

Appendix D - WATER CONTROL PLAN

CHAPTER 7—WATER CONTROL PLAN

7-01 GENERAL OBJECTIVES

Abiquiu Dam and Reservoir is operated primarily for flood control, sediment control, and water supply within the restrictions imposed by the Flood Control Act of 1960 (Exhibit E, Public Law 86-645) and in accordance with the Rio Grande Compact (Exhibit B). The Corps considers Abiquiu Dam and Reservoir to be one of the reservoirs of the Middle Rio Grande project as defined in Public Law 86-645. Any deviation to this plan, not deemed an emergency, requires advice and consent (i.e., unanimous consent) of the Rio Grande Compact Commissioners (see paragraph 7-14), if the deviation is a departure from the operation schedule detailed in Public Law 86-645. Flood control releases are contingent on flow in the Rio Grande and inflow to the Rio Chama below Abiquiu Dam. Operation of Abiquiu Dam is integrated with Cochiti, Galisteo, and Jemez Canyon Dams for flood control. Transmountain diversion water from the San Juan Basin and Rio Grande system water are stored under the authority contained in Public Laws 97-140 and 100-522, as amended by Public Law 116-260 (Sec. 337 of WRDA 2020). San Juan-Chama (SJ-C) project contractors can store SJ-C project water and Rio Grande system water up to elevation 6,230 feet NGVD29 in accordance with applicable State and Federal laws, including the Rio Grande Compact.

The hydroelectric power facility is a run-of-river plant, with releases based on the water supply and flood control release schedules of Abiquiu Dam.

7-02 CONSTRAINTS

Switching releases from the hydropower facility to the Corps' outlet works may require up to nine hours to perform, during which time the reservoir releases are reduced in order to raise the closure gate, so all releases bypass the power plant.

Rio Chama Acequia Association (RCAA) has several diversion structures in the Rio Chama reach from Abiquiu Dam to the confluence of the Rio Grande. Most of these structures are of rock construction that may experience minor damages at flows above 1,800 cfs. Bank erosion and sloughing begin at about 1,800 cfs.

7-03 OVERALL PLAN FOR WATER CONTROL MANAGEMENT

Abiquiu Dam is regulated to control flows on the lower Rio Chama and the Rio Grande to non-damaging flow rates. Abiquiu, Cochiti, and Jemez Canyon Dams are all regulated as a system. Water stored in the flood space is evacuated as rapidly as conditions downstream permit. Flood storage can be evacuated after 1 July on the spring flood recession only when the natural flow at the Otowi gage on the Rio Grande is greater than 1,500 cfs. Flood storage that is retained through the summer is released after 1 November and must be fully evacuated by 31 March of the following year.

Water stored for SJ-C project contractors (SJ-C project water and Rio Grande system water) is limited to elevation 6,230 feet NGVD29 and released as requested by the storing entities. All other natural Rio Chama flow and releases from upstream reservoirs are passed through Abiquiu Dam with minimum regulation.

Water stored for SJ-C project contractors (SJ-C project water and Rio Grande system water) may be evacuated, as necessary on a forecast basis, to limit flood storage to the top of the flood control pool or to permit maintenance or repair of the dam or appurtenant structures. See Exhibit J for example of evacuation of conservation storage.

Table 7-1 Reservoir Storage Allocations

Reservoir Use	Elevation Limits (feet)	Capacity (acre-feet)
Surcharge Space	6,350.0 – 6,374.7	349,030
Induced Surcharge Space	6,283.5 – 6,350.0	656,342
Exclusive Flood Control Space	6,230.0 – 6,283.5	326,579
Joint Use Flood Control and Conservation Space	6,060.0 – 6,230.0	229,199

7-04 STANDING INSTRUCTIONS TO PROJECT OPERATOR

Abiquiu Dam releases could be done through the hydropower facility or through the Corps' outlet works bypassing the hydropower facility. Standing instruction to the Abiquiu project operator will be in accordance with paragraph 7-05 and Exhibit F. The County of Los Alamos operates the hydropower facility at the Abiquiu Dam under a Memorandum of Agreement with the Corps (Exhibit G). The coordinated procedure for operation of the power plant is explained in Exhibit H.

a. Conservation, Normal Flood, and Emergency Regulation

Instructions to the project operator and Los Alamos County for storage and release are issued by the Water Management Section (WMS), Hydrology & Hydraulics Branch, Engineering and Construction Division.

b. Instructions During Loss of Communication for Flood and Non-Flood Conditions

In the event of a communications disruption between the District Office and the Abiquiu Dam project office or Los Alamos County, reservoir regulation will be in accordance with Exhibit F, paragraph 10, Table F-1 of this manual. Communications should be reestablished as rapidly as possible.

7-05 FLOOD RISK MANAGEMENT

Flood risk management (flood control) at Abiquiu Dam begins when channel capacity is approached or exceeded at the Rio Chama below Abiquiu Dam, the Rio Chama at Chamita gage, or the Rio Grande at Otowi gage, or the flood control operation at Cochiti Lake requires storage at Abiquiu Reservoir.

a. Regulation under Normal Conditions

(1) Elevation 6,060 feet to 6,283.5 feet NGVD29

Abiquiu Dam is operated for flood control on the Rio Chama and Rio Grande. Joint use for conservation storage is stored in the flood control pool below elevation 6,230 feet NGVD29. Releases from Abiquiu Dam are limited by the following control points:

Table 7-2 Control Points and Flow

Control Point	Flow (cfs)
Rio Chama Below Abiquiu Dam	1,800
Rio Chama at Chamita Gage	3,000
Rio Grande at Otowi Gage	10,000

The channel capacity below Abiquiu Dam is variable, dependent on sediment accumulations that result from inflow by tributary arroyos. The channel below Abiquiu Dam will carry about 1,800 cfs for extended periods when conditioned by bringing the flow up slowly from about 1,200 cfs. Channel capacity below the Rio Ojo Caliente confluence is about 3,000 cfs as measured at the Chamita gage. Abiquiu Dam operation will limit the flow in the Rio Grande to 10,000 cfs, as measured at the Otowi gage, when possible. When Abiquiu Dam is being operated for flood control, a minimum release rate will be maintained to satisfy the downstream Rio Chama irrigation demand to the extent that such inflow is available. Flood releases should, if possible, also match the flow of the Rio Ojo Caliente to transport sediment from this tributary on down to the Rio Grande.

Flood water stored in the flood space is evacuated as rapidly as conditions downstream permit. When the natural Rio Grande flow at Otowi gage falls below 1,500 cfs after 1 July, on the spring flood recession, flood storage that has not been evacuated is retained until after the irrigation season. This storage that is retained through the summer is released after 1 November and before 31 March of the following year. Subsequent flood storage, due to excess rainfall, would be released as rapidly as conditions downstream permit.

(2) Elevation 6,283.5 feet to 6,350 feet NGVD29

Abiquiu Reservoir has sufficient space to store a flood equal to 130% of the Standard Project Flood (SPF). Operation in the range above the top of the flood control pool, elevation 6,283.5 feet NGVD29, is to continue operating for downstream control points until the lake level reaches elevation 6,350 feet NGVD29, which is the spillway crest. When the reservoir level approaches elevation 6,300 feet NGVD29, releases will be through Corps' outlet works bypassing the hydropower in accordance with procedures explained in Exhibit H.

(3) Elevation 6,350 feet NGVD29 and Above

When the lake level reaches spillway elevation 6,350 feet NGVD29, the conduit is operated to maintain lake elevation at spillway crest until gates are fully opened. Maintain maximum releases reached during the event until reaching top of flood control elevation (6,283.5 feet NGVD29).

b. Conservation Storage (Joint Use Space) Evacuation

The authorized flood control space in Abiquiu Reservoir is 502,000 acre-feet. The storage up to elevation 6,230 feet NGVD29 of SJ-C project water and Rio Grande system water in Abiquiu Reservoir was authorized by Public Laws 97-140 and 100-522, as amended by Public Law 116-260 (Sec. 337 of WRDA 2020). When forecasts indicate that more space is needed for flood control, pre-evacuation of conservation storage would begin such that reservoir level would not exceed top of the flood control (6,283.5 feet NGVD29). The amount to be evacuated and the time to initiate the release would be dependent upon the runoff forecasts. The analysis of the forecasting methodology and example of the pre-evacuation process are shown in Exhibit J.

Table 7-3 summarizes the regulation of Abiquiu Dam.

c. Gate Openings

Complete discussion of the decision process used to determine gate opening is included in Exhibit F.

d. Rating Curves and Tables

Elevation-Area-Capacity tables are published to 0.01-foot interval under separate cover. Copies of the tables are maintained at the project office and the WMS for use in daily operations. Elevation-Area-Capacity tables in 1-foot increment are shown in Table 7-4. Plates 7-1A through 7-4 are conduit, tailwater, spillway rating curves, and Elevation-Area-Capacity curves. Plate 7-5 shows Rio Chama rating curves, and Plate 7-6 illustrates the hydropower facility rating curves.

7-06 RECREATION

A recreation pool is provided by the conservation storage in the joint use pool. There are no specific operations for recreation at Abiquiu Reservoir.

7-07 WATER QUALITY

Water quality improvement is incidental to the flood and sediment control operations, since water quality control is not an authorized project purpose; however, all federal facilities comply with applicable federal, state, interstate, and local substantive standards (USACE 2018). Operation of the hydroelectric power facility may reduce levels of dissolved oxygen in the river downstream of the dam as the result of passing hypolimnetic water through the turbines. To assure that water quality is maintained to state standards, the power facility is equipped with a dissolved oxygen monitoring system. If the dissolved oxygen level should fall below state standards, an air injection system will be operated to introduce oxygen at the turbine draft tubes. As a side measure, monitoring for supersaturated nitrogen is performed during operation of air injection.

7-08 FISH AND WILDLIFE

a. Wildlife

Abiquiu Reservoir lies within the Great Basin Conifer Desert Scrub biotic community, and the uplands surrounding the reservoir are situated within the Great Basin Conifer Woodland. These areas generally have moderate wildlife habitat value. Historically, upland areas have been heavily grazed and habitat at lower elevations has been adversely affected by periodic flooding and sedimentation. Wildlife habitat and utilization of the general reservoir area has shown an increase. The wildlife and fish species by taxa that may occur in Rio Arriba County are mammals (89), birds (251), reptiles (28), amphibians (12), and fish (33). Mammals associated with the upland areas surrounding Abiquiu Reservoir include mule deer, pronghorn, coyote, desert cottontail, Ord's kangaroo rat, piñon mouse, rock squirrel, and white-throated wood rat. The riparian corridors support beaver, muskrat, raccoon, striped skunk, and Botta's pocket gopher. Bobcat and other large carnivores occur infrequently in the area due to disturbances by humans.

The present size of the lake has benefitted waterfowl, shorebirds, wading birds, and some raptors. The Rio Grande is a major migratory flyway for birds with the peak nesting season from 15 April through 15 August. More than 160 bird species, which are Federally protected under the Migratory Bird Treaty Act, may be found in the Rio Chama valley. The more frequently observed birds are the American Kestrel, Prairie Falcon, Mourning Dove, Great Horned Owl, Common Nighthawk, Western Grebe, Great Blue Heron, Common Merganser, Mallard Duck, and wintering Bald Eagles. Most reptiles are found in areas adjacent to the reservoir, while amphibious species generally inhabit marginal lakeside habitats. Species include the Northern Sagebrush Lizard, Plateau Fence Lizard, Many-lined Skink, Black-necked Garter Snake, Western Painted

Turtle, Spadefoot Toads, Tiger Salamander, Boreal Chorus Frog, Bullfrog, and Northern Leopard Frog.

b. Fish

Aquatic and semi aquatic fauna have benefitted from the increased storage of water for SJ-C project contractors. Abiquiu Reservoir is currently managed by the New Mexico Department of Game and Fish as a "two-story" cold and warmwater fishery, and a "put-grow-and-take" fishery. Sportfish include Rainbow Trout, Brown Trout, Kokanee Salmon, Channel Catfish, Smallmouth Bass, and Walleye. New Mexico Department of Game and Fish, in cooperation with multiple agencies, constructed instream aquatic habitat features on the Rio Chama downstream of Abiquiu Dam. Habitat features include rock and wood sills, pools, rock grade control structures, rock habitat structures, rock deflectors, and riparian vegetation. Stream habitat in the lower Rio Chama benefits from the discharge of higher quality water maintained in accordance with state standards, although the pronounced variation in flows still limit aquatic fauna. The stream fishery on the Rio Chama above Abiquiu Reservoir is being enhanced by the influence of the larger reservoir.

7-09 WATER CONSERVATION/WATER SUPPLY

Water conservation and water supply storage is done under the terms of the storing entities' water supply contracts and storage permits with the New Mexico Office of the State Engineer (NMOSE) and in accordance with applicable State and Federal laws, including the Rio Grande Compact. Storage of SJ-C project water and/or Rio Grande system water requires a contract with the Corps for designated storage space in Abiquiu Reservoir. Release of stored conservation water is made at the request of the owner.

7-10 HYDROELECTRIC POWER

The hydroelectric power facility is a non-federal facility owned and operated by Los Alamos County with no storage allocation. The facility has a rated capacity of 17.0 megawatts and is operated in accordance with the normal regulation schedule of the reservoir. For reservoir releases below 2,500 cfs, normally, all releases are made through a combination of the three turbines and three bypass valves. For reservoir releases above 2,500 cfs, the hydroelectric power facility is shut down. The closure gate is lifted, and all releases are regulated by the Corps' service gates. Corps coordination with respect to operation of the hydroelectric power facility is described in detail in Exhibit H.

At elevation 6,230 feet NGVD29, a reservoir release of about 75 cfs represents the lower boundary of turbine operation and about 1,500 cfs is the upper boundary with all three turbines operating. The bypass valves have a discharge capacity of 2,500 cfs at elevation 6,230 feet NGVD29.

The turbines are designed to operate between a minimum reservoir elevation of 6,170 feet NGVD29 and a maximum reservoir elevation of 6,300 feet NGVD29. If the reservoir level is above or below the turbine operating range, the hydroelectric power

facility is shut down and releases are made through the bypass valves, if the conduit remains pressurized, or the Corps' gates, if the conduit is depressurized.

7-11 NAVIGATION

Navigation is not a project purpose.

7-12 DROUGHT CONTINGENCY PLANS

The purpose of the Drought Contingency Plan for the Rio Grande Basin is to provide a basic reference for water management decisions and responses to water shortages induced by climatological droughts. As a water management document, it is limited to those drought concerns relating to water control management actions. Refer to Appendix F of the Rio Grande Basin Master Water Control Manual for more information.

7-13 FLOOD EMERGENCY ACTION PLANS

The purpose of the Flood Emergency Plan is to outline and define procedures to be followed in the event that critical conditions develop which could lead to the failure of or uncontrolled release of water from Abiquiu Dam. This plan further assigns responsibilities of Corps personnel in the degree necessary to take prompt remedial action to prevent dam failure and to prevent or minimize loss of life and property damage. Refer to Abiquiu Reservoir Emergency Action Plan dated August 2018 for additional information.

7-14 DEVIATION FROM NORMAL REGULATION

There are occasions when it is necessary or desirable to deviate from the water control plan for short periods of time. Approval of deviations is required from the Corps South Pacific Division (SPD) office. The protocol in the SPD regulation "Guidance on the Preparation of Deviations from Approved Water Control Plans," (CESPD-RBT, Regulation No. 10-1-04) dated 18 December 2014, or any updated guidance, shall be followed when requesting deviations (Exhibit I).

The Flood Control Act of 1960 (Public Law 86-645) requires advice and consent of the Rio Grande Compact Commissioners for any departure from the operation schedule detailed in Public Law 86-645. The upper basin reservoirs (Abiquiu, Cochiti, Galisteo, and Jemez Canyon Dams) are operated in accordance with Public Law 86-645 (Exhibit E) which states, in part, that:

"All reservoirs of the Middle Rio Grande project will be operated at all times in the manner described above in conformity with the Rio Grande compact, and no departure from the foregoing operation schedule will be made except with the advice and consent of the Rio Grande compact, and no departure from the foregoing operation schedule will be made except with the advice and consent of the Rio Grande Compact Commission: Provided, That whenever the Corps of Engineers determines that an emergency exists

affecting the safety of major structures or endangering life and shall so advise the Rio Grande Compact Commission in writing these rules of operation may be suspended during the period of and to the extent required by such emergency”.

7-15 RATE OF RELEASE CHANGE

The allowable rate of release change varies with flow magnitude. Generally, the increase and decrease in stage at the downstream gage should be held to a range of 0.25 to 0.50 foot. The limitation on the increase in stage at the downstream gage is based on public safety concerns. The limitation on the decrease in stage at the downstream gage is based on trying to prevent bank sloughing. Flow changes should not be made in less than one-hour intervals. WMS, or the Abiquiu Operations Project Manager, at their discretion, may exceed the normal rates of change in release in the event of drowning, accidents, failure of operational facilities, severe weather, or other emergencies deemed to require a more rapid rate of increase or decrease in the rate of release. Refer to Exhibit F for more information.

Table 7-3 Regulation of Abiquiu Dam and Reservoir

A. Non-Flood Operations (6,060 feet to 6,230 feet NGVD29):

Pass Rio Grande inflow and irrigation releases from El Vado dam.

Storage and release of SJ-C project water will be as requested by the water owner.

Storage and release of Rio Grande system water will be as requested by the water owner and according to the State storage permit conditions.

B. Flood Risk Management Operations (6,060 feet to 6,283.5 feet NGVD29):

Flood control operation at Abiquiu Dam will be to minimize downstream damages and evacuate flood storage as rapidly as downstream conditions permit. Flood control operation will meet the following constraints:

1. Control dam releases as measured at the Rio Chama below Abiquiu Dam gage to 1,200 cfs and increase gradually to 1,800 cfs. Cease releases of conservation and water supply storage when releases reach 1,500 cfs.
2. Limit flow at Rio Chama at Chamita gage to 3,000 cfs.
3. Limit flow at Rio Grande at Otowi gage to 10,000 cfs.
4. Flood water that couldn't pass through Cochiti Dam due to Middle Rio Grande valley conditions will be retained at Abiquiu Dam.
5. Release flood storage will not be made after 01 July when the natural flow at the Otowi gage is below 1,500 cfs.
6. Flood carryover water during the summer will be released after 31 October and before 31 March of the following year.
7. Change in release rate will be in accordance with paragraph 7-15.

C. Flood Control Operations (6,283.5 feet to 6,350.0 feet NGVD29):

1. Evacuate flood storage as rapidly as downstream conditions permit (except as noted in D-2 below).
2. When the reservoir level approaches elevation 6,300 feet NGVD29, releases will be through Corps' outlet works bypassing the hydropower facility.

D. Flood Control Operations (6,350.0 feet NGVD29 and Above):

1. When lake level reaches spillway elevation 6,350 feet NGVD29, the conduit is operated to maintain lake elevation at spillway crest until gates are fully opened.
2. Maintain maximum releases reached during the event until reaching top of flood control elevation (6,283.5 feet NGVD29).

Table 7-4 Reservoir Elevation-Area-Capacity Table

Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6080	0	0	6107	111	1,077
6081	1	0	6108	116	1,191
6082	1	1	6109	122	1,310
6083	4	4	6110	130	1,436
6084	5	8	6111	139	1,570
6085	6	14	6112	150	1,715
6086	8	21	6113	161	1,870
6087	10	30	6114	170	2,036
6088	12	41	6115	178	2,210
6089	14	54	6116	194	2,395
6090	17	69	6117	211	2,598
6091	20	88	6118	226	2,816
6092	23	109	6119	241	3,050
6093	25	133	6120	253	3,297
6094	29	160	6121	267	3,557
6095	35	192	6122	278	3,829
6096	40	230	6123	291	4,114
6097	45	272	6124	310	4,414
6098	53	321	6125	334	4,736
6099	61	378	6126	348	5,077
6100	69	443	6127	362	5,432
6101	76	516	6128	376	5,801
6102	82	595	6129	390	6,184
6103	88	680	6130	408	6,583
6104	94	771	6131	429	7,002
6105	99	867	6132	446	7,439
6106	105	969	6133	465	7,895

Table 7-4 Reservoir Elevation-Area-Capacity Table (continued)

Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6134	490	8,372	6161	1,130	28,222
6135	519	8,876	6162	1,174	29,374
6136	539	9,405	6163	1,216	30,569
6137	556	9,953	6164	1,263	31,809
6138	571	10,516	6165	1,313	33,096
6139	584	11,094	6166	1,367	34,436
6140	596	11,684	6167	1,422	35,831
6141	609	12,286	6168	1,474	37,279
6142	622	12,902	6169	1,527	38,779
6143	635	13,530	6170	1,581	40,333
6144	646	14,171	6171	1,631	41,939
6145	658	14,823	6172	1,689	43,599
6146	671	15,487	6173	1,745	45,316
6147	685	16,165	6174	1,797	47,087
6148	700	16,858	6175	1,854	48,912
6149	718	17,567	6176	1,916	50,797
6150	742	18,297	6177	1,974	52,742
6151	764	19,050	6178	2,030	54,744
6152	786	19,825	6179	2,085	56,801
6153	808	20,622	6180	2,132	58,910
6154	834	21,443	6181	2,177	61,064
6155	861	22,290	6182	2,224	63,265
6156	895	23,168	6183	2,274	65,514
6157	941	24,086	6184	2,323	67,812
6158	987	25,050	6185	2,371	70,159
6159	1,034	26,061	6186	2,422	72,556
6160	1,080	27,117	6187	2,479	75,006

Table 7-4 Reservoir Elevation-Area-Capacity Table (continued)

Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6188	2,535	77,513	6215	3,918	164,473
6189	2,591	80,076	6216	3,973	168,419
6190	2,646	82,694	6217	4,030	172,420
6191	2,698	85,366	6218	4,084	176,477
6192	2,753	88,092	6219	4,138	180,588
6193	2,807	90,872	6220	4,191	184,753
6194	2,858	93,704	6221	4,243	188,970
6195	2,908	96,587	6222	4,295	193,239
6196	2,956	99,519	6223	4,347	197,560
6197	3,002	102,498	6224	4,396	201,931
6198	3,049	105,524	6225	4,446	206,352
6199	3,094	108,595	6226	4,495	210,823
6200	3,136	111,710	6227	4,545	215,343
6201	3,172	114,864	6228	4,595	219,913
6202	3,208	118,054	6229	4,643	224,532
6203	3,268	121,292	6230	4,691	229,199
6204	3,325	124,589	6231	4,744	233,916
6205	3,389	127,946	6232	4,795	238,686
6206	3,448	131,364	6233	4,845	243,506
6207	3,500	134,838	6234	4,894	248,375
6208	3,549	138,363	6235	4,943	253,294
6209	3,601	141,938	6236	4,993	258,262
6210	3,651	145,564	6237	5,043	263,280
6211	3,700	149,239	6238	5,094	268,348
6212	3,755	152,967	6239	5,144	273,467
6213	3,809	156,749	6240	5,195	278,637
6214	3,861	160,584	6241	5,246	283,857

Table 7-4 Reservoir Elevation-Area-Capacity Table (continued)

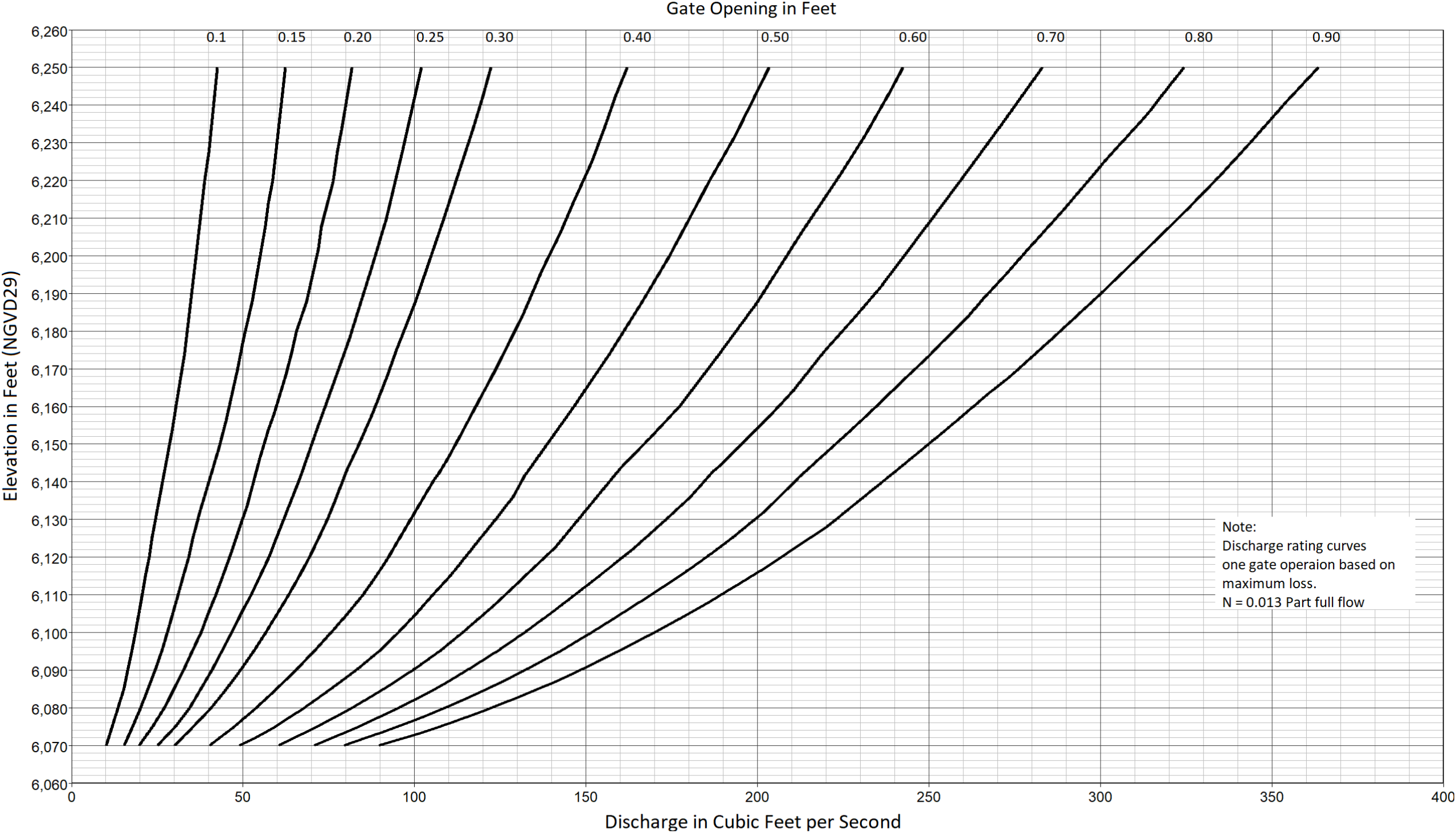
Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6242	5,294	289,127	6269	6,769	451,251
6243	5,343	294,446	6270	6,830	458,050
6244	5,395	299,815	6271	6,889	464,910
6245	5,446	305,235	6272	6,949	471,829
6246	5,496	310,706	6273	7,009	478,808
6247	5,546	316,227	6274	7,070	485,847
6248	5,596	321,798	6275	7,131	492,948
6249	5,646	327,419	6276	7,191	500,109
6250	5,698	333,091	6277	7,252	507,330
6251	5,752	338,816	6278	7,314	514,613
6252	5,805	344,595	6279	7,375	521,958
6253	5,858	350,426	6280	7,437	529,364
6254	5,911	356,311	6281	7,500	536,832
6255	5,964	362,248	6282	7,563	544,364
6256	6,016	368,238	6283	7,625	551,958
6257	6,071	374,282	6284	7,686	559,613
6258	6,127	380,381	6285	7,747	567,330
6259	6,184	386,536	6286	7,807	575,107
6260	6,240	392,748	6287	7,868	582,944
6261	6,294	399,015	6288	7,929	590,843
6262	6,351	405,338	6289	7,990	598,802
6263	6,410	411,718	6290	8,049	606,822
6264	6,468	418,157	6291	8,110	614,901
6265	6,528	424,655	6292	8,169	623,041
6266	6,589	431,214	6293	8,228	631,239
6267	6,648	437,832	6294	8,284	639,495
6268	6,710	444,511	6295	8,345	647,810

Table 7-4 Reservoir Elevation-Area-Capacity Table (continued)

Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6296	8,404	656,184	6323	10,181	906,675
6297	8,465	664,619	6324	10,253	916,892
6298	8,526	673,114	6325	10,327	927,182
6299	8,588	681,671	6326	10,403	937,547
6300	8,652	690,291	6327	10,481	947,989
6301	8,714	698,974	6328	10,560	958,509
6302	8,776	707,719	6329	10,641	969,110
6303	8,843	716,529	6330	10,720	979,790
6304	8,912	725,406	6331	10,802	990,551
6305	8,981	734,353	6332	10,884	1,001,394
6306	9,047	743,367	6333	10,968	1,012,320
6307	9,114	752,447	6334	11,053	1,023,331
6308	9,180	761,594	6335	11,139	1,034,427
6309	9,244	770,806	6336	11,226	1,045,609
6310	9,307	780,082	6337	11,315	1,056,880
6311	9,371	789,421	6338	11,405	1,068,240
6312	9,436	798,824	6339	11,496	1,079,690
6313	9,501	808,293	6340	11,590	1,091,233
6314	9,566	817,826	6341	11,689	1,102,873
6315	9,633	827,426	6342	11,787	1,114,611
6316	9,701	837,093	6343	11,887	1,126,448
6317	9,769	846,828	6344	11,984	1,138,383
6318	9,838	856,631	6345	12,086	1,150,418
6319	9,906	866,503	6346	12,185	1,162,554
6320	9,974	876,443	6347	12,286	1,174,789
6321	10,043	886,452	6348	12,389	1,187,127
6322	10,111	896,529	6349	12,496	1,199,569

Table 7-4 Reservoir Elevation-Area-Capacity Table (continued)

Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)	Elevation (feet NGVD29)	Surface Area (acres)	Capacity (acre-feet)
6350	12,606	1,212,120	6377	16,023	1,597,662
6351	12,715	1,224,781	6378	16,150	1,613,748
6352	12,823	1,237,550	6379	16,278	1,629,962
6353	12,936	1,250,429	6380	16,404	1,646,303
6354	13,051	1,263,423	6381	16,529	1,662,770
6355	13,169	1,276,533			
6356	13,289	1,289,762			
6357	13,411	1,303,112			
6358	13,537	1,316,586			
6359	13,665	1,330,187			
6360	13,797	1,343,917			
6361	13,930	1,357,781			
6362	14,064	1,371,778			
6363	14,199	1,385,909			
6364	14,344	1,400,181			
6365	14,485	1,414,595			
6366	14,616	1,429,145			
6367	14,744	1,443,825			
6368	14,873	1,458,634			
6369	15,001	1,473,571			
6370	15,129	1,488,636			
6371	15,256	1,503,828			
6372	15,382	1,519,147			
6373	15,510	1,534,593			
6374	15,639	1,550,168			
6375	15,767	1,565,871			
6376	15,896	1,581,702			



Elevations in NGVD29
NGVD29 to NAVD88 add 3.33 feet

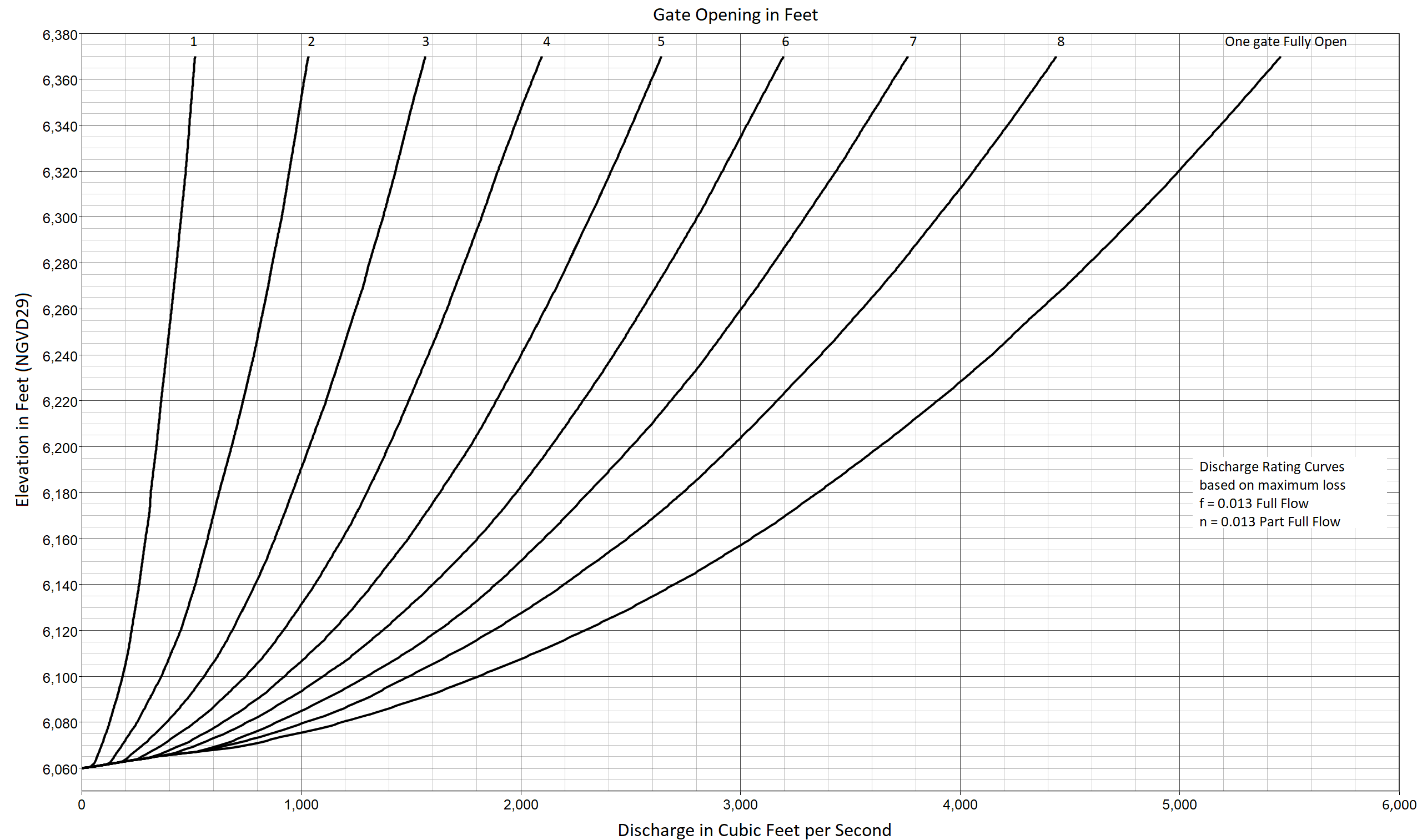
U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE BASINNEW MEXICO

ABIQUIU RESERVOIR PROJECT
CONDUIT RATING CURVES
ONE GATE, INCREMENTS
LESS THAN ONE FOOT

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

Plate Number
7-1A



Elevations in NGVD29
NGVD29 to NAVD88 add 3.33 feet

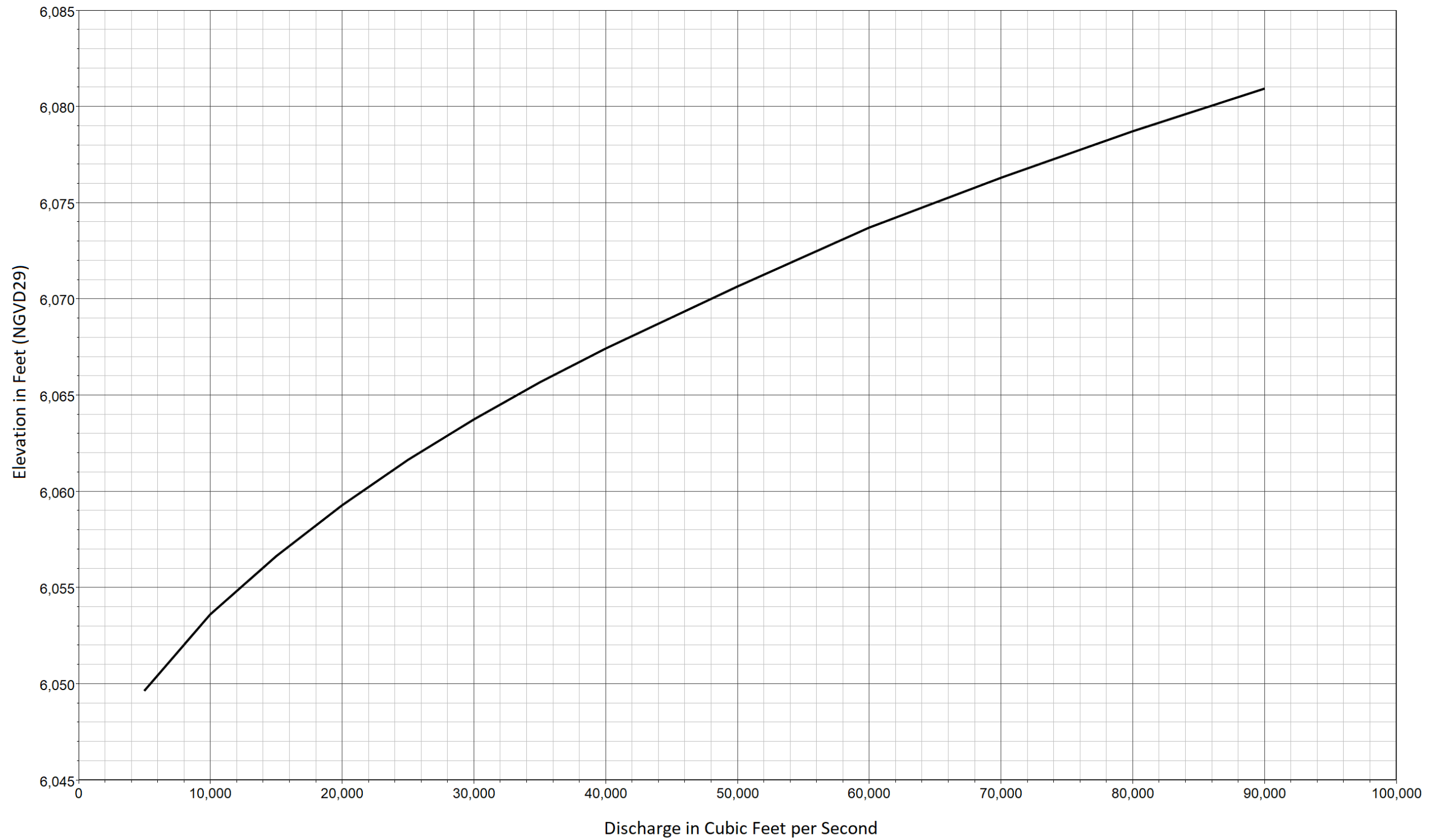
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ABIQUIU RESERVOIR PROJECT
CONDUIT RATING CURVES
ONE GATE, ONE-FOOT
INCREMENTS

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

Plate Number
7-1B



Elevations in NGVD29
NGVD29 to NAVD88 add 3.33 feet

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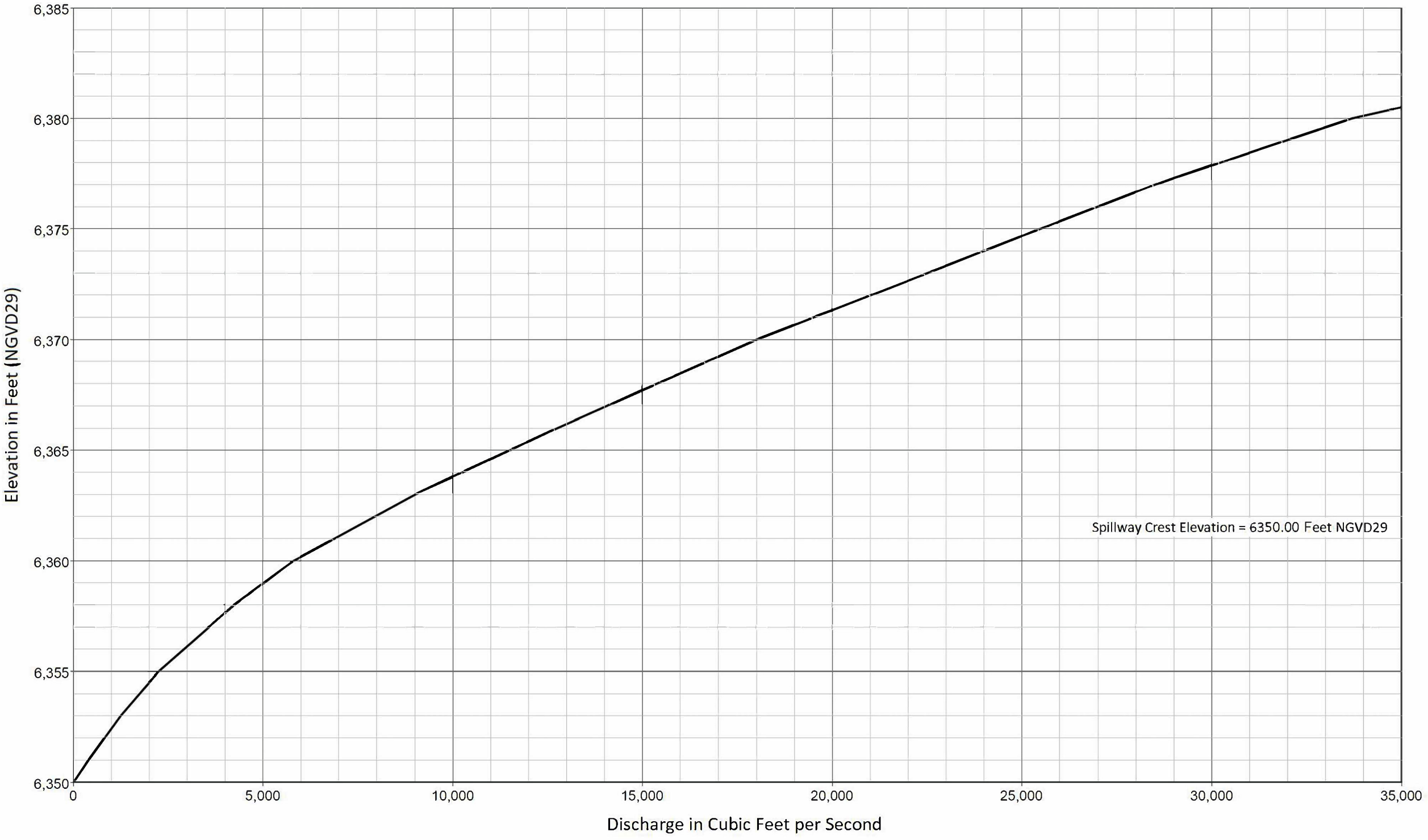
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ABIQUIU RESERVOIR PROJECT

**DAM & SPILLWAY
TAILWATER RATING CURVE**

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

Plate Number
7-2



Elevations in NGVD29
NGVD29 to NAVD88 add 3.33 feet

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

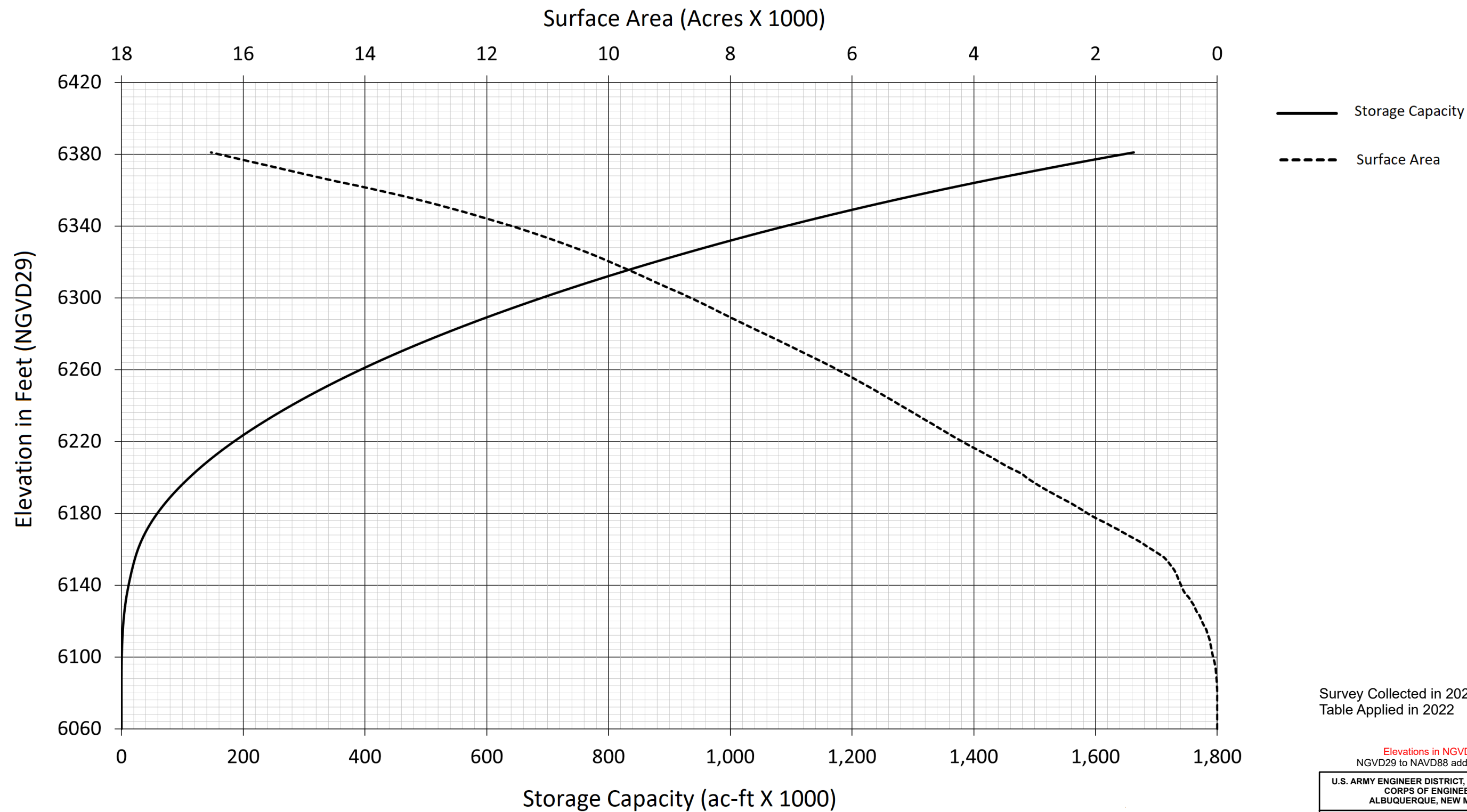
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ABIQUIU RESERVOIR PROJECT

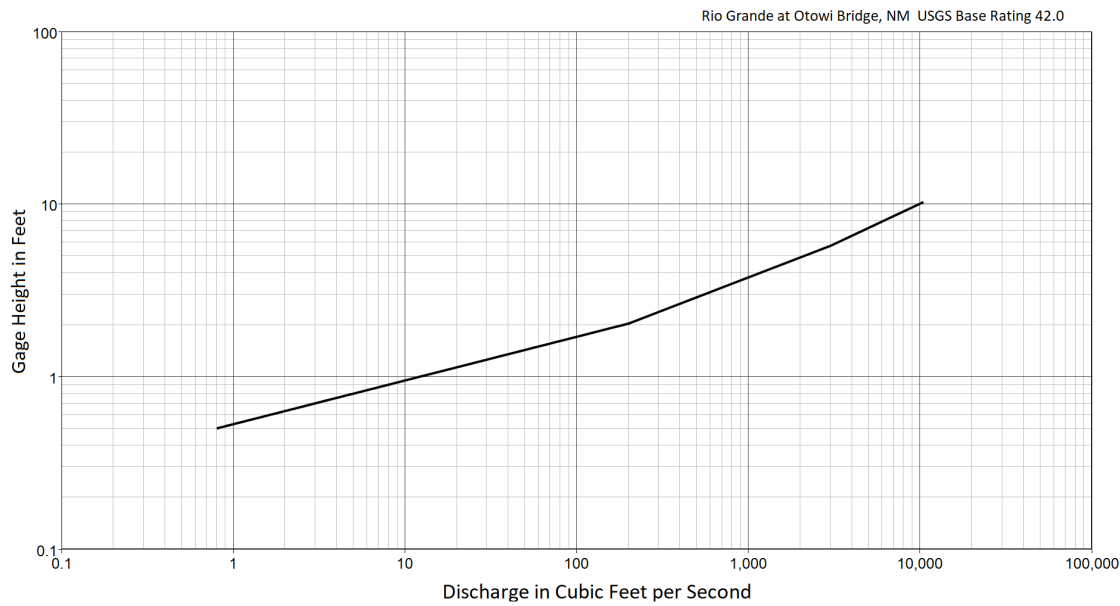
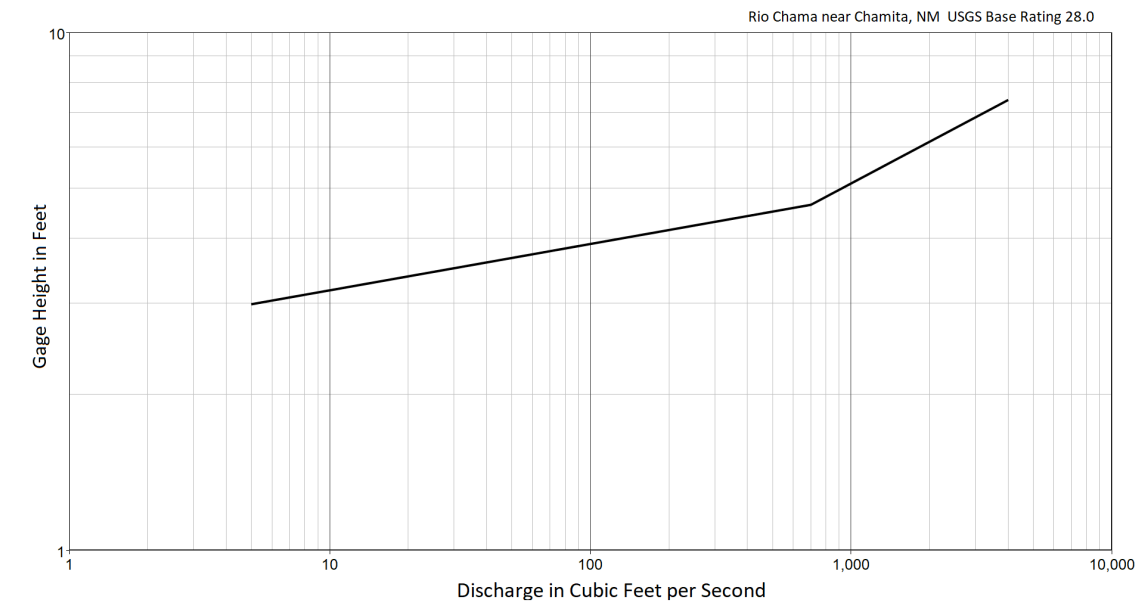
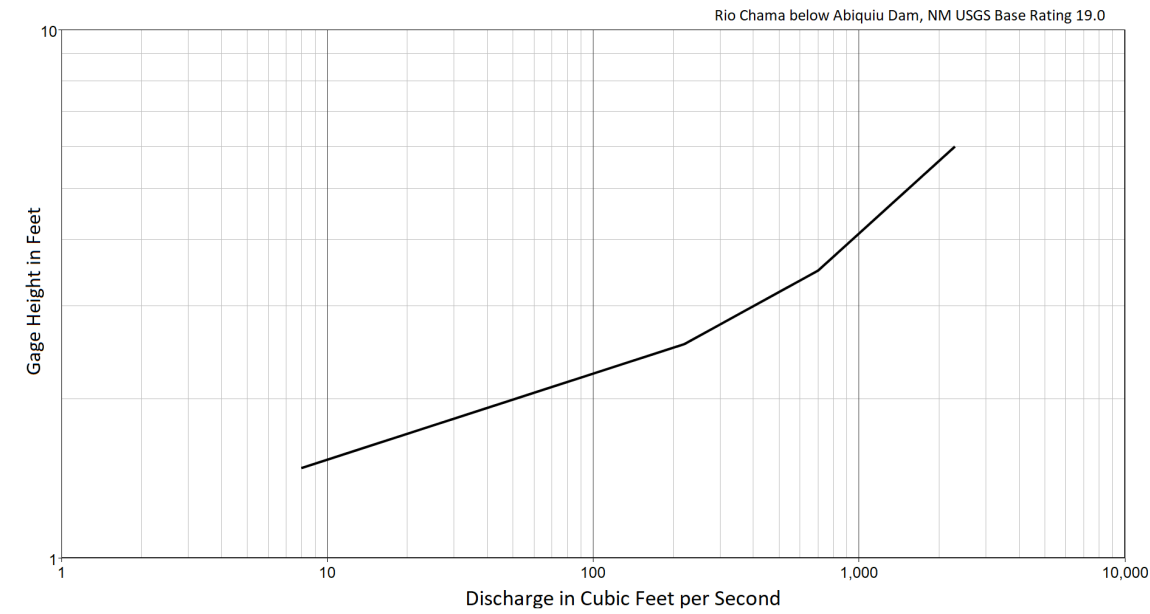
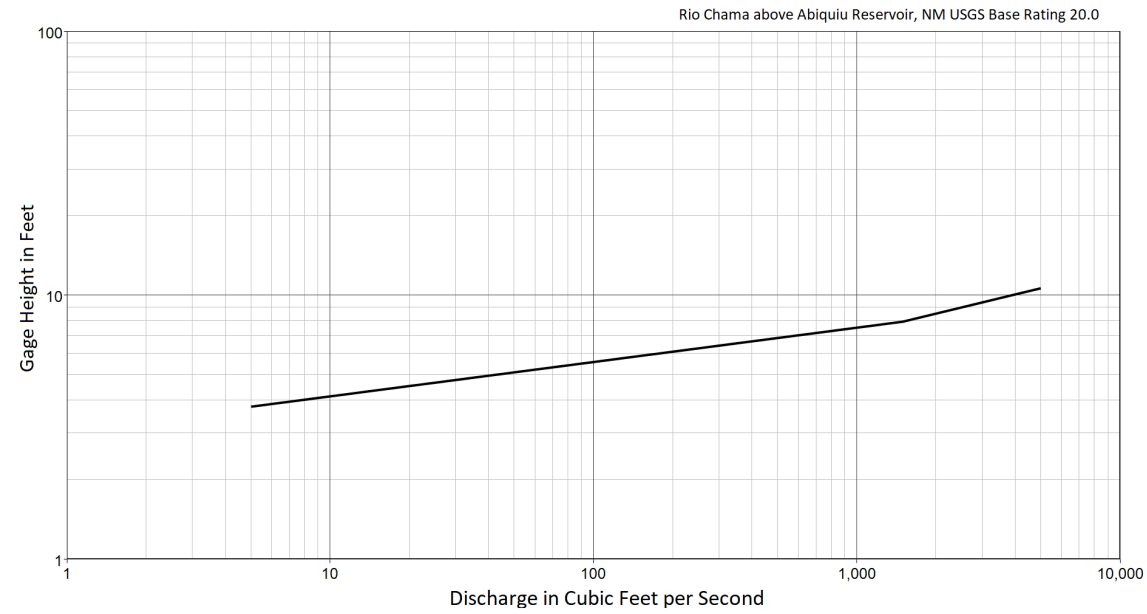
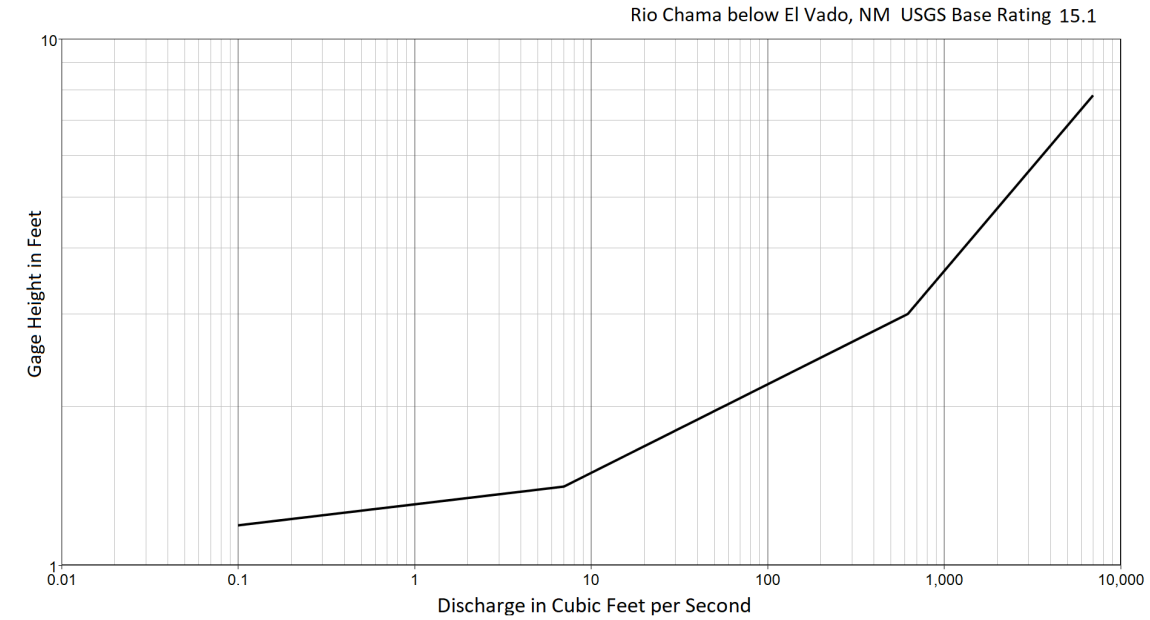
SPILLWAY RATING CURVE

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

Plate Number
7-3



Survey Collected in 2020
Table Applied in 2022



USGS INFORMATION

DESCRIPTION

Stage-discharge relations (ratings) are usually developed from a graphical analysis of numerous discharge measurements. Measurements are made on various schedules and sometimes for different purposes. All discharge measurements are compiled and maintained in a data base. Each measurement is carefully made, and undergoes quality assurance review. Some measurements indicate a temporary change in the rating, often due to a change in the streambed (for example, erosion or deposition) or growth of riparian vegetation. Such changes are called shifts; they may indicate a short- or long-term change in the rating for the gage. In normal usage, the measured shifts (or corrections) are applied mathematically to a defined rating.

The tables being provided are shift corrected, incorporating the mathematical adjustments for ease of use by the user. The shift adjustments are applied to the individual ratings as measured data becomes available, resulting in an adjusted rating. Some ratings may change as often as weekly, others may not change for months or years.

WARNING

The stage-discharge rating provided in this file should be considered provisional and subject to change. Stage-discharge ratings change over time as the channel features that control the relation between stage and discharge vary. Users are cautioned to consider carefully the applicability of this rating before using it for decisions that concern personal or public safety or operational consequences.

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
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ABIQUIU RESERVOIR PROJECT

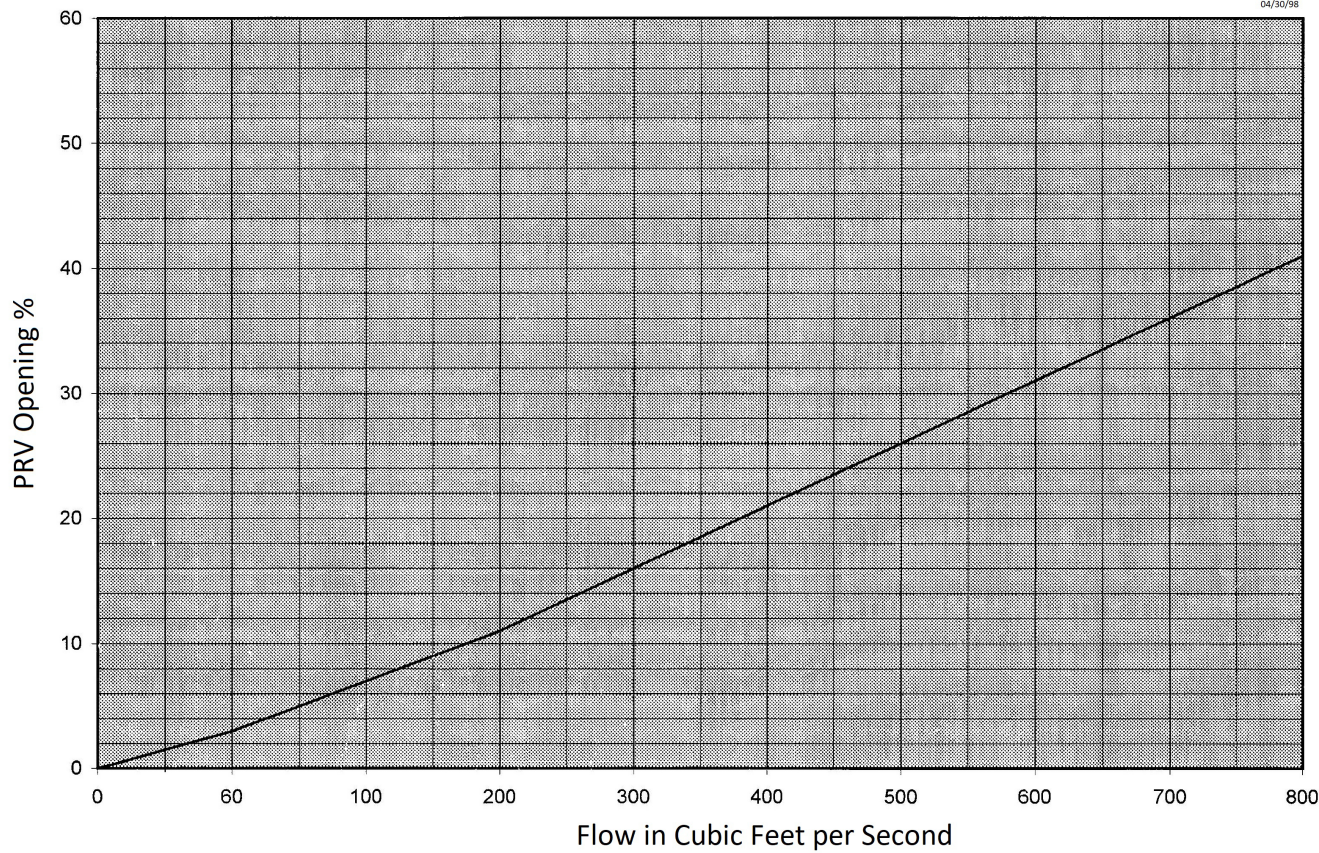
**RATING CURVES FOR
RIO CHAMA**

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

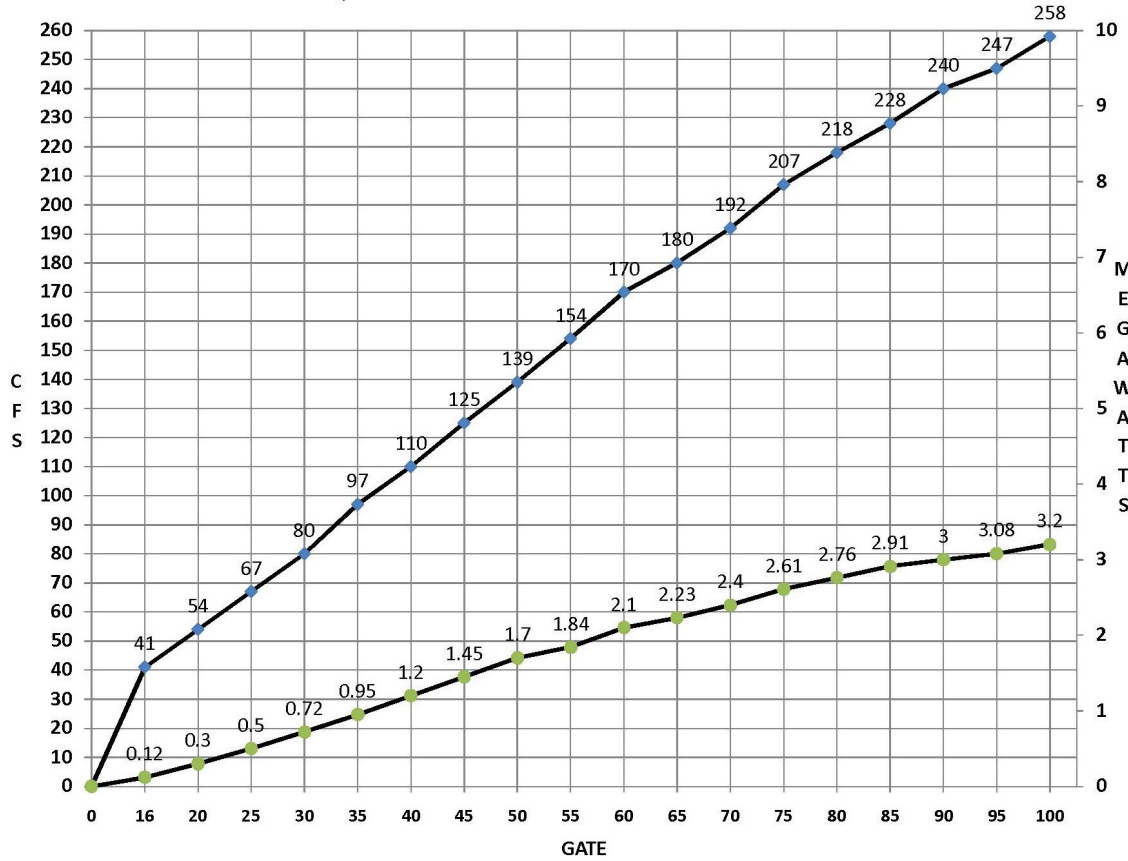
Plate Number
7-5

Abiquiu PRV Opening vs. Flow in CFS

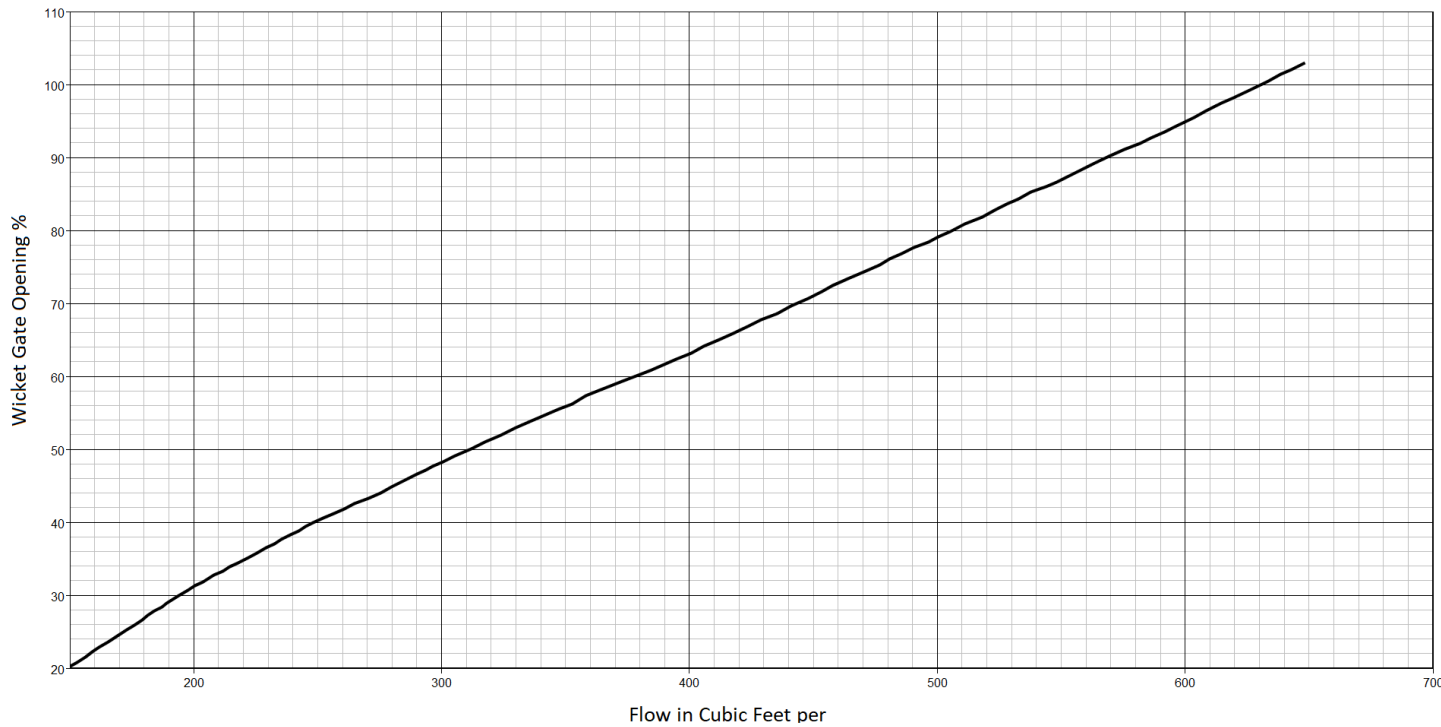
04/30/98



ABIQUIU UNIT THREE FLOW VS. MEGAWATT CHART

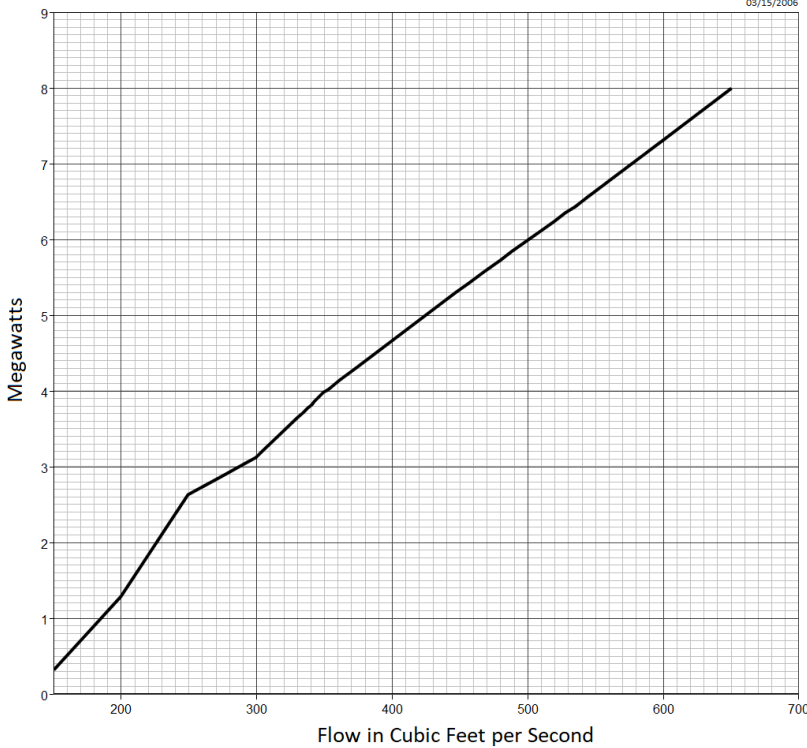


Abiquiu Wicket gate Opening vs. Flow in CFS



Abiquiu Megawatts vs. Flow in CFS

03/15/2006



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ABIQUIU RESERVOIR PROJECT
**HYDRO POWER FACILITY
RATING CURVES**

TO ACCOMPANY WATER
CONTROL MANUAL
DATED 2023

Plate Number
7-6