US Army Corps
of Engineers®
Los Angeles District

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL

BLUE DIAMOND DETENTION BASIN
BLUE DIAMOND WASH
CLARK COUNTY, NEVADA

December 2002

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
Blue Diamond Detention Basin

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PLATES

APPENDICES

Standing Instructions to the Project Operator
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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.

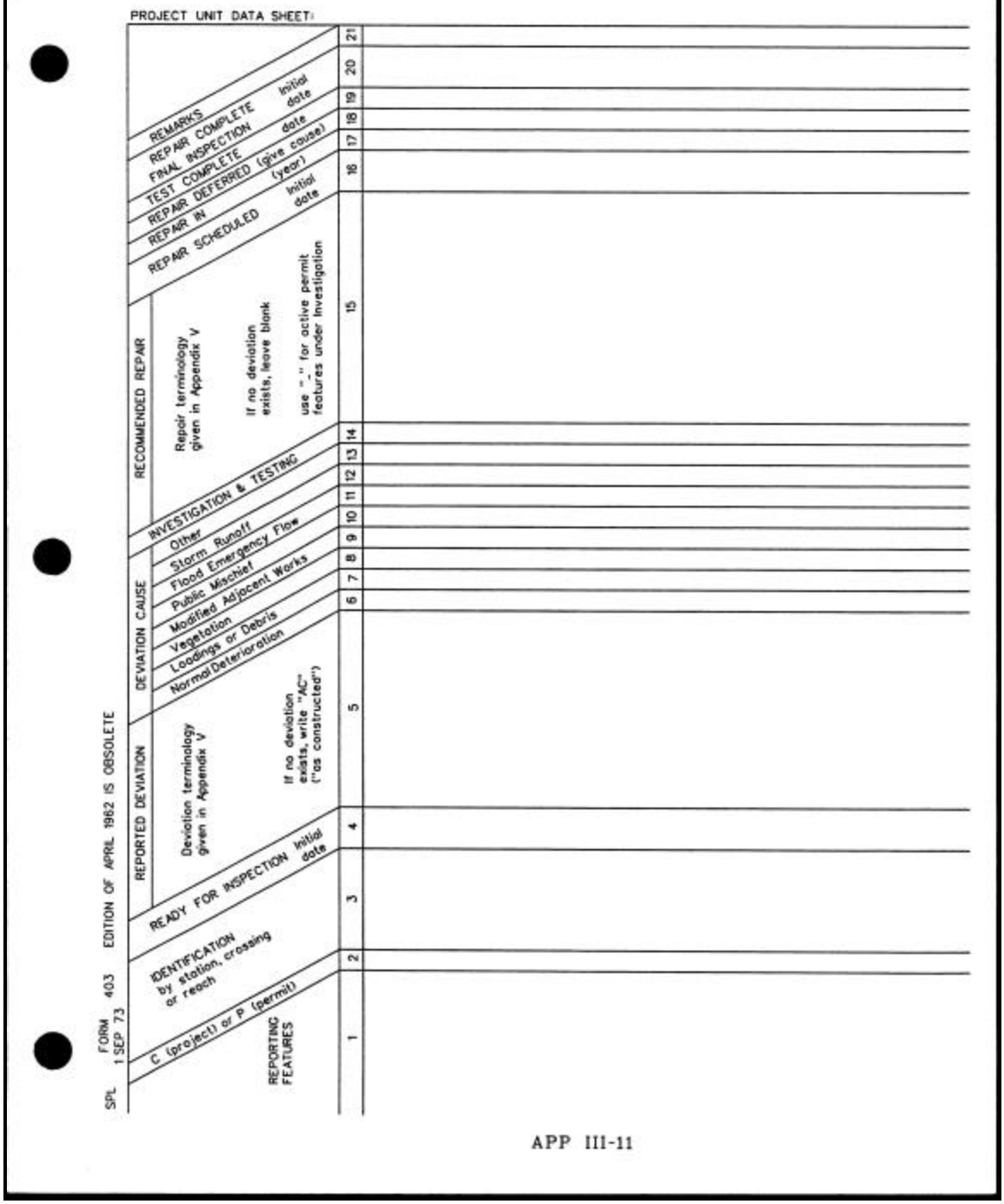
The Clark County Regional Flood Control District, in cooperation with the National Weather Service and the US Geological Survey, owns, operates, and maintains flood threat recognition system (gages). Located in or near the Las Vegas Valley is a total of 87 field stations consisting of 12 weather stations, 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.

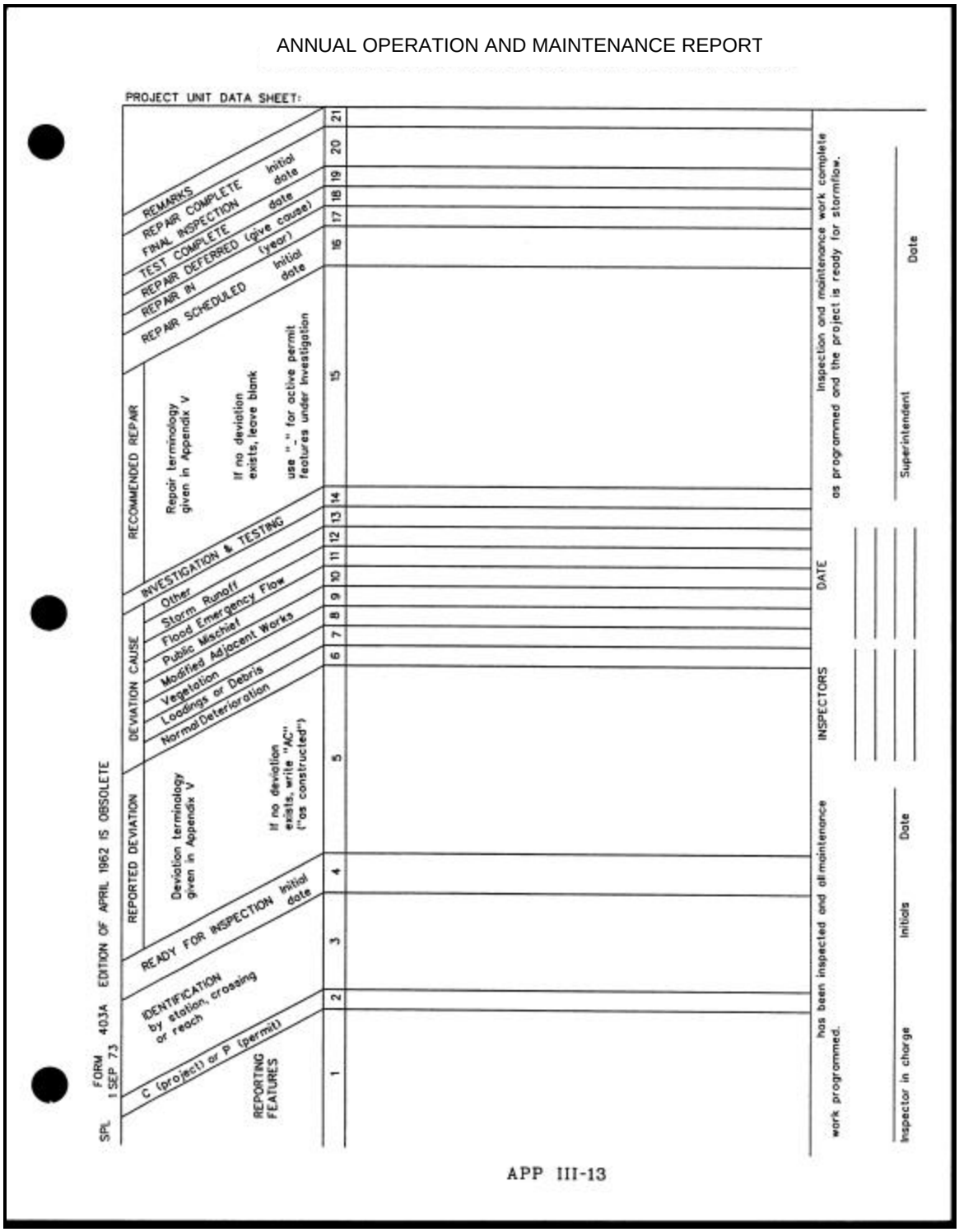
Form SPL 403

ANNUAL OPERATION AND MAINTENANCE REPORT



APP III-11

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.

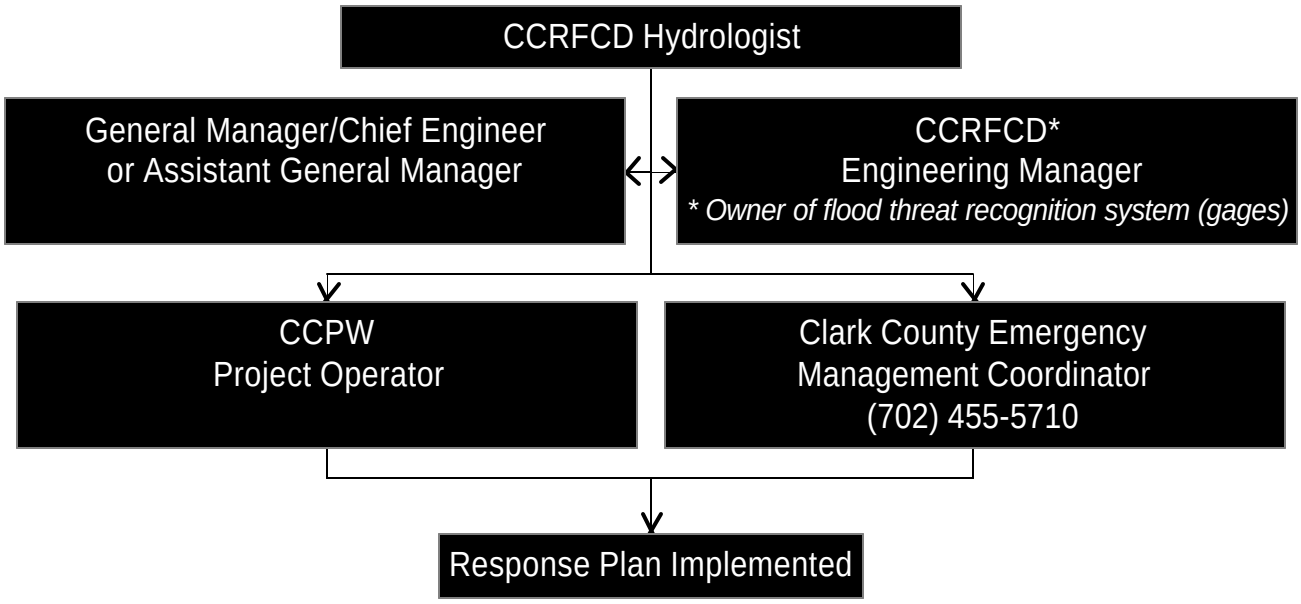
V. UPDATING

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.

Table I-1
Chain of Command for Corps of Engineers, Los Angeles District
Reservoir Operations Decisions

* The Corps' Reservoir Operation Center (ROC) can be reached at (213) 452-3623. This number also allows callers to page ROC personnel when the ROC is not open.

Table I-2
Response Plan Implementation at Blue Diamond Detention Basin



Note: Arrowed lines denote communication sequence during flood event.

For more information or questions, please contact agency personnel at (702) 455-3139.

Table I-3
Blue Diamond Detention Basin Area Table[1]

Elevation (ft)	Area (Ac)
2917.62	0.0
2918	0.0
2919	0.0
2920	0.2
2921	1.0
2922	1.8
2923	2.8
2924	4.0
2925	5.3
2926	6.8
2927	8.5
2928	10.3
2929	12.4
2930	14.6
2931	16.9
2932	19.2
2933	21.8
2934	24.4
2935	27.0
2936	29.6
2937	31.8
2938	34.0
2939	36.0
2940	38.1
2941	40.2
2942	42.3
2943	45.0
2944	47.7
2945	50.5
2946	53.2
2947	55.7
2948	58.6
2949	61.4
2950	64.1
2951	66.8
2952	69.4
2953	72.4
2954	75.0
2955	77.3
2956	79.8
2957	82.3
2958	85.8
2959	89.2
2960	92.6
2961	96.0
2962	98.9
2963	102.5
2964	107.6
2965	110.7
2966	114.2
2966.24	**116.0**
2967	117.5
2968	121.5
2969	124.9
2970	128.4
2971	132.0
2972	135.1
2973	139.1
2974	142.6
2975	145.6
2976	148.6
2977	151.1

1. Based on the Final Design. This supersedes the Design Area Table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998. Spillway crest is at 2966.24 ft NAVD88.

Table I-3a
Blue Diamond Detention Basin Area Table[1]
(Metric Unit Version)

Elevation (m)	Area (m^2)
889.33	0
889.5	0
890.0	281
890.5	4,463
891.0	11,656
891.5	17,499
892.0	28,553
892.5	42,221
893.0	52,223
893.5	69,580
894.0	88,355
894.5	100,839
895.0	120,710
895.5	137,608
896.0	147,422
896.5	163,497
897.0	181,932
897.5	194,832
898.0	215,823

Elevation (m)	Area (m^2)
898.5	237,261
899.0	249,920
899.5	270,437
900.0	292,830
900.5	304,685
901.0	322,932
901.5	335,976
902.0	362,184
902.5	388,359
903.0	402,957
903.5	436,235
904.0	451,888
904.11	**469,549**
904.5	477,861
905.0	506,614
905.5	523,096
906.0	548,969
906.5	577,284
907.0	592,160

1. Based on the Final Design. This supersedes the Design Area Table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998. The spillway crest is at 904.110 m NAVD88.

Table I-4
Blue Diamond Detention Basin Storage Table[1]

Elevation (ft)	Storage (Ac-Ft)	Elevation (ft)	Storage (Ac-Ft)	Elevation (ft)	Storage (Ac-Ft)
2917.62	0.0	2938	272.3	2959	1563.1
2918	0.0	2939	308.3	2960	1655.7
2919	0.0	2940	346.4	2961	1751.6
2920	0.2	2941	386.6	2962	1850.6
2921	1.2	2942	429.0	2963	1953.1
2922	3.0	2943	473.9	2964	2060.7
2923	5.8	2944	521.6	2965	2171.4
2924	9.8	2945	572.2	2966	2285.6
2925	15.1	2946	625.3	2966.14	2302.0
2926	21.9	2947	681.1	**2966.24**	**2312.8**
2927	30.3	2948	739.7	2967	2403.1
2928	40.7	2949	801.1	2968	2524.5
2929	53.0	2950	865.1	2969	2649.5
2930	67.6	2951	931.9	2970	2777.9
2931	84.5	2952	1001.3	2971	2909.9
2932	103.7	2953	1073.7	2972	3045.0
2933	125.5	2954	1148.7	2973	3184.1
2934	149.9	2955	1226.1	2974	3326.7
2935	176.9	2956	1305.9	2975	3472.4
2936	206.5	2957	1388.2	2976	3620.9
2937	238.3	2958	1473.9	2977	3772.0

1. Based on the Final Design. This supersedes the Design Storage Table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998. The spillway crest is at 2966.24 ft NAVD88.

Table I-4a
Blue Diamond Detention Basin Storage Table[1]
(Metric Unit Version)

Elevation (m)	Storage (m^3)
889.33	0
889.5	0
890.0	86
890.5	1,868
891.0	7,456
891.5	13,755
892.0	28,564
892.5	50,824
893.0	69,720
893.5	107,292
894.0	155,423
894.5	192,015
895.0	258,785
895.5	335,834
896.0	389,257
896.5	481,133
897.0	584,603
897.5	653,806
898.0	775,254
898.5	912,387

Elevation (m)	Storage (m^3)
899.0	999,386
899.5	1,149,557
900.0	1,324,405
900.5	1,428,283
901.0	1,610,762
901.5	1,733,978
902.0	1,938,950
902.5	2,160,648
903.0	2,305,552
903.5	2,551,517
904.0	2,742,071
904.08	2,839, 494
904.11	**2,852,791**
904.5	2,987,696
905.0	3,275,564
905.5	3,465,881
906.0	3,778,812
906.5	4,107,568
907.0	4,323,100

1. Based on the Final Design. This supersedes the Design Storage Table in the Design Memorandum -- Blue Diamond Detention Basin -- April 1998. The spillway crest is at 904.110 m NAVD88.

Table I-5
Blue Diamond Detention Basin
Outlet Works Discharge Table

Elevation (ft, NAVD)	Discharge (cfs)
2917.85	0
2918	11
2919	22
2920	34
2921	49
2922	64
2923	74
2924	80
2925	84
2926	89
2927	94
2928	98
2929	104
2930	109
2931	114
2932	118
2933	122
2934	126
2935	130
2936	134

Elevation (ft, NAVD)	Discharge (cfs)
2937	137
2938	141
2939	144
2940	148
2941	151
2942	154
2943	157
2944	160
2945	163
2946	166
2947	169
2948	172
2949	175
2950	178
2951	181
2952	183
2953	186
2954	188
2955	191
2956	194

Elevation (ft, NAVD)	Discharge (cfs)
2957	196
2958	199
2959	202
2960	204
2961	206
2962	208
2963	210
2964	213
2965	215
2966	217
2966.24	**218**
2967	220
2968	222
2969	224
2970	226
2971	230
2972	231
2973	231
2974	233

Notes:
1. Refer to Table I-6 for total discharge.
2. Spillway crest is at 2966.24 ft, NAVD88.
3. Discharge values are based on the Final Design. This supersedes the Outlet Works Discharge table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998.

Table I-5a
Blue Diamond Detention Basin
Outlet Works Discharge Table
(Metric Unit Version)

Elevation (m)	Discharge (m^3/s)
889.33	0
889.5	0.34
890.0	0.72
890.5	1.46
891.0	2.11
891.5	2.30
892.0	2.52
892.5	2.54
893.0	2.78
893.5	2.98
894.0	3.32
894.5	3.46
895.0	3.59
895.5	3.80
896.0	4.10
896.5	4.28
897.0	4.38
897.5	4.55
898.0	4.71

Elevation (m)	Discharge (m^3/s)
898.5	4.81
899.0	4.97
899.5	5.11
900.0	5.20
900.5	5.33
901.0	5.49
901.5	5.57
902.0	5.73
902.5	5.83
903.0	5.90
903.5	6.04
904.0	6.10
904.11	**6.17**
904.5	6.24
905.0	6.35
905.5	6.41
906.0	6.52
906.5	6.60

Notes:

1. Refer to Table I-6a for total discharge.
2. Spillway crest is at 904.110 m, NAVD88.
3. Discharge values are based on the Final Design. This supersedes the Outlet Works Discharge table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998.

Table I-6
Blue Diamond Detention Basin
Outlet Works and Spillway Discharge Table

Elevation (ft, NAVD)	Outlet Works Discharge (cfs)	Spillway Discharge (cfs)	Total Discharge (cfs)
2966.24	218	0	218
2967	220	4,004	4,224
2968	222	18,447	18,669
2969	224	32,890	33,114
2970	226	47,332	47,558
2971	228	70,940	71,168
2972	231	94,548	94,779
2973	231	124,186	124,417
2974	233	154,530	154,763

Notes:

1. Spillway crest elevation is at 2966.24 ft, NAVD88.
2. Maximum water surface elevation is at 2973.64 ft, NAVD88.
3. Total discharge values are based on the Final Design. This supersedes the Outlet Works and Spillway Discharge table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998.

Table I-6a
Blue Diamond Detention Basin
Outlet Works and Spillway Discharge Table
(Metric Unit Version)

Elevation (m, NAVD)	Outlet Works Discharge (m^3/s)	Spillway Discharge (m^3/s)	Total Discharge (m^3/s)
904.11	6.17	0	6.17
904.5	6.24	178	184
905.0	6.35	951	958
905.5	6.41	1503	1506
906.0	6.52	2790	2797
906.5	6.60	4376	4382

Notes:

1. Spillway crest elevation is at 904.110 m, NAVD88.
2. Maximum water surface elevation is at 906.36 m, NAVD88.
3. Total discharge values are based on the Final Design. This supersedes the Outlet Works and Spillway Discharge table contained in Design Memorandum -- Blue Diamond Detention Basin -- April 1998.

Photo 1. Blue Diamond Detention Basin. Spillway structure.

Photo 2. Blue Diamond Detention Basin. Spillway steps.

Photo 3. Blue Diamond Detention Basin. Sediment berm.

Photo 4. Blue Diamond Detention Basin. Outlet works trash rack.

Photo 5. Blue Diamond Detention Basin. Upstream end of outlet works, showing intake structure constrictor plate.

Photo 6. Blue Diamond Detention Basin. Downstream end of outlet works and dissipator blocks.

Photo 7. Blue Diamond Detention Basin. Looking downstream of outlet structure.

Photo 8. Blue Diamond Detention Basin. Riprap collector channel from a box culvert located upstream of the entrance of the basin bypass conduit.

Photo 9. Blue Diamond Detention Basin. Downstream end of basin bypass conduit.

Photo 10. Blue Diamond Detention Basin. Staff gages for elevations above spillway crest.

Note: Staff gages for elevations above spillway crest are located on the left and right ends of the spillway structure.

Photo 11. Blue Diamond Detention Basin. Basin depth gage.

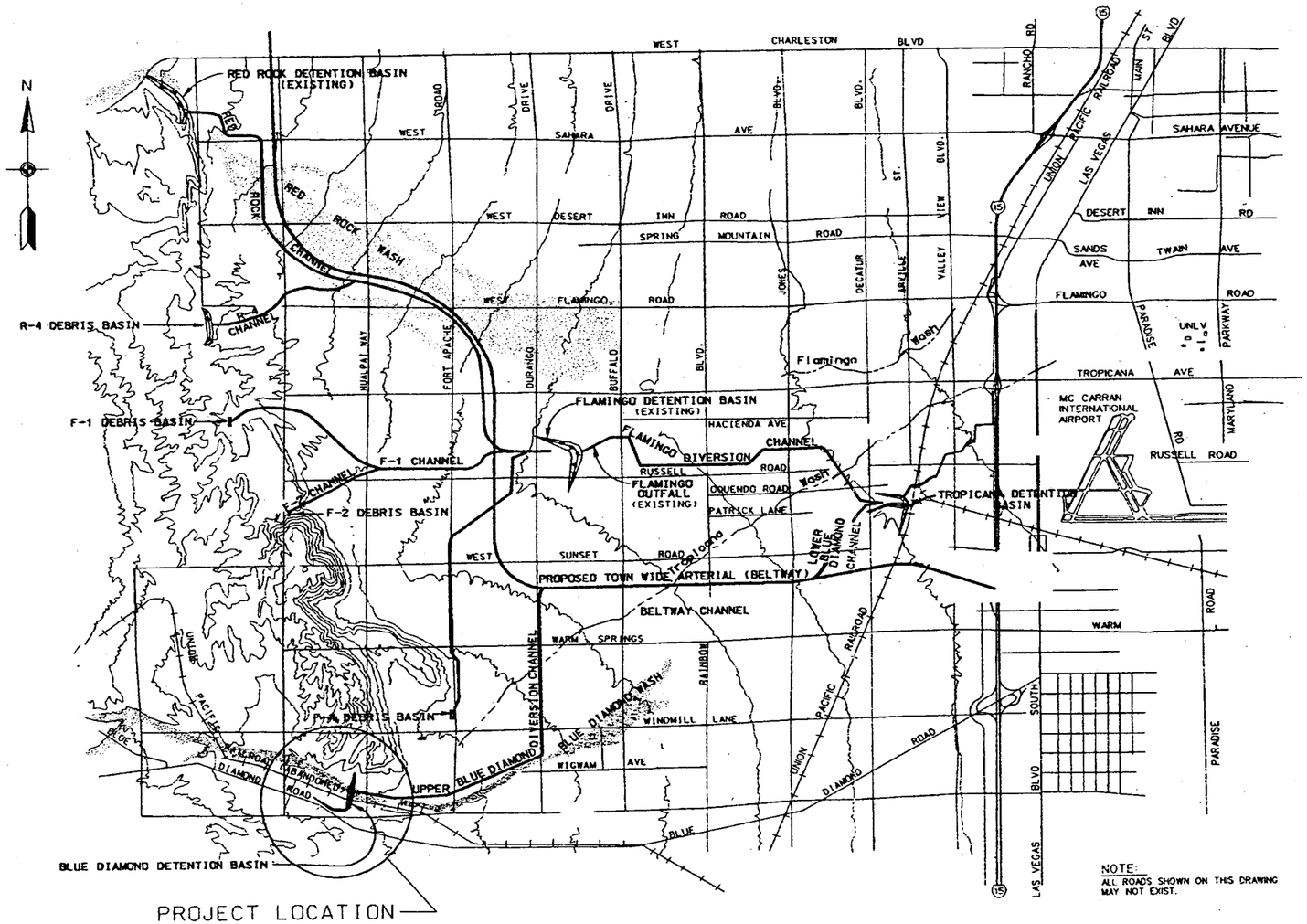
Photo 12. Blue Diamond Detention Basin. Hydrologic instrumentation vault.

Photo 13. Blue Diamond Detention Basin. Water surface sensor.

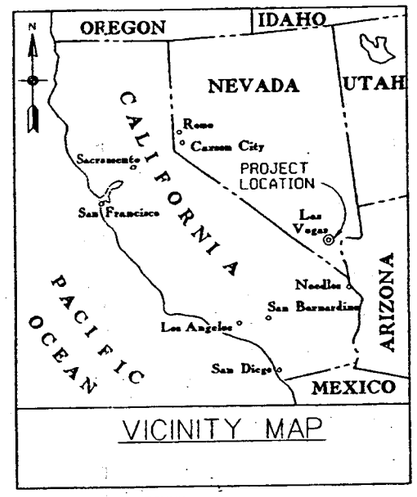
Photo 14. Blue Diamond Detention Basin. Sediment staff gages.

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

BLUE DIAMOND DETENTION BASIN



NOTE:
ALL ROADS SHOWN ON THIS DRAWING MAY NOT EXIST.



VICINITY MAP

LEGEND

SYMBOL	DESCRIPTION
×3 635.300	EXISTING ELEVATION
×3 633.500	FINISHED GRADE ELEVATION
	CENTERLINE/CONTROL LINE
	RIGHT-OF-WAY
	CONSTRUCTION EASEMENT
	FENCE
	RAILROAD
	TOP OF SLOPE
	TOE OF SLOPE

PROJECT LOCATION MAP
SCALE: 1000 500 0 1000 2000 METER

AGENCY	PLANS REVIEWED BY	DATE
SPRINT/CENTRAL TELEPHONE COMPANY		
LAS VEGAS VALLEY WATER DISTRICT		
SOUTHWEST GAS COMPANY		
NEVADA POWER COMPANY		
CLARK COUNTY SANITATION DISTRICT		
COMMUNITY CABLE T.V.		
UNION PACIFIC RAILROAD		
WILATEL		

Clark County Department of Public Works

Approved by:

M.J. Manning, P.E., Director

Clark County Regional Flood Control District

Approved by:

Gale Wm. Fraser, II P.E., General Manager

County Manager

Donald L. "Pat" Shalmy

County Commissioners

Bruce L. Woodbury, Chair
Erin Kenny, Vice Chair
Yvonne Atkinson Gates
Dario Herrara
Mary J. Kincaid
Lance W. Malone
Myrna Williams

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR

METRIC

THIS PROJECT WAS DESIGNED BY THE LOS ANGELES DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF THE INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY E.R. 110-1-8152.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	ADDED SIGNATURES		
2	ADDED CLARK COUNTY SIGNATURES		

REVISIONS

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
VICINITY AND PROJECT LOCATION MAPS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J. SERRANO
V. CARSON
DRAWN BY: J. SERRANO
CHECKED BY: G. DAVIS
DATE:

APPROVED:
CHIEF, ENGINEERING DIVISION

SUBMITTED BY:
CHIEF, DESIGN BRANCH

PREPARED UNDER THE DIRECTION OF:
JOHN P. CARROLL, COLONEL
DISTRICT ENGINEER

SPEC. NO. DACW09-98-B-0008
DISTRICT FILE NO. 96V490 REV '98

CADD FILE NAME: BDDBB_01.DGN

SCALE:

SHEET 1 OF 57 SHEETS

SAFETY PAYS

PLATE 1

VALUE ENGINEERING PAYS

E 223.000 E 223.250 E 223.500 E 223.750 E 224.000 E 224.250

N 8,142,500 N 8,142,250 N 8,142,000 N 8,141,750

N 8142612.833 E 223042.939

S78°30'26.02"E 749.395

S11°15'31.13"E 185.429

N 8142583.027 E 223189.535

S55°51'45.02"E 19.196

N 8142503.132 E 223376.550

N84°36'51.57"E 322.489

N 8142535.868 E 223631.434

N 8142495.991 E 222940.440

N16°31'09.15"W 186.610

N 8142478.158 E 223878.605

N86°03'53.38"E 242.234

S70°24'39.20"E 209.359

N 8142407.967 E 224075.843

N 8142461.534 E 223636.942

WATER SURFACE AT SPILLWAY ELEVATION

TEMPORARY TORTOISE FENCE. FOR DETAILS SEE SHEET 29

S51°26'53.60"E 509.718

UNION PACIFIC RR (ABANDONED)

R/W

N 8142109.697 E 223226.483

N 8142146.896 E 223243.322

N 8142017.621 E 223547.828

N21°01'32.59"E 167.204

N 8141955.814 E 223161.082

N34°41'12.76"E 37.936

N 8141924.433 E 223139.766

N54°12'13.11"E 189.297

N 8141813.712 E 223293.305

BLUE DIAMOND ROAD

N 8141759.364 E 223487.300

REFERENCE NOTE:
FOR BASIN SECTIONS A-A, B-B, AND C-C SEE SHEET 7

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR

SCALE: 60 30 0 60 120

CONTOUR INTERVAL: 0.500

N 8141600.184 E 223607.739

N88°14'37.58"W 273.925

ADD NEW BARBED WIRE FENCE 480 METERS

B

R/W

N88°14'37.75"W 191.703

60' M

N 8141591.789 E 223881.535

N 8141585.914 E 224073.148

S0°11'16.21"W 822.057

NOTE: ALL DIMENSIONS ARE SHOWN IN METERS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
	ADDED SEDIMENT BERM AND SLOPE STABILIZER		

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H SAGE, P.E.
CHIEF, DESIGN BRANCH

DESIGNED BY: PMV
DRAWN BY: PMV
CHECKED BY: HJ

DISTRICT FILE NO. 402 REV 'A'

SPEC. NO DACW09-98-B-0009

CADD FILE NAME: BDDRA_03.DGN

SCALE: 200:1

SHEET 37 OF 57 SHEETS

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
GENERAL PLAN

SAFETY PAYS

PLATE 2

VALUE ENGINEERING PAYS

NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY AERIAL MAPPING CO., INC. ON AUGUST 20, 1992. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL DATUM IS BASED ON NAVD88 DATUM.

30 15 0 30 60

CONTOUR INTERVAL: 0.500

SHEET INDEX

4 | 6 5

REFERENCE NOTES:

1. FOR BASIN SECTIONS. SEE SHEETS 3 AND 7
2. FOR DAM EMBANKMENT AND SPILLWAY PROFILE. SEE SHEET 8
3. FOR DAM EMBANKMENT AND SPILLWAY CROSS SECTIONS. SEE SHEETS 9-11
4. FOR RCC STEPPED SPILLWAY AND STILLING BASIN DETAILS. SEE SHEETS 14-15
5. FOR SUBDRAINAGE SYSTEM. SEE SHEET 28
6. FOR ACCESS ROADS #1 AND #2. SEE SHEETS 12-13
7. FOR SPILLWAY ACCESS ROADS #1 AND #2. SEE SHEETS 26-27
8. FOR PIPE ACCESS GATE DETAILS. SEE SHEET 29
9. FOR TEMPORARY TORTOISE FENCING DETAILS. SEE SHEET 29
10. FOR TURNAROUND #1 AND TURNAROUND #2 DETAILS. SEE SHEET 12
11. FOR BASIN GRADING CONTROL AND FOR DAM ℄ CONTROL DATA. SEE SHEET 5. FOR RIPRAP TOE CONTROL DATA. SEE SHEET 11
12. HYDROLOGIC INSTRUMENTATION SYSTEM. SEE SHEETS 31-32
13. FOR GUARDRAIL DETAILS. SEE SHEET 12

LEGEND

①	CONSTRUCTION/REFERENCE NOTE
G3	BASIN GRADING CONTROL REFERENCE
⑤	RIPRAP TOE CONTROL REFERENCE
890	FINISHED GRADE CONTOUR
887.5	EXISTING GRADE CONTOUR

PROVIDE TEMPORARY TORTOISE FENCING ⑨

PROVIDE TEMPORARY TORTOISE FENCING ALONG R/W ⑨

SLOPE STABILIZER SEE SHEET 15A

CONTRACTOR STAGING AREA

1V:10H

1V:10H

R/W

P.I. #1 0+00

R=12.000

⑩ TURNAROUND #1

NEW ACCESS GATE STA 0+64.000 BEGIN DAM

ACCESS ROAD #1

NEW ACCESS GATE TO STA. 0+00

STA 1+12.793 ACCESS GATE

1+00

UPSTREAM FACE 0.460 RIPRAP

GRADE BREAKS

0.300 RIPRAP TOE

N10 46' 34"E

SPILLWAY ACCESS ROAD #1

STA 2+11.900 BEGIN RCC SPILLWAY

DOWNSTREAM FACE 0.300 RIPRAP

2+00

GUARD RAIL

HYDROLOGIC INSTRUMENTATION SYSTEM

0.460 RIPRAP TOE ⑪

3+00

R/W

MATCHLINE SHEET 6

MATCHLINE SHEET 5

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
⚠	ADDED SLOPE STABILIZER		

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT

BLUE DIAMOND DETENTION BASIN

DETAIL PLAN NO. 1

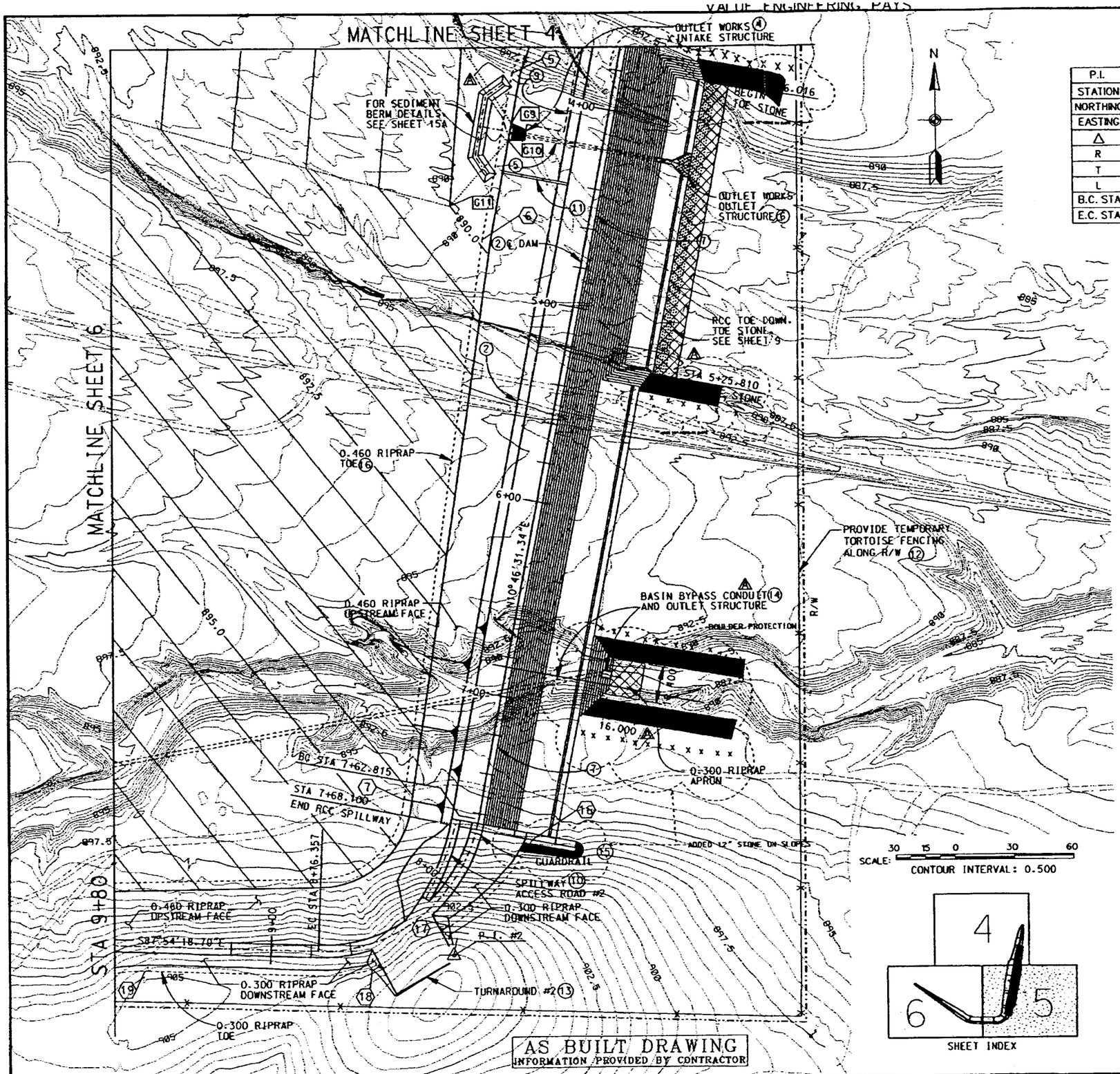
DESIGNED BY:	PHU
DRAWN BY:	PHU
CHECKED BY:	MJ
SUBMITTED BY:	THOMAS M. SAGE, P.E. CHIEF, DESIGN BRANCH
SPEC. NO. DACW09-95-B-0009	
DISTRICT FILE NO. 987/ 493 REV 2	
C-ADD FILE NAME: BDDBA_04.DGN	
SCALE: 1"=100'	
SHEET 4 OF 57 SHEETS	

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SAFETY PAYS

PLATE 3a

VALUE ENGINEERING PAYS



SAFETY PAYS

CONTROL DATA ℄ DAM

P.I.	#1	#2	#3	#4
STATION	0+00.000	———	———	16+30.697
NORTHING	8 142 437.136	8 141 620.270	8 141 630.765	8 141 931.553
EASTING	223 051.383	223 895.921	223 609.025	223 162.735
Δ	———	81°19'09.43"	31°53'02.86"	———
R	———	80.000	150.000	———
T	———	68.713	42.848	———
L	———	113.543	83.472	———
B.C. STA.	———	7+62.815	8+76.357	———
E.C. STA.	———	10+51.883	11+35.355	———

BASIN GRADING CONTROL

PT. NO.	NORTHING	EASTING	ELEV.
G1	8 142 076.407	223 902.628	889.998
G2	8 142 111.864	223 878.924	890.360
G3	8 142 155.696	223 808.749	891.360
G4	8 142 216.486	223 732.774	892.471
G5	8 142 242.902	223 660.140	893.484
G6	8 142 267.428	223 624.347	893.991
G7	8 142 288.541	223 587.685	894.504
G8	8 142 126.100	223 518.633	895.177
G9	8 142 037.501	223 927.716	889.508 ⚠1
G10	8 142 029.266	223 926.186	889.508 ⚠2
G11	8 141 997.008	223 896.028	890.000
G12	8 142 059.799	223 658.296	893.242
G13	8 141 727.754	223 500.665	900.589

REFERENCE NOTES:

1. FOR BASIN SECTIONS. SEE SHEETS 3 AND 7
2. FOR DAM EMBANKMENT AND SPILLWAY PROFILE. SEE SHEET 8
3. FOR DAM EMBANKMENT AND SPILLWAY CROSS SECTIONS. SEE SHEETS 9-11
4. FOR OUTLET WORKS INTAKE STRUCTURE AND TRASHRACK. SEE SHEETS 18-20
5. FOR OUTLET WORKS CONDUIT PLAN AND PROFILE. SEE SHEET 17
6. FOR OUTLET WORKS OUTLET STRUCTURE. SEE SHEET 21
7. FOR RCC STEPPED SPILLWAY AND STILLING BASIN DETAILS. SEE SHEETS 14-15
8. FOR SUBDRAINAGE SYSTEM. SEE SHEET 28
9. HYDROLOGIC INSTRUMENTATION SYSTEM. SEE SHEETS 31-32
10. FOR SPILLWAY ACCESS ROADS #1 AND #2. SEE SHEETS 26-27
11. BASIN DEPTH GAUGE. SEE SHEET 34
12. FOR TEMPORARY TORTOISE FENCING DETAILS. SEE SHEET 29
13. FOR TURNAROUND #1 AND TURNAROUND #2 DETAILS. SEE SHEET 12
14. FOR BASIN PYPASS DETAILS. SEE SHEETS 22-25
15. FOR GUARDRAIL DETAILS. SEE SHEET 12
16. FOR RIPRAP TOE CONTROL DATA. SEE SHEET 11

LEGEND

①	CONSTRUCTION/REFERENCE NOTE
G3	BASIN GRADING CONTROL REFERENCE
⑤	RIPRAP TOE CONTROL REFERENCE
890	FINISHED GRADE CONTOUR
887.5	EXISTING GRADE CONTOUR

NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY AERIAL MAPPING CO., INC. ON AUGUST 20, 1992. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL DATUM IS BASED ON NAVD88 DATUM.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
⚠	ADDED RIPRAP APRON, TOE STONE DETAILS, SEDIMENT BERM, AND TWO GRADING ELEV.		

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
DETAIL PLAN NO. 2

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: PWU
DRAWN BY: PWU
CHECKED BY: HU

SUBMITTED BY: THOMAS M. SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: BDDA_03.DGN

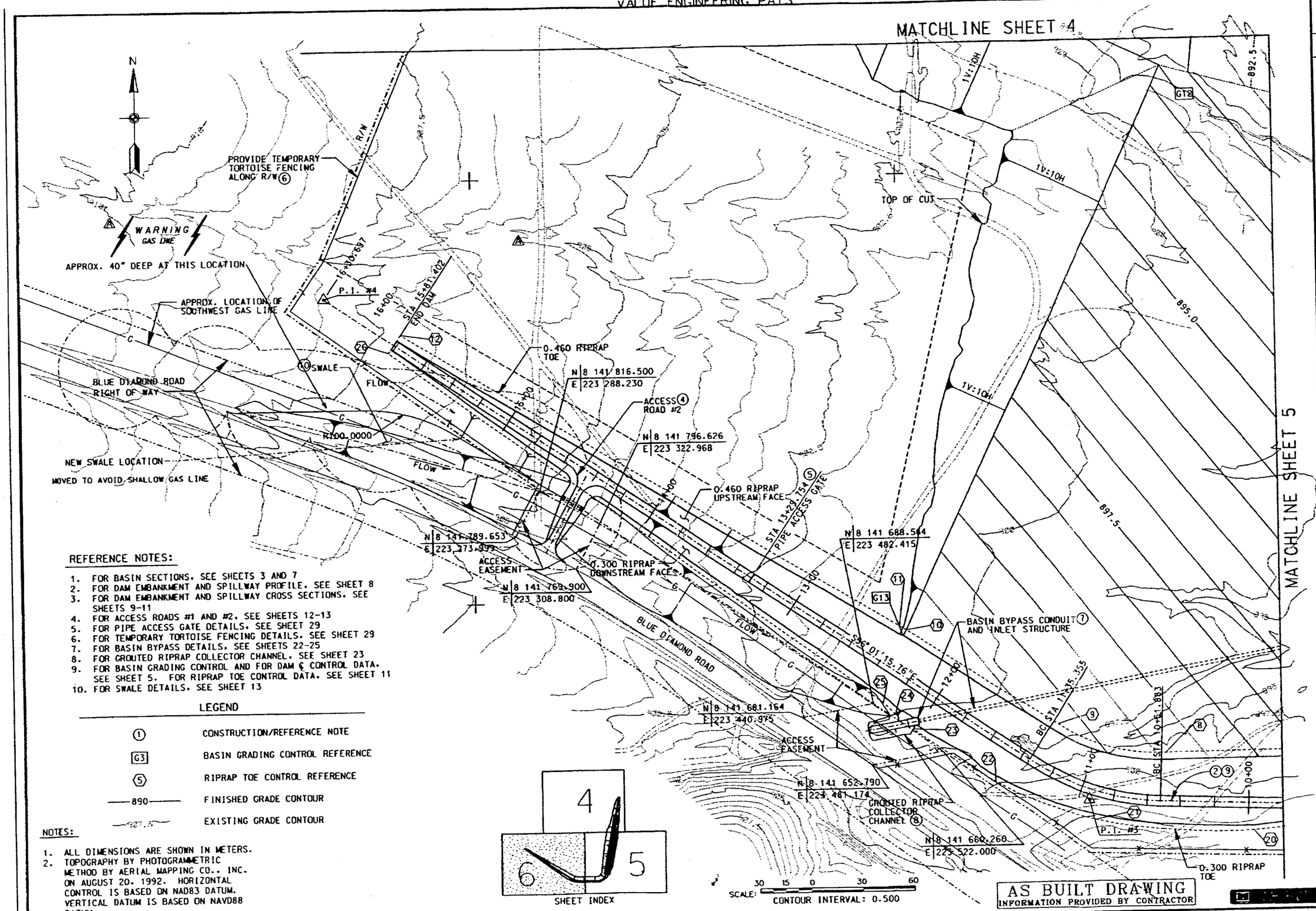
SPEC. NO. DACW09-94-B-0009

DISTRICT FILE NO. 488/484 REV 'A'

SCALE: 1000:1

SHEET 5 OF 57 SHEETS

PLATE 3b



REFERENCE NOTES:

1. FOR BASIN SECTIONS, SEE SHEETS 3 AND 7
2. FOR DAM EMBANKMENT AND SPILLWAY PROFILE, SEE SHEET 8
3. FOR DAM EMBANKMENT AND SPILLWAY CROSS SECTIONS, SEE SHEETS 9-11
4. FOR ACCESS ROADS #1 AND #2, SEE SHEETS 12-13
5. FOR PIPE ACCESS GATE DETAILS, SEE SHEET 29
6. FOR TEMPORARY TORTOISE FENCING DETAILS, SEE SHEET 29
7. FOR BASIN BYPASS DETAILS, SEE SHEETS 22-25
8. FOR GROUTED RIPRAP COLLECTOR CHANNEL, SEE SHEET 23
9. FOR BASIN GRADING CONTROL AND FOR DAM ℄ CONTROL DATA, SEE SHEET 5. FOR RIPRAP TOE CONTROL DATA, SEE SHEET 11
10. FOR SWALE DETAILS, SEE SHEET 13

LEGEND

(1)	CONSTRUCTION/REFERENCE NOTE
G3	BASIN GRADING CONTROL REFERENCE
(5)	RIPRAP TOE CONTROL REFERENCE
890	FINISHED GRADE CONTOUR
892.5	EXISTING GRADE CONTOUR

NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY AERIAL MAPPING CO., INC. ON AUGUST 20, 1992. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL DATUM IS BASED ON NAVD88 DATUM.

SHEET INDEX

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	ADDED WARNING SYM. AND DIMENSION LINE		

REVISIONS

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
DETAIL PLAN NO. 3

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: PWU
DRAWN BY: PWU
CHECKED BY: HJ

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: BDDTA_05.DGN

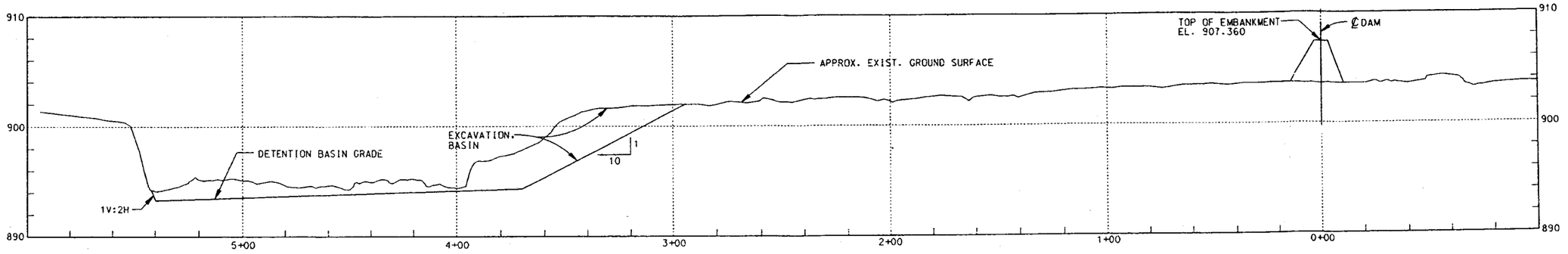
SPEC. NO. DACW09-91-B-0009

DISTRICT FILE NO. 1187 495 REV 'A'

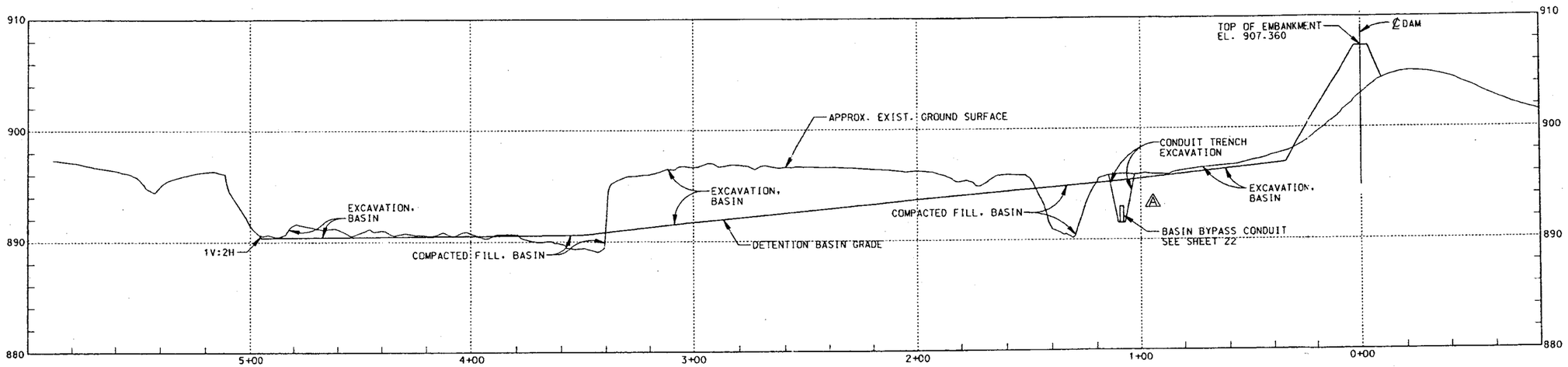
SCALE: 1"=100'

SHEET 5 OF 57 SHEETS

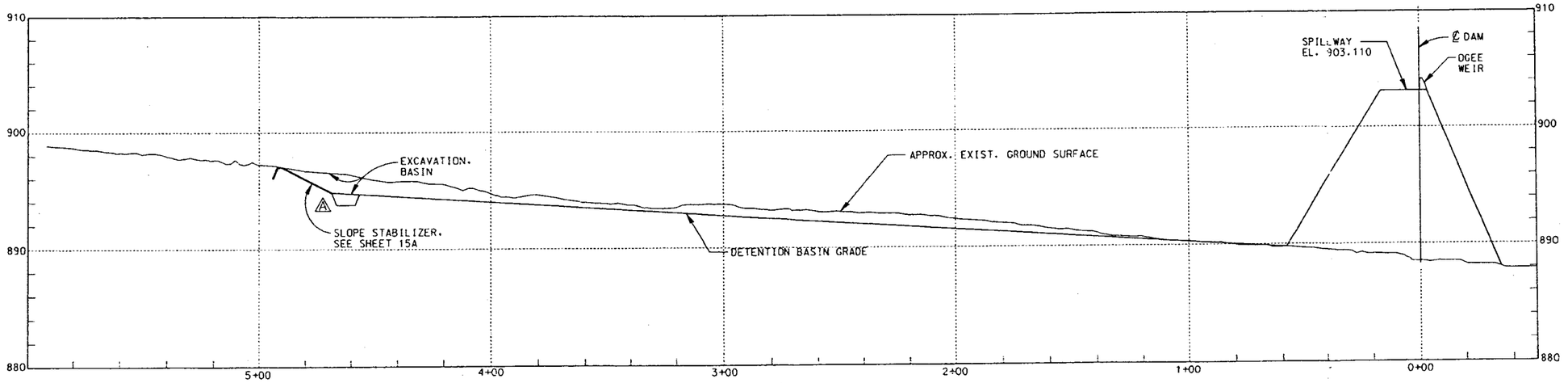
VALUE ENGINEERING PAYS



BASIN SECTION A-A



BASIN SECTION B-B



BASIN SECTION C-C

NOTES:
1. ALL DIMENSIONS ARE SHOWN IN METERS
2. FOR PLAN VIEW OF BASIN, SEE SHEET 3
3. DAM AND SPILLWAY DETAILS NOT SHOWN. FOR DAM EMBANKMENT AND SPILLWAY DETAILS, SEE SHEETS 9 THRU 11

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	ADDED SLOPE STABILIZER		
2	REVISED BYPASS CONDUIT CALLOUTS, AND		

REVISIONS

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN

DETENTION BASIN SECTIONS

DESIGNED BY: PWU
DRAWN BY: PWU
CHECKED BY: MU

CADD FILE NAME: BDDBa_07.DGN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H SAGE, P.E.
CHIEF, DESIGN BRANCH

SPEC. NO. DACW09-99-B-0009

DISTRICT FILE NO. 196/498 REV 'A'

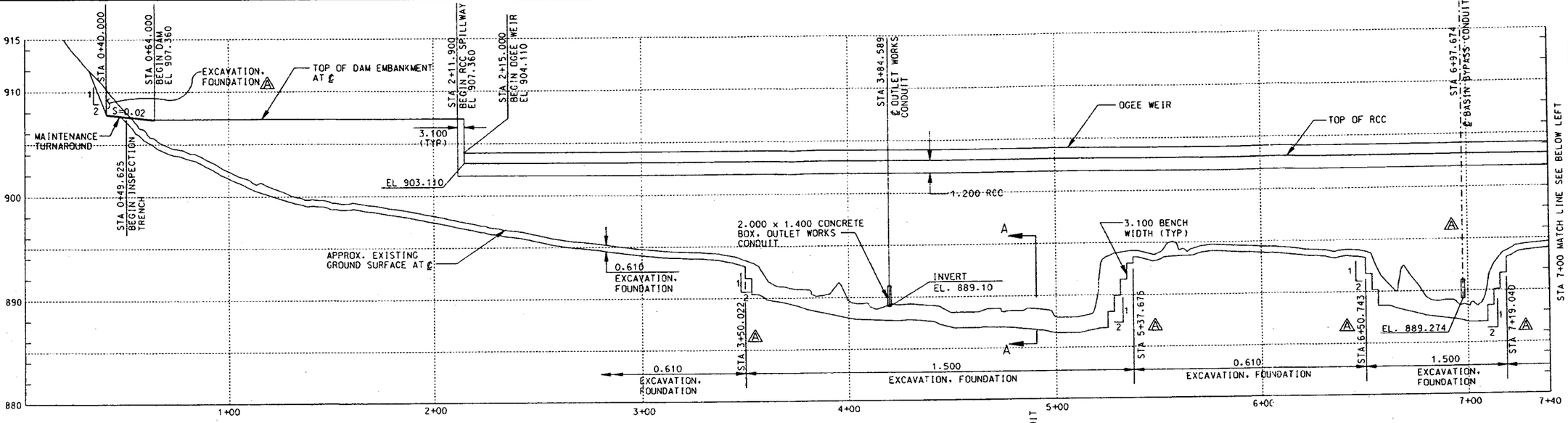
SCALE: 1000:1

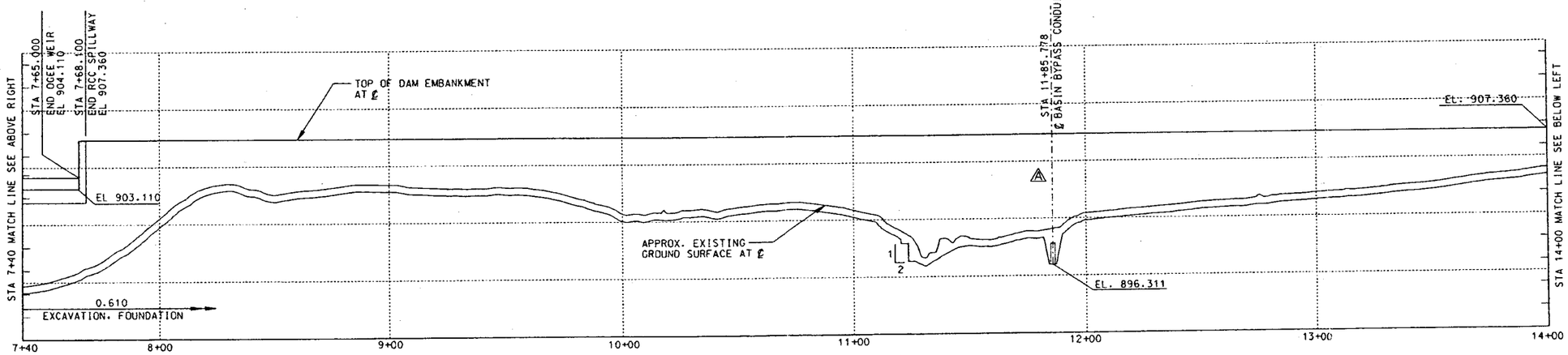
SHEET 7 OF 57 SHEETS

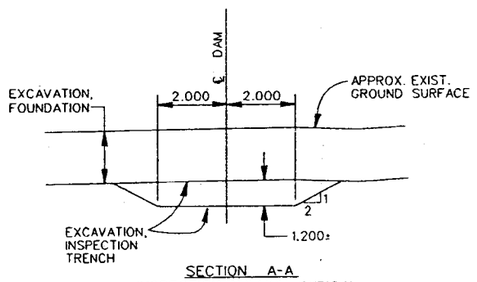
SAFETY PAYS

PLATE 4

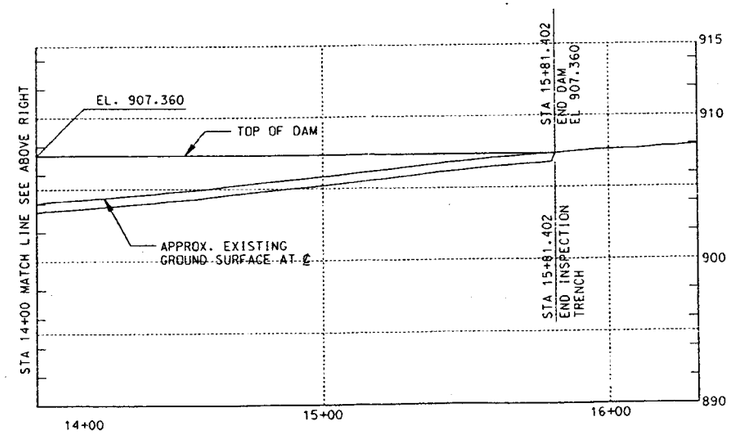
VALUE ENGINEERING PAYS







SECTION A-A
INSPECTION TRENCH TYPICAL
NOT TO SCALE



PROFILE - DAM EMBANKMENT

REFERENCE NOTES:

1. THIS PROFILE IS TAKEN LOOKING DOWNSTREAM.
2. FOR PLAN VIEW OF DAM EMBANKMENT, SEE SHEETS 3-6.
3. FOR SPILLWAY PLAN VIEW, DETAILS, AND CROSS SECTIONS, SEE SHEETS 9-10 AND 14-15.
4. FOR DAM OUTLET WORKS CONDUIT DETAILS, SEE SHEET 17.
5. FOR BASIN BYPASS CONDUIT DETAILS, SEE SHEET 22.

NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY AERIAL MAPPING CO., INC. ON AUGUST 20, 1992. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD88 DATUM.

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
	REVISED BYPASS CONDUIT CALLOUTS AND STATIONING, ADDED NOTE.		

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
DAM EMBANKMENT - PROFILE

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: PWU
DRAWN BY: PWU
CHECKED BY: HU

THOMAS H SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: BDDBA_08.DGN

SUBMITTED BY:

DISTRICT FILE NO. 785/497 REV. N

SPEC. NO. DACW09-99-R-0009

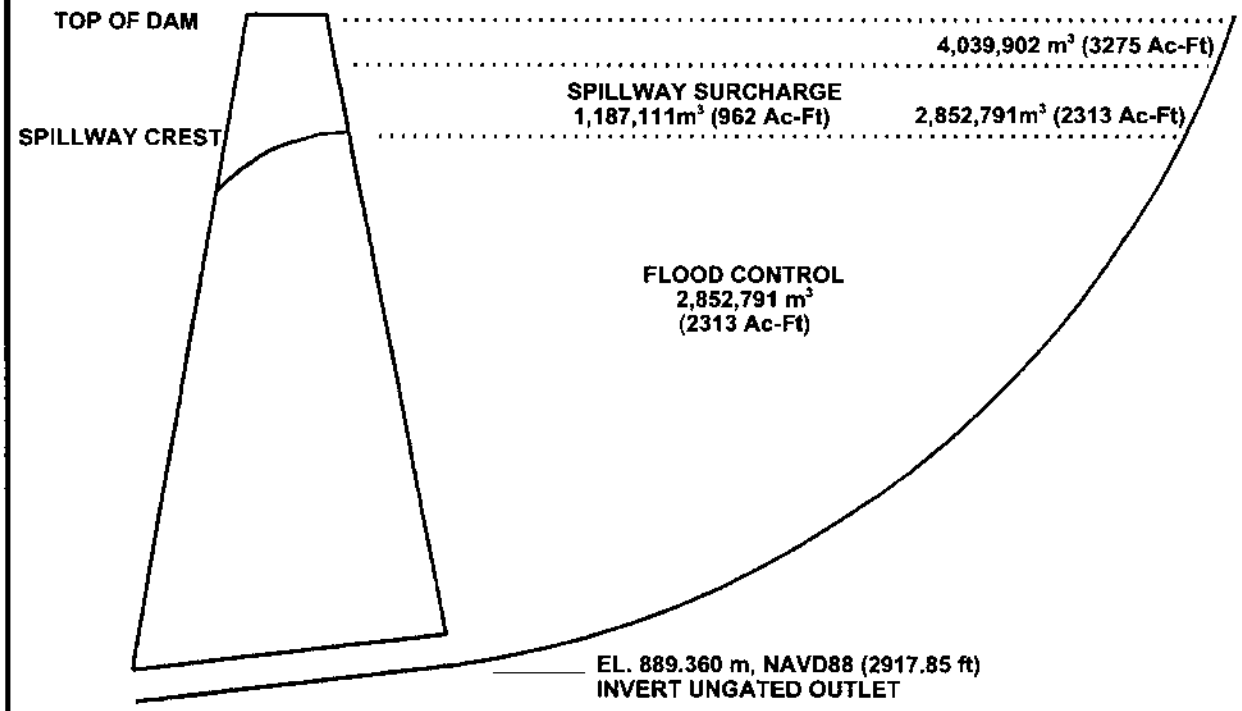
SCALE: 1:1000

SHEET 8 OF 57 SHEETS

SAFETY PAYS

Plates 6-17 are not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.



EL. 907.360 m, NAVD88 (2976.92ft)

EL. 906.360 m, NAVD88 (2973.64 ft)

EL. 904.110 m, NAVD88 (2966.24 ft)

Drainage Area = 174.15 km² (67.24 mi²)

INFLOW

100-Year Peak = 388m³/s* (13,700 cfs)
PMF Peak = 4,078 m³/s (144,000 cfs)
*Computed Probability

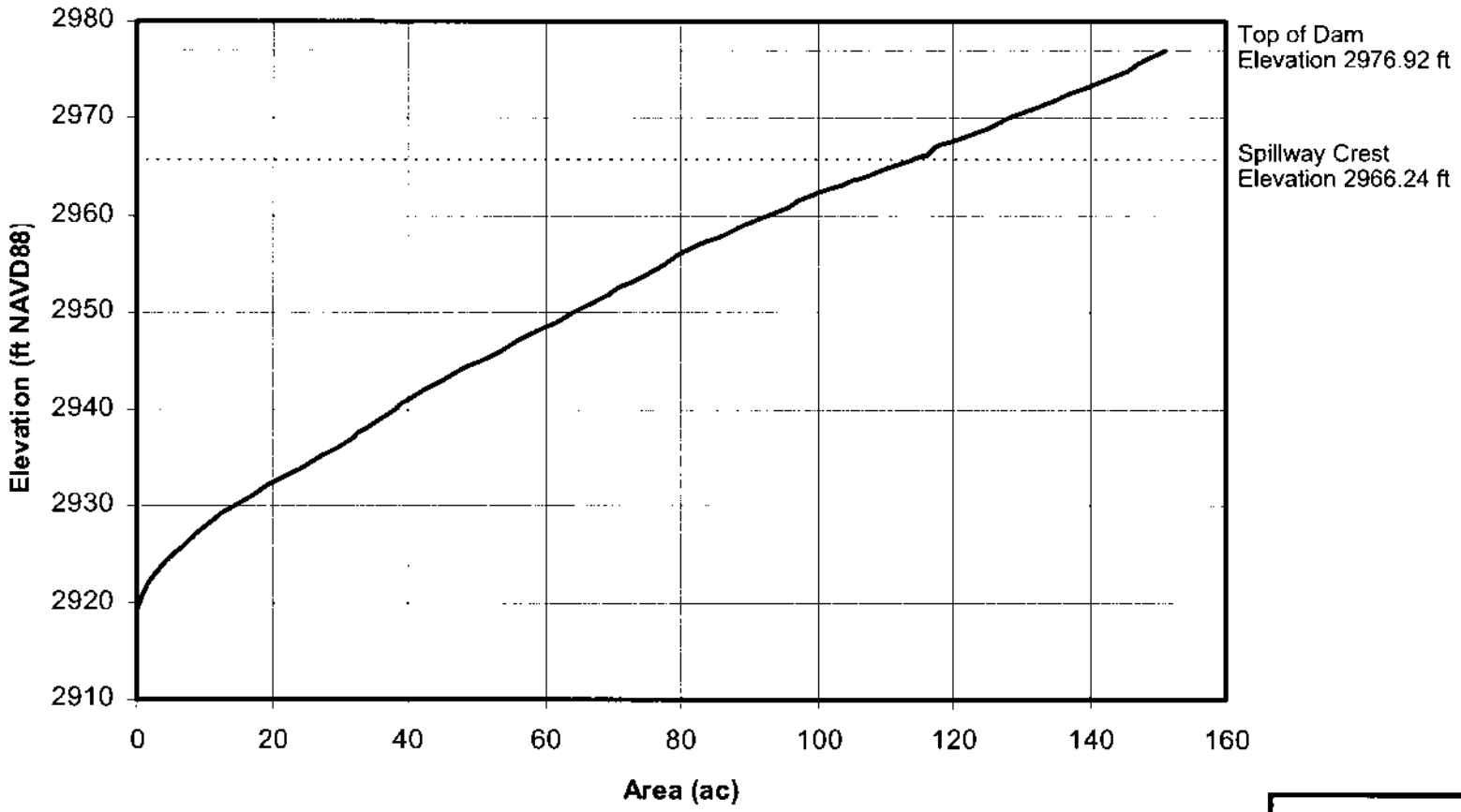
Notes:
1. Final Design Reservoir Allocation Diagram. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.
2. The total flood control storage value shown also includes 1) 293,571 m³ (238 Ac-Ft) for sediment deposition during the project design flood event, and 2) 110,508 m³ (89.59 Ac-Ff) for antecedent sediment deposition.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

RESERVOIR ALLOCATION DIAGRAM[1]

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 18



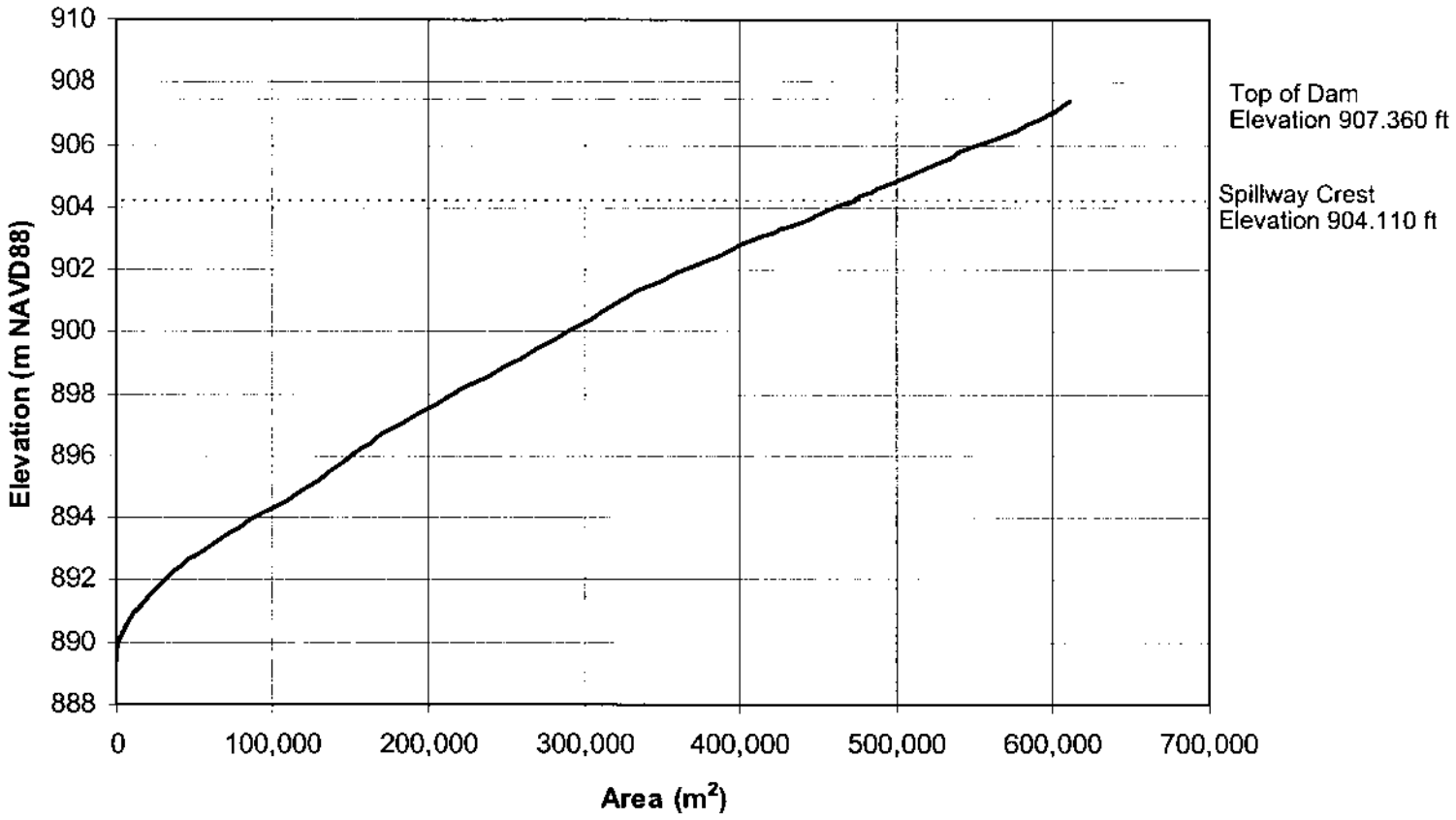
Note: Final Design Surface Area Elevation Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

SURFACE AREA ELEVATION CURVE

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 19



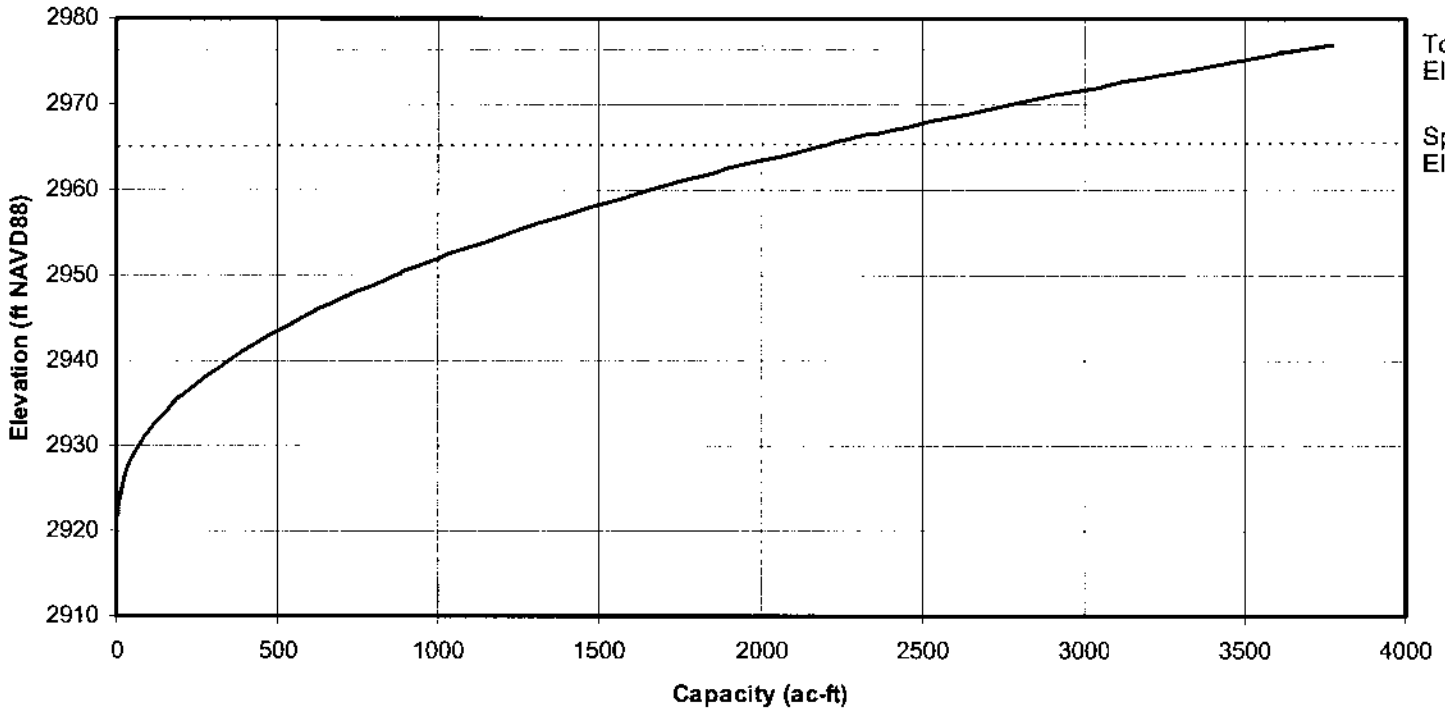
Note: Final Design Surface Area Elevation Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

SURFACE AREA ELEVATION CURVE (Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 19a



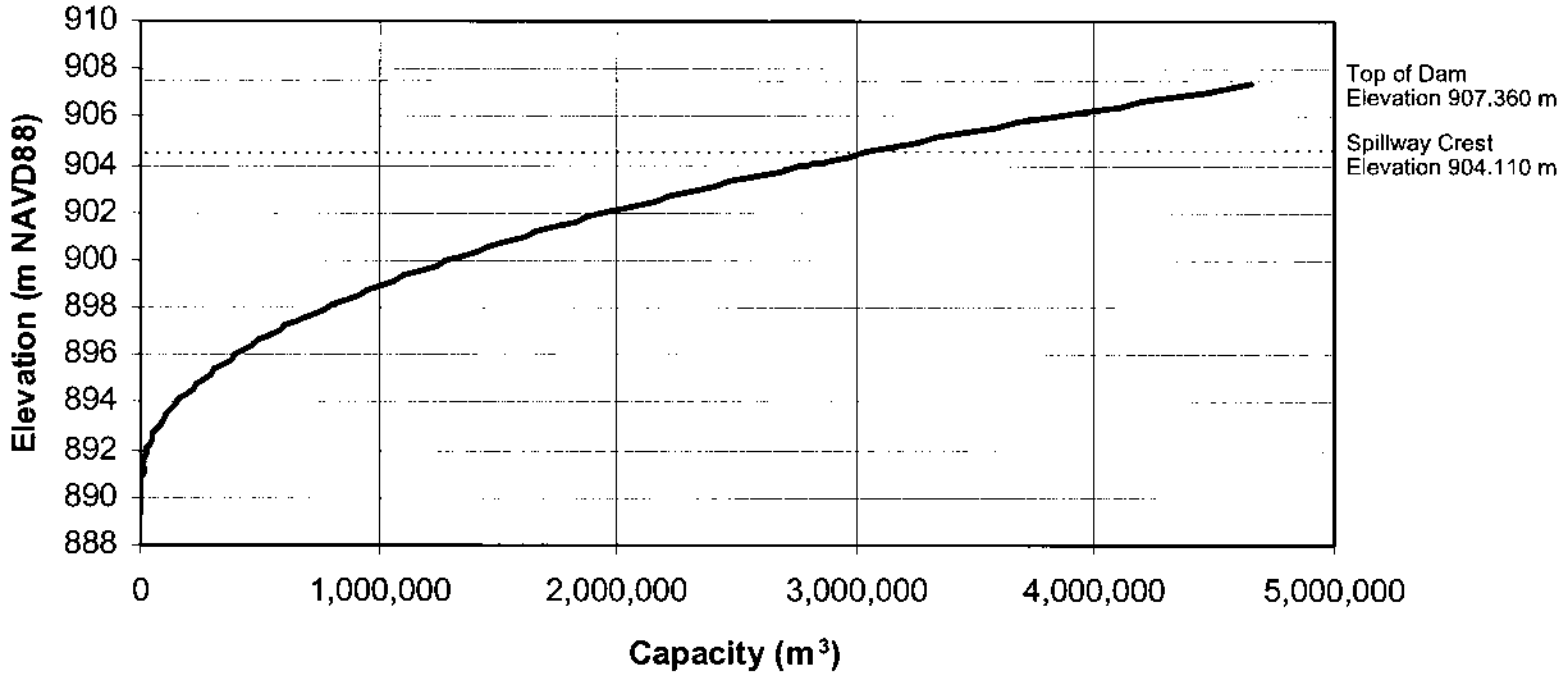
Note: Final Design Storage Elevation Curve This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

STORAGE ELEVATION CURVE

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 20



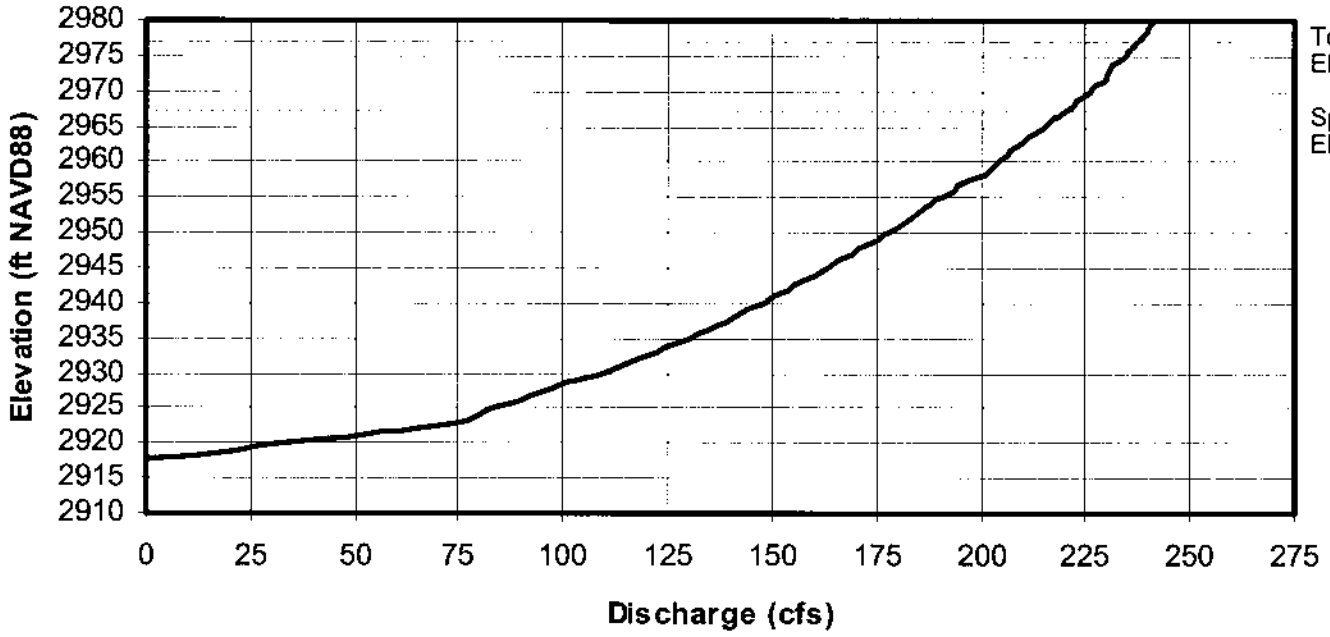
Note: Final Design Storage Elevation Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

STORAGE ELEVATION CURVE (Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 20a

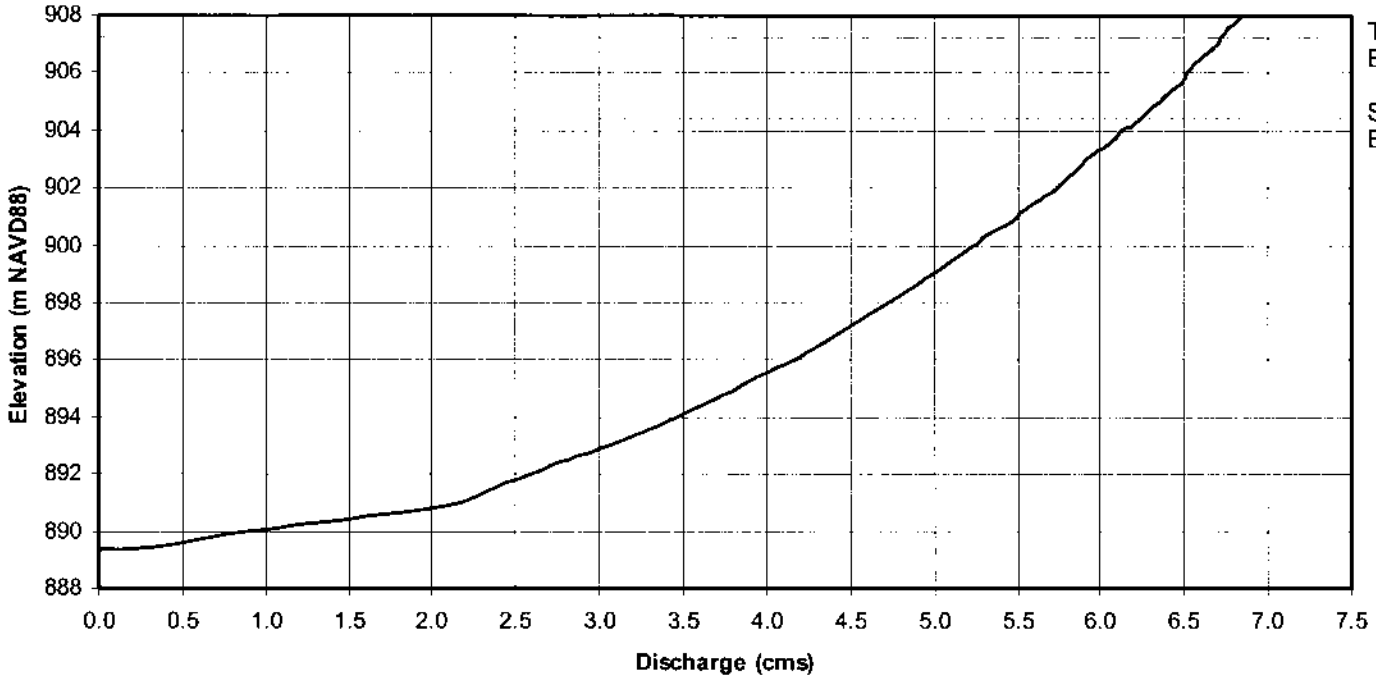


Note: Final Design Outlet Discharge Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

OUTLET DISCHARGE CURVE

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Top of Dam
Elevation 907.360 m

Spillway Crest
Elevation 904.110 m

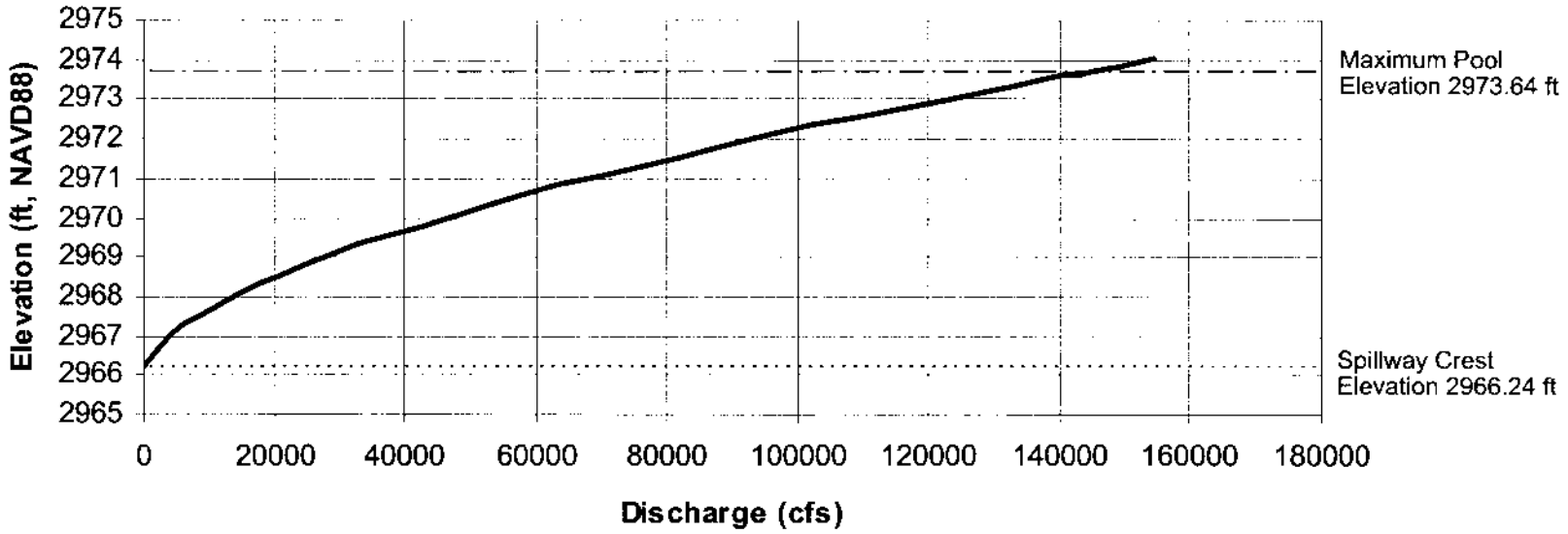
Note: Final Design Outlet Discharge Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

OUTLET DISCHARGE CURVE
(Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Plate 21a



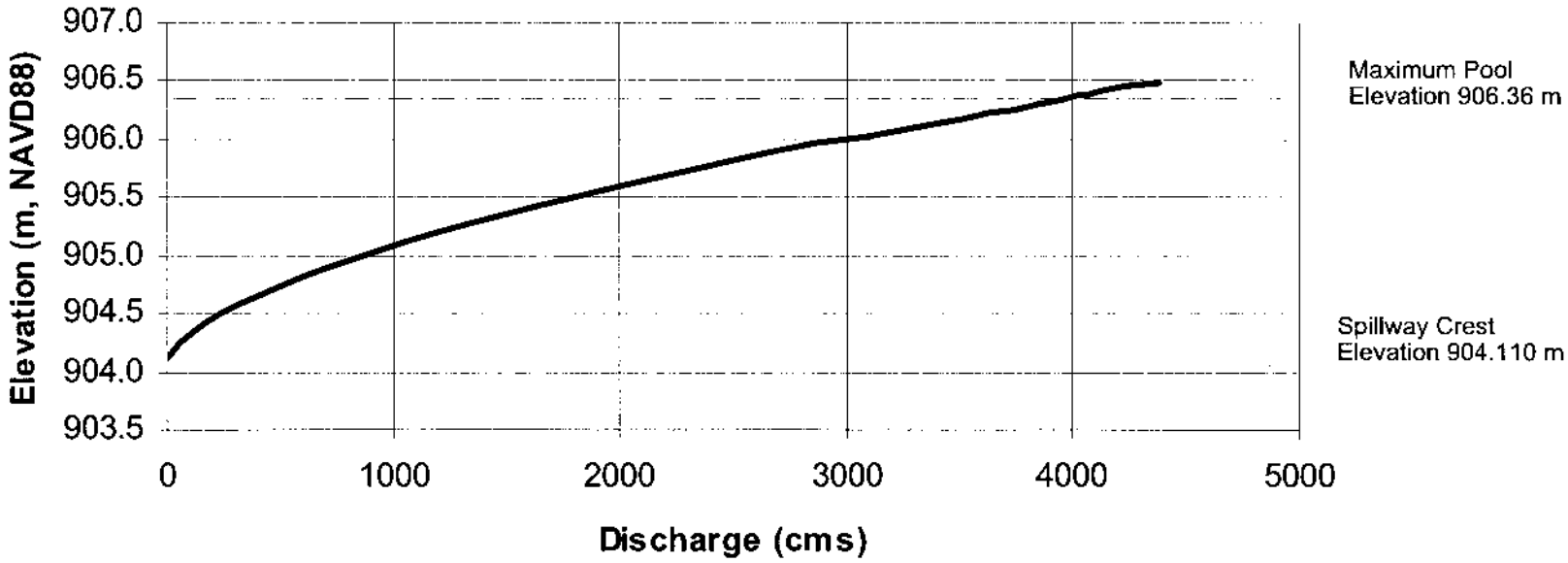
Note: Final Design Rating Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

SPILLWAY RATING CURVE

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 22



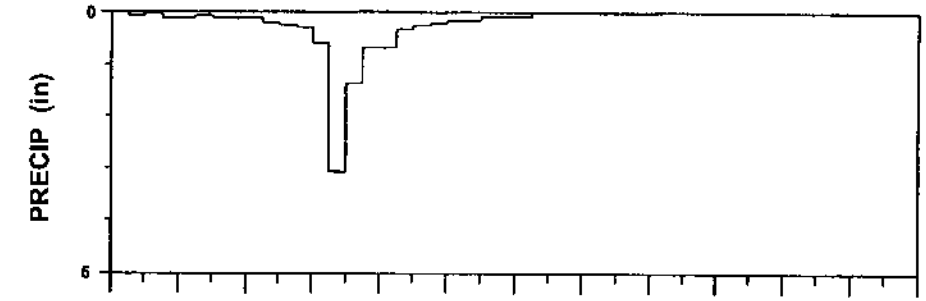
Note: Final Design Rating Curve. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

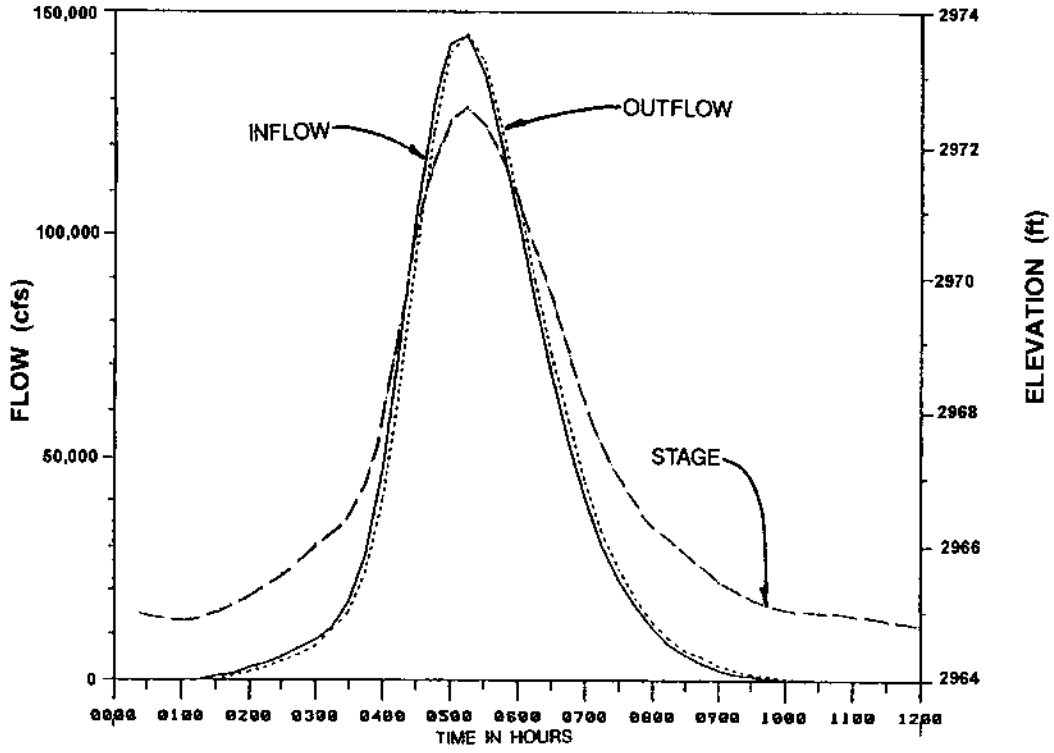
BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

SPILLWAY RATING CURVE
(Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 22a





Total Precip.	9.70 in
Effective Precip.	8.20 in
Precip. Loss	1.50 in

Drainage Area	67.24 mi^2
Spillway Crest	2966.24 ft NAVD88
Maximum Inflow	144,000 ft^3/s
Maximum Storage	3275 Ac-Ft
Inflow Volume	29,226 Ac-Ft
Maximum Stage	2973.64 ft NAVD88
Maximum Outflow	144,000 ft^3/s

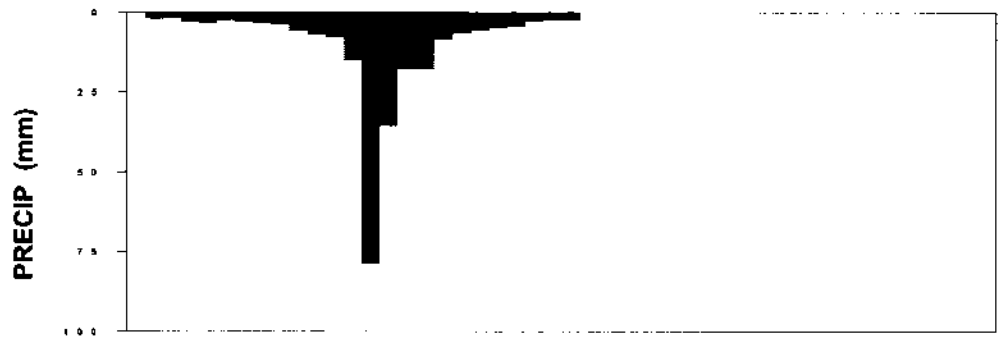
Source: Final Design PMF Routing dated June 2002. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

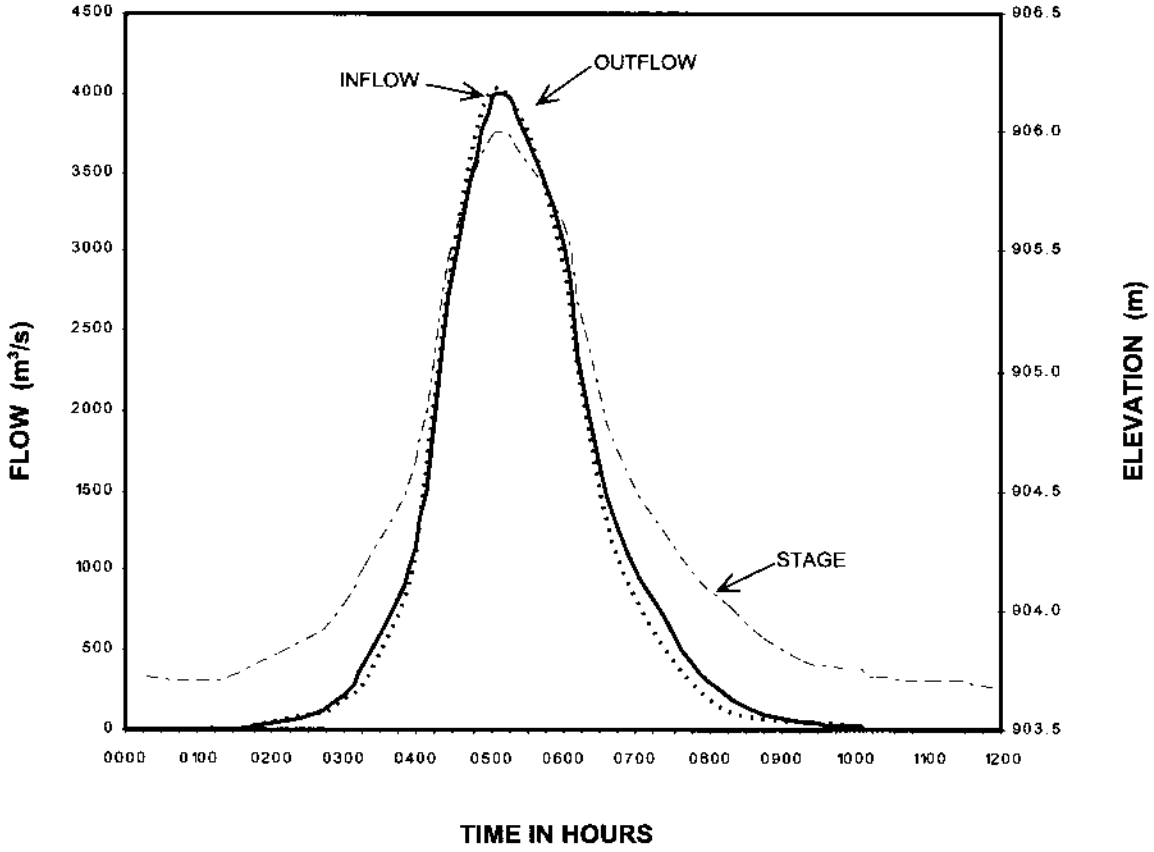
BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

PROBABLE MAXIMUM FLOOD ROUTING
Basin Hyetograph and Inflow, Outflow and Stage Hydrographs

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 23





Total Precip.	246.4 mm
Effective Precip.	208.3 mm
Precip. Loss	38.1 mm

Drainage Area	174.15 km²
Spillway Crest	904.11m NAVD88
Maximum Inflow	4078 m³/s
Maximum Storage	4,039,680 m³
Inflow Volume	36,050,271 m³
Maximum Stage	906.36 m NAVD88
Maximum Outflow	4078 m³/s

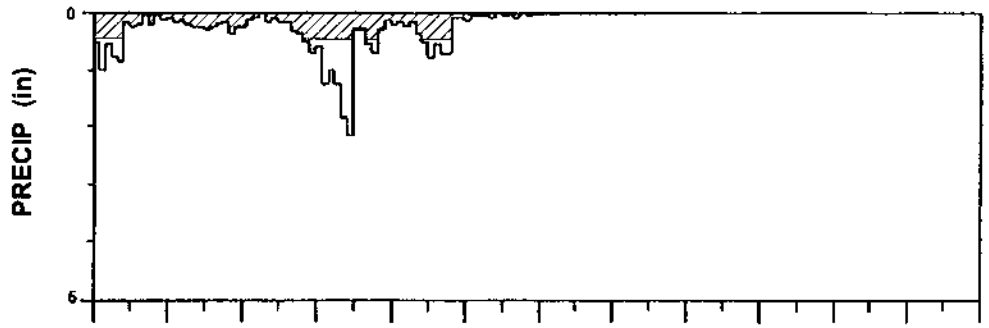
Source: Final Design PMF Routing dated June 2002. This supersedes Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

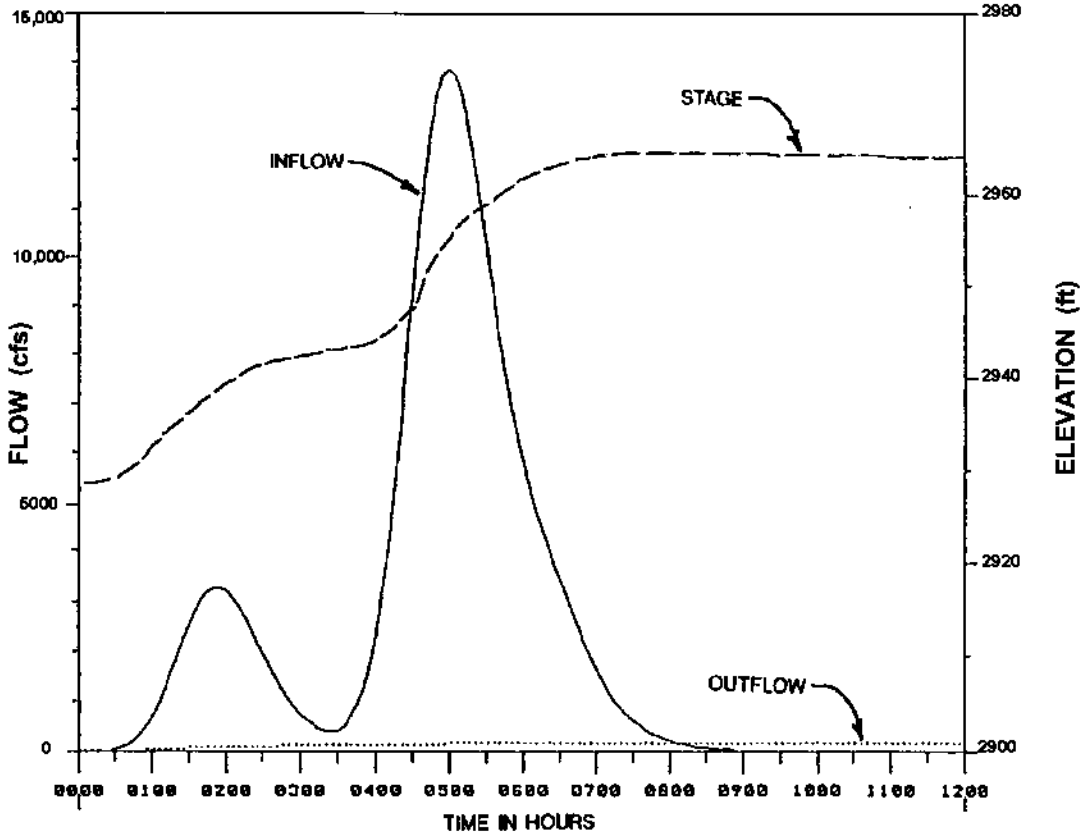
PROBABLE MAXIMUM
FLOOD ROUTING
Basin Hyetograph and Inflow,
Outflow and Stage Hydrographs
(Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 23a



Total Precip.	2.22 in
Effective Precip.	0.65 in
Precip. Loss	1.57 in



Drainage Area	67.24 mi^2
Spillway Crest	2966.24 ft NAVD88
Maximum Inflow	13,700 ft^3/s
Maximum Storage	2302 Ac-Ft
Inflow Volume	2334 Ac-Ft
Maximum Stage	2966.14ft NAVD88
Maximum Outflow	218 ft^3/s

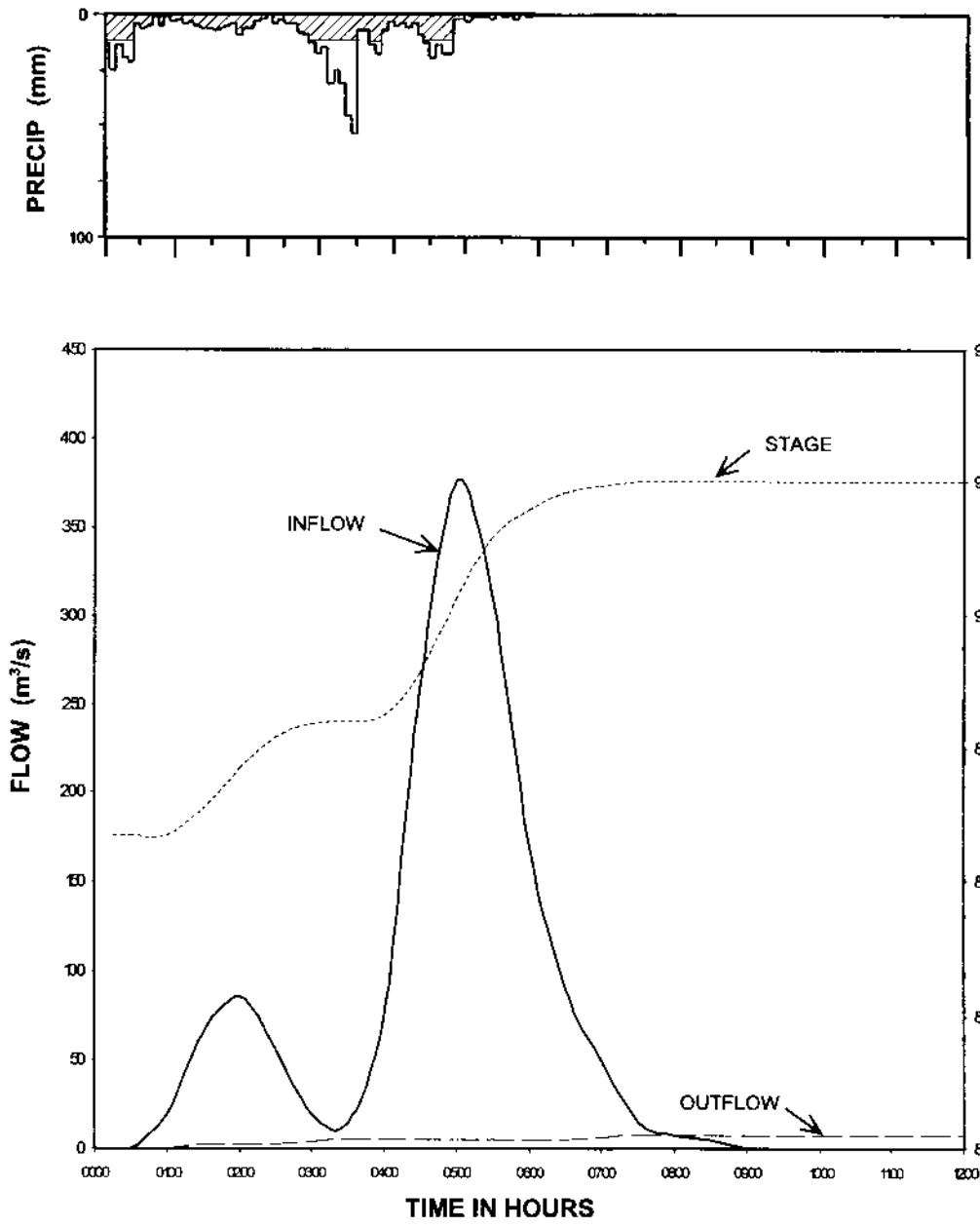
Source: Final Design RDF Routing dated March 2001. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

RESERVOIR DESIGN
FLOOD ROUTING
Basin Hyetograph and Inflow, Outflow and Stage Hydrographs

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 24



Total Precip.	56.4 mm
Effective Precip.	16.5 mm
Precip. Loss	39.9 mm

Drainage Area	174.15 km²
Spillway Crest	904.11 m NAVD88
Maximum Inflow	388 m³/s
Maximum Storage	2,839,494 m³
Inflow Volume	2,878,989 m³
Maximum Stage	904.08 m NAVD88
Maximum Outflow	6.17 m³/s

Source: Final Design RDF Routing dated March 2001. This supersedes the Blue Diamond Detention Basin Design Memorandum dated April 1998.

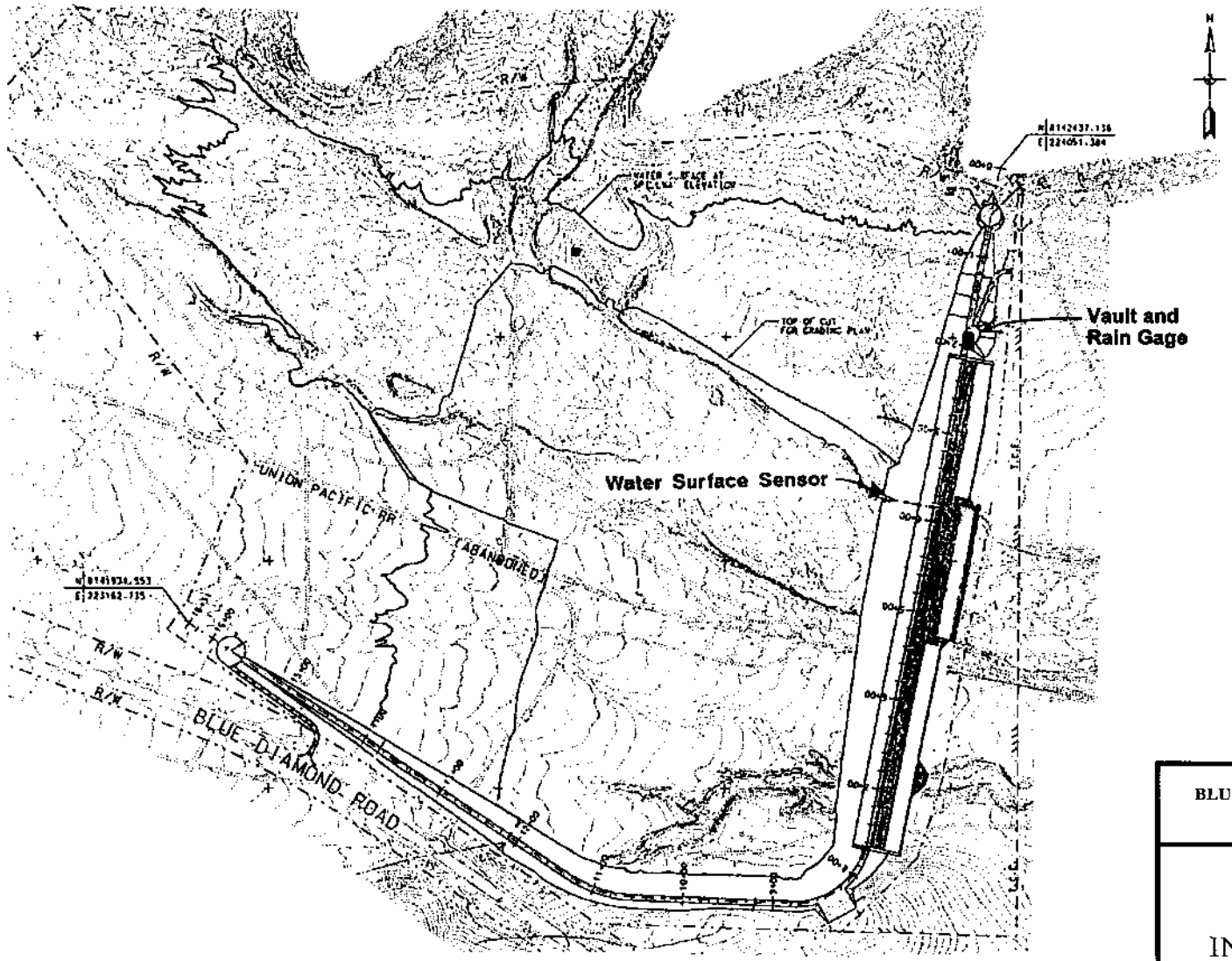
BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

RESERVOIR DESIGN FLOOD ROUTING

Basin Hyetograph and Inflow, Outflow and Stage Hydrographs (Metric Units)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 24a



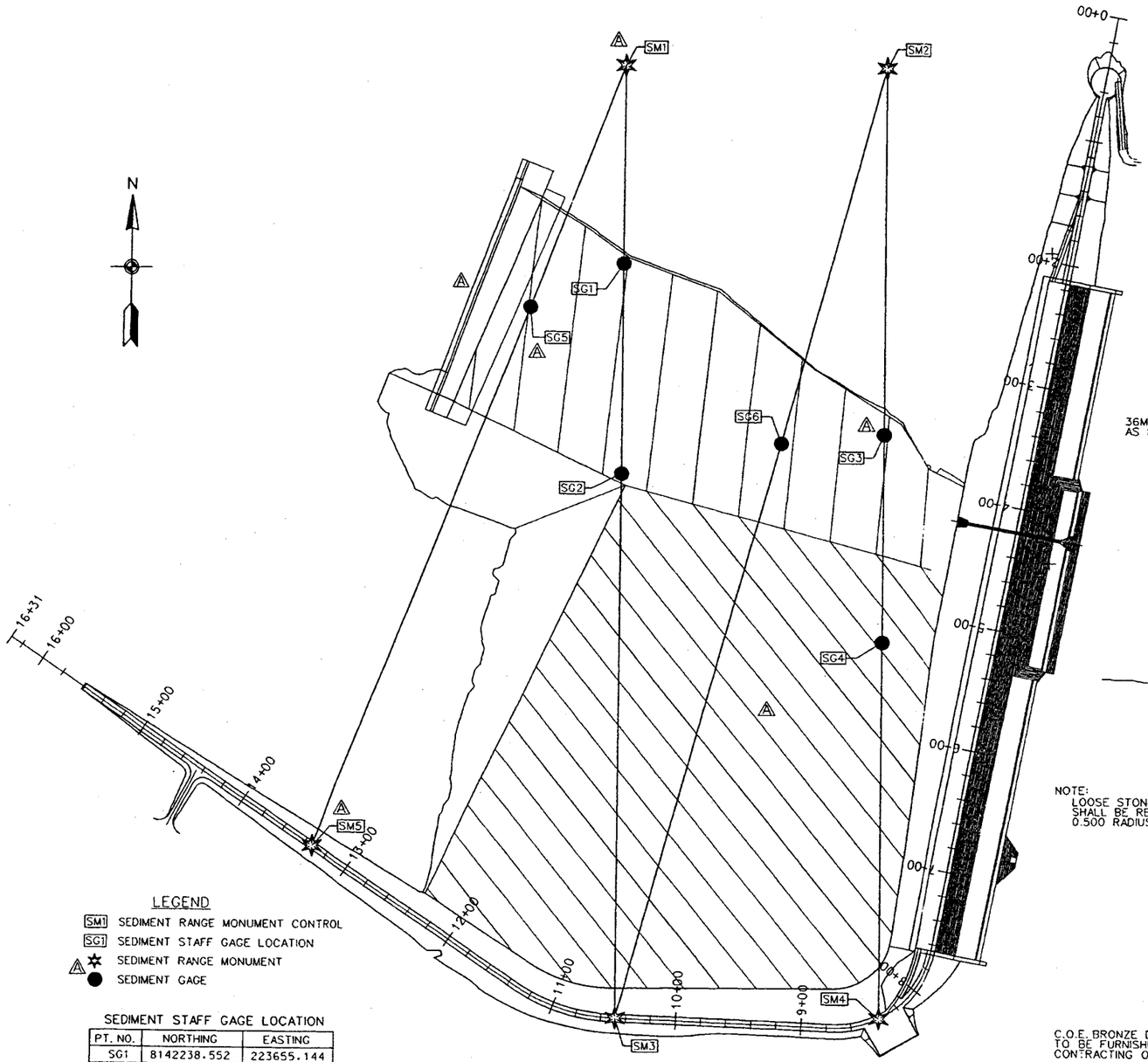
Not To Scale

BLUE DIAMOND DETENTION BASIN
LAS VEGAS, NEVADA

HYDROLOGIC FACILITIES INSTRUMENTATION LAYOUT

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 25



LEGEND

- SM1 SEDIMENT RANGE MONUMENT CONTROL
- SG1 SEDIMENT STAFF GAGE LOCATION
- SEDIMENT RANGE MONUMENT
- SEDIMENT GAGE

SEDIMENT STAFF GAGE LOCATION

PT. NO.	NORTHING	EASTING	
SG1	8142238.552	223655.144	
SG2	8142069.448	223655.144	
SG3	8142103.038	223864.984	Δ
SG4	8141934.814	223864.984	
SG5	8142202.985	223579.957	Δ
SG6	8142095.245	223782.851	

SEDIMENT RANGE MONUMENT LOCATION

PT. NO.	NORTHING	EASTING	
SM1	8142395.458	223655.141	Δ
SM2	8142395.047	223864.990	
SM3	8141629.092	223655.159	
SM4	8141630.696	223864.974	
SM5	8141766.277	223404.955	Δ

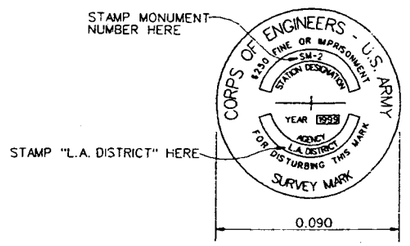
SEDIMENT RANGE MONUMENT AND SEDIMENT STAFF GAGE PLACEMENT - PLAN

SCALE: 50 25 0 50 100

NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD88 DATUM.

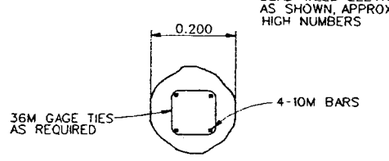
TYPICAL MONUMENT DETAILS



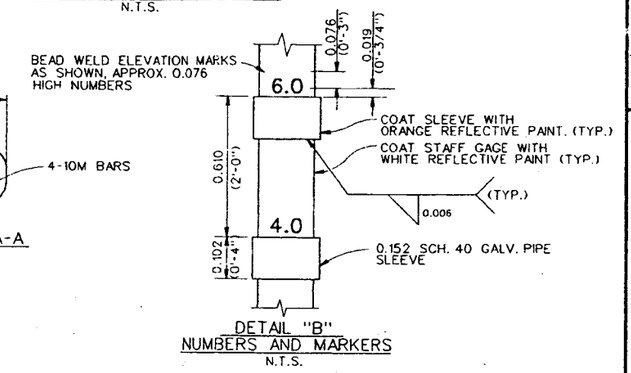
TOP VIEW OF BRONZE DISK
N.T.S.

NOTES:

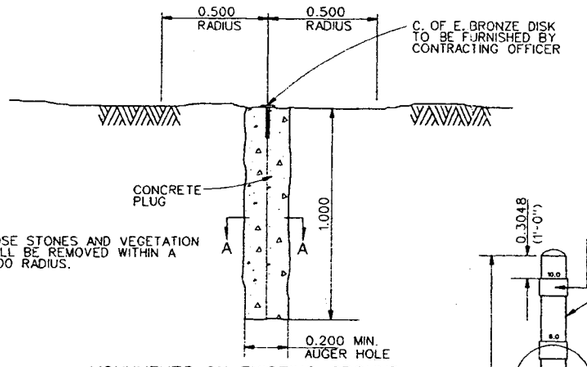
1. BRONZE DISKS TO BE FURNISHED BY CONTRACTING OFFICER.
2. FOR MONUMENT NUMBER SEE SCHEDULE.
3. SIZE OF LETTERS AND NUMBERS STAMPED ON DISK TO 0.005 m HEIGHT.
4. METAL STAMPING OUTFITS SHALL BE USED FOR STAMPING LETTERS AND NUMBERS.



SECTION A-A
N.T.S.



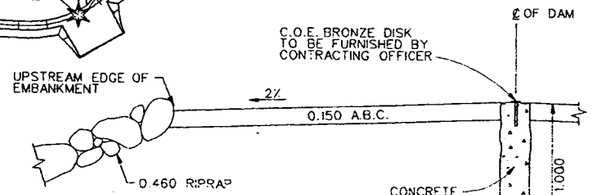
DETAIL "B"
NUMBERS AND MARKERS
N.T.S.



NOTE: LOOSE STONES AND VEGETATION SHALL BE REMOVED WITHIN A 0.500 RADIUS.

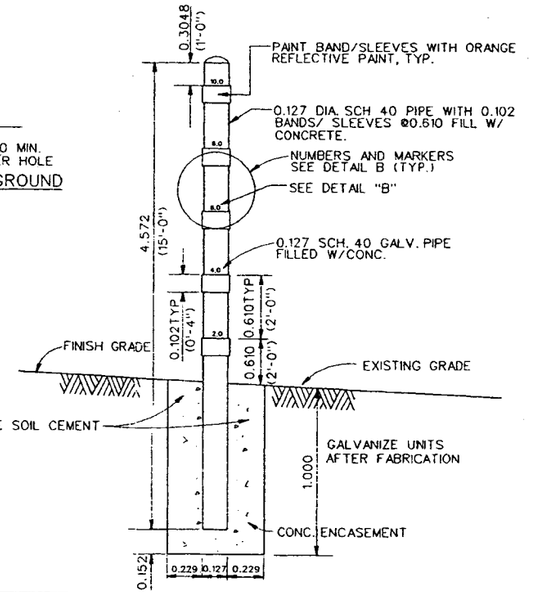
MONUMENTS ON EXISTING GROUND
N.T.S.

NOTE: SEDIMENT STAFF GAGES ARE MARKED IN FEET.



MONUMENTS ON CREST OF EMBANKMENT
N.T.S.

AS BUILT DRAWING
INFORMATION PROVIDED BY CONTRACTOR



SEDIMENT STAFF GAGE DETAILS
N.T.S.

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISED GRADING PLAN, MOVED STAFF GAGES, MOVED SED. RANGE MONUMENTS, AND LEGEND. ADDED SLOPE STABILIZER.		

REVISIONS

TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
SEDIMENT RANGE MONUMENTS AND STAFF GAGES
GENERAL PLAN AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.S.V.C.
DRAWN BY: J.S.
CHECKED BY: G.D.

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: 8100BA_30.DGN
SPEC. NO. DACW09-99-B-0009
3/9 REV. 'A'
DISTRICT FILE NO. 1561

SCALE: AS SHOWN
SHEET 30 OF 57 SHEETS

APPENDIX A

FINDING OF NO SIGNIFICANT IMPACT AND FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT APRIL 1998

BLUE DIAMOND DETENTION BASIN

BLUE DIAMOND WASH

CLARK COUNTY, NEVADA

Los Angeles District

U.S. Army Corps of Engineers

December 2002

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

FINDING OF NO SIGNIFICANT IMPACT

BLUE DIAMOND DETENTION BASIN

Las Vegas Wash and Tributaries
(Tropicana and Flamingo Washes)
Clark County, Nevada

I have reviewed the attached Supplemental Environmental Assessment (SEA) that has been prepared for the Blue Diamond Detention Basin portion of the Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Clark County, Nevada project. Significant environmental resources potentially affected by the proposed action include topography, geology, and soils, mineral resources, land use, air quality, water resources, vegetation and wildlife, fisheries, cultural resources, recreation, esthetics, and socioeconomics. In accordance with 40 CFR § 1508.13, information in the SEA, particularly regarding the project description and background, compliance with applicable regulations, and project benefits, impacts, and mitigation measures is incorporated herein by reference. The long-term beneficial impact of the overall project would be the reduction of flood damages. I have determined that the proposed action will not have a significant impact upon the existing environment or the quality of the human environment. Therefore, preparation of a Supplemental Environmental Impact Statement is not required.

2 APRIL 1998
Date

Robert L. Davis
Colonel, Corps of Engineers
District Engineer

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

FINAL

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

BLUE DIAMOND DETENTION BASIN

Las Vegas Wash and Tributaries
(Tropicana and Flamingo Washes)
Clark County, Nevada

March 1998

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

BLUE DIAMOND DETENTION BASIN

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SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

BLUE DIAMOND DETENTION BASIN

CHAPTER 1 - LOCATION

1.01 General. - The project study area is located in Clark County in southern Nevada, and is located in the southwestern and central portions of the Las Vegas community. The Blue Diamond Detention Basin will be located on a natural wash approximately 10.5 miles southwest of downtown Las Vegas. See plate 1 for map of the overall study area. Plate 2 shows the Blue Diamond Detention Basin in detail.

CHAPTER 2 - PROJECT BACKGROUND

2.01 General. - This Supplemental Environmental Assessment (SEA) amends the U.S. Army Corps of Engineers Feasibility Report and Final Environmental Impact Statement (FR/FEIS) for Las Vegas Wash and Tributaries, Tropicana and Flamingo Washes, Nevada, dated October 1991. In addition, Supplemental Environmental Assessments (EA's) and Findings of No Significant Impact (FONSI's) have been prepared, as noted in the following tabulation.

SUMMARY OF ENVIRONMENTAL ASSESSMENTS/FINDINGS OF NO SIGNIFICANT IMPACT PREVIOUSLY PREPARED OR UNDER PREPARATION

Project Feature	Title of EA/FONSI	Date
Red Rock Detention Basin	Alternative Disposal Sites	January 1994
Red Rock Detention Basin	Red Rock Dam Modifications and Summerlin Stockpile Disposal Site	February 1995
Red Rock Detention Basin	Desert Sportsman's Disposal Site	October 1995
Las Vegas Wash (Tropicana and Flamingo Washes) Project	Recreation Report	June 1996
Tropicana Detention Basin	Tropicana Detention Basin and Outlet Channel	June 1996

Army Corps of Engineers (Corps) have indicated that only a comprehensive combined drainage and detention system would provide appropriate protection to the alluvial fan (project area) as well as commercial and residential developments further downstream. Since preparation of the FR/FEIS and EA/FONSI's, the location of the dam has been refined. The dam has been changed from an off-line basin with a diversion structure to an on-line structure located about 6,500 feet (1.23 miles) upstream of the original (Feasibility Report) location. The recommended Blue Diamond Detention Basin is similar in concept and function and is not substantially different in location than the feasibility design.

CHAPTER 4 - PROJECT DESCRIPTION

4.01 Overall Project Description. - The project description remains the same as that for the plan tentatively selected for implementation that is described and evaluated in the FR/FEIS for Las Vegas Wash and Tributaries, Tropicana and Flamingo Washes, Nevada, dated October 1991. The plan comprises a comprehensive system of detention basins, debris basins, lateral collector channels and primary channels. The system is designed to intercept and divert floodflows in the project area into detention basins, from which flows would be released at nondamaging rates downstream. The Corps' proposed plan is the National Economic Development (NED) plan and would provide 100-year flood protection to the area.

4.02 Authorized Blue Diamond Detention Basin. - Blue Diamond Dam is an off-channel structure just north of the Blue Diamond Wash channel and Blue Diamond Road, or about 7.5 miles west of the I-15 Freeway on Blue Diamond Road. The main embankment would be comprised of roller compacted concrete (RCC) with a maximum height of about 49 feet at its highest point. The basin would have a capacity of 2,300 acre-feet at the 100-year water surface; and 4,050 acre-feet at the crest of the dam, of which 200 acre-feet would be for the accumulation of sediment. The crest of the dam (elevation 2869 feet above mean sea level) is about 6,524 feet long, and is designed to reduce a 100-year flood with a peak inflow of 12,300 cubic feet per second (cfs) to an outflow of 180 cfs. The outlet would consist of an ungated 30-inch diameter reinforced concrete conduit, located under the main embankment near the center of the dam.

A diversion dike with a maximum height of about 15 feet, would be constructed across Blue Diamond Wash to divert flows to the excavated inlet channel for the reservoir. The diversion dike would have a low flow outlet to the natural channel below the structure to maintain the existing habitat downstream.

The excavated inlet would consist of a 900 foot-long reinforced concrete trapezoidal channel having a depth of 13 feet, an invert width of 100 feet, and side

The head wall will be 12 feet wide and 11 feet high. The walls will vary in height from 11 feet to 5 feet.

An environmental by-pass channel, as committed to in the EIS, is incorporated into the design of the Outlet Works. It will release at least the first 50 cubic feet per second (cfs) from the detention basin to the natural wash downstream following a large storm event.

4.04 Changes to the Feasibility Report Plan. - The Blue Diamond Detention Basin will be constructed essentially as presented in the FR/EIS with the exception that the dam has been relocated. The dam has been changed from an off-line basin with a diversion structure to an on-line structure located about 6,500 feet (1.23 miles) upstream of the original (Feasibility Report) location. The recommended Blue Diamond Detention Basin is similar in concept and function and is not substantially different in location than the Feasibility design. Information documented in the FEIS and previously prepared EA/FONSI's remains current except as noted.

CHAPTER 5 - ALTERNATIVES CONSIDERED

5.01 Alternatives Considered. - Numerous alternatives were considered and eliminated prior to completion of the Feasibility Report and FEIS and numerous alinements of the channels were considered subsequent to completion of the FR/FEIS. Most of the alternatives were not economically justified. No further alternatives are being studied as part of this action.

CHAPTER 6 - AFFECTED ENVIRONMENT

6.01 General. - This section contains discussions of environmental resources within areas that would be affected by the construction of the Blue Diamond Detention Basin. This SEA amends the 1991 FR/FEIS, which for the existing environment is still current. As noted in Chapter 4, above, the only changes from the project as originally proposed in the FR/FEIS is the change in the areal location of the dam and basin. A description of the existing environment at the site is provided in the following paragraphs.

6.02 Topography, Geology, and Soils. - The project area for the Blue Diamond Detention Basin lies within and adjacent to the Las Vegas Valley of southern Nevada. Elevations range from approximately 1,800 to 2,400 feet in the valley to 11,912 feet at Charleston Peak. The Las Vegas Valley extends in a northwest-southeast direction with the Spring Mountains to the west; the Pintwater,

automobiles. Due to meteorological conditions, which are typified by low-level temperature inversions and calm or light winds, the highest CO concentrations are measured during the winter months. Another issue of concern in the Las Vegas Valley is PM10 air pollution. Particulates, particularly combustion particles and fugitive dust, having a diameter of 10 microns or less, are commonly referred to as PM10. These particulates, because they are small enough to be inhaled, constitute a public health hazard when ambient concentrations exceed certain levels. On January 8, 1993, the U. S. Environmental Protection Agency reclassified the Las Vegas Valley Nonattainment Area from "moderate" to "serious" for PM10. Construction activities could be a major source of PM10 emissions (e.g., fugitive dust) within the Las Vegas Valley and Clark County as a whole. Additional information may be found in the EIS, Chapter 3.

6.06 Water Resources. - The project area is generally arid in nature. Natural drainage paths are generally ephemeral in nature, conveying surface flows only in response to storm events. Precipitation over the area is infrequent and totals to a yearly average of only 4.4 inches. Much of this rainfall, however, occurs as short duration, high intensity late summer storms. High intensity rainfall events produce rapid runoff and "flash" flooding of downslope areas, especially if the storm cell is moving in the downslope direction. The mountain region tributary to the project area generates large volumes and rates of runoff due to its steep slopes, lack of vegetation, and low permeability. Sediment movement can be extensive during major flows, and can even be quite significant during one or more minor flows. Lateral channel migration can occur and sediment deposition can occur, reducing channel conveyance capacity and widening the floodplain.

The water quality for storm water runoff is, with the exception of turbidity, most likely a function of human activity in the tributary areas. As the watershed is developed, the occurrence and concentrations of contaminants associated with rural and urban areas can be expected to increase in storm water runoff. Additional information may be found in the EIS, Chapter 3.

6.07 Vegetation and Wildlife. - Except as otherwise noted, information on biological resources is based on the Final Fish and Wildlife Coordination Act Report (Final CAR), dated October 1991, from the U. S. Fish and Wildlife Service (FWS); and previous Corps environmental evaluations prepared for the project, one in 1985, and a supplement prepared in 1988. The Final CAR may be found in Appendix B of the EIS. Complete plant and animal species lists are provided in Appendixes A through D of the Final CAR. The primary plant communities affected by construction of the Blue Diamond Detention Basin are the creosote bush scrub community and the Mojave desert wash scrub community. These habitat communities are discussed in the following subparagraphs. Additional information may be found in the EIS, Chapter 3.

zebra-tailed lizard (Callisaurus draconoides), side-bloched lizard (Uta stansburiana), desert horned lizard (Phrynosoma platyrhinos), and western whiptail (Cnemidophorus tigris), and such snakes as the coachwhip (Masticophis flagellum), glossy snake (Arizona elegans), gopher snake (Pituophis catenifer), and the Mojave rattlesnake (Crotalus scutulatus). The desert tortoise (Gopherus agassizii) is found here and is further discussed under Sensitive Species, paragraph 6.08 d., below.

Birds of creosote bush scrub include turkey vulture (Cathartes aura), red-tailed hawk (Buteo jamaicensis), Gambel's quail (Callipepla gambelii), greater roadrunner (Geococcyx californianus), Say's phoebe (Sayornis saya), horned lark (Eremophila alpestris), common raven (Corvus corax), verdin (Auriparus flaviceps), blue-grey gnatcatcher (Polioptila caerulea), logger-head shrike (Lanius ludovicianus), Abert's towhee (Pipilo aberti), and black-throated sparrow (Amphispiza bilineata). Many other species are either summer or winter residents (Appendix B of the Final CAR).

Mammals characteristic of creosote bush scrub include black-tailed jackrabbit (Lepus californicus), white-tailed antelope squirrel (Ammospermophilus leucurus), desert woodrat (Neotoma lepida), pocket mice (Perognathus spp.), kangaroo rats (Dipodomys spp.), coyote (Canus latrans), kit fox (Vulpes macrotis), and desert cottontail (Sylvilagus audubonii). A complete list is provided in Appendix D of the Final CAR.

Fauna associated with upland habitats described above are found in desert riparian habitat with a variety of other species attracted there in part by the more diverse flora. Honey mesquite and desert willow are particularly important to wildlife. The leaves of the mesquite are grazed by insect herbivores, and the abundant, energy-rich flowers provide an important resource for other insect species. Many birds forage on the insects and a variety of vertebrates on the fruit and seed pods. Desert willow attracts many insects, and this species is used extensively by birds for foraging and nesting. Reptiles found in desert riparian habitat include zebra-tailed, side-blotched, and desert horned lizards and speckled rattlesnake (Crotalus mitchellii). Desert tortoises often construct burrows in the banks of desert washes, and may forage in these areas because of the likelihood of a higher concentration of desert annuals, particularly during drier years.

Birds found in this habitat include several raptors, Gambel's quail, mourning dove, greater roadrunner, four species of hummingbirds, and many passerines, in particular the ash-throated flycatcher, verdin (Auriparus flaviceps), blue-grey gnatcatcher, cactus wren (Campylorhynchus brunneicapillum), phainopepla, Lucy's warbler (Vermivora luciae), Abert's towhee, and white-crowned sparrow.

fragmented and appear to be declining over most of its range. It is currently considered a rare species by the State of Nevada. The desert tortoise or its sign was found in the majority of the Las Vegas Valley area west of urbanized Las Vegas, and within the Blue Diamond Detention Basin area (see the Final CAR, Appendix B). Within the Blue Diamond Detention Basin, there is about 197 acres of tortoise habitat that may be impacted (see paragraph 7.07, below).

No other sensitive wildlife species are expected to occur within the project area. A Formal Consultation, under Section 7 of the Endangered Species Act, was completed for the desert tortoise for the overall project. See the FEIS, Appendixes D and E for the Biological Assessment and Biological Opinion, respectively. Additional information may be found in the EIS, Chapter 3.

6.08 Fisheries. - All of the watercourses within the project area are intermittent streams, and as such no fishery is present.

6.09 Cultural Resources. - The first archeological evidence of human occupation in southern Nevada consists of artifacts in association with extinct mammals at Tule Springs near Las Vegas. These date to about 13,000 years ago and mark the beginning of the Tule Springs period, which lasted until about 6,000 years ago. The few sites that can be assigned to this period are located near ancient water sources. Following a brief hiatus, the Corn Creek-Gypsum period began about 5,000 years ago. Milling stones, which were used for seed processing, first appear in archeological assemblages dating to this period.

By the subsequent Big Springs period, beginning about 1,450 years ago, irrigation agriculture, in addition to hunting and gathering of wild plants, was practiced in the Las Vegas Valley, and permanent settlements were established near springs. Ceramics and other southwestern Pueblo traits document the presence of the Virgin Anasazi people. During the same time period, the ancestors of the historic Southern Paiute, a Numic-speaking Great Basin people, occupied southern Nevada. By about A.D. 1150, the Virgin Anasazi pueblos had been abandoned, but the Southern Paiute continued to occupy the region until the time of white contact. Today their descendants live on the Moapa Indian Reservation and in the Las Vegas Indian Colony.

The record of European and American exploration in the region begins with the expeditions of Jedediah S. Smith in 1826 and Antonio Armijo in 1829-1830. After Fremont's expedition of 1844, which followed the cutoff from the Muddy River to Las Vegas Springs, the Old Spanish Trail was established across this region. Mormon colonization of southern Nevada began in 1855 with the establishment of a mission and fort on Las Vegas Creek. This was abandoned by the Mormons after two years, but the buildings were used by later settlers. By 1915 there were at least

and filters out into the open undeveloped desert basin. The emphasis on landscape treatment is minimal to none in the downtown and Strip areas due to the lack of open space. However, the urban development includes introduced landscape vegetation that contrast with the native character of the rural and natural areas. There are significant urban features and planned landscape areas which are visually apparent within the surrounding urban development. These elements are generally high activity areas such as urban malls, convention facilities, golf courses, and country clubs. The emphasis on design and landscape enhancement increases the visual character of these developments. The Las Vegas Valley area includes two major transportation corridors, which traverse the desert in north to south, and northwest to southeast directions. The linear features provide strong viewer orientation to distant scenic vistas and the downtown core. The elevated sections allow for more of the valley to be seen in panoramic views. The intersection of these highways is located in the central core of the urban development adjacent to the downtown. The existing visual character of the Blue Diamond Detention Basin project area is poor due to the highly disturbed nature of the area, the impact of gypsum mining adjacent to the project area, and the interspersion of development and vacant lots. Additional information may be found in the EIS, Chapter 3.

6.12 Socioeconomics. - Growth in the Las Vegas Valley area of Clark County, Nevada is occurring at a phenomenal rates. Its location relative to other metropolitan centers such as Los Angeles, Phoenix, and Salt Lake City, its warm climate, and its relative affordability have made the area attractive to increasing numbers of residents. The current population (1993 estimate) of Clark County is estimated to be approximately 919,388 persons, with about 95 percent concentrated in the urbanized metropolitan area of Las Vegas. Projections of future population in Clark County vary widely, ranging from 816,000 to 1,069,430 persons in the year 2000. Population growth has been most rapid in the areas in and adjacent to the project area.

High rates of employment growth have been associated with the high population growth rates. The County's largest single employer is Nellis Air Force Base, employing approximately 12,000 military and civilian personnel. Hotel and Gaming is the largest industry, accounting for 88,100 jobs in 1987, or 31 percent of the total. Retail trade is also a strong component of the local economy, accounting for 49,800 jobs in 1987, or 18 percent of the total. The annual unemployment rate in Clark County for 1988 is projected to be approximately 5.5 percent, one of the lowest in the nation. Between 1980 and 1988 the unemployment rate varied from a high of 10.9 percent in 1982 to the current low of approximately 5.5 percent. The unemployment rate has decreased steadily since 1982.

Expansion of the housing stock has been driven by the area's population growth. Currently, several large subdivisions are under construction. The housing

7.03 Mineral Resources. - The proposed location for the Blue Diamond Detention Basin would have no impact on mineral resources. Other impacts on mineral resources are still as documented in the FR/FEIS.

7.04 Land Use. - Construction of the Blue Diamond Detention Basin will have no additional effect on land use. It will transfer the land use impacts, as identified in the FR/FEIS, to the revised areal location of the dam. Other impacts on land use are still as documented in the FR/FEIS.

7.05 Air Quality. - Construction of the Blue Diamond Detention Basin will have no additional effect on air quality. It will transfer the air quality impacts, as identified in the FR/FEIS, to the revised areal location of the dam. Other impacts on air quality are still as documented in the FR/FEIS.

7.06 Water Resources. - Revising the location of the Blue Diamond Detention Basin will not further affect water resources. Other impacts on water resources are still as documented in the FR/FEIS.

7.07 Vegetation and Wildlife. - Because of the highly disturbed nature of the FR/FEIS location of the Blue Diamond Detention Basin as well as the revised location, the impacts to vegetation and wildlife are considered to be comparable between the sites, as noted below.

R The vegetation in the Blue Diamond Wash proper, is good quality Mojave Desert Wash scrub, which extends upstream (west) of Durango Road and includes both the original diversion site and the proposed on-line damsite. The vegetation within the area that would have been impacted by construction of the diversion structure (diversion site) is Mojave desert wash scrub or desert riparian habitat (riverine intermittent streambed under the National Wetland Inventory Classification System) and lines both sides of the relatively narrow channel at this point in a continuous strip of good quality vegetation. Upstream, approximately 1.23 miles from the diversion site, at the proposed location for the on-line structure (on-line site), the channel is considerably wider, and the stream channel is braded with large areas of creosote bush scrub within the channel itself. The Mojave Desert Wash scrub lines a number of the channels, but only a thin strip of vegetation occurs there. The quality of the vegetation at the on-line site (particularly with regard to supporting migratory bird species) is not as good as the diversion site.

R A comparison of the two sites is shown in the following tabulation of permanently impacted area:

7.09 Cultural Resources. - No impacts to cultural resources are expected to occur in the Blue Diamond Detention Basin site. Other impacts on cultural resources are still as documented in the FR/FEIS.

7.10 Recreation. - The impacts on recreation are still as documented in the FR/FEIS.

7.11 Esthetics. - The impacts on esthetics are still as documented in the FR/FEIS.

7.12 Socioeconomics. - There is no change in this element as originally evaluated in the FR/FEIS.

CHAPTER 8 - COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

8.01 Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements. - Compliance with applicable laws, regulations, and Executive Orders is outlined below.

a. National Historic Preservation Act of 1966, as Amended. - The project is in compliance. There is no change in compliance from the FEIS.

b. Fish and Wildlife Coordination Act. - The project is in compliance. There is no change in compliance from the FEIS.

c. Endangered Species Act, as Amended. - The project is in compliance. The project will not affect the continued existence of any Endangered or Threatened species. There is no change in compliance from the FEIS.

d. National Environmental Policy Act. - The project is in compliance. This Supplemental Environmental Assessment has been prepared in accordance with the National Environmental Policy Act.

e. Clean Air Act. - The project is in compliance. The contractor will be responsible for complying with all applicable Federal, State, and local laws and regulations concerning air quality.

f. Clean Water Act, as Amended. - The project entails discharge of dredged or fill material into waters of the United States. Information on the project's compliance may be found in the FEIS.

g. Farmland Protection Policy Act. - No change from the original FEIS.

R a. U. S. Department of the Interior, Fish and Wildlife Service. - The U. S. Department of Interior, Fish and Wildlife Service, in their letter of December 8, 1997, had the following specific comments:

(1) **COMMENT**: "We have reviewed the draft Supplemental Environmental Assessment (SEA) for the Blue Diamond Detention Basin portion of the Las Vegas Wash and Tributaries, Clark County, Nevada, project. The document does not adequately address the impacts to biological resources of construction of the detention basin at its new location. The Fish and Wildlife Coordination Act Report prepared by our agency for this project in August 1991 indicated the plant community in Blue Diamond Wash was good quality Mojave desert wash scrub, particularly in the three mile stretch downstream from the original proposed detention basin site. The new site is about 1.23 miles upstream of that location. Therefore, there is no adequate description of biological resources for the new site except that it is "highly disturbed." No information is provided on the extent of desert wash vegetation at the new site."

RESPONSE: As indicated, the vegetation in the Blue Diamond Wash is good quality Mojave Desert Wash scrub, which extends upstream (west) of Durango Road and includes both the original diversion site and the proposed on-line damsite. As noted in the draft SEA, the vegetation within the area that would have been impacted by construction of the diversion structure (diversion site) is Mojave desert wash scrub or desert riparian habitat (riverine intermittent streambed under the National Wetland Inventory Classification System) and lines both sides of the relatively narrow channel at this point in a continuous strip of good quality vegetation. Upstream approximately 1.23 miles upstream of the diversion site, at the revised location for the on-line structure (on-line site), the channel is considerably wider, and the stream channel is braded with large areas of creosote bush scrub within the channel itself. The Mojave Desert Wash scrub lines a number of the channels, but only a thin strip of vegetation occurs there. The quality of the vegetation at the on-line site (particularly with regard to supporting migratory bird species) is not as good as the diversion site.

A comparison of the two sites is shown in the following tabulation of permanently impacted area:

Site	Riparian (Acres)	Upland (Acres)	Bare Channel (Acres)	Total (Acres)
Diversion Site	2.56	0.00	16.14	18.70
On-Line Site	3.68	15.71	5.11	24.50

movement to downstream areas except to state that the impacts are comparable between the two sites. It is not clear how these impacts could be considered similar when the detention basin likely will trap sediments and impede their movement for an additional distance of 1.23 miles. Sediment movement is important to the ecology of a desert riparian system, and this issue should be discussed in the final SEA."

RESPONSE: The structures at either location would have identical effects downstream of the structure. Either structure would trap all sediment originating upstream of the structure and both are designed to accommodate all sediment over the 100-year life of the project. As committed to in the Final EIS, either structure would provide a minimum flow (the first 50 cfs) downstream to maintain the vegetation within the channel. As the 50-cfs flow is considered to be a non-damaging flow, either structure will protect the existing vegetation from removal by high velocity flows. It is anticipated that the vegetation downstream of either alternative location would increase both in areal extent and density. The eastward limit of the good quality vegetation (as well as identifiable stream channel) occurs at (the extension of) Durango Road in either case. In addition, development is/will be occurring eastward of (the extension of) Durango Road. The following tabulation shows the linear amount of stream channel and vegetation to be preserved under each alternative.

Site	Riparian Area (Mi. Of Stream Channel)
Diversion Site	1.14 Miles
On-Line Site	2.37 Miles

As noted in Response #1, above, impacts and analysis of the Blue Diamond Wash downstream of Blue Diamond Dam will be analyzed in a future Design Memorandum and Environmental Assessment addressing the entire channel from Blue Diamond Dam to the Southern Beltway Channel.

(4) **COMMENT**: "Of additional concern is coordination with our Las Vegas Sub-Office on desert tortoise and other sensitive species. We recommend you contact them as soon as possible to resolve any issues related to this new site."

RESPONSE: Concur. On-going coordination with your Las Vegas Sub-Office will be continued, particularly with regard to the desert tortoise and other sensitive species, to resolve any issues related to this new site.

(5) **COMMENT**: "We appreciate the opportunity to comment on this supplemental environmental assessment. If you have any questions, please contact Mary Jo Elpers at (702) 784-5227."

PLATES

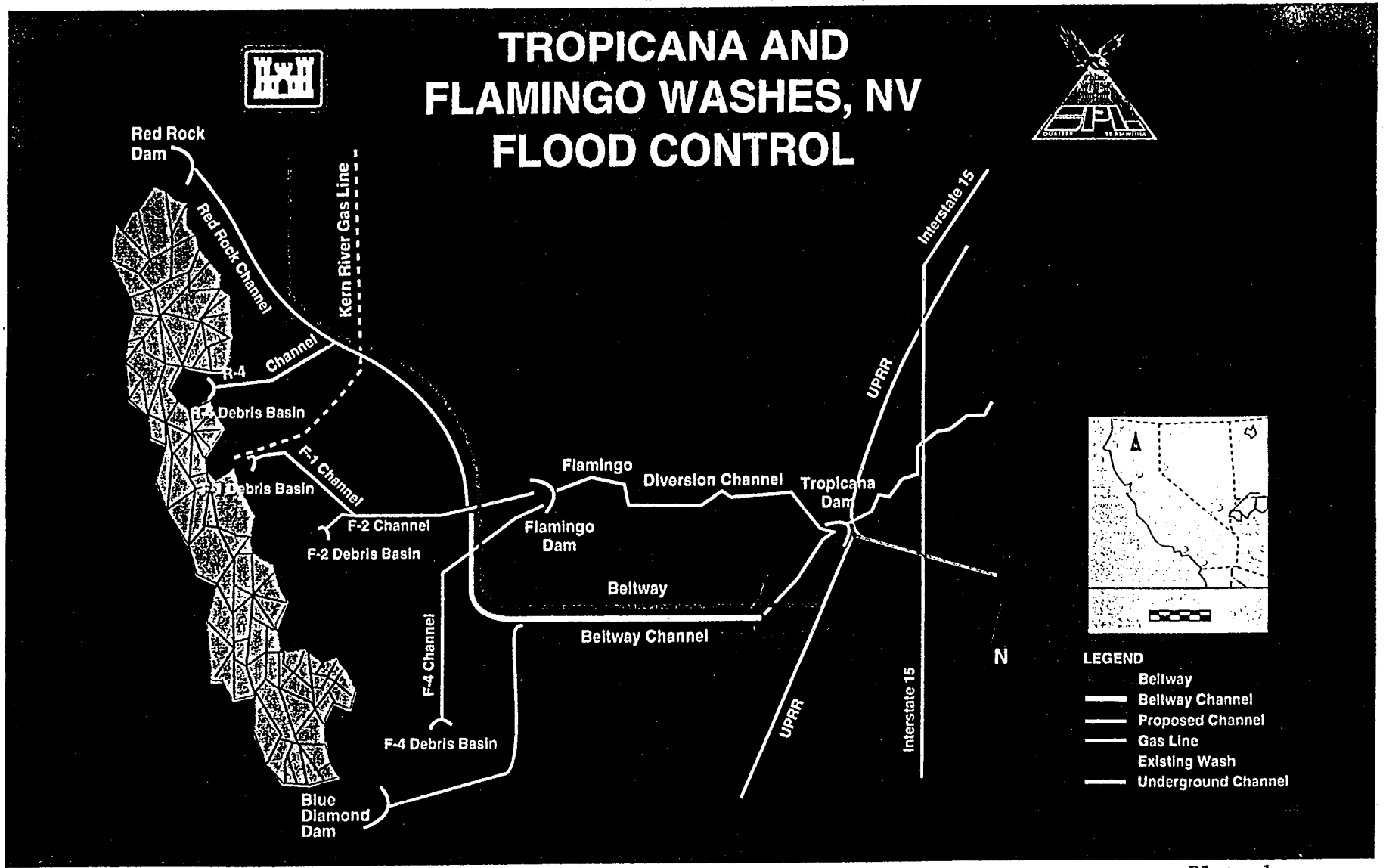
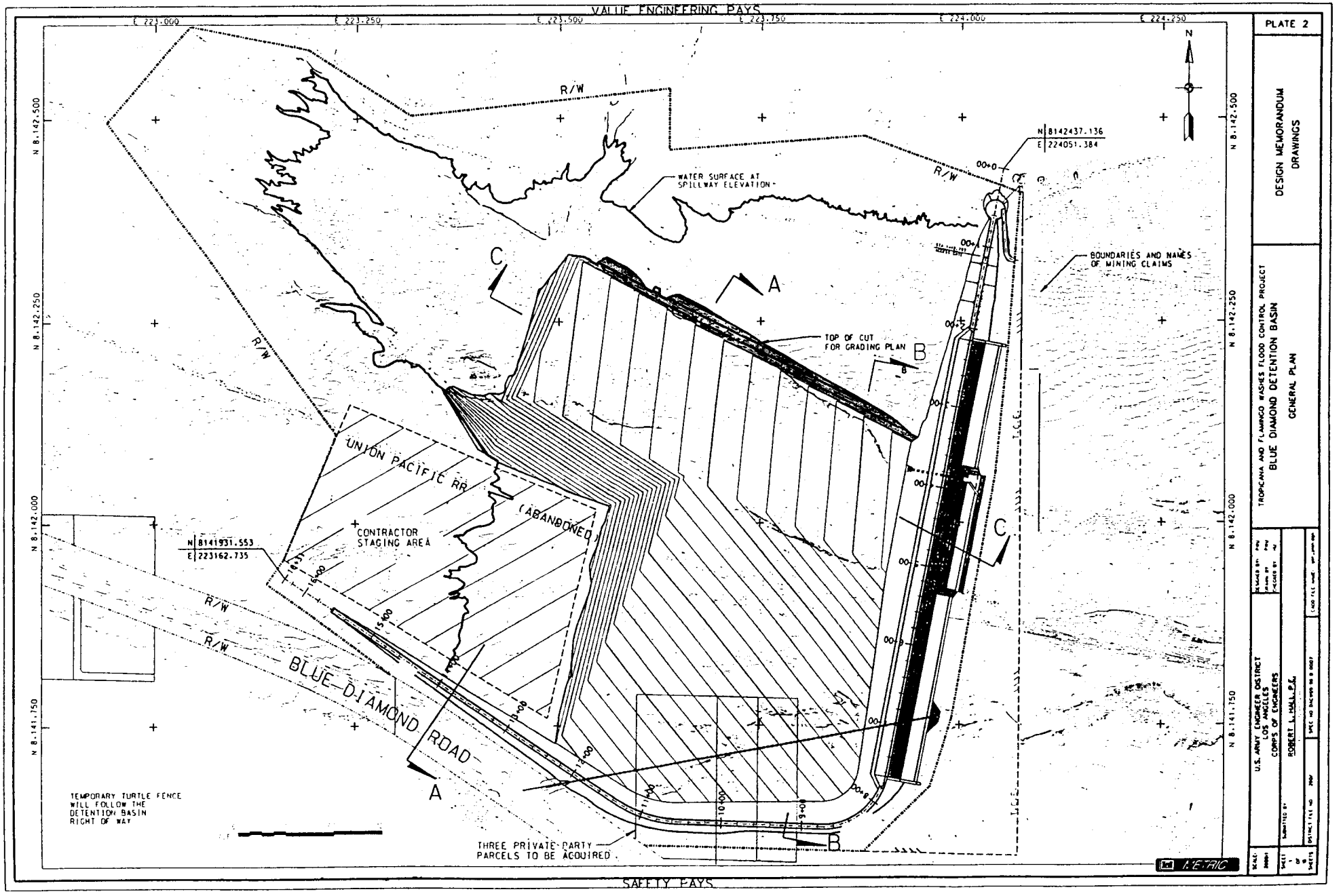

TROPICANA AND
FLAMINGO WASHES, NV
FLOOD CONTROL
Red Rock Dam
Red Rock Channel
Kern River Gas Line
R-4 Channel
Debris Basin
F-1 Channel
Debris Basin
F-2 Channel
F-2 Debris Basin
Flamingo Diversion Channel
Flamingo Dam
Tropicana Dam
Interstate 15
UPRR
Beltway
Beltway Channel
F-4 Channel
F-4 Debris Basin
Blue Diamond Dam
N
LEGEND
Beltway
Beltway Channel
Proposed Channel
Gas Line
Existing Wash
Underground Channel

Plate 1


VALUE ENGINEERING PAYS
E 223.000
E 223.250
E 223.500
E 223.750
E 224.000
E 224.250
N 8,142,500
N 8,142,250
N 8,142,000
N 8,141,750
R/W
WATER SURFACE AT SPILLWAY ELEVATION
N 8142437.136
E 224051.384
BOUNDARIES AND NAMES OF MINING CLAIMS
TOP OF CUT FOR GRADING PLAN
UNION PACIFIC RR
(ABANDONED)
CONTRACTOR STAGING AREA
N 8141931.553
E 223162.735
BLUE DIAMOND ROAD
TEMPORARY TURTLE FENCE WILL FOLLOW THE DETENTION BASIN RIGHT OF WAY
THREE PRIVATE PARTY PARCELS TO BE ACQUIRED
A
B
C
N
METRIC
SAFETY PAYS
PLATE 2
DESIGN MEMORANDUM
DRAWINGS
TROPICANA AND FLAMINGO WASHES FLOOD CONTROL PROJECT
BLUE DIAMOND DETENTION BASIN
GENERAL PLAN
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS
ROBERT L. HALL, P.E.

APPENDIX A

METRIC CONVERSION FACTORS

Conversion Factors, Non-SI to SI Units of Measurement

Non-SI units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
acres	4,046.873	square meters
acre-feet	1,233.489	cubic meters
feet	0.3048	meters
gallons (U.S. liquid)	3.785412	liters
inches	2.54	centimeters
miles (U.S. statute)	1.609347	kilometers
pounds (mass)	0.4535924	kilograms
square miles	2.589998	square kilometers
yards	0.9144	meters

APPENDIX B

PERTINENT CORRESPONDENCE

U. S. Department of Interior,
Fish and Wildlife Service December 8, 1997

United States Department of the Interior

FISH AND WILDLIFE SERVICE
RENO FISH AND WILDLIFE OFFICE
4600 KIETZKE LANE, SUITE 125C
RENO, NEVADA 89502-5055

December 8, 1997
File No. COE 3-2

Colonel Robert Davis, District Engineer
U.S. Army Corps of Engineers
Los Angeles District
Post Office Box 532711
Los Angeles, California 90053-2325

Attention: Mr. Ronald MacDonald

Dear Colonel Davis:

We have reviewed the draft Supplemental Environmental Assessment (SEA) for the Blue Diamond Detention Basin portion of the Las Vegas Wash and Tributaries, Clark County, Nevada, project. The document does not adequately address the impacts to biological resources of construction of the detention basin at its new location. The Fish and Wildlife Coordination Act Report prepared by our agency for this project in August 1991 indicated the plant community in Blue Diamond Wash was good quality Mojave desert wash scrub, particularly in the three mile stretch downstream from the original proposed detention basin site. The new site is about 1.23 miles upstream of that location. Therefore, there is no adequate description of biological resources for the new site except that it is "highly disturbed." No information is provided on the extent of desert wash vegetation at the new site.

The draft SEA also states that impacts to vegetation and wildlife are considered to be comparable between the sites. It is not clear how impacts to wildlife will be comparable if the vegetation types are different, even if the habitat is disturbed. We are interested in knowing the amount and species of desert wash scrub shrubs in the portion of the wash to be affected by the detention basin. This information should be provided in the final SEA. We again recommend that our mitigation recommendation for Blue Diamond Wash, as stated in our Final Coordination Act Report for the project, be implemented.

The SEA does not provide information on how modification of the stream channel with an on-line detention basin will affect sediment movement to downstream areas except to state that the impacts are comparable between the two sites. It is not clear how these impacts could be

APPENDIX C

PROJECT MAILING LIST

Betty Burge
TORT Group
5157 Poncho Circle
Las Vegas, NV 89119

Alan ONeil
U. S. National Park Service
601 Nevada Highway
Boulder City, NV 89005

City of Las Vegas
Planning Department
400 E Stewart Avenue
Las Vegas, NV 89101

U. S. Fish and Wildlife Service
4600 Kietzke Lane
Building C125
Reno, NV 89502

City of Las Vegas
Planning & Development
400 E Stewart Avenue
Las Vegas, NV 89101

Regional Environmental Officer
U. S. Department of the
Interior, PSW Region
600 Harrison St., Suite 515
San Francisco, CA 94107-1376
Natural Resources Conservation
Service
2357A Renaissance Drive
Las Vegas, NV 89119

NV Div. of Water Resources
555 E. Washington Ave.
Suite 4200
Las Vegas, NV 89119

Regional Forester
Region 4, Forest Service
324 25th Street
Ogden, UT 84401

irector, Office of
Ecology & Conservation
N.O.A.A., Room 5813 (PP/EC)
14th and Constitution Ave., NW
Washington, DC 20230

James Ley
Office of the County Manager
500 S. Grand Central Parkway
Las Vegas, NV 89155

Bureau of Land Management
Nevada State Office
P. O. Box 12000
Reno, NV 89520-0006

Clark County Commissioners
500 S. Grand Central Parkway
Las Vegas, NV 89155

U. S. Fish and Wildlife Service
1500 North Decatur Blvd., # 01
Las Vegas, Nevada 89109

Clark County Planning
Commission
500 S. Grand Central Parkway
Las Vegas, NV 89155

David Cowperthwaite
NV Div. of Env. Protection
333 W. Nye Ln., Room 138
Carson City, NV 89710

Glenn Trowbridge
CC Parks & Recreation
500 S. Grand Central Pkwy
Las Vegas, NV 89155

Clark County Regional Flood
Control District
301 E Clark Avenue, Suite 301
Las Vegas, NV 89101

U. S. Bureau of Land
Management
ATTN: Mark Chatterton
4765 Vegas Drive
Las Vegas, NV 89108-2135
EIS Coord, Fed. Activ. Br (P-5)
EPA, Region IX
75 Hawthorne Street
San Francisco, CA 94105

U. S. Bureau of Reclamation
P. O. Box 61470
Boulder City, NV 89006-1470

City of Las Vegas
Office of the Mayor
400 E Stewart Avenue
Las Vegas, NV 89101

Clark County
Comprehensive Planning
500 S. Grand Central Parkway
Las Vegas, NV 89155

Dave Brickey
Sierra Club
Las Vegas Group
P. O. Box 19777
Las Vegas, NV 89132
U. S. Forest Service
Las Vegas Ranger District
2881 S. Valley View, Suite 16
Las Vegas, NV 89102

U. S. Geological Survey
6770 S. Paradise
Las Vegas, NV 89119

State Historic Preservation
Officer
Historic Preservation Office
100 Stewart St.
Carson City, NV 89710
Director, Western Division of
Project Review, ACHP
730 Sims Street, Room 401
Golden, CO 80401

State Conservationist
Natural Res. Conservation Servic
5301 Longley Lane, Bldg. F,
Suite 201
Reno, NV 89511
FEMA, Region IX
Disaster Resp. and Recovery
Presidio, Bldg. 105
San Francisco, CA 94129

APPENDIX B

CHAIN OF CORRESPONDENCE FOR APPROVAL OF THE BLUE DIAMOND DETENTION BASIN STANDING INSTRUCTIONS

BLUE DIAMOND DETENTION BASIN

BLUE DIAMOND WASH

CLARK COUNTY, NEVADA

Los Angeles District

U.S. Army Corps of Engineers

December 2002

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS
333 MARKET ST.
SAN FRANCISCO, CALIFORNIA 94105-2197

CESPD-MT-E

27 NOV 2002

MEMORANDUM FOR Commander, Los Angeles District,ATTN: CESPL-ED-HR

SUBJECT: Approval -Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control

1. The South Pacific Division, Water Management Team previously conducted policy compliance and quality assurance review of the subject document and provided review comments via E-mail to Ms. Cynthia Wong, of the Reservoir Regulation Section.

2. Approval of this document is given with the proviso that the SPD comments are included in the final version of the Standing Instructions for Blue Diamond Detention Basin. Once completed, a copy should be provided to this office.

3. In the future, Dr. Checks should be used as the tool for reviewing all Water Control related documents. If you have any questions, please do not hesitate in contacting Ms. Theresa Mendoza of my staff at (415) 977-8106.

FOR THE COMMANDER:

Marda Q Stothers

MARDA Q. STOTHERS
Chief, Engineering & Construction Division

Wong, Cynthia M SPL

From: Mendoza, Theresa A SPD
Sent: Monday, December 02, 2002 10:47 AM
To: Wong, Cynthia M SPL
Subject: RE: Blue Diamond SI- QA Review Comments

thanks.... 

-----Original Message-----
From: Wong, Cynthia M SPL
Sent: Monday, December 02, 2002 10:44 AM
To: Mendoza, Theresa A SPD
Cc: Meneses, Melvin M SPL
Subject: RE: Blue Diamond SI- QA Review Comments

Terry,

I have incorporated all of your required changes to the final document. A copy of the final version of the Standing Instructions for Blue Diamond Detention Basin will be sent out to your office this week.

-Cynthia

-----Original Message-----

Wong, Cynthia M SPL

From: Mendoza, Theresa A SPD
Sent: Wednesday, November 27, 2002 11:11 AM
To: Wong, Cynthia M SPL
Subject: RE: Blue Diamond SI- QA Review Comments

Good morning Cynthia:

I'm working on the approval letter today. It will contain a statement that approval is given with the proviso that comments/changes are incorporated. I also need to make a correction to what I had E-mailed you yesterday. Please see the change in red bold text below. Thanks...TERRY -----Original Message-----

[Mendoza, Theresa A SPD] -----Original Message-----
From: Mendoza, Theresa A SPD
Sent: Tuesday, November 26, 2002 3:24 PM
To: Wong, Cynthia M SPL
Cc: Bigornia, Boniface G SPD; Sing, Edward F SPD
Subject: Blue Diamond SI- QA Review Comments

Cynthia:

I work with Boni Bigornia, in SPD Water Management and was asked to conduct a QA review of the Blue Diamond Standing Instructions (SI) that was provided to SPD. Here are a few minor review comments/editing:

Page	Para	Current Text	Change Required
iv	Preface Para 1	NAVD	change to "NAVD88" to be consistent with all reference survey controls
I-3	3	3. Project Operating Constraints	change to para 4. Project Operating Constraints; para 3 already exists
I-4	4	4. Project Operation and Maintenance	change to para 6. Project Operation and Maintenance to follow paragraph number sequence
T-1	Table I-1	South Pacific Division (415) 977-8101	x8101 out of service due to recent retirement of WMT leader. Change to **Chief, Engineeri & Division**,South Pacific Division (415) 977-8031 until position is permanently filled
T-2	Table I-2	top box - Hydrologist	Recommend that title specify which entity hydrologist is being referred to....SPL, NWS???

Hope these comments are useful to you. Do not hesitate in contacting me if you have questions. Thanks...TERRY MENDOZA (415) 977-8106

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

CESPL-ED-HR

13 November 2002

MEMORANDUM FOR Commander, South Pacific Division, CESPD-MT-E

SUBJECT: Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control

1. Enclosed are three copies of the draft Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control. Also inserted in the front of each copy are the following: (1) the District Engineer's Quality Control Certification, (2) the Programmatic and Supplemental Quality Control Plans, (3) the Review Comments and Responses. This package is being sent for your policy compliance review and quality assurance, and if everything is satisfactory, Division approval.

2. If there are any questions, please contact Cynthia Wong of the Reservoir Regulation Section at (213) 452-3560.

FOR THE COMMANDER:

Joseph B. Evelyn

JOSEPH B. EVELYN, P.E.
Chief, Hydrology and Hydraulics Branch

Encl

CESPL–ED-HR 9 October 2002

MEMORANDUM FOR Commander, Los Angeles District

SUBJECT: Quality Control Certification, Blue Diamond Detention Basin, Standing Instructions to the Project Operator for Water Control

1. Reference: CESPD-R-1110-1-8, Quality Management Plan of Directorate of Engineering and Technical Services, dated 26 May 2000.

2. The subject Quality Control Certification is submitted for your review and approval. If there are any questions, please contact Ms. Cynthia Wong, Reservoir Regulations Section, at (213) 452-3560.

Encl

for ROBERT E. KOPLIN, P.E.
Chief, Engineering Division

US ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
DISTRICT ENGINEER'S QUALITY CONTROL CERTIFICATION

Blue Diamond Detention Basin
Standing Instructions to the Project Operator for Water Control

COMPLETION OF QUALITY CONTROL ACTIVITIES

Los Angeles District, Engineering Division has completed the Standing Instructions to the Project Operator for Water Control for Blue Diamond Detention Basin, Las Vegas, Nevada. Certification is hereby given that all quality control activities defined in the Quality Control Plan appropriate to the level of risk and complexity inherent in the project have been completed. Documentation of the quality control process is enclosed. An independent review of the report has been completed. The report has been reviewed for technical and functional adequacy and has been revised in response to the local sponsors, Clark County Regional Flood Control District and Clark County Public Works.

for BONIFACE BIGORNIA — 9 Oct. '02
Independent Technical Review Manager — (date)

JOSEPH B. EVELYN, P.E. — 10-10-02
Chief, Hydrology and Hydraulics Branch — (date)

QUALITY CONTROL CERTIFICATION

As noted above, all issues and concerns resulting from technical review of the product have been resolved. The report may be transmitted to Clark County Regional Flood Control District and Clark County Public Works.

for ROBERT E. KOPLIN, P.E. — 10/11/02
Chief, Engineering Division — (date)

RUTH VILLALOBOS
Chief, Planning Division

10/21/02
(date)

GEORGE L. BEAMS, P.E.
Chief, Construction-Operations Division

30 OCT 02
(date)

STEPHEN E. TEMMEL
District Counsel

31 Oct 02
(date)

RICHARD G. THOMPSON
Colonel, Corps of Engineers
District Engineer

31 OCT 2002
(date)

CESPL–ED-HR 19 September 2002

MEMORANDUM FOR RECORD

SUBJECT: Supplemental Quality Control Plan (QCP) for the Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control, Las Vegas, NV

The subject Quality Control Plan, enclosed with this memorandum, has been reviewed and approved by the undersigned Engineering Division Branch Chiefs, and is hereby approved by the Chief, Engineering Division in accordance with the Los Angeles District Quality Management Plan.

Brian Tracy (for) 9/19/02
JOSEPH B. EVELYN, P.E. (date)
Chief, Hydrology and Hydraulics Branch

9/20/02
ABBAS T. ROODSARI, P.E. (date)
Chief, Geotechnical Branch

J. Sage 9/20/02
THOMAS H. SAGE, P.E. (date)
Chief, Design Branch

9/20/02
ROBERT E. KOPLIN, P.E. (date)
Chief, Engineering Division

Encl

CESPL-ED-HR 19 September 2002

MEMORANDUM FOR RECORD

SUBJECT: Supplemental Quality Control Plan (QCP) for the Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control, Las Vegas, NV

1. **Objective**. This document supplements the programmatic QCP as specified in CESPL-R-1110-1-8, *Quality Management Plan*, and establishes the specific in-house quality control (QC) and review procedure for the Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control.

2. Description of Document. The Blue Diamond Detention Basin Standing Instructions to the Project Operator for Water Control (SI) presents instructions to ensure the efficient and safe operation of the project at all times. The SI includes instructions to the Project Operator during normal conditions and emergency conditions. Blue Diamond Detention Basin is part of the Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) drainage system. Blue Diamond Detention Basin is designed and constructed by the Corps of Engineers to control the 100-year computed probability runoff on Blue Diamond Wash. When the project is turned over to the local sponsors, they will accept ownership and operation and maintenance responsibilities for the dam. The primary responsibility for the dam safety and operation lies with the owners and local sponsors of Blue Diamond Detention Basin.

3. **Local Sponsor**. The local sponsors consist of Clark County Public Works and Clark County Regional Flood Control District. The sponsors will be responsible for executing the SI.

4. **Production Team**. The following team members contributed to the development of the Standing Instructions.

Discipline	**Team Member**	**Office**
Team Leader	Melvin Meneses	CESPL-ED-HR
Reservoir Regulation	Cynthia Wong	CESPL-ED-HR
Hydrology	Jody Fischer	CESPL-ED-HH
Design	Paul Underwood	CESPL-ED-DB

5. Independent Technical Review. The following members performed an independent technical review and provided written comments to the Review Team Leader for response coordination and back-check responses.

Discipline	Team Member	Office
Water Management/ Review Team Leader	Boni Bigornia	CESPD-CM-B
Project Management	Kevin Inada	CESPL-PM-C
Construction Operations	Ted Masigat	CESPL-CO-OE
Construction	Robert Caskie	CESPL-CO-AV
Environmental	Alex Watt	CESPL-PD-RQ
Hydraulics & Hydrology	Joseph Evelyn	CESPL-ED-H
Soils Design	George Nahapetian	CESPL-ED-GD
Office of Counsel	Stephen E. Temmel	CESPL-OC
Local Sponsor	Stephen Roberts	Clark County Regional Flood Control District
Local Sponsor	John Cantanese	Clark County Public Works
Local Sponsor	Gil Suckow	Clark County Public Works

6. Administrative Duties. The ITRT Leader is normally responsible for the administrative duties associated with the review procedure and resolution of issues. For the Blue Diamond SI, since the ITR Leader is assigned from outside of the Los Angeles District, the Production Team Leader performed these duties, which include the development of this supplemental QCP. This is in accordance with paragraph 5.c of SPL's current Programmatic QCP for Water Control Documents.

7. Document To Be Reviewed. Draft Blue Diamond Standing Instructions to the Project Operator for Water Control.

8. Quality Control Certification. At the completion of the Standing Instructions, the District will execute the District Engineer's Quality Control Certification in accordance with CESPD Regulation 1110-1-8, *Quality Management Plan.*

Melvin Meneses
Production Team Leader

CESPL–ED-HR 16 September 2002

MEMORANDUM FOR RECORD

SUBJECT: Approval of the Programmatic Quality Control Plan for Water Control Documents

The subject Quality Control Plan, enclosed with this memorandum, has been reviewed and approved by the undersigned Engineering Division Branch Chiefs, and is hereby approved by the Chief, Engineering Division in accordance with the Los Angeles District Quality Management Plan.

Brian Tracy for 9/13/02
JOSEPH B. EVELYN, P.E. (date)
Chief, Hydrology and Hydraulics Branch

9/13/02
ABBAS T. ROODSARI, P.E. (date)
Chief, Geotechnical Branch

9/20/02
THOMAS H. SAGE, P.E. (date)
Chief, Design Branch

9/26/02
for ROBERT E. KOPLIN, P.E. (date)
Chief, Engineering Division

Encl

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PROGRAMMATIC QUALITY CONTROL PLAN

WATER CONTROL DOCUMENTS
1 April 2002

1. References:

a. ER 1110-1-12, Quality Management, Engineering and Design, 1 June 1993.
b. EC 1165-2-203, Technical Policy Compliance Review, 15 October 1996.
c. CESPD-R-1110-1-8, Quality Management Plan of Directorate of Engineering and Technical Services, 26 May 2000.
d. CESPL-ED Memorandum, Subject: Engineering Division Policy Memorandum No. 5, Development of Quality Control Plans, 8 October 1997.

2. Objective. The objective of this Programmatic Quality Control Plan (QCP) is to describe a quality control process that will result in a quality water control document that specifies an operation of a water control facility that meets all its project purposes. This QCP establishes a process to be followed by the production team, along with a system of reviews and coordination that will help insure that the team's efforts are properly directed. This QCP addresses both quality control, which deals with the study process, and quality verification, which deals with the review process. This QCP presents the appropriate level of independent technical review (ITR) of Water Control Management (WCM) Studies to ensure that they are consistent with project authorizing documents, applicable engineering regulations, policies, guidance, sound technical practices of the disciplines involved, and the needs of the local sponsor(s) as appropriate. Quality Control includes the verification of assumptions, methods, procedures, and data used in the production of the document. It also includes verification of the alternatives evaluated, appropriateness of the data used, and the reasonableness of the results.

3. Applicability. This programmatic QCP is applicable to all water control documents outlined in Section 6 of this QCP. These documents will be developed by or under the direction of the Los Angeles District Reservoir Regulation Section.

4. Supplemental QCP. An Independent Technical Review Team (ITRT) Leader will prepare a brief Supplemental QCP each time a document covered by this programmatic QCP is prepared or undergoes a major revision. The supplemental QCP will describe the document being prepared or revised, will list the local sponsors of the associated project(s) and will list the members of a Production Team and an ITRT assigned to the work. The Production Team, ITRT and ITRT Leader concepts are described in Section 5 of this QCP. Appendix A contains a template of a Supplemental QCP. A memorandum will be prepared by the ITRT Leader that routes the Supplemental QCP through each branch chief in Engineering Division for concurrence by the branch chiefs and then to the Chief, Engineering Division for final approval.

5. Quality Control Activities. Technical review of water control documents will be accomplished in accordance with the CESPL-ED Quality Management Plan. Three types of reviews will be carried out; a "production team" review, a "supervisory" review, and an "independent technical" review.

The production team review, the supervisory review and the independent technical review will be conducted in a "seamless" manner. Intermediate products will be technically reviewed during development before they are integrated into the overall document. Technical section chiefs and/or senior personnel will be responsible for providing an overview/peer check of major assumptions, analytical approaches, and significant calculations throughout the study effort. Additionally, the production team members will consult with their ITR team counterpart during the study effort to discuss assumptions, procedures, and/or significant calculations to resolve any significant comments prior to the final ITR.

While the production team and supervisory reviews may be conducted on an informal basis, the consultations with the ITR team counterpart will be documented, with copies forwarded to the ITRT Leader. In the course of executing the work, the Production Team members and supervisory staff should be promptly advised of any significant developments that adversely affect the quality, schedule, or cost of producing the document.

a. Production Team Review. A specific production team will be established for each water control document. The leader of the Production Team will be a member of the Los Angeles District Reservoir Regulation Section. The Production Team Leader will request the services of other disciplines and will arrange for their funding, as necessary. The section chief in charge of these disciplines will designate production team members and if appropriate, review team members for their portion of the document. If the Production Team Leader wishes to assign staff from outside of the district, this will be coordinated with the section chief of the corresponding discipline prior to any work taking place.

All members of the production team will review the entire internal draft water control document. The main purpose of this overall review is to discover and resolve any inconsistencies or contradictions among the sections in the document produced by the various disciplines.

b. Supervisory Review. The supervisor of each production team member, in order to assure the quality of the technical subproduct for which she/he is responsible, will review the team member's subproduct. All or part of this review may be delegated to another member of the supervisor's staff at the supervisor's discretion. The supervisory review will address all aspects of the subproduct, including its conformance to the project authorizing document, applicable technical policy and guidance as well as to the proper selection and application of technical criteria. The supervisory review will also include a thorough check of calculations and results. Within the Reservoir Regulation Section, supervisory reviews will be performed by the Production Team Leader's work group leader, if there is one, as well as by the Section Chief, and by the Hydrology and Hydraulics Branch Chief.

c. Independent Technical Review. The ITRT will be composed of members from each discipline necessary for the development of the water control document. The members will be work group leaders and/or journeymen level engineers in the technical area being reviewed. In the case of the Water Control Independent Technical Review, the Los Angeles District Reservoir Regulation Section will consult with the South Pacific Division (SPD) Water Control Center (WCC), in determining the ITRT member for water control. The ITRT member for water control may be from within the Los Angeles District, from the SPD WCC, or from the water control function in another district. Generally, the ITRT member for water control will be the ITRT Leader, however, if the ITRT member for water control is assigned from outside the Los Angeles District, the Production Team Leader will handle the administrative duties of the ITRT Leader.

The sponsors will be afforded the opportunity and will be encouraged to participate in the independent technical review. The ITRT team leader will coordinate the sponsors' involvement.

Review schedules will be prepared during the development of each document. Each ITRT member will prepare memoranda documenting their seamless review consultations and final ITRT comments, which will become part of the ITRT's records. All comments will be addressed and appropriate changes incorporated into the document.

d. District Engineer's Quality Control Certification. At the conclusion of the ITR, the Los Angeles District will execute the District Engineer's Quality Control Certification. This certification will be prepared and signed by the ITRT Leader. It will then be routed to and signed by the Reservoir Regulation Section Chief, the H&H Branch Chief, the Engineering Division Chief and finally by the District Engineer. The draft document and the Quality Control Certification will then be submitted to the SPD WCC for Policy Compliance Review and Quality Assurance. A model of this certification can be found within Appendix H of CESPD R 1110-1-8.

6. Water Control Documents. This Programmatic QCP applies to the following water control documents:

a. Water Control Manuals (for individual water control projects)
b. Master Water Control Manuals
c. Interim Water Control Plans During Construction
d. Preliminary Water Control Plans
e. Final Water Control Plans
f. Standing Instructions to Project Operators for Water Control
g. Drought Contingency Plans
h. Initial Reservoir Filling Plans

7. Scope of Independent Technical Review. Specifics of the ITR will involve the following:

a. Compliance with established policies, principles, and procedures.
b. Adequacy of the scope, content, and organization of the technical documentation.
c. Appropriateness of all assumptions and methods

d. Appropriateness data presented
e. Consistency
f. Accuracy
g. Comprehensiveness

8. Conflict Resolution Procedures. Specific issues raised in the ITR will be documented in a comment, response, action required, and action taken format. Any disagreements will be brought to the attention of the appropriate functional chief to facilitate resolution of any unresolved technical disagreements between the production team and review team counterparts.

Issues that cannot be resolved between the Production Team and the ITRT will be raised to senior district and SPD staff for resolution. Frequent informal contact, by telephone or meetings, will be maintained on a routine basis by individuals and by small groups of team members. Should issues arise concerning Corps of Engineers policy or technical criteria that cannot be answered at the District or SPD level, HQUSACE advice will be sought. If necessary, Issue Resolution Conferences or other appropriate meetings will be arranged.

9. Policy Questions. Policy issues, if any, will be resolved through SPD.

10. Revisions to the Programmatic or Supplemental QCPs. This programmatic QCP will be updated as necessary to reflect changes in Corps or SPD policy or procedures. The Supplemental QCP will be updated if there are changes in the staff available for the Production or Review Teams. Changes to the ITR member for water control will be coordinated with the SPD WCC.

11. Division Policy Compliance Review and Quality Assurance. The SPD WCC shall perform the Division Policy Compliance Review and Quality Assurance in accordance with CESPD Regulation No. 1110-1-8, Subject: Quality Management Plan, dated 26 May 2000 Appendix D. A flowchart of the entire process for producing a water control document is furnished as Appendix B to this document.

12. Filing of the Water Control Management Quality Control Documents. This programmatic QCP, QCP supplements, and SPD approvals will be kept on file within the Los Angeles District Reservoir Regulation Section.

APPENDIX A

CESPL-ED-HR (1110) [date]

MEMORANDUM FOR RECORD

SUBJECT: Supplement to the Los Angeles District Programmatic Quality Control Plan for Water Control Documents dated 22 January 2002 for the [Project] [Document]

1. This Supplement provides the product description, identifies the local project sponsor, and lists the Production and Independent Technical Review Team (ITRT) members for the [preparation/revision] of the [project] [document].

2. [Describe the purpose of the document]

3. The local sponsor for this document is [name of owner, operator and/or local sponsor].

4. The production team for this document is as follows:

Discipline	Team Member	Office
[list the discipline]	[name of team member]	[org code ie: CESPL]

5. The ITRT for this document is as follows:

Discipline	Team Member	Office
[list the discipline]	[name of team member]	[org code]

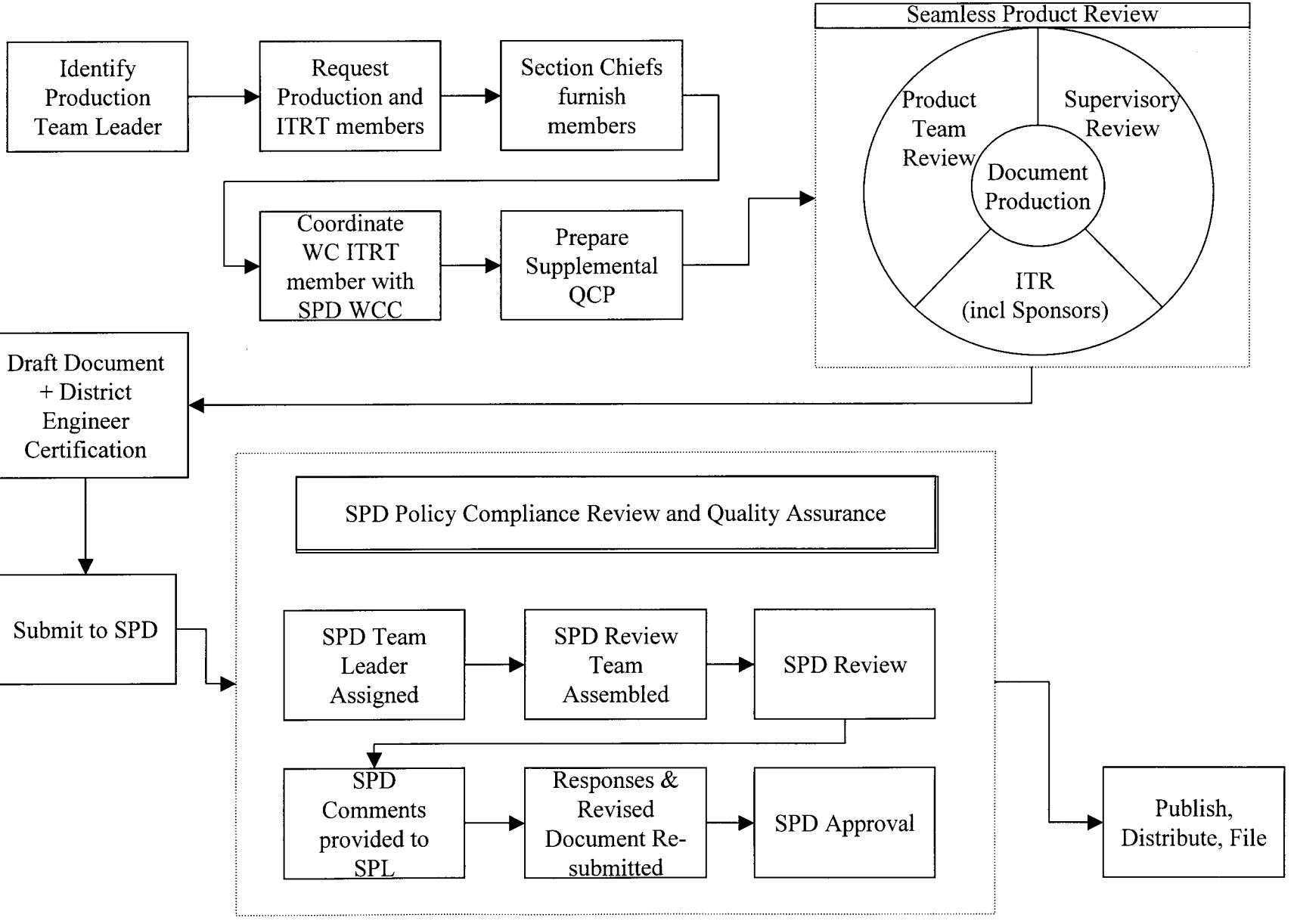
The ITRT member for water control has been coordinated with [name] of the South Pacific Division Water Control Center (SPD WCC).

6. The document to be reviewed will be the internal draft [project] [document].

7. When the ITR process is complete the Los Angeles District will execute the District Engineer's Quality Control Certification in accordance with CESPD Regulation 1110-1-8, Quality Management Plan. The draft document and the certification will then be submitted to the SPD WCC for Policy Compliance Review and Quality Assurance.

NAME
Independent Technical Review Team Leader

Appendix B
Los Angeles District Programmatic Quality Control Process for Water Control Documents



REVIEW COMMENTS AND RESPONSES
TO
BLUE DIAMOND
DRAFT STANDING INSTRUCTIONS
FOR THE PROJECT OPERATOR FOR WATER CONTROL

Dated August 2001

The review comments and responses are presented in the following order:

1. Corps of Engineers
   - CESPD-CM-B
   - CESPL-PM-C
   - CESPL-CO-AV

2. Local Sponsors
   - Clark County Regional Flood Control District
   - Clark County Public Works

Corps of Engineers

Comments and Responses

Response to comments from CESPD-CM-O, B. Bigornia dated 30 August 2001, on draft Blue Diamond Standing Instructions.

1. Use a continuous underlining of all headings.

Response: *Concur. Headings have been revised.*

2. Sec. I.A.2, Para 2. Include a copy of the signed '98 FONSI in the report.

Response: *Concur. '98 FONSI is included.*

3. Sec. I.A.3. Show the location of the Basin Bypass Conduit on Plate 1.

Response: *Do not concur. The location of the Basin Bypass Conduit should not be located on Plate 1 as suggested due to the scale of the map. The Basin Bypass Conduit is located under the entire basin and is shown in proper detail on plates 3b and 3c.*

4. I.B.1. Normal Conditions. What would be deemed a major storm event with large volume of storm runoff?

Response: *We propose to send a monitor if the weather service predicts a rainfall total of 1inch in 24-hours as a start. As project experience is gained, the Project Operator shall determine the conditions necessary to send a monitor to the project site. Section was modified as such.*

5. I.B.1. Include in the report the phone number of the NWS office that would be needed to determine a 'major storm'.

Response: *Concur. NWS phone number and website are included in the report.*

6. Table I-1. Change the SPD information to 415 977-8101. Also, there is no longer a pager number.

Response: *Concur. Phone number has been revised. Pager number has been deleted.*

7. Section II. Data Collection and Reporting. Include copies of the reference SPL forms #403 in the report.

Response: *Concur. Forms #403 are included in Section II, Data Collection and Reporting of the report.*

Response to comments from CESPL-PM-C, K. Inada dated 22 December 2001 on draft Blue Diamond Standing Instructions.

1. Please provide a copy of this report to Rob Caskie, Con-Ops, for his review comments.

Response: *Concur. Review was requested and comments were received from Rob Caskie.*

2. Specify a level in the basin at which sediment must be removed during annual checks. In addition, indicate a time at which it should be removed (i.e. prior to May) (page I-4, para. 5)

Response: *The paragraph on page I-4 has been revised. 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).*

3. Show how the SPL Emergency Operations office is included in our organization (T-1) and in the associated narratives.

Response: *Do not concur. SPL Emergency Operations is part of our organization, but is not involved in making Reservoir Operations decisions, and therefore is not included in Table I. SPL Emergency Operations' involvement is contained in the document entitled "Emergency Action Plan for Blue Diamond Detention Basin, US Army Corps of Engineers, Los Angeles District", dated November 2000.*

Response to comments from CESPL-CO-AV, R. Caskie dated 23 January 2002, on draft Blue Diamond Standing Instructions.

1. Harvey Beverly performed an as-built survey of the Blue Diamond Detention Basin and also determined the capacity at spillway crest elevation. You may want to obtain this information and utilize this info in the report. The basin actually ended up having a capacity greater than designed so we put back some material into the basin that was originally excavated (removed) by the Contractor (about 15 acre feet from what Harvey calculated was put back into the basin).

Response: *We obtained the as-built survey from Harvey Beverly; however, upon discussions with Tom Sage, Kevin Inada, and Paul Underwood, we are using the final design storage volume table since the local sponsors are required to restore the detention basin back to final design conditions. This supersedes the storage table in the Blue Diamond Detention Design Memorandum dated April 1998.*

2. I don't know whose responsibility it is to create reporting forms, I know the Sponsor has to provide the reports, but blank form examples for reporting events pertinent to this facility may ensure that we get the info in the format that we want the info from the Sponsor. Do we normally include blank reporting forms? Looking at the Table of Contents it would appear that this issue would be Appendix 2, which I don't see.

Response: *Concur. Forms #403 which are used for annual operation and maintenance reporting are included in Section II, Data Collection and Reporting of the Standing Instructions.*

Local Sponsors

Comments and Responses

Response to comments from Clark County Regional Flood Control District dated 14 January 2002, on draft Blue Diamond Standing Instructions.

1. Pertinent Data Tables. Change 100-year peak inflow to read 13,800 cfs rather than 138,000 cfs. Probable maximum flood (PMF) peak inflow and outflow values (146,588.3 cfs) are equal, however spillway design discharge (144,500 cfs) indicates there is attenuation of PMF event. On metric Pertinent Data Table, spillway design discharge and PMF inflow and outflow values all equal 4,105.94 m3/s, which is 145,000 cfs in English units, which does not agree with English Pertinent Data Table. Determine correct spillway design discharge and PMF peak inflow and outflow values, and be consistent in Pertinent Data Table, text, and figures. Explain why elevation of spillway maximum water surface (2973.74 ft/906.40 m) does not agree with PMF peak elevation (2972.61 ft/906.05 m). Values listed elsewhere in report should be reflected in Pertinent Data Tables. Resolve these and other discrepancies describe herein.

Response: *The 100-year peak inflow was changed to read 13,700 cfs, rather than 13,800 cfs. The PMF peak inflow values were both changed to 144,000 cfs, which shows no attenuation of the PMF event. PMF and RDF routing values, which differ from the values in the previous draft SI and in the DM, were taken from the results of revised HEC1 runs that were made after the DM was printed. These routings are not documented in any report, but they were done using the project's as-built features (top of dam elevation, spillway crest elevation, outlet works configuration), adjusted drainage area (due to the construction of the basin by-pass), and the adjusted storage and area relationships (from the changed grading plan). An explanation of this departure from the DM values is explained in the added "Preface" of the current draft SI. The Preface also explains why the as-built crest elevation differs from the revised PMF maximum elevation.*

2. Section I.A.1. District is listed as Project Operator and keeper of Standing Instructions. In accordance with Project Cooperation Agreement, Corps will turn project over to CCPW, who will be responsible for inspection, maintenance, and operation of facility. District will provide funds to CCPW to inspect, maintain, and operate facility. Clarify appropriate responsible local agencies. Provide CCPW with copy of Standing Instructions.

Response: *Concur. Text has been revised to have CCPW responsible for inspection, maintenance, and operation of facility. District will provide funds to CCPW to inspect, maintain, and operate facility. CCPW was also provided with a copy of draft Standing Instructions to review, and a copy of the approved SI will also be provided.*

3. Section I.A.3. Detention basin storage capacity is listed as 2030 acre-feet. Total storage capacity is 2268 acre-feet according to Pertinent Data Table and Design Memorandum – Blue Diamond Detention Basin dated April 1998, and 2382 acre-feet according to Plate 18. Resolve discrepancies or clarify that storage volume of 2080 acre-feet is for clear water only.

Response: *See response to comment #1. The design storage capacity of the detention basin is 2313 ac-ft (2,852,791 m^3). This supersedes the storage table in the Blue Diamond Detention Basin Design Memorandum, dated April 1998. The design storage capacity includes an allowance of 238 ac-ft (293,571 m^3) for sediment deposition during the RDF and 89.59 ac-ft (110,508 m^3) for antecedent sediment storage.*

Flood Control	*2,742,283 m^3*	*2223 ac-ft*
Antecedent Sediment Storage	*110,508 m^3*	*89.59 ac-ft*
Gross Capacity at spillway crest	*2,852,791 m^3*	*2313 ac-ft*

Note: Flood control includes 238 ac-ft (293,571 m^3) for sediment deposition during the RDF.

4. Section I.A.3, Embankment. Continue outline numbering system on project components within body of report. Coordinate values of embankment crest elevation and maximum height above streambed with Pertinent Data Table.

Response: *Concur. Numbering system for the project components within body of report have been continued.*

5. Section I.A.3, Outlet Works. In addition to clogging, trash rack prevents damage to outlet conduit from large debris. Please include this purpose in trash rack description.

Response: *Concur. Added to trash rack description.*

6. Section I.A.5. Corps states that Project Operator is required to remove sediment accumulation annually and after each major storm event. Standard practice for other District-funded facilities is to remove sediment once it accumulates to a pre-determined level, such as the crown of sediment berm. Please confirm with CCPW District's understanding of their maintenance procedure to remove sediment when level reaches crown of sediment berm in Blue Diamond Wash Detention Basin.

Response: *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).*

7. Section B.2. Identify "SPL" and provide name, title, address, and/or phone number of contact.

Response: *Concur. "Los Angeles District" has been added to identify "SPL". The 24-hr phone number of the Reservoir Operations Center, (213) 452-3623, has been added. Names, phone numbers, etc. are in SPL's annual publication titled, "Instructions for Reservoir Operations Center Personnel (The Orange Book)". SPL will send copies of the Orange Book to both CCPW and CCRFRD prior to the flood season of each year.*

8. Section II. Clarify that District, not Project Operator, owns, operates, and maintains flood threat recognition system (gages), however, CCPW (Project Operator) will be responsible for monitoring site during a storm event. District is unaware of a stream gage down stream of outlet works. Refer to District website at www.CCRFCD.org for map of gage locations.

Response: *Concur. Clarification has been added that the District owns, operates, and maintains flood threat recognition system (gages) and CCPW (Project Operator) will be responsible for monitoring the project site during a storm event. Stream gage note from figure has been removed. The District's website with gage locations has been added to the Standing Instructions for reference.*

9. Table I-2. Provide Chain of Command for CCPW, Project Operator, in Table. Include District's role as owner of flood threat recognition (gages).

Response: *Table I-2 was modified to show the response implementation plan only and not chain of commands of both agencies. CCPW is indicated as Project Operator and CCRFCD as owner of flood threat recognition system (gages).*

10. Tables I-3 through I-6. Tables are reportly taken from Design Memorandum-Blue Diamond Detention Basin dated April 1998, or revised based on As-Built information. However, values conflict with information provided in Pertinent Data Table. Resolve the following discrepancies:

a. Tables I-3 and I-3a. Detention basin area at spillway crest is greater in table than given in Pertinent Data Table.

b. Tables I-4 and I-4a. Detention basin storage capacity at spillway crest is greater in tables than given in Pertinent Date Table.

c. Tables I-5 and I-5a. Outlet works discharge rate at 100-year peak flood elevation is slightly greater in tables than in Pertinent Data Table.

d. Tables I-6 and I-6a. Outlet works discharge rate at maximum water surface elevation is less in tables report in Section I.A.3, Outlet Works.

Response: Also see response to comment #1. Tables I-3 and I-4 have been updated to reflect final design storage and area values. This supersedes the Design Memorandum Blue Diamond Detention Basin dated April 1998. Tables I-5 and I-6 were updated to reflect the final design conditions.

11. Plate 18. Basin capacity at spillway crest is 2382 acre-feet on figure and 2268 acre-feet on Pertinent Data Table. Please verify total capacity at spillway crest. If actual basin capacity is 2382 acre-feet, 352 acre-feet is available for sediment storage, which is 114 acre-feet more that debris yield produced by 100-year storm event. Therefore,

additional sediment storage is available to allow CCPW to perform standard maintenance procedures as described in Comment 6. PMF peak flowrate is given as 146,588.3 cfs on Pertinent Data Table. Resolve discrepancies.

Response: *Also see response to comment #1. The final design storage capacity of the detention basin is 2313 ac-ft (2,852,791 m^3). This supersedes the storage table in the Blue Diamond Detention Basin Design Memorandum, dated April 1998. The design storage capacity includes an allowance of 238 ac-ft (293,571 m^3) for sediment deposition during the RDF and 89.59 ac-ft (110,508 m^3) for antecedent sediment storage.*

12. Plates 22 and 22a. Maximum pool elevation on figures agrees with spillway elevation of maximum water surface, but not PMF peak elevation on Pertinent Data Table. Resolve discrepancies.

Response: *See response to comment #1.*

13. Plates 23 and 23a. On Plate 23, correct drainage area, maximum storage, maximum stage, and maximum outflow to match Pertinent Data Table and Plate 18. On Plate 23a. Correct maximum storage and maximum stage to match Pertinent Data Table and Plate 18.

Response: *See response to comment #1. Plate was updated.*

14. Plates 24 and 24a. On Plate 24, correct drainage area, maximum inflow, maximum storage, inflow volume, and maximum stage to match Pertinent Data Table and Plate 18. On Plate 24a, correct maximum storage, inflow volume, and maximum stage to match Pertinent Data Table and Plate 18.

Response: *See response to comment #1. Plate was updated.*

15. Plate 25. Remove stream gage note from figure.

Response: *Concur. Stream gage note from figure has been removed.*

Response to comments from John Cantanese, Clark County Department of Public Works dated 5 March 2002, on draft Blue Diamond Standing Instructions.

1. Page I-1. "Background and Responsibilities", A-1. General Information; in addition, a copy of the Standing Instructions need to be referenced to Clark County Department of Public Works (CCPW) which Owns, Operates and Maintains the Detention Basin Facility.

Response: *Concur. Revision made as suggested.*

2. Page I-2. "Background and Responsibilities", A-1. Spillway; Reference that the spillway is constructed with Roller Compacted Concrete.

Response: *Concur. Revision made as suggested.*

3. Page I-4. "Background and Responsibilities", A-5. "Project Operations and Maintenance"; Page I-2 references a sediment berm. In the last paragraph it is noted that no additional storage volume is allocated for sediment. This does not appear to be consistent.

Response: *The sediment berm is not designed in conjunction with allocation of sediment storage. Its only purpose is to prevent the intake structure from clogging during storm events only, as stated in section I.A.3c. Also, note that we stated in the initial draft of the SI that there is no allowance for sediment, however, it was discovered there was an additional 89.59 ac-ft (110,508 m^3) of extra storage that was agreed to be used for <u>antecedent</u> sediment deposition (see preface of the revised SI). Section I.A.5, Project Operation and Maintenance, and other sections of the SI were revised to reflect theses changes.*

4. Page II-2. "Data Collection and Reporting"; Designation of the Project Operator needs to be established. Is Clark County Public Works the lead on record keeping and monitoring? Clark County Maintenance Management Division should be designated as the lead entity.

Response: *Paragraph was modified to state that the Project Operator, Clark County Public Works is required to provide the Corps of Engineers, Los Angeles District with the year's record of detention basin water surface elevation, inflow and outflow data. The Project Operator may choose internally designate the Clark County Maintenance Management Division as lead entity on record keeping and monitoring.*

5. Page III-1, This detention basin is planned to be a multi-functional facility. How are the future public recreational facilities being incorporated into these standing instructions. Should the final design of the future recreational facilities be included within this document.

Response: *It is not necessary at this time to include the future public facilities in the document since the dam supposedly will perform the same way with or without the development. In addition, such public facilities will be designed so they will not have an impact to the performance of the project.*

Response to comments from Gil Suckow, Clark County Department of Public Works dated 25 February 2002, on draft Blue Diamond Standing Instructions.

1. Page ii. The gross capacity at the dam spillway crest is 2268 acre feet while the 100-year flood (Design Flood) inflow volume is 2370 acre feet. Is this correct?

Response: *See "Preface" of the revised SI. The design storage capacity of the detention basin is 2313 ac-ft (2,852,791 m^3). This supersedes the storage table in the Blue Diamond Detention Basin Design Memorandum, dated April 1998. The design storage capacity includes an allowance of 238 ac-ft (293,571 m^3) for sediment deposition during the RDF and 89.59 ac-ft (110,508 m^3) for antecedent sediment storage.*

Flood Control	*2,742,283 m^3*	*2223 ac-ft*
Antecedent Sediment Storage	*110,508 m^3*	*89.59 ac-ft*
Gross Capacity at spillway crest	*2,852,791 m^3*	*2313 ac-ft*

Note: Flood control includes 238 ac-ft (293,571 m^3) for sediment deposition during the RDF.

2. Page I-4. Last paragraph under item 5. Is there no additional sediment storage?

Response: *See "Preface" of the revised SI. Page I-4 has been modified. Based on the final design of the BDDB, there is 89.59 ac-ft available for antecedent sediment storage.*

3. Page II-1. Last sentence in the first paragraph. It would appear that the Regional Flood Control District Hydrologist would be better able to prepare any meteorological information.

Response: *The last sentence in the first paragraph has been revised to, "The Project Operator shall also obtain data from the Clark County Regional Flood Control District Hydrologist and the National Weather Service regarding hydrometeorological conditions."*

4. Page T-3. The crest elevation shown on page ii is 1966.24 with the area at dam spillway 111.5 acre. The table indicates an area of 114.2. Is there an apparent error in the data being presented?

Response*: The area table on page T-3 has been updated with the final design and page ii has also been updated. The area at dam spillway is 116 ac on both pages. This supersedes the area table in the Blue Diamond Detention Basin Design Memorandum, dated April 1998. Also see "Preface" of the revised SI.*

5. Page T-4. The crest elevation is correct, but there appears to be some inconsistency with the storage area data listed on page ii.

Response *The storage table on page T-4 has been updated with the final design and page ii has also been updated. This supersedes the storage table in the Blue Diamond Detention Basin Design Memorandum, dated April 1998. Also see "Preface" of the revised SI.*

6. Page T-5. The peak discharge information on page ii appears inconsistent. The data in the table is 216 cfs and the information on page ii is 212.9.

Response: *The discharge values on page T-5 have been updated with the final design values. On Table T-5, the peak discharge at spillway crest elevation is 218 cfs and the RDF Routing's, peak outflow is 218 cfs at maximum stage of 2966.14 ft (see plate 24). Also see "Preface" of the revised SI on why the spillway crest elevation is higher than the RDF routing's maximum elevation.*

7. I am requesting that the sediment information for a ten-year and twenty-five year storm be provided in the manual and the appropriate formula for the calculation for any year sediment load.

Response: *Per a telephone conversation between Ms. Jody Fischer of the Corps, Hydrology and Hydraulic Section and Mr. Gil Suckow in February 2002, Mr. Suckow accepted that only the average annual debris and the 100-yr sediment would be provided. This information is included in the Standing Instructions on page I-2. 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 293,571 m^3. The average annual sediment yield is 19,571 m^3/yr (1/15 of the 100-year computed probability debris yield).*

Response to comments from Gil Suckow, Clark County Department of Public Works dated 27 February 2002, on draft Blue Diamond Standing Instructions.

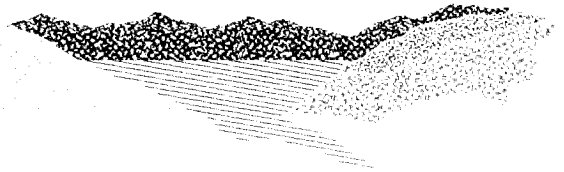
1. Page 1-5. Item 2. Please clarify who is the Project Operator. What does SPL stand for? The SPL Reservoir Operations Center is not specifically identified and listed in Table I-1. The sentence "In addition, the Clark County Department of Public Works will post…" appears to be confusing in relation to the project operator. Please Clarify. Perhaps a list of definitions is appropriate.

Response: *Text in Section I.A.1 has been revised to clarify that the Project Operator is CCPW. SPL stands for the Los Angeles District. This has also been clarified in the text. The sentence "In addition, the Clark County Department of Public Works will post…" has been revised to read, "In addition, the Project Operator will post…"*

2. Page T-2. I am requesting that the table be revised to more accurate conditions. Accordingly, I have asked Tim Sutko, RFCD Hydrologist, to revise the Table and will forward the corrections to you.

Response: *Table I-2 was modified to show the response implementation plan only and not chain of commands of both agencies and includes the revisions as suggested by Tim Sutko.*

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT



January 14, 2002

Mr. Matt Shun
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box 2711
Los Angeles, CA 90053-2711

Re: Standing Instructions to the Project Operator for Water Control – Blue Diamond Detention Basin

Dear Mr. Shun:

Clark County Regional Flood Control District (District) reviewed draft *Standing Instructions to the Project Operator for Water Control – Blue Diamond Detention Basin, Blue Diamond Wash, Clark County, Nevada* dated August 2001. Blue Diamond Detention Basin is a feature in the Tropicana and Flamingo Washes project, a cost share project between the U.S. Army Corps of Engineers (Corps), District, and Clark County Department of Public Works (CCPW). The following comments are offered for your consideration as the project proceeds.

1. Pertinent Data Tables. Change 100-year peak inflow to read 13,800 cfs rather than 138,000 cfs. Probable maximum flood (PMF) peak inflow and outflow values (146,588.3 cfs) are equal, however spillway design discharge (144,500 cfs) indicates there is attenuation of PMF event. On metric Pertinent Data Table, spillway design discharge and PMF inflow and outflow values all equal 4,105.94 m^3/s, which indicates no attenuation of PMF event. In addition, conversion of 4105.94 m^3/s is 145,000 cfs in English units, which does not agree with English Pertinent Data Table. Determine correct spillway design discharge and PMF peak inflow and outflow values, and be consistent in Pertinent Data Table, text, and figures. Explain why elevation of spillway maximum water surface (2973.74 ft/906.40 m) does not agree with PMF peak elevation (2972.61 ft/906.05 m). Values listed elsewhere in report should be reflected in Pertinent Data Tables. Resolve these and other discrepancies described herein.

2. Section I.A.1. District is listed as Project Operator and keeper of Standing Instructions. In accordance with Project Cooperation Agreement, Corps will turn project over to CCPW, who will be responsible for inspection, maintenance, and

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operation of facility. District will provide funds to CCPW to inspect, maintain, and operate facility. Clarify appropriate responsible local agencies. Provide CCPW with copy of Standing Instructions.

3. Section I.A.3. Detention basin storage capacity is listed as 2030 acre-feet. Total storage capacity is 2268 acre-feet according to Pertinent Data Table and *Design Memorandum – Blue Diamond Detention Basin* dated April 1998, and 2382 acre-feet according to Plate 18. Resolve discrepancies or clarify that storage volume of 2080 acre-feet is for clear water only.

4. Section I.A.3, Embankment. Continue outline numbering system on project components within body of report. Coordinate values of embankment crest elevation and maximum height above streambed with Pertinent Data Table.

5. Section I.A.3, Outlet Works. In addition to clogging, trash rack prevents damage to outlet conduit from large debris. Please include this purpose in trash rack description.

6. Section I.A.5. Corps states that Project Operator is required to remove sediment accumulation annually and after each major storm event. Standard practice for other District-funded facilities is to remove sediment once it accumulates to a pre-determined level, such as crown of sediment berm. Please confirm with CCPW District's understanding of their maintenance procedure to remove sediment when level reaches crown of sediment berm in Blue Diamond Wash Detention Basin.

7. Section B.2. Identify "SPL" and provide name, title, address, and/or phone number of contact.

8. Section II. Clarify that District, not Project Operator, owns, operates, and maintains flood threat recognition system (gages), however, CCPW (Project Operator) will be responsible for monitoring site during a storm event. District is unaware of a stream gage downstream of outlet works. Refer to District web site at www.CCRFCD.org for map of gage locations.

9. Table I-2. Provide Chain of Command for CCPW, Project Operator, in Table. Include District's role as owner of flood threat recognition system (gages).

10. Tables I-3 through I-6. Tables are reportedly taken from *Design Memorandum – Blue Diamond Detention Basin* dated April 1998, or revised based on As-Built information. However, values conflict with information provided in Pertinent Data Table. Resolve the following discrepancies:

    a. Tables I-3 and I-3a. Detention basin area at spillway crest is greater in tables than given in Pertinent Data Table.

    b. Tables I-4 and I-4a. Detention basin storage capacity at spillway crest is greater in tables than given in Pertinent Data Table.

    c. Tables I-5 and I-5a. Outlet works discharge rate at 100-year peak flood elevation is slightly greater in tables than in Pertinent Data Table.

    d. Tables I-6 and I-6a. Outlet works discharge rate at maximum water surface elevation is less in tables than reported in Section I.A.3, Outlet Works.

11. Plate 18. Basin capacity at spillway crest is 2382 acre-feet on figure and 2268 acre-feet on Pertinent Data Table. Please verify total capacity at spillway crest. If actual basin capacity is 2382 acre-feet, 352 acre-feet is available for sediment storage, which is 114 acre-feet more than debris yield produced by 100-year storm event. Therefore, additional sediment storage is available to allow CCPW to perform standard maintenance procedures as described in Comment 6. PMF peak flowrate is given as 146,588.3 cfs on Pertinent Data Table. Resolve discrepancies.

12. Plates 22 and 22a. Maximum pool elevation on figures agrees with spillway elevation of maximum water surface, but not PMF peak elevation on Pertinent Data Table. Resolve discrepancies.

13. Plates 23 and 23a. On Plate 23, correct drainage area, maximum storage, maximum stage, and maximum outflow to match Pertinent Data Table and Plate 18. On Plate 23a, correct maximum storage and maximum stage to match Pertinent Data Table and Plate 18.

14. Plates 24 and 24a. On Plate 24, correct drainage area, maximum inflow, maximum storage, inflow volume, and maximum stage to match Pertinent Data Table and Plate 18. On Plate 24a, correct maximum storage, inflow volume, and maximum stage to match Pertinent Data Table and Plate 18.

15. Plate 25. Remove stream gage note from figure.

If you have any questions regarding District comments on this project, please give me a call.

GALE WM. FRASER, II, P. E.
General Manager/Chief Engineer

BY: Stephen C. Roberts
Stephen C. Roberts, P.E.
Engineering Manager

SCR/jar

cc: Kevin Inada, COE
Tom Sage, COE
Rob Caskie, COE
John Catanese, CCPW

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Department of Public Works

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M.J. Manning, Director • E-Mail: mjm@co.clark.nv.us

March 5, 2002

Cynthia M. Wong
U.S. Army Corp of Engineers
Los Angeles District
P.O. Box 532711, CESPL-CO-O
Los Angeles, CA 90053

USACOE BLUE DIAMOND DETENTION BASIN FLOOD CONTROL FACILITY
STANDING INSTRUCTIONS TO THE OPERATOR FOR WATER CONTROL

Dear Ms. Wong:

Clark County Department of Public Works has completed review of the Draft Standing Instructions to the Project Operator for the Water Control Blue Diamond Detention Basin. The following corrections and comments are offered for your consideration:

Page I-1, "Background and Responsibilities", A-1. General Information; in addition, a copy of the Standing Instructions need to be referenced to Clark County Department of Public Works (CCPW) which Owns, Operates and Maintains the Detention Basin facility.

Page I-2, "Background and Responsibilities", A-1. Spillway; Reference that the spillway is constructed with Roller Compacted Concrete.

Page I-4, "Background and Responsibilities", A-5. " Project Operations and Maintenance"; Page I-2 references a sediment berm. In the last paragraph it is noted that no additional storage volume is allocated for sediment. This does not appear to be consistent.

Page II-2, "Data Collection and Reporting"; Designation of the Project Operator needs to be established. Is Clark County Public Works the lead on record keeping and monitoring? Clark County Maintenance Management Division should be designated as the lead entity.

Page III-1, This detention basin is planned to be a multi-functional facility. How are the future public recreational facilities being incorporated into these standing instructions? Should the final design of the future recreational facilities be included within this document?

On October 23, 2001, Jim Farley with the USACOE conducted the Blue Diamond Detention Basin dam safety and periodic inspection class which included a field inspection at the dam site. Items of concerns were addressed and repairs were pointed out. Were these repairs made and incorporated in the "AS-BUILT" record drawings provided? Were the sponsors provided a back check of the list of concerns and corrections?

Included with this submittal are the comments provided by Gil Suckow with Public Works Maintenance Management Division, dated February 25 and 27, 2002. Please call Mr. Suckow at (702) 455-7540 for any questions or comments regarding his review.

If you have any questions or comments, please call the undersigned at (702) 455-6616.

M.J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: _____
JOHN J. CATANESE
Associate Engineer

JJC:cf

Attachments

cc: Kevin Inada, U.S. Army Corps of Engineers, Los Angeles
Tom Sage, U.S. Army Corps of Engineers, Los Angeles
Huma Nisar, U.S. Army Corps of Engineers, Los Angeles
Gale Wm. Fraser II, Clark County Regional Flood Control District
Tim Sutko, Clark County Regional Flood Control District
Cameron Harper, Manager, Maintenance Management
Gil Suckow, Maintenance Management
Denis Cederburg, Manager, Design Engineering

MEMORANDUM

M. J. MANNING
DIRECTOR

Department of Public Works

TO: JOHN CATANESE, ASSOCIATE ENGINEER, DESIGN ENGINEERING

FROM: GIL SUCKOW, PRINCIPAL ENGINEERING TECHNICIAN, MAINTENANCE MANAGEMENT DIVISION

SUBJECT: STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL BLUE DIAMOND DETENTION BASIN

DATE: FEBRUARY 25, 2002

Provided are review comments for the above mentioned project:

1. Page ii. The gross capacity at the dam spillway crest is 2268 acre feet while the 100 year flood (Design flood) inflow volume is 2370 acre feet. Is this correct?

2. Page I-4. Last paragraph under item 5. Is there no additional sediment storage?

3. Page II-1. Last sentence in the first paragraph. It would appear that the Regional Flood Control District Hydrologist would be better able to prepare any meteorological information.

4. Page T-3. The crest elevation shown on page ii is 1966.24 with the area at dam spillway 111.5 acre feet. The table indicates a volume of 114.2. Is there an apparent error in the data being presented?

5. Page T-4. The crest elevation is correct, but there appears to be some inconsistency with the storage area data listed on page ii.

6. Page I-5. The peak discharge information on page ii appears inconsistent. The data in the table is 216 cfs and the information on page ii is 212.9.

7. I am requesting that the sediment information for a ten-year and twenty-five year storm be provided in the manual and the appropriate formula for the calculation for any year sediment load.

Should you have any questions or concerns, or wish to discuss my comments further, please let me know.

GS:djt

cc: Denis Cederburg
L Cameron Harper

MEMORANDUM

M. J. MANNING
DIRECTOR

Department of Public Works

TO: JOHN CATANESE, ASSOCIATE ENGINEER, DESIGN ENGINEERING

FROM: GIL SUCKOW, PRINCIPAL ENGINEERING TECHNICIAN, MAINTENANCE MANAGEMENT DIVISION

SUBJECT: STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL BLUE DIAMOND DETENTION BASIN – ADDITIONAL COMMENTS

DATE: FEBRUARY 27, 2002

Provided are review comments for the above mentioned project:

1. Page 1-5. Item 2. Please clarify who is the Project Operator. What does SPL stand for? The SPL Reservoir Operations Center is not specifically identified and listed in Table I-1. The sentence "In addition, the Clark County Department of Public Works will post..." appears to be confusing in relation to the project operator. Please Clarify. Perhaps a list of definitions is appropriate.

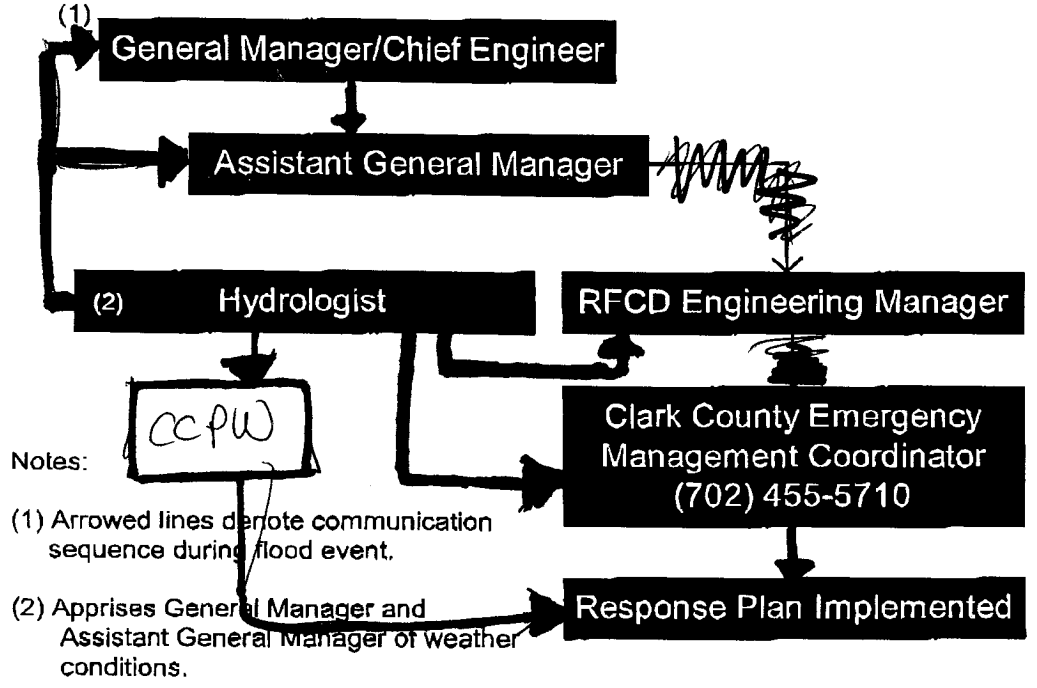
2. Page T-2. I am requesting that the table be revised to more accurately reflect actual conditions. Accordingly, I have asked Tim Sutko, RFCD Hydrologist, to revise the Table and will forward the corrections to you.

Should you have any questions or concerns, or wish to discuss my comments further, please let me know.

GS:djt

cc: Tim Sutko
Denis Cederburg
L. Cameron Harper

Table I-2
Chain of Command for Clark County Flood Control District
Response Plan Implementation at Blue Diamond Detention Basin



For more information or questions, please contact agency personnel at (702) 455-3139.