810	870	940	1,000	1,060	1,110	1,160	1,210	1,260	1,300	1,350	1,390	1,430	1,470	1,510	1,550	1,580	1,620	47
48	560	660	740	820	890	960	1,020	1,070	1,130	1,180	1,230	1,280	1,330	1,370	1,410	1,450	1,500	1,540	1,570	1,610	1,650	48
49	570	670	760	830	910	970	1,030	1,090	1,150	1,200	1,250	1,300	1,350	1,390	1,440	1,480	1,520	1,560	1,600	1,640	1,680	49
50	580	680	770	850	920	990	1,050	1,110	1,170	1,220	1,270	1,320	1,370	1,420	1,460	1,510	1,550	1,590	1,630	1,670	1,710	50

FONTANA DAM
LOW-LEVEL OUTLET DISCHARGE
IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1350	1355	1360	1365	1370	1375	1380	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	
51	590	690	780	860	940	1,010	1,070	1,130	1,190	1,240	1,300	1,350	1,390	1,440	1,490	1,530	1,570	1,620	1,660	1,700	1,730	51
52	600	700	790	880	950	1,020	1,090	1,150	1,210	1,260	1,320	1,370	1,420	1,460	1,510	1,560	1,600	1,640	1,680	1,720	1,760	52
53	610	710	810	890	970	1,040	1,100	1,170	1,230	1,280	1,340	1,390	1,440	1,490	1,540	1,580	1,630	1,670	1,710	1,750	1,790	53
54	620	730	820	910	980	1,050	1,120	1,190	1,250	1,300	1,360	1,410	1,460	1,510	1,560	1,610	1,650	1,690	1,740	1,780	1,820	54
55	630	740	830	920	1,000	1,070	1,140	1,200	1,270	1,320	1,380	1,430	1,480	1,530	1,580	1,630	1,680	1,720	1,760	1,810	1,850	55
56	630	750	850	930	1,010	1,090	1,160	1,220	1,280	1,340	1,400	1,450	1,510	1,560	1,610	1,660	1,700	1,750	1,790	1,830	1,880	56
57	640	760	860	950	1,030	1,100	1,170	1,240	1,300	1,360	1,420	1,480	1,530	1,580	1,630	1,680	1,730	1,770	1,820	1,860	1,900	57
58	650	770	870	960	1,040	1,120	1,190	1,260	1,320	1,380	1,440	1,500	1,550	1,600	1,650	1,700	1,750	1,800	1,840	1,890	1,930	58
59	660	780	880	970	1,060	1,130	1,210	1,280	1,340	1,400	1,460	1,520	1,570	1,630	1,680	1,730	1,780	1,820	1,870	1,910	1,960	59
60	670	790	890	990	1,070	1,150	1,220	1,290	1,360	1,420	1,480	1,540	1,600	1,650	1,700	1,750	1,800	1,850	1,900	1,940	1,980	60
61	680	800	910	1,000	1,090	1,170	1,240	1,310	1,380	1,440	1,500	1,560	1,620	1,670	1,720	1,780	1,820	1,870	1,920	1,970	2,010	61
62	690	810	920	1,010	1,100	1,180	1,260	1,330	1,400	1,460	1,520	1,580	1,640	1,690	1,750	1,800	1,850	1,900	1,950	1,990	2,040	62
63	700	820	930	1,030	1,110	1,200	1,270	1,340	1,410	1,480	1,540	1,600	1,660	1,710	1,770	1,820	1,870	1,920	1,970	2,020	2,060	63
64	710	830	940	1,040	1,130	1,210	1,290	1,360	1,430	1,500	1,560	1,620	1,680	1,740	1,790	1,840	1,890	1,950	1,990	2,040	2,090	64
65	720	840	950	1,050	1,140	1,220	1,300	1,380	1,450	1,510	1,580	1,640	1,700	1,760	1,810	1,870	1,920	1,970	2,020	2,070	2,110	65
66	720	850	960	1,060	1,150	1,240	1,320	1,390	1,460	1,530	1,600	1,660	1,720	1,780	1,830	1,890	1,940	1,990	2,040	2,090	2,140	66
67	730	860	970	1,070	1,170	1,250	1,330	1,410	1,480	1,550	1,610	1,680	1,740	1,790	1,850	1,910	1,960	2,010	2,060	2,110	2,160	67
68	740	870	980	1,090	1,180	1,270	1,350	1,420	1,500	1,560	1,630	1,690	1,750	1,810	1,870	1,930	1,980	2,030	2,080	2,130	2,180	68
69	750	880	990	1,100	1,190	1,280	1,360	1,440	1,510	1,580	1,650	1,710	1,770	1,830	1,890	1,950	2,000	2,050	2,110	2,160	2,210	69
70	750	890	1,000	1,110	1,200	1,290	1,370	1,450	1,530	1,600	1,660	1,730	1,790	1,850	1,910	1,970	2,020	2,080	2,130	2,180	2,230	70
71	760	900	1,020	1,120	1,220	1,310	1,390	1,470	1,540	1,610	1,680	1,750	1,810	1,870	1,930	1,990	2,040	2,100	2,150	2,200	2,250	71
72	770	910	1,030	1,130	1,230	1,320	1,400	1,480	1,560	1,630	1,700	1,760	1,830	1,890	1,950	2,010	2,060	2,120	2,170	2,220	2,280	72
73	780	920	1,040	1,140	1,240	1,330	1,420	1,500	1,570	1,650	1,720	1,780	1,850	1,910	1,970	2,030	2,090	2,140	2,190	2,250	2,300	73
74	790	930	1,050	1,150	1,250	1,350	1,430	1,510	1,590	1,660	1,730	1,800	1,870	1,930	1,990	2,050	2,110	2,160	2,220	2,270	2,320	74
75	790	930	1,060	1,170	1,270	1,360	1,450	1,530	1,610	1,680	1,750	1,820	1,880	1,950	2,010	2,070	2,130	2,180	2,240	2,290	2,350	75
76	800	940	1,070	1,180	1,280	1,370	1,460	1,540	1,620	1,700	1,770	1,840	1,900	1,970	2,030	2,090	2,150	2,200	2,260	2,310	2,370	76
77	810	950	1,080	1,190	1,290	1,390	1,470	1,560	1,640	1,710	1,780	1,850	1,920	1,990	2,050	2,110	2,170	2,230	2,280	2,340	2,390	77
78	820	960	1,090	1,200	1,300	1,400	1,490	1,570	1,650	1,730	1,800	1,870	1,940	2,000	2,070	2,130	2,190	2,250	2,300	2,360	2,410	78
79	820	970	1,100	1,210	1,310	1,410	1,500	1,590	1,670	1,740	1,820	1,890	1,960	2,020	2,090	2,150	2,210	2,270	2,320	2,380	2,430	79
80	830	980	1,110	1,220	1,330	1,420	1,510	1,600	1,680	1,760	1,830	1,910	1,970	2,040	2,110	2,170	2,230	2,290	2,350	2,400	2,460	80
81	840	990	1,120	1,230	1,340	1,440	1,530	1,610	1,700	1,770	1,850	1,920	1,990	2,060	2,120	2,190	2,250	2,310	2,370	2,420	2,480	81
82	850	1,000	1,130	1,240	1,350	1,450	1,540	1,630	1,710	1,790	1,870	1,940	2,010	2,080	2,140	2,210	2,270	2,330	2,390	2,440	2,500	82
83	850	1,000	1,140	1,250	1,360	1,460	1,550	1,640	1,730	1,810	1,880	1,960	2,030	2,090	2,160	2,220	2,290	2,350	2,410	2,460	2,520	83
84	860	1,010	1,150	1,260	1,370	1,470	1,570	1,660	1,740	1,820	1,900	1,970	2,040	2,110	2,180	2,240	2,310	2,370	2,430	2,490	2,540	84
85	870	1,020	1,160	1,280	1,380	1,490	1,580	1,670	1,760	1,840	1,910	1,990	2,060	2,130	2,200	2,260	2,330	2,390	2,450	2,510	2,560	85
86	880	1,030	1,170	1,290	1,400	1,500	1,590	1,680	1,770	1,850	1,930	2,010	2,080	2,150	2,220	2,280	2,350	2,410	2,470	2,530	2,590	86
87	880	1,040	1,170	1,300	1,410	1,510	1,610	1,700	1,780	1,870	1,950	2,020	2,090	2,170	2,230	2,300	2,360	2,430	2,490	2,550	2,610	87
88	890	1,050	1,180	1,310	1,420	1,520	1,620	1,710	1,800	1,880	1,960	2,040	2,110	2,180	2,250	2,320	2,380	2,450	2,510	2,570	2,630	88
89	900	1,060	1,190	1,320	1,430	1,540	1,630	1,730	1,810	1,900	1,980	2,050	2,130	2,200	2,270	2,340	2,400	2,470	2,530	2,590	2,650	89
90	900	1,060	1,200	1,330	1,440	1,550	1,650	1,740	1,830	1,910	1,990	2,070	2,150	2,220	2,290	2,360	2,420	2,490	2,550	2,610	2,670	90
91	910	1,070	1,210	1,340	1,450	1,560	1,660	1,750	1,840	1,930	2,010	2,090	2,160	2,240	2,310	2,380	2,440	2,510	2,570	2,630	2,690	91
92	920	1,080	1,220	1,350	1,470	1,570	1,670	1,770	1,860	1,940	2,030	2,100	2,180	2,250	2,330	2,390	2,460	2,530	2,590	2,650	2,710	92
93	930	1,090	1,230	1,360	1,480	1,590	1,690	1,780	1,870	1,960	2,040	2,120	2,200	2,270	2,340	2,410	2,480	2,550	2,610	2,670	2,730	93
94	930	1,100	1,240	1,370	1,490	1,600	1,700	1,800	1,890	1,970	2,060	2,140	2,220	2,290	2,360	2,430	2,500	2,570	2,630	2,690	2,760	94
95	940	1,110	1,250	1,380	1,500	1,610	1,710	1,810	1,900	1,990	2,070	2,150	2,230	2,310	2,380	2,450	2,520	2,590	2,650	2,720	2,780	95
96	950	1,120	1,260	1,390	1,510	1,620	1,730	1,820	1,920	2,010	2,090	2,170	2,250	2,330	2,400	2,470	2,540	2,610	2,670	2,740	2,800	96
97	960	1,120	1,270	1,400	1,520	1,640	1,740	1,840	1,930	2,020	2,110	2,190	2,270	2,340	2,420	2,490	2,560	2,630	2,690	2,760	2,820	97
98	960	1,130	1,280	1,410	1,540	1,650	1,750	1,850	1,950	2,040	2,120	2,210	2,290	2,360	2,440	2,510	2,580	2,650	2,720	2,780	2,840	98
98	960	1,130	1,280	1,410	1,540	1,650	1,750	1,850	1,950	2,040	2,120	2,210	2,290	2,360	2,440	2,510	2,580	2,650	2,720	2,780	2,840	98
98.5	970	1,140	1,290	1,420	1,540	1,650	1,760	1,860	1,950	2,050	2,130	2,210	2,290	2,370	2,450	2,520	2,590	2,660	2,730	2,790	2,860	98.5

FONTANA DAM
LOW-LEVEL OUTLET DISCHARGE
IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1450	1455	1460	1465	1470	1475	1480	1485	1490	1495	1500	1505	1510	1515	1520	1525	1530	1535	1540	1545	1550	
0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.75
2	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	20	20	20	20	20	20	2
3	30	30	35	35	35	35	35	35	35	35	35	40	40	40	40	40	40	40	40	40	45	3
4	55	55	60	60	60	60	60	65	65	65	65	70	70	70	70	70	70	75	75	75	75	4
5	85	90	90	90	95	95	95	100	100	100	100	100	110	110	110	110	110	110	110	120	120	5
6	120	120	130	130	130	130	140	140	140	140	150	150	150	150	150	160	160	160	160	160	170	6
7	160	170	170	170	180	180	180	190	190	190	190	200	200	200	210	210	210	210	220	220	220	7
8	200	210	210	220	220	230	230	230	240	240	250	250	250	260	260	260	270	270	270	280	280	8
9	250	250	260	260	270	270	280	280	290	290	300	300	310	310	320	320	320	330	330	340	340	9
10	290	300	300	310	320	320	330	330	340	340	350	360	360	370	370	380	380	390	390	400	400	10
11	330	340	350	350	360	370	370	380	390	390	400	410	410	420	420	430	440	440	450	450	460	11
12	370	380	390	400	410	410	420	430	430	440	450	460	460	470	480	480	490	490	500	510	510	12
13	410	420	430	440	450	460	470	470	480	490	500	500	510	520	530	530	540	550	550	560	570	13
14	450	460	470	480	490	500	510	520	530	540	540	550	560	570	580	580	590	600	610	610	620	14
15	490	500	510	520	530	540	550	560	570	580	590	600	610	620	630	640	640	650	660	670	680	15
16	530	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	720	730	16
17	580	590	600	610	620	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	17
18	620	630	640	660	670	680	690	710	720	730	740	750	760	770	790	800	810	820	830	840	850	18
19	660	670	690	700	710	730	740	750	770	780	790	800	810	830	840	850	860	870	880	890	900	19
20	700	710	730	740	760	770	790	800	810	830	840	850	860	880	890	900	910	930	940	950	960	20
21	740	750	770	790	800	820	830	840	860	870	890	900	910	930	940	950	960	980	990	1,000	1,010	21
22	780	790	810	830	840	860	870	890	900	920	930	950	960	970	990	1,000	1,010	1,030	1,040	1,050	1,070	22
23	810	830	850	870	880	900	920	930	950	960	980	990	1,010	1,020	1,040	1,050	1,060	1,080	1,090	1,100	1,120	23
24	850	870	890	910	920	940	960	970	990	1,010	1,020	1,040	1,050	1,070	1,080	1,100	1,110	1,130	1,140	1,150	1,170	24
25	890	910	930	940	960	980	1,000	1,020	1,030	1,050	1,070	1,080	1,100	1,110	1,130	1,140	1,160	1,170	1,190	1,200	1,220	25
26	920	940	960	980	1,000	1,020	1,040	1,060	1,070	1,090	1,110	1,130	1,140	1,160	1,180	1,190	1,210	1,220	1,240	1,250	1,270	26
27	960	980	1,000	1,020	1,040	1,060	1,080	1,100	1,120	1,140	1,150	1,170	1,190	1,200	1,220	1,240	1,250	1,270	1,290	1,300	1,320	27
28	1,000	1,020	1,040	1,060	1,080	1,100	1,120	1,140	1,160	1,180	1,200	1,210	1,230	1,250	1,270	1,280	1,300	1,320	1,330	1,350	1,370	28
29	1,030	1,050	1,080	1,100	1,120	1,140	1,160	1,180	1,200	1,220	1,240	1,260	1,280	1,290	1,310	1,330	1,350	1,370	1,380	1,400	1,420	29
30	1,070	1,090	1,110	1,140	1,160	1,180	1,200	1,220	1,240	1,260	1,280	1,300	1,320	1,340	1,360	1,380	1,400	1,410	1,430	1,450	1,470	30
31	1,100	1,130	1,150	1,170	1,200	1,220	1,240	1,260	1,280	1,300	1,330	1,350	1,370	1,380	1,400	1,420	1,440	1,460	1,480	1,500	1,510	31
32	1,140	1,160	1,190	1,210	1,240	1,260	1,280	1,300	1,330	1,350	1,370	1,390	1,410	1,430	1,450	1,470	1,490	1,510	1,530	1,550	1,560	32
33	1,170	1,200	1,230	1,250	1,270	1,300	1,320	1,340	1,370	1,390	1,410	1,430	1,450	1,470	1,490	1,510	1,530	1,550	1,570	1,590	1,610	33
34	1,210	1,240	1,260	1,290	1,310	1,340	1,360	1,380	1,410	1,430	1,450	1,470	1,500	1,520	1,540	1,560	1,580	1,600	1,620	1,640	1,660	34
35	1,240	1,270	1,300	1,320	1,350	1,370	1,400	1,420	1,450	1,470	1,490	1,520	1,540	1,560	1,580	1,600	1,630	1,650	1,670	1,690	1,710	35
36	1,280	1,300	1,330	1,360	1,390	1,410	1,440	1,460	1,490	1,510	1,530	1,560	1,580	1,600	1,630	1,650	1,670	1,690	1,710	1,730	1,750	36
37	1,310	1,340	1,370	1,390	1,420	1,450	1,470	1,500	1,520	1,550	1,570	1,600	1,620	1,640	1,670	1,690	1,710	1,730	1,760	1,780	1,800	37
38	1,340	1,370	1,400	1,430	1,460	1,480	1,510	1,540	1,560	1,590	1,610	1,640	1,660	1,680	1,710	1,730	1,750	1,780	1,800	1,820	1,840	38
39	1,370	1,400	1,430	1,460	1,490	1,520	1,550	1,570	1,600	1,630	1,650	1,680	1,700	1,730	1,750	1,770	1,800	1,820	1,840	1,870	1,890	39
40	1,410	1,440	1,470	1,500	1,530	1,550	1,580	1,610	1,640	1,660	1,690	1,710	1,740	1,770	1,790	1,810	1,840	1,860	1,890	1,910	1,930	40
41	1,440	1,470	1,500	1,530	1,560	1,590	1,620	1,650	1,670	1,700	1,730	1,750	1,780	1,800	1,830	1,850	1,880	1,900	1,930	1,950	1,970	41
42	1,470	1,500	1,530	1,560	1,590	1,620	1,650	1,680	1,710	1,740	1,760	1,790	1,820	1,840	1,870	1,890	1,920	1,940	1,970	1,990	2,020	42
43	1,500	1,530	1,560	1,600	1,630	1,660	1,690	1,720	1,750	1,770	1,800	1,830	1,860	1,880	1,910	1,930	1,960	1,990	2,010	2,040	2,060	43
44	1,530	1,560	1,600	1,630	1,660	1,690	1,720	1,750	1,780	1,810	1,840	1,870	1,890	1,920	1,950	1,970	2,000	2,030	2,050	2,080	2,100	44
45	1,560	1,590	1,630	1,660	1,690	1,720	1,760	1,790	1,820	1,850	1,870	1,900	1,930	1,960	1,990	2,010	2,040	2,070	2,090	2,120	2,140	45
46	1,590	1,630	1,660	1,690	1,730	1,760	1,790	1,820	1,850	1,880	1,910	1,940	1,970	2,000	2,020	2,050	2,080	2,110	2,130	2,160	2,180	46
47	1,620	1,660	1,690	1,720	1,760	1,790	1,820	1,850	1,880	1,920	1,950	1,980	2,000	2,030	2,060	2,090	2,120	2,140	2,170	2,200	2,220	47
48	1,650	1,680	1,720	1,750	1,790	1,820	1,850	1,890	1,920	1,950	1,980	2,010	2,040	2,070	2,100	2,130	2,160	2,180	2,210	2,240	2,260	48
49	1,680	1,710	1,750	1,790	1,820	1,850	1,890	1,920	1,950	1,980	2,020	2,050	2,080	2,110	2,140	2,160	2,190	2,220	2,250	2,280	2,300	49
50	1,710	1,740	1,780	1,820	1,850	1,890	1,920	1,950	1,990	2,020	2,050	2,080	2,110	2,140	2,170	2,200	2,230	2,260	2,290	2,320	2,340	50

FONTANA DAM

LOW-LEVEL OUTLET DISCHARGE

IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1450	1455	1460	1465	1470	1475	1480	1485	1490	1495	1500	1505	1510	1515	1520	1525	1530	1535	1540	1545	1550	
51	1,730	1,770	1,810	1,850	1,880	1,920	1,950	1,990	2,020	2,050	2,080	2,120	2,150	2,180	2,210	2,240	2,270	2,300	2,330	2,350	2,380	51
52	1,760	1,800	1,840	1,880	1,910	1,950	1,980	2,020	2,050	2,090	2,120	2,150	2,180	2,210	2,240	2,270	2,300	2,330	2,360	2,390	2,420	52
53	1,790	1,830	1,870	1,910	1,940	1,980	2,020	2,050	2,080	2,120	2,150	2,180	2,220	2,250	2,280	2,310	2,340	2,370	2,400	2,430	2,460	53
54	1,820	1,860	1,900	1,940	1,970	2,010	2,050	2,080	2,120	2,150	2,190	2,220	2,250	2,280	2,320	2,350	2,380	2,410	2,440	2,470	2,500	54
55	1,850	1,890	1,930	1,970	2,000	2,040	2,080	2,110	2,150	2,190	2,220	2,250	2,290	2,320	2,350	2,380	2,420	2,450	2,480	2,510	2,540	55
56	1,880	1,920	1,960	2,000	2,030	2,070	2,110	2,150	2,180	2,220	2,250	2,290	2,320	2,350	2,390	2,420	2,450	2,480	2,510	2,550	2,580	56
57	1,900	1,940	1,990	2,030	2,060	2,100	2,140	2,180	2,210	2,250	2,290	2,320	2,360	2,390	2,420	2,460	2,490	2,520	2,550	2,580	2,610	57
58	1,930	1,970	2,010	2,050	2,090	2,130	2,170	2,210	2,250	2,280	2,320	2,350	2,390	2,420	2,460	2,490	2,520	2,560	2,590	2,620	2,650	58
59	1,960	2,000	2,040	2,080	2,120	2,160	2,200	2,240	2,280	2,320	2,350	2,390	2,420	2,460	2,490	2,530	2,560	2,590	2,620	2,660	2,690	59
60	1,980	2,030	2,070	2,110	2,150	2,190	2,230	2,270	2,310	2,350	2,380	2,420	2,460	2,490	2,530	2,560	2,590	2,630	2,660	2,690	2,730	60
61	2,010	2,060	2,100	2,140	2,180	2,220	2,260	2,300	2,340	2,380	2,420	2,450	2,490	2,520	2,560	2,590	2,630	2,660	2,700	2,730	2,760	61
62	2,040	2,080	2,130	2,170	2,210	2,250	2,290	2,330	2,370	2,410	2,450	2,490	2,520	2,560	2,590	2,630	2,660	2,700	2,730	2,770	2,800	62
63	2,060	2,110	2,150	2,200	2,240	2,280	2,320	2,360	2,400	2,440	2,480	2,520	2,550	2,590	2,630	2,660	2,700	2,730	2,770	2,800	2,830	63
64	2,090	2,130	2,180	2,220	2,270	2,310	2,350	2,390	2,430	2,470	2,510	2,550	2,580	2,620	2,660	2,690	2,730	2,770	2,800	2,830	2,870	64
65	2,110	2,160	2,210	2,250	2,290	2,340	2,380	2,420	2,460	2,500	2,540	2,580	2,620	2,650	2,690	2,730	2,760	2,800	2,830	2,870	2,900	65
66	2,140	2,180	2,230	2,270	2,320	2,360	2,400	2,450	2,490	2,530	2,570	2,610	2,640	2,680	2,720	2,760	2,790	2,830	2,870	2,900	2,930	66
67	2,160	2,210	2,250	2,300	2,340	2,390	2,430	2,470	2,510	2,560	2,600	2,630	2,670	2,710	2,750	2,790	2,820	2,860	2,900	2,930	2,970	67
68	2,180	2,230	2,280	2,320	2,370	2,410	2,460	2,500	2,540	2,580	2,620	2,660	2,700	2,740	2,780	2,820	2,850	2,890	2,930	2,960	3,000	68
69	2,210	2,250	2,300	2,350	2,390	2,440	2,480	2,530	2,570	2,610	2,650	2,690	2,730	2,770	2,810	2,850	2,880	2,920	2,960	2,990	3,030	69
70	2,230	2,280	2,330	2,370	2,420	2,460	2,510	2,550	2,590	2,640	2,680	2,720	2,760	2,800	2,840	2,880	2,910	2,950	2,990	3,020	3,060	70
71	2,250	2,300	2,350	2,400	2,440	2,490	2,530	2,580	2,620	2,660	2,710	2,750	2,790	2,830	2,870	2,910	2,940	2,980	3,020	3,060	3,090	71
72	2,280	2,330	2,370	2,420	2,470	2,510	2,560	2,600	2,650	2,690	2,730	2,770	2,820	2,860	2,900	2,940	2,970	3,010	3,050	3,090	3,120	72
73	2,300	2,350	2,400	2,450	2,490	2,540	2,590	2,630	2,680	2,720	2,760	2,800	2,840	2,890	2,930	2,970	3,000	3,040	3,080	3,120	3,160	73
74	2,320	2,370	2,420	2,470	2,520	2,570	2,610	2,660	2,700	2,750	2,790	2,830	2,870	2,910	2,960	3,000	3,030	3,070	3,110	3,150	3,190	74
75	2,350	2,400	2,450	2,500	2,540	2,590	2,640	2,680	2,730	2,770	2,820	2,860	2,900	2,940	2,980	3,030	3,070	3,100	3,140	3,180	3,220	75
76	2,370	2,420	2,470	2,520	2,570	2,620	2,660	2,710	2,760	2,800	2,840	2,890	2,930	2,970	3,010	3,050	3,090	3,130	3,170	3,210	3,250	76
77	2,390	2,440	2,490	2,540	2,590	2,640	2,690	2,740	2,780	2,830	2,870	2,910	2,960	3,000	3,040	3,080	3,120	3,160	3,200	3,240	3,280	77
78	2,410	2,470	2,520	2,570	2,620	2,670	2,710	2,760	2,810	2,850	2,900	2,940	2,990	3,030	3,070	3,110	3,150	3,190	3,230	3,270	3,310	78
79	2,430	2,490	2,540	2,590	2,640	2,690	2,740	2,790	2,830	2,880	2,920	2,970	3,010	3,060	3,100	3,140	3,180	3,220	3,260	3,300	3,340	79
80	2,460	2,510	2,560	2,610	2,670	2,710	2,760	2,810	2,860	2,900	2,950	3,000	3,040	3,080	3,130	3,170	3,210	3,250	3,290	3,330	3,370	80
81	2,480	2,530	2,590	2,640	2,690	2,740	2,790	2,840	2,880	2,930	2,980	3,020	3,070	3,110	3,150	3,200	3,240	3,280	3,320	3,360	3,400	81
82	2,500	2,550	2,610	2,660	2,710	2,760	2,810	2,860	2,910	2,960	3,000	3,050	3,090	3,140	3,180	3,220	3,270	3,310	3,350	3,390	3,430	82
83	2,520	2,580	2,630	2,680	2,740	2,790	2,840	2,890	2,930	2,980	3,030	3,070	3,120	3,160	3,210	3,250	3,300	3,340	3,380	3,420	3,460	83
84	2,540	2,600	2,650	2,710	2,760	2,810	2,860	2,910	2,960	3,010	3,050	3,100	3,150	3,190	3,240	3,280	3,320	3,370	3,410	3,450	3,490	84
85	2,560	2,620	2,670	2,730	2,780	2,830	2,880	2,930	2,980	3,030	3,080	3,130	3,170	3,220	3,260	3,310	3,350	3,390	3,440	3,480	3,520	85
86	2,590	2,640	2,700	2,750	2,800	2,860	2,910	2,960	3,010	3,060	3,110	3,150	3,200	3,240	3,290	3,330	3,380	3,420	3,470	3,510	3,550	86
87	2,610	2,660	2,720	2,770	2,830	2,880	2,930	2,980	3,030	3,080	3,130	3,180	3,230	3,270	3,320	3,360	3,410	3,450	3,490	3,540	3,580	87
88	2,630	2,690	2,740	2,800	2,850	2,900	2,960	3,010	3,060	3,110	3,160	3,200	3,250	3,300	3,340	3,390	3,430	3,480	3,520	3,570	3,610	88
89	2,650	2,710	2,760	2,820	2,870	2,930	2,980	3,030	3,080	3,130	3,180	3,230	3,280	3,330	3,370	3,420	3,460	3,510	3,550	3,600	3,640	89
90	2,670	2,730	2,790	2,840	2,900	2,950	3,000	3,060	3,110	3,160	3,210	3,260	3,310	3,350	3,400	3,450	3,490	3,540	3,580	3,620	3,670	90
91	2,690	2,750	2,810	2,870	2,920	2,980	3,030	3,080	3,130	3,180	3,230	3,280	3,330	3,380	3,430	3,470	3,520	3,560	3,610	3,650	3,700	91
92	2,710	2,770	2,830	2,890	2,940	3,000	3,050	3,110	3,160	3,210	3,260	3,310	3,360	3,410	3,450	3,500	3,550	3,590	3,640	3,680	3,730	92
93	2,730	2,790	2,850	2,910	2,970	3,020	3,080	3,130	3,180	3,230	3,290	3,340	3,380	3,430	3,480	3,530	3,570	3,620	3,670	3,710	3,760	93
94	2,760	2,820	2,880	2,930	2,990	3,050	3,100	3,150	3,210	3,260	3,310	3,360	3,410	3,460	3,510	3,560	3,600	3,650	3,690	3,740	3,780	94
95	2,780	2,840	2,900	2,960	3,010	3,070	3,130	3,180	3,230	3,290	3,340	3,390	3,440	3,490	3,540	3,580	3,630	3,680	3,720	3,770	3,810	95
96	2,800	2,860	2,920	2,980	3,040	3,090	3,150	3,200	3,260	3,310	3,360	3,410	3,460	3,510	3,560	3,610	3,660	3,710	3,750	3,800	3,840	96
97	2,820	2,880	2,940	3,000	3,060	3,120	3,170	3,230	3,280	3,340	3,390	3,440	3,490	3,540	3,590	3,640	3,690	3,740	3,780	3,830	3,870	97
98	2,840	2,910	2,970	3,030	3,090	3,140	3,200	3,260	3,310	3,360	3,420	3,470	3,520	3,570	3,620	3,670	3,720	3,770	3,810	3,860	3,910	98
98	2,840	2,910	2,970	3,030	3,090	3,140	3,200	3,260	3,310	3,360	3,420	3,470	3,520	3,570	3,620	3,670	3,720	3,770	3,810	3,860	3,910	98
98.5	2,860	2,920	2,980	3,040	3,100	3,160	3,210	3,270	3,320	3,380	3,430	3,480	3,530	3,580	3,630	3,680	3,730	3,780	3,830	3,870	3,920	98.5

FONTANA DAM
LOW-LEVEL OUTLET DISCHARGE
IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605	1610	1615	1620	1625	1630	1635	1640	1645	1650	
0.75	0	0	0	0	0	0	0	0	0	0	0											0.75
2	20	20	20	20	20	20	20	20	20	20	20											2
3	45	45	45	45	45	45	45	45	45	45	50											3
4	75	75	80	80	80	80	80	80	85	85	85											4
5	120	120	120	120	120	120	130	130	130	130	130											5
6	170	170	170	170	170	180	180	180	180	180	190											6
7	220	220	230	230	230	230	240	240	240	240	250											7
8	280	280	290	290	290	300	300	300	310	310	310											8
9	340	340	350	350	360	360	360	370	370	370	380											9
10	400	400	410	410	420	420	430	430	440	440	440											10
11	460	460	470	470	480	480	490	490	500	500	510											11
12	510	520	530	530	540	540	550	550	560	560	570											12
13	570	570	580	590	590	600	610	610	620	620	630											13
14	620	630	640	640	650	660	660	670	680	680	690											14
15	680	680	690	700	710	720	720	730	740	750	750											15
16	730	740	750	760	770	770	780	790	800	810	810											16
17	790	800	810	820	830	840	840	850	860	870	880											17
18	850	860	870	880	890	900	900	910	920	930	940											18
19	900	910	920	940	950	960	970	980	990	990	1,000											19
20	960	970	980	990	1,000	1,010	1,020	1,040	1,050	1,060	1,070											20
21	1,010	1,030	1,040	1,050	1,060	1,070	1,080	1,090	1,100	1,120	1,130											21
22	1,070	1,080	1,090	1,100	1,120	1,130	1,140	1,150	1,160	1,170	1,180											22
23	1,120	1,130	1,140	1,160	1,170	1,180	1,190	1,210	1,220	1,230	1,240											23
24	1,170	1,180	1,200	1,210	1,220	1,240	1,250	1,260	1,270	1,290	1,300											24
25	1,220	1,230	1,250	1,260	1,270	1,290	1,300	1,310	1,330	1,340	1,350											25
26	1,270	1,280	1,300	1,310	1,330	1,340	1,350	1,370	1,380	1,400	1,410											26
27	1,320	1,330	1,350	1,360	1,380	1,390	1,410	1,420	1,440	1,450	1,460											27
28	1,370	1,380	1,400	1,410	1,430	1,450	1,460	1,480	1,490	1,500	1,520											28
29	1,420	1,430	1,450	1,470	1,480	1,500	1,510	1,530	1,540	1,560	1,570											29
30	1,470	1,480	1,500	1,520	1,530	1,550	1,570	1,580	1,600	1,610	1,630											30
31	1,510	1,530	1,550	1,570	1,580	1,600	1,620	1,630	1,650	1,670	1,680											31
32	1,560	1,580	1,600	1,620	1,640	1,650	1,670	1,690	1,700	1,720	1,740											32
33	1,610	1,630	1,650	1,670	1,690	1,700	1,720	1,740	1,760	1,770	1,790											33
34	1,660	1,680	1,700	1,720	1,740	1,750	1,770	1,790	1,810	1,830	1,840											34
35	1,710	1,730	1,750	1,770	1,790	1,800	1,820	1,840	1,860	1,880	1,900											35
36	1,750	1,770	1,790	1,810	1,830	1,850	1,870	1,890	1,910	1,930	1,950											36
37	1,800	1,820	1,840	1,860	1,880	1,900	1,920	1,940	1,960	1,980	2,000											37
38	1,840	1,860	1,890	1,910	1,930	1,950	1,970	1,990	2,010	2,030	2,050											38
39	1,890	1,910	1,930	1,950	1,970	2,000	2,020	2,040	2,060	2,080	2,100											39
40	1,930	1,950	1,980	2,000	2,020	2,040	2,060	2,080	2,100	2,130	2,150											40
41	1,970	2,000	2,020	2,040	2,060	2,090	2,110	2,130	2,150	2,170	2,190											41
42	2,020	2,040	2,060	2,090	2,110	2,130	2,150	2,180	2,200	2,220	2,240											42
43	2,060	2,080	2,110	2,130	2,150	2,180	2,200	2,220	2,240	2,270	2,290											43
44	2,100	2,130	2,150	2,170	2,200	2,220	2,240	2,270	2,290	2,310	2,340											44
45	2,140	2,170	2,190	2,220	2,240	2,270	2,290	2,310	2,340	2,360	2,380											45
46	2,180	2,210	2,230	2,260	2,280	2,310	2,330	2,360	2,380	2,400	2,430											46
47	2,220	2,250	2,280	2,300	2,330	2,350	2,380	2,400	2,420	2,450	2,470											47
48	2,260	2,290	2,320	2,340	2,370	2,390	2,420	2,440	2,470	2,490	2,520											48
49	2,300	2,330	2,360	2,380	2,410	2,440	2,460	2,490	2,510	2,540	2,560											49
50	2,340	2,370	2,400	2,420	2,450	2,480	2,500	2,530	2,550	2,580	2,600											50

FONTANA DAM

LOW-LEVEL OUTLET DISCHARGE

IN CUBIC FEET PER SECOND

HB VALVE POSITION PERCENT	HEADWATER ELEVATION																					HB VALVE POSITION PERCENT
	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605	1610	1615	1620	1625	1630	1635	1640	1645	1650	
51	2,380	2,410	2,440	2,460	2,490	2,520	2,540	2,570	2,600	2,620	2,650											51
52	2,420	2,450	2,480	2,510	2,530	2,560	2,590	2,610	2,640	2,660	2,690											52
53	2,460	2,490	2,520	2,550	2,570	2,600	2,630	2,650	2,680	2,710	2,730											53
54	2,500	2,530	2,560	2,590	2,610	2,640	2,670	2,700	2,720	2,750	2,780											54
55	2,540	2,570	2,600	2,630	2,650	2,680	2,710	2,740	2,770	2,790	2,820											55
56	2,580	2,610	2,640	2,660	2,690	2,720	2,750	2,780	2,810	2,830	2,860											56
57	2,610	2,640	2,670	2,700	2,730	2,760	2,790	2,820	2,850	2,880	2,900											57
58	2,650	2,680	2,710	2,740	2,770	2,800	2,830	2,860	2,890	2,920	2,950											58
59	2,690	2,720	2,750	2,780	2,810	2,840	2,870	2,900	2,930	2,960	2,990											59
60	2,730	2,760	2,790	2,820	2,850	2,880	2,910	2,940	2,970	3,000	3,030											60
61	2,760	2,790	2,830	2,860	2,890	2,920	2,950	2,980	3,010	3,040	3,070											61
62	2,800	2,830	2,860	2,900	2,930	2,960	2,990	3,020	3,050	3,080	3,110											62
63	2,830	2,870	2,900	2,930	2,960	3,000	3,030	3,060	3,090	3,120	3,150											63
64	2,870	2,900	2,930	2,970	3,000	3,030	3,060	3,100	3,130	3,160	3,190											64
65	2,900	2,940	2,970	3,000	3,040	3,070	3,100	3,130	3,160	3,190	3,220											65
66	2,930	2,970	3,000	3,040	3,070	3,100	3,130	3,170	3,200	3,230	3,260											66
67	2,970	3,000	3,040	3,070	3,100	3,140	3,170	3,200	3,230	3,270	3,300											67
68	3,000	3,030	3,070	3,100	3,140	3,170	3,200	3,240	3,270	3,300	3,330											68
69	3,030	3,070	3,100	3,130	3,170	3,200	3,240	3,270	3,300	3,330	3,370											69
70	3,060	3,100	3,130	3,170	3,200	3,240	3,270	3,300	3,340	3,370	3,400											70
71	3,090	3,130	3,160	3,200	3,230	3,270	3,300	3,340	3,370	3,400	3,440											71
72	3,120	3,160	3,200	3,230	3,270	3,300	3,340	3,370	3,410	3,440	3,470											72
73	3,160	3,190	3,230	3,270	3,300	3,340	3,370	3,410	3,440	3,470	3,510											73
74	3,190	3,230	3,260	3,300	3,330	3,370	3,410	3,440	3,470	3,510	3,540											74
75	3,220	3,260	3,290	3,330	3,370	3,400	3,440	3,470	3,510	3,540	3,580											75
76	3,250	3,290	3,330	3,360	3,400	3,440	3,470	3,510	3,540	3,580	3,610											76
77	3,280	3,320	3,360	3,400	3,430	3,470	3,510	3,540	3,580	3,610	3,650											77
78	3,310	3,350	3,390	3,430	3,460	3,500	3,540	3,570	3,610	3,650	3,680											78
79	3,340	3,380	3,420	3,460	3,500	3,530	3,570	3,610	3,640	3,680	3,710											79
80	3,370	3,410	3,450	3,490	3,530	3,570	3,600	3,640	3,680	3,710	3,750											80
81	3,400	3,440	3,480	3,520	3,560	3,600	3,630	3,670	3,710	3,750	3,780											81
82	3,430	3,470	3,510	3,550	3,590	3,630	3,670	3,700	3,740	3,780	3,810											82
83	3,460	3,500	3,540	3,580	3,620	3,660	3,700	3,740	3,770	3,810	3,850											83
84	3,490	3,530	3,570	3,610	3,650	3,690	3,730	3,770	3,800	3,840	3,880											84
85	3,520	3,560	3,600	3,640	3,680	3,720	3,760	3,800	3,840	3,870	3,910											85
86	3,550	3,590	3,630	3,670	3,710	3,750	3,790	3,830	3,870	3,910	3,940											86
87	3,580	3,620	3,660	3,700	3,740	3,780	3,820	3,860	3,900	3,940	3,980											87
88	3,610	3,650	3,690	3,730	3,770	3,810	3,850	3,890	3,930	3,970	4,010											88
89	3,640	3,680	3,720	3,760	3,810	3,850	3,890	3,930	3,970	4,000	4,040											89
90	3,670	3,710	3,750	3,790	3,840	3,880	3,920	3,960	4,000	4,040	4,080											90
91	3,700	3,740	3,780	3,820	3,870	3,910	3,950	3,990	4,030	4,070	4,110											91
92	3,730	3,770	3,810	3,860	3,900	3,940	3,980	4,020	4,060	4,100	4,140											92
93	3,760	3,800	3,840	3,890	3,930	3,970	4,010	4,050	4,090	4,130	4,170											93
94	3,780	3,830	3,870	3,920	3,960	4,000	4,040	4,080	4,130	4,170	4,210											94
95	3,810	3,860	3,900	3,950	3,990	4,030	4,070	4,120	4,160	4,200	4,240											95
96	3,840	3,890	3,930	3,980	4,020	4,060	4,110	4,150	4,190	4,230	4,270											96
97	3,870	3,920	3,960	4,010	4,050	4,100	4,140	4,180	4,220	4,260	4,310											97
98	3,910	3,950	4,000	4,040	4,080	4,130	4,170	4,210	4,260	4,300	4,340											98
98	3,910	3,950	4,000	4,040	4,080	4,130	4,170	4,210	4,260	4,300	4,340											98
98.5	3,920	3,970	4,010	4,060	4,100	4,140	4,190	4,230	4,270	4,320	4,360											98.5

Tennessee Valley Authority
Division of Water Control Planning
Engineering Laboratory

NORRIS DAM

DISCHARGE RATINGS

FOR ASSUMED DAM FAILURES

DURING AN EARTHQUAKE

--o--

Advance Report No. 1

--o--

Norris, Tennessee
January 1974

Report No. 2-633

NORRIS DAM
DISCHARGE RATINGS
FOR ASSUMED DAM FAILURES
DURING AN EARTHQUAKE

INTRODUCTION

At the request of the Flood Control Branch, Division of Water Control Planning, a study was conducted by the Engineering Laboratory to establish discharge rating curves for various debris configurations resulting from a failure of Norris Dam. This study was authorized by the Project Management Corporation, Clinch River Breeder Reactor. The study was made to supply flow data to be used in the determinations of the necessary flood protection works for the Clinch River Breeder Reactor. Six failure cases detailed on Plate 1 were tested. The discharge ratings for the six cases are shown on Plates 2 and 3.

THE MODEL

A 1:150 scale model of Norris Dam duplicating the failure section and the topography immediately upstream from the dam and a 2400-foot reach downstream from the dam was installed in the eight-foot laboratory flume. A general view of the model with failure Case A installed is shown in Figure 1. The topography both upstream and downstream from the dam was obtained from drawing 232-D-264 shown on Plate 4. Model discharges were obtained from readings of a carefully calibrated diaphragm orifice located in the water supply line or a calibrated eight-foot sharp crested weir located at the upstream end of the eight-foot flume. The eight-foot weir was used whenever the discharge exceeded 2,000,000 cfs. Headwater heights were measured at two piezometers located 1200 and 1800 feet upstream from the dam. The headwater levels were determined by means of hook gages reading to .001 foot. Tailwater heights were taken from a staff gage located 1300 feet downstream from the dam. The tailwater level was controlled at the end of the flume by means of slot gates.

TEST PROCEDURE

During each discharge rating test a constant discharge was set up using the appropriate tailwater level shown on Plate 5. Recordings were then made of the headwater elevation, tailwater elevation and the discharge. The test procedure was repeated at other constant flows so that sufficient information was obtained to establish a discharge rating curve of headwater elevation vs. discharge for each case tested.

TEST CASES

Six failure schemes designated as cases A, B, C, D, E and F_{1-5} were rated. Details of the schemes are shown on Plate 1. The existing topography both upstream and downstream from the dam was duplicated in the model from contours given on Plate 4. The debris configuration was assumed to be as shown on Plate 1 for each case.

Case E was identical to case A except that the sideflow to the left and right of the debris was prevented by constructing sheet metal walls as shown on Plate 1. The difference between the discharge of case A and E at any headwater elevation will give the discharge not going over the top of the debris.

Four tests labeled No TW Effect on Plate 2 were conducted with the tailwater level lowered so that it would have no influence on the headwater level. At near maximum test Q the headwater level was reduced 5.4, 5.3 and 7.6 feet for cases A, B and D, respectively, by eliminating the tailwater effect.

For case F_{1-5} the remains of the dam, assumed broken off at elevation 970, was moved to five different positions as shown on Plate 1. A discharge rating was obtained for each location so that data would be available to estimate discharge coefficients which might be applicable to failures at other dams.

TEST RESULTS

The discharge rating curves for each case are shown on Plates 2 and 3. Tabulations of the rating data are given on Tables 1 to 10. A summary of the discharges at headwater elevations 970 and 1035 is given on Table 11 to show the spread in discharge between the various cases tested.

Photographs of the dry and operating model are shown on Figures 1 to 22 for each scheme. Additional photographs and color slides of the model operation are available at the TVA Engineering Laboratory.

TABLES

FIGURES

PLATES

TABLE 1

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE A

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
1A	965.42	421,800	
2A	982.75	656,500	
3A	992.97	920,300	919.0
4A	1001.80	1,181,200	932.5
5A	1011.85	1,520,300	948.0
6A	1019.65	1,805,500	959.5
7A	1028.80	2,119,400	970.2
8A	1036.60	2,436,300	981.5
9A	1045.63	2,709,400	990.0
10A	1040.20	2,709,400	T.W. Low
11A	1030.45	2,196,100	973.0
12A	912.86	95,100	
13A	925.45	141,500	
14A	939.70	214,800	
15A	1037.03	2,462,700	982.0

TABLE 2

NORRIS DAM FAILURE STUDY
SUMMARY OF TESTS RESULTS
DISCHARGE RATING
CASE B

Test No.	H. W. Elev.	Q cfs	T.W. Elev.
26B	955.53	397,000	885.0
27B	966.18	625,300	902.0
28B	973.08	800,800	913.0
29B	980.13	1,004,000	923.0
30B	986.28	1,197,000	934.0
31B	991.98	1,377,000	942.0
32B	998.43	1,597,000	950.0
33B	1004.58	1,802,000	959.0
33B	1003.38	1,802,000	Low T.W.
34B	1010.28	2,003,000	967.0
35B	1017.03	2,203,000	974.0
36B	1022.43	2,413,000	981.0
37B	1028.13	2,594,000	987.0
38B	1033.38	2,799,000	993.0
39B	1038.27	3,010,000	999.0
39B	1032.93	3,009,000	Low T.W.
40B	949.83	293,800	875.0
41B	937.68	194,900	865.0

TABLE 3

NORRIS DAM FAILURE STUDY
SUMMARY OF TESTS RESULTS
DISCHARGE RATING
CASE C

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
59C	942.23	100,900	853.0
60C	960.11	192,000	864.0
61C	973.52	295,200	876.0
62C	978.62	389,800	885.0
63C	984.62	508,700	894.5
64C	991.82	692,900	906.5
65C	998.27	901,900	918.5
66C	1004.12	1,103,000	928.5
67C	1009.67	1,295,000	938.0
68C	1014.77	1,493,000	946.5
69C	1019.42	1,686,000	954.0
70C	1024.67	1,889,000	962.5
71C	1029.47	2,095,000	969.8
72C	1033.67	2,291,000	976.0
73C	1038.50	2,493,000	983.0
74C	1043.42	2,703,000	990.0
75C	1045.79	2,824,000	994.0
76C	1043.27	2,824,000	Low T.W.
77C	930.47	57,600	845.0
78C	909.62	20,700	839.0

TABLE 4

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE D

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
42D	888.48	99,800	851.00
43D	907.15	192,800	865.00
44D	920.20	296,100	876.00
45D	929.35	388,100	885.5
46D	941.80	591,000	900.5
47D	950.13	756,200	910.5
48D	959.53	952,900	921.0
49D	971.05	1,199,800	933.0
50D	982.00	1,418,700	943.0
51D	991.00	1,599,100	951.0
52D	1000.15	1,806,400	959.0
53D	1009.60	1,996,900	966.5
54D	1018.60	2,196,500	973.5
55D	1028.05	2,421,100	981.0
56D	1035.62	2,589,800	986.5
57D	1043.20	2,778,300	993.0
58D	1027.90	2,784,900	Low T.W.

TABLE 5

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE E

Test No.	H.W. Elev.	Q cfs	T.W.(1) Elev.
16E	979.00	68,400	
17E	987.25	170,300	
18E	993.70	271,000	
19E	998.95	367,200	
20E	1010.20	601,200	900.8
21E	1018.09	781,400	912.8
22E	1025.95	979,400	923.0
23E	1033.19	1,175,600	932.2
24E	1040.80	1,386,300	942.5
25E	1046.50	1,569,600	949.8

(1) No tailwater effect

TABLE 6

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE F_1

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
81	1007.35	384,100	885.0
82	1018.63	596,600	900.5
83	1027.25	801,300	912.7
84	1035.85	997,000	923.4
85	1043.15	1,207,100	933.5
86	1049.65	1,401,700	943.0
87	1055.80	1,598,700	951.0
88[1]	983.80	96,800	851.5
89[1]	992.80	198,700	865.0
90[1]	1000.00	296,700	875.5

[1]Model flow was unstable because of the small head on the crest. Test classified as unreliable.

TABLE 7

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE F_2

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
91[1]	982.45	98,500	851.0
92[1]	991.15	199,600	864.5
93[1]	997.90	295,700	876.0
94	1004.20	392,000	885.5
95	1014.70	594,400	900.5
96	1023.85	796,400	912.5
97	1031.65	997,100	923.0
98	1038.70	1,192,900	933.0
99	1045.42	1,400,400	942.5
100	1051.90	1,604,900	951.3

[1]Model flow was unstable because of the small head on the crest. Test classified as unreliable.

TABLE 8

NORRIS DAM FAILURE STUDY
SUMMARY OF TESTS RESULTS
DISCHARGE RATING
CASE F_3

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
101	1037.65	1,609,300	951.5
102	1042.98	1,797,000	959.0
103	1048.45	1,994,200	966.0
104	1031.17	1,397,600	942.5
105	1024.65	1,196,800	933.0
106	1017.85	998,400	923.0
107	1009.90	796,100	912.50
108	1001.20	602,700	901.0
109	990.22	396,100	885.5
110	954.13	100,500	859.0
111	975.42	198,100	864.5
112	983.35	295,600	876.0

TABLE 9

NORRIS DAM FAILURE STUDY
SUMMARY OF TEST DATA
DISCHARGE RATING
CASE F_4

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
113	919.35	100,100	851.5
114	943.00	200,100	865.0
115	959.95	297,400	876.0
116	972.85	388,300	885.0
117	985.45	590,000	900.5
118	995.50	797,800	912.5
119	1003.75	994,400	923.0
120	1011.10	1,191,700	933.0
121	1017.85	1,395,000	942.5
122	1024.00	1,594,500	951.0
123	1030.22	1,807,200	959.0
124	1035.70	2,003,700	966.5
125	1041.25	2,197,500	973.5
126	1046.35	2,409,000	980.5

TABLE 10

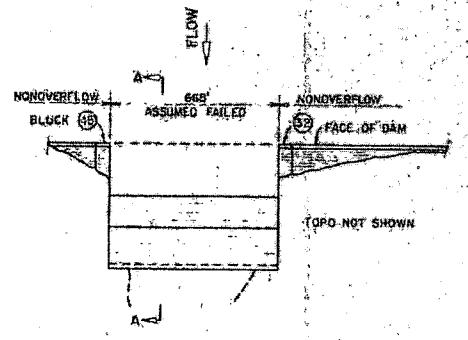
NORRIS DAM FAILURE STUDY
SUMMARY OF TEST RESULTS
DISCHARGE RATING
CASE F_5

Test No.	H.W. Elev.	Q cfs	T.W. Elev.
127	1042.68	2,598,000	987.00
128	1037.65	2,399,600	980.00
129	1047.77	2,797,700	993.00
130	1054.47	3,014,700	999.00
131	1033.09	2,190,300	973.00
132	1028.65	2,007,200	966.50
133	1023.03	1,797,200	959.00
134	1016.80	1,594,400	951.00
135	1010.20	1,394,000	942.50
136	1003.30	1,196,000	933.00
137	995.98	998,500	923.40
138	987.40	799,700	912.50
139	977.65	604.300	900.50
140	959.50	393,700	885.50
141	911.35	102,100	852.00
142	931.00	199,400	864.50
143	946.00	296,200	876.00

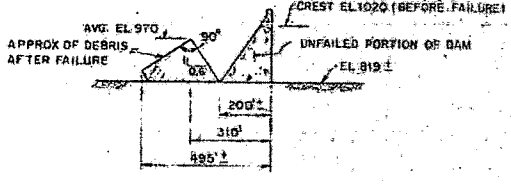
TABLE 11
SUMMARY OF DISCHARGE
CASE A THRU F_1-F_5
HEADWATER ELEVATIONS 970 & 1035

CASE	H.W. ELEV.	Q CFS	H.W. ELEV.	Q CFS
A	970	475,000	1035	2,370,000
B	970	740,000	1035	2,880,000
C	970	260,000	1035	2,310,000
D	970	1,180,000	1035	2,590,000
E	970	0	1035	1,230,000
F_1	970	0	1035	970,000
F_2	970	0	1035	1,105,000
F_3	970	165,000	1035	1,510,000
F_4	970	378,000	1035	1,980,000
F_5	970	505,000	1035	2,270,000

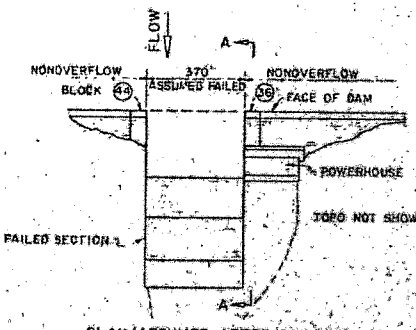
PLATE



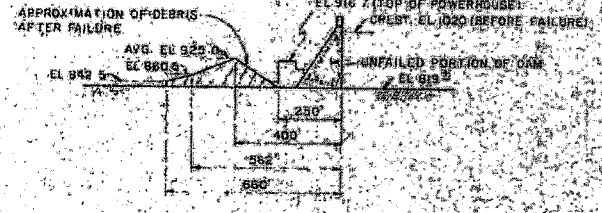
PLAN (ASSUMED AFTER FAILURE)
(CASE A)



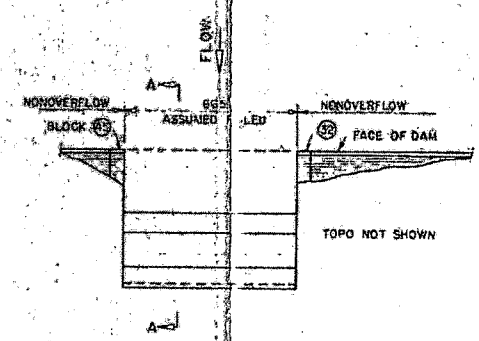
SECTION A-A



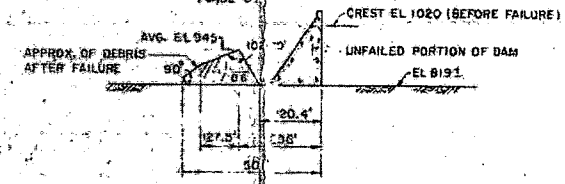
PLAN (ASSUMED AFTER FAILURE)
(CASE D)



SECTION A-A



PLAN (ASSUMED AFTER FAILURE)
(CASE B)



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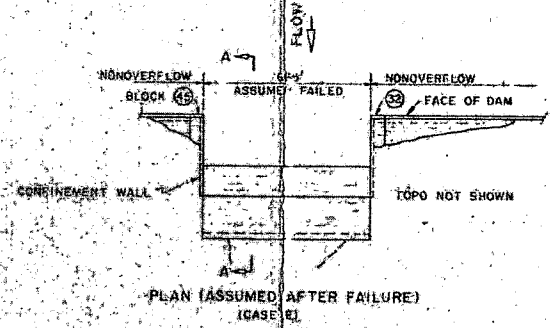
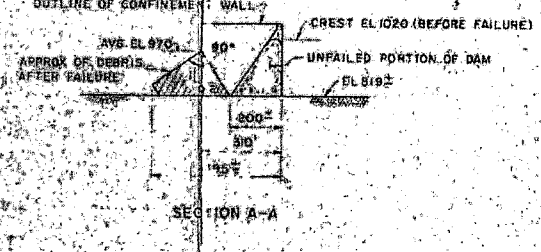
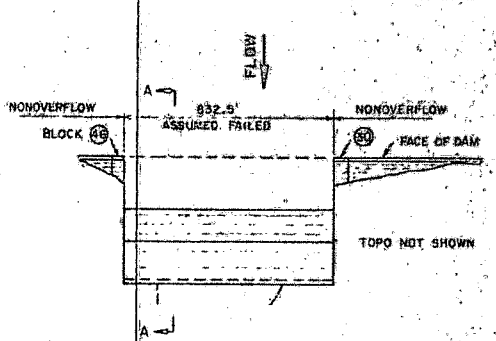


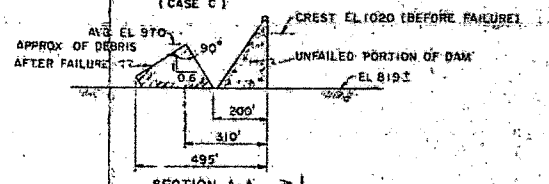
PLAN (ASSUMED AFTER FAILURE)
(CASE E)



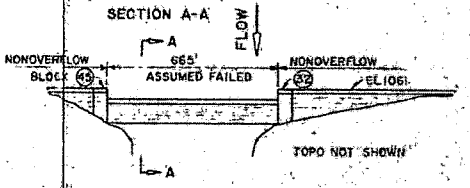
SECTION A-A



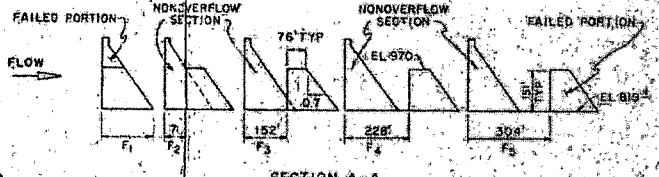
PLAN (ASSUMED AFTER FAILURE)
(CASE C)



SECTION A-A



PLAN (ASSUMED AFTER FAILURE)
(CASE F)



SECTION A-A

NORRIS DAM FAILURE STUDY

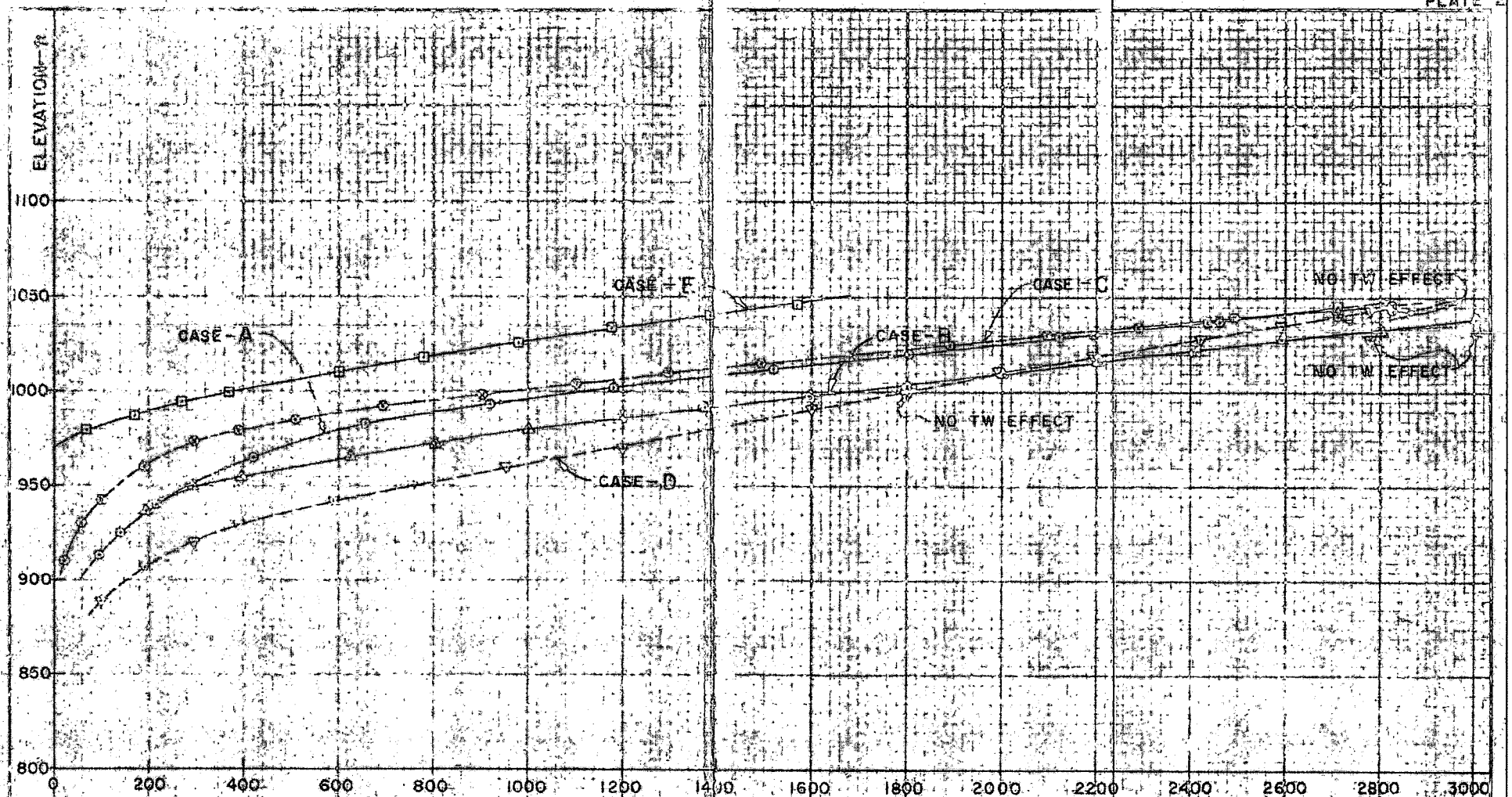
DETAILS OF
CASES A, B, C, D, E, & F TO 6

NORRIS DAM PROJECT
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
KNOXVILLE, TENNESSEE

12-18-73

2-EL-98-K-109

PLATE 2



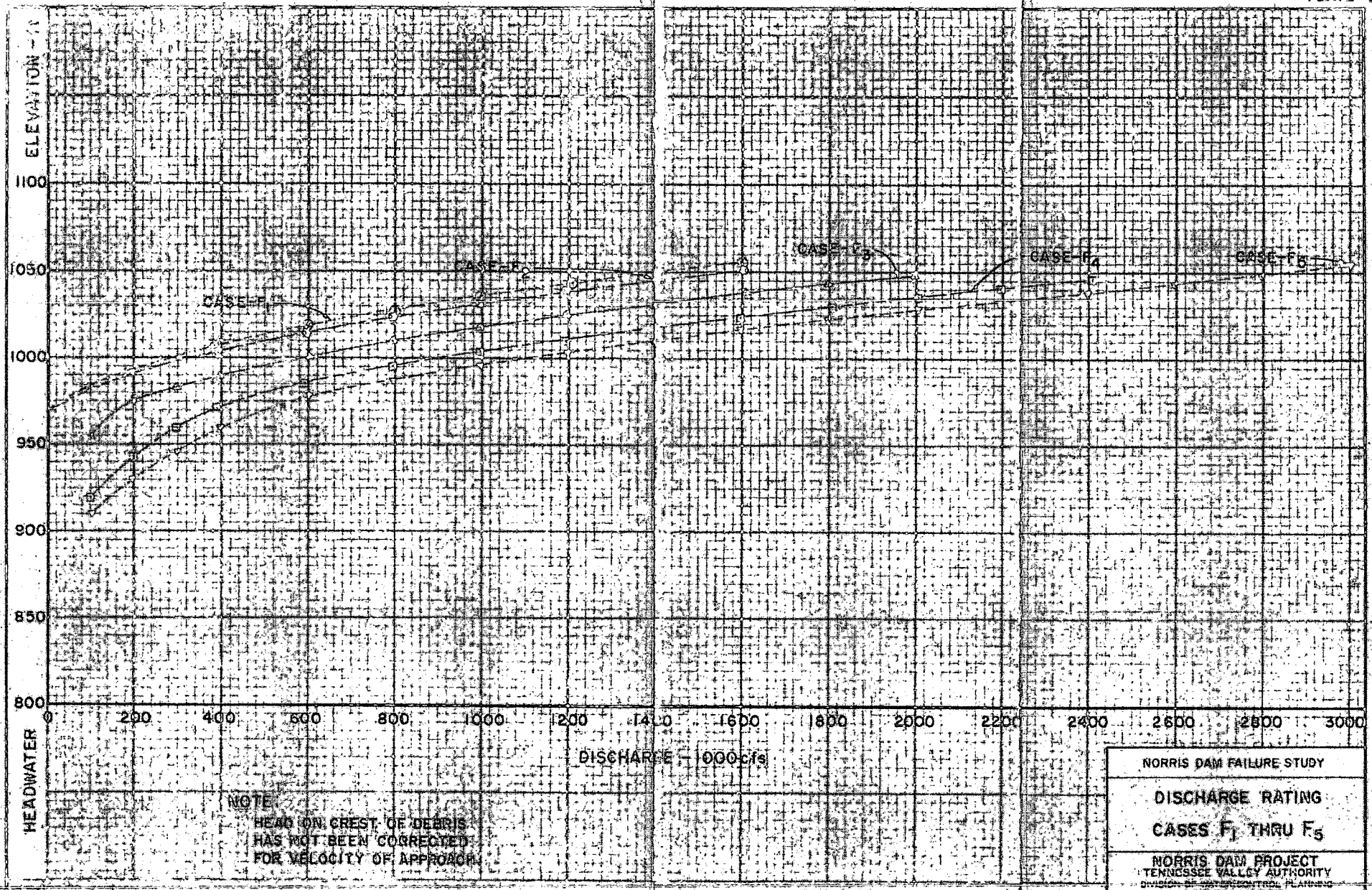
NOTE.
Tests marked NO TW EFFECT were conducted with the tailwater lowered so that it would have no influence on the headwater level.

NORRIS DAM FAILURE STUDY

DISCHARGE RATING
CASE A, B, C, D AND E

NORRIS DAM PROJECT
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
ENGINEERING LABORATORY

DRAWN 11-9-73 | 2 | 98 | 8-107R3



NORRIS DAM FAILURE STUDY

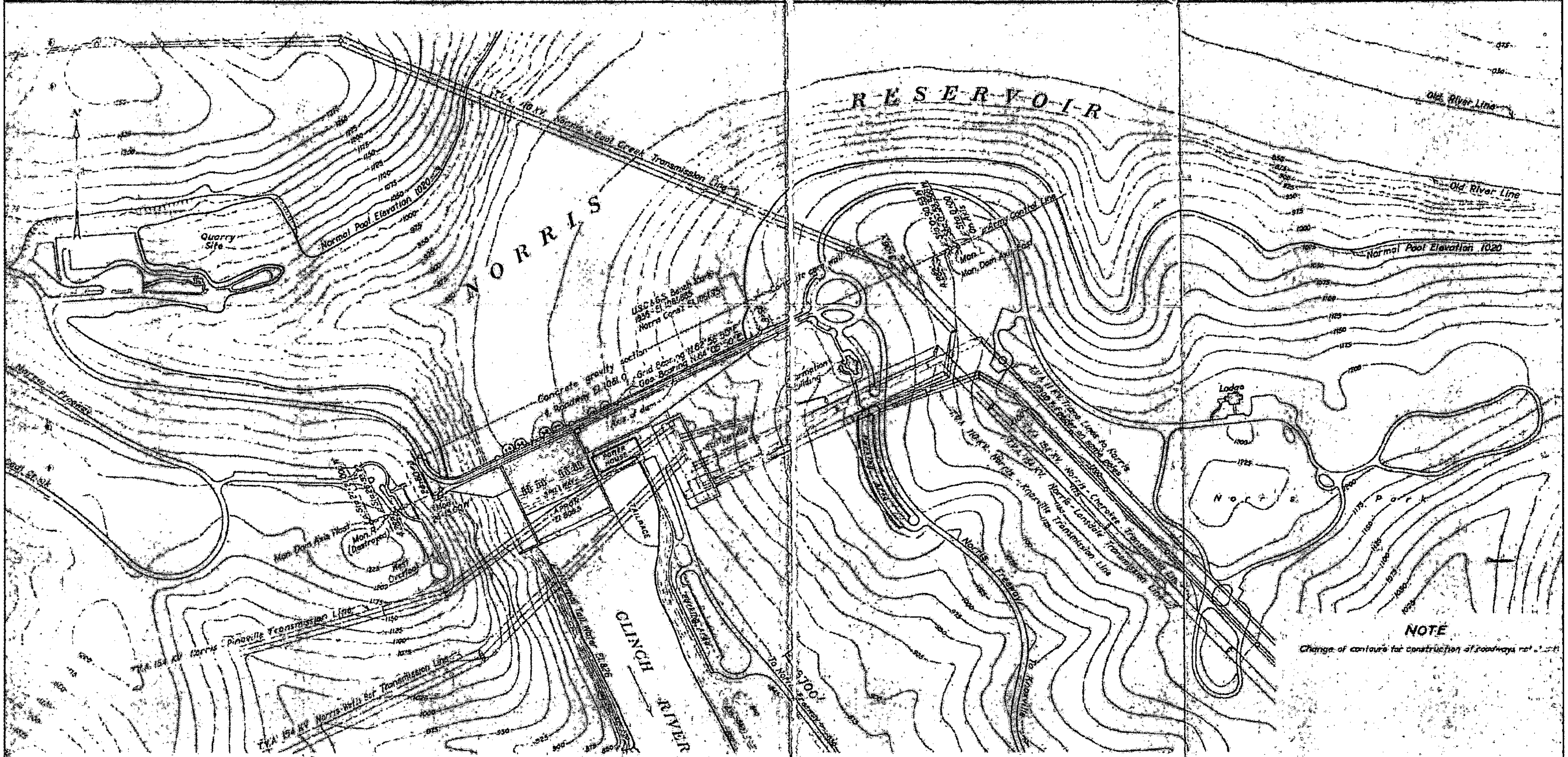
DISCHARGE RATING

CASES F_1 THRU F_5

NORRIS DAM PROJECT
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
ENGINEERING LABORATORY

NORRIS	12-19-73	2	EL 98	8-108

PLATE



Scale: 1/2400

200 0 200 400 600 800 1000 FEET

CONTOUR INTERVAL 25 FEET

DATUM IS MEAN SEA LEVEL

MONUMENT	CO-ORDINATES Tennessee Lambert Proj.	GEOGRAPHIC POSITION	ELEVATION Mean Sea Level Datum U.S.C.&G.S.-1912 Adj.	ELEVATION U.S.C.&G.S. 1936
L	E = 2,584,254.47 N = 673,249.76	Lat. 36°13'35.03" Long 84°05'12.87"	1159.401	
R Destroyed	E = 2,581,902.93 N = 672,050.58	Lat. 36°13'23.63" Long 84°05'41.85"	1199.476	
DAM AXIS EAST	E = 2,584,219.60 N = 673,236.77		1149.925	
U.S.C.&G.S. B.M. 1936			1061.75	1061.565
24 15.00 R	E = 2,582,148.84 N = 672,180.78		1061.797	
DAM AXIS WEST	E = 2,581,876.24 N = 672,841.77		1203.248	

UNITED STATES
TENNESSEE VALLEY AUTHORITY
NORRIS PROJECT

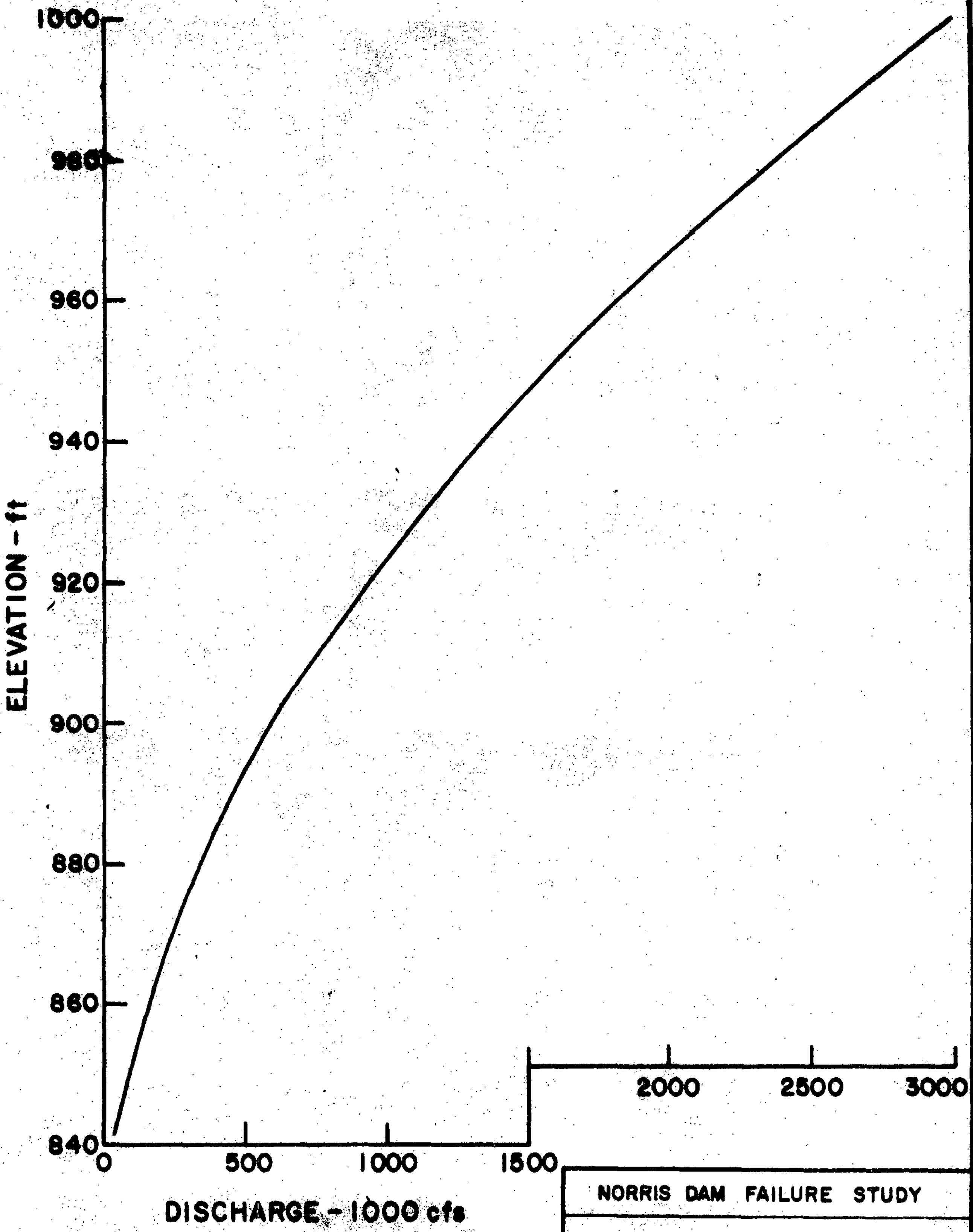
NORRIS DAM
GENERAL LAYOUT

Rev. 1-11-46 Rev. 1-15-37

DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION	UNITED STATES TENNESSEE VALLEY AUTHORITY
SUBMITTED B. H. Steele	SUBMITTED Roy McBee
RECOM. [illegible]	RECOMMENDED [illegible]
APPROVED R. F. Walter	APPROVED [illegible]

232-D-264 DENVER, COLO. JUNE 1936

RECORD DRAWING AS CONSTRUCTED



NORRIS DAM FAILURE STUDY

TAILWATER

RATING CURVE

NORRIS DAM
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
ENGINEERING LABORATORY

NORRIS	1-18-74	2	EL	98	A-110

DRAWN | ENGINEER KWK
CHECKED RS | APPROVED BED

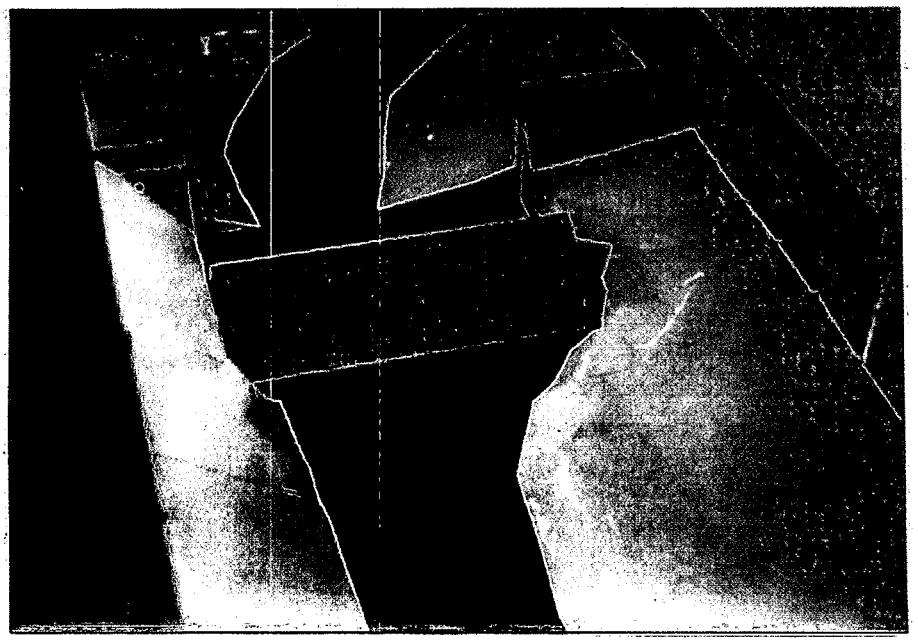


Figure 1 - General view of model
Case A - Looking upstream

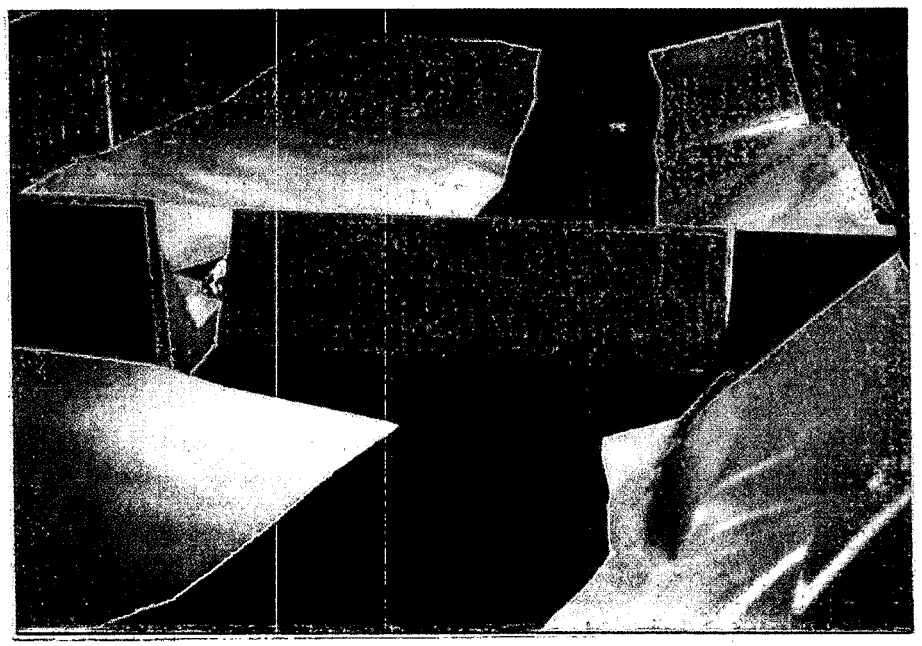


Figure 2 - General view of model
Case A - Looking downstream

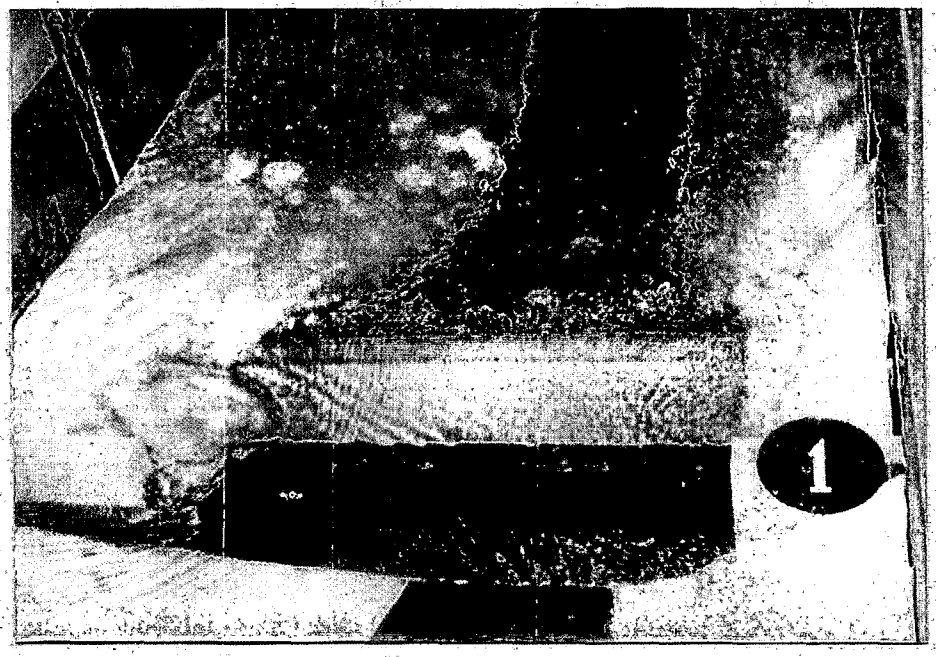


Figure 3 - H.W. El. - 1045.63
Case A - T.W. El. - 990.0
Test No. 9

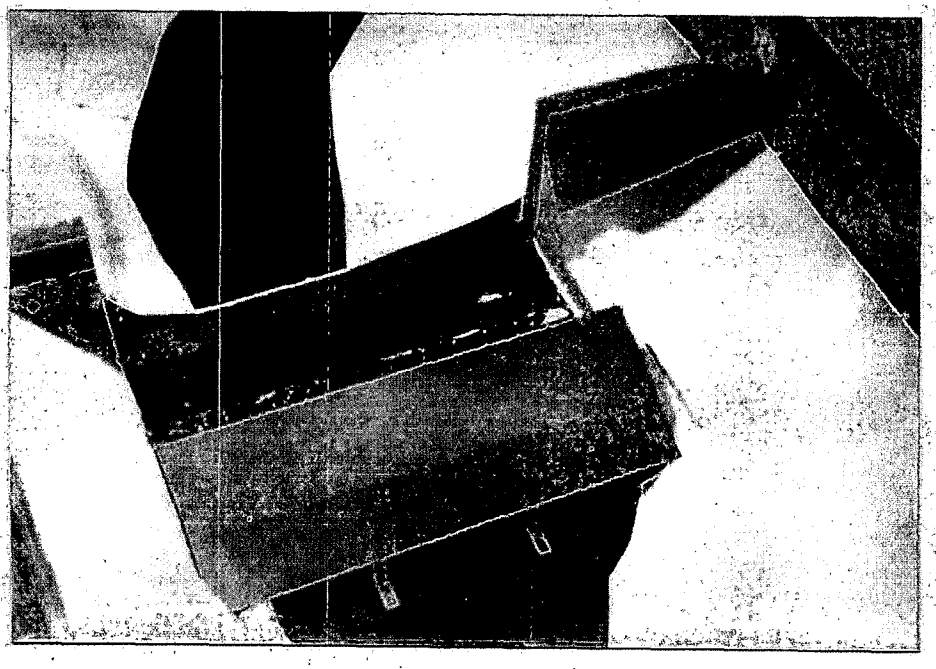


Figure 4 - General view of model
Case B - Looking upstream

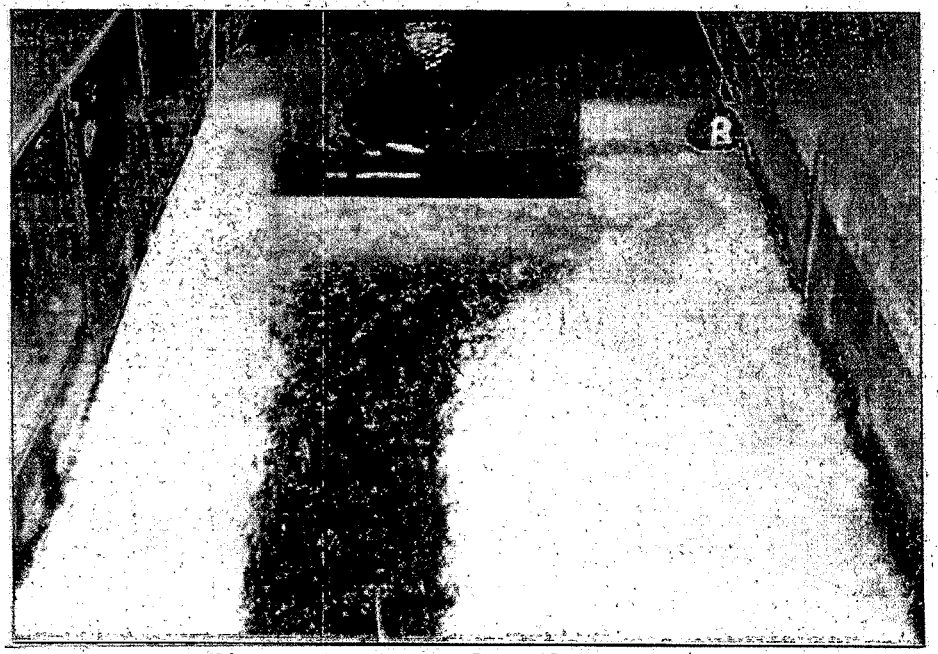


Figure 5 - H.W. El. - 1038.27
Case B - T.W. El. - 999.00
Test No. 39

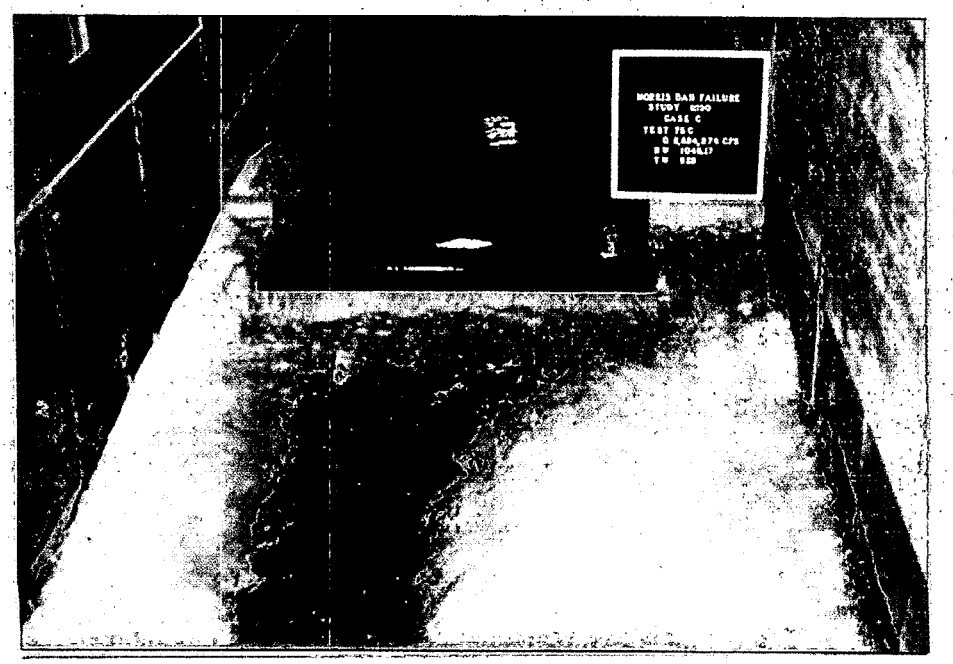


Figure 6 - H.W. El. - 1045.79
Case C - T.W. El. - 994.00
Test No. 75

Figure 7 - General view of model
Case D - Looking upstream

Figure 8 - H.W. El. - 929.35
Case D - T.W. El. - 885.50
Test No. 45

Figure 9 - H.W. El. - 1018.60
Case D - T.W. El. - 973.50
Test No. 54

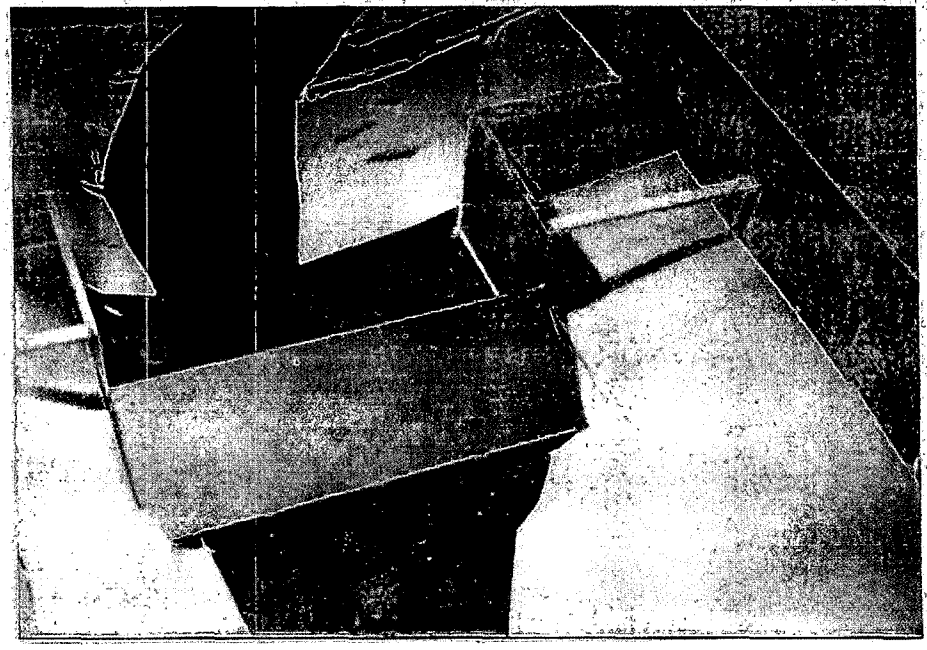


Figure 10 - General view of model
Case E - Looking upstream

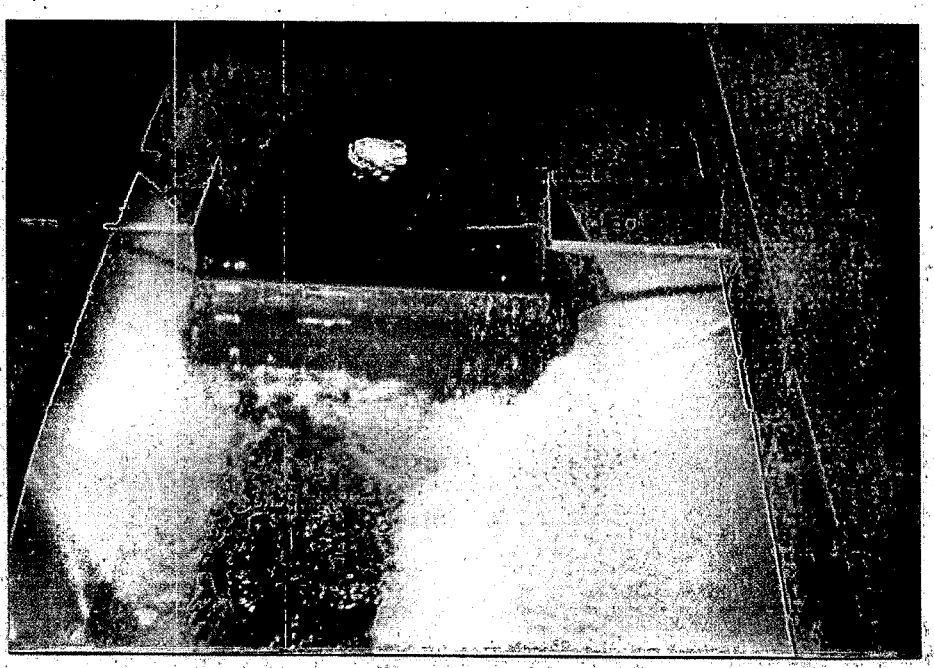


Figure 11 - H.W. El. - 1046.50
Case E - T.W. El. - 949.80
Test No. 25

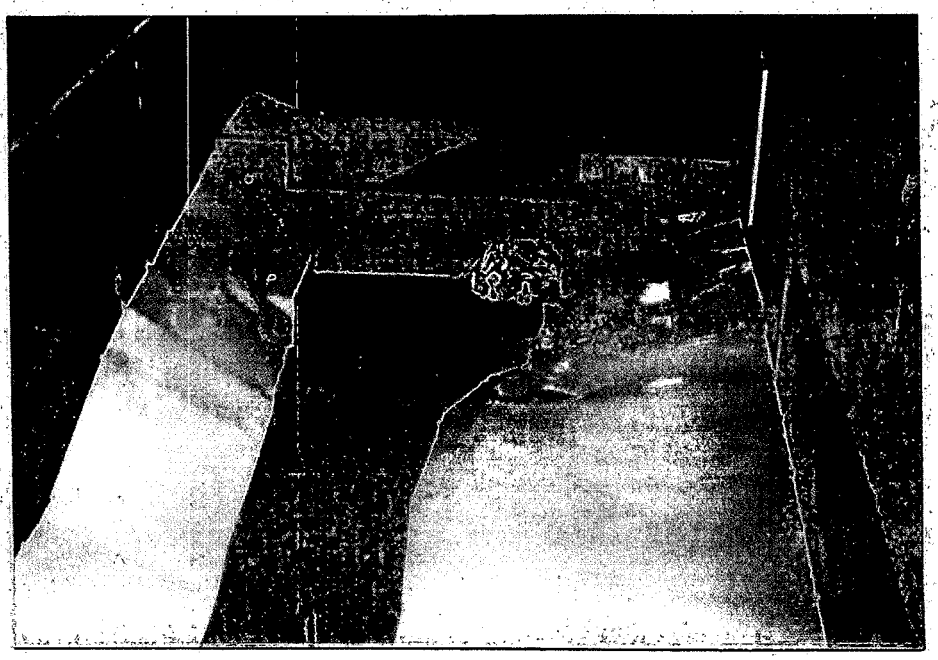


Figure 12 - General view of model
Case F_1 - Looking upstream

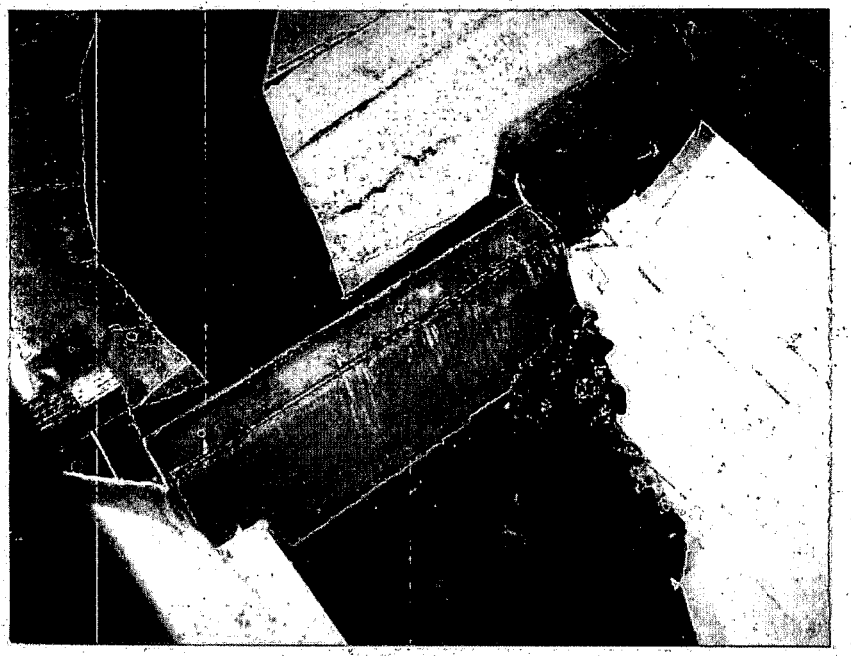


Figure 13 - H.W. El. - 982.45
Case F_2 - T.W. El. - 851.00
Test No. 91

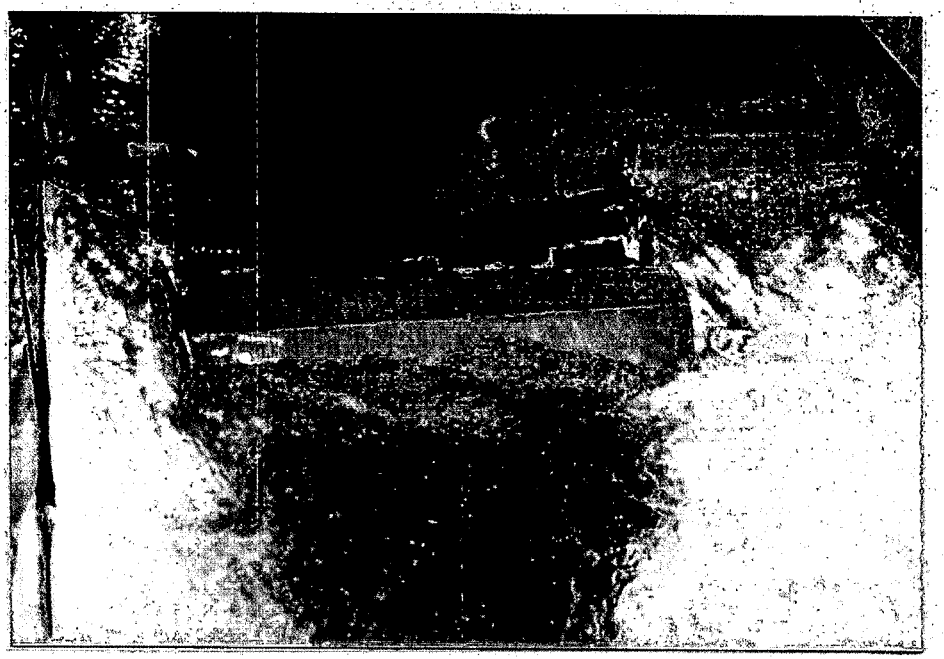


Figure 14 - H.W. El. - 1048.45
Case F_3 - T.W. El. - 966.00
Test No. 103

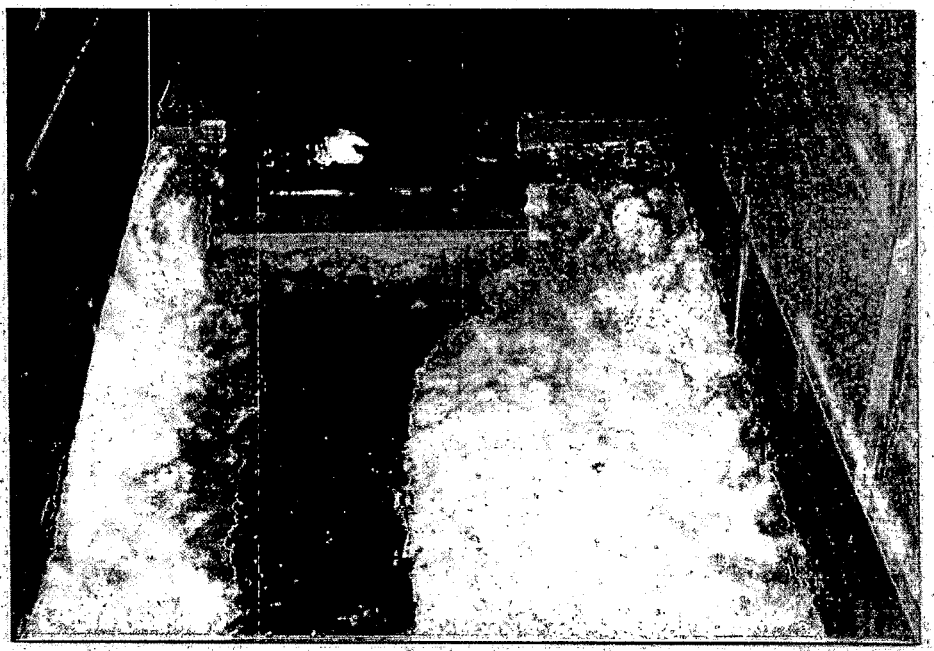


Figure 15 - H.W. El. - 1046.35
Case F_4 - T.W. El. - 980.50
Test No. 126

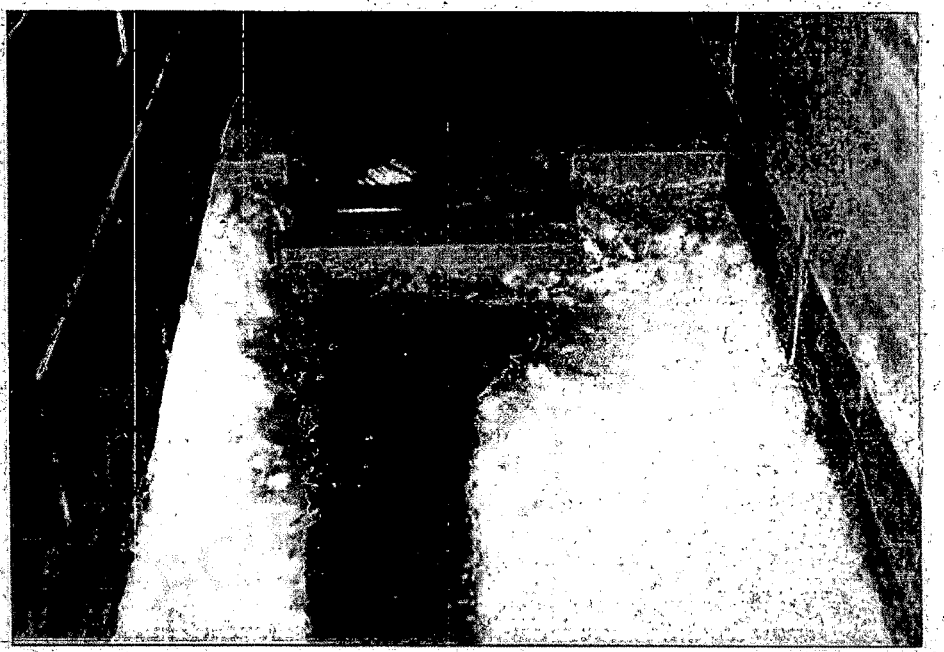
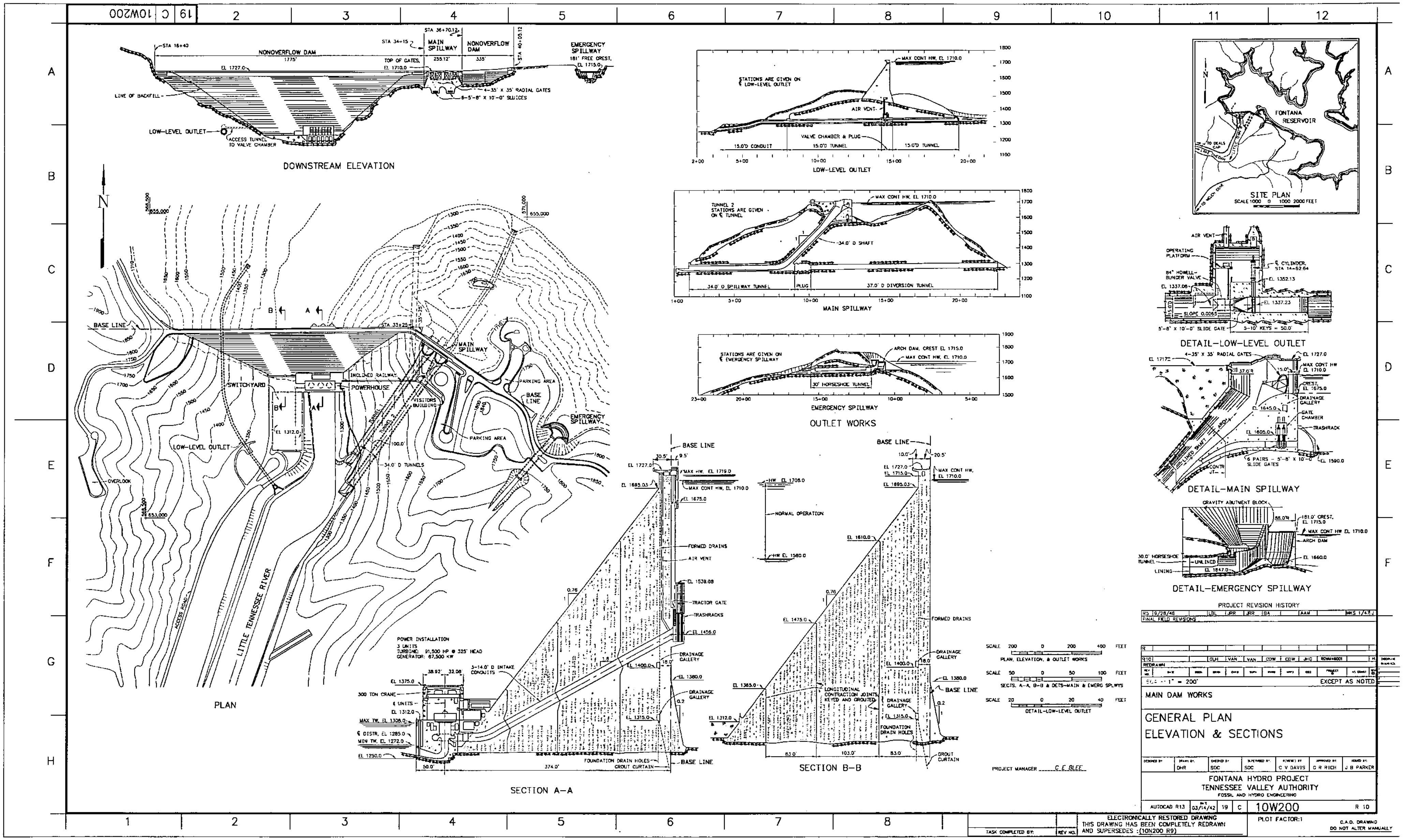
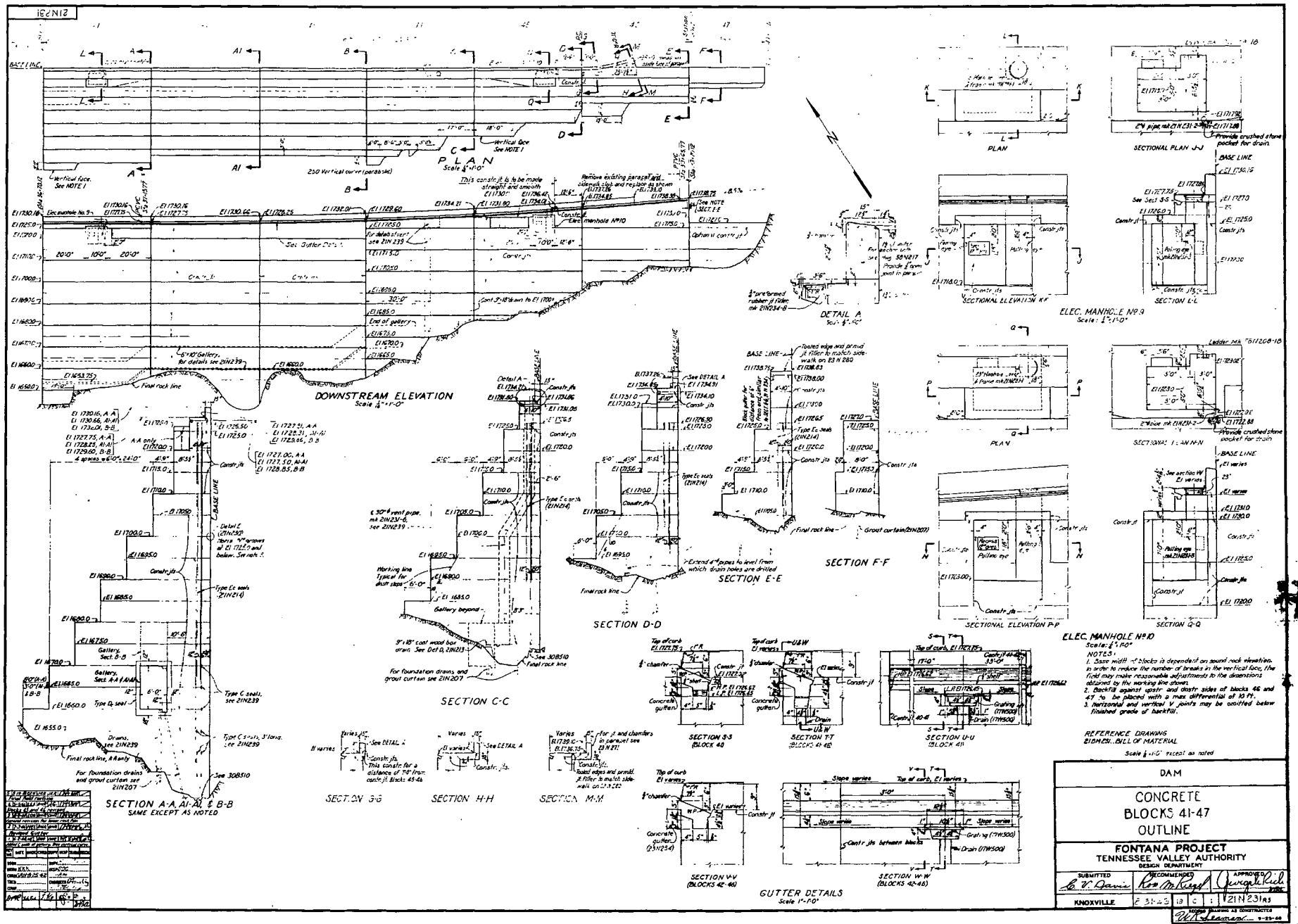
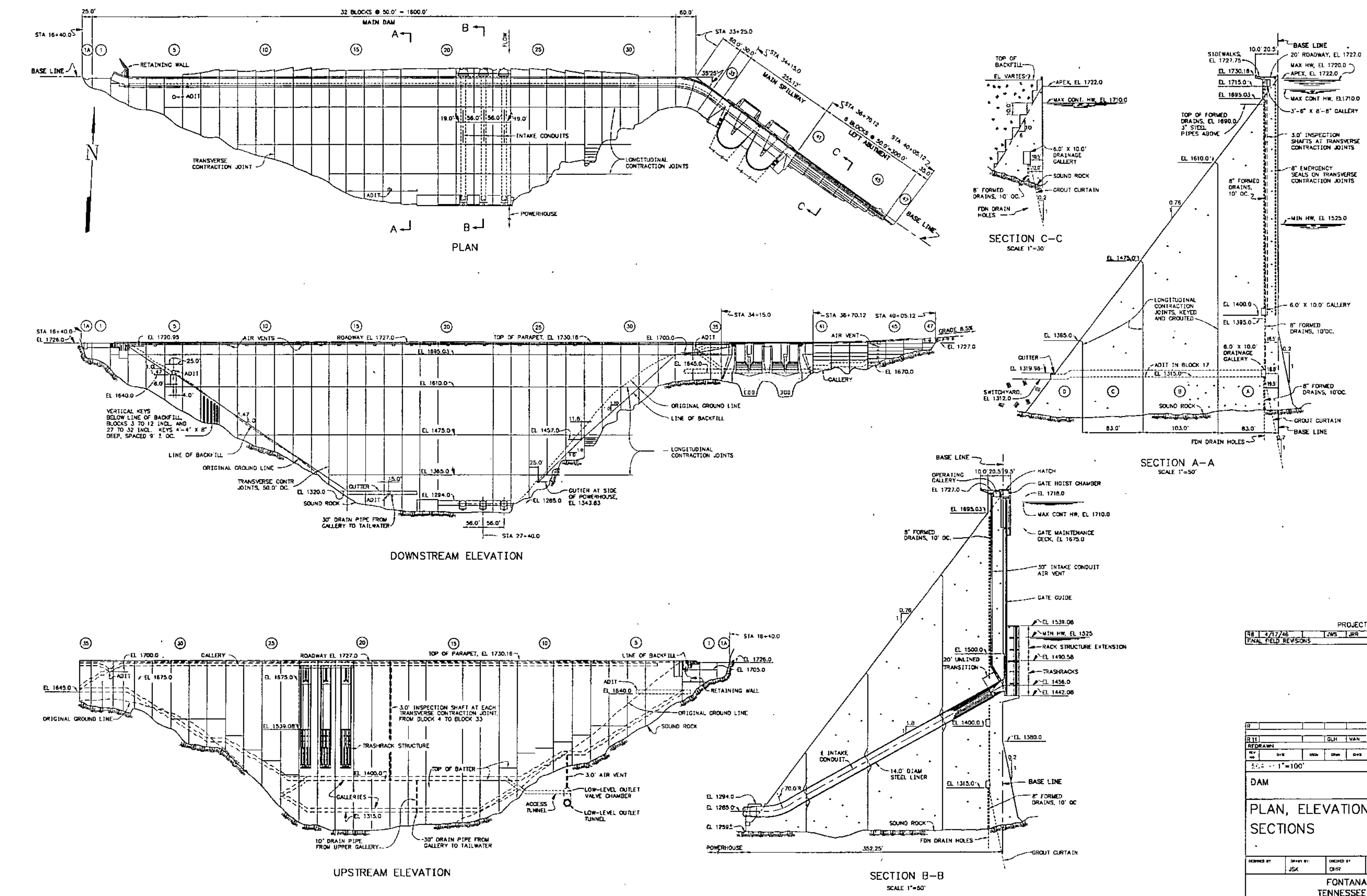


Figure 16 - H.W. El. - 1054.47
Case F_5 - T.W. El. - 999.00
Test No. 130



DOWNSTREAM ELEVATION
NONOVERFLOW DAM
1775'
MAIN SPILLWAY
255.12'
NONOVERFLOW DAM
335'
EMERGENCY SPILLWAY
181' FREE CREST, EL 1715.0
STA 16+40
STA 34+15
STA 36+70.12
STA 40+05.12
EL 1727.0
TOP OF GATES, EL 1710.0
LINE OF BACKFILL
4-35' X 35' RADIAL GATES
6-5'-8" X 10'-0" SLUICES
LOW-LEVEL OUTLET
ACCESS TUNNEL TO VALVE CHAMBER
PLAN
BASE LINE
SWITCHYARD
POWERHOUSE
INCLINED RAILWAY
VISITORS BUILDING
MAIN SPILLWAY
PARKING AREA
EMERGENCY SPILLWAY
LOW-LEVEL OUTLET
OVERLOOK
ACCESS ROAD
LITTLE TENNESSEE RIVER
34.0' D TUNNELS
LOW-LEVEL OUTLET
STATIONS ARE GIVEN ON ℄ LOW-LEVEL OUTLET
MAX CONT HW, EL 1710.0
AIR VENT
VALVE CHAMBER & PLUG
15.0'D CONDUIT
15.0'D TUNNEL
MAIN SPILLWAY
TUNNEL 2 STATIONS ARE GIVEN ON ℄ TUNNEL
34.0' D SHAFT
34.0' D SPILLWAY TUNNEL
PLUG
37.0' D DIVERSION TUNNEL
EMERGENCY SPILLWAY
STATIONS ARE GIVEN ON ℄ EMERGENCY SPILLWAY
ARCH DAM, CREST EL 1715.0
30' HORSESHOE TUNNEL
OUTLET WORKS
SITE PLAN
SCALE 1000 0 1000 2000 FEET
FONTANA RESERVOIR
DETAIL-LOW-LEVEL OUTLET
AIR VENT
OPERATING PLATFORM
84" HOWELL-BUNGER VALVE
℄ CYLINDER, STA 14+52.64
EL 1352.13
EL 1337.23
SLOPE 0.0065
5'-8" X 10'-0" SLIDE GATE
3-10' KEYS = 50.0'
DETAIL-MAIN SPILLWAY
4-35' X 35' RADIAL GATES
EL 1727.0
MAX CONT HW EL 1710.0
CREST, EL 1675.0
DRAINAGE GALLERY
GATE CHAMBER
TRASHRACK
6 PAIRS - 5'-8" X 10'-0" SLIDE GATES
DETAIL-EMERGENCY SPILLWAY
GRAVITY ABUTMENT BLOCK
181.0' CREST, EL 1715.0
MAX CONT HW EL 1710.0
ARCH DAM
30.0' HORSESHOE TUNNEL
UNLINED
LINING
EL 1660.0
EL 1647.0
SECTION A-A
POWER INSTALLATION
3 UNITS
TURBINE: 91,500 HP @ 325' HEAD
GENERATOR: 67,500 KW
3-14.0' D INTAKE CONDUITS
300 TON CRANE
MAX TW, EL 1308.0
MIN TW, EL 1272.0
EL 1250.0
FORMED DRAINS
AIR VENT
TRACTOR GATE
TRASHRACKS
DRAINAGE GALLERY
FOUNDATION DRAIN HOLES
GROUT CURTAIN
BASE LINE
50.0'
374.0'
SECTION B-B
NORMAL OPERATION
LONGITUDINAL CONTRACTION JOINTS, KEYED AND GROUTED
DRAINAGE GALLERY
FOUNDATION DRAIN HOLES
GROUT CURTAIN
83.0'
103.0'
SCALE 200 0 200 400 FEET PLAN, ELEVATION, & OUTLET WORKS
SCALE 50 0 50 100 FEET SECTS. A-A, B-B & DETS-MAIN & EMERG SPLWYS
SCALE 20 0 20 40 FEET DETAIL-LOW-LEVEL OUTLET
PROJECT MANAGER C. E. BLEE
PROJECT REVISION HISTORY
SCALE 1" = 200' EXCEPT AS NOTED
MAIN DAM WORKS
GENERAL PLAN
ELEVATION & SECTIONS
C V DAVIS
G R RICH
J B PARKER
FONTANA HYDRO PROJECT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING
AUTOCAD R13
03/14/42
19 C 10W200 R 10
ELECTRONICALLY RESTORED DRAWING
THIS DRAWING HAS BEEN COMPLETELY REDRAWN AND SUPERSEDES :(10N200 R9)
PLOT FACTOR:1
C.A.D. DRAWING DO NOT ALTER MANUALLY


PLAN
Scale 1/4"=1'-0"
DOWNSTREAM ELEVATION
Scale 1/4"=1'-0"
SECTION A-A, A1-A1, & B-B
SAME EXCEPT AS NOTED
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
SECTION H-H
SECTION M-M
DETAIL A
Scale 1"=1'-0"
ELEC. MANHOLE NO.9
Scale: 1/2"=1'-0"
ELEC. MANHOLE NO.10
Scale: 1/2"=1'-0"
SECTION J-J
SECTION K-K
SECTION L-L
SECTION N-N
SECTION P-P
SECTION Q-Q
SECTION S-S (BLOCK 46)
SECTION T-T (BLOCKS 44-46)
SECTION U-U (BLOCK 47)
SECTION V-V (BLOCKS 42-46)
SECTION W-W (BLOCKS 42-46)
GUTTER DETAILS
Scale 1"=1'-0"
NOTES:
1. Base width of blocks is dependent on sound rock elevation. In order to reduce the number of breaks at the vertical face, the field may make reasonable adjustments to the dimensions obtained by the working line stakes.
2. Backfill against upstr. and dnstr. sides of blocks 46 and 47 to be placed with a max. differential of 10 FT.
3. Horizontal and vertical V Joints may be omitted below finished grade of backfill.
REFERENCE DRAWING
21DM231...BILL OF MATERIAL
Scale 1/8"=1'-0" except as noted
DAM
CONCRETE
BLOCKS 41-47
OUTLINE
FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
21N231ias
RECORD DRAWING AS CONSTRUCTED



PROJECT REVISION HISTORY

R8 4/12/46 FINAL FIELD REVISIONS

SCALE 1"=100' EXCEPT AS NOTED

DAM

PLAN, ELEVATIONS & SECTIONS

FONTANA HYDRO PROJECT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R13 | 6-5-42 | 19 | C | 21W200 | R 11

ELECTRONICALLY RESTORED DRAWING
THIS DRAWING HAS BEEN COMPLETELY REDRAWN
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PLOT FACTOR:1

C.A.D. DRAWING
DO NOT ALTER MANUALLY

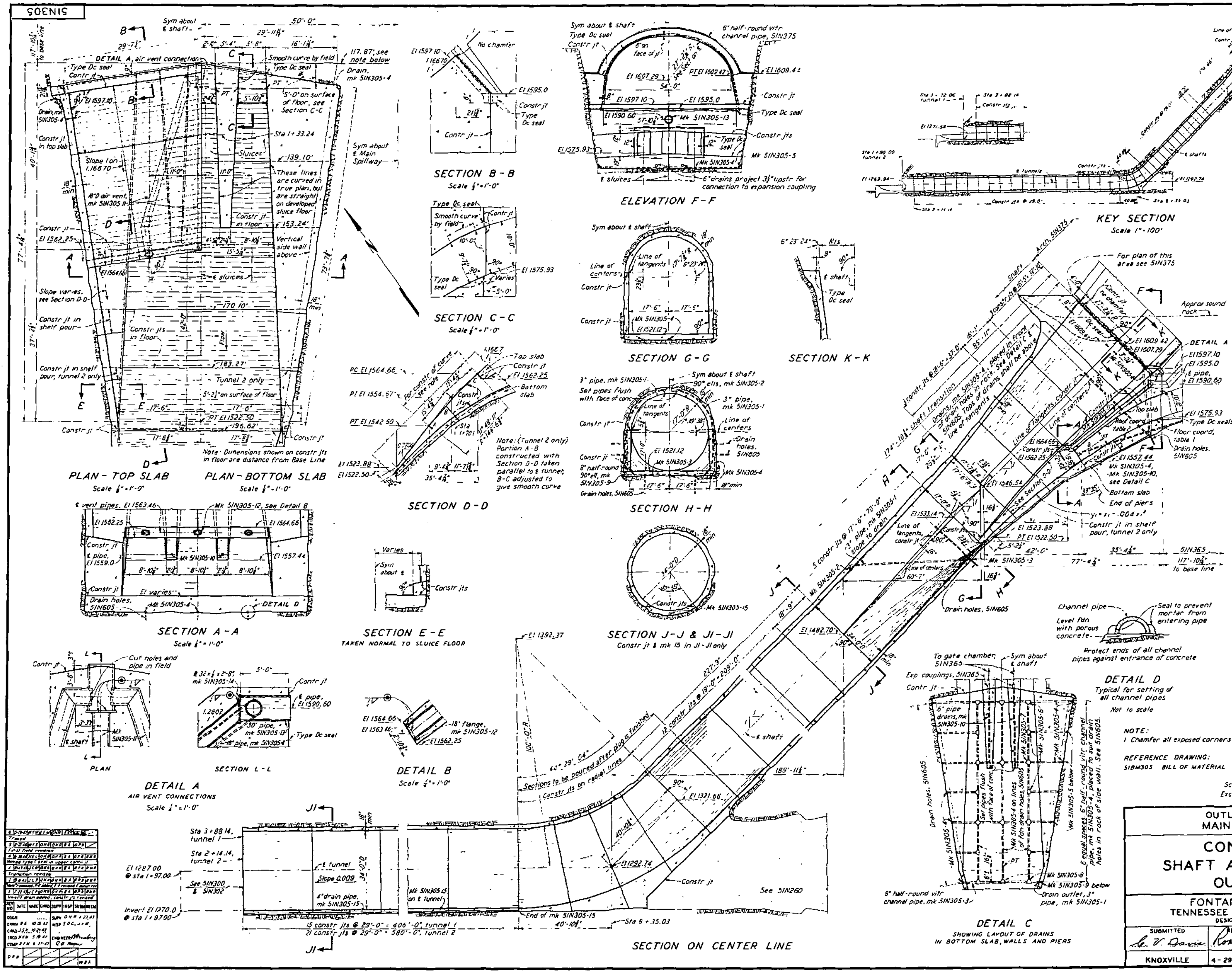


TABLE 1

$y_1 = x_1 - .004 x_1^2$

x_1	y_1	EL
0.000'	0.000'	1522.500
5.000	4.900	1527.400
10.000	9.600	1532.100
15.000	14.100	1536.600
20.000	18.400	1540.900
25.000	22.500	1545.000
30.000	26.400	1548.900
35.000	30.100	1552.600
42.000	34.944	1557.444
45.000	36.900	1559.400
50.000	40.000	1562.500
55.000	42.900	1565.400
60.000	45.600	1568.100
65.000	48.100	1570.600
70.000	50.400	1572.900
75.000	52.500	1575.000
77.370	53.426	1575.926

SLUICE FLOOR

TABLE 2

a	b
Note a	Note b
0.00'	5.77'
5.00	6.28
10.00	6.82
15.00	7.39
20.00	7.92
25.00	8.41
30.00	8.98
35.00	9.62
40.00	10.00

Note a:
"a" is measured on surface of floor from El 1557.44.
Note b:
"b" is measured normal to floor at point "a".

SLUICE ROOF

TABLES OF COORDINATES

NOTE:
1 Chamfer all exposed corners 3/4", except as noted

REFERENCE DRAWING:
5IBM305 BILL OF MATERIAL

Scale 1/4" = 1'-0"
Except as noted

OUTLET WORKS
MAIN SPILLWAY

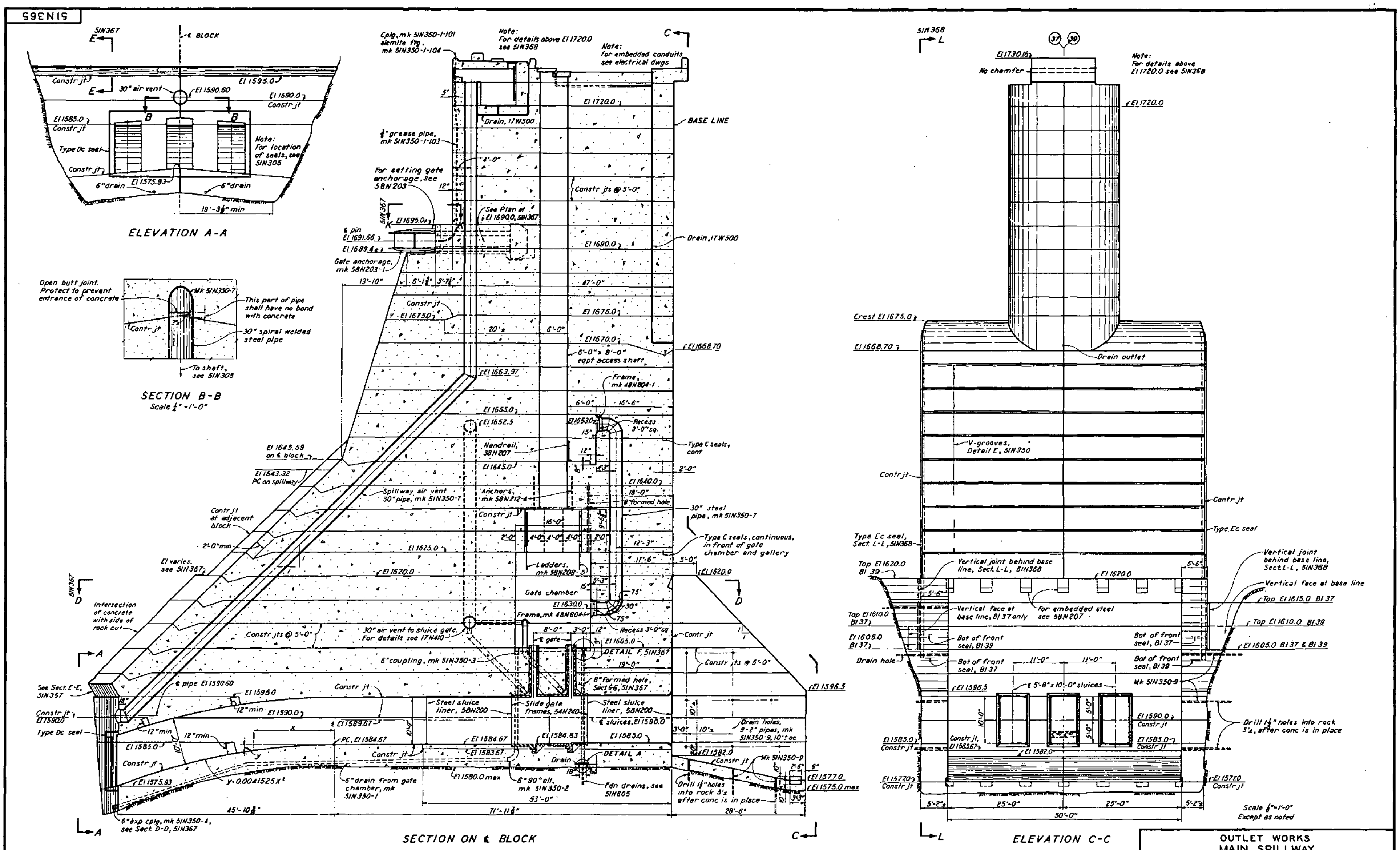
CONCRETE
SHAFT AND TUNNEL
OUTLINE

FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT

SUBMITTED — RECOMMENDED — APPROVED

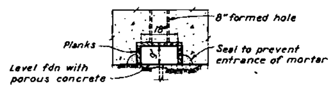
KNOXVILLE 4-29-43 19 C 4 5IN305R6

RECORD DRAWING AS CONSTRUCTED



SLUICE FLOOR COORDINATES*			
x	y	x	y
0	0.0	30	3.737
5	0.104	35	5.087
10	0.415	40	6.644
15	0.934	45	8.409
20	1.661	45.881	8.741
25	2.595		

*Dimensions given in feet.



NOTES:
For list see 51N350.

REFERENCE DRAWINGS:
For list see 51N350.

COMPANION DRAWINGS: 51N367 & 51N368

OUTLET WORKS
MAIN SPILLWAY

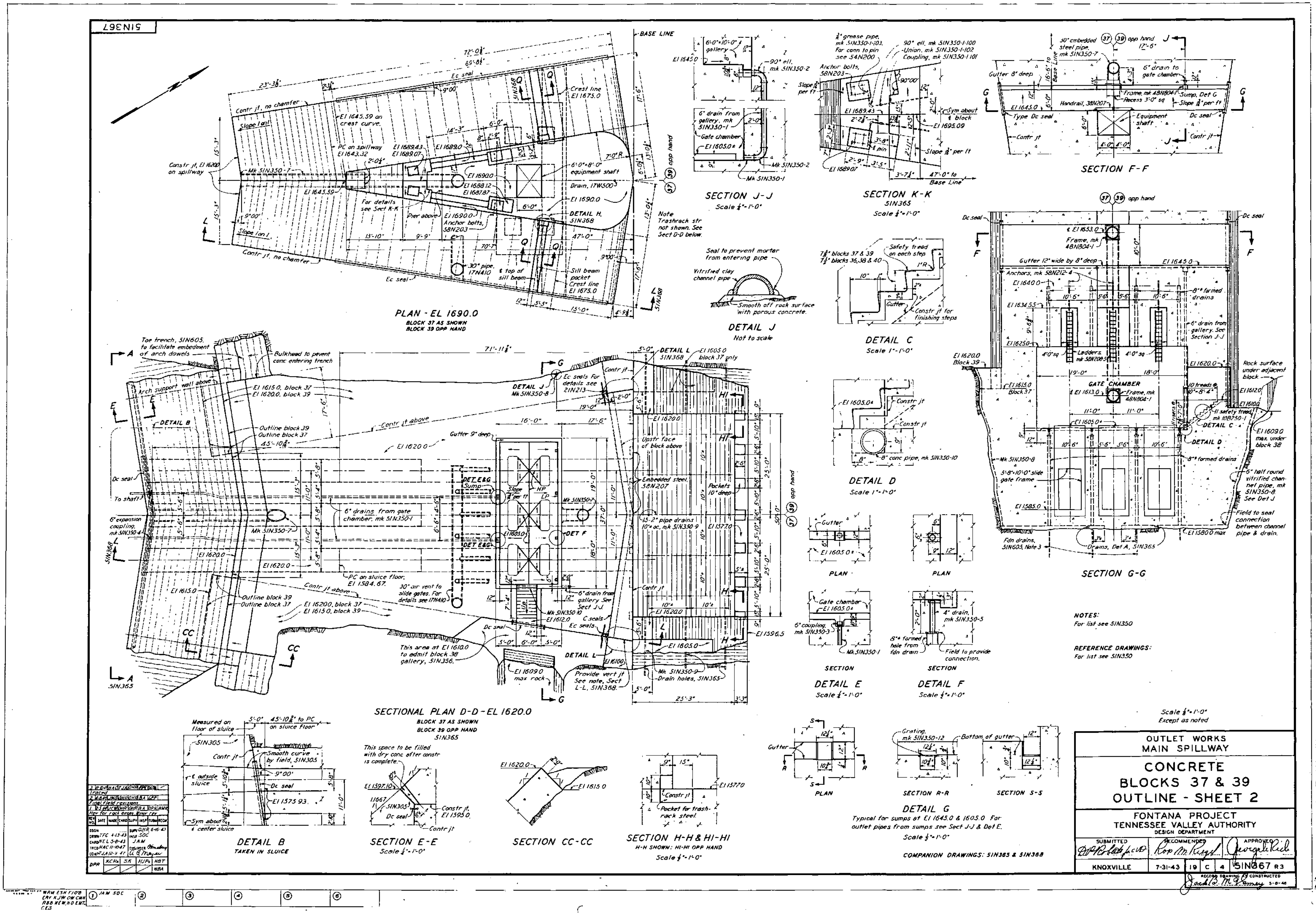
CONCRETE
BLOCKS 37 & 39
OUTLINE - SHEET 1

FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT

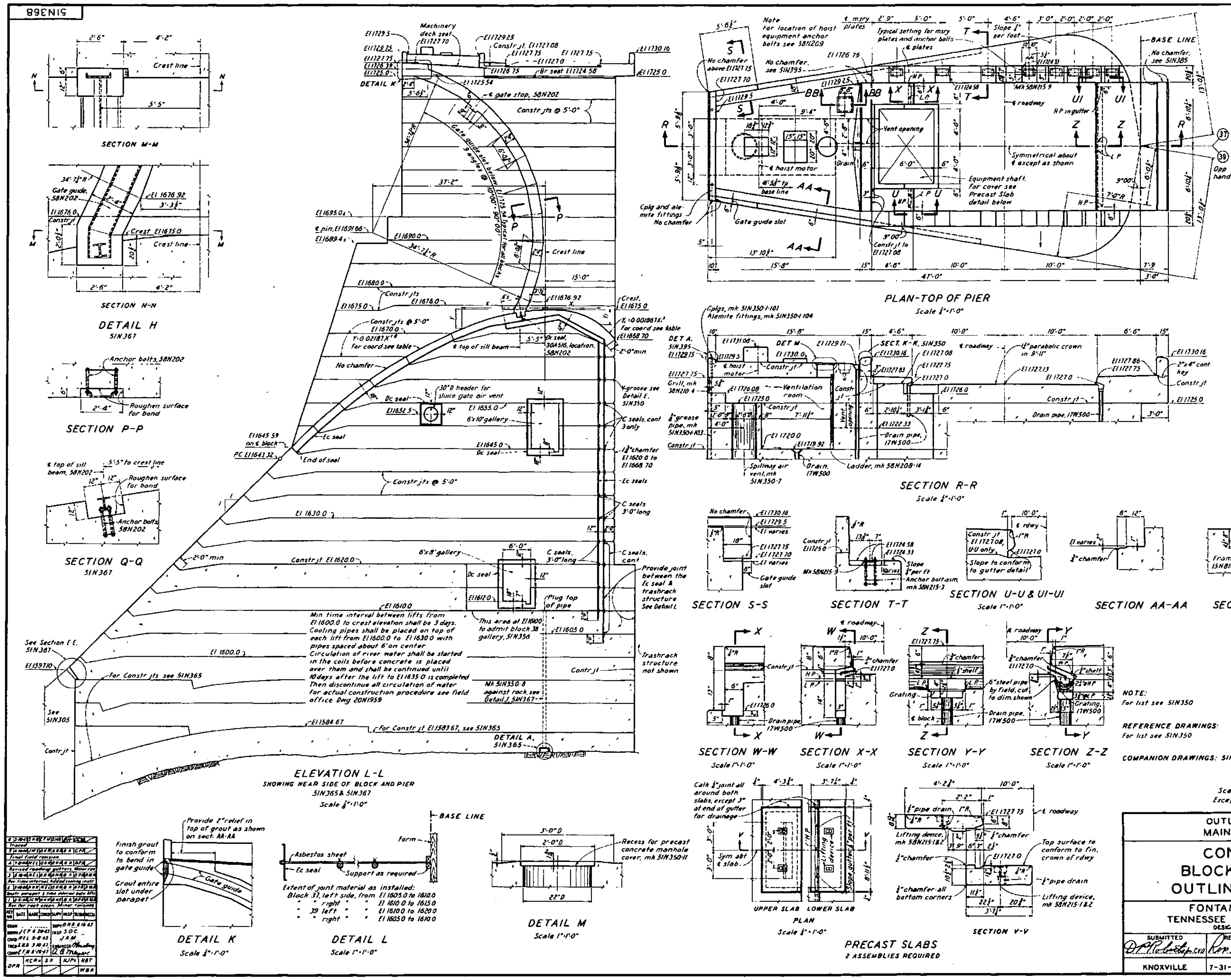
SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 7-31-43 | 19 | C | 4 | 51N365R3

RECORD DRAWING AS CONSTRUCTED



51N367
PLAN - EL 1690.0
BLOCK 37 AS SHOWN
BLOCK 39 OPP HAND
SECTIONAL PLAN D-D - EL 1620.0
BLOCK 37 AS SHOWN
BLOCK 39 OPP HAND
51N365
SECTION J-J
Scale ¼"=1'-0"
SECTION K-K
51N365
Scale ¼"=1'-0"
SECTION F-F
DETAIL J
Not to scale
DETAIL C
Scale 1"=1'-0"
DETAIL D
Scale 1"=1'-0"
SECTION G-G
DETAIL E
Scale ¼"=1'-0"
DETAIL F
Scale ¼"=1'-0"
DETAIL B
TAKEN IN SLUICE
SECTION E-E
Scale ¼"=1'-0"
SECTION CC-CC
SECTION H-H & HI-HI
H-H SHOWN: HI-HI OPP HAND
Scale ¼"=1'-0"
DETAIL G
Typical for sumps at El 1645.0 & 1605.0. For outlet pipes from sumps see Sect J-J & Det E.
Scale ¼"=1'-0"
COMPANION DRAWINGS: 51N365 & 51N368
NOTES:
For list see 51N350
REFERENCE DRAWINGS:
For list see 51N350
Scale ¼"=1'-0"
Except as noted
OUTLET WORKS
MAIN SPILLWAY
CONCRETE
BLOCKS 37 & 39
OUTLINE - SHEET 2
FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
7-31-43
19
C
4
51N367 R3
RECORD DRAWING AS CONSTRUCTED



COORDINATES OF WEIR PROFILE

DNSTR FROM CREST LINE

Y=0.02187X^1.8

X	Y	EL
0.0 *	0.0	1675.000
2.00'	0.076'	1674.924
4.00	0.265	1674.735
4.428'	0.318	1674.682
6.405'	0.619	1674.381
8.00	0.923	1674.076
10.00	1.380	1673.620
12.00	1.916	1673.084
14.00	2.529	1672.471
16.00	3.216	1671.784
18.00	3.975	1671.025
20.00	4.805	1670.195
22.00	5.704	1669.296
24.00	6.672	1668.328
26.00	7.706	1667.294
28.00	8.805	1666.195
30.00	9.969	1665.031
32.00	11.197	1663.803
34.00	12.489	1662.511
36.00	13.842	1661.158
38.00	15.257	1659.743
40.00	16.732	1658.268
42.00	18.268	1656.732
44.00	19.864	1655.136
46.00	21.519	1653.481
48.00	23.232	1651.768
50.00	25.003	1649.997
52.00	26.832	1648.168
54.00	28.718	1646.282
57.029▵	31.683	1643.317

UPSTR FROM CREST LINE

$Y_1=0.001867X_1^3$

X_1	Y_1	EL
0.0 *	0.0	1675.000
2.00'	0.015'	1674.985
4.00	0.119	1674.881
6.00	0.403	1674.597
8.00	0.956	1674.044
10.00	1.867	1673.133
12.00	3.226	1671.774
14.00	5.123	1669.877
15.00•	6.301	1668.699

* Crest line
' Edge of sill beam slot
▵ P.C
• Upstream face

Scale 1/8"=1'-0"
Except as noted

OUTLET WORKS
MAIN SPILLWAY

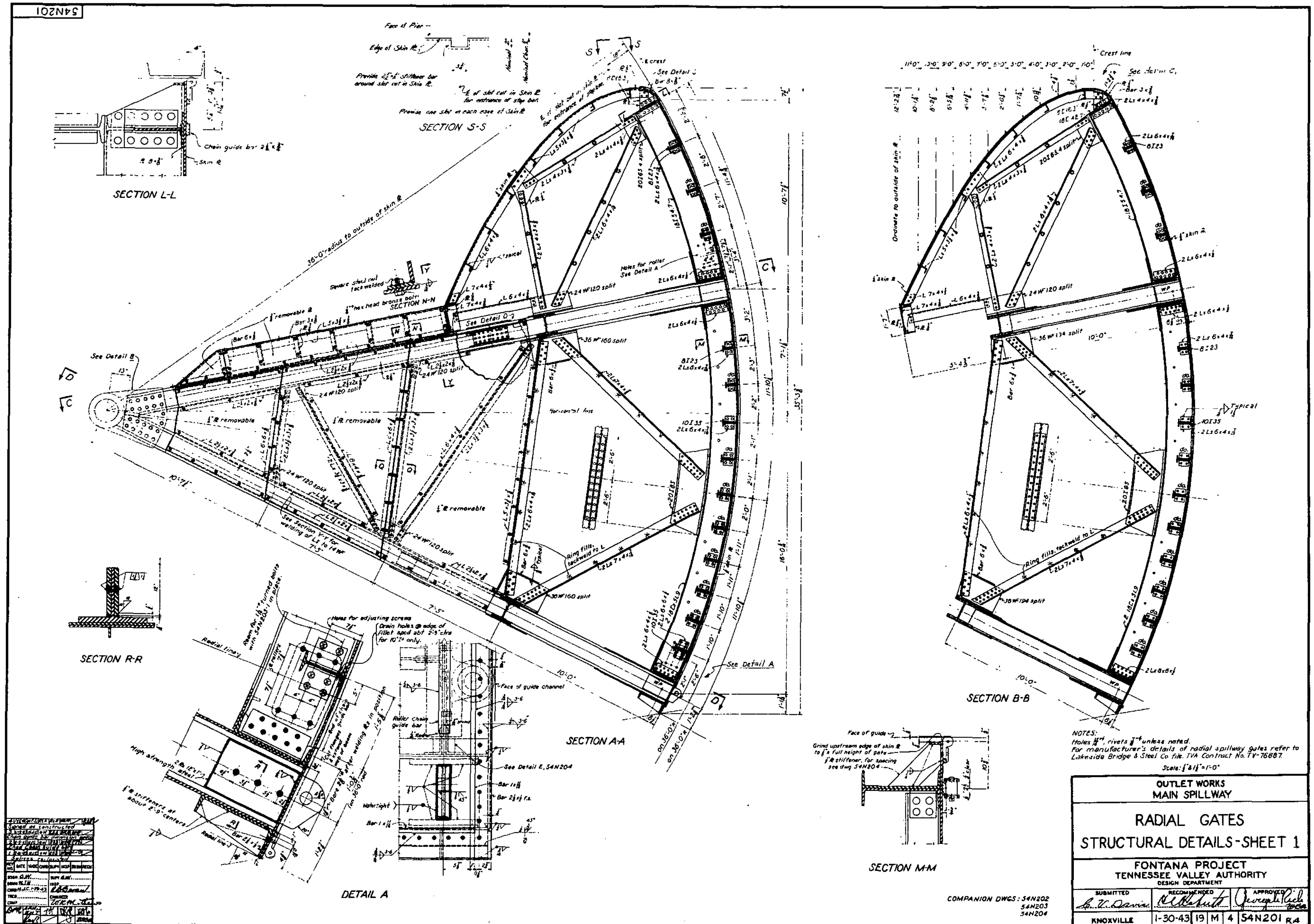
CONCRETE BLOCKS 37 & 39 OUTLINE-SHEET 3

FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT

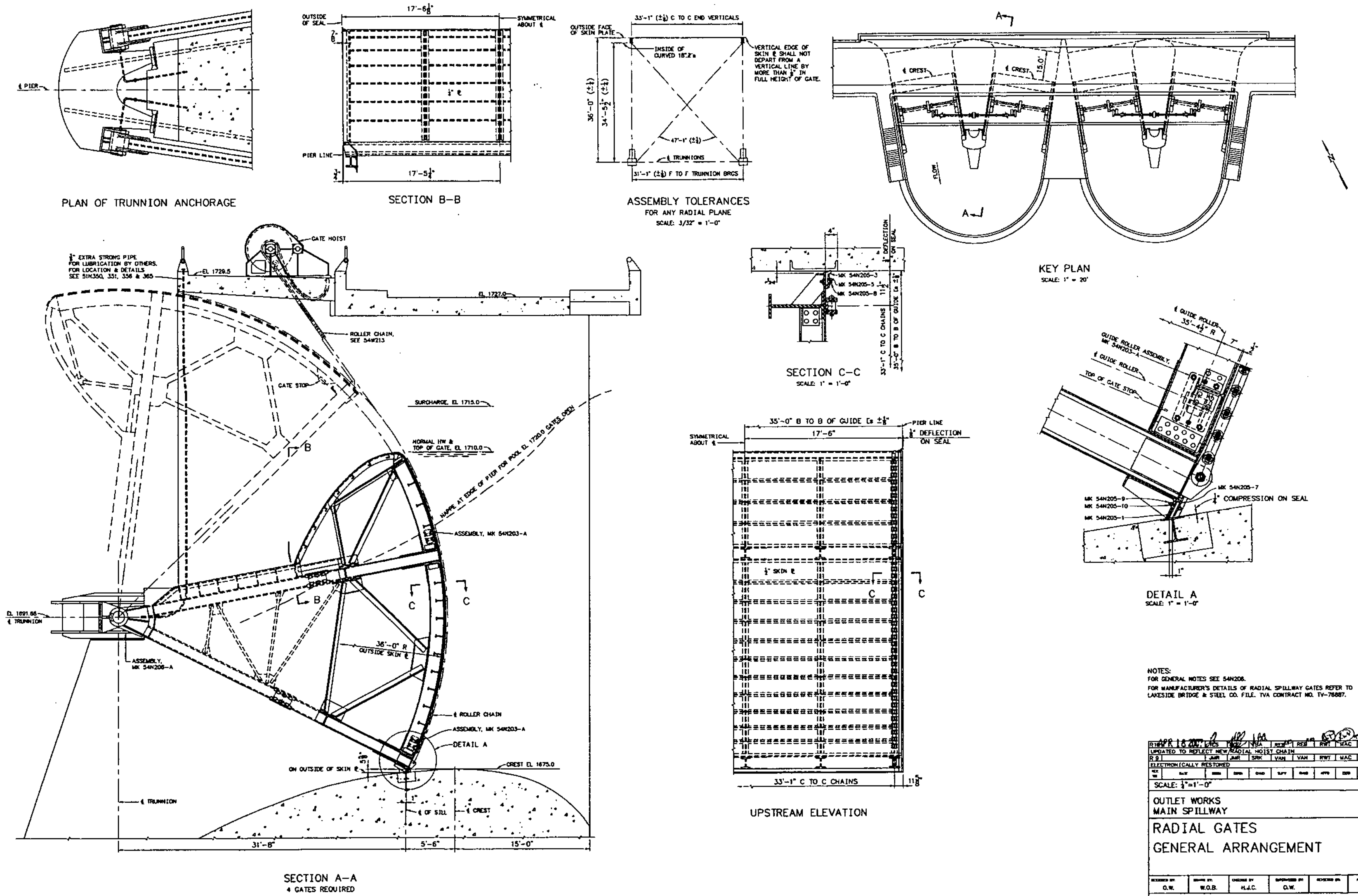
SUBMITTED	RECOMMENDED	APPROVED
D. P. Robertop CVO	Ros M. Riegel	George Rich

KNOXVILLE	7-31-43	19	C	4	5IN368 R8

RECORD DRAWING AS CONSTRUCTED Jack B. McVamey 5-6-48



54N201
SECTION L-L
SECTION S-S
SECTION R-R
SECTION A-A
SECTION B-B
SECTION M-M
DETAIL A
NOTES:
Holes 15/16", rivets 7/8" unless noted.
For manufacturer's details of radial spillway gates refer to Lakeside Bridge & Steel Co. file. TVA Contract No. TV-76887.
COMPANION DWGS: 54N202
54N203
54N204
OUTLET WORKS
MAIN SPILLWAY
RADIAL GATES
STRUCTURAL DETAILS - SHEET 1
FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
1-30-43
19
M
4
54N201
R4



NOTES:
FOR GENERAL NOTES SEE 54N206.
FOR MANUFACTURER'S DETAILS OF RADIAL SPILLWAY GATES REFER TO LAKESIDE BRIDGE & STEEL CO. FILE. TVA CONTRACT NO. TV-76887.

R10 APR 18 2007 | RCS | | VBA | REB | REB | RWT | MAC
UPDATED TO REFLECT NEW RADIAL HOIST CHAIN
R 9 | | JMR | JMR | SRK | VAN | VAN | RWT | MAC
ELECTRONICALLY RESTORED

SCALE: 1/4"=1'-0" EXCEPT AS NOTED

OUTLET WORKS
MAIN SPILLWAY

RADIAL GATES
GENERAL ARRANGEMENT

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
O.W.	W.O.B.	H.J.C.	O.W.			

FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

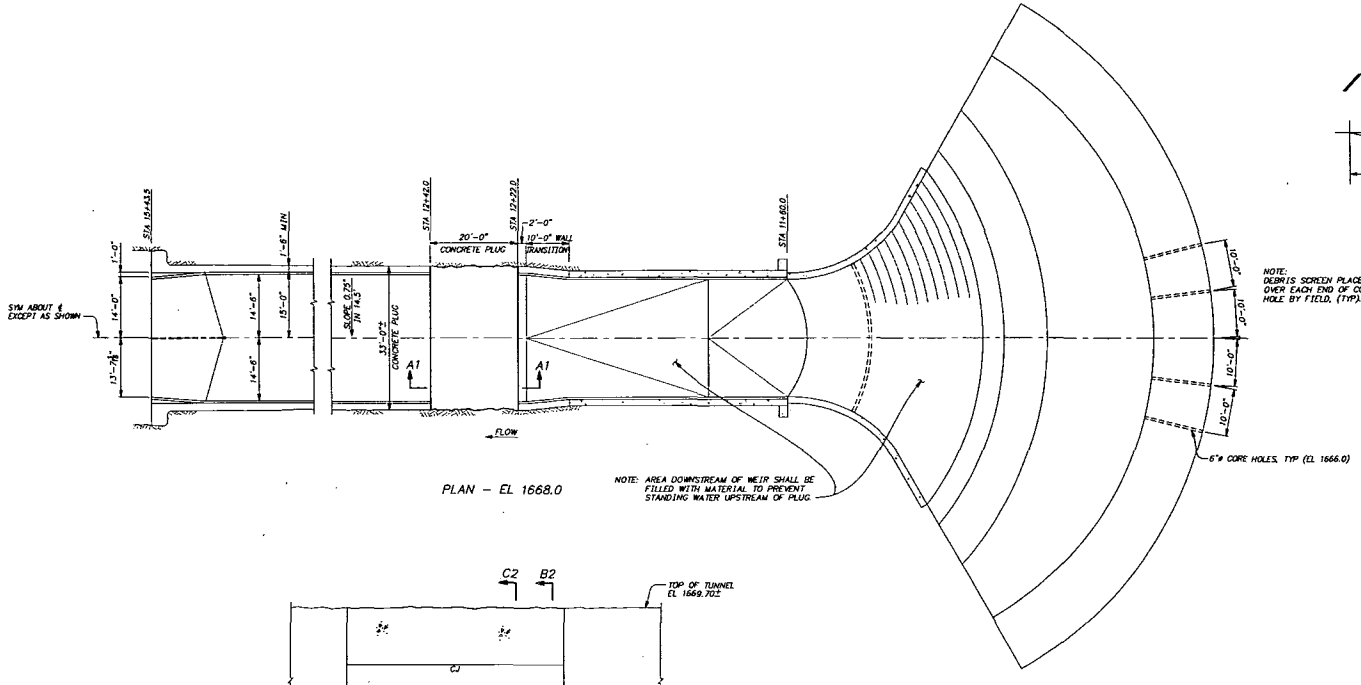
AUTOCAD R14 | DATE 1-30-43 | 19 | M | 54W200 | R 10

ELECTRONICALLY RESTORED DRAWING
THIS DRAWING HAS BEEN COMPLETELY REDRAWN
AND SUPERSEDES :(54N200 R8)

TASK COMPLETED BY: | REV NO.

PLOT FACTOR:48
W_TVA

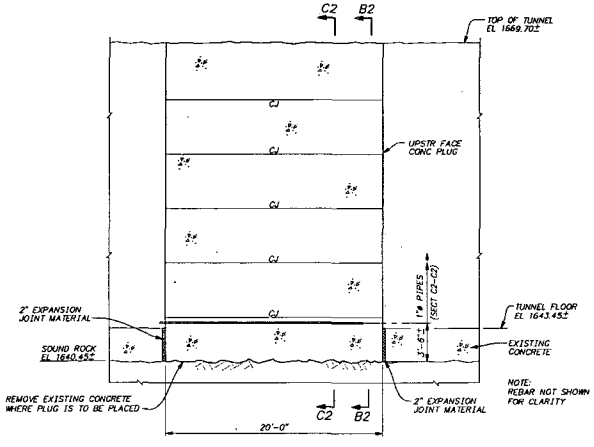
C.A.D. DRAWING
DO NOT ALTER MANUALLY



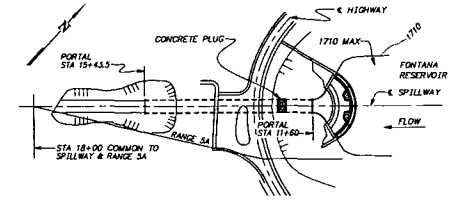
PLAN – EL 1668.0

NOTE: AREA DOWNSTREAM OF WEIR SHALL BE FILLED WITH MATERIAL TO PREVENT STANDING WATER UPSTREAM OF PLUG.

NOTE: DEBRIS SCREEN PLACED OVER EACH END OF CORE HOLE BY FIELD, (TYP).



A1 – A1
TYP CONC PLUG SECTION
1/4" = 1'-0"



KEY PLAN
1" = 100'

NOTES:
1. SPILLWAY TUNNEL AT FONTANA EMERGENCY SPILLWAY SHALL BE PLUGGED WITH 20'-0" THICK CONCRETE PLUG.
2. ALL EXISTING CONCRETE SURFACES THAT WILL HAVE CONCRETE PLUG PLACED AGAINST THEM SHALL BE REMOVED TO SOUND ROCK.
3. SHEAR REINFORCEMENT (#8 REBAR) SHALL BE PLACED PERPENDICULAR TO SIDES OF TUNNEL. REBAR WILL BE ANCHORED INTO ROCK WITH HILTI HIT RE500 ADHESIVE TO 17" MINIMUM DEPTH. REBAR WILL EXTEND INTO CONCRETE PLUG A MINIMUM OF 17" AND BE GREASED.
4. REINFORCING SHALL BE BILLET STEEL MEETING THE REQUIREMENTS OF ASTM A615, GRADE 60 WITH F_y = 60,000 PSI.
5. CONCRETE NOTES:
   CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301-99, EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS BELOW.
   a) CONCRETE COMPRESSIVE STRENGTH SHALL BE 3,000 PSI AT 28 DAYS.
   b) AGGREGATE FOR CONCRETE SHALL HAVE A NOMINAL MAXIMUM SIZE OF 3/4".
   c) CEMENT SHALL BE TYPE I.
   d) FLY ASH CONFORMING TO THE REQUIREMENTS OF ASTM C618 SHALL BE INCLUDED IN THE MIX.
   e) A WATER REDUCING AGENT CONFORMING TO ASTM C494 SHALL BE INCLUDED IN THE MIX.
   f) AIR ENTRAINMENT, BY VOLUME, USING AN ADMIXTURE CONFORMING TO ASTM C260, SHALL BE BETWEEN 4% AND 7%.
   g) MAXIMUM SLUMP AT POINT OF DISCHARGE SHALL BE 5".
   h) MAXIMUM TEMPERATURE OF CONCRETE SHALL NOT EXCEED 80° F.
   i) THE CONCRETE SUPPLIER WILL BE RESPONSIBLE FOR THE MIX DESIGN. THE DESIRED MIX WILL HAVE A LOW HEAT OF HYDRATION, MINIMIZING THE CEMENT CONTENT AND MAXIMIZING THE FLY ASH. THE SUPPLIER WILL ADHERE TO SECTION 4 OF ACI 301-99. PRIOR TO PROCUREMENT, THE SUPPLIER WILL SUBMIT THE MIX DESIGN AND DATA TO SUBSTANTIATE THE PERFORMANCE OF THE MIX TO THE TVA LEAD ENGINEER FOR APPROVAL.
   j) CONCRETE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 1-6-ACI 301-99 BY AN INDEPENDENT TESTING AGENCY. TEST RESULTS SHALL BE PROMPTLY SENT TO THE TVA LEAD ENGINEER.
   k) THE JOINTS BETWEEN LIFTS WILL BE PREPARED IN ACCORDANCE WITH SECTION 6-ACI 301-99 AND GENERAL CONSTRUCTION SPECIFICATION G-2.
   l) EACH LIFT WILL BE ALLOWED TO CURE FOR 7 DAYS PRIOR TO PLACING THE NEXT LIFT. WATER WILL BE PUMPED CONTINUOUSLY THROUGH THE 1" DIAMETER BLACK IRON PIPES IN EACH LIFT UNTIL THE NEXT LIFT IS PLACED.
   m) BLACK IRON PIPES SHALL BE FILLED WITH GROUT WHEN CONCRETE PLACEMENT IS COMPLETE.
6. CONCRETE SUPPLIER SHALL BE:
   SOUTHERN CONCRETE MATERIALS
   MURPHY, NC 28906
   (828) 837-9147
7. FOR DESIGN CALCULATIONS, SEE EDMS NO. B92 021025 005.

COMPANION DRAWING: 51W850-2

REV NO	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
0	1-28-97	JDD	KGK	JDD	CBD	RWT	RWT	MAC		
1	AS CONSTRUCTED 11/08/02	JDD	KGK	KBB	CBD	MAC	MAC	RRH		
2	ORIGINAL ISSUE									

SCALE: 1" = 1'-0" EXCEPT AS NOTED

OUTLET WORKS
EMERGENCY SPILLWAY

CONCRETE
TUNNEL PLUG
PLAN, SECTIONS AND DETAILS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
JD DUNCAN	KG KEEBLE	KB BARRETT	CB DODD	MA COMES	MA COMES	RR HOESLY

FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
RIVER SYSTEMS OPERATIONS

AUTOCAD 2000 | DATE | 19 | C | 51W850-1 | R 1

TASK COMPLETED BY: | REV NO.

PLOT FACTOR:

C.A.D. DRAWING
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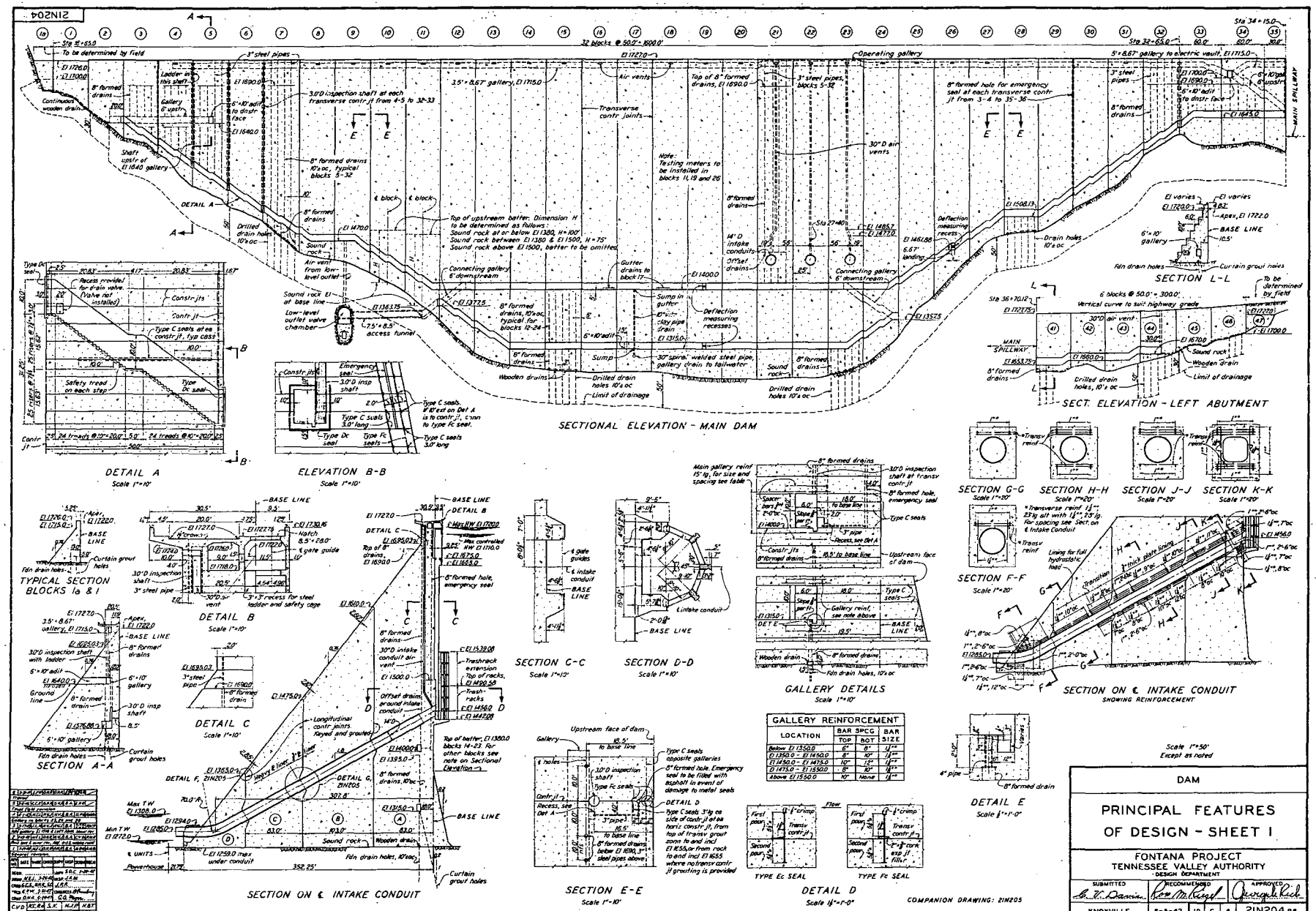
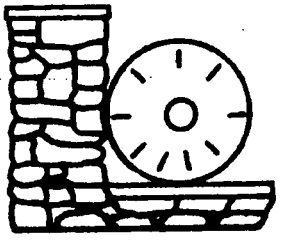

2IN204
SECTIONAL ELEVATION - MAIN DAM
SECT. ELEVATION - LEFT ABUTMENT
SECTION L-L
DETAIL A
ELEVATION B-B
TYPICAL SECTION BLOCKS Ia & I
DETAIL B
DETAIL C
SECTION A-A
SECTION ON ℄ INTAKE CONDUIT
SECTION C-C
SECTION D-D
GALLERY DETAILS
SECTION G-G
SECTION H-H
SECTION J-J
SECTION K-K
SECTION F-F
SECTION ON ℄ INTAKE CONDUIT
SHOWING REINFORCEMENT
SECTION E-E
DETAIL D
TYPE Ec SEAL
TYPE Fc SEAL
DETAIL E
GALLERY REINFORCEMENT
LOCATION | BAR SPCG TOP | BAR SPCG BOT | BAR SIZE
Below El 1350.0 | 6" | 8" | 1¼"
El 1350.0 – El 1450.0 | 8" | 10" | 1¼"
El 1450.0 – El 1475.0 | 10" | 12" | 1¼"
El 1475.0 – El 1550.0 | 8" | 10" | 1¼"
Above El 1550.0 | 10" | None | 1¼"
COMPANION DRAWING: 2IN205
DAM
PRINCIPAL FEATURES OF DESIGN - SHEET 1
FONTANA PROJECT
TENNESSEE VALLEY AUTHORITY
DESIGN DEPARTMENT
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
8-5-42
10 C 4 2IN204 R6

WR28-2-900-123

METHOD FOR ESTIMATING DISCHARGE AT OVERFLOW SPILLWAYS WITH CURVED CRESTS AND RADIAL GATES



TENNESSEE VALLEY AUTHORITY
OFFICE OF NATURAL RESOURCES AND ECONOMIC DEVELOPMENT
DIVISION OF AIR AND WATER RESOURCES
WATER SYSTEMS DEVELOPMENT BRANCH
NORRIS, TENNESSEE

Tennessee Valley Authority
Office of Natural Resources and Economic Development
Division of Air and Water Resources
Water Systems Development Branch

METHOD FOR ESTIMATING DISCHARGE AT OVERFLOW SPILLWAYS WITH CURVED CRESTS AND RADIAL GATES

Report No. WR28-2-900-123

Prepared by
E. Dean Harshbarger,
Billy J. Clift,
and
James W. Boyd

Norris, Tennessee
January 1985

CONTENTS

LIST OF FIGURES

INTRODUCTION

The discharge at overflow spillways is determined by the spillway width, spillway gate position, a representative head (or water depth), and a discharge coefficient. For rating purposes, the spillway width and head are usually specified and the discharge coefficient is determined from scale model tests. Most of the spillways for the Tennessee Valley Authority (TVA) dams were model tested at the TVA Engineering Laboratory.

The original development of specific TVA spillway discharge coefficients (Kirkpatrick, 1957; TVA, 1962) did not establish an orderly connection between the discharge characteristics of various spillways, and therefore, the data could not be directly applied to other installations. However, revised discharge coefficient curves which did establish usable relationships were developed (TVA, 1972) and were later augmented by additional model tests. Presently data from Apalachia, Boone, Fort Patrick Henry, Hales Bar, Hiwassee, Melton Hill, Nickajack, Watts Bar and Wheeler model tests are used to define discharge coefficients with respect to gate openings, headwater elevations and crest shapes. Using these relationships, the coefficients for installations of similar design may be obtained without model testing. Discharge coefficients for Normandy Dam (TVA, 1984) were determined in this manner.

This report describes the discharge coefficient relationships established by TVA and how they are used to compute spillway rating tables for similar spillway installations in lieu of model testing.

DISCHARGE CRITERIA

The major factors which influence the discharge coefficient are the position of the gate seal point with respect to the highest point of the spillway crest, the curvature (or shape) of the crest and the curvature of the gate. Although no systematic attempt has been made to determine the quantitative effect of these factors individually, the

basic trend of the coefficient data has been established with respect to crest shape. The crest shapes were identified by their relative similarity to standard crests (Creager, 1950; Corps of Engineers, 1954; Bureau of Reclamation, 1960) which approximate closely the lower portion of a free jet issuing from a sharp-crested weir.

For each standard crest shape there is a corresponding head at which flow over the crest will not separate from the surface of the crest, but will conform exactly to the crest contours. This head is termed the "standard crest design head." The TVA spillway discharge coefficient relationships are based on normalized data from the nine spillway models tested, together with standard crest design heads determined by comparing the model crest shape with standard crests.

In given situations, if the flow over the spillway crest touches or impinges upon the gate, the discharge is computed using a formula for gated discharges. If the flow does not impinge upon the gate, the discharge is computed using a formula for free discharge.

Discharge coefficients were determined for gated and free discharge using spillway models consisting of three spillway bays placed across an open channel with uniform flow. The width of the channel corresponded to the distance between the centerlines of the end piers to include the effect of flow contraction around piers. These spillway crests approximate standard crests from a point near the upstream face of the spillway to a point downstream near the gate seal point. The gate seal point is usually located below the crest elevation on the downstream portion of the crest to prevent discharge jets from overshooting the spillway for small gate openings under high heads.

The discharge nappe was unrestricted due to low tailwater elevations in the model tests. Therefore, the spillway discharge coefficient relationships do not include the effects of tailwater submergence.

GATED DISCHARGE

At multipurpose reservoirs, spillway discharge is used to regulate reservoir water levels and downstream water flowrates.

Therefore various spillway gate positions are needed to provide a range of discharge rates for each headwater elevation. To release water, the gate is raised to a predetermined position which allows a prescribed discharge to pass over the spillway crest.

The gated discharge shown in Figure 1 is determined by the area of the opening under the gate, by the water velocity through the gate opening and by the discharge coefficient of the gate opening. The area is based on the vertical distance, G, between the gate bottom point and the spillway point directly below. The water velocity is a function of the acceleration due to gravity and the mean water depth over the gate opening, H_m, defined as the distance from the surface of the headwater to the gate opening mid-point.

The equation for gated discharge through one spillway bay is:

$$Q = C\ L\ G\ \sqrt{2g\ H_m} \qquad (1)$$

where

Q = discharge, ft^3/s

C = discharge coefficient, dimensionless

L = spillway bay width, ft

G = vertical gate opening, ft

g = acceleration due to gravity, ft/s^2

H_m = head on the vertical gate opening mid-point measured from the reservoir headwater elevation, ft

The discharge coefficients were developed as a function of vertical gate opening, standard crest design head, and headwater elevation as shown in Figures 2a and 2b. The general uncertainty of the gated discharge coefficient relationship is considered to be within ± 2 percent based on the maximum deviation from the average trend. At small vertical gate openings (i.e., less that two feet) the error may be greater (Kirkpatrick, 1972).

To use Figure 2a, the headwater elevation, HL_1, at which the spillway discharge touches, but does not impinge upon the spillway gate must be determined. Starting with the desired gate opening, G, and the standard crest design head, H_o, the ratio H_c/H_o can be determined from Figure 2b. Then HL_1 can be determined by using the equation:

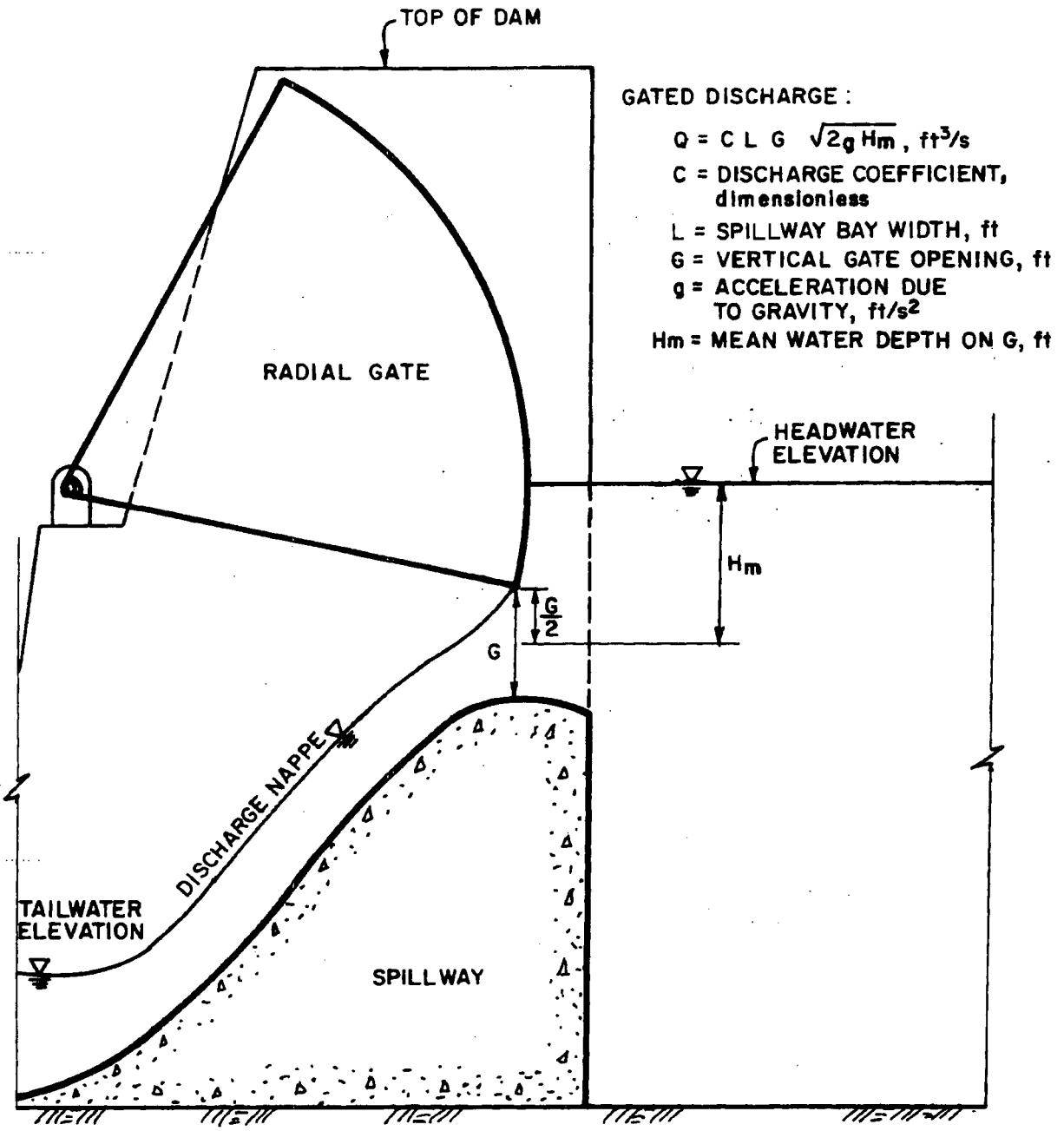


Figure 1: Gated Spillway Discharge

NOTE

HL_1 = HEADWATER ELEVATION AT WHICH SPILLWAY DISCHARGE TOUCHES BUT DOES NOT IMPINGE UPON THE GATE, ft
HL = HEADWATER ELEVATION, ft
H_o = STANDARD CREST DESIGN HEAD, ft
H_c = HEAD ON CREST, ft
HL_{cr} = CREST ELEVATION, ft
H_m = HEAD ON MID-POINT OF GATE OPENING, ft
G = VERTICAL GATE OPENING, ft
L = SPILLWAY BAY WIDTH, ft
g = ACCELERATION DUE TO GRAVITY, ft/s^2

COEFFICIENTS

1. FOR $HL_1 \leq HL \leq HL_5$
   $C = f(G/H_o, HL)$
2. FOR $HL > HL_5$
   $C = f(G/H_o, HL_5)$

TRANSITION HEADWATER ELEVATIONS

$HL_1 = HL_{cr} + (H_c/H_o)\,H_o$
$HL_2 = HL_1 + 0.025\,H_o$
$HL_3 = HL_1 + 0.050\,H_o$
$HL_4 = HL_1 + 0.075\,H_o$
$HL_5 = HL_1 + 0.100\,H_o$

REFERENCE DRAWINGS AEL 99 B105
AEL 99 B106

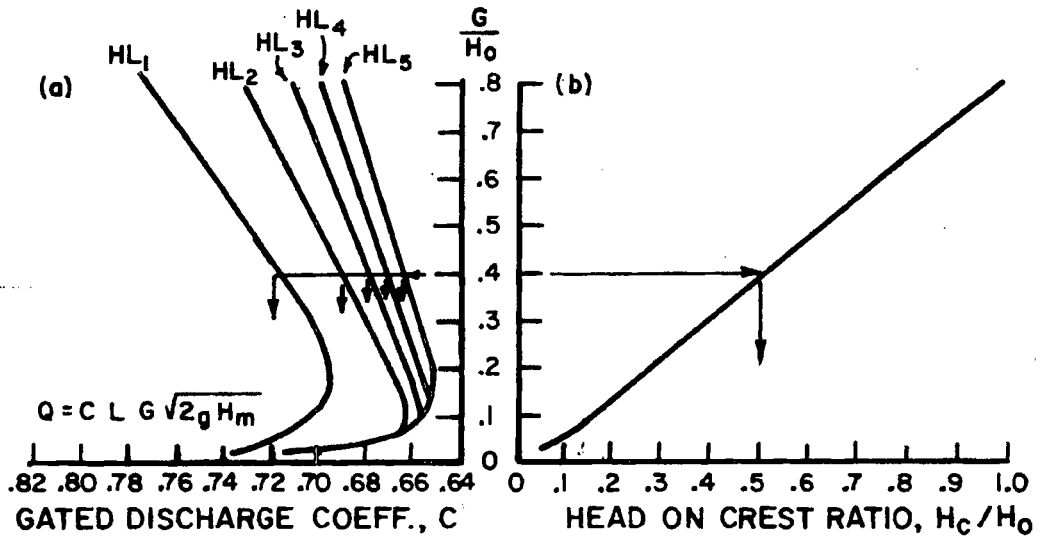


Figure 2: Gated Discharge Coefficients and Associated Headwater Elevations for Specified Gate Openings and Standard Crest Design Heads at Curved Spillways with Radial Gates

$$HL_1 = HL_{cr} + \frac{H_c}{H_o} H_o \qquad (2)$$

Where:

HL_1	=	headwater elevation at which spillway discharge touches but does not impinge upon the gate, ft
HL_{cr}	=	spillway crest elevation, ft
H_c	=	head on crest, ft
H_o	=	standard crest design head, ft
H_c/H_o	=	dimensionless ratio specified by G/H_o in Figure 2b

Once HL_1 is known, the discharge coefficients for higher headwater elevations can be determined as shown in Figure 2a. For transition headwater elevations HL_1 through HL_5 in Figure 2a, increased headwater elevation may not cause increased discharge and may even cause decreased flow because of flow contraction losses and friction losses resulting from increased water impingement upon the gate. At headwater elevations greater than HL_5 there is no significant increase in the various flow losses, and therefore the discharge coefficient is constant and equal to the discharge coefficient for headwater elevation HL_5. At small gate openings (say less than a foot), there may be little, or no transition and the discharge coefficients may be constant at some headwater elevation less than headwater elevation HL_5. The general uncertainty of the H_c/H_o vs G/H_o relationship is within ± 10 percent at small vertical gate openings and ± 2 percent at large openings based on the maximum deviations from the trend.

At headwater elevation HL_1, gated discharge is equal to free discharge described later in this report. However, due to the uncertainties of the discharge coefficient relationship and the H_c/H_o relationship to headwater elevation HL_1, either the gated discharge coefficient for headwater elevation HL_1 at large vertical gate openings or the headwater elevation HL_1 at small vertical gate openings may require adjustment as described later in this report to mathematically ensure gated discharge equivalent to free discharge.

In some cases, headwater elevation HL_1 may be the headwater elevation for maximum spillway discharge at the maximum vertical gate opening. This maximum spillway discharge elevation is critical in extreme flood control situations. Although the relationship between

headwater HL_1 and the ratio H_c/H_o in Figures 2a and 2b is satisfactory for most spillway operations, deviations from the average trend are inherent due to variations in gate designs and locations. Other computation methods may have the same uncertainty because they require friction factors, kinetic energy factors, etc., that are best evaluated through individual model or prototype tests.

FREE DISCHARGE

Free spillway discharge occurs when water discharges freely through the vertical gate opening, as shown in Figure 3, without impinging on the gate. For each vertical gate opening, free discharge is limited by headwater elevation HL_1 previously described. The equation for free spillway discharge through a single spillway bay is:

$$Q = C\ L\ H_c^{3/2} \qquad (3)$$

in which

Q = discharge, ft^3/s
C = discharge coefficient, dimensionless
L = spillway bay width, ft
H_c = head on crest measured from the reservoir headwater elevation, ft

This equation is similar to the general equation for weirs across open channels. The free discharge coefficient varies with the head on crest, H_c, shown in Figure 3, and with the standard crest design head. The relationship between discharge coefficients, head on crest, and the standard crest design head is shown in Figure 4. The uncertainty of the discharge coefficient relationship is within ± 1 percent based on the maximum deviation from the average trend (Kirkpatrick, 1972).

GATE ARRANGEMENTS AND IDENTIFICATION

Gate opening arrangement, or the pattern of open gates across the spillway is important at installations with several spillway bays and

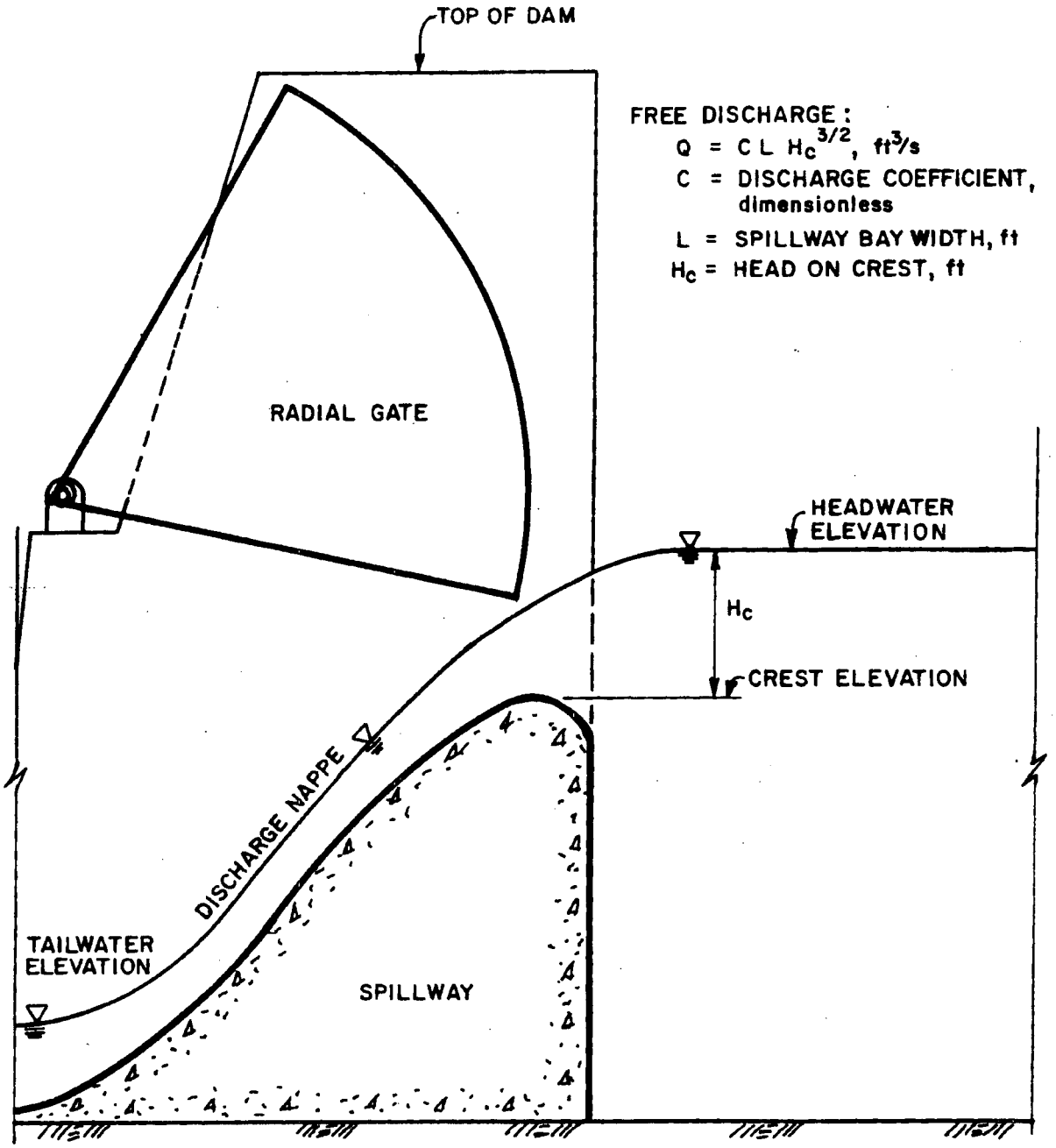


Figure 3: Free Spillway Discharge

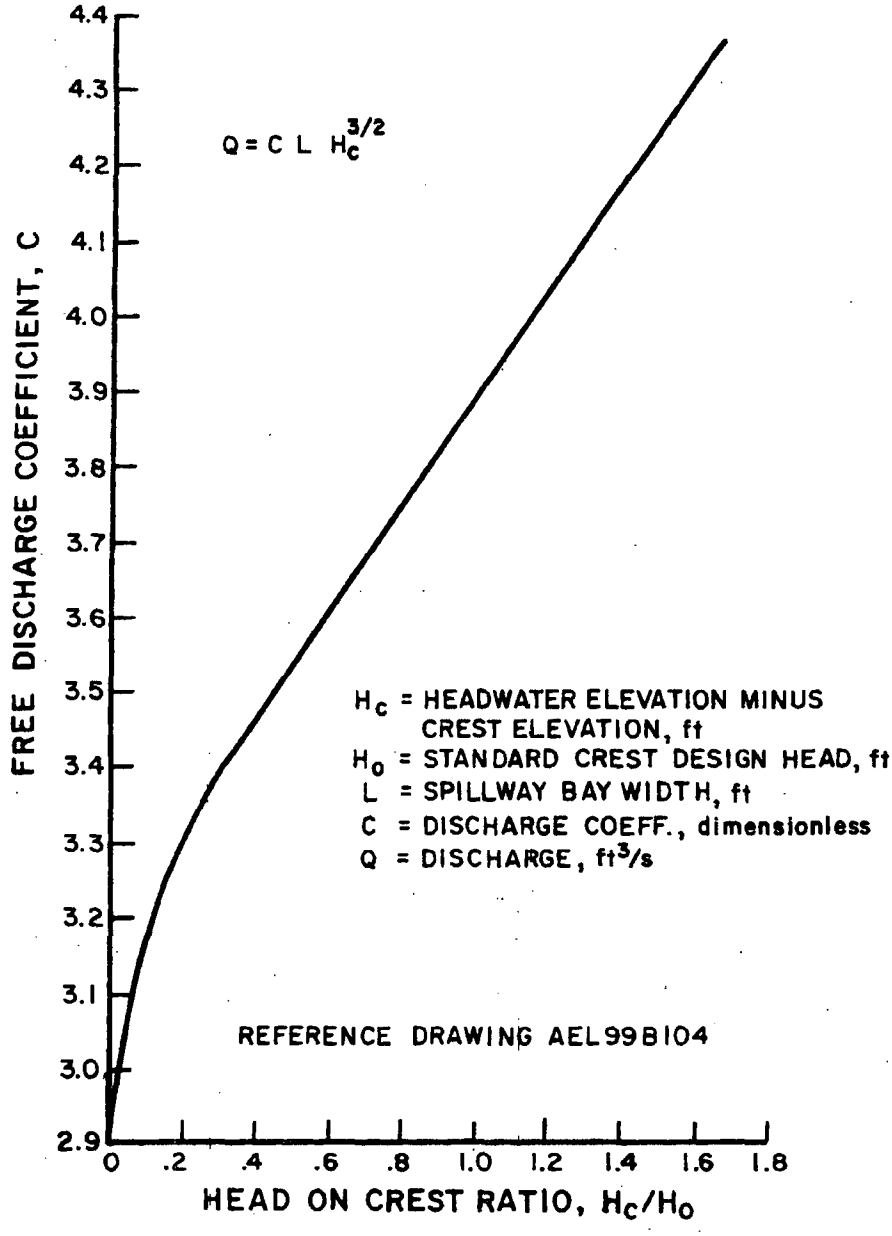


Figure 4: Free Discharge Coefficients for Specified Headwater Elevations and Standard Crest Design Heads at Curved Spillways

gates. Some gate opening arrangements will produce flow patterns in the stilling basin that are hazardous to the structural stability of the dam and stilling basin and to navigation downstream.

In practice, each gate is assigned an identification number and a diagram showing the spillway gate number and location is included in the spillway rating tables. For a given flow and headwater elevation, the gates to be opened and the required amount of opening to obtain the given flow are identified by a specific gate arrangement number. Increasing gate arrangement number indicates increasing flow.

RATING TABLES

Spillway rating tables are used for daily water control operations and water control planning. For each gate arrangement number, discharge rates are listed as a function of headwater elevation. At multiple gate spillways, the listed discharge represents the total discharge for the gate positions prescribed in the table of gate arrangements. The primary purpose of the spillway rating table is to determine the appropriate gate opening arrangements required to pass the listed discharge for the given headwater elevation. The alternate use is to determine the discharge for a given gate arrangement and headwater elevation.

Only discrete discharge rates are listed in the rating table. In the event that a preferred rate is not listed, the rate nearest to it should be used to minimize gate arrangement adjustments and to avoid using gate arrangements not authorized in the rating table.

The TVA discharge coefficient relationships can be used in lieu of calibration data to prepare rating tables for spillways that meet conditions of geometric similitude and have an established table of gate arrangements. Seven major parameters must be evaluated for each spillway rating.

1. Standard crest design head: determined by crest shape.
2. Vertical gate openings: determined by gate positions.
3. Gated discharge headwater elevations: determined for each gate opening by the relationships in Figures 2a and 2b for

transitional headwater elevations based on headwater elevation HL_1. Note adjustment listed in (4) below for headwater elevation HL_1.

4. Gated discharge coefficients: with minor adjustments, they are determined for each vertical gate opening and headwater elevation by the relationships in Figure 2a. At headwater elevation HL_1, the gated discharge must be equivalent to free discharge. However, due to the uncertainties of the discharge relationships, the gated and free discharge equations may not converge. In this case, the gated discharge coefficient is adjusted so that the gated discharge from equation (1) is equal to the free discharge from equation (3). Also the adjusted gated discharge coefficient at headwater elevation HL_1 must not be less than the constant gated discharge coefficient at headwater elevation HL_5. If the coefficient must be readjusted to be equal to the constant coefficient, headwater elevation HL_1 must be adjusted also by using equations (1) and (3) which are solved iteratively to establish headwater elevation HL_1 for equivalent discharges.

   After adjustment, the coefficients are plotted as a function of transitional headwater elevation. An average, monotonically-decreasing curve is drawn to pass through the maximum and minimum coefficient points to define interpolated coefficients in the transitional headwater range. For headwaters greater than the transitional headwaters, the discharge coefficient is constant and equal to the minimum coefficient. At small gate openings, the interpolated coefficients may be equal or they may become equal at some headwater within the transitional headwater range.
5. Free discharge coefficients: determined for each crest elevation and headwater elevations less than, or equal to headwater elevation HL_1, by the relationship in Figure 4.
6. Adjacent gate effect: the discharge coefficients include the effect of flow contraction around spillway piers when the gate

openings for adjacent bays are equal. Although reduced discharge occurs due to contractions at piers between adjacent gates with dissimilar gate openings (Kirkpatrick, 1957), the reduction is not significant when compared with the accuracy of discharge coefficient relationships where interior adjacent gate openings do not vary more than one position. At end gates, the dam abutment may have the same effect as a closed gate. Where the abutment approximates one gate, the estimated end gate discharge reduction varies from one percent at median gate positions to three percent at the maximum gate position. If the approach channel corresponds to the spillway end piers, there is no discharge reduction.

7. Overtopping discharge: the spillway discharge coefficent relationships cannot be used to estimate discharge over the gates or over the dam. At small gate openings, the top of the gate elevation may be lower than the top of the dam elevation and, therefore, gated discharge headwater elevations must not exceed the top of the gate elevation in discharge calculations for small gate openings.

A representative discharge rating curve for one gate is shown in Figure 5. Some, or all, gates at a particular dam may have identical discharge characteristics at all gate positions and will have duplicate discharge rating curves. Discharge rates for each gate arrangement are determined by summing individual rates according to the prescribed gates, gate positions, and headwater elevations for each gate arrangement number. The spillway rating table normally lists discharge rates to the nearest 10 cubic feet per second for rates less than 100,000 and to the nearest 100 cubic feet per second at higher rates.

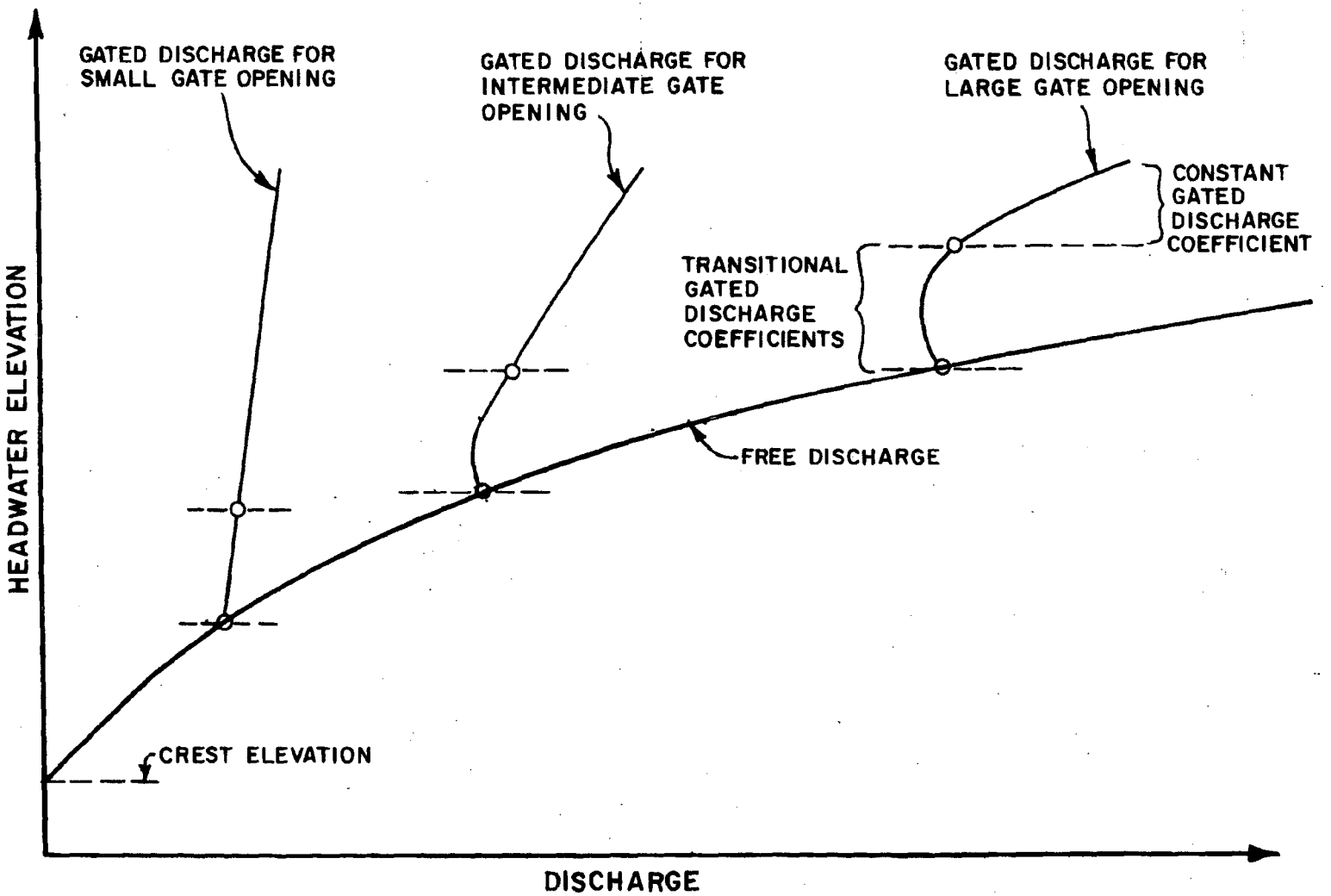


Figure 5: Representative Discharge Curve for a Radial Gate Over a Curved Spillway

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