



Dam Safety Section

INTEROFFICE MEMORANDUM

TO: Lyle Swank, Eastern Region Office Manager
CC: Steve Bosworth, James Cefalo, Pam Skaggs
FROM: John Falk PE, Dam Safety Manager
DATE: March 18, 2015
SUBJECT: Reservoir Storage Capacity

Daniels Dam & Reservoir

Based on my review of IDWR Dam Safety files, the U.S. Bureau of Reclamation (USBR) reportedly funded the project and performed design review and approval for construction of the dam in accordance with the Congressional authorization commonly referred to as the *Small Reclamation Projects Act of 1956 (PL-984)*. Consequently, much of the preliminary site and subsurface investigation reports apparently were never submitted to IDWR; this despite repeated request, the last attempt being 3/17/1980 during the initial preparation of the National Dam Safety Program's Phase I Inspection reporting effort.

Plans and specifications for construction of Daniels Dam were prepared by W.H. Smith, P.E. and dated September 1965. Although the design plans are sealed by the design engineer, they do not bear the signature of the State Reclamation Engineer, Mr. C.E. Tappan which normally was required prior to beginning construction. Instead, correspondence from Mr. Tappan to Mr. Smith dated 9/30/1965 offers state approval conditional to State Reclamation Office receiving requested geological and foundation reports, and as-constructed prints. There is no record of asbuilt drawings in the IDWR archives; suggesting either a) none were prepared by the engineer of record and/or b) none were provided by the USBR Upper Colorado Region 4 (Salt Lake City) office representative. Construction of the dam was substantially complete by winter 1967, and the first filling occurred in 1968.

Permit R-1104 was issued to St. Johns Irrigation Company on 1/9/1962 for 9,500 acre-feet (AF) of storage; however Water Right License 15-2080 limits the reservoir storage capacity to 8,700 AF. This smaller value likely is based directly upon the 1965 design drawings (Figure 1). It's important to note that the total reservoir volume consists of two (2) water right storage components; one @ 8,075 AF allotted to irrigation, and a transferred amount equal to 625 AF that was originally dedicated to Elkhorn Dam located approximately 3 miles downstream. Elkhorn Dam was built in 1917, but was abandoned in the early 1950's due to the inability of the reservoir to hold water.

The results of a cooperative irrigation study performed by USDA-SCS and IDWR (July, 1981) determined that approximately 1,730 acre-feet of sediment had been deposited in the reservoir during the first 13 seasons of operation (1968-1980). Although these calculations have not been independently confirmed, there is little doubt that significant deposition of sediment has occurred in the reservoir and with it a corresponding decrease in storage capacity. To date, there has been no formal revision to the reported storage capacity of Daniels Reservoir.

Recommendation: Until such time an area/ capacity survey is performed by a licensed professional and submitted to IDWR Dam Safety for review and approval, the physical volume of water impounded by Daniels Dam measured at the spillway crest, elevation 5162.5 feet (USGS-MSL), is presumed to be 8,700 acre-feet. Note that this "official" value does not account for any deposition of bottom sediments in the reservoir that likely has occurred since the dam was constructed nearly 50 years ago.

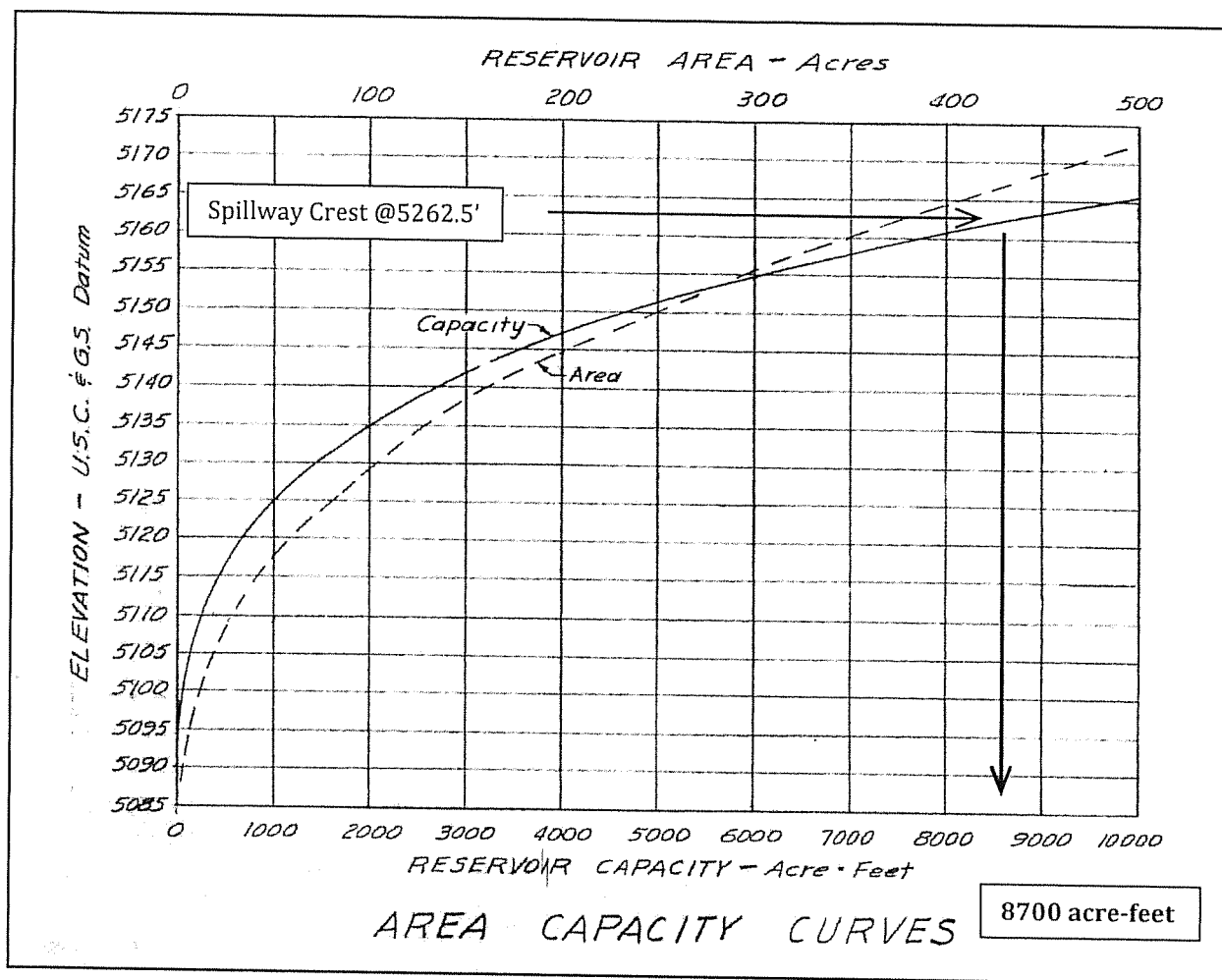


Figure 1 – Area and Capacity Diagram; copy from design drawings prepared by W.H. Smith, P.E (1965). The diagram is printed on sheet 3/9. The design spillway crest is elevation 5262.5 feet, a value which equals or closely matches the existing USGS quadrangle datum (MSL).

An independent estimate of storage capacity was performed by IDWR staff using height measurements (IDWR Dam Safety 2003) and surface area (2009 aerial photographs), from which the following equation was used to obtain an estimate for reservoir storage capacity at or near full-pool conditions:

$$\rightarrow 81.7 \text{ feet (hydraulic height)} \times 265.2 \text{ acres (surface area)} \times 0.4 \text{ (shape factor)} = 8,667 \text{ acre-feet}$$

This calculation is used only for comparison against the storage value included with the 1965 design drawings (Figure 1). In this instance, both values for water volume are similar. Therefore, because the design drawings correspond with the WR License, a storage value of **8,700 AF** is recommended to represent the storage capacity of the reservoir. Note that this "official" capacity value does not account for any deposition of sediment in the bottom of the reservoir that may have occurred since construction of the dam. Note also that the pool level in the reservoir is measured via a vertical steel tape in the gate house. The tape is reverse notation, i.e. the spillway crest is 13.5 feet, and each incremental decrease in the pool level corresponds to a larger number on the tape. Although unconfirmed, the intent of this accounting seems to have been to "zero" the tape at the dam crest.