Flood & Blowsand Risk Assessment and Improvement Plan for Western Coachella Valley

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ABBREVIATIONS AND ACRONYMS

ac	acre
cfs	cubic feet per second
cy	cubic yard
ft	feet
AC	Asphalt Concrete
AASHTO	American Association of State and Highway and Transportation Officials
ADT	Average Daily Traffic
AMC	Antecedent Moisture Condition
AREMA	American Railway Engineering and Maintenance-of-Way Association
CVAG	Coachella Valley Association of Government
CVMSHCP	Coachella Valley Multi-Species Habitat and Conservation Plan
DPLM3	Date Palm Drive (Per TPPS - Between 30th Ave. and Vista Chino)
DPLM5	Date Palm Drive and Varner Road
DLN3	Dillon Road (Per TPPS - Between N. Indian Canyon Drive and Palm Drive)
DLN3-A	Dillon Road – Crossing A
DLN3-B	Dillon Road – Crossing B
GAT3	North Gene Autry Trail (Per TPPS - Between E. Via Escuela and Salvia Rd.)
INCN7	North Indian Canyon Drive (Per TPPS - Between Sunrise Pkwy and Garnet Avenue)
INCN7-A	North Indian Canyon Drive – Crossing A
INCN7-B	North Indian Canyon Drive – Crossing B
INCN13	North Indian Canyon Drive (Per TPPS – Between Pierson Blvd. and Mission Lakes Blvd.)
INCN14	North Indian Canyon Drive (Per TPPS – Between Mission Lakes Blvd. and SR-62)
LM1	Little Morongo Road (Per TPPS - Between Pierson Blvd. and Mission Lakes Blvd.)
LM3	Little Morongo Road (Per TPPS - Between Dillon Rd. and 2 Bunch Palms Trail)
MBI	Michael Baker International
PM10	Particulate matter smaller than or equal to 10 microns
RCFC&WCD	Riverside County Flood Control and Water Conservation District
RCTC	Riverside County Transportation Commission
TBP2	2 Bunch Palms Trail (Per TPPS - Between Little Morongo Rd. and Palm Drive)
TPPS	Transportation Project Prioritization Study
VRNR2	Varner Road (Per TPPS - Between Mountain View Rd. and Date Palm Drive)

1 INTRODUCTION

1.1 Project Overview

The Western Coachella Valley has experienced significant flooding in the recent years; most notably during the February 14, 2019 flooding event. This event exposed the vulnerability of the region's roadway infrastructure and the adverse social and economic impacts of roadway closures attributed to flooding. The flooding was particularly widespread and damaging in the western part of the valley for roadways crossing the Whitewater River, Mission Creek, Morongo Wash, Long Canyon and Chino Canyon.

Flood events pose an imminent danger to all commuters in a route of travel. Due to the nature of the storms in the desert region, flood events often occur with little warning. Flash flood are a common occurrence in the desert region indicating flooding is imminent and immediate precautions should be taken to protect life and property. Avoidance of the path of stormwater is the primary safety measure. As stormwaters continue to rise, so do the negative ramifications during and following a flood event.

Road closures during flood events are common which results in prolonged periods of traffic congestion for commuters, including emergency response personnel (See Figure 1-1). Emergency response vehicles must navigate through the traffic congestion and/or take alternative routes to transport injured or sick people to Desert Regional Hospital, the region's only trauma center. The week preceding the February 14th flooding event and the week immediately after, emergency response times increased roughly 60 percent with a 10 percent increase in incident volume. These data points show the direct impact of road closures on inhibiting or limiting access of emergency response vehicles to critical emergency facilities.

When storm events pass and the water levels reside, roadways generally remain closed due to the sediment accumulation and miscellaneous debris on the roadways transported during the flood event (See Figure 1-2). The increased flow rates generated by the storm event increases flow velocities to erodible levels within the upstream channels and transport sediment and miscellaneous debris downstream onto the roadways. Sediment accumulation and miscellaneous debris on a roadway is a serious safety issue. Maintenance activities must be performed to remove accumulated sediment and miscellaneous debris prior to opening of the roadways to ensure the roadway is safely accessible. City and County maintenance crews are overburdened following storm events in an effort to clear the roadways in a timely manner.

Unfortunately, maintenance activities are not limited to the initial removal of sediment and miscellaneous debris following flood events. Within the Coachella Valley, there is a is a natural sand migration process referred to as "Blowsand". During periods of heavy winds, fine grained particles are transported and deposited downwind and onto the roadways, also referred to as "sediment deposits" (See Figure 1-3). The accumulation of sand on the roadway poses a serious safety concern as commuters are forced to drive through or around the sediment deposits. In some cases, roads are closed completely until maintenance personnel is able to remove the sand. The ongoing effort to remove blowsand from roadways is a continuous and costly process throughout the year.

Blowsand events also have a direct and indirect effect on air quality resulting in the suspension of fine particulate matter (PM10, particulate matter smaller than or equal to 10 microns), into the atmosphere. Blowsand produces PM10 in two ways; by direct particle erosion and fragmentation (natural PM10), and by secondary effects. As sand deposits on road surfaces are ground into PM10 by moving vehicles and resuspended in the air (man-made PM10).

PM10 has been linked to increased respiratory, morbidity and mortality. Studies have indicated that approximately 50 percent of total suspended particulate matter, by weight, is of PM10 size or less. Under the Clean Air Act, the Environmental Protection Agency sets and reviews national air quality standards for particulate matter. Air quality monitors measure concentration of particulate matter throughout the country to ensure the protection of public health and the environment.

As recently as April and May 2019, North Indian Canyon Drive was closed due to poor visibility resulting from blowsand and dust (See Figure 1-4). Gene Autry Trail has also been closed during major wind events

As the population of Coachella Valley continues to grow, so do the traffic volumes and the daily commutes at flood crossings and areas susceptible to blowsand events. The increased traffic will further contribute to the social and economic impacts from flood and blowsand events.

FIGURE 1-1: NORTH INDIAN CANYON DRIVE (FEBRUARY 14, 2019)

FIGURE 1-2: WILLOW WASH CROSSING (VRNR2)

FIGURE 1-3: NORTH INDIAN CANYON DRIVE (SEDIMENT DEPOSITS)

FIGURE 1-4: NORTH INDIAN CANYON DRIVE (BLOWSAND EVENT)

1.2 Scope of Work

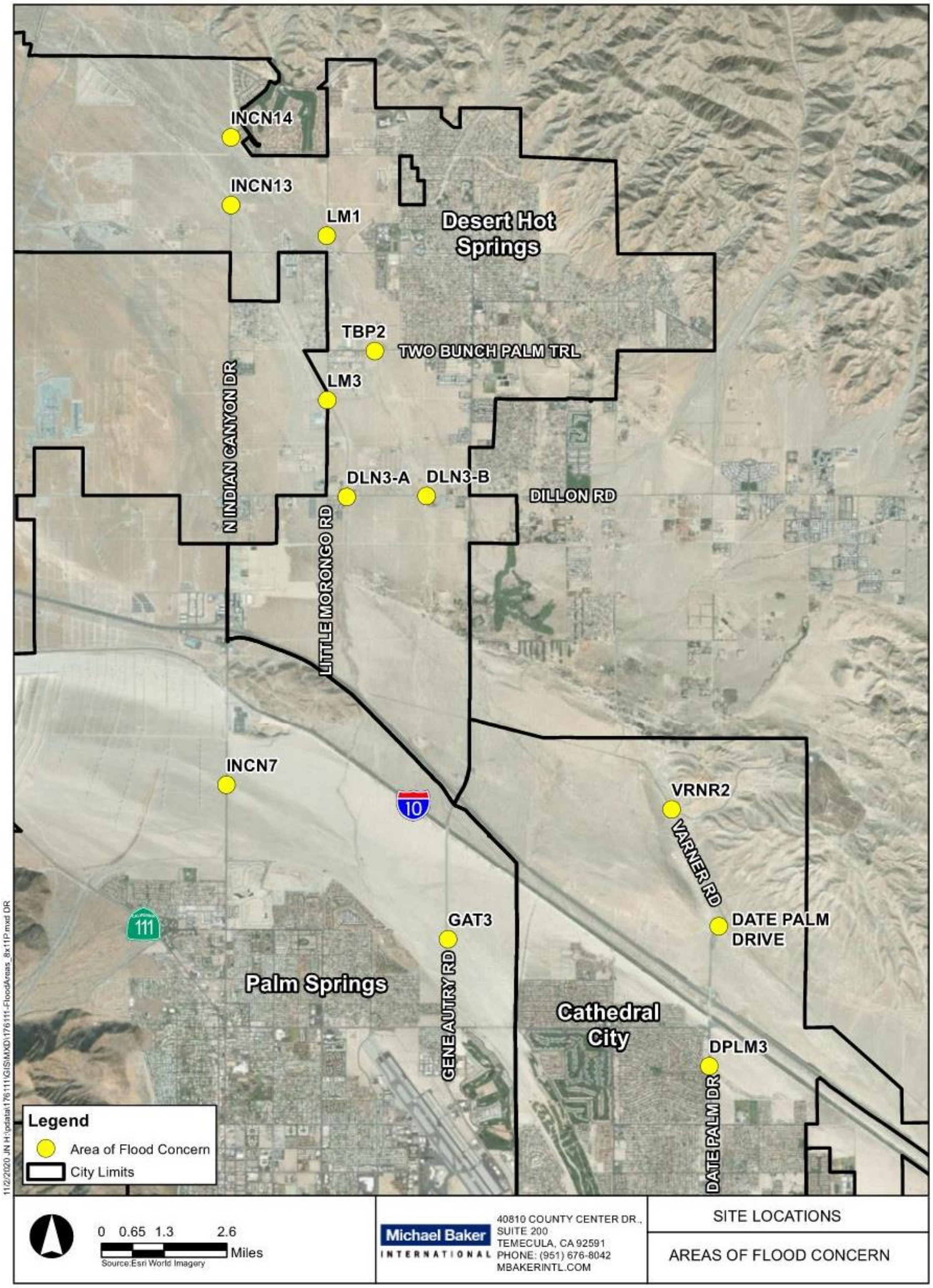
The Coachella Valley Association of Governments (CVAG), as a recognized regional transportation planning agency, has undertaken this project to identify, develop and evaluate alternative concepts for (12) twelve areas of flood concern within the Western Coachella Valley, as identified below in Table 1-1. (See Figure1-5 for location map for areas of flood concern.) The alternative concept designs shall mitigate the adverse impacts associated with flood and blowsand events. The areas of flood concern are located in the cities of Palm Springs, Desert Hot Springs, Cathedral City and the Unincorporated County of Riverside. The naming convention is consistent with the segment name per CVAG's 2016 Transportation Project Prioritization Study (TPPS).

TABLE 1-1: AREAS OF FLOOD CONCERN

CITY	FLOOD CROSSING (SEGMENT PER TPPS)	STREET NAME
PALM SPRINGS	INCN7	North Indian Canyon Drive
	GAT3	North Gene Autry Trail
DESERT HOT SPRINGS	DLN3-A	Dillon Road
	DLN3-B	Dillon Road
	LM3 *	Little Morongo Road
	TBP2	2 Bunch Palms Trail
	LM1	Little Morongo Road
	INCN13	North Indian Canyon Drive
	INCN14	North Indian Canyon Drive
CATHEDRAL CITY	DPLM3	Date Palm Drive and Los Gatos Road
	VRNR2	Varner Road
	DPLM5	Date Palm Drive and Varner Road

* Shared jurisdiction with Unincorporated County of Riverside

FIGURE 1-5: AREAS OF FLOOD CONCERN



The development of alternative feasible design concepts was a collaborative effort between Michael Baker International (MBI), CVAG and the stakeholders. As a regional transportation agency, CVAG has a responsibility to consider and incorporate, as appropriate, the transportation plans of cities, counties, districts, private organizations, and state and federal agencies. MBI assumed this responsibility throughout this process by communicating and engaging with City representatives to ensure the proposed alternative concepts meet their expectations, preferences and needs; both in the near term and long term. Alternative concepts were presented to stakeholders for concurrence at various stages of the design process. Modification and adjustments were incorporated into the designs based on the feedback of the stakeholders.

Consideration of creative solutions to mitigate for flood and blowsand events was encouraged. The typical bridge construction methods provided in the TPPS come with a significant cost. For example, per the TPPS, the recommended bridge on N. Indian Canyon Drive across the Whitewater River (INCN7) between Sunrise Parkway and Palm Springs Station Road was estimated to cost over $204 million dollars and the recommended bridge across the same channel on N. Gene Autry Trail was estimated to cost over $233 million dollars. The Federal Highway Administration (FHWA) has a Highway Bridge Program that funds construction of bridges. Currently, in California there is a 19-year backlog of projects, and new bridges are not being considered for funding. As a result, these costly solutions have not moved forward. A new approach must be considered to identify near-term solutions that are feasible and cost-effective.

The identification, development and evaluation of alternative concepts considered all of the following design criteria:

- Provides near-term, practical, cost-effective solutions that are compatible with current site conditions
- Consideration of best available technology, construction materials and practices that could potentially change the approach to future similar projects
- Ensures compatibility with future long-term development plans per City General Plan, County General Plan, and other applicable policy documents
- Provides a level of flood protection appropriate for the specific location. Where locations are heavily travelled, a 100-year storm frequency design vs. 10-year frequency design for roads less travelled. The intent is to provide the most efficient and cost-effective design
- Mitigates the adverse impacts associated with blowsand events, to maximum extent practical
- Compatibility with the Coachella Valley Multi-Species Habitat and Conservation Plan (CVMSHCP). Alternative concepts shall minimize negative impacts to Federal and State listed or other sensitive plan and animal species.
- Complies with local and county design guidelines and follows best engineering practices
- Consideration of non-structural measures to mitigate adverse impacts associated with flood and blowsand events

Alternative concepts have been prepared for all twelve crossings taking into consideration the criterial elements outlined above. Plan sets were prepared for each of the three cities; Palm Springs, Desert Hot Springs and Cathedral City. Each plan set provides sufficient detail to clearly identify the recommended improvements at each location to mitigate the adverse impacts associated with flood and blowsand events.

Alternative concepts were evaluated for environmental limitations and constraints for compatibility with the Coachella Valley Multi-Species Habitat and Conservation Plan (See Section 5). An engineer's estimate of costs was also prepared for each concept. A summary of the estimate of costs and methodology of evaluation is provided in Section 7.

In order to determine the prioritized need for the twelve areas of flood concern, a risk assessment was performed. The risk assessment serves as an unbiased, methodical tool to provide CVAG direction in prioritizing funding for these regional arterials to address flooding and blowsand events.

The risk assessment performed analyzed the frequency of flood events, magnitude of social and economic impacts and costs of recommended improvements for each of the areas of flood concern. Areas of concern with greatest risk were considered highest priority for mitigation against future flooding events. The methodology and summary of recommendations are outlined in Section 8.

2 PROJECT APPROACH

MBI implemented a four-phased approach to identify, develop, and evaluate alternative concepts to best manage resources and perform all elements of the scope of work in a cost-effective and efficient manner.

2.1 Phase 1: Review Existing Information

The initial phase involved reaching out and speaking with stakeholders to discuss the scope of work. During this initial meeting, MBI received feedback from the stakeholders regarding specific issues and concerns at each of the areas of flood and blowsand concern. MBI requested information of existing studies and applicable information (hydrology studies, HEC-RAS analysis, as-built drawings, etc.) to best understand the site-specific issues and concerns at each location identified in Table 1-1, within their jurisdiction. Information was reviewed to gain a better understanding of the probability/frequency at which events occur, social and economic impacts, applicable biological constraints/limitations and general site conditions. This information provides the foundation to develop creative, effective alternative concepts for flood and blowsand mitigation.

MBI researched and performed due diligence of key reports, documents, data and plans that provided information relevant to addressing the flood and blowsand issues. Examples of key documents reviewed includes Riverside Flood Control & Water Conservation data, Transportation Project Prioritization Study (TPPS), Coachella Valley Multiple Species Habitat Conservation plan (CVMSHCP) and publications, reports from South Coast Air Quality Management District and General Plans for the County of Riverside, Cities of Palm Springs, Desert Hot Springs, and Cathedral City.

Key areas of focus included long-range policy documents that may impact the implementation of the proposed improvements, with a key focus on the circulation, conservation, and land use elements.

Upon a comprehensive understanding and familiarity with relevant material, MBI developed a checklist for each area of concern. This checklist served as a tool to identify the specific characteristics of each flood crossing that will assist in the development and design of alternative concepts. Equally as important, this checklist also identified information that was not available through past studies. In which case, MBI performed technical studies to obtain this information, as outlined in Phase 2, Technical Studies.

2.2 Phase 2: Technical Studies

Prior to performing technical studies, MBI conducted focused site visits at each of the areas of concern. This preliminary field work allowed MBI to recognize critical infrastructure that is most prone to be damaged in a flood or blowsand event and critical for emergency access/circulation. Site visits also helped MBI understand potential species on the development sites, as well as to record existing site conditions that will support the alternative concept designs. Photographic documentation was collected during the site visits and was used during regular scheduled meetings and presentations to discuss project updates and share ideas to CVAG and stakeholders.

Site specific hydrology analysis were conducted at areas of concern, as required, when this information was not available in past studies. Hydrology analysis were necessary to determine the anticipated flow rate for design purposes. Although most precipitation over the Coachella Valley occurs during the winter storms, thunderstorms can occur at any time of the year causing extremely high rates of precipitation for relatively short durations. For that reason, various storm events and durations were modeled to better understand the magnitude and frequency of flows.

The "level of flood protection" is a critical component in the development of alternative concepts. Flood mitigation structures are directly proportional to cost. A drainage structure/conveyance will typically increase in costs as the level of flood protection increases. As a cost saving measure, MBI considered alternative concept designs for various levels of flood protection. Where locations are heavily travelled, MBI provided a 100-year storm frequency design vs 10-year frequency design for roadways less traveled. The intention is to provide the most efficient and cost-effective design. Level of flood protection for each area of flood concern was discussed with stakeholders for concurrence prior to the development of alternative concepts.

It is important to note that all locations for consideration of reduced level of protection from a 100-year storm were discussed and received concurrence from the stakeholders prior to commencement of design.

2.3 Phase 3: Identify, Develop and Evaluate Alternative Concepts

Alternative design concepts have been identified, developed and evaluated for each of the twelve areas of flood concern to meet the design criteria outlined in Section 1.2, Scope of Work.

Each area of flood concern has its own unique characteristics and constraints/limitations. Concepts proposed for one location may not be feasible at another location. Site constraints/limitations may include, but not limited to, utility conflicts, flat topography in relation to street elevations, existing street grades, limited headwater depth, existing improvements in the vicinity, including street intersections, availability of land and environmental restrictions.

MBI has partnered with Contech Engineering Solutions to utilize the CON/SPAN O-Series Bridge System at locations where site conditions are compatible (See Manufacturer's Data in Appendix E). This product is a precast buried bridge system that provides the level of protection of a standard bridge at a fraction of the costs. Benefits of the CON/SPAN O-Series System include:

- Buried Bridge Structure - Reduces maintenance costs and lowers life cycle costs as there are no bridge deck or joints at the deck/roadway interface
- Modular Bridge System - Rapid installation results in reduced overall project costs, delays and detours
- Designed "Site Specific" - Meets your site needs in full compliance with AASHTO and AREMA design standards for highway and railway use
- Lighter piece weights or longer lay lengths for most projects
- Outward horizontal reactions – one-sided keyway, reduced forming and grouting
- Maximized clear span and clear distance between footings
- Proven design methodology with over 7,000 installations since 1983

Alternative Design Concepts Plan Sets have been prepared and are included herein, which identify the proposed improvements at each flood crossings. Alternative design concepts have been prepared at a conceptual level for compatibility with currents site conditions. A separate plan set has been prepared for each of the three jurisdiction areas; City of Palm Springs, City of Desert Hot Springs and Cathedral City.

A Photo Documentation Sheet and a Plan and Profile Sheets were prepared for each crossing.

Photo documentation sheet includes satellite imagery with linework added of existing street centerline. Street centerline stationing has been added which correlates with the stationing shown on the Plan and Profile Sheet.

Plan and Profile Sheet includes detailed information of the existing conditions and proposed alternative design concept. Plan view includes topography, existing pavement, right of way, proposed limits of improvements and proposed improvements to include street and storm drain facilities. Street centerline stationing has been provided which correlates with the profile above and the photo documentation sheet. This allows the viewer to view both sheets simultaneously to better understand the location of existing features in relation to the proposed improvements.

Profile includes the existing street centerline elevation, proposed street centerline elevation and proposed storm drain improvements.

Alternative Design Concept Plan Sets for each of the three cities are included in the back of this report. Engineering Cost Estimates have also been prepared for each area of flood concern, as outlined in Section 6.

2.4 Phase 4: Risk Assessment

Risk factors were considered to determine the prioritized need of all twelve areas of flood concern. The risk assessment includes a simple, transparent, and unbiased methodology to prioritize the proposed improvements for each flood crossing. Prioritization must consider the overall benefit of circulation for the entire Coachella Valley, as opposed to local jurisdictions and social and economic impacts. The methodology and recommendations are described in Section 8: Risk Factors and Mitigation Recommendations.

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3 FLOOD METHODOLOGY

3.1 Flood Areas of Concern

3.1.1 Level of Flood Protection

The base flood is defined in the National Flood Insurance Program (NFIP) as "*the flood having a one percent chance of being equaled or exceeded in any given year*." This flood has typical been described as the 100-year storm event. Ideally, all proposed flood crossings would provide protection for all storm events up the 100-year level of flood protection. However, protection from the 100-year storm event is not always the most cost-effective design nor necessary.

Level of protection is proportional to costs of construction, where a higher level of flood protection leads to higher construction costs. As outlined in Section 1.2, Scope of Work, the proposed conceptual designs are to provide near-term, practical, cost-effective solutions that are compatible with current site conditions. Where flood crossings are located on heavily traveled segments, a 100-year flood protection is appropriate. However, on segments less traveled, a 10-year level of flood protection should be considered.

During the initial stages of the design process, MBI discussed and received concurrence from City representatives regarding which flood crossings would be eligible for consideration for a reduced level of flood protection. The level of protection for all areas of flood concerns are outlined below in Table 3-1.

TABLE 3-1: LEVEL OF FLOOD PROTECTION

CITY NAME	FLOOD CROSSING NAMES	DESIGN STORM EVENT	Q(100	Q(10)
			(CFS)	(CFS)
PALM SPRINGS	INCN7-A	100-YEAR	4,800	-
	INCN7-B	100-YEAR	47,000	-
	GAT3	100-YEAR	47,000	-
DESERT HOT SPRINGS	DLN3-A	100-YEAR	14,366	-
	DLN3-B	10-YEAR	33,322	12,303
	LM3	10-YEAR	14,366	5,210
	TBP2	10-YEAR	33,322	12,303
	LM1	10-YEAR	31,707	12,004
	INCN13	100-YEAR	14,146	-
	INCN14	10-YEAR	14,653	6,100
CATHEDRAL CITY	DPLM3	Not applicable		
	DPLM5	100-YEAR	3,250	-
	VRNR2	100-YEAR	3,250	-

Design Flow Rates (green shading)

3.1.2 Hydrology

MBI utilized hydrologic data from past studies, when information was available and deemed reliable/accepted. If hydrologic data was not available, technical studies were performed. This section discusses the hydrological methods used to determine the peak flow rates tributary to flood crossings identified in this study. The flow rates were used for the preliminary sizing of the proposed storm drain structures at each of the areas of flood concern.

CivildCadd/CivilDesign Hydrology – Hydraulics Software by CivilDesign Corporation and Joseph E. Bondiman and Associates, Incorporated was used to compute hydrology calculations. The peak discharges and time of concentration at specified nodes are shown on the hydrology maps. Per criteria from the RCFC&WCD Hydrology Manual, onsite hydrology was computed using the Synthetic Unit Hydrograph method as each watershed tributary to the flood crossing location is much larger than 600 acres. Effective rainfall calculations from the Synthetic Unit Hydrograph method was used to calculate the flowrates for the 10-year and the 100-year 1-hr, 3-hr, 6-hr, and 24-hr duration storms.

- Drainage boundaries for each crossing were delineated using the contours developed from available GIS and Lidar data sources. Hydrological parameters such as slope, flow length, drainage area is calculated using the contour data.
- The hydrologic soil groups were determined in accordance with Web Soil Survey. Hydrologic Soil Group (HSG) Type A, B, C, and D were found in each watershed.
- The Runoff Indices (RI) were weighted and averaged over each sub-area in accordance with the values given in Plate D-5.5-5.6 of the RCFC Hydrology Manual for each soil cover and land use.
- The loss rate was determined from the Infiltration Rate for Pervious Areas Versus Runoff Index Numbers (Plate E-6.2). Antecedent moisture condition (AMC) II was assumed for 10-year storm and AMC III for 100-yr storm. AMC is defined as the relative wetness of a watershed just prior to flood producing storm events. AMC 1 has the lowest runoff potential, reflective of dry soil conditions. AMC 3 has the highest runoff potential, reflective of saturated soil conditions from antecedent rains.
- NOAA Atlas 14 was utilized to obtain the 100-yr rainfall amounts for each duration. The effective rainfall was then calculated by subtracting the unit loss rate for each unit time period.
- The effective rainfall was multiplied by the subarea for each drainage area to obtain the stormwater runoff volume.

Hydrologic studies were performed for all flood crossings within Desert Hot Springs (See Appendix B: Hydrologic Models and Exhibits). These seven crossings are located along Mission Creek and Morongo Wash:

- Mission Creek – DLN3-A, LM3, INCN13
- Morongo Wash – DLN3-B, TBP2, LM1, INCN14

Effective rainfall calculations from the Synthetic Unit Hydrograph method were used to calculate the flowrates for the 10-year and the 100-year 1-hr, 3-hr, 6-hr, and 24-hr duration storms. Upon the review and comparison of the 1-hr, 3-hr, 6-hr and 24-hr storm events, it was determined to use the 24-hour storm event as the basis for conceptual design.

Hydrology studies were also performed for one area of flood concern in Cathedral City at DPLM3 (See Appendix C: Hydrologic Models and Exhibits). Effective rainfall calculations from the Synthetic Unit Hydrograph method were used to calculate the flowrates for the 2-year, 5-year and the 100-year, 24-hour storm events.

TABLE 3-2: SUMMARY OF HYDROLOGIC DATA

									HSG SOIL TYPE BREAKDOWN				Q100 DESIGN STORM				Q10
CITY NAME	FLOOD CROSSING NAMES	WATERSHED AREA (ACRES)	WATERSHED AREA (SQ MI)	FLOW LENGTH (FT)	CENTROIDAL LENGTH, LCA (FT)	UPSTREAM NODE ELEV. (FT)	DOWNSTREAM NODE ELEV. (FT)	DELTA (DIFF. ELEV.) (FT)	A ACRES	B ACRES	C ACRES	D ACRES	1 HR (CFS)	3 HR (CFS)	6 HR (CFS)	24 HR (CFS)	24 HR (CFS)
PALM SPRINGS	INCN7-A	Not applicable, flow rates determined from past studies														4,800	-
	INCN7-B	Not applicable, flow rates determined from past studies														47,000	-
	GAT3	Not applicable, flow rates determined from past studies														47,000	-
DESERT HOT SPRINGS	DLN3-A	28,037	43.81	127,961	65,400	8,560	860	7,700	3,645	3,645	14,579	6,168	9,968	14,097	15,276	14,366	-
	DLN3-B	72,795	113.74	143,796	71,882	8,920	840	8,080	7,280	10,919	38,785	15,811	20,597	31,625	35,230	33,322	12,303
	LM3	28,037	43.81	127,961	65,400	8,560	860	7,700	3,645	3,645	14,579	6,168	9,968	14,097	15,276	14,366	5,210
	TBP2	72,795	113.74	143,796	71,882	8,920	840	8,080	7,280	10,919	38,785	15,811	20,597	31,625	35,230	33,322	12,303
	LM1	65,737	102.71	129,241	59,055	8,920	1,120	7,800	1,972	9,203	38,785	15,777	21,539	32,009	35,208	31,707	12,004
	INCN13	27,247	42.57	112,375	65,934	8,560	1,160	7,400	3,626	3,598	14,136	5,887	10,380	14,355	15,464	14,146	-
	INCN14	25,938	40.53	99,925	51,073	8,280	1,300	6,980	864	3,533	15,270	6,271	11,812	15,712	16,854	14,653	6,100
CATHEDRAL CITY	DPLM3	Refer to Hydrology Summary for DPLM3															-
	VRNR2	Not applicable, flow rates determined from past studies														3,250	-
	DATE PALM DRIVE	Not applicable, flow rates determined from past studies														3,250	-

TABLE 3-3: SUMMARY OF HYDROLOGIC DATA (DPLM3)

FLOOD CROSSING NAME	WATERSHED AREA	FLOW LENGTH	CENTROID LENGTH	UPSTRM. NODE ELEV.	DNSTRM. NODE ELEV.	DELTA (DIFF. ELEV.)	DESIGN STORM	FLOW RATE	VOLUME
	(ACRES)	(FT)	(FT)	(FT)	(FT)	(FT)		(CFS)	(AC-FT))
DPLM3	224	6793	2408	414.2	366.4	47.8	2-YR 24-HR	25.4	15.8
							5-YR 24-HR	41.8	25.8
							10-YR 24-HR	54.1	33.4
							25-YR 24-HR	70.3	43.5

3.1.3 Hydraulics

Preliminary sizing of roadway under crossings were determined using the Bentley FlowMaster Program by Haestad Methods Solution Center. The program allows the user to perform hydraulic calculations for various hydraulic element types, from pipes and open channels to inlets and weirs.

Additional hydraulic studies will be required during final engineering to verify capacity of proposed conceptual designs. Preliminary design plans for the proposed structures at each crossing can be found in the Alternative Concept Plans included herein. Contech Con/Span O-series arch structures are proposed at most crossings and reinforced concrete box culverts where it was not feasible to propose the arch structures. The Alternative Concept Plans show the dimensions, number of barrels, and slopes at each crossing.

FlowMaster software program is used to determine the water surface depth (normal depth) at each crossing. Normal depth calculations were performed based on the design flow rates tributary to each crossing in the Cities of Desert Hot Springs, Cathedral City and City of Palm Springs. Output results from FlowMaster are included in Appendix D. The results show that the conceptual culvert dimension shown on the alternative concept plans at each crossing are designed adequately for the safe conveyance of a 10-year and a 100-year flood waters. More detailed hydraulic analysis are recommended for each crossing should the stakeholders approve final design plans for any flood crossing analyzed in this report.

4 BLOWSAND

4.1 Methodology

Blowsand is a phenomenon known to create hazards contributing to social and economic impacts in the Coachella Valley (See Figures 1-3 and 1-4). Blowsand is created by wind systems that transport sand masses from a source area to a location downwind. Wind is created via the flow of air molecules moving from a high pressure/cool (HPC) system to a low pressure/warm (LPW) system. As temperatures rise, conduction occurs near the Earth's surface and heats the air directly above it. This causes air molecules to rise creating a Low Pressure (LPW) system and a void near the Earth's surface. This creates the opportunity for cooler, Higher Pressure (HPC) system to enter. The mechanics of this flow is what we call wind.

Other parameters of wind directly influence the severity of a Blowsand event. The velocity of wind is directly proportionate to the pressure gradient. (i.e. wind velocity is dependent on the temperature difference between neighboring climate systems). The higher the pressure gradient, the higher the wind velocity. Wind velocity and the pressure gradient are also directly proportionate to height. Wind speeds and pressure gradients increase as the distance (i.e. height) from the surface increases. Air density is inversely proportionate to the pressure gradient and height. Air density is higher near the earth's surface. As height increases the air density decreases. Air density acts as wind friction, resisting wind flow along its path.

Similarly, surface friction, such as vegetation, rocks, trees, and civil structures (E.g. raised roadway, bridges, columns, etc.) also act as wind friction, creating a lower velocity system at a lower height. It is important to sustain mitigation practices that will sustain lower velocity wind systems in high wind velocity prone regions, e.g. the arid areas, studied and a part of this report.

Sand transport is categorized by different modes of conveyance dependent on grain size and frictional shear velocity. Figure 3-1 illustrates the classifications of sand transport in relationship to the Earth's surface. Figure 3-2 classifies the sand transport by the grain diameter and frictional shear velocity. Generally, Creep ($d < 0.5mm$) is the largest of the particles that are affected by a high wind event. Saltation ($0.5mm>d>0.07mm$) is the second classification and the main contributor to the overall sand transport mass. Sand grain diameters within $0.07 – 2mm$ range are generally considered in sand transport modeling. Dust or permanent suspension ($d<0.07mm$) is less of a concern regarding blowsand mitigation due to its different physical properties and the ability to maintain suspension for longer distances and periods of time. However, dust in a high velocity high density system can become a hazard as shown in Figure 1-4. A more definitive classification of frictional shear velocities, diameter sizes, drift potentials and volumes are recommended to ensure proper design criteria is met. For the purpose of this study the concepts recommended are based on assumed parameters based on available data and research.

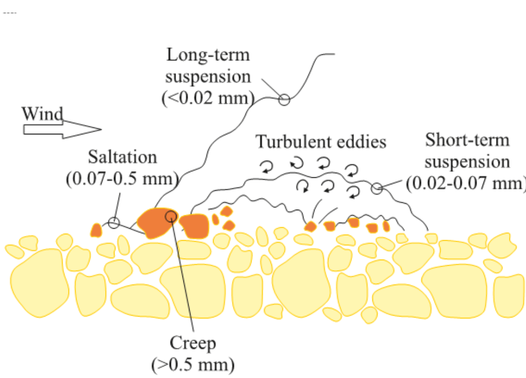


FIGURE 4-1: SAND TRANSPORT CLASSIFICTION (Bruno et al)

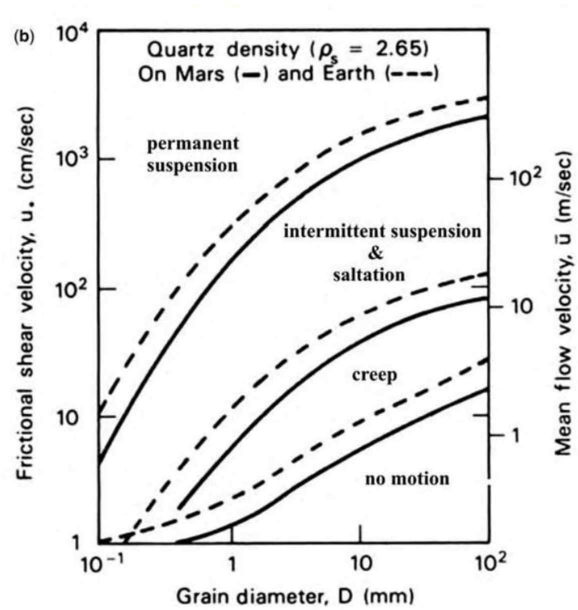


FIGURE 4-2: SAND TRANSPORT CLASSIFICATION (BROOKFIELD)

There are many methods to classify the various mitigation concepts, one method, considered for the purposes of this study is the Source-Path-Receiver (SPR) categorization of Sand Mitigation Measures (SMMs). This method was proposed by the Journal of Wind Engineering and Industrial Aerodynamics. This framework results in three sand course mitigation categories.

4.1.1 Sand Mitigation – Source

Mitigation measures installed at the sand source (deposition, sand sheets, sand dunes, etc.). This measure is completely independent of the sites in question. The goal is to reduce the shear stress by reinforcing the sand grain cohesion and reduce erosion of sand by increasing the aerodynamic roughness (i.e. wind speed/turbulence). Some examples include:

1. Source Roughness
    a. Vegetation
    b. Hay Barrels
    c. Gravel Installation
    d. Wind Breaks
    e. Shelter Belts
2. Netting & Mulching
    a. Erosion Control Netting
    b. Hydroseed & Hydromulch

4.1.2 Sand Mitigation - Path

Path Mitigation measures are intended to interrupt the flow (i.e. reduce the velocity) of the wind along its path.

1. Velocity Reduction Via Ground Modification
    a. Ditch
    b. Berm
    c. Ditch-Berm
2. Fence & Barrier
    a. Varying Permeability/Porosity Fence
    b. Non-Porous Fencing
    c. Slat Varying Fence (Horizontal, Vertical, Inclined)
    d. Patterned Fence (Grid, Holes, Porous Deflection)
    e. Nylon Fence
    f. Concrete Fence
    g. Shelterbelts
3. Peak Season Artificial Flood
    a. Will increase the local density of the Earth and sand creating cohesion and less lift from sand.

4.1.3 Sand Mitigation - Receiver

Installed directly along the roadway (i.e. receiver) or infrastructure. Receiver SMMs are intended to serve as a supplement to other sand mitigation methods.

1. Aerodynamic Barriers
    a. Curved Shields (recent patented)
    b. Sleeper Wall
2. Flow Through
    a. Culvert Design
    b. Bridge (i.e. Elevated Roadway)
3. Warning Systems / Signal Synchronization
4. Public Awareness
5. Policy Implementation

4.2 Coachella Valley

The Coachella Valley suffers from frequent wind events. The strongest and most persistent winds typically occur immediately to the east of Banning Pass/San Gorgonio Pass, which is noted as a wind power generation resource area. To better understand the cause of these frequent wind events, it is important to understand the geographic location of the Coachella Valley. The Coachella Valley sits east of two major mountain ranges (San Jacinto Mountains and the Santa Rosa Mountains) and south of another mountain range (San Bernardino Mountains). The cause of the wind, as described in Section 3.2, is directly related to low pressure versus high pressure. Wind always moves from high pressure to low pressure.

During the warm sunny days, the valley floor is heated by the sun’s rays. As the valley floor heats up, heat rises and forces air upward. The lack of molecules at the surface generates a low-pressure area triggering an influx of air rushing into the Coachella Valley from the coastal regions – west of Banning Pass/Gorgonio Pass. The scientific name for this process is known as the “Venturi Effect”.

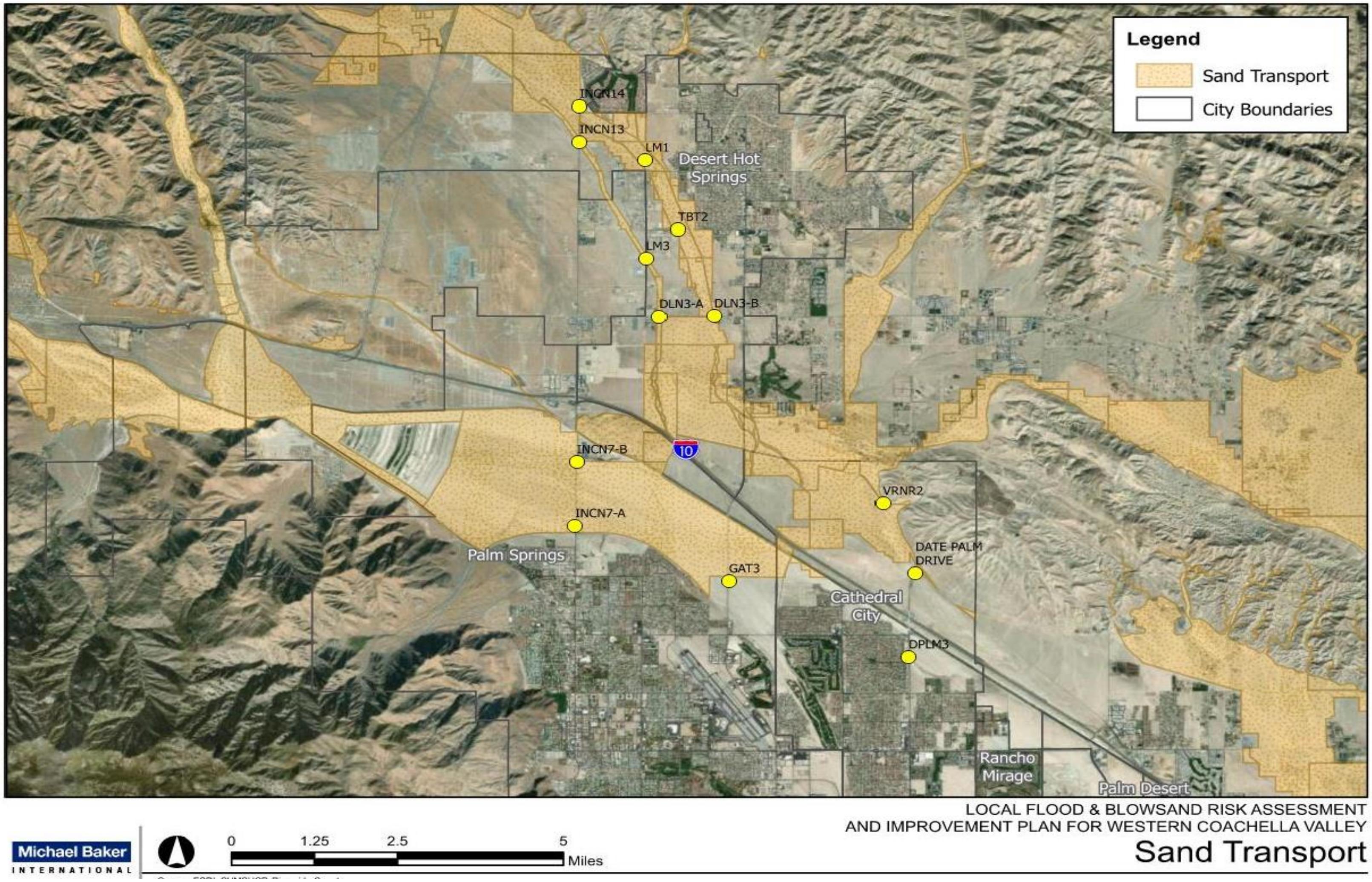
Transporting winds from the Pass occur most frequently and with the greatest intensity during the spring and early summer months. The months of March – May, April specifically, have been identified as Blowsand Peak Season. The peak season is the direct correlation of the increase in pressure gradients and high wind velocity systems. As the desert warms up for their upcoming summer the neighboring climates maintain cooler climates increasing the local pressure gradient and creating the perfect environment for high winds and high risk of Blowsand events.

Of the twelve areas of flood and blowsand concern, the greatest impact is located within the entrance to the Coachella Valley at N. Indian Canyon Drive (INCN7-A and B). The next crossing in the path of high winds along the valley floor is the crossing at N. Gene Autry Road (GAT3). These two crossings are located directly in the path of the wind tunnel into the Coachella Valley and cross the Whitewater River, a major source of sand transport (See Figure 4-1).

Once having entered the Valley, the winds tend to dissipate rapidly in the southeasterly direction, Upon reaching the lower portion of the Whitewater River channel near Indio, wind velocities have reduced and dissipated to a level incapable of transporting significant quantities of sand.

The blowsand process varies considerably over time, depending on the availability of flood-provided sand, fluctuations in the transporting wind regime, and to a lesser extent, changes in vegetative cover.

FIGURE 4-3: SAND TRANSPORT



4.3 Goals and Objectives

Sand migration is a natural phenomenon that is critical for the ecological processes that sustain core habitat and other conserved habitat areas. Essential ecological processes, including sand source areas and sand transport systems, hydrological systems, watershed features, and flooding regimes are protected under the CVMSHCP. For this reason, source mitigation measures are not recommended in the Coachella Valley.

The goal to mitigate for blowsand is not to prevent it from occurring, but to control and prevent/minimize blowsand from accumulating onto the roadways.

Blowsand off the roadway provides significant benefits that include:

- Increased safety (unobstructed path of travel)
- Path of travel for emergency response vehicles
- Reduction in PM10 (man-made)
- Reduced maintenance costs to remove sediment deposits following blowsand events
- Reduced road closures

Indirect benefits (social and economic) are also attributed to maintaining a safe and accessible path of travel which improves the overall quality of life in the Coachella Valley. A few examples worth noting; a reduction of PM10 levels provide improved air quality and improved health for individuals with compromised respiratory systems. Lives are saved when the commute time to the hospital is reduced during the most critical moments following an emergency response call.

4.4 Alternative Conceptual Designs

The areas of flood and blowsand concern, as identified in the scope of this study, are located where roadways cross concentrated flow paths including the Whitewater River, Mission Creek, Morongo Wash and Willow Wash. These concentrated flow paths consist primarily of unconsolidated sandy and gravelly sediment deposits that contains loose sand and silty sand. Minimal vegetation exists within these washes. It the combination of soil characteristics and lack of vegetation in these rivers and washes that create the perfect environment for blowsand events. The areas of sediment deposits attributed to blowsand are primarily confined to limits of the roadways within these rivers and washes. In most of these locations, the roadway elevations are at or lower than the adjacent elevations of the rivers and washes. Any wind event that generates velocities capable of transporting sediment will result in sediment deposits on the roadways, resulting in a safety concern and possibly lead to roadway closures.

The alternative concepts developed by MBI are not to prevent the natural process of sand migration. The objective of these concepts is to allow the natural process to occur but in a controlled manner. A combination of elevated roadways and a widened opening will allow sediment to be transported under the roadways, with as little resistance as possible.

The proposed alternative concepts consider the following design criteria to mitigate the adverse effects of blowsand:

- Contech CON/SPAN Bridge Systems are proposed which maximize the width to height ratio in an effort of providing uninterrupted flow.
- Roadway surfaces to be elevated to allow the sediment deposits to flow under the roadway
- Provide aerodynamic barriers at strategic locations to allow maintenance activities, when and if necessary
- Provide maintenance access, as necessary

With the implementation of the design criteria outlined above, it is the goal to provide mitigation that is self-sustainable and reduces maintenance to maximum extent feasible. In concept, the conveyance of sediment deposits will flow through the proposed underpass and continue downwind with little disruption; replicating natural blowsand patterns prior to roadway construction.

4.5 Warning Systems / Signal Synchronization

Until alternative concepts are constructed and the adverse impacts of blowsand and flood events are mitigated, measures to notify the public should be implemented as soon as practical. A signal synchronization and/or warning system is not a mitigation in itself but serves as a temporary measure until areas of flood and blowsand concern are improved.

The two areas of concern of the highest priority for the warning systems are N. Indian Canyon Drive and N Gene Autry Trail. Upon the event of a road closure, warning signs shall notify the travelers at either end of the crossings that the roadway is closed and other relevant travel information on an ongoing basis. Location of signs should be strategically located to ensure the travelers are notified in advance of reaching the affected area; reducing congestion and maintaining a steady circulation of traffic. Ideally, travelers should be provided an alternative path of travel.

5 FLOOD AREAS OF CONCERN

5.1 City of Palm Springs

5.1.1 North Indian Canyon Drive (INCN7)

North Indian Canyon Drive is a four-lane divided Major Thoroughfare road per the City of Palm Springs General Plan with an ultimate right of way of 100'. In its current state, it does not have curb improvements. It is improved with asphalt pavement for the four lanes, striped median and 8-foot asphalt pavement shoulders. It has power poles adjacent to the East shoulder within the Right of Way.

The segment of N Indian Canyon Drive that crosses the Whitewater river is approximately 1.5 miles in length. After further investigation of the historic water crossing across the road, INCN7 was divided in two crossing for structural mitigation improvements proposed per this report. Stations were assigned for the N Indian Canyon Drive from station 39+00 to 130+00 for the segment crossing the Whitewater river. The crossing INCN7-A is between stations 46+13.40 and 47+12.40. The tributary area is the Chino Canyon Creek and Levee. The crossing INCN7-B is between stations 115+85.00 and 120+58.50. The tributary area is the upstream portion of Whitewater River from the West. These water crossings merge downstream in the area between N Indian Canyon Drive and Gene Autry Trail.

The proposed improvements for the INCN7-A crossing include three arch culverts, each at 5' high x 25' wide. They will convey the 100-year flow of 7,000 cfs. The culverts are placed perpendicular to N Indian Canyon Drive to replicate the alignment of the existing crossing.

Headwalls have been placed to ensure a 100-foot width clearance is provided to accommodate the 100' wide section per the General Plan. Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

In one update meeting, consideration was given to the possible use of one these culverts for an undercrossing for pedestrian and bicycle uses of N Indian Canyon Drive as part of the CV Link project. Such option is possible, but further study will be required, as it is beyond the scope of work of this report.

The proposed improvements for the INCN7-B crossing may include nine arch culverts, each at 8'-7" high x 49' wide. They can convey the 100-year flow of 47,000 cfs. The culverts are placed perpendicular to N Indian Canyon Drive to replicate the alignment of the existing Arizona crossing.

Headwalls have been placed to ensure a 68-foot clearance is provided to match the proposed improvements per City of Palm Springs Project 01-11. Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

A 16' wide paved emergency/pedestrian and bicycle access road is recommended to the west side of N Indian Canyon Drive. The access road may be 15' from the edge of the road to provide additional safety to pedestrians and bicycle users. The access road may have bridges with 80' spans like Big R Bridges on sheets 14 and 15 of the set of plans at the same location of the crossings INCN7-A and INCN7-B. In addition to convey storm flows.

5.1.2 North Gene Autry Trail (GAT3)

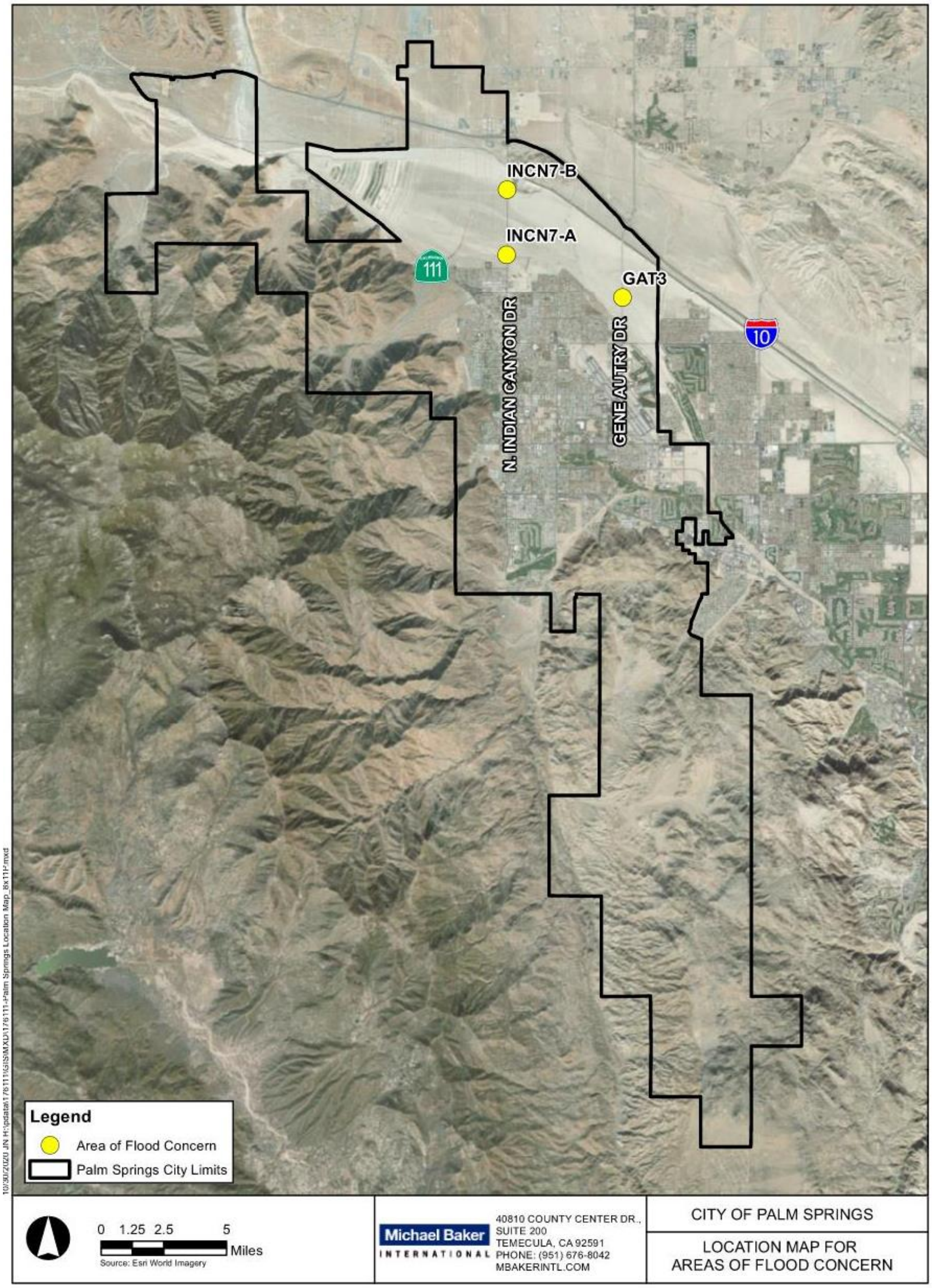
North Gene Autry Trail is a four-lane divided Major Thoroughfare road per the City of Palm Springs General Plan with an ultimate right of way of 100'. In its current state, it does not have curb improvements. It is improved with asphalt pavement for the four lanes, striped median and 8-foot asphalt pavement shoulders. It has power poles adjacent to the East shoulder within the Right of Way.

The segment of North Gene Autry Trail that crosses the Whitewater river is approximately 1.5 miles in length. North Gene Autry Trail crosses the Whitewater river diagonally. Three crossings with five arch culverts are proposed. The first crossing is between stations 22+50.00 and 28+21.67. The second crossing is between stations 36+00.00 and 41+71.67. And third crossing is between stations 51+00.00 and 56+7 1.67

The proposed improvements for each of the GAT3 crossing may include five arch culverts, each at 6'-4" high x 33' wide. The combination of the three crossings can convey the 100-year flow of 47,000 cfs. The source for the flow modeling was taken from the HEC-RAS Hydraulic Model for Whitewater River Prepared by West Consultants, Inc, dated 06-2016 and provided by Riverside County Flood Control and Water Conservation District. The culverts are placed perpendicular to the road.

Headwalls have been placed to ensure a 100-foot width clearance is provided to accommodate the 100' wide section per the General Plan. Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

FIGURE 5-1: AREA OF FLOOD CONCERN – PALM SPRINGS



5.2 Desert Hot Springs

Seven areas of flood concern identified in this study are located within Desert Hot Springs; all of which cross one of the two washes extending along the westerly boundary of Desert Hot Springs; Mission Creek and Morongo Wash.

Mission Creek has a tributary of 27,247 acres upstream of the crossing at North Indian Canyon Drive (INCN13). The tributary extends approximately 21 miles upstream with an increase in elevation of roughly 7,400 vertical feet. Continuing downstream from INCN13, the creek passes under an existing bride at Pierson Blvd. and continues to the next crossing at Little Morongo Road (LM3). Continuing downstream from LM3, the creek crosses Dillon Road (DLN3-A). As the Mission Creek descends towards the valley floor, the tributary area increases to 28,037 acres at the last crossing (DLN3-A) evaluated in this study.

The upper stream of the Morongo Wash is called the Big Morongo Creek which travel approximately 19 miles and descends roughly 6,980 vertical feet from the canyons above before crossing North Indian Canyon Drive (INCN14). Tributary area at this location is 25,938 acres. Continuing downstream from INCN14, the wash confluences with Little Morongo Creek from the Mission Lakes Country Club until reaching the next crossing at Little Morongo (LM1). Tributary area has increased to 65,737 acres. Continuing downstream from LM1, Morongo Wash confluences with the Trap Channel 2 upstream of Pierson Blvd. before crossing Pierson and reaching the next crossing at 2 Bunch Palms Trail (TBP2). Continuing downstream from TBP2, the Morongo Wash crosses Dillon Road (DLN3-B). As the Morongo Wash descends towards the valley floor, the tributary area increases to 72,795 acres at the last crossing (DLN3-B) evaluated in this study.

5.2.1 Dillon Road (DLN3-A and DLN3-B)

Dillon Road is currently a two-lane, 28-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, DLN3, extends in an east/west direction between Little Morongo Road to the west and Palm Drive to the east. Per the General Plan, this road is classified as a Secondary 1 with future plans to widen this roadway to a 4-lane, 80-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders and a 16-foot median.

This segment is unique as it crosses over two washes; Mission Creek and Morongo Wash. The crossing at Mission Creek corresponds to DLN3-A. The crossing at Morongo Wash corresponds to DLN3-B. It is assumed that any improvements to these crossings would occur simultaneously, as there is little to no benefit to improving only one crossing at not the other. The objective of the proposed alternative concepts is to provide continuity along the entire segment of DLN3. For this reason, these two crossings are considered as one in the risk assessment in Section 5.

<u>DLN3-A</u>

In the current condition, stormwater runoff from Mission Creek crosses the roadway, on the surface, at approximate station 75+00, which corresponds to the low point in the street (See sheet 4 of the Alternative Concept Plan Set). Constraints and limitations include existing power poles and utility vaults that must be relocated to accommodate the proposed alternative concept. Adjustments to existing private driveway approaches are also required at the westerly limits of the proposed improvements.

The proposed improvements include (5) CON/SPAN O-Series Bridge Systems (multiple cell configuration), each at 5' high x 25' wide with concrete base slab. Bridge system was designed to accommodate the 100-year flow of 14,366 cfs. The bridge system is placed perpendicular to street centerline at a length of 46 feet. Headwalls have been placed to ensure a 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately nine feet at the highest point, in relation to existing grade. This is achieved by designing the roadway with a gradual transition on each side of the bridge system from station 71+10 to 78+80; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 28-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 22 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

DLN3-B

In the current condition, stormwater runoff from Morongo Wash crosses the roadway, on the surface, at approximate station 118+00, which corresponds to the low point in the street (See sheet 6 of the Alternative Concept Plan Set). Constraints and limitations are minimal. Although existing power poles are within the limits of proposed improvements, the poles are at a higher elevation than the current roadway elevation. Relocation is not anticipated.

The proposed improvements include (4) CON/SPAN O-Series Bridge Systems, (multiple cell configuration) each at 5' high x 25' wide with concrete base slab. Bridge system was designed to accommodate the 10-year flow of 12,303 cfs. The bridge system is placed perpendicular to street centerline at a length of 46 feet. Headwalls have been placed to ensure a 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately 6 to 7 feet at the highest point, in relation to existing grade. This is achieved by designing the roadway with a gradual transition on each side of the bridge system from station 114+00 to 121+50; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 28-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 22 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

5.2.2 Little Morongo (LM3)

Little Morongo is currently a two-lane, 28-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, LM3, extends in a north/south direction between Dillon Road to the south and 2 Bunch Palms Trail to the north. Per the General Plan, this road is classified as a Secondary II with future plans to widen this roadway to a 4-lane, 64-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders. No median is proposed for ultimate condition.

In the current condition, stormwater runoff from Mission Creek crosses the roadway, on the surface, between approximate stations of 61+00 to 63+00, which corresponds to the low point in the street (See sheet 8 of the Alternative Concept Plan Set). The alignment of Mission Creek intersects the roadway at an inclination of approximately 45 degrees. Constraints and limitations include a high voltage power pole at an approximate station of 61+00. Relocation is anticipated.

The proposed improvements include (4) concrete box culverts, each at 4' high x 10' wide, which was designed to accommodate the 10-year flow of 5,210 cfs. Higher flows in excess of 10-year storm will flow on the surface over the roadway. The box culverts are placed and an angle to match the alignment of Mission Creek. Headwalls have been placed to ensure a 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the box culverts at street centerline. A low-point was created directly above the box culverts to ensure stormwater runoff is conveyed across the road during higher intensity storm events (greater than 10-year storm). This is achieved by designing the roadway with a high point to the south of the low point at approximate station 59+80. This high point will ensure stormwater is contained within Mission Creek and does not flow south along Little Morongo. The proposed roadway design includes a gradual transition on each side of the box culverts from station 56+50 to 65+00; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 28-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 22 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

5.2.3 2 Bunch Palms Trail (TBP2)

2 Bunch Palms Trail is a two-lane, 40-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, TBP2, extends in an east/west direction between Little Morongo Road to the west and Palm Drive to the east. Per the General Plan, this road is classified as a Secondary II with future plans to widen this roadway to a 4-lane, 64-foot width from face of curb to face of curb;

consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders. No median is proposed for ultimate condition.

In the current condition, stormwater runoff from Morongo Wash crosses the roadway, on the surface at approximate station 36+00, which corresponds to the low point in the street. (See sheet 10 of the Alternative Concept Plan Set. Constraints and limitations include utility vaults that must be adjusted to accommodate the proposed alternative concept. Adjustments to existing private driveway approaches are also required at the westerly limits of the proposed improvements. Power poles are within the limits of proposed improvements; however, these power poles are spaced far enough from street centerline to protect in place.

The proposed improvements include (4) CON/SPAN O-Series Bridge Systems, (multiple cell configuration) each at 5' high x 25' wide with concrete base slab. Bridge system was designed to accommodate the 10-year flow of 12,303 cfs. The bridge system is placed perpendicular to street centerline at a length of 60 feet. Headwalls have been placed to ensure a minimum of 56-foot clearance is provided to accommodate the existing 40-foot paved roadway with an 8-foot shoulder on each side of the roadway (40 + 16 = 56). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately 8 to 9 feet at the highest point, in relation to existing grade. This is achieved by designing the roadway with a gradual transition on each side of the bridge system from station 32+20 to 39+00; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 40-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 28 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

5.2.4 Little Morongo (LM1)

Little Morongo is a two-lane, 28-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, LM1, extends in a north/south direction between Pierson Blvd. to the south and Mission Lakes Blvd./W 16th Street to the north. Per the General Plan, this road is classified as a Secondary II with future plans to widen this roadway to a 4-lane, 64-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders. No median is proposed for ultimate condition.

In the current condition, the majority of stormwater runoff from Morongo Wash crosses the roadway, on the surface, between approximate stations of 152+00 to 155+00, which corresponds to the low point in the street (See sheet 12 of the Alternative Concept Plan Set). Additional flow also crosses the roadway to the south at approximate station 146+70. Power poles are within the limits of proposed improvements; however, these power poles are spaced far enough from street centerline to protect in place. The intersection at Pierson Blvd. also presents a challenge to create a smooth connection with existing conditions. This intersection is fixed and therefore limits the point of connection at station 144+00.

The proposed improvements include (3) CON/SPAN O-Series Bridge Systems, (multiple cell configuration) each at 5' high x 25' wide with concrete base slab and (1) 48-inch RCP. Bridge system and storm drainpipe were designed to accommodate the 10-year flow of 12,004 cfs. Higher flows (greater than 10-year storm) are intended to flow over the roadway at the low point. The bridge system is placed perpendicular to street centerline at a length of 46 feet. Headwalls have been placed to ensure a minimum of 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately 5 feet at the bridge system, in relation to existing grade. This design is intended to allow the low flows (10-year) storm to flow under the roadway. Higher flows (greater than 10-year) will flow over the roadway at the proposed low-point at approximate station 148+00. This is achieved by designing the roadway with a high point to the south of the low point at approximate station 146+26. This high point will ensure stormwater is contained within Morongo Wash and does not flow south along Little Morongo.

A gradual transition on each side of the sump (low point) from station 144+00 to 157+10; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 28-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 22 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

5.2.5 North Indian Canyon (INCN13)

North Indian Canyon is a two-lane, 28-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, INCN13, extends in a north/south direction between Pierson Blvd. to the south and Mission Lakes Blvd. to the north. Per the General Plan, this road is classified as a Secondary II with future plans to widen this roadway to a 4-lane, 64-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders. No median is proposed for ultimate condition.

In the current condition, minimal stormwater runoff from Mission Creek crosses under the roadway through three existing 18" to 24" culverts. These culverts are significantly undersized and provide minimal benefit, if any. The entrance of these culverts is known to become clogged due to sediment accumulation and with miscellaneous debris/vegetation. During a storm event that generates runoff, stormwater will likely exceed the capacity of these culverts and flow across the roadway, on the surface, at approximate station 169+50, which corresponds to the low point in the street (See sheet 14 of the Alternative Concept Plan Set). Constraints/limitation are minimal. Power poles are within the limits of proposed improvements; however, these power poles are spaced far enough from street centerline to protect in place.

The proposed improvements include double concrete box culverts, each at 8' high x 16' wide, which was designed to accommodate the 100-year flow of 14,146 cfs. The box culverts are placed and an angle to match the alignment of Mission Creek. Headwalls have been placed to ensure a 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the proposed box culverts at street centerline; increasing the height of the roadway approximately 6 to 7 feet at the highest point in relation to existing grade. This is achieved by designing the roadway with a gradual transition on each side of the box culverts from station 164+70 to 173+00; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

Proposed roadway width will match existing conditions at a width of 28-feet. An 8-foot shoulder of gravel to be provided on each side of roadway. Grade break will be located at outside edge of shoulders, 22 feet from street centerline, where a 2:1 slope will descend and daylight with existing grades.

5.2.6 North Indian Canyon (INCN14)

North Indian Canyon is a two-lane, 28-foot width paved asphalt roadway with 8-foot gravel/dirt shoulders. This segment, INCN14, extends in a north/south direction between Mission Lakes Blvd. to the south and Twentynine Palms Highway 62. to the north. Per the General Plan, this road is classified as a Secondary II with future plans to widen this roadway to a 4-lane, 64-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles in each direction with 8-foot shoulders. No median is proposed for ultimate condition.

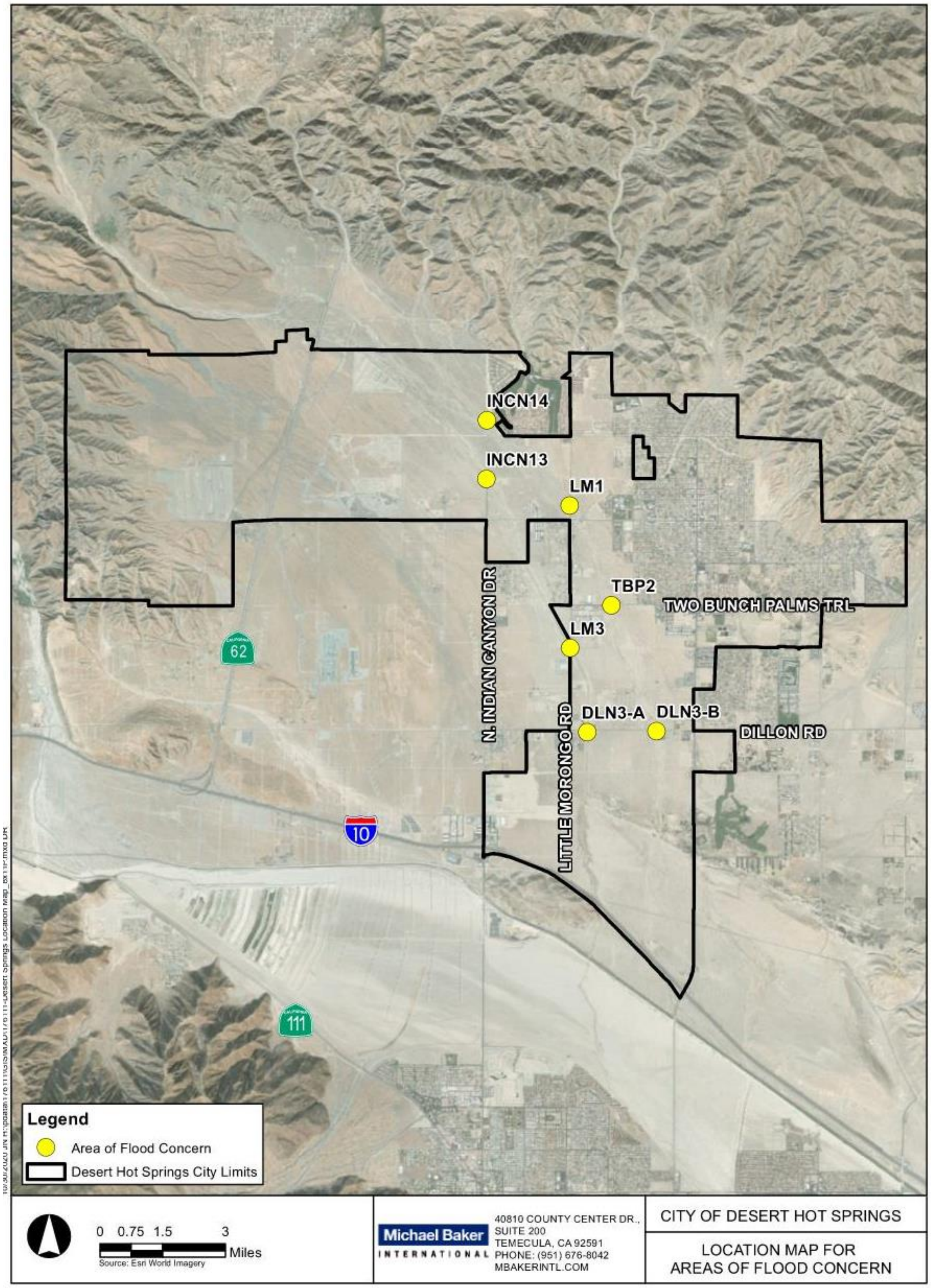
In the current condition, stormwater runoff from the Morongo Wash crosses over the roadway, on the surface, between approximate stations 199+00 and 209+00 (See sheet 16 of the Alternative Concept Plan Set). Constraints/limitation are minimal. There are no power poles along this segment of roadway. The intersection at Mission Lakes Blvd. presents a challenge to create a smooth connection with existing conditions. This intersection is fixed and therefore limits the point of connection at station 197+10.

The proposed improvements include (2) CON/SPAN O-Series Bridge Systems, (multiple cell configuration) each at 5' high x 25' wide with concrete base slab which were designed to accommodate the 10-year flow of 6,100 cfs. Higher flows (greater than 10-year storm) are intended to flow over the roadway at the low point. The bridge system is placed perpendicular to street centerline at a length of 46 feet. Headwalls have been placed to ensure a minimum of 44-foot clearance is provided to accommodate the existing 28-foot paved roadway with an 8-foot shoulder on each side of the roadway (28 + 16 = 44). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 24-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately 5 feet at the bridge system, in relation to existing grade. This design is intended to allow the low flows (10-year) storm to flow under the roadway. Higher flows (greater than 10-year) will flow over the roadway at the proposed low-point at approximate station 201+83. This is achieved by designing the roadway with a high point to the south of the low point at approximate station 200+00. This high point will ensure stormwater is contained within Morongo Wash and does not flow south along North Indian Canyon Drive.

A gradual transition on each side of the sump (low point) from station 197+10 to 209+00; representing the limits of proposed improvements. The limits of improvements are greater than all other crossings due to the width of the crossing and flat terrain. Much of the roadway must be raised to direct stormwater runoff to the south towards the proposed bridge system. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

FIGURE 5-2: AREA OF FLOOD CONCERN – DESERT HOT SPRINGS



5.3 Cathedral City

5.3.1 Varner Road (VRNR2)

Varner Road is currently a two-lane, 38-foot width paved asphalt roadway which includes a shoulder on each side of roadway of approximately 5-feet. This segment, VRNR2, extends in a north/south direction connecting Date Palm Drive to Palm Drive in Desert Hot Springs. Per the General Plan, this road is classified as a Modified Major Highway with future plans to widen this roadway to a 6-lane, 94-foot width from face of curb to face of curb; consisting of two, 12-foot drive aisles and one, 16-foot drive aisle in each direction. A median is also proposed for ultimate condition with a width of 14-feet.

In the current condition, stormwater runoff from the Willow Wash crosses over the roadway, on the surface, at approximate station 55+00 (See sheet 4 of the Alternative Concept Plan Set). Constraints/limitation are minimal. Power poles are within the limits of proposed improvements; however, these power poles are spaced far enough from street centerline to protect in place.

The area of flood concern, VRNR2, is located approximately 6,900 feet upstream from DPLM5, area of flood concern at Date Palm Drive and Varner Road. Given the proximity to the downstream flood crossing, the design flow rate for DPLM5 was used as the design flow rate of VRN2. This is a conservative approach, as the tributary area is reduced traveling upstream along the drainage path. (Refer to Section 5.3.2, Date Palm Drive (DPLM5), for detailed explanation of design flow rates.)

The proposed improvements include (1) CON/SPAN O-Series Bridge Systems, (multiple cell configuration) at 5’ high x 25’ wide with concrete base slab which was designed to accommodate the 100-year flow of 3,250 cfs. The bridge system was placed and an angle to match the alignment of Willow Wash. Headwalls have been placed to provide a minimum distance of 23-feet from street centerline, measured perpendicular, to accommodate the existing 38-foot paved roadway with an additional 4-foot shoulder on each side of the roadway (38 + 8 = 46). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway is to be elevated to allow a minimum of 36-inch cover over the bridge system at street centerline; increasing the height of the roadway approximately 4 to 5 feet at the bridge system, in relation to existing grade.

A gradual transition on each side of the bridge system is proposed from station 51+90 to 58+20; representing the limits of proposed improvements. Proposed gradients of roadways were minimized, and lengths of proposed vertical curves were maximized, as feasible, to ensure a smooth transition and compliance with Caltrans Highway Design standards.

5.3.2 Date Palm Drive (DPLM5)

Date Palm Drive is currently a two-lane, 46-foot width paved asphalt roadway which includes a shoulder on each side of roadway of approximately 5-feet. This segment extends in a north/south direction connecting Varner Road to Cathedral City. Per the General Plan, this road is classified as an Arterial Highway with future plans to widen this roadway to a 6-lane, 96-foot width from face of curb to face of curb; consisting of three, 12-foot drive aisles and a 5-foot bike lane in each direction. A median is also proposed for ultimate condition with a width of 14-feet.

In the current condition, stormwater runoff from Long Canyon Wash crosses under the roadway through an existing box culver 6’ wide x 7’ high. This culvert is significantly undersized to convey the stormwater runoff generated by the 100-year storm. Per the Regional Drainage Study for Edom Hill and Flat Top Hill Area, Tentative Parcel Map 30726, capacity of the existing box culvert is limited to only 25 percent required to convey the stormwater runoff generated by the 100-year storm. Constraints/limitations include a power pole within the limits of proposed improvements, located near the outlet of the exiting box culvert. This power pole will require relocation. A water air valve on the upstream side will also require relocation.

The proposed improvements include double concrete box culverts, each at 8’ high x 10’ wide, which was designed to accommodate the 100-year flow of 3,250 cfs. The 100-year design flow rate was provided by the Coachella Valley Water District, as outlined in a letter dated October 7, 2003, included in Appendix B. The District adopted this flow rate from the hydrology study titled, “Del Webb Sun City, Palm Desert, Phase III Existing Conditions Flood Hazards along Interstate 10, Morongo Wash Bridges to Washington Street”, prepared by Exponent.

The proposed box culverts are placed and an angle to match the alignment of Long Canyon Wash. Headwalls have been placed to ensure a 28-foot clearance is provided from street centerline, measured perpendicular, (56-feet between back of headwalls) to accommodate the existing 46-foot paved roadway with a 5-foot shoulder on each side of the roadway (46 + 10 = 56). Headwall widths are assumed to be one foot. Rip-rap energy dissipator to be placed on downstream end.

The proposed roadway elevation will not change as a result of the proposed improvement. Upon completion of the box culvert installation, the roadway will be returned to match existing grades.

5.3.3 Date Palm Drive (DPLM3)

The intersection of Date Palm Drive and Los Gatos Road, referred to as DPLM3, has a history of flooding. This intersection is a low point and accepts stormwater runoff from the west along Los Gatos Road and from both directions along Date Palm Drive; north and south. Two existing grate inlets on the west side of Date Palm Drive collect stormwater and convey across Date Palm Drive through two existing 12-inch pipes. This existing storm drain system is significantly undersized.

During flood events, when the capacity of the existing storm drain is exceeded, stormwater begins to pond on the west side of Date Palm Drive. Southerly travel lanes on Date Palm Drive into Cathedral City are forced to close due to ponding. Ponding depth continues to rise until depth of water reaches the existing street centerline elevation (crown); at which point stormwater spills over the crown and flows on the surface to the east and across the northerly travel lanes. Ultimately, all stormwater flows are conveyed through a combination of storm drain or surface flow and discharge to the east of Date Palm Drive.

Preliminary hydrology studies estimate the tributary area to the low point at DPLM3 is 224 acres. This tributary consists of primarily developed residential with no existing storm drain. All stormwater runoff flows on the surface to DPLM3. The estimated flow rates and corresponding storm volumes for various storm events to DPLM3 are outlined in Table 3-2. (See Appendix C for Hydrology Models, Exhibits and Reference Studies)

During the 100-year storm event, the tributary area to DPLM3 is likely much larger than 224 acres. Per the FEMA, Flood Insurance Rate Map, Map Number 06065C1577G, stormwater flows generated during the 100-year storm event are shown to travel from the north in a southerly direction across Vista Chino and continue south to DPLM3. (See Appendix C - Hydrologic Models, Exhibits and Reference Studies) Note that the analysis performed, as outlined in the table above, did not account for stormwater flows north of Vista Chino, as it was assumed stormwater runoff did not cross Vista Chino for storm events up to the 25-year storm. It is unknown as to the storm frequency (i.e., 2-year, 5-year, 10-year, 25-year, etc.) that will cause stormwater flows to cross over Vista Chino and continue to DPLM3. This level of hydrologic and hydraulic analysis is beyond the scope of this study. Regardless of when overflow of stormwater will flow across Vista Chino (2-year, 5-year, 10-year, 25-year, etc.) this additional stormwater will amplify the flood issues at DPLM and put more strain on an already insufficient storm drain system.

Preliminary hydraulic analysis indicates that the two, existing 12-inch storm drainpipes only have capacity to convey 6 cfs before ponding occurs (3 cfs per 12-inch pipe). Ponding occurs when the stormwater surface elevation exceeds the existing grate elevation. With a limited capacity of only 6 cfs, the capacity of the existing storm drain is insufficient to convey even a 2-year storm.

The alternative concept proposed at DPLM3 includes the removal of the existing storm drain system and replacement with a greater capacity storm drain system. However, simply increasing the size of the storm drainpipes is not a feasible alternative.

The proposed alternative concepts to mitigate flooding are limited due to constraints/ limitations. The flat topography in the vicinity of DPLM3 presents a challenge. The existing 12-inch storm drainpipes have a gradient of only 0.5 percent crossing Date Palm Drive with minimal cover on the upstream side at the grate inlets. Per the as-built drawings, the existing invert at the upstream pipe is 365.00. The existing grate elevation is 366.41; only 1.41 feet higher than the invert of the pipe. The proposed alternative concepts must consider the following:

- Invert at outlet (downstream) is fixed at ~364.50. Improvements must join existing grade for positive drainage downstream.
- The grate elevation is fixed at ~366.41. Grate inlets are located at a sump and must remain at this low elevation to ensure positive drainage to the grates.

The proposed alternative concept includes replacement of existing (2) 12-inch pipes with (4) elliptical reinforced concrete pipe (14” rise x 23” span each). Box culverts with a 12-inch rise and increased width were considered; but ultimately considered not feasible. Box culvert are not available with only a 12-inch rise. To increase to 18-inch is not feasible due to the limited cover.

Four catch basins are also proposed upstream of the two grate inlets on Los Gatos Road and on west side of Date Palm Drive. Catch basins will include trash capture devices to prevent trash and misc. debris from reaching the grate inlets. (See Sheet 9 of the Alternative Concept Plan Set) 12-inch RCP will connect each catch basin to the grate inlets at the sump.

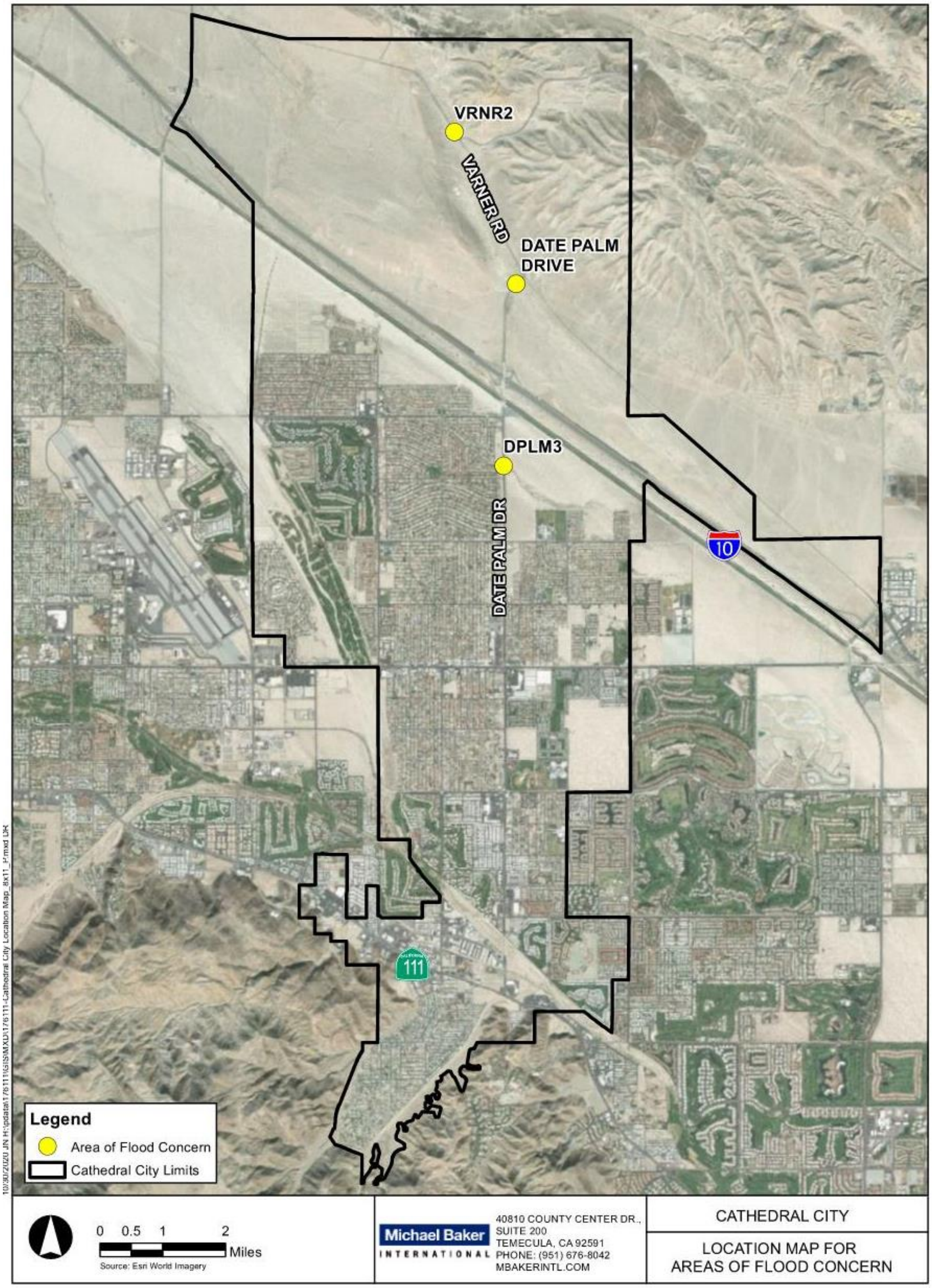
Hydraulic analysis indicates the proposed improvements described above will increase the hydraulic capacity from 6 cfs to 24 cfs; which is approximately a level of protection to accommodate a 2-year frequency storm event. (See Appendix D, Preliminary Hydraulic Calculations)

Level of protection of a 2-year storm is an improvement but should not be considered sufficient for ultimate conditions. Alternative concepts have been considered to provide a greater level of protection.

As shown on Sheet 8 of the Alternative Concept Plan Set, a retention basin is recommended at the intersection of Los Gatos Road and Date Palm Drive. Vacant land exists on the south and north side of Los Gatos Road, adjacent to Date Palm Drive. Either one or both locations would be a feasible location to provide a retention basin to improve the level of protection at DPLM3. Preliminary design and hydrology/hydraulic calculations estimate that the retention basin shown on Sheet 8 of the Alternative Concept Plat Set, in combination with the proposed improvements, could provide a level of protection up to the 10-year storm event and perhaps greater.

Note that the improvements proposed at DPLM3, for the purpose of this study, are limited to only the improvements shown on Sheet 9 of the Alternative Concept Plan Set. Estimate of costs to construct the retention basin have not been included herein. Retention basins are considered a feasible future alternative that must be analyzed in more detail to determine basin sizing and level of protection feasible. The hydrology and hydraulic analysis to evaluate future retention basin sizing and potential level of protection is beyond the scope of this study

FIGURE 5-3: AREA OF FLOOD CONCERN – CATHEDRAL CITY



6 ENVIRONMENTAL

As part of CVAG's current effort to address the adverse impacts to roadways throughout the CVAG region associated with flood and blowsand events, MBI reviewed environmental constraints proximal to each proposed improvement site to identify key areas of concern that should be considered during implementation of the improvements. The findings of the environmental review have been summarized in Table 4-1, Environmental Constraints/Notes.

Reviews of applicable policy and environmental documents were conducted as part of this environmental constraints analysis including the respective General Plans, Active Transportation Plans, and Hazard Mitigation Plans for applicable local jurisdictions for each crossing, in addition to the CVAG Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP). Each constraint is identified in Table 4-1 under the "Environmental Constraints/Notes" column categorized by roadway and document.

In addition to the literature review, as part of the constraints identification process, MBI met with CVAG environmental staff in August of 2020 to describe the proposed improvements, and again in September 2020 to review recommendations for each improvement.

Maps have also been created to show a graphic representation of the environmental constraints and are included in Figures 4-1 through 4-12.

All of the proposed roadway improvement projects are included as Covered Activities in Table 7-3 of the CVMSHCP. As a Permittee under the CVMSHCP, CVAG would receive take authorization for all such Covered Activities contingent upon the goals and requirements of the CVMSHCP being fulfilled during implementation of these activities. This would provide CVAG with a more streamlined approval process for these projects during which the projects and associated proposed avoidance and minimization measures, as well as any additional mitigation, would be reviewed for consistency with the purpose of the CVMSHCP, its permits, and its Implementing Agreement (IA). If the projects are determined to be in full compliance with the requirements of the CVMSHCP, the IA, and the take permits, CVAG would then receive coverage for the projects under the take authorizations granted by the CVMSHCP's Endangered Species Act Section 10(a) Permit and Natural Community Conservation Plan (NCCP) Permit. Work that falls outside of the pre-approved areas of these projects may not be considered part of the Covered Activities. If any work is not considered a Covered Activity, it may require additional review requirements and potentially additional consultation with wildlife agencies should listed or Covered Species be determined to be present or potentially affected by the work.

FIGURE 6-1: NORTH INDIAN CANYON DRIVE (INCN7-A)

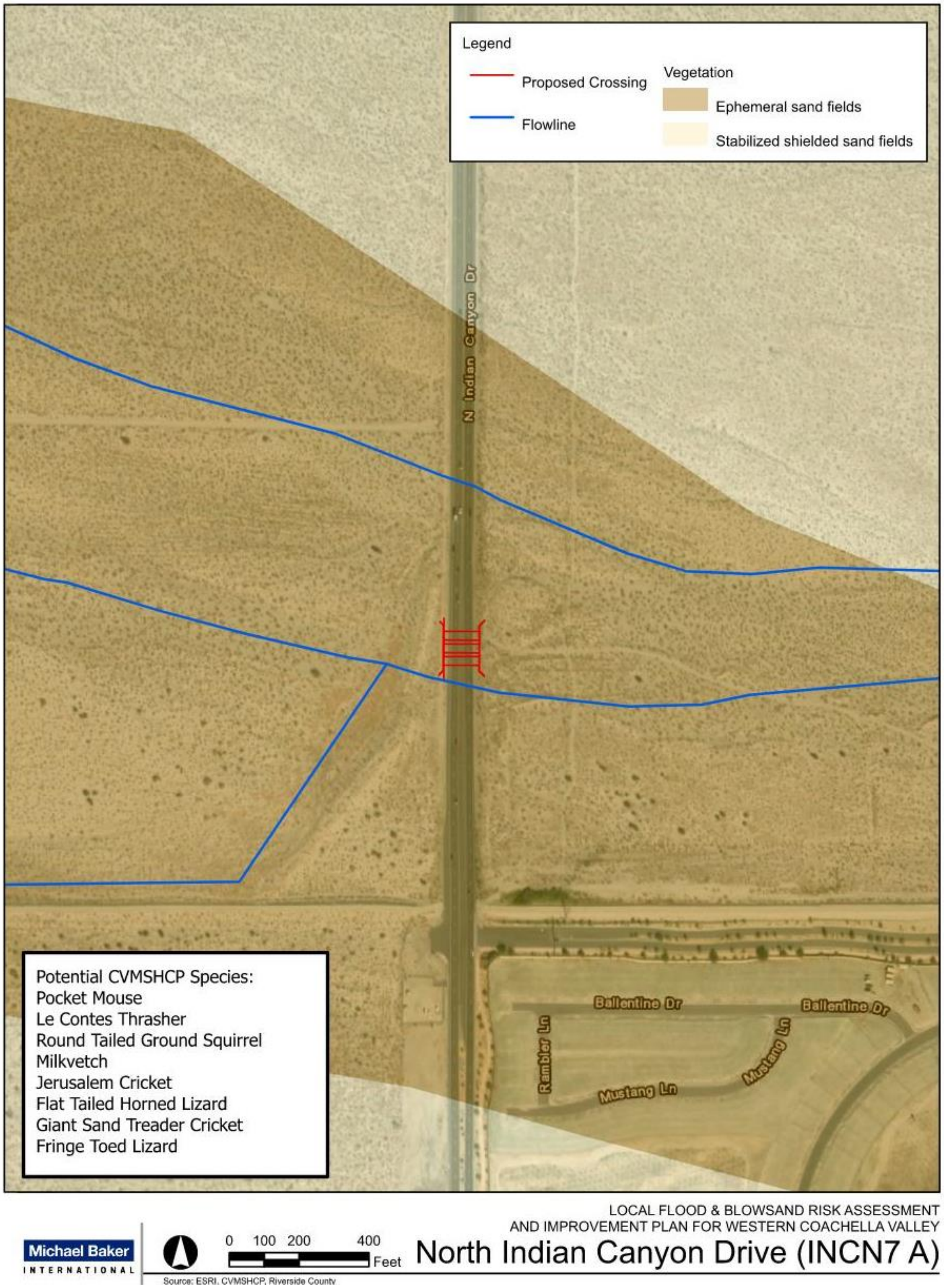


FIGURE 6-2: NORTH INDIAN CANYON DRIVE (INCN7-B)

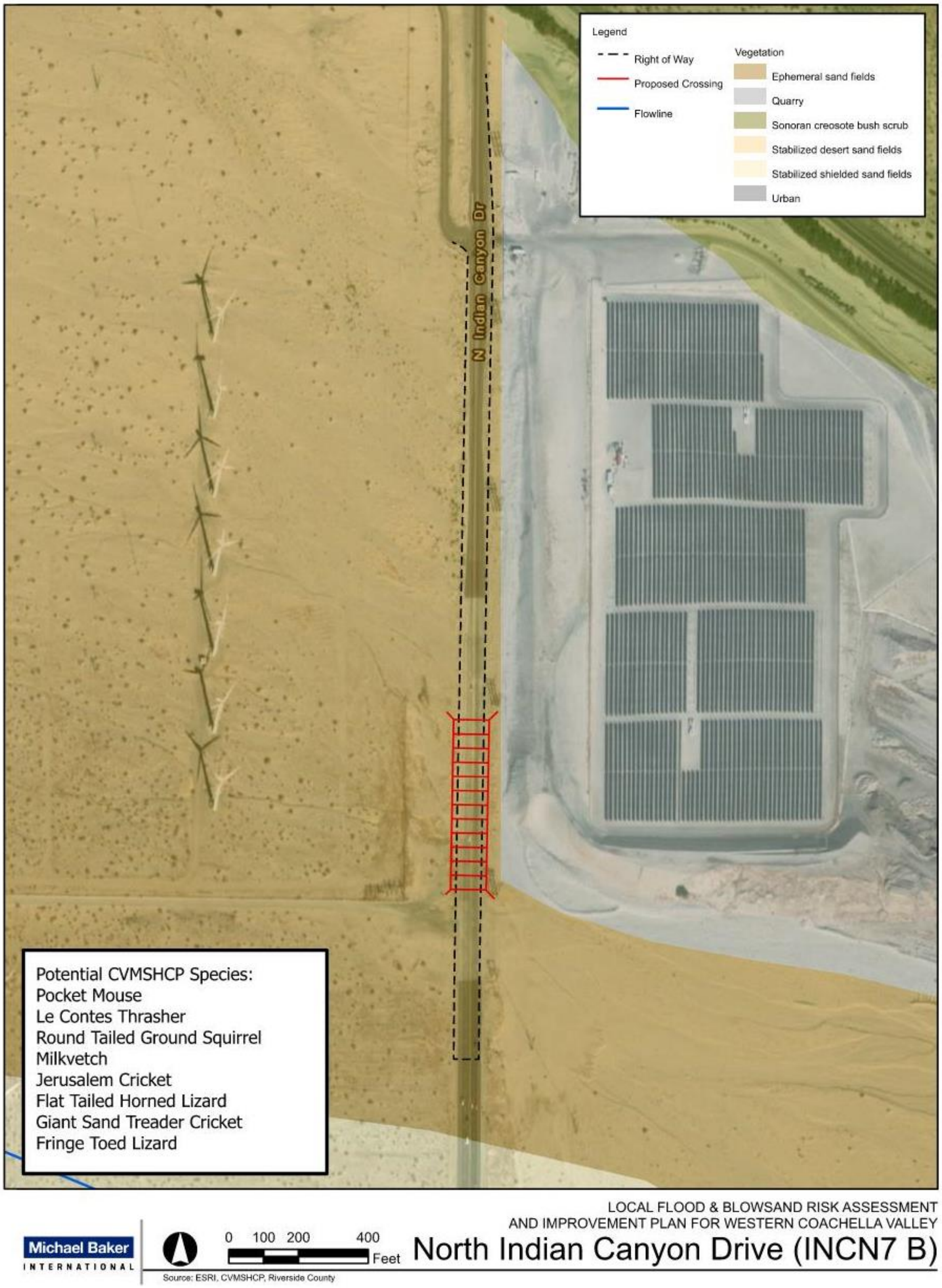


FIGURE 6-3: NORTH GENE AUTRY TRAIL (GAT3)

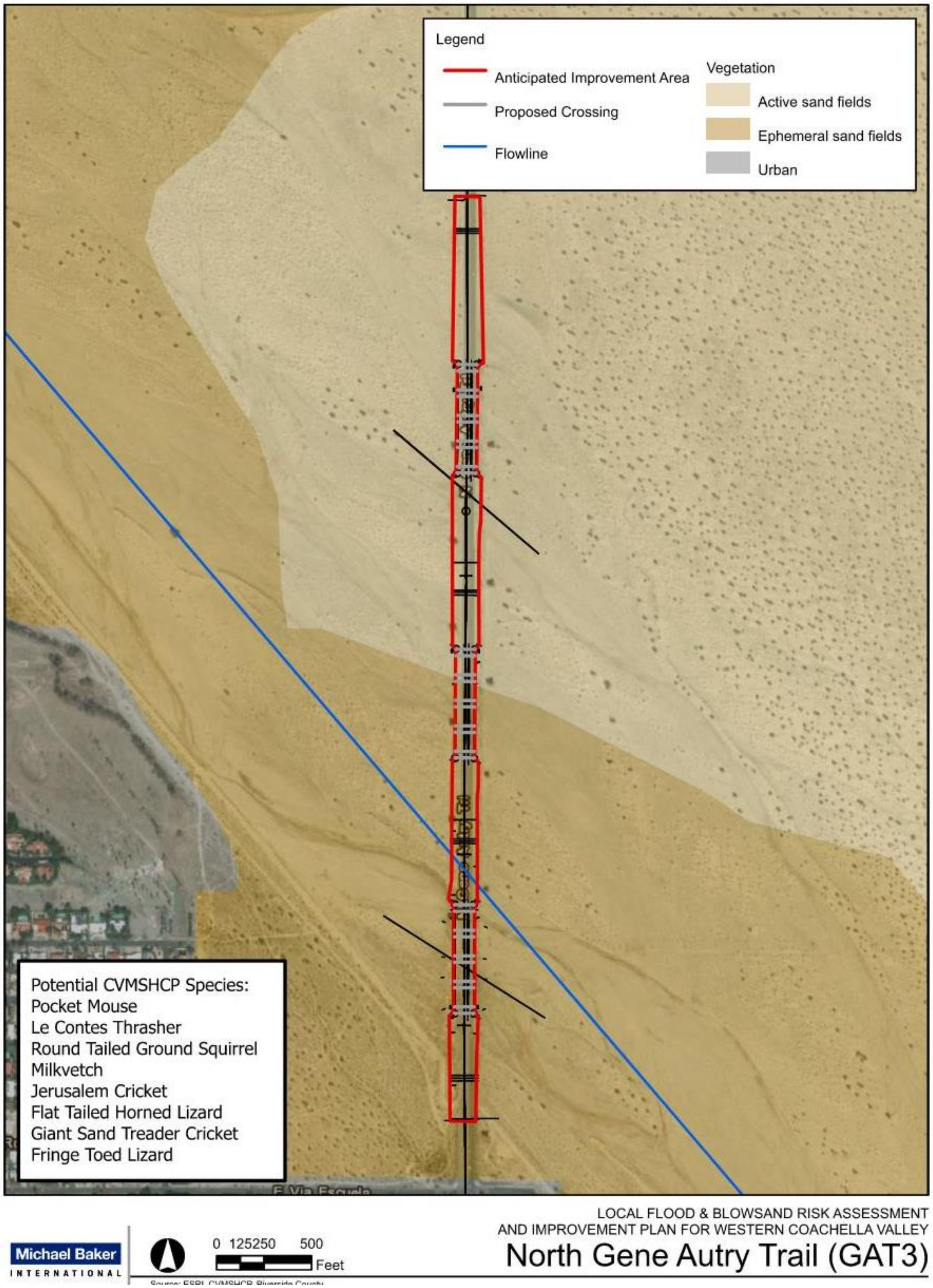


FIGURE 6-4: DILLON ROAD DLN3-A

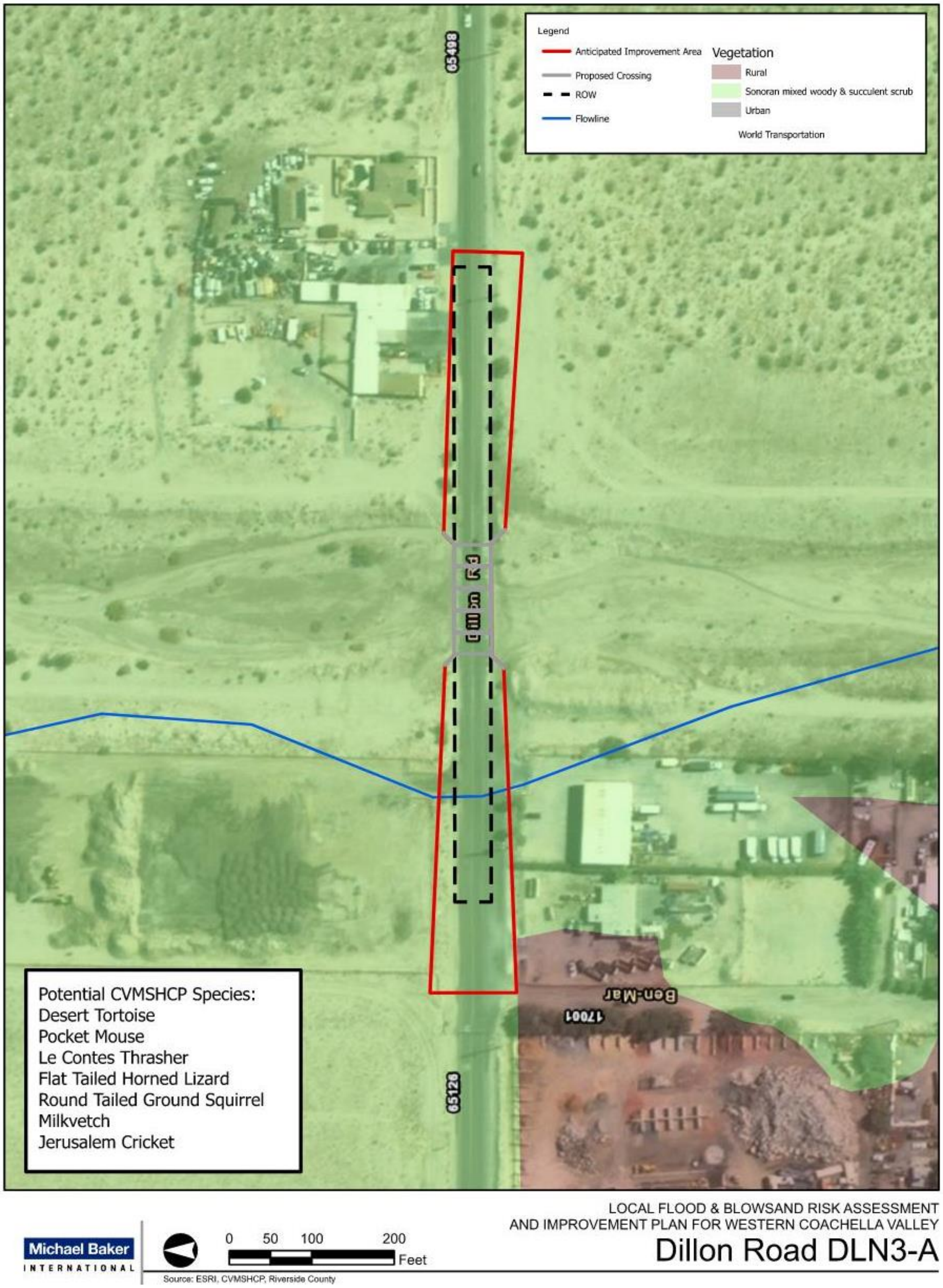


FIGURE 6-5: DILLON ROAD DLN3-B

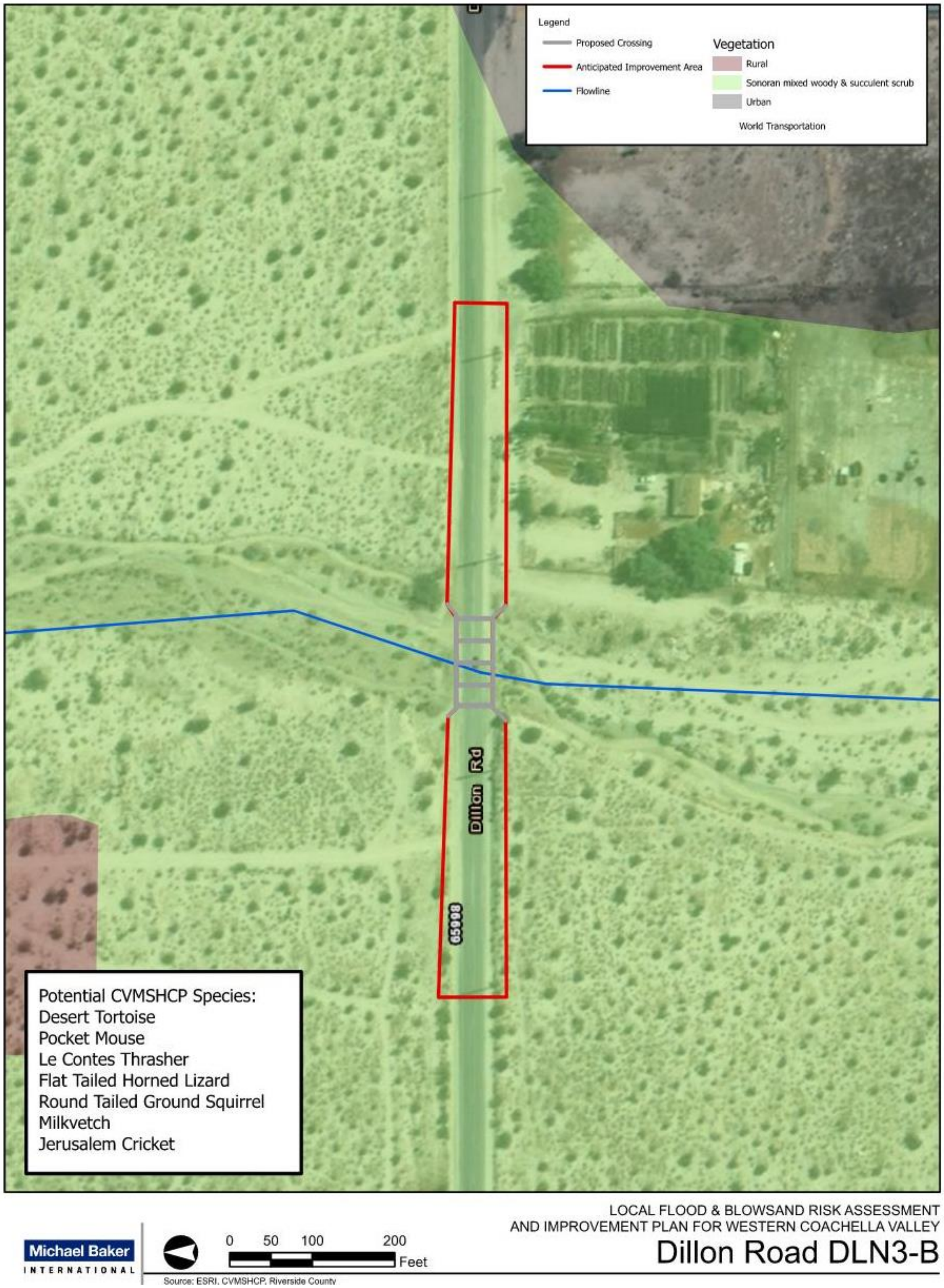


FIGURE 6-6: LITTLE MORONGO ROAD (LM3)

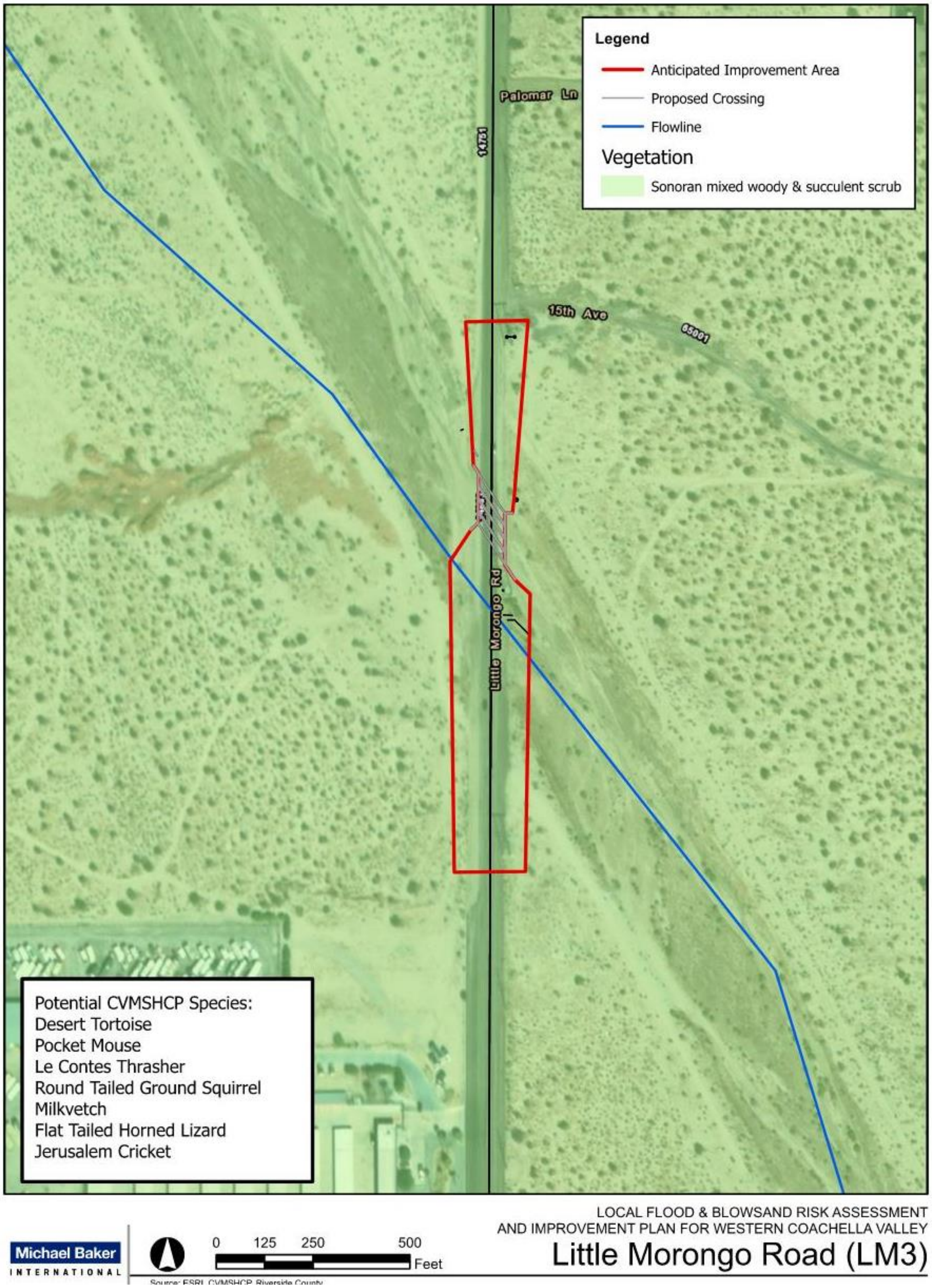


FIGURE 6-7: 2 BUNCH PALMS TRAIL (TBP2)

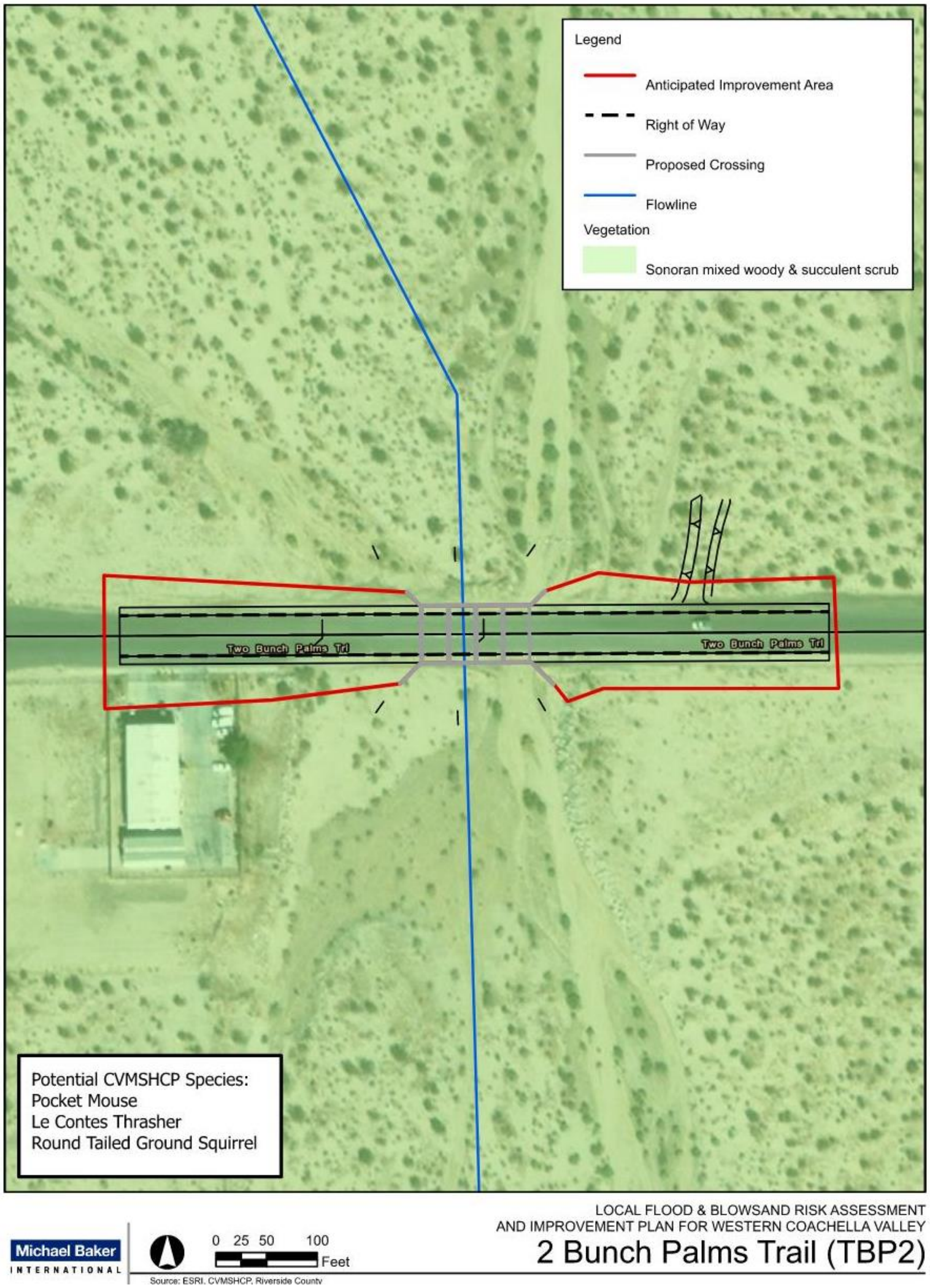


FIGURE 6-8: LITTLE MORONGO ROAD (LM1)

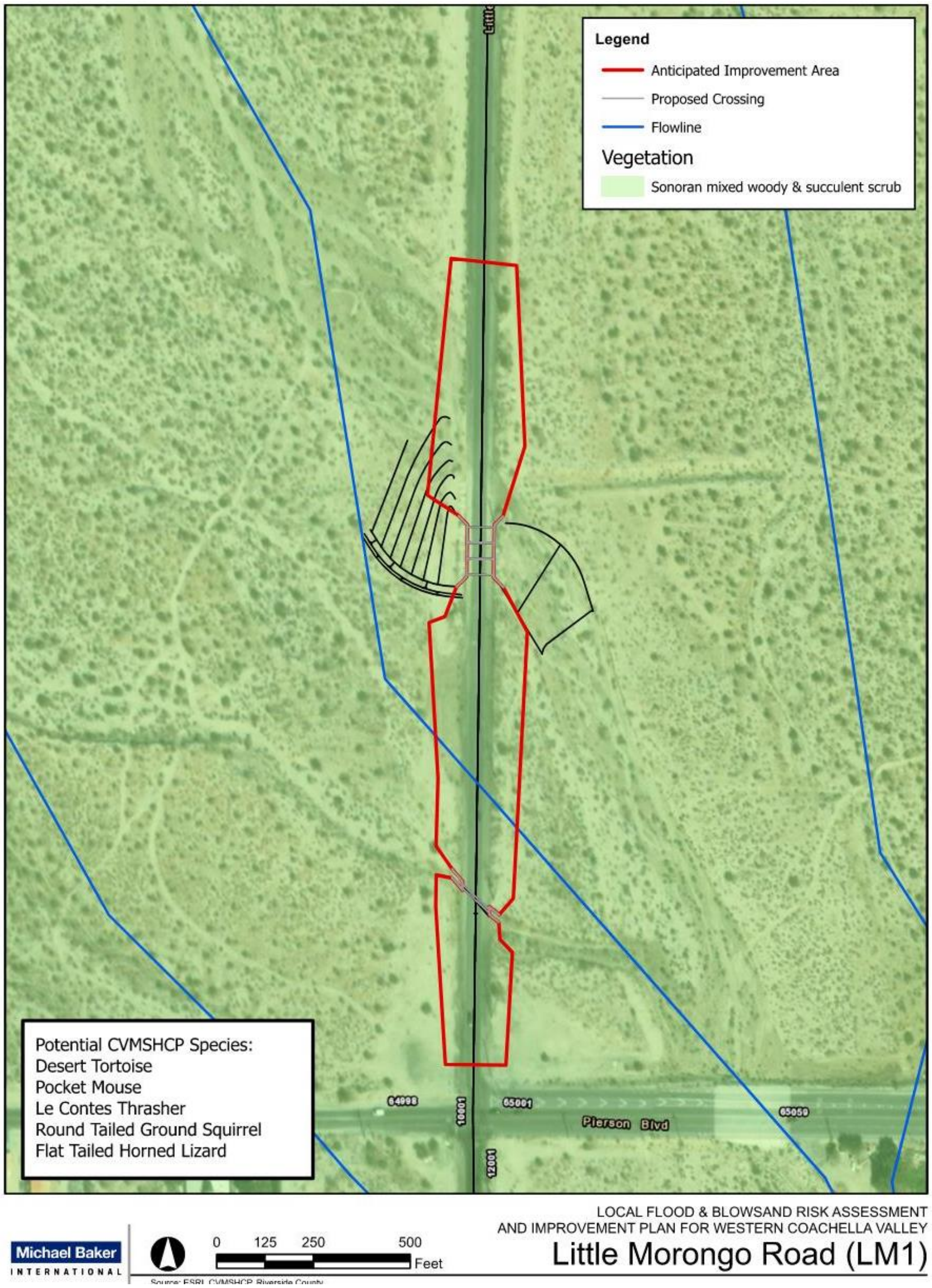


FIGURE 6-9: NORTH INDIAN CANYON DRIVE (INCN13)

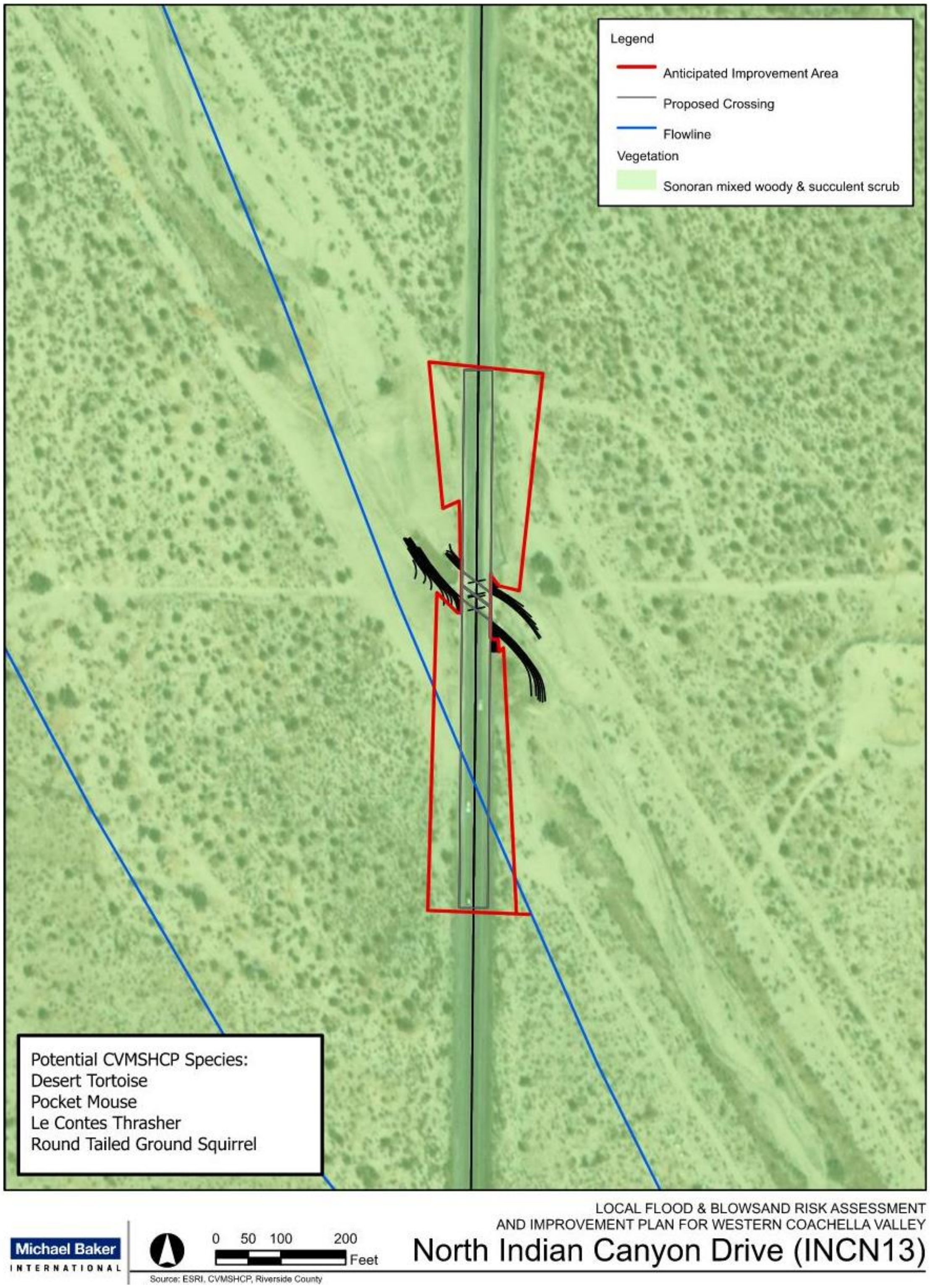


FIGURE 6-10: NORTH INDIAN CANYON DRIVE (INCN14)

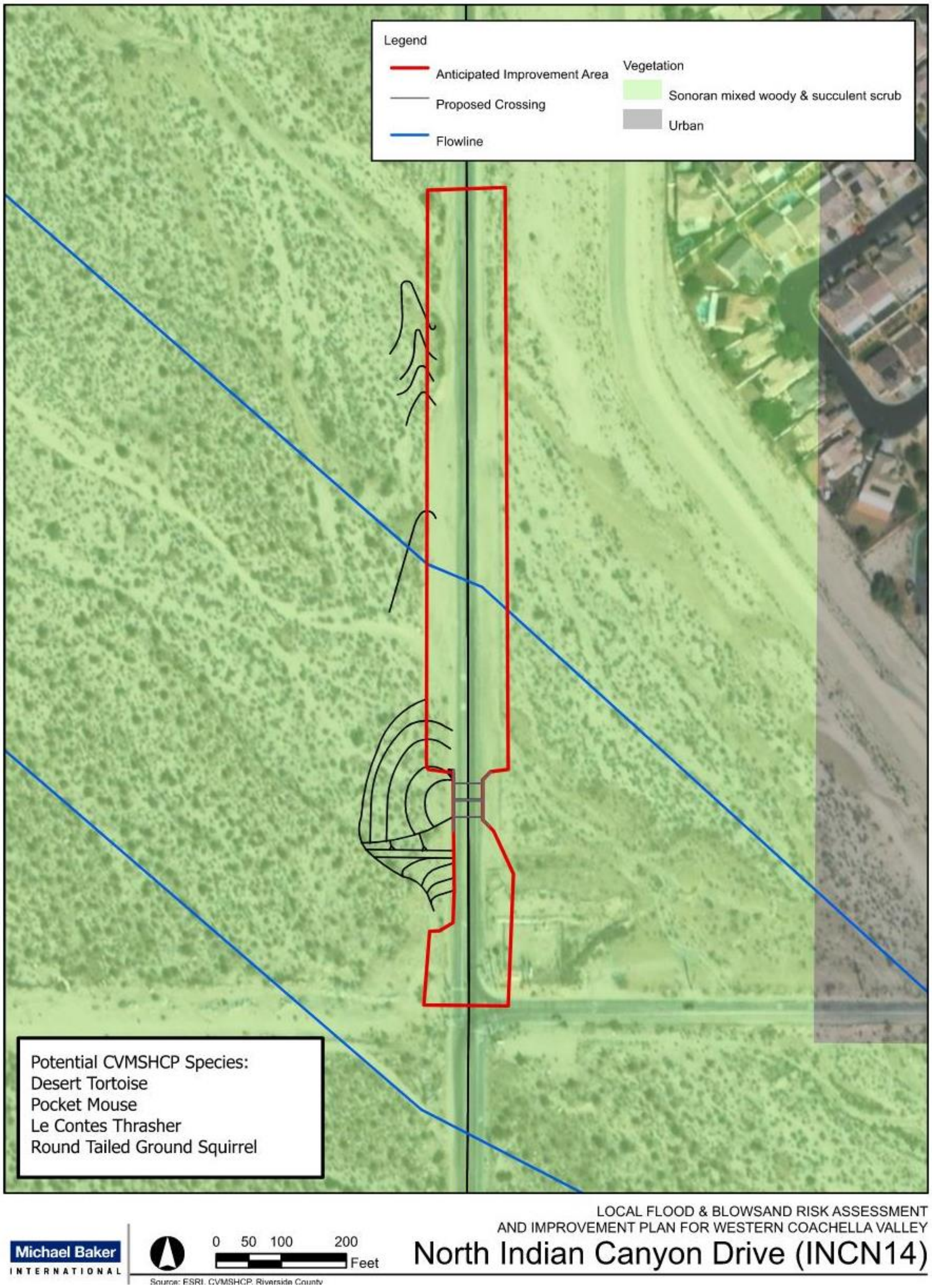


FIGURE 6-11: VARNER ROAD (VRNR2)

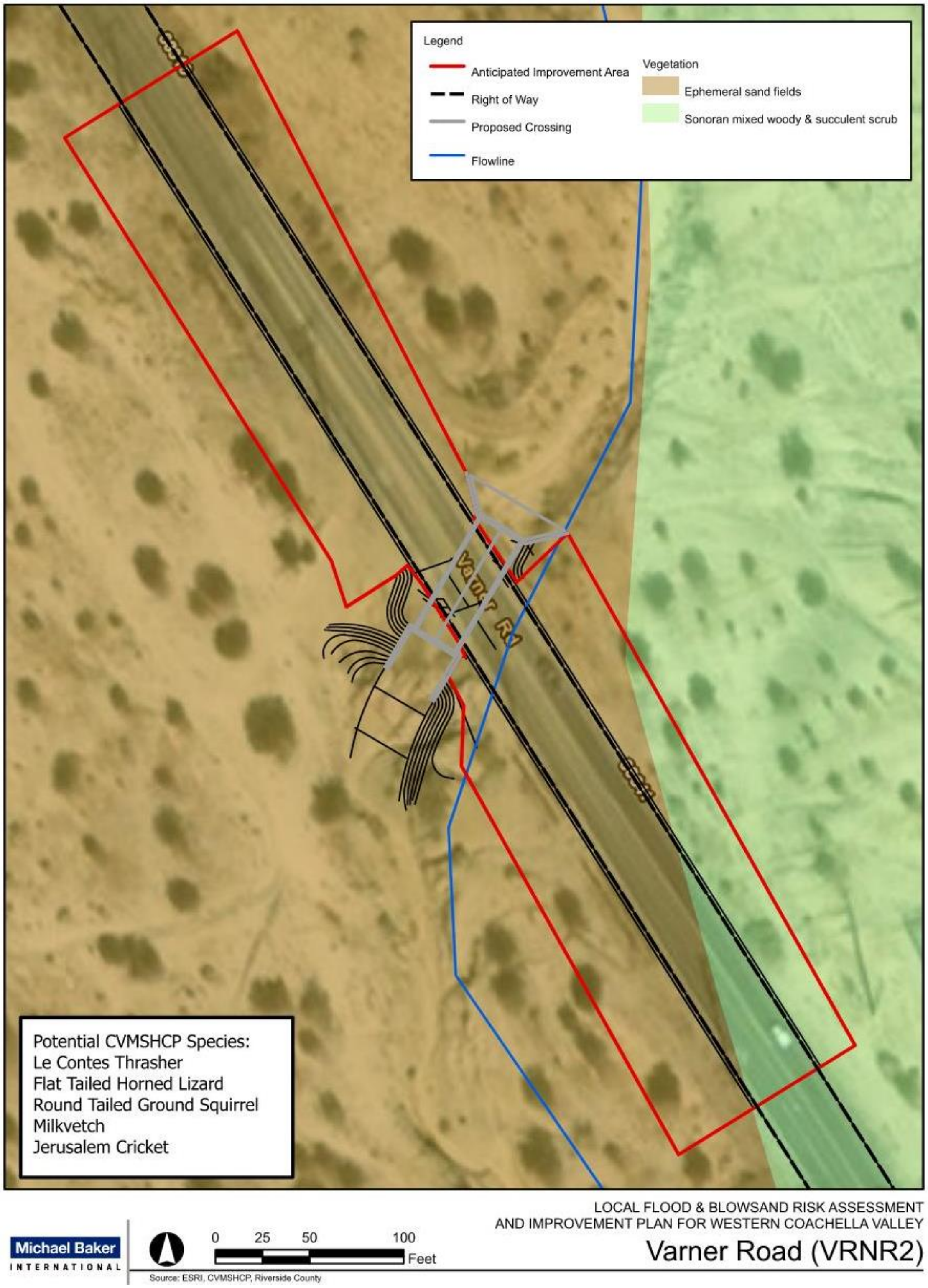


FIGURE 6-12: DATE PALM DRIVE

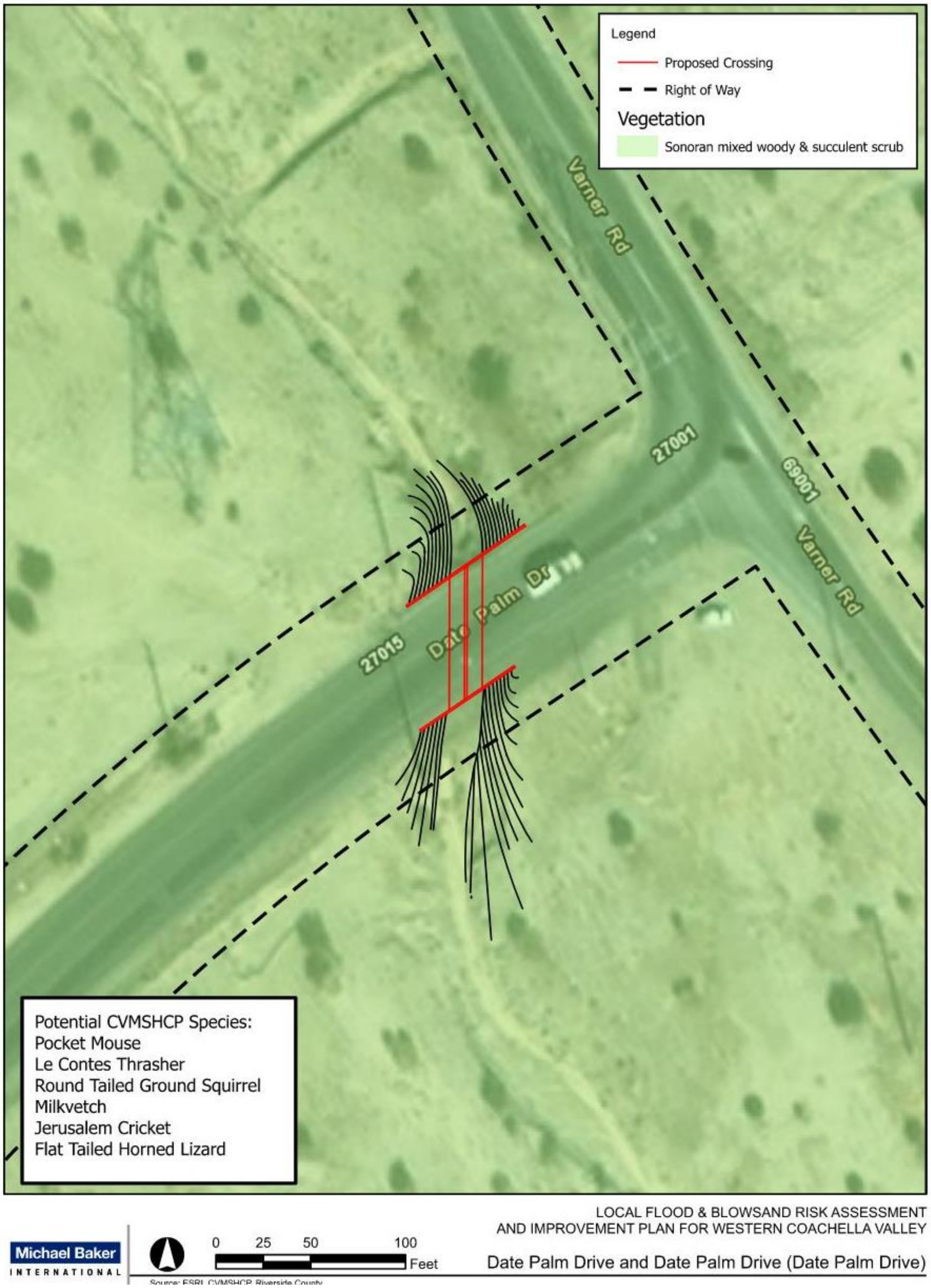


FIGURE 6-13: DATE PALM DRIVE AND GATOS ROAD (DPLM3)

TABLE 6-1: ENVIRONMENTAL CONSTRAINTS/NOTES

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
INCN7-A Indian Canyon Drive across Whitewater River	City of Palm Springs	**Palm Springs General Plan (2007)** <u>Circulation Element:</u> Identified as a Major Thoroughfare (4-lane divided), Truck Route, and 2nd Priority Class II Bike Lane Project <u>Recreation/Open Space/Conservation Element:</u> Identified as MRZ-2, adjacent to Wind Energy Overlay (existing wind farm) and active mining facility (Granite); within Biological Sensitivity Area and adjacent to Whitewater Floodplain Preserve <u>Safety Element:</u> located in Wind Hazard Zone (high wind erodibility rating) and 100-year flood zone; roadway traverses the Garnet Hill Fault <u>Air Quality Element:</u> Located in active blowsand hazard zone <u>Land Use Element:</u> Airport Compatibility Zone D (Primary Traffic Patterns) <u>Community Design Element:</u> Roadway identified as: 1) Scenic Corridor; 2) Master Streetscape Street; and 3) Enhanced Transportation Corridor **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Whitewater Floodplain Conservation Area Biological resources: - Coachella Valley (CV) Fringe-toed Lizard - Palm Springs Pocket Mouse - CV Round-tailed Ground Squirrel - Le Conte's Thrasher - CV Giant Sand-treader Cricket - CV Milkvetch Fringe-toed Lizard Preserve Area: need to increase sand transport across the roadway and decrease the possibility for sand to deposit and get stuck under bridges Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segments = Racquet Club to Old City Limits, and Old City Limits to RR Crossing [including bridge over Whitewater River])	Crosses Whitewater River (jurisdictional) CV Milkvetch Critical Habitat is located immediately off the west side of Indian Canyon Drive (U.S. Fish and Wildlife Service [USFWS]) Coordination required with Coachella Valley Joint Project Review due to conservation area Bureau of Land Management (BLM) land is located immediately off the west side of Indian Canyon Drive: may require additional analysis of BLM resources and/or BLM approval

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
INCN7-B Indian Canyon Drive across Whitewater River	City of Palm Springs	**Palm Springs General Plan (2007)** <u>Circulation Element:</u> Identified as a Major Thoroughfare (4-lane divided), Truck Route, and 2nd Priority Class II Bike Lane Project <u>Recreation/Open Space/Conservation Element:</u> Identified as MRZ-2, adjacent to Wind Energy Overlay (existing wind farm) and active mining facility (Granite); within Biological Sensitivity Area <u>Safety Element:</u> located in Wind Hazard Zone (high wind erodibility rating) and 100-year flood zone; roadway traverses the Garnet Hill Fault <u>Air Quality Element:</u> located in active blowsand hazard zone <u>Community Design Element:</u> roadway identified as: 1) Scenic Corridor; 2) Master Streetscape Street; and 3) Enhanced Transportation Corridor **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Whitewater Floodplain Conservation Area Biological resources: - Coachella Valley (CV) Fringe-toed Lizard - Palm Springs Pocket Mouse - CV Round-tailed Ground Squirrel - Le Conte's Thrasher - CV Giant Sand-treader Cricket - CV Milkvetch Fringe-toed Lizard Preserve Area: need to increase sand transport across the roadway and decrease the possibility for sand to deposit and get stuck under bridges Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segments = Racquet Club to Old City Limits, and Old City Limits to	Crosses Whitewater River (jurisdictional) Very near CV Milkvetch Critical Habitat (USFWS) Coordination required with Coachella Valley Joint Project Review due to conservation area BLM land located immediately to the north of location

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
			RR Crossing [including bridge over Whitewater River])	
GAT3 Gene Autry Trail across Whitewater River	City of Palm Springs	**Palm Springs General Plan (2007)** Circulation Element: Identified as a Major Thoroughfare (4-lane divided), Truck Route, and 2nd Priority Class II Bike Lane Project Recreation/Open Space/Conservation Element: Identified as MRZ-3, within Biological Sensitivity Area Safety Element: located in Wind Hazard Zone (high wind erodibility rating) and 100-year flood zone Air Quality Element: located in active blowsand hazard zone Land Use Element: Airport Compatibility Zone D (Primary Traffic Patterns) Community Design Element: roadway identified as both a Scenic Corridor and an Enhanced Transportation Corridor **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Whitewater Floodplain Conservation Area Biological resources: - CV Fringe-toed Lizard - Palm Springs Pocket Mouse - CV Round-tailed Ground Squirrel - Le Conte's Thrasher - CV Giant Sand-treader Cricket - CV Milkvetch Need to increase sand transport across the roadway and decrease the possibility for sand to deposit and get stuck under bridges for CV Fringe-toed Lizard Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segments = Vista Chino to Whitewater River Crossing, and Whitewater River Bridge Crossing)	Crosses Whitewater River (jurisdictional) A portion is within Agua Caliente Indian Reservation (allotted) Coordination required with Coachella Valley Joint Project Review due to conservation area

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
INCN14 Indian Canyon Drive north of Mission Lakes Boulevard	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street II (90-foot right-of-way [ROW]); Transit Priority Route (potential future bus route); 100-year flood zone (Federal Emergency Management Agency [FEMA]) **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Upper Mission Creek/Big Morongo Canyon Conservation Area and Morongo Wash Special Provisions Area Biological resources: - Morongo Wash Flood Control/Corridor - Le Conte's Thrasher - Palm Springs Pocket Mouse Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Mission Lakes to SR-62)	CV Milkvetch Critical Habitat (USFWS) Crosses mapped wetland (riverine) (USFWS)
INCN13 Indian Canyon Drive north of Pierson Boulevard	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street II (90-foot ROW); Transit Priority Route (potential future bus route) 100-year flood zone (FEMA) **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Upper Mission Creek/Big Morongo Canyon Conservation Area and Morongo Wash Special Provisions Area Biological resources: - Le Conte's Thrasher - Palm Springs Pocket Mouse Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and*	Crosses Mission Creek (jurisdictional) Very near CV Milkvetch Critical Habitat (USFWS) Crosses mapped wetland (riverine) (USFWS) Coordination required with Coachella Valley Joint Project Review due to conservation area

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
			Outside Conservation Areas, of the CVMSHCP (Segment = Pierson Blvd. to Mission Lakes)	
LM1 Little Morongo Road north of Pierson Boulevard	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street II (90-foot ROW), Class I off-street bike path 100-year flood zone (FEMA) **Desert Hot Springs Bicycle and Pedestrian Master Plan (2016)** Proposed multi-use path (Priority Project #3) **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Upper Mission Creek/Big Morongo Canyon Conservation Area and Morongo Wash Special Provisions Area Biological resources: - Morongo Wash Flood Control/Corridor - Le Conte's Thrasher - Palm Springs Pocket Mouse Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Mission Lakes Boulevard to Pierson Boulevard)	CV Milkvetch Critical Habitat (USFWS) Crosses mapped wetland (riverine) (USFWS)
LM3 Little Morongo Road north of Dillon Road	Border of City of Desert Hot Springs and County of Riverside	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street II (90-foot ROW); Class I off-street bike path 100-year flood zone (FEMA)	Upper Mission Creek/Big Morongo Canyon Conservation Area Biological resources: - Le Conte's Thrasher - Palm Springs Pocket Mouse	Very near CV Milkvetch Critical Habitat (USFWS) Crosses mapped wetland (riverine) (USFWS)

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	COACHELLA VALLEY MSHCP	NOTES
		Desert Hot Springs Bicycle and Pedestrian Master Plan (2016) Proposed multi-use path (Priority Project #3) **County of Riverside - Western Coachella Valley Area Plan (2019)** Major roadway (118-foot ROW) Class I bike path Special flood hazard area **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Two Bunch Palms to Dillon Road)	Coordination required with Coachella Valley Joint Project Review due to conservation area
DLN3-A Dillon Road east of Little Morongo Road	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** Mobility and Infrastructure Element: Identified as Secondary Street I (100-foot ROW); Transit Priority Route (potential future bus route); Class II buffered bike lane and future CV Link Alignment **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Willow Hole Conservation Area Biological resources: - Palm Springs Pocket Mouse - Le Conte's Thrasher - CV Round-tailed Ground Squirrel - Little San Bernardino Mountains Linanthus Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section	Crosses mapped wetland (riverine) (USFWS) Coordination required with Coachella Valley Joint Project Review due to conservation area

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	**COACHELLA VALLEY MSHCP**	**NOTES**
			7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Indian Canyon Drive to Palm Drive)	
DLN3-B Dillon Road west of Palm Drive	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street I (100-foot ROW); Transit Priority Route (potential future bus route); Class II buffered bike lane and future CV Link Alignment 100-year flood zone (FEMA) **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Upper Mission Creek/Big Morongo Canyon Conservation Area and Morongo Wash Special Provisions Area Biological resources: - Morongo Wash Flood Control/Corridor - Le Conte's Thrasher - Palm Springs Pocket Mouse Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Indian Canyon Drive to Palm Drive)	Crosses mapped wetland (riverine) (USFWS) Coordination required with Coachella Valley Joint Project Review due to conservation area
TBT2 Two Bunch Palms Trail east of Little Morongo Road	City of Desert Hot Springs	**Desert Hot Springs General Plan (2020)** <u>Mobility and Infrastructure Element:</u> Identified as Secondary Street II (90-foot ROW), Class II bike lane/cycle track	Upper Mission Creek/Big Morongo Canyon Conservation Area and Morongo Wash Special Provisions Area Biological resources:	Crosses mapped wetland (riverine) (USFWS)

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	COACHELLA VALLEY MSHCP	NOTES
		<u>Land Use and Community Design Element:</u> Floodway Overlay; Industrial Cannabis Overlay also immediately adjacent to the southwest 100-year flood zone (FEMA)	- Morongo Wash Flood Control/Corridor - Le Conte's Thrasher - Palm Springs Pocket Mouse - CV Milkvetch - CV Jerusalem Cricket Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Little Morongo Road to Palm Drive)	
		Desert Hot Springs Bicycle and Pedestrian Master Plan (2016) Proposed Class II bike lane/cycle track		
		Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018) High Wind Erosion Susceptibility Area		
VRNR2 Varner Road north of Edom Hill Road	City of Cathedral City	**Cathedral City General Plan (2009)** <u>Circulation Element:</u> Identified as Arterial Highway <u>Environmental Hazards Element:</u> Very severe wind hazard zone, high susceptible to seismically induced settlement and liquefaction Located in North City Specific Plan 100-year flood zone (FEMA)	Willow Hole Conservation Area Biological resources: - Palm Springs Pocket Mouse - CV Milkvetch - Le Conte's Thrasher - CV Fringe-toed Lizard - CV Round-tailed Ground Squirrel	CV Milkvetch Critical Habitat (USFWS) Crosses mapped wetland (riverine) (USFWS) Coordination required with Coachella Valley Joint Project Review due to conservation area

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	COACHELLA VALLEY MSHCP	NOTES
		Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018) High Wind Erosion Susceptibility Area	Fringe-toed Lizard Preserve Area: need to increase sand transport across the roadway and decrease the possibility for sand to deposit and get stuck under bridges Mapped as a designated Sand Transport area by the CVMSHCP Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Mountain View Road to Date Palm Drive)	Located on BLM land: may require additional analysis of BLM resources and/or BLM approval
DATE PALM DRIVE Date Palm Drive north of Interstate 10 (I-10)	City of Cathedral City	**Cathedral City General Plan (2009)** <u>Circulation Element:</u> Identified as Arterial Highway <u>Environmental Hazards Element</u>: Very severe wind hazard zone, high susceptible to seismically induced settlement Located in North City Specific Plan 100-year flood zone (FEMA) **Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018)** High Wind Erosion Susceptibility Area	Within the MSHCP boundary but not within a Conservation Area Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = I-10 to Varner Road [includes realignment])	

SITE IDENTIFIER/ FLOODING AREA	JURISDICTION(S)	ENVIRONMENTAL CONSTRAINTS/NOTES		
		CITY/COUNTY PLANS	COACHELLA VALLEY MSHCP	NOTES
DPLM3 Date Palm Drive south of I-10	City of Cathedral City	**Cathedral City General Plan (2009)** Circulation Element: Identified as Arterial Highway Environmental Hazards Element: Very severe wind hazard zone, high susceptible to seismically induced settlement 100-year flood zone (FEMA)	Within the MSHCP boundary but within an Indian reservation (not a part of MSHCP) Roadway is included as a Covered Regional Road Project in Table 7-3: *CVAG Regional Road Projects*, in Section 7.2: *Transportation Projects Within and Outside Conservation Areas*, of the CVMSHCP (Segment = Vista Chino to I-10)	Within Agua Caliente Indian Reservation
		Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (2018) High Wind Erosion Susceptibility Area		

7 ENGINEER'S ESTIMATE OF COSTS

Engineer's estimate of costs (Estimates) were prepared for the proposed improvements at each area of flood concern. Quantities were calculated from the Alternative Concepts Plan Sets included in the back of this report. Unit costs and lump sum items were determined from Engineer's professional experience utilizing Caltrans standard cost codes for District 8 (Riverside and San Bernardino Counties). Unit costs were also verified for accuracy with actual contractor's bid items of similar projects.

For proposed improvements involving Contech CON/SPAN O-Series Bridge Systems, estimates were provided by Contech for all supplied components based on their review and quantity takeoffs of the Alternative Concept Plan Sets.

Each estimate includes a 25 percent contingency and 12 percent cost for consultant services.

TABLE 7-1: SUMMARY OF MITIGATION COSTS

CITY	FLOOD CROSSING (SEGMENT PER TPPS)	STREET NAME	MITIGATION COSTS
PALM SPRINGS	INCN7-A	North Indian Canyon Drive	$ 10,851,000
	INCN7-B	North Indian Canyon Drive	$ 23,796,000
	GAT3	North Gene Autry Trail	$ 34,582,000
	Bike Trail / Emergency Access	North Indian Canyon Drive	$ 10,111,000
DESERT HOT SPRINGS	DLN3-A	Dillon Road	$ 2,848,000
	DLN3-B	Dillon Road	$ 2,323,000
	LM3 *	Little Morongo Road	$ 1,875,000
	TBP2	2 Bunch Palms Trail	$ 3,565,000
	LM1	Little Morongo Road	$ 2,819,000
	INCN13	North Indian Canyon Drive	$ 1,383,000
	INCN14	North Indian Canyon Drive	$ 1,797,000
CATHEDRAL CITY	DPLM3	Date Palm Drive and Los Gatos Road	$ 475,000
	VRNR2	Varner Road	$ 1,966,000
	DATE PALM DR	Date Palm Drive and Date Palm Drive	$ 1,629,000

*** Shared jurisdiction with Unincorporated County of Riverside**

TABLE 7-2: NORTH INDIAN CANYON 'A' (INCN7-A)

(3) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 100.00	3,808	$ 380,800.00
2	Class 2 Aggregate Base	CY	$ 75.00	1,367	$ 102,525.00
3	Minor Concrete (Curb and gutter)	LF	$ 50.00	3,077	$ 153,843.00
4	Roadway Excavation	CY	$ 60.00	2,208	$ 132,480.00
5	Import Borrow	CY	$ 25.00	32,314	$ 807,850.00
6	Construct cast in place foundation/piles	CY	$ 1,000.00	2,357	$ 2,357,000.00
7	Construct cast in place headwall	CY	$ 1,400.00	173	$ 242,200.00
8	Structure Excavation	CY	$ 70.00	2,357	$ 164,990.00
9	Structure Backfill	CY	$ 50.00	2,176	$ 108,800.00
10	Removal of existing road (base and surfacing)	CY	$ 35.00	3,248	$ 113,680.00
11	Traffic Control (close road, set detour signs)	LS	$ 50,000.00	1	$ 50,000.00
12	Striping	LF	$ 0.55	12,307	$ 6,770.00
13	Pavement Markings	SF	$ 40.00	58	$ 2,320.00
14	Signing	EA	$ 350.00	2	$ 700.00
15	Reinforcing Steel for footings and headwalls	LB	$ 2.50	217,707	$ 544,300.00
16	Drainage System (inlet system at 700' intervals along N. Indian Canyon Dr.)	LS	$ 84,400.00	1	$ 84,400.00
17	Grade Control Structure (Articulated concrete block, concrete, etc)	LS	$ 400,000.00	1	$ 400,000.00
18	Contech Components (CON/SPAN O-Series - 300 LF)	LS	$ 850,000.00	1	$ 850,000.00
19	Utility Relocations (Power Poles (9), Electrical Vault, Sewer, Fiber or Gas)	LS	$ 400,000.00	1	$ 400,000.00
20	Right-of-Way (Acquisition and TCE)	LS	$ 200,000.00	1	$ 200,000.00
21	Mobilization (10%)	LS	$ 789,184.22	1	$ 789,200.00
	Subtotal Construction Costs				**$ 7,891,858.00**
	Contigencies (25%)	LS	$ 1,972,964.50	1	$ 1,973,000.00
	CE Cost (12%)	LS	$ 986,482.25	1	$ 986,500.00
	Total for Location "A"				**$ 10,851,000.00**

TABLE 7-3: NORTH INDIAN CANYON 'B' (INCN7-B)

(9) 7' High x 34' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 100.00	5,133	$ 513,300.00
2	Class 2 Aggregate Base	CY	$ 75.00	1,843	$ 138,225.00
3	Minor Concrete (Curb and gutter)	LF	$ 50.00	4,392	$ 219,578.00
4	Roadway Excavation	CY	$ 60.00	1,355	$ 81,300.00
5	Import Borrow	CY	$ 25.00	53,754	$ 1,343,850.00
6	Construct cast in place foundation/piles	CY	$ 1,000.00	4,878	$ 4,878,000.00
7	Construct cast in place headwall	CY	$ 1,400.00	601	$ 841,400.00
8	Structure Excavation	CY	$ 70.00	4,878	$ 341,460.00
9	Structure Backfill	CY	$ 50.00	6,111	$ 305,550.00
10	Removal of existing road (base and surfacing)	CY	$ 35.00	4,378	$ 153,230.00
11	Traffic Control (close road, set detour signs)	LS	$ 50,000.00	1	$ 50,000.00
12	Striping	LF	$ 0.55	17,566	$ 9,661.43
13	Pavement Markings	SF	$ 40.00	58	$ 2,320.00
14	Signing	EA	$ 350.00	2	$ 700.00
15	Reinforcing Steel for footings and headwalls	LB	$ 2.50	471,019	$ 1,177,550.00
16	Drainage System (inlet system at 1000' intervals along N. Indian Canyon Dr.)	LS	$ 84,400.00	1	$ 84,400.00
17	Grade Control Structure (Articulated concrete block, concrete, etc)	LS	$ 1,600,000.00	1	$ 1,600,000.00
18	Contech Components (CON/SPAN O-Series - 1200 LF)	LS	$ 3,400,000.00	1	$ 3,400,000.00
19	Utility Relocations (Sewer and Fiber or Gas)	LS	$ 150,000.00	1	$ 150,000.00
20	Right-of-Way	LS	$ 285,000.00	1	$ 285,000.00
21	Mobilization (10%)	LS	$ 1,730,613.83	1	$ 1,730,600.00
	Subtotal Construction Costs				**$ 17,306,124.43**
	Contigencies (25%)	LS	$ 4,326,531.11	1	$ 4,326,500.00
	CE Cost (12%)	LS	$ 2,163,265.55	1	$ 2,163,300.00
	Total for Location "B"				**$ 23,796,000.00**

TABLE 7-4: NORTH GENE AUTRY TRAIL (GAT3)

(15) 6.34' High x 33' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	HMA (Type A) - PG	Ton	$ 110.00	12,004	$ 1,320,500.00
2	Class 2 AB	CY	$ 70.00	4,311	$ 301,800.00
3	Curb	LF	$ 25.00	9,700	$ 242,500.00
4	Roadway Excavation	CY	$ 65.00	3,221	$ 209,400.00
5	Import Borrow	CY	$ 26.00	143,406	$ 3,728,600.00
6	Structural Concrete (foundations (piles and caps), wing walls, culvert floors)	CY	$ 250.00	19,411	$ 4,852,800.00
7	Structural Concrete (Headwall)	CY	$ 1,000.00	2,794	$ 2,794,000.00
8	Structure Excavation	CY	$ 70.00	12,076	$ 845,400.00
9	Structure Backfill	CY	$ 50.00	10,715	$ 535,800.00
10	Removal of existing road (base and surfacing)	CY	$ 35.00	9,670	$ 338,500.00
11	Traffic Control (close road, set detour signs)	LS	$ 200,000.00	1	$ 200,000.00
12	Striping	LF	$ 0.40	38,800	$ 15,600.00
13	Pavement Markings	SF	$ 15.00	270	$ 4,100.00
14	Signing	EA	$ 350.00	2	$ 700.00
15	Relocate Flashing Signal Ahead Warning Sign Structure	EA	$ 25,000.00	1	$ 25,000.00
16	Bar Reinforcing Steel (foundations and headwalls)	LB	$ 1.00	1,091,042	$ 1,091,100.00
17	ArmorFlex (20' wide each side of culverts)	SQFT	$ 18.00	71,100	$ 1,279,800.00
18	Contech Components (CON/SPAN O-Series)	LS	$ 4,000,000.00	1	$ 4,000,000.00
19	Relocate Billboards	EA	$ 50,000.00	5	$ 250,000.00
20	Utility Relocations (7 steel, 1 wood power pole, 2 SCE vaults, relocate impacted services to billboards, Protect/Adjust FO and Gas)	LS	$ 1,000,000.00	1	$ 1,000,000.00
21	Mobilization	LS	$ 2,115,066.67	1	$ 2,115,100.00
	Subtotal Construction Costs				**$ 25,150,700.00**
	Contigencies (25%)	LS	$ 6,287,675.00	1	$ 6,287,700.00
	CE Cost (12%)	LS	$ 3,143,837.50	1	$ 3,143,800.00
	Total for Location "GAT-3"				**$ 34,582,000.00**

TABLE 7-5: BIKE TRAIL AND EMERGENCY ACCESS (INCN7)

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 100.00	2,205	$ 220,500.00
2	Class 2 Aggregate Base 3"	CY	$ 75.00	1,089	$ 81,675.00
3	Minor Concrete (Curb and gutter)	LF	$ 50.00	0	$ -
4	Roadway Excavation	CY	$ 60.00	27,378	$ 1,642,680.00
5	Import Borrow	CY	$ 25.00	63,156	$ 1,578,900.00
6	Construct cast in place foundation/piles	CY	$ 1,000.00	236	$ 236,000.00
7	Construct cast in place headwall	CY	$ 1,400.00	0	$ -
8	Structure Excavation	CY	$ 70.00	236	$ 16,520.00
9	Structure Backfill	CY	$ 50.00	6,111	$ 305,550.00
10	Removal of existing road (base and surfacing)	CY	$ 35.00	0	$ -
11	Traffic Control (close road, set detour signs)	LS	$ 50,000.00	1	$ 50,000.00
12	Striping	LF	$ 0.55	16,800	$ 9,240.00
13	Pavement Markings	SF	$ 40.00	58	$ 2,320.00
14	Signing	EA	$ 350.00	2	$ 700.00
15	~~Relocate Streetlight (N. Indian Canyon Dr. & Palm Springs Station Rd.)~~	~~EA~~	~~$ 5,000.00~~	0	$ -
16	Reinforcing Steel for footings and headwalls	LB	$ 2.50	100,311	$ 250,780.00
17	~~Modification to Solar Plant Site Entrance (across from Palm Springs Station~~	~~LS~~	~~$ 15,000.00~~	0	$ -
18	~~Adjustments to Palms Springs Station Road~~	~~LS~~	~~$ 150,000.00~~	0	$ -
19	Drainage System (inlet system at 1000' intervals along N. Indian Canyon Dr.	LS	$ 84,400.00	0	$ -
20	Grade Control Structure (Articulated concrete block, concrete, etc)	LS	$ 1,600,000.00	0	$ -
21	Contech Components (CON/Big R Modular Bridge - 12' wide x 80' span)	LS	$ 89,000.00	17	$ 1,513,000.00
22	Install on site Contech Components (CON/Big R Modular Bridge - 12' wide x	LS	$ 25,000.00	17	$ 425,000.00
23	Right-of-Way	LS	$ 285,000.00	1	$ 285,000.00
24	Mobilization (10%)	LS	$ 735,318.33	1	$ 735,300.00
	Subtotal Construction Costs				**$ 7,353,165.00**
	Contigencies (25%)	LS	$ 1,838,291.25	1	$ 1,838,300.00
	CE Cost (12%)	LS	$ 919,145.63	1	$ 919,100.00
	Total for Bike Trail				**$ 10,111,000.00**

TABLE 7-6: DILLON ROAD (DLN3-A)

(5) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110	741	$ 81,510
2	Class 2 Aggregate Base	CY	$ 100	266	$ 26,600
3	Roadway Excavation	CY	$ 75	439	$ 32,925
4	Import Borrow	CY	$ 25	4,905	$ 122,625
5	Construct cast in place foundation	CY	$ 1,000	377	$ 377,000
6	Construct cast in place headwall	CY	$ 1,400	179	$ 250,600
7	Structure Excavation	CY	$ 110	580	$ 63,800
8	Structure Backfill	CY	$ 120	1,928	$ 231,360
9	Removal of existing road (base and surfacing)	CY	$ 50	632	$ 31,600
10	Traffic Control (close road, set detour signs)	LS	$ 45,000	1	$ 45,000
11	Striping	LF	$ 1	2,310	$ 1,270
12	Signing	EA	$ 350	1	$ 350
13	Reinforcing Steel for footings	LB	$ 2	28,892	$ 43,300
14	Rip-Rap Slope Protection	CY	$ 150	335	$ 50,250
15	Contech Components (CONSPAN O-Series - 230 LF of 5'x25' spans)	LS	$ 365,400	1	$ 331,000
16	Utility Relocations (Power Poles (2), Electrical Vault)	LS	$ 120,000	1	$ 120,000
17	Private Property improvements	LS	$ 35,000	1	$ 35,000
18	Right-of-Way (TCE and right-of entry)	LS	$ 20,000	1	$ 20,000
19	Mobilization (10%)	LS	$ 207,132	1	$ 207,100
	Subtotal Construction Costs				**$ 2,071,290**
	Contigencies (25%)	LS	$ 517,823	1	$ 517,800
	CE Cost (12%)	LS	$ 258,911	1	$ 258,900
	Total for Location "DLN3-A"				**$ 2,848,000**

TABLE 7-7: DILLON ROAD (DLN3-B)

(4) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110	722	$ 79,420
2	Class 2 Aggregate Base	CY	$ 100	259	$ 25,900
3	Roadway Excavation	CY	$ 75	693	$ 51,975
4	Import Borrow	CY	$ 25	4,758	$ 118,950
5	Construct cast in place foundation	CY	$ 1,000	298	$ 298,000
6	Construct cast in place headwall	CY	$ 1,400	185	$ 259,000
7	Structure Excavation	CY	$ 110	828	$ 91,080
8	Structure Backfill	CY	$ 120	865	$ 103,800
9	Removal of existing road (base and surfacing)	CY	$ 50	796	$ 39,800
10	Traffic Control (close road, set detour signs)	LS	$ 45,000	1	$ 45,000
11	Striping	LF	$ 1	2,250	$ 1,238
12	Reinforcing Steel for footings	LB	$ 2	22,550	$ 33,825
13	Rip-Rap Slope Protection	CY	$ 150	267	$ 40,050
14	Contech Components (CON/SPAN O-Series - 184 LF of 5' x 25')	LS	$ 332,700	1	$ 332,700
15	Mobilization (10%)	LS	$ 168,971	1	$ 169,000
16	Subtotal Construction Costs				**$ 1,689,738**
	Contigencies (25%)	LS	$ 422,434	1	$ 422,400
	CE Cost (12%)	LS	$ 211,217	1	$ 211,200
	Total for Location "DLN3-B"				**$ 2,323,000**

TABLE 7-8: LITTLE MORONGO ROAD (LM3)

(3) Box Culverts (6' High x 12' Wide)

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110.0	818	$ 89,980
2	Class 2 Aggregate Base	CY	$ 100.0	294	$ 29,400
3	Roadway Excavation	CY	$ 75.0	522	$ 39,150
4	Import Borrow	CY	$ 25.0	7,028	$ 175,700
5	Structural Concrete (RCB, parapet, cut-off wall, wingwalls)	CY	$ 1,000.0	434	$ 434,000
6	Structure Excavation	CY	$ 110.0	668	$ 73,480
7	Structure Backfill	CY	$ 120.0	543	$ 65,160
8	Removal of existing road (base and surfacing)	CY	$ 50.0	698	$ 34,900
9	Traffic Control (close road, set detour signs)	LS	$ 50,000.0	1	$ 50,000
10	Striping	LF	$ 0.6	3,400	$ 1,870
11	Reinforcing Steel (RCB, parapet, cut-off wall, wingwalls)	LB	$ 1.5	51,353	$ 77,030
12	Rip-Rap Slope Protection	CY	$ 150.0	259	$ 38,850
13	Relocate existing PP	LS	$ 225,000.0	1	$ 225,000
14	Mobilization	LS	$ 148,280.0	1	$ 148,300
15	Subtotal Construction Costs				**$ 1,363,440**
	Contigencies (25%)	LS	$ 340,860.0	1	$ 340,900
	CE Cost (12%)	LS	$ 170,430.0	1	$ 170,400
	Total for Location "LM3"				**$ 1,875,000**

TABLE 7-9: TWO BUNCH PALM TRAIL (TBP2)

(4) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110.00	935	$ 102,850.00
2	Class 2 Aggregate Base	CY	$ 100.00	336	$ 33,600.00
3	Roadway Excavation	CY	$ 75.00	885	$ 66,375.00
4	Import Borrow	CY	$ 25.00	6,384	$ 159,600.00
5	Construct cast in place foundation	CY	$ 1,000.00	648	$ 648,000.00
6	Construct cast in place headwall	CY	$ 1,400.00	197	$ 275,800.00
7	Structure Excavation	CY	$ 110.00	1,493	$ 164,230.00
8	Structure Backfill	CY	$ 120.00	1,301	$ 156,120.00
9	Removal of existing road (base and surfacing)	CY	$ 50.00	798	$ 39,900.00
10	Traffic Control (close road, set detour signs)	LS	$ 45,000.00	1	$ 45,000.00
11	Striping	LF	$ 0.55	2,720	$ 1,496.00
12	Signing (remove existing sign)	EA	$ 200.00	1	$ 200.00
13	Reinforcing Steel for footings	LB	$ 1.50	49,713	$ 74,569.50
14	Rip-Rap Slope Protection	CY	$ 150.00	668	$ 100,200.00
15	Contech Components (CON/SPAN O-Series - 300 LF of 5'x25' spans)	LS	$ 385,300.00	1	$ 385,300.00
16	Utility Relocations adjust Sewer MHs (2), protect all others	LS	$ 50,000.00	1	$ 50,000.00
17	Private Property improvements	LS	$ 25,000.00	1	$ 25,000.00
18	Right-of-Way (TCE)	LS	$ 5,000.00	1	$ 5,000.00
19	Mobilization (10%)	LS	$ 259,248.94	1	$ 259,200.00
	Subtotal Construction Costs				**$ 2,592,440.50**
	Contigencies (25%)	LS	$ 648,110.13	1	$ 648,100.00
	CE Cost (12%)	LS	$ 324,055.06	1	$ 324,100.00
	Total for Location "TBP2"				**$ 3,565,000.00**

TABLE 7-10: LITTLE MORNOGO ROAD (LM1)

(1) 48" RCP and (3) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110	1,261	$ 138,710
2	Class 2 Aggregate Base	CY	$ 100	453	$ 45,300
3	Roadway Excavation	CY	$ 75	1,790	$ 134,250
4	Import Borrow	CY	$ 25	7,001	$ 175,025
5	Construct cast in place foundation (CONSPAN)	CY	$ 1,000	301	$ 301,000
6	Construct cast in place headwall (CONSPAN)	CY	$ 1,400	137	$ 191,800
7	Structural Concrete (CULVERT)	CY	$ 1,000	59	$ 58,938
8	Structure Excavation (CONSPAN)	CY	$ 110	1,519	$ 167,090
9	Structure Excavation (CULVERT)	CY	$ 110	39	$ 4,290
10	Structure Backfill (CONSPAN)	CY	$ 120	639	$ 76,680
11	48" RCP	LF	$ 500	70	$ 35,000
12	Removal of existing road (base and surfacing)	CY	$ 50	1,075	$ 53,750
13	Traffic Control (close road, set detour signs)	LS	$ 45,000	1	$ 45,000
14	Striping	LF	$ 1	3,930	$ 2,162
15	Pavement Markings	SF	$ 40	53	$ 2,120
16	Signing	EA	$ 350	4	$ 1,400
17	Reinforcing Steel for footings (CONSPAN)	LB	$ 2	23,025	$ 34,538
18	Reinforcing Steel (CULVERT)	LB	$ 2	4,103	$ 6,154
19	Utility Relocations	LS	$ 75,000	1	$ 75,000
20	Contech Components (CON/SPAN O-Series - 138 LF of 5'x25' spans)	LS	$ 222,000	1	$ 222,000
21	Utility Relocations (4 Sewer MHs, FH, SCE MH, 2 other MHs)	LS	$ 75,000	1	$ 75,000
22	Mobilization (10%)	LS	$ 205,023	1	$ 205,000
23	Subtotal Construction Costs				**$ 2,050,206**
24	Contigencies (25%)	LS	$ 512,551	1	$ 512,600
	CE Cost (12%)	LS	$ 256,276	1	$ 256,300
	Total for Location "LM1"				**$ 2,819,000**

TABLE 7-11: NORTH INDIAN CANYON (INCN13)

(2) Box Culverts (16' Wide x 8' High)

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110	799	$ 87,890
2	Class 2 Aggregate Base	CY	$ 100	287	$ 28,700
3	Roadway Excavation	CY	$ 75	804	$ 60,300
4	Import Borrow	CY	$ 25	4,808	$ 120,200
5	Structural Concrete (RCB, parapet, cut-off wall, wingwalls)	CY	$ 1,000	482	$ 482,360
6	Structure Excavation	CY	$ 110	395	$ 43,450
7	Structure Backfill	CY	$ 120	179	$ 21,480
8	Removal of existing road (base and surfacing)	CY	$ 50	681	$ 34,050
9	Traffic Control (close road, set detour signs)	LS	$ 25,000	1	$ 25,000
10	Striping	LF	$ 1	3,320	$ 1,826
11	Signing (Remove existing signs)	EA	$ 150	2	$ 300
12	Reinforcing Steel (RCB, parapet, cut-off wall, wingwalls)	LB	$ 2	51,353	$ 77,030
13	Rip-Rap Slope Protection	CY	$ 150	182	$ 27,300
14	Utility Relocations (Protect in place)	LS	$ -	1	$ -
15	Mobilization	LS	$ 112,210	1	$ 112,200
16	Subtotal Construction Costs				**$ 1,005,496**
	Contigencies (25%)	LS	$ 251,374	1	$ 251,400
	CE Cost (12%)	LS	$ 125,687	1	$ 125,700
	Total for Location "INCN13"				**$ 1,383,000**

TABLE 7-12: NORTH INDIAN CANYON (INCN14)

(2) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 110	1,255	$ 138,050
2	Class 2 Aggregate Base	CY	$ 100	430	$ 43,000
3	Roadway Excavation	CY	$ 75	696	$ 52,200
4	Import Borrow	CY	$ 25	8,189	$ 204,725
5	Construct cast in place foundation	CY	$ 1,000	224	$ 224,000
6	Construct cast in place headwall	CY	$ 1,400	90	$ 126,000
7	Structure Excavation	CY	$ 110	591	$ 65,010
8	Structure Backfill	CY	$ 120	634	$ 76,080
9	Removal of existing road (base and surfacing)	CY	$ 50	115	$ 5,750
10	Traffic Control (close road, set detour signs)	LS	$ 45,000	1	$ 45,000
11	Striping	LF	$ 1	5,360	$ 2,948
12	Pavement Markings	SF	$ 40	78	$ 3,120
13	Signing (remove existing sign)	EA	$ 200	3	$ 600
14	Reinforcing Steel for footings	LB	$ 2	16,296	$ 24,444
15	Relocate exisitng barbed wire fence w/metal posts	LF	$ 25	1,200	$ 30,000
16	Contech Components (CON/SPAN O-Series - 92 LF of 5'x25' spans)	LS	$ 135,500	1	$ 135,500
17	Utility Relocations (no visible utilities impacted)	LS	$ -	1	$ -
18	Mobilization (10%)	LS	$ 130,714	1	$ 130,700
	Subtotal Construction Costs				**$ 1,307,127**
	Contigencies (25%)	LS	$ 326,782	1	$ 326,800
	CE Cost (12%)	LS	$ 163,391	1	$ 163,400
	Total for Location "INCN14"				**$ 1,797,000**

TABLE 7-13: VARNER ROAD (VRNR2)

(1) 5' High x 25' Wide CON/SPAN Bridge System

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 200.00	823	$ 164,600.00
2	Class 2 Aggregate Base	CY	$ 100.00	296	$ 29,600.00
3	Roadway Excavation	CY	$ 90.00	919	$ 82,710.00
4	Import Borrow	CY	$ 25.00	5,340	$ 133,500.00
5	Construct Cast inplace foundation	CY	$ 1,000.00	209	$ 209,000.00
6	Construct cost in place headwall	CY	$ 1,400.00	179	$ 250,600.00
7	RIP RAP	CY	$ 50.00	100	$ 5,000.00
8	Structure Excavation (Culvert)	CY	$ 120.00	339	$ 40,680.00
9	Structure Backfill (CULVERT)	CY	$ 150.00	398	$ 59,700.00
10	Removal of existing road (base and surfacing)	CY	$ 100.00	702	$ 70,200.00
11	Traffic Control (close road, set detour signs)	LS	$ 50,000.00	1	$ 50,000.00
12	Striping	LF	$ 2.50	3,780	$ 9,450.00
13	Pavement Markings	SF	$ 30.00	53	$ 1,590.00
14	Reset Roadside Sign (Metal Post)	EA	$ 600.00	4	$ 2,400.00
15	Remove Guardrailing	LF	$ 20.00	300	$ 6,000.00
16	Reinforcing Steel (CULVERT)	LB	$ 1.50	14,865	$ 22,297.50
17	Midwest Guardrail System (wood posts)	LF	$ 50.00	550	$ 27,500.00
18	Alternative In-Line Terminal System	EA	$ 4,000.00	1	$ 4,000.00
19	Utility Relocations (Protect PPs)	LS	$ 20,000.00	1	$ 20,000.00
20	Contech Components (CON/SPAN O-Series - 68 LF of 5' x 25')	LS	$ 98,250.00	1	$ 98,250.00
21	Mobilization (10%)	LS	$ 143,008.61	1	$ 143,000.00
22	Subtotal Construction Costs				**$ 1,430,077.50**
	Contigencies (25%)	LS	$ 357,519.38	1	$ 357,500.00
	CE Cost (12%)	LS	$ 178,759.69	1	$ 178,800.00
	Total for Varner Road				**$ 1,966,000.00**

TABLE 7-14: DATE PALM DRIVE (DPLM5)

(2) Box Culverts (10' Wide X 8' High)

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Hot Mixed Asphalt (Type A)	Ton	$ 200.00	237	$ 47,400.00
2	Class 2 Aggregate Base	CY	$ 100.00	85	$ 8,500.00
3	Structural Concrete, Box Culvert	CY	$ 1,500.00	303	$ 454,500.00
4	Remove Existing Culvert	LF	$ 115.00	126	$ 14,490.00
5	Structure Excavation (Culvert)	CY	$ 120.00	1,446	$ 173,520.00
6	Structure Backfill (Culvert)	CY	$ 150.00	651	$ 97,650.00
7	Removal of existing road (base and surfacing)	CY	$ 100.00	202	$ 20,200.00
8	Traffic Control (close road, set detour signs)	LS	$ 50,000.00	1	$ 50,000.00
9	Striping	LF	$ 2.50	600	$ 1,500.00
10	Pavement Markings	SF	$ 30.00	30	$ 900.00
11	Reset Roadside Sign (Metal Post)	EA	$ 600.00	1	$ 600.00
12	Reinforcing Steel (Culvert)	LB	$ 1.50	66,142	$ 99,210.00
13	Remove Exisitng Guardrailing	LF	$ 20.00	100	$ 2,000.00
14	Midwest Guardrail System (Wood Posts)	LF	$ 50.00	100	$ 5,000.00
15	Alternative In-Line Terminal System	EA	$ 4,000.00	4	$ 16,000.00
16	Utility Relocations/Adjustments (Relocate PP, guy anchors, & guy poles, Adjust MH)	LS	$ 75,000.00	1	$ 75,000.00
17	Mobilization (10%)	LS	$ 118,496.67	1	$ 118,500.00
	Subtotal Construction Costs				**$ 1,184,970.00**
	Contigencies (25%)	LS	$ 296,242.50	1	$ 296,200.00
	CE Cost (12%)	LS	$ 148,121.25	1	$ 148,100.00
	Total for Date Palm Drive				**$ 1,629,000.00**

TABLE 7-15: DATE PALM DRIVE AND LOS GATOS ROAD (DPLM3)

Strom Drain Improvements

Item No.	Item Description	Unit	Unit Cost	Quantitiy	Item Cost
1	Remove and Replace Roadway (2' each side of existing cross gutters/encase	SQFT	$ 30.00	1,185	$ 35,550.00
2	Curb Inlet Catch Basin (L=14') (COR Std 300)	EA	$ 5,000.00	4	$ 20,000.00
3	Grate Inlets (COR Std 305)	EA	$ 4,500.00	2	$ 9,000.00
4	RIP RAP Pad (15'x60'x4')	CY	$ 50.00	133	$ 6,670.00
5	Reinforced Concrete Encasement	EA	$ 26,000.00	2	$ 52,000.00
6	Elliptical Concrete Pipes (14"x23") (4 total @ 93.3' each)	LF	$ 250.00	373	$ 93,300.00
7	12" RCP	LF	$ 200.00	149	$ 29,800.00
8	Traffic Control (close road, set detour signs)	LS	$ 25,000.00	1	$ 25,000.00
9	Remove Cross gutter and Spandel	SQFT	$ 4.00	2,500	$ 10,000.00
10	Construct Cross Gutter and curb returns	CY	$ 400.00	65	$ 26,000.00
11	Remove 12" CMP with concrete encasement	LF	$ 20.00	188	$ 3,760.00
12	Mobilization (10%)	LS	$ 34,564.44	1	$ 34,600.00
	Subtotal Construction Costs				**$ 345,680.00**
	Contigencies (25%)	LS	$ 86,420.00	1	$ 86,400.00
	CE Cost (12%)	LS	$ 43,210.00	1	$ 43,200.00
	Total for Date Palm Drive and Los Gatos Road				**$ 475,000.00**

8 RISK ASSESEMNT AND MITIGATION RECOMMENDATIONS

This section describes potential risks or adverse conditions that could result from the current environment that could be avoided through the implementation of the proposed mitigations within this report. It then evaluates different characteristics of the mitigation projects to create a tiered priority of systematic improvements. The priority system is intended to be simple, by assessing the benefits of each project against regional concerns during blowsand and flooding events.

As part of the prioritization exercise, a recommendation of funding allocation is also provided using different budget constraint models.

8.1 Risk Factor

This project has specific risks related to the occurrences of flooding and accumulation of sediment deposits at low water crossings. The magnitude, frequency and impacts of flooding and blowsand events vary considerably among all crossings. The prioritization criteria were developed to identify risk factors and the extent of impacts as a result of flood and blowsand events. The locations studied have all been documented as areas requiring improvements to reduce or eliminate the impacts of the events on traffic access and operations.

Although blowsand is a regional issue, the greatest impacts are observed at the low water crossings; these locations are most susceptible to sediment deposits. The combination of low roadway elevations at the washes, lack of vegetation and sandy/fine-grained soil conditions create the perfect environment for sediment transport onto the roadways during flood events and periods of heavy wind.

As described in Section 4.3, the goal to mitigate for blowsand is not to prevent it from occurring, but to control and prevent/minimize blowsand from accumulating onto the roadways. Raising the roadways at these crossings is a feasible alternative that will provide a signification reduction in sediment accumulation onto the roadways. This mitigation measure will not solve all adverse impacts of blowsand, but it will address the flood issues and greatly reduce the adverse impacts of blowsand at the areas most susceptible to these events.

Other considerations of risks, such as habitat protection and environmental impacts caused by construction activities, could be present but have been determined to be indiscernible between the subject locations, as most of the proposed alternative concepts can be constructed within the existing right of way.

Risk for this study is then primarily associated with the probability and size of flooding events, the amount of roadway traffic that would be affected, and the need of routes used for evacuations or emergency access.

8.2 Project Selection

One key focus of this study is to identify the projects that would mitigate for emergency flooding events that paralyze access to key routes and make regional travel difficult and impractical. Some mitigations were occasionally studied separately but were combined or eliminated for practical reasons. Mitigations that contain multiple flow crossing locations are:

- DLN3 (Dillon Road between N Indian Canyon Drive to Palm Drive)
- INCN7 (N Indian Canyon Road between I-10 interchange to Tramview Road)

One project did show roadway flooding conditions, but it was determined that the drainage was primarily local drainage from the neighboring subdivision development and not regional. While this study discusses possible treatments to mitigate the issues, it was unlike the other project areas where regional catchment areas, rather local, were the source of floodwaters:

- DPLM3 (Date Palm Drive at Los Gatos Road)

Two projects were included as planned connections in the CV Link master plan, which could also serve as an emergency access only route and not intended for general traffic. One route is confirmed in the CV Link Master Plan to run adjacent to GAT3, so it will be referenced as ACCESS GAT3. The other route is identified as a connector to the Palm Springs Railroad Station on Indian Canyon Road, running adjacent to INCN7. This CV Link / Emergency Access improvement is referenced as ACCESS INCN7.

In total, twelve (12) projects were evaluated for implementation priorities. These 12 projects are outlined in Table 8-1.

TABLE 8-1: PRIORITIZATION – AREAS OF FLOOD CONCERN

TPPS SEGMENT NAME	LOCATION DESCRIPTION	CITY	COST (2015 RACE METHODOLOGY)	MITIGATION COST
DLN3	Dillon Road	Desert Hot Springs	$9,356,000	$5,171,000
DPLM5	Date Palm Drive s/o Varner Road	Cathedral City	$6,432,000	$1,629,000
INCN7	North Indian Canyon Drive	Palm Springs	$198,815,000	$34,647,000
ACCESS INCN7	North Indian Canyon Drive CV Link / Emergency Access	Palm Springs	N/A	$10,000,000
GAT3	North Gene Autry Trail	Palm Springs	$233,900,000	$34,582,000
ACCESS GAT3	North Gene Autry Trail CV Link / Emergency Access	Palm Springs	N/A	$15,000,000
INCN13	North Indian Canyon Drive	Desert Hot Springs	$3,508,500	$1,383,000
INCN14	North Indian Canyon Drive	Desert Hot Springs	$3,508,500	$1,797,000
LM1	Little Morongo Road	Desert Hot Springs	$4,678,000	$2,819,000
LM3	Little Morongo Road	Desert Hot Springs	$6,432,000	$1,875,000
TBP2	2 Bunch Palms Trail	Desert Hot Springs	$18,712,000	$3,565,000
VRNR2	Varner Road	Cathedral City	$4,824,000	$1,966,000

The costs for each mitigation were included, along with the original costs extracted from the 2015 Regional Arterial Cost Estimation (RACE) for bridges on these segments. Several segments did not propose a bridge improvement in the 2015, but the same methodology was applied to generate an estimated value for a full bridge improvement using appropriate widths and estimated lengths. The cost differential shows the cost effectiveness of the mitigation projects relative to using standard or planned project types.

8.3 Evaluating Priorities

Highlighting the needs of maintaining regional hospital access for all emergency response teams, as well as the pubic, is particularly critical during flooding events. The volume of users affected by route closures is the next highest priority. Finally, the stormwater flow that would requirement maintenance or potential infrastructure repair is the lowest tier priority of the project objectives. The questions were considered for each location included:

- *Is this a necessary/preferred route for access to the freeway, airport or hospital/ emergency evacuations?*
- *What amount of traffic volume does the roadway/route service?*
- *What design flows does this mitigation resolve in terms of maintenance?*

8.3.1 Emergency and Evacuation Access

The region has one trauma care center, Desert Regional Medical Center, located in the heart of Palm Springs at N. Indian Canyon Drive and Tachevah Drive. Access to this facility is considered a primary concern and one of the essential objectives that the mitigation efforts will address. The area also relies on access to Palm Springs International Airport (Tahquitz Canyon Way and El Cielo Road, west of Gene Autry Trail) and the I-10 freeway for inter-regional travel, good transport, and emergency/evacuation routing. Arterials that connection population areas to these points are of heightened importance.

8.3.2 Traffic Volumes

The amount of traffic considered in this prioritization were measured around the region in 2017, with the source information from CVAG website link for Interactive Map: Coachella Valley Traffic Counts. Simply stated, the amount of traffic in vehicles per day is a direct reflection of the number of users impacted by its potential closure during flooding and sand migration events. The higher the ADT, the greater the relative importance this road has to the region. Where a mitigation only provided for "emergency access" the ADT value was disregarded.

8.3.3 Stormwater Flows

Hydrologic data was determined at each of the project locations. For comparison purposes, design flows were reviewed to determine the extent of potential impact during an anticipated storm event. In general, greater flow rates during storm events represent a greater risk, potential damage, greater impact to access, and/or likelihood of flooding.

8.3.4 Prioritization Rankings

The projects were evaluated on their merits against the main objectives outlined in the study. A tiered ranking system provided insight into which projects would best meet the needs of the Western Coachella Valley during a flooding or emergency event. Values of *Highest*, *Medium*, and *Lowest* were assigned based on known characteristics of the roadway segments.

As described above, the greatest weight was placed on "Emergency and Evacuation Access". The least weight was put on "Stormwater Flows". The resulting tiers show projects in the *HIGH*, *MEDIUM*, and *LOWEST* tiers or priority. Projects in the same tiers are considered relatively equal in priority and benefit. The results are shown in Table 8-2.

TABLE 8-2: PRIORITIZATION – SUMMARY OF RESULTS

TPPS SEGMENT NAME	LOCATION DESCRIPTION	CITY	EMERGENCY AND EVACUATION ACCESS	TRAFFIC VOLUME (veh/day)	STORMWATER FLOWS	FINAL PRIORITY
GAT3	North Gene Autry Trail	Palm Springs	HIGHEST * Connection to I-10 * Connection to Airport	HIGHEST * 27,000 veh/day	HIGHEST * Whitewater River Crossing	***HIGHEST***
INCN7	North Indian Canyon Drive	Palm Springs	HIGHEST * Connection to I-10 * Connection to Airport	HIGHEST * 15,000 veh/day	HIGHEST * Whitewater River Crossing	***HIGHEST***
ACCESS GAT3	North Gene Autry Trail CV Link / Emergency Access	Palm Springs	HIGHEST * Connection to Trauma Center for Emergency Access Only	LOWEST * Emergency Access Only	HIGHEST * Whitewater River Crossing	***HIGHEST***
ACCESS INCN7	North Indian Canyon Drive CV Link / Emergency Access	Palm Springs	HIGHEST * Connection to Trauma Center for Emergency Access Only	LOWEST * Emergency Access Only	HIGHEST * Whitewater River Crossing	***HIGHEST***
VRNR2	Varner Road	Cathedral City	MEDIUM * Alternate route for I-10 closure	HIGHEST * 11,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***MEDIUM***
DLN3	Dillon Road	Desert Hot Springs	MEDIUM * Alternate route for I-10 closure	MEDIUM * 8,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***MEDIUM***
DPLM5	Date Palm Drive s/o Varner Road	Cathedral City	MEDIUM * Alternate route for I-10 closure	MEDIUM * 7,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***MEDIUM***
TBP2	2 Bunch Palms Trail	Desert Hot Springs	LOWEST * Connects fewer areas of population	HIGHEST * 11,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***MEDIUM***
LM3	Little Morongo Road	Desert Hot Springs	LOWEST * Connects fewer areas of population	MEDIUM * 6,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***LOWEST***
INCN13	North Indian Canyon Drive	Desert Hot Springs	LOWEST * Connects fewer areas of population	MEDIUM * 6,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***LOWEST***
INCN14	North Indian Canyon Drive	Desert Hot Springs	LOWEST * Connects fewer areas of population	LOWEST * 5,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***LOWEST***
LM1	Little Morongo Road	Desert Hot Springs	LOWEST * Connects fewer areas of population	LOWEST * 4,000 veh/day	LOWEST * Whitewater River Tributary Crossing	***LOWEST***

8.4 Constraints Analysis

Project implementation is often not done in a predetermined order but is a product of the constraints that are faced by each project. The list can contain any number of issues that arise: unavailable funding (including matching city funds), localized environmental impacts, lack of strong political or community support, etc. Any of these items can delay a project or make it less of a priority. Additionally, the completion of one mitigation project could reduce the benefit of another nearby project, if it serves the same population or functionality.

This study focuses on the probability that funding for all of the projects will not be immediately available. The amount needed for the entire system of improvements is roughly $90 million.

8.4.1 Unconstrained Model

An unconstrained model suggests that the full list of improvements can be installed as listed in the prioritization rankings. Table 8-3 shows all improvements installed, regardless of cost.

TABLE 8-3: UNCONSTRAINED MODEL ($115M BUDGET)

TPPS SEGMENT NAME	LOCATION DESCRIPTION	CITY	FINAL PRIORITY	COST
GAT3	North Gene Autry Trail	Palm Springs	HIGHEST	$34,582,000
INCN7	North Indian Canyon Drive	Palm Springs	HIGHEST	$34,647,000
ACCESS GAT3	North Gene Autry Trail CV Link / Emergency Access	Palm Springs	HIGHEST	$15,000,000
ACCESS INCN7	North Indian Canyon Drive CV Link / Emergency Access	Palm Springs	HIGHEST	$10,000,000
VRNR2	Varner Road	Cathedral City	MEDIUM	$1,966,000
DLN3	Dillon Road	Desert Hot Springs	MEDIUM	$5,171,000
DPLM5	Date Palm Drive s/o Varner Road	Cathedral City	MEDIUM	$1,629,000
TBP2	2 Bunch Palms Trail	Desert Hot Springs	MEDIUM	$3,565,000
INCN13	North Indian Canyon Drive	Desert Hot Springs	LOWEST	$1,383,000
INCN14	North Indian Canyon Drive	Desert Hot Springs	LOWEST	$1,797,000
LM1	Little Morongo Road	Desert Hot Springs	LOWEST	$2,819,000
LM3	Little Morongo Road	Desert Hot Springs	LOWEST	$1,875,000
TOTAL				**$114,434,000**

8.4.2 Partially Constrained Model (50% Budget)

Using a partially constrained model of 50% of the project budget of approximately $55 million available, decisions need to be made on which menu of projects are ultimately installed. As mentioned previously, the projects of the same assigned priorities have relatively equivalent importance. These projects can be substituted with one another with nearly the same overall benefit. Table 7-4 provides an example set of projects that could be installed using 50% of the overall budget. This includes two (2) of the *HIGHEST* projects, three (3) of the *MEDIUM* projects, and one (1) of the *LOWEST* projects. The *HIGHEST* priority projects included one primary roadway mitigation and one emergency access alternative.

Importantly, at least one of the *HIGHEST* priority projects, GAT3 or INCN7, should be included in this list. However, it can be argued that one of these higher-cost projects can satisfy the connectivity needed for the same population. For that reason, both are interchangeable, but only one may be necessary for initial implementation. Because they are seen as nearly equivalent, the team did not choose a specific alignment (GAT3 or INCN7) that was preferable. Our recommendation is that this decision is one best made by CVAG staff with input from the cities most affected by the choice: Desert Hot Springs, Palm Springs, and Cathedral City.

Because of the importance of these two primary routes, our recommendation is that the roadway that was not selected for a major road improvement instead uses a less-expensive CV Link pathway that doubles as an emergency access alternative. (In this case, ACCESS INCN7). This provides critical emergency access for each primary route but would not serve the general driving public.

TABLE 8-4: 50% BUDGET – PARTIALLY CONSTRAINED MODEL ($55M BUDGET)

TPPS SEGMENT NAME	LOCATION DESCRIPTION	CITY	FINAL PRIORITY	Cost
GAT3	North Gene Autry Trail	Palm Springs	HIGHEST	$34,582,000
ACCESS INCN7	North Indian Canyon Drive CV Link / Emergency Access	Palm Springs	HIGHEST	$10,000,000
VRNR2	Varner Road	Cathedral City	MEDIUM	$1,966,000
DLN3	Dillon Road	Desert Hot Springs	MEDIUM	$5,171,000
DPLM5	Date Palm Drive s/o Varner Road	Cathedral City	MEDIUM	$1,629,000
INCN13	North Indian Canyon Drive	Desert Hot Springs	LOWEST	$1,383,000
TOTAL				**$54,731,000**

8.4.3 Highly Constrained Model (25% Budget)

A highly constrained budget is shown at 25% of the total budget needed for the sum of the projects' construction costs. This value is not enough to complete one of the primary improvements on GAT3 or INCN7. Instead, the CV Link projects with emergency access only (ACCESS GAT3 and ACCESS INCN7) could be built adjacent to both major roadway segments. Because of the degree of benefit of GAT3 and INCN7 (and to a lesser extent ACCESS GAT3 and ACCESS INCN7), they should be constructed as a minimum to begin addressing the emergency access and evacuation concerns. The other projects do not significantly improve these issues without the *HIGHEST* priority projects completed. The table below shows an example of providing partial improvements if less than $35M is available to afford one of the top two projects.

TABLE 8-5: 25% BUDGET – HIGHLY CONSTRAINED MODEL ($30M BUDGET)

TPPS SEGMENT NAME	LOCATION DESCRIPTION	CITY	FINAL PRIORITY	COST
ACCESS GAT3	North Gene Autry Trail CV Link / Emergency Access	Palm Springs	HIGHEST	$15,000,000
ACCESS INCN7	North Indian Canyon Drive CV Link / Emergency Access	Palm Springs	HIGHEST	$10,000,000
VRNR2	Varner Road	Cathedral City	MEDIUM	$1,966,000
DPLM5	Date Palm Drive s/o Varner Road	Cathedral City	MEDIUM	$1,629,000
TOTAL				**$28,595,000**

8.5 Priority Recommendations

- Build at least one of these projects first if budget is available: GAT3 or INCN7.
- These projects are considered equivalent in this study. Consult the CVAG Transportation Committee or meet separately with the cities of Desert Hot Springs, Palm Springs, and Cathedral City to understand their priorities and preferences
- Once one of the highest priority projects GAT3 or INCN7 is constructed, the need for the other is significantly reduced. Given the higher costs of these improvements, it's advisable to spread the funding to other higher or medium improvements.
- As an alternative to building both of the largest improvements on these primary routes, GAT3 could be constructed with ACCESS INCN7, or similarly, INCN7 could be constructed with ACCESS GAT3. This would provide public access on one major route and emergency access only on the other.
- If funding is below the amount needed for GAT3 or INCN7, build one or (or both) ACCESS GAT3 and ACCESS INCN7 to establish emergency access to these primary routes.

9 FUNDING SOURCES AND OPPORTUNITIES

This section describes possible funding opportunities to fund the infrastructure improvements identified in the risk assessment.

9.1 Grant Programs

9.1.1 California Department of Water Resources

Flood Corridor Program

The Flood Corridor Program (FCP) provides grant funding for nonstructural flood management projects throughout the state that include wildlife habitat enhancement and/or agricultural land preservation. By conserving agricultural lands, preserving wildlife habitat, acquiring flood flow easements, and restoring floodplain functions, floodwaters can safely spread over and, in some cases, move more quickly through floodplains or be detained for later release. These efforts can reduce peak flows upstream and downstream. Other benefits include:

- Enhanced wetland development
- Recharged groundwater
- Enhanced wildlife habitat
- Trapped sediment
- Acquire sites that cannot be made safe from future flooding.

This program was established in March 2000 when California voters passed Proposition 13, the "Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act". Additional funding has been provided by Proposition 84 and Proposition 1E, which were passed in 2006.

9.1.2 California Transportation Commission (CTC)

Senate Bill 1, the Road Repair and Accountability Act of 2017, (SB1) authorizes an investment of $54 billion through the year 2024 to fix roads, freeways and bridges in communities across California. These funds will be split equally between state and local projects.

Local Partnership Program (LPP)

SB 1 created the current LPP and continuously appropriates $200 million annually from the Road Maintenance and Rehabilitation Account to local and regional transportation agencies that have sought and received voter approval of taxes or that have imposed fees, which taxes or fees are dedicated solely for transportation improvements (Measure A qualifies Riverside County for the LPP).

The primary objective of the LPP program is to provide funding to those counties, cities, districts, and regional transportation agencies where voters have approved taxes and fees, including uniform developer fees used for transportation improvements [as defined by Government Code Section 8879.67(b)]. Consistent with the intent behind SB 1, the CTC intends this program to balance the need to direct increased revenue to the state's highest transportation needs while fairly distributing the economic impact of increased funding.

The LPP funds are distributed through a 40% statewide competitive component and a 60% formulaic component.

Guidelines for the 2021 LPP are expected to be released in January 2021 with applications due in Summer 2021. CVAG-TUMF projects are eligible for LPP-Competitive grants due to the mitigation fee dedicated to transportation projects and Riverside County's Measure A, which lowers the local match.

The LPP-Competitive grants will fund only the construction components of highway improvement projects. Funds allocated to RCTC from the LPP Formulaic program may be applied to non-construction components: planning, design and environmental clearance.

The Formulaic Program funds are limited (approximately $6 - $7 million annually). RCTC reviews the proposals for local agency projects as well as the RCTC Measure A projects to determine the projects that meet the LPP guidelines and can be delivered within the timeframe of the program.

Local agencies are eligible to submit project applications directly to the CTC for the competitive program. RCTC, as the transportation sales tax administrator (self-help county), determines projects for the Formulaic program.

Formulaic Program

Eligibility: Jurisdictions with voter approved taxes, tolls, or fees, which are dedicated solely to transportation improvements.

Formulaic Share Distribution: The Commission will adopt the funding share for each eligible taxing authority by establishing northern and southern California shares and by attributing the proportional share of revenues from voter approved taxes, tolls, and fees and distributing in proportion based on the county's population and revenue. For the southern distribution, 75 percent is based on the population of the county in which the taxing authority is located compared to the total population of southern California counties with voter-approved sales taxes dedicated solely to transportation improvements; and 25 percent based on the total amount of sales tax revenue generated by the voter-approved transportation-dedicated sales tax measures of the taxing authority compared to the total amount of revenues from voter-approved transportation-dedicated sales tax measures in all of southern California.

Competitive Program

Eligibility: Jurisdictions with voter approved taxes, tolls, or fees, which are dedicated solely to transportation improvements or that have imposed fees, including uniform developer fees, which are dedicated solely to transportation improvements.

Eligible projects for both the formulaic and competitive LPP include improvements to the local road system including safety or operational improvements intended to reduce accidents and fatalities or improve traffic flow on the local road segment.

9.1.3 Federal Emergency Management Agency

Two programs administered by FEMA that are applicable to the Flood and Blowsand alternatives are the Flood Mitigation Assistance (FMA) Program and the Building Resilient Infrastructure and Communities (BRIC) Program, These programs provide funding for eligible mitigation planning and implementation projects that reduces disaster losses and protect life and property from future disaster damages.

Flood Mitigation Assistance

As appropriated by the Consolidated Appropriations Act, 2018 (Public Law 115-141); the Fiscal Year (FY) 2020 Flood Mitigation Assistance (FMA) Grant Program provides resources to assist states and local communities in their efforts to reduce or eliminate the risk of repetitive flood damage to buildings and structures insurable under the National Flood Insurance Program (NFIP) as authorized by the National Flood Insurance Act of 1968, as amended. Local governments are considered sub-applicants and must apply to the California Office of Emergency Services (Cal OES). The 2020 FMA sub-applications are due at Cal OES no later than December 3, 2020. Award selection is anticipated in Summer, 2021.

The FMA Grant Program is a nationally competitive program that was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 with the goal of reducing or eliminating claims under the NFIP and is focused on mitigating repetitive loss (RL) properties and severe repetitive loss (SRL) properties. The total amount of funds distributed under the FY 2020 FMA will be $160,000,000. Of this, a total $70,000,000 has been prioritized for community flood mitigation projects and advance flood mitigation assistance leaving an estimated $90,000,000 available for other FMA priorities that include technical assistance, flood mitigation planning, and mitigation of RL and SRL properties.

Eligible Community Flood Mitigation Projects include

- Infrastructure protective measures
- Floodwater storage and diversion
- Utility protective measures
- Storm water management
- Wetlands restoration/creation
- Aquifer storage and recovery
- Localized flood control to protect a critical facility
- Floodplain and stream restoration
- Water and sanitary sewer system protective measures

Applicants (states) and sub-applicants (local governments) must have a FEMA approved mitigation plan as of the application deadline in order to apply for mitigation projects in accordance with Title 44 CFR Part 201.

The maximum federal share for FMA planning sub-applications is as follows:

- Up to $600,000 per applicant for all Project Scoping Sub-applications
- Up to $30,000,000 for community flood mitigation projects
- $50,000 for Technical Assistance for states/territories who were awarded FMA Grant Program funds totaling at least $1,000,000 in FY 2019.
- $100,000 per Applicant for mitigation planning with a maximum of $50,000 for state plans and $25,000 for local plans.

A maximum of 10 percent of grant funds awarded can be used by the recipient for management costs, and a maximum of 5 percent of grant funds awarded can be used by the subrecipient for management costs, per HMA Guidance.

Federal funding is available for up to 75 percent of the eligible FMA activity costs. FEMA may contribute up to 90 percent for RL properties and up to 100 percent Federal cost share for SRL properties.

Building Resilient Infrastructure and Communities

The FEMA BRIC Program allocates $500 million annually for states, tribal set-aside and national competition for planning and implementation projects that eliminate and reduce risk due to natural disasters. BRIC is designed to assist states and local communities in implementing a sustained pre-disaster natural hazard mitigation program. Local governments are eligible sub-applicants and can sponsor applications through their State grant funding agencies. BRIC is highly competitive, sub-applications are due at Cal OES by December 20, 2020.

FEMA requires that recipients adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for pre-disaster mitigation projects. All mitigation projects submitted as part of a BRIC grant application must be consistent with the goals and objectives identified in: a) the current, FEMA-approved state or tribal (Standard or Enhanced) Mitigation Plan; and b) the local mitigation plan for the jurisdiction in which the project is located.

FEMA Application Review and Selection Process

Mitigation projects must be cost-effective and designed to increase resilience and reduce risk of injuries, loss of life, and damage and destruction of property, including critical services and facilities. This means the project, as documented by the applicant, achieves the following goals:

- Addresses a problem that has been repetitive or that poses a risk to public health and safety and improved property if left unresolved;
- Satisfies applicable cost-effectiveness requirements through completion of a Benefit-Cost Analysis BCA
- Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address; and
- Accounts for long-term changes to the areas and entities it protects and has manageable future maintenance and modification requirements.

FEMA has specified minimum project criteria via regulation (44 CFR Part 79 and 44 CFR Section 206.434), including that Applicants must demonstrate mitigation projects are cost effective. The BCA is the method by which the future benefits of a hazard mitigation project are determined and compared to its costs.

The result is a Benefit-Cost Ratio (BCR), which is calculated by a project's total benefits divided by its total costs. The BCR is a numerical expression of the "cost-effectiveness" of a project. A project shall be considered cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs. Projects that are not cost-effective will not be eligible. Mitigation projects must be cost-effective and designed to increase resilience and reduce risk of injuries, loss of life, and damage and destruction of property,

9.2 Capital Improvement Fees and Assessments

9.2.1 Measure A and Transportation Uniform Mitigation Fees

In Riverside County, Measure A is a ½ cent local transaction and use tax for funding transportation regional projects. It was originally approved by the voters in 1989 and was set to expire in 2009. However, in 2002, the voters extended the measure to 2039. Measure A is administered by Riverside County Transportation Commission Measure A was enacted to fill the funding shortfall to: implement necessary highway, commuter rail, and transit projects; secure new transportation corridors through environmental clearance and right-of-way purchases; provide adequate maintenance and improvements on the local street and road system; promote economic growth throughout the county; and provide specialized programs to meet the needs of commuters and the specialized needs of the growing senior and disabled population. Is it was estimated that approximately $4.7 billion would be collected over the 30-year period between 2009 and 2039 for a variety of transportation mode improvements and programs in Riverside County. Funds are returned to source to the respective regions in proportion to funds generated within the regions (Western Riverside, Coachella Valley, Palo Verde Valley). Projects will receive funding in accordance with the Transportation Improvement Plan (TIP) for each region. The estimated allocation to Coachella Valley is approximately $439 million over the 30-year period.

The Transportation Project Prioritization Study (TPPS), developed through the Coachella Valley Association of Governments, will function as the TIP for future needs within the Coachella Valley.

The TPPS improvements will be accomplished with a mix of Measure "A" funds, state and federal highway funds, and the existing CVAG Transportation Uniform Mitigation Fee (TUMF) on new development.

Regional arterial and freeway projects to receive Measure A funding will be determined through public meetings and environmental clearance processes that will occur throughout the 30-year period (to 2039).

Thirty-five percent (35%) of the Measure "A" revenues are returned to the cities and the county in the Coachella Valley and used to assist with funding local street and road improvements. These funds will supplement existing federal, state, and local funds. Local street improvements adjacent to new residential and business developments will continue to be paid for by the developers.

Cities and the County in the Coachella Valley must participate in the TUMF program to assist in the financing of the priority regional arterial system in order to receive these funds. If a city or the county chooses not to levy the TUMF, the funds they would otherwise receive for local streets and roads will be added to the Measure "A" funds for the Regional Arterial Program.

Allocations of funds to the cities and the county will be based on a formula weighted 50 percent on proportionate dwelling units and 50 percent on Measure "A" revenues generated within each jurisdiction. A five-year Capital Improvement Program for the use of these funds is prepared and annually updated with public participation by each city and the County.

The Flood and Blowsand project alternatives locations are currently prioritized in the Transportation Project Prioritization System (TPPS) in Table 8-1 with the points that were assigned to the described projects in 2015.

9.2.2 Benefit Assessment Districts

Assessment districts are formed for a variety of purposes to fund the maintenance and construction of public improvements. All assessment districts require a majority approval of the district's property owners with votes weighted in proportion to the proposed assessment amounts on each parcel. The district formation and voting procedures are specified in California Government Code Sec 53750 et. seq. Assessments districts may issue bonds to finance public improvements pursuant to the Improvement Bond Act of 1915 (Streets and Highways Code Sec. 8500). The bonds are repaid from the annual assessment installments. Financing of improvements using assessment revenue may also be obtained through the California Infrastructure and Economic Development Bank (see below). The improvements financed with assessments must provide a special benefit to the properties in the district and the assessment on each parcel must be proportional to the benefit received by that parcel.

9.2.3 Road and Bridge Benefit District

Road and Bridge Benefit Districts (RBBD) are established pursuant to Section 66484 of the California Government Code. These districts are formed specifically to provide funding for road and bridge improvements within an established area of benefit. The district fees are assessed on new development projects in proportion to the benefit. The local jurisdiction would establish the RBBD by ordinance. Approval of an ordinance to form a district and collect fees is subject to a majority protest by the landowners in the district.

9.2.4 Storm Water Management (Enterprise) Fees.

Senate Bill 231 was signed into law in 2018. This law is significant for local government storm water management activities because it includes storm drainage in the definition of sewer systems in Article XIII D of the California Constitution. The intent of the legislation is to allow new fees and fee increases for the purpose of funding storm water management activities subject to majority protest only—not Prop. 218 ballot procedures as was previously the case for only non-exempt property-related charges (water, sewer, solid waste, etc.). Many jurisdictions charge storm water or drainage fees. However, these fees typically cover only a small fraction of the costs related to storm water management, including compliance with the Clean Water Act as well as maintaining and constructing new flood control improvements.

Under the old law, the fees could not be raised to even a justifiable level without passage of a ballot measure in a special or general election. Fee-based revenues could be the source of bonded debt service to fund improvements.

9.2.5 Groundwater Extraction Fees

The groundwater extraction fee is a unit charge for pumping groundwater from a groundwater basin to offset the cost of groundwater management activities. A recent court decision, City of San Buenaventura vs. United Water Conservation District validates a more general application of groundwater extraction charges. This decision may have positive implications for funding of a storm water program outside of Prop. 218 if groundwater is, or could be, a significant resource in a community's water supply. The groundwater extraction fee would be a component of customers' water utility bills and used to fund maintenance of groundwater quality, enhance groundwater recharge and develop the groundwater resource.

9.2.6 Local Groundwater Management Authority

A Groundwater Extraction Charge may be imposed, or increased, if a Groundwater Sustainability Plan pursuant to Water Code 10730.2 is adopted. The project area is within the West Whitewater

River Sub-Basin Area of Benefit, which is managed by the Coachella Valley Water District. The CVWD charges a Replenishment Assessment Charge (RAC) paid by public and private well owners. The RAC is used primarily to offset the cost of operating the Whitewater Groundwater Replenishment Facility. The groundwater recharge benefit of the Cathedral City detention basin alternative (DPLM3) may be calculated and presented to the CVWD as a possible use of the RAC revenues.

TABLE 9-1: FLOOD AND BLOW SAND PROJECTS LISTED IN THE TPPS

Project Alternative	TPPS No.	Build Project Number	Agency	Project Description in TPPS	2015 Points	2017 TPPS Buildable Project Cost ($1,000's)
North Indian Canyon Drive	NCN7	B-513	Palm Springs	Sunrise Pkwy to Palm Springs Station Road	11.00	$204,100
North Gene Autry Trail	GAT3	B-002	Palm Springs	Future Bridge over the Whitewater River	10.00	$233,900
Dillion Road A & B	DLN3	B-412	Unincorporated Desert Hot Springs	North Indian Canyon Drive to Palm Drive, including. future bridge at Mission Creek	10.00	$14,801
Little Morongo 3	LM3	B-162	Desert Hot Springs	Two Bunch Palms Trail to Dillon Road, including future bridge at Mission Creek	9.00	$14,539
Bunch Palms Trail	TBP2	B-197	Desert Hot Springs	Little Morongo Road to Palm Drive	11.00	$5,423
Little Morongo 1	LM1	B-160	Desert Hot Springs	Mission Lakes Boulevard to Pierson Boulevard	7.00	$3,721
North Indian Canyon Drive	INCN13	B-158	Desert Hot Springs	Pierson Blvd to Mission Lakes Blvd including future bridge at Mission Creek	9.00	$6,946
North Indian Canyon Drive	INCN14	B-159	Desert Hot Springs	Mission Lakes Boulevard to SR-62	10.00	$10,251
Varner Road	VRNR2	B-181	Cathedral City	Mountain View Rd to Date Palm Dr -	8.00	$12,505
Date Palm Drive	DPLM5	--	Cathedral City	I-10 IC to Varner Road, including realignment and bridge at Long Canyon Channel	Funded (status revised by City of Cathedral City)	
Date Palm Drive	DPLM3	B-434	Cathedral City	30th Avenue to Vista Chino	4.00	$3,324

The indicated TPPS Buildable Project Costs in Table 8-1 are for the total project described in the TPPS; see Table 6-1: Summary of Mitigation Costs for the cost of proposed project alternatives.

The TUMF typically funds only 35% of estimated project costs. This level of funding would provide the local needed for most competitive grant programs, such as LPP.

9.2.7 Coachella Valley Multiple Species Habitat Conservation Plan (CVMSCP)

The CVMSCP mitigation fee program may be applied for the acquisition of qualifying habitat area as a co-benefit, along with groundwater recharge, of alternatives that use detention (DPLM3) as the primary method of flood protection.

9.3 Direct Loans and Bonded Debt Programs

Infrastructure State Revolving Funds (SRF)

The California Infrastructure and Economic Development Bank (I-Bank, State "I-Bank Act" CA Gov't Code Sec 63000) SRF program offers direct loans at below market interest rates with proceeds from bundled bond issues. The I-Bank SRF program funds a wide range of infrastructure including drainage, water supply and conservation, watershed protection, flood control, parks and recreation and environmental mitigation.

Funding sources for debt service must be identified and may include water, sewer and other enterprise revenues, general fund revenues, property assessments, Mello-Roos special taxes, lease revenues and other recurring revenues acceptable to I-Bank. I-Bank SRF funding amounts range between $50,000 and $25 million. Use of SRF must conform to prevailing wage requirements and there is a 1 percent origination fee for I-Bank loans. Loan applications are accepted continuously. Loan Terms:

- Maximum term 30 years
- The interest rate benchmark is Thompson's Municipal Market Data Index
- Staff may adjust the interest rate based on upon factors that include:
- Area unemployment rates
- Medium Household Income
- Recent bond credit rating (if any)

TABLE 9-2: GRANT FUNDING MATRIX BY ALTERNATIVE

Applicable Project Alternatives	Program	Agency	Fund Source/Funding Cycle	Criteria/Notes/Feasibility
Grants				
All alternatives	Local Partnership Program	California Transportation Commission	Annual competitive program	Medium feasibility of award for the competitive program would require cooperation with RCTC to list projects.
Cathedral City (DPLM3)	Flood Corridor Program	California Department of Water Resources	Revenue Source: Propositions 13 and 84); Floodway Corridor Program (Proposition 1E) Total Estimated Available Funding: $6.6 million This Grant Program is set to terminate on 06/30/2022.	Application to project limited to acquisition for non-structural flood control protection and wildlife habitat protection.

Applicable Project Alternatives	Program	Agency	Fund Source/Funding Cycle	Criteria/Notes/Feasibility
Cathedral City (DPLM3)	Coachella Valley Open Space Acquisition Program	Coachella Valley Mountains Conservancy	Propositions 68 and 33 Total Estimated Available Funding: $8.8 million Potential Funding Awarded in the Next 6 Months: $1.5 million Estimated Number of Awards: 10-20 per year. Continuous application process.	Medium feasibility. Need to demonstrate benefit of detention basin as open space in furtherance of CVMC goals
All Alternatives	Flood Mitigation Assistance (FMA) grants	FEMA	Sub-application submission deadline is December 3, 2020; $70 million for community flood mitigation projects	Objective is to reduce or eliminate claims under the NFIP and is focused on mitigating repetitive loss (RL) properties and severe repetitive loss (SRL) properties. Feasibility is potentially high with life-safety benefits yielding a high BRC.
	Building Resilient Infrastructure and Communities		Sub-application submission deadline is December 3, 2020. $600,000 annual maximum per state or territory	High feasibility to demonstrate benefit of reduction of overall risk to the population from future hazard events, while also reducing reliance on Federal funding in future disasters.