
CUMBERLAND RIVER BASIN

VOLUME X

**WOLF CREEK DAM
(LAKE CUMBERLAND)
WATER CONTROL MANUAL**

U.S. ARMY CORPS OF ENGINEERS

Nashville District

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Prepared by

SVERDRUP CORPORATION

For

U.S. ARMY CORPS OF ENGINEERS

Nashville District

December 1998

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WOLF CREEK DAM & LAKE CUMBERLAND PERTINENT DATA

DAM LOCATION

- Dam Location
 - State: Kentucky
 - County: Russell
 - Nearest Community: City of Jamestown, Kentucky
located 10 miles northeast of the project
via US 127 North
 - River: Cumberland
 - Mile: 460.9
 - Latitude: North 36°52'09"
 - Longitude: West 85°08'45"

- Adjacent Water Control Facilities
 - Upstream
 - Laurel Dam - Laurel River, Mile 2.3
 - Martins Fork Dam - Martins Fork, Mile 15.6
 - Downstream
 - Cordell Hull Dam - Cumberland River, Mile 313.5

ORIGINAL AUTHORIZATION AND HISTORY

- Primary Project Purposes
 - Flood Control
 - Hydropower
- Authorizing Legislation
 - PL 75-761, Flood Control Act of 1938
 - PL 79-525, River and Harbor Act of 1946

- Additional Operating Purposes
 - Recreation
 - Fish and Wildlife
 - Water Quality
 - Water Supply
- Authorizing Legislation (continued)
 - PL 78-534, Flood Control Act of 1944
 - PL 85-624, Fish and Wildlife Coordination Act of 1958
 - PL 92-500, Federal Water Pollution Control Act Amendments of 1972

Although storage space is not allocated for water supply on either a permanent (PL 85-500) or temporary (PL 78-534) basis, water is being withdrawn for municipal and industrial purposes. Consequently, during drought, consideration is given to keeping the lake level above the supply pipe intakes.

- Construction Dates
 - Began - August 41
 - Suspended due to WWII - August 43
 - Work resumed - September 46
 - Closure - December 50
 - Impoundment - 1 February 51
 - Inservice
 - Power
 - Unit 1 - 22 August 52
 - Unit 2 - 24 July 52
 - Unit 3 - 17 March 52
 - Unit 4 - 16 December 51
 - Unit 5 - 31 October 51
 - Unit 6 - 6 October 51

PHYSICAL COMPONENTS OF DAM

| | | | |
|---|--|--|------------------|
| • Type of Structure | Combination concrete gravity and rolled earthfill embankment | | |
| • Dam Section Lengths | | | |
| Spillway Section, Concrete | - 590 feet | | 179.8 m |
| Power Section, Concrete | - 481 feet | | 146.6 m |
| Left Side Non-overflow Section, Concrete | - 285 feet | | 86.9 m |
| Right Side Non-overflow Section, Concrete | - 440 feet | | 134.1 m |
| Embankment Section, Rolled Earthfill | - 3,940 feet | | 1,200.9 m |
| Total Dam Length | - 5,736 feet | | 1,748.3 m |
| • Structure Elevations | | | |
| Top of Dam, Roadway, and Embankment | - 773 NGVD | | 235.6 m |
| Top of Gates | - 760 NGVD | | 231.6 m |
| Spillway Crest | - 723 NGVD | | 220.4 m |
| Flood Plain, General Elevation | - 590 NGVD | | 179.8 m |
| Minimum Tailwater, Zero Flow | - 543 NGVD | | 165.5 m |
| Stream Bed, approximate | - 540 NGVD | | 164.6 m |
| Base of Dam, Concrete Section, approx. | - 515 NGVD | | 157.0 m |
| • Outlet Works | | | |
| Spillway | | | |
| Type-Concrete Gravity, Ogee, with Bucket Stilling Basin | | | |
| Total Effective Width | - 500 feet | | 152.4 m |
| Tainter Gates | | | |
| Number | - 10 | | |
| Width | - 50 feet | | 15.2 m |
| Height | - 37 feet | | 11.3 m |
| Design Discharge (with surcharge of 42 feet) | -541,000 cfs | | 15,321 cu. m/sec |
| Sluices | | | |
| Type-Cast Iron, Slide, Hydraulically Operated | | | |
| Number of Conduits | - 6 | | |
| Number of Gates per Conduit | - 2 (in tandem) | | |
| Width (of conduits) | - 4 feet | | 1.22 m |
| Height (of conduits) | - 6 feet | | 1.83 m |
| Discharge Capacity (pool at spillway crest) | - 9,800 cfs | | 278 cu. m/sec |
| • Power Plant | | | |
| Type – 6 Francis adjustable blade propeller turbines | | | |
| Operating Heads | | | |
| Maximum with full flood control pool | - 214 feet | | 65.2 m |
| Nominal (normal for design) | - 160 feet | | 48.8 m |
| Minimum with full drawdown | - 111 feet | | 33.8 m |
| Penstock | | | |
| Number | - 6 | | |
| Diameter | - 20 feet | | 6.1 m |
| Discharge at full rating | - 3,750 cfs each | | 106.2 cu. m/sec. |
| 50,000 kva, 160-foot head | (22,500 cfs total) | | 637.2 cu. m/sec. |
| Nameplate Power Rating | - 45 MW each | | |
| | (270 MW total) | | |
| Estimated average annual generation | 867,000 MWH | | |

HYDRAULICS AND HYDROLOGY

- Drainage Areas

- Project

- Total - 5,789 sq. mi. 14,992 sq. km.

- Local Uncontrolled - 5,451 sq. mi. 14,117 sq. km.

- (between Wolf Creek and Laurel & Martins Fork)

- Control Point - Celina, Tennessee

- Total - 7,307 sq. mi. 18,923 sq. km.

- Local Uncontrolled - 583 sq. mi. 1,510 sq. km.

- (between Celina and Wolf Creek & Dale Hollow)

- Downstream Project - Cordell Hull

- Total - 8,096 sq. mi. 20,967 sq. km.

- Local Uncontrolled - 1,372 sq. mi. 3,553 sq. km.

- (between Cordell Hull and Wolf Creek & Dale Hollow)

- Top of Pool Elevations (NGVD)

| | | Meters |
|---------------|-------------|---------|
| Flood Control | 760.00 NGVD | 231.6 m |
| Hydropower | 723.00 NGVD | 220.4 m |
| Inactive | 673.00 NGVD | 205.1 m |

- Surface Area at Top of Pools

| | | |
|---------------|--------------|-----------------|
| Flood Control | 63,530 acres | 25,719 hectares |
| Hydropower | 50,250 acres | 20,343 hectares |
| Inactive | 35,820 acres | 14,501 hectares |

- Length of Reservoir at Top of Pools

| | | |
|---------------|-----------|--------|
| Flood Control | 101 miles | 163 km |
| Hydropower | 98 miles | 158 km |
| Inactive | 92 miles | 148 km |

- Shoreline Length at Top of Pool

| | | |
|---------------|-------------|----------|
| Flood Control | 1,255 miles | 2,020 km |
|---------------|-------------|----------|

HYDRAULICS AND HYDROLOGY
(continued)

• Storage Volumes

| | | Cubic Hectometers |
|---------------------------|-----------|-------------------|
| Acre Feet | | |
| Flood Control | 2,094,000 | 2,583 |
| Hydropower | 2,142,000 | 2,642 |
| Inactive | 1,853,000 | 2,286 |
| Total | 6,089,000 | 7,511 |
| | | |
| Day Second Feet (day cfs) | | |
| Flood Control | 1,056,000 | |
| Hydropower | 1,080,000 | |
| Inactive | 934,000 | |
| Total | 3,070,000 | |
| | | |
| Runoff (inches) | | |
| Flood Control | 6.78 | 17.22 |
| Hydropower | 6.94 | 17.63 |
| Inactive | 6.00 | 15.24 |
| Total | 19.72 | 50.09 |

• Average Flows (cfs) (1952 - 1996)

| <u>Month</u> | <u>Generation</u> | <u>Spill*</u> | <u>Total</u> | <u>Total Cubic Meters/Sec</u> |
|--------------|-------------------|---------------|--------------|-----------------------------------|
| Jan | 12,374 | 656 | 13,030 | 369 |
| Feb | 11,554 | 418 | 11,972 | 339 |
| Mar | 13,352 | 933 | 14,285 | 405 |
| Apr | 13,419 | 828 | 14,247 | 403 |
| May | 9,774 | 327 | 10,101 | 286 |
| Jun | 8,376 | 52 | 8,428 | 239 |
| Jul | 6,999 | 8 | 7,007 | 198 |
| Aug | 6,645 | 8 | 6,653 | 188 |
| Sep | 4,997 | 8 | 5,005 | 142 |
| Oct | 4,525 | 9 | 4,533 | 128 |
| Nov | 5,664 | 32 | 5,696 | 161 |
| Dec | 9,111 | 37 | 9,148 | 259 |
| Annual | 8,888 | 276 | 9,164 | 260 |

*These values do not include the flow provided for the fish hatchery.

REAL ESTATE

- Acquisition
 - Fee Holdings - 92,068 acres 37,272 hectares
 - Easement Holdings - 474 acres 192 hectares

- Elevation of Acquisition -Elevation 765 (five feet above the top of the flood control pool) plus additional lands at the damsite and upstream which were deemed necessary to avoid paying excessive severance or incidental damages due to isolation.

ACCESS LOCATIONS

| | <u>River Mile</u> | | |
|-----------------------------|-------------------|------|------------------------|
| • Bridge Crossings | | | |
| U.S. Highway 127 | 460.9 | | |
| State Highway 90 | 510.9 | | |
| | | | <u>Bank</u> |
| • Industrial Docks | | | |
| John Sherman Power Plant | 512.4 | R | |
| • Recreation Areas | | | |
| Corps of Engineers | | | |
| Kendall | 460.0 | R | |
| Halcomb's Landing | 461.0 | R | |
| Grider Hill | 461.9 | L | |
| 76 Falls | 461.9 | L | (Indian Creek) |
| Wolf Creek | 474.4 | R | |
| Fall Creek | 488.9 | R | |
| Cumberland Point | 494.4 | R | |
| Mill Springs | 498.4 | L | |
| Fishing Creek | 503.9 | R | (Fishing Creek) |
| Wattsboro | 508.9 | R | |
| Echo Point | 511.4 | L | (Big South Fork River) |
| Omega | 524.9 | R | |
| Cave Creek | 527.4 | L | |
| By Others | | | |
| Lake Cumberland State Park | 468.4 | R | |
| Pulaski County Park | 503.9 | R | (Fishing Creek) |
| Burnside Island Park | 511.4 | L | |
| Cumberland Falls State Park | 555.4 | Both | |
| Commercial Boat Docks | | | |
| Grider Hill Dock | 461.9 | L | (Indian Creek) |
| Beaver Lodge Dock | 466.9 | L | (Beaver Creek) |
| Lake Cumberland State Dock | 472.9 | R | |
| Jamestown Dock | 473.4 | R | |
| Alligator Dock No. 1 | 474.4 | R | (Wolf Creek) |
| Alligator Dock No. 2 | 474.4 | R | (Wolf Creek) |
| Conley Bottom Resort | 495.9 | L | |
| Lee's Ford Dock | 503.9 | R | (Fishing Creek) |
| Burnside Marina | 511.9 | L | |
| Buck Creek Dock | 528.4 | R | (Buck Creek) |
| Rockcastle Dock | 540.9 | R | |

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VOLUME X
WOLF CREEK DAM (LAKE CUMBERLAND)
WATER CONTROL MANUAL**

**CHAPTER I
INTRODUCTION**

1.1. Authorization. This manual was prepared for the U.S. Army Corps of Engineers, Nashville District, by the Sverdrup Corporation under contract DACW62-87-C-0068, modification P00011 in accordance with ER 1110-2-240, ETL 1110-2-251, and EC 1110-2-256.

1.2. Purpose. The purpose of this manual is to serve as a guide for the day to day and emergency regulation of the Wolf Creek project, and to provide background information on the project.

1.3. Scope. This manual presents the plan of regulation for the Wolf Creek project and furnishes information pertinent to its operation.

1.4. Emergency Regulation Assistance Procedures. In the event that unusual conditions arise, contact can be made by telephone to the CELRN-EP-H Water Management Section at the phone number listed in Appendix E. During nonduty hours, assistance can be obtained by contacting one of the officials also listed in Appendix E.

1.5. Update Procedure. Regulations specify that this Water Control Manual be published in loose leaf form, and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current.

1.6. Responsible Agencies.

- | | |
|--------------------------------|---|
| ▪ Project Owner: | U.S. Army Corps of Engineers |
| ▪ Operating Agency: | U.S. Army Corps of Engineers |
| ▪ Regulating Agency: | U.S. Army Corps of Engineers |
| ▪ Hydropower Marketing Agency: | Southeastern Power Administration (SEPA) |
| ▪ Hydropower Scheduling: | Tennessee Valley Authority (TVA) |

1.7. Related Manuals and Reports.

1.7.1. Original Water Control Manuals.

| Master Regulation Manual for Reservoirs in the Cumberland River Basin Revised March, 1954 | | |
|--|---|---------------------|
| | <u>Appendices</u> | <u>Date</u> |
| A: | Regulation Manual for Wolf Creek | Revised March, 1954 |
| B: | Regulation Manual for Dale Hollow | Revised March, 1954 |
| C: | Regulation Manual for Center Hill | Revised March, 1954 |
| D: | Regulation Manual for Old Hickory | November, 1959 |
| E: | Regulation Manual for Cheatham | November, 1959 |
| F: | Regulation Manual for Barkley Reservoir | April, 1969 |
| G: | Regulation Manual for J. Percy Priest Reservoir | April, 1977 |

1.7.2. Revised Water Control Manuals.

| <u>Cumberland River Basin Water Control Manuals</u> | | <u>Published</u> |
|---|---------------------------------------|------------------|
| Volume I | Master Water Control Reference Manual | April, 1990 |
| Volume II | Master Water Control Plan | December, 1998 |
| Volume III | Barkley Water Control Manual | December, 1998 |
| Volume IV | Cheatham Water Control Manual | December, 1998 |
| Volume V | Old Hickory Water Control Manual | December, 1998 |
| Volume VI | Cordell Hull Water Control Manual | December, 1998 |
| Volume VII | J. Percy Priest Water Control Manual | December, 1998 |
| Volume VIII | Center Hill Water Control Manual | December, 1998 |
| Volume IX | Dale Hollow Water Control Manual | December, 1998 |
| Volume X | Wolf Creek Water Control Manual | December, 1998 |
| Volume XI | Laurel Water Control Manual | December, 1998 |
| Volume XII | Martins Fork Water Control Manual | December, 1998 |

1.7.3. Related Manuals.

1. Wolf Creek Dam Instructions for Reservoir Regulation - Revised December, 1998.
2. Laurel Creek Dam Instructions for Reservoir Regulation - Revised December, 1998.
3. Cumberland River Basin Drought Contingency Plan - November, 1994.

CHAPTER II WATER CONTROL PLAN

2.1. Primary Objectives. The water control plan at Wolf Creek has two major objectives. These are to:

1. To store water during flood events and thereby reduce flood damages downstream Cumberland Rivers.
2. To generate hydropower.

2.2. Regulation Curve.

2.2.1. The regulation curve, or guide curve, represents the primary guidance for operations at Wolf Creek Dam. It defines the operating limits of reservoir elevations as a function of time of year and is presented graphically on Plate A-1. The Wolf Creek guide curve consists of three "hard" lines and two "soft" lines. The hard lines are described as such because they form the congressionally authorized operating boundaries which horizontally divide the reservoir into three distinct "pools", as described below. The soft lines further subdivide the power pool and are discussed later in this chapter.

2.2.2. Inactive Pool. Inactive storage at Wolf Creek extends from the bottom of the reservoir up to elevation 673. Water is not released if it would bring the surface of the pool below the top of this zone. Inactive storage is provided primarily to offset lake sedimentation and provide head for hydropower. Other benefits of this permanent pool include depth for recreation, water intake installation, habitat for fish and other aquatic life, and insurance water for drought periods.

2.2.3. Power Pool. The power pool extends from elevation 673 up to the second hard line at elevation 723. This 50 foot depth is the "normal" operating zone of the reservoir. This is the zone in which water is stored for the purpose of generating electricity. The power pool is usually permitted to fill during wet winter and spring months and remain near elevation 723 from mid-May through mid-June. During the summer and fall seasons, hydropower releases result in a steady drawdown of the reservoir.

2.2.4. The power pool is further subdivided by two curves which define a continually varying zone within the power pool. This is called the "SEPA power

marketing zone" or the "SEPA band". SEPA is the acronym for the Southeastern Power Administration which is the Federal entity responsible for marketing the power generated at all Corps of Engineers projects in the Nashville District. The SEPA band ranges in depth from 4.8 to 18 feet, but for most of the year it about 11 feet in depth. The location of the band within the full power pool varies. Its low point throughout December is at elevation 682, nine feet above the bottom of the power pool. Its high point is from May 15th until June 15th when its top is at elevation 723, which corresponds to the top of the power pool. The lines which bound this zone are sometimes referred to as "soft lines" because there is not a specific requirement to keep the pool within this zone.

2.2.5. Flood Control Pool. The flood control pool extends from elevation 723 up to the top most hard line at elevation 760. The normal condition is for this pool to remain empty so that the space is available to store water during flood events and thus reduce the downstream damages due to flooding. Following a flood event water is released from this pool as quickly as possible based on downstream conditions in order to restore the capability to provide protection from future flood events.

2.3. Normal Regulation.

2.3.1. During periods of normal regulation, the water surface elevation behind the dam is maintained within the hydropower pool limits and all releases will be made through the turbines as governed by the demand for power. There is a large amount of flexibility in operating the Wolf Creek project within the bounds of the power pool, which is 50 feet deep. As further guidance, the SEPA band is used to locate a more specific desirable location for the water surface, but there is still a fair amount of flexibility within the band, and there is no absolute requirement for the pool to remain within the band.

2.3.2. Daily Water Management. As a result of a daily analysis of current hydrologic conditions, the Water Management Section directs TVA to schedule a specific amount of energy production for the following day at Wolf Creek and, if needed, to modify the generating schedule for the current day. TVA accepts this daily total generation and then schedules the energy on an hourly basis to best meet power demands. The District discourages TVA from deviating from the prescribed daily generation at the project.

2.3.3. Operators. The Wolf Creek powerhouse is manned twenty-four hours a day, seven days a week. The TVA load coordinator in Chattanooga communicates the hourly generation schedule directly to the Wolf Creek operators who, in turn, control

all turbine and spillway releases from the dam. The Wolf Creek operators also remotely control all hydropower operations for the Laurel project based on schedules received from East Kentucky Power Cooperative (EKPC). The primary water management functions of the powerhouse operators are to insure the headwater levels are above the minimum allowable, that changes in generation do not exceed three units per hour, and that the machinery is operated within allowable limits. If instructions are issued from TVA which conflict with these criteria, plant personnel are to inform TVA that such a conflict exists and the execution of such instructions is not permitted. The attending personnel are supervised by the Construction and Operations Division but it is the responsibility of the Water Management Section of the Engineering- Planning Division to issue specific spillway release instructions and to insure adherence to the water control plan.

2.3.4. Rates of Change in Hydropower Generation. Large surges in releases can cause bank erosion, adversely impact recreation users below the dam, and make commercial navigation more difficult further downstream on the Cumberland River. In order to minimize river level fluctuations, changes in hydropower generation are limited to three units per hour, up or down.

2.3.5. Minimum Flows. In general, hydropower releases are scheduled to meet peak energy demands. Normally this results in more water being discharged during the Monday through Friday period with lesser amounts on the weekend. Sunday is usually the lowest energy demand day. However, since Wolf Creek supplies such a large portion of the flow in the Cumberland River downstream, it is desirable to have significant releases through the turbines virtually everyday, even on low energy demand days. Therefore every effort, consistent with other operating objectives, is made to maintain a minimum daily release of at least 1000 dsf.

2.3.6. Water Quality. Water quality needs are a primary consideration during the normally dry portion of the year, June through October. Old Hickory Dam is considered the water quality control point for Cumberland basin system operations. Generally, when desirable dissolved oxygen conditions in releases from Old Hickory are maintained, acceptable water quality conditions along the Cumberland River mainstem are assured. The Tennessee water quality standard for dissolved oxygen (warmwater fishery) is a minimum of 5.0 mg/l. The theoretical bi-weekly minimum average flows needed to meet this standard below Old Hickory have been estimated as follows:

| | |
|-------|-----------|
| April | 2,000 cfs |
| May | 4,900 cfs |

| | |
|-----------|--------------------------|
| June | 7,600 cfs |
| July | 9,100 cfs |
| August | 9,400 cfs |
| September | 7,400 cfs ⁽¹⁾ |
| October | 2,000 cfs |

⁽¹⁾ Higher flows are needed until Old Hickory destratifies.

2.3.7. Actual flow requirements during a specific year may vary significantly from these numbers. Since there is no significant storage capacity at Old Hickory to supply such flows, releases from the upstream storage projects, including Wolf Creek, would be used to meet this need.

2.3.8. Tailwater Fishery. In the late summer and early fall months the dissolved oxygen level of the Wolf Creek discharge sometimes falls below desired levels. During such occurrences the turbines may be operated at a reduced capacity. This type operation increases the tailwater dissolved oxygen level, thereby helping to protect the downstream fishery resource. However, to avoid excessive wear, the turbines should not be operated below their cavitation limits.

2.4. Flood Regulation.

2.4.1. There are two distinct modes of operation relative to flood regulation:

- 1) Normal flood operation where outflows are reduced to provide flood protection for Celina, Tennessee and points downstream including the principal damage center of Nashville, Tennessee.
- 2) Emergency flood operation where downstream flood reduction is an objective, but protection of the dam is the prime concern.

2.4.2. Control Station. The primary damage center affected by the operation of Wolf Creek during flood events is the Cumberland River at Nashville, Tennessee. The reference gage for Nashville is located downtown at Cumberland River Mile 191.1. This is 269.8 river miles downstream of Wolf Creek Dam. Due to the distance and corresponding travel time between Wolf Creek and Nashville, it is not possible to exert influence on the flow at Nashville quickly enough to have the desired impact on flood stages. Consequently, the key station controlling the operation of Wolf Creek during flood events is at Celina, Tennessee. Celina is located 80.1 river miles below the dam at the confluence of the Obey River and the Cumberland River. It takes about twelve hours for the initial effect of release changes at Wolf Creek to begin to affect

flows at Celina, and about 30 to 36 hours for the flow to become fully stabilized. When formulating a flood control plan it is generally assumed that the travel time from Wolf Creek to Celina is about 24 hours (Travel time from Wolf Creek to Nashville is about three to four days.) The gage which measures the stage at Celina is located on the Cumberland River, downstream of the Obey confluence. The flow at Celina is made up of releases from Wolf Creek and Dale Hollow, as well as runoff from the 583 square mile uncontrolled drainage area below these two reservoirs.

2.4.3. Control Flow. The control flow for Celina has been established at 40,000 cfs (stage of 25 feet) during the flood season and 30,000 cfs (stage of 22 feet) during crop season. Under certain conditions the control flow can be increased to 50,000 cfs as described below. Crop season is generally understood to be from April 15 through December 15, however these dates may be adjusted depending on actual field conditions. Flood season is designated as anytime other than crop season, generally from December 15 through April 15. The official flood stage at Celina is 40 feet. It is recognized that the control flows (maximum desired flows) for Celina result in river stages well below damage levels. These control flows have been set to leave room in the Cumberland River for uncontrolled inflows between Celina and the primary damage center at Nashville. The channel capacity of the Cumberland River below Wolf Creek Dam is about 60,000 cfs. The channel capacity of the Obey River below Dale Hollow is 12,000 cfs.

2.4.4. Rate of Release Change Limits. Hourly increases in spillway releases at Wolf Creek are limited to 2,000 cfs and decreases are limited to 4,000 cfs. The purpose of these restrictions is to reduce sudden surges downstream and to reduce excessive bank erosion. These restrictions are waived during emergency flood operations as described below.

2.4.5. Normal Flood Operations. The Celina flow is allowed to reach the maximum desired amount without flood control procedures being initiated. If the Celina flow is forecasted to exceed the maximum desired level, releases from Wolf Creek are curtailed, and flood control storage utilized in a manner that will reduce the flood crest at Celina and further downstream as much as practical. After the flood crest has passed, utilized flood control storage is evacuated as fast as practical to prepare for future potential floods. When evacuating flood control storage, consideration is given to preventing a second flood crest at Celina and allowing Celina flows to recede to the maximum desired amount. As described above, the normal flood season control flow at Celina is 40,000 cfs. During the flood season a 50,000 cfs control flow at Celina can be implemented when the flood control pools at both Wolf Creek and Dale Hollow are over half full and the flood control pool at Center Hill is near empty. This operation

accelerates the evacuation of flood control storage at both Wolf Creek and Dale Hollow while allowing the flow at Carthage and Nashville to remain at or below maximum desired levels.

2.4.6. Emergency Flood Operation. If forecast indicate that limiting the project discharge to that necessary to maintain control flow at Celina would result in the water surface in the reservoir surpassing the top of the flood pool (elevation 760.0 ft) then emergency operations should be initiated. This operation, discussed below, is controlled by the Emergency Operation Schedule (EOS) presented as Plate A-8. The intent of this plan is to prevent the overtopping of the dam while minimizing project discharges as much as practical.

- A. Below 60,000 cfs - If the computed release is less than 60,000 cfs (channel capacity) then the project discharge should be brought to that level as soon as practical under the rate of release change limitation. (Some delay in the attainment of this release is acceptable if such action would avoid synchronization of peak releases with those from other storage reservoirs thereby reducing the peak at Nashville as determined by CERLRN-EP-H, Water Management personnel.)
- B. Above 60,000 cfs - If the computed release is greater than 60,000 cfs, increases should be scheduled at the normal maximum rate of 2,000 cfs per hour, up to the computed rate or until the EOS indicates higher release rates. From this schedule, shown as Plate A-8, the required discharge can be determined using only the reservoir elevation and the rate of change in reservoir stage.

During such operations, spillway gates should be opened as uniformly as possible so that water can be stored above the normal top of the flood control pool. The elevation of the top of the spillway gates in the closed position is equal to the top of the normal flood control pool. If the gates were not opened uniformly, water could not necessarily be stored above the top of the flood pool, because water would spill over the top of any unopened gates. This type of operation is referred to as "induced surcharge" and by raising all spillway gates uniformly, it in effect provides additional storage above the flood pool. When operating according to the EOS project discharges are increased until the lake elevation peaks. Spillway gates should then remain in their existing opening until the pool falls to elevation 760.0 ft. At that time gates should be adjusted uniformly such that outflow approximates inflow until the flow at Celina recedes to the maximum desired amount and project

releases recede to below bankfull discharge. At this time normal flood control procedures are to be resumed.

2.5. Drought Regulation

2.5.1. Priorities. As specified in the Cumberland River Basin Drought Contingency Plan, the system wide priorities for drought regulation in the basin are:

1. Water Supply*
2. Water Quality*
3. Navigation
4. Hydropower
5. Recreation

*For Public Health and Safety

2.5.2. Authorization. Of these purposes, only hydropower was specifically mentioned in the authorizing legislation. Flood Control is the other specifically authorized purpose, but it is not a factor during a drought. Wolf Creek Dam is also operated for water quality and fish and wildlife under the general authorities of the Federal Water Pollution Control Act Amendments and the Fish and Wildlife Coordination Act respectively. While there is no general authority at Wolf Creek for storage allocated for water supply on either a permanent (PL 85-500) or temporary (PL 78-534) basis, water is being withdrawn for municipal and industrial purposes. Consequently, in the interest of public health and safety, high priority is given to maintaining the lake level above the minimum operating elevations of all water supply intakes.

2.5.3. Together with Dale Hollow and Center Hill, Wolf Creek serves as one of the prime reservoirs which maintain desired Cumberland River flows during times of drought. Most of the water flowing downstream at such times is being released from a combination of these three reservoirs.

2.5.4. Municipal Water Supply. As discussed later in Chapter III, Wolf Creek Dam (Lake Cumberland) serves as the water supply source for approximately 80,000 people. The minimum pool level at which all five water withdrawal systems can function is 673, which corresponds to the top of the inactive pool. It is a top priority to prevent the reservoir from falling below this level.

2.5.5. Thermal Power Water Supply. Thermal power production water supply is not an authorized project purpose at Wolf Creek or any other project in the Nashville

District. However hydropower generation is. Since the power generating capacity at the Cumberland Steam Plant is almost three times the capacity of all nine Nashville District hydropower plants combined, and since this power is produced using only about 9% of the water required by the hydropower plants, it is generally agreed that in times of scarce water it would not be prudent to continue weekday/weekend power peaking operations at the expense of thermal power. To accommodate thermal power demands for cooling water, minimum flows of between 4,000 and 6,000 cfs are desirable past the Cumberland Steam Plant. Every effort is made to provide this flow as long as other water management objectives are not impacted, however, during droughts it may be necessary to provide flows which are less than the desired amount. In an effort to partially offset this, a more uniform flow may be provided by eliminating the weekday/weekend peaking operation at the storage projects.

2.5.6. Water Quality for Public Health and Safety. Water quality is a primary consideration for the operation of Wolf Creek during both normal and drought periods. Operation of the project would continue as described in paragraphs 2.3.6. through 2.3.8. Depending on the severity of the drought, the weekly average outflows from Wolf Creek and Old Hickory may be less than the desired quantity; however every effort will be made to maintain an acceptable level of dissolved oxygen in the project tailwaters.

2.5.7. Navigation. Navigation is not a project purpose at Wolf Creek and no operations for navigation are anticipated during drought conditions. However, the normal operation of limiting changes in hydropower releases to three units per hour will remain in effect. Project operations for purposes described above should keep the navigable reservoir levels above the inactive pools in the mainstem. This alone would provide adequate depths for navigation through these slackwater pools.

2.5.8. Hydropower. As discussed in the Drought Contingency Plan, an informal agreement was signed between the Corps of Engineers and SEPA on December 15, 1988. This agreement states that if the combined volume of water in the power pools of Wolf Creek, Dale Hollow and Center Hill is equal to or greater than that defined by the cumulative bottoms of the SEPA bands at each project, then the three projects will be operated normally. If the combined volume of water in the three power pools is between 70% and 100% of the power pool cumulative volumes below the SEPA bands, then hydropower releases may be reduced to a combined minimum daily average of 3,600 cfs. If the combined volume of water in the three power pools is less than 70% of the power pool cumulative volumes below the SEPA bands, then hydropower releases may be reduced to a combined minimum daily average of 2,000

cfs. However, during the summer months, water quality requirements would probably require higher flows.

2.5.9. Recreation. Recreation is the last purpose specifically prioritized in the Drought Contingency Plan. Water should be conserved in the power pool to meet recreation needs to the extent possible. However all the above discussed priorities take precedence over recreation. The impacts that drought may have on recreational facilities is discussed further in Chapter III.

2.6. Special Regulation.

2.6.1. Stabilization for Spawning. Usually in late April or early May, the largemouth bass and crappie spawn occurs. For a two to three week period during this event it is critical to keep a relatively stable pool for good spawning conditions. If however, the water should rise in the flood control pool and evacuation of this storage is necessary, it should be evacuated as rapidly as practical to attempt to delay spawn. Stabilization efforts are initiated when the Nashville District determines that the spawn is occurring, based on criteria established by the Kentucky Department of Fish and Wildlife Resources. The agency's criteria to identify the beginning of the spawning period for all lakes in Kentucky is a surface water temperature of 65 degrees Fahrenheit as measured on three consecutive days. Lake level stabilization to enhance the fish spawn is a cooperative effort between the Corps, State of Kentucky, SEPA, and TVA.

2.6.2. In addition to the functional goals discussed in this chapter, there are often other miscellaneous requirements of reservoir regulation for special purposes or circumstances. These include such things as providing specific water levels or discharges for construction activities, project maintenance, inspections, and response to emergency situations such as drownings and oil and chemical spills. Normally special operations can be accomplished within the frame work of the approved reservoir operating plan and therefore do not require approval of higher authority. In rare circumstances when deviation from the approved plan is necessary, prior approval of the Great Lakes and Ohio River Division (LRD) Office is required.

2.7. Safety. Maintaining the integrity of the structure under all conditions of streamflow, and assuring the safety of the general public both at the project and in the river system below the project takes precedence over all functional requirements. The project design and this water control plan are intended to result in safe conditions for all anticipated circumstances. If however, conditions arise where adherence to this

plan would jeopardize structural integrity or the general public, safety conditions should prevail.

2.8. Specific Operating Rules.

2.8.1. Normal and Drought Conditions.

- (1) Maintain headwater elevation within the limits of the hydropower pool and release all water through the turbines as governed by hydropower generation schedules.
- (2) Limit change in hydropower generation to three units per hour, up or down.
- (3) Make a special report to Water Management personnel if minimum desired hydropower releases of at least 1000 cfs (daily average) is not scheduled.

2.8.2. Flood Periods.

- (1) When spillway gates are being operated, maintain uniform openings of all gates as closely as possible, with no more than one foot difference among the gate openings.
- (2) When sluices are operated, they will be either fully closed or fully opened.
- (3) Limit the rate of increase of combined spillway and sluice releases to 2,000 cfs per hour, unless operating under the Emergency Operation Schedule. Limit decrease in these releases to 4,000 cfs per hour and, if practical, limit this decrease to 2,000 cfs per hour.
- (4) In conjunction with Dale Hollow, limit the flow at Celina to 30,000 cfs during crop season and 40,000 cfs during flood season. If during flood control season, more than one half of the flood control capacity of Wolf Creek and Dale Hollow is being used and if the Center Hill flood control pool is near empty, increase the control flow at Celina to 50,000 cfs.

- (5) Limit total project releases to bankfull capacity of 60,000 cfs, unless larger releases are required to the Emergency Operation Schedule (EOS).
- (6) If forecasts indicate the need to completely utilize the flood control pool and total project releases above 60,000 cfs are necessary, increase releases up to 2,000 cfs per hour until the required release rate is achieved or until the Emergency Operation Schedule (EOS) indicates higher release rates. Once the EOS is triggered, calculate the rate of rise in the pool and determine the required releases from the EOS, Plate A-8, every two hours.
- (7) If operating under the Emergency Operations Schedule, limit the rate of increase in total outflow to 20,000 cfs per two hour period until pool elevation reaches the Limiting Surcharge Curve (the upper most curve depicted on Plate A-8) or until free flow conditions are reached.
- (8) Once the Limiting Surcharge Curve is reached, it must be followed without deviation.
- (9) After the pool peaks (either during normal flood control operations or when the Limiting Surcharge Curve is reached while operating under the Emergency Operation Schedule), maintain spillway gates at existing opening until the pool falls to elevation 760.0. Then adjust gates uniformly such that outflow approximates inflow until the flow at Celina recedes to the maximum desired amount and project releases recede to below bankfull discharge. After this is achieved, resume normal flood control procedures.

2.9. Instructions to Operators. Additional instructions regarding normal and emergency operations and specific instructions on operators data collection and reporting duties can be found in the separate Wolf Creek Dam Instructions for Reservoir Regulation document.

2.10. Deviations from Water Control Plan. Permission to deviate from this plan must be obtained from the Great Lakes and Ohio River Division, Water Management Branch.

2.11. Standing Instructions. See next page.

STANDING INSTRUCTIONS
WOLF CREEK

In the unlikely event that contact can not be established between operators of the Wolf Creek project and the Nashville District Water Management Section the following guidelines should be used by operators.

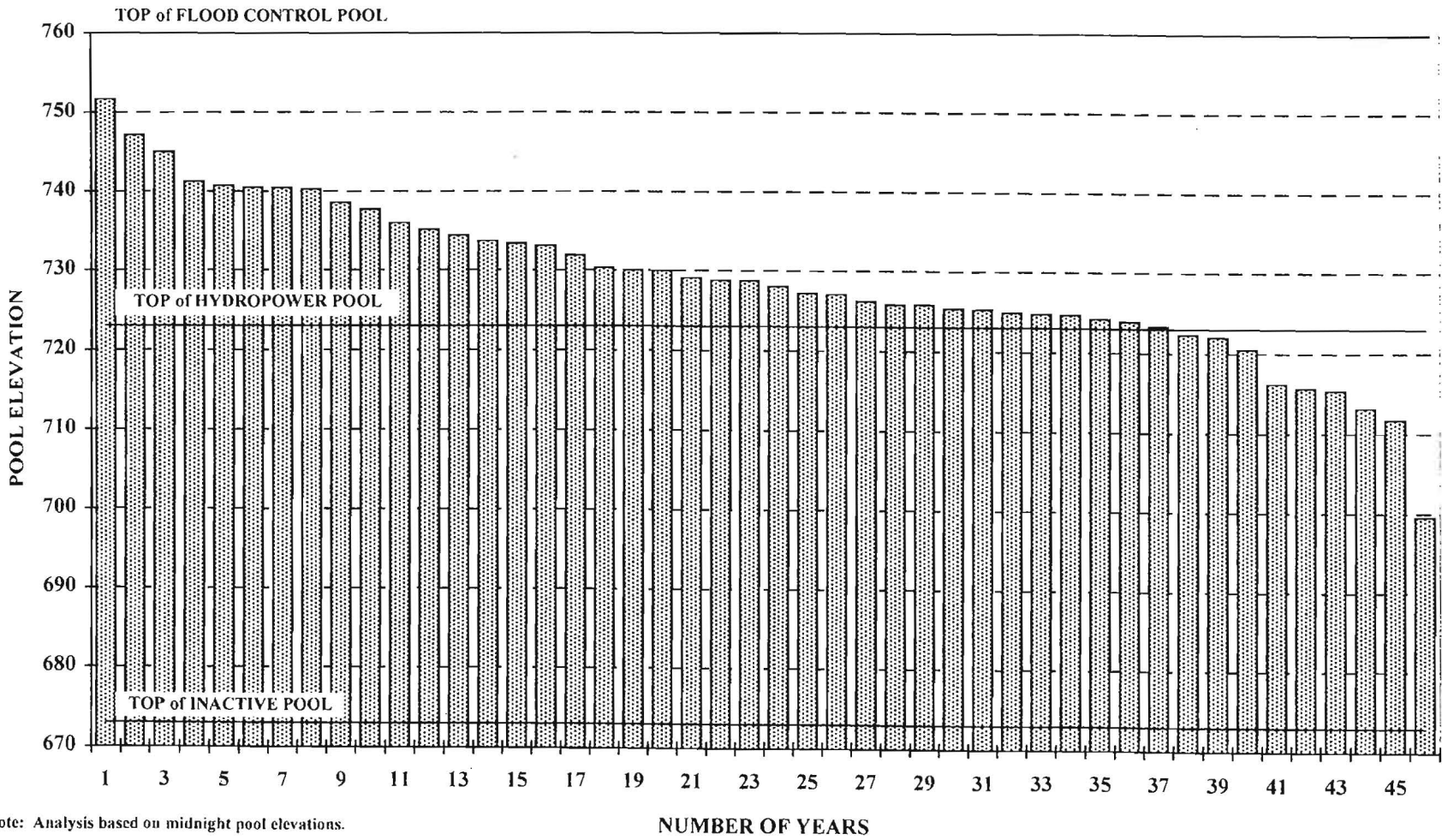
1. The power pool at Wolf Creek extends between elevations 673.0 and 723.0. Except during flood control operations, when the reservoir level is within the power pool all releases are made through the turbines as governed by hydropower generation schedules.
2. If the headwater level approaches the lower limit of the power pool, elevation 673.0, reduce or curtail hydropower discharges as necessary to prevent the headwater from falling below elevation 673.0 and notify the power scheduling agency.
3. Limit changes in hydropower discharges to three units per hour, up or down.
4. When flood conditions develop downstream on the Cumberland River, the primary purpose of Wolf Creek is flood control. This function is served by storing water above the dam until downstream flooding has subsided. The flood pool extends between elevations 723.0 and 760.0. After the flood threat has passed, reservoir flood control storage is evacuated as rapidly as downstream conditions permit. The following paragraphs give guidance on operations for flood control.
5. Even if the headwater is within the power pool, hydropower releases should be reduced or curtailed entirely in the interest of flood control. The hydropower scheduling agency should be notified of these actions.
6. To the extent possible, limit flows at Celina to a maximum of 40,000 cfs during the flood season (15 Dec - 15 Apr) and 30,000 cfs during the crop season (15 Apr - 15 Dec).
7. Although bankfull capacity below the dam is 60,000 cfs, limit total project releases consistent with seasonal maximum at Celina, unless larger releases are required by the Emergency Operations Schedule.
8. Limit increases in sluice or spillway discharges to 2,000 cfs per hour and decreases to 4,000 cfs per hour. All spillway gates should be operated at approximately the same opening.
9. When Wolf Creek headwater is rising within the flood pool, routinely check the Emergency Operation Schedule (EOS). If the rate of rise in headwater criteria is met, follow the EOS instructions without deviation.
10. When all flood control storage has been evacuated, lowering the headwater to elevation 723.0 resume normal operations.

CHAPTER III EFFECT OF WATER CONTROL PLAN

3.1. Pool Elevation. Plate III-1 shows the annual peak headwater elevation of Lake Cumberland for 46 years of history arranged in descending order. The pool elevation frequency curve displayed as Plate III-2, shows the percent of time that the pool has been at or below various elevations. During the history of the project, the pool has been within the range of the power pool about 90 percent of the time and within the flood control pool about 10 percent of the time. Plate III-3 displays the range of pool elevation used during each year between 1951 and 1996. This chart shows the consistent use of the upper 75 percent of the power pool, and frequent use of the flood control pool.

3.2. Project Discharge. The project history discharges are depicted in Plates III-4 and III-5. Plate III-4 shows the average turbine and spill discharges for each month of the year. This project has a relatively small amount of spill. It is about three percent of the total historical flow and usually occurs between January and May. The months of March and April have the highest average turbine and spillway release. October has the lowest average discharge, and there has rarely been any spill from the project during the period between July and September. Plate III-5 shows the annual average turbine and spill discharge for each year from 1953 through 1996. The largest amount of water passed through the project in 1994. That was also the year that the largest amount of spill occurred. The lowest net through the project occurred in the drought year of 1988.

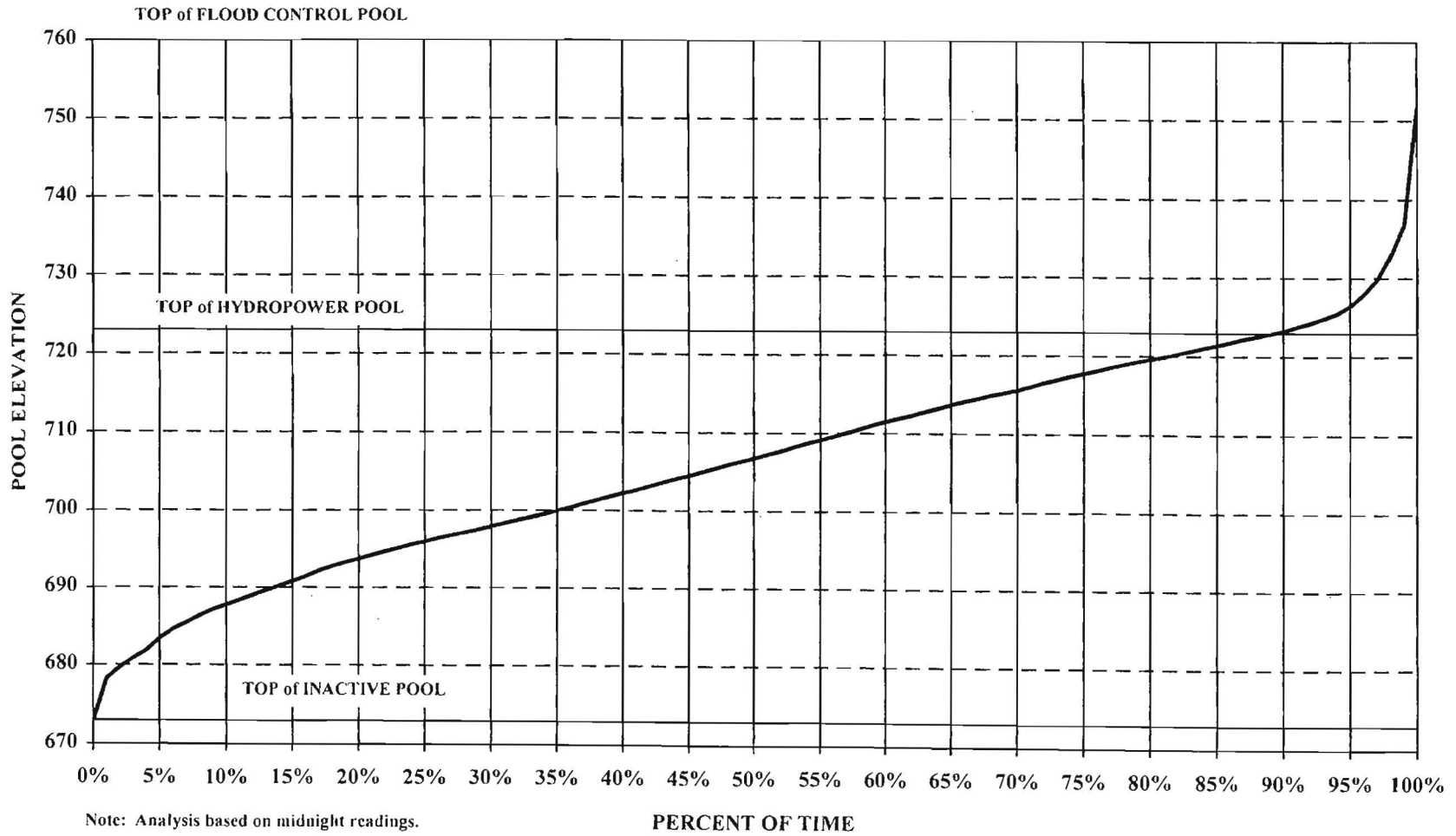
**LAKE CUMBERLAND
POOL ELEVATION - NUMBER OF YEARS EQUALED OR EXCEEDED
1951 THROUGH 1996**



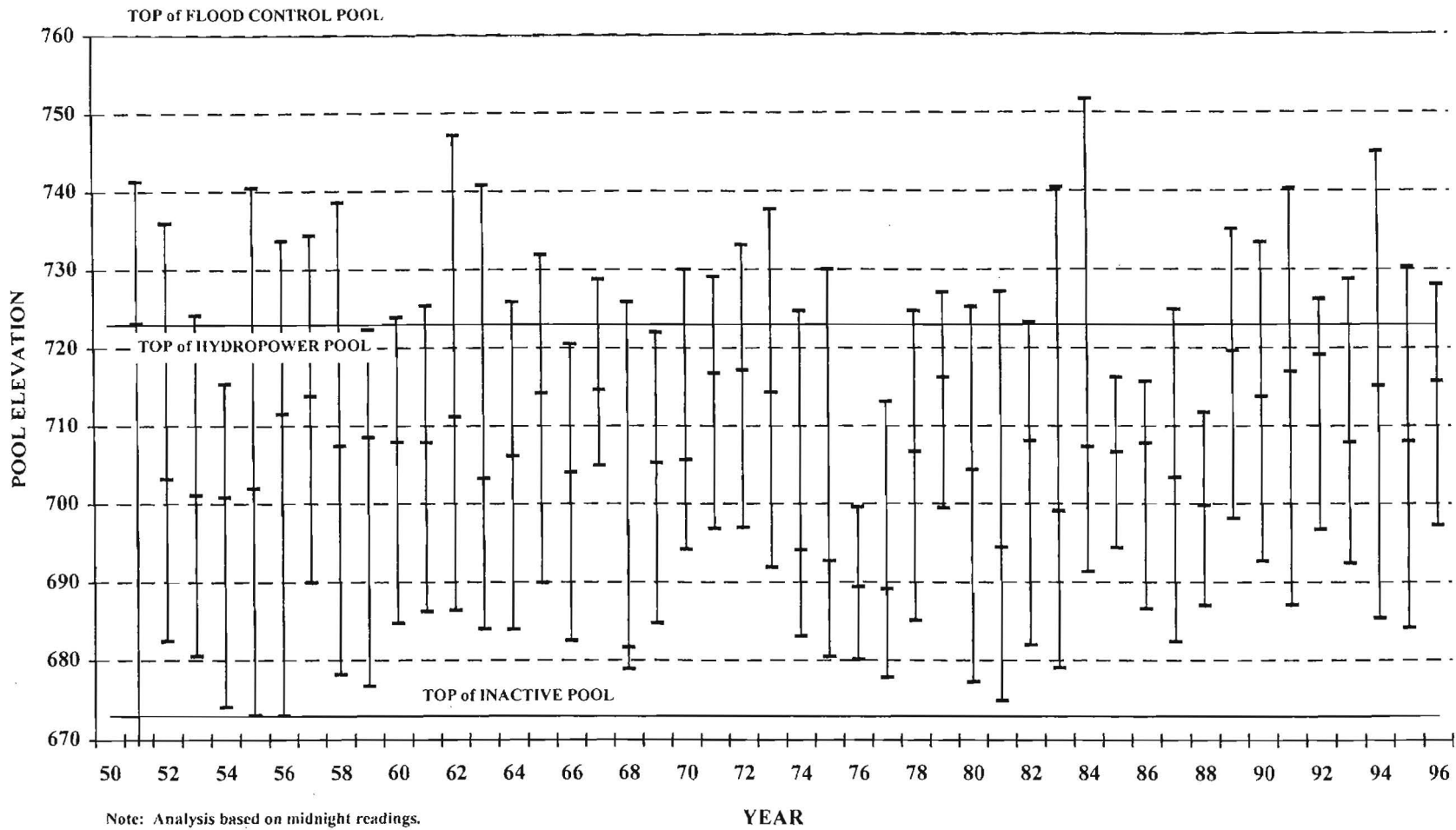
Note: Analysis based on midnight pool elevations.

III - 2

LAKE CUMBERLAND
POOL ELEVATION - PERCENT OF TIME AT OR BELOW
1952 THROUGH 1996

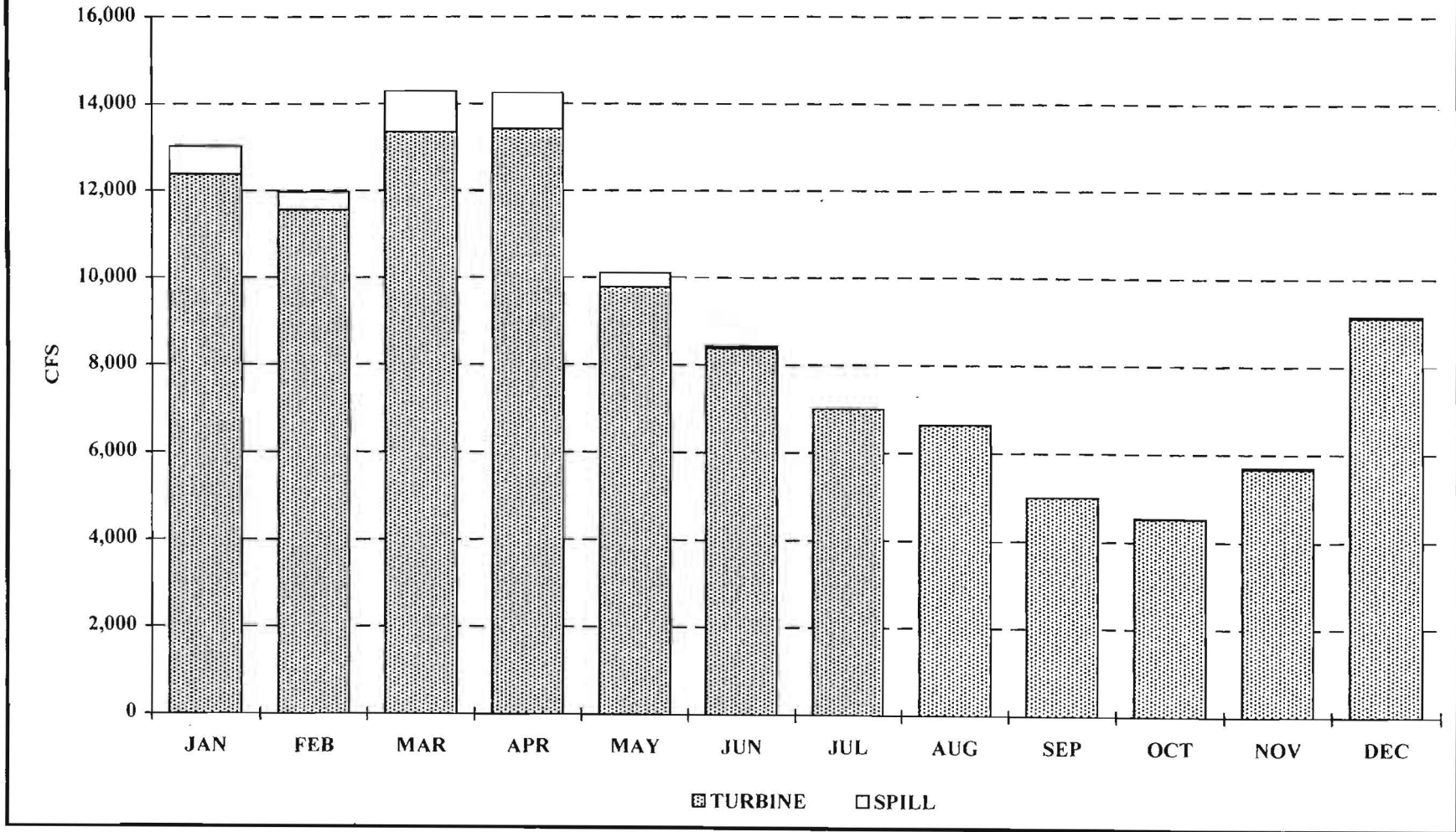


**LAKE CUMBERLAND
POOL ELEVATION - ANNUAL MAXIMUM, MEDIAN, AND MINIMUM
1950 THROUGH 1996**

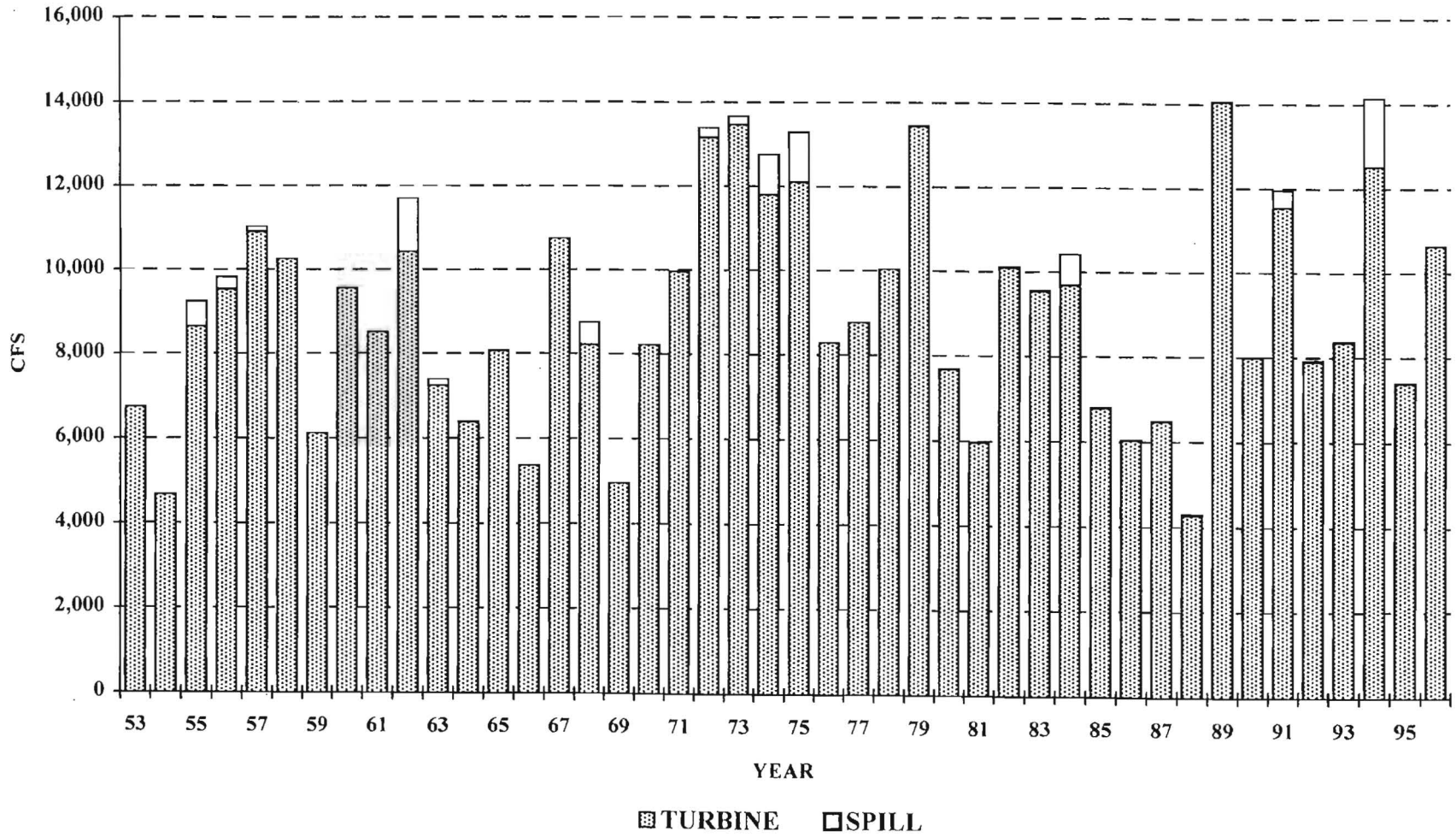


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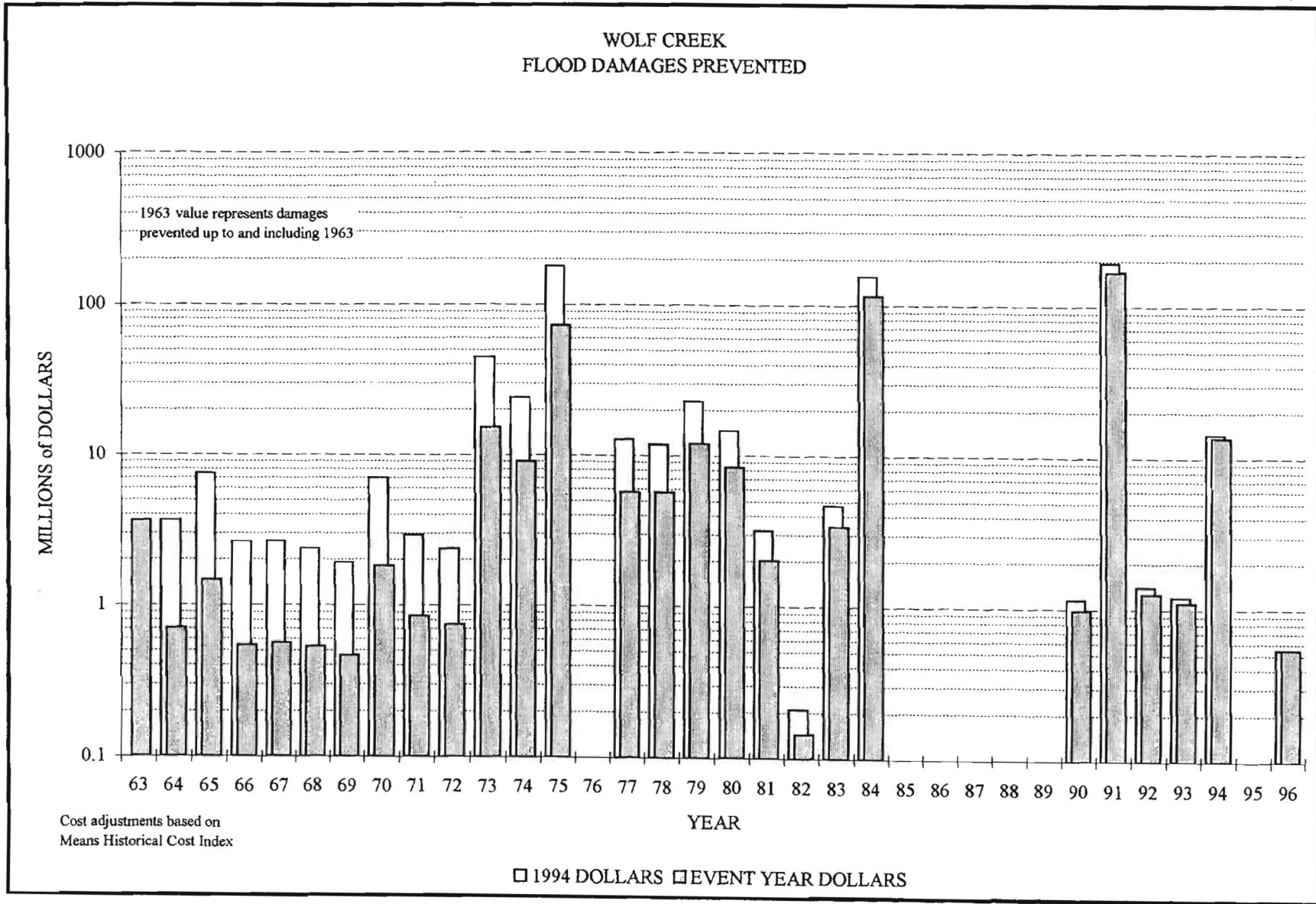
WOLF CREEK DAM
AVERAGE MONTHLY TURBINE & SPILL RELEASE
1952 THROUGH 1996

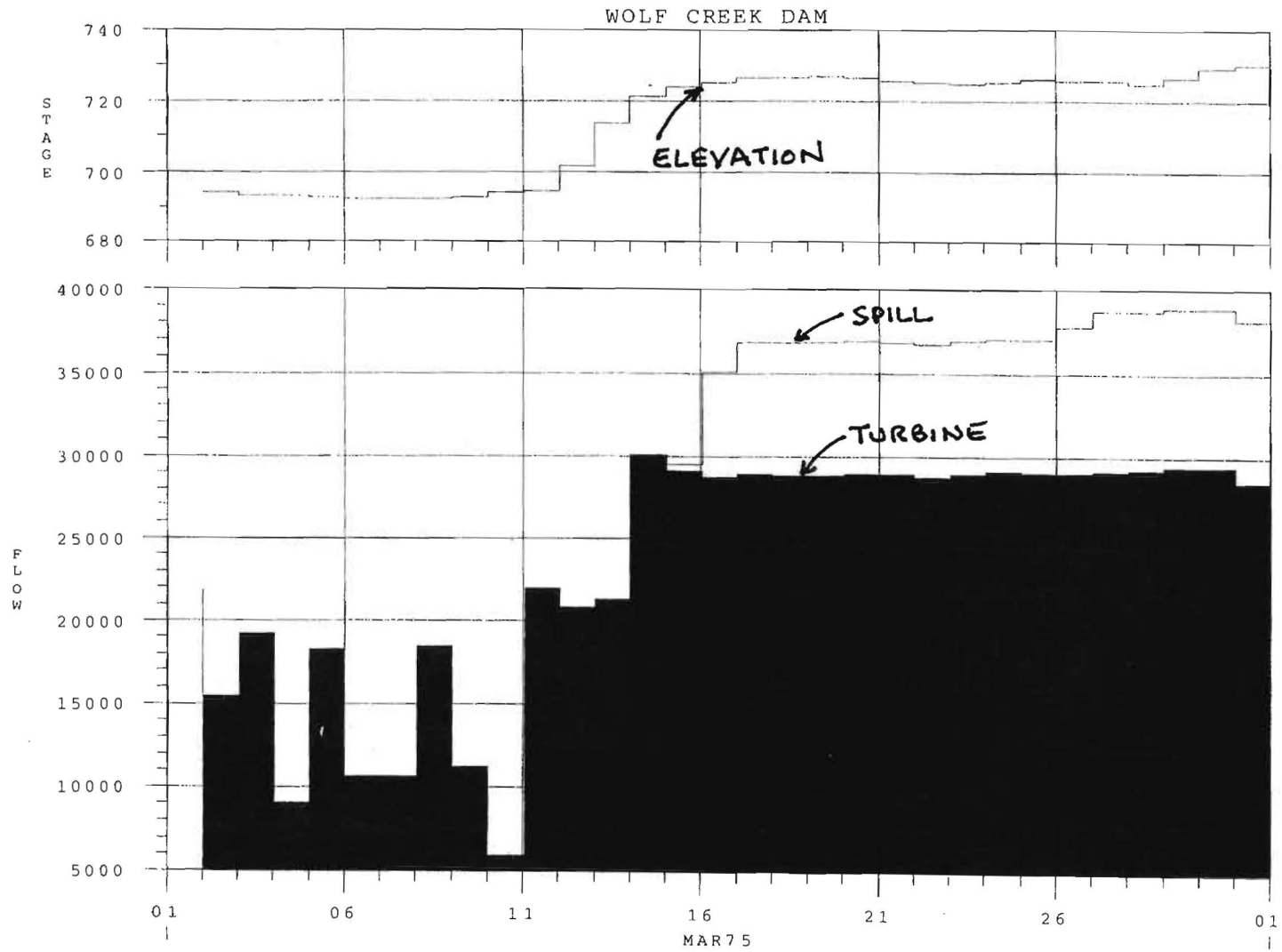


WOLF CREEK DAM DISCHARGE - AVERAGE ANNUAL TURBINE & SPILL 1953 THROUGH 1996

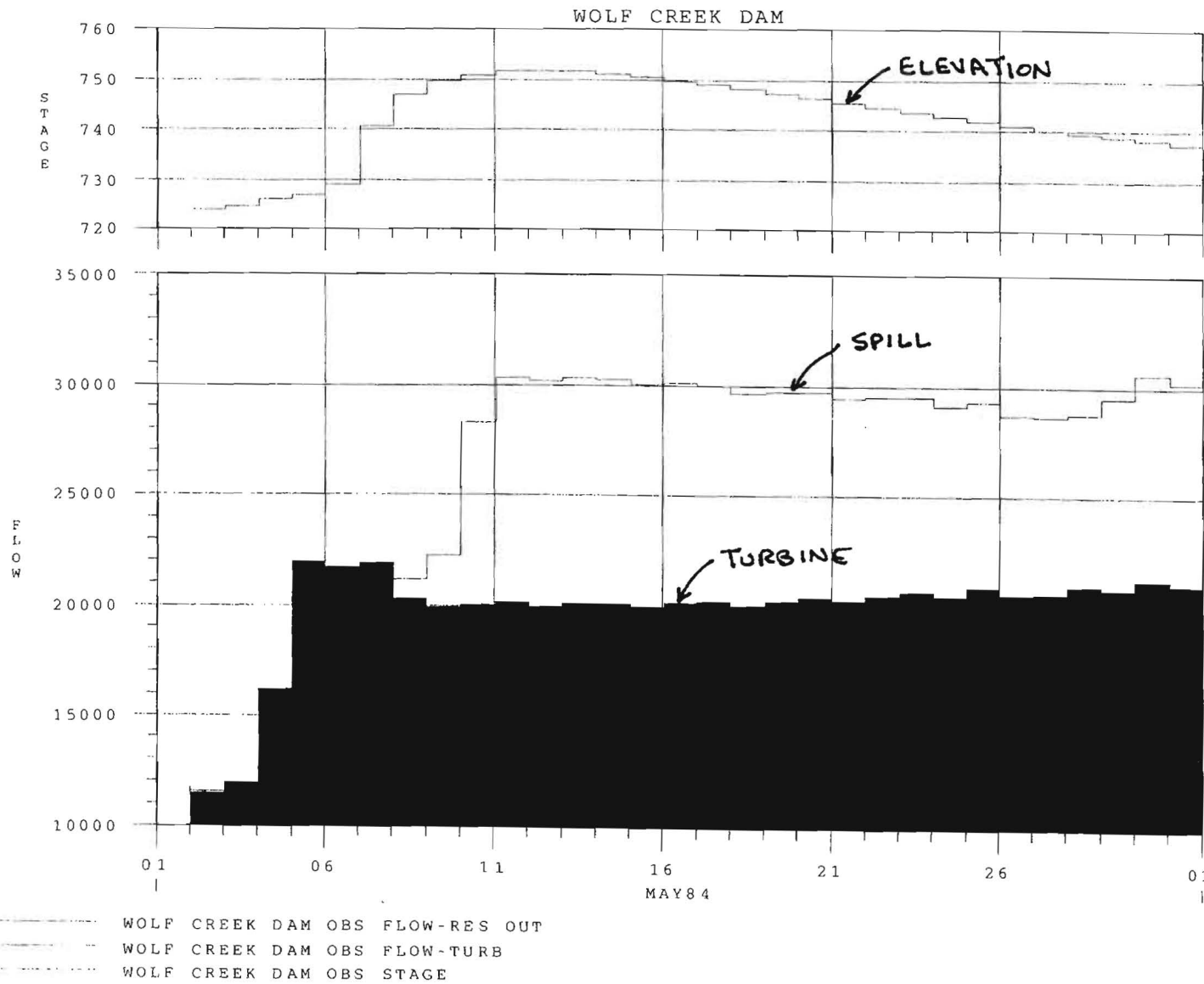


3.3. Flood Control. As shown in Plate III-3, the flood control pool has been used to some extent in 37 of the 47 years of the project's history. The water surface has been above elevation 740 in eight of those years and above elevation 750 in one year, 1984. The highest volume of flood control storage used was in 1984 when 76% of the flood pool was used. The monetary value of this flood control is displayed annually on Plate III-6. The value presented for 1963 represents damages prevented up to and including 1963. The greatest event year dollars flood damages prevented were in 1975, 1984, and 1991. These three years combined account for about 80 percent of the damage prevention values. Plates III-7 and III-8 show the actual timing of flood storage use during the 1975 and 1984 flood events. The only years during which zero flood control benefits were attributed were 1976, the drought years of the mid 80's, and 1995. The cumulative flood control benefits adjusted for inflation through the year 1996 have been over 660 million dollars.





_____ WOLF CREEK DAM OBS FLOW-RES OUT
 _____ WOLF CREEK DAM OBS FLOW-TURB
 _____ WOLF CREEK DAM OBS STAGE

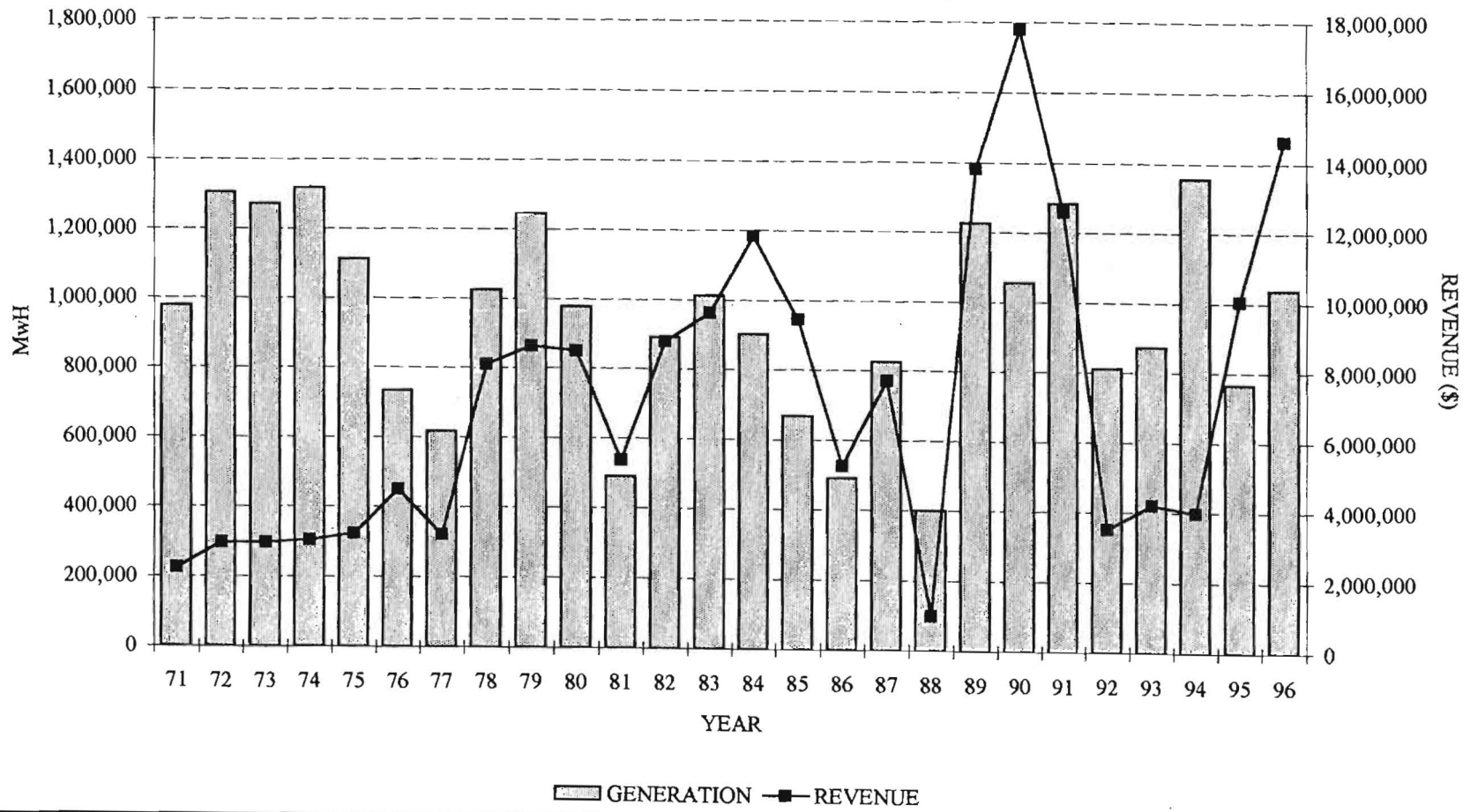


3.4. Hydropower.

3.4.1. Total revenue from hydropower generation at Wolf Creek has been over 186 million dollars between 1971 and 1996. During this same time period, the project has generated over 24,000 gigawatt hours of power. Annual generation and revenue are shown graphically on Plate III-9 and numerically on Plate III-10. The peak generation year was 1994, while the peak revenue year was 1990. The minimum generation year was 1988. The impact of the drought of the mid to late eighties is evident in the generation values shown on Plate III-9.

3.4.2. Fluctuations in revenue do not necessarily follow the same annual fluctuation pattern as generation. Hydropower revenue attributed to individual projects tends to be more a function of accounting, as total revenue is divided among the Cumberland Basin hydropower projects. In addition, only about one third of a project's hydropower revenue comes from the actual generation of power, while the remainder comes from selling power capacity. As at other District projects, revenues do not fluctuate solely with generation quantity due to the fact that a majority of revenues are derived from capacity and not from generation.

WOLF CREEK
HYDROPOWER - ANNUAL GENERATION and REVENUE



SUMMARY OF WOLF CREEK DAM HYDROPOWER OUTPUT

| FISCAL YEAR | ESTIMATED ANNUAL GENERATION (million kwh) | GROSS GENERATION (million kwh) | % ABOVE/BELOW ESTIMATED ANNUAL GENERATION | STATION USE (million kwh) | NET ^① GENERATION (million kwh) | REVENUE (\$ million) | REVENUE (¢ / kwh sold) |
|-------------|---|--------------------------------|---|---------------------------|---|----------------------|------------------------|
| 1971 | 800 | 981.9 | 23 | 3.9 | 977.9 | 2.24 | .23 |
| 1972 | 800 | 1,307.3 | 63 | 3.4 | 1,303.9 | 2.94 | .23 |
| 1973 | 800 | 1,275.0 | 59 | 3.9 | 1,271.1 | 2.94 | .23 |
| 1974 | 800 | 1,320.7 | 65 | 2.8 | 1,317.9 | 3.03 | .23 |
| 1975 | 800 | 1,115.3 | 39 | 2.2 | 1,113.1 | 3.21 | .29 |
| 1976 | 800 | 736.2 | -8 | 2.3 | 734.0 | 4.50 | .61 |
| 1977 | 800 | 619.3 | -23 | 3.4 | 615.9 | 3.19 | .52 |
| 1978 | 800 | 1,026.6 | 28 | 2.8 | 1,023.8 | 8.09 | .79 |
| 1979 | 800 | 1,248.7 | 56 | 3.4 | 1,245.3 | 8.64 | .69 |
| 1980 | 800 | 982.1 | 23 | 3.5 | 978.6 | 8.50 | .87 |
| 1981 | 800 | 494.3 | -38 | 4.0 | 490.3 | 5.37 | 1.10 |
| 1982 | 800 | 896.0 | 12 | 4.1 | 892.0 | 8.79 | .99 |
| 1983 | 800 | 1,017.0 | 27 | 4.4 | 1,012.6 | 9.63 | .95 |
| 1984 | 800 | 906.9 | 13 | 4.5 | 902.4 | 11.86 | 1.31 |
| 1985 | 800 | 671.6 | -16 | 4.4 | 667.1 | 9.46 | 1.42 |
| 1986 | 800 | 496.3 | -38 | 4.3 | 492.0 | 5.25 | 1.07 |
| 1987 | 800 | 829.1 | 4 | 4.4 | 824.6 | 7.71 | .94 |
| 1988 | 800 | 405.1 | -49 | 4.5 | 400.7 | 0.99 | .25 |
| 1989 | 800 | 1,230.5 | 54 | 4.0 | 1,226.5 | 13.83 | 1.13 |
| 1990 | 800 | 1,058.7 | 32 | 3.9 | 1,054.7 | 17.80 | 1.69 |
| 1991 | 800 | 1,288.2 | 61 | 3.5 | 1,284.6 | 12.61 | .98 |
| 1992 | 800 | 814.6 | 2 | 4.3 | 810.5 | 3.50 | .43 |
| 1993 | 800 | 876.6 | 10 | 4.2 | 872.7 | 4.20 | .48 |
| 1994 | 800 | 1,360.9 | 70 | 4.2 | 1,357.0 | 3.99 | .29 |
| 1995 | 800 | 771.1 | -4 | 4.5 | 766.9 | 10.04 | 1.31 |
| 1996 | 800 | 1,041.5 | 30 | 4.7 | 1,037.1 | 14.63 | 1.41 |

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^① Net generation plus station use may not equal gross generation due to rounding

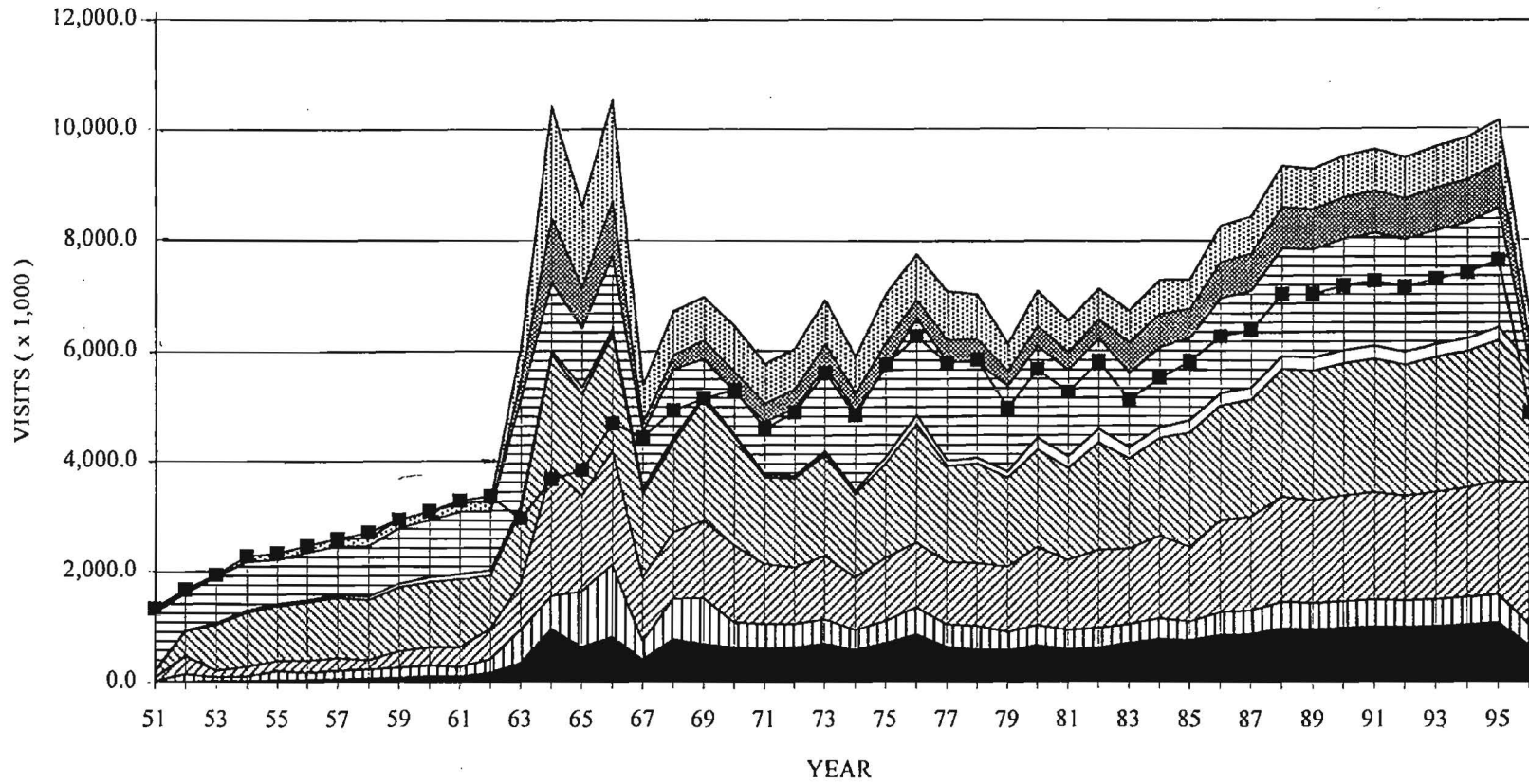
3.5. Recreation.

3.5.1. As shown in Plate III-11, recreational use of Wolf Creek has risen steadily through the years with 1995 representing the year of peak usage. Over 7.6 million visits were recorded at the project during 1994. The most popular activities at Wolf Creek have been fishing, sightseeing, and boating. In comparison to the other nine projects in the District, Wolf Creek ranks 3rd behind Old Hickory and J. Percy Priest in rate of use. It is the most intensively used of the large storage projects.

3.5.2. The visitation dollar benefit attributed to Lake Cumberland is shown on Plate III-12. Prior to 1996, this was a very conservative rough estimate based on an average expenditure rate of \$1.96 per visitor hour for all the various user groups, such as boaters, campers, hunters, etc. In addition, it was intended to reflect only those expenditures made in the vicinity of the lake and did not attempt to account for major expenditures prior to the visit, such as the purchase of camping gear or a boat. Plate III-13 shows the impacts of low lake levels on water based recreational facilities and water supply intakes.

3.5.3. For 1996, a distinct decrease in the visitation chart and increase in the dollar benefit chart can easily be detected. This is due to a change in methodology of how the District determines these recreational values. The Nashville District now uses the Visitor Information and Reporting System (VIRS) which was developed by the Waterways Experiment Station (WES). This system counts each "visitor" on Corps' property for recreation as "one", even if that visitor stayed a full week on the property. The previous method used by the District would have counted a full week stay as seven recreation use-days. This different methodology would account for the decrease in the visitation chart. The sharp increase in the dollar benefit is also attributed to the new VIRS system. It reflects a much greater average expenditure rate which varies depending on the recreational activity. However, similar to the previous technique, this new accounting method still does not attempt to account for major expenditures of durable goods.

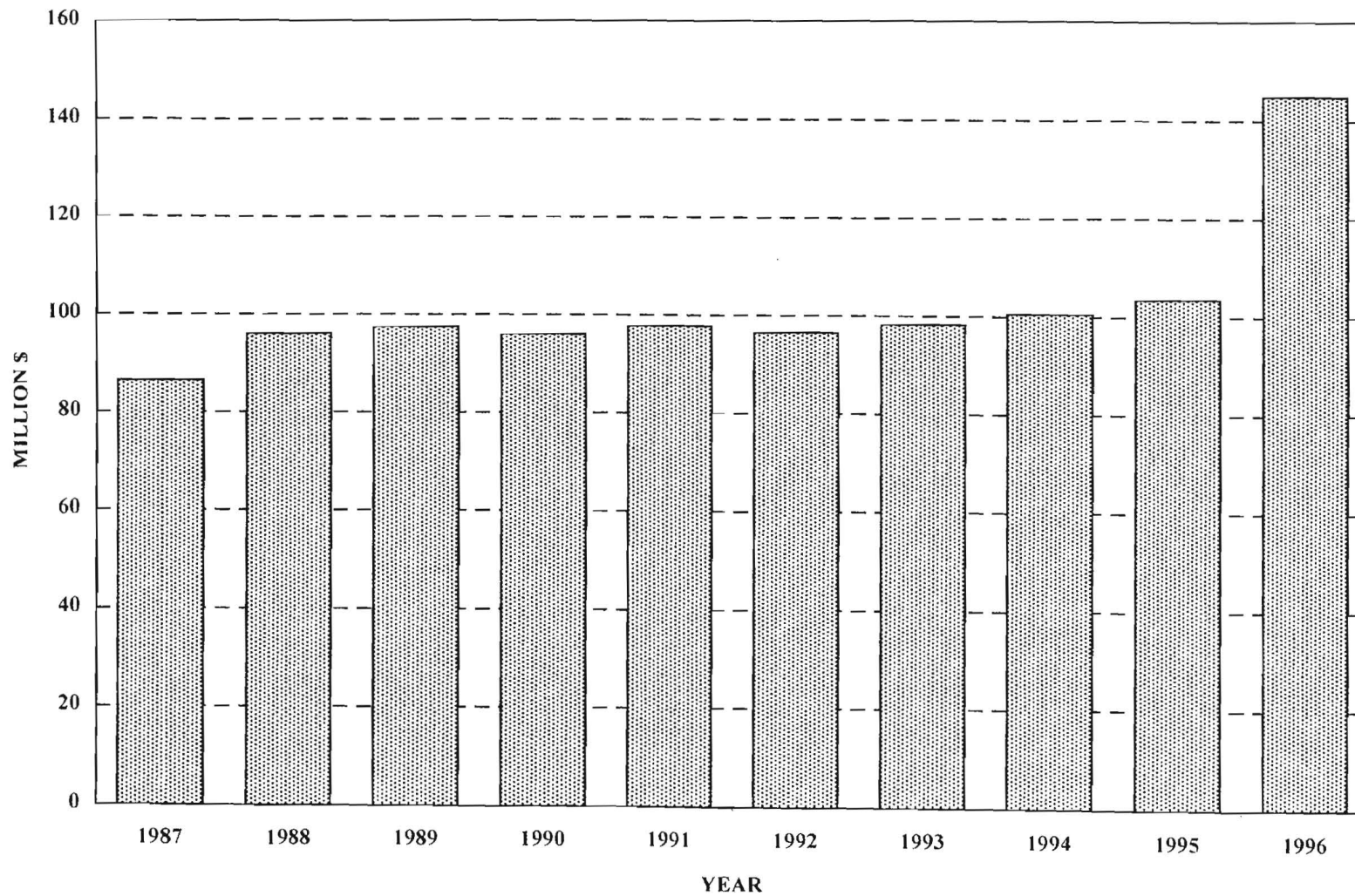
LAKE CUMBERLAND
ANNUAL VISITATION



Source:
ORNOC



LAKE CUMBERLAND VISITATION DOLLAR BENEFIT



LAKE CUMBERLAND

IMPACTS OF LAKE LEVELS ON RECREATION AND NATURAL RESOURCES

| SUMMER PEAK, TOP OF SEPA BAND - ELEVATION 723.0 SUMMER PEAK, BOTTOM OF SEPA BAND - ELEVATION 711.2 | | | | | | | | | | |
|---|--------|---|----------------------|-------------------|--|----------------------|-------------------|---|----------------------|-------------------|
| WATER BASED FACILITIES | | INITIAL IMPACT (A) ELEVATION 710.0 (1.2 feet below bottom of SEPA Band) | | | MAJOR IMPACT (B) ELEVATION 680.0 (31.2 feet below bottom of SEPA Band) | | | SEVERE IMPACT (C) ELEVATION 673.0 (38.2 feet below bottom of SEPA Band) | | |
| Type | Number | Usable | Marginal or Unusable | Percent Reduction | Usable | Marginal or Unusable | Percent Reduction | Usable | Marginal or Unusable | Percent Reduction |
| Beaches | 4 | 4 | 0 | 0% | 1 | 3 | 75% | 0 | 4 | 100% |
| Boat Ramps | 36 | 33 | 3 | 8% | 6 | 30 | 83% | 4 | 32 | 89% |
| Marinas | 12 | 12 | 0 | 0% | 9 | 3 (D) | 25% | 6 | 6 (E) | 50% |
| Wet Moorage at Marinas | 2,489 | 2,489 | 0 | 0% | 2,115 | 374 | 15% | 1,245 | 1,244 | 50% |
| Private Docks | 268 | 268 | 0 | 0% | 215 | 53 | 20% | 161 | 107 | 40% |
| Public Water Intakes | 5 | 5 | 0 | 0% | 5 | 0 | 0% | 5 | 0 | 0% |
| Industrial Water Intakes | 2 | 2 | 0 | 0% | 1 | 1 (F) | 50% | 0 | 2 (G) | 100% |
| Water Surface Acreage | 50,250 | 46,220 | 4,030 | 8% | 37,820 | 12,430 | 25% | 35,820 | 14,430 | 29% |

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LAKE CUMBERLAND
IMPACTS OF LAKE LEVELS ON RECREATION AND NATURAL RESOURCES

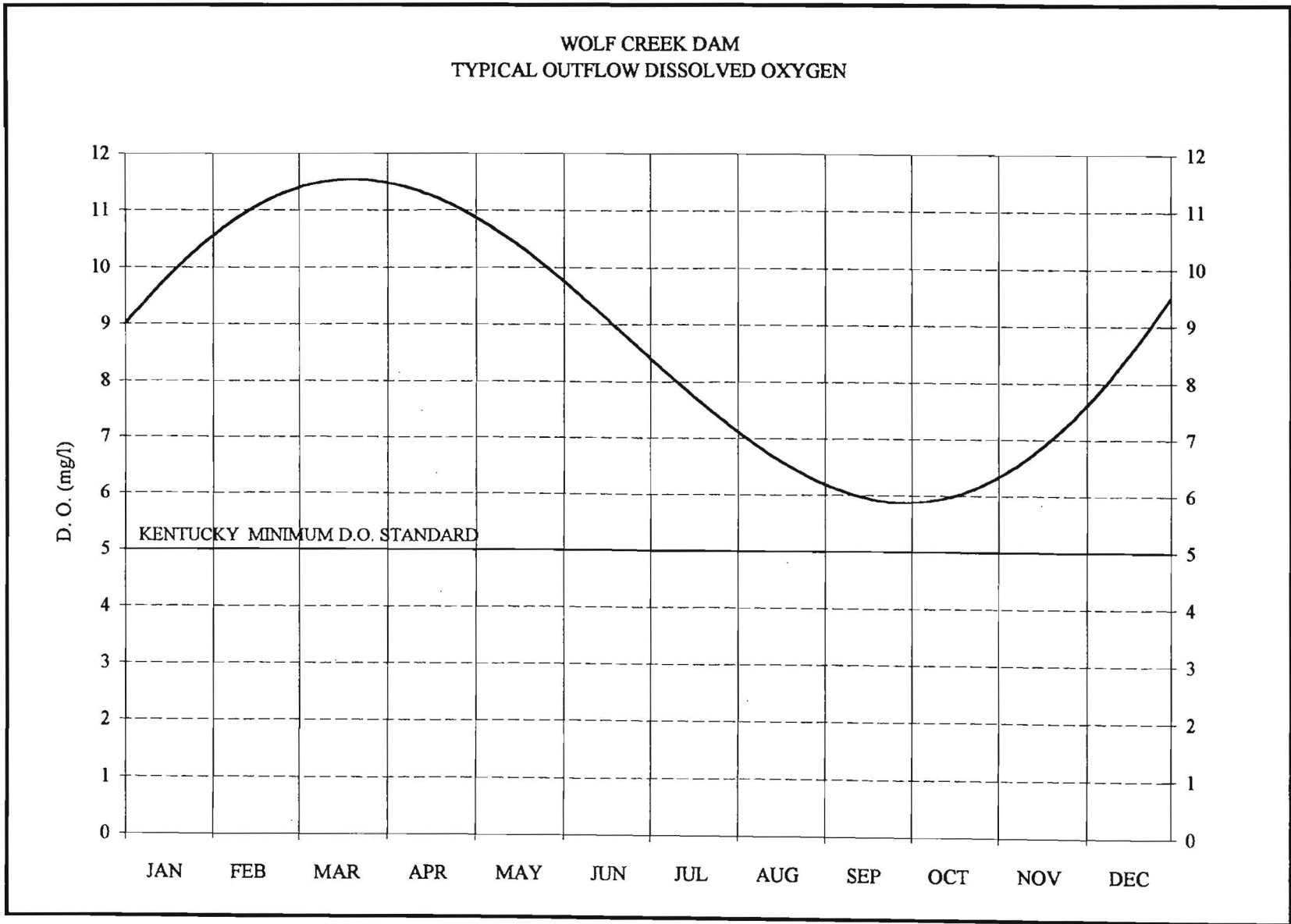
FOOTNOTES:

- A. Initial Impacts - The level where recreation and natural resources management impacts are first observed: some ramps are unusable, most beaches are unusable or minimally usable, and/or navigation hazards begin to surface.
- B. Major Impacts - The level where significant impact would occur: water or boating access would be significantly limited, a significant number of boat ramps would be unusable, major navigation hazards occur, channels to marinas would become impassable and/or slips would have to be relocated, exposed mud or rock bottom surfaces would make water access from recreation areas inaccessible, a majority of privately permitted boat docks would be unusable or relocated, and all swimming beaches are unusable.
- C. Severe Impacts - The level where a majority of recreation facilities are virtually out of business: all or almost all boat ramps are closed, all swimming beaches are closed, major navigation hazards severely limit lake use, channels to marinas are impassable, and slips are unusable, and a majority of the privately permitted boat docks are unusable.
- D. Little's Marina, London Marina, Buck Creek Marina
- E. Little's Marina, London Marina, Buck Creek Marina, Burnside Marina, Alligator Marina #1, Lee's Ford Marina
- F. Kingsford Charcoal
- G. John Sherman Cooper Steam Plant, Kingsford Charcoal

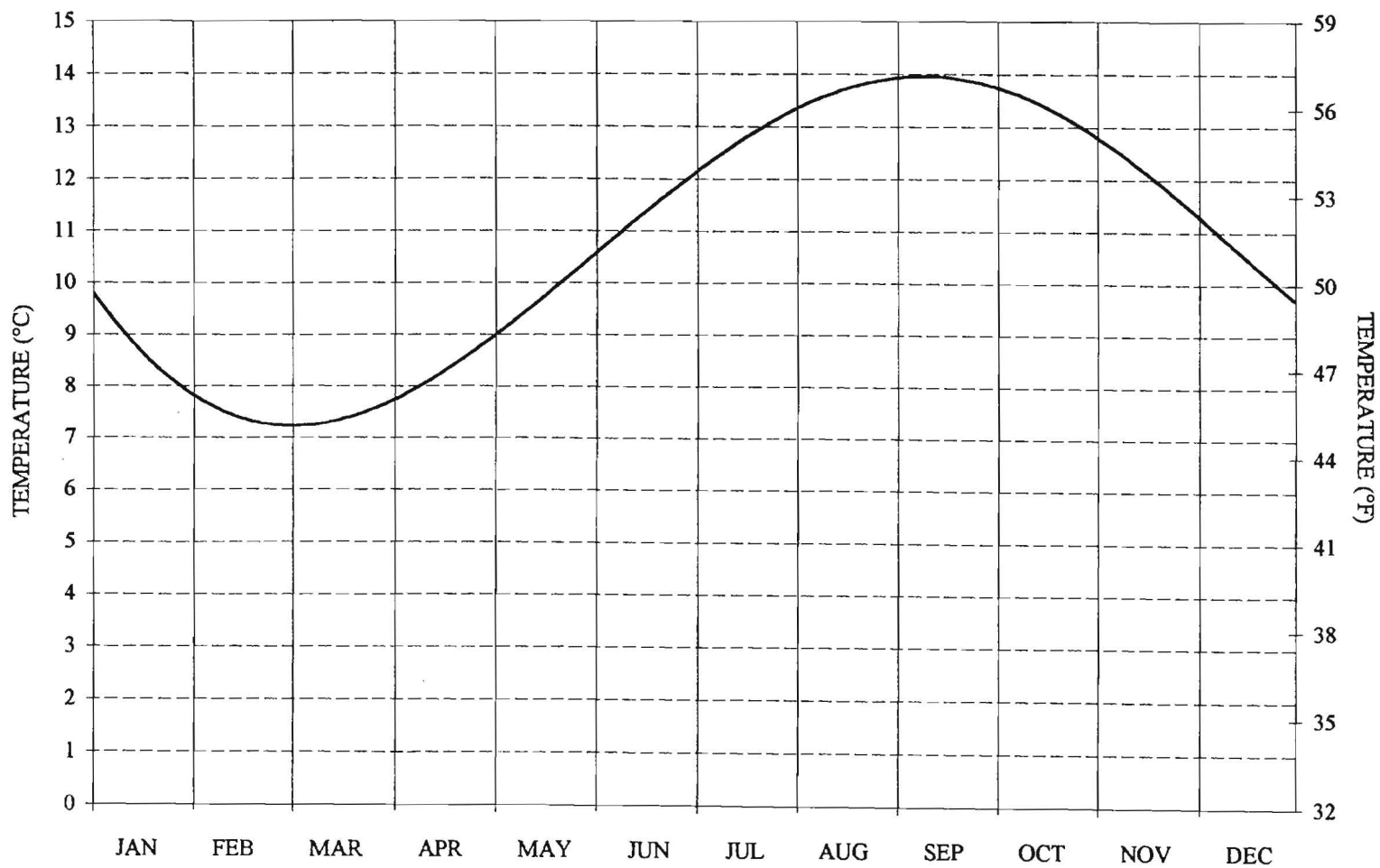
3.6. Water Quality

3.6.1. The water quality of Lake Cumberland is generally very good, helped considerably by the large tracts of undeveloped, wooded drainage area. Steep banks surround the reservoir and the water is deep, clear, and cold. Water depths of 100 feet have been measured as far as 90 miles upstream of the dam. The land use surrounding the lake consists of forestry, mining, and agriculture, with some industry and small pockets of urban areas. However, within the vast 5,789 square mile drainage area, there are no metropolitan areas and Middlesboro, with a population of only about 12,000 people, is the largest community. Wastewater discharges returned to the lake from the municipal suppliers which serve about 80,000 people, have not had much of an effect on the overall water quality in the reservoir. Excess nutrients and algae blooms have not caused any substantial problems. Mean summer depth in the reservoir is about 80 feet and mean retention time is about 215 days.

3.6.2. Lake Cumberland is thermally stratified from April through November. Despite this stratification, the dissolved oxygen content remains high. Plates III-14 and III-15 display the typical annual cycle of outflow dissolved oxygen and temperature data as randomly collected over the years. Lake Cumberland outflow DO levels are comparably higher than those at Center Hill or Dale Hollow. They typically remain above the 5.0 mg/l minimum DO standard, even during the low flow period of September and October. Outflow temperatures are relatively cold, ranging between 45 degrees to 57 degrees Fahrenheit (7 degrees to 14 degrees centigrade), which is somewhat predictable for a deep storage reservoir.



WOLF CREEK DAM
TYPICAL OUTFLOW TEMPERATURE



III - 21

3.7 Fish & Wildlife.

3.7.1 In general terms, Wolf Creek Dam (Lake Cumberland) has good water quality. Trophically, the lake is oligotrophic throughout most of its volume, but in certain locations (Pitman, Lilly, and Beaver Creek embayments) it is more enriched, approaching eutrophic conditions. The lake is considered to be a warm, monomictic waterbody with thermal stratification occurring normally from May to November. Dissolved oxygen levels in the hypolimnion gradually decline during stratification, but are not usually severely depleted. In recent years, a trend toward increasing dissolved oxygen depletion in the hypolimnion has been observed.

3.7.2. With the impoundment of Lake Cumberland, the fishery present in the Cumberland River underwent major changes. The riverine fish populations changed to what is typical of large, southern reservoirs. Lake Cumberland provides habitat for warm and cool water species. The native walleye fishery declined, and remaining stocks of walleye were depleted through overfishing, pollution, and loss of habitat. The sport fishery is based upon black basses (largemouth, smallmouth, spotted), crappie (white, black), walleye, various panfish, and introduced striped bass. The forage base consists of gizzard shad, threadfin shad, and alewife. The alewives are introduced, most likely from releases of bait fish. Some commercial fishing occurs, primarily centered on taking catfish and paddlefish. Stockings of lake adapted walleye began in 1973 and continue. Striped bass were first stocked in 1957 and by the 1980's a trophy fishery had developed. The striped bass fishery remains significant, though the take of trophy fish has decreased recently.

3.7.3. Management of the fishery at Lake Cumberland is complicated by the magnitude of lake level fluctuations caused by flood control operations and hydroelectric power generation and deterioration of habitat quality (structure) normal in an aging reservoir. A fish attractor program is ongoing at Lake Cumberland to augment cover.

3.7.4. Tailwater Fishery. Operation of Wolf Creek Dam converted the Cumberland River below the dam to a cold water environment. A popular trout fishery is well established in the approximately 80 river miles of tailwater between the dam and the Tennessee state line. Anglers harvest both rainbow and brown trout in the tailwater. Bank and boat angling are both pursued in the tailwater reach.

3.8 Water Supply. Although water supply is not an authorized project purpose at any Nashville District project, all but one of them are used by municipalities for this purpose. Of these, Lake Cumberland is the fourth most intensively used for water supply. In 1990 it was estimated that this project serves as the water supply source for over 80,000 people through five water systems which directly access the lake and through 12 additional systems which purchase water from those systems with direct access. The five direct access systems withdraw approximately 12 cfs from Lake Cumberland. A significant portion of this amount is returned to the Cumberland Basin via sewage treatment plant discharges. Pertinent information on these five municipal systems is presented on Plate III-16.

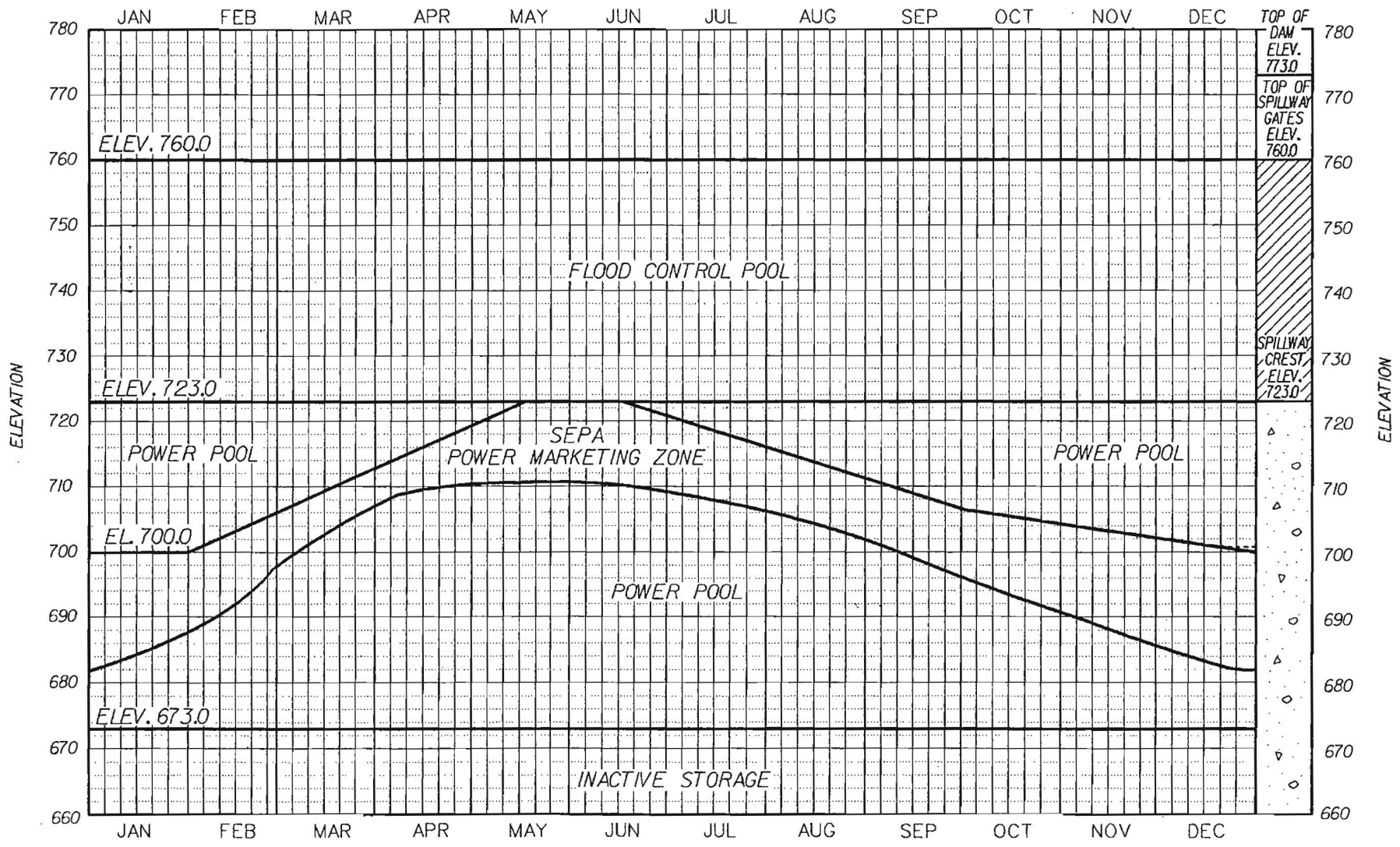
LAKE CUMBERLAND WATER SUPPLY INTAKES

| SYSTEM | STATE | | RIVER | | EMBAYMENT | | INLET | | | SERVICES | |
|------------|--------|---------|--------------|-------|--------------|----------------|--------------|----------------|--------|----------|--------|
| | COUNTY | NAME | BANK MILE | NAME | BANK MILE | (ins.) DIA. | TOP ELEV. | OPER. ELEV. | NUM. | POP. | |
| Albany | KY | Clinton | Cumberland | 462.2 | | Indian Creek | 12 | floating | 673.00 | 2,400 | 6,000 |
| Jamestown | KY | Russell | Cumberland | 472.6 | R | Greasy Creek | 4@10 | floating | 670.00 | 1,200 | 3,600 |
| Monticello | KY | Wayne | Cumberland | 498.4 | L | | 10 | | 673.00 | 3,000 | 7,500 |
| Somerset | KY | Pulaski | Cumberland | 514.3 | R | | | 667.00 | 673.00 | 7,033 | 29,784 |
| Burnside | KY | Pulaski | Cumberland | 517.5 | L | | 6 | 662.70 | 650.00 | 340 | 1,200 |

III - 24

| SYSTEM | PRODUCTION (gpd) | | | PLANT PHONE NUMBER | OFFICE | | |
|------------|------------------|--------------------|----------------|--------------------------|-----------------|---------------------------------|-------|
| | AVERAGE DAILY | DESIGN CAPACITY | SURVEY DATE | | PHONE NUMBER | CONTACT | |
| | | | | | | NAME | TITLE |
| Albany | 750,000 | 1,000,000 | 5/08/ | [REDACTED] | 606 [REDACTED] | City Clerk | |
| Jamestown | 1,700,000 | 3,000,000 | 5/08/ | [REDACTED] | [REDACTED] | Public Works Supervisor | |
| Monticello | 1,500,000 | 2,000,000 | 8/20/ | [REDACTED] | [REDACTED] | City Of Monticello Utility Comm | |
| Somerset | 3,500,000 | 6,000,000 | 5/09/90 | [REDACTED] | [REDACTED] | Manager | |
| Burnside | 199,000 | 360,000 | 8/20/90 | [REDACTED] | 606 [REDACTED] | | |

WOLF CREEK PROJECT GUIDE CURVE



U.S. ARMY CORPS OF ENGINEERS
NASHVILLE DISTRICT

**WOLF CREEK RESERVOIR
CUMBERLAND RIVER, KENTUCKY
AREA AND VOLUME TABLE
(Dam Site at Mile 460.9)**

| ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF | ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF | ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF |
|-----------------|---------------|---------------------|----------------|-----------------|---------------|---------------------|----------------|-----------------|---------------|---------------------|----------------|
| 545 | 0 | 0 | 0 | 590 | 5,450 | 72,200 | 36,400 | 635 | 23,500 | 707,000 | 356,000 |
| 6 | 40 | 20 | 10 | 1 | 5,780 | 77,800 | 39,200 | 6 | 23,910 | 730,000 | 368,000 |
| 7 | 75 | 75 | 38 | 2 | 6,110 | 83,700 | 42,200 | 7 | 24,320 | 754,000 | 380,000 |
| 8 | 120 | 170 | 86 | 3 | 6,440 | 90,000 | 45,400 | 8 | 24,730 | 779,000 | 393,000 |
| 9 | 150 | 310 | 160 | 4 | 6,760 | 96,600 | 48,700 | 9 | 25,140 | 804,000 | 405,000 |
| 550 | 190 | 480 | 240 | 595 | 7,090 | 104,000 | 52,400 | 640 | 25,550 | 829,000 | 418,000 |
| 1 | 240 | 700 | 350 | 6 | 7,420 | 111,000 | 56,000 | 1 | 25,930 | 855,000 | 431,000 |
| 2 | 300 | 960 | 480 | 7 | 7,750 | 118,000 | 59,500 | 2 | 26,320 | 881,000 | 444,000 |
| 3 | 350 | 1,290 | 650 | 8 | 8,080 | 126,000 | 63,500 | 3 | 26,700 | 908,000 | 458,000 |
| 4 | 400 | 1,660 | 840 | 9 | 8,410 | 135,000 | 68,100 | 4 | 27,080 | 935,000 | 471,000 |
| 555 | 450 | 2,090 | 1,050 | 600 | 8,730 | 143,000 | 72,100 | 645 | 27,470 | 962,000 | 485,000 |
| 6 | 500 | 2,570 | 1,300 | 1 | 9,140 | 152,000 | 76,600 | 6 | 27,850 | 989,000 | 499,000 |
| 7 | 560 | 3,100 | 1,560 | 2 | 9,550 | 161,000 | 81,200 | 7 | 28,230 | 1,018,000 | 513,000 |
| 8 | 610 | 3,680 | 1,860 | 3 | 9,960 | 171,000 | 86,200 | 8 | 28,620 | 1,046,000 | 527,000 |
| 9 | 660 | 4,320 | 2,180 | 4 | 10,370 | 181,000 | 91,300 | 9 | 29,000 | 1,075,000 | 542,000 |
| 560 | 720 | 5,010 | 2,530 | 605 | 10,770 | 192,000 | 96,800 | 650 | 29,380 | 1,104,000 | 557,000 |
| 1 | 790 | 5,760 | 2,900 | 6 | 11,180 | 203,000 | 102,000 | 1 | 29,650 | 1,133,000 | 571,000 |
| 2 | 870 | 6,590 | 3,320 | 7 | 11,590 | 214,000 | 108,000 | 2 | 29,920 | 1,163,000 | 586,000 |
| 3 | 940 | 7,490 | 3,780 | 8 | 12,000 | 226,000 | 114,000 | 3 | 30,190 | 1,193,000 | 601,000 |
| 4 | 1,020 | 8,470 | 4,270 | 9 | 12,400 | 238,000 | 120,000 | 4 | 30,460 | 1,224,000 | 617,000 |
| 565 | 1,090 | 9,530 | 4,810 | 610 | 12,810 | 251,000 | 127,000 | 655 | 30,730 | 1,254,000 | 632,000 |
| 6 | 1,170 | 10,600 | 5,340 | 1 | 13,250 | 264,000 | 133,000 | 6 | 31,000 | 1,285,000 | 648,000 |
| 7 | 1,250 | 11,800 | 5,950 | 2 | 13,690 | 277,000 | 140,000 | 7 | 31,270 | 1,316,000 | 663,000 |
| 8 | 1,320 | 13,100 | 6,610 | 3 | 14,130 | 291,000 | 147,000 | 8 | 31,540 | 1,348,000 | 680,000 |
| 9 | 1,400 | 14,400 | 7,260 | 4 | 14,570 | 306,000 | 154,000 | 9 | 31,810 | 1,379,000 | 695,000 |
| 570 | 1,470 | 15,800 | 7,970 | 615 | 15,010 | 320,000 | 161,000 | 660 | 32,080 | 1,411,000 | 711,000 |
| 1 | 1,540 | 17,400 | 8,770 | 6 | 15,450 | 336,000 | 169,000 | 1 | 32,370 | 1,443,000 | 728,000 |
| 2 | 1,610 | 18,900 | 9,530 | 7 | 15,890 | 351,000 | 177,000 | 2 | 32,660 | 1,476,000 | 744,000 |
| 3 | 1,680 | 20,600 | 10,400 | 8 | 16,330 | 367,000 | 185,000 | 3 | 32,960 | 1,509,000 | 761,000 |
| 4 | 1,750 | 22,300 | 11,200 | 9 | 16,770 | 384,000 | 194,000 | 4 | 33,250 | 1,542,000 | 777,000 |
| 575 | 1,820 | 24,100 | 12,200 | 620 | 17,210 | 401,000 | 202,000 | 665 | 33,550 | 1,575,000 | 794,000 |
| 6 | 1,890 | 25,900 | 13,100 | 1 | 17,640 | 418,000 | 211,000 | 6 | 33,840 | 1,609,000 | 811,000 |
| 7 | 1,960 | 27,900 | 14,100 | 2 | 18,060 | 436,000 | 220,000 | 7 | 34,140 | 1,643,000 | 828,000 |
| 8 | 2,030 | 29,900 | 15,100 | 3 | 18,490 | 454,000 | 229,000 | 8 | 34,430 | 1,677,000 | 845,000 |
| 9 | 2,100 | 31,900 | 16,100 | 4 | 18,910 | 473,000 | 238,000 | 9 | 34,730 | 1,712,000 | 863,000 |
| 580 | 2,170 | 34,100 | 17,200 | 625 | 19,330 | 492,000 | 248,000 | 670 | 35,020 | 1,747,000 | 881,000 |
| 1 | 2,500 | 36,400 | 18,400 | 6 | 19,760 | 512,000 | 258,000 | 1 | 35,290 | 1,782,000 | 898,000 |
| 2 | 2,830 | 39,000 | 19,700 | 7 | 20,180 | 532,000 | 268,000 | 2 | 35,550 | 1,817,000 | 916,000 |
| 3 | 3,160 | 42,000 | 21,200 | 8 | 20,610 | 552,000 | 278,000 | 3 | 35,820 | 1,853,000 | 934,000 |
| 4 | 3,480 | 45,400 | 22,900 | 9 | 21,030 | 573,000 | 289,000 | 4 | 36,090 | 1,889,000 | 952,000 |
| 585 | 3,810 | 49,000 | 24,700 | 630 | 21,450 | 594,000 | 299,000 | 675 | 36,350 | 1,925,000 | 971,000 |
| 6 | 4,140 | 53,000 | 26,700 | 1 | 21,860 | 616,000 | 311,000 | 6 | 36,620 | 1,962,000 | 989,000 |
| 7 | 4,470 | 57,300 | 28,900 | 2 | 22,270 | 638,000 | 322,000 | 7 | 36,880 | 1,998,000 | 1,007,000 |
| 8 | 4,800 | 61,900 | 31,200 | 3 | 22,680 | 660,000 | 333,000 | 8 | 37,150 | 2,035,000 | 1,026,000 |
| 9 | 5,120 | 66,900 | 33,700 | 4 | 23,090 | 683,000 | 344,000 | 9 | 37,410 | 2,073,000 | 1,045,000 |
| 590 | 5,450 | 72,200 | 36,400 | 635 | 23,500 | 707,000 | 356,000 | 680 | 37,680 | 2,110,000 | 1,064,000 |

**WOLF CREEK RESERVOIR
CUMBERLAND RIVER, KENTUCKY
AREA AND VOLUME TABLE
(Dam Site at Mile 460.9)**

| ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF | ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF | ELEV. M.S.L. | AREA Acres | VOLUME Acre Feet | VOLUME KDSF |
|-----------------|---------------|---------------------|----------------|-----------------|---------------|---------------------|----------------|-----------------|---------------|---------------------|----------------|
| 680 | 37,680 | 2,110,000 | 1,064,000 | 715 | 47,780 | 3,602,000 | 1,816,000 | 750 | 59,560 | 5,473,000 | 2,759,000 |
| 1 | 37,950 | 2,148,000 | 1,083,000 | 6 | 48,090 | 3,650,000 | 1,840,000 | 1 | 59,960 | 5,533,000 | 2,790,000 |
| 2 | 38,220 | 2,186,000 | 1,102,000 | 7 | 48,390 | 3,699,000 | 1,865,000 | 2 | 60,360 | 5,593,000 | 2,820,000 |
| 3 | 38,500 | 2,225,000 | 1,122,000 | 8 | 48,700 | 3,747,000 | 1,889,000 | 3 | 60,752 | 5,654,000 | 2,851,000 |
| 4 | 38,770 | 2,263,000 | 1,141,000 | 9 | 49,010 | 3,796,000 | 1,914,000 | 4 | 61,150 | 5,715,000 | 2,881,000 |
| 685 | 39,040 | 2,302,000 | 1,161,000 | 720 | 49,310 | 3,845,000 | 1,939,000 | 755 | 61,550 | 5,776,000 | 2,912,000 |
| 6 | 39,310 | 2,341,000 | 1,180,000 | 1 | 49,630 | 3,895,000 | 1,964,000 | 6 | 61,940 | 5,838,000 | 2,943,000 |
| 7 | 39,580 | 2,381,000 | 1,200,000 | 2 | 49,940 | 3,944,000 | 1,988,000 | 7 | 62,340 | 5,900,000 | 2,975,000 |
| 8 | 39,860 | 2,420,000 | 1,220,000 | 3 | 50,250 | 3,995,000 | 2,014,000 | 8 | 62,740 | 5,963,000 | 3,006,000 |
| 9 | 40,130 | 2,460,000 | 1,240,000 | 4 | 50,570 | 4,045,000 | 2,039,000 | 9 | 63,140 | 6,026,000 | 3,038,000 |
| 690 | 40,400 | 2,501,000 | 1,261,000 | 725 | 50,880 | 4,096,000 | 2,065,000 | 760 | 63,530 | 6,089,000 | 3,070,000 |
| 1 | 40,700 | 2,541,000 | 1,281,000 | 6 | 51,190 | 4,147,000 | 2,091,000 | 1 | 63,750 | 6,153,000 | 3,102,000 |
| 2 | 40,990 | 2,582,000 | 1,302,000 | 7 | 51,510 | 4,198,000 | 2,116,000 | 2 | 63,960 | 6,216,000 | 3,134,000 |
| 3 | 41,290 | 2,623,000 | 1,322,000 | 8 | 51,820 | 4,250,000 | 2,143,000 | 3 | 64,170 | 6,280,000 | 3,166,000 |
| 4 | 41,580 | 2,665,000 | 1,344,000 | 9 | 52,130 | 4,302,000 | 2,169,000 | 4 | 64,380 | 6,345,000 | 3,199,000 |
| 695 | 41,880 | 2,706,000 | 1,364,000 | 730 | 52,450 | 4,354,000 | 2,195,000 | 765 | 64,600 | 6,409,000 | 3,231,000 |
| 6 | 42,170 | 2,748,000 | 1,385,000 | 1 | 52,800 | 4,407,000 | 2,222,000 | 6 | 64,810 | 6,474,000 | 3,264,000 |
| 7 | 42,470 | 2,791,000 | 1,407,000 | 2 | 53,150 | 4,460,000 | 2,249,000 | 7 | 65,020 | 6,539,000 | 3,297,000 |
| 8 | 42,760 | 2,833,000 | 1,428,000 | 3 | 53,500 | 4,513,000 | 2,275,000 | 8 | 65,240 | 6,604,000 | 3,330,000 |
| 9 | 43,060 | 2,876,000 | 1,450,000 | 4 | 53,850 | 4,567,000 | 2,303,000 | 9 | 65,450 | 6,669,000 | 3,362,000 |
| 700 | 43,360 | 2,919,000 | 1,472,000 | 735 | 54,190 | 4,621,000 | 2,330,000 | 770 | 65,660 | 6,735,000 | 3,396,000 |
| 1 | 43,640 | 2,963,000 | 1,494,000 | 6 | 54,540 | 4,675,000 | 2,357,000 | 1 | 66,360 | 6,801,000 | 3,429,000 |
| 2 | 43,930 | 3,007,000 | 1,516,000 | 7 | 54,890 | 4,730,000 | 2,385,000 | 2 | 67,050 | 6,868,000 | 3,463,000 |
| 3 | 44,220 | 3,051,000 | 1,538,000 | 8 | 55,240 | 4,785,000 | 2,412,000 | 3 | 67,750 | 6,935,000 | 3,496,000 |
| 4 | 44,510 | 3,095,000 | 1,560,000 | 9 | 55,590 | 4,840,000 | 2,440,000 | | | | |
| 705 | 44,800 | 3,140,000 | 1,583,000 | 740 | 55,940 | 4,896,000 | 2,468,000 | | | | |
| 6 | 45,090 | 3,185,000 | 1,606,000 | 1 | 56,300 | 4,952,000 | 2,497,000 | | | | |
| 7 | 45,380 | 3,230,000 | 1,628,000 | 2 | 56,670 | 5,009,000 | 2,525,000 | | | | |
| 8 | 45,670 | 3,276,000 | 1,652,000 | 3 | 57,030 | 5,065,000 | 2,554,000 | | | | |
| 9 | 45,950 | 3,321,000 | 1,674,000 | 4 | 57,390 | 5,123,000 | 2,583,000 | | | | |
| 710 | 46,240 | 3,367,000 | 1,698,000 | 745 | 57,750 | 5,180,000 | 2,612,000 | | | | |
| 1 | 46,550 | 3,414,000 | 1,721,000 | 6 | 58,110 | 5,238,000 | 2,641,000 | | | | |
| 2 | 46,860 | 3,461,000 | 1,745,000 | 7 | 58,480 | 5,296,000 | 2,670,000 | | | | |
| 3 | 47,160 | 3,508,000 | 1,769,000 | 8 | 58,840 | 5,355,000 | 2,700,000 | | | | |
| 4 | 47,470 | 3,555,000 | 1,792,000 | 9 | 59,200 | 5,414,000 | 2,730,000 | | | | |
| 715 | 47,780 | 3,602,000 | 1,816,000 | 750 | 59,560 | 5,473,000 | 2,759,000 | | | | |

Note: Areas and volumes determined by Nashville District Corps of Engineers in January 1949 from Wolf Creek Reservoir Maps prepared by stereo-projection from aerial photographs flown in 1942. Map scale, 1:10,000; contour interval, 10 feet; datum, m.s.l. (Sandy Hook).

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| Elevation | 1-ft. Gate Opening | | | | | | | | | |
|-----------|---------------------|------|------|------|------|------|------|------|------|------|
| | Discharge in c.f.s. | | | | | | | | | |
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 297 | 306 | 314 | 322 |
| 725 | 330 | 338 | 346 | 354 | 362 | 370 | 378 | 386 | 394 | 401 |
| 726 | 408 | 415 | 422 | 429 | 436 | 442 | 448 | 454 | 460 | 466 |
| 727 | 472 | 478 | 484 | 490 | 496 | 502 | 507 | 513 | 519 | 524 |
| 728 | 529 | 534 | 540 | 545 | 551 | 556 | 561 | 566 | 571 | 576 |
| 729 | 581 | 586 | 591 | 596 | 601 | 606 | 610 | 615 | 619 | 623 |
| 730 | 628 | 632 | 636 | 641 | 645 | 649 | 654 | 658 | 663 | 667 |
| 731 | 671 | 675 | 680 | 684 | 688 | 693 | 697 | 701 | 705 | 709 |
| 732 | 713 | 717 | 721 | 725 | 728 | 732 | 736 | 740 | 743 | 747 |
| 733 | 751 | 755 | 759 | 762 | 766 | 770 | 773 | 777 | 781 | 785 |
| 734 | 788 | 792 | 796 | 799 | 803 | 806 | 810 | 814 | 817 | 821 |
| 735 | 824 | 828 | 831 | 834 | 838 | 841 | 844 | 848 | 851 | 854 |
| 736 | 858 | 861 | 864 | 868 | 871 | 875 | 878 | 881 | 884 | 887 |
| 737 | 890 | 893 | 896 | 900 | 903 | 906 | 910 | 913 | 916 | 919 |
| 738 | 922 | 925 | 928 | 931 | 934 | 937 | 940 | 943 | 946 | 949 |
| 739 | 952 | 955 | 958 | 961 | 964 | 967 | 970 | 973 | 975 | 978 |
| 740 | 981 | 984 | 987 | 990 | 993 | 996 | 998 | 1001 | 1004 | 1007 |
| 741 | 1010 | 1013 | 1016 | 1019 | 1021 | 1024 | 1027 | 1030 | 1033 | 1035 |
| 742 | 1038 | 1041 | 1044 | 1046 | 1049 | 1052 | 1054 | 1057 | 1060 | 1062 |
| 743 | 1065 | 1068 | 1071 | 1073 | 1076 | 1079 | 1081 | 1084 | 1086 | 1089 |
| 744 | 1091 | 1094 | 1096 | 1099 | 1102 | 1104 | 1107 | 1109 | 1112 | 1114 |
| 745 | 1117 | 1119 | 1122 | 1124 | 1127 | 1129 | 1132 | 1134 | 1137 | 1139 |
| 746 | 1142 | 1144 | 1147 | 1149 | 1152 | 1154 | 1157 | 1159 | 1162 | 1164 |
| 747 | 1167 | 1169 | 1172 | 1174 | 1177 | 1179 | 1182 | 1184 | 1187 | 1189 |
| 748 | 1191 | 1194 | 1196 | 1198 | 1201 | 1203 | 1206 | 1208 | 1210 | 1213 |
| 749 | 1215 | 1217 | 1220 | 1222 | 1224 | 1227 | 1229 | 1231 | 1234 | 1236 |
| 750 | 1238 | 1240 | 1243 | 1245 | 1247 | 1250 | 1252 | 1254 | 1256 | 1259 |
| 751 | 1261 | 1263 | 1265 | 1268 | 1270 | 1272 | 1274 | 1276 | 1279 | 1281 |
| 752 | 1283 | 1285 | 1287 | 1290 | 1292 | 1294 | 1296 | 1298 | 1301 | 1303 |
| 753 | 1305 | 1307 | 1309 | 1312 | 1314 | 1316 | 1318 | 1320 | 1323 | 1325 |
| 754 | 1327 | 1329 | 1331 | 1333 | 1335 | 1337 | 1340 | 1342 | 1344 | 1346 |
| 755 | 1348 | 1350 | 1352 | 1354 | 1356 | 1358 | 1361 | 1363 | 1365 | 1367 |
| 756 | 1369 | 1371 | 1373 | 1375 | 1377 | 1379 | 1381 | 1384 | 1386 | 1388 |
| 757 | 1390 | 1392 | 1394 | 1396 | 1398 | 1400 | 1402 | 1404 | 1406 | 1408 |
| 758 | 1410 | 1412 | 1414 | 1416 | 1418 | 1420 | 1422 | 1424 | 1426 | 1428 |
| 759 | 1430 | 1432 | 1434 | 1436 | 1438 | 1440 | 1442 | 1444 | 1446 | 1448 |
| 760 | 1450 | | | | | | | | | |

Sheet 1 of 11

Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 2-ft. Gate Opening | | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 722 | 737 |
| 726 | 752 | 766 | 780 | 794 | 808 | 822 | 836 | 850 | 864 | 877 |
| 727 | 890 | 903 | 916 | 929 | 941 | 953 | 965 | 977 | 988 | 999 |
| 728 | 1010 | 1021 | 1032 | 1043 | 1054 | 1065 | 1076 | 1087 | 1098 | 1108 |
| 729 | 1118 | 1128 | 1138 | 1148 | 1158 | 1168 | 1178 | 1188 | 1197 | 1206 |
| 730 | 1215 | 1224 | 1233 | 1242 | 1251 | 1260 | 1269 | 1278 | 1287 | 1296 |
| 731 | 1305 | 1314 | 1323 | 1332 | 1341 | 1350 | 1358 | 1366 | 1374 | 1382 |
| 732 | 1390 | 1398 | 1406 | 1414 | 1422 | 1430 | 1438 | 1446 | 1454 | 1462 |
| 733 | 1469 | 1477 | 1485 | 1492 | 1500 | 1508 | 1515 | 1522 | 1530 | 1537 |
| 734 | 1545 | 1552 | 1559 | 1567 | 1574 | 1582 | 1589 | 1596 | 1603 | 1610 |
| 735 | 1617 | 1624 | 1631 | 1638 | 1645 | 1652 | 1659 | 1665 | 1672 | 1679 |
| 736 | 1686 | 1693 | 1699 | 1706 | 1712 | 1719 | 1726 | 1732 | 1739 | 1745 |
| 737 | 1752 | 1759 | 1765 | 1771 | 1778 | 1784 | 1790 | 1797 | 1803 | 1810 |
| 738 | 1816 | 1822 | 1829 | 1835 | 1841 | 1847 | 1854 | 1860 | 1866 | 1872 |
| 739 | 1878 | 1884 | 1890 | 1896 | 1902 | 1908 | 1914 | 1920 | 1925 | 1931 |
| 740 | 1937 | 1943 | 1949 | 1954 | 1960 | 1966 | 1972 | 1978 | 1983 | 1989 |
| 741 | 1995 | 2001 | 2006 | 2012 | 2017 | 2023 | 2029 | 2034 | 2040 | 2045 |
| 742 | 2051 | 2057 | 2062 | 2068 | 2073 | 2079 | 2084 | 2090 | 2095 | 2101 |
| 743 | 2106 | 2111 | 2117 | 2122 | 2128 | 2133 | 2139 | 2144 | 2149 | 2155 |
| 744 | 2160 | 2165 | 2170 | 2176 | 2181 | 2186 | 2191 | 2196 | 2201 | 2206 |
| 745 | 2211 | 2216 | 2221 | 2226 | 2231 | 2236 | 2242 | 2247 | 2252 | 2257 |
| 746 | 2262 | 2267 | 2272 | 2277 | 2282 | 2287 | 2292 | 2297 | 2302 | 2307 |
| 747 | 2312 | 2317 | 2322 | 2327 | 2332 | 2337 | 2341 | 2346 | 2351 | 2356 |
| 748 | 2361 | 2366 | 2371 | 2375 | 2380 | 2385 | 2390 | 2395 | 2400 | 2404 |
| 749 | 2409 | 2414 | 2419 | 2423 | 2428 | 2433 | 2437 | 2442 | 2447 | 2451 |
| 750 | 2456 | 2461 | 2465 | 2470 | 2474 | 2479 | 2484 | 2488 | 2493 | 2497 |
| 751 | 2502 | 2507 | 2511 | 2516 | 2520 | 2525 | 2529 | 2534 | 2538 | 2543 |
| 752 | 2547 | 2551 | 2556 | 2560 | 2565 | 2569 | 2574 | 2578 | 2582 | 2587 |
| 753 | 2591 | 2595 | 2600 | 2604 | 2609 | 2613 | 2617 | 2622 | 2626 | 2631 |
| 754 | 2635 | 2639 | 2644 | 2648 | 2652 | 2657 | 2661 | 2665 | 2670 | 2674 |
| 755 | 2678 | 2682 | 2687 | 2691 | 2695 | 2699 | 2703 | 2708 | 2712 | 2716 |
| 756 | 2720 | 2724 | 2728 | 2732 | 2737 | 2741 | 2745 | 2749 | 2753 | 2757 |
| 757 | 2761 | 2765 | 2769 | 2773 | 2777 | 2781 | 2786 | 2790 | 2794 | 2798 |
| 758 | 2802 | 2806 | 2810 | 2814 | 2818 | 2822 | 2826 | 2830 | 2834 | 2838 |
| 759 | 2842 | 2846 | 2850 | 2854 | 2858 | 2862 | 2866 | 2870 | 2874 | 2878 |
| 760 | 2882 | | | | | | | | | |

Sheet 2 of 11

Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 3-ft. Gate Opening | | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1264 | 1284 | 1304 | 1323 | 1342 | 1361 | 1380 | 1398 | 1416 | 1434 |
| 728 | 1452 | 1470 | 1487 | 1504 | 1521 | 1538 | 1555 | 1572 | 1589 | 1606 |
| 729 | 1622 | 1638 | 1654 | 1670 | 1686 | 1701 | 1716 | 1731 | 1746 | 1761 |
| 730 | 1776 | 1791 | 1805 | 1819 | 1833 | 1847 | 1861 | 1875 | 1889 | 1903 |
| 731 | 1917 | 1931 | 1945 | 1959 | 1972 | 1985 | 1998 | 2011 | 2024 | 2037 |
| 732 | 2050 | 2063 | 2076 | 2089 | 2101 | 2113 | 2125 | 2137 | 2149 | 2161 |
| 733 | 2173 | 2185 | 2197 | 2209 | 2221 | 2233 | 2245 | 2256 | 2267 | 2278 |
| 734 | 2289 | 2301 | 2312 | 2323 | 2335 | 2346 | 2357 | 2368 | 2379 | 2390 |
| 735 | 2401 | 2412 | 2423 | 2434 | 2445 | 2455 | 2465 | 2476 | 2486 | 2497 |
| 736 | 2507 | 2517 | 2528 | 2538 | 2548 | 2558 | 2569 | 2579 | 2589 | 2599 |
| 737 | 2609 | 2619 | 2629 | 2639 | 2649 | 2659 | 2668 | 2678 | 2688 | 2698 |
| 738 | 2708 | 2717 | 2727 | 2736 | 2746 | 2755 | 2764 | 2774 | 2783 | 2793 |
| 739 | 2802 | 2811 | 2820 | 2829 | 2838 | 2847 | 2857 | 2866 | 2875 | 2884 |
| 740 | 2893 | 2902 | 2911 | 2920 | 2929 | 2938 | 2947 | 2956 | 2965 | 2974 |
| 741 | 2983 | 2992 | 3000 | 3009 | 3017 | 3026 | 3035 | 3043 | 3052 | 3060 |
| 742 | 3069 | 3078 | 3086 | 3094 | 3103 | 3111 | 3120 | 3128 | 3136 | 3145 |
| 743 | 3153 | 3161 | 3170 | 3178 | 3186 | 3194 | 3202 | 3211 | 3219 | 3227 |
| 744 | 3235 | 3243 | 3251 | 3259 | 3267 | 3275 | 3283 | 3291 | 3299 | 3307 |
| 745 | 3315 | 3323 | 3331 | 3339 | 3347 | 3354 | 3362 | 3370 | 3378 | 3385 |
| 746 | 3393 | 3401 | 3408 | 3416 | 3423 | 3431 | 3438 | 3446 | 3453 | 3461 |
| 747 | 3468 | 3476 | 3483 | 3491 | 3498 | 3506 | 3513 | 3521 | 3528 | 3536 |
| 748 | 3543 | 3550 | 3558 | 3565 | 3572 | 3580 | 3587 | 3594 | 3602 | 3609 |
| 749 | 3616 | 3623 | 3630 | 3638 | 3645 | 3652 | 3659 | 3666 | 3673 | 3680 |
| 750 | 3687 | 3694 | 3701 | 3708 | 3715 | 3722 | 3730 | 3737 | 3744 | 3751 |
| 751 | 3758 | 3765 | 3772 | 3778 | 3785 | 3792 | 3799 | 3806 | 3812 | 3819 |
| 752 | 3826 | 3833 | 3840 | 3846 | 3853 | 3860 | 3867 | 3873 | 3880 | 3886 |
| 753 | 3893 | 3900 | 3906 | 3913 | 3920 | 3927 | 3933 | 3940 | 3947 | 3953 |
| 754 | 3960 | 3967 | 3973 | 3980 | 3986 | 3993 | 3999 | 4006 | 4012 | 4019 |
| 755 | 4025 | 4032 | 4038 | 4045 | 4051 | 4058 | 4064 | 4071 | 4077 | 4084 |
| 756 | 4090 | 4096 | 4103 | 4109 | 4116 | 4122 | 4128 | 4135 | 4141 | 4148 |
| 757 | 4154 | 4160 | 4166 | 4173 | 4179 | 4185 | 4191 | 4197 | 4204 | 4210 |
| 758 | 4216 | 4222 | 4228 | 4234 | 4240 | 4246 | 4253 | 4259 | 4265 | 4271 |
| 759 | 4277 | 4283 | 4289 | 4295 | 4301 | 4307 | 4314 | 4320 | 4326 | 4332 |
| 760 | 4338 | | | | | | | | | |

Sheet 3 of 11

Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

4-ft. Gate Opening

| Elevation | Discharge in c.f.s. | | | | | | | | | |
|-----------|---------------------|------|------|------|------|------|------|------|------|------|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1883 | 1908 | 1932 | 1956 | 1980 | 2004 | 2028 | 2052 |
| 729 | 2075 | 2098 | 2121 | 2144 | 2167 | 2190 | 2212 | 2234 | 2256 | 2278 |
| 730 | 2290 | 2311 | 2332 | 2352 | 2372 | 2392 | 2412 | 2431 | 2450 | 2469 |
| 731 | 2488 | 2507 | 2525 | 2543 | 2561 | 2579 | 2597 | 2615 | 2633 | 2650 |
| 732 | 2667 | 2684 | 2701 | 2718 | 2735 | 2752 | 2769 | 2786 | 2803 | 2820 |
| 733 | 2837 | 2853 | 2869 | 2885 | 2901 | 2917 | 2933 | 2949 | 2965 | 2981 |
| 734 | 2997 | 3013 | 3029 | 3044 | 3059 | 3074 | 3089 | 3104 | 3119 | 3134 |
| 735 | 3149 | 3164 | 3179 | 3194 | 3209 | 3224 | 3238 | 3252 | 3266 | 3280 |
| 736 | 3294 | 3308 | 3322 | 3336 | 3350 | 3364 | 3378 | 3392 | 3406 | 3420 |
| 737 | 3433 | 3447 | 3460 | 3474 | 3487 | 3501 | 3514 | 3527 | 3541 | 3554 |
| 738 | 3567 | 3580 | 3593 | 3606 | 3619 | 3632 | 3644 | 3657 | 3670 | 3683 |
| 739 | 3696 | 3709 | 3721 | 3734 | 3746 | 3758 | 3771 | 3784 | 3796 | 3809 |
| 740 | 3821 | 3833 | 3846 | 3858 | 3870 | 3882 | 3895 | 3907 | 3919 | 3931 |
| 741 | 3943 | 3955 | 3966 | 3978 | 3989 | 4001 | 4013 | 4024 | 4036 | 4047 |
| 742 | 4059 | 4070 | 4082 | 4093 | 4104 | 4116 | 4127 | 4138 | 4149 | 4161 |
| 743 | 4172 | 4183 | 4194 | 4205 | 4216 | 4228 | 4239 | 4250 | 4261 | 4272 |
| 744 | 4283 | 4294 | 4305 | 4315 | 4326 | 4337 | 4348 | 4359 | 4369 | 4380 |
| 745 | 4391 | 4402 | 4413 | 4423 | 4433 | 4444 | 4454 | 4465 | 4475 | 4486 |
| 746 | 4496 | 4507 | 4517 | 4528 | 4538 | 4549 | 4559 | 4570 | 4580 | 4591 |
| 747 | 4601 | 4611 | 4621 | 4632 | 4642 | 4652 | 4662 | 4672 | 4682 | 4692 |
| 748 | 4702 | 4712 | 4722 | 4731 | 4741 | 4751 | 4761 | 4770 | 4780 | 4789 |
| 749 | 4799 | 4809 | 4818 | 4828 | 4838 | 4847 | 4857 | 4866 | 4876 | 4886 |
| 750 | 4895 | 4905 | 4914 | 4923 | 4933 | 4943 | 4953 | 4962 | 4972 | 4981 |
| 751 | 4991 | 5000 | 5010 | 5019 | 5028 | 5038 | 5047 | 5056 | 5066 | 5075 |
| 752 | 5084 | 5093 | 5102 | 5112 | 5121 | 5130 | 5139 | 5148 | 5157 | 5166 |
| 753 | 5175 | 5184 | 5193 | 5202 | 5211 | 5220 | 5229 | 5238 | 5247 | 5256 |
| 754 | 5265 | 5274 | 5283 | 5291 | 5300 | 5309 | 5318 | 5327 | 5335 | 5344 |
| 755 | 5353 | 5362 | 5370 | 5379 | 5388 | 5397 | 5405 | 5413 | 5422 | 5431 |
| 756 | 5440 | 5449 | 5457 | 5466 | 5474 | 5483 | 5491 | 5500 | 5508 | 5517 |
| 757 | 5525 | 5533 | 5542 | 5550 | 5559 | 5567 | 5575 | 5584 | 5592 | 5601 |
| 758 | 5609 | 5617 | 5626 | 5634 | 5642 | 5651 | 5659 | 5667 | 5675 | 5684 |
| 759 | 5692 | 5700 | 5708 | 5717 | 5725 | 5733 | 5741 | 5749 | 5758 | 5766 |
| 760 | 5774 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 5-ft. Gate Opening | | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2616 | 2643 | 2670 | 2696 | 2722 | 2748 |
| 730 | 2774 | 2800 | 2826 | 2852 | 2878 | 2904 | 2930 | 2956 | 2982 | 3008 |
| 731 | 3033 | 3057 | 3081 | 3105 | 3129 | 3153 | 3177 | 3201 | 3225 | 3249 |
| 732 | 3272 | 3295 | 3318 | 3341 | 3364 | 3386 | 3408 | 3430 | 3452 | 3474 |
| 733 | 3496 | 3517 | 3538 | 3559 | 3580 | 3601 | 3622 | 3643 | 3664 | 3684 |
| 734 | 3704 | 3724 | 3744 | 3764 | 3784 | 3804 | 3824 | 3844 | 3864 | 3883 |
| 735 | 3902 | 3921 | 3940 | 3959 | 3978 | 3997 | 4016 | 4035 | 4054 | 4073 |
| 736 | 4092 | 4110 | 4128 | 4146 | 4164 | 4182 | 4200 | 4218 | 4236 | 4253 |
| 737 | 4270 | 4287 | 4304 | 4322 | 4339 | 4356 | 4373 | 4390 | 4408 | 4425 |
| 738 | 4442 | 4459 | 4476 | 4492 | 4509 | 4526 | 4543 | 4560 | 4576 | 4593 |
| 739 | 4610 | 4626 | 4643 | 4659 | 4675 | 4692 | 4708 | 4724 | 4740 | 4756 |
| 740 | 4772 | 4788 | 4804 | 4819 | 4835 | 4851 | 4867 | 4883 | 4898 | 4913 |
| 741 | 4928 | 4943 | 4958 | 4973 | 4988 | 5003 | 5018 | 5033 | 5048 | 5063 |
| 742 | 5078 | 5093 | 5108 | 5122 | 5137 | 5152 | 5166 | 5181 | 5195 | 5210 |
| 743 | 5224 | 5238 | 5253 | 5267 | 5281 | 5295 | 5309 | 5323 | 5337 | 5351 |
| 744 | 5365 | 5379 | 5393 | 5407 | 5420 | 5434 | 5448 | 5462 | 5475 | 5489 |
| 745 | 5502 | 5516 | 5529 | 5543 | 5556 | 5570 | 5583 | 5597 | 5610 | 5624 |
| 746 | 5637 | 5650 | 5664 | 5677 | 5690 | 5704 | 5717 | 5730 | 5744 | 5757 |
| 747 | 5770 | 5783 | 5796 | 5809 | 5822 | 5835 | 5848 | 5861 | 5873 | 5886 |
| 748 | 5899 | 5912 | 5924 | 5937 | 5950 | 5962 | 5975 | 5988 | 6000 | 6013 |
| 749 | 6025 | 6038 | 6050 | 6062 | 6075 | 6087 | 6100 | 6112 | 6124 | 6137 |
| 750 | 6149 | 6161 | 6173 | 6186 | 6198 | 6210 | 6222 | 6234 | 6246 | 6258 |
| 751 | 6270 | 6282 | 6294 | 6306 | 6318 | 6330 | 6342 | 6354 | 6365 | 6377 |
| 752 | 6389 | 6401 | 6413 | 6424 | 6436 | 6448 | 6459 | 6471 | 6483 | 6494 |
| 753 | 6506 | 6518 | 6529 | 6541 | 6552 | 6564 | 6575 | 6586 | 6598 | 6609 |
| 754 | 6620 | 6631 | 6643 | 6654 | 6666 | 6677 | 6688 | 6699 | 6711 | 6722 |
| 755 | 6733 | 6744 | 6755 | 6766 | 6777 | 6788 | 6800 | 6811 | 6822 | 6833 |
| 756 | 6844 | 6855 | 6866 | 6877 | 6888 | 6899 | 6910 | 6921 | 6931 | 6942 |
| 757 | 6953 | 6964 | 6975 | 6985 | 6996 | 7007 | 7018 | 7029 | 7039 | 7050 |
| 758 | 7061 | 7071 | 7081 | 7092 | 7102 | 7113 | 7124 | 7134 | 7145 | 7155 |
| 759 | 7166 | 7176 | 7187 | 7197 | 7208 | 7218 | 7228 | 7239 | 7249 | 7260 |
| 760 | 7270 | | | | | | | | | |

Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 6-ft. Gate Opening | | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3403 | 3435 | 3467 | 3498 |
| 731 | 3529 | 3560 | 3591 | 3621 | 3651 | 3681 | 3711 | 3741 | 3771 | 3800 |
| 732 | 3829 | 3858 | 3887 | 3915 | 3943 | 3971 | 3999 | 4027 | 4054 | 4081 |
| 733 | 4108 | 4135 | 4162 | 4188 | 4214 | 4240 | 4266 | 4292 | 4317 | 4342 |
| 734 | 4367 | 4392 | 4417 | 4442 | 4467 | 4492 | 4517 | 4542 | 4566 | 4590 |
| 735 | 4614 | 4638 | 4662 | 4686 | 4710 | 4734 | 4757 | 4780 | 4803 | 4826 |
| 736 | 4849 | 4872 | 4895 | 4918 | 4940 | 4962 | 4984 | 5006 | 5028 | 5050 |
| 737 | 5072 | 5093 | 5114 | 5135 | 5156 | 5177 | 5198 | 5219 | 5240 | 5261 |
| 738 | 5282 | 5303 | 5324 | 5345 | 5366 | 5387 | 5407 | 5427 | 5448 | 5468 |
| 739 | 5488 | 5508 | 5528 | 5548 | 5568 | 5588 | 5608 | 5629 | 5649 | 5669 |
| 740 | 5689 | 5708 | 5727 | 5746 | 5765 | 5784 | 5803 | 5822 | 5841 | 5860 |
| 741 | 5879 | 5897 | 5916 | 5934 | 5953 | 5971 | 5989 | 6008 | 6026 | 6045 |
| 742 | 6063 | 6081 | 6099 | 6117 | 6135 | 6153 | 6170 | 6188 | 6206 | 6224 |
| 743 | 6242 | 6260 | 6277 | 6295 | 6312 | 6330 | 6347 | 6364 | 6382 | 6399 |
| 744 | 6416 | 6433 | 6450 | 6467 | 6484 | 6501 | 6518 | 6535 | 6552 | 6569 |
| 745 | 6586 | 6603 | 6619 | 6636 | 6652 | 6669 | 6686 | 6702 | 6719 | 6735 |
| 746 | 6752 | 6768 | 6784 | 6801 | 6817 | 6833 | 6849 | 6865 | 6881 | 6897 |
| 747 | 6913 | 6929 | 6945 | 6960 | 6976 | 6992 | 7008 | 7024 | 7039 | 7055 |
| 748 | 7071 | 7087 | 7102 | 7118 | 7133 | 7149 | 7164 | 7180 | 7195 | 7211 |
| 749 | 7226 | 7241 | 7256 | 7272 | 7287 | 7302 | 7317 | 7332 | 7347 | 7362 |
| 750 | 7377 | 7392 | 7407 | 7421 | 7436 | 7451 | 7466 | 7481 | 7495 | 7510 |
| 751 | 7525 | 7540 | 7554 | 7569 | 7583 | 7598 | 7612 | 7627 | 7641 | 7656 |
| 752 | 7670 | 7684 | 7699 | 7713 | 7727 | 7742 | 7756 | 7770 | 7785 | 7799 |
| 753 | 7813 | 7827 | 7841 | 7855 | 7869 | 7883 | 7897 | 7911 | 7925 | 7939 |
| 754 | 7953 | 7967 | 7981 | 7994 | 8008 | 8022 | 8036 | 8050 | 8063 | 8077 |
| 755 | 8091 | 8105 | 8118 | 8132 | 8145 | 8159 | 8172 | 8186 | 8199 | 8213 |
| 756 | 8226 | 8239 | 8253 | 8266 | 8279 | 8293 | 8306 | 8319 | 8333 | 8346 |
| 757 | 8359 | 8372 | 8385 | 8399 | 8412 | 8425 | 8438 | 8451 | 8464 | 8477 |
| 758 | 8490 | 8503 | 8516 | 8529 | 8542 | 8555 | 8568 | 8581 | 8593 | 8606 |
| 759 | 8619 | 8632 | 8645 | 8657 | 8670 | 8683 | 8696 | 8709 | 8721 | 8734 |
| 760 | 8747 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 7-ft. Gate Opening | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3438 | 3508 | 3579 | 3650 |
| 731 | 3722 | 3794 | 3867 | 3940 | 4014 | 4088 | 4163 | 4238 | 4262 | 4297 |
| 732 | 4332 | 4367 | 4402 | 4436 | 4470 | 4504 | 4538 | 4571 | 4604 | 4637 |
| 733 | 4670 | 4702 | 4733 | 4765 | 4796 | 4828 | 4859 | 4891 | 4922 | 4954 |
| 734 | 4985 | 5015 | 5045 | 5074 | 5104 | 5134 | 5163 | 5193 | 5223 | 5252 |
| 735 | 5282 | 5310 | 5338 | 5367 | 5395 | 5423 | 5451 | 5479 | 5507 | 5535 |
| 736 | 5563 | 5590 | 5617 | 5643 | 5670 | 5697 | 5723 | 5750 | 5777 | 5803 |
| 737 | 5803 | 5856 | 5882 | 5907 | 5933 | 5959 | 5984 | 6010 | 6035 | 6061 |
| 738 | 6086 | 6111 | 6136 | 6160 | 6185 | 6210 | 6234 | 6259 | 6283 | 6308 |
| 739 | 6332 | 6356 | 6380 | 6403 | 6427 | 6450 | 6474 | 6497 | 6521 | 6544 |
| 740 | 6567 | 6590 | 6613 | 6636 | 6659 | 6682 | 6704 | 6727 | 6750 | 6772 |
| 741 | 6795 | 6817 | 6840 | 6862 | 6884 | 6906 | 6928 | 6950 | 6972 | 6993 |
| 742 | 7015 | 7036 | 7058 | 7079 | 7101 | 7122 | 7143 | 7165 | 7186 | 7207 |
| 743 | 7229 | 7250 | 7271 | 7292 | 7313 | 7334 | 7355 | 7376 | 7396 | 7417 |
| 744 | 7438 | 7458 | 7478 | 7499 | 7519 | 7539 | 7559 | 7579 | 7599 | 7619 |
| 745 | 7639 | 7659 | 7679 | 7698 | 7718 | 7738 | 7757 | 7777 | 7797 | 7816 |
| 746 | 7836 | 7855 | 7874 | 7894 | 7913 | 7932 | 7951 | 7970 | 7990 | 8009 |
| 747 | 8028 | 8047 | 8066 | 8084 | 8103 | 8122 | 8140 | 8159 | 8178 | 8196 |
| 748 | 8215 | 8233 | 8252 | 8270 | 8289 | 8307 | 8325 | 8344 | 8362 | 8381 |
| 749 | 8399 | 8417 | 8435 | 8453 | 8471 | 8489 | 8507 | 8525 | 8542 | 8560 |
| 750 | 8578 | 8596 | 8613 | 8631 | 8648 | 8666 | 8684 | 8701 | 8719 | 8736 |
| 751 | 8754 | 8771 | 8788 | 8806 | 8823 | 8840 | 8857 | 8874 | 8892 | 8909 |
| 752 | 8926 | 8943 | 8960 | 8977 | 8994 | 9011 | 9028 | 9045 | 9061 | 9078 |
| 753 | 9095 | 9112 | 9128 | 9145 | 9161 | 9178 | 9195 | 9211 | 9228 | 9244 |
| 754 | 9261 | 9277 | 9294 | 9310 | 9326 | 9343 | 9359 | 9375 | 9391 | 9408 |
| 755 | 9424 | 9440 | 9456 | 9472 | 9488 | 9504 | 9520 | 9536 | 9552 | 9568 |
| 756 | 9584 | 9600 | 9616 | 9631 | 9647 | 9663 | 9679 | 9695 | 9710 | 9726 |
| 757 | 9742 | 9658 | 9773 | 9789 | 9804 | 9820 | 9835 | 9851 | 9866 | 9882 |
| 758 | 9897 | 9912 | 9927 | 9943 | 9958 | 9973 | 9988 | 10003 | 10019 | 10034 |
| 759 | 10049 | 10064 | 10079 | 10095 | 10110 | 10125 | 10140 | 10155 | 10170 | 10185 |
| 760 | 10200 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

8-ft. Gate Opening

| Elevation | Discharge in c.f.s. | | | | | | | | | |
|-----------|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3438 | 3508 | 3579 | 3650 |
| 731 | 3722 | 3794 | 3867 | 3940 | 4014 | 4088 | 4163 | 4238 | 4314 | 4390 |
| 732 | 4467 | 4545 | 4623 | 4701 | 4780 | 4859 | 4939 | 5019 | 5100 | 5141 |
| 733 | 5180 | 5219 | 5257 | 5295 | 5333 | 5371 | 5408 | 5445 | 5482 | 5518 |
| 734 | 5554 | 5590 | 5626 | 5661 | 5696 | 5731 | 5766 | 5801 | 5836 | 5870 |
| 735 | 5904 | 5938 | 5972 | 6005 | 6038 | 6071 | 6104 | 6137 | 6170 | 6203 |
| 736 | 6235 | 6266 | 6298 | 6329 | 6361 | 6392 | 6423 | 6455 | 6486 | 6518 |
| 737 | 6549 | 6579 | 6609 | 6640 | 6670 | 6700 | 6730 | 6760 | 6790 | 6820 |
| 738 | 6850 | 6879 | 6908 | 6936 | 6965 | 6994 | 7022 | 7051 | 7080 | 7108 |
| 739 | 7137 | 7165 | 7192 | 7220 | 7247 | 7275 | 7303 | 7330 | 7358 | 7385 |
| 740 | 7413 | 7440 | 7466 | 7493 | 7519 | 7546 | 7573 | 7599 | 7626 | 7652 |
| 741 | 7679 | 7705 | 7731 | 7756 | 7782 | 7808 | 7833 | 7859 | 7885 | 7910 |
| 742 | 7936 | 7961 | 7986 | 8011 | 8036 | 8061 | 8086 | 8111 | 8135 | 8160 |
| 743 | 8185 | 8209 | 8233 | 8258 | 8282 | 8306 | 8330 | 8354 | 8379 | 8403 |
| 744 | 8427 | 8451 | 8474 | 8498 | 8521 | 8545 | 8568 | 8592 | 8615 | 8639 |
| 745 | 8662 | 8685 | 8708 | 8731 | 8754 | 8777 | 8800 | 8823 | 8846 | 8869 |
| 746 | 8891 | 8913 | 8936 | 8958 | 8980 | 9003 | 9025 | 9047 | 9070 | 9092 |
| 747 | 9114 | 9136 | 9158 | 9180 | 9202 | 9224 | 9246 | 9268 | 9289 | 9310 |
| 748 | 9331 | 9352 | 9374 | 9395 | 9417 | 9438 | 9459 | 9481 | 9502 | 9524 |
| 749 | 9545 | 9566 | 9587 | 9607 | 9628 | 9649 | 9670 | 9691 | 9711 | 9732 |
| 750 | 9753 | 9773 | 9794 | 9814 | 9835 | 9855 | 9875 | 9896 | 9916 | 9937 |
| 751 | 9957 | 9977 | 9997 | 10017 | 10037 | 10057 | 10077 | 10097 | 10117 | 10137 |
| 752 | 10156 | 10176 | 10195 | 10215 | 10234 | 10254 | 10274 | 10293 | 10313 | 10332 |
| 753 | 10352 | 10371 | 10390 | 10410 | 10429 | 10448 | 10467 | 10486 | 10506 | 10525 |
| 754 | 10544 | 10563 | 10582 | 10601 | 10620 | 10639 | 10658 | 10677 | 10696 | 10715 |
| 755 | 10733 | 10752 | 10770 | 10789 | 10807 | 10826 | 10845 | 10863 | 10882 | 10900 |
| 756 | 10919 | 10937 | 10955 | 10974 | 10992 | 11010 | 11028 | 11046 | 11065 | 11083 |
| 757 | 11101 | 11119 | 11137 | 11155 | 11173 | 11191 | 11209 | 11227 | 11245 | 11263 |
| 758 | 11281 | 11299 | 11316 | 11334 | 11351 | 11369 | 11387 | 11404 | 11422 | 11439 |
| 759 | 11457 | 11474 | 11491 | 11509 | 11526 | 11543 | 11560 | 11577 | 11595 | 11612 |
| 760 | 11629 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| Elevation | 9-ft. Gate Opening | | | | | | | | | |
|-----------|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Discharge in c.f.s. | | | | | | | | | |
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3438 | 3508 | 3579 | 3650 |
| 731 | 3722 | 3794 | 3867 | 3940 | 4014 | 4088 | 4163 | 4238 | 4314 | 4390 |
| 732 | 4467 | 4545 | 4623 | 4701 | 4780 | 4859 | 4939 | 5019 | 5100 | 5181 |
| 733 | 5263 | 5345 | 5428 | 5511 | 5595 | 5679 | 5764 | 5849 | 5935 | 6021 |
| 734 | 6077 | 6118 | 6159 | 6200 | 6241 | 6282 | 6323 | 6364 | 6405 | 6445 |
| 735 | 6485 | 6524 | 6563 | 6602 | 6640 | 6678 | 6716 | 6754 | 6792 | 6830 |
| 736 | 6868 | 6905 | 6942 | 6979 | 7015 | 7051 | 7087 | 7123 | 7159 | 7195 |
| 737 | 7231 | 7266 | 7301 | 7336 | 7371 | 7406 | 7440 | 7474 | 7508 | 7542 |
| 738 | 7576 | 7610 | 7644 | 7677 | 7710 | 7743 | 7776 | 7809 | 7842 | 7875 |
| 739 | 7908 | 7940 | 7972 | 8004 | 8036 | 8068 | 8100 | 8132 | 8164 | 8195 |
| 740 | 8226 | 8257 | 8288 | 8319 | 8350 | 8381 | 8412 | 8442 | 8472 | 8502 |
| 741 | 8532 | 8562 | 8592 | 8622 | 8652 | 8682 | 8711 | 8740 | 8769 | 8798 |
| 742 | 8827 | 8856 | 8885 | 8914 | 8943 | 8972 | 9000 | 9028 | 9056 | 9084 |
| 743 | 9112 | 9140 | 9168 | 9196 | 9224 | 9252 | 9280 | 9307 | 9334 | 9361 |
| 744 | 9388 | 9415 | 9442 | 9469 | 9496 | 9523 | 9550 | 9577 | 9604 | 9631 |
| 745 | 9657 | 9683 | 9710 | 9736 | 9762 | 9789 | 9815 | 9842 | 9868 | 9894 |
| 746 | 9920 | 9946 | 9972 | 9998 | 10023 | 10048 | 10073 | 10098 | 10123 | 10148 |
| 747 | 10173 | 10198 | 10223 | 10248 | 10273 | 10298 | 10323 | 10348 | 10373 | 10398 |
| 748 | 10422 | 10447 | 10472 | 10497 | 10522 | 10547 | 10571 | 10595 | 10619 | 10643 |
| 749 | 10667 | 10691 | 10715 | 10739 | 10763 | 10787 | 10811 | 10835 | 10858 | 10881 |
| 750 | 10904 | 10927 | 10950 | 10974 | 10997 | 11020 | 11043 | 11066 | 11090 | 11113 |
| 751 | 11136 | 11159 | 11182 | 11204 | 11227 | 11250 | 11273 | 11296 | 11318 | 11341 |
| 752 | 11364 | 11386 | 11409 | 11431 | 11453 | 11476 | 11498 | 11520 | 11543 | 11565 |
| 753 | 11587 | 11609 | 11631 | 11653 | 11675 | 11697 | 11719 | 11741 | 11763 | 11784 |
| 754 | 11806 | 11828 | 11849 | 11871 | 11892 | 11914 | 11935 | 11957 | 11978 | 12000 |
| 755 | 12021 | 12042 | 12063 | 12085 | 12106 | 12127 | 12148 | 12169 | 12190 | 12211 |
| 756 | 12232 | 12253 | 12274 | 12294 | 12315 | 12336 | 12357 | 12377 | 12398 | 12419 |
| 757 | 12440 | 12460 | 12481 | 12501 | 12522 | 12542 | 12562 | 12583 | 12603 | 12624 |
| 758 | 12644 | 12664 | 12684 | 12704 | 12724 | 12744 | 12765 | 12785 | 12805 | 12825 |
| 759 | 12845 | 12865 | 12885 | 12904 | 12924 | 12944 | 12964 | 12984 | 13003 | 13023 |
| 760 | 13043 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| 10-ft. Gate Opening | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3438 | 3508 | 3579 | 3650 |
| 731 | 3722 | 3794 | 3867 | 3940 | 4014 | 4088 | 4163 | 4238 | 4314 | 4390 |
| 732 | 4467 | 4545 | 4623 | 4701 | 4780 | 4859 | 4939 | 5019 | 5100 | 5181 |
| 733 | 5263 | 5345 | 5428 | 5511 | 5595 | 5679 | 5764 | 5849 | 5935 | 6021 |
| 734 | 6108 | 6195 | 6283 | 6371 | 6460 | 6549 | 6638 | 6728 | 6818 | 6909 |
| 735 | 7000 | 7091 | 7185 | 7179 | 7223 | 7267 | 7311 | 7355 | 7398 | 7441 |
| 736 | 7484 | 7527 | 7569 | 7611 | 7653 | 7695 | 7737 | 7779 | 7820 | 7861 |
| 737 | 7902 | 7943 | 7984 | 8024 | 8064 | 8104 | 8144 | 8183 | 8222 | 8261 |
| 738 | 8300 | 8339 | 8378 | 8416 | 8454 | 8492 | 8530 | 8567 | 8604 | 8641 |
| 739 | 8678 | 8715 | 8752 | 8789 | 8825 | 8861 | 8897 | 8933 | 8969 | 9005 |
| 740 | 9041 | 9076 | 9111 | 9146 | 9181 | 9216 | 9251 | 9286 | 9321 | 9356 |
| 741 | 9391 | 9425 | 9459 | 9493 | 9527 | 9561 | 9594 | 9627 | 9660 | 9693 |
| 742 | 9726 | 9759 | 9792 | 9825 | 9858 | 9891 | 9923 | 9955 | 9987 | 10019 |
| 743 | 10051 | 10083 | 10115 | 10147 | 10179 | 10211 | 10242 | 10273 | 10304 | 10335 |
| 744 | 10366 | 10397 | 10428 | 10459 | 10490 | 10521 | 10552 | 10582 | 10612 | 10642 |
| 745 | 10672 | 10702 | 10732 | 10762 | 10792 | 10822 | 10852 | 10881 | 10910 | 10939 |
| 746 | 10968 | 10997 | 11026 | 11055 | 11084 | 11113 | 11142 | 11171 | 11200 | 11229 |
| 747 | 11258 | 11287 | 11316 | 11345 | 11373 | 11401 | 11429 | 11457 | 11485 | 11513 |
| 748 | 11541 | 11569 | 11597 | 11625 | 11653 | 11681 | 11708 | 11735 | 11762 | 11789 |
| 749 | 11816 | 11843 | 11870 | 11897 | 11924 | 11951 | 11978 | 12005 | 12032 | 12059 |
| 750 | 12085 | 12111 | 12138 | 12164 | 12190 | 12217 | 12243 | 12269 | 12296 | 12322 |
| 751 | 12348 | 12374 | 12400 | 12425 | 12451 | 12477 | 12503 | 12529 | 12554 | 12580 |
| 752 | 12606 | 12631 | 12656 | 12682 | 12707 | 12732 | 12757 | 12782 | 12808 | 12833 |
| 753 | 12858 | 12883 | 12908 | 12932 | 12957 | 12982 | 13007 | 13032 | 13056 | 13081 |
| 754 | 13106 | 13130 | 13155 | 13179 | 13203 | 13228 | 13252 | 13276 | 13301 | 13325 |
| 755 | 13349 | 13373 | 13397 | 13421 | 13445 | 13469 | 13493 | 13517 | 13540 | 13564 |
| 756 | 13588 | 13612 | 13635 | 13659 | 13682 | 13706 | 13729 | 13753 | 13776 | 13800 |
| 757 | 13823 | 13846 | 13869 | 13893 | 13916 | 13939 | 13962 | 13985 | 14008 | 14031 |
| 758 | 14054 | 14077 | 14099 | 14122 | 14144 | 14167 | 14190 | 14212 | 14235 | 14257 |
| 759 | 14280 | 14302 | 14325 | 14347 | 14369 | 14392 | 14414 | 14436 | 14459 | 14481 |
| 760 | 14503 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SPILLWAY RATING TABLE
WOLF CREEK DAM
(Discharge per Gate)

| Free Flow | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Discharge in c.f.s. | | | | | | | | | | |
| Elevation | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 723 | 0 | 7 | 16 | 27 | 40 | 55 | 71 | 89 | 109 | 131 |
| 724 | 156 | 181 | 207 | 233 | 260 | 288 | 317 | 348 | 380 | 413 |
| 725 | 446 | 480 | 515 | 551 | 588 | 626 | 664 | 703 | 743 | 784 |
| 726 | 826 | 868 | 911 | 955 | 1000 | 1045 | 1091 | 1137 | 1184 | 1232 |
| 727 | 1281 | 1330 | 1380 | 1431 | 1482 | 1534 | 1586 | 1639 | 1693 | 1747 |
| 728 | 1802 | 1858 | 1914 | 1971 | 2029 | 2087 | 2146 | 2205 | 2265 | 2325 |
| 729 | 2386 | 2447 | 2509 | 2572 | 2635 | 2699 | 2763 | 2828 | 2893 | 2959 |
| 730 | 3026 | 3093 | 3161 | 3229 | 3298 | 3368 | 3438 | 3508 | 3579 | 3650 |
| 731 | 3722 | 3794 | 3867 | 3940 | 4014 | 4088 | 4163 | 4238 | 4314 | 4390 |
| 732 | 4467 | 4545 | 4623 | 4701 | 4780 | 4859 | 4939 | 5019 | 5100 | 5181 |
| 733 | 5263 | 5345 | 5428 | 5511 | 5595 | 5679 | 5764 | 5849 | 5935 | 6021 |
| 734 | 6108 | 6195 | 6283 | 6371 | 6460 | 6549 | 6638 | 6728 | 6818 | 6909 |
| 735 | 7000 | 7091 | 7183 | 7275 | 7367 | 7460 | 7554 | 7649 | 7744 | 7840 |
| 736 | 7936 | 8032 | 8129 | 8226 | 8324 | 8423 | 8522 | 8621 | 8720 | 8819 |
| 737 | 8918 | 9018 | 9119 | 9220 | 9322 | 9424 | 9527 | 9630 | 9734 | 9838 |
| 738 | 9942 | 10047 | 10152 | 10258 | 10364 | 10470 | 10577 | 10685 | 10793 | 10901 |
| 739 | 11010 | 11119 | 11228 | 11338 | 11448 | 11559 | 11670 | 11782 | 11893 | 12005 |
| 740 | 12116 | 12230 | 12345 | 12459 | 12574 | 12688 | 12804 | 12919 | 13035 | 13150 |
| 741 | 13266 | 13384 | 13502 | 13621 | 13739 | 13857 | 13977 | 14096 | 14216 | 14335 |
| 742 | 14455 | 14577 | 14698 | 14820 | 14941 | 15063 | 15187 | 15312 | 15436 | 15561 |
| 743 | 15685 | 15812 | 15939 | 16065 | 16192 | 16319 | 16447 | 16576 | 16704 | 16833 |
| 744 | 16961 | 17090 | 17219 | 17348 | 17477 | 17606 | 17738 | 17870 | 18002 | 18134 |
| 745 | 18266 | 18400 | 18533 | 18667 | 18800 | 18934 | 19069 | 19203 | 19338 | 19472 |
| 746 | 19607 | 19745 | 19883 | 20021 | 20159 | 20297 | 20438 | 20579 | 20720 | 20861 |
| 747 | 21002 | 21144 | 21285 | 21427 | 21568 | 21710 | 21852 | 21994 | 22137 | 22279 |
| 748 | 22421 | 22566 | 22711 | 22856 | 23001 | 23146 | 23293 | 23440 | 23587 | 23734 |
| 749 | 23881 | 24028 | 24176 | 24323 | 24471 | 24618 | 24768 | 24918 | 25069 | 25219 |
| 750 | 25369 | 25521 | 25673 | 25826 | 25978 | 26130 | 26285 | 26440 | 26595 | 26750 |
| 751 | 26905 | 27064 | 27222 | 27380 | 27539 | 27698 | 27856 | 28013 | 28171 | 28328 |
| 752 | 28486 | 28644 | 28803 | 28961 | 29120 | 29278 | 29440 | 29603 | 29765 | 29928 |
| 753 | 30090 | 30253 | 30416 | 30580 | 30743 | 30906 | 31074 | 31241 | 31409 | 31576 |
| 754 | 31744 | 31910 | 32077 | 32243 | 32410 | 32576 | 32745 | 32913 | 33082 | 33250 |
| 755 | 33419 | 33590 | 33761 | 33933 | 34104 | 34275 | 34447 | 34619 | 34792 | 34964 |
| 756 | 35136 | 35310 | 35484 | 35657 | 35831 | 36005 | 36180 | 36355 | 36530 | 36705 |
| 757 | 36880 | 37059 | 37239 | 37418 | 37598 | 37777 | 37959 | 38140 | 38322 | 38503 |
| 758 | 38685 | 38866 | 39046 | 39227 | 39407 | 39588 | 39771 | 39955 | 40138 | 40322 |
| 759 | 40505 | 40690 | 40875 | 41060 | 41245 | 41430 | 41618 | 41806 | 41994 | 42182 |
| 760 | 42370 | | | | | | | | | |

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Notes: (1) To ascertain the discharge for more than one gate, sum the tabular discharge for each gate in operation.
(2) Wolf Creek has ten (10) spillway gates.

SLUICE RATING TABLE

WOLF CREEK DAM

(Discharge per Sluice)

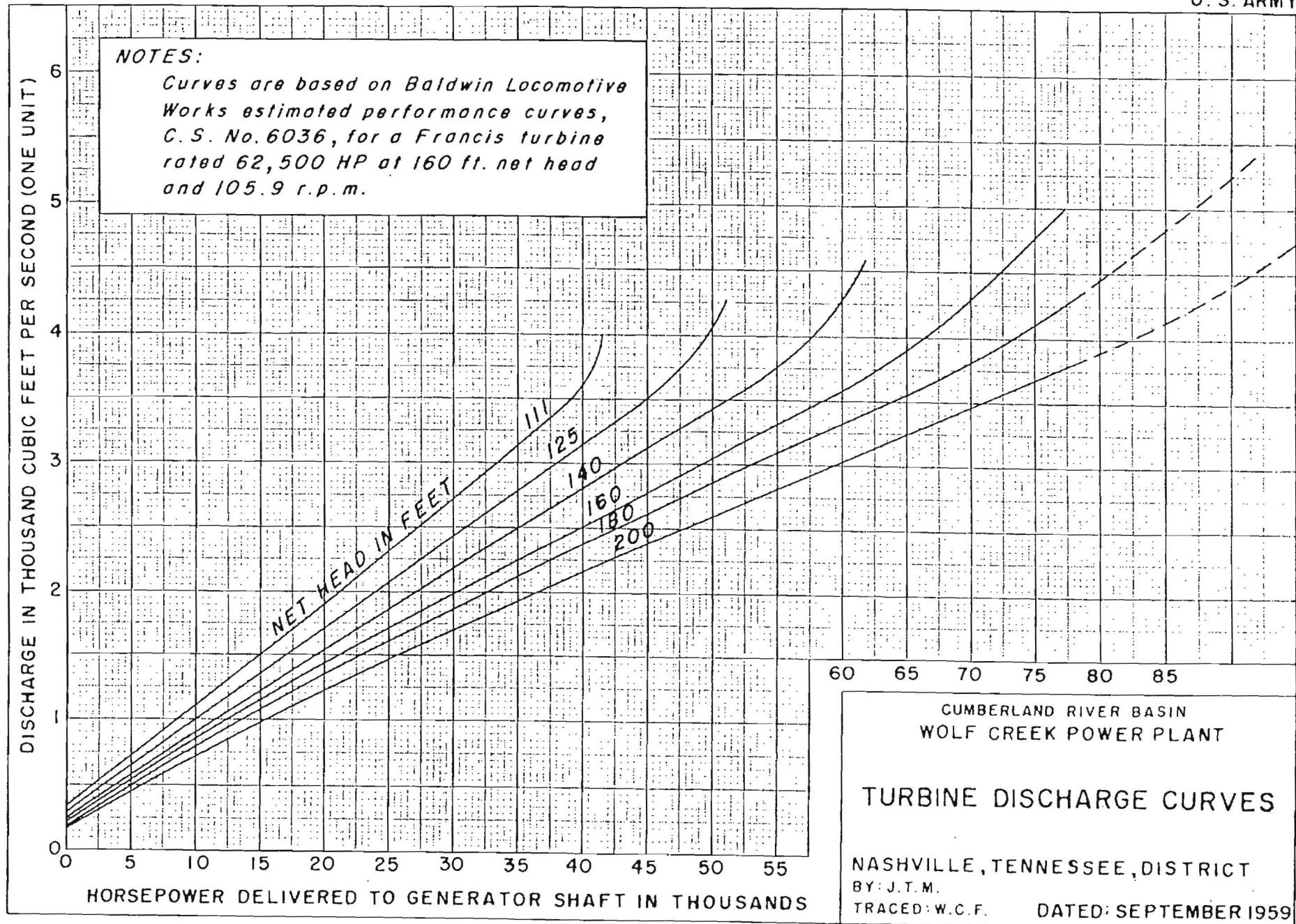
| Head in feet | Discharge in c.f.s. | | | | | | | | | |
|-----------------|---------------------|------|------|------|------|------|------|------|------|------|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 100 | 1268 | 1269 | 1269 | 1270 | 1271 | 1271 | 1272 | 1272 | 1273 | 1274 |
| 101 | 1274 | 1275 | 1276 | 1276 | 1277 | 1277 | 1278 | 1279 | 1279 | 1280 |
| 102 | 1281 | 1281 | 1282 | 1282 | 1283 | 1284 | 1284 | 1285 | 1286 | 1286 |
| 103 | 1287 | 1288 | 1288 | 1289 | 1289 | 1290 | 1291 | 1291 | 1292 | 1292 |
| 104 | 1293 | 1294 | 1294 | 1295 | 1296 | 1296 | 1297 | 1297 | 1298 | 1299 |
| 105 | 1299 | 1300 | 1301 | 1301 | 1302 | 1302 | 1303 | 1304 | 1304 | 1305 |
| 106 | 1305 | 1306 | 1307 | 1307 | 1308 | 1309 | 1309 | 1310 | 1310 | 1311 |
| 107 | 1312 | 1312 | 1313 | 1313 | 1314 | 1315 | 1315 | 1316 | 1317 | 1317 |
| 108 | 1318 | 1318 | 1319 | 1320 | 1320 | 1321 | 1321 | 1322 | 1323 | 1323 |
| 109 | 1324 | 1324 | 1325 | 1326 | 1326 | 1327 | 1327 | 1328 | 1329 | 1329 |
| 110 | 1330 | 1330 | 1331 | 1332 | 1332 | 1333 | 1334 | 1334 | 1335 | 1335 |
| 111 | 1336 | 1337 | 1337 | 1338 | 1338 | 1339 | 1340 | 1340 | 1341 | 1341 |
| 112 | 1342 | 1343 | 1343 | 1344 | 1344 | 1345 | 1346 | 1346 | 1347 | 1347 |
| 113 | 1348 | 1348 | 1349 | 1350 | 1350 | 1351 | 1351 | 1352 | 1353 | 1353 |
| 114 | 1354 | 1354 | 1355 | 1356 | 1356 | 1357 | 1357 | 1358 | 1359 | 1359 |
| 115 | 1360 | 1360 | 1361 | 1362 | 1362 | 1363 | 1363 | 1364 | 1364 | 1365 |
| 116 | 1366 | 1366 | 1367 | 1367 | 1368 | 1369 | 1369 | 1370 | 1370 | 1371 |
| 117 | 1372 | 1372 | 1373 | 1373 | 1374 | 1374 | 1375 | 1376 | 1376 | 1377 |
| 118 | 1377 | 1378 | 1379 | 1379 | 1380 | 1380 | 1381 | 1381 | 1382 | 1383 |
| 119 | 1383 | 1384 | 1384 | 1385 | 1386 | 1386 | 1387 | 1387 | 1388 | 1388 |
| 120 | 1389 | 1390 | 1390 | 1391 | 1391 | 1392 | 1392 | 1393 | 1394 | 1394 |
| 121 | 1395 | 1395 | 1396 | 1397 | 1397 | 1398 | 1398 | 1399 | 1399 | 1400 |
| 122 | 1401 | 1401 | 1402 | 1402 | 1403 | 1403 | 1404 | 1405 | 1405 | 1406 |
| 123 | 1406 | 1407 | 1407 | 1408 | 1409 | 1409 | 1410 | 1410 | 1411 | 1411 |
| 124 | 1412 | 1413 | 1413 | 1414 | 1414 | 1415 | 1415 | 1416 | 1417 | 1417 |
| 125 | 1418 | 1418 | 1419 | 1419 | 1420 | 1420 | 1421 | 1422 | 1422 | 1423 |
| 126 | 1423 | 1424 | 1424 | 1425 | 1426 | 1426 | 1427 | 1427 | 1428 | 1428 |
| 127 | 1429 | 1430 | 1430 | 1431 | 1431 | 1432 | 1432 | 1433 | 1433 | 1434 |
| 128 | 1435 | 1435 | 1436 | 1436 | 1437 | 1437 | 1438 | 1438 | 1439 | 1440 |
| 129 | 1440 | 1441 | 1441 | 1442 | 1442 | 1443 | 1444 | 1444 | 1445 | 1445 |
| 130 | 1446 | 1446 | 1447 | 1447 | 1448 | 1449 | 1449 | 1450 | 1450 | 1451 |
| 131 | 1451 | 1452 | 1452 | 1453 | 1454 | 1454 | 1455 | 1455 | 1456 | 1456 |
| 132 | 1457 | 1457 | 1458 | 1458 | 1459 | 1460 | 1460 | 1461 | 1461 | 1462 |
| 133 | 1462 | 1463 | 1463 | 1464 | 1465 | 1465 | 1466 | 1466 | 1467 | 1467 |
| 134 | 1468 | 1468 | 1469 | 1469 | 1470 | 1471 | 1471 | 1472 | 1472 | 1473 |
| 135 | 1473 | 1474 | 1474 | 1475 | 1475 | 1476 | 1477 | 1477 | 1478 | 1478 |
| 136 | 1479 | 1479 | 1480 | 1480 | 1481 | 1481 | 1482 | 1483 | 1483 | 1484 |
| 137 | 1484 | 1485 | 1485 | 1486 | 1486 | 1487 | 1487 | 1488 | 1488 | 1489 |
| 138 | 1490 | 1490 | 1491 | 1491 | 1492 | 1492 | 1493 | 1493 | 1494 | 1494 |
| 139 | 1495 | 1495 | 1496 | 1497 | 1497 | 1498 | 1498 | 1499 | 1499 | 1500 |
| 140 | 1500 | 1501 | 1501 | 1502 | 1502 | 1503 | 1504 | 1504 | 1505 | 1505 |
| 141 | 1506 | 1506 | 1507 | 1507 | 1508 | 1508 | 1509 | 1509 | 1510 | 1510 |
| 142 | 1511 | 1512 | 1512 | 1513 | 1513 | 1514 | 1514 | 1515 | 1515 | 1516 |
| 143 | 1516 | 1517 | 1517 | 1518 | 1518 | 1519 | 1519 | 1520 | 1521 | 1521 |
| 144 | 1522 | 1522 | 1523 | 1523 | 1524 | 1524 | 1525 | 1525 | 1526 | 1526 |
| 145 | 1527 | 1527 | 1528 | 1528 | 1529 | 1529 | 1530 | 1531 | 1531 | 1532 |
| 146 | 1532 | 1533 | 1533 | 1534 | 1534 | 1535 | 1535 | 1536 | 1536 | 1537 |
| 147 | 1538 | 1538 | 1538 | 1539 | 1539 | 1540 | 1541 | 1541 | 1542 | 1542 |
| 148 | 1543 | 1543 | 1544 | 1544 | 1545 | 1545 | 1546 | 1546 | 1547 | 1547 |
| 149 | 1548 | 1548 | 1549 | 1549 | 1550 | 1550 | 1551 | 1551 | 1552 | 1552 |
| 150 | 1553 | 1553 | 1554 | 1555 | 1555 | 1556 | 1556 | 1557 | 1557 | 1558 |

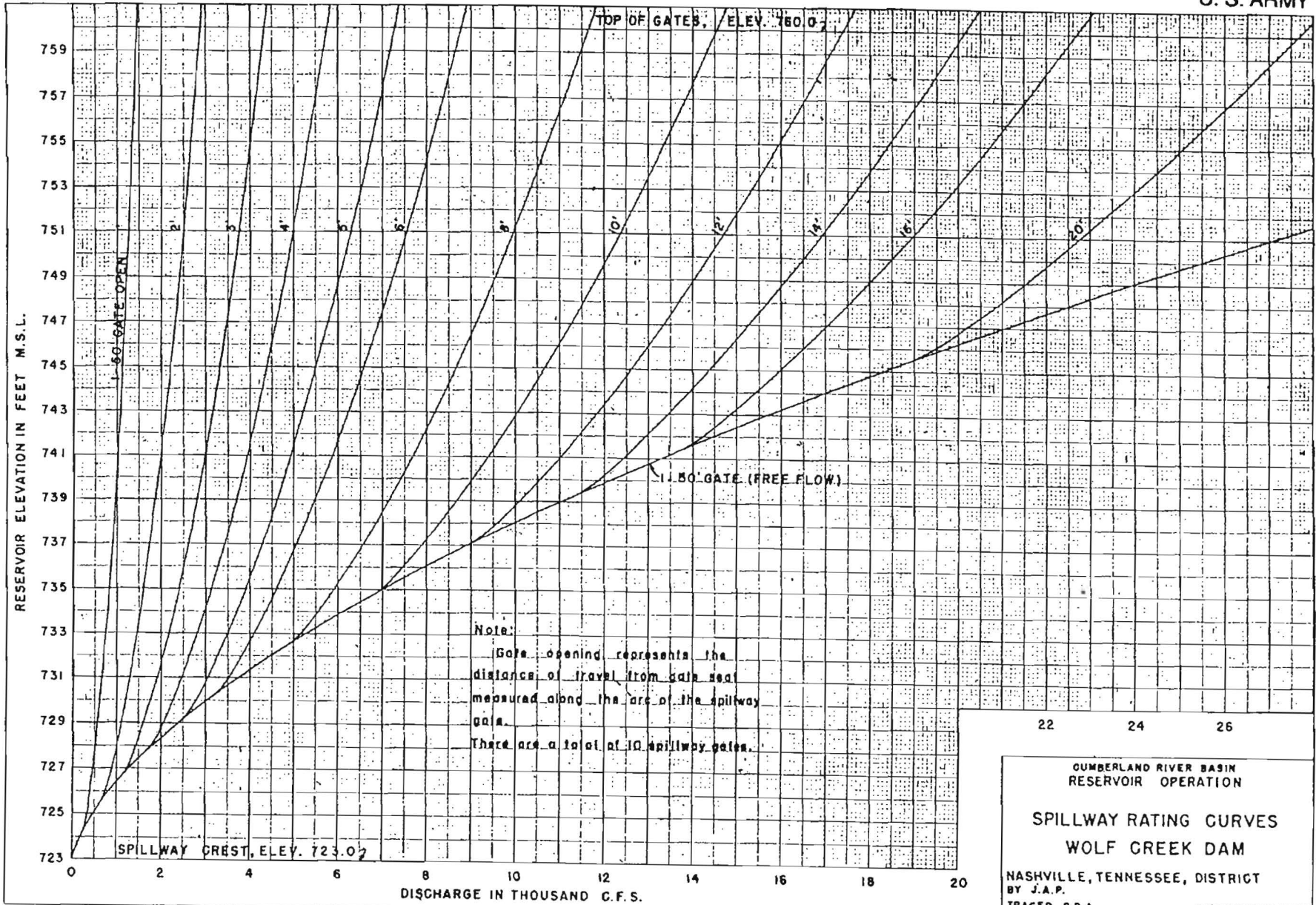
- Notes: (1) Head is differential in feet between reservoir and tailwater elevations.
(2) Whenever tailwater is below elevation 546, use this elevation in computing head.
(3) To ascertain the discharge for more than one sluice, sum the tabular discharge for each sluice in operation.
(4) Wolf Creek has six (6) sluice gates.

SLUICE RATING TABLE
WOLF CREEK DAM
(Discharge per Sluice)

| Head in feet | Discharge in c.f.s. | | | | | | | | | |
|-----------------|---------------------|------|------|------|------|------|------|------|------|------|
| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 150 | 1553 | 1553 | 1554 | 1555 | 1555 | 1556 | 1556 | 1557 | 1557 | 1558 |
| 151 | 1558 | 1559 | 1559 | 1560 | 1560 | 1561 | 1561 | 1562 | 1562 | 1563 |
| 152 | 1563 | 1564 | 1564 | 1565 | 1565 | 1566 | 1566 | 1567 | 1567 | 1568 |
| 153 | 1568 | 1569 | 1569 | 1570 | 1570 | 1571 | 1572 | 1572 | 1573 | 1573 |
| 154 | 1574 | 1574 | 1575 | 1575 | 1576 | 1576 | 1577 | 1577 | 1578 | 1578 |
| 155 | 1579 | 1579 | 1580 | 1580 | 1581 | 1581 | 1582 | 1582 | 1583 | 1583 |
| 156 | 1584 | 1584 | 1585 | 1585 | 1586 | 1586 | 1587 | 1587 | 1588 | 1588 |
| 157 | 1589 | 1589 | 1590 | 1590 | 1591 | 1591 | 1592 | 1592 | 1593 | 1593 |
| 158 | 1594 | 1594 | 1595 | 1595 | 1596 | 1596 | 1597 | 1597 | 1598 | 1598 |
| 159 | 1599 | 1599 | 1600 | 1600 | 1601 | 1601 | 1602 | 1602 | 1603 | 1603 |
| 160 | 1604 | 1604 | 1605 | 1605 | 1606 | 1606 | 1607 | 1607 | 1608 | 1608 |
| 161 | 1609 | 1609 | 1610 | 1610 | 1611 | 1611 | 1612 | 1612 | 1613 | 1613 |
| 162 | 1614 | 1614 | 1615 | 1615 | 1616 | 1616 | 1617 | 1617 | 1618 | 1618 |
| 163 | 1619 | 1619 | 1620 | 1620 | 1621 | 1621 | 1622 | 1622 | 1623 | 1623 |
| 164 | 1624 | 1624 | 1625 | 1625 | 1626 | 1626 | 1627 | 1627 | 1628 | 1628 |
| 165 | 1629 | 1629 | 1630 | 1630 | 1631 | 1631 | 1632 | 1632 | 1633 | 1633 |
| 166 | 1634 | 1634 | 1635 | 1635 | 1636 | 1636 | 1637 | 1637 | 1638 | 1638 |
| 167 | 1639 | 1639 | 1640 | 1640 | 1641 | 1641 | 1642 | 1642 | 1643 | 1643 |
| 168 | 1644 | 1644 | 1644 | 1645 | 1645 | 1646 | 1646 | 1647 | 1647 | 1648 |
| 169 | 1648 | 1649 | 1649 | 1650 | 1650 | 1651 | 1651 | 1652 | 1652 | 1653 |
| 170 | 1653 | 1654 | 1654 | 1655 | 1655 | 1656 | 1656 | 1657 | 1657 | 1658 |
| 171 | 1658 | 1659 | 1659 | 1660 | 1660 | 1661 | 1661 | 1662 | 1662 | 1662 |
| 172 | 1663 | 1663 | 1664 | 1664 | 1665 | 1665 | 1666 | 1666 | 1667 | 1667 |
| 173 | 1668 | 1668 | 1669 | 1669 | 1670 | 1670 | 1671 | 1671 | 1672 | 1672 |
| 174 | 1673 | 1673 | 1674 | 1674 | 1675 | 1675 | 1675 | 1676 | 1676 | 1677 |
| 175 | 1677 | 1678 | 1678 | 1679 | 1679 | 1680 | 1680 | 1681 | 1681 | 1682 |
| 176 | 1682 | 1683 | 1683 | 1684 | 1684 | 1685 | 1685 | 1686 | 1686 | 1686 |
| 177 | 1687 | 1687 | 1688 | 1688 | 1689 | 1689 | 1690 | 1690 | 1691 | 1691 |
| 178 | 1692 | 1692 | 1693 | 1693 | 1694 | 1694 | 1695 | 1695 | 1696 | 1696 |
| 179 | 1696 | 1697 | 1697 | 1698 | 1698 | 1699 | 1699 | 1700 | 1700 | 1701 |
| 180 | 1701 | 1702 | 1702 | 1703 | 1703 | 1704 | 1704 | 1705 | 1705 | 1705 |
| 181 | 1706 | 1706 | 1707 | 1707 | 1708 | 1708 | 1709 | 1709 | 1710 | 1710 |
| 182 | 1711 | 1711 | 1712 | 1712 | 1712 | 1713 | 1713 | 1714 | 1714 | 1715 |
| 183 | 1715 | 1716 | 1716 | 1717 | 1717 | 1718 | 1718 | 1719 | 1719 | 1720 |
| 184 | 1720 | 1720 | 1721 | 1721 | 1722 | 1722 | 1723 | 1723 | 1724 | 1724 |
| 185 | 1725 | 1725 | 1726 | 1726 | 1727 | 1727 | 1727 | 1728 | 1728 | 1729 |
| 186 | 1729 | 1730 | 1730 | 1731 | 1731 | 1732 | 1732 | 1733 | 1733 | 1733 |
| 187 | 1734 | 1734 | 1735 | 1735 | 1736 | 1736 | 1737 | 1737 | 1738 | 1738 |
| 188 | 1739 | 1739 | 1740 | 1740 | 1740 | 1741 | 1741 | 1742 | 1742 | 1743 |
| 189 | 1743 | 1744 | 1744 | 1745 | 1745 | 1746 | 1746 | 1746 | 1747 | 1747 |
| 190 | 1748 | 1748 | 1749 | 1749 | 1750 | 1750 | 1751 | 1751 | 1751 | 1752 |
| 191 | 1752 | 1753 | 1753 | 1754 | 1754 | 1755 | 1755 | 1756 | 1756 | 1757 |
| 192 | 1757 | 1757 | 1758 | 1758 | 1759 | 1759 | 1760 | 1760 | 1761 | 1761 |
| 193 | 1762 | 1762 | 1762 | 1763 | 1763 | 1764 | 1764 | 1765 | 1765 | 1766 |
| 194 | 1766 | 1767 | 1767 | 1767 | 1768 | 1768 | 1769 | 1769 | 1770 | 1770 |
| 195 | 1771 | 1771 | 1772 | 1772 | 1772 | 1773 | 1773 | 1774 | 1774 | 1775 |
| 196 | 1775 | 1776 | 1776 | 1777 | 1777 | 1777 | 1778 | 1778 | 1779 | 1779 |
| 197 | 1780 | 1780 | 1781 | 1781 | 1782 | 1782 | 1782 | 1783 | 1783 | 1784 |
| 198 | 1784 | 1785 | 1785 | 1786 | 1786 | 1786 | 1787 | 1787 | 1788 | 1788 |
| 199 | 1789 | 1789 | 1790 | 1790 | 1791 | 1791 | 1791 | 1792 | 1792 | 1793 |
| 200 | 1793 | | | | | | | | | |

- Notes: (1) Head is differential in feet between reservoir and tailwater elevations.
(2) Whenever tailwater is below elevation 546, use this elevation in computing head.
(3) To ascertain the discharge for more than one sluice, sum the tabular discharge for each sluice in operation.
(4) Wolf Creek has six (6) sluice gates.





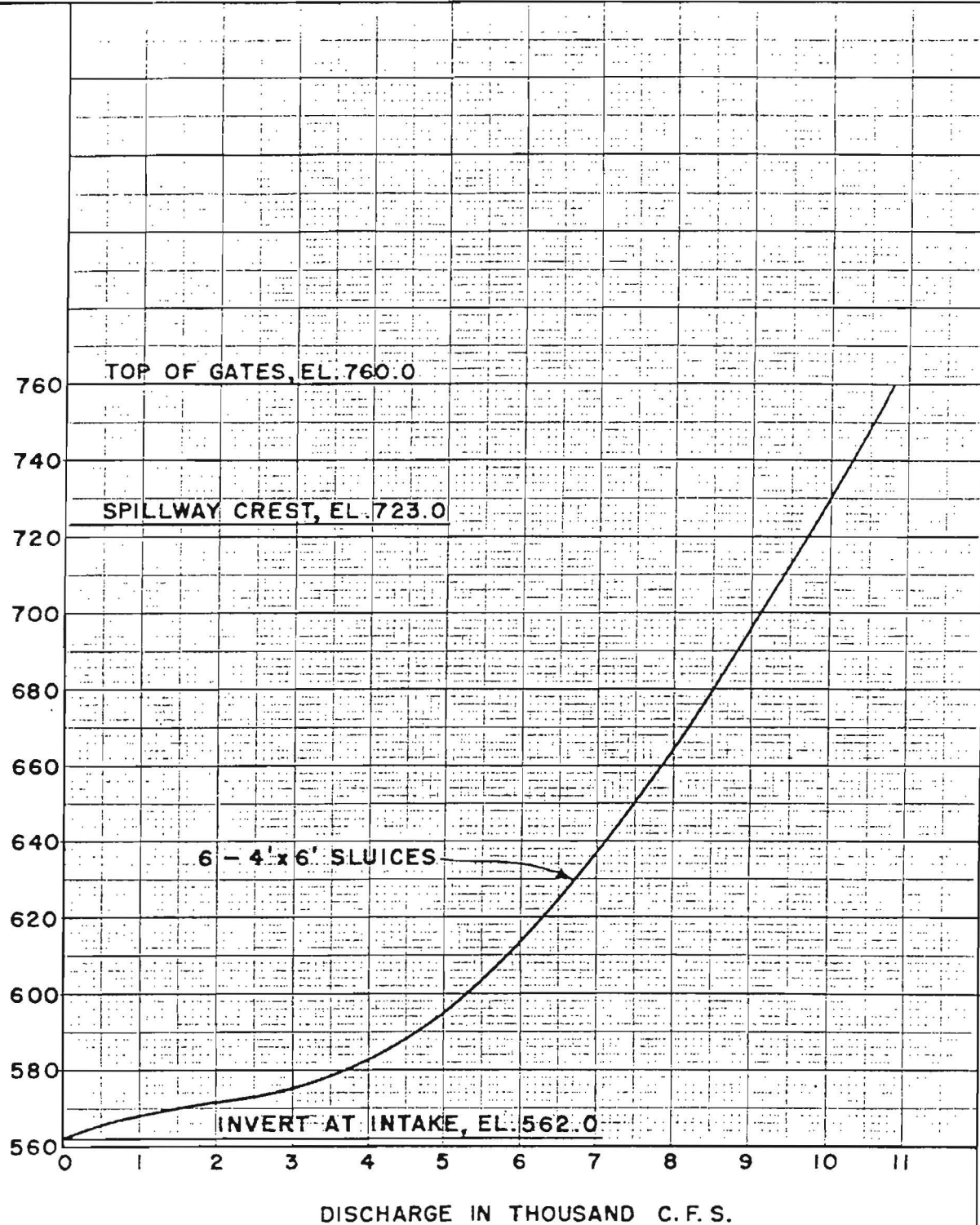
22 24 26

GUMBERLAND RIVER BASIN
 RESERVOIR OPERATION

SPILLWAY RATING CURVES
 WOLF CREEK DAM

NASHVILLE, TENNESSEE, DISTRICT
 BY J.A.P.
 TRACED G.D.A. DECEMBER 1950

ELEVATION IN FEET, MEAN SEA LEVEL

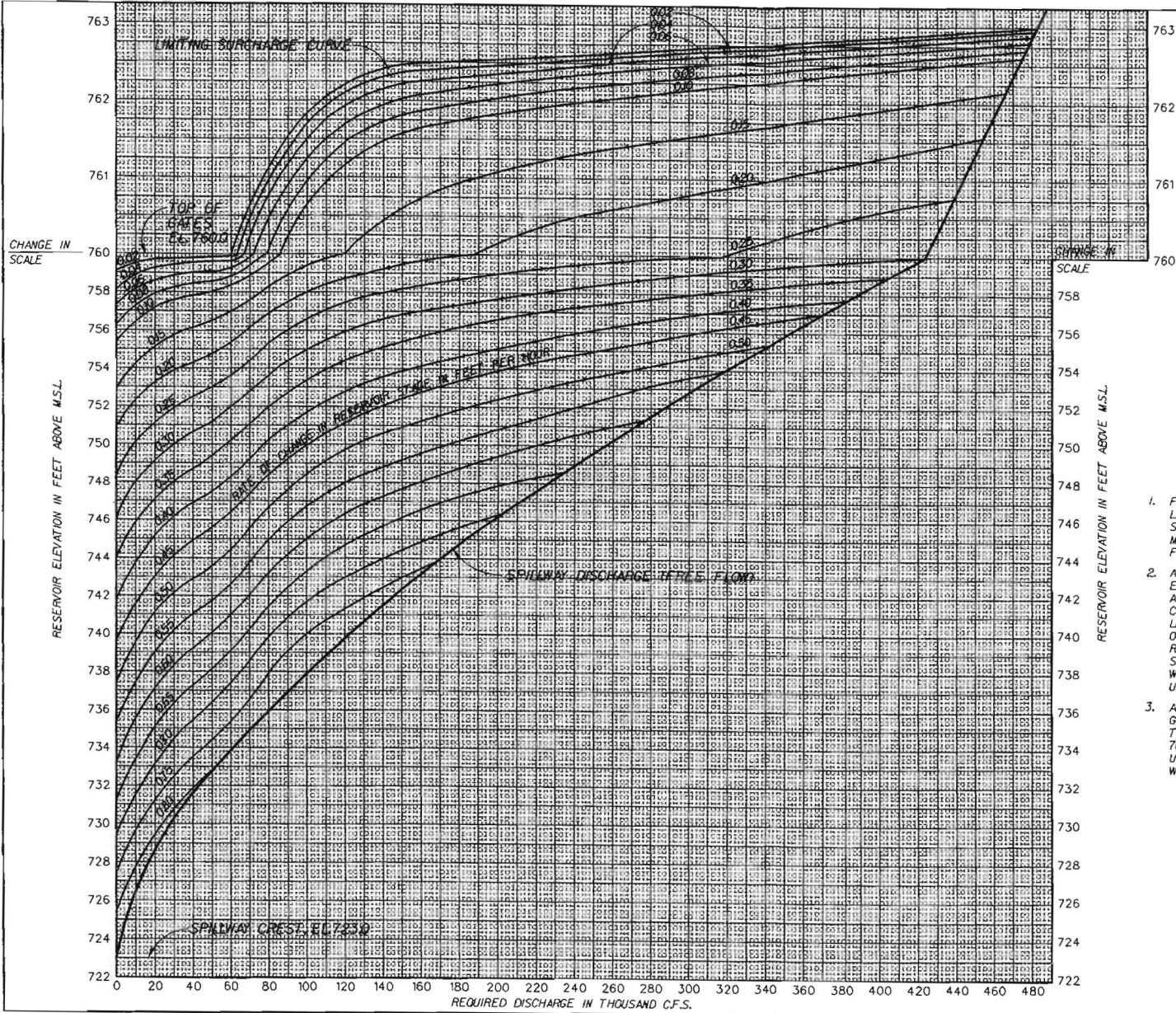


CUMBERLAND RIVER BASIN
RESERVOIR OPERATION

SLUICE RATING CURVE
WOLF CREEK DAM

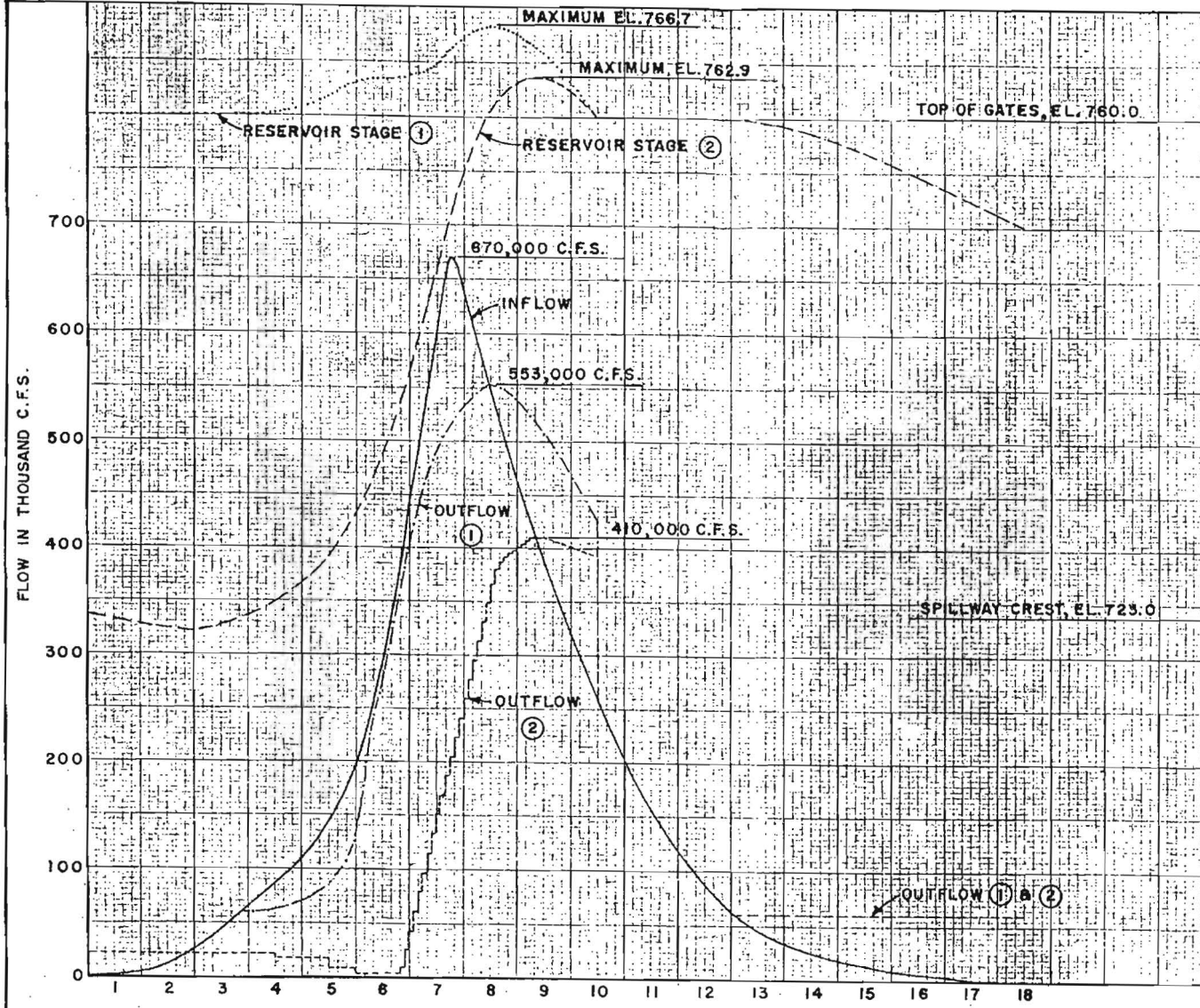
NASHVILLE, TENNESSEE, DISTRICT
BY: C. N. A.
TRACED: C. A. H.

OCTOBER 1953



- OPERATION INSTRUCTIONS
1. FOLLOW REGULAR OPERATION INSTRUCTIONS UNTIL LARGER RELEASES ARE REQUIRED BY THIS SCHEDULE. SEE SEPARATE INSTRUCTIONS AS TO WHEN RESERVOIR MAY BE OPERATED WITHOUT SPECIFIC INSTRUCTIONS FROM DISTRICT OFFICE.
 2. ADJUST THE TOTAL OUTFLOW (INCLUDING THAT FOR POWER) EVERY TWO HOURS ON THE BASIS OF THE RATE OF RISE AND THE RESERVOIR ELEVATION AS INDICATED BY THE CURVES. HOWEVER, WHEN THE RESERVOIR IS BELOW THE LIMITING SURCHARGE CURVE, DO NOT CHANGE THE TOTAL OUTFLOW BY MORE THAN 20,000 C.F.S. IN A TWO HOUR PERIOD, REGARDLESS OF THE INDICATED DISCHARGE. ONCE THE SURCHARGE CURVE IS REACHED, IT MUST BE FOLLOWED WITHOUT DEVIATION. OPERATE ALL CREST GATES AS UNIFORMLY AS POSSIBLE.
 3. AFTER THE RESERVOIR HAS CRESTED, MAINTAIN MAXIMUM GATE OPENING OBTAINED UNTIL THE RESERVOIR RECEDES TO ELEVATION 760. HOLD THE RESERVOIR AT ELEVATION 760 OR AT MAXIMUM LEVEL REACHED, IF BELOW 760, UNTIL OPERATION CAN BE RESUMED IN ACCORDANCE WITH REGULAR OPERATION INSTRUCTIONS.

CUMBERLAND RIVER BASIN
 WOLF CREEK DAM
 EMERGENCY OPERATION SCHEDULE
 NASHVILLE DISTRICT



LEGEND

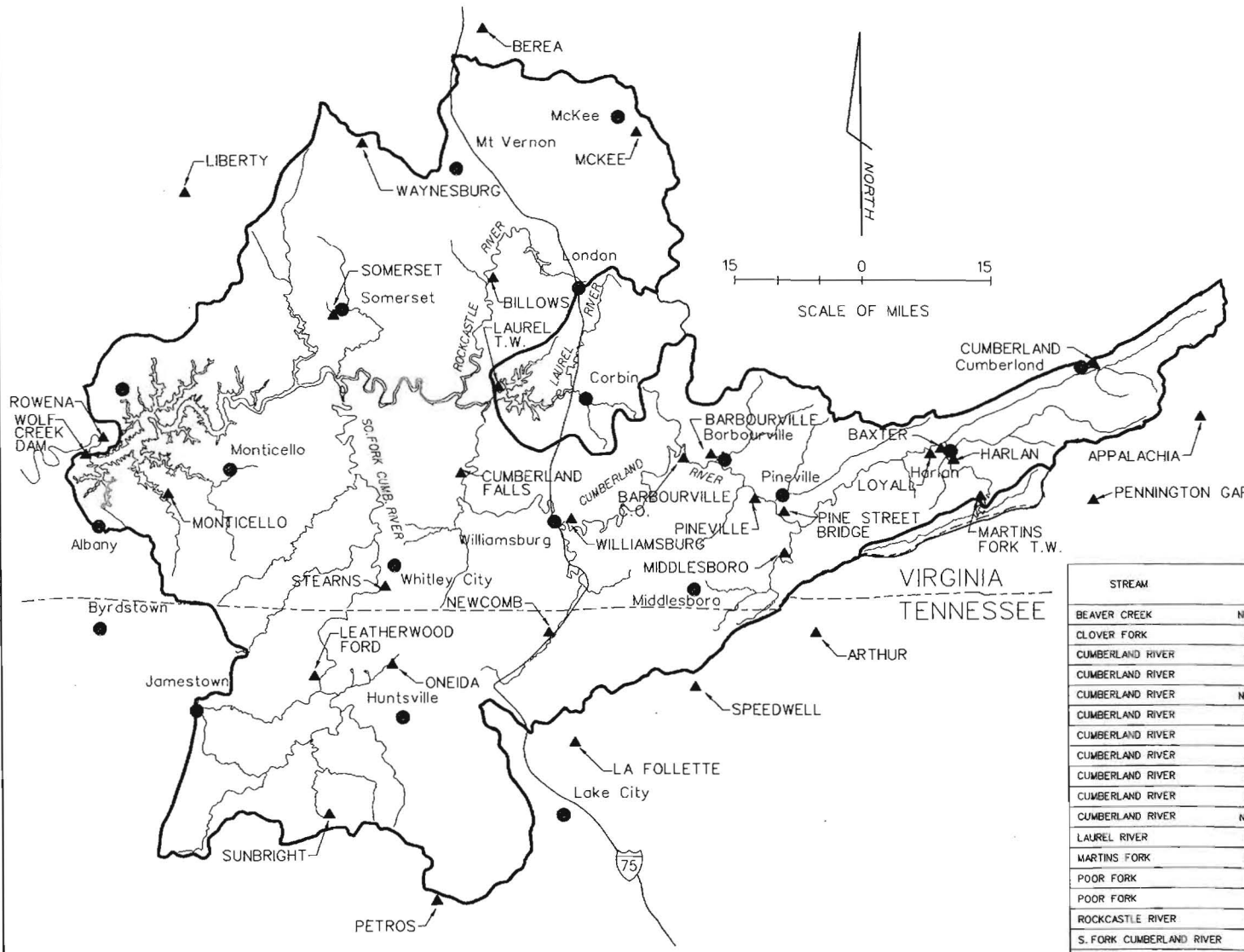
① POOL AT ELEVATION 760.0 (TOP OF GATES) AT START OF FLOOD AND RESERVOIR REGULATED IN ACCORDANCE WITH INDUCED SURCHARGE CURVE.

② POOL AT ELEVATION 723.0 (SPILLWAY CREST) AT START OF FLOOD AND RESERVOIR REGULATED IN ACCORDANCE WITH EMERGENCY GATE OPERATION SCHEDULE.

**CUMBERLAND RIVER BASIN
RESERVOIR OPERATION
WOLF CREEK RESERVOIR
INFLOW - OUTFLOW - STAGE
HYDROGRAPHS**

SPILLWAY DESIGN FLOOD
NASHVILLE, TENNESSEE, DISTRICT
BY: C. N. A.
TRACED: C. A. H. **OCTOBER 195**

WOLF CREEK SUBBASIN MAP



| LOCATION | PRECIPITATION GAGE | RIVER STAGE GAGE | WATER QUALITY GAGE | GOES GAGE |
|-------------------|--------------------|------------------|--------------------|-----------|
| APPALACHIA | ▲ | | | |
| ARTHUR | ▲ | | | |
| BEREA | ▲ | | | ▲ |
| MCKEE (GRAY HAWK) | ▲ | | | ▲ |
| LA FOLLETTE | ▲ | | | |
| LIBERTY | ▲ | | | ▲ |
| NEWCOMB | ▲ | | | ▲ |
| ONEIDA | ▲ | | | ▲ |
| PENNINGTON GAP | ▲ | | | |
| PETROS | ▲ | | | ▲ |
| SOMERSET | ▲ | | | |
| SPEEDWELL | ▲ | | | |
| SUNBRIGHT | ▲ | | | |
| WAYNESBURG | ▲ | | | ▲ |

| STREAM | LOCATION | PRECIPITATION GAGE | RIVER STAGE GAGE | WATER QUALITY GAGE | GOES GAGE |
|--------------------------|-------------------------|--------------------|------------------|--------------------|-----------|
| BEAVER CREEK | NEAR MONTICELLO | ▲ | ▲ | | ▲ |
| CLOVER FORK | AT HARLAN | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | AT LOYALL | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | PINEVILLE, PINE ST. BR. | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | NEAR PINEVILLE | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | AT BARBOURVILLE | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | BARBOURVILLE CUT OFF | ▲ | ▲ | AIR TEMP. | ▲ |
| CUMBERLAND RIVER | AT WILLIAMSBURG | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | AT CUMBERLAND FALLS | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | AT WOLF CREEK DAM | ▲ | ▲ | | ▲ |
| CUMBERLAND RIVER | NEAR ROWENA | | ▲ | | ▲ |
| LAUREL RIVER | AT LAUREL T.W. | | ▲ | | |
| MARTINS FORK | AT MARTINS FORK T.W. | ▲ | ▲ | ▲ | ▲ |
| POOR FORK | AT CUMBERLAND | ▲ | ▲ | | |
| POOR FORK | BAXTER | ▲ | ▲ | | |
| ROCKCASTLE RIVER | AT BILLOWS | ▲ | ▲ | | |
| S. FORK CUMBERLAND RIVER | AT LEATHERWOOD FORD | ▲ | ▲ | | |
| S. FORK CUMBERLAND RIVER | NEAR STEARNS | ▲ | ▲ | | |
| YELLOW CREEK | NEAR MIDDLESBORO | ▲ | | | |

WOLF CREEK SUBBASIN DATA COLLECTION NETWORK

| STREAM | LOCATION | DRAINAGE | | | HYDROLOGIC | | | NORTH LATITUDE | WEST LONGITUDE |
|------------------------|---------------------|----------|----------------|---------------|------------|--------------|--|-------------------|-------------------|
| | | DATUM | AREA sq.mi. | RIVER MILE | COUNTY | UNIT CODE | | | |
| Beaver Creek | near Monticello | 804.72 | 43 | 24.0 | Wayne | 05130103 | | | |
| Clover Fork | at Harlan | 1155.70 | 222 | 1.4 | Harlan | 05130101 | | | |
| Cumberland River | near Harlan | 1140.10 | 374 | 691.9 | Harlan | 05130101 | | | |
| Cumberland River | Pineville Pine St | 900.00 | 770 | 654.4 | Bell | 05130101 | | | |
| Cumberland River | near Pineville | 955.45 S | 809 | 647.2 | Knox | 05130101 | | | |
| Cumberland River | at Barbourville | 942.97 | 960 | 635.2 | Knox | 05130101 | | | |
| Cumberland River | Barbourville Cutoff | 900.00 | 1035 | 633.2 | Knox | 05130101 | | | |
| Cumberland River | at Williamsburg | 891.57 | 1607 | 590.3 | Whitley | 05130101 | | | |
| Cumberland River | at Cumberland Falls | 825.28 | 1977 | 562.4 | McCreary | 05130101 | | | |
| Cumberland River | at Wolf Creek Dam | 0.00 S | 5789 | 460.9 | Russell | 05130103 | | | |
| Cumberland River | near Rowena | 540.80 S | 5790 | 459.4 | Russell | 05130103 | | | |
| Laurel River | Laurel TW | | 282 | 2.3 | Laurel | 05130101 | | | |
| Martins Fork | at Martins Fork TW | 1259.00 | 55.8 | 15.3 | Harlan | 05130101 | | | |
| Poor Fork | at Cumberland | 1410.15 | 82.3 | 24.6 | Harlan | 05130101 | | | |
| Poor Fork | Baxter | 1147.26 | | | Harlan | 05130101 | | | |
| Rockcastle River | at Billows | 802.90 | 604 | 24.4 | Laurel | 05130102 | | | |
| S Frk Cumberland River | at Leatherwood Ford | 862.79 S | 806 | 70.1 | Scott | 05130104 | | | |
| S Frk Cumberland River | near Stearns | 763.83 | 954 | 49.6 | McCreary | 05130104 | | | |
| Yellow Creek | near Middlesboro | 1097.99 | 60.6 | 11.4 | Bell | 05130101 | | | |
| | Appalachia | | | | Wise | | | | |
| | Arthur | | | | Claiborne | 06010206 | | | |
| | Berea | | | | Madison | 05100205 | | | |
| | Gray Hawk | | | | Jackson | 05130106 | | | |
| | La Follette | | | | Campbell | 06010205 | | | |
| | Liberty | | | | Casey | 05110001 | | | |
| | Newcomb | | | | Campbell | 05130101 | | | |
| | Oneida | | | | Scott | 05130104 | | | |
| | Pennington Gap | | | | Lee | 06010206 | | | |
| | Petros | | | | Morgan | 06010205 | | | |
| | Somerset | | | | Pulaski | 05130103 | | | |
| | Speedwell | | | | Claiborne | 06010206 | | | |
| | Sunbright | | | | Morgan | 05130104 | | | |
| | Waynesburg | | | | Lincoln | 05130103 | | | |

WOLF CREEK SUBBASIN DATA COLLECTION NETWORK

| STREAM | LOCATION | USGS ID | TELEPHONE ACCESS | | PRECIP STAGE | WQ |
|------------------------|---------------------|-------------|------------------|---------------------|--------------|----|
| | | | GOES ID | DSS PATHNAME PART B | | |
| | | | | | | |
| Beaver Creek | near Monticello | KY 03413200 | CE66ED0E | MONTICELLO | SP | |
| Clover Fork | at Harlan | KY 03400990 | CE4BC7B8 | HARLAN KY | SP | |
| Cumberland River | near Harlan | KY 03401000 | 16C77C5A | LOYALL KY | SP | |
| Cumberland River | Pineville Pine St | KY 03402900 | CE77E86A | PINE ST. BR. KY. | SP | |
| Cumberland River | near Pineville | KY 03403000 | CE5663B8 | PINEVILLE | SP | |
| Cumberland River | at Barbourville | KY 03403500 | CE566D6A | BARBOURVILLE | SP | |
| Cumberland River | Barbourville Cutoff | KY 03403545 | CE6B2B76 | BARBOURVILLE C.O. | SPA | |
| Cumberland River | at Williamsburg | KY 03404000 | CE568E98 | WILLIAMSBURG | SP | |
| Cumberland River | at Cumberland Falls | KY 03404500 | 16C88A4C | CUMBERLAND FALLS K | S | |
| Cumberland River | at Wolf Creek Dam | KY 03413500 | | WOLF CREEK DAM | SP | |
| Cumberland River | near Rowena | KY 03414000 | 16C78CDE | ROWENA KY. | S | |
| Laurel River | Laurel TW | KY | | LAUREL DAM | S | |
| Martins Fork | at Martins Fork TW | KY 03400800 | CE4C7602 | MARTINS FORK T.W. | SP4 | |
| Poor Fork | at Cumberland | KY 03400500 | CE56A6A6 | CUMBERLAND KY. | SP | |
| Poor Fork | Baxter | KY | | BAXTER | SP | |
| Rockcastle River | at Billows | KY 03406500 | CE56933C | BILLOWS | SP | |
| S Frk Cumberland River | at Leatherwood Ford | TN 03410210 | | | SP | |
| S Frk Cumberland River | near Stearns | KY 03410500 | CE56804A | STEARNS | SP | |
| Yellow Creek | near Middlesboro | KY 03402000 | CE569DEE | MIDDLESBORO | SP | |
| | Appalachia | VA | | APPALACHIA | P | |
| | Arthur | TN | | ARTHUR | P | |
| | Berea | KY | CE66FE78 | BEREA | P | |
| | Gray Hawk | KY | CE66AE04 | MCKEE (GRAY HWK) | P | |
| | La Follette | TN | | | P | |
| | Liberty | KY | CE66F0AA | LIBERTY | P | |
| | Newcomb | TN | CE66D894 | NEWCOMB | P | |
| | Oneida | TN | CE66954C | ONEIDA | P | |
| | Pennington Gap | VA | | PENNINGTON GAP | P | |
| | Petros | TN | | PETROS | P | |
| | Somerset | KY | CE66E3DC | SOMERSET | P | |
| | Speedwell | TN | | SPEEDWELL | P | |
| | Sunbright | TN | | SUNBRIGHT | P | |
| | Waynesburg | KY | CE66B3A0 | WAYNESBURG | P | |

WATER QUALITY
LEGEND

4 - DO, water temperature, pH & conductivity
A - air temperature

CLIMATOGRAPHY OF THE UNITED STATES NO. 20
 WILLIAMSTOWN, KY

CLIMATOLOGICAL SUMMARY

PERIOD: 1951-80
 ELEVATION: 920 FT

| | TEMPERATURE (F) | | | | | | | | | | | | | | PRECIPITATION TOTAL S. (INCHES) | | | | | | | | | | | | |
|------|-----------------|-----------------|-----------|----------------|--------|-----|---------------|--------|-----|---------------------|--------------|--------------|-------------|-----------------|---------------------------------|-------|------------------|------|----------------|------|-----|------|-----------------|------|---------------------|-------------|--------------|
| | MEANS | | | EXTREMES | | | | | | MEAN NUMBER OF DAYS | | | | | DEGREE DAYS | | * * * * * | | | | | SNOW | | | MEAN NUMBER OF DAYS | | |
| | * DAILY MAXIMUM | * DAILY MINIMUM | * MONTHLY | RECORD HIGHEST | YEAR | DAY | RECORD LOWEST | YEAR | DAY | 90 AND ABOVE | 32 AND BELOW | 32 AND BELOW | 0 AND BELOW | HEATING BASE 65 | COOLING BASE 55 | MEAN | GREATEST MONTHLY | YEAR | GREATEST DAILY | YEAR | DAY | MEAN | MAXIMUM MONTHLY | YEAR | .10 OR MORE | .50 OR MORE | 1.00 OR MORE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JAN | 39.2 | 20.7 | 30.0 | 72 | 52 | 1 | -21+ | 63 | 24 | 0 | 10 | 26 | 2 | 1085 | 0 | 3.01 | 6.81 | 51 | 2.10 | 51 | 14 | 6.3 | 24.0 | 77 | 7 | 2 | 0 |
| FEB | 43.2 | 23.1 | 33.2 | 77+ | 54 | 16 | -14 | 51 | 2 | 0 | 6 | 23 | 1 | 890 | 0 | 2.87 | 8.20 | 56 | 3.06 | 75 | 23 | 4.1 | 11.7 | 60 | 6 | 2 | 1 |
| MAR | 53.2 | 32.0 | 42.6 | 80+ | 77 | 30 | -2+ | 60 | 6 | 0 | 1 | 17 | 0 | 694 | 0 | 4.70 | 14.77 | 64 | 4.13 | 64 | 10 | 4.4 | 15.6 | 60 | 9 | 3 | 1 |
| APR | 65.4 | 42.8 | 54.1 | 88+ | 51 | 25 | 20+ | 72 | 8 | 0 | 0 | 5 | 0 | 333 | 6 | 4.01 | 9.38 | 70 | 3.06 | 70 | 02 | .1 | 1.5 | 53 | 8 | 2 | 1 |
| MAY | 74.6 | 52.2 | 63.4 | 93+ | 62 | 19 | 27+ | 66 | 10 | 0 | 0 | 0 | 0 | 134 | 85 | 4.12 | 7.77 | 61 | 3.80 | 61 | 08 | .0 | .0 | | 8 | 3 | 1 |
| JUN | 82.1 | 60.5 | 71.3 | 102+ | 52 | 29 | 37+ | 66 | 1 | 3 | 0 | 0 | 0 | 13 | 202 | 3.73 | 8.55 | 60 | 4.24 | 60 | 23 | .0 | .0 | | 7 | 3 | 1 |
| JUL | 85.7 | 64.6 | 75.2 | 104+ | 54 | 15 | 50+ | 75 | 14 | 8 | 0 | 0 | 0 | 0 | 316 | 4.59 | 8.96 | 68 | 3.84 | 57 | 05 | .0 | .0 | | 7 | 3 | 1 |
| AUG | 85.0 | 63.1 | 74.1 | 101+ | 64 | 4 | 44+ | 65 | 29 | 7 | 0 | 0 | 0 | 0 | 282 | 3.58 | 7.46 | 74 | 3.12 | 77 | 12 | .0 | .0 | | 6 | 2 | 1 |
| SEP | 79.4 | 56.8 | 68.1 | 101+ | 53 | 3 | 36+ | 74 | 23 | 3 | 0 | 0 | 0 | 47 | 140 | 3.47 | 9.42 | 79 | 4.57 | 65 | 01 | .0 | .0 | | 5 | 2 | 1 |
| OCT | 68.1 | 45.0 | 56.6 | 94 | 53 | 1 | 20+ | 62 | 26 | 0 | 0 | 3 | 0 | 277 | 17 | 2.62 | 5.85 | 73 | 3.29 | 73 | 01 | .0 | .0 | | 5 | 2 | 1 |
| NOV | 54.2 | 34.7 | 44.5 | 81+ | 61 | 3 | 0 | 58 | 30 | 0 | 1 | 14 | 0 | 615 | 0 | 3.52 | 7.37 | 51 | 2.35 | 57 | 19 | 1.7 | 10.0 | 66 | 7 | 2 | 1 |
| DEC | 43.7 | 25.7 | 34.7 | 70+ | 56 | 7 | -9+ | 63 | 20 | 0 | 5 | 23 | 1 | 939 | 0 | 3.29 | 8.35 | 78 | 2.61 | 78 | 08 | 2.5 | 9.3 | 61 | 7 | 2 | 0 |
| YEAR | 64.5 | 43.4 | 54.0 | 104 | JUL 54 | 15 | -21 | JAN 63 | 24 | 21 | 23 | 111 | 4 | 5027 | 1048 | 43.51 | MAR 14.77 | 64 | SEP 4.57 | 65 | 01 | 19.1 | JAN 24.0 | 77 | 82 | 28 | 10 |

*FROM 1951-80 NORMALS

ESTIMATED VALUE BASED ON DATA FROM SURROUNDING STATIONS

+ ALSO ON EARLIER DATES.

DEGREE DAYS TO SELECTED BASE TEMPERATURES (F)

| BASE | HEATING DEGREE DAYS | | | | | | | | | | | | |
|----------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
| BELOW 65 | 1085 | 890 | 694 | 333 | 134 | 13 | 0 | 0 | 47 | 277 | 615 | 939 | 5027 |
| 60 | 930 | 750 | 554 | 202 | 60 | 0 | 0 | 0 | 12 | 160 | 465 | 784 | 3917 |
| 57 | 837 | 666 | 470 | 139 | 32 | 0 | 0 | 0 | 5 | 108 | 379 | 691 | 3327 |
| 55 | 775 | 617 | 416 | 106 | 20 | 0 | 0 | 0 | 0 | 78 | 322 | 636 | 2970 |
| 50 | 634 | 486 | 297 | 39 | 6 | 0 | 0 | 0 | 0 | 26 | 193 | 491 | 2172 |
| BASE | COOLING DEGREE DAYS | | | | | | | | | | | | |
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
| ABOVE 55 | 0 | 7 | 32 | 79 | 280 | 489 | 626 | 592 | 393 | 128 | 7 | 7 | 2640 |
| 57 | 0 | 0 | 23 | 52 | 230 | 429 | 564 | 530 | 338 | 96 | 0 | 0 | 2262 |
| 60 | 0 | 0 | 15 | 25 | 166 | 339 | 471 | 437 | 255 | 55 | 0 | 0 | 1763 |
| 65 | 0 | 0 | 0 | 6 | 85 | 202 | 316 | 282 | 140 | 17 | 0 | 0 | 1048 |
| 70 | 0 | 0 | 0 | 0 | 30 | 97 | 175 | 143 | 62 | 0 | 0 | 0 | 507 |

DERIVED FROM THE 1951-80 MONTHLY NORMALS

PROBABILITY THAT THE MONTHLY PRECIPITATION WILL BE EQUAL TO OR LESS THAN THE INDICATED PRECIPITATION AMOUNT MONTHLY PRECIPITATION (INCHES)

| PROBABILITY LEVELS | MONTHLY PRECIPITATION (INCHES) | | | | | | | | | | | |
|--------------------|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| .05 | .95 | .48 | 1.30 | 1.26 | 1.64 | 1.22 | 1.70 | 1.17 | .61 | .76 | .98 | .83 |
| .10 | 1.23 | .73 | 1.75 | 1.64 | 2.02 | 1.57 | 2.13 | 1.51 | .91 | 1.01 | 1.31 | 1.14 |
| .20 | 1.66 | 1.14 | 2.43 | 2.21 | 2.56 | 2.09 | 2.74 | 2.01 | 1.42 | 1.39 | 1.82 | 1.62 |
| .30 | 2.02 | 1.54 | 3.02 | 2.69 | 3.00 | 2.53 | 3.26 | 2.43 | 1.89 | 1.71 | 2.26 | 2.05 |
| .40 | 2.37 | 1.94 | 3.59 | 3.16 | 3.42 | 2.96 | 3.75 | 2.84 | 2.38 | 2.03 | 2.69 | 2.46 |
| .50 | 2.73 | 2.38 | 4.20 | 3.64 | 3.85 | 3.40 | 4.26 | 3.27 | 2.91 | 2.36 | 3.15 | 2.90 |
| .60 | 3.13 | 2.89 | 4.87 | 4.18 | 4.31 | 3.89 | 4.80 | 3.73 | 3.51 | 2.72 | 3.65 | 3.39 |
| .70 | 3.60 | 3.50 | 5.66 | 4.80 | 4.85 | 4.45 | 5.44 | 4.27 | 4.23 | 3.15 | 4.24 | 3.97 |
| .80 | 4.20 | 4.32 | 6.69 | 5.61 | 5.53 | 5.18 | 6.24 | 4.97 | 5.20 | 3.70 | 5.01 | 4.73 |
| .90 | 5.13 | 5.64 | 8.30 | 6.86 | 6.56 | 6.31 | 7.49 | 6.05 | 6.77 | 4.57 | 6.22 | 5.94 |
| .95 | 6.00 | 6.91 | 9.80 | 8.02 | 7.51 | 7.36 | 8.63 | 7.05 | 8.27 | 5.38 | 7.34 | 7.06 |

THESE VALUES WERE DETERMINED FROM THE INCOMPLETE GAMMA DISTRIBUTION.

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

158714 WILLIAMSTOWN, KY

DEG MIN DEG MIN
LAT: 38 39N LONG: 84 37W

PERIOD: 1951-80

FREEZE DATA

PROBABILITY OF LATER DATE IN SPRING (THRU JULY 31) THAN INDICATED(*)

| TEMP (F) | SPRING FREEZE DATES (MO/DAY) | | | | | | | | |
|----------|------------------------------|------|------|------|------|------|------|------|------|
| | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 |
| 36 | 4/15 | 4/20 | 4/24 | 4/28 | 5/01 | 5/04 | 5/08 | 5/12 | 5/17 |
| 32 | 4/03 | 4/09 | 4/13 | 4/16 | 4/20 | 4/23 | 4/26 | 5/01 | 5/06 |
| 28 | 3/22 | 3/28 | 3/31 | 4/03 | 4/06 | 4/09 | 4/13 | 4/16 | 4/22 |
| 24 | 3/16 | 3/20 | 3/23 | 3/25 | 3/28 | 3/30 | 4/02 | 4/05 | 4/09 |
| 20 | 2/27 | 3/05 | 3/09 | 3/12 | 3/16 | 3/19 | 3/22 | 3/27 | 4/01 |
| 16 | 2/14 | 2/21 | 2/26 | 3/02 | 3/06 | 3/10 | 3/15 | 3/20 | 3/27 |

PROBABILITY OF EARLIER DATE IN FALL (BEGINNING AUG 1) THAN INDICATED(*)

| TEMP (F) | FALL FREEZE DATES (MO/DAY) | | | | | | | | |
|----------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 36 | 9/29 | 10/03 | 10/06 | 10/08 | 10/10 | 10/12 | 10/15 | 10/18 | 10/22 |
| 32 | 10/11 | 10/15 | 10/18 | 10/20 | 10/22 | 10/24 | 10/27 | 10/30 | 11/02 |
| 28 | 10/19 | 10/24 | 10/27 | 10/30 | 11/02 | 11/05 | 11/08 | 11/11 | 11/16 |
| 24 | 10/29 | 11/03 | 11/06 | 11/09 | 11/12 | 11/15 | 11/18 | 11/21 | 11/26 |
| 20 | 11/04 | 11/10 | 11/14 | 11/17 | 11/20 | 11/23 | 11/27 | 12/01 | 12/06 |
| 16 | 11/15 | 11/21 | 11/26 | 11/30 | 12/03 | 12/07 | 12/10 | 12/15 | 12/21 |

PROBABILITY OF LONGER THAN INDICATED FREEZE FREE PERIOD (DAYS)

| TEMP (F) | FREEZE FREE PERIOD | | | | | | | | |
|----------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 36 | 181 | 174 | 170 | 165 | 158 | 154 | 149 | 142 | |
| 32 | 204 | 198 | 193 | 189 | 185 | 181 | 177 | 172 | 165 |
| 28 | 231 | 224 | 218 | 213 | 209 | 204 | 199 | 194 | 186 |
| 24 | 247 | 241 | 236 | 232 | 229 | 225 | 221 | 216 | 210 |
| 20 | 273 | 264 | 259 | 253 | 249 | 244 | 239 | 233 | 225 |
| 16 | 298 | 289 | 282 | 276 | 271 | 266 | 260 | 254 | 245 |

(*)PROBABILITY OF OBSERVING A TEMPERATURE AS COLD, OR COLDER, LATER IN THE SPRING OR EARLIER IN THE FALL THAN THE INDICATED DATE.
0/00 INDICATES THAT THE PROBABILITY OF OCCURRENCE OF THRESHOLD TEMPERATURE IS LESS THAN INDICATED PROBABILITY.

GROWING DEGREE UNITS TO SELECTED BASE TEMPERATURES (F)

| BASE | GROWING DEGREE UNITS | | | | | | | | | | | | |
|------|----------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
| 40 M | 45 | 53 | 187 | 437 | 732 | 947 | 1097 | 1063 | 850 | 522 | 207 | 72 | 6212 |
| 40 S | 45 | 98 | 285 | 722 | 1454 | 2401 | 3498 | 4561 | 5411 | 5933 | 6140 | 6212 | |
| 45 M | 19 | 23 | 109 | 305 | 579 | 797 | 942 | 908 | 700 | 377 | 122 | 33 | 4914 |
| 45 S | 19 | 42 | 151 | 456 | 1035 | 1832 | 2774 | 3682 | 4382 | 4759 | 4881 | 4914 | |
| 50 M | 7 | 8 | 58 | 196 | 429 | 647 | 787 | 753 | 550 | 249 | 62 | 12 | 3758 |
| 50 S | 7 | 15 | 73 | 269 | 698 | 1345 | 2132 | 2885 | 3435 | 3684 | 3746 | 3758 | |
| 55 M | 2 | 2 | 26 | 115 | 290 | 497 | 632 | 598 | 402 | 147 | 26 | 3 | 2740 |
| 55 S | 2 | 4 | 30 | 145 | 435 | 932 | 1564 | 2162 | 2564 | 2711 | 2737 | 2740 | |
| 60 M | 0 | 0 | 9 | 55 | 170 | 351 | 477 | 443 | 266 | 71 | 9 | 1 | 1852 |
| 60 S | 0 | 0 | 9 | 64 | 234 | 585 | 1062 | 1505 | 1771 | 1842 | 1851 | 1852 | |

M = MONTHLY DATA S = SUM OF MONTHLY DATA

GROWING DEGREE UNITS FOR CORN

| CORN | GROWING DEGREE UNITS FOR CORN | | | | | | | | | | | | |
|------|-------------------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
| M | 26 | 34 | 116 | 269 | 460 | 636 | 756 | 728 | 552 | 318 | 117 | 37 | 4049 |
| S | 26 | 60 | 176 | 445 | 905 | 1541 | 2297 | 3025 | 3577 | 3895 | 4012 | 4049 | |

NOTE: FOR CORN THE BASE IS 50, AND THE DEGREE UNITS ARE ADJUSTED FOR TEMPERATURES BELOW 50 AND ABOVE 86

OTHER CLIMATOLOGICAL DATA ARE AVAILABLE IN A VARIETY OF SUMMARIES AND FORMATS, SUCH AS THE CLIMATOGRAPHY OF THE UNITED STATES; NO. 60 - CLIMATE OF STATES; NO. 81 - MONTHLY NORMALS (AND SUPPLEMENTS: ANNUAL DEGREE DAYS TO SELECTED BASES DERIVED FROM THE 1951-80 NORMALS; AND MONTHLY PRECIPITATION PROBABILITIES, SELECTED PROBABILITY LEVELS DERIVED FROM THE 1951-80 NORMALS); NO. 84 - DAILY NORMALS; NO. 85 - DIVISIONAL NORMALS. A VARIETY OF DATA IS AVAILABLE EITHER ON MAGNETIC TAPE, MICROFICHE, OR PAPER COPY.

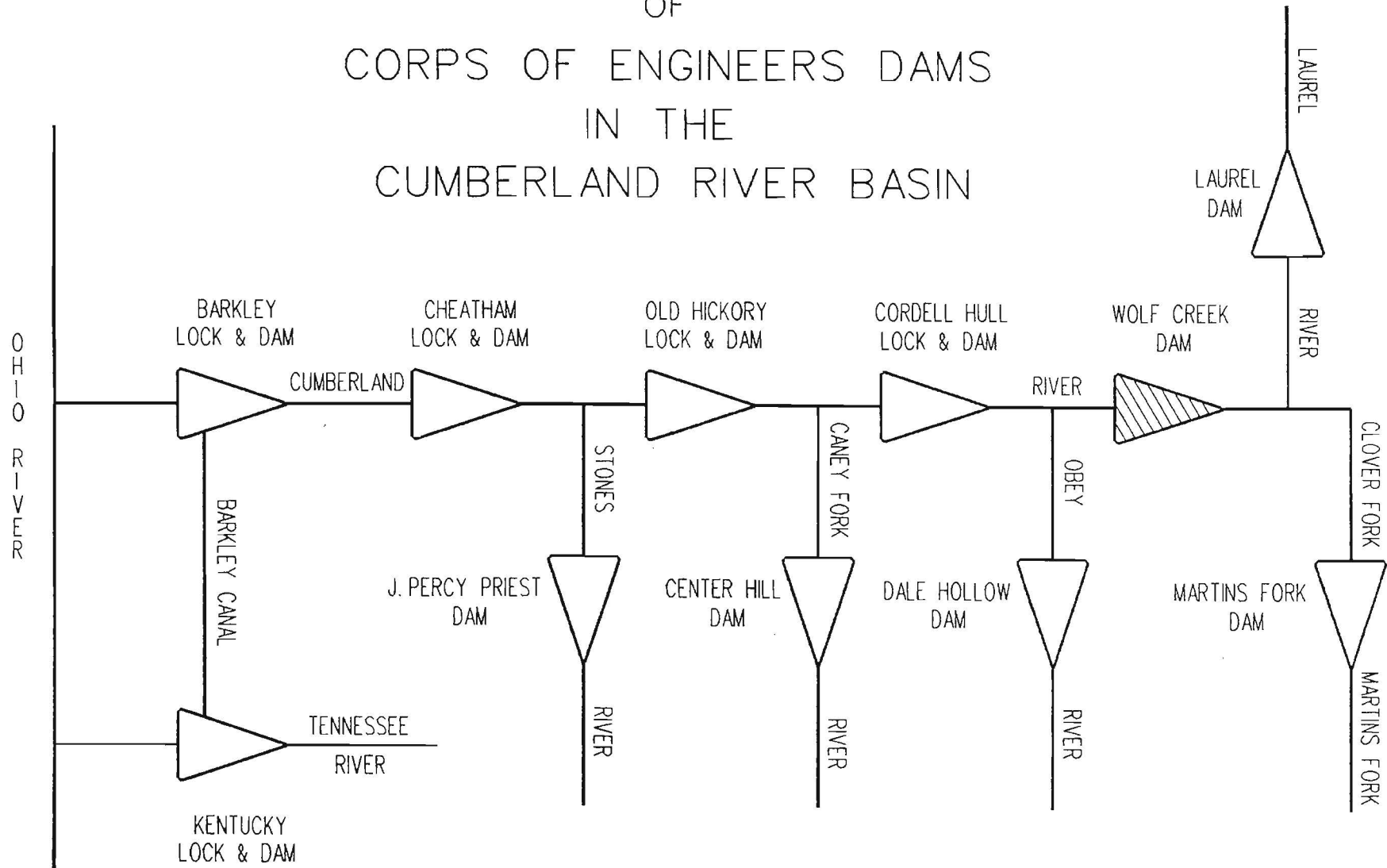
TO OBTAIN INFORMATION ABOUT CLIMATOLOGICAL DATA AND RELATED PUBLICATIONS, CONTACT:

DIRECTOR
NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NC 28801-2696
FOR TELEPHONE: (704) 259-06821

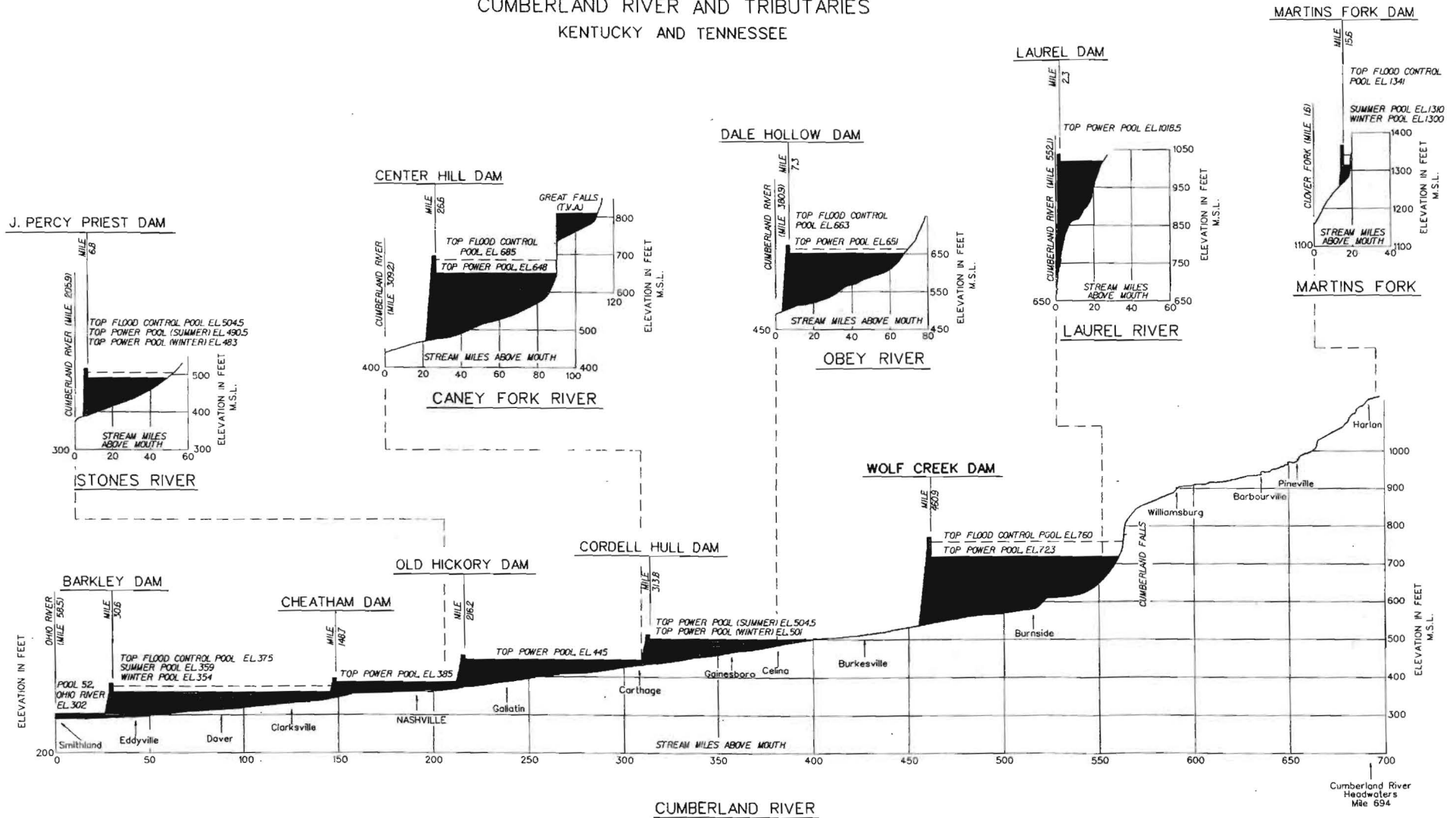
DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NC



SCHEMATIC
OF
CORPS OF ENGINEERS DAMS
IN THE
CUMBERLAND RIVER BASIN



PROFILE OF
CUMBERLAND RIVER AND TRIBUTARIES
KENTUCKY AND TENNESSEE



Redacted
Ex. 7

| | | | |
|--|-----------------------------------|-----------------------------------|-------------------|
| CUMBERLAND RIVER WATERSHED | | | |
| WOLF CREEK RESERVOIR PROJECT | | | |
| CUMBERLAND RIVER, KENTUCKY | | | |
| DAM | | | |
| GENERAL PLAN, ELEVATIONS AND SECTIONS | | | |
| IN 3 SHEETS | 200' | 100' 0 | 200' 400' |
| SCALE: 1 INCH = 200 FEET | | | |
| U. S. ENGINEER OFFICE, NASHVILLE, TENN. MAY 1941 | | | |
| DESIGNED BY <i>J. C. G.</i> | APPROVED BY <i>[Signature]</i> | APPROVED BY <i>[Signature]</i> | |
| ENGINEER | PRINCIPAL ENGINEER | MAJOR CORPS OFFICER | DISTRICT ENGINEER |
| CHECKED P. A. B. TO ACCOMPANY SPECIFICATIONS | | | |
| DATE: DECEMBER 1940 | 02-3/3.1 | | 9-27-41 |

AS SHOWN OR AS CONSTRUCTED

Plate C - 4

Redacted

EX. 7

OHIO RIVER BASIN
WOLF CREEK DAM
CUMBERLAND RIVER, KY.

DAM

SCALE IN FEET

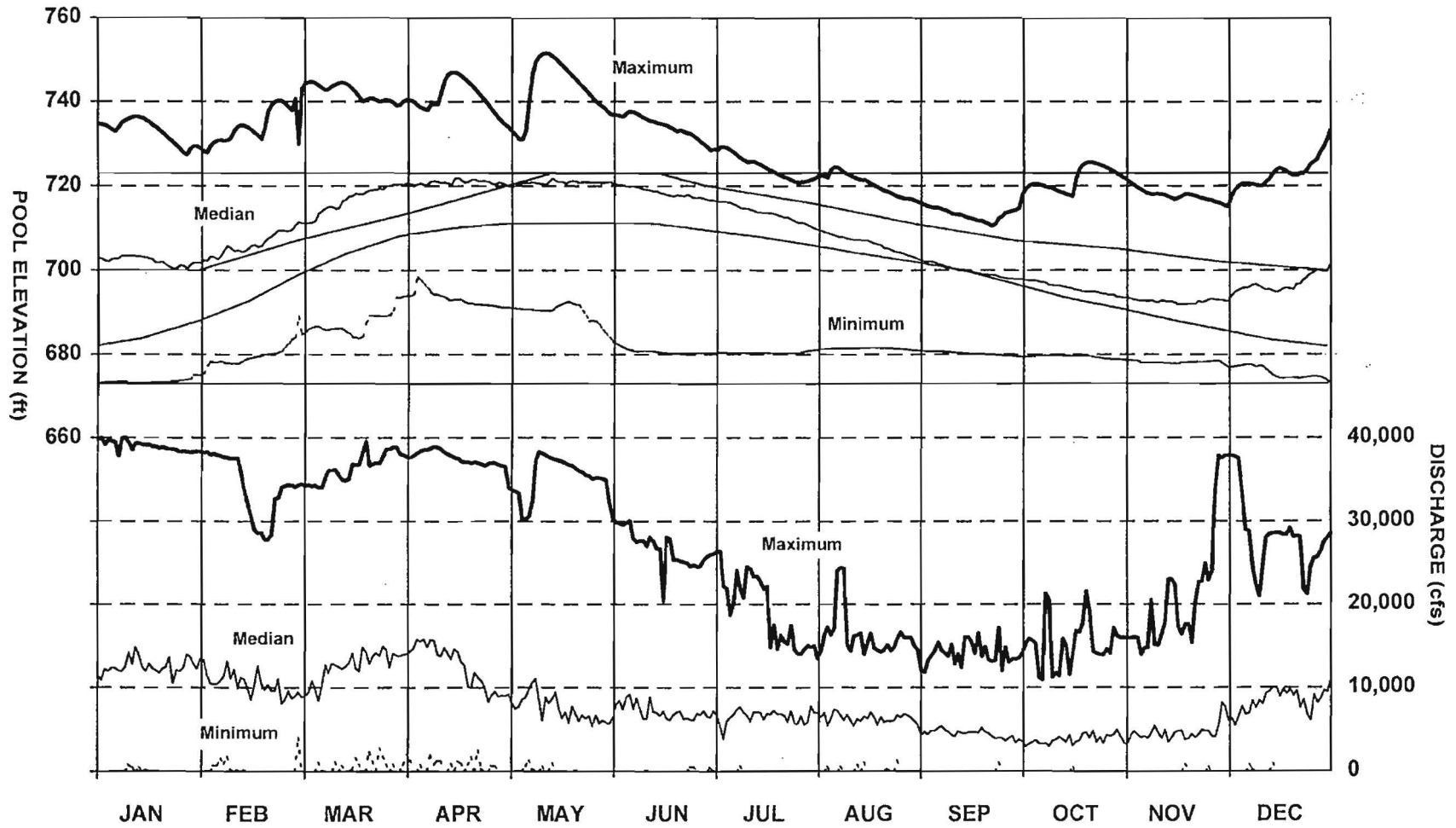
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U.S. ARMY ENGINEER DISTRICT, NASHVILLE

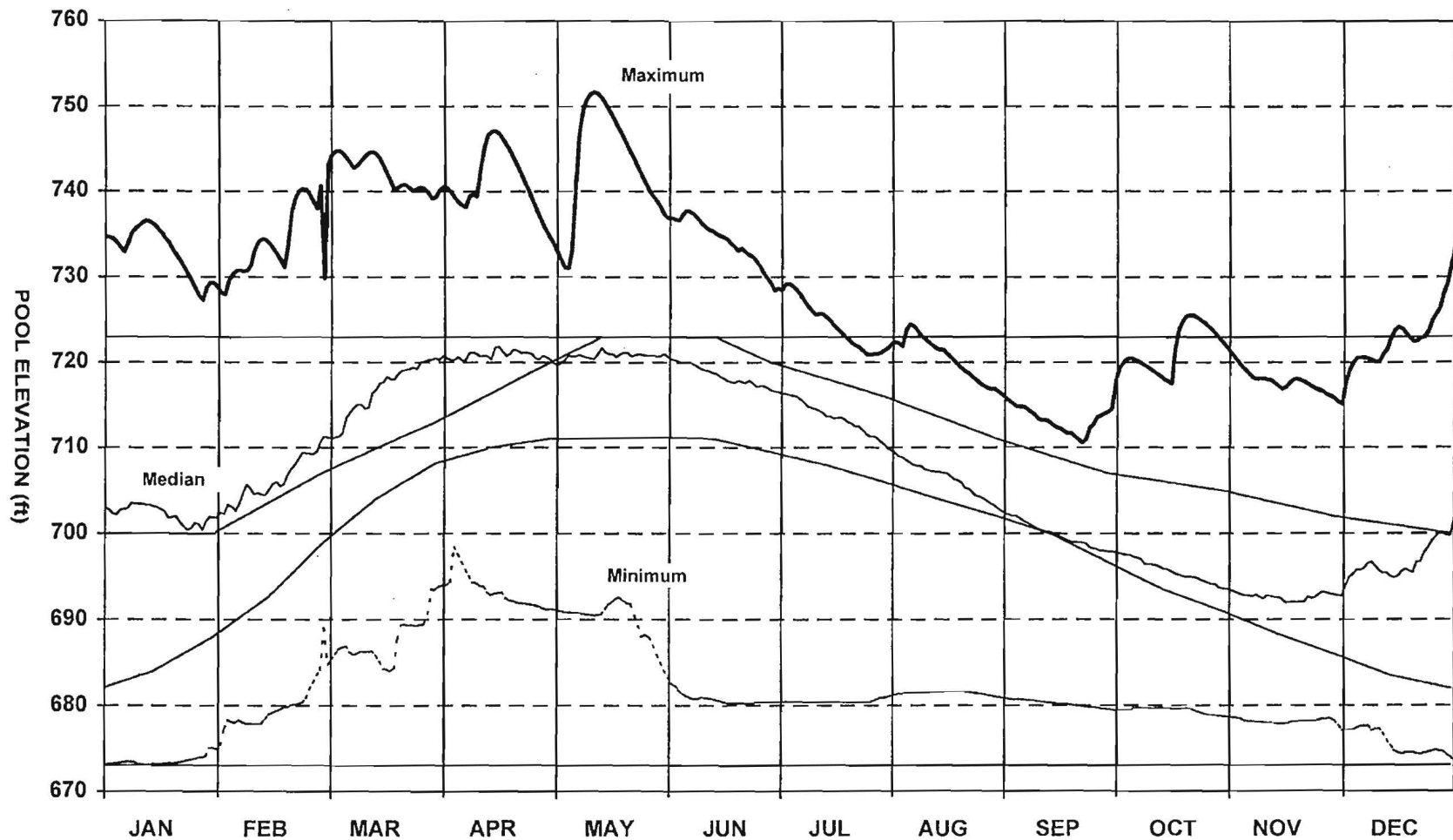
30 JUNE 1971

PLATE C-5

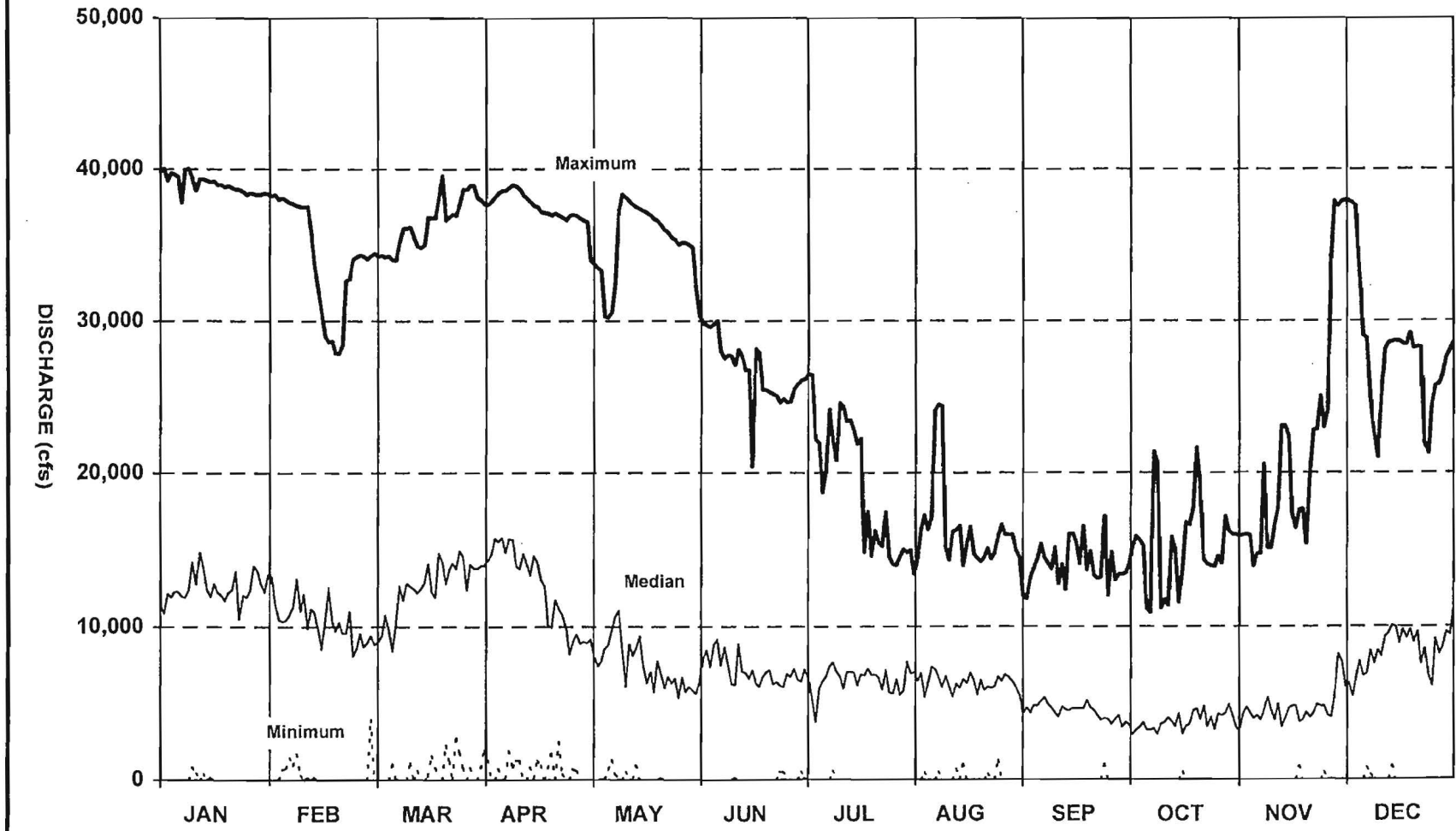
WOLF CREEK
DAILY MAXIMUM, MEDIAN & MINIMUM AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1952 THROUGH 1996



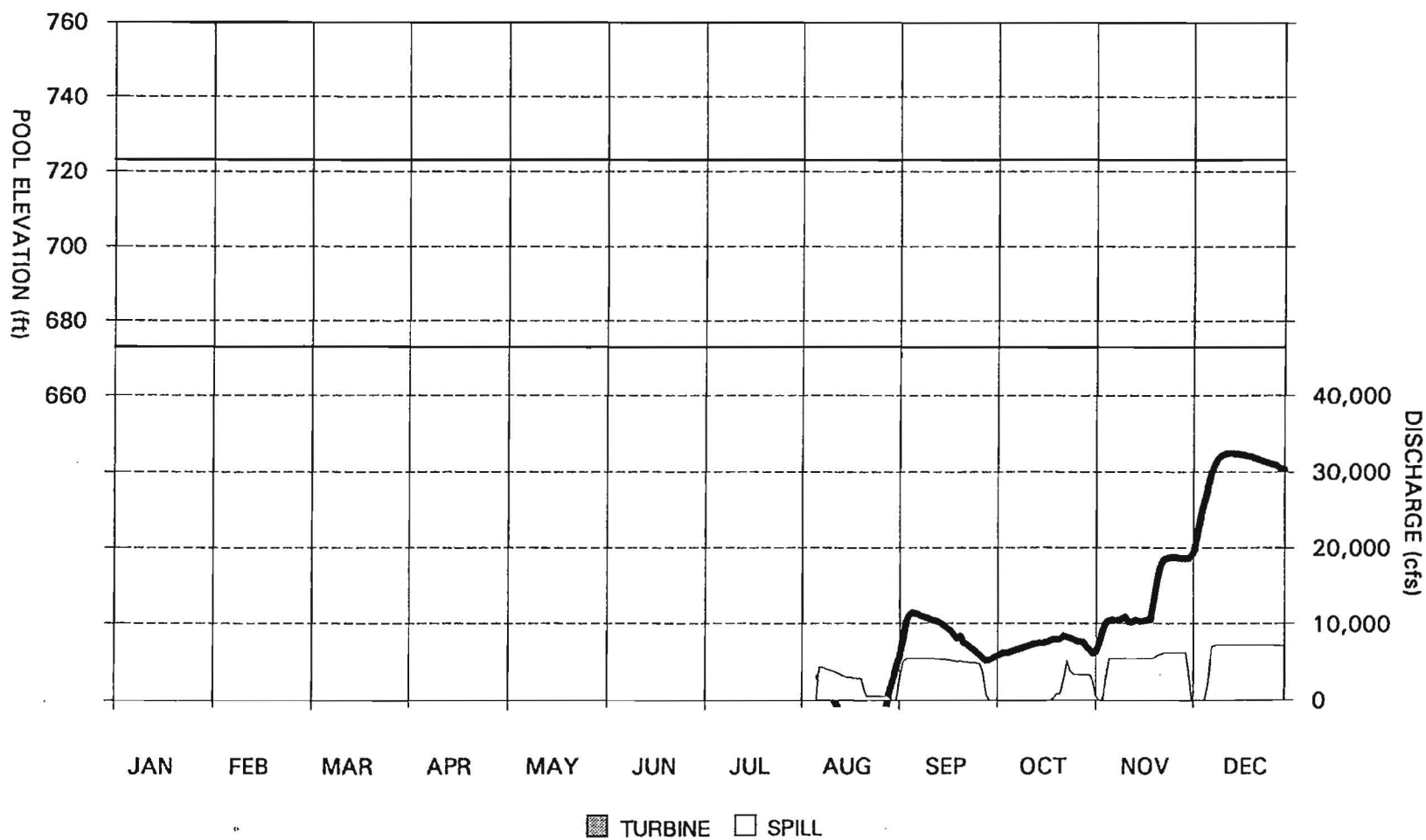
WOLF CREEK
DAILY MAXIMUM, MEDIAN & MINIMUM MIDNIGHT POOL ELEVATION
1952 THROUGH 1996



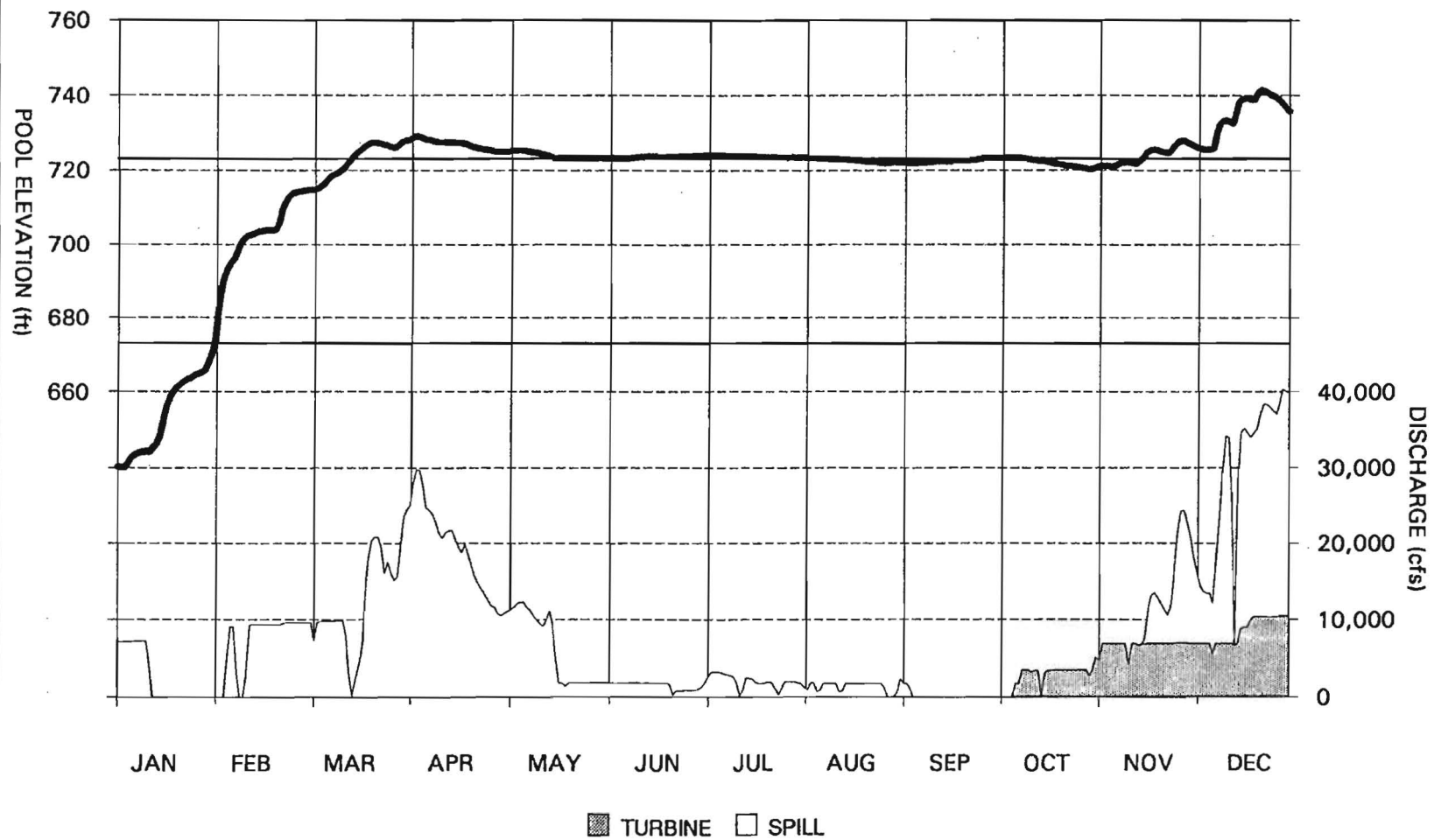
WOLF CREEK
DAILY MAXIMUM, MEDIAN & MINIMUM AVERAGE DISCHARGE
1952 THROUGH 1996



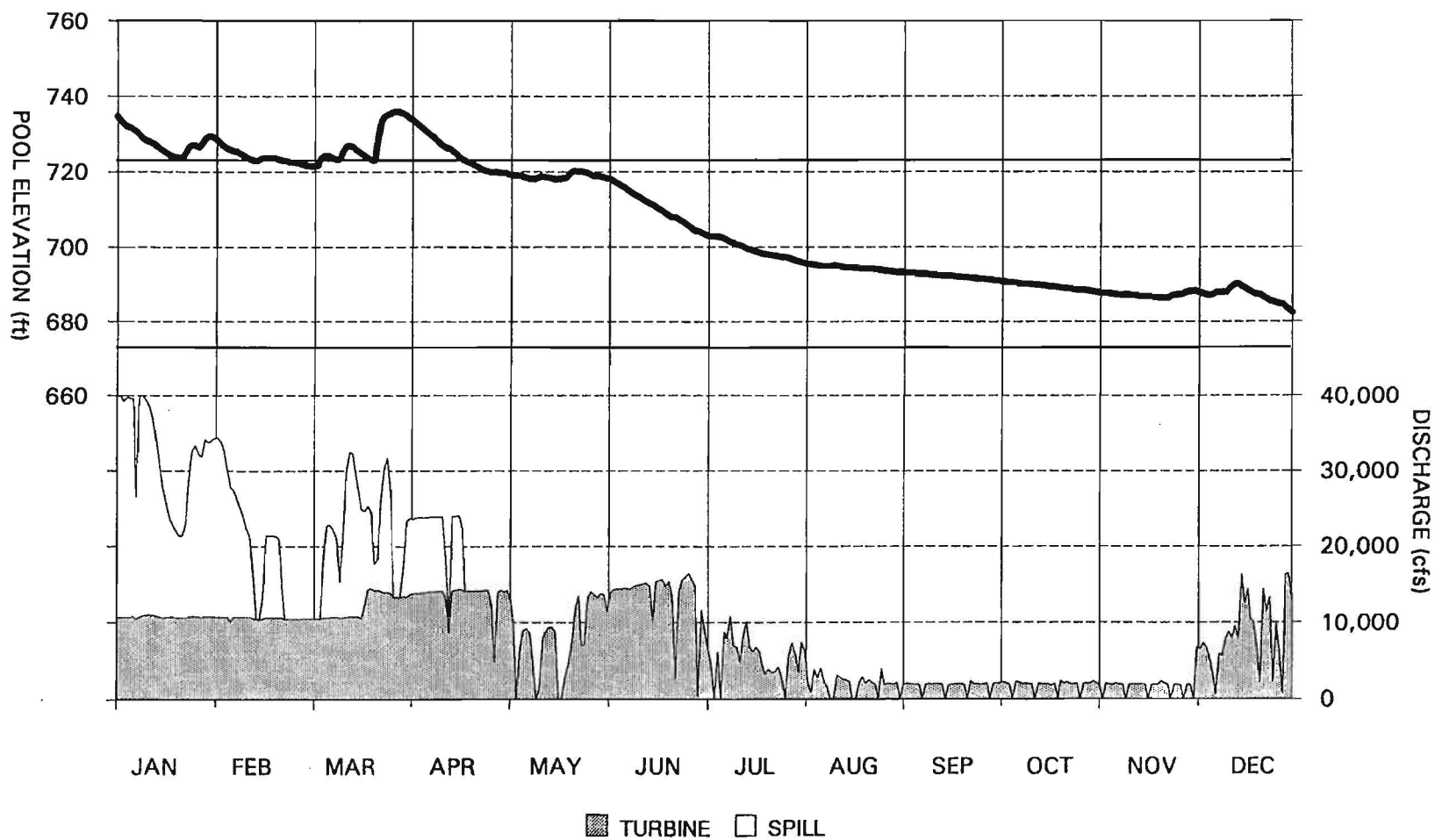
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1950



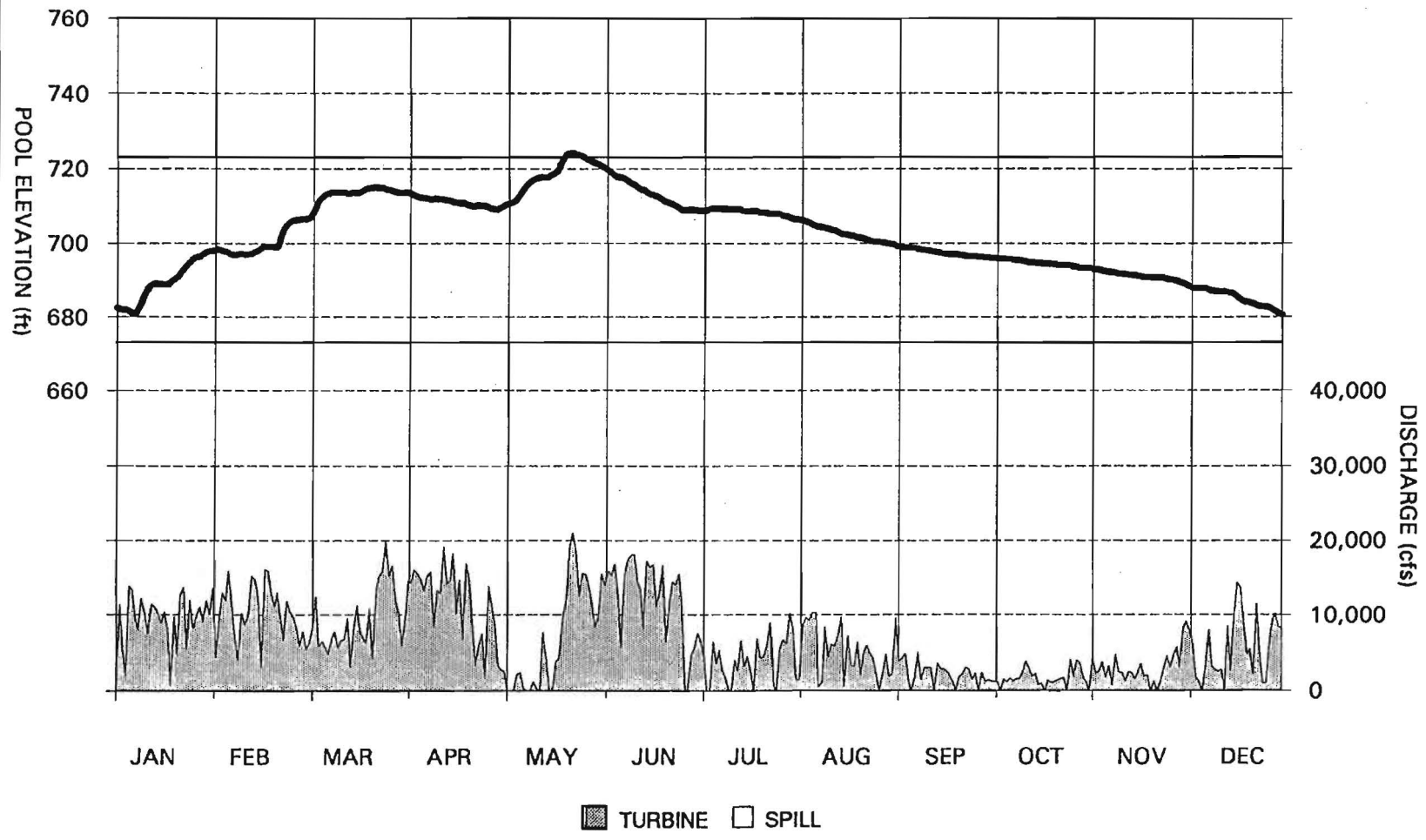
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1951



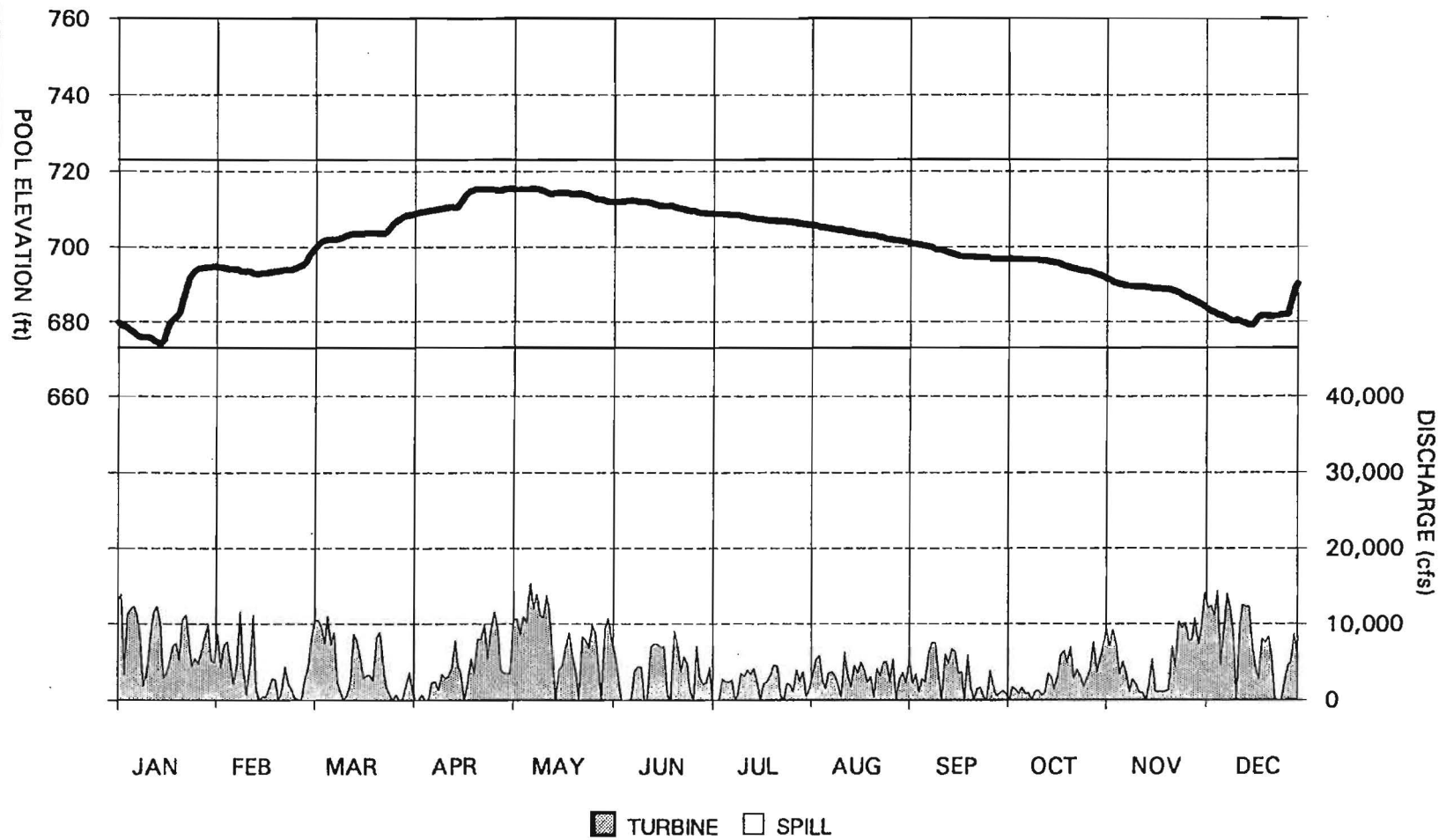
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1952



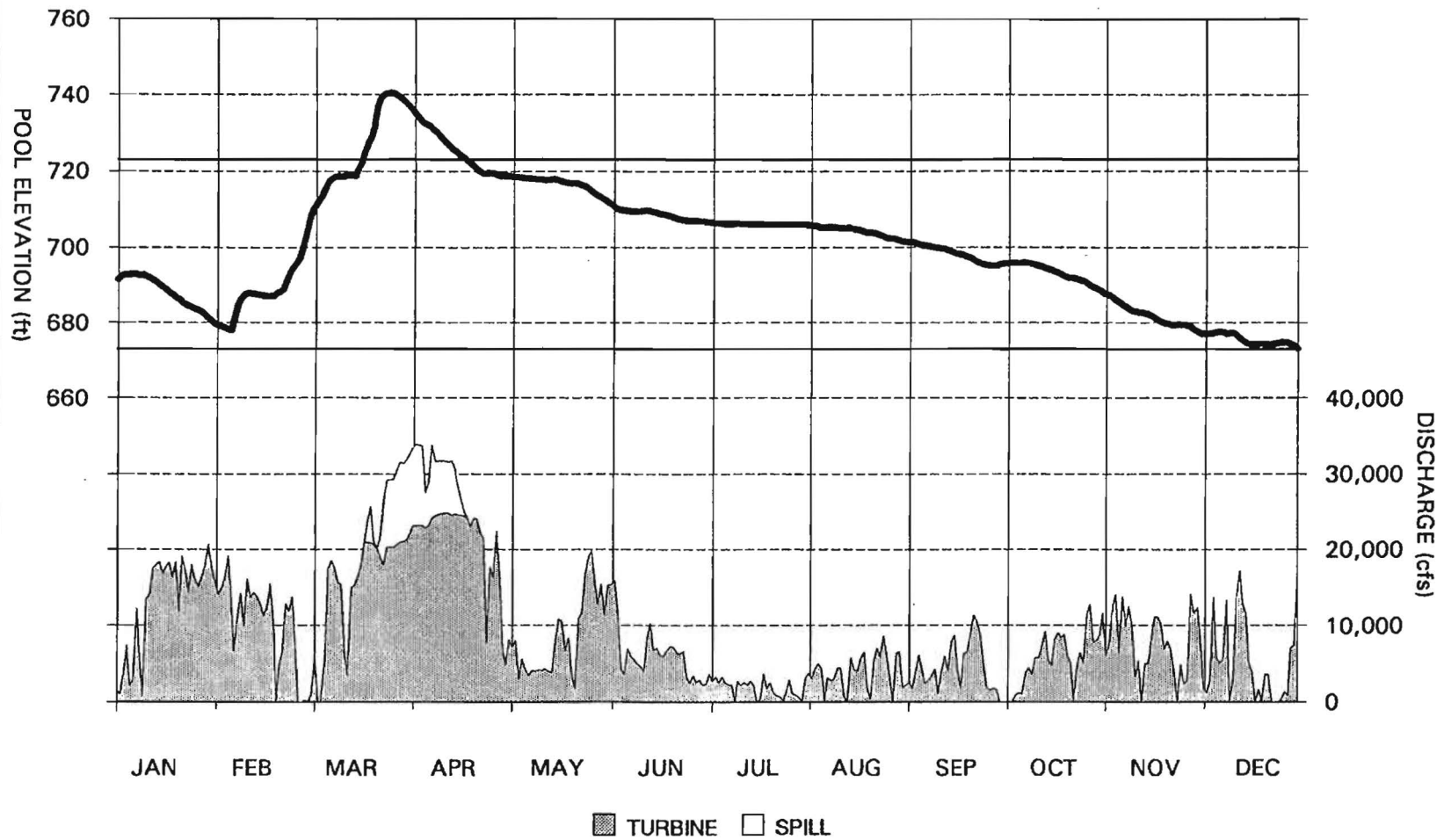
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1953



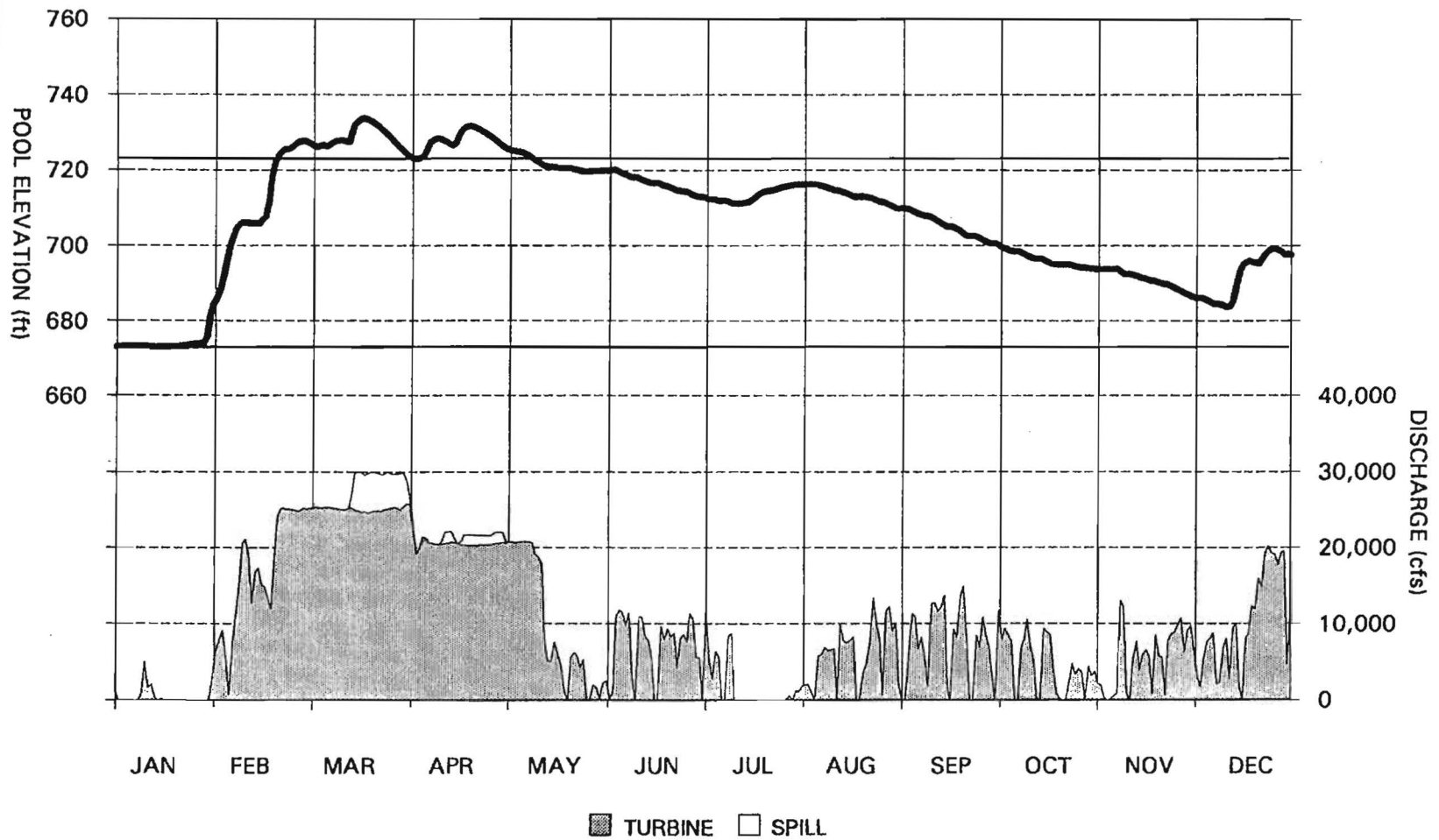
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1954



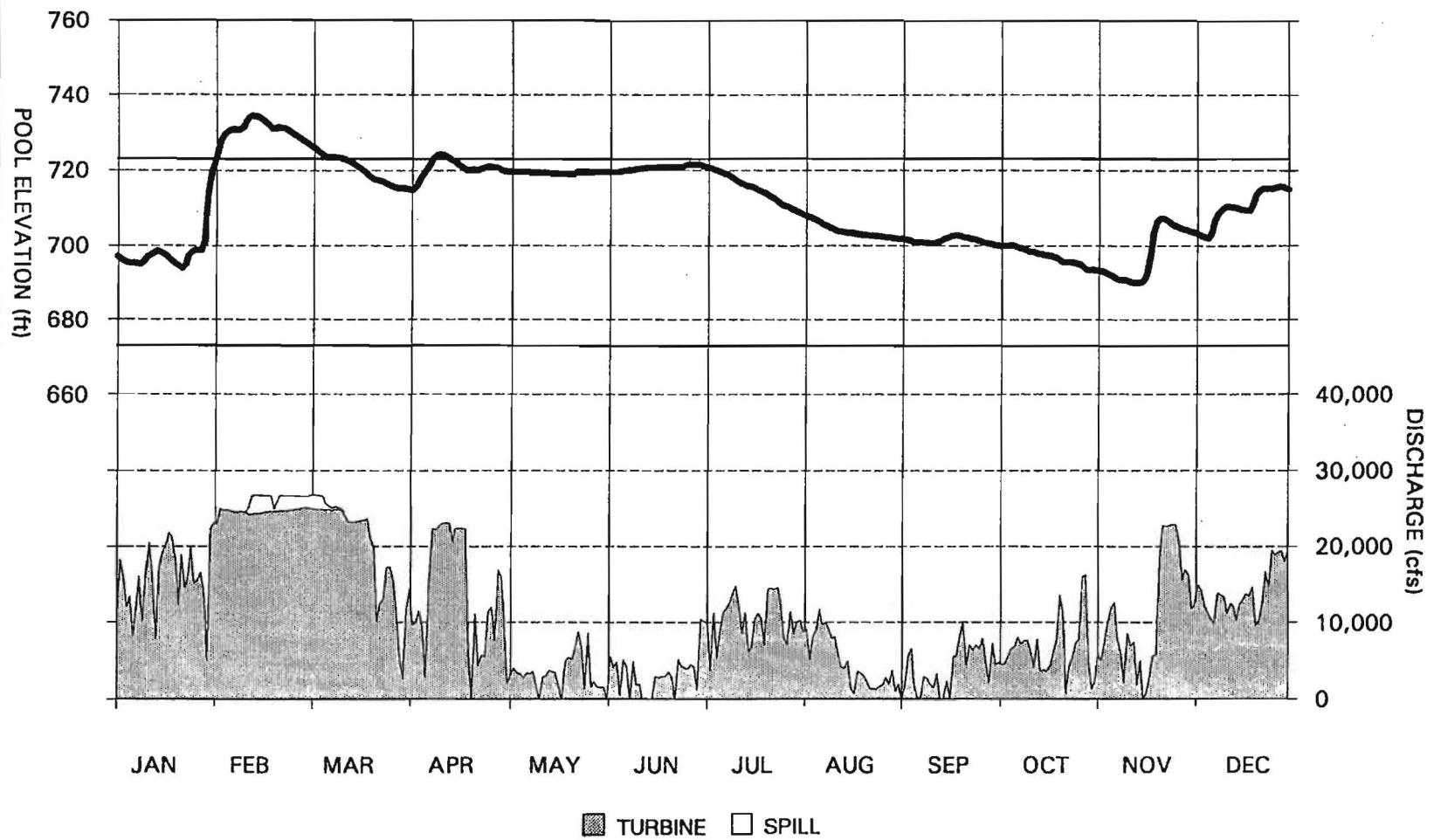
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1955



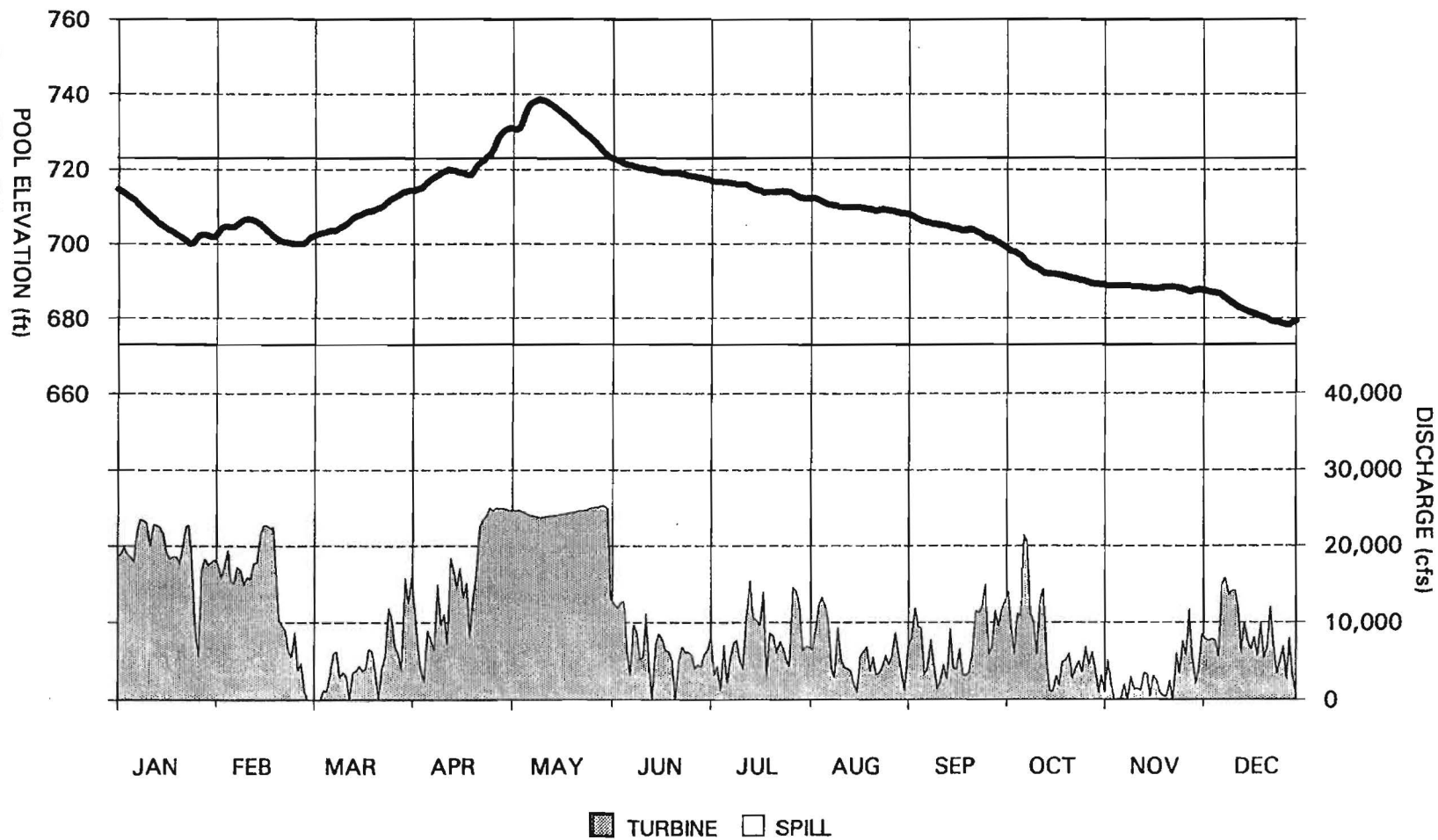
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1956



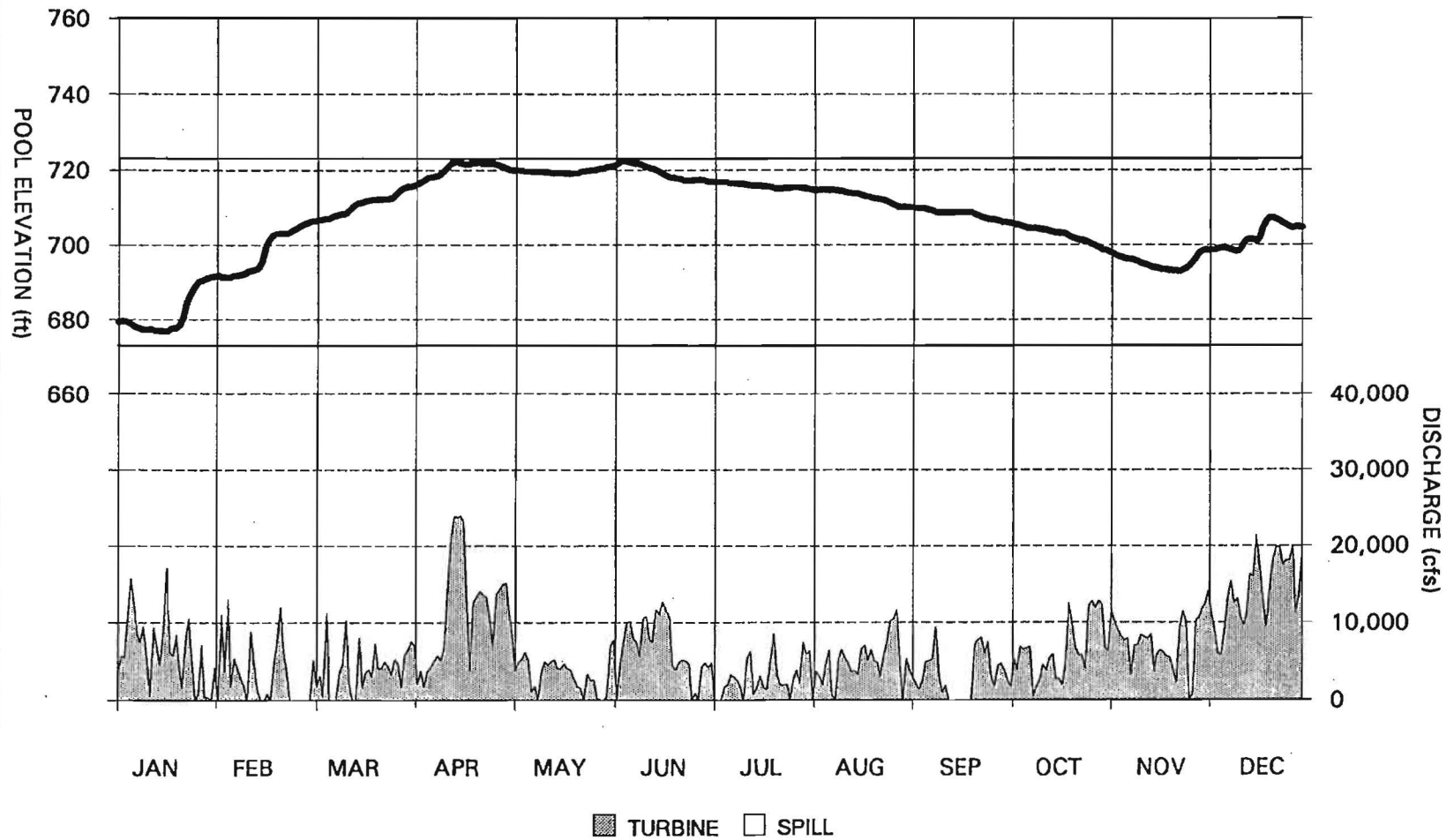
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1957



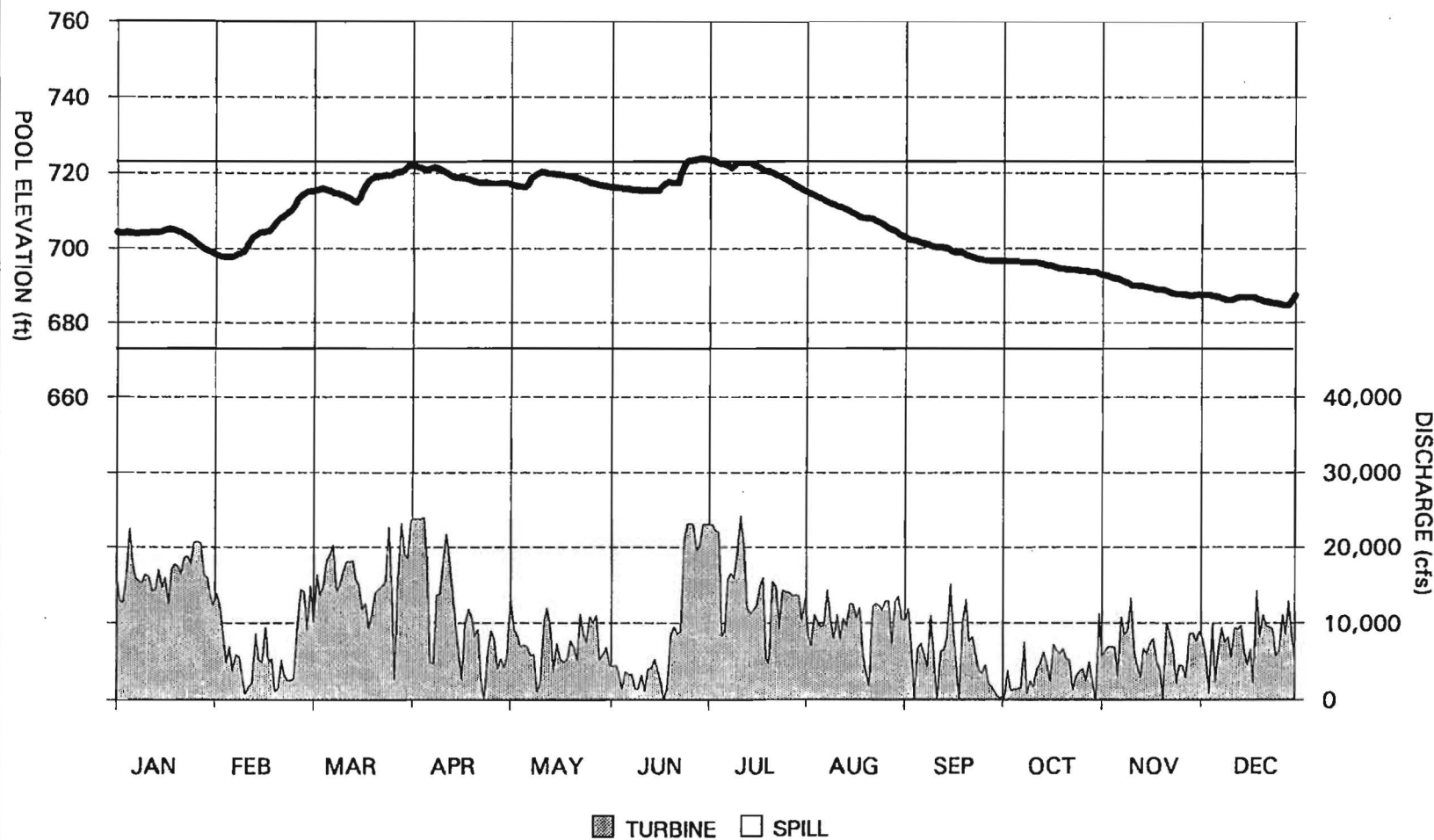
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1958



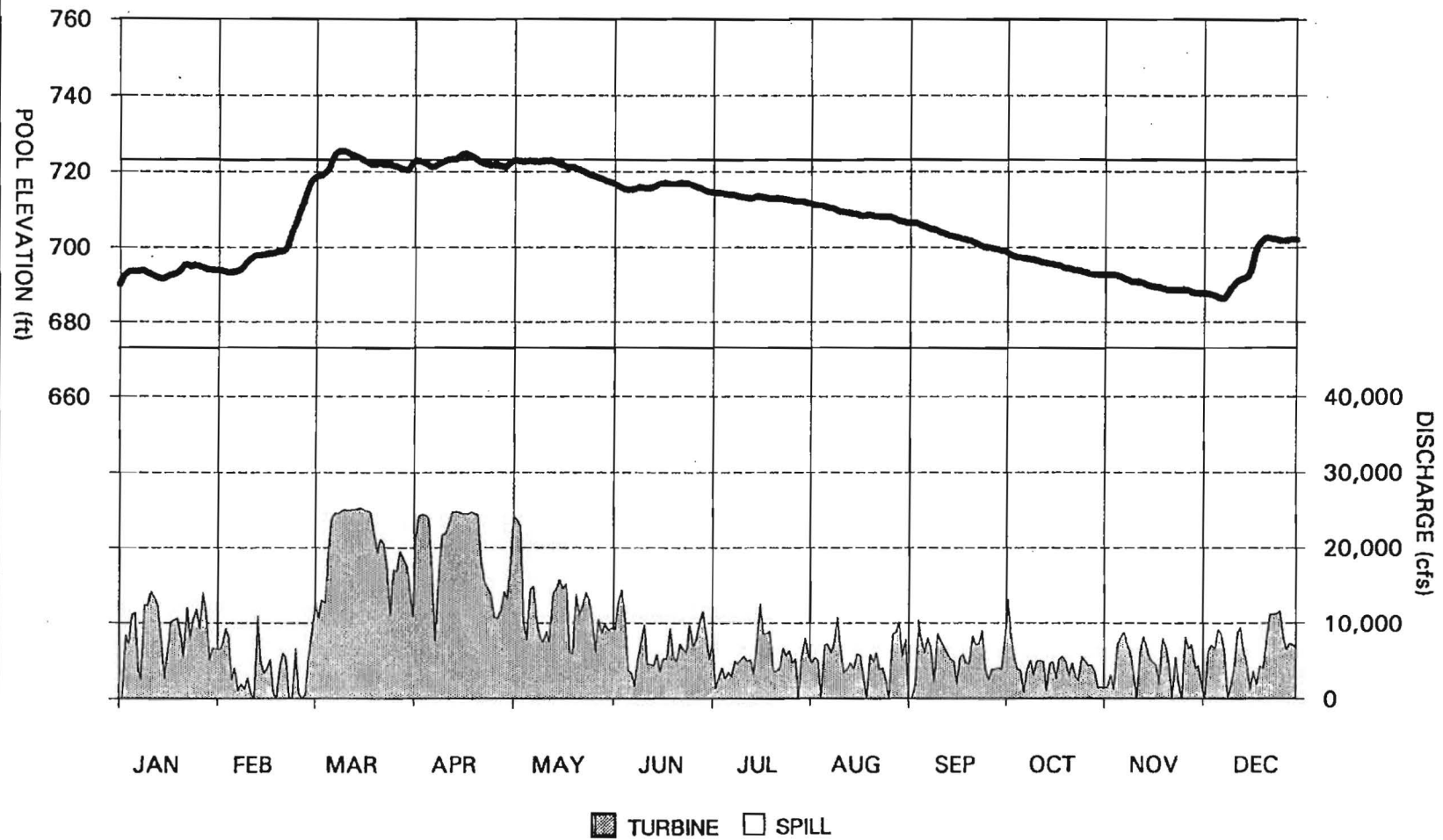
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1959



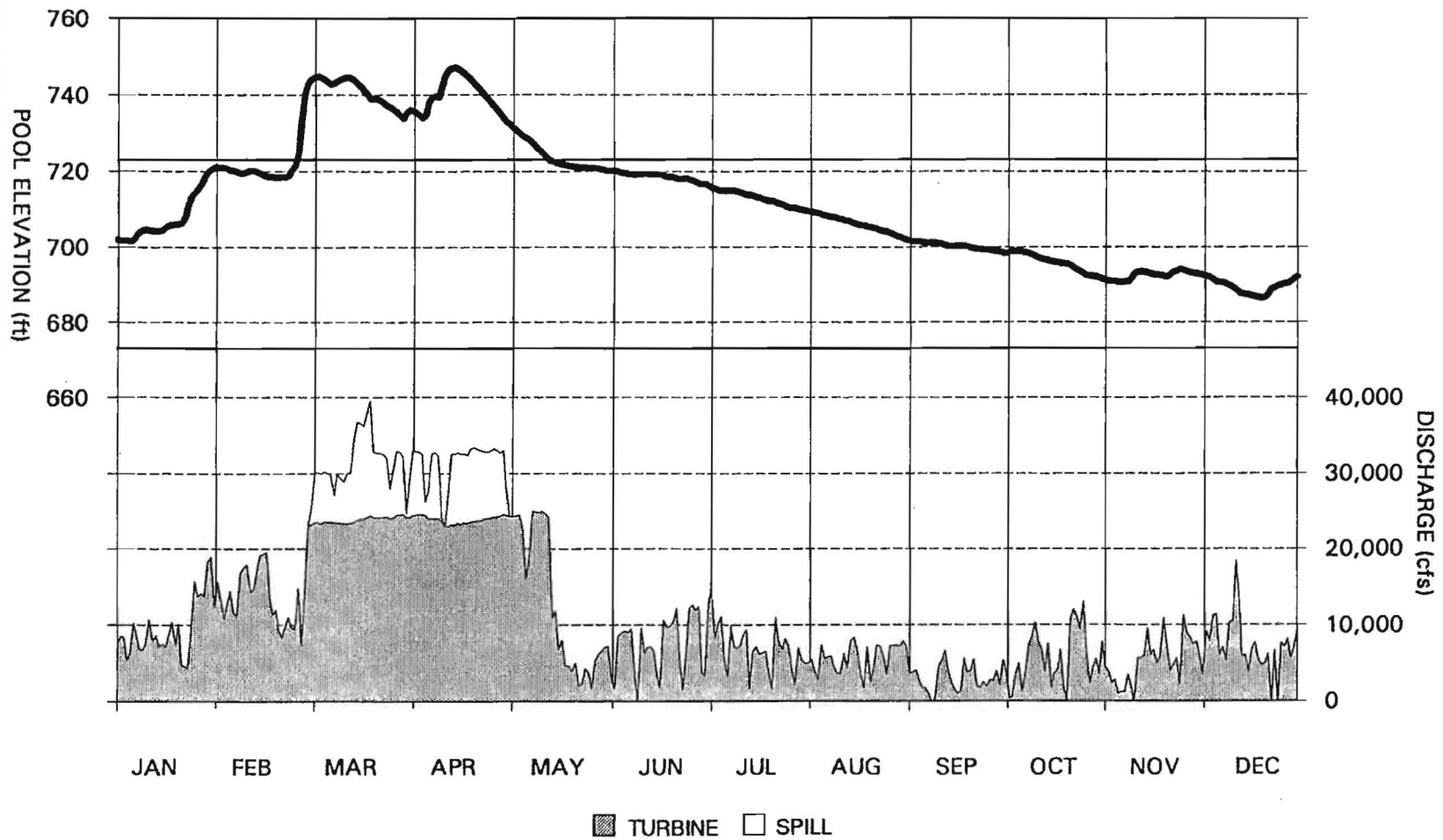
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1960



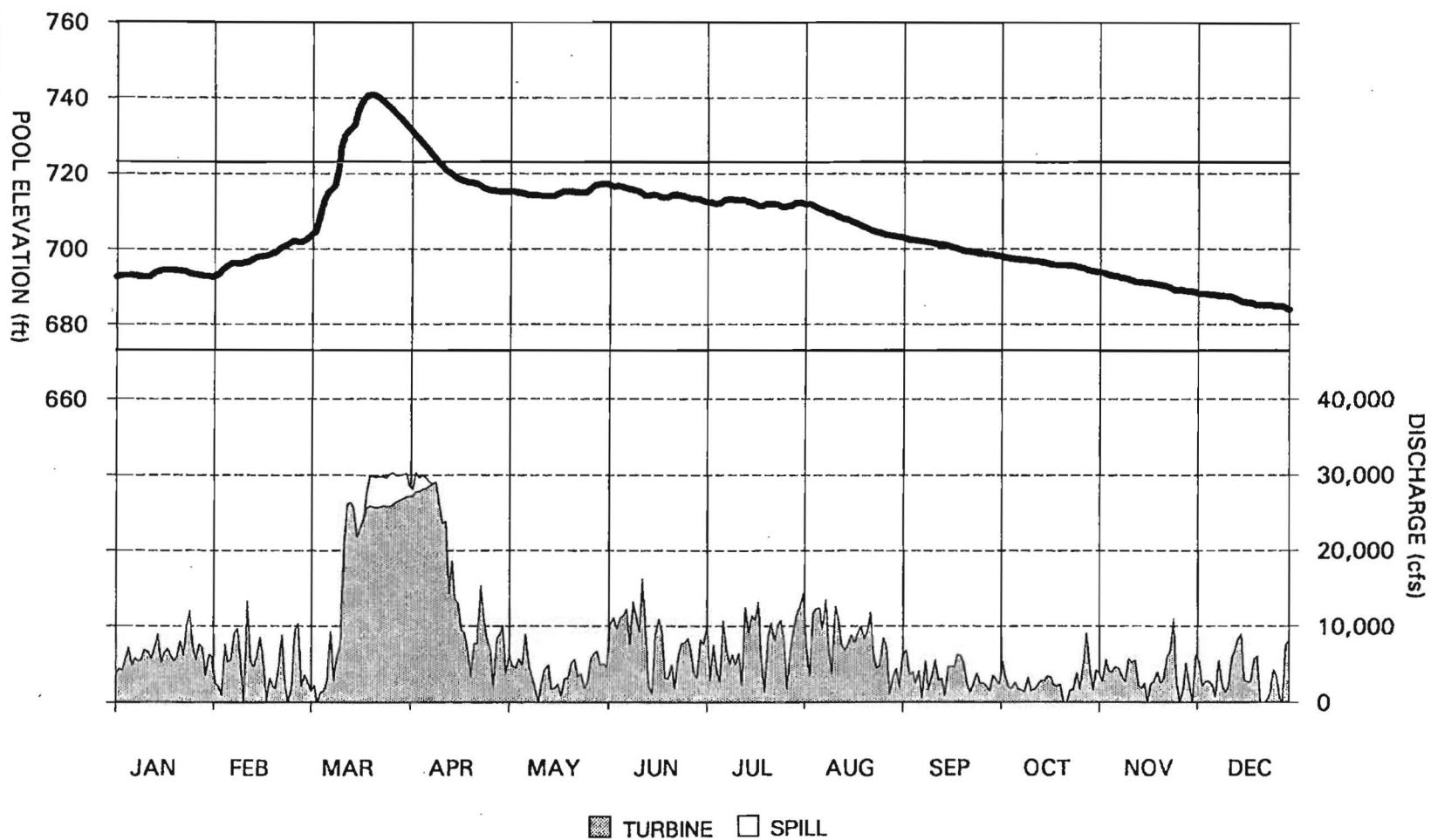
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1961



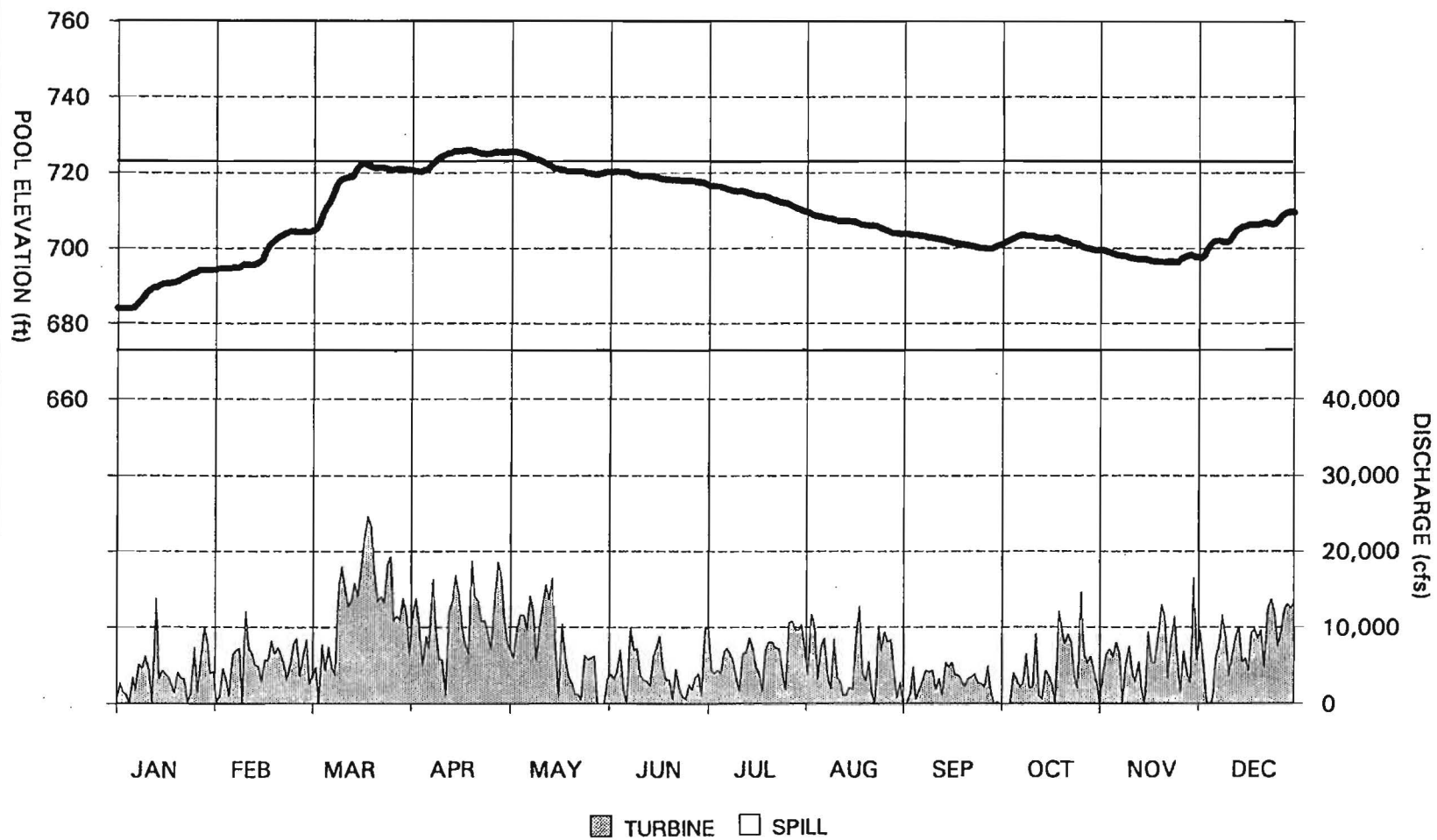
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1962



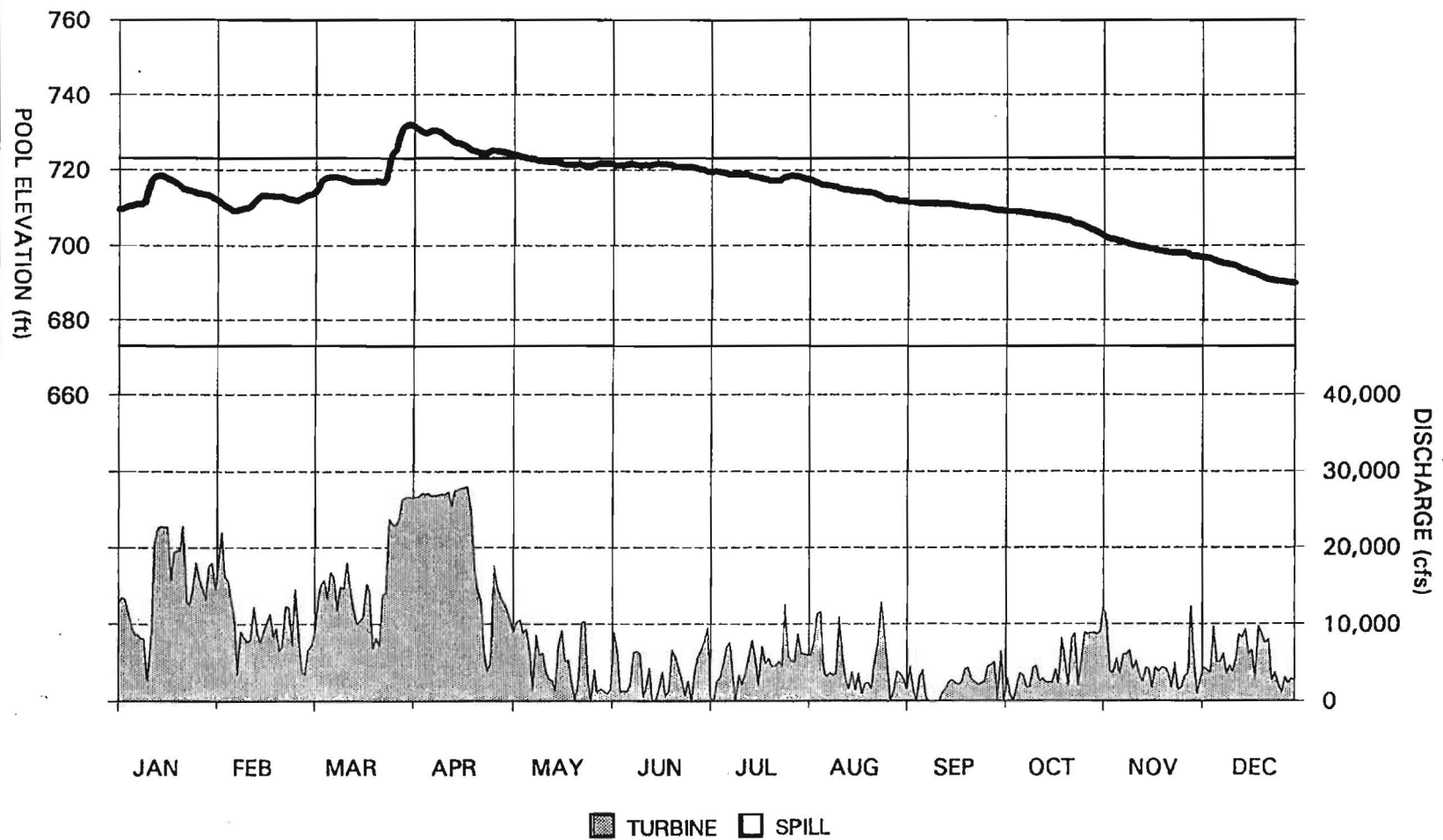
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1963



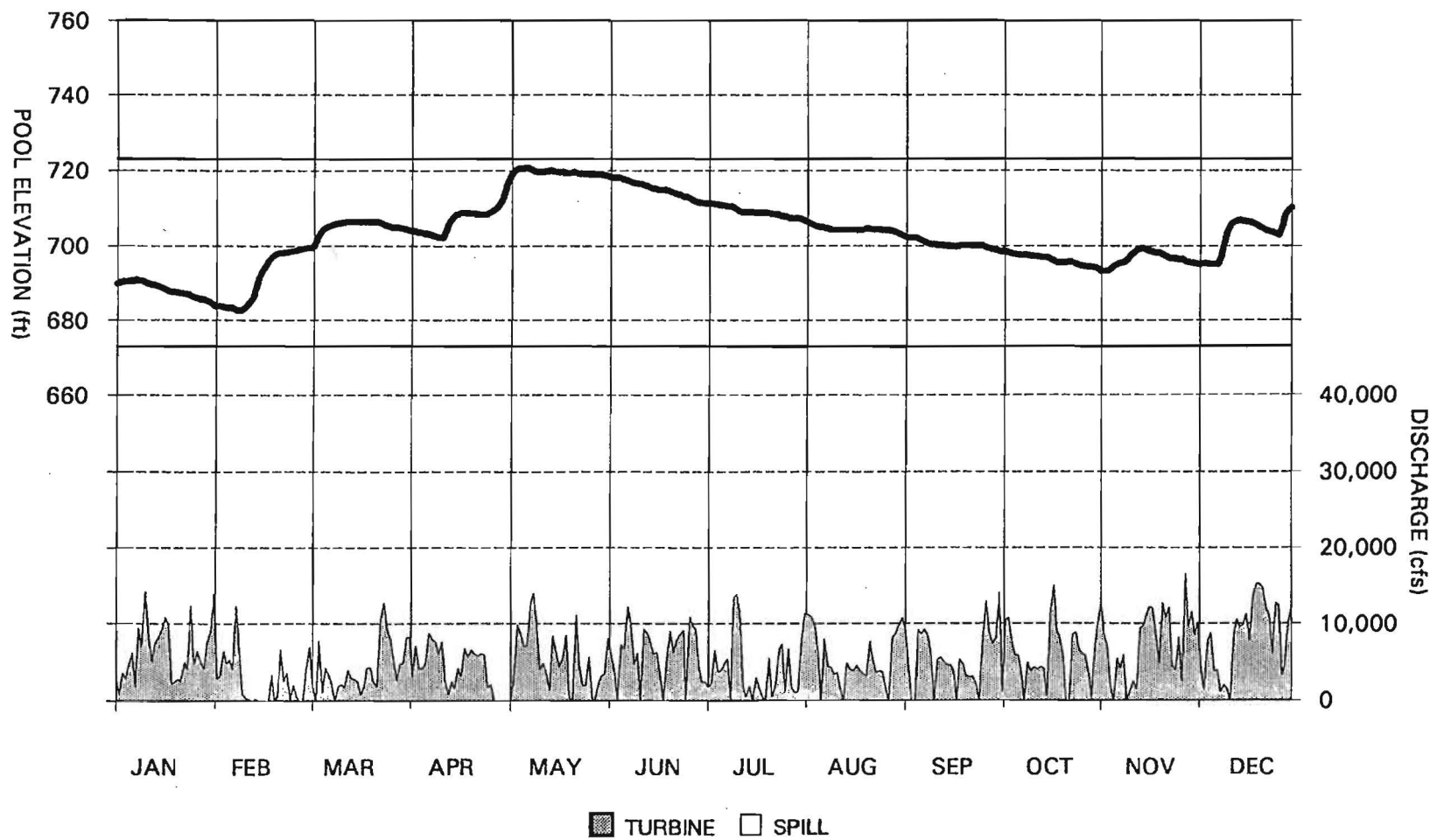
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1964



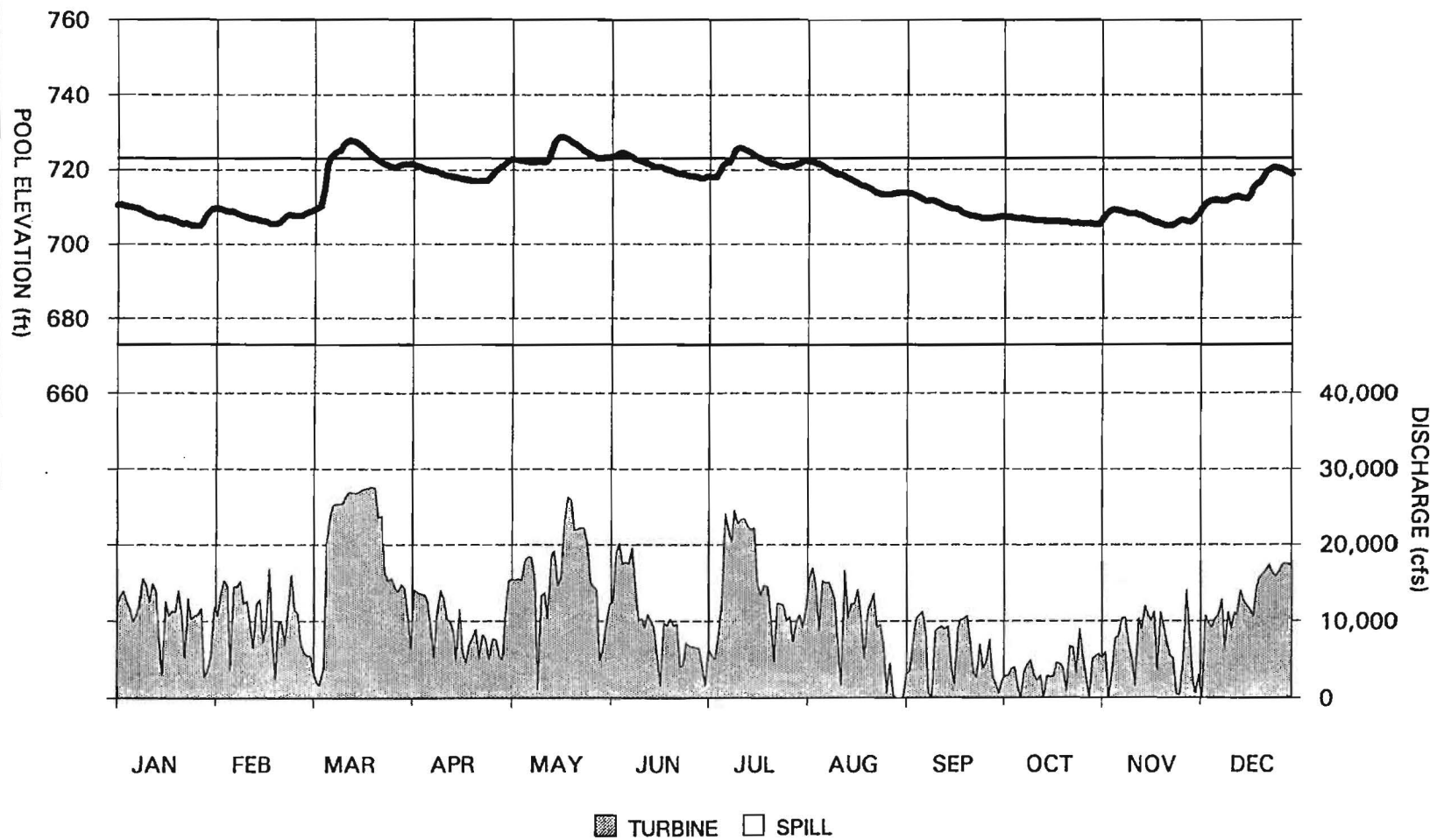
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1965



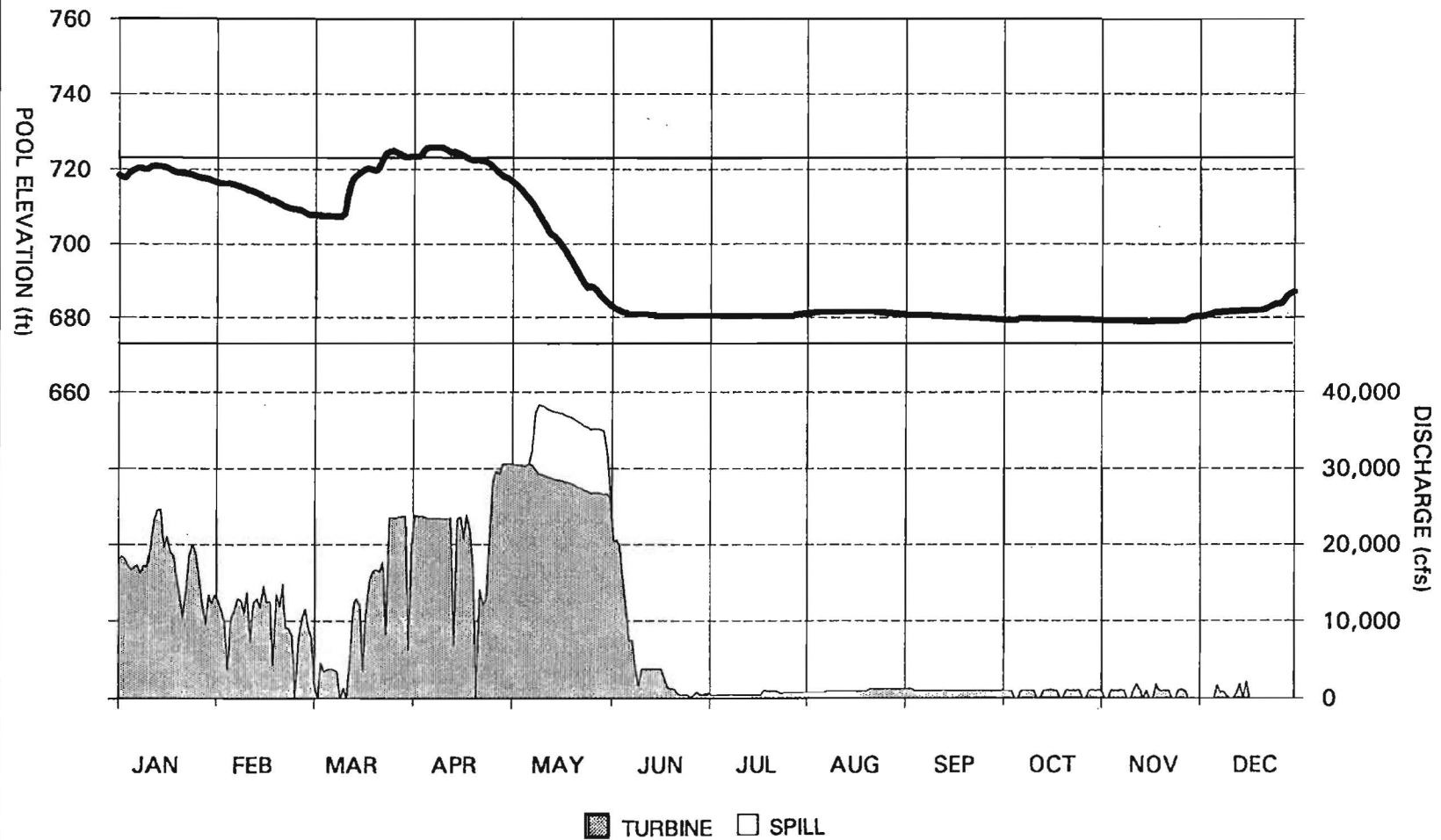
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1966



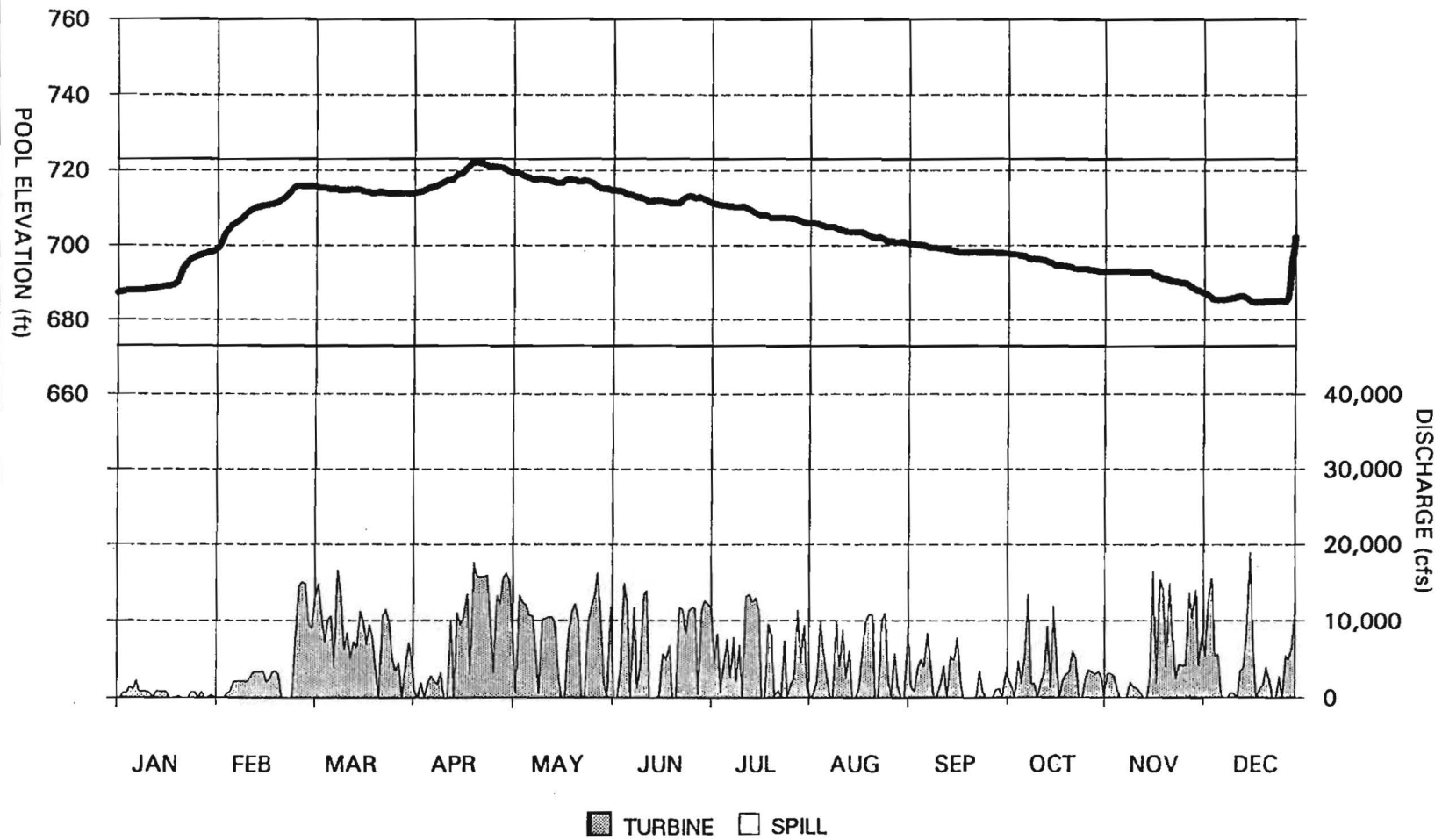
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1967



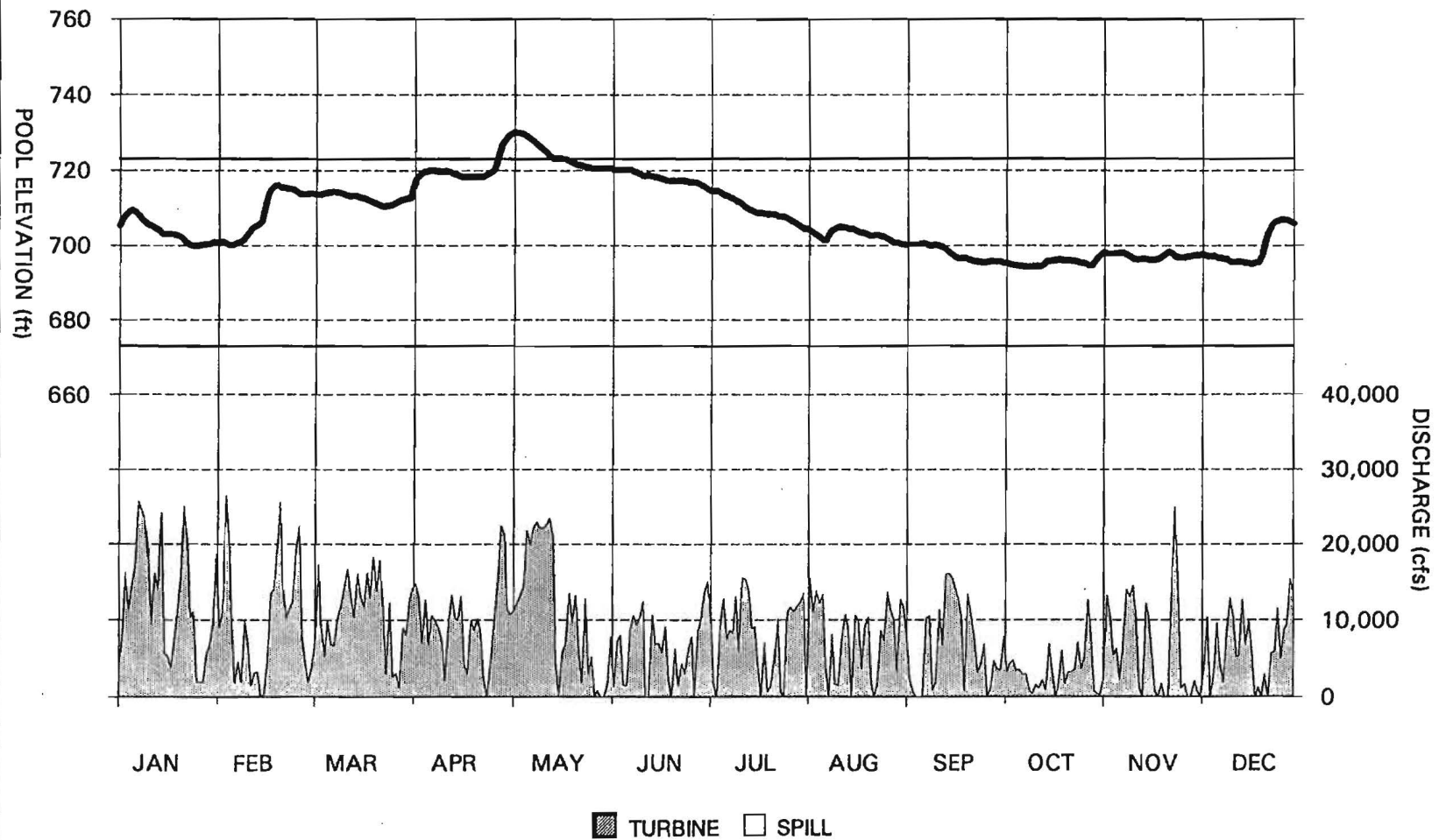
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1968



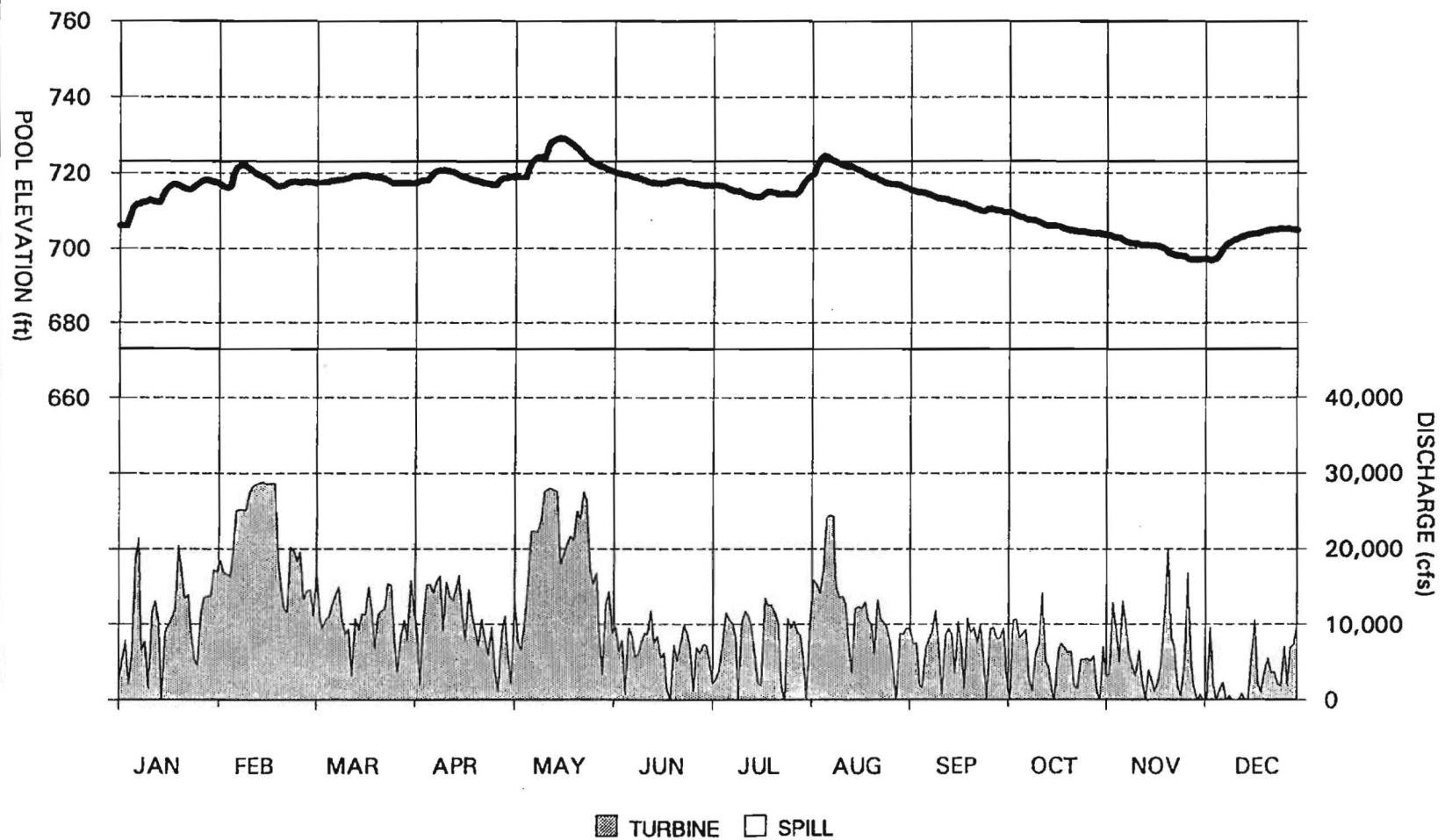
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1969



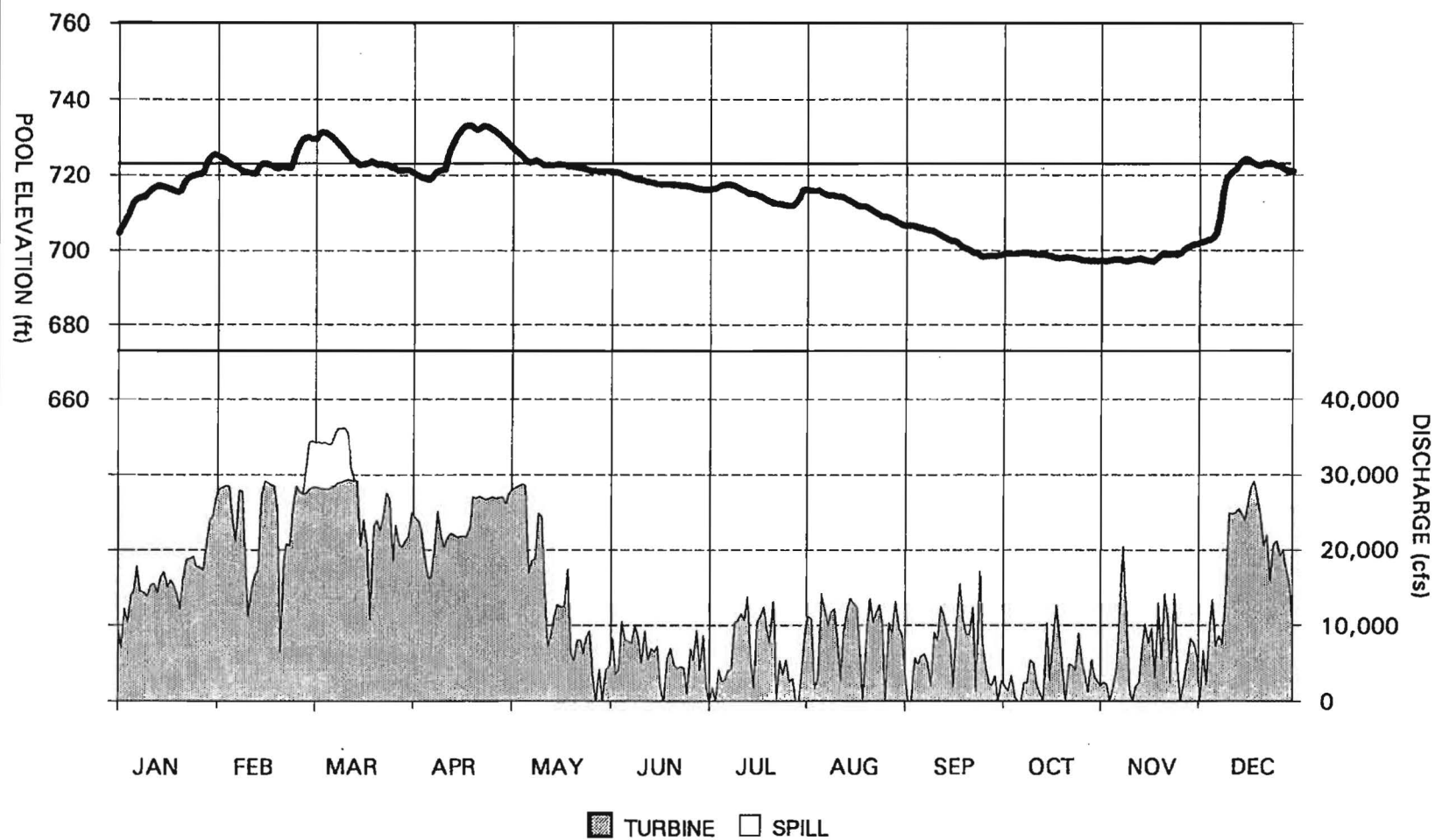
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1970



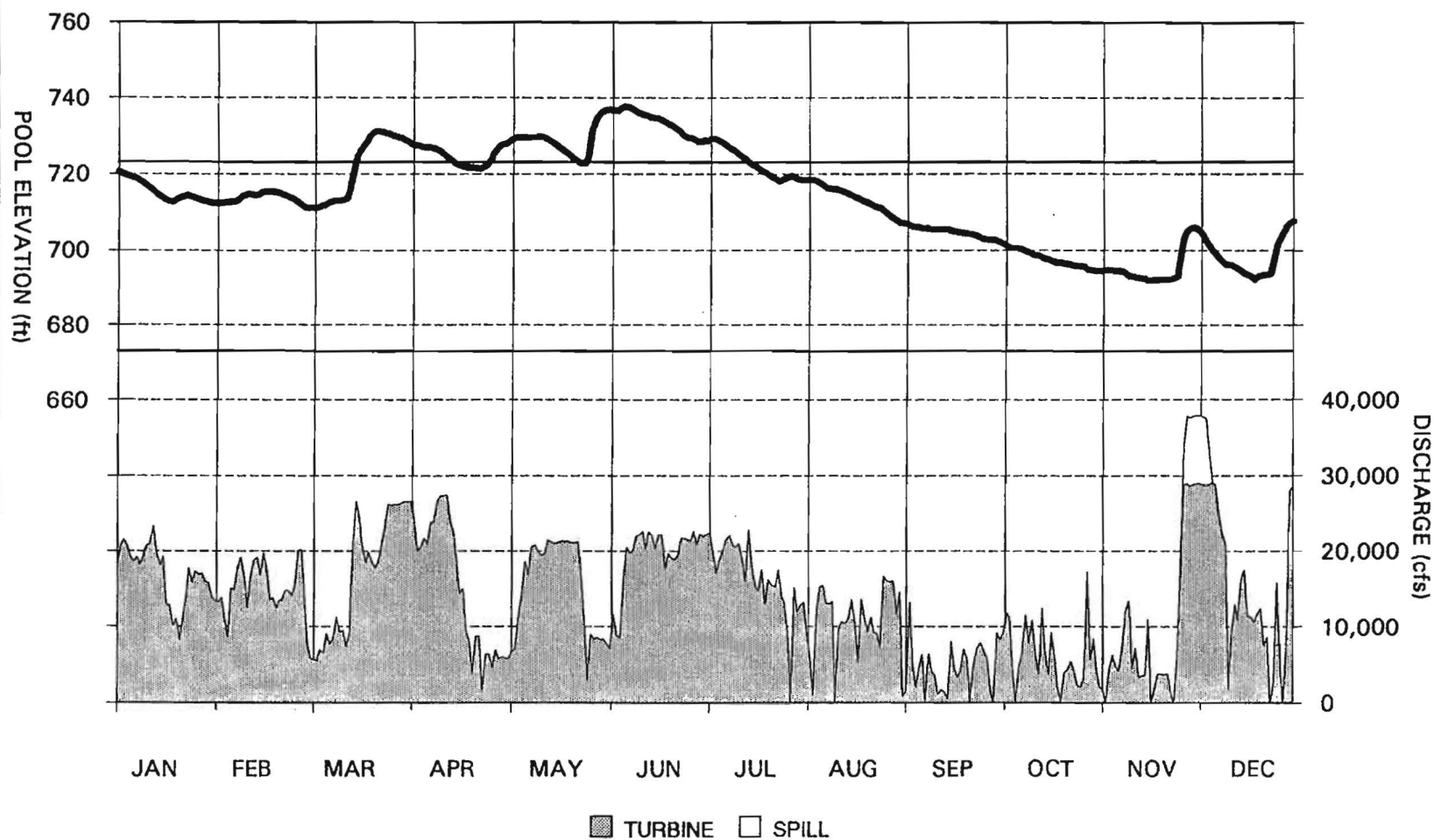
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1971



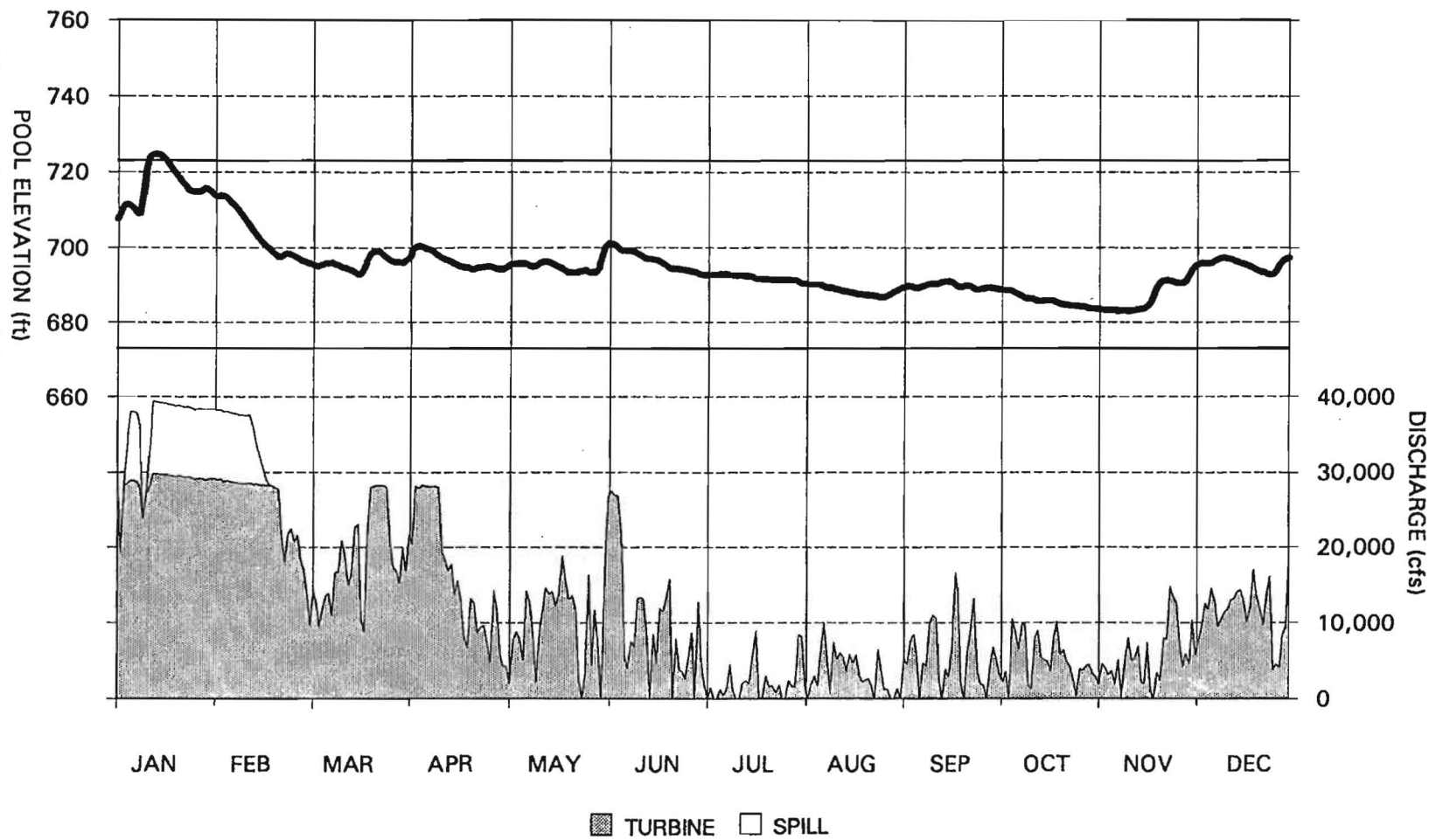
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1972



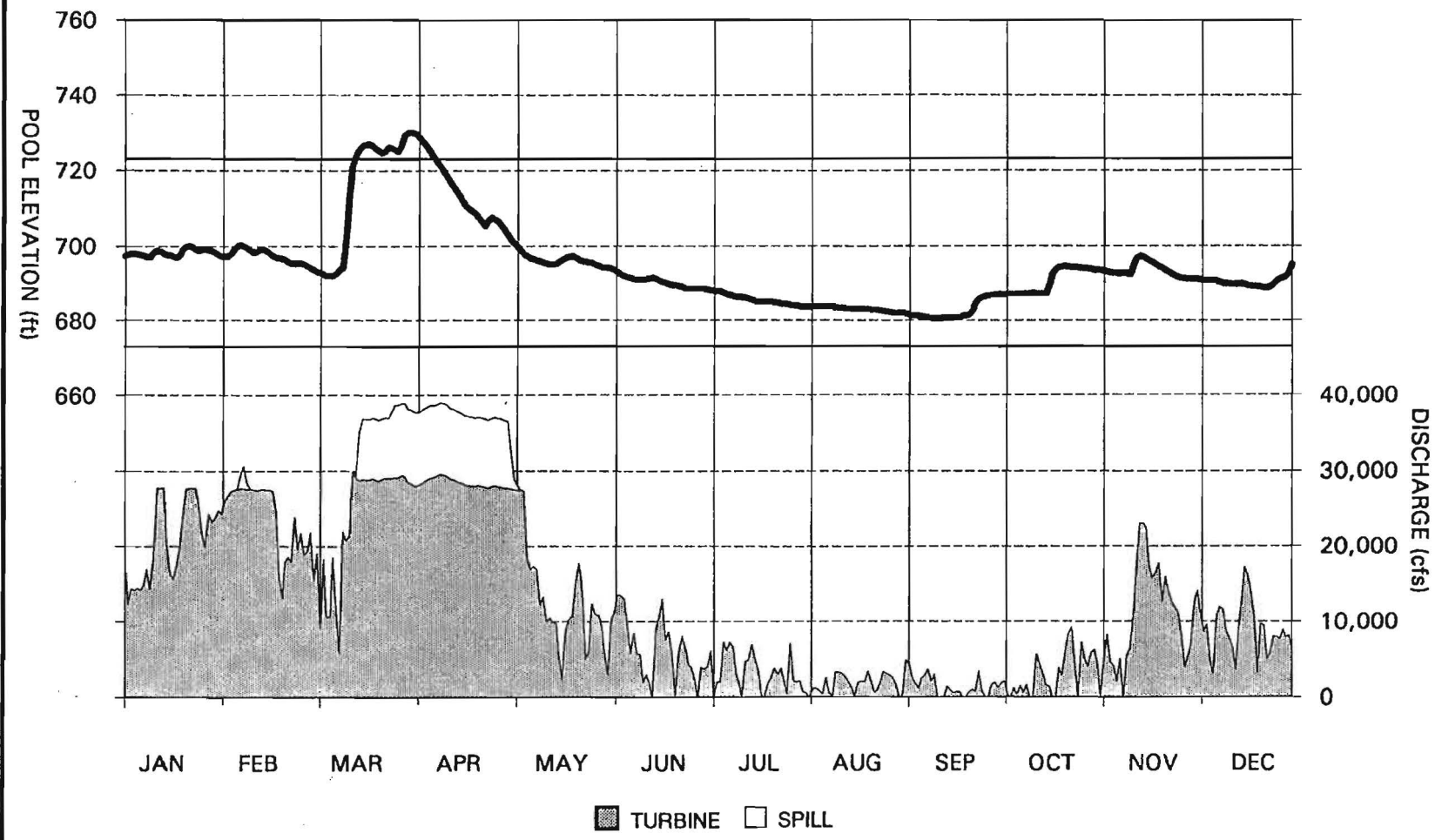
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1973



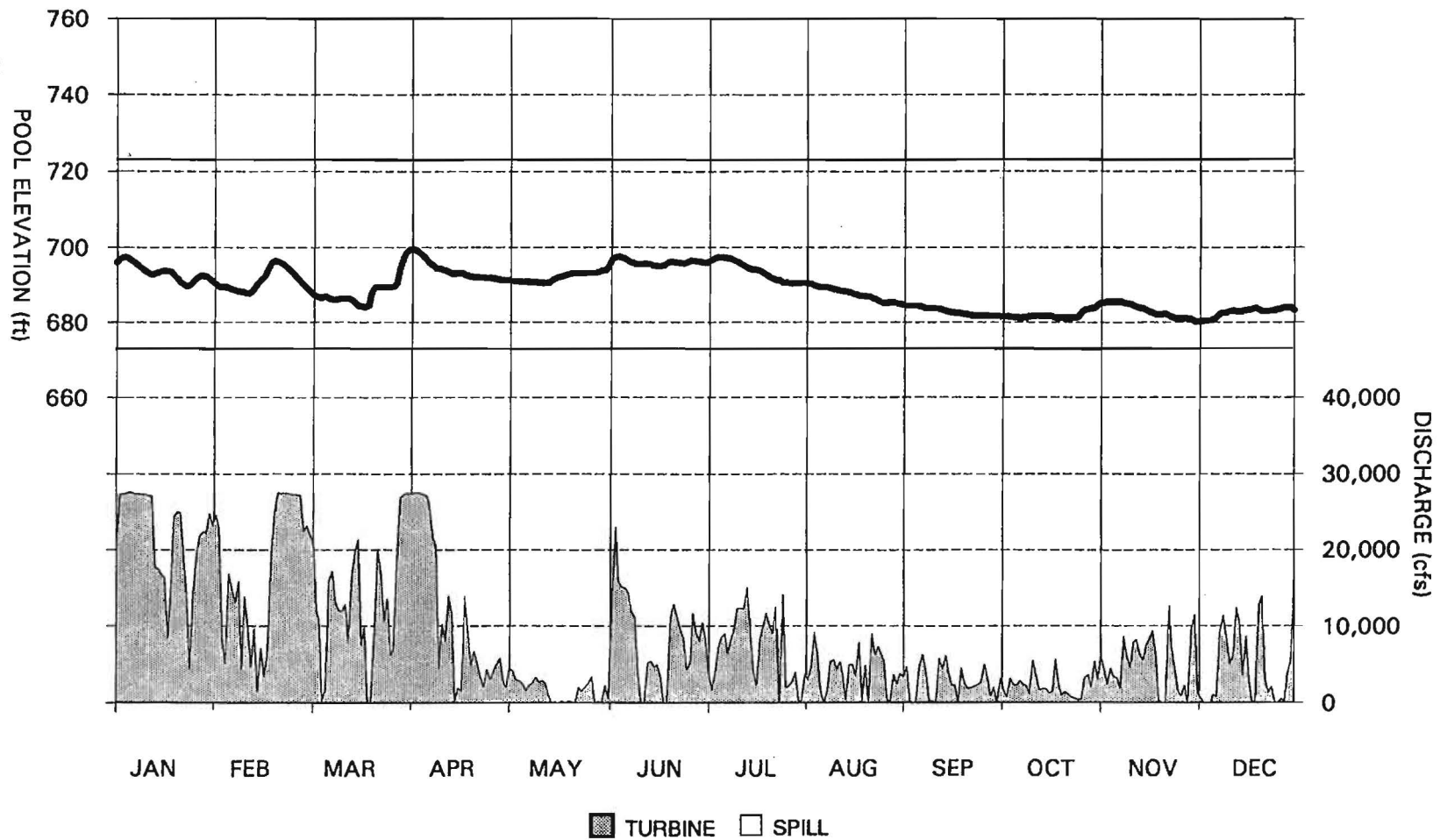
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1974



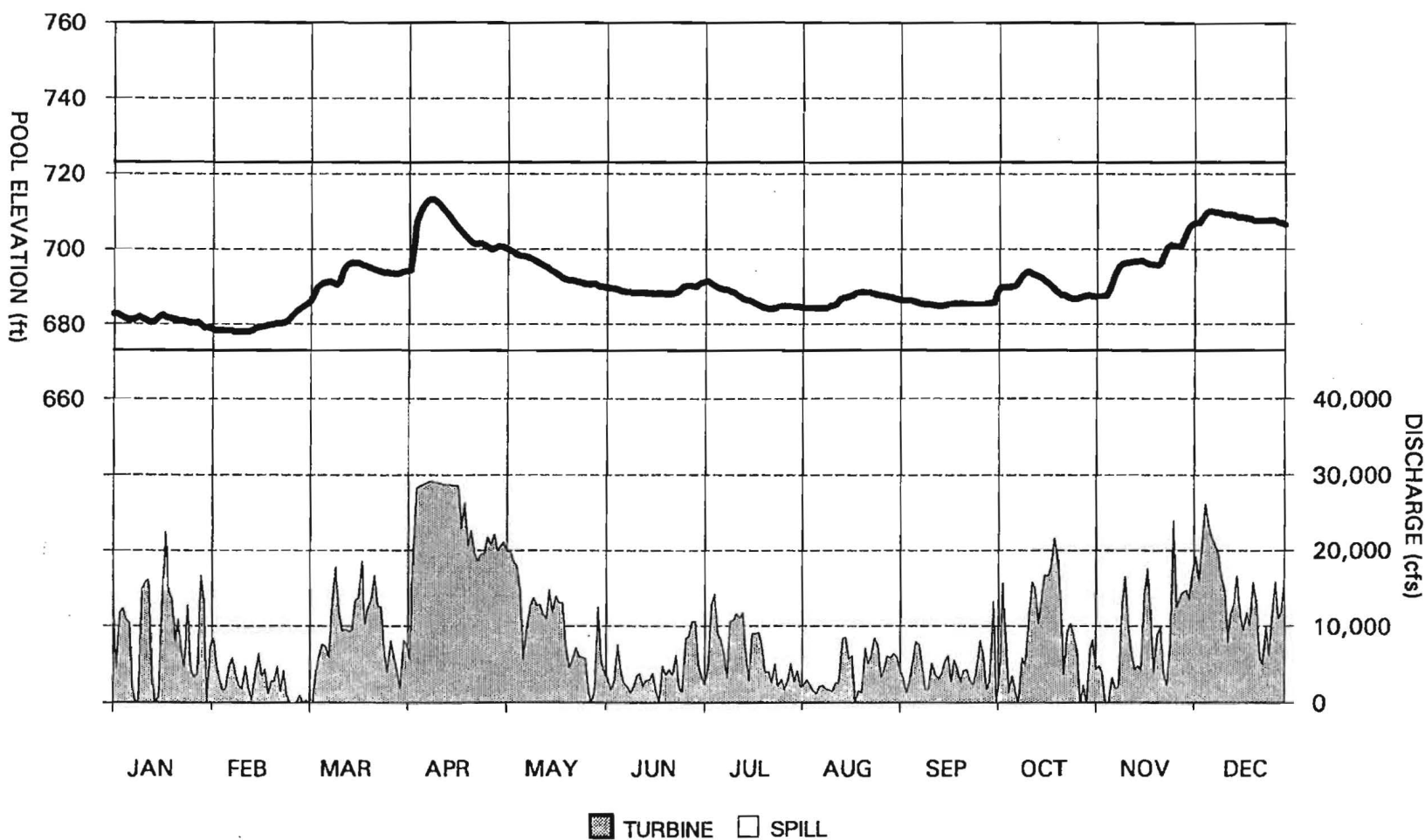
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1975



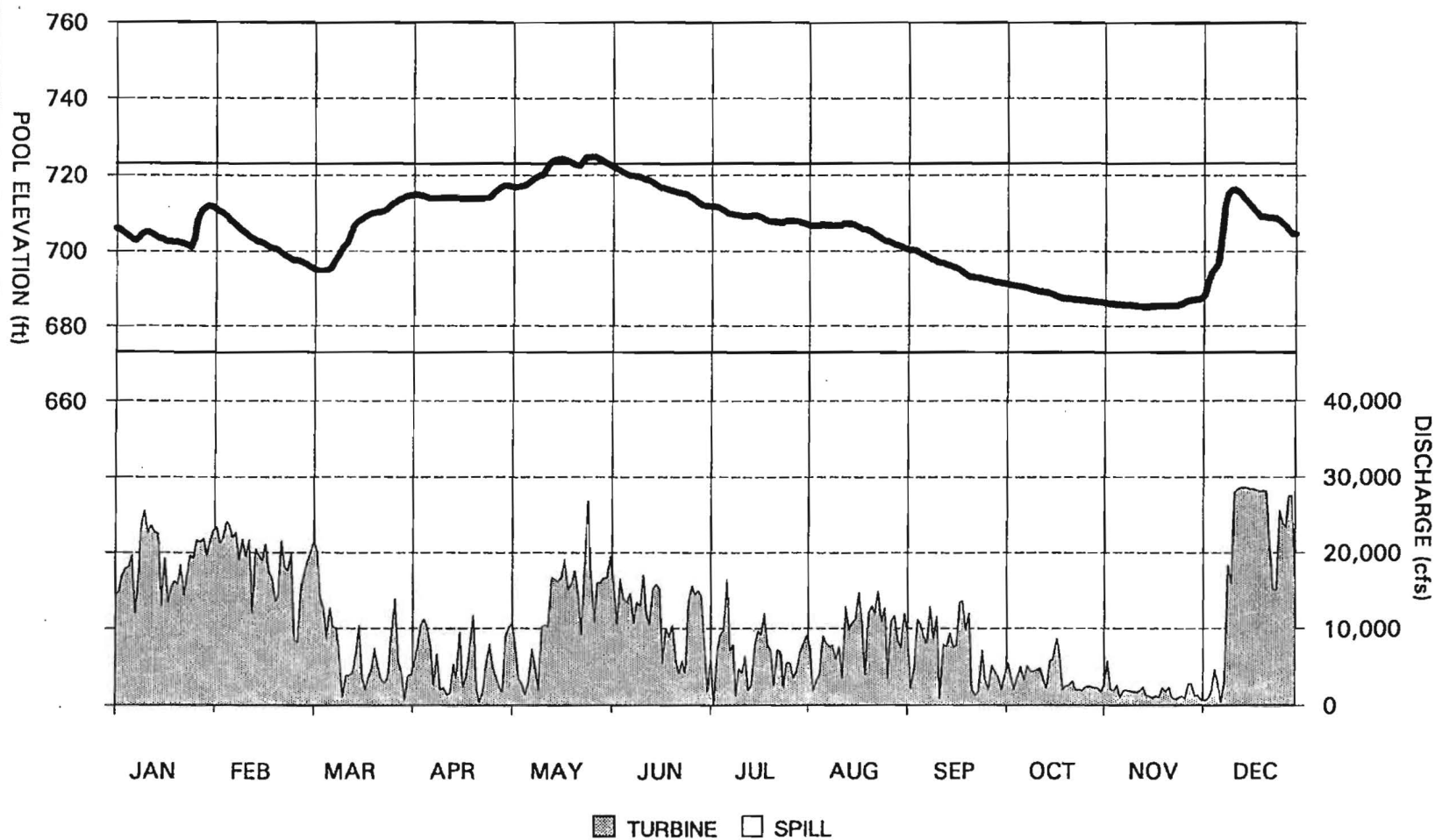
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1976



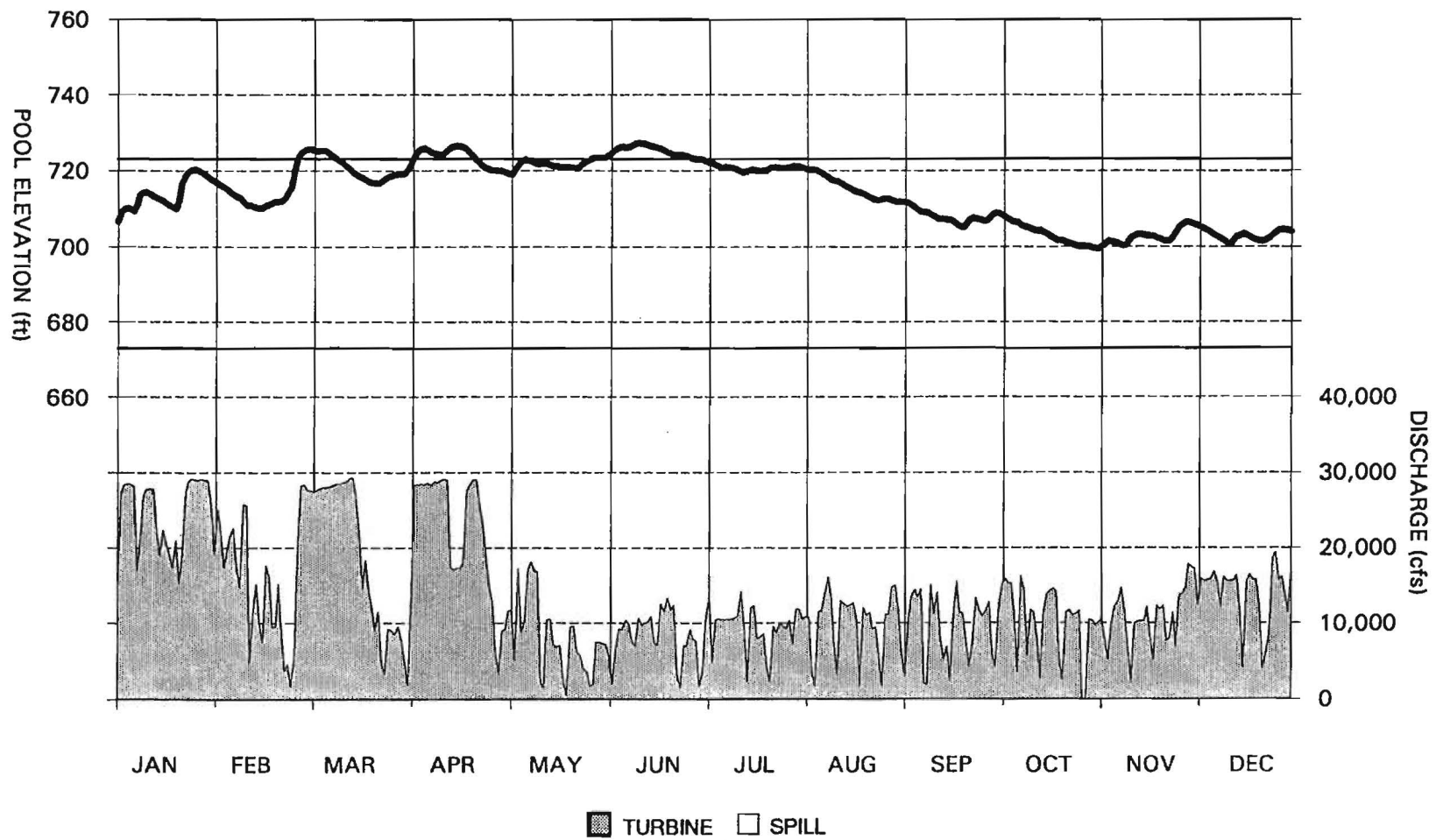
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1977



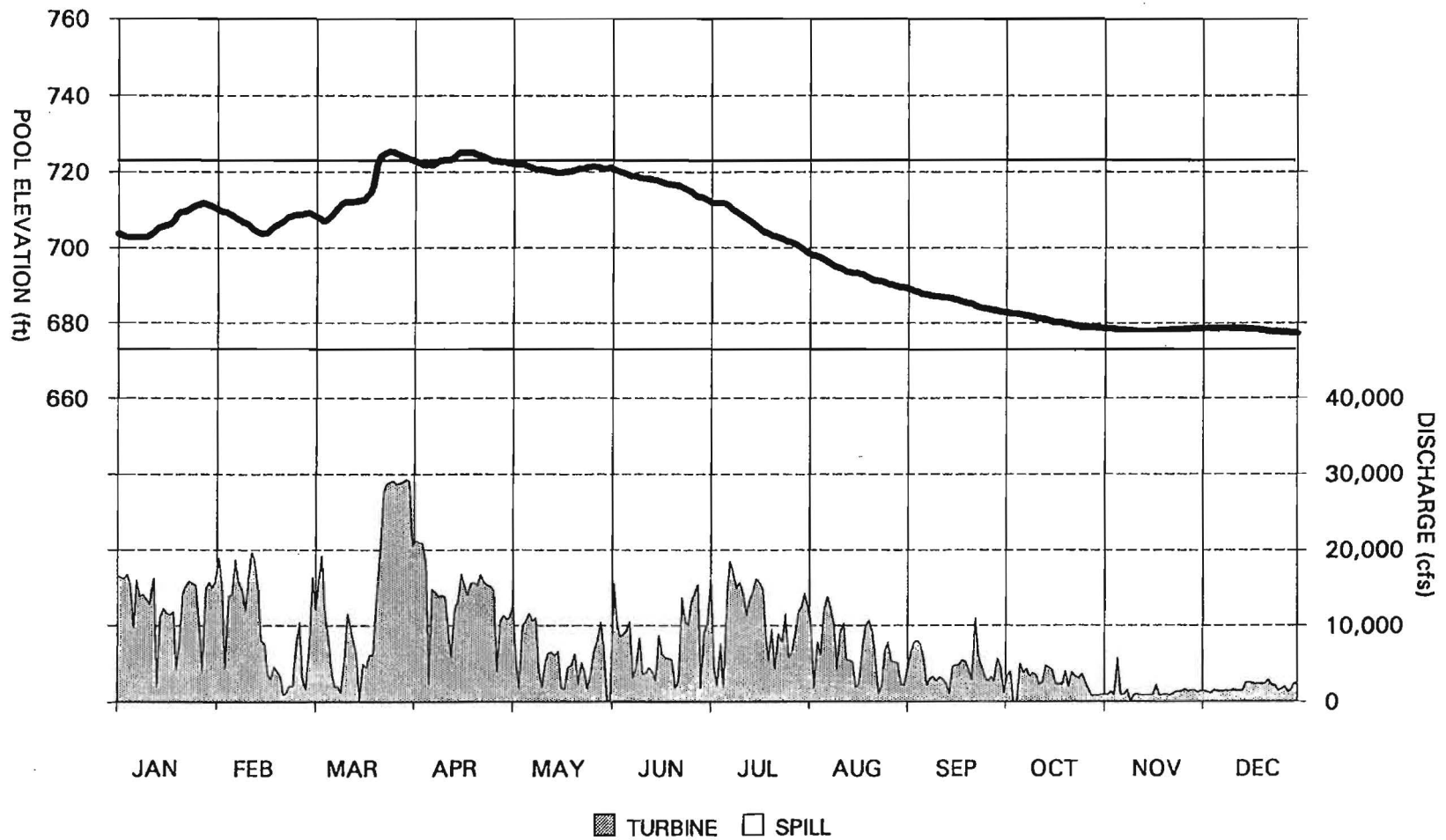
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1978



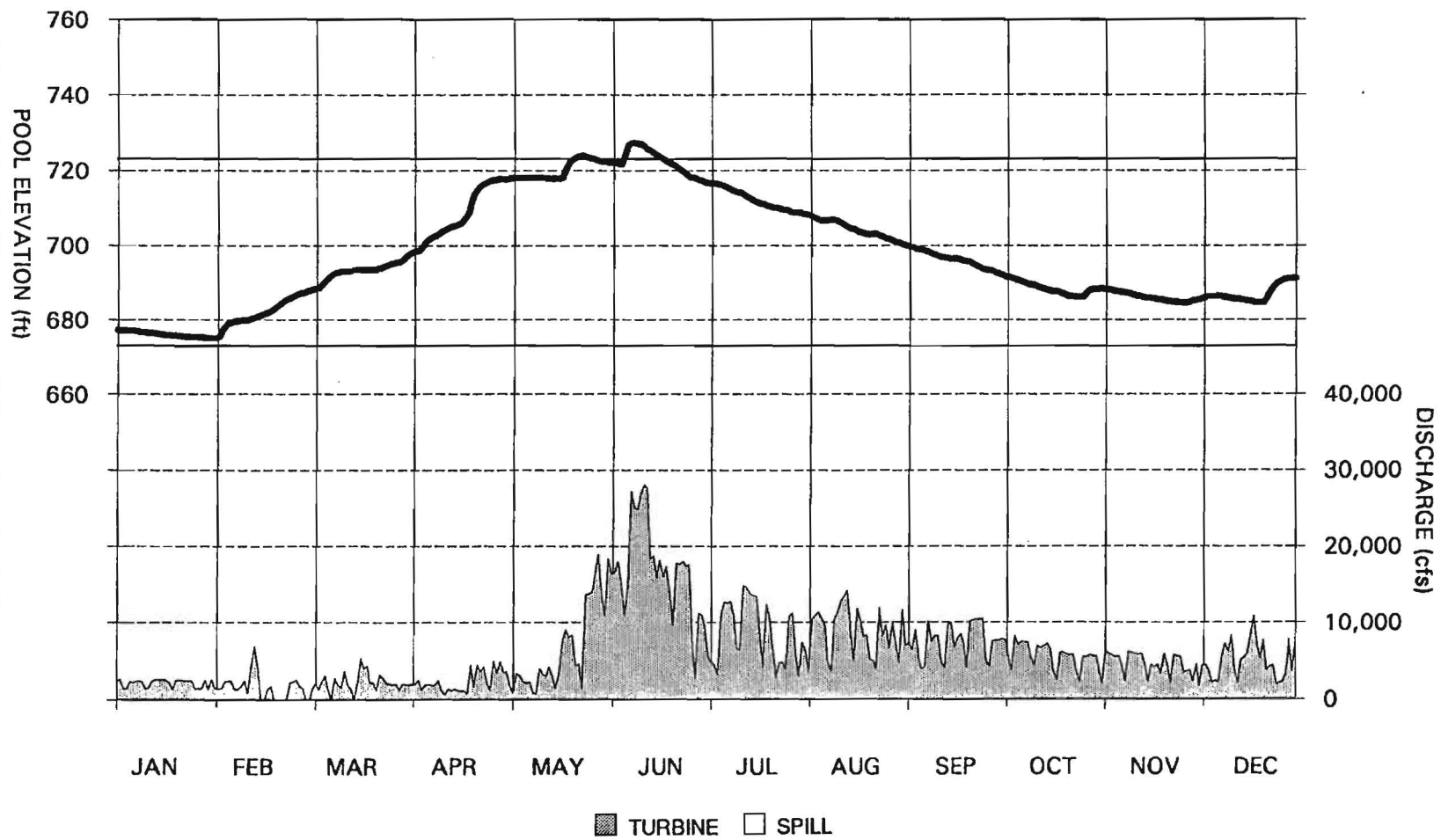
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1979



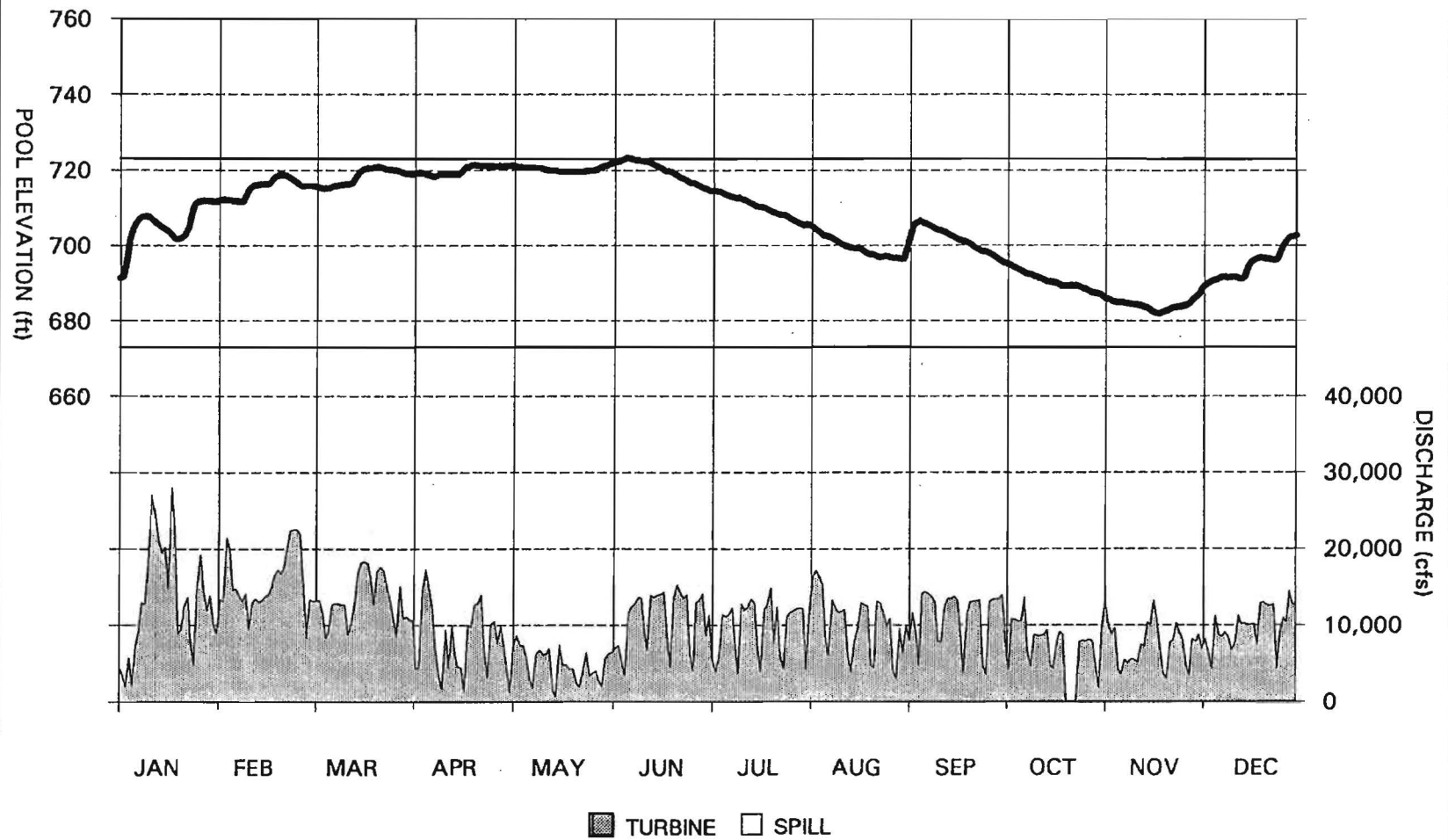
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1980



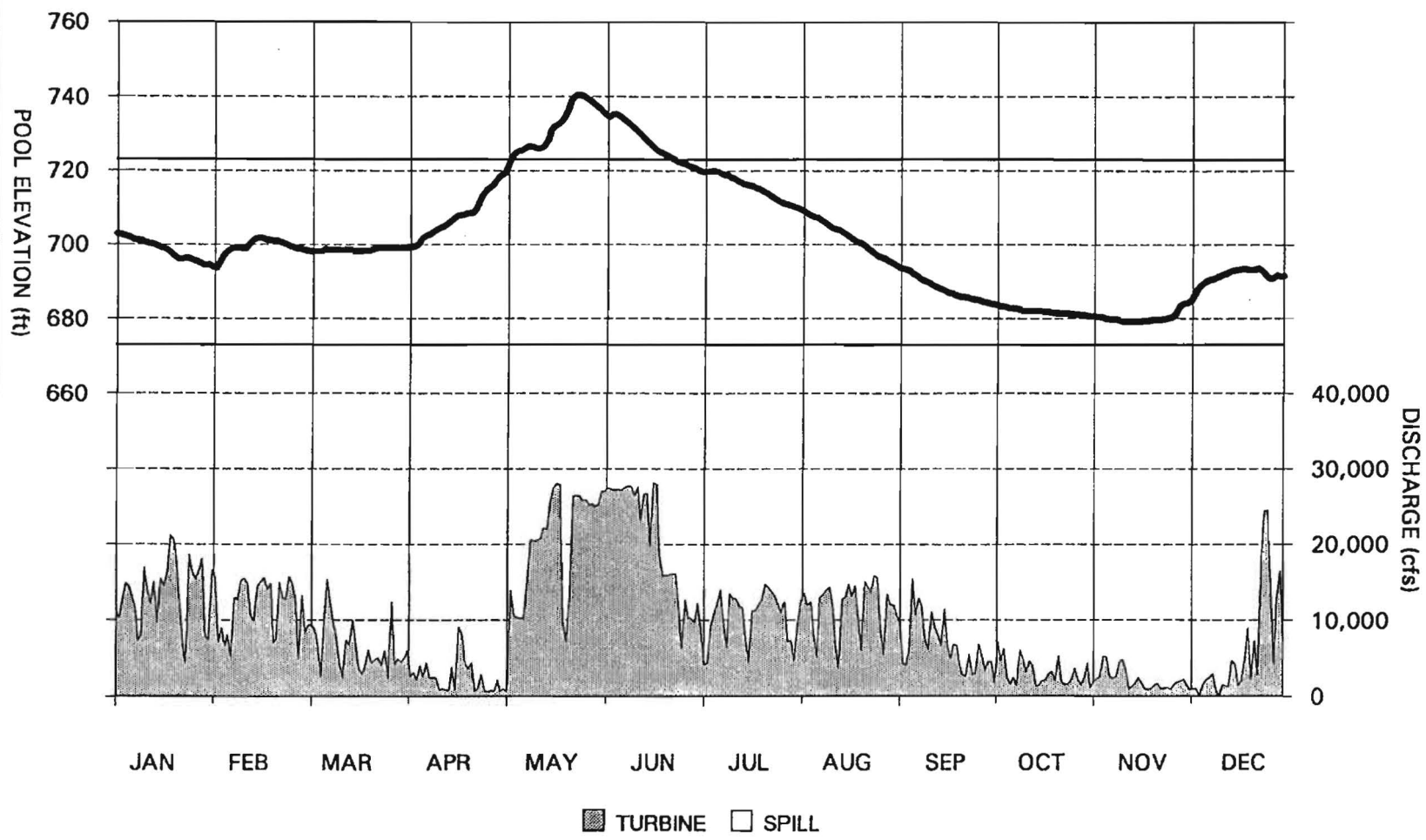
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1981



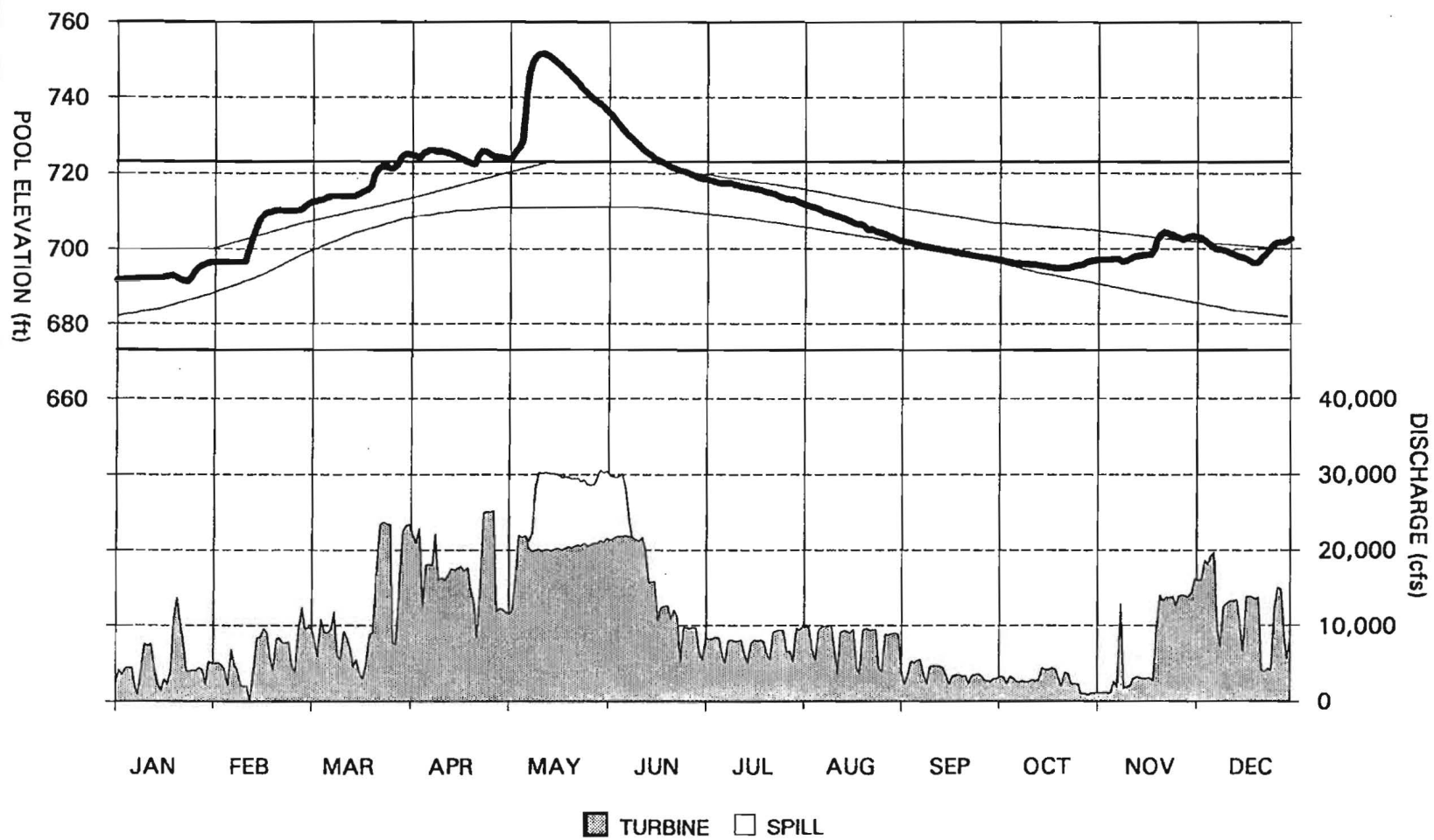
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1982



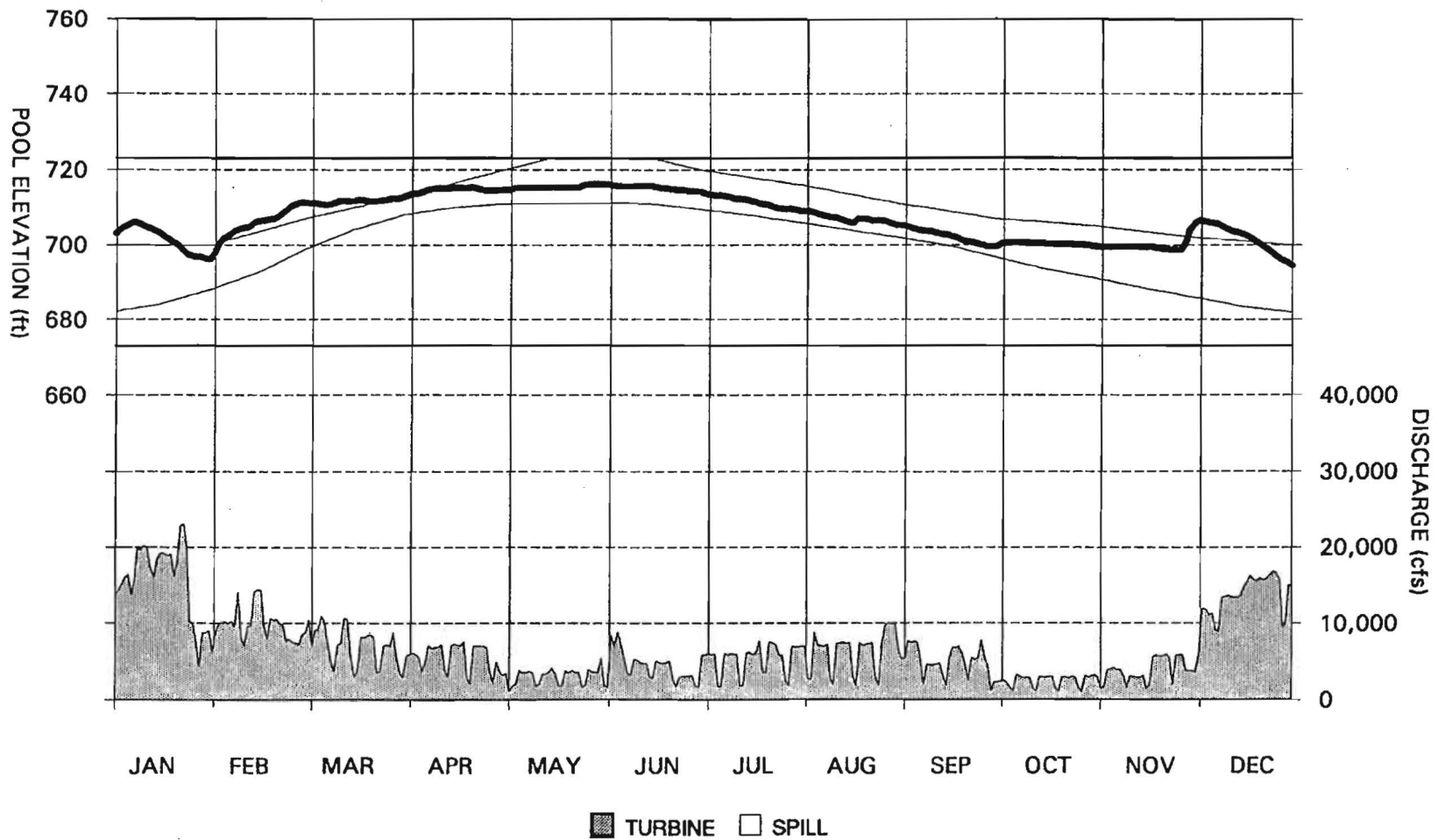
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1983



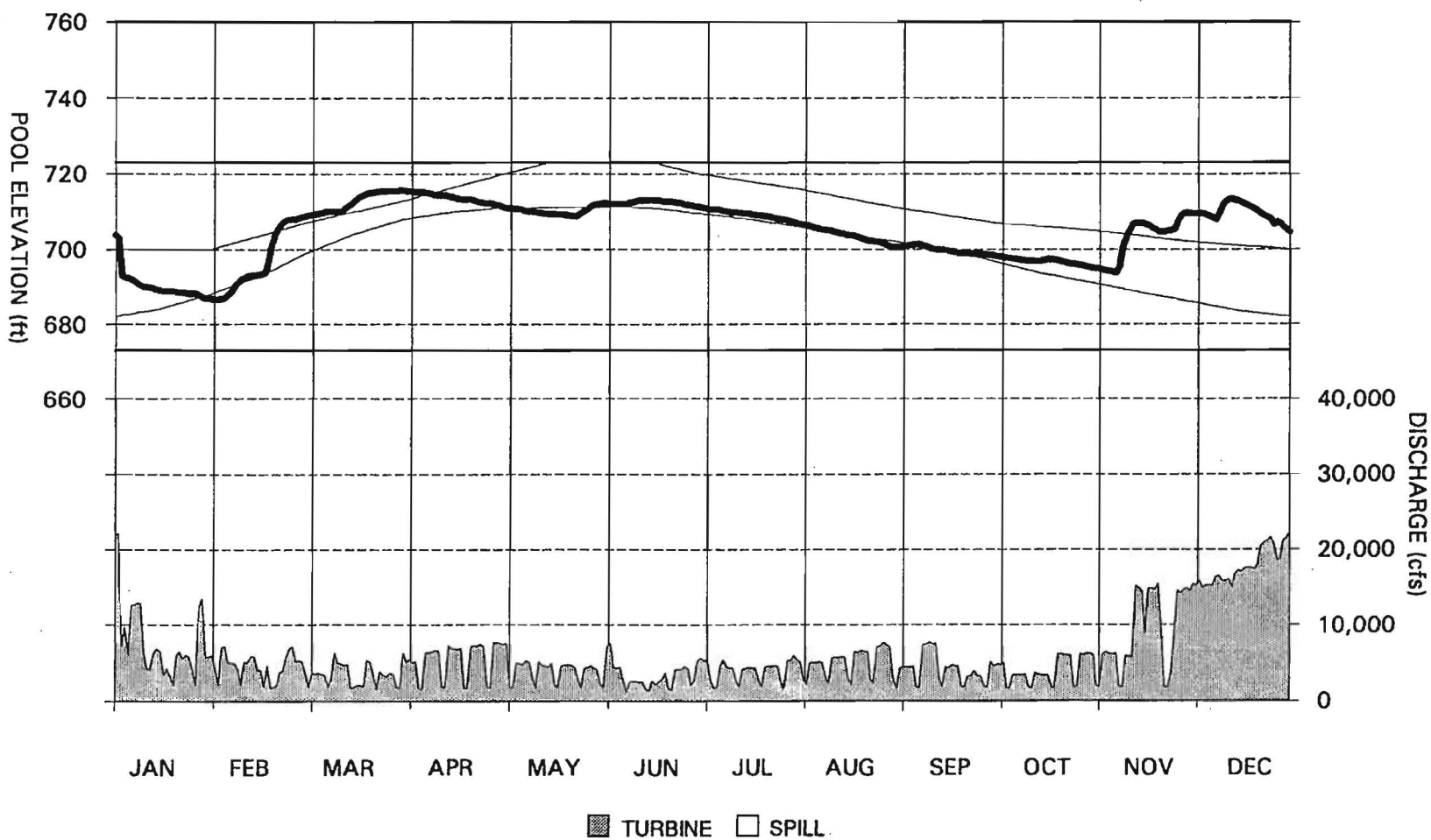
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1984



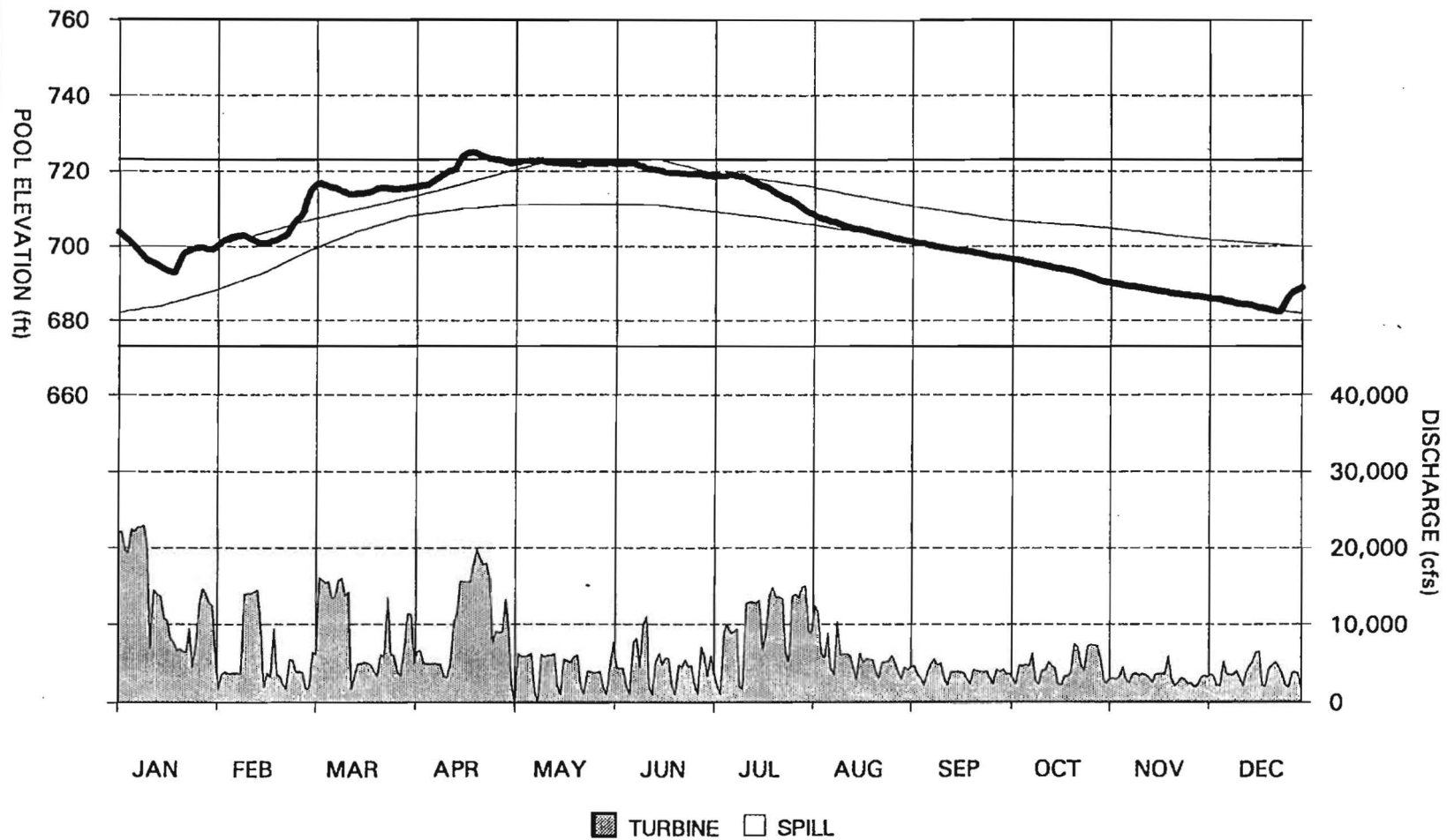
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1985



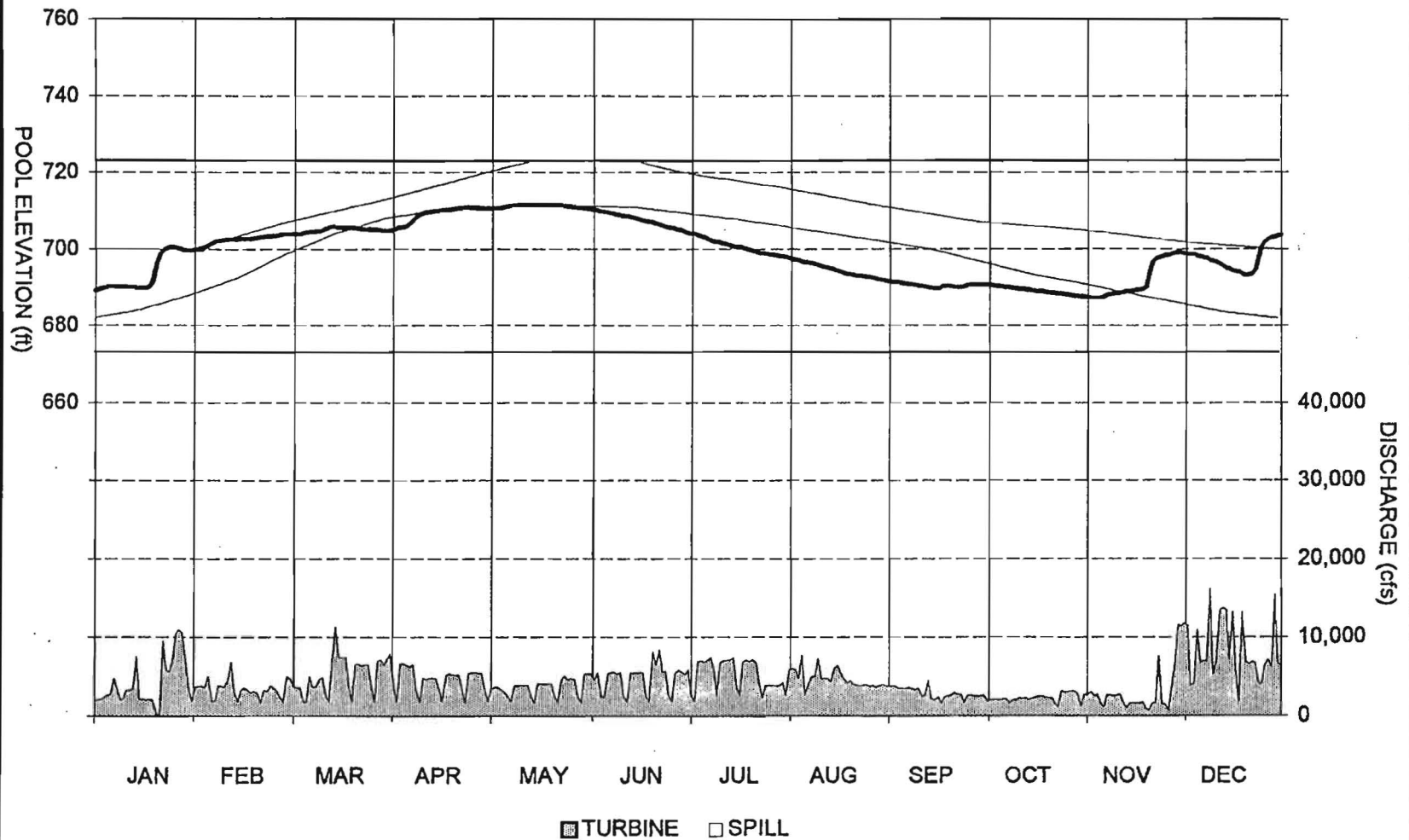
**WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1986**



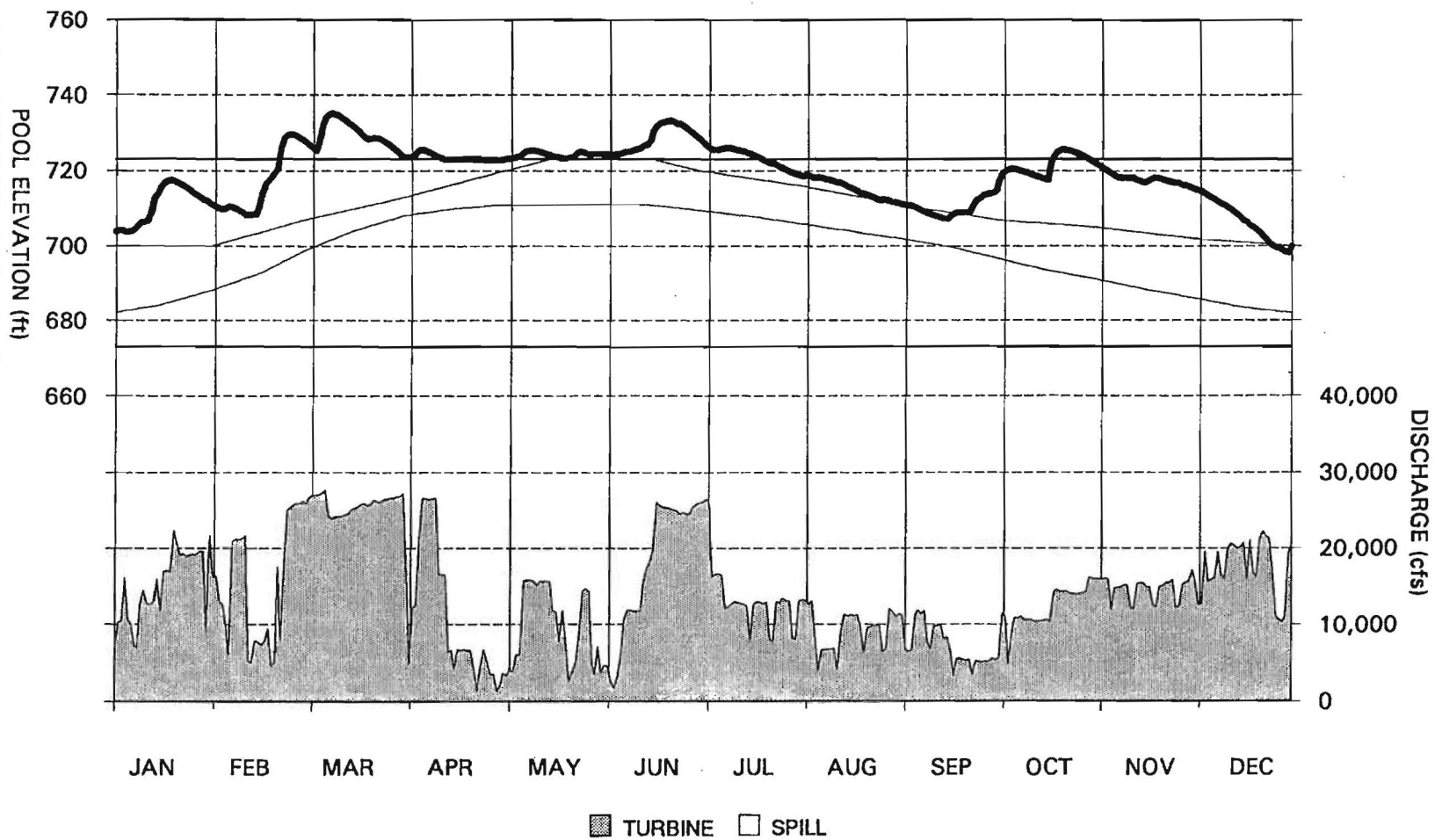
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1987



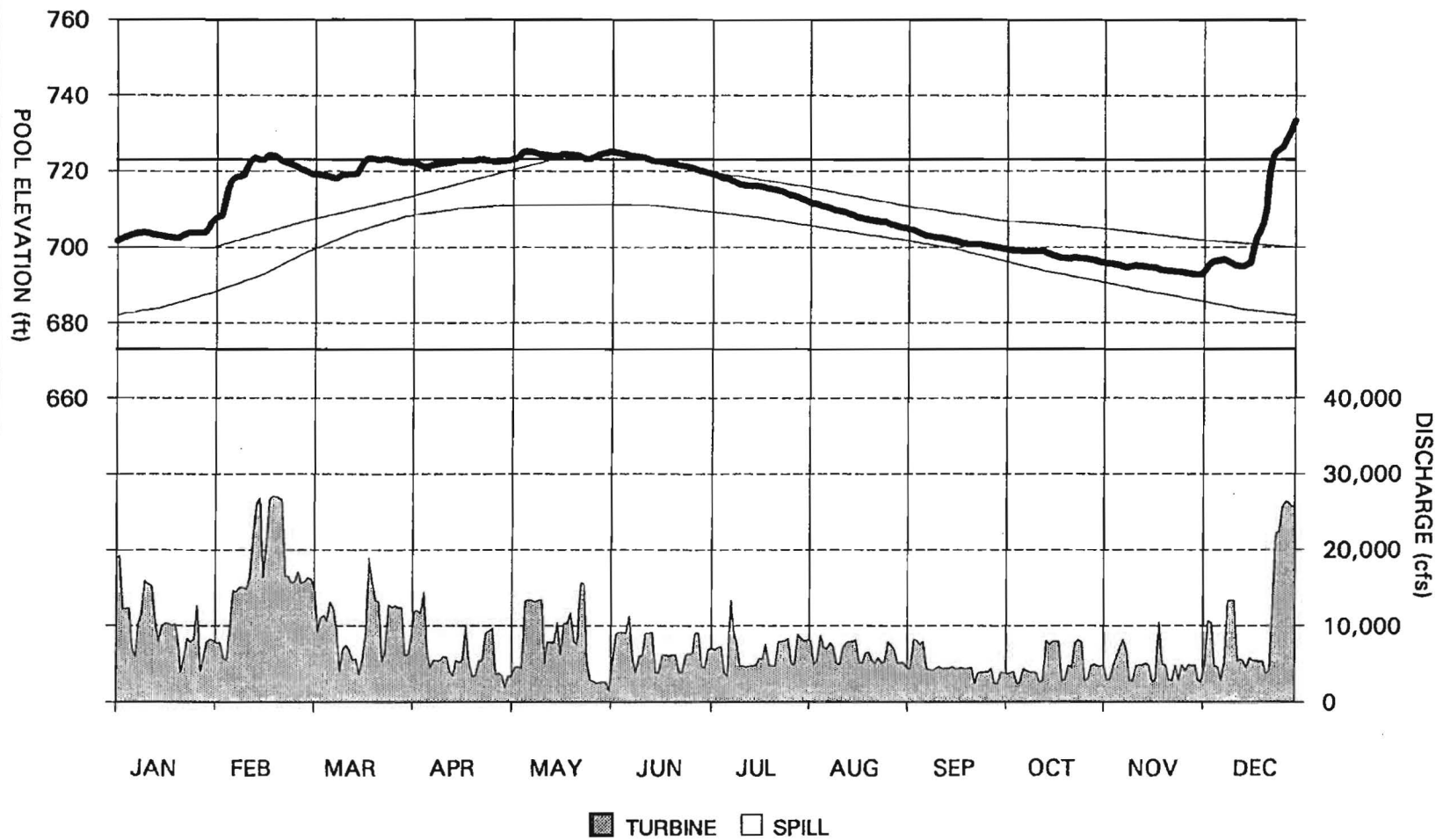
**WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1988**



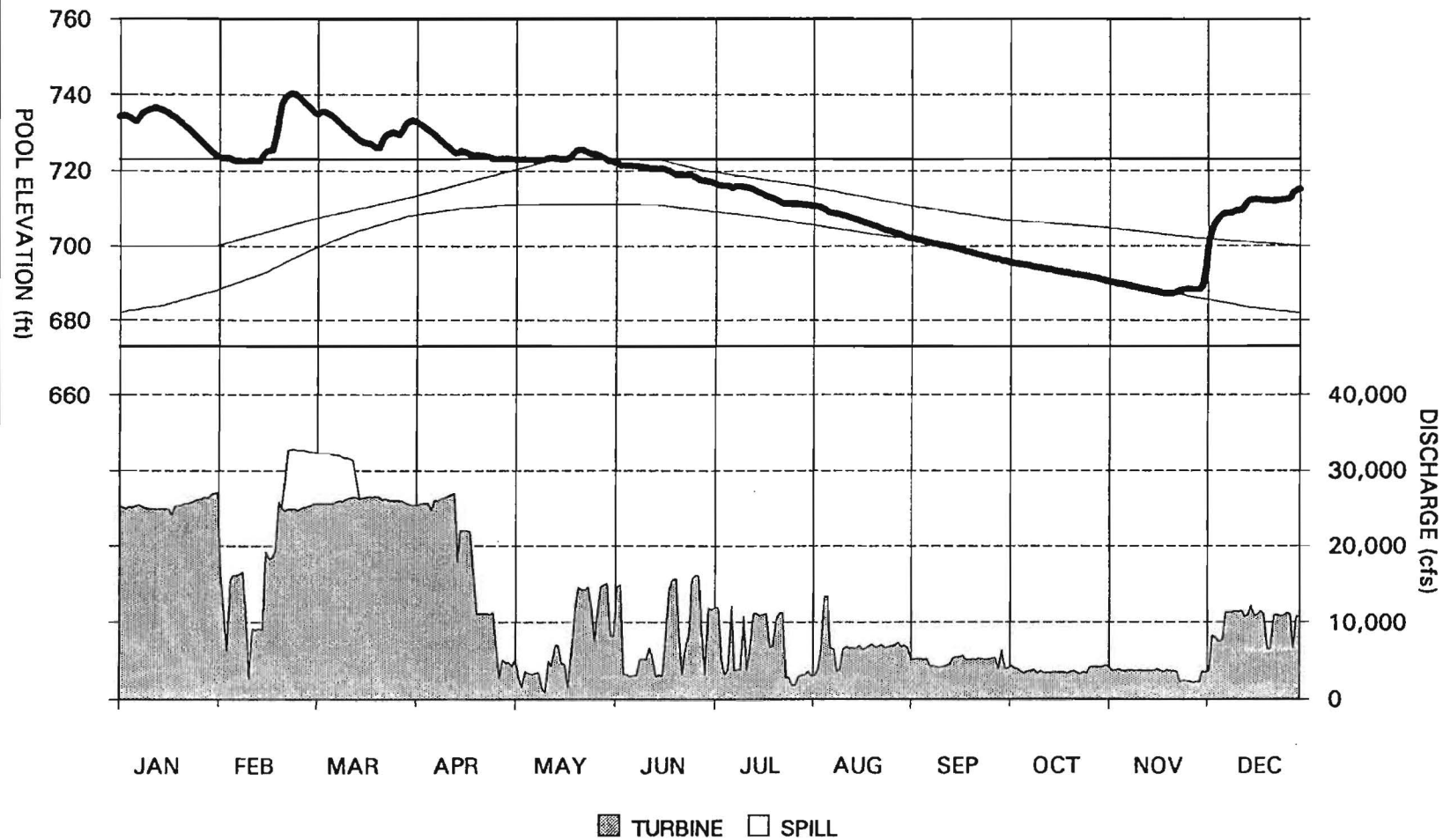
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1989



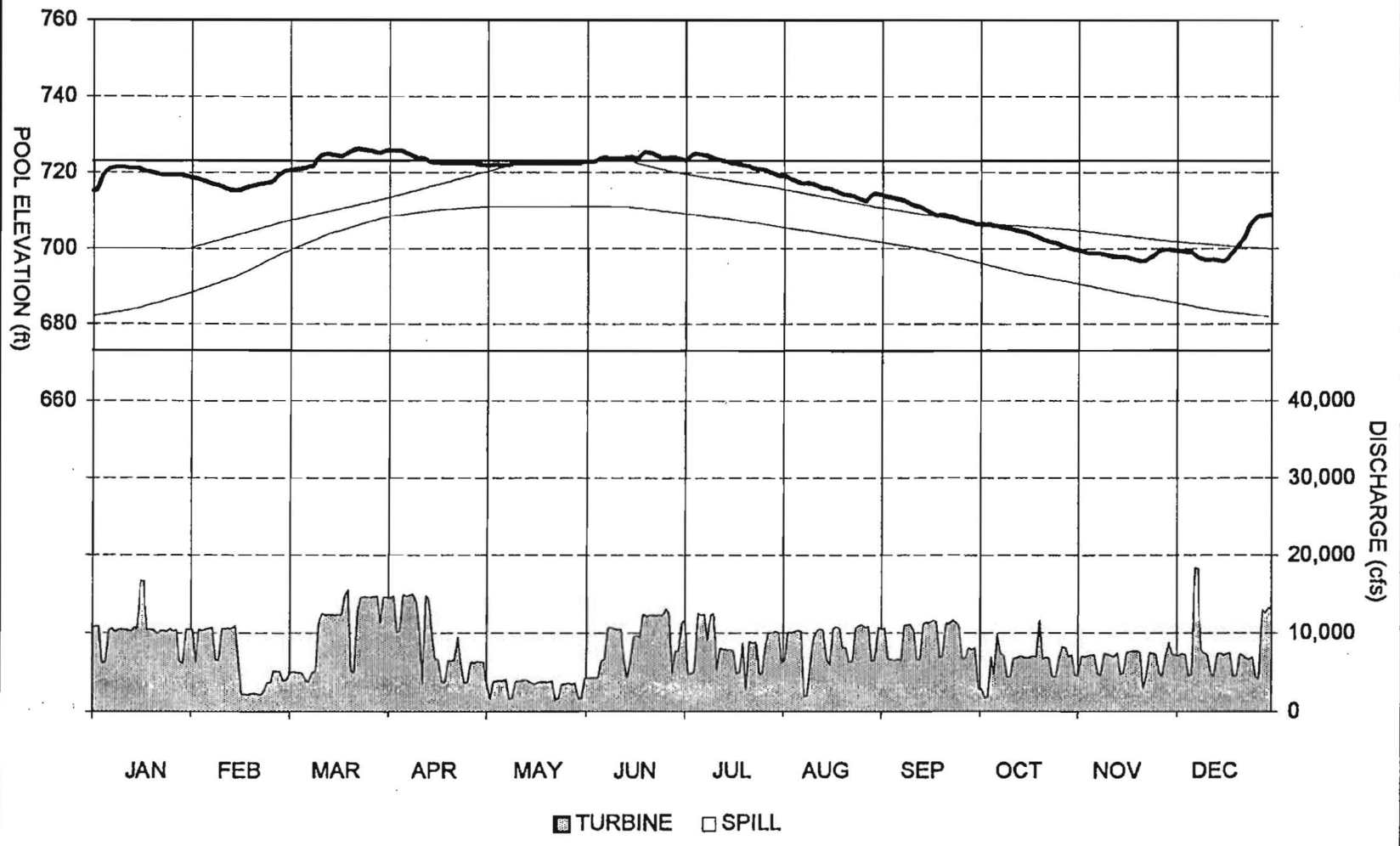
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1990



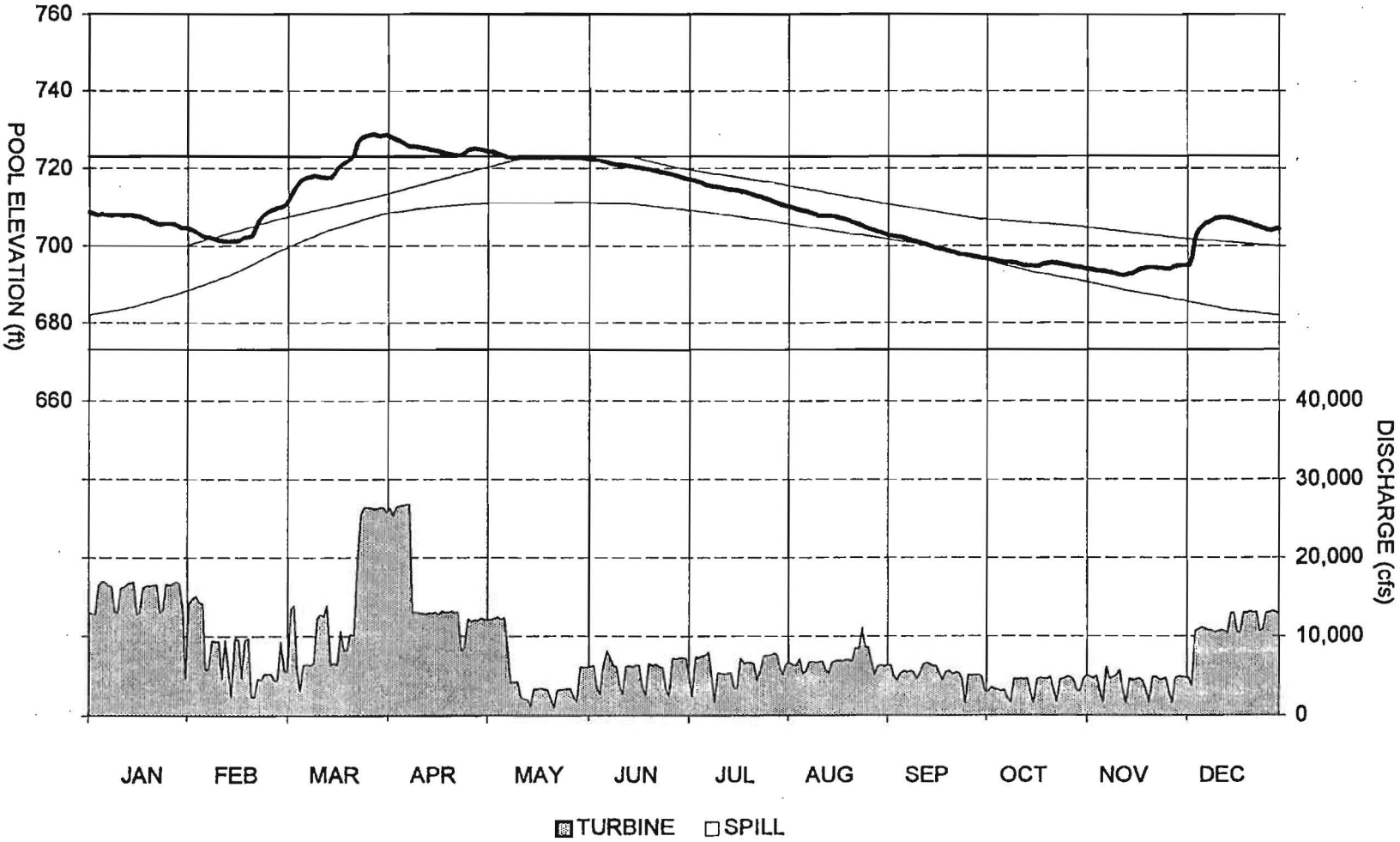
**WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1991**



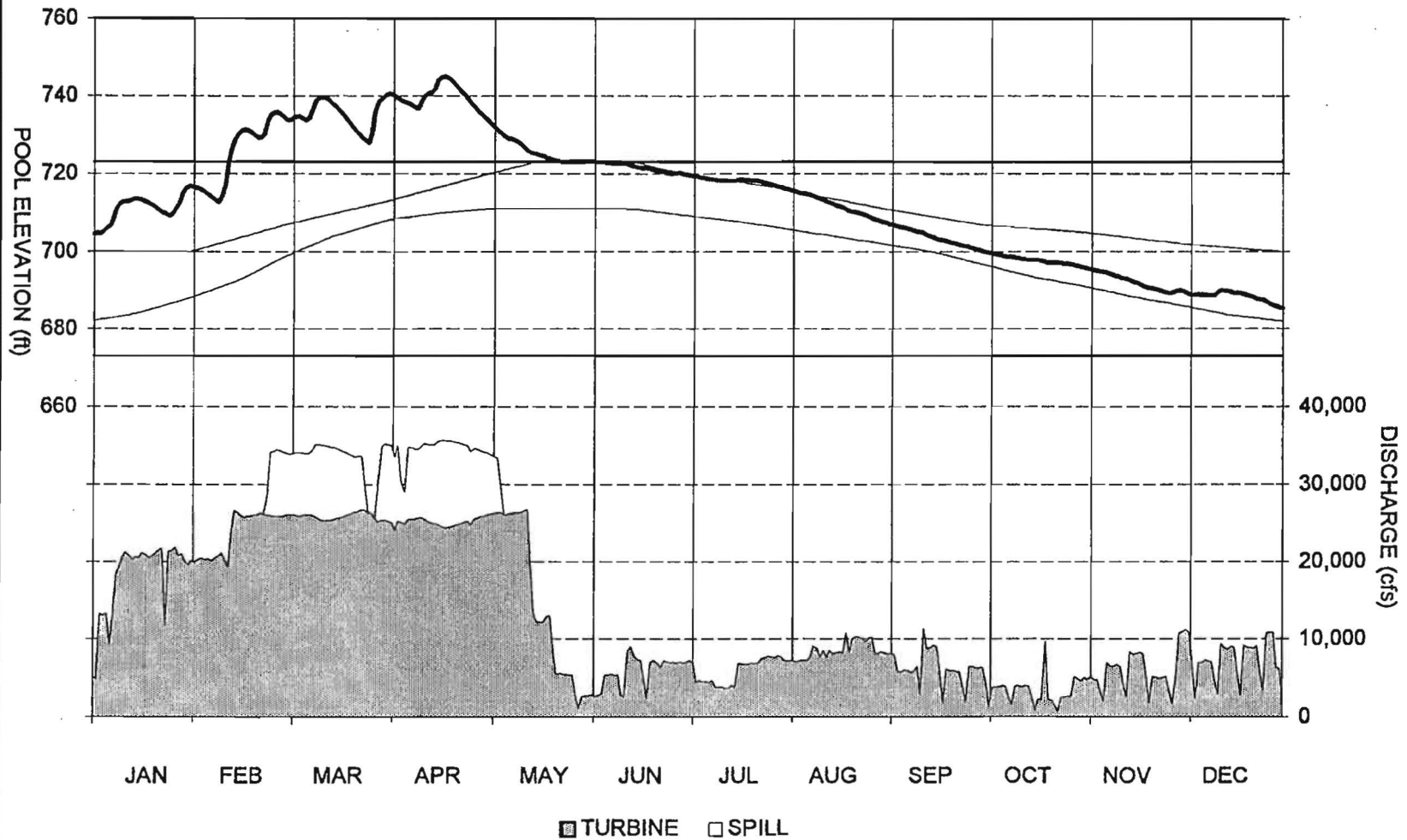
**WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1992**



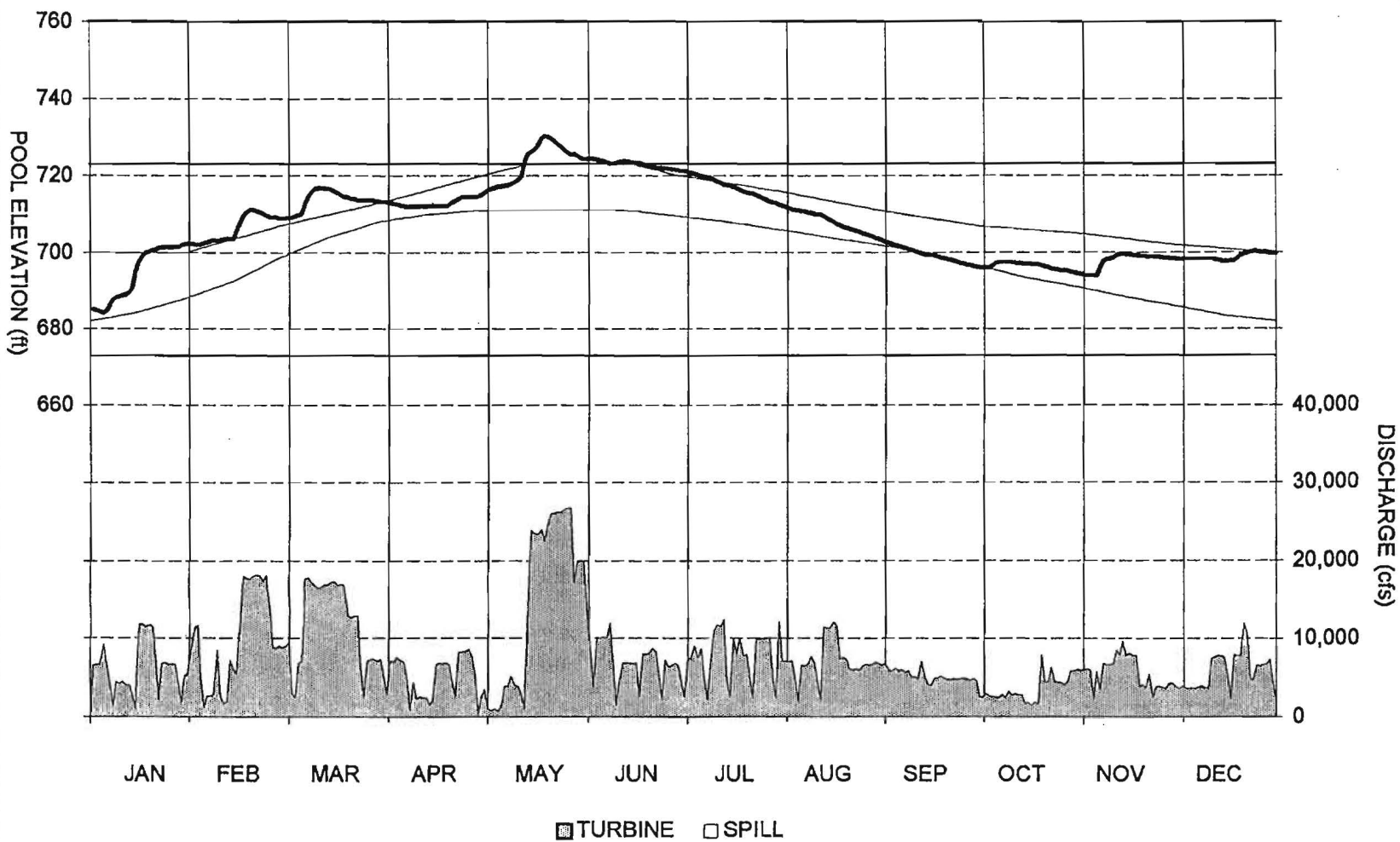
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1993



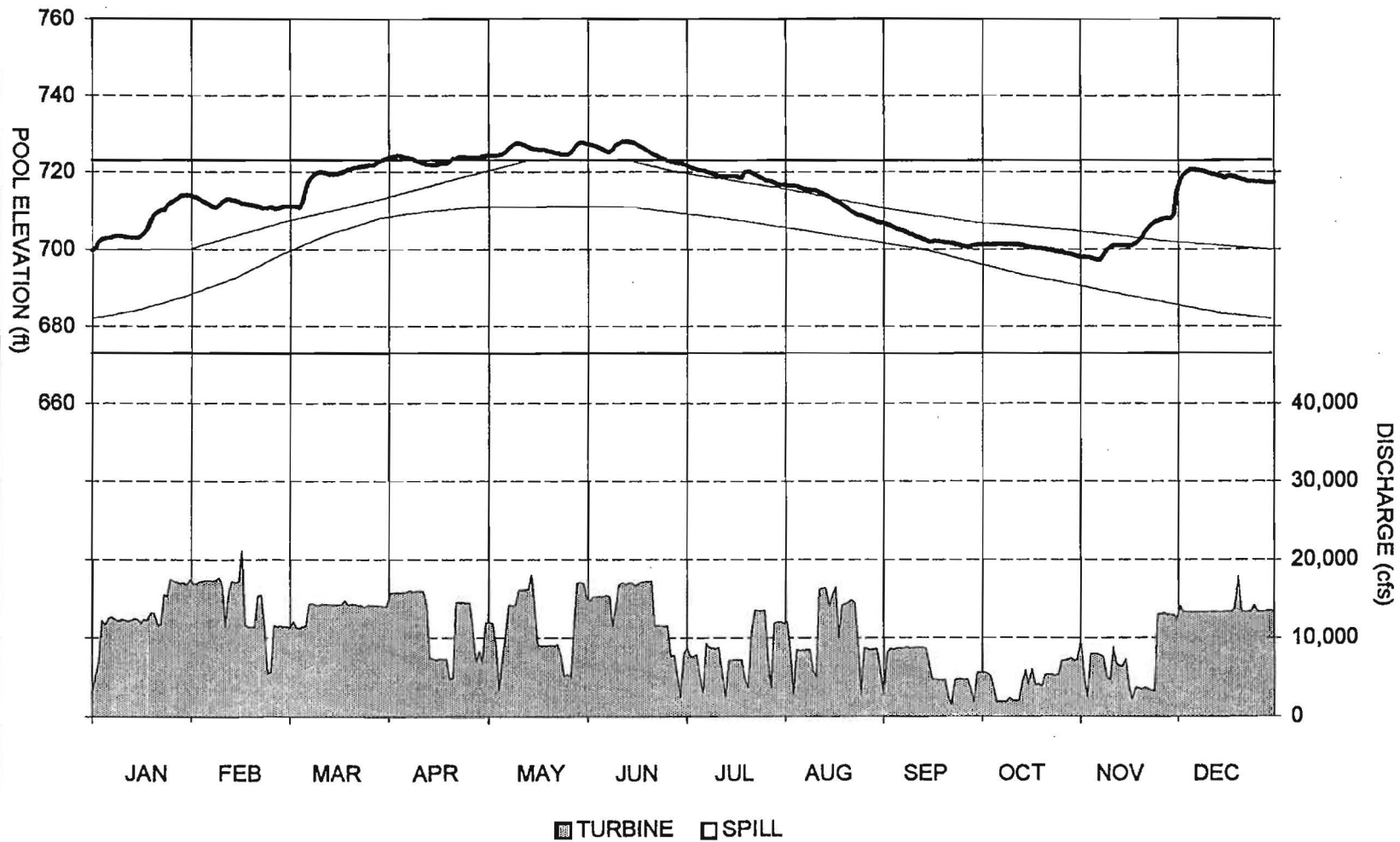
WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1994



WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1995



WOLF CREEK
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1996



CONTACT**TELEPHONE****Office****Home****Restricted**

Locks

Barkley
Cheatham
Old Hickory
Cordell Hull

**Resource Managers**

Center Hill 931/858-3125
Cheatham 615/254-3734
Cordell Hull 615/735-1034
Dale Hollow 931/243-3136
J. Percy Priest 615/889-1975
Lake Barkley 502/362-4236
Lake Cumberland (Wolf Creek) 606/679-6337
Laurel 606/864-6412
Martins Fork 606/573-1468
Old Hickory 615/822-4846

Public Affairs Office (PAO)

Chief, E.M. Evans 615/736-7161 615/399-1342

FM Radio Call Letters

Emergency Operations Center (Base)
Center Hill
Cheatham
Cordell Hull
Dale Hollow
J. Percy Priest
Barkley
Wolf Creek (Lake Cumberland)
Laurel
Martins Fork
Old Hickory

**■ GREAT LAKES AND OHIO RIVER DIVISION (LRD)****Water Management Branch**

Chief

River and Reservoir Control Section

Chief



Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

CONTACT

TELEPHONE

Office

Home

Restricted

■ **TENNESSEE VALLEY AUTHORITY (TVA)**

Reservoir Operations (Knoxville)

Manager, Janet [REDACTED]

Power Supply Operations (Chattanooga)

Load Coordinator

Manager, [REDACTED]

Data Collection

Supervisor, [REDACTED]

Daily Operations (Chattanooga)

Manager, [REDACTED]

■ **SOUTHEASTERN POWER ADMINISTRATION (SEPA)**

Systems Engineering

Manager, [REDACTED]

Power Operations

Specialist, [REDACTED]

■ **NATIONAL WEATHER SERVICE (NWS)**

Nashville Office

Chief, [REDACTED]

Nashville Radar Site

Weather Forecast Office

Memphis

Service Hydrologist, [REDACTED]

Louisville

River Forecast Center

Cincinnati (Wilmington, OH)

Kansas City

Slidell

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

CONTACT

TELEPHONE

Office

Home

Restricted

■ **UNITED STATES GEOLOGIC SERVICE (USGS)**

Tennessee Office
District Chief, [redacted]
Assist. Dist. Chief, [redacted]
Supervisor of Field Operations
[redacted]

[redacted]

Kentucky Office
District Chief, [redacted]
Assist. Dist. Chief, [redacted]
Supervisor of Field Operations
Upper Cumberland
[redacted]

[redacted]

[redacted]

West Kentucky
[redacted]

[redacted]

[redacted]

■ **NATIONAL RESPONSE CENTER**

800/424-8802

N.R.C. will call Coast Guard if it is determined to be the Coast Guard's responsibility or jurisdiction.

■ **TENNESSEE EMERGENCY MANAGEMENT AGENCY**

[redacted]

615/741-0001

Note: T.E.M.A. will notify the Tennessee Department of Water Pollution Control in case of a spill.

■ **KENTUCKY DISASTER EMERGENCY RESPONSE**

502/564-7815

800/255-2587

■ **TENNESSEE DEPARTMENT OF WATER POLLUTION CONTROL**
Spill Notification

[redacted]
Jack [redacted]

615/226-6918

615/532-0654

[redacted]


■ **KENTUCKY ENVIRONMENTAL RESPONSE EMERGENCY**
Spill Notification

502/564-2380

800/928-2380

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

■ PERTINENT GAGES IN THE CUMBERLAND BASIN WITH TELEPHONE ACCESS

| Stream | Subbasin | Location | Restricted No. | Goes Station ID |
|---------------------|-----------------|---------------------|----------------|---|
| Cumberland River | Barkley | Clarksville | |  |
| Cumberland River | Barkley | Dover | | |
| Red River | Barkley | Port Royal | | |
| Cumberland River | Cheatham | Nashville | | |
| Harpeth River | Cheatham | Kingston Springs | | |
| Harpeth River | Cheatham | Franklin | | |
| Mill Creek | Cheatham | Antioch | | |
| Cumberland River | Old Hickory | Carthage | | |
| W Fork Stones River | J. Percy Priest | Smyrna | | |
| Cumberland River | Cordell Hull | Penitentiary Branch | | |
| Cumberland River | Cordell Hull | Celina | | |
| Roaring River | Cordell Hull | Gainsboro | | |
| Cumberland River | Wolf Creek | Pineville Pine St | | |

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