STANDING INSTRUCTINOS TO THE DAM OPERATOR

SANTA FE DAM

SAN GABRIEL RIVER

Exhibit A

to the

Water Control Manual for

Santa Fe Dam

U.S. Army Corps of Engineers

Los Angeles

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STANDING INSTRUCTIONS TO THE DAM OPEATOR
SANTA FE DAM

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STANDING INSTRUCTIONS TO THE DAM OPERATOR

SANTA FE DAM

A-I. BACKGROUND AND RESPONSIBILITIES

A-1-01 General Information

This exhibit is prepared in accordance with instructions contained in EM 111-2-3600, paragraph 9-2 (Standing Instructions to Project Operators for Water Control), and ER 1110-2-240, and pertains to duties and responsibilities of dam operators associated with the operation of Santa Fe Dam.

Operational instructions to dam operators are outlined with specific emphasis on flood emergencies when communication between the dam operator and RRS (Reservoir Regulation Section) has been disrupted. This exhibit is designed to be used as an operational guide for the dam operator in implementing the Santa Fe Dam Gate Regulation Schedule (found at the end of this exhibit). Associated plates are contained in the main body of the water control manual.

The dam operator is required to have available at the damsite this water control manual and exhibits, and the current version of other manuals that complement these standing instructions. These manuals are: (a) "Instructions for Reservoir Operations Center Personnel" (the "Orange Book"); (b) "Operation and Maintenance Manual for Santa Fe Dam"; and (c) "Santa Fe Dam Emergency Plan". Deviation from standing instructions will require approval of the District Commander.

The purpose of Santa Fe Dam is to regulate flood flows down the San Gabriel River, minimizing flood damage downstream of the structure. The protected area includes the floodplains of the San Gabriel River, Rio Hondo

and Los Angeles River. The regulation of Santa Fe Dam is coordinated with that of Whittier Narrows Dam.

Table 9-01 is an organizational chart depicting the chain of command for reservoir regulation decisions.

Gate Operation instructions to the dam operator are issued by the Reservoir Regulation Section (RRS) in Engineering Division. Dam operators are part of the Operations Branch, under the Construction-Operations Division.

Santa Fe Dam is located on the San Gabriel River, upstream of Whittier Narrows Dam, as seen on plate 1-1. The dam is situated about 4 miles downstream of the mouth of San Gabriel Canyon, about 16 miles east-northeast of the Los Angeles Civic Center, and about 3 miles west-southwest of the town of Azusa. Santa Fe Dam consists of an earthfill embankment with outlet works and a spillway. A basin plan of Santa Fe Dam is shown on plate 2-3.

Santa Fe Dam is owned, operated, and maintained by the U.S. Army Corps of Engineers, Los Angeles District, which has complete regulatory responsibility.

A-1-02 Role of the Project Operator

a. Normal Conditions. The Dam Operator will be instructed by RRS as necessary for water control actions under normal conditions) see Plate A-1 of this exhibit). The dam operator will verify that all equipment at the project is in good operating condition; test-operate gates and electrical facilities in the control house and inspect all structures and equipment according to a pre-established schedule; and refer to the Operation and Maintenance Manual for instructions on actual operation procedures for all equipment.

b. Emergency Conditions. The dam operator will be present at the dam

during periods of significant runoff, as instructed by the Operations Branch; operate the dam in accordance with instructions from RRS; and follow the Santa Fe Dam Gate Regulation Schedule provided in this exhibit during periods of communication disruption (Note: Six full hours should be allowed to reestablish communication).

A-II. DATA COLLECTINAND REPORTING

A-2-01 Normal Conditions

During normal conditions, measurements are made daily at 0800 hours local time by the dam operator to determine reservoir staff reading (water surface elevation), float well or manometer gauge "tape" reading, incremental precipitation since last report, total accumulated precipitation for the season, the setting of each outlet gate, and the times of theses measurements. This information will be logged on the appropriate forms and reported by radio to RRS, WUK 4ROC, as requested.

The dam operator will also maintain records, including water surface elevations, downstream gauge heights, precipitation amounts, outlet gate settings, and log all radio an telephone communications on forms prescribed below.

a. The Record of Calls Form (SPL-188). This form is used each time a message is transmitted or received by radio or telephone. The purpose of every call will be noted, whether for radio check, reservoir report, etc.

b. Flood Control Basin Operation Report Form (SPL-19). The dam operator should log all of the information on this form each time a water surface elevation measurement is taken or a gate change has been completed.

c. Rainfall Record Form (SPL-31). This form should be filled in each time a rainfall measurement is taken from a glass tube rainfall gauge.

d. Record of Data from Digital Recorders (SPL-648). This form is used to tabulate water surface, downstream gauge height, and precipitation data from digital recorders.

All of these forms should be submitted monthly to the Water Control Data Unit CESPL-ED-HR (Baseyard) of RRS for archival storage. A copy of each of these forms is included in the Santa Fe Dam Water Control Manual in figures 9-1 through 9-6.

A-2-02 Emergency Conditions

During flood events, the dam operator should follow instructions as issued by RRS on measurement type and frequency. Due to the speed with which events may occur at Santa Fe Dam, measurements are fifteen minute intervals are sometimes necessary. When reporting to RRS, the dam operator should clearly describe the silt and debris situation at the gates, and downstream gauges. When instruments are not working or are stuck in the silt, the operator should not report the erroneous reading, but should rather state instrument or staff problem. Care should be taken to avoid issuing misleading reports due to siltation at the reservoir staff boards. When debris or silt causes flows to be deceptively perched above the invert, or cause a loss of contact with the staff board, the dam operator should report a descriptive message identifying the limitations, and quantifying the estimated reservoir stage. If the radio system, including the dam operator's mobile unit, malfunctions, RRS will contact the operator via telephone. It is especially important to maintain all records discussed above during emergency conditions.

A-2-03 Regional Hydrometeorological Conditions

The dam operator will be informed by RRS of regional hydrometeorological conditions that may/will impact Santa Fe Dam.

A-III. WATER CONTROL ACTION AND REPORTING

A-3-01 Normal (Non-Flood) Conditions

Except during times of emergency when fast action is critical, RRS must approve all gate changes. RRS will originate the request for a gate change, and will provide settings for each gate whenever a gate change is necessary. Generally, gates will be set according to the instructions given in this exhibit. The dam operator should implement gate changes immediately following acknowledgement of instructions. Delaying a gate change may have serious impacts on affected activities. If other concurrent activities cause a delay in implementation of a gate change, the dam operator should notify RRS by calling radio call sign WUK 4ROC and request guidance.

Once a gate change is completed, the dam operator should radio back to RRS on WUK 4ROC to report the time and change was completed, the staff and tape readings, the downstream gauge height, and the current settings of all sixteen gates.

The sixteen vertical lift gates are hydraulically operated from the control house. The dam operator should refer to the O&M Manual for instructions on actual operating procedures.

A-3-02 Emergency Conditions

During flood events and other emergency conditions, water control actions and reporting are vital to the successful operation of the dam.

If structural damage or some other emergency occurs at the dam, the dam operator should notify RRS as soon as possible with a description of the conditions.

During an emergency condition such as a hazardous chemical spill or potential drowning where immediate action is necessary, the dam operator should make the appropriate gate changes and report in to RRS as soon as possible.

During a flood event, RRS will initiate gate changes, as is done during normal (non-flood) conditions. The dam operator will implement the gate change and report back the same information as during normal (non-flood) conditions.

RRS will keep the dam operator apprised of regulation objectives and critical regulation constrains whenever possible. This will afford the dam operator a greater opportunity to recognize and identify potential problems in the field. RRS may also provide additional water surface elevation criteria, instructing the dam operator to alert them via radio channel WUK 4ROC when the reservoir pool reaches the indicated level. Such an action would normally be conducted during periods of intense storm runoff, and would require the operator to remain at the control house.

A-3-03 Inquiries

All significant inquiries received by the dam operator from citizens, constituents, or interest groups regarding water control procedures or actions must be referred directly to RRS.

A-3-04 Water Control Problems

RRS must be contacted immediately by the most rapid means available in the event that an operational malfunction, erosion, or other incident occurs that could impact project integrity in general or water control capability in particular.

Emergency departures from the operation instructions issued by RRS may be required, because of equipment failures, accidents, or other emergencies requiring immediate action. Under these situations, the dam operator should contact RRS via radio for instructions. When communications are broken, or the situation demands immediate action, the dam tender may proceed independently. RRS should be notified of such actions as soon as possible. All other emergency deviations from normal procedure should be approved in advance by RRS. The District Engineer, Los Angeles District, U.S. Army Corps of Engineers, may make temporary modifications to the water control regulations. Permanent changes are subject to approval by the Division Engineer, South Pacific Division, U.S. Army Corps of Engineers.

The dam operator should immediately alert RRS via radio channel WUK 4ROC whenever the requested gate change cannot be fully implemented due to mechanical or other physical problems. For example, debris will occasionally prevent total gate closure. RRS will evaluate the problem and provide further instructions to the dam operator.

A-3-05 Communication Outage

Coordination of flood control operation is under the direction of RRS, Corps of Engineers, Los Angeles District. During flood periods, close contact will be maintained between operating personnel at Santa Fe Dam and RRS in Los Angeles. If communication is broken between the dam operator and RRS, initially continue releases in accordance with the last instructions from RRS, and make every attempt to re-establish communications. If this effort is unsuccessful for six full hours, the dam operator should use water surface elevations and precipitation data to make releases following the Santa Fe Dam Gate Regulation Schedule in this exhibit.

Emergency notifications are normally made by RRS. However, if the dam

operator loses communication with RRS, and an emergency notification situation arises, such as an imminent dam failure or uncontrolled spillway flow (water surface elevation above 496 feet NGVD), the dam operator should make the necessary notifications. The parties listed below are to be immediately notified upon declaration of an uncontrolled emergency.

Los Angeles County Sheriff, Communication Watch Commander	213-263-9411
California Office of Emergency Services, Sacramento	916-427-4990

Notifications should include: (a) description of the type and extent of the existing or impending emergency; (b) advise for evacuation from the floodplain; (c) information on the time of the initial release of hazardous amounts of water; (d) the depth of water behind the dam; and (e) the dam operator's name and telephone number.

Upon completing the above notifications, attempt to re-establish communications with RRS. Document all notifications made, and refer to the "Orange Book" (Instructions for Reservoir Operations Center Personnel) for more information on additional emergency notifications. The dam operator should not leave the dam unless his or her safely is in jeopardy.

SANTA FE DAM - GATE REGULATION SCHEDULE

STEP NO.	CURRENT WSE AT SNFE (ft,NGVD)	GATE SETTING FOR GATES INDICATED (see schematic for gate positions) (ft of opening)																COMPUTED DISCHARGE (ft^3/sec)	DOWNSTREAM GAGE HT (ft)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
1	421.0 - 456.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0 - 130*	10.0 - 10.8

Once WSE reaches 456, Santa Fe Dam (SNFE) is operated based on concurrent conditions at Whittier Narrows Dam (WNRH).

* May be higher or lower during actual operation, depending on LACDPW's capability to recharge groundwater.

OPERATION OF SANTA FE DAM (SNFE) IN TANDEM WITH WHITTIER NARROWS DAM (WNRH):
Follow the following procedures (for more details, please refer to section 7-05 of the Santa Fe Dam and Reservoir Water Control Manual):

*1: Obtain the current WSE at SNFE (from the Santa Fe Dam tender's report or telemetry).

*2: Obtain the concurrent WSE at WNRH (from Whittier Narrows Dam tender's report or telemetry). Also, please see note 1.

*3: Determine the "equivalent SNFE WSE" corresponding to the concurrent WSE at WNRH (from *2 above) using Table 1.

*4: If current WSE at SNFE (from *1 above) is greater than the "equivalent SNFE WSE" (from *3 above), follow step below (i.e., 2,3,..11) that corresponds to the current WSE at SNFE. If the necessary step requires to increase the SNFE Reservoir outflow, then increase outflow by increments of no more than 5,000 ft^3/sec per half-hour.

*5: If current WSE at SNFE (from *1 above) is less than the "equivalent SNFE WSE (from *3 above), then there is no required SNFE release. Cut back SNFE release as necessary (to zero, if needed). Also, see note 2, and remark 1 of spillway flow conditions.

*6: Once SNFE and WNRH Reservoirs reach the same fullness in percentage storage volume (Table 1), operate SNFE to maintain the balance. Also, see Note 3.

TANDEM OPERATION

STEP NO.	CURRENT WSE AT SNFE (ft,NGVD)	GATE SETTING FOR GATES INDICATED (see restrictions) (ft of opening)																COMPUTED DISCHARGE (ft^3/sec)	DOWNSTREAM GAGE HT (ft)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
2	456.0 - 457.0	0	0	2.6	0	0	0	2.6	0	0	2.6	0	0	0	2.6	0	3.1	2,990 - 3,040	13.24 - 13.27
3	457.0 - 458.0	3.1	0	2.6	0	3.1	0	2.6	0	0	2.6	0	3.1	0	2.6	0	3.1	5,100 - 5,160	14.43 - 14.45
4	458.0 - 459.0	3.1	7.0	2.6	0	3.1	0	2.6	7.0	7.0	2.6	0	3.1	0	2.6	7.0	3.1	10,970 - 11,140	16.85 - 16.91
5	459.0 - 460.0	3.1	7.0	2.6	9.0	3.1	9.0	2.6	7.0	7.0	2.6	9.0	3.1	9.0	2.6	7.0	3.1	18,120 - 18,440	19.37 - 19.48
6	460.0 - 461.0	3.1	7.0	9.0	9.0	3.1	9.0	9.0	7.0	7.0	9.0	9.0	3.1	9.0	9.0	7.0	3.1	23,110 - 23,530	20.89 - 21.02
7	461.0 - 462.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	27,890 - 28,410	22.20 - 22.33
8	From WSE 462 - 496 ft:																		

CURRENT WSE AT SNFE (ft, NGVD)	MAXIMUM GATE SETTING ALLOWED (see restrictions)	MAX. COMPUTED DISCHARGE (ft^3/sec)	DOWNSTREAM GAGE HEIGHT (ft)
462.0 - 464.0	All gates open at 9.0 ft.	29,600 - 30,420	22.61 - 22.81
464.0 - 466.5		30,420 - 31,100	22.81 - 22.95
466.5 - 469.1		31,100 - 31,850	22.95 - 23.14
469.1 - 470.0		31,850 - 32,110	23.14 - 23.20
470.0 - 475.2		32,110 - 34,600	23.20 - 23.79
475.2 - 479.5		34,600 - 36,700	23.79 - 24.28
479.5 - 483.6		36,700 - 36,990	24.28 - 24.35
483.6 - 488.6		36,990 - 38,590	24.35 - 24.73
488.6 - 494.2		38,590 - 40,360	24.73 - 25.15
494.2 - 496.0		40,360 - 41,000	25.15 - 25.30

SPILLWAY FLOW CONDITIONS: If WSE exceeds spillway crest, follow the following steps (shaded):

STEP NO.	CURRENT WSE AT SNFE (ft, NGVD)	MAXIMUM GATE SETTING gate numbers	MAXIMUM GATE SETTING gate opening (ft)	MAX OUTLETWORKS DISCHARGE (ft^3/sec) (see remark #2)	DOWNSTREAM GAGE HT (ft)	REMARKS
9	496 - 503	#s (1,2,4,5,7,8,9,10,12,14,15,16) #s (4,6,11,13)	9.0 6.5	36,860 - 41,000	24.79 - 23.50	1) If WNRH is projected to experience spillway flow, releases at SNFE should be cut at anytime of a flood event in order to prevent spilling at WNRH. Please see note 2.
10	503 - 511	#s (1,2,4,5,9,12,15,16) #s (3,7,10,14) #s (4,6,11,13)	9.0 8.4 6.5	38,000 - 41,000 (see remark #2)	23.82 - 23.50	2) If SNFE spillway discharge enters the San Gabriel River channel, discharge from the outletworks should be adjusted so as not to exceed the channel capacity.
11	511 - 513	#s (1,5,12,16) #s (2,8,9,15) #s (3,7,10,14) #s (4,6,11,13)	8.5 8.0 6.4 6.5	40,500 - 41,000 (see remark #2)	23.18 - 23.00	

SANTA FE DAM OUTLET GATES
(looking downstream)

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16

All outlets are 6' X 9'. Sill EL at 421 ft

NOTES:

1) Whittier Narrows Dam is designated as WNRH not WNRS. Concurrent WSE at WNRH is taken at the Rio Hondo pool. However, Whittier Narrows Reservoir will have one pool elevation at WSE 218 ft and above.

2) WNRH provides a lower level of protection than SNFE does. Also, spillway flow at SNFE is far less damaging than spillway flow at WNRH.

3) In order to maintain balance of the 2 reservoirs and minimize fluctuation of releases, the water control manager must do the following:

- Monitor the watershed conditions, and the trends of inflow and WSE at WNRH and SNFE.

- Use the outflow from Morris Dam to approximate inflow to SNFE.

- Use RHDG (stream gage located on the Rio Hondo at Garvey Road) and ALWK (Alhambra Wash at Klingerman) to determine the magnitude of inflow to WNRH from the Rio Hondo and SGRP (San Gabriel River at Peck Road) to determine the inflow to WNRH from the San Gabriel River.

4) Downstream Gage Height - derived from USGS rating Table No. 6.

DAM OPERATOR INSTRUCTIONS:

1. Communication with the District Office is available.

a. Notify the Reservoir Operations Center when a gate change will be required according to the schedule.

b. Notify the Reservoir Operations Center if unable to set the gates as instructed.

2. Communication with the District Office is not Available.

a. Try to re-establish communications through mobile truck radio, by telephone, and through the Los Angeles County Department of Public Works (WUK 4470).

b. (i) Rising Stages. Allow a period of six hours to pass to reestablish communication with the District office. If after six hours communication is not reestablished follow, the gate operation schedule until communication with the office District is reestablished. In using the gate operation schedule, disregard procedures *2, *3, *5, and *6.

(ii) Falling stages. Maintain current downstream gage height until communication is reestablished.

c. If one or more of the gates cannot be operated adjust the remaining gates manually and uniformly until the downstream gage height agrees with the scheduled values. Keep a close check on gage height and change the gate opening as often as required. If the downstream gage height is not obtainable, adjust the gates that are functioning so that the sum of the gate openings will equal the sum of the openings shown in the schedule.

RESTRICTIONS:
Releases for all steps (1 through 11) may be reduced based on the following:
a) Available downstream channel capacity (channel design conveyance minus current flood flow discharge).
b) Forecasted downstream precipitation and runoff.
c) Avoidance of spillway discharge at WNRH.
d) The maximum allowable rate of increase of releases is 5,000 ft^3/sec per half-hour.

TABLE 1

CURRENT WSE AT WNRH (ft,NGVD)	VOLUME* (% Full)	EQUIVALENT SNFE WSE (ft, NGVD)
201.6	0.0	456.0
201.6 - 202.2	0.49	456.4
202.2 - 202.4	0.65	456.5
202.4 - 202.6	0.82	456.7
202.6 - 202.8	0.99	456.8
202.8 - 203.0	1.20	457.0
203.0 - 206.7	7.20	462.0
206.7 - 209.6	11.00	464.0
209.6 - 211.2	15.00	466.5
211.2 - 212.9	20.00	469.1
212.9 - 214.7	22.00	470.0
214.7 - 217.0	34.00	475.2
217.0 - 219.5	45.00	479.5
219.5 - 221.9	57.00	483.6
221.9 - 224.7	73.00	488.6
224.7 - 227.5	93.00	494.2
227.5 - 229.9	100.00	496.0

* Flood Storage Volume. SNFE debris pool (WSE 421-456) and WNRH conservation pool (WSE 184 -201.6) are not included.

PLATE A-1