SCLA MASTER PLAN OF DRAINAGE UPDATE

VICTORVILLE, SAN BERNARDINO COUNTY, CALIFORNIA

MAIN REPORT

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Date:

September 2020

JN 159408

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1 Introduction

1.1 General

The Southern California Logistics Airport (SCLA) is located on the grounds of the former George Air Force Base (AFB), which has been recently annexed by the City of Victorville as part of the redevelopment of the decommissioned military facility in San Bernardino County, California. The site is located on the north side of Victorville and immediately east of the City of Adelanto. It comprises of approximately 5,000 acres. Refer to Figure 1-1 for a vicinity map. Of the 5,000 acres, only 2,619 acres were analyzed. The remaining area was unchanged from the 2007 MPD and therefore was not analyzed in this study.

The SCLA Master Plan of Drainage (MPD) study area is located in the downstream portion of the Mojave River watershed. This document combines the findings of both the City of Adelanto MPD and the Victorville MPD documents and revises some master plan facilities, and therefore supersedes all previous studies.

The primary objectives of this report are as follows:

1. Prepare an existing condition hydrologic analysis using existing 2017 land uses and infrastructure per Google Earth and as-built plans, NOAA Atlas 14 rainfall rates, and revised AMC (Per San Bernardino Hydrology Manual Addendum for Arid Regions).
2. Prepare proposed condition hydrology, drainage, and water quality studies for the SCLA study area. The studies will update the previous hydrology models to include the updated land plan, NOAA Atlas 14 revised rainfall rates, revised AMC, and existing infrastructure.
3. Prepare a new master plan hydraulic analysis using XP-SWMM model.
4. Design water quality facilities to comply with the Phase II NPDES permit for the City of Victorville for the urbanized portion of the Mojave River Watershed dated July 1, 2013 (Order No. 2013-0001 DWQ).

1.2 Previous Studies

The following reports have been previously prepared and was used as a baseline for this study.

The report SCLA Master Plan of Drainage (MPD) was previously prepared for the City of Victorville in October 2006. The MPD study area covers the area between two previous drainage studies. A drainage master plan by the City of Adelanto covers the region to the west, and a similar study by the San Bernardino Flood Control District for the City of Victorville covers the region to the south and east. The boundaries of the Victorville MPD and Adelanto MPD are shown on Figure 1-5.

- *City of Adelanto.* Rivertech prepared the City of Adelanto Drainage Master Plan on the western region of the site in November of 1992. This area will not contribute runoff onto the expansion area.
- *Victorville Master Plan of Drainage.* Williamson & Schmid completed the Victorville Master Plan of Drainage for the Oro Grande Wash and Adjacent Watersheds that is tributary to the Mojave River in 1992. The watersheds analyzed in the report includes a portion of the golf course located on the southeast corner of the former George AFB. Portions of the expansion area and the offsite facilities (Shay Road realignment, lead track and siding track) are located on the northern boundary of the Victorville Master Plan of Drainage.

Michael Baker INTERNATIONAL

0 5 10 20 Miles

Source:

SCLA Master Plan of Drainage

Vicinity Map

Figure 1-1

In addition to the drainage master plan studies of adjacent watersheds, the Sacramento District of the U.S. Army Corps of Engineers commissioned a study of surface water drainage on George Air Force Base (USACE, 1988). The study found that the existing drainage system on the airfield was inadequate to convey even a two-year storm and recommended that the entire drainage system between the main runway and existing taxiway be reconstructed.

1.3 Existing Watershed Description

The SCLA site is tributary to two major watercourses, with Fremont Wash on the north and the Mojave River on the north and east sides. The watershed drains at multiple locations into these two watercourses, with the drainage divide located between the primary instrument and crosswind runways. The majority of the SCLA site and the area east of the site drain towards the Mojave River while the primary instrument runway and west side of the base drain towards Fremont Wash. The northern industrial area drains north towards the Fremont Wash. The Victorville Master Plan of drainage includes the watershed information on the siding and lead track areas. The flows will drain toward the Mojave River.

1.4 FEMA Floodplain Mapping

City of Victorville is a participant in the National Flood Insurance Program (NFIP). Communities participating in the NFIP must adopt and enforce minimum floodplain. The published Flood Insurance Rate Map (FIRM) for the project site is included on Community Panel Nos. 06071C5805H and 06071C5785H. The panels are shown on Figure 1-2 and Figure 1-3. The majority of the site is located outside of the existing mapped floodplain. However, there is a Zone AE floodplain through the residential area west of Adelanto Road. In addition, the Mojave River located east of the site is mapped as a Zone AE. Figure 1-4 shows the floodplains from both FIRM panels in relation to the SCLA project site.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11 North. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency. This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

This map may reflect more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

San Bernardino County
Unincorporated Areas
060270

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
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~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
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2476000mN	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
March 18, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 28, 2008 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 5785H

FIRM
FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 5785 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ADELANTO, CITY OF	060639	5785	H
SAN BERNARDINO COUNTY	060270	5785	H
VICTORVILLE, CITY OF	065068	5785	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

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06071C5785H

MAP REVISED
AUGUST 28, 2008

Federal Emergency Management Agency

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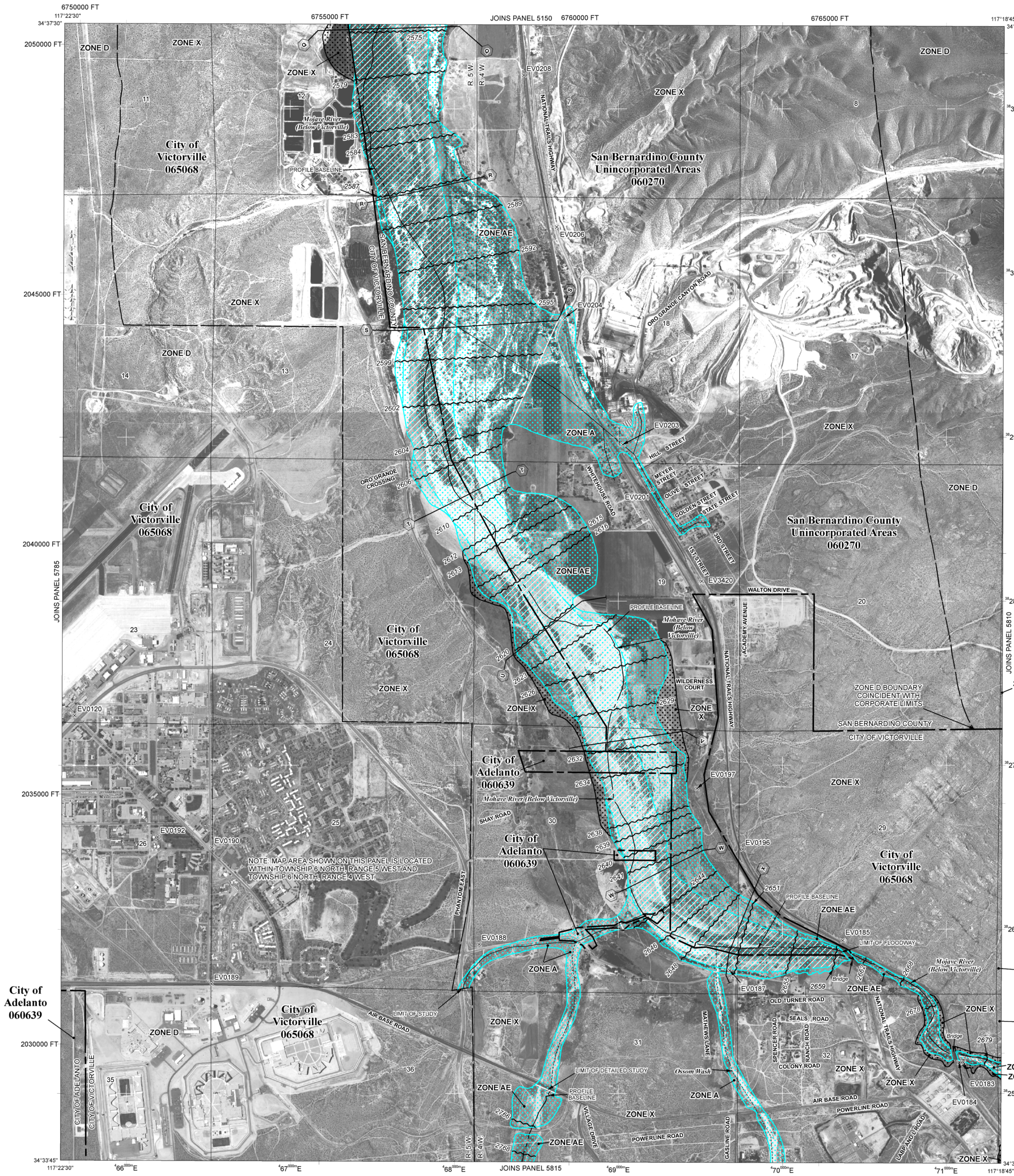

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PANEL 5805H

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PANEL 5805 OF 9400

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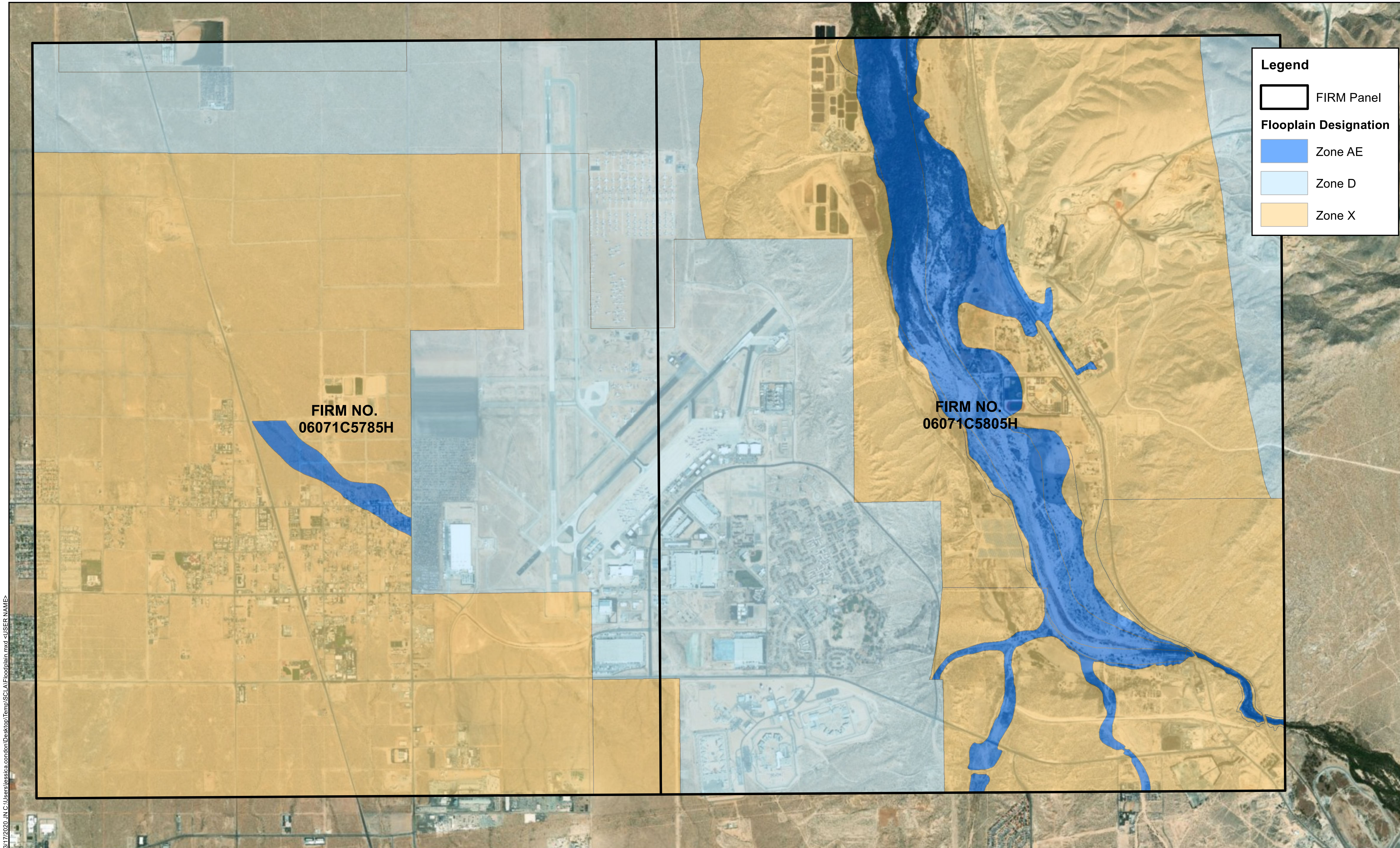
MAP REVISED
AUGUST 28, 2008

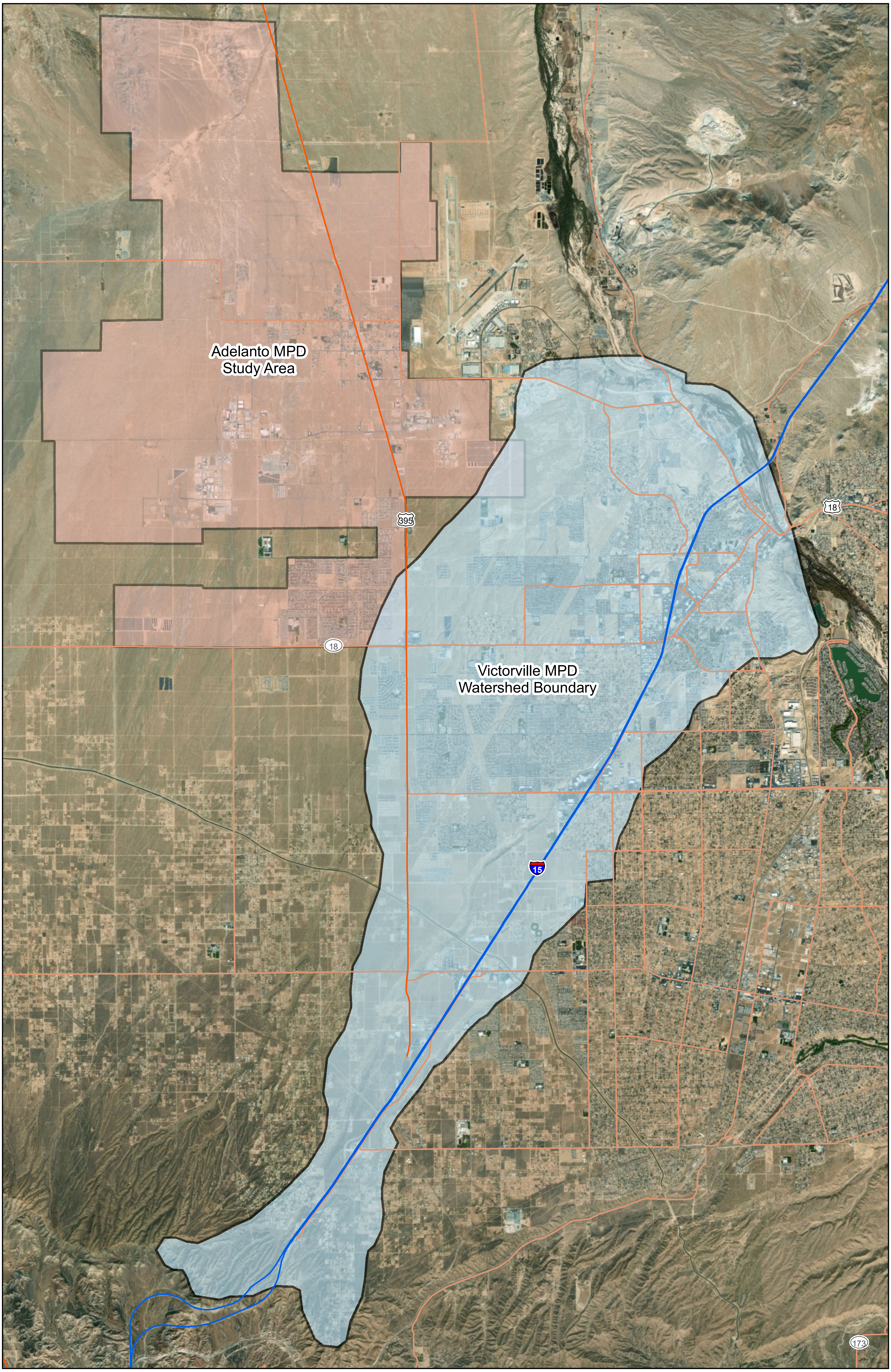
Federal Emergency Management Agency



SCLA Master Plan of Drainage Update

FEMA Floodplain Map

Figure 1-4



3/17/2020 JN C:\Users\jessica.condon\Desktop\Temp\SCLA\MPDStudyBndrys.mxd <USER NAME>

0 0.5 1 2 Miles

Source:

SCLA Master Plan of Drainage Update

Previous MPD Boundaries

Figure 1-5

2 Regulatory Requirements & Design Criteria

2.1 Flood Protection Requirements

The SCLA development is subject to requirements and ordinances defined by the San Bernardino County Flood Control District. Development within the area may also be subject to requirements by the following programs and/or permitting agencies:

- The FEMA National Flood Insurance Program (NFIP)
- U.S. Army Corps of Engineers Section 404 of the National Clean Water Act
- The California Environmental Quality Act (CEQA)
- The California Fish and Game Code
- Regional Water Quality Control Board 404 Permit.

The environmental requirements are not discussed in this document. The NFIP requirements are listed below:

- Structures within flood hazard areas must be protected from flood hazards.
- All habitable structures must have 100-year flood protection.
- The building lowest floors must be at least one foot above the 100-year water surface elevations.
- Where levees are proposed as a flood protection measure, the top of levee elevations must be at least three feet above the water surface elevation.
- No underground parking structures shall be allowed in areas subject to flooding.
- Potential impacts to adjacent structures/properties shall be evaluated where proposed building pads/structures encroach upon a floodplain.
- Development within floodplain areas may be subject to FEMA requirements.
    - Conditional Letter of Map Revision and Letter of Map Revisions are necessary for any structures (culverts, bridges, levees, etc) and fill placed with a FEMA mapped floodplain.

2.2 Hydrology Design Criteria

Hydrology follows the methodology in the San Bernardino County Hydrology Manual and the 2010 Addendum. The 2010 Addendum made the following changes in the project area:

- NOAA Atlas 14 precipitation values shall be used instead of the NOAA 2 rainfall data in the San Bernardino County manual.
- An Antecedent Moisture Condition (AMC) of 1 shall be used for all storm frequencies, according to Figure ADD-1. The 2007 SCLA MPD used variable AMCs dependent on the storm return frequency, as stipulated in the Hydrology Manual.

2.3 Hydraulic Design Criteria

The design criteria for the SCLA MPD are based upon the City of Victorville Standard Specifications for Public Improvements (April 19, 1976) and the Victorville Master Plan of Drainage for Oro Grande Wash and Adjacent Watersheds that are tributary to the Mojave River (March 1992).

2.3.1 City of Victorville Local Standards

The primary source of drainage design criteria for drainage at the SCLA is the City of Victorville Standard Specifications for Public Improvements. These drainage design criteria are summarized below:

- Drainage facilities shall be designed to provide a level of flood protection from a 100-year return period storm event (Q100), assuming ultimate anticipated development on the watershed
- Depth of water in streets during the 100-year design event shall not be higher than 3 inches above the top of curb.
- Finished building lot elevations must be above the 100-year water surface elevation. In areas where natural ground relief does not preclude inundation of building floors by the 100-year event, the drainage system must ensure that the 100-year water surface elevation does not exceed building floor elevation.
- Cross-gutters on minor streets or collector streets shall be restricted to intersections only. If it is necessary to convey drainage in the middle of a block, it will be conveyed by a pipe with the capacity to carry runoff from a 10-year design event (Q10), combined with a dip engineered to convey the Q100.
- Drainage across arterial streets shall be accomplished at mid-block using pipe with the capacity to convey the Q100.
- Where a street must cross a major wash, flood flows will be conveyed by a standard wash crossing design set forth in City of Victorville Standard Drawing D-01A. The pipe culverts shall have capacity to carry the 10-year (beneath), and 100-year (with dip) for mino and collector streets, and 100-year storm (beneath) for arterial streets. The wash crossing shall have capacity to pass the 100-year flow as a dip crossing when acting with the culvert (local and collector streets).
- Minimum storm drain pipe diameter shall be 18 inches. Pipes must be reinforced concrete.
- A soft-bottom channel will be permitted for flow velocities of 5 feet per second with side slope protection. 5- 12 feet per second requires concrete lining.
- Primary drainage channels and conduits shall have sufficient capacity to contain the Q100 with 2 feet of freeboard in open channels and 0.75 feet of freeboard between the design water surface elevation inside catch basins and the gutter at the catch basin inlet.

2.3.2 San Bernardino County Flood Control District MPD Criteria

In addition to the city standard requirements, there are additional design criteria described in the San Bernardino County Flood Control District Victorville Master Plan of Drainage for Oro Grande Wash and Adjacent Watersheds that are tributary to the Mojave River (March, 1992). These requirements are as follows:

- Existing natural drainage courses will remain unimproved in areas zoned for densities less than or equal to one dwelling unit per 2.5 acres.
- Regional drainage facilities are those in which the peak runoff from a 100 year design event (Q100) is greater than 750 cfs. These facilities are designed to convey the peak runoff from a 100-year design event.
- Secondary drainage facilities convey locally generated flows. They are defined as facilities where the runoff from a 25-year design event (Q25) is greater than 300 cfs, or where a waterway in excess of 20 square feet in area (equivalent to a 60-inch diameter pipe) is required. These facilities are designed to convey the Q25.

- Local drainage facilities are specified where the Q25 exceeds 100 cfs, or where street capacity is exceeded. The minimum facility considered is a 24-inch reinforced concrete pipe.
- There shall not be more than 100 cfs or the equivalent of the Q25 in overland flow at any location.
- Street flow shall not exceed street drainage capacity during the 25-year event.

2.3.2.1 Open Channel Requirements (Not Within Active Airfield)

- Proposed open channels shall be designed for clear flow, as the anticipated development at the SCLA site reduces debris potential downstream.
- Proposed concrete-lined channels not within the active airfield zone shall have a trapezoidal cross-section, with a side slope cotangent of 1.5 (i.e., 1.5H:1V) unless otherwise noted. Invert lining shall be a minimum of 8 inches thick, and the side slope lining will be a minimum of 6 inches thick.
- All improved channels shall be fenced for safety.
- Channel depth shall be calculated as normal depth, based on the Uniform Flow (Manning) Equation, plus a minimum freeboard of 2.5 feet.
- Channels with a base of 10 feet or more will have a 20-foot access road along each side of the channel.
- Channels with a base of less than 10 feet will have a 20-foot access road along one side of the channel.
- When proposed alignments parallel existing roadways, the drainage channels will generally be offset along back property lines to reduce construction and access problems. In some cases where alignment options are limited or access is not a problem, open channels may be aligned immediately adjacent to roadways. Proposed alignments and channel sections should be reviewed and may be revised during the design phase of each project to determine the most efficient design solution for each facility.

2.3.2.2 Closed Conduit Requirements

- Proposed conduits shall be reinforced concrete pipe or reinforced concrete box culvert.
- Closed conduits shall not be used to convey runoff from foothills, mountains, or wherever debris and sedimentation might be a problem.
- Maximum pipe size diameter shall be 108 inches.
- Minimum pipe slope shall be 0.003 foot/foot.

2.3.3 City versus District Drainage Requirements

The City of Victorville Standard Specifications and the San Bernardino County Flood Control Districts Victorville MPD have some conflicting criteria.

- Minimum pipe diameter: The City specifies a minimum pipe diameter of 18-inches, while the District specifies a minimum pipe diameter of 24-inches. The 18-inch diameter specification was used for the SCLA study.
- Channel Freeboard: The City specifies a minimum freeboard of 2 feet, while the District specifies a minimum freeboard of 2.5 feet. As per direction of the client, the 2.5-foot freeboard for the 50-year return period criterion was used for the SCLA study.
- Design peak flow for closed conduit: Per the direction given by the client, all closed conduits were sized to convey the 50-year storm.

- Street flow capacity: Street capacity may come into conflict depending on the calculation of runoff from design events. For example, the City requires that the depth of water during the 100-year design event shall not be higher than 3 inches above the top of curb, while the District specifies that street flow shall not exceed the capacity of the street during the 25-year design event. As directed by the client, the former was adopted for the SCLA study.

2.3.4 Federal Aviation Administration

In addition to municipal drainage requirements, the SCLA drainage plan must make special consideration of airport facilities. The Federal Aviation Administration (FAA) Advisory Circular 150/5320-5B contains an extensive discussion concerning airport drainage, some of which is applicable to the SCLA MPD. Drainage criteria that may pertain to this study are summarized below:

- At a minimum, storm water facilities for runways and appurtenant areas should be capable of conveying runoff from the 5-year design event as calculated using the Rational Method [Chapter 3, Paragraph 4(c)(2)].
- Inlets to storm water conveyance systems should be located at least 75 feet from the edge of pavement and spaced to limit overland flow to a maximum of 400 feet [Chapter 3, Paragraph 7(e) and 7(g)].
- Flow in conduits should maintain a mean velocity of 2.5 feet per second to help prevent sedimentation [Chapter 3, Paragraph 8(b)(2)].
- Drainage facilities for fueling aprons should be designed to prevent spread of fuel spills to other areas and provide for the safe disposal of fuel spillage. Drainage facilities for fueling aprons should be resistant to corrosion by aircraft fuels and washing liquids [Chapter 3, Paragraph 8(e)].
- Structural components of drainage facilities located in usable areas of the airport should be designed so that they do not extend above ground level. [Chapter 3, Paragraph 10 (a)].Design and construction of culverts and channels should follow requirements of local jurisdictions [Chapter 3, Paragraph 11].

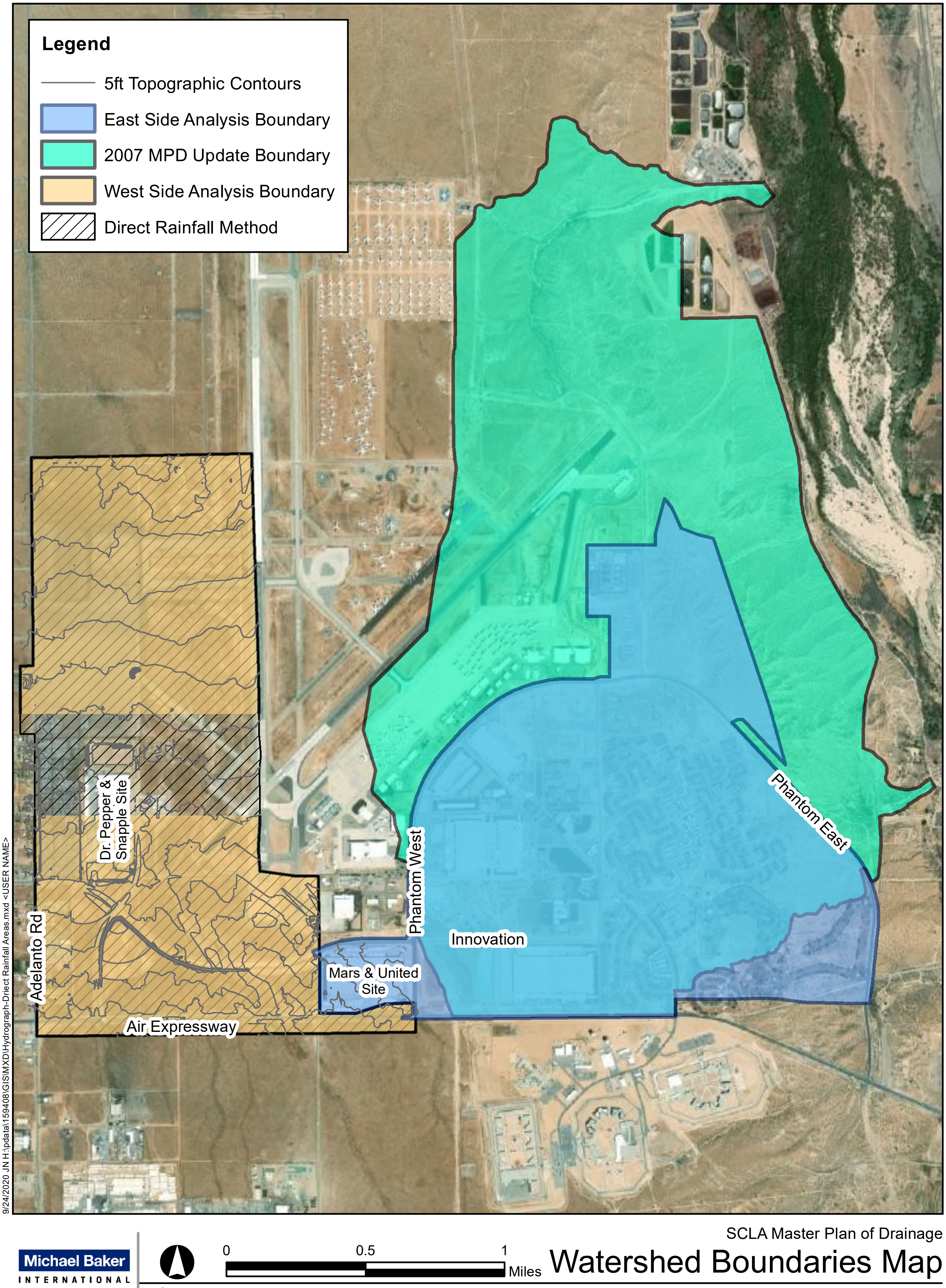
2.4 Modeling Methodology

Three separate analyses were completed for the project site; Update to 2007 MPD Existing Hydrology, East Side, and West Side. The update to the 2007 MPD existing condition hydrology included changes to the NOAA rainfall and AMC value per San Bernardino County Hydrology, as described in Sections 2.4.1.1 and 2.4.1.2. The East side and West side analyses are based on the proposed changes to the 2007 MPD and have Phantom West as a general boundary between the two. More information is provided in the following sections on the analyses. Figure 2-1 shows the boundary divisions of the East and West side areas, as well as the update to the 2007 existing hydrology. This MPD Update only analyzes a portion of the SCLA project site. The area not analyzed have no proposed changes from the 2007 MPD and therefore are not included in the study. The update to the existing hydrology analyzes 3301 acres, the East side analyzes 1390 acres, and the west side analyzes 1229 acres.

2.4.1 East Side Analysis

Hydrology calculations for the Eastern watershed were completed according to the San Bernardino County Flood Control District (SBCFCD) Hydrology Manual. Rational Method and Unit Hydrograph

Method analyses were completed for the east side existing and proposed conditions. The results are discussed in Section 3.3 and the calculations are included in Appendix A.



Michael Baker INTERNATIONAL

SCLA Master Plan of Drainage

Watershed Boundaries Map

Figure 2-1

2.4.1.1 Precipitation

According to the Victorville Master Plan of Drainage, the average annual precipitation is 5 inches, of which 70 percent falls between October and March. During this winter period, precipitation is generated by storms of low intensity and long duration. The summer period (from April through September) usually yields thunderstorms of high intensity and short duration. On average, thunderstorms occur three days per year.

The precipitation for the SCLA study area was based upon the NOAA Atlas 14. The unadjusted 1-hour precipitation depths for the SCLA study area are summarized in Table 2-1. The intensity-duration relationship was assumed to plot as a straight line on log-log paper, using a slope of 0.70 as recommended for desert and mountain regions by the San Bernardino County Hydrology Manual. The point precipitation Frequency estimates from NOAA Atlas 14 reference is included in Exhibit C.

Table 2-1–NOAA Atlas 14 Precipitation Depths for SCLA Study Area

Duration	Precipitation (inches)			
	10-year	25-year	50-year	100-year
1-HR	0.56	0.71	0.84	0.97
6-HR	1.08	1.35	1.57	1.80
24-HR	1.81	2.27	2.63	3.00

2.4.1.2 Infiltration and Soils

The most significant factor affecting infiltration is the nature of the soil on the watershed. Accordingly, the U.S. Department of Agriculture Soil Conservation Service (now the Natural Resource Conservation Service) classifies soils according to their infiltration capacity. Soils in the SCLA Eastern study area are classified as SCS Soil Type A and C according to the soils data downloaded from the NRCS Web Soil Survey for San Bernardino County, Mojave River Area CA671. Soils in Group C have a slow infiltration rate when thoroughly wet. These soils consist mainly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture and have a slow rate of water transmission. Soils in Group A are present in a small portion of the study area. Group A soils have high infiltration rates when thoroughly wet. They are typically composed mostly of sand or gravel.

Other important factors in soil infiltration are the antecedent moisture condition (AMC) and land use/soil cover. Following the methodology outlined in the 2010 Addendum to the San Bernardino County Hydrology Manual, an AMC I (lowest runoff potential) was used for all storm events.

The development area will have a commercial landuse in the proposed condition (90 percent impervious). The landuse for the prison run-on was assumed to remain the same. For the recreational area west of Nevada Street between Aerospace and Sabre, a park condition (15 percent impervious) was assumed.

2.4.1.3 Rational Method

The rational method analysis was completed using Advanced Engineering Software (AES) RATSCx 2013. The hydrology parameters required for the analysis include: topography, as-built data (where possible), hydrologic soil types, land use and aerial photography. Rational method analysis is limited to drainage areas 640 acres or less. For larger areas, the Unit Hydrograph Method is required.

2.4.1.4 Unit Hydrograph (UH) Method

The Unit Hydrograph analysis was completed using CivilCadd/CivilDesign (CivilD) Software. The results of the analysis will be used to size the proposed basins. The inputs needed for generating the 100-year 24-hour unit hydrographs and their sources are shown below:

- Time of Concentration – AES Rational method analysis
- Rainfall duration and depths – SBCFCD Hydrology Manual
- AMC II SCS Curve number – Area weighted curve number spreadsheet
- Area, Ap, Fp - AES Rational method analysis

The following assumptions were applied:

- Valley undeveloped S-Graph was selected to represent watershed runoff response to rainfall
- Base flow was assumed to be zero

2.4.2 West Side Analysis

The West Side analysis was performed using a state-of-the-art hydrologic and hydraulic approach because of the area's unique drainage characteristics. Innovyze's (formerly XP Solutions) XPSWMM, which is an improved version of the U.S. EPA Storm Water Management Model (SWMM), was used for this evaluation. XPSWMM is on the Federal Emergency Management Agency (FEMA) list of acceptable hydraulics software for such studies. XPSWMM is a dynamic wave model that solves the full St. Venant Equations. XPSWMM can model the surface in two dimensions, while linking to the subsurface infrastructure, or storm drain system. The result is a comprehensive model that can dynamically communicate between the surface and subsurface facilities throughout the modeled design storm duration. Using these advanced modeling techniques, hydrologic and hydraulic analyses were completed for both baseline (existing) and proposed conditions.

2.4.2.1 Topography

Topography is one the most important parameters for 2D model. The topography was provided by the client and supplemented with topographic contours provided by the City of Adelanto and the US Geological Survey. The study was performed using the North American Vertical Datum of 1988 (NAVD88).

2.4.2.2 Grid Size

The grid cell resolution is an important consideration in two-dimensional modeling. Small grid cell sizes increase accuracy but require additional computation times; while larger grid sizes compromise accuracy but decrease computation time. The determination of grid size requires a trade-off to ensure a workable model without compromising satisfactory accuracy. Multiple cell sizes (multiple domain) can be specified within one model, allowing a larger grid size to be used in areas were high detail is not required and a smaller grid size to be used in primary areas of interest. The grid size specified in this study was intended to replicate the hydraulic behavior of the drainage watershed. This study used a 10-ft grid size as it reflects the conveyances (street surface) within the study area and captures enough detail.

2.4.2.3 Offsite Flows

Offsite flows enter the West Side project site through a series of existing culverts at the southern boundary (under Air Expressway). Hydrographs for each culvert were entered into the model and were taken from a FLO 2D model generated by Michael Baker International for the offsite tributary area south of Air Expressway. The FLO 2D output summary is included in Appendix E.

2.4.2.4 Boundary Conditions

Flow boundaries were utilized in XPSWMM at the downstream edge of the model. Flow boundaries are used to allow the flow to exit the model, rather than pond at the boundary.

In addition to the flow boundaries, ridges were added where necessary to accurately model flow patterns. They were added surrounding buildings when the model showed flow traveling through the building due to the topo not accurately capturing the newly developed building elevations (i.e. Dr. Pepper/Snapple). The same approach was applied for some of the newer development that is not captured in the topo, such as the elevated grading for Innovation.

2.4.2.5 Direct Rainfall Method

Direct rainfall method (DRM) was utilized in the XPSWMM model. DRM is the process of adding rainfall directly to the 2-dimensional surface. This method allows the surface's physical characteristics (i.e. topography, land use) to dictate the flow patterns, resulting in a more realistic rainfall-runoff modeling approach.

The DRM was prepared by using the San Bernardino County Hydrology Manual rainfall pattern to develop hyetographs.

For this study, the initial infiltration loss was assumed to be 0 and the continuing loss absolute value was set to 2 in/hr. The initial infiltration loss specifies the depth of rainfall that infiltrates before any runoff occurs. The continuing loss occurs after the initial loss has been satisfied.

2.4.2.6 Soil, Land Use, Infiltration

Existing landuse was determined based on Google Maps aerial and street view imagery as desert brush poor (20%) for open space and the urban land use with the corresponding imperviousness for developed areas. For areas with a landuse of desert brush poor and soil group A, soil B was used in the model due to the AES rational method software not allowing the input of soil A for desert brush landuse. Proposed Landuse was based on the proposed site plan (Exhibit D).

Soil type was determined and was applied to the 2-D model. Both the land use and soil types were used to apply infiltration.

3 Existing Condition

3.1 Watershed Description and Drainage Patterns

The SCLA site is tributary to two major watercourses, with Fremont Wash on the north and the Mojave River on the north and east sides. The watershed drains at multiple locations into these two watercourses, with the drainage divide located between the primary instrument and crosswind runways. The majority of the SCLA site drains toward the Mojave River. The primary instrument runway and west side of the base drain toward Fremont Wash.

The headwaters of the SCLA watershed are located approximately 1.25 miles south of Air Expressway, at an elevation of approximately 2,930 feet above mean sea level. The slopes on the watershed are mild (on the order of one-half to one percent), with steeper slopes on the banks of the Mojave River and Fremont Wash.

The current Flood Insurance Study (FIS) published by the Federal Emergency Management Agency (FEMA) indicate that the floodplains associated with the Mojave River and Fremont Wash do not extend onto the SCLA site (FIRM Panel No. 060270 5825 B, 23 June 1981). No floodplain mapping was prepared within the SCLA project area limits.

3.2 Existing Drainage Facilities

The east side of the project site contains existing Reinforced Concrete Pipes (RCP) ranging from 36” to 84” as well as a 29” x 18” Corrugated Metal Pipe (CMP). The existing facilities are shown on Figure 3-1. The existing condition 50-year peak flowrate are shown on Table 3-1.

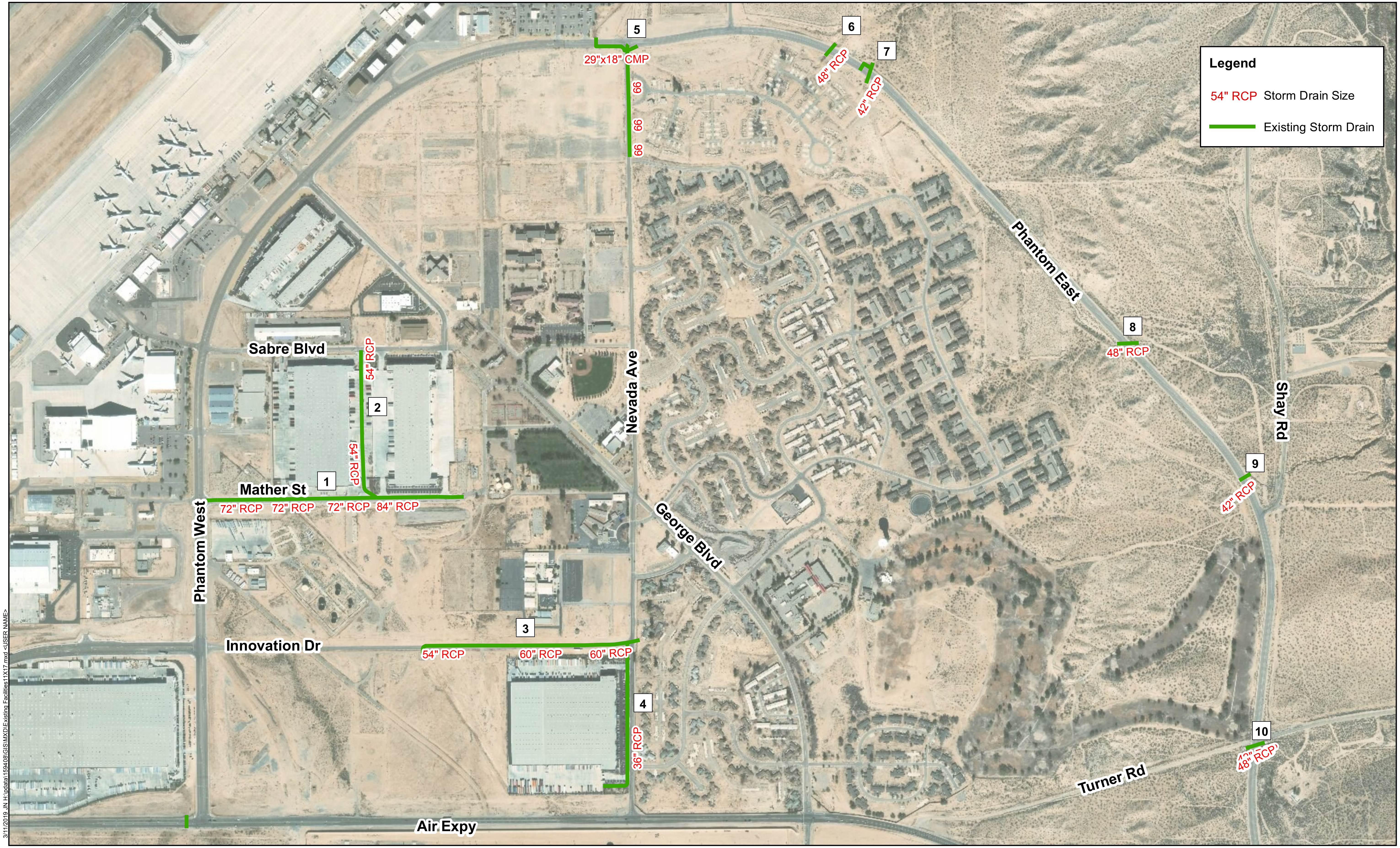
Table 3-1– Existing Drainage Facilities

#	Watershed	Street Name	Storm Drain Size/Type	Approximate 50-Year Flow* (cfs)
1	A	Mather St	72” RCP	182
		Mather St	84” RCP	270
2	A	Between Sabre Blvd & Mather St	54” RCP	16
3	H	Innovation Dr	54” RCP	11
		Innovation Dr	60” RCP	11
4	H	Nevada Ave	36” RCP	47
5	A	Phantom/Nevada	29” x 18” CMP	77
6	U	Phantom East	48” RCP	22

Table 3-1– Existing Drainage Facilities				
#	**Watershed**	**Street Name**	**Storm Drain Size/Type**	**Approximate 50-Year Flow* (cfs)**
7	U	Phantom East	42” RCP	22
8	H	Phantom East	48” RCP	278
9	N	Phantom East	42” RCP	92

*Flow rate calculated in AES

The West side contains existing culverts crossing Gateway and Innovation. These culverts are associated with the interim basin built during the Dr. Pepper/Snapple Site development. Since no as-builts were available for these culverts, the sizes were determined based on site visits. The Gateway Culverts were modeled as eight 24-inch storm drains, and the Innovation Culverts were modeled as ten 24-inch storm drains. Since the proposed condition directs flow away from the interim basin and existing culverts, the facilities were not analyzed in this study. The locations of these culverts are shown on Figure 3-3.



Michael Baker INTERNATIONAL

Source:

0 500 1,000 2,000 Feet

SCLA Master Plan of Drainage

Existing Facilities Map - East Side

Figure 3-1

3.3 Existing Hydrology Results- East Side

Michael Baker updated the existing condition rational method hydrology for the 2- through 100-year frequency storm events for the East side analysis. Hydrology reflects the existing condition as of 2017. See Exhibit A for the Existing Condition Hydrology Map and Appendix A for the existing condition hydrology results.

The purpose of the hydrology analysis is to determine the impacts of the proposed development and compare the flow rates to the existing condition. The proposed development will change the direction of the flow patterns significantly enough to make analyzing the impacts of development at comparable discharge points impossible. Therefore, a second existing condition hydrology was completed by utilizing the proposed drainage areas and flow paths with the existing condition land use. This allows a comparison of the effects of the proposed development (i.e. land use change), rather than the change in flow path direction.

For this analysis the eastern drainage area was divided into three watersheds, A, B, and B. See Exhibit B for the Proposed Development Hydrology Map. Watershed A discharges at the north end of the site, while Watersheds B and C discharge to the east. Results of the rational method analysis are shown in Table 3-2.

Table 3-2– Existing Peak Flow Rate Summary

Watershed	Outlet Node	Tributary Area (Acres)	10-Year Flow (cfs)	25-Year Flow (cfs)	50-Year Flow (cfs)	100-Year Flow (cfs)
A	138	636.4	408.4	540.8	658.1	778.0
B	219	570.8	398.7	546.4	676.9	809.4
C	306	182.7	231.6	322.4	401.8	481.2

The time of concentration, area-averaged Fm and area-averaged Ap were taken from the rational method results and entered into the CivilD unit hydrograph model. Additionally, the area-averaged curve number for the watershed was utilized. Since the CivilD model requires the AMC II curve number, the area-averaged AMC I curve number was converted to AMC II before entering it in the model. The existing UH model was created to use as a base for comparison of the proposed unit hydrograph, which was then used to size the flood mitigation basins discussed in Section 6.

The results of the existing condition unit hydrograph analysis are shown in Table 3-3.

Table 3-3– Existing Unit Hydrograph Summary

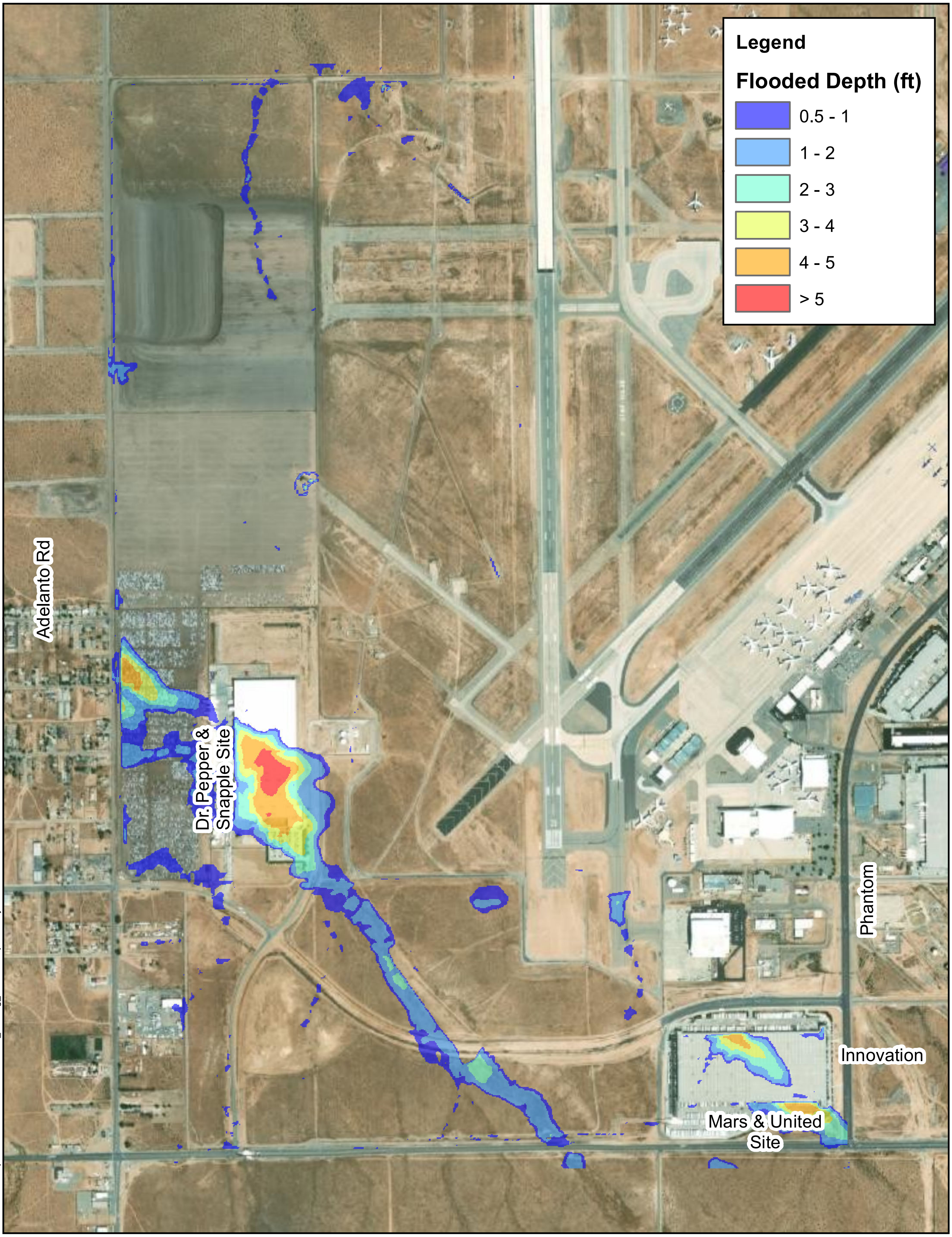
Watershed	Tributary Area (Acres)	100-Year Peak Flow (cfs)
A	636.4	914.4
B	570.8	1036.7

Table 3-3– Existing Unit Hydrograph Summary		
Watershed	**Tributary Area (Acres)**	**100-Year Peak Flow (cfs)**
C	182.7	386.8

3.4 Existing Hydrology Results- West Side

To fully show the impacts of the developed condition, a pre-developed condition model and interim existing model were analyzed. The pre-developed condition represents the existing condition prior to the development of the Dr. Pepper/Snapple site and Innovation grading. In this condition, the offsite flows enter the site through the existing culverts at the southern boundary of the project area and travel northwest before crossing Adelanto Road and entering the residential community as sheet flow. The pre-development existing condition flooding results are shown on Figure 3-2.

In the interim existing condition, the Dr. Pepper/Snapple and Innovation grading is developed and changes the flow patterns by incorporating a large basin south of Innovation. The offsite flows enter the basin and crosses under Gateway via 8 barrels of 24” RCP, where flow then crosses Innovation via the existing 10 barrels of 24” RCP. The Dr.Pepper/Snapple site grading and interim basin assist in reducing the flow crossing Adelanto and entering the community, however, there is still significant flooding south of Innovation which makes the land unusable. The interim existing condition flooded depth results are shown on Figure 3-3.



Michael Baker INTERNATIONAL

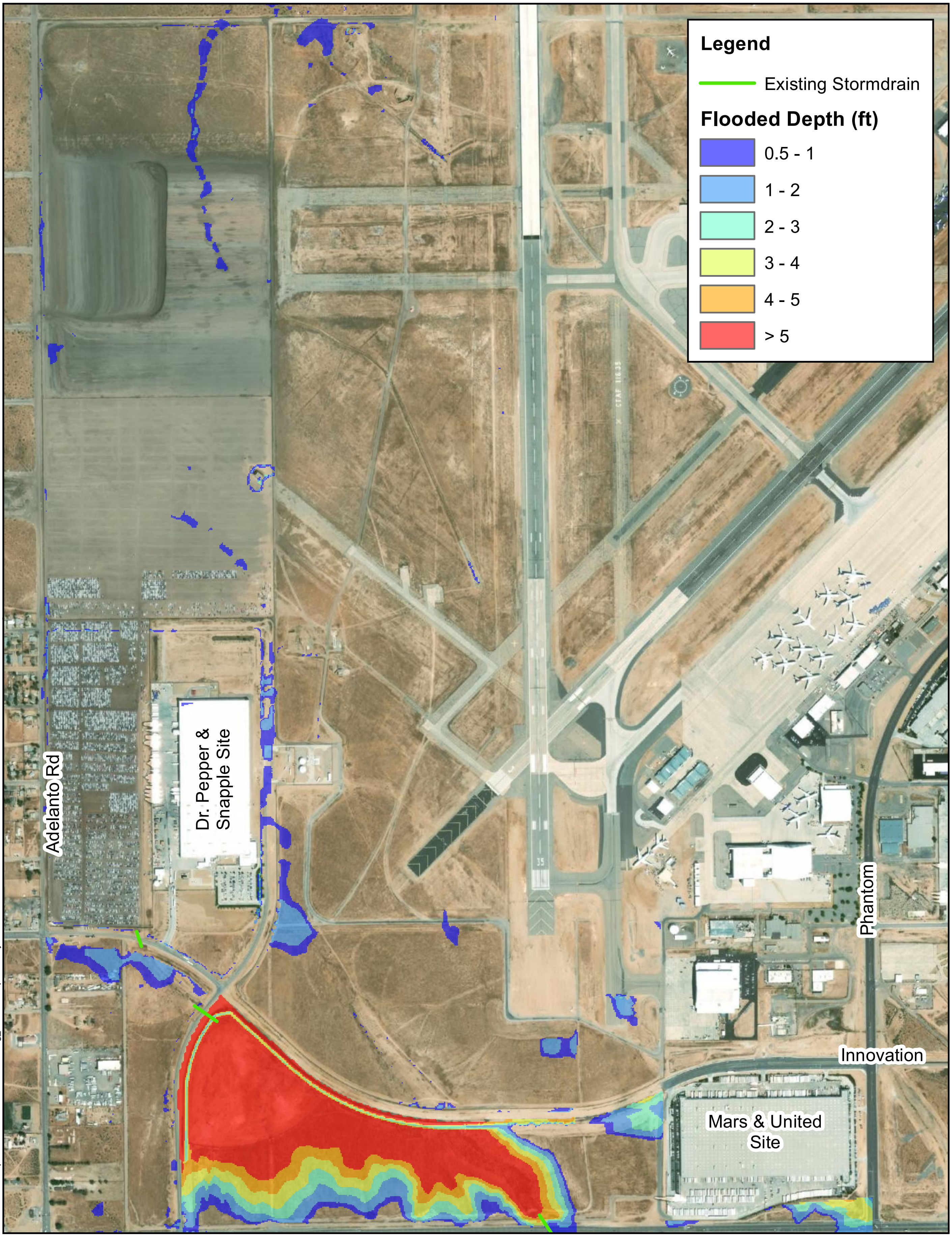
0 500 1,000 Feet

Source:

SCLA Existing Condition Hydrology

Pre Dev Existing Flood Depths - 100-YR

Figure 3-2



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Michael Baker INTERNATIONAL

Source:

SCLA Existing Condition Hydrology

Interim Existing Flood Depths - 100-YR

Figure 3-3

4 Proposed Condition

Storm water runoff is a function of watershed characteristics, precipitation, infiltration, and routing processes. Each of these topics is discussed briefly in the following paragraphs. The SCLA drainage study follows methods and procedures found in the San Bernardino County Hydrology Manual and 2010 Addendum.

4.1 Proposed Land Use Development

The SCLA is located on the site of the former George AFB. The proposed land uses for the ultimate SCLA project are based on the Stirling Southern California Logistics Centre Master Plan. The project will convert the former military facility to a business park featuring manufacturing, industrial, and technology uses. The planned business, industrial and technology park will increase the footprint of former George AFB slightly, as well as increase the percent impervious from current base facilities. Exhibit B shows the Proposed Watershed Map. Landuse for both the East and West areas are shown on Exhibit D.

4.2 Watershed Characteristics and Delineation

The SCLA site is tributary to two major watercourses, with Fremont Wash on the north and the Mojave River on the north and east sides. The watershed drains at multiple locations into these two watercourses, with the drainage divide located between the primary instrument and crosswind runways. The majority of the SCLA site and the area east of the site drain toward the Mojave River. The primary instrument runway and west side of the base drain toward Fremont Wash.

Base maps for watershed delineation were developed using 1-foot contour interval topography of the SCLA development area provided by the client. Outside the coverage of this mapping, the topography was supplemented with 2-foot contour interval topography acquired from the City of Adelanto and 10-foot and 20-foot contour interval topographic maps from the U.S. Geological Survey.

4.3 Proposed Hydrology Results – East Side

In the east side proposed condition, the project site is divided into three watersheds, A, B, and C. Watershed A has a tributary area of 636.4 acres and starts at the Mars/United site (Building 1) and includes Phantom West, Aerospace, Sabre, George and the northern portion of Nevada. The watershed discharges through a proposed 78-inch storm drain to the north of the site (just east of the power plant. Watershed B has a tributary area of 570.8 acres and contains portions of Air Expressway and Phantom East, most of Innovation, and many lots between Phantom West and Phantom East. The watershed will discharge to the Mojave River through a 90” storm drain. Lastly, Watershed C has a tributary area of 182.7 acres and contains the future golf course in the south east of the SCLA project site. The watershed has a proposed storm drain system that ranges in size from 18” to 54” before discharging in to the Mojave River. The 10-, 25-, 50-, and 100-year storm events were calculated for the watershed. The 100-year and 50-year events are the primary criteria used to determine flood protection levels and street flow capacity. The 50-year event was used to size onsite storm drains. The 100-year event analysis was used to size proposed basins.

The results of the rational method analysis are shown in Table 4-1. The node points are illustrated on the proposed condition watershed map, Exhibit B.

Table 4-1– Proposed Peak Flow Rate Summary						
Watershed	**Outlet Node**	**Tributary Area (Acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**	**100-Year Flow (cfs)**
A	138	636.4	477.8	612.1	730.0	851.2
B	219	570.8	384.7	593.3	723.8	855.7
C	306	182.7	293.4	384.7	463.0	543.5

Appendix A contains detailed hydrology calculations for the entire site. Table 4-2 shows the proposed unmitigated unit hydrograph results. The mitigated peak flow summary is shown on Table 6-1 and discussed in Section 6.

Table 4-2– Proposed Unit Hydrograph Summary				
Watershed	**Tributary Area (Acres)**	**Existing 100-Year Peak Flow (cfs)**	**90% of Existing Peak Flow (cfs)**	**Unmitigated Proposed 100-Year Peak Flow (cfs)**
A	636.4	914.4	823.0	1001.6
B	570.8	1036.7	933.0	1100.4
C	182.7	386.8	348.1	448.6

4.4 Proposed Hydrology Results – West Side

The west side proposed improvements include a series of trapezoidal channels, new and upsized storm drain culverts, and the use of existing and proposed basins. Since the site drains into a FEMA mapped flood plain, the west facilities were sized to handle the 100-year storm event. All proposed improvements are shown in Figure 4-1.

In the existing condition, offsite drainage crosses Air Expressway via 7 culverts. Culverts 1 and 2 are located west of Gateway. A proposed channel (20’ base width, 2:1 side slopes, 7’ depth) begins at the Culvert 1 outlet location, runs east and north along Gateway until it transitions to a triple barrel 36” RCP that outlets into the existing interim basin southeast of Innovation & Gateway.

Culverts 3 through 5 are located east of Gateway and are proposed to outlet into a 20’ base width channel (2:1, 6’ deep) that drains east and joins a proposed 30’ base width channel (2:1, 7’ deep) that collects flow from Culverts 6 and 7, drains west and continues north and west as a 60’ base width (2:1, 7’ depth) channel before outletting into the existing interim basin. Due to easement restrictions the proposed channels along Air Expressway will need to be reconstructed to outlet into the new channels with the culverts aligned to face eastward to improve the junction hydraulics and reorient them into the new downstream direction.

The proposed condition onsite drainage consists of storm drains that collect flow and discharge into the proposed channels at various low point locations. To eliminate onsite flooding south of Innovation and east of the existing basin, grading is proposed to drain the site towards the basin as well as to increase the capacity of the basin. Proposed grading is included in Figure 4-1.

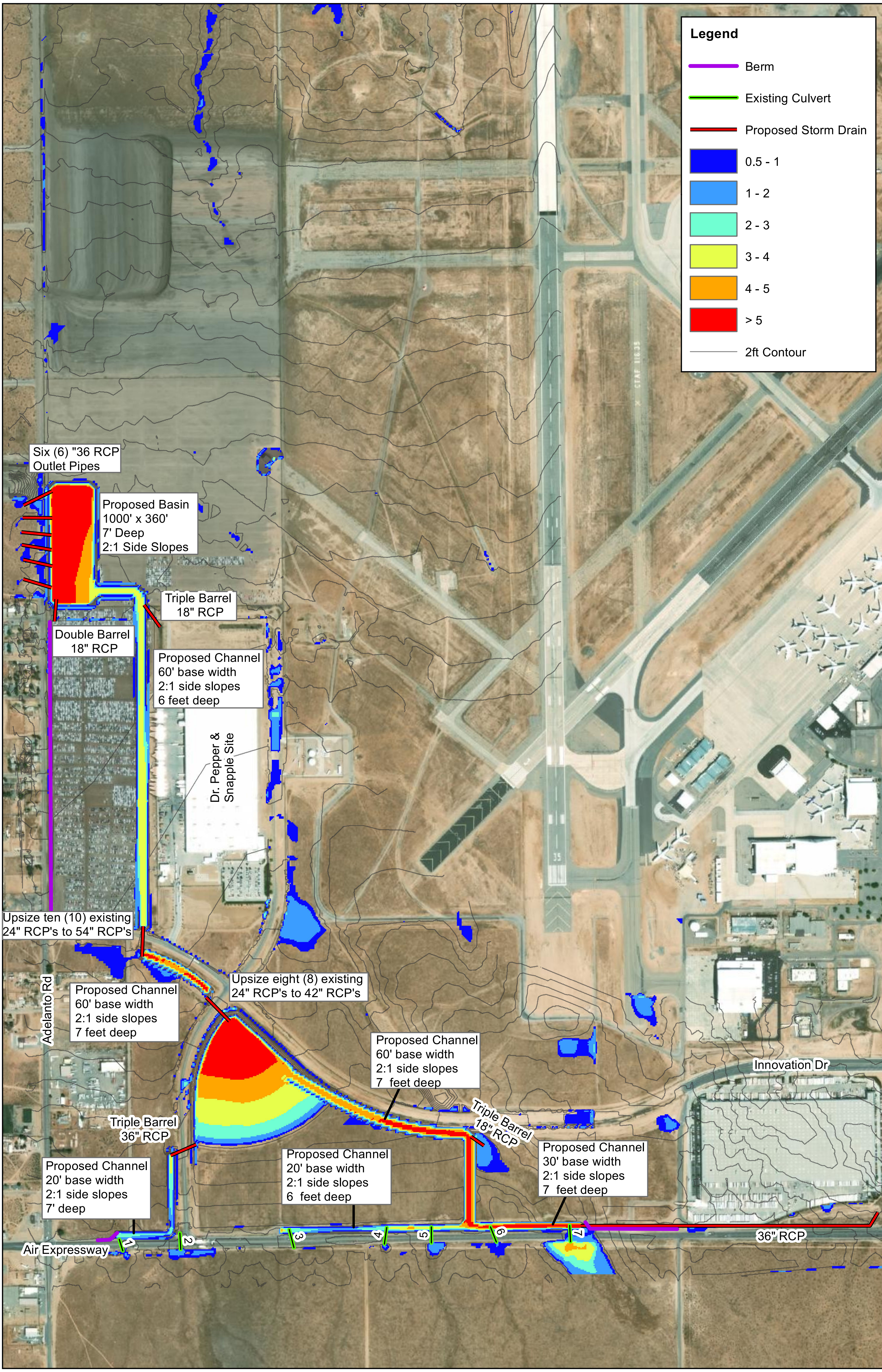
As a conservative approach, the private storm drain system on the Dr. Pepper/Snapple site was not considered in the model and the entire site drainage was collected by a proposed storm drain located at the northwest corner of the site. A curb/berm is proposed on the west edge of the existing parking lot west of the Dr. Pepper/Snapple Site. Onsite flows drain in the northwest direction where a proposed storm drain collects the flow and discharges to the proposed spreading basin.

The existing culverts that convey flow from the basin, under Gateway are upsized to 8 barrels of 42" RCP from the existing 8 barrels of 24" RCPs. A proposed 60' base width (2:1, 7' depth) picks up the flow from the detention basin and follows along the south side of Innovation to the inlet location of existing culverts under Innovation, just west of the Dr. Pepper/Snapple Site. The existing culverts are proposed to increase from 10 barrels of 24" RCPs to 54" RCPs. The culverts will outlet to a proposed 60' base channel (2:1, 6' Depth) that runs north then west where it discharges into a proposed spreading basin (approximately 1000' x 360' and 7' deep with 2:1 side slopes). A series of six 36" RCP's collect flow from the basin and outlet to the undeveloped area north of residential area located west of Adelanto Rd.

Due to the extremely flat elevation and downstream tie in, the channels will require leveed sides. Per FEMA, leveed channels require a minimum of 3 feet of freeboard plus an additional 1' near structures such as bridges and culverts. Based on the modeled depth of flow in the channels, some additional walls are proposed for added freeboard in certain locations. During final design, the exact height of the freeboard walls should consider additional height to account for super elevation where the channels have turns.

Two berms on the north side of Air Expressway are proposed to ensure offsite flows enter the channel; one east of the proposed channel near Culvert 7 and the other west of the channel near Culvert 1. The proposed berm, freeboard wall locations, and proposed condition flooded depth results are shown in Figure 4-1.

As shown in the exhibit, the sheet flow that crossed Adelanto Road and entered the residential community in the existing condition is eliminated in the proposed condition.



Michael Baker INTERNATIONAL

SCLA Proposed Condition

Proposed Flooded Depth - 100 YR

Figure 4-1

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5 Plan Formulation

5.1 Design Objectives and Criteria

The hydrology of arid regions like that of the SCLA study area is characterized by low-intensity winter precipitation and very intense summer storms. As a result, a storm drainage system must provide a large capacity that may only be utilized a few days of the year. Due to the divided West and East Side analysis, there are separate objectives for each analysis. In the East Side analysis, the objective is to utilize a network of storm drain facilities that outlet to the Mojave River as discussed in Section 4. To ensure the proposed condition does not exceed the existing condition, water quality/flood mitigation basins are proposed and are discussed in Section 6. In the West Side analysis, the objective is to design the proposed condition to handle the 100-year event, which is accomplished using an above ground channel and two basins. These objectives are a change from the previous SCLA MPD and supersede that document.

This SCLA master of drainage system is guided by the following principles:

- East Side:
    - Provide flood control facilities to convey the 50-year peak, primarily through a network of street flow and storm drain systems. Because the ultimate grading of the site is unknown, drainage facilities are sized for a 50-year flow capacity assuming the ultimate facilities will mimic the grade of the existing flow lines. In the 100- year, flow would be carried in the streets.
    - AES rational method computer estimated pipe sizes were used as a baseline to determine proposed facility sizes and verified using the Manning's Equation to compare flow through the facility compared to the capacity of the system.
- West Side:
    - XP-SWMM 2017 will be used to size all drainage facilities on the west side of the project area.
    - Provide flood control facilities to convey 100-year flow through detention/spreading basins and channel and remove or minimize any flood hazards.

5.2 Plan Facilities

A drainage plan has been developed for the entire SCLA development site in the previous Master Plan. The plan was developed using currently available information on proposed land uses and roadway alignments on the site. This plan is being updated to reflect changes in proposed land use. The backbone of the planned facilities consists of a network of street flow, with underground conduits proposed as needed. There are major pipe crossings across Phantom East Road.

5.3 Drainage Channel Geometry

As discussed in Section 4.4, the drainage channel geometry in the West Side analysis, was sized for the 100-year storm. The geometry of the channel is trapezoidal with 2:1 side slopes. Per the criteria outlined in Section 2.3.3, the channel will require 2.5 feet of freeboard in the 100-year storm in final design.

5.4 Plan Facilities Alignments

The proposed alignment of the trapezoidal channel generally follow existing flow paths, roadways, and/or adjacent property boundaries.

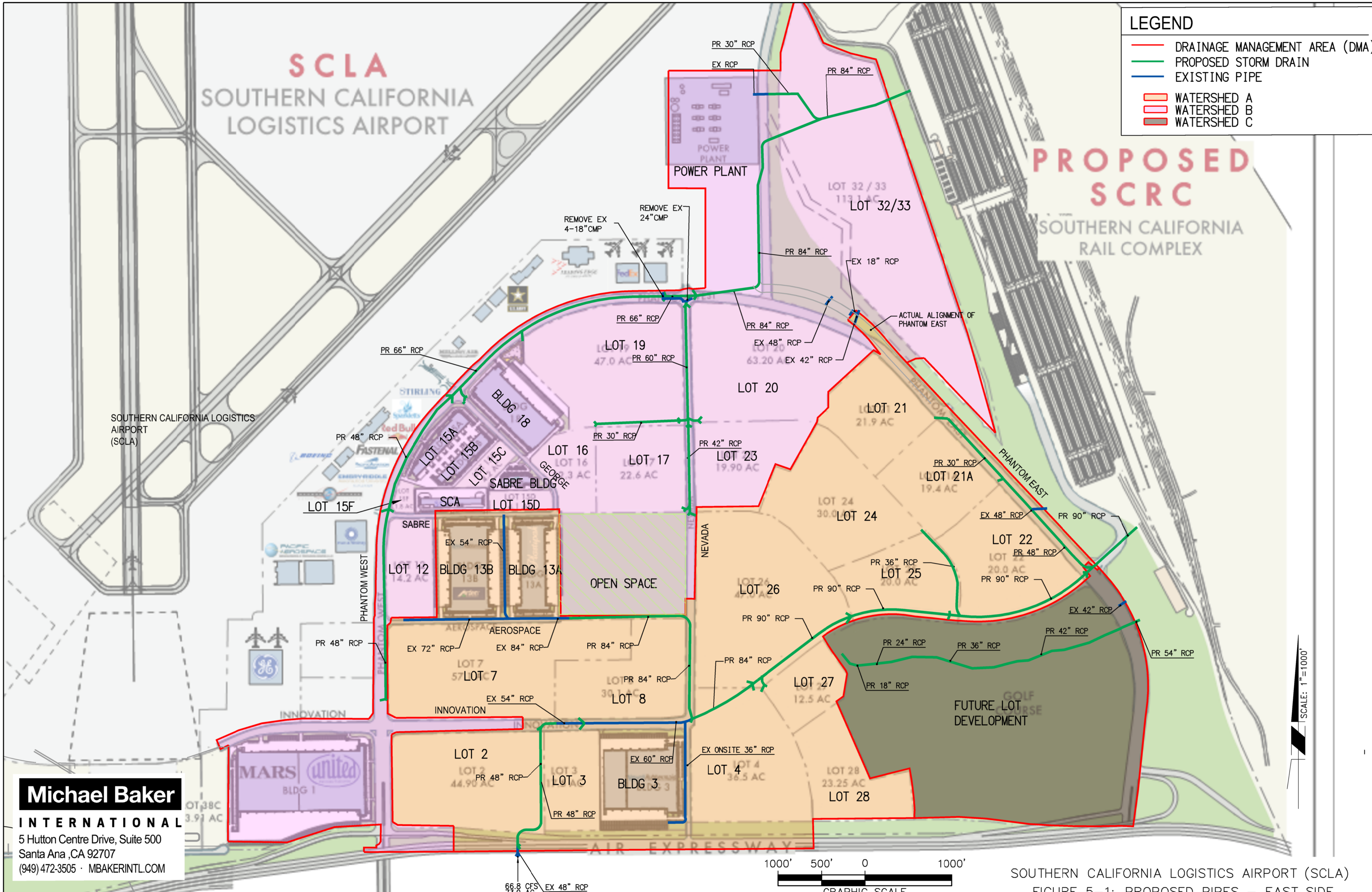
5.5 Preliminary Facility Sizing

Preliminary drainage facility sizes were determined using the methods, objectives, and criteria outlined in Section 5.1. The proposed facilities were sized for the 50-year storm event per agreement with the City. Sizing was determined based on recommended AES pipe sizes, then upsized as needed to tie into downstream systems. Table 5-1 shows the preliminary proposed sizing. The capacities were calculated using the Manning's Equation, and the 50-year flow rate was taken from the Rational Method hydrology calculations. Proposed Facilities are shown on Figure 5-1. Detailed hydraulics analyses should be completed for final design.

Table 5-1: East Side Proposed Facility Sizing						
Watershed	**Nodes**	**Proposed Size**	**Slope**	**Q50**	**Capacity (cfs)**	**Length (ft)**
A	112-110	54" RCP*	0.00196	4.3	87.2	1227
	110-113	84" RCP*	0.00050	71.8	142.6	1412
	113-114	84" RCP	0.00491	134.4	449.0	570
	114-115	84" RCP	0.00139	169.8	239.2	1291
	102-118	48" RCP	0.00392	80.4	90.2	1784
	118-115	60" RCP*	0.01934	136.7	363.1	1567
	122-115	36" RCP*	0.02167	19.6	98.5	1421
	115-123	84" RCP	0.00405	344.9	407.8	839
	123-128	90" RCP	0.00501	455.5	545.2	1336
	128-129	90" RCP	0.00503	504.1	546.1	1113
	133.20-129	36" RCP	0.00522	40.3	48.3	1149
	129-134	90" RCP	0.42515	569.1	5020.3	167
	136-137	30" RCP	0.05965	78.8	100.5	1140
	137-134	48" RCP	0.01332	121.6	166.2	1502
	134-138	90" RCP	0.16910	730.0	3166.1	822
B	109-202	48" RCP	0.005	81.1	101.8	2225
	202-203	48" RCP	0.005	98.7	106.1	1660
	203-204	66" RCP	0.002	141.0	154.0	956
	204-205	66" RCP	0.004	158.2	200.1	2039
	207-208	36" RCP	0.010	76.3	99.0	1038
	211-208	30" RCP	0.003	21.5	23.2	947
	208-205	60" RCP~	0.008	189.1	239.1	1503
	205-212	84" RCP	0.006	449.4	509.7	758
	212-213	84" RCP	0.008	449.4	575.2	620
	213-214	84" RCP	0.008	457.7	579.1	734
	214-215	84" RCP	0.052	457.7	1455.3	988

Table 5-1: East Side Proposed Facility Sizing						
Watershed	**Nodes**	**Proposed Size**	**Slope**	**Q50**	**Capacity (cfs)**	**Length (ft)**
	217-215	30" RCP	0.055	91.6	96.6	942
	215-218	84" RCP	0.067	534.6	1664.0	815
	218-219	84" RCP	0.066	723.8	1645.0	743
C	301-302	18" RCP	0.016	4.4	13.5	368
	302-303	24" RCP	0.021	20.2	33.0	708
	303-304	36" RCP	0.033	92.1	121.7	966
	304-305	42" RCP	0.049	219.7	224.2	1336
	305-306	54" RCP	0.050	438.2	440.9	240

Note: * Represents existing facilities
~Innovation at Phantom have plans for a 66” storm drain that has not been built



SOUTHERN CALIFORNIA LOGISTICS AIRPORT (SCLA)
FIGURE 5-1: PROPOSED PIPES – EAST SIDE

6 Water Quality

The Southern California Logistics Airport (SCLA) is a development project located within the south Lahontan region in the City of Victorville, San Bernardino County, California. The development area is formerly operated as George Air Force Base. Land uses within the SCLA Southern California Logistics Center site consist generally of airport/aviation facilities and commercial development.

This document provides guidance for the project/watershed development addressing storm water quality issues as individual projects evolve during the development period of the site. It is intended to provide a framework of guidelines to assist in long-term runoff quality objectives. This document includes water quality objectives based on the Lahontan Region Basin Plan prepared by the Regional Water Quality Control Board, guidelines according to the Federal Aviation Administration (FAA), the City of Victorville, and the County of San Bernardino.

The proposed development of the site consists of commercial landuses. Infiltration basins provide effective treatment of commercial areas and are widely used in this region. Infiltration basins will be used to satisfy the water quality requirements: treating the Design Capture Volume and preventing hydromodification. The basins will also be used to satisfy the flood control requirement to mitigate the 100yr flow to 90% of existing levels.

6.1 Infiltration basins

Infiltration basins allow retained runoff to percolate into the underlying soils in 48 hours or less. Particulates are removed as water travels through the underlying soil. The bottom of an infiltration basin is typically vegetated with dryland grasses or other vegetative ground cover.

Each property owner will be required to construct water quality facilities and prepare drainage and water quality reports before the lot is constructed. This document presents planning level basin sizes for each lot to give future developers an estimate of the footprint required for basins.

6.2 Criteria

In 2013, the Lahontan Regional Water Quality Control Board issued a Phase II NPDES permit for the City of Victorville for the urbanized portion of the Mojave River Watershed dated July 1, 2013 (Order No. 2013-0001 DWQ). The permit requires the following:

- Post-project runoff shall not exceed estimated pre-project flow rate for the 10-year, 24-hour storm (Hydromodification Requirement).
- Implementation of Low Impact Development (LID) standards to reduce runoff and treat stormwater for the 85 percentile 24-hour storm event for volumetric controls (LID Requirement).

Additionally, per City criteria the 100-year post-project runoff cannot exceed 90% of the pre-project flow rate (Flood Mitigation Requirement).

6.3 Methodology

6.3.1 Hydromodification

To satisfy the NPDES Hydromodification Requirement, the 10-year, 24-hour storm flowrate was calculated for each project site in the existing condition and proposed condition. Then the S-value, Ia value, and area averaged curve numbers were calculated to determine the 10-year volume for each project site. The difference between the proposed and the existing 10-year volumes is the basin volume required for hydromodification. If the proposed condition was less than the existing condition, no hydromodification was required.

6.3.2 Low Impact Development

To satisfy the LID requirement, the 85th percentile 24-hour was calculated and used to size the LID basin volume, per the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (TGD). This was produced for each project site.

6.3.3 Flood Mitigation

For flood mitigation, the proposed unit hydrograph calculated in CivilD, was converted to a standard time step and input in Pondpack. See Appendix D for basin calculations. Along with the inflow hydrograph, the assumed basin stage storage for watersheds A, B, and C were utilized. Using an iterative process, the volume needed to reduce the developed condition to below the existing condition while maintaining 1 foot of freeboard was determined. Table 6-1 provides the unit hydrograph summary, showing the peak outflow of the basin is less than 90% of the existing condition unit hydrograph peak flow rate. The calculated volume was divided by the total watershed area to get a volume per development acre, which was used to determine flood mitigation basin sizes for each project site. Additionally, a safety factor of 15% was applied to be conservative.

Finally, the required basin volume for each project site was taken as the largest value of the three analyses (Hydromodification, LID, and Flood Control). As shown in Table 6-2, the flood control volume was the largest required basin volume for each project site.

Table 6-1– Proposed Unit Hydrograph Summary

Watershed	Tributary Area (Acres)	Existing 100-Year Peak Flow (cfs)	90% of Existing Peak Flow (cfs)	Unmitigated Proposed 100-Year Peak Flow (cfs)	Mitigated Proposed 100-Year Peak Flow (cfs)
A	636.4	914.4	823.0	1001.6	411.0
B	570.8	1036.7	933.0	1100.4	399.4
C	182.7	386.8	348.1	448.6	144.7

Table 6-2: Basin Sizing Summary						
Watershed	**Subarea**	**Drainage Area**	**Total Area (ac)**	**Hydromod Vrequired (ac-ft)**	**LID Vrequired (ac-ft)**	**Flood Mitigation Vrequired (ac-ft)**
A	A-10	Building 13AB	38.40	0.06	1.85	3.26
A	A-16, A-17	Building 3	26.30	0.07	1.27	2.23
A	A-4	Lot 2	45.00	2.24	2.17	3.82
A	A-39	Lot 21a	23.80	0.71	1.15	2.02
A	A-41	Lot 22	31.50	1.66	1.52	2.67
A	A-30.3 - 30.5, 33, 33.1	Lot 24	35.40	0.97	1.71	3.00
A	A-34	Lot 25	22.30	0.61	1.07	1.89
A	A-27.1	Lot 26	62.20	1.59	3.00	5.28
A	A-27	Lot 27	13.30	0.45	0.64	1.13
A	A-18, A-19	Lot 3	17.10	0.52	0.82	1.45
A	A-38	Lot 21	22.30	0.67	1.07	1.89
A	A-25	Lot 28	23.80	0.60	1.15	2.02
A	A-24	Lot 4.1	21.30	0.54	1.03	1.81
A	A-26	Lot 4.2	17.30	0.43	0.83	1.47
A	A-12	Lot 7	58.40	2.43	2.81	4.96
A	A-15	Lot 8	30.30	0.87	1.46	2.57
A	offsite	Prison	73.90	-	3.56	6.27
A	Roads in Watershed A	Road A	73.80	2.88	3.56	6.26
B	B-1.4, B-1.5, B-1.6	Building 1	45.90	0.12	2.21	4.05
B	B-9	Building 18	19.50	0.01	0.94	1.72
B	B-26, 27, 27.1, 27.2	Future+Road B	46.30	1.41	2.23	4.08
B	B-6	Lot 15	33.90	0.23	1.63	2.99
B	B-17	Lot 17	22.50	-	1.08	1.98
B	B-12	Lot 19	50.70	0.01	2.44	4.47
B	B-18	Lot 23	24.20	0.44	1.17	2.13
B	B-3	Lot12	14.90	0.43	0.72	1.31
B	B-20, B-21	Lot16	12.00	-	0.58	1.06
B	B-24	Lot20	57.20	1.08	2.76	5.05
B	B-29	Lot 32/33	109.70	5.97	5.29	9.68
B	B-30	Offsite Run-on	5.70	0.31	0.27	0.50
B	B-15	Park	38.80	-	1.87	3.42
B	B-28	Power+Road B	26.10	1.02	1.26	2.30

Table 6-2: Basin Sizing Summary						
Watershed	**Subarea**	**Drainage Area**	**Total Area (ac)**	**Hydromod Vrequired (ac-ft)**	**LID Vrequired (ac-ft)**	**Flood Mitigation Vrequired (ac-ft)**
B	Roads in Watershed B	Road B	63.40	1.26	3.05	5.59
C	C-1, C-2, C-3, C-4, C-5	Future Development	171.10	10.07	8.24	15.71
C	C-6	Road C	11.60	0.55	0.56	1.07

7 Design Considerations

7.1 Agency Agreements, Permits, and Approvals

Implementation of the recommended watershed improvements would involve various regulatory and governmental agencies for approvals and environmental clearances. The regulatory agencies focus primarily on (1) the environmental issues and impacts and/or, (2) public safety. Early involvement of the jurisdictional agencies and stakeholders within the watershed facilitate development of an implementable plan and ensures requirements associated with the agreements or permits are incorporated into the design.

7.2 General Environmental

The California Environmental Quality Act applies to all discretionary activities proposed to be carried out or approved by California public agencies, including state, regional, county and local agencies, unless an exemption applies. Generally, the implementation of CEQA entails three (3) separate phases: a) preliminary review of a project to determine whether it is subject to CEQA; b) preparation of an Initial Study to determine whether the project may have a significant environmental effect; and c) preparation of an EIR if the project may have a significant environmental effect, or of a Negative Declaration if no significant effects will occur. CEQA applies only to government activities that are defined as a project. A project is defined as the whole of an action, which has the potential for resulting in a physical change in the environment, directly or ultimately. [Guidelines Sec. 15378(a)] The effect on the environment must, however, be reasonably foreseeable and the effect must be on the physical environment. [Pub. Res. Code Sec. 21065]

7.3 FEMA

The implementation of the proposed watershed drainage system improvements would result in the elimination of the flood hazard zones on the site. In addition, any modifications or encroachment into the published floodplain for communities participating in the National Flood Insurance Program (NFIP) must be approved by FEMA. Communities that participate in the NFIP are responsible for submitting data to FEMA reflecting projects that modify the floodplain or flood hazard zones. Because the SCLA is located on a former military installation, there are no mapped flood hazard zones on-site.

7.4 Right-of-Way and Property Acquisition

The right-of-way associated with the drainage channel is 5 feet outside the toe of the slope on each bank per San Bernardino County Standards. This does not include any maintenance access roads. The water quality basins locations will require right-of-way for access to the basins and temporary easements just for construction purposes. SCLA will maintain the west side channels and the water quality basins will be owned and maintained by each property owner.

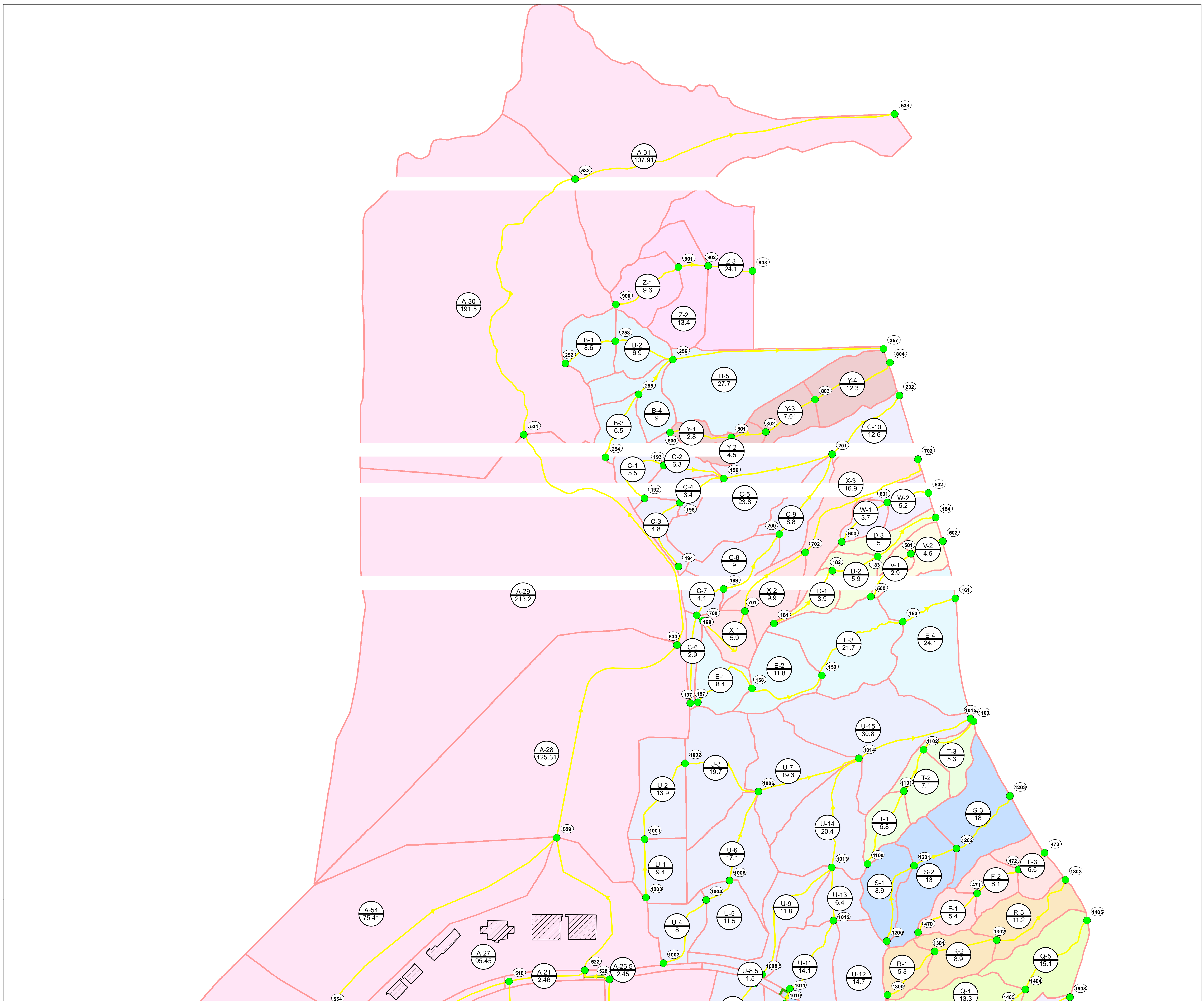
8 Conclusion

The drainage master plan provides guidance for the project/watershed development for drainage and runoff management (stormwater and water quality) issues as individual projects evolve during the development period of the Vision Plan. The recommended system outlined here is intended to provide a framework of general criteria and guidelines to assist in long-term runoff quantity and quality objectives. The recommended backbone drainage facilities report will provide 50-year storm drain conveyance for the SCLA development area on the eastern portion of the property and 100-year drainage facilities on the western portion. Storm drain sizes may change slightly during final design due to final grading and modeling of the storm drain system with a program that allows pressurized flow. The recommended street flow and storm drain alignments generally follow existing and proposed roadways on the SCLA site. Channel and basin sizes will be confirmed during final design.

If significant changes occur to the proposed development plan, then the Drainage Master Plan should be updated.

Exhibit A

Rational Method Existing Watershed Map



Watershed	Nodes	Q10	Q100	Watershed	Nodes	Q10	Q100	Watershed	Nodes	Q10	Q100	Watershed	Nodes	Q10	Q100	Watershed	Nodes	Q10	Q100
A	501	8.2	16.6	A	533	537.5	1100.5	E	159	11.9	27.6	N	1606	18.9	114.3	U	1007	14.4	25.5
	502	78.0	93.5		540	9.7	17.5		160	21.6	52.8		1607	44.1	114.3		1008	14.4	25.5
	503	88.0	118.9		541	17.6	34.5		161	30.7	78.7		1608	51.6	131.9		1008.5	14.4	25.5
	504	129.5	208.2		542	35.7	71.6	F	470	6.3	12.8	P	1500	2.8	5.5		1009	13.8	25.7
	505	129.5	208.2		543	0.7	85.5		471	6.3	12.8		1501	2.8	5.5		1010	13.8	25.7
	506	178.4	288.8		550	6.8	14.7		472	12.0	25.0		1502	7.3	14.6		1011	15.7	29.3
	507	3.0	5.2		551	6.8	14.7		473	17.6	37.7		1503	12.4	25.9		1012	40.8	85.0
	508	3.0	5.2		552	22.9	51.1	H	401	1.8	3.9	Q	1400	4.7	9.5		1013	64.4	134.4
	509	10.4	18.7		553	74.4	184.5		402	1.8	3.9		1401	6.9	13.8		1014	152.5	331.8
	510	187.1	309.9		554	85.3	209.9		403	1.8	5.1		1402	11.6	23.2		1015	161.2	363.7
	511	187.1	309.9	B	252	9.8	19.6		404	2.2	8.4		1403	17.6	36.4	V	500	3.5	7.0
	512	211.7	296.4		253	9.8	19.6		405	7.1	11.3		1404	29.0	61.7		501	3.5	7.0
	513	3.7	7.4		254	6.9	13.9		405.1	3.2	6.2		1405	37.1	93.0		502	7.9	16.6
	514	15.1	30.1		255	6.9	13.9		406	32.8	71.9	R	1300	7.0	14.0	W	600	4.4	8.9
	515	15.1	30.1		256	38.1	92.0		407	7.1	12.6		1301	7.0	14.0		601	4.4	8.9
	516	218.5	390.5	C	192	4.9	10.2		408	12.6	23.1		1302	15.1	31.7		602	9.2	19.3
	517	242.7	442.4		193	4.9	10.2		409	12.6	23.1		1303	22.0	48.9	X	700	4.6	9.7
	518	413.8	721.1		194	4.1	8.6		410	29.6	55.3	S	1200	9.7	19.6		701	4.6	9.7
	519	175.9	375.6		195	4.1	8.6		412	9.6	18.3		1201	9.7	19.6		702	10.1	23.0
	520	175.9	375.6		196	15.7	33.8		413	18.7	37.6		1202	21.3	44.7		703	15.6	39.9
	521	175.9	375.6		197	2.1	4.4		414	18.7	37.6		1203	33.8	74.5	Y	800	3.4	6.8
	522	454.8	816.3		198	2.1	4.4		415	36.8	76.5	T	1100	6.4	13.1		801	3.4	6.8
	523	11.5	21.8		199	4.5	10.0		416	60.0	129.9		1101	6.4	13.1		802	8.0	16.3
	524	21.8	43.8		200	8.7	20.7		417	102.8	227.6		1102	12.6	26.8		803	13.0	28.4
	525	33.5	72.4		201	39.0	93.1		418	102.8	235.0		1103	15.6	34.6		804	19.4	45.7
	526	33.5	75.9		202	41.8	103.3		419	141.3	344.3	U	1000	13.8	25.5	Z	900	10.6	21.7
	527	42.4	95.5	D	181	4.1	8.3		421	148.3	395.8		1001	13.8	25.5		901	10.6	21.7
	528	42.4	95.5		182	4.1	8.3	N	1601	5.4	11.5		1002	22.6	46.6		902	23.0	48.9
	529	537.5	1012.2		183	9.0	19.1		1602	6.4	13.7		1003	12.7	22.9		903	45.1	96.1
	530	537.5	1012.2		184	11.8	26.1		1603	6.4	13.7		1004	12.7	22.9				
	531	537.5	1079.0	E	157	6.4	13.6		1604	22.6	52.0		1005	25.5	49.1				
	532	537.5	1100.5		158	6.4	13.6		1605	36.6	90.3		1006	73.3	152.7				

Source:

SCLA Hydrology Analysis

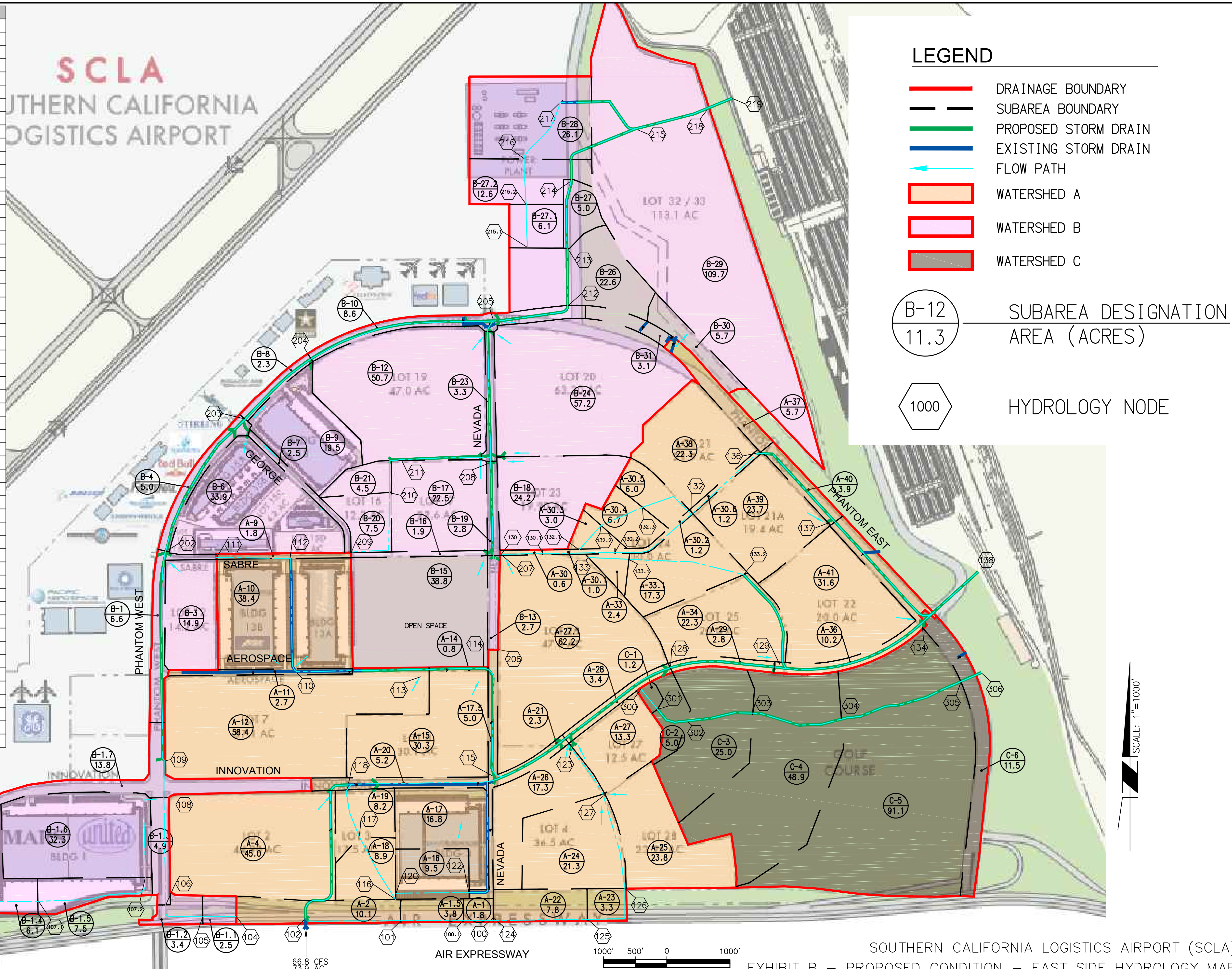
Eastside Existing Condition Hydromap

Exhibit A

Exhibit B

Rational Method Proposed Watershed Map

Watershed	Nodes	Q10	Q100
A	112	2.8	5.0
	110	45.8	84.8
	113	83.9	160.0
	114	105.7	202.2
	100.1	2.3	4.0
	101	3.7	7.0
	102	75.2	82.9
	117	13.5	23.8
	118	110.8	148.9
	122	12.8	22.8
	115	240.7	397.0
	125	10.0	17.7
	126	11.7	21.4
	127	49.0	91.1
	123	310.4	526.7
	128	340.3	583.8
	133.1	4.6	8.1
	133.2	25.6	47.3
	129	381.5	660.0
	130.1	1.0	1.8
	130.2	1.3	2.5
	132.2	6.5	11.5
	132.3	17.4	31.3
	132	22.1	41.6
	136	48.4	93.4
	137	74.4	144.4
	134	477.8	851.2
B	105	5.2	9.2
	106	9.6	17.4
	108	40.7	77.7
	107.1	9.9	17.4
	107.2	12.7	23.7
	109	50.3	95.4
	202	60.6	116.6
	203	86.1	167.0
	204	96.1	187.6
	205	273.7	532.1
	207	42.7	91.8
	208	114.9	223.8
	210	10.0	17.7
	211	13.8	25.0
	212	273.7	532.1
	213	277.2	543.2
	214	227.2	543.2
	215.2	11.0	19.4
	216	27.9	50.8
	217	58.0	107.6
	215	325.9	633.3
	218	445.9	855.7
C	301	2.9	5.0
	302	13.2	23.5
	303	59.4	107.6
	304	140.9	257.5
	305	278.0	514.1
	306	293.4	543.5



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SOUTHERN CALIFORNIA LOGISTICS AIRPORT (SCLA)
EXHIBIT B – PROPOSED CONDITION – EAST SIDE HYDROLOGY MAP

H:\pdata\159408\CADD\Strmwater\Exhibits\SCLA_East_PR_Hydromap_RV_2019.dwg 02/12/19 - 4:07pm jessica.pacheco

Exhibit C

NOAA Atlas 14 Precipitation Frequency Estimates

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.5879°, Longitude: -117.373°
Elevation: 2872.39 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.086** (0.071-0.106)	**0.119** (0.098-0.146)	**0.165** (0.136-0.203)	**0.205** (0.167-0.254)	**0.261** (0.206-0.335)	**0.307** (0.237-0.402)	**0.356** (0.268-0.477)	**0.408** (0.299-0.562)	**0.482** (0.339-0.691)	**0.542** (0.368-0.804)
10-min	**0.124** (0.102-0.151)	**0.171** (0.141-0.210)	**0.237** (0.195-0.292)	**0.293** (0.239-0.364)	**0.374** (0.295-0.480)	**0.440** (0.340-0.576)	**0.510** (0.384-0.683)	**0.585** (0.429-0.805)	**0.691** (0.486-0.991)	**0.776** (0.528-1.15)
15-min	**0.149** (0.123-0.183)	**0.207** (0.170-0.254)	**0.287** (0.236-0.353)	**0.355** (0.289-0.440)	**0.453** (0.357-0.580)	**0.532** (0.411-0.696)	**0.617** (0.465-0.826)	**0.707** (0.519-0.974)	**0.835** (0.588-1.20)	**0.939** (0.639-1.39)
30-min	**0.200** (0.165-0.245)	**0.277** (0.228-0.340)	**0.384** (0.316-0.473)	**0.475** (0.387-0.589)	**0.607** (0.478-0.777)	**0.713** (0.551-0.933)	**0.826** (0.623-1.11)	**0.947** (0.695-1.31)	**1.12** (0.788-1.61)	**1.26** (0.856-1.87)
60-min	**0.236** (0.194-0.288)	**0.326** (0.269-0.400)	**0.452** (0.371-0.556)	**0.559** (0.456-0.693)	**0.714** (0.563-0.914)	**0.839** (0.648-1.10)	**0.972** (0.733-1.30)	**1.11** (0.817-1.53)	**1.32** (0.926-1.89)	**1.48** (1.01-2.20)
2-hr	**0.326** (0.269-0.399)	**0.438** (0.361-0.537)	**0.594** (0.488-0.730)	**0.727** (0.592-0.901)	**0.918** (0.724-1.18)	**1.07** (0.828-1.40)	**1.23** (0.930-1.65)	**1.41** (1.03-1.94)	**1.65** (1.16-2.37)	**1.84** (1.25-2.74)
3-hr	**0.383** (0.316-0.469)	**0.510** (0.420-0.625)	**0.686** (0.564-0.843)	**0.836** (0.681-1.04)	**1.05** (0.829-1.35)	**1.22** (0.946-1.60)	**1.41** (1.06-1.88)	**1.60** (1.17-2.20)	**1.87** (1.32-2.68)	**2.08** (1.42-3.09)
6-hr	**0.504** (0.415-0.617)	**0.667** (0.550-0.818)	**0.892** (0.732-1.10)	**1.08** (0.882-1.34)	**1.35** (1.07-1.73)	**1.57** (1.21-2.05)	**1.80** (1.35-2.41)	**2.04** (1.49-2.80)	**2.37** (1.67-3.40)	**2.63** (1.79-3.91)
12-hr	**0.622** (0.513-0.762)	**0.840** (0.692-1.03)	**1.14** (0.935-1.40)	**1.39** (1.13-1.72)	**1.73** (1.37-2.22)	**2.01** (1.55-2.63)	**2.30** (1.73-3.08)	**2.59** (1.90-3.57)	**3.01** (2.12-4.31)	**3.33** (2.26-4.94)
24-hr	**0.771** (0.684-0.887)	**1.07** (0.949-1.23)	**1.47** (1.30-1.70)	**1.81** (1.58-2.10)	**2.27** (1.92-2.73)	**2.63** (2.18-3.23)	**3.00** (2.43-3.78)	**3.38** (2.67-4.38)	**3.91** (2.96-5.28)	**4.32** (3.16-6.04)
2-day	**0.877** (0.777-1.01)	**1.24** (1.10-1.43)	**1.73** (1.52-1.99)	**2.13** (1.86-2.48)	**2.68** (2.27-3.22)	**3.11** (2.58-3.82)	**3.55** (2.87-4.47)	**4.00** (3.15-5.19)	**4.62** (3.50-6.24)	**5.10** (3.73-7.13)
3-day	**0.953** (0.845-1.10)	**1.35** (1.20-1.56)	**1.90** (1.68-2.20)	**2.35** (2.06-2.74)	**2.97** (2.51-3.57)	**3.44** (2.86-4.23)	**3.93** (3.18-4.95)	**4.44** (3.50-5.75)	**5.13** (3.88-6.93)	**5.67** (4.14-7.93)
4-day	**1.00** (0.891-1.16)	**1.43** (1.27-1.65)	**2.02** (1.79-2.34)	**2.50** (2.19-2.92)	**3.16** (2.68-3.80)	**3.67** (3.04-4.51)	**4.19** (3.39-5.27)	**4.72** (3.72-6.12)	**5.46** (4.13-7.37)	**6.02** (4.40-8.42)
7-day	**1.06** (0.935-1.21)	**1.51** (1.34-1.74)	**2.14** (1.89-2.47)	**2.65** (2.32-3.09)	**3.36** (2.85-4.04)	**3.90** (3.24-4.80)	**4.45** (3.60-5.60)	**5.00** (3.94-6.48)	**5.75** (4.35-7.77)	**6.31** (4.61-8.82)
10-day	**1.10** (0.974-1.26)	**1.58** (1.40-1.82)	**2.24** (1.98-2.59)	**2.79** (2.45-3.25)	**3.56** (3.01-4.28)	**4.14** (3.43-5.08)	**4.72** (3.83-5.95)	**5.32** (4.19-6.89)	**6.12** (4.63-8.27)	**6.72** (4.91-9.39)
20-day	**1.23** (1.09-1.42)	**1.81** (1.60-2.09)	**2.64** (2.33-3.04)	**3.33** (2.92-3.88)	**4.32** (3.66-5.20)	**5.09** (4.22-6.26)	**5.88** (4.76-7.41)	**6.69** (5.27-8.66)	**7.76** (5.86-10.5)	**8.56** (6.25-12.0)
30-day	**1.36** (1.21-1.57)	**2.03** (1.80-2.34)	**3.00** (2.65-3.47)	**3.84** (3.37-4.48)	**5.07** (4.29-6.10)	**6.03** (5.01-7.42)	**7.02** (5.69-8.85)	**8.04** (6.34-10.4)	**9.41** (7.11-12.7)	**10.4** (7.61-14.6)
45-day	**1.56** (1.39-1.80)	**2.36** (2.09-2.72)	**3.54** (3.13-4.09)	**4.59** (4.02-5.34)	**6.14** (5.21-7.40)	**7.42** (6.16-9.12)	**8.73** (7.07-11.0)	**10.1** (7.95-13.1)	**12.0** (9.04-16.1)	**13.4** (9.76-18.7)
60-day	**1.71** (1.52-1.97)	**2.59** (2.29-2.98)	**3.93** (3.47-4.54)	**5.14** (4.50-5.99)	**6.95** (5.89-8.37)	**8.46** (7.03-10.4)	**10.1** (8.16-12.7)	**11.7** (9.24-15.2)	**14.0** (10.6-19.0)	**15.8** (11.6-22.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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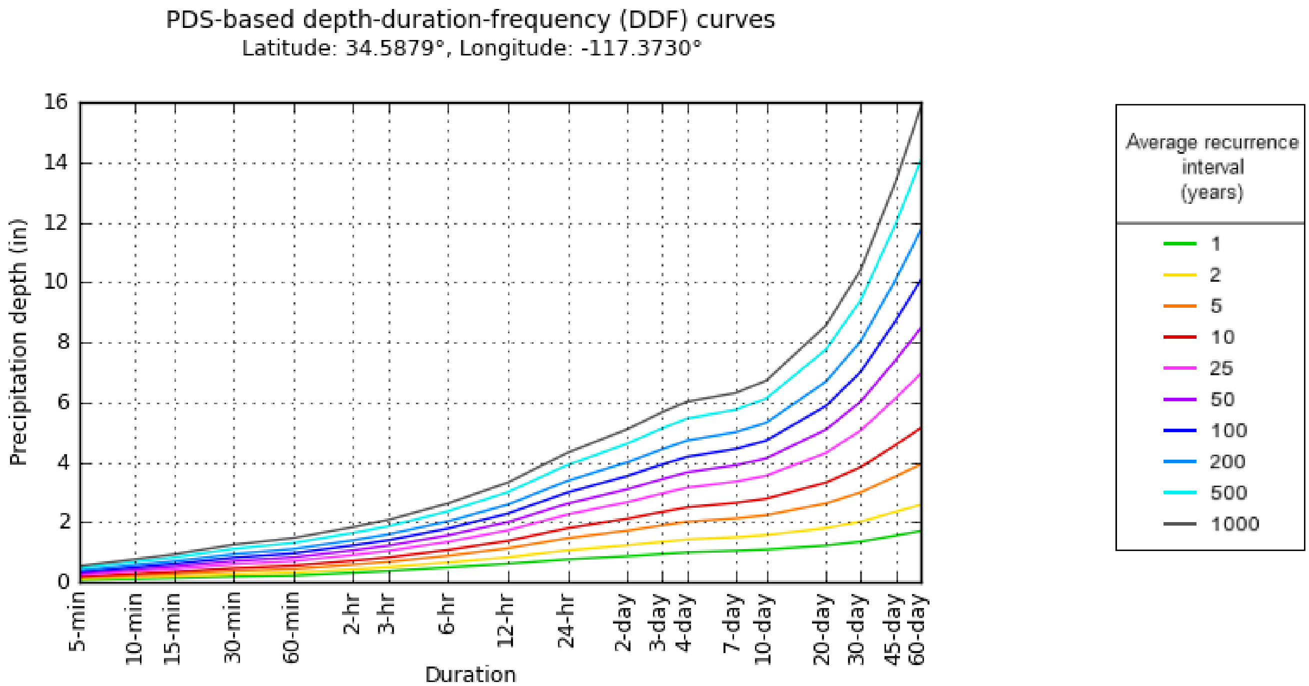
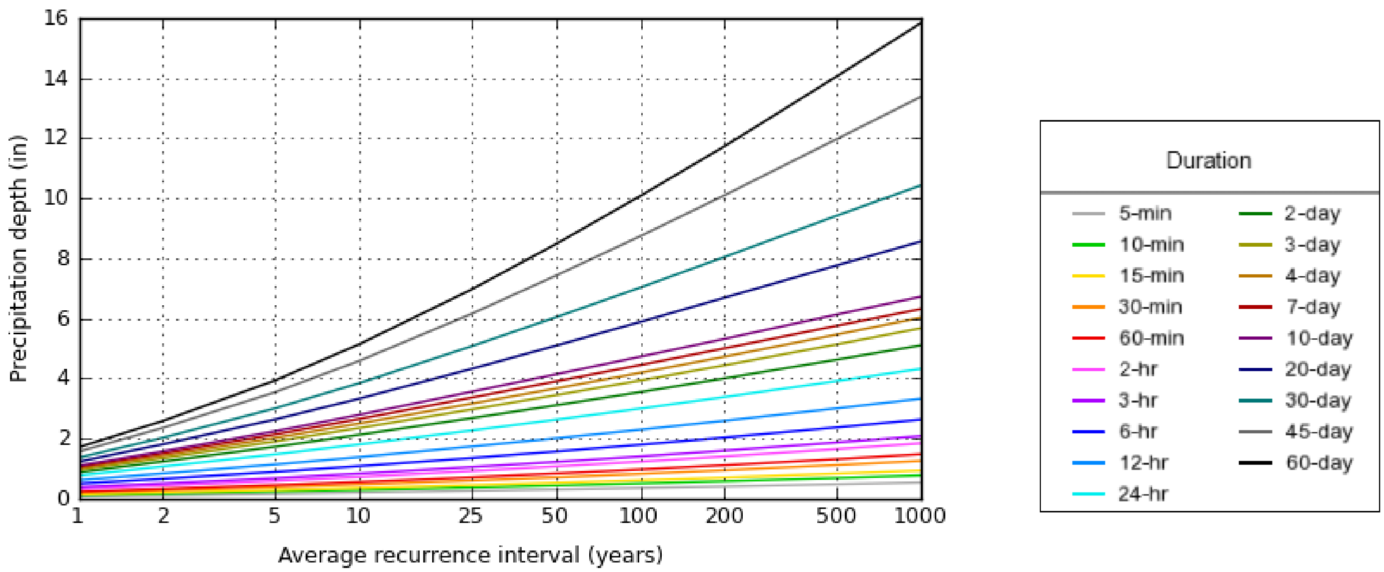
PF graphical





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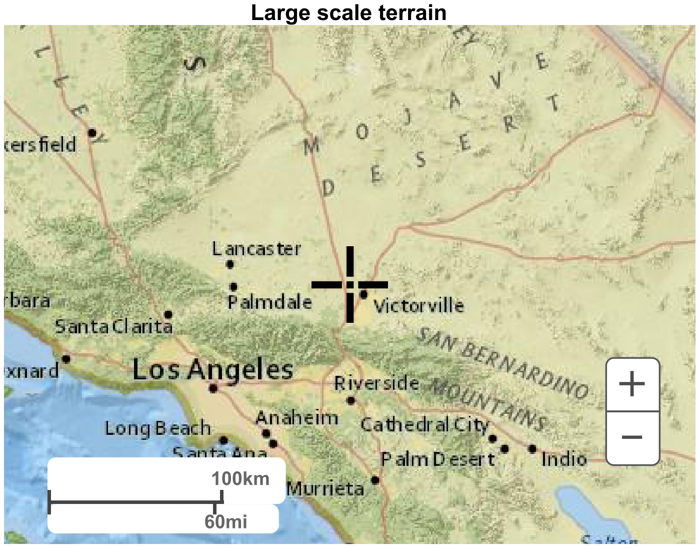
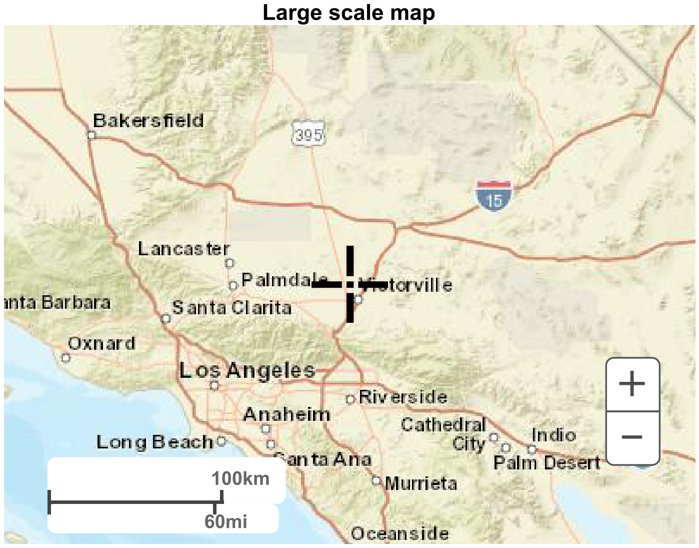
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Exhibit D

Proposed Landuse Plan

GLOBAL ACCESS

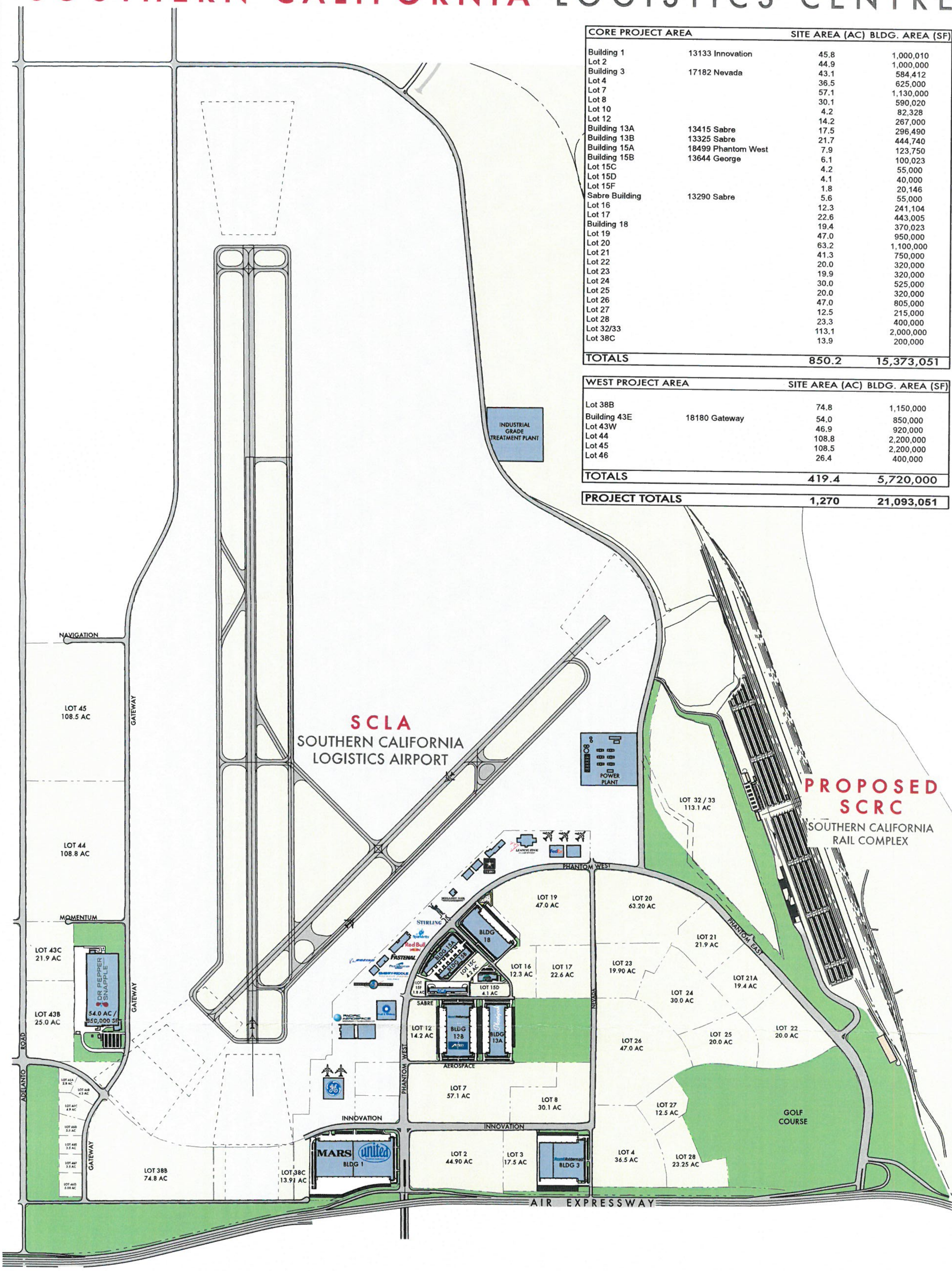
VICTORVILLE CALIFORNIA

SOUTHERN CALIFORNIA LOGISTICS CENTRE

CORE PROJECT AREA		SITE AREA (AC)	BLDG. AREA (SF)
Building 1	13133 Innovation	45.8	1,000,010
Lot 2		44.9	1,000,000
Building 3	17182 Nevada	43.1	584,412
Lot 4		36.5	625,000
Lot 7		57.1	1,130,000
Lot 8		30.1	590,020
Lot 10		4.2	82,328
Lot 12		14.2	267,000
Building 13A	13415 Sabre	17.5	296,490
Building 13B	13325 Sabre	21.7	444,740
Building 15A	18499 Phantom West	7.9	123,750
Building 15B	13644 George	6.1	100,023
Lot 15C		4.2	55,000
Lot 15D		4.1	40,000
Lot 15F		1.8	20,146
Sabre Building	13290 Sabre	5.6	55,000
Lot 16		12.3	241,104
Lot 17		22.6	443,005
Building 18		19.4	370,023
Lot 19		47.0	950,000
Lot 20		63.2	1,100,000
Lot 21		41.3	750,000
Lot 22		20.0	320,000
Lot 23		19.9	320,000
Lot 24		30.0	525,000
Lot 25		20.0	320,000
Lot 26		47.0	805,000
Lot 27		12.5	215,000
Lot 28		23.3	400,000
Lot 32/33		113.1	2,000,000
Lot 38C		13.9	200,000
TOTALS		850.2	15,373,051

WEST PROJECT AREA		SITE AREA (AC)	BLDG. AREA (SF)
Lot 38B		74.8	1,150,000
Building 43E	18180 Gateway	54.0	850,000
Lot 43W		46.9	920,000
Lot 44		108.8	2,200,000
Lot 45		108.5	2,200,000
Lot 46		26.4	400,000
TOTALS		419.4	5,720,000

PROJECT TOTALS		1,270	21,093,051



SCLC MASTER PLAN

RGA

STIRLING

VICTORVILLE California