R E S E R V O I R R E G U L A T I O N R E P O R T

FOR

TAHCHEVAH CREEK DETENTION
RESERVOIR AND CHANNEL IMPROVEMENTS
WHITEWAER RIVER BASIN, CALIF.

AUTHORITY

1. The authority for preparation of this manual is contained in paragraph 5, Engineering Regulation 1110-2-240, titled “Engineering and Design, Reservoir Regulation,” dated 25 March 1963. Detailed instructions pertaining to the contents of the manual are contained in Chanpter 6, Engineering Manual 1110-2-3600, titled “Engineering and Design, Reservoir Regulation,” and dated 25 May 1959.

SCOPE

2. This manual contains (a) descriptive information pertaining to the drainage area and project; (b) a description of the plan of operation; and (c) the basis of design for the project, including the reservoir and spillway design flood routings.

BASIN INFORMATION

3. Description.—-Tahchevah Creek Detention Reservoir is located near the western edge of Palm Springs, California, about 1,200 feet downstream from the mouth of Tahchevah Canyon (see pl.1). The drainage area above the dam is 3.2 square miles. Tahchevah Creek originates on the eastern slope of the San Jacinto Mountains about 3 miles west of the business section of the City of Palm Spirngs. The path of flow is generally east to the dam, thence east and south through the project channel to Baristo Creek channel (see pl. 2). Elevations in the drainage area above the mouth of the canyon vary from about 5,200 feet above mean sea level at the upper end to about 550 feet a the lower end, with the gradient varying from about 3,200 to 300 feet per mile, respectively. The 3.2 square miles of project drainage area is entirely mountainous with the exception of about 0.4 square mile of alluvial cone.

a. The lower slopes of the San Jacinto Maountains below elevation 5,200 feet (which includes all of the project drainage

area) are sparsely covered with scattered creosote bush, ocotillo, paloverde, ironwood, and scattered growths of cactus.

b. Most of the mountainous parts of the drainage area consist of massive bare rock. Soils in the canyon are shallow and low in organic matter and soluble salts. The alluvial cone below the base of the mountains consists of unconsolidated sand, gravel, cobbles, and boulders.

4. Economic development.-—Tahchevah Creek Detention Reservoir and Channel Improvements provide protection against floods and debris for the central part of the City of Palm Springs, California. The protected area is highly developed and includes valuable business property, residential property, and public improvements such as parks, schools, streets, highways, and utilities. The value of property subject to flood damage was estimated to be $57,900,000 in 1963.

5. Existing structures affecting runoff.—-There are no structures in the drainage area above Tahchevah Dam that affect runoff.

6. Climatology.—-The project area lies in a zone characterized by extreme heat and dryness during the summer months, while the climate during the winter months is mild. The monthly mean, maximum, and minimum temperatures at Palm Springs for the period 1922 through 1965 are given in table 1. The extremes of temperature range from 18°F to 122°F. The average annual frostfree period is generally more than 300 days. Prevailing winds are northwest with velocities occasionally exceeding 40 miles per hour.

a. The mean seasonal precipitation, the greater percentage falling during the winter months, varies from about 12 inches at the upper end of the project drainage area to about 6 inches at Palm Springs. Season totals vary widely, and quite frequently precipitation for a single month exceeds the mean seasonal value. At nearby points in the desert, the mean seasonal precipitation has been exceeded by more than 100 percent during a single thunderstorm. Snow falls occasionally in the headwaters of Tahchevah Creek but melts rapidly. The effect of snow on runoff is negligible. Ishoyets of mean seasonal precipitation (July to June, inclusive) for a 77-year period (1878 to 1954, inclusive) are shown on plate 2. The monthly mean, maximum, and minimum precipitation at Palm Springs are give in Table 1.

b. Most precipitation in the drainage area results from general winter storms that are associated with extratropical cyclones of North pacific origin. Major storms, consisting of one or more cyclonic disturbances, occasionally last 4 days or more and result in precipitation over large areas. Tropical hurricanes originating

off the west coast of Mexico occasionally move north of their usual path and pass over southern California, bringing intense precipitation for periods of up to 3 days. Thunderstorms that may result in intense precipitation during short periods over small areas occur occasionally either in association with general storm or independently. Summer thunderstorms in the area are fairly frequent. The duration of critical rainfall intensity is usually not more than 2 hours and rarely more than 3 hours.

7. Runoff.—-Streamflow is negligible except immediately after the heaviest rains, because climate and basin characteristics are not conducive to continuous runoff. During high-intensity storms, the streamflow increases rapidly in response to rainfall. High-intensity rainfall, in combination with the effect of steep gradients, results in intense debris-laden floods. There are no runoff records available for Tahchevah Creek.

8. Floods.—-Historical references indicate that 12 relatively large winter floods occurred in or near the Whitewater River Basin from 1825 through 1891. More authoritative records since 1891 show that moderate to large winter floods occurred in February 1914, January 1916, December 1921, April 1926, February 1927, February 1937, March 1938, December 1940, and January 1943. From the little information available, the floods of 1927 and 1938 appear to have been the largest general floods since 1891. Summer floods, usually caused by local storms of small areal extent but occasionally by storms covering the whole basin, occur infrequently in the area. No reliable records of floods on Tahchevah Creek are available.

9. Flood damages.—-No significant information no monetary damages is available.

10. Downstream channel.—-The outlet channel, from the spillway to its confluence with Baristo Creek, is 11,400 feet long. It consists of 2,270 feet of 54-inch RCP, 4,580 feet of 60-inch RCP, 2,493 feet of 72-inch RCP, 1,802 feet of 8 x 4.5 feet RC Box, and 252 feet of transition sections. The channel is designed for discharges ranging from 160 cubic feet per second at the dam to 300 cubic feet per second at Baristo Creek. See plates 3 and 4 for downstream channel plan and sections.

PROJECT INFORMATION

11. Authorization.—-Tahchevah Creek Detention Reservoir and Channel Improvements was authorized by act of Congress, Flood Control Act of 1960, Public Law 86-645, Eighty-sixth Congress, second session, approved 14 July 1960.

12. Construction history.--Construction of Tahchevah Creek Detention Reservoir and Channel Improvements began on 27 June 1964. Work was completed on 31 March 1965. The cost of the project through 30 June 1965, not including expenditures by local interests, was $1,321,776.

13. Purpose.--The purpose of the project is to provide protection from floods for the highly developed, central part of the City of Palm Springs.

14. Relationship to coordinated plan of development for the basin.—-Tahchevah Creek Detention Reservoir and Channel Improvements is an integral part of the comprehensive plan for the Whitewater River Basin within the Pal Springs area.

15. Description.--The project consists of Tahchevah Creek Flood Control Basin and dam, and the outlet channel to its confluence with Baristo Creek Channel. A general plan of the project is shown on plate 5, and a detailed description is contained in the following paragraphs.

16. Dam.—-The dam is an unzoned, relatively impervious earth-fill embankment with a crest length, including spillway, of 3,610 feet at the top of dam, elevation 582, and a crest width of 20 feet. The maximum height above the original Tahchevah Creek streambed is 42 feet. Both the upstream and downstream slope is 2.25 on 1. The upstream and downstream faces of the dam are protected by a 3-foot layer of stone. Typical embankment sections are shown on plate 6.

17. Deflection dike.—-A deflection dike about 520 feet long with a top width of 20 feet and side slopes of 1 on 2 is located upstream from the outlet works to direct debris and low flow away from the pool drain and spillway (see pl. 5).

18. Outlet works.—-The outlet works are located on the center line of the spillway near the south abutment and consist of an intake tower and an outlet conduit. The plan, profile, and sections of the outlet works are shown on plate 7 and the outlet discharge curve is shown on plate 8. A general description of the outlet works is contained in the following subparagraphs.

a. The intake tower is a rectangular reinforced-concrete structure bout 100 feet upstream from the axis of the embankment. It is 13 feet long, 9 feet wide, and rises 12 feet above invert elevation 543.

b. The outlet conduit extends under the embankment along the centerline of the spillway and discharges into a low-flow channel in the spillway. It consists of a concrete-encased reinforced-concrete

pipe 150 feet long with an inside diameter of 36 inches and a slope of 0.029072. The maximum capacities of the conduit with the water surface at spillway crest (elev. 565.5) and top of dam (elev. 582) are 160 and 210 cubic feet per second, respectively.

19. Spillway.—-The spillway (see pl. 9) is a rectangular reinforced-concrete structure, consisting of a broadcrested overflow weir, 80 feet long, a short approach channel, and an outlet transition channel. The crest of the spillway is at elevation 565.5 feet, the overall length of the spillway channel is 300 feet, including the approach and outlet channel, and the width ranges from 85 feet at the upstream and to 55 feet at the downstream end. The spillway discharge curve is shown on plate 10.

20. Reservoir.—-The reservoir formed by Tahchevah Dam has an area and gross capacity at spillway crest (elev. 565.5) of 58.0 acres ad 945 acre-feet, respectively. At the top of the dam (elev. 582) the area is 73.1 acres and the gross capacity is 2,019 acre-feet. There is a 300 acre-foot allowance for sediment below spillway crest. Area and capacity curves are shown on plate 11 and a tabulation of areas and capacities is given in table 2.

21. Basis for design.—-The hydrologic design of Tahchevah Dam is based upon the assumption that greatest flows from small drainage areas occur during local thunderstorms or tropical hurricanes. The tropical hurricane that centered over Indio, California, on 24 September 1939 was the largest recorded. While it has not been ascertained whether thunderstorm activity attended the 1939 storm, it produced intensities similar to those produced by thunderstorms and its total duration was considerably longer than an average thunderstorm. This storm was assumed to be of sufficient intensity and duration to be used as a basis for the reservoir design flood.

a. The reservoir design flood was computed, using a total precipitation over the drainage area of 6.45 inches and a variable precipitation-loss rate. The loss rate was assumed to average 0.35 inch per hour with a minimum rate of 0.15 inch per hour. The effective rainfall over the drainage area was 4.33 inches. This rainfall resulted in a flood having a peak discharge of 4,200 cubic feet per second and a volume of 720 acre-feet.

b. The spillway crest elevation was determined by routing the reservoir design flood through the reservoir assuming the reservoir empty at the beginning of the routing. Using net storage, a maximum water-surface elevation of 565.5 feet was reached with a peak outflow of 160 cubic feet per second. On this basis, the spillway crest elevation was set at 565.5 feet. See plate 12 for the reservoir design flood routing.

c. The spillway design flood was based on the assumed occurrence of probable maximum precipitation as determined by a method[1] developed by the Los Angeles District. The precipitation-runoff relationships during the spillway design flood were assumed to be, in general, the same as those of the reservoir-design flood, except that a constant precipitation-loss rate of 0.15 inch per hour was used. The total precipitation over the drainage area was 15.05 inches with an effective precipitation of 14.55 inches. The resultant peak discharge was 13,000 cubic feet per second and the volume of runoff 2,420 acre-feet.

d. The spillway design flood was routed through the reservoir assuming the ungated outlet blocked and the reservoir full to spillway crest at the beginning of runoff. A maximum water-surface elevation of 576.8 was reached, and using a free board of 5.2 feet, the top of the dam was set at elevation 582 feet. See plate 13 for the spillway design flood routing.

22. Development of the reservoir area.—-There is no plan of development for the reservoir area at the present time. However, it could be used for recreational facilities. Such facilities could include a golf driving rage, a roving-archery range, day-camping areas, or a community park with picnic tables and equestrian trails.

OPERATION

23. Responsibility for operation.—-The responsibility for operation of Tahchevah Creek Detention Reservoir and Channel Improvements as outlined in the Code of Federal Regulations, paragraph 208.10, lies with the Chief Engineer, Riverside County Flood Control and Water Conservation District. See exhibit A for a reprint of the Code of Federal Regulations (Extract). The project was transferred to the Riverside County Flood Control and Water Conservation District on 2 August 1965 for operation and maintenance.

24. Flood control operation plan.—-There is no plan of operation for flood control because Tahchevah Dam has no gated outlet. However, flood flows are automatically controlled to non-damaging discharges by the ungated outlet in the structure.

[1] Described in paragraphs 26-28 of the District Engineer's report titled "Design Memorandum No. 1, Hydrology for Wilson Canyon and Mansfield Street Channels and Debris Basins," dated May 1959, and approved by the Office of the Chief of Engineers 8 October 1959.

COLLECTION OF HYDROLOGIC DATA

25. Hydrologic facilities.—-Hydrologic facilities include: (a) 10 adjustable staff gages, (b) a waterstage recording system, and (c) a recording rain gage.

a. One 4-foot staff gage is located on the south side of the intake structure, and nine 4-foot staff gages, just south of the spillway, ascend in a row along the upstream face of the dam from elevation 546 to the top of the dam, elevation 582.

b. A water-stage recorder is located in a recording house at the south end of the dam.

c. A long-term recording rain gage is located near the north end of the dam.

26. Sedimentation.—-The sedimentation allowance in Tahchevah Creek reservoir of 300 acre-feet is based on a 100-year design life for the project. There are no sedimentation ranges in the reservoir.

27. Reporting criteria.—-The operating agency is required to report to the Corps of Engineers when any of the following conditions occur:

a. Rainfall of 1 inch in 1 hour at Palm Springs.

b. Rainfall of 2 inches in 3 hours at Palm Springs.

c. Water surface reaches an elevation of 555.0 feet.

The rain gage recorder chart is sent to the Regulation and Meteorology Section, Corps of Engineers, where the data is recorded and the chart returned for permanent filing. The water-surface recorder chart is also sent to the Regulation and Meteorology Section for any record above 555.0 feet. This chart is then returned for permanent filing.