STANDING INSTRUCTIONS TO THE PROJECT OPERATOR

FOR WATER CONTROL

BLUE DIAMOND DETENTION BASIN

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES),
NEVADA

Los Angeles District
U.S. Army Corps of Engineers
December 2002

Blue Diamond Detention Basin
Las Vegas and Tributaries
(Tropicana and Flamingo Washes)
Nevada

Pertinent Data[1] (English Units)

Completion Date ..... **January 2001**
Stream System ..... **Blue Diamond Wash**
Drainage Area ..... **67.24 mi^2**
Total length of dam (embankment and spillway) ..... **4,978.35 ft**

Dam embankment (earthfill)
Crest elevation ..... **2,976.90 ft**
- **Crest length** ..... **3,153.54 ft**
- **Crest width** ..... **19.69 ft**
- **Maximum height above streambed** ..... **59.07 ft**

Spillway
- **Crest elevation** ..... **2,966.24 ft**
- **Crest length** ..... **1,824.80 ft**
- **Elevation of maximum water surface)** ..... **2,973.64 ft**
- **Design Discharge** ..... **144,000 ft^3/s**

Outlet Works (ungated steel bulkhead with 3.22 ft wide by 1.94 ft high opening)
- **Height of concrete box conduit** ..... **6.56 ft**
- **Width of concrete box conduit** ..... **4.59 ft**
- **Length of concrete box conduit** ..... **222.68 ft**
- **Intake elevation** ..... **2917.85 ft**

Basin Bypass Conduit
- **Height of concrete box conduit** ..... **5.25 ft**
- **Width of concrete box conduit** ..... **4.59 ft**
- **Length of concrete box conduit** ..... **1610.89 ft**
- **Intake elevation** ..... **2941.94 ft**

Detention Basin (design)
- **Area at dam spillway crest** ..... **116 ac**
- **Gross capacity at dam spillway crest** ..... **2313 Ac-Ft**

Storage allocation below dam spillway crest
- **Flood control (includes 89.59 Ac-Ft for antecedent sediment allowance)** ..... **2313 Ac-Ft**

100-year flood (reservoir design flood routing)
- **Inflow volume (6-hr)** ..... **2334 Ac-Ft**
- **Peak inflow** ..... **13,700 ft^3/s**
- **Peak outflow** ..... **218 ft^3/s**
- **Peak elevation** ..... **2,966.14 ft**
- **Drawdown time (99% recovery)** ..... **7 day**

Probable maximum flood (spillway design flood routing)
- **Inflow volume (24-hr)** ..... **29,226 Ac-Ft**
- **Peak inflow** ..... **144,000 ft^3/s**
- **Peak outflow** ..... **144,000 ft^3/s**
- **Peak elevation** ..... **2,973.64 ft**
- **Spillway flow duration** ..... **8.75 h**

[1] Note: All SI-to-English conversions based on Federal Standard 376B.
All elevations based on the following survey controls:
Horizontal: North America Datum of 1983 (NAD 83)
Vertical: North America Vertical Datum of 1988 (NAVD88)

Blue Diamond Detention Basin
Las Vegas and Tributaries
(Tropicana and Flamingo Washes)
Nevada

Pertinent Data[1] (Metric Units)

Completion Date ..... **January 2001**
Stream System ..... **Blue Diamond Wash**
Drainage Area ..... **174.15 km^2**
Total length of dam (embankment and spillway) ..... **1,517.400 m**

Dam embankment (earthfill)
- **Crest elevation** ..... **907.360 m**
- **Crest length** ..... **961.200 m**
- **Crest width** ..... **6.000 m**
- **Maximum height above streambed** ..... **18.000 m**

Spillway
- **Crest elevation** ..... **904.110 m**
- **Crest length** ..... **556.200 m**
- **Elevation of maximum water surface** ..... **906.36 m**
- **Design discharge** ..... **4,078 m^3/s**

Outlet Works (ungated steel bulkhead with 0.980 m wide by 0.590 m high opening)
- **Height of concrete box conduit** ..... **2.000 m**
- **Width of concrete box conduit** ..... **1.400 m**
- **Length of concrete box conduit** ..... **67.874 m**
- **Intake elevation** ..... **889.360 m**

Basin Bypass Conduit
- **Height of concrete box conduit** ..... **1.600 m**
- **Width of concrete box conduit** ..... **1.400 m**
- **Length of concrete box conduit** ..... **491.000 m**
- **Intake elevation** **896.704m**

Detention Basin (design)
- **Area at dam spillway crest** ..... **469,549 m^2**
- **Gross capacity at dam spillway crest** ..... **2,852,791 m^3**

Storage allocation below dam spillway crest
- **Flood control (includes 110,508 m^3 for antecedent sediment allowance)** ..... **2,852,791 m^3**

100-year flood (reservoir design flood routing)
- **Inflow volume (6-hr)** ..... **2,878,989 m^3**
- **Peak inflow** ..... **388 m^3/s**
- **Peak outflow** ..... **6.17 m^3/s**
- **Peak elevation** ..... **904.08 m**
- **Drawdown time (99% recovery)** ..... **7 day**

Probable maximum flood (spillway design flood routing)
- **Inflow volume (24-hr)** ..... **4,039,680 m^3**
- **Peak inflow** ..... **4,078 m^3/s**
- **Peak outflow** ..... **4,078 m^3/s**
- **Peak elevation** ..... **906.36 m**
- **Spillway flow duration** ..... **8.75 h**

[1] Note: All elevations based on the following survey controls:
Horizontal: North America Datum of 1983 (NAD 83)
Vertical: North America Vertical Datum of 1988 (NAVD88)

PREFACE

The original design criteria and basis, along with the results of studies and investigations for the construction of the Blue Diamond Detention Basin of the Las Vegas Wash and Tributaries are contained in a Corps document entitled “Design Memorandum, Blue Diamond Detention Basin”, dated April 1998 (DM). During the final design phase - after the DM was published - several minor design feature adjustments were found to be necessary as discussed below. In addition, the Probable Maximum Flood (PMF) and the Reservoir Design Flood (RDF) were re-routed using the project’s new configuration to demonstrate that the original design intent of the project is not compromised by the changes. Although used in the actual construction of the project, there was no formal report written to document the modified features, as well as the results of the new routings. This document titled “Standing Instructions to the Project Operator for Flood Control” (SI) was written to document the project’s as-built configuration and the results of the new PMF and RDF routings. The changes made during the final design are outlined as follows:

1. Raised Spillway and Embankment. In April 1998 the spillway and embankment were raised by 1.18 ft (0.36 m) in order to minimize debris disposal during construction (i.e. to balance cut and fill), as required by the Bureau of Land Management (BLM). The spillway crest elevation was raised from 2965.06 ft to 2966.24 ft (903.75 m to 904.11 m) NAVD88, and the top of dam elevation was raised from 2975.72 ft to 2976.90 ft (907.00 m to 907.36 m).

2. Sediment Berm. A sediment berm located just upstream of the outlet works was added in the final design to retain deposition material and prevent the intake structure from clogging up during flood events.

3. Drainage Area and Bypass Culvert. The contributing drainage area was reduced by 1.01 mi^2 (2.62 km^2) from 68.25 mi^2 to 67.24 mi^2 (176.77 km^2 to 174.15 km^2) in order to incorporate the effects of the bypass culvert. Although the bypass culvert was included in the DM, the hydrologic analysis for its addition was not completed until the final design phase of the project.

4. Outlet Works. The height of the box culvert was increased from 4.69 ft (1.4 m) to 6.56 ft (2.0 m), and the restrictor plate dimensions were changed from 2.5 ft (0.762 m) square to 3.22 ft W x 1.94 ft H (0.98 m W x 0.59 m H). These changes were made for maintenance and structural reasons respectively.

5. Antecedent Sediment Storage. The final grading and the raising of the entire project resulted in additional storage below the spillway crest elevation. This storage volume, which totals 89.59 Ac-Ft (110,508 m^3), has been allocated for antecedent sediment storage, as agreed by the Corps and the local sponsors.

6. New Routings. The Probable Maximum Flood (PMF) and the Reservoir Design Flood (RDF) were rerouted using the modified configuration of the project. The maximum outflow resulting from the RDF increased from 213 ft^3/s to 218 ft^3/s (6.03 m^3/s to 6.17 m^3/s). This slight increase was found to have no downstream negative impact. The PMF maximum outflow decreased slightly (145,000 to

144,000 ft^3/s or 4106 to 4078 m^3/s) with the subtraction of the 1.01 mi^2 (2.62 km^2) contributing area.

7. Low Flow (Environmental By-Pass) Channel Removed. The original configuration of the outlet structure, as shown in the DM, was not designed to discharge low flows. The original design, however, included a low flow diversion channel intended to discharge up to 50 cfs (1.420 cms) to the natural channel. During the final design, the outlet structure was reconfigured to discharge all flows into the natural channel, eliminating the need for the low flow channel.

8. A summary of the changes from the 1998 DM to the As-Built conditions follows in Figure 1 so that information needed for future work on the dam may be readily available.

Figure 1. Changes Since the DM

Measurement	Units (Metric)	Units (English)	DM (Metric)	As-Built (Metric)	DM (English)	As-Built (English)
Dam Invert						
Elevation	m	(ft)	889.33	889.36	2917.75	2917.85
Antecedent Sediment Storage						
Volume	m^3	(Ac-Ft)	None	110,508	None	89.59
Spillway						
Elevation	m	(ft)	903.75	904.11	2965.06	2966.24
Volume	m^3	(Ac-Ft)	2,797,691	2,852,791	2268	2313
Top of Dam						
Elevation	m	(ft)	907	907.36	2975.72	2976.9
Outlet Works						
Invert	m	(ft)	889.33	889.36	2917.75	2917.85
Orifice	m	(ft)	.762 x.762	.98w x .59h	2.5 x 2.5	3.22w x 1.94h
Box Culvert	m	(ft)	1.4 x 1.4	1.4w x 2h	4.59 x 4.59	4.59w x 6.56h
Length	m	(ft)	73	67.87	240	222.68
Slope	m/m	(ft/ft)	0.00933	0.015072	---	---
RDF						
Starting Elev.	m	(ft)	889.33	893.37	2917.80	2931.00
Max Stage	m	(ft)	903.75	904.08	2965.06	2966.14
Max Storage	m^3	(Ac-Ft)	2,791,388	2,839,494	2263	2302
Qpeak in	m^3/s	(ft^3/s)	391	388	13,800	13,700
Qpeak out	m^3/s	(ft^3/s)	6.03	6.17	213	218
PMF						
Starting Elev.	m	(ft)	903.75	904.11	2965.06	2966.24
Max Stage	m	(ft)	906.04	906.36	2972.56	2973.64
Max Storage	m^3	(Ac-Ft)	2,853,062	4,039,680	2313	3275
Qpeak in	m^3/s	(ft^3/s)	4106	4078	145,000	144,000
Qpeak out	m^3/s	(ft^3/s)	4106	4078	145,000	144,000
Freeboard	m	(ft)	0.96	1.00	3.16	3.28

Notes:

1. DM – Blue Diamond Detention Basin Design Memorandum dated April 1998
2. RDF – Reservoir Design Flood
3. PMF – Probable Maximum Flood
4. RDF Maximum Stage is slightly less than spillway crest elevation because of the effect of the bypass culvert which when added in the design reduced the contributing drainage area. The spillway crest elevation was not readjusted.
5. Hydrology Computations were done in English units and then converted to metric.

Metric to English Conversion Constants
(Based on Federal Standard 376B – Revised 27 January 1993)

From	Divide By	To Obtain
meters (m)	0.3048	feet (ft)
kilometers (km)	1.609	miles (mi)
square meters (m^2)	4046.9	acres (ac)
square kilometers (km^2)	2.589988	square miles (mi^2)
cubic meters (m^3)	1233.5	acre-feet (Ac-Ft)
cubic meters per second (m^3/s)	0.028317	cubic feet per second (ft^3/s)

Blue Diamond Detention Basin – 15 May 2001

Standing Instructions to the Project Operator
For Water Control
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PLATES

APPENDICES

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I. BACKGROUND AND RESPONSIBILITIES

A. General Information

1. Purpose of Document. This document is prepared in compliance with Paragraph 9-2 of EM 1110-2-3600 (Management of Water Control Systems) and ER 1100-2-240 (Water Control Management) to ensure the efficient and safe operation of the project at all times. A copy of these Standing Instructions to the Project Operator is to be kept at the headquarters of the Clark County Regional Flood Control District (CCRFCD) and Clark County Public Works (CCPW). In accordance with the Project Cooperation Agreement, CCPW is the Project Operator and will be responsible for inspection, maintenance, and operation of the facility and CCRFCD will provide funds to CCPW to inspect, maintain, and operate facility. Any deviation from the authorized purpose of Blue Diamond Detention Basin will require approval of the Commander, South Pacific Division, Corps of Engineers.

2. Project Purpose and Authorization. Blue Diamond Detention Basin is part of the Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) drainage system. This drainage system is designed to provide protection from a 100-year computed probability flood event, under future conditions, to the central and southwest areas of the Las Vegas community. Blue Diamond Detention Basin was designed to control the 100-year computed probability runoff on Blue Diamond Wash.

In October 1982, a Senate Resolution (Committee on Environment and Public Works) authorized the Corps' Las Vegas Wash and Tributaries feasibility study. This study analyzed and recommended solutions to flooding problems in the vicinity of Las Vegas Wash and its tributaries. Further authority was provided with the Water Resources Development Act of 1986, Title IV, Section 401(c). The feasibility study concluded that the construction of Blue Diamond Detention Basin was necessary to store water and reduce outflow in conjunction with other elements of the Las Vegas Wash and Tributaries drainage system. The Water Resources Act of 1992 formally authorized the Blue Diamond Detention Basin project. The project is in compliance with all environmental requirements and regulations, as determined by the Final Supplemental Environmental Assessment (SEA), dated March 1998, and the signed Finding of No Significant Impact (FONSI), dated April 1998. The FONSI is presented in the Appendix.

3. Project Location and Description. Blue Diamond Detention Basin is located on Blue Diamond Wash approximately 17 miles southwest of downtown Las Vegas, Nevada (reference plates 1 and 2). Its tributary drainage area is 67.24 mi^2 (174.15 km^2). The dam is designed to regulate the 100-year flood to a magnitude within the conveyance capacity of the downstream flood control system. In addition, the dam has been designed to safely pass the probable maximum flood through the reservoir and over the spillway. The design detention basin storage capacity is 2,313 Ac-Ft (2,852,791 m^3), which also includes 1) an allowance for sediment deposition by the project design flood, and 2) 89.59 Ac-Ft (110,508 m^3) for antecedent sediment storage. Operations and maintenance policies will stipulate that sediment deposits can be

allowed to accumulate up to 89.59 Ac-Ft (110,508 m^3) behind the dam within the flood pool space before all of the sediment deposits must be cleaned-out. According to the Sediment and Debris Yield results (Reference: Blue Diamond Detention Basin Design Memorandum, Hydrology Appendix, Page A1-7), the 100-year computed probability debris yield estimate for Blue Diamond Detention Basin is 238 Ac-Ft (293,571 m^3). The average annual sediment yield is 15.9 Ac-Ft/yr (19,571 m^3/yr) (1/15 of the 100-year computed probability debris yield). Other pertinent information is presented in the "Pertinent Data" sheet at the beginning of this document. Plates 3 through 17 show in detail the various features of the project.

a. Embankment

The dam embankment is roughly horseshoe shaped in plan view and consists of an earth embankment 4978.35 ft (1517.400 m) long with a maximum height of 56.14 ft (17.110 m) above the streambed (reference plates 5 through 8 for profile and cross sections). The crest elevation is at 2976.90 ft (907.360 m), NAVD88. The dam has a 19.69 ft (6.000 m) wide crest with 2 percent cross slopes downward from the centerline. The crest functions as a maintenance road accessible from the south via Blue Diamond Road and an unimproved road from the north.

The upstream embankment slope (1V on 2.5H) is protected by a 1.50 ft (460 mm) thick layer of riprap. Riprap also covers and protects the downstream slope.

b. Spillway

The spillway is constructed with roller compacted concrete through the dam embankment (photo 1). The alignment of the spillway centerline is perpendicular to the axis of the dam embankment. The spillway crest elevation is at 2,966.24 ft (904.110 m). The spillway crest shape is elliptical with a vertical upstream face. The spillway has an ogee crest 3.28 ft (1 m) high and a length of 1824.80 ft (556.200 m). The purpose of the ogee crest is to keep the spillway discharge uniformly oriented and distributed within the spillway chute. Blue Diamond Detention Basin incorporates a stepped spillway chute that provides protection during spillway flow by reducing flow velocities at the toe of the spillway structure. The spillway has an overall slope of 2:1 and consists of a series of 1.97 ft (0.600 m) high and 3.94 ft (1.200 m) long steps (photo 2). The spillway plan view is shown on plate 9.

The flow over the spillway is governed by the relationship $Q=CLh^{3/2}$, where L is the length of the spillway, h is the design head on the spillway crest, and C is the coefficient of discharge. The coefficient of discharge was obtained from "EM1110-2-1603, Engineering and Design, Hydraulic Design of Spillways" and varied from 3.08 to 3.93, depending on the head to design head ratio (h/hD). The required head to pass the Probable Maximum Flood (PMF) event was determined to be 7.5 ft (2.3 m). The spillway rating curve is shown on plate 22.

c. Sediment Berm

Upstream of the outlet works is a sediment berm designed to retain deposition material and prevent the intake structure from clogging during a flood event (photo 3). The berm is 171.39 ft (52.240 m) long and has a crest elevation of 2923.77 ft (891.165 m) NAVD88. The berm has a top width of 8.20 ft (2.500 m) and ranges in height from 0 ft (0.0 m) to a maximum of 3.94 ft (1.200 m). See plate 10 for structural details of the sediment berm.

d. Outlet Works

The intake structure is comprised of an entrance and a trash rack. The entrance consists of a steel bulkhead with a 3.22 ft by 1.94 ft (0.980 m by 0.590 m) opening mounted on the upstream end of the outlet works conduit (photo 5). The entrance is protected by a sloping trash rack mounted on walls over a horizontal concrete apron (photo 4). The horizontal apron is 25.33 ft (7.720 m) in length measured along the centerline, and the distance between the supporting walls varies from 25.49 ft at the upstream end to 14.21 ft (7.770 m to 4.330 m) at the entrance to the conduit. The wall varies in height from nearly 0 feet at the upstream end to 10.37 ft (~0 to 3.160 m) at the entrance to the conduit. The trashrack, consisting of structural steel members and pipe, prevents large size debris from entering the intake structure and damaging the outlet conduit, clogging the conduit entrance. A 6.56 ft (2.000 m) deep cutoff wall is provided at the upstream end of the apron.

The outlet conduit entrance is controlled by the above-mentioned ungated 3.22 ft by 1.94 ft (0.980 m by 0.590 m) rectangular orifice with a sharp-edge entrance. The Blue Diamond outlet is submerged when the headwater depth (pool elevation – invert elevation) is greater than 2.15 ft (0.660 m). The outlet discharge curve is based on critical depth control at the inlet for discharges up to 34.3 cfs (0.97 cms) and orifice flow, with control at the inlet for discharge greater than 34.3 cfs (0.97 cms). The orifice equation coefficient of discharge used was 0.625, which accounts for sharp edges, partially suppressed contraction, and the energy loss. The discharge when the detention basin pool is at the spillway crest elevation of 2966.24 ft (904.11 m) NAVD88 is 218 cfs (6.17 cms) and the discharge when the pool is at the maximum water surface elevation of 2973.64 ft (906.36 m) NAVD88 is 231 cfs (6.56 cms). See table I-5 and I-6 for as-built outlet works discharge and spillway crest discharge tables. The outlet discharge curve is shown on plate 21.

Discharge passing through the orifice flows through a 4.59 ft wide by 6.56 ft high (1.400 m by 2.000 m) reinforced concrete box conduit. The conduit is 222.68 ft (67.874 m) long and has an invert slope of 0.01507. The flow regime is supercritical throughout the conduit for all discharges. The maximum depth of flow within the conduit is 2.49 ft (0.760 m).

At the downstream end of the outlet there are rectangular concrete energy dissipator blocks (photos 6 and 7). For outlet works detail reference plates 11 through 14.

e. Basin Bypass Conduit

The basin bypass conduit collects flow from a previously existing 4.00 ft high by 6.00 ft wide (1.219 m by 1.829 m) concrete box culvert under Blue Diamond Road (photo 8). The previously existing conduit empties into a small riprap collector channel which leads into a 1610 ft (491 m) long concrete box bypass conduit under the entire basin, as shown on plates 3b and 3c. The bypass conduit exits at the face of the stepped spillway draining into Blue Diamond Wash (photo 9). The bypass conduit is a 5.25 ft high by 4.59 ft wide (1.600 m by 1.400 m) reinforced concrete box culvert with an invert slope of 0.0178. Reference plates 15 and 16.

4. Project Operating Constraints. Since the dam's outlet works and spillway are ungated facilities, there are no operating constraints at Blue Diamond Detention Basin and there are no on-site damtenders. The entire basin storage space is allocated exclusively to flood control, as shown on plate 18. The detention basin's

elevation-area curve and elevation-storage capacity curve are shown on plates 19 and 20, respectively. The elevation-area and elevation-capacity relationships are presented in tabular format in tables I-3 and I-4, respectively. The elevation-discharge capacities of the outlet works and the spillways are shown on plates 21 and 22, respectively. The elevation-discharge capacities of the outlet works are presented in tabular format in table I-5. The outlet and spillway elevation-discharge relationships are presented on table I-6. The project's routings of the Probable Maximum Flood and Reservoir Design Flood are shown in plates 23 and 24, respectively. The resulting maximum water surface elevation during the Probable Maximum Flood is 2973.64 ft (906.36 m) NAVD88. The project was designed to reduce the 100-year peak inflow of 13,700 cfs to an outflow of 218 cfs (388 m^3/s to 6.17 m^3/s) as shown on plate 24.

5. Project Operation and Maintenance. Operation and maintenance (O&M) activities for Blue Diamond Detention Basin are to be conducted by the Project Operator. Those sections in the Code of Federal Regulations, Title 33, part 208.10 applicable to operation and maintenance of the project are in effect upon completion of project construction and transfer to the Project Operator for O&M. Applicable paragraphs from these sections include, but are not limited to, the following:

> *"The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the 'Superintendent,' who shall be responsible for the development and maintenance of, and directly in charge of an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States."*

> *"Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods."*

> *"The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works."*

> *"It shall be the duty of the Superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works." (The reports are to be submitted to the U.S. Army Corps of Engineers, Los Angeles District, Hydrology and Hydraulics Branch, Reservoir Regulation Section.)*

In addition to those items specified therein, the Project Operator is responsible for the maintenance of the reservoir storage capacity once sediment accumulates to a maximum amount of 89.59 Ac-Ft (110,508 m^3). The Project Operator must clean-out the accumulated sediment deposits during the non-flood season, or once the sediment accumulation exceeds more than 89.59 Ac-Ft (110,508 m^3).

B. Role of the Project Operator

1. Normal Conditions The Project Operator is responsible for operation and maintenance during normal hydrometeorological conditions, when little or no runoff occurs, without daily instruction. However, the Corps of Engineers, Los Angeles District should be contacted when conditions are such that consultation or instructions regarding operation and maintenance is needed. Since Blue Diamond is an ungated facility, the Project Operator is not normally on site during normal conditions. Whenever the National Weather Service or the Clark County Regional Flood Control District predicts a major storm event with a large volume of storm runoff, an emergency condition exists, then the Clark County Public Works shall post a site monitor at the project. Initially, if the National Weather Service predicts a rain total of 1 inch in 24-hours, a site monitor shall be sent to the project site. As more project experience is gained, the Project Operator shall determine the conditions necessary to send the monitor to the site. The National Weather Service can be reached at (702) 263-9744 or www.wrh.noaa.gov/lasvegas/office.shtml.

2. Emergency Conditions During flood conditions, the Project Operator shall keep the Los Angeles District (SPL) Reservoir Operations Center informed, as required, of the project status at (213) 452-3623 (see Table I-1 for other phone numbers). Project status information includes the following: (1) current basin water surface elevation, outflow (both outlet works and spillway), and inflow; (2) incremental and cumulative watershed precipitation; (3) any unusual or critical conditions, such as, but not limited to, debris clogging the outlet works intake structure, boils near the downstream toe, or embankment sloughing. In addition, the Project Operator is to have a person on site to monitor for any of these conditions. Once on site, the monitor can determine the reservoir's water surface elevation using the staff boards at the project. For water surface elevations below spillway crest, a staff gage is embedded in a concrete structure on the side slope just to the right of the trash rack (Photo 11). For water surface elevations during spillway flow events, staff boards located on both ends of the spillway structure are provided (Photo 10). Note that since each staff board on each end of the spillway structure can only be read from each opposing side of the spillway, the site monitor will need a pair of binoculars to take readings.

3. Initial Filling of Detention Basin During the first significant flood event, the Project Operator shall monitor and/or report on the condition of seepage, if any, in the toe drains; wave run-up on the embankment; hydrostatic boils near the downstream toe; and any embankment sloughing. Each of the above activities is described in the following paragraphs herein.

(1) Seepage in the toe drains is not normally expected to occur unless significant impoundments remain in the detention basin for numerous weeks and, as such, would not indicate an adverse condition with the embankment. To prevent build up of uplift pressure under the spillway apron, egress points of seepage shall be monitored and checked carefully to insure egress pipes are not blocked. Monitoring these conditions should consist of observing for a cloudy condition in the seepage water, indicating possible internal embankment or foundation erosion. If seepage commences within a shorter duration after initial impoundment and the seepage is cloudy in nature, internal erosion might be occurring. Should this be the case, the situation should be reported as described in the Emergency Action Plan for Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, dated November 2000.

(2) Wave run-up on the embankment resulting from waves 2 feet or greater in height, should be monitored closely for embankment surface erosion or sloughing. If either of these two conditions is apparent, they should be reported as described in the Emergency Action Plan for Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, dated November 2000.

(3) Any hydrostatic boils that occur near the downstream toe indicate an internal erosion condition that may or may not be associated with the embankment drainage system. The water emitting from the boil should be observed as to condition (either clear or cloudy). In addition, sandbags should be placed around the boil to control seepage and prevent loss of material. The condition should be reported as described in the Emergency Action Plan for Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, dated November 2000.

(4) Any embankment sloughing, caused by either wave run-up (reference paragraph (2) above) or by the receding basin water surface elevation after the peak of the flood event, should be reported as described in the Emergency Action Plan for Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, dated November 2000. In addition, gravel and/or rock should be placed in the sloughed area to stabilize the area.

C. Reservoir Operations References

The Los Angeles District Reservoir Operations Decisions and Response Implementation Plan, along with respective telephone numbers, are shown in tables I-1 and I-2. Table I-1 is the Los Angeles District Reservoir Operations Decisions chain of command to be used as reference primarily during emergency operating conditions. Table I-2 is the Response Plan Implementation at Blue Diamond Detention Basin to be used as reference during emergency operating conditions.

II. DATA COLLECTION AND REPORTING

There is one rain gage within the Blue Diamond Wash watershed, located in the hydrologic instrumentation vault shown on photo 12. There is a water level (water surface sensor) gage (photo 13) within the detention basin. The water level gage records in real time. The location of the instrumentation and rain gage and water surface sensor are shown on plate 25. Also, within the basin are six sediment staff gages for measuring sediment deposition. These sediment staff gages are shown on photo 14 and on plate 26. Note that the instrument vault was constructed on the left portion of the embankment where it may not be accessible during spillway flow events. In the event that necessary repairs to the gages during spillway flows cannot be made, the Project Operator, CCPW must send a monitor to manually observe and record real time hydrometeorogical information for as long as necessary. The Project Operator shall also obtain data from the Clark County Regional Flood Control District Hydrologist and the National Weather Service regarding hydrometeorological conditions.

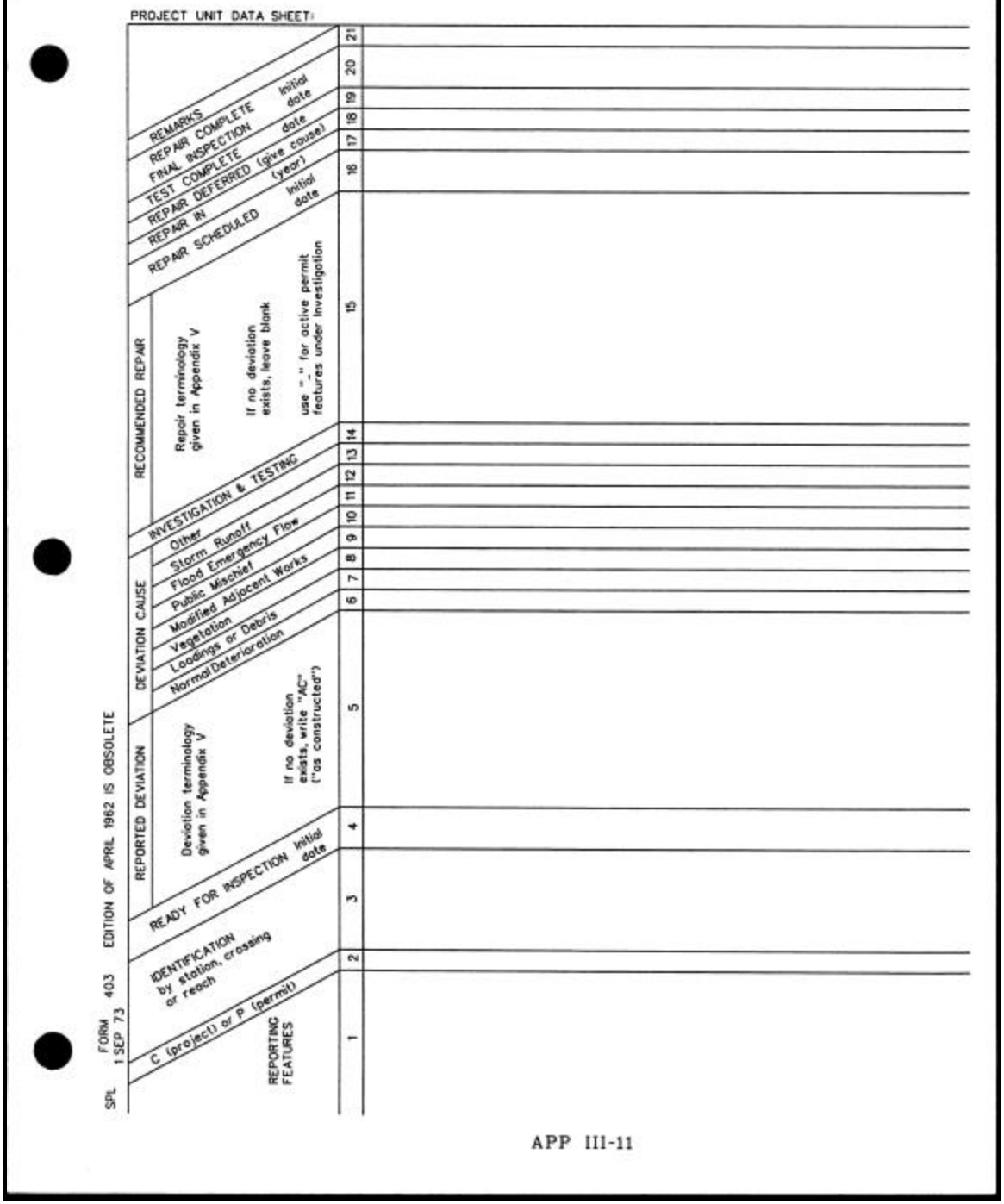
The Clark County Regional Flood Control District, in cooperation with the National Weather Service and the US Geological Survey, owns, operates, and maintains flood threat recognition system (gages). Located in or near the Las Vegas Valley is a total of 87 field stations consisting of 12 weather stations, 49 rainfall/water level stations and 26 rainfall stations in operation. Refer to the District website at www.CCRFCD.org for map of gage locations and data collected by the system.

At the end of each water year (September 30), the Project Operator, CCPW shall provide the Corps of Engineers Los Angeles District (SPL) with the year's record of detention basin water surface elevation, inflow and outflow data. This data will be used by SPL to determine the flood benefits of the project for each year and is used in other reports that SPL prepares annually. The data can be submitted with the maintenance report, described in the Las Vegas and Tributaries Operation, Maintenance Repair, Replacement, and Rehabilitation Manual. The December submission is due on or before 1 December. The submission can be made using Corps of Engineers forms SPL 403, SPL 403A, SPL 403B, a narrative report, or a reporting agency form. (Copies of forms SPL 403, SPL 403A, and SPL 403B are presented on the next pages.) The time interval of the data can range from 15 minutes, for intense storm events, to annual maximum/minimum values. Daily or more frequent values should be transmitted in electronic format as well as using the afore-mentioned forms.

The Project Operator is responsible for maintaining the official record of all project data mentioned herein.

Form SPL 403

ANNUAL OPERATION AND MAINTENANCE REPORT



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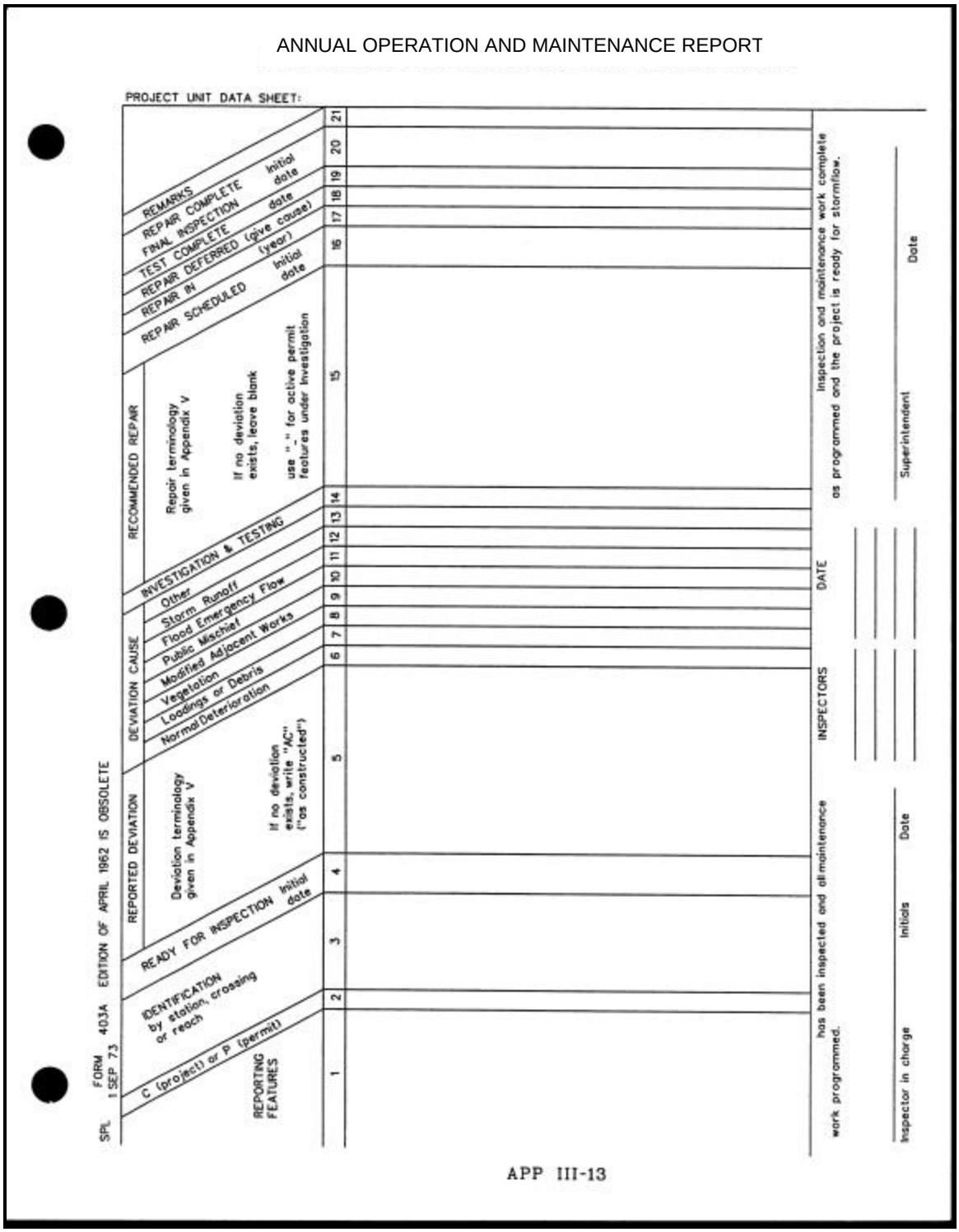
Form SPL 403A



APP III-13

Form SPL 403B

ANNUAL OPERATION AND MAINTENANCE REPORT

PROJECT UNIT DATA SHEET

page

SPL FORM 1 SEP 73 4038 EDITION OF APRIL 1962 IS OBSOLETE

APP III-15

III. WATER CONTROL ACTION AND REPORTING

A. Normal Conditions

The Blue Diamond Detention Basin outlet works are ungated and the project is, therefore, a self-regulating facility. There are no additional water control actions required for the Project Operator to undertake.

B. Emergency Conditions

During emergency conditions, such as debris clogging the outlet works, embankment piping or downstream toe boils, the Project Operator shall keep the Corps of Engineers, Los Angeles District (SPL) apprised, as appropriate.

C. Inquiries

All significant inquiries received by the Project Operator from citizens, constituents or interest groups regarding the status of a project in an emergency situation must be answered with the best available information. The Project Operator should consult with SPL if sensitive information is requested, especially during emergency situations.

D. Water Control Problems

The Corps of Engineers, Los Angeles District 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.

E. Communication Outages

Should communication outages occur during an emergency situation, the Project Operator shall continue to monitor the situation and make every effort to contact the District Engineer at the earliest possible opportunity, and report the situation as described in Section III (B) above. The Project Operator is to document all attempts to contact the District Engineer. If the structure is in danger of failing due to overtopping, internal erosion, or other cause, the Project Operator shall leave the site for his/her safety.

IV. REFERENCES

List herein are reference documents to these Standing Instructions. Copies of these documents should be kept on file by the Project Operator, as appropriate.

Design Memorandum, Blue Diamond Detention Basin, Department of the Army, Los Angeles District, Corps of Engineers, Los Angeles, California, April 1998.

Contract Drawings, Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Clark County, Nevada, Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, 5 August 1999. The Los Angeles District File Number is 196/490 Rev 'B' for sheet 1, titled "Index to Contract Drawings."

Emergency Action Plan for Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, November 2000.

Foundation and Embankment Criteria and Performance Report, Blue Diamond Detention Basin, U.S. Army Corps of Engineers, Los Angeles District, August 2001.

Management of Water Control Systems (EM 1110-2-3600), U.S. Army Corps of Engineers, 30 November 1987.

Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual, Las Vegas Wash & Tributaries (Tropicana and Flamingo Washes), Las Vegas, Nevada U.S. Army Corps of Engineers, Los Angeles District, March 1997.

V. UPDATING

Clark County Regional Flood Control District and Clark County Public Works are responsible for updating Table I-2 at least annually, in October or November. With the exception of Table I-2, the Standing Instructions shall be updated by the Corps of Engineers in response to significant project modifications or changes in the project operation plan.