



EXECUTIVE REPORT ON THE EASTERN COACHELLA VALLEY STORMWATER MASTER PLAN

Prepared for



March 2017



COACHELLA VALLEY WATER DISTRICT
PALM DESERT, CALIFORNIA

EXECUTIVE REPORT

on the

EASTERN COACHELLA VALLEY
STORMWATER MASTER PLAN

March 2017

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OVERVIEW

This Executive Summary provides a brief description and summary of the Eastern Coachella Valley Stormwater Master Plan (Master Plan). The Master Plan covers areas within unincorporated Riverside County and includes the communities of Mecca, North Shore, Thermal, Oasis, and Santa Rosa. The Master Plan area is bounded on the north by Avenue 52, on the west by the Santa Rosa Mountains, on the east by the East Side Dike, and on the south by the Salton Sea (**Plate 1**). Existing land use within the area is primarily agricultural, but the Coachella Valley Water Management Plan forecasts a 250 percent increase in population in this area by 2040¹ with a significant conversion from agricultural to urban land uses. Coachella Valley Water District (CVWD) is developing the Master Plan in anticipation of future urban growth in the Eastern Coachella Valley.

The Master Plan Study area is divided into two regions and separated by the Coachella Valley Stormwater Channel. Region 1 includes the Oasis and Valley Floor area west of the Coachella Valley Stormwater Channel and is called the Oasis/Valley Floor Area Stormwater Master Plan (OASMP). Region 2 includes the Mecca and North Shore area east of the Coachella Valley Stormwater Channel and is called the Mecca/North Shore Area Stormwater Master Plan (MASMP). The Coachella Valley Stormwater Channel is included as part of the OASMP study. Together, these two stormwater master plans form the overall Eastern Coachella Valley Stormwater Master Plan.

The recommended improvements discussed briefly in this Executive Report are shown on **Plate 1**. Detailed exhibits showing the proposed facility alignments, preliminary size information, and design flow rates are included in the Stormwater Master Plan reports for the Oasis/Valley Floor and Mecca/North Shore Areas. These reports are available for review at the CVWD offices during normal business hours. These individual stormwater studies contain the design parameters used to develop the proposed facilities. Planning level plan and profiles of each stormwater facility are also included in the Master Plan.

SCOPE

The Master Plan encompasses the Santa Rosa Mountains on the west, the Salton Sea and Riverside-Imperial County line on the south, the East Side Dike on the east, and Avenue 52 on the north. The Mecca/North Shore Area Stormwater Master Plan area includes approximately 48 square miles of tributary watershed. The Oasis/Valley Floor Area Stormwater Master Plan area includes approximately 181 square miles of tributary watershed. The Coachella Valley Stormwater Channel watershed area encompasses approximately 1,500 square miles.

The overall scope of the Master Plan includes the following:

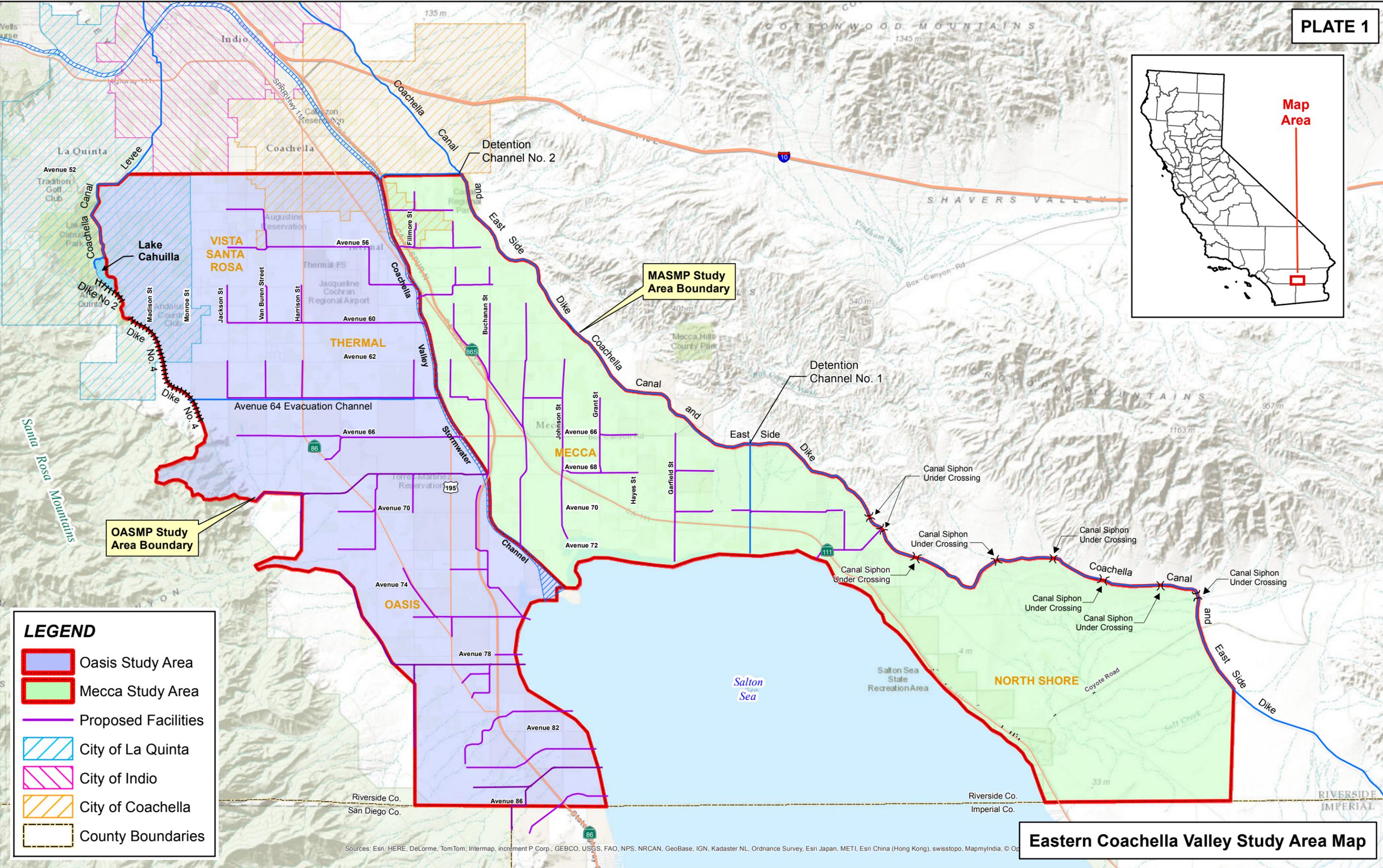
¹ Coachella Valley Water Management Plan 2010 Update (MWH, January 2012)

1. Determination of the peak flow rates and points of concentration of storm runoff in the area;
2. Development of alternative stormwater facility alignments and sizes that are feasible from an engineering perspective;
3. Analysis of the alternative alignments of the proposed stormwater facilities based on economics and environmental impacts;
4. Selection of preferred alternative stormwater facilities alignments;
5. Preparation of preliminary plans and profiles and supporting probable cost estimates of the preferred stormwater alignments;
6. Preparation of a Stormwater Master Plan facility map; and
7. Preparation of a Program-Level Environmental Impact Report for the Stormwater Master Plan.

PURPOSE

The purpose of the Master Plan is to provide a comprehensive stormwater strategy that provides flood protection for both existing and future developments within the study area. Construction of the proposed facilities presented herein will provide flood protection from the 100-Year flood. The primary objective for existing regional stormwater facilities that do not currently meet the 100-Year design standard is to increase capacity to provide flood protection to life and property for the 100-Year flood. Facilities required to meet the Standard Project Flood standard per CVWD Ordinance 1234.1 may require additional infrastructure modifications that may not be implemented immediately due to cost and other competing priorities. It is anticipated that the Master Plan will be used as a guide for the long term construction scheduling of backbone stormwater facilities within the region. The Master Plan will also serve as a planning guide for locating and sizing local stormwater facilities that will be constructed by developers and other parties.

The stormwater facilities proposed in this Master Plan are based on a preliminary engineering analysis which included environmental and economic factors. The proposed alignment locations and facility sizes contained in the Master Plan are general in nature. Precise facility locations and sizes will require a detailed analysis at the time of design. The Master Plan provides a framework on which future analysis and design will be based.



LEGEND

- Oasis Study Area
- Mecca Study Area
- Proposed Facilities
- City of La Quinta
- City of Indio
- City of Coachella
- County Boundaries

Eastern Coachella Valley Study Area Map

Map revised Feb. 20, 2015; G:\2012\12-0001\Report\Exec Summary\Figures and Exhibits\ECV_StudyArea.mxd

DESCRIPTION OF PROBLEM

The Eastern Coachella Valley population is on a steady growth trend. The valley was one of the fastest growing areas in California between 2000 and 2010 and forecasts still predict a 250 percent increase in population by the year 2040. With the exception of the Coachella Valley Stormwater Channel, USBR Dikes No. 2 and No. 4, the Avenue 64 Evacuation Channel, and the East Side Dike System, (including Evacuation Channels No. 1 and No. 2) there are no existing major stormwater facilities within the study area (**Plate 1**). Existing local stormwater facilities consist primarily of roadside ditches and agricultural drains. These local stormwater facilities are not adequate to convey runoff generated in the area. During major storm events, floodwaters, silt and other debris impact a wide area of prime agricultural land as well as developing communities. This has historically resulted in property damage and major storm events have left roads and highways impassable. Development activity within the Master Plan area is currently limited but will increase over time as urban land uses replace agricultural land uses. The addition of impervious surfaces associated with urbanization reduces infiltration and increases surface runoff.² In most cases, local ordinances require that developments mitigate runoff increases. Even so, the projected escalations of population density and property values will result in a greater need to provide additional flood protection to prevent loss of life and property.

OASIS/VALLEY FLOOR AREA FLOOD RISKS:

Much of the area within the Master Plan is designated as Zone A, Zone X and Zone D on FEMA's Flood Insurance Rate Maps (FIRMs). Zone A designates areas that are subject to inundation by the 1 percent annual chance flood (also known as the base flood). Zone X designates areas subject to inundation by the 0.2 percent annual chance flood and/or areas of 1 percent annual chance flood with average depths of less than one foot and/or areas protected by levees from the 1 percent chance flood. Zone D designates areas in which flood hazards are undetermined, but possible.

Areas north of Avenue 65 are protected from regional flooding by the United States Bureau of Reclamation (USBR) Dikes No. 2 and No. 4, which are FEMA accredited levees. Dike No. 2 extends from Avenue 58 to the north end of Coral Mountain near Avenue 59. Dike No. 4 extends from the south end of Coral Mountain, below Avenue 59, to south of Avenue 65. These dikes protect the Oasis/Valley Floor area from floodwater discharged from the upstream canyons and provide detention storage for the floodwaters. Accumulated floodwater stored behind the dikes is released to the Coachella Valley Stormwater Channel via the Avenue 64 Evacuation Channel at a maximum outflow of 400 cubic feet per second. Additionally, Lake Cahuilla (shown on **Plate 1**) provides some protection since it captures storm waters from the Santa Rosa Mountains to the west.

² CADDIS: The Causal Analysis/Diagnosis Decision Information System Volume 2: Sources, Stressors & Responses (EPA, July 31, 2012)

Alluvial fan flooding from the Santa Rosa Mountains is a major flood risk to the Oasis/Valley Floor Region. Flash flood waters from nine canyons between Avenue 62 and the Riverside/Imperial County Line cross coalescing alluvial fan surfaces in the Oasis/Valley Floor Region on the way to the Salton Sea or Coachella Valley Stormwater Channel. Local stormwater flooding is also a concern. Numerous unimproved agricultural channels are scattered throughout the area. These channels have a very limited flow capacity and do not provide 100-Year flood protection.

Additional flooding occurs in the reach of the Coachella Valley Stormwater Channel that extends approximately 17 miles from Avenue 54 to the Salton Sea. This reach of the Coachella Valley Stormwater Channel is an unlined earthen channel with limited channel capacity. Overbank flooding along the Coachella Valley Stormwater Channel is predicted to occur during the 100-Year and greater storms. This flooding results in a 2-mile wide floodplain through Oasis/Valley Floor area and the Mecca/North Shore area.

MECCA/NORTH SHORE AREA FLOOD RISKS:

The majority of the Mecca Area is designated as Zone D on the FIRMs. A small portion of the North Shore Area is designated as Zone A, with the remaining area designated as Zone X.

The Coachella Canal/USBR East Side Dike forms the upstream stormwater divide along the northeast side of the Mecca/North Shore study area. The East Side Dike provides flood protection from the undeveloped Chocolate Mountains to the east. Floodwaters generated from this source are temporarily detained by the East Side Dike and then released through two existing wasteway channels (Detention Channels No. 1 and No. 2 as shown on **Plate 1**), which convey the flows to the Coachella Valley Stormwater Channel. The dike and the two wasteways were built in 1947 by the USBR.

The East Side Dike was designed to protect the Coachella Canal; however, it is not currently a FEMA Accredited Levee. CVWD is designing improvements for the wasteways and plans to certify the East Side Dike to FEMA in the future. For purposes of the Master Plan, the wasteways and the watershed upstream of the East Side Dike are assumed to not be a source of flooding.

In addition to the wasteways, there are other sites where stormwater runoff flows across or under the Coachella Canal. There are several Coachella Canal siphons in the North Shore Region, which allow stormwater from the hills and mountains to the east to drain across the Coachella Canal to the Salton Sea.

The major flood risk to the Mecca Area is riverine flooding from the Coachella Valley Stormwater Channel. In 2013, Northwest Hydraulic Consultants hydraulically modeled and re-mapped the Coachella Valley Stormwater Channel floodplain. The study was provided to FEMA for a physical map revision of the floodplain.

Another flood risk to the Mecca Area is from local stormwater, which originates from the areas that lie between the Coachella Canal and the Coachella Valley Stormwater Channel/Salton Sea. Similar to the Oasis/Valley Floor Area, numerous unimproved agricultural channels exist in the Mecca Area. These channels have very limited flow capacities and do not provide 100-Year flood protection. Additionally there are undersized culverts that cross the Union Pacific Railroad (UPRR) and Highway 111. During large storm events, these undersized culverts cause stormwater to back up and inundate the southwest portion of the Mecca Area near Lincoln Street/Hammond Road and Fourth Street.

The flood risk to the North Shore Area is from both local and regional stormwater runoff. In addition to the flood risks, the North Shore Area has significant environmental constraints. During the alternatives analysis phase of the Master Plan it was determined by CVWD that the environmental constraints in this region will likely preclude major development. For this reason master planned stormwater facilities are not included in the Master Plan for this area.

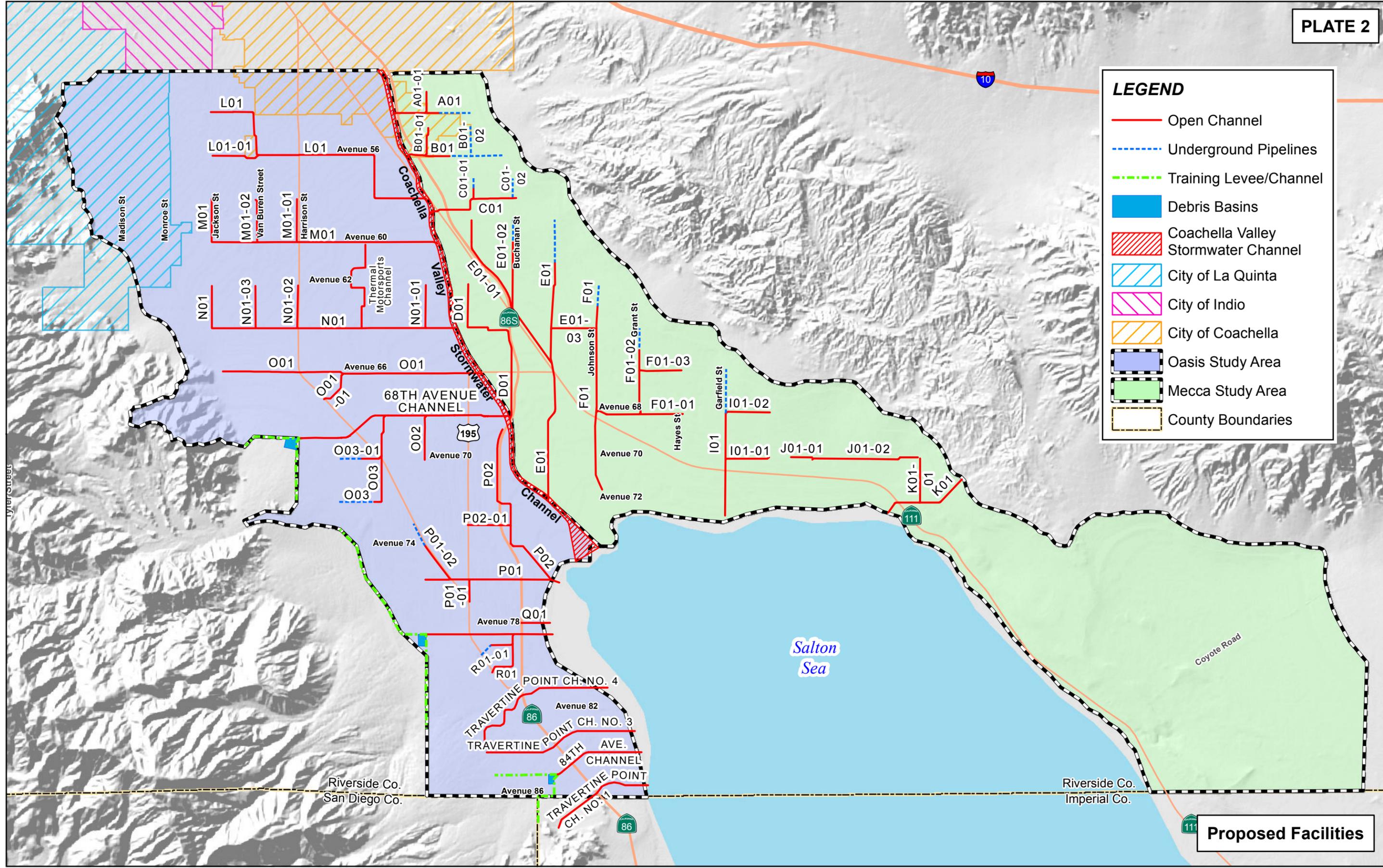
FACILITY SIZING CRITERIA

On March 25, 2013, CVWD adopted Ordinance 1234.1, which updated its Stormwater Policies. The standards contained in this ordinance were used to compute stormwater runoff and to size the facilities identified in the Master Plan. A summary of key provisions is listed below:

- The National Oceanic and Atmospheric Administration (NOAA Atlas 14), 100-year rainfall depths are utilized to calculate the 100-Year discharge.
- The 6-hour Indio Storm of September 24, 1939 Standard Project Storm (SPS) is utilized for calculating the Standard Project Flood (SPF).
- The design standard for the Coachella Valley Stormwater Channel is the SPS/SPF peak flow with a minimum of one foot freeboard. Initially the CVSC will be upgraded in all deficient locations in order to provide life and property flood protection from the 100-Year storm event. In the future, the CVSC may be further upgraded to meet the design standard applicable at that time. However, upgrades beyond the 100-Year storm event are speculative at this time due to cost and logistical constraints. Any additional upgrades will be subject to separate environmental review at such time as they are proposed
- The design standard for the Coachella Valley Stormwater Channel is the SPS/SPF peak flow with a minimum of one foot freeboard. Initially the CVSC will be upgraded in all deficient locations in order to provide life and property flood protection from the 100-Year storm

LEGEND

- Open Channel
- Underground Pipelines
- Training Levee/Channel
- Debris Basins
- Coachella Valley Stormwater Channel
- City of La Quinta
- City of Indio
- City of Coachella
- Oasis Study Area
- Mecca Study Area
- County Boundaries



Proposed Facilities

Underground reinforced concrete pipes (RCPs) are proposed up to a diameter of 96-inches. Where the capacity of a 96-inch diameter RCP would be exceeded, open channels are proposed. Single and multi-cell reinforced concrete boxes (RCBs) are proposed for most road crossings due to capacity limitations of the RCPs. At least two feet of cover is provided for all underground facilities and the hydraulic grade line (HGL) is kept a minimum of two feet below existing ground surface.

OASIS/VALLEY FLOOR AREA RECOMMENDED IMPROVEMENTS

The recommended improvements for this area have been divided into ten stormwater systems and the Coachella Valley Stormwater Channel discussed in the next section (refer to **Plate 2**). Alluvial fan flooding is a major concern for the Oasis/Valley Floor region. Diversions/control of alluvial fan flows will be achieved primarily through training levees that will guide flows towards the inlets of the proposed conveyance channels. Three basins are proposed to capture the sediment and debris from the alluvial fans for the 68th Avenue Stormwater System, Kings Road Stormwater System, and the Avenue 84 Avenue Stormwater System. A list of the stormwater systems is provided below:

- Line L Stormwater System
 - Jackson Street/Avenue 54 area (Mainline) - 6.9 miles
 - Jackson Street/Avenue 56 area (Lateral) - 1.1 miles
- Line M Stormwater System
 - Avenue 58/Jackson Street area (Mainline) - 6.3 miles
 - Avenue 58/Harrison Street area (Lateral 1) - 1.0 mile
 - Avenue 58/Van Buren Street area (Lateral 2) - 1.0 mile
- Line N Stormwater System
 - Avenue 62/Jackson Street area (Mainline) - 6.7 miles
 - Avenue 62/Fillmore Street area (Lateral 1)- 1.0 mile
 - Avenue 62/Harrison Street area (Lateral 2)- 1.0 mile
 - Avenue 62/Van Buren Street area (Lateral 3)- 1.0 mile
- Line 01 Stormwater System
 - Jackson Street/Avenue 66 area (Mainline) – 6.2 miles
 - Harrison Street/Avenue 66 area (Lateral)- 0.9 miles
- 68th Avenue Stormwater System
 - Training Levees- 2.5 miles
 - Concrete Trapezoidal Channel- 6.0 miles
- Line 02 Stormwater System (Drains to 68th Ave Stormwater System)
 - Avenue 70/Fillmore Street area (Mainline) – 1.1 miles
- Line 03 Stormwater System (Drains to 68th Ave Stormwater System)
 - Tyler Street/Polk Street area (Mainline) – 3.0 miles
 - Tyler Street/Harrison Street area (Lateral)- 1.0 mile

- Line P Stormwater System
 - Fillmore Street/Highway 86 area (Mainline 1) – 3.1 miles
 - Avenue 77/Pierce Street area (Lateral 1)- 0.5 miles
 - Avenue 73/Harrison Street area (Lateral 2)- 1.6 miles
 - Avenue 70/Buchanan Street area (Mainline 2) – 4.3 miles
 - Pierce Street/Avenue 73 area (Lateral 1)- 1.0 mile
- Line Q Stormwater System
 - Highway 86/Salton Sea area (Mainline 1) – 0.72 miles
- King’s Road Stormwater System
 - Training Levees- 6.3 miles
 - Concrete Trapezoidal Channel- 3.0 miles
- Line R Stormwater System (Drains to Kings Road System)
 - Harrison Street/Kings Road Channel area (Mainline) – 1.3 miles
 - Harrison Street area (Lateral)- 0.84 miles
- 84th Avenue Stormwater System
 - Training Levees- 2.5 miles
 - Concrete Trapezoidal Channel- 2.3 miles
- Travertine Point Stormwater System
 - Channel 1 - 2.6 miles
 - Channel 3 - 3.6 miles
 - Channel 4 - 3.7 miles

COACHELLA VALLEY STORMWATER CHANNEL IMPROVEMENTS

The proposed Coachella Valley Stormwater Channel improvements consist of concrete-lined banks extending from upstream of Avenue 52 to Airport Boulevard. At Airport Boulevard, the channel transitions to a fully-lined concrete channel that extends south to the existing Thermal Drop Structure. Downstream of the Thermal Drop Structure the channel will have concrete-lined banks for about 1.2 miles downstream of Lincoln Street. The purpose of the fully lined concrete section is to improve conveyance capacity at the existing Hwy 111/UPRR crossings. This will minimize infrastructure improvements, utility relocation, and right-of-way acquisition. The proposed channel improvements will reduce the height of the Thermal Drop Structure and lower the existing channel bed from the drop structure to upstream of Avenue 52.

Other proposed improvements consist of new bridges at Airport Boulevard, Avenue 62, Highway 111, and Highway 86. Also included will be widening of the two UPRR Bridges and a widening of the low-water “Arizona Crossing” at Lincoln Street.

MECCA/NORTH SHORE AREA RECOMMENDED IMPROVEMENTS

The recommended improvements for the Mecca/North Shore Area consist of nine stormwater systems. Five of these systems (Lines A to E) drain directly to the Coachella Valley Stormwater Channel, three systems (Lines F, I and K) drain into the Salton Sea, and one system (Line J) drains into the existing Detention Channel No. 1. The updated Town of Mecca Stormwater Master Plan is also included in this area. The proposed stormwater systems are listed below:

- Line A Stormwater System
 - Pierce Street/Avenue 54 area (Mainline) – 1.8 miles
 - Fillmore Street/Avenue 54 area (Lateral)- 0.5 miles
- Line B Stormwater System
 - Buchanan Street/Highway 86 area (Mainline) – 2.2 miles
 - Avenue 55/Fillmore Street area (Lateral 1)- 0.7 miles
 - Avenue 55/Pierce Street area (Lateral 2)- 0.7 miles
- Line C Stormwater System
 - Buchanan Street/Highway 111 area (Mainline) – 2.2 miles
 - Pierce Street/Avenue 58 area (Lateral 1)- 0.5 miles
 - Avenue 57/Buchanan Street area (Lateral 2)- 0.5 miles
- Line D Stormwater System
 - Avenue 62/Avenue 66 area (Mainline) – 4.0 miles
- Line E Stormwater System
 - Avenue 59/Lincoln Street Stormwater Channel area (Mainline) – 6.5 miles
 - Avenue 59/Highway 111 area (Lateral 1)- 3.6 miles
 - Avenue 59/Highway 111 area (Lateral 2)- 2.1 miles
 - Johnson Street/Lincoln Street area (Lateral 3)- 1.0 mile
- Line F Stormwater System
 - Avenue 62/Johnson Street Stormwater Channel area (Mainline) – 4.8 miles
 - Hayes Street/Grant Street area (Lateral 1)- 2.0 miles
 - Avenue 64/Grant Street area (Lateral 2)- 2.0 miles
 - Hayes Avenue/Avenue 66 area (Lateral 3)- 1.0 mile
- Line I Stormwater System
 - Avenue 66/Salton Sea area (Mainline) – 3.4 miles
 - Arthur Street/Avenue 70 area (Lateral 1)- 1.0 mile
 - Arthur Street/Avenue 68 area (Lateral 2)- 1.0 mile
- Line J Stormwater System
 - Detention Channel No. 1 (Cleveland Street)/Avenue 70 area (Lateral 1)- 0.4 miles
 - Vander Veer Road/ Detention Channel No. 1 area (Lateral 2)- 2.5 miles

- Line K Stormwater System
 - Coachella Canal/ Salton Sea area (Mainline) – 2.0 miles
 - Avenue 70/Avenue 72 area (Lateral)- 1.0 mile

Mecca Area SMP Update: The updated cost estimate for the Mecca Area (Town of Mecca) Stormwater Master Plan has been included in Table 1. The revisions to the Mecca Area utilized the alignments established in the 2006 Mecca Stormwater Master Plan (originally prepared by URS Corp) with the latest NOAA Atlas 14 rainfall data. Facilities were resized as needed to convey the updated NOAA 14 flows based on Normal Depth Method calculations.

ESTIMATED PROBABLE COSTS

Probable Budget estimates were prepared as part of the Master Plan. The estimated probable cost of each storm drain system is tabulated in **Table 1 - Estimated Probable System Cost for the Oasis/Valley Floor Area SMP**, **Table 2 - Estimated Probable System Cost for the Coachella Valley Stormwater Channel** and **Table 3 - Estimated Probable System Cost for the Mecca/North Shore Area SMP**. Unit prices used in determining costs are based on 2014 Riverside County Flood Control and Water Conservation District project planning costs, Northwest Hydraulic Consultant's costs prepared for previous CVWD stormwater reports, WEBB Associates' database of constructions prices and RS Means (2015). Rights-of-Way costs for all open channels facilities were calculated assuming a unit cost of \$30,000/acre. Contingency costs are 15 percent of the total storm drain and earth work costs, except as noted on Table 2. Additionally, there is a budget of 10 percent of the construction costs has been included for engineering and inspection.

Operation and maintenance (O&M) costs were based on a 40-year design life of the project. The cost associated with yearly maintenance includes sediment and vegetation removal. O&M costs assumed a two percent rate of inflation and a two percent discount rate over the 40-year design life, and have been converted to a Net Present Value.

The total estimated costs of the proposed Oasis/Valley Floor Area, Coachella Valley Stormwater Channel and Mecca/North Shore Area Master Plan improvements are **\$580,333,000**, **\$215,300,000**, and **\$258,723,000** respectively.

Table 1: Estimated Probable Stormwater System Cost for the Oasis/Valley Floor Area Stormwater Master Plan

Item	Line L Stormwater System	Line M Stormwater System	Line N Stormwater System	68 th Ave Stormwater System	Line O1 Stormwater System	Line O2 Stormwater System	Line O3 Stormwater System	Line P Stormwater System	Line Q Stormwater System	Kings Road Stormwater System	Line R Stormwater System	84 th Ave Stormwater System	Total Cost
Storm Drain & Earthwork	\$35,255,000	\$35,876,000	\$49,895,000	\$97,500,000	\$35,914,000	\$2,629,000	\$10,638,000	\$41,940,000	\$1,782,000	\$81,500,000	\$3,807,000	\$48,400,000	\$445,136,000
Contingencies ¹	\$5,255,000	\$5,381,000	\$7,484,000	\$14,600,000	\$5,387,000	\$394,000	\$1,596,000	\$6,291,000	\$267,000	\$12,200,000	\$571,000	\$7,300,000	\$66,726,000
Engineering and Inspection ²	\$3,526,000	\$3,588,000	\$4,989,000	\$9,700,000	\$3,591,000	\$263,000	\$1,064,000	\$4,194,000	\$178,000	\$8,100,000	\$381,000	\$4,800,000	\$21,774,000
Right of Way	\$3,060,000	\$3,195,000	\$2,949,000	\$3,100,000	\$2,274,000	\$288,000	\$747,000	\$2,304,000	\$30,000	\$2,800,000	\$147,000	\$1,500,000	\$22,394,000
O & M ³	\$534,000	\$558,000	\$892,000	\$8,700,000	\$554,000	\$12,000	\$39,000	\$593,000	\$13,000	\$8,000,000	\$20,000	\$4,400,000	\$24,303,000
Total Cost	\$47,630,000	\$48,598,000	\$66,209,000	\$123,900,000	\$47,720,000	\$3,554,000	\$14,084,000	\$55,322,000	\$2,270,000	\$104,500,000	\$4,926,000	\$61,600,000	\$580,333,000

Table 2: Estimated Probable Stormwater System Cost for the CVSC

Item	CVSC
Storm Drain & Earthwork	\$165,100,000
Contingencies ¹	\$24,800,000
Engineering and Inspection ²	\$ 16,500,000
Right of Way	0
O & M ³	\$8,900,000
Total Cost	\$215,300,000

Table 3: Estimated Probable Stormwater System Cost for the Mecca/North Shore Area Stormwater Master Plan

Item	Line A Stormwater	Line B Stormwater	Line C Stormwater	Line D Stormwater	Line E Stormwater	Line F Stormwater	Line I Stormwater System	Line J Stormwater System	Line K Stormwater System	Mecca Area MDP Update	Total Cost
Storm Drain & Earthwork	\$7,620,000	\$10,739,000	\$10,275,000	\$17,208,000	\$73,970,000	\$39,940,000	\$13,988,000	\$8,101,000	\$7,590,000	\$3,836,000	\$193,267,000
Contingencies ¹	\$1,143,000	\$1,611,000	\$1,541,000	\$2,581,000	\$11,096,000	\$5,991,000	\$2,098,000	\$1,215,000	\$1,139,000	\$575,000	\$28,990,000
Engineering and Inspection ²	\$762,000	\$1,074,000	\$1,027,000	\$1,721,000	\$7,397,000	\$3,994,000	\$1,399,000	\$810,000	\$759,000	\$384,000	\$19,327,000
Right of Way	\$465,000	\$489,000	\$765,000	\$768,000	\$4,239,000	\$3,948,000	\$1,332,000	\$939,000	\$870,000	\$516,000	\$14,331,000
O & M ³	\$42,000	\$49,000	\$92,000	\$185,000	\$859,000	\$1,253,000	\$132,000	\$90,000	\$59,000	\$47,000	\$2,808,000
Total Cost	\$10,032,000	\$13,962,000	\$13,700,000	\$22,463,000	\$97,561,000	\$55,126,000	\$18,949,000	\$11,155,000	\$10,417,000	\$5,358,000	\$258,723,000

1. Contingencies assumes 15% of Construction Costs
 2. Engineering and Inspection Budget assumes 10% of Construction Costs
 3. Net Present Value of O&M for 40 Years, assuming an inflation rate of 2% and discount rate of 5.5%

FACILITY PHASING OF MASTER PLAN

The Coachella Valley Stormwater Channel is the backbone stormwater protection system for the Master Plan area. The 17 miles of the Coachella Valley Stormwater Channel from Avenue 52 to the Salton Sea is an unlined earthen channel with limited capacity. The limited capacity of the Coachella Valley Stormwater Channel results in significant flooding and a Special Flood Hazard designation from FEMA in the Oasis/Valley Floor and Mecca areas. The majority of the stormwater facilities proposed as part of the Master Plan drain directly into the Coachella Valley Stormwater Channel. The downstream portions of these facilities are dependent on the lowered water surface elevation that will result from the improvement of the Coachella Valley Stormwater Channel. Because of these factors, the improvement of the Coachella Valley Stormwater Channel should be the number one priority stormwater project in the Master Plan area.

The hierarchy for the construction of the stormwater facilities is as follows:

1. Coachella Valley Stormwater Channel Improvements
2. Stormwater Systems A through D, and L through N, O1, 68th Avenue Stormwater Channel, can be built as needed by development. The downstream ends of these facilities will not fully function until the Coachella Valley Stormwater Channel is improved.
3. Stormwater Systems O2 and O3 require the downstream portion of the 68th Avenue channel to be constructed prior to their construction. Stormwater System R requires the downstream portion of the Kings Road Stormwater Channel to be in place prior to construction of Stormwater System R.
4. Detention Channel No. 1 will need to be improved in order to convey the additional flows from Stormwater Systems J01-01 and J01-02.
5. Stormwater Systems E, F, I, K, P, Q, Kings Road Channel, and the 84th Avenue Stormwater Channel drain directly into the Salton Sea and do not require any additional facilities to be in place.

FINDINGS

The findings of the Master Plan are as follows:

- 1) The Eastern Coachella Valley is subject to significant flooding from various sources;
 - a) Alluvial fan flooding from the Santa Rosa Mountains
 - b) Riverine flooding from the Coachella Valley Stormwater Channel
 - c) Localized flooding from the Valley Floor
- 2) The Eastern Coachella Valley is expected to experience continued growth and development;
- 3) There are currently limited existing facilities that provide flood protection;
 - a) USBR Dikes No. 2 and 4 (FEMA Certified)
 - b) Avenue 64 Evacuation Channel
 - c) East Side Dike System

4) Other existing facilities do not provide 100-Year flood protection.

CONCLUSION

The Master Plan provides a comprehensive long-term plan to provide stormwater facilities that are necessary to protect life and property from flood hazards in the Eastern Coachella Valley. The total cost of the proposed improvements is estimated to be **\$1,054,356,000**. Necessary measures should be undertaken to implement this plan as the Eastern Coachella Valley continues to develop and expand.

A L B E R T A .



A S S O C I A T E S

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