ATTACHMENT C

Initial Study w/Special Studies

INITIAL STUDY
FOR TENTATIVE TRACT MAP (TTM) 20454
SINGLE-FAMILY RESIDENTIAL PROJECT

Prepared for:

City of Victorville
Development Department
P.O. Box 5001
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LIST OF ABBREVIATIONS AND ACROYNMS

AAQS	Ambient Air Quality Standards
amsl	above mean sea level
APE	Area of Potential Effect
APN	Assessor Parcel Number
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
ARB	Air Resources Board
BACMs	Best Available Control Measures
BMPs	Best Management Practices
BRA	Biological Resources Assessment
BUOW	Burrowing Owl
CAAA	Clean Air Act Amendment
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CBC	California Building Code
CCAR	California Climate Action Registry (now called Climate Action Reserve)
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNEL	Community Noise Equivalent Level
CO	Carbon Monoxide
CO_{2e}	Carbon Dioxide equivalent
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DIF	Development Impact Fee
DP	Development Permits
DTSC	Department of Toxic Substances Control
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FGC	Fish & Game Code
FTA	Federal Transit Association
GCC	Global Climate Change
GHG	Greenhouse Gas
ITP	Incidental Take Permit
IWWTP	SCLA Industrial Wastewater Treatment Plant
LMAD	Landscape Maintenance Assessment District
LST	Localized Significance Thresholds
LUST	Leaking Underground Storage Tank
MBTA	Migratory Bird Treaty Act
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District

MM	Mitigation Measure
MND	Mitigated Negative Declaration
NAAQS	National Ambient Air Quality Standards
NOx	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
PM_{10}	particulate matter less than 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board – Lahontan Region
SBCFD	Victorville Fire Department, San Bernardino County
SBDC	San Bernardino Development Code
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCLA	Southern California Logistics Airport
SIP	State Implementation Plan
SJUSD	Snowline Joint Unified School District
SOx	Oxides of Sulfur
SRA	State Responsibility Area
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TRC	Tribal Cultural Resources
TTM	Tentative Tract Map
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
VdB	vibration-velocity decibel
VESD	Victorville Elementary School District
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
VVUHSD	Victor Valley Union High School District
VVWRA	Victor Valley Wastewater Reclamation Authority
VWD	Victorville Water District
WEAP	Worker Education Awareness Program
WQMP	Water Quality Management Plan

ENVIRONMENTAL CHECKLIST FORM

1. Project Title: City of Victorville Case No. PLAN21-00033
(TTM 20454, Single-Family Residential Subdivision)

2. Lead Agency Name: City of Victorville, Planning Department
Address: 14343 Civic Drive
P.O. Box 5001
Victorville, CA 92393-5001

3. Contact Person: Alex Jauregui, Assistant City Planner
Phone Number: 760-955-5135
E-Mail: AJauregui@victorvilleca.gov

4. Project Location: The proposed project is located on the south side of Nyack Road and the west side of Mesa View Drive. The approximate 30.22-acre property occupies three existing Assessor Parcel Number (APN) parcels designated as APN 3134-021-05, 3134-021-06, and 3134-021-07 in the City of Victorville San Bernardino County, California. The site is located in as found on the USGS Baldy Mesa Quadrangle, 7.5 Minute Series topographic map in Township 5 North, Range 5 West, Section 33 of the San Bernardino Meridian. The geographic coordinates are as follows: 117° 24' 37" West and 34° 28' 49" North (refer to Figures 1 and 2 for project location depicted at a regional and site scale, and Figure 3 which shows the proposed tract map).

5. Project Sponsor's Name and Address: Ms. Tiffany Yu and Mr. Greg Quan
Bedford Opportunity Fund II, LLC
212 S. Palm Avenue, Suite 200
Alhambra, CA 91801

6. General Plan Designation: Low Density Residential

7. Zoning Classification: Single-Family Residential, R-1

8. Project Description:

A. Introduction

This document is being prepared for the City of Victorville (City) for the environmental review of Tentative Tract Map (TTM) No. 20454. This project proposes to develop a 108-Lot Single-Family Residential Subdivision to be located within an approximately 30-acre parcel along the southwest corner of Mesa View Drive and Nyack Road. Refer to Figures 1 and 2. The project site had a previously approved Tentative Tract Map, TTM 17486, which has since expired. The purpose of the project is to provide additional housing options to serve the growing population of the City of Victorville by subdividing the existing land in accordance with City of Victorville development standards.

B. Project Description

If approved by the City, the approximately 30.22-acre Project site will be graded in accordance with TTM No. 20454 which contains 108 residential lots that have a minimum lot size of approximately 7,200 square feet (sf), as well as the associated roadways and utility infrastructure required to support the single-family residential subdivision. Most of the lots, except those on Nyack Road face the interior roadways. At this time, it is assumed that residential subdivision will be graded and developed in one or more phases. Refer to Figure 3.

All access roads will be paved and developed along the exterior as follows: Mesa View Drive on the east, Nyack Road on the north, and the interior roadways shown on the Tract Map. The main ingress and egress to the subdivision will be from either of two entrances, one on Nyack Road and the other on Mesa View Drive.

The Project site is relatively flat and will be graded to ensure stormwater runoff patterns follow existing drainage courses or be carried in proposed streets. One stormwater basin is planned at the northwestern property boundary (Lot B) and one will be installed at the northeastern boundary of the project (Lot C). Lot B will discharge into a regional master planned drainage channel that will transport runoff to the north.

The project proposes a landscaping area of about 1.2-acres, which is 4% coverage of the overall site; this meets the City's landscaping requirements. A ten-foot-wide landscape buffer is planned between the lots on the east boundary and Mesa View Drive, for a total of 34,762 square feet. These landscaped buffer areas will be dedicated as a Landscape Maintenance Assessment District (LMAD), which will be maintained by the City of Victorville

C. Road Improvements

The regional storm drain facility, identified as Line E-01, is proposed to be installed along the west boundary Lot A. This will include grading the channel on the project site to meet the City's design requirements. Once the subdivision is constructed, the subdivision will be annexed into a Drainage Facilities Assessment District for the proposed drainage improvements.

Off-site improvements that will be completed as part of the project include construction of Nyack Road and build-out of Mesa View Drive.

The project will connect to water, sewer, natural gas, and telecommunication adjacent to the project site. Electricity connections will connect to the project on Mesa View Drive. Utilities, such as the electricity lines fronting the property will be undergrounded as part of the construction of the project. Water will connect to a future line in Nyack Road and Mesa View (existing line). Sewer will connect to the existing line in Nyack Road.

D. List of All Required Applications

1. TTM No. 20454: City Case No. PLAN21-00033 required to approve the proposed TTM and associated environmental assessment (e.g. Initial Study and Mitigated Negative Declaration (MND) required for CEQA compliance).
2. Construction Permits (e.g. Building Permits, Grading Permits, Encroachment Permits, etc.): Required to permit the proposed project improvements at the site, such as site buildings, landscaping, drainage improvements and street improvements.

E. Construction Scenario

The anticipated construction sequence is as follows, but may be adjusted to conform to specific conditions at the time of actual construction:

1. Clear and grub;
2. Preparation of subgrade;
3. Mass-grade site;
4. Installation of the storm drain system;
5. Installation of public sewer system;
6. Installation of public water system;
7. Fine grade to prepare for surface improvements;
8. Install landscaping; place final lift of asphalt/concrete;
9. Install signage and striping;
10. Install private utilities, including water quality infrastructure;
11. Install curb, gutters, sidewalks and first asphalt lift; and
12. Construct new homes.

Most of the preceding construction activities are self-explanatory. Construction of the tract site will be completed in closely spaced, sequential phases with the entirety of the horizontal construction to be completed first. This will include clearing and grubbing, grading and installation of utilities, and may also include development of internal paved areas. Grading will encompass approximately 76,422 cubic yards (CY) of raw cut and an estimated 71,359 CY of raw fill. Anticipated adjusted net earthwork will be negligible. Once the horizontal improvements are completed, the Applicant will either begin to develop the site with homes for sale. This pattern of development will continue until the site has been completed. Construction should be initiated in 202 and the project should open for occupancy in 2025. Construction details are further discussed in the Air Quality evaluation in Appendix 1. It is anticipated that between 20 and 30 construction workers will be on site at any given time during construction.

9. Surrounding land uses and setting: (Briefly describe the project's surroundings)

The project site is located on the west side of Highway 395 and north of Bear Valley Road. Mesa View Drive is paved on the east side of the project site, with existing single-family residences on the east side of this roadway. To the north is Nyack Road and then open space with single-family residences located north of the small area of open space adjacent to Mesa View. On the west is open space, a substantial surface runoff channel and on the west side of the channel is Fremontia Road. To the south is open space and several Water reservoirs located further south, south of Olivine Road. Except for Mesa View, all of the peripheral roadways are graded dirt roads.

10. Other agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

The one permit currently known to be required is a State General Construction Permit that is obtained by filing a Notice of Intent with the State Water Resources Control Board; preparing and implementing a Stormwater Pollution Prevention Plan (SWPPP); and maintaining a copy of the SWPPP on the project site during construction to coordinate with the Lahontan Regional Board and San Bernardino County inspectors. Although the onsite channel has been avoided, connections with the onsite stormwater runoff system may require a permit for stream channel alterations. Also, it is possible that one or more listed species (Joshua trees, Mohave ground squirrel and desert tortoise) may occur on the property and permits to incidentally take these species may be required from the California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service.

11. Have California Native American tribes traditionally and cultural affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?

    Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

Tribal notices were prepared in accordance with Public Resources Code Section 21080.3.1 and provided to four tribes who had requested notification in the past (Cabazon Band of Mission Indians, Morongo Band of Mission Indians, San Manuel Band of Mission Indians, and the Twenty-Nine Palms Band of Mission Indians). Of the noted tribes, only the Yuhaaviatam of San Manuel Nation (formerly known as the San Manuel Band of Mission Indians) requested consultation, resulting in Cultural Mitigation Measures CUL-2 – CUL-4 and Tribal Cultural Mitigation Measures TCR-1 – TCR-2 being included in the Initial Study and Draft Mitigated Negative Declaration at their request.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Energy
☒ Geology / Soils	☒ Greenhouse Gas Emissions	☒ Hazards & Hazardous Materials
☒ Hydrology & Water Quality	☐ Land Use / Planning	☐ Mineral Resources
☒ Noise	☐ Population / Housing	☐ Public Services
☐ Recreation	☒ Transportation	☒ Tribal Cultural Resources
☐ Utilities / Service Systems	☐ Wildfire	☒ Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation, the following finding is made:

☐	The proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	Although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	The proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	The proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	Although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Tom Dodson & Associates
Prepared by

June 2024
Date

a. J.
Alex Jauregui, Assistant City Planner
Lead Agency

6/28/2024
Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.
   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and
   b) the mitigation measure identified, if any, to reduce the impact to less than significance.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
I. AESTHETICS: Except as provided in Public Resources Code Section 21099, would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning or other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

SUBSTANTIATION

a. *Less Than Significant Impact* – Adverse impacts to scenic vistas can occur in one of two ways. First, an area itself may contain existing scenic vistas that would be altered by new development. A review of the TTM 20454, Single-Family Residential project area determined that there are no scenic vistas/values located internally within the area proposed for the development of the Project. The proposed Project is located adjacent to existing residential subdivision development to the east and northeast. The remaining area surrounding the project site is vacant Mojave-desert habitat and contains the same vegetation that is currently found within the project site. The project site is located within a mixed visual setting of highly disturbed native habitat and residential subdivisions. The development of the TTM 20454, Single-Family Residential Project is not expected to impact any important scenic vistas/values within the project area.

A scenic vista impact can also occur when a scenic vista can be viewed from the project area or immediate vicinity and a proposed development may interfere with the view to a scenic vista. A scenic vista impact can also occur when a scenic vista can be viewed from the project area or immediate vicinity and a proposed development may interfere with the view to a scenic vista. The City of Victorville General Plan indicates that the San Gabriel Mountains contributes to the unique visual character of the City. The Project site is oriented in an area in which this important visual feature is already compromised by the ongoing residential development in the area surrounding the project site. These interrupted views indicate that development at this site would not add substantially to interruption of any important public views in any direction once developed. Therefore, the proposed Project would have a less than significant impact on scenic vistas or scenic values at this site.

b. *Less Than Significant Impact* – The project site consists of a highly disturbed native desert habitat with no distinctive features, such as trees or rock outcrops. It has one north-south drainage feature that bisects the western edge of the site. The site is essentially uniformly flat due to its location on the alluvial fan between the San Gabriel Mountains and the Mojave River channel, which is located to the northeast. The site has been designated for single-family residential use under both the prior General Plan and the current Victorville General Plan. No roadways within the vicinity of the project site are considered eligible for official designation as a County or State Scenic Highway. No other scenic resources are located within the project site, and as such, there are no scenic resources within the site that would be damaged as a result of development of the proposed project. Therefore, there is a less than significant potential to damage a scenic onsite resource.

c. *Less Than Significant Impact* – The TTM 20454, Single-Family Residential site is located within an urbanizing area of the City of Victorville. The Victorville General Plan has designated the project site for Single-Family Residential Use and the zoning classification is the same. By developing this vacant site in accordance with City General Plan and design guidelines for single-family uses and development plans, the visual character of this site will be converted to a suburban visual setting consistent with surrounding single-family residences, but also consistent with the General Plan vision for the City at build-out. With the City's design elements incorporated in the proposed project, implementation will be consistent with the surrounding urban setting and the potential aesthetic impacts to the site will result in a less than significant impact.

d. *Less Than Significant Impact* – The implementation of the proposed project will create new sources of light during the occupancy phase of the project. Light and glare from interior and exterior building lighting, safety and security slighting, and vehicular traffic accessing the site will generate new light once the site is occupied. The proposed project must be developed in accordance with the City's Development Code, which would ensure that any building or exterior lighting would not significantly impact adjacent uses. Thus, the proposed project will introduce a new source of light into the project area, but design requirements can limit the lighting impacts to the project site. Based on this finding, the potential lighting-related impacts of this proposed project ware concluded to be less than significant.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
II. AGRICULTURE AND FORESTRY RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

SUBSTANTIATION

a-e. *No Impact* – The project site has not historically been used for agriculture or timber management purposes. Accordingly, the City has not designated this site nor zoned this site for agricultural use or timber management, as the General Plan and Zoning Classifications are Single-Family Residential. This indicates that the City intends for the project site to be developed for a use that would suit this land use designation/zoning classification which it has assigned this project site. Therefore, given that the City does not identify the project site for agricultural use, and that no Prime Farmland, Unique Farmland or Farmland of Statewide Importance has been identified within the project site, implementation of the proposed project and conversion of the project site to the proposed single-family residential uses will not pose any significant adverse impact to agricultural resources or values. No mitigation is required.

Similarly, the project site is not located within forest land, timberland or timberland zoned for Timberland Production. Therefore, the proposed project will not conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)). No adverse impacts are anticipated and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☒	☐	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

SUBSTANTIATION: The background Air Quality data is abstracted from the following report: "Air Quality and GHG Impact Analysis, American Organics Victor Valley Regional Composting Facility Expansion Project, Victorville, California" prepared by Giroux & Associates dated January 24, 2020. The air quality impact forecast is abstracted from this study: *"Air Quality Study – Tentative Tract Map (TTM) 20454 Housing Development – Mesa View Drive and Nyack Road, Victorville, CA"* prepared by M.S. Hatch Consulting, LLC. dated October 25, 2021. The Hatch Consulting study can be found in Appendix 1 to this document.

<u>Background</u>

The climate of the Victor Valley, technically called an interior valley subclimate of Southern California's Mediterranean-type climate, is characterized by hot summers, mild winters, infrequent rainfall, moderate afternoon breezes, and generally fair weather. The clouds and fog that form along the Southern California coastline rarely extend across the mountains to Victorville and surrounding high desert communities. The most important local weather pattern is associated with the funneling of the daily onshore sea breeze through El Cajon Pass into the upper desert to the northeast of the heavily developed portions of the Los Angeles Basin. This daily airflow brings polluted air into the area late in the afternoon from late spring to early fall. This transport pattern creates both unhealthful air quality as well as destroying the scenic vistas of the mountains surrounding the Victor Valley.

The low annual humidity, moderate temperature swings, very low rainfall and frequent breezy conditions are typical of California's "Upper Desert" subclimate. Most years do not see temperatures drop below about 20°F or above about 105°F. Occasionally, however, there are some very hot temperatures over 105°F with a record high of 113°F in 1995, and some colder temps down to a record low of -1°F in December 1949.

The Victor Valley is in a transition area between the semi-arid conditions of the Los Angeles Basin and the completely arid portions of the Mojave Desert. The Valley's location in the "rainshadow" of the San Gabriel Mountains further enhances its dryness. Rainfall averages around 6 inches per year, with light to moderate rain falling on only 10 days per year. Because of Southern California's location on the edge of the mid-latitude storm track, a shift in the jet stream aloft of a few hundred miles north or south can mean the difference between a year with twice the annual average rainfall and one with drought conditions where less than one-half of the normal rainfall is observed. The project area may occasionally experience a light winter snowfall (1-2 inches per year), but temperatures do not remain cold enough for the snow to stay on the ground for very long.

Winds blow primarily from south to north and from west to east in response to the regional pattern of airflow from the cool ocean to the heated interior. A large portion of the airflow across the proposed project area therefore has its origin in more developed areas of the Los Angeles Basin. Over 50 percent of all airflow derives from a narrow sector from south through west. These winds are moderately strong, averaging from 8-12 mph, but become light and variable at night with about 10 percent of all hours almost complete calm. Afternoon winds may, at times, exceed 20 mph and begin to pick up fine dust and other loose material.

The wind distribution is an important atmospheric parameter because it controls both the initial rate of pollutant dispersal near the source as well as the ultimate regional trajectory of air pollution. These prevailing winds provide a vehicle for visible smog to be transported from the South Coast Air Basin through the mountain passes to the Mojave Desert Air Basin (MDAB). The rapid daytime heating of the lower air leads to convective activity. This exchange of upper air tends to accelerate surface winds during the warm part of the day when convection is at a maximum. During the winter, the rapid cooling of the surface layers at night retards this exchange of momentum which often results in calm winds.

In addition to winds which govern the horizontal dispersion of locally generated emissions, vertical temperature structure controls the depth through which pollutants can be mixed. The strong surface heating by day in the Mojave Desert usually creates a vertical temperature distribution that decreases rapidly with height (unstable). At night, especially in winter, cool air settles in low-lying areas and forms shallow radiation-induced temperature inversions (stable) that may temporarily restrict the dispersion of low-level pollutant emissions. Such inversions "burn off" rapidly after sunrise. The elevated subsidence/marine inversions that create major air quality problems in coastal environments are rarely observed in the desert. When they do form, their bases are from 6 - 8,000 feet mean sea level and thus do not impede vertical dispersion. The low-level radiation inversions, however, play an important role in limiting the dispersive capacity of the local airshed from late evening to the next morning. Because they burn off rapidly in the morning, their importance to the dispersion of air contaminants is limited to localized effects.

Ambient Air Quality Setting

In order to gauge the significance of the air quality impacts of the proposed project, those impacts, together with existing background air quality levels, must be compared to the applicable ambient air quality standards. These standards are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare. They are designed to protect those people most susceptible to further respiratory distress such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise, called "sensitive receptors." Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed. Recent research has shown, however, that chronic exposure to ozone (the primary ingredient in photochemical smog) may lead to adverse respiratory health even at concentrations close to the ambient standard.

National AAQS were established in 1971 for six pollution species with states retaining the option to add other pollutants, require more stringent compliance, or to include different exposure periods. The initial attainment deadline of 1977 was extended several times in air quality problem areas like Southern California. In 2003, the Environmental Protection Agency (EPA) adopted a rule, which extended and established a new attainment deadline for ozone for the year 2021. Because the State of California had established AAQS several years before the federal action and because of unique air quality problems introduced by the restrictive dispersion meteorology, there is considerable difference between state and national clean air standards. Those standards currently in effect in California are shown in Table 1. Sources and health effects of various pollutants are shown in Table 2.

The Federal Clean Air Act Amendments (CAAA) of 1990 required that the U.S. Environmental Protection Agency (EPA) review all national AAQS in light of currently known health effects. EPA was charged with modifying existing standards or promulgating new ones where appropriate. EPA subsequently developed standards for chronic ozone exposure (8+ hours per day) and for very small diameter particulate matter (called "PM-2.5"). New national AAQS were adopted in 1997 for these pollutants.

Planning and enforcement of the federal standards for PM-2.5 and for ozone (8-hour) were challenged by trucking and manufacturing organizations. In a unanimous decision, the U.S. Supreme Court ruled that EPA did not require specific congressional authorization to adopt national clean air standards. The Court also ruled that health-based standards did not require preparation of a cost-benefit analysis. The Court did find, however, that there was some inconsistency between existing and "new" standards in their required attainment schedules. Such attainment-planning schedule inconsistencies centered mainly on the 8-hour ozone standard. EPA subsequently agreed to downgrade the attainment designation for a large number of communities to “non-attainment” for the 8-hour ozone standard.

Evaluation of the most current data on the health effects of inhalation of fine particulate matter prompted the California Air Resources Board (ARB) to recommend adoption of the statewide PM-2.5 standard that is more stringent than the federal standard. This standard was adopted in 2002. The State PM-2.5 standard is more of a goal in that it does not have specific attainment planning requirements like a federal clean air standard, but only requires continued progress towards attainment.

Similarly, the ARB extensively evaluated health effects of ozone exposure. A new state standard for an 8-hour ozone exposure was adopted in 2005, which aligned with the exposure period for the federal 8-hour standard. The California 8-hour ozone standard of 0.07 ppm is more stringent than the federal 8-hour standard of 0.075 ppm. The state standard, however, does not have a specific attainment deadline. California air quality jurisdictions are required to make steady progress towards attaining state standards, but there are no hard deadlines or any consequences of non-attainment. During the same re-evaluation process, the ARB adopted an annual state standard for nitrogen dioxide (NO_2) that is more stringent than the corresponding federal standard, and strengthened the state one-hour NO_2 standard.

As part of EPA’s 2002 consent decree on clean air standards, a further review of airborne particulate matter (PM) and human health was initiated. A substantial modification of federal clean air standards for PM was promulgated in 2006. Standards for PM-2.5 were strengthened, a new class of PM in the 2.5 to 10 micron size was created, some PM-10 standards were revoked, and a distinction between rural and urban air quality was adopted. In December, 2012, the federal annual standard for PM-2.5 was reduced from 15 $\mu g/m^3$ to 12 $\mu g/m^3$ which matches the California AAQS. The severity of the basin’s non-attainment status for PM-2.5 may be increased by this action and thus require accelerated planning for future PM-2.5 attainment.

In response to continuing evidence that ozone exposure at levels just meeting federal clean air standards is demonstrably unhealthful, EPA had proposed a further strengthening of the 8-hour standard. A new 8-hour ozone standard was adopted in 2015 after extensive analysis and public input. The adopted national 8-hour ozone standard is 0.07 ppm which matches the current California standard. It will require three years of ambient data collection, then 2 years of non-attainment findings and planning protocol adoption, then several years of plan development and approval. Final air quality plans for the new standard are likely to be adopted around 2022. Ultimate attainment of the new standard in ozone problem areas such as Southern California might be after 2025.

Of the standards shown in Table 1, those for ozone (O_3), and particulate matter (PM-10) are exceeded at times in the MDAB. They are called “non-attainment pollutants.” Because of the variations in both the regional meteorology and in area-wide differences in levels of air pollution emissions, patterns of non-attainment have strong spatial and temporal differences.

Table III-1

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 $\mu g/m^3$)		0.070 ppm (137 $\mu g/m^3$)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 $\mu g/m^3$	Gravimetric or Beta Attenuation	150 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 $\mu g/m^3$		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 $\mu g/m^3$	Gravimetric or Beta Attenuation	12.0 $\mu g/m^3$	15 $\mu g/m^3$	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 $\mu g/m^3$)	Gas Phase Chemiluminescence	100 ppb (188 $\mu g/m^3$)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 $\mu g/m^3$)		0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 $\mu g/m^3$)	Ultraviolet Fluorescence	75 ppb (196 $\mu g/m^3$)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 $\mu g/m^3$)	
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30 Day Average	1.5 $\mu g/m^3$	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 $\mu g/m^3$ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 $\mu g/m^3$		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	**No National Standards**		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

See footnotes on next page …

For more information please call ARB-PIO at (916) 322-2990

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Table III-1 (continued)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (5/4/16)**

Table III-2
HEALTH EFFECTS OF MAJOR CRITERIA POLLUTANTS

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Reduced tolerance for exercise. • Impairment of mental function. • Impairment of fetal development. • Death at high levels of exposure. • Aggravation of some heart diseases (angina).
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Aggravation of respiratory and cardiovascular diseases. • Irritation of eyes. • Impairment of cardiopulmonary function. • Plant leaf injury.
Lead (Pb)	• Contaminated soil.	• Impairment of blood function and nerve construction. • Behavioral and hearing problems in children.
Respirable Particulate Matter (PM-10)	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Reduced lung function. • Aggravation of the effects of gaseous pollutants. • Aggravation of respiratory and cardio respiratory diseases. • Increased cough and chest discomfort. • Soiling. • Reduced visibility.
Fine Particulate Matter (PM-2.5)	• Fuel combustion in motor vehicles, equipment, and industrial sources. • Residential and agricultural burning. • Industrial processes. • Also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.	• Increases respiratory disease. • Lung damage. • Cancer and premature death. • Reduces visibility and results in surface soiling.
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Aggravation of respiratory diseases (asthma, emphysema). • Reduced lung function. • Irritation of eyes. • Reduced visibility. • Plant injury. • Deterioration of metals, textiles, leather, finishes, coatings, etc.

Source: California Air Resources Board, 2002.

Baseline Air Quality

Monitoring of air quality in the MDAB is the responsibility of the Mojave Desert Air Quality Management District (MDAQMD) headquartered in Victorville, California. Existing levels of criteria air pollutants in the project area can generally be inferred from measurements conducted at the Victorville Station at 14306 Park Avenue. Although the Victorville Station monitors most of the spectrum of pollutants, data for CO is no longer monitored in the Mojave Desert. Table 4 summarizes the last three years of monitoring data from the available data at for this Victorville monitoring station. From these data one can infer that baseline air quality levels near the project site are occasionally unhealthful, but that such violations of clean air standards usually affect only those people most sensitive to air pollution exposure.

a. Photochemical smog (ozone) levels occasionally exceed standards. The 8-hour state ozone standard has been exceeded approximately 7 percent of all days in the last three years while the 1-hour state standard has been exceeded less than one percent of all days. The 8-hour federal standard has been exceeded approximately 5 percent of all days in the past three years. Attainment of all clean air standards in the project vicinity is not likely to occur soon, but the severity and frequency of violations is expected to continue to slowly decline during the current decade

b. Respirable dust (PM-10) levels often exceed the state standard of 50 $\mu g/m^3$ but the less stringent federal PM-10 standard of 150 $\mu g/m^3$ is violated with much less frequency. However, given the high Max. 24-Hour concentrations it is clear that PM-10 is still of concern.

c. A substantial fraction of PM-10 is comprised of ultra-small diameter particulates capable of being inhaled into deep lung tissue (PM-2.5). There has only been one measured violation in the last three years.

Although complete attainment of every clean air standard is not yet imminent, extrapolation of the steady improvement trend suggests that such attainment could occur within the reasonably near future.

Standards of Significance

The Mojave Desert AQMD has adopted numerical emissions thresholds as indicators of potential impact even if the actual air quality increment cannot be directly quantified. The MDAQMD thresholds are as follows:

Carbon Monoxide (CO)	548 pounds/day	100 tons/year
Nitrogen Oxides (NOx)	137 pounds/day	25 tons/year
Sulfur Oxides (SOx)	137 pounds/day	25 tons/year
Reactive Organic Gases (ROG)	137 pounds/day	25 tons/year
Particulate Matter (PM-10)	82 pounds/day	15 tons/year
Particulate Matter (PM-2.5)	65 pounds/day	12 tons/year
GHG	548,000 pounds/day	100,000 tons/year

Table III-3
AIR QUALITY MONITORING SUMMARY (2016-2018)
(Number of Days Standards Were Exceeded and Maximum Levels During Such Violations)
(Entries shown as estimated days exceeding standard)

Pollutant/Standard	2016	2017	2018
Ozone			
1-Hour > 0.09 ppm (S)	4	0	5
8-Hour > 0.07 ppm (S)	33	17	55
8- Hour > 0.075 ppm (F)	18	7	27
Max. 1-Hour Conc. (ppm)	0.100	0.088	0.107
Max. 8-Hour Conc. (ppm)	0.086	0.082	0.097
Nitrogen Dioxide			
1-Hour > 0.18 ppm (S)	0	0	0
Max. 1-Hour Conc. (ppm)	0.097	0.057	0.057
Inhalable Particulates (PM-10)			
24-Hour > 50 $\mu g/m^3$ (S)	na	na	Na
24-Hour > 150 $\mu g/m^3$ (F)	1.9	1.0	1.0
Max. 24-Hr. Conc. ($\mu g/m^3$)	226.5	182.5	165.2
Ultra-Fine Particulates (PM-2.5)			
24-Hour > 35 $\mu g/m^3$ (F)	1	0	0
Max. 24-Hr. Conc. ($\mu g/m^3$)	41.5	27.2	32.7

na = not available
S=State Standard
F=Federal Standard

Source:Victorville Station: Ozone, CO, NO_2, PM-10, PM-2.5
data: www.arb.ca.gov/adam/

a. *Less Than Significant Impact* – Projects such as the proposed TTM 20454, Single-Family Residential Project do not directly relate to the AQMP in that there are no specific air quality programs or regulations governing general development. Conformity with adopted plans, forecasts and programs relative to population, housing, employment and land use is the primary yardstick by which impact significance of planned growth is determined. The single-family residential development proposed is consistent with the City's General Plan, and based on the emission forecast below, the proposed project will not exceed the MDAQMD thresholds of significance. Therefore, the proposed project can be considered consistent with the AQMP and it will not conflict with or obstruct implementation of the applicable AQMP.

b. *Less Than Significant With Mitigation Incorporated* – Air pollution emissions associated with the proposed Project would occur over both a short and long-term time periods. Short-term emissions include fugitive dust from construction activities (i.e., site prep, demolition, grading, and exhaust emission) at the proposed Project site. Long-term emissions generated by future operation of the proposed Project primarily include energy consumption and trips generated by the future development.

Table III-4 and Table III-5 compare the estimated annual and daily emissions summaries from the construction and operation of the proposed housing development to the significant emission thresholds described in the Mojave Desert Air Quality Management District CEQA and Federal Conformity Guidelines, dated February 2020, summarized above. The estimated emissions of criteria pollutants are provided for each year of construction and the total operational emissions are well below the applicable thresholds. Based on these findings, the proposed project could be developed without any mitigation. However, since the Mojave Desert Air Basin is not in attainment for PM-10 and Ozone, the following mitigation measures will be implemented during construction to minimize these emissions.

Table III-4
ANNUAL EMISSIONS SUMMARY AND SIGNIFICANCE THRESHOLDS

Emissions Source	Total Emissions (tons per year)						
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	CO_2e
Year 1 Construction Emissions (2023)	0.34	2.83	3.16	0.01	0.54	0.25	719
Year 2 Construction Emissions (2024)	0.30	2.26	3.06	0.01	0.43	0.17	737
Year 3 Construction Emissions (2025)	1.06	0.52	0.80	<0.01	0.09	0.04	165
Total Operational Emissions	1.72	0.96	5.47	0.01	1.13	0.32	1,454
Significant Emissions Threshold	**25**	**25**	**100**	**25**	**15**	**12**	**100,000**

Table III-5
DAILY EMISSIONS SUMMARY AND SIGNIFICANCE THRESHOLDS

Emissions Source	Total Emissions (tons per year)						
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	CO_2e
Year 1 Construction Emissions (2023)	3.39	34.55	28.62	0.06	9.08	5.14	6,459
Year 2 Construction Emissions (2024)	2.45	17.00	24.25	0.06	3.33	1.34	6,352
Year 3 Construction Emissions (2025)	56.78	15.95	23.64	0.06	3.24	1.26	6,249
Total Operational Emissions	10.42	6.53	37.65	0.08	6.60	1.98	9,533
Significant Emissions Threshold	**137**	**137**	**548**	**137**	**82**	**65**	**548,000**

ROG: Reactive Organic Compounds, used interchangeably with Volatile Organic Compounds (VOC); NOx: oxides of nitrogen; CO: Carbon monoxide; SOx: oxides of sulfur; PM_{10}: particulate matter less than 10 micrometers in diameter; $PM_{2.5}$: particulate matter less than 2.5 micrometers in diameter; and CO_2e: Carbon dioxide equivalent

AQ-1 ***Fugitive Dust Control. The following measures shall be incorporated into Project plans and specifications for implementation:***

- ***Apply soil stabilizers or moisten inactive areas.***
- ***Water exposed surfaces to avoid visible dust leaving the construction site (at least 2-3 times/day).***
- ***Cover all stock piles with tarps at the end of each day and as needed during the construction day.***
- ***Provide water spray during loading and unloading of earthen materials.***
- ***Require the contractor to minimize in-out traffic from construction zone to the extent feasible, and enforce a speed limit of 15 MPH on site to avoid dust migration from the site.***
- ***Cover all trucks hauling dirt, sand, or loose material and require all trucks to maintain at least two feet of freeboard.***
- ***Sweep streets daily if visible soil material is carried out from the construction site.***

Similarly, ozone precursor emissions (ROG and NOx) are calculated to be below SCAQMD CEQA thresholds. However, because of the regional non-attainment for photochemical smog, the use of reasonably available control measures for diesel exhaust is recommended. Combustion emissions control options include:

AQ-2 ***<u>Exhaust Emissions Control</u>. The following measures shall be incorporated into Project plans and specifications for implementation:***

- ***Utilize off-road construction equipment that has met or exceeded the maker's recommendations for vehicle/equipment maintenance schedule.***
- ***Contactors shall utilize Tier 4 or better heavy equipment.***
- ***Enforce 5-minute idling limits for both on-road trucks and off-road equipment.***

Additionally, in order to ensure comments received from the MDAQMD are addressed adequately, the following mitigation measure has been included at their request, which will also act to further implement mitigation measures AQ-1 & AQ-2.

AQ-3 ***<u>Dust Mitigation Measures.</u> In accordance with Mojave Desert Air Quality Management District (MDAQMD) requirements and prior to commencement of earth moving activities, the Project Proponent shall: obtain MDAQMD permits for any miscellaneous process equipment that may not be exempt under District Rule 219 including, but not limited to internal combustion engines with a manufacturer's maximum continuous rating greater than 50 brake horsepower; and prepare and submit to the MDAQMD a dust control plan that describes all applicable dust control measures that will be implemented at the project. Additionally, the Project Proponent shall implement the following measures:***

- ***Signage compliant with Rule 403 Attachment B shall be erected at each project entrance not later than the commencement of construction.***
- ***Use a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes to minimize visible fugitive dust emissions. For projects with exposed sand or fines deposits (and for projects that expose such soils through earthmoving), chemical stabilization or covering with a stabilizing layer of gravel will be required to eliminate visible dust/sand from sand/fines deposits.***
- ***All perimeter fencing shall be wind fencing or the equivalent, to a minimum of four feet in height or the top of all perimeter fencing. The owner/operator shall maintain the wind fencing as needed to keep it intact and remove windblown dropout. This wind fencing requirement may be superseded by local ordinance, rule or project-specific biological mitigation prohibiting wind fencing.***
- ***All maintenance and access vehicular roads and parking areas shall be stabilized with chemical, gravel, or asphaltic pavement sufficient to eliminate visible fugitive dust from vehicular travel and wind erosion. Take actions to prevent project-related trackout onto paved surfaces, and clean any project related trackout within 24-hours. All other earthen surfaces within the project area shall be stabilized by natural or irrigated vegetation, compaction, chemical or other means sufficient to prohibit visible fugitive dust from wind erosion.***

c. *Less Than Significant Impact* – The development of the proposed project is located on an approximate 30-acre site. As previously stated, the total development is proposed to consist of 110 single-family residences. According to the Hatch Consulting report (Appendix 1), the proposed project is not considered one of the project types that MDAQMD CEQA Guidelines require to be evaluated for potentially exposing sensitive receptors to substantial pollutant concentrations. As such the project was not evaluated for Local Significance Thresholds, hazardous pollutant concentrations, or potential health risks to sensitive receptors. The proposed project does not include such uses, and thus, due to the lack of significant stationary source emissions, no long-term localized significance threshold analysis is needed.

d. *Less Than Significant Impact* – The potential for the Project to generate objectionable odors has also been considered. Land uses generally associated with odor complaints include: Agricultural uses (livestock and farming); Wastewater treatment plants; Food processing plants; Chemical plants; Composting operations; Refineries; Landfills; Dairies; and, Fiberglass molding facilities. The Project does not contain land uses typically associated with emitting objectionable odors. Potential odor sources associated with the proposed Project may result from construction equipment exhaust and the application of asphalt and architectural coatings during construction activities and the temporary storage of typical solid waste (refuse) associated with the proposed project's (long-term operational) uses. Standard construction requirements would minimize odor impacts from construction. The construction odor emissions would be temporary, short-term, and intermittent in nature and would cease upon completion of the respective phase of construction and is thus considered less than significant. It is expected that project-generated refuse would be stored in covered containers and removed at regular intervals in compliance with the City's solid waste regulations. The proposed Project would also be required to comply with MDAQMD Rule 402 to prevent occurrences of public nuisances. Therefore, odors associated with the proposed Project construction and operations would be less than significant and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

SUBSTANTIATION: The following information is provided based on a study titled *"General Biological Resources Assessment, Tentative Tract Map 20454 Victorville, San Bernardino County, California"* (BRA) prepared by RCA Associates, Inc. dated October 2021 and provided as Appendix 2a. RCA Associates, Inc. also prepared a *"Protected Plant Preservation Plan"* for the project site dated December 9, 2021, provided as Appendix 2b.

General Site Conditions

The project area is in the western portion of the Mojave Desert, on the west side of Highway 395 and north of Bear Valley Road. The topography of the project area is essentially flat. Elevation within the proposed project area is approximately 3,000 feet above mean sea level (amsl). The project site abuts existing residential development to the east and open space to the west. Habitat types within the project area include *Larrea tridentata* Shrubland Alliance (creosote bush scrub).

The site shows minimal signs of disturbance with native vegetation dominating the property. Dominant species are Joshua trees (*Yucca* brevifolia), creosote bush (*Larrea tridentata*), ephedra (*Ephedra nevadensis*), rubber rabbitbrush (*Ericameria nauseosa*), California buckwheat (Erigonum fasciculatum), kelch grass (Schismus *barbatus), and* fiddleneck (*Amsinckia tessellata).* Table 1 (Appendix A of Appendix 2a) provides a list of all plant species observed during the field investigation.

Conclusion
As part of the surveys, the property and adjoining areas were evaluated for presence of native habitats which may support populations of sensitive wildlife species. The property was also evaluated for the presence of sensitive habitats including wetlands, vernal pools, riparian habitats, and jurisdictional areas. No special status wildlife species were observed on the property; however, numerous Joshua trees, which are being considered for listing as a State threatened species, are present on the site. A comprehensive survey of the onsite Joshua trees was prepared, see Appendix 2b. No desert tortoise or burrowing owl were identified on the site, and the biologists concluded that Mohave ground squirrel are not expected to occur on the site. A potential jurisdictional channel is located in the western portion of the site, but the development will avoid this channel.

There is habitat within the project area that is suitable to support nesting birds. Most native bird species are protected from unlawful take by the Migratory Bird Treaty Act (MBTA) (Appendix A of the General Biological Resources Assessment). In December 2017, the Department of the Interior (DOI) issued a memorandum concluding that the MBTA's prohibitions on take apply "[...] only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs". Then in April 2018, the United States Fish and Wildlife Service (USFWS) issued a guidance memorandum that further clarified that the take of migratory birds or their active nests (i.e., with eggs or young) that is incidental to, and not the purpose of, an otherwise lawful activity does not constitute a violation of the MBTA.

However, the State of California provides additional protection for native bird species and their nests in the California Fish and Game Code (FGC) (Appendix A of the General Biological Resources Assessment). Bird nesting protections in the FGC include the following (Sections 3503, 3503.5, 3511, 3513 and 3800):

- Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird.
- Section 3503.5 prohibits the take, possession, or needless destruction of any nests, eggs, or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys, and falcons, among others), and Strigiformes (owls).
- Section 3511 prohibits the take or possession of Fully Protected birds.
- Section 3513 prohibits the take or possession of any migratory nongame bird or part thereof, as designated in the MBTA. To avoid violation of the take provisions, it is generally required that project-related disturbance at active nesting territories be reduced or eliminated during the nesting cycle.
- Section 3800 prohibits the take of any non-game bird (i.e., bird that is naturally occurring in California that is not a gamebird, migratory game bird, or fully protected bird).

The project could result in direct impacts to nesting birds potentially occurring within the project site. In general, impacts to all bird species (common and special status) can be avoided by conducting work outside of the nesting season, which is generally February 1st through August 31st. However, if all work cannot be conducted outside of nesting season, mitigation is required to minimize impacts.

Impact Analysis

a. *Less Than Significant With Mitigation Incorporated* – Implementation of the project has a potential for a significant adverse effect, either directly or through habitat modifications, on one species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW and USFWS. The project site is vacant containing various types of native and non-native vegetation. The Biological Resources Assessment (BRA) provided as Appendix 2a to this Initial Study determined that the project site contains suitable habitat for burrowing owl and desert tortoise, and the site was determined to be unlikely to support Mojave ground squirrel; however, no State- and/or federally listed threatened or endangered species, or other sensitive species were observed on site during the field survey. Thus, for purposes of this analysis, it is assumed that temporary ground disturbance within the project site may have a potential to adversely impact (a State and federally-listed of special concern [SSC]), and desert tortoises (a State and federally-listed threatened species). As such, the following mitigation measures shall be implemented to prevent any impacts to burrowing owl, desert tortoise, and Mohave ground squirrel:

BIO-1 ***A qualified biologist shall develop a Worker Education Awareness Program (WEAP) that would include information on general and special status species within the project area, identification of these species and their habitats, techniques being implemented during construction to avoid impacts to species, consequences of killing or injuring an individual of a listed species, and reporting procedures when encountering listed or sensitive species. All construction crews, foremen, and other project personnel potentially working on site should attend this education program prior to the first day of work.***

BIO-2 ***Burrowing Owl would be included as one of the species covered in the WEAP that all construction crews, foremen, and other project personnel potentially working on site should attend prior to the first day of work.***

Preconstruction presence/absence surveys for burrowing owl shall be conducted no less than 14 days prior to any onsite ground disturbing activity by a qualified biologist, including prior to each phase of new ground disturbance. The burrowing owl surveys shall be conducted pursuant to the recommendations and guidelines established by the California Department of Fish and Wildlife in the "California Department of Fish and Wildlife 2012 Staff Report on Burrowing Owl Mitigation." In the event this species is not identified within the project limits, no further mitigation is required, and a letter shall be prepared by the qualified biologist documenting the results of the survey. The letter shall be submitted to CDFW prior to commencement of project activities. If during the preconstruction survey, the burrowing owl is found to occupy the site, Mitigation Measure BIO-3 shall be required.

BIO-3 ***If burrowing owls are identified during the survey period, the Developer, in conjunction with the shall take the following actions to offset impacts prior to ground disturbance:***

The Developer, in conjunction with the City shall notify CDFW within three business days of determining that a burrowing owl is occupying the site to discuss the observed location, activities and behavior of the burrowing owl(s) and appropriate avoidance and minimization measures.

Active nests within the areas scheduled for disturbance or degradation shall be avoided until fledging has occurred, as confirmed by a qualified biologist. Following fledging, owls may be passively relocated by a qualified biologist, as described below.

If impacts on occupied burrows are unavoidable, onsite passive relocation techniques may be used if approved by the CDFW to encourage owls to move to alternative burrows provided by the Developer outside of the impact area.

If relocation of the owls is approved for the site by CDFW, CDFW shall require the City to hire a qualified biologist to prepare a plan for relocating the owls to a suitable site and conduct an impact assessment. A qualified biologist shall prepare and submit a passive relocation program in accordance with Appendix E (i.e., Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans) of the 2012 Staff Report on Burrowing Owl Mitigation (CDFG 2012) to the CDFW for review/approval prior to the commencement of disturbance activities onsite.

The relocation plan must include all of the following and as indicated in Appendix E:

- ***The location of the nest and owls proposed for relocation.***
- ***The location of the proposed relocation site.***
- ***The number of owls involved and the time of year when the relocation is proposed to take place.***
- ***The name and credentials of the biologist who will be retained to supervise the relocation.***
- ***The proposed method of capture and transport for the owls to the new site.***
- ***A description of site preparation at the relocation site (e.g., enhancement of existing burrows, creation of artificial burrows, one-time or long-term vegetation control).***

The Developer shall conduct an impact assessment, in accordance with the Staff Report on Burrowing Owl Mitigation prior to commencing project activities to determine appropriate mitigation, including the acquisition and conservation of occupied replacement habitat at no less than a 2:1 ratio.

Prior to passive relocation, suitable replacement burrows site(s) shall be provided at a ratio of 2:1 and permanent conservation and management of burrowing owl habitat such that the habitat acreage, number of burrows and burrowing owl impacts are replaced consistent with the Staff Report on Burrowing Owl Mitigation including its Appendix A within designated adjacent conserved lands identified through coordination with CDFW and the City. A qualified biologist shall confirm the natural or artificial burrows on the conservation lands are suitable for use by the owls. Monitoring and management of the replacement burrow site(s) shall be conducted and a reporting plan shall be prepared. The objective shall be to manage the replacement burrow sites for the benefit of burrowing owls (e.g., minimizing weed cover), with the specific goal of maintaining the functionality of the burrows for a minimum of 2 years.

A final letter report shall be prepared by the qualified biologist documenting the results of the passive relocation. The letter shall be submitted to CDFW.

BIO-4 Although no desert tortoises were detected during the site surveys, habitat within the project footprint is considered marginally suitable for this species. Therefore, a qualified biologist shall conduct a pre-construction clearance survey no more than 14 days prior to initiating construction in accordance with U.S. Fish and Wildlife Service's (2019) survey protocol; if the biologist detects a desert tortoise, the biologist or applicant will contact the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife immediately. Regardless of the survey results, a biological monitor should be present at the site during all clearing and grubbing activities above grade. The biologist/monitor should remain on-call during construction activities to respond to a circumstance where a desert tortoise wanders into the construction area.

The Joshua tree is a California State Candidate for listing as threatened or endangered. As a candidate species, the Joshua Tree is now fully protected and cannot be trimmed, removed if fallen, removed, or relocated without an Incidental Take Permit (ITP) from the California Department of Fish and Wildlife. Additionally, a minimum of 40' buffer from the outside of the canopy would need to be avoided. As part of the candidacy process, three interim regulations under Section 2084 of the Fish and Game Code were adopted allowing for permits to be issued by the California Department of Fish and Wildlife for incidental take (removal) of western Joshua trees during its year-long candidacy period for listing under CESA. Appendix 2b contains a Protected Plant Preservation Plan which indicates that the project site contains 121 Joshua Trees, of which 18 are identified as being suitable for transplanting. As such, the following mitigation measure shall be implemented to avoid potential impacts to Joshua Tree.

BIO-5 ***Prior to construction a preconstruction survey shall be conducted by a qualified biologist to verify the location of any Joshua Trees in the site. The biologist shall prepare a report that shall be submitted to the County and the California Department of Fish and Wildlife (CDFW). This report shall determine whether the sole Joshua Tree on the property can be avoided, relocated onsite or mitigated under the WJTCA. The report shall include the findings and/or avoidance/mitigation recommendations in conformance with the WJTCA after consultation with the CDFW. The site developer shall fund the WJTCA mitigation recommendations to fully mitigate loss of the sole Joshua Tree located on the property.***

Therefore, with implementation of the above mitigation measures, there is a less than significant potential for implementation of this project to have a significant adverse effect, on species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.

b. *Less Than Significant With Mitigation Incorporated* – Implementation of the proposed project has a potential to have an adverse effect on the streambed identified on the west side of the project. No riparian or wetland resources were identified on the project site. However, the applicant has indicated that the proposed project will avoid disturbances within the streambed. At a minimum the following mitigation measures shall be implemented to ensure that the project does not disturb the streambed during construction.

BIO-6 ***The development shall not disturb any streambed jurisdictional area during construction. The streambed boundary shall be identified in the field prior to construction and the construction contract shall include prohibitions on any construction activities being carried out in the streambed channel. City field inspectors shall verify this measure is being implemented during site construction.***

BIO-7 ***Prior to construction and issuance of any grading permit within the channel, the applicant/developer shall obtain written correspondence from the California Department of Fish and Wildlife (CDFW) stating that notification under section 1602 of the Fish and Game Code is not required for the Project, or the applicant/developer shall obtain a CDFW-executed Lake and Streambed Alteration Agreement, authorizing impacts to Fish and Game Code section 1602 resources associated with the Project.***

Though the project footprint contains suitable habitat for several sensitive species, it does not contain any known riparian habitat or any other sensitive natural community identified by any agency. None of the plants, animals or habitat observed on the site (refer to Appendix 2a) are considered to be sensitive natural communities and none have been identified as part of the BRA. Therefore, there is a less than significant potential for implementation of this project to have an adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.

c. *No Impact* – According to the data gathered by RCA Associates in the BRA, no federally protected wetlands occur within the project footprint. RCA Associates assessed the project APE for the presence of any state and/or federal jurisdictional waters. The result of the jurisdictional waters assessment is that there are no wetlands potentially subject to regulation by the USACE under Section 404 of the CWA, the RWQCB under Section 401 of the CWA and/or Porter Cologne Water Quality Control Act, or the CDFW under Section 1602 of the FGC, respectively. Therefore, the project will not impact any wetlands. Therefore, implementation of the proposed project will have no potential to impact any federally protected wetlands through direct removal, filling, hydrological interruption, or other means. No mitigation is required.

d. *Less Than Significant With Mitigation Incorporated* – Based on the field survey of the project site, the project will not substantially interfere with the movement of any native resident or migratory species or with established native or migratory wildlife corridors, or impede the use of native nursery sites. However, the State does protect all migratory and nesting native birds. Potential impacts to nesting or migratory birds have been identified in Appendix 2a and mitigation measure **BIO-8** has been identified to reduce nesting bird impacts to a level of less than significant. To prevent interfering with native bird nesting, the following mitigation measure shall be implemented.

BIO-8 ***Nesting bird surveys shall be conducted by a qualified avian biologist no more than three (3) days prior to vegetation clearing or ground disturbance activities. Preconstruction surveys shall focus on both direct and indirect evidence of nesting, including nest locations and nesting behavior. The qualified avian biologist will make every effort to avoid potential nest predation as a result of survey and monitoring efforts. If active nests are found during the preconstruction nesting bird surveys, a Nesting Bird Plan (NBP) shall be prepared and implemented by the qualified avian biologist. At a minimum, the NBP shall include guidelines for addressing active nests, establishing buffers, ongoing monitoring, establishment of avoidance and minimization measures, and reporting. The size and location of all buffer zones, if required, shall be based on the nesting species, individual/pair's behavior, nesting stage, nest location, its sensitivity to disturbance, and intensity and duration of the disturbance activity. To avoid impacts to nesting birds, any grubbing or vegetation removal should occur outside peak breeding season (typically February 1 through September 1).***

Thus, with implementation of the above measure, any effects on the use of wildlife nursery sites can be reduced to a less than significant impact.

e. *Less Than Significant With Mitigation Incorporated* – Based on the field survey, there is one species that is specifically protected by a local policy or ordinance within the project site, the Joshua Tree. In accordance with City requirements, RCA Associates prepared a Protected Plant Preservation Plan that will be implemented in accordance with mitigation measure **BIO-5**. With implementation of this mitigation measure, the City's local policy will be fulfilled.

f. *No Impact* – Please refer to the discussion under response IV(a) above. The Biological Resources Assessment provided as Appendix 2a concluded that the project is not located in an area within a Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan, and implementation of the project will therefore not result in a significant impact to any such plans.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

SUBSTANTIATION: The information provided in this section of the Initial Study is abstracted from the following report: *"A Phase I Cultural Resource Survey, TTM 20454, Southwest Corner of Mesa View Drive and Nyack Road City of Victorville, California"* prepared by Hudlow Cultural Resource Associates dated December 2021. This Report is provided as Appendix 3 of this Initial Study.

Background

The Phase I Cultural Resource Survey consisted of a pedestrian survey of the site and a cultural resource record search. No cultural resources were identified; no further work is required. If human remains or potential human remains are observed during construction, work in the vicinity of the remains will cease, and they will be treated in accordance with the provisions of State Health and Safety Code Section 7050.5.

Based on the results of this study, no further cultural resources investigation is recommended for the project unless development plans undergo such changes as to include areas not covered by this study. However, if buried cultural materials are encountered during any earth-moving operations associated with the project, all work within 50 feet of the discovery should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

Impact Analysis

a&b. *Less Than Significant With Mitigation Incorporated* – CEQA establishes that "a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment" (PRC §21084.1). "Substantial adverse change," according to PRC §5020.1(q), "means demolition, destruction, relocation, or alteration such that the significance of a historical resource would be impaired."

Per the above discussion and definition, no archaeological sites or isolates were recorded within the project boundaries; thus, none of them requires further consideration during this study. In light of this information and pursuant to PRC §21084.1, the following conclusions have been reached for the project:

- No historical resources within or adjacent to the project area have any potential to be disturbed as they are not within the proposed area in which the facilities will be constructed and developed, and thus, the project as it is currently proposed will not cause a substantial adverse change to any known historical resources.
- No further cultural resources investigation is necessary for the proposed project unless construction plans undergo such changes as to include areas not covered by this study.

However, since earth moving activities are required, the following mitigation measure will ensure that impacts to any buried cultural materials that may be discovered during earth moving activities is less than significant:

CUL-1 ***Should any cultural resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection shall be performed immediately by a qualified archaeologist. Responsibility for making this determination shall be with the City's onsite inspector. The archaeological professional shall assess the find, determine its significance, and make recommendations for appropriate mitigation measures within the guidelines of the California Environmental Quality Act.***

Additionally, as a result of Native American tribal noticing required per Public Resources Code Section 21080.3.1, the City entered into consultation with the Yuhaaviatam of San Manuel Nation (formerly known as the San Manuel Band of Mission Indians) regarding the subject project. While the Yuhaaviatam of San Manuel Nation noted that due to the nature and location of the proposed project, and given the their present state of knowledge, they not have any concerns with the project's implementation, as planned, the following mitigation measures were requested in order to ensure any impacts to potential resources are addressed accordingly.

CUL-2 ***In the event that cultural resources are discovered during project activities, all work in the immediate vicinity of the find (within a 60-foot buffer) shall cease and a qualified archaeologist meeting Secretary of Interior standards shall be hired to assess the find. Work on the other portions of the project outside of the buffered area may continue during this assessment period. Additionally, the San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed within TCR-1, regarding any pre-contact and/or historic-era finds and be provided information after the archaeologist makes his/her initial assessment of the nature of the find, so as to provide Tribal input with regards to significance and treatment.***

CUL-3 ***If significant pre-contact and/or historic-era cultural resources, as defined by CEQA (as amended, 2015), are discovered and avoidance cannot be ensured, the archaeologist shall develop a Monitoring and Treatment Plan, the drafts of which shall be provided to SMBMI for review and comment, as detailed within TCR-1. The archaeologist shall monitor the remainder of the project and implement the Plan accordingly.***

With the above mitigation incorporation, the potential for impacts to cultural resources will be reduced to a less than significant level. No additional mitigation is required.

c. *Less Than Significant Impact With Mitigation Incorporated* – As noted in the discussion above, no available information suggests that human remains may occur within the Area of Potential Effect (APE) and the potential for such an occurrence is considered very low. Human remains discovered during the project will need to be treated in accordance with the provisions of HSC §7050.5 and PRC §5097.98, which is mandatory. State law (Section 7050.5 of the Health and Safety Code) as well as local laws requires that the Police Department, County Sheriff and Coroner's Office receive notification if human remains are encountered. Compliance with these laws is considered adequate mitigation for potential impacts, and as such the potential for impact to discovery and treatment of human remains would be less than significant level. Therefore, mitigation measure CUL-4 has been included accordingly as noted above.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VI. ENERGY: Would the project:				
a) Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operations?	☐	☒	☐	☐
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☒	☐	☐

SUBSTANTIATION

a. *Less Than Significant With Mitigation Incorporated* – During construction, the proposed project will utilize construction equipment that is CARB approved, minimizing emissions generated and electricity required to the extent feasible (as outlined under Section III, Air Quality, above). As stated in Section III, Air Quality, the construction of the proposed TTM 20454 Project would require mitigation measures to minimize emissions impacts from construction equipment use (refer to MM **AQ-1, AQ-2 and AQ-3**). These mitigation measures also apply to energy resources as they require equipment not in use for 5 minutes to be turned off, and for electrical construction equipment to be used where available. These measures would prevent a significant impact during construction due to wasteful, inefficient, or unnecessary consumption of energy resources, and would also conform to the CARB regulations regarding energy efficiency.

This project proposes to develop a 108-Lot Single-Family Residential Subdivision and energy consumption encompasses many different activities. For example, construction can include the following activities: delivery of equipment and material to a site from some location (note it also requires energy to manufacture the equipment and material, such as harvesting, cutting and delivering wood from its source); employee trips to work, possibly offsite for lunch (or a visit by a catering truck), travel home, and occasionally leaving a site for an appointment or checking another job; use of equipment onsite (electric or fuel); and sometimes demolition and disposal of construction waste. To minimize energy costs of construction debris management, mitigation has been established to require diversion of all material capable of being recycled. As stated above, energy consumption by equipment will be reduced by requiring shutdowns when equipment is not in use after five minutes and ensuring equipment is being operated within proper operating parameters (tune-ups) to minimize emissions and fuel consumption. These requirements are consistent with State and regional rules and regulations. Under the construction scenario outlined above, the proposed project will not result in wasteful, inefficient, or unnecessary energy consumption during construction.

The proposed project will be supplied electricity by Southern California Edison (SCE) through the power distribution system located adjacent to the site. SCE will be able to supply sufficient electricity. Natural gas would be supplied by Southern California Gas. The site will connect to the existing natural gas line adjacent to the project site. As such, the amount of electricity and natural gas required by the project is considered modest. Furthermore, as identified under Section III, Air Quality, above the proposed project will further encourage energy efficiency, including being plumbed for solar energy, which could minimize operational energy use even further than through the mandatory energy efficiency requirements discussed below. However, the proposed structures must be constructed in conformance with a variety of existing energy efficiency regulatory requirements or guidelines including:

- Compliance with Title Chapter 6 of the California Code of Regulations with respect to energy efficiency standards for new building construction.

- Both federally and non-federally regulated appliances shall abide by the efficiency standards of Title 20, Section 1601 et seq. of the California Code of Regulations.
- Compliance California Green Building Standards Code, AKA the CALGreen Code (Title 24, Part 11), which became effective on January 1, 2017. The purpose of the CALGreen Code is to improve public health, safety, and general welfare by enhancing the design and construction of building through the use of building concepts encouraging sustainable construction practices.
- The provisions of the CALGreen code apply to the planning, design, operation, construction, use, and occupancy of every newly construction building.
- Compliance The Building Energy Efficiency Standards (CBSC) would ensure that the building energy use associated with the proposed project would not be wasteful or unnecessary.
- Compliance with Indoor Water use consumption reduced through the maximum fixture water use rates.
- Compliance with diversion of construction and demolition materials from landfills.
- Compliance with Victorville Municipal Code Chapter 13.60 - Water Efficient Landscaping.
- Compliance with Victorville Municipal Code Title 16, Article 5 – Building and Fire Regulations.
- Compliance with AQMD Mandatory use of low-pollutant emitting finish materials.
- Compliance with AQMD Rules 431.1 and 431.2 to reduce the release of undesirable emissions.
- Compliance with diesel exhaust emissions from diesel vehicles and off-road diesel vehicle/equipment operations.

Compliance with these regulatory requirements for operational energy use and construction energy use would not be wasteful or unnecessary use of energy. Further, SCE is presently in compliance with State renewable energy supply requirements and SCE will supply electricity to the project. Under the operational scenario for the proposed project, the proposed project will not result in wasteful, inefficient, or unnecessary energy consumption that could result in a significant adverse impact to energy issues based on compliance with the referenced laws, regulations and guidelines. No mitigation beyond those identified above are required.

b. *Less Than Significant With Mitigation Incorporated* – Based on the analysis in the preceding discussion, the proposed project will not conflict with current State energy efficiency or electricity supply requirements or any local plans or programs for renewable energy or energy efficiency requirements. The City of Victorville has adopted State energy efficiency standards as part of its Municipal Code. No mitigation beyond those identified above are required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VII. GEOLOGY AND SOILS: Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
(ii) Strong seismic ground shaking?	☐	☐	☒	☐
(iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
(iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite land-slide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

SUBSTANTIATION: Some of the information provided in this Section is abstracted from the following report: *"Updated Geotechnical Report for Proposed Single-Family Residential Development Trat No. 17486 City of Victorville, San Bernardino County"* prepared by GeoTek, Inc. dated March 30, 2016. This report is provided as Appendix 4 to this Initial Study.

a. i. Ground Rupture

No Impact – According to the regulatory map obtained from the California Department of Conservation (DOC) showing Alquist-Priolo Earthquake Fault Zones and other seismic hazards (Figure VII-1), the proposed project site is not located in an area that has been mapped as containing geologic hazards, and therefore is not located in an Alquist Priolo Earthquake Fault Zone. The nearest fault zones are about 17 miles to the North (the Helendale Fault Zone) and approximately 18 miles to the south within the San Bernardino Mountains (the San Andreas Fault Zone). As such, the project site and general area do not contain any known faults, active or inactive. Therefore, no potential exists for the proposed project to experience any fault rupture along a delineated active fault.

ii. Strong Seismic Ground Shaking

Less Than Significant Impact – The proposed project site, as with most of southern California, is in a seismically active area, and will most likely be subject to some groundshaking during the life of the occupancy of the TTM 20454 Project. According to both the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlay map (Figure VII-2) and the DOC map provided above under issue (a[i], Figure VII-1), the proposed project is not located in close proximity to any delineated active faults. However, due to the proximity of known active faults, the project site and area can be exposed to significant ground shaking during major earthquakes on either of regional faults. As a result, and like all other development projects in the City and throughout the Southern California Region, the proposed project will be required to comply with all applicable seismic design standards contained in the 2019 California Building Code (CBC), including Section 1613 Earthquake Loads. Compliance with the CBC will ensure that structural integrity will be maintained in the event of an earthquake. Therefore, impacts associated with strong ground shaking will be less than significant without mitigation.

iii. Seismic-Related Ground Failure Including Liquefaction

No Impact – According to both the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlay map (Figure VII-2) and the DOC map provided above under issue (a[i], Figure VII-1), the proposed project does not contain land with any liquefaction susceptibility. Therefore, it is not anticipated that the proposed project would be susceptible to seismic-related ground failure, including liquefaction. No impacts are anticipated and no mitigation is required.

iv. Landslides

No Impact – According to the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlay map (Figure VII-2), the project site is not located in an area with any known earthquake induced landslide hazards. Based on a site reconnaissance the project site is essentially flat and the surrounding topography is essentially flat. Therefore, the project will not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides. No impacts under this issue are anticipated and no mitigation is required.

b. *Less Than Significant With Mitigation Incorporated* – The project site is vacant with native vegetation coverage; the site has been historically vacant and undisturbed. City grading standards, best management practices and the Storm Water Pollution Prevention Plan (SWPPP) and Water Quality Management Plan (WQMP) are required to control the potentially significant erosion hazards. The topography is generally flat. It is anticipated that any required soil excavation will be reused on site, i.e., the site will balance for grading purposes. During project construction when soils are exposed temporary soil erosion could occur, which could be exacerbated by rainfall. Project grading would be managed through the preparation and implementation of a SWPPP, that will be required to implement best management practices to achieve concurrent water quality controls after construction is completed and the TTM 20454 Project is in operation. The following mitigation measures or equivalent BMPs shall be implemented to address these issues:

GEO-1 Stored backfill material shall be covered with water resistant material during periods of heavy precipitation to reduce the potential for rainfall erosion of stored backfill material. Where covering is not possible, measures such as the use of straw bales or sand bags shall be used to capture and hold eroded material on the project site for future cleanup such that erosion does not occur.

GEO-2 ***Excavated areas shall be backfilled and compacted such that erosion does not occur. Paved areas disturbed by this project shall be repaved in such a manner that roadways and other disturbed areas are returned to the pre-project conditions or better.***

GEO-3 ***All exposed, disturbed soil (trenches, stored backfill, etc.) will be sprayed with water or soil binders twice a day or more frequently if fugitive dust is observed migrating from disturbed areas.***

GEO-4 ***The length of trench which can be left open at any given time will be limited to that needed to reasonably perform construction activities. This will serve to reduce the amount of backfill stored onsite at any given time.***

Implementation of these measures and implementation of the SWPPP and associated BMPs will ensure that construction activities and long-term operations will not generate surface runoff that could cause significant erosion or loss of topsoil.

c. *Less Than Significant Impact* – Refer to the discussion under VII(a) above. Potential instability associated with slope stability and liquefaction related to the project was determined to be negligible, as the project is not identified by the DOC map provided as (Figure VII-1) and by the San Bernardino County General Plan, General Land Use Plan with Geologic Overlays (Figure VII-2) as being located within a liquefaction or landslide hazard zone. The potential for shrinkage or subsidence at the site will be limited due to the coarse soils at the site. The risk for subsidence at the site is considered low because the soils within the project site do not contain substantial nutrients or organic matter, and are not of a clay type, and as such are not particularly susceptible to subsidence. Given that the project site will be graded, filled, and compacted in accordance with the City's grading standards, and that no known geological hazards exist within the project site, the potential for significant soil instability is minimal. Therefore, the potential for the project to be located on a geologic unit or soil that is unstable or for the project to cause the soils to become unstable is considered less than significant. No mitigation is required.

d. *Less Than Significant Impact* – According to the United States Department of Agriculture (USDA) Web Soil Survey map prepared for the project site (Appendix 5), the proposed project site is located on fine sand, 2 to 5 Percent Slopes. Expansive soils are generally of a clay type soil, not a sandy soil such as the fine sand series soils that underlay the project site. Compliance with the 2019 California Building Code (CBC) is sufficient to ensure that the proposed structures will conform to the underlying soils and thereby be constructed safely as habitable structures. Thus, based on the absence of clay-type soils on site, the proposed project would have a less than significant potential to be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

e. *No Impact* – The project does not propose any septic tanks or alternative wastewater disposal systems. Therefore, determining if the project site soils are capable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater does not apply. No impacts are anticipated. No mitigation is required.

f. *Less Than Significant With Mitigation Incorporated* – The potential for discovering paleontological resources during development of the project is considered low based on the young alluvial sediments underlying the project site. No unique geologic features are known or suspected to occur on or beneath the site. However, because paleontological resources are located beneath the surface and can only be discovered as a result of ground disturbance activities, the following measure shall be implemented:

GEO-5 Should any paleontological resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection should be performed immediately by a qualified paleontologist. Responsibility for making this determination shall be the project's qualified paleontologist as approved by the City Zoning Administrator. The paleontological professional shall assess the find, determine its significance, and determine appropriate mitigation measures within the guidelines of the California Environmental Quality Act that shall be implemented to minimize any impacts to a paleontological resource.

With incorporation of this contingency mitigation, the potential for impact to paleontological resources will be reduces to a less than significant level. No additional mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VIII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☒	☐	☐

SUBSTANTIATION: The background Greenhouse Gas data is abstracted from the following report: "Air Quality and GHG Impact Analysis, American Organics Victor Valley Regional Composting Facility Expansion Project, Victorville, California" prepared by Giroux & Associates dated January 24, 2020. The air quality impact forecast is abstracted from this study: *"Air Quality Study – Tentative Tract Map (TTM) 20454 Housing Development – Mesa View Drive and Nyack Road, Victorville, CA"* prepared by M.S. Hatch Consulting, LLC dated October 25, 2021. The Hatch Consulting study can be found in Appendix 1 to this document.

<u>Background</u>

The GHG emissions that will be generated by the proposed project during construction and operation are summarized in Tables III-4 and III-5. The estimated emissions of greenhouse gases for each year of construction and total annual operational emissions are well below the applicable MDAQMD significance thresholds. Refer to Tables III-4 and III-5.

Global Climate Change (GCC) is defined as the change in average meteorological conditions on the earth with respect to temperature, precipitation, and storms. Many scientists believe that the climate shift taking place since the industrial revolution (1900) is occurring at a quicker rate and magnitude than in the past. Scientific evidence suggests that GCC is the result of increased concentrations of greenhouse gases in the earth's atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases. Many scientists believe that this increased rate of climate change is the result of greenhouse gases resulting from human activity and industrialization over the past 200 years.

An individual project like the project evaluated in this GHGA cannot generate enough greenhouse gas emissions to effect a discernible change in global climate. However, the project may participate in the potential for GCC by its incremental (cumulative) contribution of greenhouse gasses combined with the cumulative increase of all other sources of greenhouse gases, which when taken together constitute potential influences on GCC.

AB 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other things, it is designed to maintain California's reputation as a "national and international leader on energy conservation and environmental stewardship." It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Require the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requires immediate "early action" control programs on the most readily controlled GHG sources.
- Mandates that by 2020, California's GHG emissions be reduced to 1990 levels.
- Forces an overall reduction of GHG gases in California by 25-40%, from business as usual, to be achieved by 2020.

- Must complement efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Maximum GHG reductions are expected to derive from increased vehicle fuel efficiency, from greater use of renewable energy and from increased structural energy efficiency. Additionally, through the California Climate Action Registry (CCAR now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e., company owned) and indirect sources (i.e., not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

a. *Less Than Significant Impact* – The proposed project will emit slightly more than 10,000 tons of GHG per year. Compared to the significance thresholds, this volume of GHG emissions is about 10% of the threshold. No potential for significant GHG emissions exists and no mitigation is required.

b. *Less Than Significant Impact With Mitigation Incorporated* – Based on the data presented in Appendix 1, the proposed project will not conflict with any applicable plan, policy or regulation adopted for the purposed of reducing the emissions of greenhouse gases.

Additionally, the City of Victorville has adopted a Climate Action Plan (CAP) to demonstrate how the City will reduce its greenhouse gas (GHG) emissions in compliance with AB32. To determine consistency with the CAP, the City of Victorville provided Screening Tables to aid in measuring the reduction of GHG emissions attributable to certain design and construction measures incorporated into development projects. The CAP establishes categories of GHG reduction measures to reduce GHG emissions generated by development projects. Inasmuch as the City's CAP includes a GHG screening table to ensure compliance with the CAP, the following mitigation measures have been included in order to ensure compliance with future versions of the City's GHG Screening Table and AB32

GHG-1 Prior to the recordation of the final map, the applicant/developer shall complete a revised Greenhouse Gas Emissions Screening Table in accordance with the City's adopted version of the San Bernardino County Regional Greenhouse Gas Reduction Plan 2021, while achieving the minimum number of points necessary to comply with the City of Victorville Greenhouse Gas reductions goals.

GHG-2 To the extent feasible, the City of Victorville Planning Department shall verify incorporation of the identified Screening Table Measures within the Project building plans/site designs and/or verify compliance with an updated version of the City's Greenhouse Gas Screening Table prior to the issuance of building permit(s).

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IX. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☒	☐	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☒	☐

SUBSTANTIATION

a&b. *Less Than Significant With Mitigation Incorporated* – The project may create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials; or may create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. During construction there is a potential for accidental release of petroleum products in sufficient quantity to pose a significant hazard to people and the environment. The following mitigation measure will be incorporated into the Storm Water Pollution Prevent Plan (SWPPP) prepared for the project and implementation of this measure can reduce this potential hazard to a less than significant level.

HAZ-1 All accidental spills or discharge of hazardous material during construction activities shall be reported to the Certified Unified Program Agency and shall be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately a licensed disposal or treatment facility. This measure shall be incorporated into the SWPPP prepared for the proposed project. Prior to accepting the site as

remediated, the area contaminated shall be tested to verify that any residual concentrations meet the standard for future residential or public use of the site.

The project consists of 108 single-family residences and associated infrastructure; occupancy of the site would not involve the use of a substantial amount of hazardous materials. Household cleaning supplies would be used in small quantities to support the single-family residences. Compliance with all Federal, State, and local regulations governing the storage and use of hazardous materials is required, and will ensure that the project operates in a manner that poses no substantial hazards to the public or the environment. No further mitigation is required.

c. *Less Than Significant With Mitigation Incorporated Impact* – The project site is not located within one-quarter mile from a public school. The nearest school is Mesa Linda Middle School located about one-mile to the east. Regardless, as stated above under issues IX(a) and (b), above, the proposed project is not of a type that would handle or emit hazardous materials such that the students and faculty of the nearby school would be adversely impacted. As stated above, compliance with all Federal, State, and local regulations governing the storage and use of hazardous materials is required, and will ensure that the project operates in a manner that poses no substantial hazards to the public or the environment. Furthermore, during construction, mitigation measure (MM) **HAZ-1** above would ensure that any accidental spills of hazardous materials are remediated, posing no significant threat to students and faculty members of any school. Based on this information, implementation of the project will have a less than significant potential to emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

d. *No Impact* – The project site consists of vacant land containing native and non-native vegetation, consistent with the remnants of the rural desert character that can be found throughout undeveloped parcels within and around the City of Victorville. The project site is surrounded by existing development in two directions with substantial undeveloped land to the south and west of the project site. The project will not be located on a site that is included on a list of hazardous materials sites that are currently under remediation. According to the California State Water Board's GeoTracker website (consistent with Government Code Section 65962.5), which provides information regarding Leaking Underground Storage Tanks (LUST) and other cleanup program sites, there are no open clean-up sites within 2,500 feet of the project site (Figure IX-1).

e. *No Impact* – The project site is not located within two miles of an airport or private airstrip. The closest airport is the Southern California Logistics Airport (SCLA), which is located approximately three miles northeast of the project site; the Project is not located within the SCLA Airport Planning Area and Airport Safety Review Area, as shown on Figure IX-2, and Figure IX-3, which depicts the Airport Safety Review Area by the San Bernardino County Land Use Plan General Plan Hazard Overlays. Therefore, no impacts are anticipated under this issue and no mitigation is required.

f. *Less Than Significant With Mitigation Implementation* – The City of Victorville General Plan Emergency/Public Safety Facilities Location Map (Figure IX-4), indicates that, in the vicinity of the project, Highway 395 is delineated as emergency response/evacuation routes. The two adjacent roadways, Mesa Linda and Nyack, do not function as evacuation routes; therefore, the proposed project's offsite improvements to these two roadways will not have a direct adverse impact to emergency response/evacuation routes. Access to the site will be provided through new entryways along Mesa Linda and Nyack. The proposed onsite parking and circulation plans will be reviewed by the local Fire Department and Police Department to ensure that the project's ingress/egress are adequate for accommodating emergency vehicles. Because the proposed project will require construction within adjacent roadways, a limited potential to interfere with emergency response or an evacuation plan can occur during construction. Mitigation to address traffic disruption and emergency access issues are included in the Transportation Section. Therefore, with the implementation of mitigation identified in the Transportation Section of this document, there is a less than significant potential for the development of the project to physically interfere with any adopted emergency response plans, or evacuation plans. No mitigation is required.

g. *Less Than Significant Impact* – According to the San Bernardino County Land Use Plan General Plan Hazard Overlays (Figure IX-3), there are no fire safety overlay districts delineated by the County. Furthermore, according to CALFIRE, there are no fire hazard zones within the City of Victorville that are of state responsibility (Figure IX-5); there are also no fire hazard zones within a local responsibility area.[1] The proposed project is located in a flat urban area with residential development occurring in the surrounding area, and with native desert vegetation within and surrounding the site to the south and west. This is an area with very little fuel load in the surrounding area that could be susceptible to wildfires. Therefore, because the proposed project is located outside of the area identified as a high fire hazard zone by CALFIRE, the proposed project has a less than significant potential to expose people or structures to a significant risk of loss, injury or death involving wildland fires. No mitigation is required.

[1] https://gis.data.ca.gov/datasets/CALFIRE-Forestry::fhsz-in-lra?geometry=-117.868%2C34.263%2C-116.833%2C34.462

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
X. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	☐	☒	☐	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
(i) result in substantial erosion or siltation onsite or offsite?	☐	☐	☒	☐
(ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?	☐	☐	☒	☐
(iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?; or,	☐	☒	☐	☐
(iv) impede or redirect flood flows?	☐	☐	☒	☐
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☒	☐	☐
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

SUBSTANTIATION: Some of the information provided in this Section is abstracted from the following report: *"Mojave River Watershed Water Quality Management Plan For: Former Tract 17486"* prepared by Ludwig Engineering Associates, Inc. dated September 29, 2021. This report is provided as Appendix 6 to this Initial Study.

a. *Less Than Significant With Mitigation Incorporated* – The proposed project is located within a developed area within the Mojave River watershed, which is within the Lahontan Regional Water Quality Control Board's (RWQCB) jurisdiction. The City of Victorville Water District (VWD) is responsible for the water supply to the City. VWD currently pumps potable water supplies from groundwater in Mojave Groundwater Basin and purchases water from MWA's Regional Recharge and Recovery Project, when available. VWD is required to meet potable water quality requirements of the Division of Drinking Water, State Water Resources Control Board (SWRCB), as well as the California Department of Public Health.

Typically, the three main sources of potential violation of water quality standards or waste discharge requirements are from generation of municipal wastewater, stormwater runoff, and potential discharges of pollutants, such as accidental spills. Municipal wastewater at this location is delivered to the SCLA Industrial Wastewater Treatment Plant (IWWTP) through the City's sewer collection system that will deliver the wastewater for treatment to this facility. The IWWTP currently treats about 1.9 million gallons per day (mgd) and meets the waste discharge requirements imposed by the RWQCB. To address stormwater and accidental spills within this environment, any new project must ensure that site development implements a Storm Water Pollution Prevention Plan (SWPPP) and a National Pollutant Discharge Elimination System (NPDES) Water Quality Management Plan (WQMP) to control potential sources of water pollution that could violate any standards or discharge requirements during construction (short term) and future occupancy to ensure that project-related after development surface runoff meets discharge requirements over the short- and long-term.

Appendix 6 provides the WQMP under the Phase II Small MS4 General Permit for the Mojave River Watershed. The WQMP provided specifies stormwater runoff permit Best Management Practices (BMPs) requirements for capturing, retaining, and treating on site stormwater once the residential subdivision has been developed. Because the project site currently consists of pervious surfaces, the project has identified onsite drainage that will generally be directed to two onsite bioretention basins that will be installed to handle the two-year 24-hour storm event and mitigate the difference between the Pre- and Post- 100-year volume of stormwater runoff. The WQMP prepared for the project will include measures to minimize urban runoff from impacting receiving waters to the Maximum Extent Practicable (MEP). This is a requirement of the County and City, which enforces the RWQCB's measure to protect the watershed. These measures include development of bioretention basins that will collect and treat runoff generated within the project site. These measures can reduce potential impacts to receiving waters to a less than significant level.

The SWPPP would specify the BMPs that the project would be required to implement during construction activities to ensure that all potential water pollutants of concern are prevented, minimized, and/or otherwise appropriately treated prior to being discharged from the subject property. With implementation of these mandatory plans and their BMPs, as well as mitigation measure (MM) **HAZ-1** above, the development of the TTM 20454 Project will not cause a violation of any water quality standards or waste discharge requirements.

b. *Less Than Significant Impact* – Implementation of the proposed project will not deplete groundwater supplies that would substantially affect the water availability for existing or planned land uses or biological resources. Given that the project does not require extensive excavation, the potential to intercept groundwater during grading of both the project site and offsite roadways is considered to be less than significant. The groundwater basin would not be physically altered or impacted as a result of the proposed project. The design of the drainage and retention facilities of the proposed project would offset much of the loss of the existing pervious surface at the site.

The TTM 20454 Project is a single-family residential project that will consist of 108 new residences. The project would be supplied with water by VWD that uses groundwater in Mojave Groundwater Basin and purchases water from MWA's Regional Recharge and Recovery Project, when available, to meet primary customer demand. The District's Urban Water Management Plan (2015)[2] identifies sufficient water resources to meet demand in its service area. The total supply for VWD in 2015 for retail customers, was 21,454 acre-feet (AF) in 2015, while the demand was 20,843 AF. According to VWD, the City assumed a use of 202 gallons of water per capita per day. The proposed project would accommodate a population approximately 368 persons; this is because, according to the Southern California Association of Governments (SCAG)[3] Local Profile for the City of Victorville indicates that the 2018 average household size for the City was 3.5, and the proposed project consists of 108 residences (3.5 x 108 = 367.5). Therefore, the demand for potable water by the proposed project is anticipated to be 74,336 gallons per day (GPD), equivalent to 83.3 AF per year (AFY). Based on the projected water demand for single-family uses within the VWD retail service area for 2025, 18,291 AFY, and for 2040, 23,867 AFY, it is anticipated that the additional 83.3 AFY demanded by the project can be accommodated into the future, particularly given that the overall available water supply is

[2] https://www.victorvilleca.gov/home/showdocument?id=209
[3] https://www.scag.ca.gov/Documents/Victorville.pdf

anticipated to be 32,627 AFY in 2025 (5,860 AF above overall demand), and 40,788 AFY in 2040 (5,860 AF above overall demand). The anticipated available water supply within VWD's service area is anticipated to be greater than the demand for water in the future, which indicates that VWD has available capacity to serve the proposed project without significant adverse impacts on area groundwater basins.

While the development of the project may result in a slight reduction in the amount of surface runoff recharge associated with natural runoff, this reduction is expected to be off-set/replaced by infiltration from the onsite bioretention basins, as well as the required onsite landscaping. The development of the project will, therefore, not substantially interrupt the existing percolation of the site, or any flow of groundwater under the project site. Impacts to groundwater resources are forecast to be less than significant from implementing the TTM 20454 Project. No mitigation is required.

c i. Result in substantial erosion or siltation onsite or offsite?

Less Than Significant Impact – Based on the WQMP provided in Appendix 6, the proposed project is not anticipated to significantly change the volume of flows downstream of the project site, and would not be anticipated to change the amount of surface water in any water body in an amount that could initiate a new cycle of erosion or sedimentation downstream of the project site. The onsite drainage system will capture the incremental increase in runoff from the project site associated with project development. Onsite flows will be captured in the proposed site biofiltration basins. These systems will be designed to capture the 2-year 24-hour storm event flows and mitigate the difference between the pre- and post-100-year volume runoff. Treated surface runoff will be discharged in conformance with San Bernardino County and City of Victorville requirements. The downstream drainage system will not be substantially altered given the control of future surface runoff from the project site; thus, the potential for downstream erosion or sedimentation will be controlled to a less than significant impact level.

c. ii. Substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?

Less Than Significant Impact – The proposed project will not alter the existing drainage course located on the west side of the project site. The drainage patterns onsite will be modified to capture stormwater runoff but will maintain the existing offsite downstream drainage system through control of future discharges from the site, which would prevent flooding onsite or offsite from occurring. Thus, the implementation of onsite drainage improvements and applicable requirements will ensure that stormwater runoff will not substantially increase the rate or volume of runoff in a manner that would result in flooding on- or off-site. Impacts under this issue are considered less than significant with no mitigation required.

c. iii. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Less Than Significant With Mitigation Incorporated – As indicated above, the project will not substantially create or contribute runoff water that would exceed the capacity of existing or planned stormwater capacity, or provide substantial additional sources of polluted water, particularly because the site plan includes water quality control BMPs that will collect and treat on-site runoff. The project will require the implementation of a SWPPP and WQMP, and implementation of mitigation measure **HAZ-1**, which will ensure that discharge of polluted material does not occur or is remediated in the event of an accidental spill. At present, the site is mostly pervious and runoff either retained on site or is directed into the streambed; thus, with the development of the site as proposed and through development of the planned drainage systems, runoff from the site would be managed more efficiently than that which exists at present. Thus, the implementation of onsite drainage improvements and applicable requirements will ensure that that drainage and stormwater will not create or contribute runoff that would exceed the capacity of existing or planned offsite stormwater drainage systems or provide substantial additional sources of polluted runoff. Impacts under this issue are considered less than significant with implementation of mitigation.

c. iv. Impede or redirect flood flows?

Less Than Significant Impact – According to the San Bernardino County Land Use Plan General Plan Hazard Overlays (Figure IX-3), the proposed development area of the project is not located in a 100-year or 500-year flood hazard area. Furthermore, development of this site is not anticipated to redirect or impede flood flow at the project site, particularly given that surface flows on site will be directed to the onsite drainage features which will be capable of intercepting the incremental increase in the 100-year flow rate from the project site or otherwise be detained on site and discharged in conformance with San Bernardino County and City of Victorville requirements. Therefore, impacts under this issue are considered less than significant and no mitigation is required.

d. *Less Than Significant With Mitigation Incorporated* – Please refer to response IX(c) above. The proposed development area of the project is not located within a flood hazard, tsunami, or seiche zone. As stated above, the project site is located at the southwest corner of Nyack and Mesa Linda. During construction, runoff will be managed through implementation of a SWPPP and Water Quality Management Plan (WQMP), and implementation of MM **HAZ-1**, which will ensure that the risk of release of pollutants from the project site is less than significant. The project is located more than 70 miles from the Pacific Ocean, which eliminates the potential for a tsunami to impact the project area. Additionally, a seiche would not occur within the vicinity of the project because no lakes or enclosed bodies of water exist near the site that could be impacted by such an event. Finally, according to the San Bernardino County Land Use Plan General Plan Hazard Overlays (Figure IX-3), the proposed project is located outside of the area of inundation related to the Mojave River channel. As such, with the implementation of MMs **HAZ-1** above, the proposed project would have a less than significant potential to risk release of pollutants due to project inundation.

e. *Less Than Significant Impact* – Please refer to the discussion under issue X(b) above. The "2018 Sustainable Groundwater Management Basin Prioritization: Process and Results" document, prepared by the State of California Department of Water Resources[4], indicates that the Mojave River Basin, which underlies the proposed project, is under very low priority. As stated in the 2018 Basin Prioritization, of the 517 groundwater basins in California, 109 are prioritized as high and medium and 408 are prioritized as low and very low. The Mojave River Basin does not have a sustainable groundwater management plan and the project will not interfere with the overall water quality of the basin as discussed above. Though the Groundwater Basin has several sub-basins that experienced overdrafts in 2017-2018[5], the Watermaster replaces overdrafts through fees collected from water users that is used to purchase additional water supplied through the State Water Project. Furthermore, compliance with the State water conservation measures is enforced through VWD. As such, it is not anticipated that the proposed TTM 20454 Project would have a significant potential to conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

[4] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Basin-Prioritization/Files/2018-Sustainable-Groundwater-Management-Act-Basin-Prioritization.pdf
[5] http://www.mojavewater.org/files/25AR1718_Revised.pdf

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XI. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

SUBSTANTIATION

a. *No Impact* – Refer to the aerial photos provided as Figures 1 and 2, which depict the project's regional and site-specific location. The project site would be installed within a site zoned for Single-Family Residential use, and the land use designation (zoning) is the same. The project is located within a vacant site, with single family residential development and vacant land uses in all directions. The project site consists of vacant land containing native and non-native vegetation, consistent with the remnants of the rural desert character that can be found throughout undeveloped parcels within the City of Victorville. The development of a single-family residential development at this location would be consistent with both the uses surrounding the project and the surrounding land use designations and zoning classifications. Consequently, the development of the project site with the proposed use will not divide any established community in any manner. Therefore, no significant impacts under this issue are anticipated and no mitigation is necessary.

b. *Less Than Significant Impact* – The project site encompasses about 30.22-acres, and it is zoned for Single Family Residences, where up to 5 dwelling units per acre are allowed. The project proposes a total of 108 units at a density of about 3.6 dwelling units per acre with approval of TTM 20454, the proposed TTM 20454 Project will be fully consistent the General Plan Land Use Map. Therefore, the implementation of this project at this site is consistent with the City's General Plan. Based on the preceding information, implementation of the proposed project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, zone classification, or the City's Municipal Code) adopted for the purpose of avoiding or mitigating an environmental effect. No adverse impacts are anticipated under this issue and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XII. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

SUBSTANTIATION:

a&b. *No Impact* – The proposed project will be developed within a vacant site that is designated for single-family density residential use, which is a designation that does not include mining operations as a permitted use. A review of the Victorville General Plan Resource Chapter indicates that the proposed project is not located within a mineral resource designation (Figure XII-1). The project site has not been previously mined for any mineral/aggregate resources. The project site is currently located in a transitional urban residential area with no known mineral resource uses nearby. No specific plan or other land use plan is in place that would delineate important mineral resources at the project site. Therefore, the development of the project will not cause any loss of mineral resource values to the region or residents of the state, nor would it result in the loss of any locally important mineral resources within the City. No impacts would occur under these issues. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIII. NOISE: Would the project result in:				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of a project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☒	☐	☐
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

SUBSTANTIATION

Noise is generally described as unwanted sound. The proposed project will be developed within a 30.22-acre site. The project is located in an urban setting with moderate background noise from adjacent roadways and uses. The project site consists of vacant land containing native and non-native vegetation, consistent with the remnants of the rural desert character that can be found throughout undeveloped parcels within the City of Victorville.

The unit of sound pressure ratio to the faintest sound detectable to a person with normal hearing is called a decibel (dB). Sound or noise can vary in intensity by over one million times within the range of human hearing. A logarithmic loudness scale, similar to the Richter scale for earthquake magnitude, is therefore used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all sound frequencies within the entire spectrum. Noise levels at maximum human sensitivity from around 500 to 2,000 cycles per second are factored more heavily into sound descriptions in a process called "A-weighting," written as "dBA."

Leq is a time-averaged sound level; a single-number value that expresses the time-varying sound level for the specified period as though it were a constant sound level with the same total sound energy as the time-varying level. Its unit is the decibel (dB). The most common averaging period for Leq is hourly.

Because community receptors are more sensitive to unwanted noise intrusion during more sensitive evening and nighttime hours, state law requires that an artificial dBA increment be added to quiet time noise levels. The State of California has established guidelines for acceptable community noise levels that are based on the Community Noise Equivalent Level (CNEL) rating scale (a 24-hour integrated noise measurement scale). The guidelines rank noise land use compatibility in terms of "normally acceptable," "conditionally acceptable," and "clearly unacceptable" noise levels for various land use types. The State Guidelines, Land Use Compatibility for Community Noise Exposure, single-family homes are "normally acceptable" in exterior noise environments up to 60 dB CNEL and "conditionally acceptable" up to 70 dB CNEL based on this scale. Schools, libraries and churches are "normally acceptable" up to 70 dB CNEL, as are office buildings and business, commercial and professional uses with some structural noise attenuation.

a. *Less Than Significant With Mitigation Incorporated* – The background noise level at the project site is dominated by traffic noise from Mesa View Drive and nearby residences to the east-northeast. The Noise Element of the City of Victorville General Plan establishes noise quality standards for land use categories based on the State of California Office of Noise Control land use compatibility recommendations. The Noise Element shows the community exposure to noise recommended as normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable for various classes of land use sensitivity. The City of Victorville Land Use Compatibility Standards recommend a Community Noise Exposure of 55-60 dB CNEL as normally acceptable for single-family residential uses.

Short-Term Noise
Short-term construction noise impacts associates with the proposed project will occur in phases dominated by earth moving equipment and small structural construction equipment. The earth-moving sources are the noisiest type of equipment typically ranging from 75 to 90 dB at 50 feet from the source. Refer to Table XIII-1 below, which shows construction equipment noise levels at 25, 50 and 100 feet from the noise source.

Table XIII-1
NOISE LEVELS OF CONSTRUCTION EQUIPMENT AT
25, 50 AND 100 FEET (in dBA LEQ) FROM THE SOURCE

Equipment	Noise Levels at 25 feet	Noise Levels at 50 feet	Noise Levels at 100 feet
Earthmoving			
Front Loader	85	79	73
Backhoes	86	80	74
Dozers	86	80	74
Tractors	86	80	74
Scrapers	91	85	79
Trucks	91	85	79
Material Handling			
Concrete Mixer	91	85	79
Concrete Pump	88	82	76
Crane	89	83	77
Derrick	94	88	82
Stationary Sources			
Pumps	82	79	70
Generator	84	78	72
Compressors	87	81	75
Other			
Saws	84	78	72
Vibrators	82	76	70

Source: U.S. Environmental Protection Agency “Noise”

The City’s Noise Control Ordinance (Municipal Code Chapter 13.01) controls hours of operation for multiple sources of excessive noise. Noise above 55 dBA is not permitted between the hours of 10:00 PM and 7:00 AM in residential zones, or above 65 dBA between the hours of 7:00 AM or 10:00 PM in residential zones. However, the City exempts construction activity on private properties that are determined by the director of building and safety to be essential to the completion of the project (Municipal Code Chapter 13.01.060[9]). The City prohibits noise levels that exceed the above listed thresholds by the following dB(A) levels for the cumulative period of time specified:

(1) Less than 5dB(A) for a cumulative period of more than thirty minutes in any hour; (2) Less than 10 dB(A) for a cumulative period of more than fifteen minutes in any hour; (3) Less than

15 dB(A) for a cumulative period of more than five minutes in any hour; (4) Less than 20 dB(A) for a cumulative period of more than one minute in any hour; (5) 20 dB(A) or more for any period of time.

Construction noise is considered a common necessity for new development. Therefore, through compliance with the City's noise standards, short-term construction impacts may expose persons to or generate noise in excess of standards established by the City or by any other applicable agencies; as such, mitigation is outlined below to ensure that noise levels are minimized to below a level of significance.

NOI-1 ***The City will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.***

NOI-2 ***Noise minimizing measures shall be implemented to reduce noise levels to the greatest extent feasible at the nearest receptors, defined as at or below 55 dBA permitted between the hours of 10:00 PM and 7:00 AM; and at or below 65 dBA permitted between the hours of 7:00 AM and 10:00 PM. Measures shall include portable noise barriers and scheduling specific construction activities to avoid conflict with adjacent sensitive receptors.***

NOI-3 ***Equipment not in use for five minutes shall be shut off.***

NOI-4 ***Equipment shall be maintained and operated such that loads are secured from rattling or banging.***

NOI-5 ***Where commercially available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.***

NOI-6 ***Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unneces-sary revving of equipment.***

NOI-7 ***No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.***

NOI-8 ***Construction staging areas shall be located as far from adjacent sensitive receptor locations as possible.***

NOI-9 ***The developer shall post temporary signage to provide local residents with a phone number to contact if excessive noise is identified at the site. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the project. The posted notice shall encourage the adjacent residents to contact the phone number in the case of a complaint. The phone number contact shall be available 24/7 throughout construction, at a minimum by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove or attenuate the sound source causing the complaint.***

Thus, based on the existing noise circumstances within the vicinity of the project (roadway noise), short-term noise impacts are considered less than significant with the implementation of the mitigation measures above.

Long-Term Noise

The long-term or permanent change in noise consists of the additional trips associated with full occupancy of the single-family homes. The proposed project is located along Mesa View Road and the nearest sensitive receptors are the single-family homes on the east of Mesa View Road, which functions as a local collector roadway. The additional trips generated—forecast in the Traffic Impact Analysis to be 1,038 trips per day—to the site each day would contribute to a minor change in the existing noise on the project site. Furthermore, the TTM 20454 Project does not include any specific type of operational noise activities or levels beyond the noise sources associated with typical residential land use in the project study area, such as people moving to and from their home, internal vehicle trips, air conditioning units, trash collection, children playing, etc. In addition, the project residential land use is considered a noise-sensitive receiving land use and not as a significant noise generator. Therefore, long-term noise impacts for this residential land use are anticipated to be less than significant. Given that traffic noise is moderate at present at the project site due to limited traffic and minimal nighttime traffic, and that the proposed project would not contribute significant additional traffic to the surrounding roadways, long-term noise impacts would be less than significant.

With the implementation of the mitigation measures proposed to address construction noise above, the proposed project would have a less than significant potential to result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of a project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

b. *Less Than Significant With Mitigation Incorporated* – Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by vibration of room surfaces is called structure borne noises. Sources of groundborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous or transient. Vibration is often described in units of velocity (inches per second), and discussed in decibel (dB) units in order to compress the range of numbers required to describe vibration. Vibration impacts related to human development are generally associated with activities such as train operations, construction, and heavy truck movements.

The FTA Assessment states that in contrast to airborne noise, ground-borne vibration is not a common environmental problem. Although the motion of the ground may be noticeable to people outside structures, without the effects associated with the shaking of a structure, the motion does not provoke the same adverse human reaction to people outside. Within structures, the effects of ground-borne vibration include noticeable movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. FTA Assessment further states that it is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. However, some common sources of vibration are trains, trucks on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment. The Federal Transit Association (FTA) guidelines identify a level of 80 VdB for sensitive land uses. This threshold provides a basis for determining the relative significance of potential project related vibration impacts.

Construction equipment is anticipated to be located at a distance from nearby sensitive receptors as shown in Figure 2 the site aerial photo. Onsite activities will be about 100 feet from the nearest residences and roadway construction on Mesa View will be 50 feet or more. The implementation of MM **NOI-10** can ensure that construction vibration will not cause significant impact to the nearest residences.

NOI-10 ***The City shall require the Applicant's construction contractor(s) to implement the following measures:***

- ***Ensure that the operation of construction equipment that generates high levels of vibration including, but not limited to, large bulldozers, loaded trucks, pile-drivers, vibratory compactors, and drilling rigs, is minimized***

to below 72 vibration decibels (VdB), within 45 feet of existing residential structures and 35 feet of institutional structures (e.g., schools) during construction. Use of small rubber-tired bulldozers shall be enforced within these areas during grading operations to reduce vibration effects.

- ***The construction contractor shall provide signs along the roadway identifying a phone number for adjacent property owners to contact with any complaint. During future construction activities with heavy equipment within 300 feet of occupied residences, vibration field tests shall be conducted at the property line near the nearest occupied residences., If vibrations exceed 72 VdB, the construction activities shall be revised to reduce vibration below this threshold. These measures may include, but are not limited to the following: use different construction methods, slow down construction activity, or other mitigating measures to reduce vibration at the property from where the complaint was received.***

Therefore, temporary vibration levels associated with project construction would be less than significant. Furthermore, annoyance-related impacts would be short-term and would only occur during site grading and construction activities. Due to the size of the project site, and the lack of any operational uses that would include vibration, the proposed project will not expose people to generation of excessive groundborne vibration or groundborne noise levels during occupancy. Because the rubber tires and suspension systems of heavy trucks and other on-road vehicles provide vibration isolation and reduced noise, it is unusual for on-road vehicles to cause noticeable groundborne noise or vibration impact. Most problems with on-road vehicle-related noise and vibration can be directly related to a pothole, bump, expansion joint, or other discontinuity in the road surface. Smoothing a bump or filling a pothole will usually solve the problem. The proposed project would be constructed with smooth pavement throughout the project and would not result in significant groundborne noise or vibration impacts from vehicular traffic. Thus, any impacts under this issue are considered less than significant and no mitigation is required.

c. *No Impact* – No private airports are located in the vicinity of the project. The closest airport is the Southern California Logistics Airport (SCLA), which is located approximately 3 miles north of the project site; the TTM 20454 Project is not located within the SCLA Airport Planning Area and Airport Safety Review Area, as shown on Figure IX-2 and Figure IX-3, which depicts the Airport Safety Review Area by the San Bernardino County Land Use Plan General Plan Hazard Overlays. Furthermore, according to the City of Victorville General Plan Existing Noise Contour map for SCLA (Figure XIII-1), the entirety of the proposed project site is located outside of the SCLA noise contours. Additionally, the proposed project is located outside of the SCLA Proposed Future (2025) Airport Noise Contours (Figure XIII-2). Therefore, because the proposed project is located outside of the SCLA existing and future noise contours, the proposed project would have no potential to expose people residing or working in the project area to excessive noise levels from nearby airport activity. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIV. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

SUBSTANTIATION

a. *Less Than Significant Impact* – The proposed TTM 20454 Project would convert vacant land located within the City of Victorville within the City's Single-Family Residential land use designation. The proposed project will develop 108 single-family residential lots within a 30.22-acre site. As stated under issue X(b), Hydrology and Water Quality, the proposed project would accommodate a population of 368 persons; this is because, according to the Southern California Association of Governments (SCAG)[6] Local Profile for the City of Victorville indicates that the 2018 average household size for the City was 3.5, and the proposed project consists of 108 single-family home spaces (3.5 x 108 = 367.5). The SCAG Local Profile indicates that the 2018 population of the City was 123,701. SCAG's Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS)[7] indicates that the 2040 population within the City of Victorville is projected to be 184,500 persons. Given that the current population of Victorville is about 60,000 persons less than the projected 2040 population, the potential for an additional 368 new residents within the City of Victorville is considered less than significant as the project represents only about 0.06% of the potential growth anticipated between the present population and the City's projected build-out population.

Additionally, the City of Victorville General Plan indicates that there is a potential for a total of 138,617 housing units in the Planning Area at build-out. The SCAG Local Profile for the City of Victorville indicates that in 2018, the City contained 38,135 housing unit, accommodating approximately 100,000 additional housing units between the present and the City's projected build-out. As such, the addition of 108 residential units would be well within the projected number of households that would be developed by build-out of the City. Further, the project site is being built at a density of 3.6 units per acre, when it could be developed with as many as five units per acre. These units would contribute to the housing needs within the City, which, as determined by the SCAG Regional Housing Needs Assessment Final Allocation Plan 1/1/14-10/1/21,[8] was determined to be 7,371 units.[9] Given the above, the proposed project would not induce population growth beyond that which has been planned for in the City General Plan or SCAG planning documents, or that can be accommodated by the project and the City. Therefore, impacts would be less than significant. No mitigation is required.

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[6] https://www.scag.ca.gov/Documents/Victorville.pdf
[7] http://scagrtpscs.net/Documents/2016/draft/d2016RTPSCS_DemographicsGrowthForecast.pdf
[8] According to SCAG, "the RHNA does not necessarily encourage or promote growth, but rather allows communities to anticipate growth, so that collectively the region and subregion can grow in ways that enhance quality of life, improve access to jobs, promotes transportation mobility, and addresses social equity, fair share housing needs."; The intent of the future needs allocation by income groups is to relieve the undue concentration of very low and low-income households in a single jurisdiction and to help allocate resources in a fair and equitable manner.
[9] http://www.scag.ca.gov/Documents/5thCyclePFinalRHNAplan.pdf;

b. *No Impact* – No occupied residences homes are located on the vacant project site; therefore, implementation of the proposed project will not displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere. No impacts will occur; therefore, no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XV. PUBLIC SERVICES: Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?	☐	☐	☒	☐
b) Police protection?	☐	☐	☒	☐
c) Schools?	☐	☐	☒	☐
d) Parks?	☐	☐	☒	☐
e) Other public facilities?	☐	☐	☒	☐

SUBSTANTIATION:

a. *Less Than Significant Impact* – The nearest fire station serving the project is approximately 2.5 miles east of the project site. The City is served by the Victorville Fire Department, and the Liberty Park fire station is located at in Liberty Park, near the intersection of Amethyst and La Mesa Roads. The Victorville Fire Department (VVFD) provides fire protection and emergency medical services for the City. It would take approximately 3-7 minutes for Victorville Fire Department to reach the site from this station. The proposed project requires a fire protection review, which will ensure that the proposed project is developed in accordance with development standards designed to provide maximum fire protection. The proposed project will incrementally add to the existing demand for fire protection services. Cumulative impacts are mitigated through the payment of the Development Impact Fee (DIF) dedicated to fire capital improvement costs. Thus, payment of the DIF for fire suppression would offset this incremental demand for fire protection services. Based on the discussion above, and the availability of fire protection services within the City of Victorville, any impacts under this issue are considered less than significant and no mitigation is required.

b. *Less Than Significant Impact* – The City receives police services through the San Bernardino County Sheriff Department. The Victorville Police Department is responsible for providing public safety to a geographical area of approximately 74 square miles with a population of approximately 115,000 residents. The Department enforces local, state, and federal laws; performs investigations and makes arrests; administers emergency medical treatment; and responds to City emergencies. The sheriff station is located at 14200 Amargosa Road, Victorville, CA 92392. Police services are funded through the City's General Fund. The City currently supports capital facilities, including a police headquarters building, 35 police vehicles, and equipment such as computers and radios. The project site is located within existing Sheriff patrol routes and future calls can be responded to within the identified priority call target response times. The proposed project will incrementally add to the existing demand for police protection services. The City's General Fund covers operational expenses, and the proposed project will contribute property taxes to the general fund to offset this incremental demand for law enforcement. Additionally, payment of the DIF for police public safety capital improvement costs would offset this incremental demand for police services. Any impacts under this issue are considered less than significant and no mitigation is required.

c. *Less Than Significant Impact* – The proposed project would develop a single-family subdivision with 108 lots, and would generate a new demand for school services within the area. The estimated school generation rates for the project are as follows based on the generation rates included in the Countywide Plan Draft Program Environmental Impact Report (PEIR):

- The proposed project would generate a total of about 77 students of all grades.

The project area is served by the Snowline Joint Unified School District (SJUSD). Payment of fees to the SJUSD DIF mitigation programs—of which a Certificate of Compliance from must be submitted to the City's Development Department as part of the residential building fees with which the project must comply—would be sufficient to accommodate the student growth that would correspond the overall growth anticipated to occur within the City. As stated under issue IX, Population and Housing, the City anticipates that about 100,000 additional dwelling units may be developed by City buildout. No other mitigation is identified or needed. Since this is a mandatory requirement, no additional mitigation measures are required to reduce school impacts of the proposed project to a less than significant level.

d. *Less Than Significant Impact* – The proposed project would develop a single-family subdivision with 108 lots that will generate a new demand for parks and recreation. The potential increase in population related to the TTM 20454 Project is about 368 persons. The City has an adopted standard of 3 acres of parkland for every 1,000 persons, as such the project would require an additional 1+ acres of parkland to accommodate the project. As such, the proposed project would contribute in-lieu fees assessed by the City's DIF program intended for City parks. Given that the City's General Plan deems the use of in-lieu fees as appropriate mitigation for parkland, it is anticipated that, through payment of any necessary in-lieu/DIF fees, which is considered a standard condition, the proposed project will have a less than significant impact to parks and recreation facilities.

e. *Less Than Significant Impact* – Other public facilities include library and general municipal services. The proposed project will incrementally add to the existing demand for other public services. The City assesses a facilities fee as part of the DIF program, to which the proposed project would be required to contribute. Payment of DIF is deemed adequate mitigation for the proposed project as it will offset future demand generated by potential new residents. Any impacts are considered less than significant and no additional mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVI. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

SUBSTANTIATION

a. *Less Than Significant Impact* – As addressed in the discussion under XIV, Population and Housing, and XV(d) above, the proposed project would develop 108 single-family residences, and as such may induce population, though not substantially. As stated in the discussion under Population and Housing, an estimated 368 persons may reside at the new subdivision. There are three parks within about 2.5 miles of the project site—Mesa Linda Park, Eagle Ranch Park, and Liberty Park—and these parks provide a full range of park and recreation amenities. The proposed project would contribute in-lieu fees assessed by the City's DIF program intended for City parks and recreation. Given that the City's General Plan deems the use of in-lieu fees as appropriate mitigation for parks and recreation, it is anticipated that, through payment of any necessary in-lieu/DIF fees, which is considered a standard condition, the proposed project will have a less than significant impact to parks and recreation facilities. Furthermore, the proposed project will not generate a substantial increase in residents of the City who would increase the use of existing recreational facilities. Therefore, any impacts under this issue are considered less than significant. No mitigation is required.

b. *Less Than Significant Impact* – The proposed project consists of 108 new single-family residences in the City of Victorville. The project does not include any recreational facilities excepting for the use of the abutting wash to the west of the site and its maintenance road as a pedestrian path. The site is mostly vacant with no existing recreational facilities on the project site and is designated for single-family residential use. As described throughout this Initial Study, the construction of the proposed TTM 20454 Project would not cause a significant adverse physical effect on the environment under any issue. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVII. TRANSPORTATION: Would the project:				
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☒	☐	☐
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d) Result in inadequate emergency access?	☐	☒	☐	☐

SUBSTANTIATION: Some of the information provided in this Section is abstracted from the following report: *"Tract Map No. 20454 Traffic Impact Analysis"* prepared by Ganddini Group, Inc. dated December 31, 2021. This report is provided as Appendix 7a to this Initial Study. *"Vehicle Miles Traveled Assessment"* prepared by Ganddini Group, Inc. dated December 31, 2021 is provided as Appendix 7b.

CEQA Section 15064.3, subdivision (b):
(1) Land Use Projects. Vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, projects within one-half mile of either an existing major transit stop or a stop along an existing high-quality transit corridor should be presumed to cause a less than significant transportation impact. Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact.

(2) Transportation Projects. Transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact. For roadway capacity projects, agencies have discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements. To the extent that such impacts have already been adequately addressed at a programmatic level, such as in a regional transportation plan EIR, a lead agency may tier from that analysis as provided in Section 15152.

(3) Qualitative Analysis. If existing models or methods are not available to estimate the vehicle miles traveled for the particular project being considered, a lead agency may analyze the project's vehicle miles traveled qualitatively. Such a qualitative analysis would evaluate factors such as the availability of transit, proximity to other destinations, etc. For many projects, a qualitative analysis of construction traffic may be appropriate.

(4) Methodology. A lead agency has discretion to choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change in absolute terms, per capita, per household or in any other measure. A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project. The standard of adequacy in Section 15151 shall apply to the analysis described in this section.

<u>Background</u>

Appendix 7a contains the following summary of potential impacts of the proposed project's traffic on the area circulation system. The study was prepared in consultation with City of Victorville staff and in accordance with the procedures and methodologies for assessing transportation impacts established by the City. To assess the project's conformance with local operational standards, this study evaluates the project's effect on traffic operations and, if necessary, identifies recommended improvements or corrective measures to alleviate operational deficiencies substantially caused or worsened by the proposed project. For compliance with the California Environmental Quality Act (CEQA) requirements, an assessment of the project's impacts in terms of vehicle miles traveled (VMT) in a separate document (see *Tract Map No 20454 Vehicle Miles Traveled Assessment*, Ganddini Group, Inc., December 31, 2021 (Appendix 7b).

<u>Project Description</u>

The 30.2-acre project site is located at the southwest corner of Mesa View Drive and Nyack Road in the City of Victorville.

The currently vacant site is proposed to be developed with 110 single-family residential dwelling units. The number of units has been reduced to 108 units since the traffic study was prepared, which makes the traffic study conservative (over predictive). The project proposes one full access road from Mesa View Drive, and one full access to Nyack Road. For purposes of this analysis, the proposed project is anticipated to be constructed and fully operational by year 2023.

<u>Project Trips</u>

The proposed project is forecast to generate 1,038 daily trips, including 78 trips in the AM peak hour and 103 trips during the PM peak hour.

Traffic signal warrants 1-3 are currently satisfied at the unsignalized intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions. Therefore, installation of a traffic signal control is warranted at this intersection based on Existing Conditions.

<u>Levels of Service</u>

The study intersections currently operate within acceptable Levels of Service (D or better) during the peak hours for Existing conditions.

The study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Opening Year (2023) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours.

- Mesa View Drive at Bear Valley Road - #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Opening Year (2023) Without and With Project conditions during the peak hours.

The study intersections are forecast to operate within acceptable levels of Service (D or better) during the peak hours for Future Year (2033) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hour:

- Mesa View Drive at Bear Valley Road - #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Future Year (2033) Without and With Project conditions during the peak hours.

a. *Less Than Significant With Mitigation Incorporated* – The Project consists of 108 single-family residential units that will generate an estimated 1,038 trips per day. The trip generation for the proposed project was compiled using the Institute of Transportation Engineers Trip Generation Manual (11th Edition). The proposed Project is forecast to generate 78 total AM peak hour trips, 103 total PM peak hour trips. Refer to Appendix 7a for the detailed trip generation forecast. Based on the Traffic Impact Analysis (TIA), the proposed Project will contribute to a single intersection (Mesa View Drive and Bear Valley Road) exceeding the City's circulation system significance threshold. Thus, the proposed Project will require mitigation to reduce this potentially significant impact to a less than significant level. The following mitigation measure will be implemented by the proposed project.

TRAN-1 ***The project fair share calculation is based on the proportion of project peak hour intersection turning movement volumes contributed to the improvement location relative to the total new peak hour intersection turning movement volume forecast for Fugue Year (2033) With Project conditions. The developer shall pay the project's fair share percentage of the identified impacted intersection costs (Mesa View Drive at Bear Valley Road) estimated to be between 15.3% and 15.8% for the proposed project. Refer to Appendix 7a of the Initial Study for the detailed information on the cost estimate. This fee shall be paid prior to occupancy of the subdivision.***

With implementation of the preceding mitigation measure, the proposed project would have a less than significant potential to conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities. This assumes that the project will install pedestrian facilities and the bicycle lane on Mesa View Drive.

b. *Less Than Significant Impact* – Senate Bill 743 mandates that California Environmental Quality Act (CEQA) guidelines be amended to provide an alternative to Level of Service for evaluating transportation impacts. The amended CEQA guidelines, specifically Section 15064.3, recommend the use of Vehicle Miles Traveled (VMT) for transportation impact evaluation. For the purposes of this analysis the recommended VMT analysis methodology and thresholds identified within the Technical Advisory and the City's new analysis methodology have been used.

The City TIA Guidelines for VMT evaluation specify the following two screening steps: 1) Daily Vehicle Trip Thresholds Screening; and 2) Land Use Types Screening.

The proposed project will generate a maximum of 1,038 daily vehicle trips. The City's significance threshold is 1,285 weekday daily trips. The proposed project satisfies this City screening threshold, and may be presumed to result in a less than significant VMT impact.

The land use screening threshold is 136 single-family residential units. The project proposes 108 units. Thus, the proposed project may be presumed to result in a less than significant VMT impact. No mitigation is required.

c. *Less Than Significant Impact* – Design of driveways, internal roadways, and intersections will be based on City Code, which sets the standard for such design. As such the Project will construct the project access roadways in accordance with designs shown in Figure 3. Based on these direct project design improvements in the circulation system, it is not anticipated that traffic hazards will increase. As such, the Project development would have a less than significant potential to increase hazards due to geometric design features or incompatible uses.

d. *Less Than Significant With Mitigation Incorporated* – The proposed project will include roadway construction on both Nyack and Mesa Linda. Such construction can negatively impact emergency access to the project site and the adjacent residences on the east side of Mesa View during active construction. To mitigate this potential effect on emergency access, mitigation measures **TRAN-2** and **TRAN 3** shall be implemented.

TRAN-2 ***The City of Victorville shall mandate that the Applicant require their contractors prepare a construction traffic control plan. Elements of the plan should include, but are not necessarily limited to, the following:***

- ***Develop circulation and detour plans, if necessary, to minimize impacts to local street circulation. Use haul routes minimizing truck traffic on local roadways to the extent possible.***
- ***To the extent feasible, and as needed to avoid adverse impacts on traffic flow, schedule truck trips outside of peak morning and evening commute hours.***
- ***Install traffic control devices as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones where needed to maintain safe driving conditions. Use flaggers and/or signage to safely direct traffic through construction work zones.***
- ***For roadways requiring lane closures that would result in a single open lane, maintain alternate one-way traffic flow and utilize flagger-controls.***
- ***Coordinate with facility owners or administrators of sensitive land uses such as police and fire stations, hospitals, and schools. Provide advance notification to the facility owner or operator of the timing, location, and duration of construction activities.***

TRAN-3 ***The City of Victorville shall require that all disturbances to public roadways be repaired in a manner that complies with the Standard Specifications for Public Improvements or other applicable City of Victorville standard design requirements.***

Upon implementation of a construction traffic management plan, any potential conflict with emergency access will be considered less than significant in the short term. Thus, any impacts are considered less than significant with implementation of mitigation. No additional mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVIII. TRIBAL CULTURAL RESOURCES: Would the project cause a substantial change in the significance of tribal cultural resources, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to the California Native American tribe, and that is:				
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☒	☐	☐
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in sub-division (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

SUBSTANTIATION: The information provided in this section of the Initial Study is abstracted from the following report: “A Phase I Cultural Resource Survey, TTM 20454, Southwest Corner of Mesa View Drive and Nyack Road City of Victorville, California” prepared by Hudlow Cultural Resource Associates dated December 2021. This Report is provided as Appendix 3 of this Initial Study.

Background

The Phase I Cultural Resource Survey consisted of a pedestrian survey of the site and a cultural resource record search, which found that no cultural resources were identified and determined that no further work is required.

Based on the results of this study, no further cultural resources investigation is recommended for the project unless development plans undergo such changes as to include areas not covered by this study. However, if buried cultural materials are encountered during any earth-moving operations associated with the project, all work within 50 feet of the discovery should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

Impact Analysis

a&b. As noted in the projects Cultural Resource Survey, no tribal cultural resources were located within the project area and no mitigation was recommended. However, as a result of Native American tribal noticing required per Public Resources Code Section 21080.3.1, the City entered into consultation with the Yuhaaviatam of San Manuel Nation (formerly known as the San Manuel Band of Mission Indians) regarding the subject project. While the Yuhaaviatam of San Manuel Nation noted that due to the nature and location of the proposed project, and given the their present state of knowledge, they not have any concerns with the project’s implementation, as planned, the following mitigation measures were requested in order to ensure any impacts to potential resources are addressed accordingly and considered less than significant.

TCR-1 ***The San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) and any other tribe noticed in accordance with AB 52 requirements shall be contacted, as detailed in CUL-2, of any pre-contact and/or historic-era cultural resources discovered during project implementation, and be provided information regarding the nature of the find, so as to provide Tribal input with regards to significance and treatment. Should the find be deemed significant, as defined by CEQA (as amended, 2015), a cultural resources Monitoring and Treatment Plan shall be created by the archaeologist, in coordination with SMBMI and any other tribe noticed in accordance with AB 52 requirements, and all subsequent finds shall be subject to this Plan. This Plan shall allow for a monitor to be present that represents SMBMI and any other tribe noticed in accordance with AB 52 requirements for the remainder of the project, should SMBMI and/or any other tribe noticed in accordance with AB 52 requirements elect to place a monitor on-site.***

TCR-2 ***Any and all archaeological/cultural documents created as a part of the project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the applicant and Lead Agency for dissemination to SMBMI and any other tribe noticed in accordance with AB 52 requirements. The Lead Agency and/or applicant shall, in good faith, consult with SMBMI and any other tribe noticed in accordance with AB 52 requirements throughout the life of the project.***

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIX. UTILITIES AND SERVICE SYSTEMS: Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☒	☐
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

SUBSTANTIATION

a. Water

Less Than Significant Impact – The City of Victorville Water District (VWD) is responsible for the water supply to the City. Water service is available through a connection located adjacent to the project site. As previously stated under issue X, Hydrology and Water Quality, VWD's 2015 UWMP identifies sufficient water resources to meet demand in its service area. The anticipated water supply within VWD's retail service area is anticipated to be greater than the demand for water in the future, which indicates that VWD has available capacity to serve the proposed project. Therefore, development of the Seneca Estates Mobile Home Park Project would not result in a significant environmental effect related to the relocation or construction of new or expanded water facilities. Impacts are considered less than significant.

Wastewater

Less Than Significant Impact – Wastewater collection will be provided by City of Victorville and it is delivered to the SCLA Industrial Wastewater Treatment Plant (IWWTP) for treatment. The IWWTP , which treats about 1.9 mgd and recycles this water for either discharge or direct use. The WTP has a residual capacity of 2.5 mgd treatment capacity. Based on the Victorville Sewer Master Plan, based on the 107 units the proposed project is anticipated to generate 32,100 gallons of wastewater per day (GPD), or about 0.0535% of the available residual treatment capacity at the IWWTP. The project would connect to the City's existing wastewater collection system within the adjacent roadway (Nyack), and would install an internal wastewater collection system to collect sewage generated by residences, the development of which is not anticipated to cause a significant impact. Therefore, development of the TTM 20454 Project would not result in a significant environmental effect related to the relocation or construction of new or expanded wastewater facilities. Impacts are less than significant.

Stormwater
Less Than Significant Impact – The surface runoff from the site, nonpoint source storm water runoff, will be managed in accordance with the WQMP (see Appendix 6) as discussed in the Hydrology and Water Quality Section (Section X) of this Initial Study. The onsite drainage system will capture the incremental increase in runoff from the project site associated with project development. The development of the project site will require incorporation of a bioretention basin to prevent runoff from leaving the project site or otherwise pretreat the runoff before leaving the site to meet City and County of San Bernardino requirements. Therefore, surface water will be adequately managed on site and as such, development of the TTM 20454 Project would not result in a significant environmental effect related to the relocation or construction of new or expanded stormwater facilities. Impacts are less than significant.

Electric Power
Less Than Significant Impact – Southern California Edison (SCE) provides electricity to the City, and will support the electricity required to support the occupants of the mobile homes. The effort to connect to the existing electrical system, and to install electricity connections within the project site to serve future residents of the TTM 20454 with electricity is not anticipated to result in significant impacts, as evidenced by the discussions in preceding sections. Therefore, development of the proposed project would not result in a significant environmental effect related to the relocation or construction of new or expanded electric power facilities. Impacts are less than significant.

Natural Gas
Less Than Significant Impact – Natural gas will be supplied by Southwest Gas. The site will connect to the existing natural gas line adjacent to the project site within Mesa View Drive. The effort to connect to the existing gas line within the adjacent roadway, and to install natural gas lines within the project site to serve future residents of the proposed project with natural gas is not anticipated to result in significant impacts, as evidenced by the discussions in preceding sections. Therefore, development of the proposed project would not result in a significant environmental effect related to the relocation or construction of new or expanded natural gas facilities. Impacts are less than significant.

Telecommunications
Less Than Significant Impact – Development of TTM 20454 would require a connection to telecommunication services, such as wireless internet service and phone service. This can be accomplished through connection to existing services that are available to the developer at the project site. Therefore, development of the proposed project would not result in a significant environmental effect related to the relocation or construction of new or expanded telecommunications facilities. Impacts are less than significant.

b. *Less Than Significant Impact* – Please refer to the discussion under Hydrology and Water Quality above. In 2015 the total available water supply for retail customers, was 21,454 AF, while the demand was 20,843 AF. VWD anticipates that the projected water demand for Single-Family uses within the VWD retail service area for 2025 is 18,291 AFY, and for 2040 is 23,867 AFY, while the overall available water supply is anticipated to be 32,627 AFY in 2025 (5,860 AF above overall demand), and 40,788 AFY in 2040 (5,860 AF above overall demand). The proposed project is a single-family residential subdivision project consisting of 108 units, accommodating an estimated 368 residents, and given that the City assumes a potable water use of 202 GPD per capita, the demand for potable water by the proposed project is anticipated to be 74,336 GPD, equivalent to 83.3 AFY. Based on the projected water demand for single-family uses within the VWD retail service area for 2025, and for 2040, it is anticipated that the 83.3 AFY demand can be accommodated into the future. Based on these substantiating data, provision of domestic water supply can be accomplished without causing significant impacts on the existing water system or existing entitlements. Therefore, the project would have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years. Impacts under this issue are considered less than significant.

c. *Less Than Significant Impact* – New development in the City is required to install wastewater infrastructure concurrent with project development. All wastewater generated by the interior plumbing system of the proposed project would be discharged into the local sewer main and conveyed for treatment through the IWWTP. IWWTP owns and operates a WTP, which currently treats an average of 1.9 MGD and recycles millions of gallons per day. The WTP has a residual capacity of 0.6 MGD. As stated under issue XIX(a), above, the proposed project is anticipated to generate 19,440 GPD of wastewater, or about 3.2% of the available treatment capacity at the IWWTP WTP. Given that the IWWTP can treat a maximum of 2.5 MGD, and currently treats an average of 1.9 MGD, there is ample capacity available to accommodate the wastewater that would be generated as a result of the proposed project. As such, it is anticipated that there will be available capacity to accommodate the demand generated by the proposed project. Impacts under this issue are less than significant.

d&e. *Less Than Significant Impact* – The proposed project will generate demand for solid waste service system capacity and has a potential to contribute to potentially significant cumulative demand impacts on the solid waste system. Solid waste generation rates of residential uses such as that which this project proposes can produce 12.23 pounds of refuse per household per day. It is estimated that 108 units would generate about 1,320.8 pounds per day or 241.05 tons per year. Solid waste capacity has been expanded to provide adequate disposal capacity for cumulative demand over at least the next five years. Combined with the City's mandatory source reduction and recycling program, the proposed project is not forecast to cause a significant adverse impact to the solid waste disposal system due to the available capacities at nearby landfills.

The nearest landfill is the Victorville Sanitary Landfill. According to the CalRecycle, the maximum permitted capacity of Victorville Sanitary Landfill is 83,200,000 Cubic Yards (CY), while its remaining capacity is 81,510,000 CY; the Victorville Sanitary Landfill can accept 3,000 tons per day. Additionally, the Victor Valley Materials Recovery Facility (MRF), located in Victorville at 17000 Abbey Lane, serves the City by reducing waste in order to comply with the requirements of state law AB 939 which mandates a 50% reduction in the amount of waste sent to landfill by the year 2000 and beyond.

Trash and recycling service is mandatory for all occupied premises in the City of Victorville, and the City's trash and recycling service will serve the proposed mobile home park. It is not anticipated that the project will generate a significant amount of construction waste, as the project aims to use any excavated material on site, with a neutral amount of cut and fill. However, should the proposed project need to remove any excess soils, the soil removal will be accomplished using trucks during normal working hours, with a maximum of 50 round trips per day. Construction would not require demolition of any structures, though it would require vegetation removal (clearing and grubbing) which will be removed and transported to a green waste collection facility. Furthermore, any hazardous materials collected on the project site during either construction of the project will be transported and disposed of by a permitted and licensed hazardous materials service provider. Therefore, the project is expected to comply with all regulations related to solid waste under federal, state, and local statutes. The project is expected to comply with all regulations related to solid waste under federal, state, and local statutes and be served by a landfill(s) with sufficient permitted capacity to accommodate the project's solid waste disposal needs. No mitigation is necessary.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XX. WILDFIRE: If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire?	☐	☐	☐	☒
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

SUBSTANTIATION

a-d. *No Impact* – The proposed project is not located in or near state responsibility areas or lands classified as very high fire hazard severity zone, therefore the proposed project can have no impacts to any wildfire issues. According to the San Bernardino County Land Use Plan General Plan Hazard Overlays (Figure IX-3), there are no fire safety overlay districts delineated by the County. Furthermore, according to CALFIRE, there are no fire hazard zones within the City of Victorville that are of state responsibility (Figure IX-5). The project area is located within an area with very little fuel load in the surrounding area that could be susceptible to wildfires and is located within an area removed from the high fire hazard areas that are located adjacent to the San Bernardino Mountains about 15 miles to the south of the project site. As such, no impacts under these issues are anticipated.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XXI. MANDATORY FINDINGS OF SIGNIFICANCE:				
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

SUBSTANTIATION

The analysis in this Initial Study and the findings reached on all issues indicate that the proposed project can be implemented without causing any new project specific or cumulatively considerable unavoidable significant adverse environmental impacts. Mitigation is required to control potential environmental impacts of the proposed project to a less than significant impact level. The following findings are based on the detailed analysis of the Initial Study of all environmental topics and the implementation of the mitigation measures identified in the previous text and summarized following this section.

a. *Less Than Significant With Mitigation Incorporated* – The project has a potential to cause a significant impact any biological or cultural resources. The project has been identified as having a potential to degrade the quality of the natural environment, substantially reduce habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal. The project requires mitigation for biological resources to prevent significant impacts from occurring as a result of implementation of the project. Mitigation to address the potentially sensitive cultural resources is required, but will ensure that these sensitive resources are protected and will not be adversely impacted by the proposed project. Additionally, because it is not known what could be unearthed upon any excavation activities, contingency mitigation measures are provided to ensure that, in the unlikely event that any resources are found, they are protected from any potential impacts. Please see biological and cultural sections of this Initial Study.

b. *Less Than Significant With Mitigation Incorporated* – The project has nine potential impact categories that are individually limited, but may be cumulatively considerable. These are: Aesthetics, Biological Resources, Cultural Resources, Geology & Soils, Hazards & Hazardous Materials, Hydrology & Water Quality, Noise, Public Services, Transportation, Tribal Cultural Resources, and Utilities and Service Systems. Cumulative traffic, air quality, greenhouse gas, etc. impacts are considered as part of the analysis contained under the related impact category. These above issues require the implementation of mitigation measures to reduce impacts to a less than significant level and ensure that cumulative effects are not cumulatively considerable. All other environmental issues were found to have no significant impacts without implementation of mitigation. The potential cumulative environmental effects of implementing the proposed project have been determined to be less than considerable and thus, less than significant impacts.

c. *Less Than Significant With Mitigation Incorporated* – The proposed project includes activities that have a potential to cause direct substantial adverse effects on humans. The issues of Air Quality, Geology and Soils, Hazards & Hazardous Materials, and Noise require the implementation of mitigation measures to reduce human impacts to a less than significant level. Wildfire does not require mitigation at the project location. All other environmental issues were found to have no significant impacts on humans without implementation of mitigation. The potential for direct human effects from implementing the proposed project have been determined to be less than significant.

Conclusion

This document evaluated all CEQA issues contained in the latest Initial Study Checklist form. The evaluation determined that either no impact or less than significant impacts would be associated with the issues of Aesthetics, Agriculture, Energy, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Recreation, and Wildfire. The issues of Aesthetics, Biological Resources, Cultural Resources, Geology & Soils, Greenhouse Gases, Hazards & Hazardous Materials, Hydrology & Water Quality, Noise, Transportation, and Tribal Cultural Resources, require the implementation of mitigation measures to reduce project specific and cumulative impacts to a less than significant level. The required mitigation has been proposed in this Initial Study to reduce impacts for these issues to a less than significant impact level.

Based on the evidence and findings in this Initial Study, the City of Victorville proposes to adopt a Mitigated Negative Declaration for the TTM 20454 Project. A Notice of Intent to Adopt a Mitigation Negative Declaration (NOI) will be issued for this project by the City. The Initial Study and NOI will be circulated for 30 days of public comment. At the end of the 30-day review period, a final MND package will be prepared and it will be reviewed by the City for possible adoption at a future Planning Commission meeting, the date for which has yet to be determined. If you or your agency comments on the MND/NOI for this project, you will be notified about the meeting date in accordance with the requirements in Section 21092.5 of CEQA (statute).

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095, and 21151, Public Resources Code; *Sundstrom v. County of Mendocino*,(1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors*, (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; San *Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

Revised 2019
Authority: Public Resources Code sections 21083 and 21083.09
Reference: Public Resources Code sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3/ 21084.2 and 21084.3

SUMMARY OF MITIGATION MEASURES

Air Quality

AQ-1 Fugitive Dust Control. The following measures shall be incorporated into Project plans and specifications for implementation:

- Apply soil stabilizers or moisten inactive areas.
- Water exposed surfaces to avoid visible dust leaving the construction site (at least 2-3 times/day).
- Cover all stock piles with tarps at the end of each day and as needed during the construction day.
- Provide water spray during loading and unloading of earthen materials.
- Require the contractor to minimize in-out traffic from construction zone to the extent feasible, and enforce a speed limit of 15 MPH on site to avoid dust migration from the site.
- Cover all trucks hauling dirt, sand, or loose material and require all trucks to maintain at least two feet of freeboard.
- Sweep streets daily if visible soil material is carried out from the construction site.

AQ-2 Exhaust Emissions Control. The following measures shall be incorporated into Project plans and specifications for implementation:

- Utilize off-road construction equipment that has met or exceeded the maker's recommendations for vehicle/equipment maintenance schedule.
- Contactors shall utilize Tier 4 or better heavy equipment.
- Enforce 5-minute idling limits for both on-road trucks and off-road equipment.

AQ-3 Dust Mitigation Measures. In accordance with Mojave Desert Air Quality Management District (MDAQMD) requirements and prior to commencement of earth moving activities, the Project Proponent shall: obtain MDAQMD permits for any miscellaneous process equipment that may not be exempt under District Rule 219 including, but not limited to internal combustion engines with a manufacturer's maximum continuous rating greater than 50 brake horsepower; and prepare and submit to the MDAQMD a dust control plan that describes all applicable dust control measures that will be implemented at the project. Additionally, the Project Proponent shall implement the following measures:

- Signage compliant with Rule 403 Attachment B shall be erected at each project entrance not later than the commencement of construction.
- Use a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes to minimize visible fugitive dust emissions. For projects with exposed sand or fines deposits (and for projects that expose such soils through earthmoving), chemical stabilization or covering with a stabilizing layer of gravel will be required to eliminate visible dust/sand from sand/fines deposits.
- All perimeter fencing shall be wind fencing or the equivalent, to a minimum of four feet in height or the top of all perimeter fencing. The owner/operator shall maintain the wind fencing as needed to keep it intact and remove windblown dropout. This wind fencing requirement may be superseded by local ordinance, rule or project-specific biological mitigation prohibiting wind fencing.
- All maintenance and access vehicular roads and parking areas shall be stabilized with chemical, gravel, or asphaltic pavement sufficient to eliminate visible fugitive dust from vehicular travel and wind erosion. Take actions to prevent project-related trackout onto paved surfaces, and clean any project related trackout within 24-hours. All other earthen surfaces within the project area shall be stabilized by natural or irrigated vegetation, compaction, chemical or other means sufficient to prohibit visible fugitive dust from wind erosion.

Biological Resources

BIO-1 A qualified biologist shall develop a Worker Education Awareness Program (WEAP) that would include information on general and special status species within the project area, identification of these species and their habitats, techniques being implemented during construction to avoid impacts to species, consequences of killing or injuring an individual of a listed species, and reporting procedures when encountering listed or sensitive species. All construction crews, foremen, and other project personnel potentially working on site should attend this education program prior to the first day of work.

BIO-2 Burrowing Owl would be included as one of the species covered in the WEAP that all construction crews, foremen, and other project personnel potentially working on site should attend prior to the first day of work.

Preconstruction presence/absence surveys for burrowing owl shall be conducted no less than 14 days prior to any onsite ground disturbing activity by a qualified biologist, including prior to each phase of new ground disturbance. The burrowing owl surveys shall be conducted pursuant to the recommendations and guidelines established by the California Department of Fish and Wildlife in the "California Department of Fish and Wildlife 2012 Staff Report on Burrowing Owl Mitigation." In the event this species is not identified within the project limits, no further mitigation is required, and a letter shall be prepared by the qualified biologist documenting the results of the survey. The letter shall be submitted to CDFW prior to commencement of project activities. If during the preconstruction survey, the burrowing owl is found to occupy the site, Mitigation Measure BIO-3 shall be required.

BIO-3 If burrowing owls are identified during the survey period, the Developer, in conjunction with the shall take the following actions to offset impacts prior to ground disturbance:

The Developer, in conjunction with the City shall notify CDFW within three business days of determining that a burrowing owl is occupying the site to discuss the observed location, activities and behavior of the burrowing owl(s) and appropriate avoidance and minimization measures.

Active nests within the areas scheduled for disturbance or degradation shall be avoided until fledging has occurred, as confirmed by a qualified biologist. Following fledging, owls may be passively relocated by a qualified biologist, as described below.

If impacts on occupied burrows are unavoidable, onsite passive relocation techniques may be used if approved by the CDFW to encourage owls to move to alternative burrows provided by the Developer outside of the impact area.

If relocation of the owls is approved for the site by CDFW, CDFW shall require the City to hire a qualified biologist to prepare a plan for relocating the owls to a suitable site and conduct an impact assessment. A qualified biologist shall prepare and submit a passive relocation program in accordance with Appendix E (i.e., Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans) of the 2012 Staff Report on Burrowing Owl Mitigation (CDFG 2012) to the CDFW for review/approval prior to the commencement of disturbance activities onsite.

The relocation plan must include all of the following and as indicated in Appendix E:

- The location of the nest and owls proposed for relocation.
- The location of the proposed relocation site.
- The number of owls involved and the time of year when the relocation is proposed to take place.
- The name and credentials of the biologist who will be retained to supervise the relocation.
- The proposed method of capture and transport for the owls to the new site.

- A description of site preparation at the relocation site (e.g., enhancement of existing burrows, creation of artificial burrows, one-time or long-term vegetation control).

The Developer shall conduct an impact assessment, in accordance with the Staff Report on Burrowing Owl Mitigation prior to commencing project activities to determine appropriate mitigation, including the acquisition and conservation of occupied replacement habitat at no less than a 2:1 ratio.

Prior to passive relocation, suitable replacement burrows site(s) shall be provided at a ratio of 2:1 and permanent conservation and management of burrowing owl habitat such that the habitat acreage, number of burrows and burrowing owl impacts are replaced consistent with the Staff Report on Burrowing Owl Mitigation including its Appendix A within designated adjacent conserved lands identified through coordination with CDFW and the City. A qualified biologist shall confirm the natural or artificial burrows on the conservation lands are suitable for use by the owls. Monitoring and management of the replacement burrow site(s) shall be conducted and a reporting plan shall be prepared. The objective shall be to manage the replacement burrow sites for the benefit of burrowing owls (e.g., minimizing weed cover), with the specific goal of maintaining the functionality of the burrows for a minimum of 2 years.

A final letter report shall be prepared by the qualified biologist documenting the results of the passive relocation. The letter shall be submitted to CDFW.

BIO-4 Although no desert tortoises were detected during the site surveys, habitat within the project footprint is considered marginally suitable for this species. Therefore, a qualified biologist shall conduct a pre-construction clearance survey no more than 14 days prior to initiating construction in accordance with U.S. Fish and Wildlife Service's (2019) survey protocol; if the biologist detects a desert tortoise, the biologist or applicant will contact the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife immediately. Regardless of the survey results, a biological monitor should be present at the site during all clearing and grubbing activities above grade. The biologist/monitor should remain on-call during construction activities to respond to a circumstance where a desert tortoise wanders into the construction area.

BIO-5 Prior to construction a preconstruction survey shall be conducted by a qualified biologist to verify the location of any Joshua Trees in the site. The biologist shall prepare a report that shall be submitted to the County and the California Department of Fish and Wildlife (CDFW). This report shall determine whether the sole Joshua Tree on the property can be avoided, relocated onsite or mitigated under the WJTCA. The report shall include the findings and/or avoidance/mitigation recommendations in conformance with the WJTCA after consultation with the CDFW. The site developer shall fund the WJTCA mitigation recommendations to fully mitigate loss of the sole Joshua Tree located on the property.

BIO-6 The development shall not disturb any streambed jurisdictional area during construction. The streambed boundary shall be identified in the field prior to construction and the construction contract shall include prohibitions on any construction activities being carried out in the streambed channel. City field inspectors shall verify this measure is being implemented during site construction.

BIO-7 Prior to construction and issuance of any grading permit within the channel, the applicant/developer shall obtain written correspondence from the California Department of Fish and Wildlife (CDFW) stating that notification under section 1602 of the Fish and Game Code is not required for the Project, or the applicant/developer shall obtain a CDFW-executed Lake and Streambed Alteration Agreement, authorizing impacts to Fish and Game Code section 1602 resources associated with the Project.

BIO-8 Nesting bird surveys shall be conducted by a qualified avian biologist no more than three (3) days prior to vegetation clearing or ground disturbance activities. Preconstruction surveys shall focus on both direct and indirect evidence of nesting, including nest locations and nesting behavior. The qualified avian biologist will make every effort to avoid potential nest predation as a result of survey and monitoring efforts. If active nests are found during the preconstruction nesting bird surveys, a Nesting Bird Plan (NBP) shall be prepared and implemented by the qualified avian biologist. At a minimum, the NBP shall include guidelines for addressing active nests, establishing buffers, ongoing monitoring, establishment of avoidance and minimization measures, and reporting. The size and location of all buffer zones, if required, shall be based on the nesting species, individual/pair's behavior, nesting stage, nest location, its sensitivity to disturbance, and intensity and duration of the disturbance activity. To avoid impacts to nesting birds, any grubbing or vegetation removal should occur outside peak breeding season (typically February 1 through September 1).

Cultural Resources

CUL-1 Should any cultural resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection shall be performed immediately by a qualified archaeologist. Responsibility for making this determination shall be with the City's onsite inspector. The archaeological professional shall assess the find, determine its significance, and make recommendations for appropriate mitigation measures within the guidelines of the California Environmental Quality Act.

CUL-2 In the event that cultural resources are discovered during project activities, all work in the immediate vicinity of the find (within a 60-foot buffer) shall cease and a qualified archaeologist meeting Secretary of Interior standards shall be hired to assess the find. Work on the other portions of the project outside of the buffered area may continue during this assessment period. Additionally, the San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed within TCR-1, regarding any pre-contact and/or historic-era finds and be provided information after the archaeologist makes his/her initial assessment of the nature of the find, so as to provide Tribal input with regards to significance and treatment.

CUL-3 If significant pre-contact and/or historic-era cultural resources, as defined by CEQA (as amended, 2015), are discovered and avoidance cannot be ensured, the archaeologist shall develop a Monitoring and Treatment Plan, the drafts of which shall be provided to SMBMI for review and comment, as detailed within TCR-1. The archaeologist shall monitor the remainder of the project and implement the Plan accordingly.

Geology and Soils

GEO-1 Stored backfill material shall be covered with water resistant material during periods of heavy precipitation to reduce the potential for rainfall erosion of stored backfill material. Where covering is not possible, measures such as the use of straw bales or sand bags shall be used to capture and hold eroded material on the project site for future cleanup such that erosion does not occur.

GEO-2 Excavated areas shall be backfilled and compacted such that erosion does not occur. Paved areas disturbed by this project shall be repaved in such a manner that roadways and other disturbed areas are returned to the pre-project conditions or better.

GEO-3 All exposed, disturbed soil (trenches, stored backfill, etc.) will be sprayed with water or soil binders twice a day or more frequently if fugitive dust is observed migrating from disturbed areas.

GEO-4 The length of trench which can be left open at any given time will be limited to that needed to reasonably perform construction activities. This will serve to reduce the amount of backfill stored onsite at any given time.

GEO-5 Should any paleontological resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection should be performed immediately by a qualified paleontologist. Responsibility for making this determination shall be the project's qualified paleontologist as approved by the City Zoning Administrator. The paleontological professional shall assess the find, determine its significance, and determine appropriate mitigation measures within the guidelines of the California Environmental Quality Act that shall be implemented to minimize any impacts to a paleontological resource.

Greenhouse Gas Emissions

GHG-1 Prior to the recordation of the final map, the applicant/developer shall complete a revised Greenhouse Gas Emissions Screening Table in accordance with the City's adopted version of the San Bernardino County Regional Greenhouse Gas Reduction Plan 2021, while achieving the minimum number of points necessary to comply with the City of Victorville Greenhouse Gas reductions goals.

GHG-2 To the extent feasible, the City of Victorville Planning Department shall verify incorporation of the identified Screening Table Measures within the Project building plans/site designs and/or verify compliance with an updated version of the City's Greenhouse Gas Screening Table prior to the issuance of building permit(s).

Hazards and Hazardous Materials

HAZ-1 All accidental spills or discharge of hazardous material during construction activities shall be reported to the Certified Unified Program Agency and shall be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately a licensed disposal or treatment facility. This measure shall be incorporated into the SWPPP prepared for the proposed project. Prior to accepting the site as remediated, the area contaminated shall be tested to verify that any residual concentrations meet the standard for future residential or public use of the site.

Noise

NOI-1 The City will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.

NOI-2 Noise minimizing measures shall be implemented to reduce noise levels to the greatest extent feasible at the nearest receptors, defined as at or below 55 dBA permitted between the hours of 10:00 PM and 7:00 AM; and at or below 65 dBA permitted between the hours of 7:00 AM and 10:00 PM. Measures shall include portable noise barriers and scheduling specific construction activities to avoid conflict with adjacent sensitive receptors.

NOI-3 Equipment not in use for five minutes shall be shut off.

NOI-4 Equipment shall be maintained and operated such that loads are secured from rattling or banging.

NOI-5 Where commercially available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.

NOI-6 Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.

NOI-7 No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.

NOI-8 Construction staging areas shall be located as far from adjacent sensitive receptor locations as possible

NOI-9 The developer shall post temporary signage to provide local residents with a phone number to contact if excessive noise is identified at the site. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the project. The posted notice shall encourage the adjacent residents to contact the phone number in the case of a complaint. The phone number contact shall be available 24/7 throughout construction, at a minimum by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove or attenuate the sound source causing the complaint.

NOI-10 The City shall require the Applicant's construction contractor(s) to implement the following measures:

- Ensure that the operation of construction equipment that generates high levels of vibration including, but not limited to, large bulldozers, loaded trucks, pile-drivers, vibratory compactors, and drilling rigs, is minimized to below 72 vibration decibels (VdB), within 45 feet of existing residential structures and 35 feet of institutional structures (e.g., schools) during construction. Use of small rubber-tired bulldozers shall be enforced within these areas during grading operations to reduce vibration effects.
- The construction contractor shall provide signs along the roadway identifying a phone number for adjacent property owners to contact with any complaint. During future construction activities with heavy equipment within 300 feet of occupied residences, vibration field tests shall be conducted at the property line near the nearest occupied residences., If vibrations exceed 72 VdB, the construction activities shall be revised to reduce vibration below this threshold. These measures may include, but are not limited to the following: use different construction methods, slow down construction activity, or other mitigating measures to reduce vibration at the property from where the complaint was received.

Transportation

TRAN-1 The project fair share calculation is based on the proportion of project peak hour intersection turning movement volumes contributed to the improvement location relative to the total new peak hour intersection turning movement volume forecast for Fugue Year (2033) With Project conditions. The developer shall pay the project's fair share percentage of the identified impacted intersection costs (Mesa View Drive at Bear Valley Road) estimated to be between 15.3% and 15.8% for the proposed project. Refer to Appendix 7a of the Initial Study for the detailed information on the cost estimate. This fee shall be paid prior to occupancy of the subdivision.

TRAN-2 The City of Victorville shall mandate that the Applicant require their contractors prepare a construction traffic control plan. Elements of the plan should include, but are not necessarily limited to, the following:

- Develop circulation and detour plans, if necessary, to minimize impacts to local street circulation. Use haul routes minimizing truck traffic on local roadways to the extent possible.
- To the extent feasible, and as needed to avoid adverse impacts on traffic flow, schedule truck trips outside of peak morning and evening commute hours.
- Install traffic control devices as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones where needed to maintain safe driving

conditions. Use flaggers and/or signage to safely direct traffic through construction work zones.

- For roadways requiring lane closures that would result in a single open lane, maintain alternate one-way traffic flow and utilize flagger-controls.
- Coordinate with facility owners or administrators of sensitive land uses such as police and fire stations, hospitals, and schools. Provide advance notification to the facility owner or operator of the timing, location, and duration of construction activities.

TRAN-3 The City of Victorville shall require that all disturbances to public roadways be repaired in a manner that complies with the Standard Specifications for Public Improvements or other applicable City of Victorville standard design requirements.

Tribal Cultural Resources

TCR-1 The San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) and any other tribe noticed in accordance with AB 52 requirements shall be contacted, as detailed in CUL-2, of any pre-contact and/or historic-era cultural resources discovered during project implementation, and be provided information regarding the nature of the find, so as to provide Tribal input with regards to significance and treatment. Should the find be deemed significant, as defined by CEQA (as amended, 2015), a cultural resources Monitoring and Treatment Plan shall be created by the archaeologist, in coordination with SMBMI and any other tribe noticed in accordance with AB 52 requirements, and all subsequent finds shall be subject to this Plan. This Plan shall allow for a monitor to be present that represents SMBMI and any other tribe noticed in accordance with AB 52 requirements for the remainder of the project, should SMBMI and/or any other tribe noticed in accordance with AB 52 requirements elect to place a monitor on-site.

TCR-2 Any and all archaeological/cultural documents created as a part of the project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the applicant and Lead Agency for dissemination to SMBMI and any other tribe noticed in accordance with AB 52 requirements. The Lead Agency and/or applicant shall, in good faith, consult with SMBMI and any other tribe noticed in accordance with AB 52 requirements throughout the life of the project.

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California Department of Water Resources Groundwater Basin Boundary Assessment Tool: https://gis.water.ca.gov/app/bbat/

California Natural Diversity Database: http://www.dfg.ca.gov/biogeodata/cnddb/

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GENERAL BIOLOGICAL RESOURCES ASSESSMENT

TENTATIVE TRACT Map 20454
VICTORVILLE, SAN BERNARDINO COUNTY, CALIFORNIA
(Township 5 North, Range 5 West, Section 33)
APN: 3134-021-02, 05, 06 & 07

Prepared for:

Bedford Opportunity Fund II
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RCA
ASSOCIATES, INC
EST. 1990

October 25, 2021

Project: #2021-222

TITLE PAGE

Date Report Prepared:	**October 25, 2021**
Date Field Work Completed:	**October 19, 2021**
Report Title:	**General Biological Resources Assessment**
Assessor's Parcel Number:	**3134-021-02, 05, 06 & 07**
Principal Investigators:	**Ryan Hunter, Environmental Scientist/Biologist** **Jessica Hensley, Biologist** **Randall C. Arnold, Jr., Senior Biologist**
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Table of Contents

1.0 INTRODUCTION AND SUMMARY

Biological surveys were conducted on a 30-acre parcel (approximately) located on the southwest corner of Nyack Road and Mesa View Drive in the City of Victorville, California (Township 5 North, Range 5 West, Section 33, USGS Baldy Mesa, California Quadrangle, 1956) (Figures 1, 2, and 3). The site shows minimal signs of disturbance with native vegetation dominating the property. The property supports a creosote (*Larrea tridentata*) community typical of the area. A variety of plants were observed including Joshua trees (*Yucca brevifolia*), ephedra (*Ephedra nevadensis*), rubber rabbitbrush (*Ericameria nauseosa*), California buckwheat (*Eriogonum fasciculatum*), kelch grass (*Schismus barbatus*), and fiddleneck (*Amsinckia tessellata*). Table 1 (Appendix A) provided a list of all plant species observed during the field investigations.

As part of the environmental process, California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS) data sources were reviewed. Following the data review, surveys were performed on the site on October 19, 2021, during which the biological resources on the site and in the surrounding areas were documented by biologists from RCA Associates, Inc. As part of the surveys, the property and adjoining areas were evaluated for the presence of native habitats which may support populations of sensitive wildlife species. The property was also evaluated for the presence of sensitive habitats including wetlands, vernal pools, riparian habitats, and jurisdictional areas. **No special status wildlife species were observed on the property; however, numerous Joshua trees, which are listed as a State threatened species, are present on the site. A comprehensive survey of the Joshua trees will be conducted and a separate report will be prepared which will summarize the results of the survey. Due to the presence of Joshua trees on the site, an Incidental Take Permit (ITP) will be required from CDFW prior to the start of any ground disturbance activities if any Joshua trees (living or dead) will be impacted by development activities.**

Focused surveys were also conducted for both the desert tortoise and burrowing owl. Based on data from USFWS, CDFW, and a search of the California Natural Diversity Database (CNDDB, 2021), desert tortoises and burrowing owls have been documented within approximately five miles southwest of the property. Scientific nomenclature for this report is based on the following references: Hickman (1993), Munz (1974), Stebbins (2003), Sibley (2000) and Whitaker (1980).

2.0 EXISTING CONDITIONS

The property is approximately 30-acres in size and is located on the southwest corner of Nyack Road and Mesa View Drive in the City of Victorville, California (Township 5 North, Range 5 West, Section 33, USGS Baldy Mesa, California Quadrangle, 1956). The site shows minimal signs of being disturbed in the past with native vegetation present throughout the project site. Existing residential developments are located east and north of the parcel and municipal water tanks are located to the south. Vacant lands are also present west and south of the property.

Creosote bush (*Larrea tridentata*), Joshua trees (*Yucca brevifolia*), rubber rabbitbrush (*Ericameria nauseosa*), California buckwheat (*Eriogonum fasciculatum*), and Nevada jointfir (*Ephedra nevadensis*) are the dominant perennials and the dominant annuals include cheat grass (*Bromus tectorum*), kelch grass (*Schismus barbatus*), and mustard (*Brassica tourneforti*). Section 5.0 provides a more detailed discussion of the various plant species observed during the surveys.

The site is expected to support a variety of wildlife species on the site. Mammals observed on the site or which are expected to inhabit the site include jackrabbits (*Lepus californicus*), desert cottontails (*Sylvilagus auduboni*), and Antelope ground squirrel (*Ammospermophilus leucurus*). Coyote (*Canis latrans*) scats were observed on the site, indicating coyotes utilize the site during hunting activities.

Birds observed included ravens (*Corvus corax*), house finch (*Carpodacus mexicanus*), white-crowned sparrow (*Zonotricia leucophrys*), mourning dove (*Zenaida macroura*), and black throated gray warbler (*Setophaga nigrescns*). Section 5.0 provides a more detailed discussion of the various species observed during the surveys and Table 2 Appendix A) provides a list of all avian species observed. No reptiles were observed during the field investigation; however, desert spiny lizard (*Sceloporus magister*) and western whiptail lizard (*Cnemidophorus tigris*) are common in the area and likely inhabit the site.

As noted above, Joshua trees are present on the site and a comprehensive survey will be performed to evaluate the trees. In the event the Joshua trees will be impacted by the proposed development an Incidental Take Permit will be required prior to any ground disturbance activities and relocation and/or removal of any Joshua trees (living or dead). A potential jurisdictional channel is located in the western portion of the site as depicted on the site plan (Figure 4).

Table 2 provides a compendium of wildlife species which inhabit the site and/or occur in the region. No sensitive habitats (e.g., sensitive species critical habitats, etc.) have been documented in the immediate area according to the CNDDB (2021) and none were observed during the field investigations.

3.0 METHODOLOGIES

General biological surveys were conducted on October 19, 2021, during which biologists from RCA Associates, Inc. initially walked meandering transects throughout the property site. During the surveys, data was collected on the plant and animal species present on the site. All plants and animals detected during the surveys were recorded and are provided in Tables 1 & 2 (Appendix A). The property was also evaluated for the presence of habitats which might support sensitive species. Scientific nomenclature for this report is based on the following references: Hickman (1993), Munz (1974), Stebbins (2003), Sibley (2000) and Whitaker (1980). Following completion of the initial reconnaissance survey, protocol surveys were also conducted for the desert tortoise and burrowing owl as per agency requirements. Weather conditions consisted of wind speeds of 0 to 5 mph; temperatures ranged between 65 to 70 (°F) (AM) with clear skies. The applicable methodologies are summarized below.

General Plant and Animal Surveys: Meandering transects were walked throughout the site and in the surrounding area (i.e., the zone of influence) at a pace that allowed for careful documentation of the plant and animal present on the site. All plants observed were identified in the field and wildlife was identified through visual observations and/or by vocalizations. Tables 1 and 2 (Appendix A) provides a comprehensive compendium of the various plant and animal species observed during the field investigations. During the various biological surveys, all transects were walked at a pace that allowed careful observations along the transect routes and in the immediate vicinity. Field notes were recorded regarding native plant assemblages, wildlife sign, and human effects in order to determine the presence or absence of suitable tortoise foraging habitat.

Desert Tortoise: A protocol survey was conducted on October 19, 2021 for the desert tortoises during which ten-meter, parallel belt transects were walked in a north-south direction until the entire property had been checked for tortoises and any tortoise sign (burrows, tracks, scats, etc.). Surveys in the zone of influence (ZOI) were also conducted in the area west and south of the site. Comprehensive field investigations were conducted throughout the site during the biological surveys and no tortoises or tortoise sign was identified on the site or zone of influence. If tortoises are found to inhabit the site in the future, a Section 10(a) incidental take permit from the USFWS and a Section 2081 permit from CDFW will be required to mitigate impacts to the species.

Burrowing Owl: A habitat assessment (Phase 1) was conducted for the burrowing owl in conjunction with the general biological surveys to determine if the site supports suitable habitat for the species on October 19, 2021. Following completion of the habitat assessment, it was determined that the site does support suitable habitat for the burrowing owl; therefore, burrowing owl surveys were conducted in conjunction with the focused surveys for the desert tortoise.

Burrowing owls typically utilize burrows which have been excavated by other animals (squirrels, coyotes, foxes, dogs, etc.) since owls rarely dig their own burrows. CDFW protocol also requires surveys be conducted in the surrounding area out to a distance of about 500 feet; therefore, the zone of influence (ZOI) surveys were performed in the area surrounding the site where possible. If present on a site, CDFW typically requires the owls to be passively relocated during the non-breeding season. It was determined that no owls were observed during the field investigations, and there was no owl sign (i.e., whitewash, feathers, or castings) observed during the field investigations.

Mohave Ground Squirrel: The Mohave ground squirrel is a State listed species which has been documented in the region and the site does support suitable habitat for the species; however, due to the very low population levels and no recent observations in this area of the Mojave Desert, it is the opinion of RCA Associates, Inc. that the likelihood of Mohave ground squirrels occurring on the proposed project site is very low. However, CDFW may require additional surveys for the species when it is more active (Typically March – June).

4.0 LITERATURE SEARCH

As part of the environmental process, a search of the California Natural Diversity Database (CNDDB) search was performed. Based on this review, it was determined that fourteen special status species have been documented within the Baldy Mesa quad. of the property. The following tables provide data on each special status species which has been documented in the area.

Table 4-1: Federal and State Listed Species and State Species of Special Concern.
E = Endangered; T = Threatened; SSC = Species of special concern; CNPS = California Native Plant Society; CNDDB = California Natural Diversity Data Base

NAME	STATUS	HABITAT REQUIREMENTS	PRESENCE/ ABSENCE ON PROPERTY
PLANTS			
Within Baldy Mesa Quadrangle			
Short-joint beavertail (Opuntia basilaris var. brachyclada)	Federal: None State: None CNPS: 1B.2	Desert scrub Joshua tree woodland	The site does support suitable habitat for the species; however, no beavertail observed during field surveys.
Sagebrush loeflingia (*Loeflingia squarrosa var. artemisiarum*)	Federal: None State: None CNPS: 2B.2	Creosote bush scrub, sagebrush scrub, dunes	The does support suitable habitat, however no sagebrush loeflingia was observed.

Table 4-2: Special status wildlife and insects documented in the region (Source: CNDDB, 2021).

NAME	STATUS	HABITAT REQUIREMENTS	PRESENCE/ABSENCE ON PROPERTY
ANIMAL			
Within Baldy Mesa Quadrangle			
Desert tortoise (*Gopherus agassizii)*	Federal: Threatened State: Threatened	Desert shrub	No tortoises or tortoise sign observed on-site.
Yellow warbler (*Setophaga petechia*)	Federal: None State: None	Dense riparian vegetation.	The site does not support suitable habitat for the species and species is not expected to occur on the site.
Burrowing owl (*Athene cunicularia*)	Federal: None State: None CDFW: SSC	Open grassland areas where the owls utilize abandoned mammal burrows.	Marginal habitat present on the site. No owls observed during survey; however, this mobile species occurs throughout Southern California and could potentially occur in the area in the future.
Coast horned lizard (*Phrynosoma blainvillii*)	Federal: None State: None	Inhabits open areas of sandy soils and low vegetation in valleys, foothills, and semiarid mountains	Suitable habitat, none observed on site.

Mohave ground squirrel (*Xerospermophilus mohavensis*)	Federal: None State: Threatened	Desert scrub	The site supports suitable habitat for the species. Species has been identified in the area; however, species unlikely to inhabit the site due to the very low population levels in the area.
Loggerhead shrike (*Lanius ludovicianus*)	Federal: None State: None	Open country with scattered shrubs and trees	The site does provide suitable habitat, however none observed on site

Notes:

CNPS List 1A: Plants presumed extirpated in California and either rare or extinct elsewhere
CNPS List 1B: Plants rare, threatened, or endangered in California and elsewhere.
CNPS List 2A: Plants presumed extirpated in California, but more common elsewhere.
CNPS List 2B: Plants rare, threatened, or endangered in California, but more common elsewhere.
CNPS List 3: Plants about which more information is needed – a review list.
CNPS List 4: Plants of limited distribution – a watch list

4.1: Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat.)
4.2: Moderately threatened in California (2-80% occurrences threatened/moderate degree and immediacy of threat.)
4.3: Not very threatened in California (less than 20% of occurrence threatened/low degree and immediacy of threat or no current threats known.)

SSC = Species of Special Concern

5.0 RESULTS

5.1 General Biological Resources

The site supports a creosote community which covers the entire property (Figure 3). Some of the species observed during the field investigations included creosote bush (*Larrea tridentata*), Joshua trees (*Yucca brevifolia*), rubberbrush (*Ericameria nauseosa*), Nevada jointfir (*Ephedra nevadensis*), rubber rabbitbrush (*Ericamerica nauseosa var*), California buckwheat (*Eriogonum fasciculatum*), and silver cholla (*Cylindropuntia echinocarpa*). Table 1 provides a compendium of all plants occurring on the site and/or in the immediate surrounding area.

Birds observed included ravens (*Corvus corax*), house finch (*Carpodacus mexicanus*), mourning dove (*Zenaida macroura*), and black throated gray warbler (*Setophaga nigrescen*). Several other avian species were observed and are listed in Table 2. Antelope ground squirrels were the only mammals observed during the surveys; however, other species common to the area, and which may occur on the site, include black-tailed jackrabbit (*Calypte costae*), California ground squirrel (*Otospermophilus beecheyi*), Merriam's kangaroo rats (*Dipodomys merriamii*), and desert cottontail (*Sylvilagus auduboni*). Coyote scats were also noted indicating this common desert predator frequents the site during hunting forays. No reptiles were observed, although western whiptail lizard (*Cnemidophorus tigris*) and desert spiny lizard (*Sceloporus magister*) are common in the Mojave Desert and likely inhabit the property. Other species known to occur in the general area include the western fence lizard (*Sceloporus occidentalis*) and side-blotched lizard (*Uta stansburiana*). Tables 1 and 2 (Appendix A) provide a compendium of the various plant and animal species identified during the field investigations and those common to the area.

5.2 Federal and State Listed Species

The following are the listed and special status species that have the ability to occur on the project site or which are present. However, it is not a comprehensive list of all the special status species which have been documented in the immediate region (CNDDB, 2021).

Desert Tortoise: The site is located within the documented tortoise habitat according to CNDDB with the nearest documented sighting about 4-miles northwest of the property (CNDDB, 2021). The property supports suitable habitat for the desert tortoise; however, no tortoises or tortoise sign (burrows, scats, etc.) were observed anywhere within the property boundaries or in the surrounding area during the October 19, 2021, surveys. Based on the results of the survey and the low population levels of the species in the region, tortoises are not expected to move onto the site in the near future. In addition, there are several residential developments in the area and relatively busy roadways in the immediate area which may act as barriers to migration of tortoises.

Mohave Ground Squirrel: The site does occur within the known distribution of the Mohave Ground Squirrels, and the nearest documented observation is about 4-miles to the southeast of the property. However, there are no recent observations of Mojave ground squirrel within the area, and it is the opinion of RCA Associates, Inc. that Mohave ground squirrels are unlikely to occur on the site based on the following criteria.

1. Relatively small size (30-acres);
2. No recent documented observations in the general region;
3. Existing residential developments on two sides of the site, and
4. Limited connectivity with habitat in the surrounding area which may support the species.

5.3 Wildlife Species of Special Concern

The following is a list of special status wildlife species which have been documented in the region; however, only a few of these species could potentially occur on the site. Several of the species are not expected to occur on the property due to absence of suitable habitat but are included for clarity.

Burrowing Owl: The site is located within documented burrowing owl habitat according to CNDDB with the nearest documented sighting about 1-mile east of the property (CNDDB, 2021). No owls or owl sign (whitewash, etc.) were seen on the property during the focused owl survey, even though suitable (i.e., "occupiable") burrows were observed. There is a possibility of owls moving onto this site in the future based on the results of the field investigations and presence of suitable burrows for utilization; therefore, a pre-construction survey will need to be conducted 30-days prior to the start of any ground disturbance activities.

Yellow warbler: Yellow warbler have been documented in the region (Occurrence #29, Hesperia, California Quad, 2021), with the most recent observation (1953) about five miles west of the property (CNDDB, 2021). Yellow warblers are unlikely to occur on the site since suitable habitat (i.e., dense riparian vegetation) is not present.

Beavertail Cactus: Beavertail cactus are readily identifiable and if present on the site, would have been observed during the extensive field investigations conducted throughout the site. Short-joint beavertail has been observed in the region (Occurrence #13, Hesperia, California Quad, 2021), with the most recent documented siting (1991) in the region approximately six miles to the south (CNDDB, 2021). The species is not expected to occur on the site in the near future.

Sagebrush Loeflingia: This plant species typically occurs in sage brush habitats, chaparral and grassland areas and is unlikely to occur on the site given the absence of suitable habitat. The nearest observation is about five miles southeast of the site and was recorded in 1971 (Hesperia, California Quad, CNDDB 2021).

Coast horned lizard: Coast horned lizard have been documented in the region (Occurrence # 217, Hesperia, California Quad, 2021), with the most recent observation (1980) about three miles east of the property (CNDDB, 2021). The use of the site by coast horned lizards may be very infrequent given the low population levels in the region as well as the lack of any recent sightings in the immediate region according to the CNDDB (2021).

Cooper's hawk: A Cooper's hawk was observed flying over the property; however, not potential raptor nests were observed on the site and the solitary hawk was likely hunting for prey. The last documented observation in the area was about five mile southeast of the site (Occurrence #4, Hesperia, California Quad, 2021). Cooper's hawks likely utilize the site and the surrounding area infrequently for hunting.

Loggerhead Shrike: Shrikes have been documented in the region (Occurrence #19, Hesperia, California Quad, 2021), with the most recent observation in 1917 about three miles northeast of the property (CNDDB, 2021). Shrikes could potentially occur on the site; although, the use of the site by the species may be very infrequent given the low population levels in the region as well as the lack of any recent sightings according to the CNDDB (2021)

5.4 Jurisdictional Waters and Riparian Habitat

The following sources were reviewed to determine the potential presence or absence of jurisdictional streams/drainages, wetlands, and their location within the watersheds associated with the Project site, and other features that might contribute to federal or state jurisdictional authority located within watersheds associated with the Project site:

- National Wetlands Inventory (NWI) maps (USFWS 2018b). The NWI database indicates potential wetland areas based on changes in vegetation patterns as observed from satellite imagery. This database is used as a preliminary indicator of wetland habitats because the satellite data are not precise;
- USGS National Hydrography Dataset (NHD) provides the locations of "blue-line" streams as mapped on 7.5-Minute Topographic Map coverage;
- Aerial Imagery (Google Earth) (Google 2021);
- USGS 7.5-Minute Topographic Maps; and
- Natural Resources Conservation Service (NRCS) Soil Survey.

Assessments of potential jurisdictional areas within the Project site were conducted by RCA Associates, Inc. biologists Ryan Hunter and Jessica Hensley on October 19, 2021 to determine the current site conditions. All areas with potential depressions or drainages were evaluated for the presence of areas which may be considered jurisdictional waters, including jurisdictional wetlands.

Based on the field investigations, a drainage channel is located along the western boundary of the site and this area may be considered jurisdictional waters of the State and/or the U.S. However, as shown on the site plan, this area will be avoided during development activities and applicable permits (e.g., 1602, 401 and 404) may not be required.

5.5 Protected Plants

Joshua trees were the only protected plants observed on the site and were scattered throughout the property. Due to the presence of Joshua trees on the property, a comprehensive survey and evaluation of the Joshua trees, and a "protected plant preservation plan" will be prepared for the site as per City requirements. Therefore, the project proponent has contracted with RCA Associates, Inc. to perform the surveys and prepare the technical report.

6.0 IMPACTS AND MITIGATION MEASURES

6.1 General Biological Resources

Future development of the site will impact the general biological resources present on the site, and most of the vegetation will likely be removed during future construction activities. Wildlife will also be impacted by development activities and those species with limited mobility (i.e., small mammals and reptiles) will experience increases in mortality during the construction phase. However, more mobile species (i.e., birds, large mammals) will be displaced into adjacent areas and will likely experience minimal impacts. Loss of about 30-acres of desert vegetation is not expected to have a significant cumulative impact on the overall biological resources in the region given the presence of similar habitat throughout the surrounding desert region. The drainage channel located along the western boundary of the site, which may be considered jurisdictional waters of the State and/or the U.S. will be avoided during future development activities.

6.2 Federal and State Listed and Species of Special Concern

No federal listed species were observed on the site during the field investigations including the Mohave ground squirrel and desert tortoise. In addition, there are no documented observations of these species either on the site or in the immediate area (CNDDB, 2021). The site is not expected to support populations of the desert tortoise based on the absence of any tortoise sign (e.g., burrows, scats, tracks, etc.), and although suitable habitat is present on site, the probability of the species inhabiting the site is very low. In addition, Mohave ground squirrels are unlikely to inhabit the site given the very low population levels in the area; although. CDFW may require more comprehensive surveys to definitely determine the presence or absence of the species.

As per CDFW protocol, the burrowing owl survey results are valid for only 30 days; therefore, CDFW will require a 30-day pre-construction survey be performed prior to any clearing/grading activities to determine if owls have moved on to the site since the October 19, 2021, surveys.

As of September 22, 2020, CDFW temporality listed the western Joshua tree (*Yucca brevifolia*) as a threatened species for one year until a final decision in made. Therefore, a comprehensive survey and evaluation of the Joshua trees present on the site will be

<u>conducted by RCA Associates, inc. and a separate technical report will be prepared that provides the results of the survey. An Incidental Take Permit will be required prior to the start of any ground disturbance activities and any actions that may impact the Joshua trees cannot occur until an ITP permit has been issued by CDFW for the project.</u>

7.0 CONCLUSIONS AND RECOMMENDATIONS

Future development activities are expected to result in the removal of vegetation from the 30-acre parcel; however, cumulative impacts to the general biological resources (plants and animals) in the surrounding area are expected to be minimal; however, impacts to the Joshua trees on the site will be considered significant given the recently listing of the species by the State of California as a "threatened species." The following mitigation measures are recommended:

1. Pre-construction surveys for burrowing owls, desert tortoise, and nesting birds protected under the Migratory Bird Treaty Act and Section 3503 of the California Fish and Wildlife Code may need to be conducted prior to the commencement of future ground disturbance.
   a. Appropriate survey methods and time frames shall be established, to ensure that chances of detecting the target species are maximized. In the event that listed species, such as the desert tortoise, are encountered, authorization from the USFWS and CDFW must be obtained. If nesting birds are detected, avoidance measures shall be implemented to ensure that nests are not disturbed until after young have fledged.
   b. Pre-construction surveys shall encompass all areas within the potential footprint of disturbance for the project, as well as a reasonable buffer around these areas.
2. A comprehensive survey and evaluation of the Joshua trees on the site will need to be conducted and preparation of a Protected Plant Plan. The report shall identify methods, locations, and criteria for transplanting those trees that would be removed prior to ground disturbance activities and Project construction.

If any other sensitive species are observed on the property during future activities, CDFW and USFWS (as applicable) should be contacted to discuss specific mitigation measures which may be required for the individual species. CDFW and USFWS are the only agencies which can grant authorization for the "take" of any sensitive species and can approve the implementation of any applicable mitigation measures.

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CERTIFICATION

I hereby certify that the statements furnished above and in the attached exhibits, presents the data and information required for this biological evaluation, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief. Fieldwork conducted for this assessment was performed by Ryan Hunter and Jessica Hensley, reports was prepared by Randall Arnold and other biologists under his direction. I certify that I have not signed a non-disclosure or consultant confidentiality agreement with the project applicant or applicant's representative and that I have no financial interest in the project.

Date: ___10/25/2021________ Signed: Ryan Hunter

Field Work Performed By: _______Ryan Hunter______
Environmental Scientist/Biologist

Field Work Performed By: ______Jessica Hensley______
Biologist

Report Prepared By: __________Randall Arnold_____
President and Senior Biologist

Appendix A

Tables and Figures

& Regulatory Content

Figure 1: Regional Exhibit

RCA Associates, Inc.
Source: Google Earth

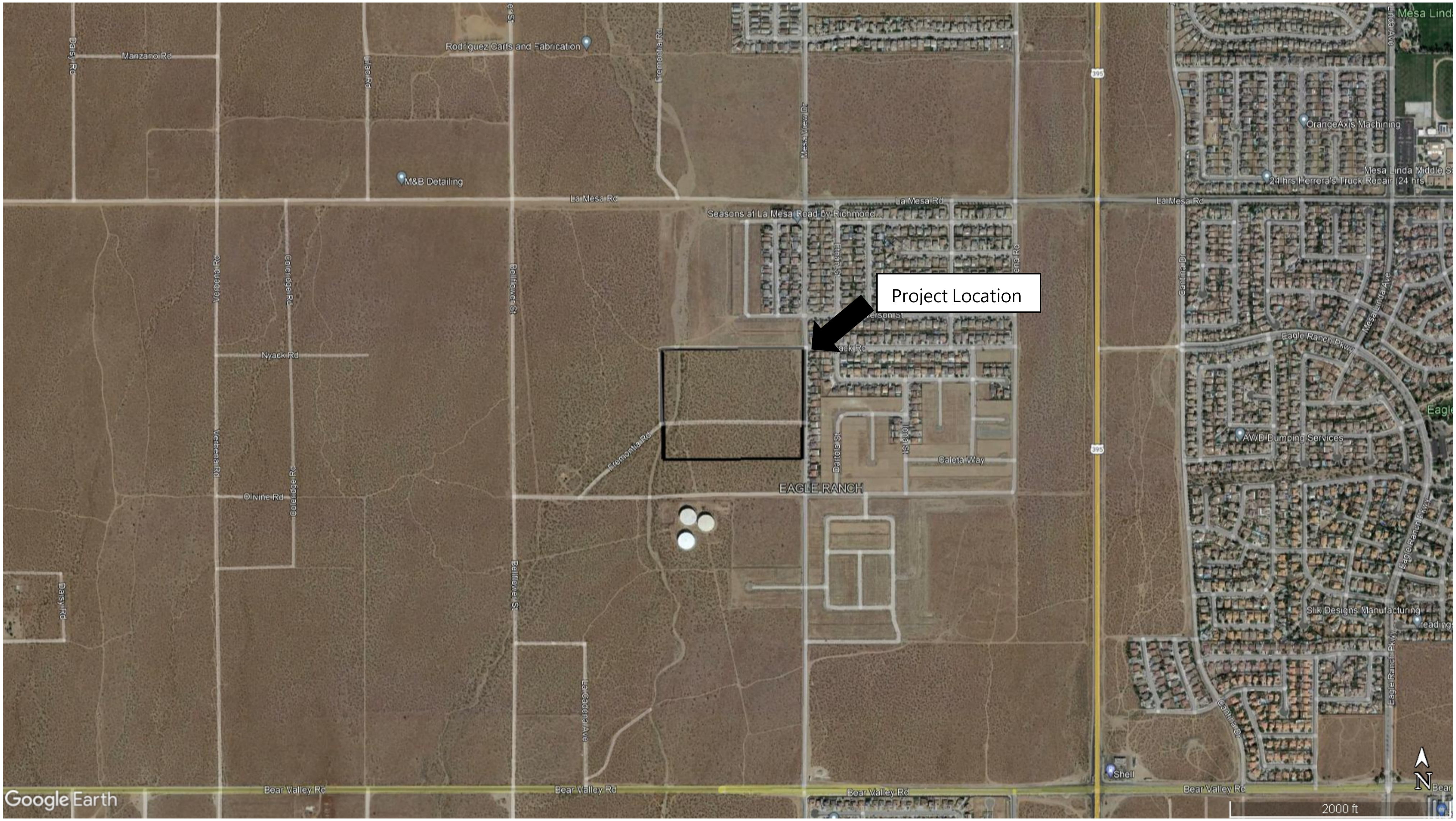

Figure 2: Vicinity Exhibit

RCA Associates, Inc.
Source: Google Earth

CENTER OF SITE LOOKING NORTH

CENTER OF SITE LOOKING EAST

FIGURE 3
PHOTOGRAPHS OF SITE

CENTER OF SITE LOOKING SOUTH

CENTER OF SITE LOOKING WEST

FIGURE 3, cont.
PHOTOGRAPHS OF SITE

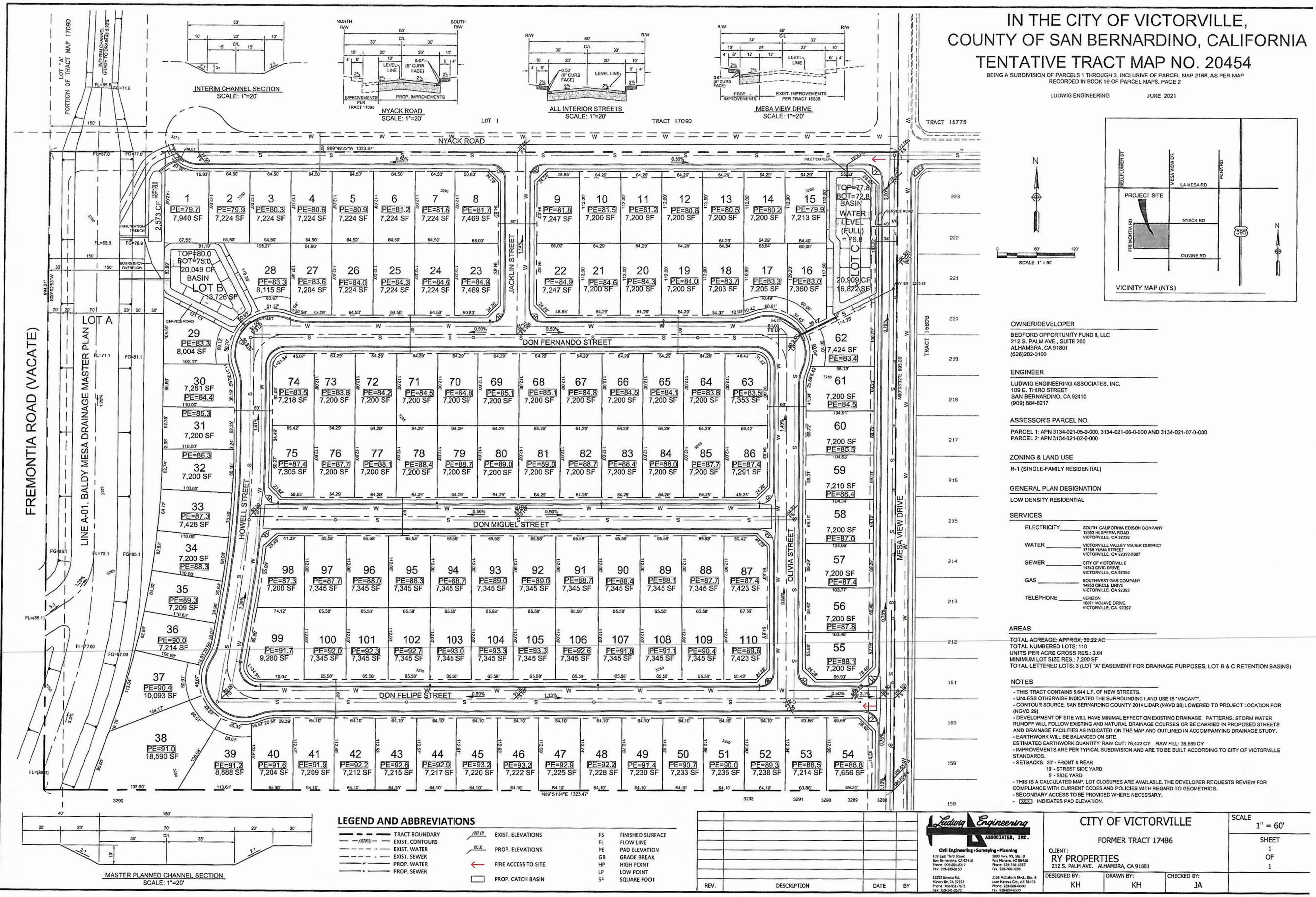

FIGURE 4: SITE PLAN

Table 1 - Plants observed on the site and known to occur in the immediate surrounding area.

Common Name	Scientific Name	Location
Joshua tree	*Yucca brevifolia*	On site and Surrounding Area
Creosote bush	*Larrea tridentata*	"
Beavertail cactus	*Opuntia basilaris*	Surrounding Area
California buckwheat	*Eriogonum fasciculatum*	On-site and surrounding area
Asian mustard	*Brassica tournefortii*	"
Cheatgrass	*Bromus tectorum*	On-site and surrounding area
Wild oat	*Avena fatua*	"
Kelch grass	*Schismus barbatus*	On-site an surrounding area
Rubber rabbitbrush	*Chrysothamnus nauseosus*	"
Ragweed	*Ambrosia sp.*	Surrounding area
Ephedra	*Ephedra nevadensis*	On-site and surrounding area
Chia	*Salvia hispanica*	"
Broom snakeweed	*Gutierrezia sarothrae*	Surrounding area
Fiddleneck	*Amsinckia tessellata*	On-site and surrounding area
Silver cholla	*Cylindropuntia echinocarpa*	"
Winterfat	*Krascheninnikovia lanata*	Surrounding area
White bursage	*Ambrosia dumosa*	On-site and surrounding area
Saltbush	*Atriplex sp.*	"
Maltese Star thistle	*Centauren melitensis*	"

Note: The above list is not intended to be a comprehensive list of every plant which may occur on the site or in the zone of influence.

Table 2 - Wildlife observed on the site during the field investigations or likely to occur on the site and/or surrounding area.

Common Name	Scientific Name	Location
Common raven	*Corvus corax*	On-site and surrounding area.
California ground squirrel	*Spermophilus beecheyi*	Surrounding area
Cactus wren	*Campylorhynchus brunneicapillus*	“
House finch	*Carpodacus mexicanus*	On-site and surrounding area
Pigeon	*Columba livia*	On-site and surrounding area
Mourning dove	*Zenaida macroura*	On-site and surrounding area
White crowned sparrow	*Zonotrichia leucophrys*	“
Western whiptail lizard	*Cnemidophorus tigris*	Surrounding area
Black throated gray warbler	*Setophaga nigrescens*	On-site and surrounding area
Desert spiny lizard	*Sceloporus magister*	Surrounding area
Antelope ground squirrel	*Ammospermophilus leucurus*	On-site and surrounding area
Desert cottontail	*Sylvilagus auduboni*	“
Jackrabbit	*Lepus Californicus*	“
Coyotes	*Canis latrans*	“
Verdin	*Auriparus flaviceps*	“
Yellow-rumped warbler	*Setophaga coronata*	“
Barn owl	*Tyto alba*	Carcass observed
Coopers hawk	*Accipiter cooperii*	Observed flying over site

Note: The above Table is not a comprehensive list of every animal species which may occur in the area, but is a list of those common species which were identified on the site or which have been observed in the region by biologists from RCA Associates, Inc.

REGULATORY CONTEXT

The following provides a summary of federal and state regulatory jurisdiction over biological and wetland resources. Although most of these regulations do not directly apply to the site, given the general lack of sensitive resource, they provide important background information.

Federal Endangered Species Act

The USFWS has jurisdiction over federally listed threatened and endangered plant and animal species. The federal Endangered Species Act (ESA) and its implementing regulations prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10 of the ESA. ESA defines "take" as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Federal regulation 50CFR17.3 defines the term "harass" as an intentional or negligent act that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering (50CFR17.3). Furthermore, federal regulation 50CFR17.3 defines "harm" as an act that either kills or injures a listed species. By definition, "harm" includes habitat modification or degradation that actually kills or injures a listed species by significantly impairing essential behavior patterns such as breeding, spawning, rearing, migrating, feeding, or sheltering (50CFR217.12).

Section10(a) of the ESA establishes a process for obtaining an incidental take permit that authorizes nonfederal entities to incidentally take federally listed wildlife or fish. Incidental take is defined by ESA as take that is "incidental to, and not the purpose of, the carrying out of another wise lawful activity." Preparation of a habitat conservation plan, generally referred to as an HCP, is required for all Section 10(a) permit applications. The USFWS and National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries Service) have joint authority under the ESA for administering the incidental take program. NOAA Fisheries Service has jurisdiction over anadromous fish species and USFWS has jurisdiction over all other fish and wildlife species.

Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any species listed under the ESA, or result in the destruction or adverse modification of its habitat. Federal agencies are also required to minimize impacts to all listed species resulting from their actions, including issuance or permits or funding. Section 7 requires consideration of the indirect effects of a project, effects on federally listed plants, and effects on critical habitat (ESA requires that the USFWS identify critical habitat to the maximum extent that it is prudent and determinable when a species is listed as threatened or endangered). This consultation results in a Biological Opinion prepared by the USFWS stating whether implementation of the HCP will result in jeopardy to any HCP Covered Species or will adversely modify critical habitat and the measures necessary to avoid or minimize effects to listed species.

Although federally listed animals are legally protected from harm no matter where they occur, the Section 9 of the ESA provides protection for endangered plants by prohibiting the malicious destruction on federal land and other "take" that violates State law. Protection for plants not living on federal lands is provided by the California Endangered Species Act.

California Endangered Species Act

CDFW has jurisdiction over species listed as threatened or endangered under Section 2080 of the California Fish and Wildlife Code. Section 2080 prohibits the take of a species listed by CDFW as threatened or endangered. The state definition of take is similar to the federal definition, except that Section 2080 does not prohibit indirect harm to listed species by way of habitat modification. To qualify as take under the state ESA, an action must have direct, demonstrable detrimental effect on individuals of the species. Impacts on habitat that may ultimately result in effects on individuals are not considered take under the state ESA but can be considered take under the federal ESA.

Proponents of a project affecting a state-listed species must consult with CDFW and enter into a management agreement and take permit under Section 2081. The state ESA consultation process is similar to the federal process. California ESA does not require preparation of a state biological assessment; the federal biological assessment and the CEQA analysis or any other relevant information can provide the basis for consultation. California ESA requires that CDFW coordinate consultation for joint federally listed and state-listed species to the extent possible; generally, the state opinion for the listed species is brief and references provisions under the federal opinion.

Clean Water Act, Section 404

The COE and the U.S. Environmental Protection Agency regulate the placement of dredged or fill material into "Waters of the United States" under Section 404 of the Clean Water Act. Waters of the United States include lakes, rivers, streams, and their tributaries, and wetlands. Wetlands are defined for regulatory purposes as "areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 Code of Federal Regulations [CFR] 328.3, 40 CFR 230.3).

The COE may issue either individual permits on a case-by-case basis or general permits on a program level. General permits are pre-authorized and are issued to cover similar activities that are expected to cause only minimal adverse environmental effects. Nationwide permits (NWP's) are general permits issued to cover particular fill activities. All NWP's have general conditions that must be met for the permits to apply to a particular project, as well as specific conditions that apply to each NWP.

Clean Water Act, Section 401

Section 401 of the Clean Water Act requires water quality certification and authorization of placement of dredged or fills material in wetlands and Other Waters of the United States. In accordance with Section 401 of the Clean Water Act, criteria for allowable discharges into surface waters have been developed by the State Water Resources Control Board, Division of Water Quality. As such, proponents of any new project which may impair water quality as a result of the project are required to create a post construction storm water management plan to insure offsite water quality is not degraded. The resulting requirements are used as criteria in granting National Pollution Discharge Elimination System (NPDES) permits or waivers, which are obtained through the Central Valley Regional Water Quality Control Board (RWQCB). Any activity or facility that will discharge waste (such as soils from construction) into surface waters, or from which waste may be discharged, must obtain an NPDES permit or waiver from the RWQCB. The RWQCB evaluates an NPDES permit application to determine whether the proposed discharge is consistent with the adopted water quality objectives of the basin plan.

California Fish and Wildlife Code, Sections 1600-1616

Under the California Fish and Wildlife Code, Sections1600-1616 CDFW regulates projects that divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake. Proponents of such projects must notify CDFW and enter into streambed alteration agreement with them.

Section 1602 of the California Fish and Wildlife Code requires a state or local government agency, public utility, or private entity to notify CDFW before it begins a construction project that will: (1) divert, obstruct, or change the natural flow or the bed, bank, channel, or bank of any river, stream, or lake; (2) use materials from a streambed; or (3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake. Once the notification is filed and determined to be complete, CDFW issues a streambed alteration agreement that contains conditions for construction and operations of the proposed project.

California Fish and Wildlife Code, Section 3503.5

Under the California Fish and Wildlife Code, Section 3503.5, it is unlawful to take, possess, or destroy any birds in the orders Falconiformes (hawks, eagles, and flacons) or Strigiformes (owls). Take would include the disturbance of an active nest resulting in the abandonment or loss of young.

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) prohibits the taking, hunting, killing, selling, purchasing, etc. of migratory birds, parts of migratory birds, or their eggs and nests. As used in the MBTA, the term "take" is defined as "to pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires." Most bird species native to North America are covered by this act.

Sensitive Natural Communities

The California Office of Planning and Research and the Office of Permit Assistance (1986) define project effects that substantially diminish habitat for fish, wildlife, or plants, or that disrupt or divide the physical arrangement of an established community as significant impacts under CEQA.

This definition applies to certain natural communities because of their scarcity and ecological values and because the remaining occurrences are vulnerable to elimination. For this study, the term "sensitive natural community" includes those communities that, if eliminated or substantially degraded, would sustain a significant adverse impact as defined under CEQA. Sensitive natural communities are important ecologically because their degradation and destruction could threaten populations of dependent plant and wildlife species and significantly reduce the regional distribution and viability of the community. If the number and extent of sensitive natural communities continue to diminish, the status of rare, threatened, or endangered species could become more precarious, and populations of common species (i.e., not special status species) could become less viable. Loss of sensitive natural communities also can eliminate or reduce important ecosystem functions, such as water filtration by wetlands and bank stabilization by riparian woodlands for example.

Protected Plants

The California Desert Native Plant Act was passed in 1981 to protect non-listed California desert native plants from unlawful harvesting on both public and privately-owned lands. Harvest, transport, sale, or possession of specific native desert plants is prohibited unless a person has a valid permit. The following plants are under the protection of the California Desert Native Plants Act:

- Dalea spinosa (smoketree)
- All species of the genus Prosopis (mesquites)
- All species of the family Agavaceae (century plants, nolinas, yuccas)
- All species of Cactus
- Creosote Rings, ten feet in diameter or greater
- All Joshua Trees

<u>**The project would be required to comply with State Regulations, the City Desert Native Plant Protection Ordinance and the California Desert Plant Protection Act. The removal of any protected plant species, such as Joshua trees, will require the project applicant to apply for an Incidental Take Permit from CDFW prior to the start of any ground disturbance activities.**</u>

PROTECTED PLANT PRESERVATION PLAN

TENTATIVE TRACT MAP 20454
VICTORVILLE, SAN BERNARDINO COUNTY, CALIFORNIA
APN: 3134-021-05, 06, and 07

Prepared for:

Bedford Opportunity Fund II
212 South Palm Avenue, Suite 200
Alhambra, California 91801

Prepared by:

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Ryan Hunter
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Brian Bunyi

RCA ASSOCIATES, INC

REGISTERED PROFESSIONAL BIOLOGIST RANDALL ARNOLD 1979-TWS STATE OF CALIFORNIA

Project No: #2021-223 JT

December 9, 2021

TITLE PAGE

Date Report Prepared:	**December 09, 2021**
Field Work Completed:	**December 08, 2021**
Report Title:	**Protected Plant Preservation Plan**
Project Location:	**Victorville, California** **APN: 3134-021-05, 06 and 07** **TTM: 20454**
Prepared for:	**Bedford Opportunity Fund II** **212 South Palm Avenue, Suite 200** **Alhambra, California 91801**
Principal Investigators:	**Ryan Hunter, Environmental Scientist/Biologist** **Jessica Hensley, Environmental Scientist/Biologist** **Brian Bunyi, Environmental Scientist/Biologist**
Contact Information:	**Randall C. Arnold, Jr.** **RCA Associates, Inc.** **15555 Main Street, #D4-235** **Hesperia, CA 92345** **(760) 956-9212** **rarnold@rcaassociatesllc.com** **www.rcaassociatesllc.com**

Table of Contents

1.0 SUMMARY

At the request of the project proponent, RCA Associates, Inc. surveyed an approximate 30-acre property (APN: 3134-021-05, 06 and 07) located on the southwest corner of the intersection of Mesa View Drive and Nyack Road in the city of Victorville, California (Figures 1 and 2). The property site is located in Section 33, Township 5 North, Range 5 West in the USGS Baldy Mesa 7.5-minute California quadrangle. The project site has vacant land adjacently south and west of the boundary with existing residential developments to the north and east beyond Mesa View Road, located in an area zoned for single family residential (R-1).

The purpose of the survey was to evaluate the Joshua trees present on the site and determine which trees were suitable for relocation and which trees could be discarded prior to site clearing activities. This report provides the results of the Joshua tree survey performed on December 8, 2021. Following completion of the survey, RCA Associates, Inc. prepared this Protected Plant Preservation Plan to assist the project proponent with future relocation of the Joshua trees. Information on the Joshua trees that may need to be relocated-transplanted in the future is provided in Section 4.0. The City of Victorville Municipal Code has a chapter (Chapter 13.33) stating the purpose of Joshua Tree preservation and the consequence of removing one, and follows the County of San Bernardino Plant Protection Plan and Management (Chapter 88.01.060) to help protect and preserve desert vegetation, including Joshua trees. The requirements of the Ordinance (Chapter 88.01.060) are provided in Appendix B.

Based on the results of the field investigations there are 121 Joshua trees which occur within the boundaries of the property (Figures 1, 2, and 3). Based on the evaluation and analysis of each tree it was determined that 18 of the 121 Joshua trees (14.9%) are suitable for transplanting. These trees are marked in red in Table 4-1. The remaining 103 Joshua trees (85.1%) were determined to be unsuitable for transplanting due to a variety of factors such as size, condition, damage, dying, excessive leaning, possibly disease, clonal, death, etc.

As of September 22, 2020, the California Department of Fish and Wildlife (CDFW) temporarily listed the western Joshua tree (*Yucca brevifolia*) as an endangered species for one year until a final decision is made in 2021. **Therefore, any attempt to remove any living or dead Joshua tree from its current position will require an Incidental Take Permit (ITP).**

2.0 INTRODUCTION AND PROJECT LOCATION

The area surveyed is located on the southwest corner of the intersection of Mesa View Drive and Nyack Road in the city of Victorville, California (Figures 1 and 2). Current conditions on the property include a moderately disturbed desert scrub community with vegetation consisting of Joshua tree (*Yucca brevifolia*), white bursage (*Ambrosia dumosa*), rubber rabbitbrush (*Ericameria nauseosa*), California buckwheat (*Eriogonum fasciculatum*), Asian mustard (*Brassica tournefortii*), and cheatgrass (*Bromus tectorum*). Single-family residential developments are located north-east and east of the property with vacant land to the north-west, west, and south. (Figure 2).

Joshua trees occur throughout the Mojave Desert in Southern California and are typically found at an elevation of 400 to 1,800 meters (~1,200 to ~5,400 feet). Joshua trees within the western portion of the Mojave Desert typically receive more annual precipitation during "normal" years; consequently, cloning occurs more often resulting in numerous trunks sprouting from the same root system (Rowland, 1978). Joshua tree habitats provide habitat for a variety of wildlife species including desert woodrats (*Neotoma* sp.) and night lizards (*Xantusia* sp.) both of which utilize the base of the trees. A variety of birds also utilize Joshua trees for nesting such as hawks, common ravens, and cactus wrens. CDFW consider Joshua tree woodlands as areas that support relatively high species diversity and as such are considered to be a sensitive desert community. Joshua trees are also considered a significant resource under the California Environmental Quality Act (CEQA) and are included in the Desert Plant Protection Act, Food and Agricultural Code (80001 – 80006).

3.0 METHODOLOGIES

Pedestrian surveys were walked throughout the site and biologists from RCA Associates, Inc. evaluated each Joshua tree to determine which trees were suitable for relocation/transplanting based on a general health assessment. Each Joshua tree received a metal numbered tag which was affixed on the north side of each tree for orientation purposes during future transplanting. Surveyor flagging was also placed around those trees suitable for transplanting to facilitate future identification. The precise location of each tree was recorded using a Garmin inReach Explorer Plus GPS unit and a Nikon Forestry Pro rangefinder were utilized to determine the extent of the property boundaries. Those Joshua trees which occur on the property site are presented in Table 4-1 and the locations are provided in Figure 3.

The factors utilized to determine which Joshua trees were suitable for transplanting include the following factors:

1. Trees from about 1 foot in height up to approximately 12 feet,
2. No visible signs of damage to the tree such as absence of bark due to rodent or other animals,
3. Minimal number of branches (No more than 2 or 3 branches),
4. No excessive leaning of the tree,
5. No yellow or brown fronds,
6. Proximity to other Joshua trees (i.e., clonal), and
7. No exposed roots at the base of the tree.
8. Dead

4.0 RESULTS

There are 121 Joshua trees on the property and the GPS locations of the Joshua trees are provided in Table 4-1. A total of 18 Joshua trees (14.9%) are suitable for relocation/transplanting based on the eight factors listed in Section 3.0 (Table 4-1). The Joshua trees suitable for transplanting should be relocated/transplanted on-site, which is the preferable option, or to an off-site area approved by the City of Victorville and CDFW. Those Joshua trees that are not suitable for relocation/transplanting due to size, health of the tree, presence of damage, excessive branches, excessive leaning, clonal, and exposed roots should be disposed of as per City requirements.

Table 4-1: Joshua tree census. (Note: The GPS locations of the Joshua trees are provided below and those trees which are suitable for transplanting on-site as part of project landscaping are highlighted in red.)

Total Number of Joshua Trees On Site	Joshua Trees to be Transplanted	Number of Clonal Trees	Number of Non-Clonal Trees	Number of Dead Trees
121	18	11	110	15

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9836	Adult	11	N 34.48104° W 117.408885°	2P 3B	Good			Yes
9837	Juvenile	7	N 34.480964° W 117.409218°	0P 0B	Good			Yes
9838	Adult		N 34.480861° W 117.409252°	0P 0B	Dead	Laying on Ground		No
9839	Adult	20	N 34.48086° W 117.40934°	11P 22B	Good	Height Multiple Branches	Yes 2	No
9840	Adult		N 34.480677° W 117.409492°	0P 0B	Dead	Laying on Ground		No
9841	Adult	12	N 34.481178° W 117.409665°	3P 4B	Good			No
9842	Adult	19	N 34.481148° W 117.409708°	2P 8B	Good	Height Multiple Branches		No
9843	Adult	19	N 34.480869° W 117.409789°	4P 10B	Good	Height		No
9844	Adult	15	N 34.48091° W 117.409973°	8P 14B	Fair	Height Multiple Branches	Yes 2	No
9845	Adult	14	N 34.480788° W 117.410046°	1P 9B	Good	Height		No
9846	Adult	19	N 34.481071° W 117.410389°	5P 24B	Fair	Light Damage Height		No
9847	Adult	10	N 34.481171° W 117.4109°	3P 4B	Good	Multiple Branches		No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9848	Adult	15	N 34.481135° W 117.410742°	6P 9B	Good	Height		No
9849	Juvenile	3	N 34.481032° W 117.41141°	0P 0B	Good			Yes
9850	Juvenile	4	N 34.481028° W 117.411408°	0P 0B	Good			Yes
9851	Adult	15	N 34.48103° W 117.41229°	1P 7B	Good	Height		No
9852	Adult	12	N 34.480903° W 117.412437°	5P 10B	Good	Leaning		No
9853	Adult	13	N 34.480761° W 117.412248°	4P 5B	Good	Height		No
9854	Adult		N 34.480495° W 117.41234°	0P 0B	Dead			No
9855	Adult	15	N 34.480667° W 117.411564°	1P 3B	Good	Height		No
9856	Adult	15	N 34.480303° W 117.41158°	9P 11B	Good	Height		No
9857	Adult	13	N 34.480331° W 117.411368°	4P 2B	Good	Height		No
9858	Adult	15	N 34.480307° W 117.411334°	10P 11B	Good	Height		No
9859	Adult	11	N 34.480283° W 117.411018°	3P 5B	Good	Multiple Branches		No
9860	Adult	22	N 34.480609° W 117.410905°	7P 16B	Good	Height		No
9861	Adult		N 34.480458° W 117.409576°	0P 0B	Dead	Laying on Ground		No
9862	Adult	17	N 34.480422° W 117.409355°	2P 13B	Good	Height		No
9863	Adult	18	N 34.480622° W 117.409145°	11P 18B	Good	Height		No
9864	Adult	15	N 34.480608° W 117.409083°	1P 2B	Good	Height		No
9865	Adult		N 34.480769° W 117.409098°	0P 0B	Dead	Laying on Ground		No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9866	Adult	10	N 34.480722° W 117.408689°	1P 3B	Good			Yes
9867	Adult	13	N 34.480365° W 117.408703°	2P 5B	Good	Height		No
9868	Adult	14	N 34.480202° W 117.408614°	5P 7B	Good	Height Leaning		No
9869	Adult	14	N 34.480118° W 117.408748°	3P 3B	Good	Height		No
9870	Adult	19	N 34.480028° W 117.408929°	12P 13B	Good	Leaning		No
9871	Adult	14	N 34.480141° W 117.409449°	9P 13B	Good	Height Multiple Branches		No
9872	Adult	13	N 34.480043° W 117.409911°	0P 2B	Good	Height		No
9873	Adult	15	N 34.480097° W 117.409962°	3P 5B	Good	Height	Yes 3	No
9874	Adult	10	N 34.480077° W 117.409991°	1P 2B	Good			Yes
9875	Adult	10	N 34.479959° W 117.410032°	1P 2B	Good			Yes
9876	Juvenile	7	N 34.480123° W 117.410929°	0P 0B	Good			Yes
9877	Adult	17	N 34.480115° W 117.411339°	3P 16B	Good			No
9878	Adult	16	N 34.480219° W 117.411918°	0P 2B	Good	Height		No
9879	Adult	17	N 34.480065° W 117.412267°	17P 22B	Good	Height		No
9880	Adult		N 34.47974° W 117.412485°	0P 0B	Dead	Laying on Ground		No
9881	Adult	12	N 34.479707° W 117.412587°	7P 21B	Good	Multiple Branches		No
9882	Adult		N 34.479526° W 117.412108°	0P 0B	Dead	Laying on Ground		No
9883	Adult	16	N 34.479595° W 117.412038°	3P 5B	Good			No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9884	Adult	9	N 34.479601° W 117.41196°	1P B	Good			Yes
9885	Adult	21	N 34.479664° W 117.411855°	16P 18B	Good	Light Damage Height		No
9886	Adult		N 34.479644° W 117.411438°	0P 0B	Dead		Yes 2	No
9887	Adult	13	N 34.479723° W 117.411192°	2P 7B	Good	Height	Yes 2	No
9888	Adult	17	N 34.479663° W 117.411148°	4P 10B	Good	Height		No
9889	Adult	13	N 34.47966° W 117.410977°	2P 14B	Good	Height Multiple Branches		No
9890	Adult	13	N 34.479838° W 117.410786°	3P 8B	Good	Height		No
9891	Adult	11	N 34.479934° W 117.410654°	3P 3B	Good			Yes
9892	Adult	18	N 34.479738° W 117.410694°	5P 20B	Good	Height		No
9893	Adult	21	N 34.479533° W 117.410272°	0P 9B	Good	Height		No
9894	Adult	10	N 34.4799° W 117.409726°	1P 3B	Good			Yes
9895	Adult	18	N 34.479678° W 117.409577°	6P 16B	Fair	Browning Dead Branches		No
9896	Adult	18	N 34.479492° W 117.409488°	3P 7B	Good	Height Light Damage		No
9897	Adult		N 34.479882° W 117.409425°	0P 0B	Dead			No
9898	Adult	27	N 34.479726° W 117.409395°	4P 16B	Fair	Height Light Damage	Yes 2	No
9899	Adult	16	N 34.479676° W 117.409382°	4P 12B	Good	Height		No
9900	Adult	13	N 34.479623° W 117.409086°	1P 5B	Good	Height	Yes 3	No
9901	Adult	14	N 34.479689° W 117.408982°	3P 7B	Good	Height Leaning		No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9902	Adult	10	N 34.479514° W 117.40892°	4P 6B	Good	Multiple Branches		No
9903	Adult	15	N 34.479696° W 117.408741°	10P 10B	Good	Height		No
9904	Adult	16	N 34.479753° W 117.408407°	20P 18B	Good	Height		No
9905	Adult	17	N 34.479644° W 117.408384°	6P 12B	Good	Height		No
9906	Adult	10	N 34.479395° W 117.408416°	2P 3B	Good		Yes 3	No
9907	Adult	12	N 34.479156° W 117.408748°	6P 6B	Good	Multiple Branches		No
9908	Adult	18	N 34.47917° W 117.408863°	7P 8B	Good	Height		No
9909	Adult	14	N 34.478972° W 117.409054°	5P 7B	Good	Height		No
9910	Adult		N 34.479032° W 117.409239°	0P 0B	Dead			No
9911	Adult	12	N 34.479125° W 117.409256°	2P 3B	Good			No
9912	Adult		N 34.479183° W 117.409271°	0P 0B	Dead			No
9913	Adult	14	N 34.479398° W 117.409314°	3P 3B	Good	Height	Yes 3	No
9914	Adult	16	N 34.479408° W 117.409428°	9P 14B	Good	Height		No
9915	Adult		N 34.479351° W 117.409572°	0P 0B	Dead			No
9916	Adult		N 34.479144° W 117.409712°	0P 0B	Dead			No
9917	Adult	13	N 34.479065° W 117.41003°	4P 6B	Good	Height		No
9918	Adult	13	N 34.479034° W 117.410146°	3P 9B	Good	Height		No
9919	Adult	14	N 34.479175° W 117.410241°	5P 10B	Good	Height	Yes 2	No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9920	Adult	20	N 34.479229° W 117.410142°	0P 5B	Good	Height		No
9921	Adult	18	N 34.479334° W 117.410195°	3P 20B	Good	Height		No
9922	Juvenile	3	N 34.479257° W 117.410316°	0P 0B	Good			Yes
9923	Adult	16	N 34.479258° W 117.410522°	1P 3B	Good	Height		No
9924	Adult	15	N 34.479339° W 117.410601°	1P 4B	Good	Height	Yes 2	No
9925	Adult	11	N 34.479213° W 117.410704°	0P 4B	Good	Multiple Branches		No
9926	Adult	20	N 34.479147° W 117.411245°	6P 24B	Good	Height		No
9927	Adult		N 34.478884° W 117.41124°	0P 0B	Dead			No
9928	Adult	23	N 34.479215° W 117.411911°	6P 18B	Good	Height		No
9929	Adult		N 34.479226° W 117.412053°	0P 0B	Dead			No
9930	Adult	24	N 34.47918° W 117.412123°	16P 43B	Good	Height		No
9931	Juvenile	5	N 34.478599° W 117.41237°	0P 0B	Good			Yes
9932	Adult	16	N 34.478644° W 117.411887°	10P 26B	Good	Height		No
9933	Adult	15	N 34.478502° W 117.411864°	5P 9B	Good	Height Leaning		No
9934	Adult	18	N 34.478737° W 117.411723°	16P 20B	Poor	Browning		No
9935	Adult	15	N 34.478831° W 117.411683°	13P 30B	Fair	Browning Multiple Branches		No
9936	Adult	13	N 34.478758° W 117.41155°	0P 5B	Good	Height		No
9937	Adult	17	N 34.478757° W 117.411306°	15P 29B	Good	Height		No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9938	Adult	11	N 34.478637° W 117.41111°	1P 2B	Good			Yes
9939	Adult	16	N 34.478639° W 117.410694°	2P 9B	Good	Height Leaning		No
9940	Juvenile	8	N 34.478641° W 117.410516°	0P 0B	Good			Yes
9941	Adult	14	N 34.47892° W 117.410553°	4P 6B	Good	Height		No
9942	Adult	14	N 34.478927° W 117.410354°	12P 21B	Good	Height		No
9943	Adult	17	N 34.478867° W 117.410506°	7P 15B	Good	Height		No
9944	Adult	19	N 34.478659° W 117.410328°	2P 10B	Good	Height		No
9945	Adult	10	N 34.478503° W 117.410003°	1P 3B	Good			Yes
9946	Adult	21	N 34.478641° W 117.410179°	7P 14B	Good	Height		No
9947	Adult	12	N 34.478511° W 117.409899°	2P 3B	Good			Yes
9948	Adult	18	N 34.478734° W 117.409891°	3P 8B	Good	Height Multiple Branches		No
9949	Adult	16	N 34.478774° W 117.409819°	11P 23B	Good	Height		No
9950	Adult	9	N 34.478784° W 117.409706°	1P 3B	Good			Yes
9951	Adult	22	N 34.478565° W 117.409404°	19P 35B	Fair	Height Broken Branches		No
9952	Adult	15	N 34.478701° W 117.409336°	2P 4B	Good	Height		No
9953	Adult	15	N 34.478678° W 117.408889°	16P 28B	Good	Height		No
9954	Adult	19	N 34.478703° W 117.408774°	13P 19B	Good	Height		No
9955	Adult	11	N 34.478864° W 117.408699°	6P 7B	Good	Multiple Branches		No

Tag#	Life Stage	Height (Feet)	Location	Panicles / Branches	Condition	Health Assessment	Number of Trunks	Transplantable
9956	Adult	18	N 34.478611° W 117.408406°	8P 18B	Good	Height		No

5.0 CONCLUSIONS

There are 121 Joshua trees located on the property and 18 of the trees are suitable for relocation/transplanting. This conclusion was based on: (1) trees which were one foot or greater in height and less than twelve feet tall (approximate); (2) in good health; (3), two branches or less; (4) density of trees (i.e., no clonal trees); (5) no exposed roots; (6) trees that are not leaning over excessively; (7) and trees that are dead. As indicated in Table 4-1, most of the Joshua trees, which were not suitable for relocation, are dead based on the December 8, 2021 field investigations.

As of September 22, 2020, the California Department of Fish and Wildlife temporarily listed the western Joshua tree (*Yucca brevifolia*) as an endangered species for one year until a final decision is made in 2021. **Therefore, any attempt to remove any living or dead Joshua tree from its current position will require an Incidental Take Permit (ITP).**

The City of Victorville's Municipal Code (Chapter 13.33) requires preservation of Joshua trees given their importance in the desert community. A qualified City-approved biologist or arborist should be retained to conduct any future relocation/transplanting activities and should follow the protocol of the County's Municipal Code (Appendix B: Chapter 18.01.060). The following criteria will be utilized by the contractor when conducting any future transplanting activities.

A. The transplantable Joshua trees will be retained in place or replanted somewhere on the site where they can remain in perpetuity or will be transplanted to an off-site area approved by the city where they can remain in perpetuity. Joshua trees which are deemed not suitable for transplanting will be cut-up and discarded as per City requirements.

B. Earthen berms will be created around each transplantable tree by the biologist prior to excavation and the trees will be watered approximately one week before transplanting. Watering the trees prior to excavation will help make excavation easier, ensure the root ball will hold together, and minimize stress to the tree.

C. Each transplantable tree will be moved to a pre-selected location which has already been excavated and will be placed and oriented in the same direction as their original direction. The hole will be backfilled with native soil, and the transplanted tree will be immediately watered. As noted in Section 3.0, a numbered metal tag was placed on the north side of the trees and the trees were also flagged with surveyor's flagging. The biologist will develop a watering regimen to ensure the survival of the transplanted trees. The watering regimen will be based upon the needs of the trees and the local precipitation.

6.0 REFERENCES

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7.0 CERTIFICATION

I hereby certify the statements furnished above and in the attached exhibits, present the data and information required for this Joshua tree survey and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief. Field work conducted for this survey was performed by Ryan Hunter, Jessica Hensley, and Brian Bunyi.

Date: 12/09/2021 Signed: Ryan Hunter

Jessica Hensley

Brian Bunyi

Field Work Performed by: Ryan Hunter
Environmental Scientist & Biologist

Jessica Hensley
Environmental Scientist & Biologist

Brian Bunyi
Environmental Scientist & Biologist

REGISTERED PROFESSIONAL BIOLOGIST
RANDALL ARNOLD
1979-TWS
STATE OF CALIFORNIA

APPENDIX A

Figures

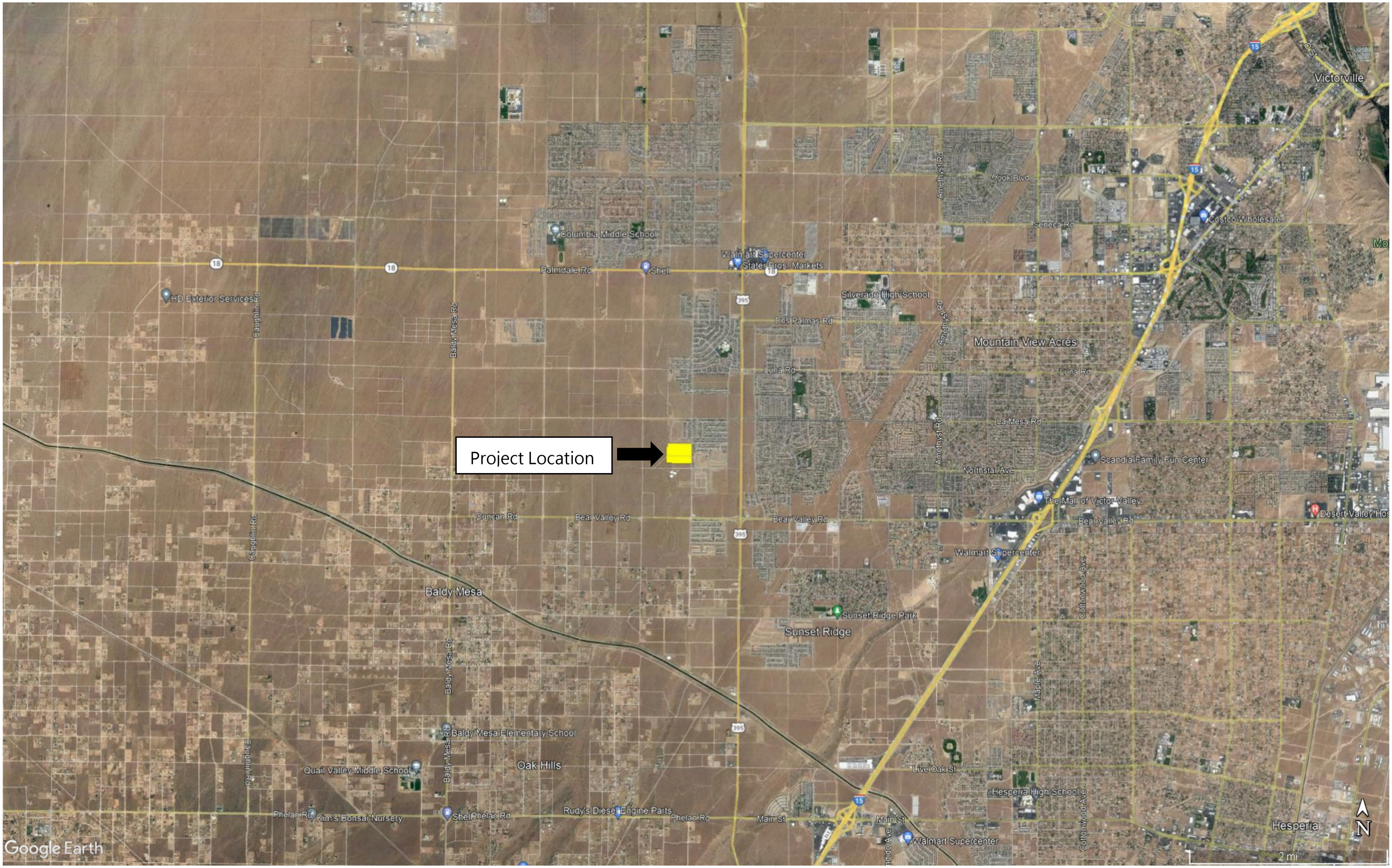

Figure 1: Regional Exhibit

RCA Associates, Inc.
Source: Google Earth

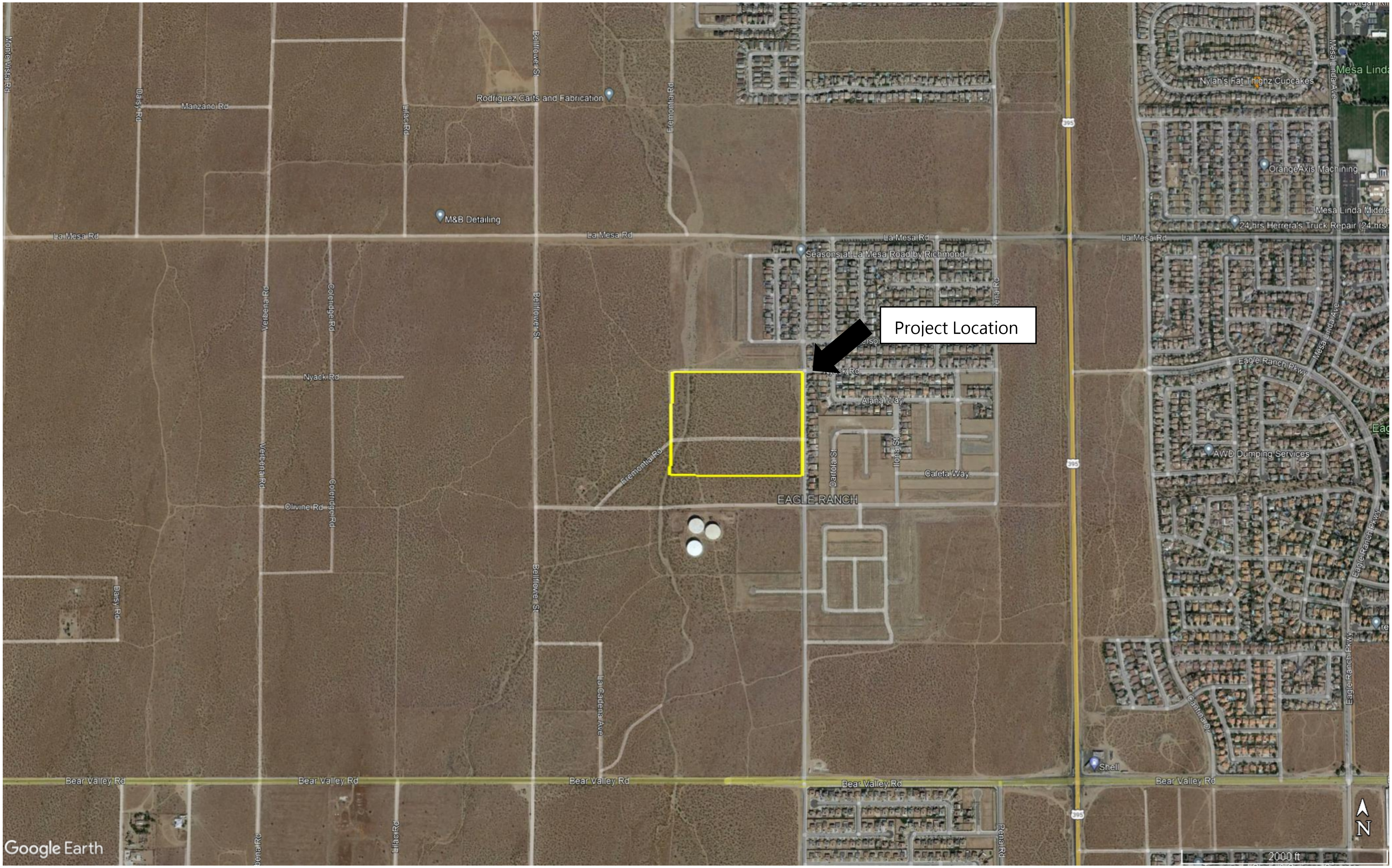

Figure 2: Vicinity Exhibit

RCA Associates, Inc.
Source: Google Earth

SW Corner of Nyack Road & Mesa View Drive, Victorville, CA

30.22-acres

RCA ASSOCIATES, INC.
SOURCE: GOOGLE EARTH

FIGURE 3: LOCATION OF JOSHUA TREES

#2021-223 JT

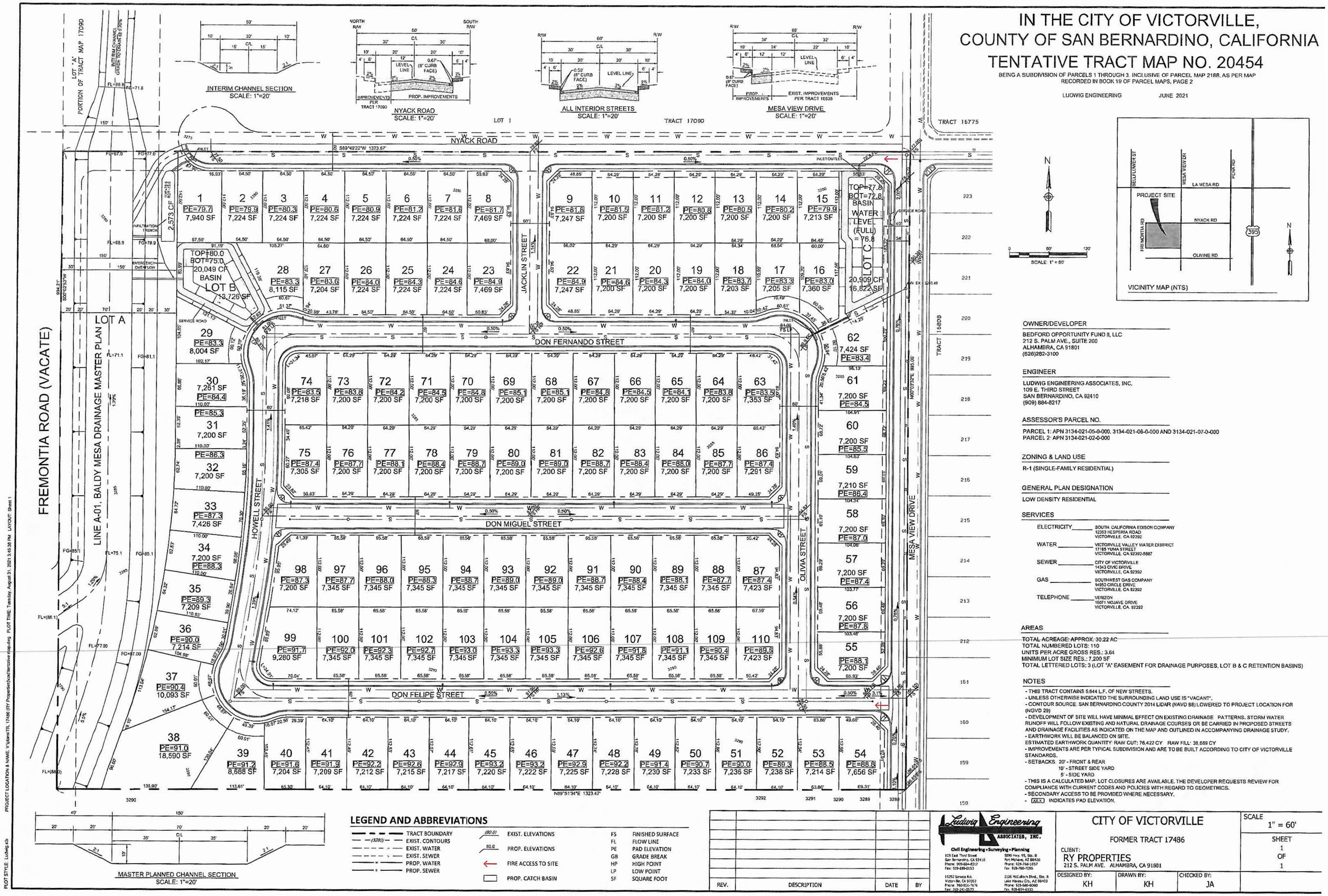

FIGURE 4: SITE PLAN

APPENDIX B

City of Victorville
Municipal Code: Chapter 13.33

County of San Bernardino
Municipal Code: Chapter 18.01.060

Chapter 13.33 - PRESERVATION AND REMOVAL OF JOSHUA TREES

Sections:

13.33.010 - Purpose and intent.

It is determined by the city council that proper and necessary steps be taken in order to protect and preserve, to the greatest extent possible, Joshua trees in all areas of the city so as to preserve the unique natural desert environment throughout the city and for the health, safety and welfare of the community.

(Ord. 1224 § 1 (part), 1988)

13.33.020 - Scope and applicability.

(a) The provisions of this chapter shall apply to all property within the corporate limits of the city.

(b) The provisions of this chapter shall not apply to:

(1) Any existing lot in a subdivision already cleared and graded with improvements installed as required by the conditions of the original subdivision;

(2) Any occupied residential properties.

(Ord. 1224 § 1 (part), 1988)

13.33.030 - Definitions.

The term "Joshua tree" means a living tree of the botanical name of Yucca Brevifolias.

(Ord. 1224 § 1 (part), 1988)

13.33.040 - Prohibition of removal and enforcement.

It is unlawful for any person to cut, damage, destroy, dig up, or harvest any Joshua tree without the prior written consent of the director of parks and recreation or his designee. A violation of this section is a misdemeanor punishable by up to six months in jail and/or a five-hundred-dollar fine.

(Ord. 1224 § 1 (part), 1988)

Chapter 88.01 Plant Protection and Management

Sections:

88.01.010 Purpose

This Chapter provides regulations and guidelines for the management of plant resources in the unincorporated areas of the County on property or combinations of property under private or public ownership. The intent is to:

(a) Promote and sustain the health, vigor and productivity of plant life and aesthetic values within the County through appropriate management techniques.

(b) Conserve the native plant life heritage for the benefit of all, including future generations.

(c) Protect native trees and plants from indiscriminate removal and to regulate removal activity.

(d) Provide a uniform standard for appropriate removal of native trees and plants in public and private places and streets to promote conservation of these valuable natural resources.

(e) Protect and maintain water productivity and quality in local watersheds.

(f) Preserve habitats for rare, endangered, or threatened plants and to protect animals with limited or specialized habitats.

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.020 Applicability

The provisions in this Chapter apply to the removal or relocation of regulated trees or plants and to any encroachment (for example, grading) within the protected zone of a regulated tree or plant on all private land within the unincorporated areas of the County and on public lands owned by the County, unless otherwise specified. Nothing in this Chapter shall relieve nor be interpreted to exempt a development from complying with applicable State or Federal laws and regulations.

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.030 Exempt Activities

The provisions in this Chapter, except those of Section 88.01.090 (Tree Protection From Insects and Disease), shall not apply to the removal of regulated trees or plants that may occur in the following situations. Removal actions shall not authorize the removal of perch trees within an identified American Bald Eagle habitat.

(a) Timber operations. Removal as part of a timber operation conducted in compliance with the Z'berg-Nejedly Forest Practice Act of 1973 (Public Resources Code Section 4526 et seq.).

(b) Government owned lands. Removal from lands owned by the United States, State of California, or local governmental entity, excluding Special Districts (i.e., Special Districts shall be subject to the provisions of this Division.).

(c) Public utilities. Removal by a public utility subject to jurisdiction of the Public Utilities Commission or any other constituted public agency, including franchised cable TV, where to establish or maintain safe operation of facilities under their jurisdiction, trees are pruned, topped, or braced.

(d) State agencies. Removal by, or under the authority of, the State of California:

(1) Department of Forestry and Fire Protection.

(2) Forest Improvement Program.

(3) Agricultural Conservation Program.

(e) Government laws. Removal required by other codes, ordinances, or laws of the County, State, or United States.

(f) Emergency. Removal of native trees and plants that are an immediate threat to the public health, safety, or welfare and that require emergency removal to prevent probable damage to a structure or injury to people or fenced animals.

(g) Forest stocking control program. Removal as part of a stocking control program prepared by a California Registered Professional Forester.

(h) Fire hazard reduction program. Removal as part of a fire hazard reduction program approved by the Fire Chief.

(i) Bona fide agricultural activity. Removal as part of a bona fide agricultural activity, as determined by the Director, which is one of the following:

(1) Conducted under a land conservation contract.

(2) An existing agricultural activity, including expansions of the activity onto undisturbed contiguous land.

(3) A proposed bona fide agricultural activity (i.e., an agricultural activity that is served by a water distribution system adequate for the proper operation of the activity).

(A) The Director shall be given 30 days' written notice of the removal describing the:

(I) Location of the land.

(II) Nature of the proposed activity.

(III) Proposed sources of water for the activity.

(B) The Director shall notify the landowner in writing before the elapse of the 30-day period if, in the opinion of the Director, the activity is not a bona fide agricultural activity, or else the activity shall be deemed bona fide.

(j) Parcel less than 20,000 square feet developed with primary structure. Removal on parcels that have a net area of 20,000 square feet or less and that are developed with a primary structure, other than a sign structure.

(k) Located within 20 feet of permitted structure. Removal from a parcel of a regulated native plant or tree that is within 20 feet of a structure that was constructed or set down on the parcel under a County development permit.

(l) Private fuel wood. Removal of two or fewer regulated native trees in the Mountain Region or Valley Region per year per acre for private fuel wood purposes. The year shall be measured as the last 12 consecutive months.

(m) Oak woodlands. The following projects shall be exempt from the conditions for mitigating the conversion of oak woodlands required in Subsection 88.01.050(e) (Native Tree or Plant Removal Permits Conditions of approval), below, in compliance with Public Resources Code 21083.4:

(1) Projects undertaken in compliance with a Natural Community Conservation Plan or subarea plan within a Natural Community Conservation Plan, as approved in compliance with Fish and Game Code Section 2800 *et seq.*, that includes oaks as a covered species or that conserves oak habitat through natural community conservation preserve designation and implementation and mitigation measures that are consistent with this Chapter.

(2) Affordable housing projects for lower income households, as defined in Health and Safety Code Section 50079.5, that are located within a city's sphere of influence.

(3) Projects on agricultural land within an Agricultural Land Use Zoning District that includes land used to produce or process plant and animal products for commercial purposes.

(4) Projects undertaken in compliance with a State agency's regulatory program certified in compliance with Public Resources Code Section 21080.5.

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.040 Regulated Trees and Plants and General Permit

(a) Regulated trees and plants. A regulated tree or plant shall be any of the those trees or plants identified in:

(1) Section 88.01.060(c) (Regulated desert native plants);

(2) Section 88.01.070(b) (Regulated trees); or

(3) Section 88.01.080(b) (Regulated riparian plants).

(b) Permit for removal required. A Tree or Plant Removal Permit issued in compliance with Section 88.01.050 (Tree or Plant Removal Requirements) shall be required for the removal of regulated tress and plants.

(c) Conditions of approval. The permits required by this Chapter may be subject to conditions imposed by the applicable review authority as identified in Subsection 88.01.050(e) (Tree or Plant Removal Permits - Condition of approval).

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.050 Tree or Plant Removal Permits

(a) When Tree or Plant Removal Permit required. A Tree or Plant Removal Permit shall be required for the removal of a regulated tree or plant as identified in this Chapter.

(1) Removals in conjunction with land use application or development permit Director approval. The Director may approve the removal of regulated trees or plants when requested in conjunction with a land use application, a Building Permit, and all other development permits (e.g., Grading Permits, Mobile Home Setdown Permits, etc.). An approved land use application and/or development permit shall be considered to include a Tree or Plant Removal Permit, if the land use application or development permit specifically reviews and approves the removals. The review of a land use application or development permit shall consider and require compliance with this Chapter.

(2) Removals <u>not</u> in conjunction with land use application or development permit Director approval. The Director may approve a Tree or Plant Removal Permit for the removal of regulated trees or plants requested not in conjunction with a land use application or development permit.

(3) Removals to mitigate fire hazards Fire Chief approval. The Fire Chief may approve a Tree or Plant Removal Permit for the removal of regulated trees or plants when requested for the purposes of mitigating fire hazards and independent of a land use application or development permit.

(b) Expert certification. The applicable review authority may require certification from an appropriate arborist, registered professional forester or a Desert Native Plant Expert that the proposed tree removal, replacement, or revegetation activities are appropriate, supportive of a healthy environment, and in compliance with this Chapter. The certification shall include the information in compliance with Department procedures.

(c) Preconstruction inspections. A preconstruction inspection before approval of development permits shall be required in areas with regulated trees or plants to determine the presence of regulated trees and plants. The preconstruction inspection may be combined with any other required inspection.

(d) Duration of Tree or Plant Removal Permits.

(1) Removals in conjunction with land use application or development permit. The duration of a Tree or Plant Removal Permit, when issued in conjunction with a land use application and/or a development permit, shall have the same duration of the associated application or permit, unless otherwise specified.

(2) Removals not in conjunction with land use application or development permit. The applicable review authority shall specify the expiration date for all other Tree or Plant Removal Permits.

(e) Conditions of approval. A Tree or Plant Removal Permit may be subject to the following conditions imposed by the applicable review authority:

(1) Types of conditions. The conditions may specify criteria, methods, and persons authorized to conduct the proposed activities in addition to the requirements in this Chapter.

(2) Transplanting or stockpiling. Where indicated in this Chapter, regulated trees and plants may be required to be transplanted and/or stockpiled for future transplanting.

(3) Performance bonds. The review authority may require the posting and maintenance of a monetary security deposit where necessary to ensure the completion of the required mitigation measures in compliance with Section 86.06.050 (Performance Guarantees).

(4) Conversion of oak woodlands. If a project will result in a conversion of oak woodlands that will have a significant effect on the environment and is not exempt under Subsection 88.01.030(m) (Exempt Activities Oak woodlands), one or more of the conditions in this Subsection may be imposed in compliance with Public Resources Code Section 21083.4. For the purposes of this Subsection, "oak" shall mean a native tree species that is in the genus *Quercus*, which is not designated as Group A or Group B commercial species under regulations adopted by the State Board of Forestry and Fire Protection in compliance with Public Resources Code Section 4526, and which is five inches or more in diameter as measured at a point 4.5 feet (breast height) above natural grade level. The applicable review authority may require certification from a Tree Expert that the proposed mitigation measures are appropriate, supportive of a healthy oak woodland environment, and in compliance with this Subsection. The certification shall include the information in compliance with Department procedures. The conditions that may be imposed include one or more of the following:

(A) Preservation. Preserve existing oak woodlands by recording conservation easements in favor of the County or an approved organization or agency.

(B) Replacement or restoration. Replace or restore former oak woodlands. The review authority may require the planting and maintenance of replacement trees, including replacing dead or diseased trees. The replacement ratio and tree sizes shall be based on the recommendation of an

Oak Reforestation Plan prepared by a registered professional forester. The requirement to maintain trees in compliance with this paragraph shall terminate seven years after the trees are planted.

(C) In-lieu mitigation fee. Contribute in-lieu mitigation fee to the Oak Woodlands Conservation Fund, established under Fish and Game Code Section 1363 for the purpose of purchasing oak woodlands conservation easements. A project applicant who contributes funds in compliance with this Subsection shall not receive or use a grant from the Oak Woodlands Conservation Fund as part of the mitigation for the project. The in-lieu fee for replacement trees shall be calculated based upon their equivalent value as established by the International Society of Arboriculture's (ISA) current edition of *Guide to Establishing Values for Trees and Shrubs*, etc.)

(D) Other mitigation measures. Perform other mitigation measures as may be required by the review authority (e.g., inch-for-inch off-site replacement planting; transfer of development rights, enrollment of project with offset provider for carbon credits in greenhouse gas emission registry, carbon reduction, and carbon trading system; etc.).

(f) Findings for Tree or Plant Removal Permits. The applicable review authority may authorize the removal of a regulated tree or plant only if the following findings are made:

(1) **Findings for removals in the Valley Region, Mountain Region, and Desert Region**. The removal of the regulated tree or plant is justified for <u>one</u> of the following reasons:

(A) The location of the regulated tree or plant and/or its dripline interferes with an allowed structure, sewage disposal area, paved area, or other approved improvement or ground disturbing activity and there is no other alternative feasible location for the improvement.

(B) The location of the regulated tree or plant and/or its dripline interferes with the planned improvement of a street or development of an approved access to the subject or adjoining private property and there is no other alternative feasible location for the improvement.

(C) The location of the regulated tree or plant is hazardous to pedestrian or vehicular travel or safety.

(D) The regulated tree or plant or its presence interferes with or is causing extensive damage to utility services or facilities, roadways, sidewalks, curbs, gutters, pavement, sewer line(s), drainage or flood control improvements, foundations, existing structures, or municipal improvements.

(E) The condition or location of the regulated tree or plant is adjacent to and in such close proximity to an existing or proposed structure that the regulated tree or plant has or will sustain significant damage.

(2) **Additional findings for removals in the Mountain Region**. In the Mountain Region only, the applicable review authority shall also make all of the following findings:

(A) Where improvements are proposed, the design of the improvements ensures that at least the following minimum percentage of the subject parcel will be maintained or established in a natural undeveloped vegetated or revegetated condition sufficient to ensure vegetative coverage for a forest environment, as determined by the applicable Review Authority.

(I) Twenty percent of commercial, industrial, and administrative/ professional uses.

(II) Thirty-five percent of multi-family residential uses.

(B) At least one half of natural areas for all uses, except single family residential uses, will be located in the front setback area or located so that significant portions are visible from the public right-of-way on which the improvements are to be located.

(C) A perch tree within a federally identified American Bald Eagle habitat will not be removed unless an adequate substitution is provided.

(D) A Registered Professional Forester has certified in writing that the condition or location of a regulated tree is contributing to overstocked tree stand conditions and that its removal will improve the overall health, safety, and vigor of the stand of trees containing the subject tree.

(3) In the Desert Region only, the applicable Review Authority shall also make the following findings:

(A) Joshua trees that are proposed to be removed will be transplanted or stockpiled for future transplanting wherever possible.

(B) In the instance of stockpiling, the permittee has complied with Department policy to ensure that Joshua trees are transplanted appropriately. Transplanting shall comply with the provisions of the Desert Native Plants

Act (Food and Agricultural Code Section 80001 et seq.), as required by Subsection 88.01.060(d) (Compliance with Desert Native Plants Act).

(C) No other reasonable alternative exists for the development of the land when the removal of specimen size Joshua Trees is requested. Specimen size trees are defined as meeting one or more of the following criteria:

(I) A circumference measurement equal to or greater than 50 inches measured at 4.5 feet above natural grade level.

(II) Total tree height of 15 feet or greater.

(III) Trees possessing a bark-like trunk.

(IV) A cluster of 10 or more individual trees, of any size, growing in close proximity to each other.

(g) Plot plan requirements. Before the issuance of a Tree or Plant Removal Permit, a plot plan shall be approved by the applicable Review Authority for each site indicating exactly which trees or plants are authorized to be removed. The required information shall be added to any other required plot plan.

(h) Construction standards. During construction and before final inspection under a development permit, the following construction standards shall apply, unless otherwise approved in writing by an arborist, registered professional forester, or a Desert Native Plant Expert:

(1) Enclosures. The trunks of regulated trees and regulated plants shall not be enclosed within rooflines or decking.

(2) Attachments. Utilities, construction signs, or other hardware shall not be attached so as to penetrate or abrase any live regulated tree or plant.

(3) Grade alterations. No grade alterations shall bury any portion of a regulated tree or plant or significantly undercut the root system within the dripline.

(i) Enforcement.

(1) Other applicable Code provisions. The provisions of Chapter 86.09 (Enforcement) shall apply to this Chapter.

(2) Enforcement authorities. The authorities responsible for the enforcement of the provisions of this Chapter shall be the same as the review authorities responsible for permit approvals asspecified in this Section. In addition, the provisions of this Chapter may be enforced by the California Department of Forestry, where applicable.

(3) Extension of time. If property is subject to snow, flooding, or other conditions that render compliance with the provisions of this Chapter within the specified time periods impractical because of inaccessibility, an enforcement officer may extend the period of time for compliance.

(4) Powers of enforcement officers.

(A) A peace officer or any authorized enforcement officer may in the enforcement of this Section:

(I) Make arrests without warrant for a violation of this Chapter that the officer may witness.

(II) Confiscate regulated native trees or plants, or parts of them, that are unlawfully harvested, possessed, sold, or otherwise obtained in violation of this Chapter.

(B) In addition, a designated enforcement officer shall be authorized and directed to enter in or upon any premises or other place, train, vehicle, or other means of transportation within or entering the State, which is suspected of containing or having present regulated plants in violation of this Chapter in order to examine permits and wood receipts and observe tags and seals and to otherwise enforce the provisions of this Chapter.

(5) When enforcement officer vested with power of peace officer. When power or authority is given by this Chapter to a person, it may be exercised by any deputy, inspector, or agent duly authorized by that person. A person in whom the enforcement of a provision of this Chapter is vested shall have the power of a peace officer as to that enforcement, which shall include State or Federal agencies with which cooperative agreements have been made by the County to enforce the provisions of this Chapter.

(6) Written permission of landowner required for removal. No person shall remove or damage all or part of any regulated tree or plant on the property of another person without first obtaining notarized written permission from the landowner and required permits, wood receipts, or tags and seals. In addition, it shall be unlawful for a person to falsify a document offered as evidence of permission to enter upon the property of another to harvest all or parts of a regulated tree or plant, whether alive or dead.

(7) Permit available for display and inspection. No person, except as provided in this Chapter, shall harvest, offer for sale, destroy, dig up or mutilate, or have in his or her possession a regulated plant or tree, or the living or dead parts of them, unless the plant or tree was harvested under a valid permit and, where applicable, a valid wood receipt on his or her person. A person shall exhibit the permit, wood receipt, tags and/or seals upon request for inspection by an authorized County enforcement officer or any peace officer. No wood receipt or tag and seal shall be valid unless it is issued with a valid permit and the permit bears the wood receipt number or tag number on its face. Required tags and seals shall be attached securely to a regulated desert native plant.

(8) Land Disturbance. No person, except as provided in this Chapter, shall commence with a disturbance of land (e.g., grading or land clearing) without first obtaining approval to assure that said disturbance will not result in the removal of any regulated native trees or plants. Said approval may be in the form of a development permit or a Tree or Plant Removal Permit issued by the appropriate authority.

(j) Penalties. Penalties shall be those specified in Chapter 86.09 (Enforcement) and shall include the following and any other penalties specified by individual Sections of this Chapter.

(1) Fine for illegal removal.

(A) In addition to other penalties and fees imposed by this Development Code or other law, a person, firm, or corporation convicted of a violation of the provisions of this Chapter shall be guilty of a misdemeanor upon conviction.

(B) When one or more plants or trees are removed in violation of the provisions of this Chapter, the removal of each separate plant or tree shall be a new and separate offense.

(C) The penalty for the offense shall be a fine of not less than $500 nor more than $1,000, or six months in jail, or both.

(D) Payment of a penalty shall not relieve a person, firm, or corporation from the responsibility of correcting the condition resulting from the violation.

(2) Replacement program for illegal removal.

(A) In addition to other penalties imposed by this Development Code or other law, a person, firm, or corporation convicted of violating the provisions of this Chapter regarding improper removal of regulated native trees or plants shall be required to retain, as appropriate, a Tree Expert or Desert Native Plant Expert to develop and implement a replacement program.

(B) The expert shall determine the appropriate number, size, species, location, and planting conditions for replacement plants or trees in sufficient quantities to revegetate the illegally disturbed area.

(C) If it is inappropriate to revegetate the illegally disturbed area, another appropriate location (e.g., public parks) may be substituted at the direction of the court.

(D) The violator shall post a bond in an amount sufficient to remove and reinstall plant/tree materials that were planted as a part of a replacement program and failed within two years.

(3) Revocation of permits.

(A) Upon conviction of a violation of this Chapter, all Tree or Plant Removal Permits issued to the convicted person, firm, or corporation shall be revoked.

(B) No new or additional Tree or Plant Removal Permits shall be issued to the permittee for a period of one year from the date of conviction.

(C) Additionally, in the Desert Region the permittee shall be required to surrender unused wood receipts or tags and seals to the Director.

Adopted Ordinance 4011 (2007); Amended Ordinance 4043 (2008); Amended Ordinance 4067 (2009)

88.01.060 Desert Native Plant Protection

This Section provides regulations for the removal or harvesting of specified desert native plants in order to preserve and protect the plants and to provide for the conservation and wise use of desert resources. The provisions are intended to augment and coordinate with the Desert Native Plants Act (Food and Agricultural Code Section 80001 et seq.) and the efforts of the State Department of Food and Agriculture to implement and enforce the Act.

(a) Definitions. Terms and phrases used within this Section shall be defined in Division 10 (Definitions) and/or defined by the California Food and Agricultural Code. The California Food and Agricultural Code definition, if one exists, shall prevail over a conflicting definition in this Development Code.

(b) Applicability. The provisions of this Section shall apply to desert native plants specified in Subsection (c) (Regulated desert native plants) that are growing on any of the following lands, unless exempt in compliance with Section 88.01.030 (Exempt Activities):

(1) Privately owned or publicly owned land in the Desert Region.

(2) Privately owned or publicly owned land in any parts of the Mountain Region in which desert native plants naturally grow in a transitional habitat.

(c) Regulated desert native plants. The following desert native plants or any part of them, except the fruit, shall not be removed except under a Tree or Plant Removal Permitin compliance with Section 88.01.050 (Tree or Plant Removal Permits). In all cases the botanical names shall govern the interpretation of this Section.

(1) The following desert native plants with stems two inches or greater in diameter or six feet or greater in height:

(A) *Dalea spinosa* (smoketree).

(B) All species of the genus *Prosopis* (mesquites).

(2) All species of the family *Agavaceae* (century plants, nolinas, yuccas).

(3) Creosote Rings, 10 feet or greater in diameter.

(4) All Joshua trees.

(5) Any part of any of the following species, whether living or dead:

(A) *Olneya tesota* (desert ironwood).

(B) All species of the genus *Prosopis* (mesquites).

(C) All species of the genus *Cercidium* (palos verdes).

(d) Compliance with Desert Native Plants Act. Removal actions of all plants protected or regulated by the Desert Native Plants Act (Food and Agricultural Code Section 80001 et seq.) shall comply with the provisions of the Act before the issuance of a development permit or approval of a land use application.

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.070 Mountain Forest and Valley Tree Conservation

This Section provides regulations to promote conservation and wise use of forest resources in the Mountain Region and native tree resources in the Valley Region. The provisions are intended to augment and coordinate with the Z'berg-Nejedly Forest Practice Act of 1973 (Public Resources Code Section 4526 et seq.) and the efforts of the State Department of Forestry and Fire Protection to implement and enforce the Act.

(a) Applicability.

(1) Private harvesting. The provisions of this Section apply to the private harvesting of all trees growing on private land and on public land in the unincorporated Mountain Region and Valley Region.

(2) Commercial harvesting. The commercial harvesting of trees shall be prohibited, except as allowed by and authorized by the State Department of Forestry and Fire Protection in compliance with the Z'berg-Nejedly Forest Practice Act of 1973 (Public Resources Code Section 4526 et seq.).

(b) Regulated trees. The following trees shall only be removed with an approved Tree or Plant Removal Permit issued in compliance with Section 88.01.050 (Tree or Plant Removal Permits):

(1) Native trees. A living, native tree with a six inch or greater stem diameter or 19 inches in circumference measured 4.5 feet above natural grade level.

(2) Palm trees. Three or more palm trees in linear plantings, which are 50 feet or greater in length within established windrows or parkway plantings, shall be considered to be heritage trees and shall be subject to the provisions of this Chapter regarding native trees.

(c) Tree protection from insects and disease. For regulations on the treatment and disposition of felled trees, see Section 88.01.090 (Tree Protection from Insects and Disease).

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.080 Riparian Plant Conservation

This Section provides regulations to promote healthy and abundant riparian habitats that protect watersheds; control transmission and storage of natural water supplies; provide unique wildlife habitats for rare, endangered and threatened plants and animals; provide attractive environments; control natural soil erosion and sedimentation to protect stream banks subject to erosion and undercutting; and provide sufficient shade to reduce temperature and evaporation and the growth of algae in streams. The provisions of this Section are intended to augment and coordinate with the responsibilities of the California Department of Fish and Game.

(a) Applicability.

(1) Applicable areas. The provisions of this Section shall apply to all riparian areas located on private land in all zones within the unincorporated areas of the County and to riparian areas on public land owned by the County, unless exempt as specified by Section 88.01.030 (Exempt Activities) and by Subsection (2) (Exemptions), below.

(2) Exemptions. The provisions of this Section shall not apply to:

(A) Emergency Flood Control District operations or water conservation measures established and authorized by an appropriate independent Special District.

(B) An area that has an existing man-made impervious structure, which is greater than 120 square feet in roof area, between the area proposed to be disturbed by a development permit and the bank of a subject stream, as measured in a straight line perpendicular to the centerline of the stream.

(b) Regulated riparian plants.

(1) Vegetation described. The removal of vegetation within 200 feet of the bank of a stream, or in an area indicated as a protected riparian area on an overlay map or Specific Plan, shall require approval of a Tree or Plant Removal Permit in compliance with Section 88.01.050 (Tree or Plant Removal Permits)shall be subject to environmental review.

(2) Streams. For the purposes of this Section, streams include those shown on United States Geological Survey Quadrangle topographic maps as perennial or intermittent, blue or brown lines (solid or dashed), and river wash areas.

(c) Preconstruction inspections. Preconstruction inspections shall include the verification of the presence of riparian vegetation.

(d) Conditions of approval. Conditions of approval for removal of riparian vegetation may be imposed in addition to, and in combination with, any condition imposed in compliance with Section 88.01.050 (Tree or Plant Removal Permits).

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

88.01.090 Tree Protection from Insects and Disease

This Section provides regulations for the treatment and disposition of felled trees in the Mountain Region to protect against damaging insects (e.g. bark beetles) and diseases. The intent is to mitigate the serious danger posed to forests from coniferous trees that are cut in land clearing operations and are then allowed to remain exposed and untreated against noxious insects, which then multiply in the felled trees to later attack and damage healthy coniferous trees.

(a) Applicability. The provisions in this Section apply to coniferous trees located on land in the Mountain Region. Every person, firm, or corporation, whether as principal, agent, or employee, that has control of, right of entry on, or access to land in the Mountain Region shall comply with this Section.

(b) Treatment of felled trees. Except as otherwise provided by this Section, felled coniferous trees, portions of trees, and stumps shall be treated in compliance with at least one, or a combination, of the following methods and the method in Subsection (c) (Stump treatment), below, within 15 days after a coniferous tree has been cut.

(1) Remove to a solid waste disposal site specifically designated by the County for this type of use.

(2) Burn sufficiently to consume the bark, when allowed by the Fire Department and the Air Pollution Control District.

(3) Lop and scatter material less than four inches in diameter so that it is piled no higher than 24 inches above the ground, when allowed by the Fire Department.

(4) Remove the bark

(5) Chip or grind.

(6) Split and scatter with bark toward the sun for a minimum of 45 consecutive days or until final inspection is completed, whichever is less.

(7) Stack in the sun and cover with six mil clear plastic, which has a continuous seal from the outside and for at least 180 days.

(8) Spray with a commercial insecticide, as approved by the Agricultural Commissioner for these insects and purposes.

(9) Treat under any other method approved by the enforcement officer in writing.

(c) Stump treatment. Fresh cut stumps of live coniferous trees shall be protected from infection by Annosus Root Rot *(Fomes annosus)* with borax powder (granular tech, 10 mole) as soon as possible after felling, covering the entire newly exposed cut and/or broken surface completely with a thin uniform layer of white borax within two hours.

(d) Inspections. In the case of construction activity, the Building Official shall not approve development permit inspections until felled coniferous trees, portions of trees, and stumps are treated in compliance with this Section.

(e) Certificate of compliance. Where trees have been treated by an approved method and the evidence of treatment is not readily observable to the inspector on the construction site, the Building Official shall require a permittee to obtain a certificate that the treatment has been completed in an acceptable manner. The certificate may be from one of the following authorities:

(1) Fire Chief.

(2) Agricultural Commissioner.

(3) Appropriately certified Pest Control Adviser as defined in Food and Agriculture Code Section 11401 et seq.

(4) Qualified Applicator as defined in Food and Agriculture Code Section 11401 et seq.

(f) Extension of time of enforcement. If compliance with Subsection (b) (Treatment of felled trees) and Subsection (c) (Stump treatment) within the specified time periods is impractical because of inaccessibility to the cut timber due to snow or flooding, an enforcement officer may extend the period of time for compliance.

Adopted Ordinance 4011 (2007); Amended Ordinance 4067 (2009)

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PHASE I CULTURAL RESOURCE SURVEY,
TTM 20454,
SOUTHWEST CORNER OF MESA VIEW DRIVE AND NYACK ROAD
CITY OF VICTORVILLE, CALIFORNIA

Submitted to:
RY Properties
212 S. Palm Avenue, Suite 200
Alhambra, California 91801

Keywords:
Baldy Mesa 7.5' Quadrangle,
City of Victorville, California Environmental Quality Act

Submitted by:
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DECEMBER 2021

Management Summary

At the request of RY Properties, a Phase I Cultural Resource Survey was conducted at a 30.22-acre site for a proposed single-family residential development, at the southwest corner of Mesa View Drive and Nyack Road, in the City of Victorville, California. The Phase I Cultural Resource Survey consisted of a pedestrian survey of the site and a cultural resource record search.

No cultural resources were identified; no further work is required. If cultural resources are encountered during the further course of construction, a qualified archaeologist should be consulted for further evaluation.

If human remains or potential human remains are observed during construction, work in the vicinity of the remains will cease, and they will be treated in accordance with the provisions of State Health and Safety Code Section 7050.5. The protection of human remains follows California Public Resources Codes, Sections 5097.94, 5097.98, and 5097.99.

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1.0 Introduction

At the request of RY Properties, *Hudlow Cultural Resource Associates* conducted a Phase I Cultural Resource Survey at a 30.22-acre site for a proposed residential development at the southwest corner of Mesa View Drive and Nyack Road, City of Victorville, California. The Phase I Cultural Resource Survey consisted of a pedestrian survey of the site and a cultural resource record search.

2.0 Survey Location

The survey area is in the City of Victorville. It lies within the S ½ of the NW ¼ of Section 33, T.5N., R.5W., San Bernardino Baseline and Meridian, as displayed on the United States Geological Survey Baldy Mesa 7.5-minute quadrangle map (Figure 1). The proposed residential development located at the southwest corner of Mesa View Drive and Nyack Road in a semi-rural area in the City of Victorville, California.

3.0 Records Search

A record search of the survey area and the environs within a half mile was conducted at the South Central Coast Archaeological Information Center. Archaeological Information Center staff conducted the record search on January 25, 2022 (Appendix II). The record search revealed that four cultural resources have been recorded within one-half mile of the project area. Each of these cultural resources are historic resources, three are historic trash scatters and the last is a historic road cut. Two cultural resources surveys have been conducted within one half mile; both of these surveys are right-of-way projects. No cultural resources have previously identified within the current project boundaries, and no cultural resources surveys have been conducted within the current project boundaries as well.

4.0 Environmental Background

The survey area is located at elevation of 3300 and 3320 feet above mean sea level west of Cajon Pass and Ora Grande Wash and north of Baldy Mesa. The survey area lies within a creosote scrub landscape, which is covered in modern, dumped trash (Figures 2 and 3).

5.0 Prehistoric Archaeological Context

A generally accepted prehistoric cultural chronology for the western Mojave region has yet to be developed, partially because sparse local

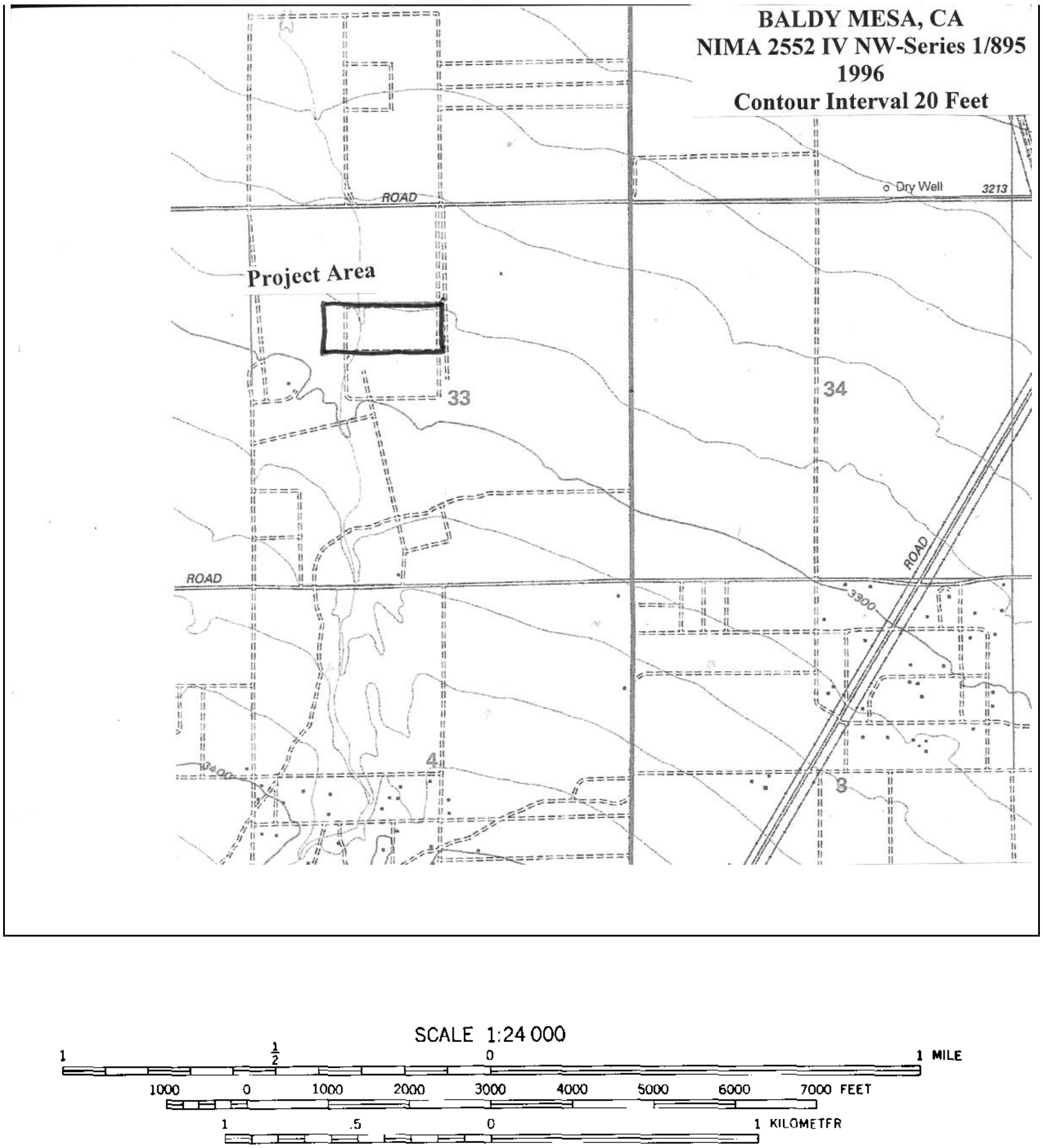

Figure 1
Survey Area Location Map

chronometric data is unavailable to use as a foundation. Consequently, most proposed local culture histories have been borrowed from other regions, with minor modifications based on sparse local data. The most common pattern is the tripartite Early/Middle/Late sequence familiar in Californian culture history, often with the addition of a Post-Contact (Norwood 1987) or Protohistoric Period (Sutton 1988). The differences between the sequences are mainly in the inclusion of various horizons, technologies, or stages. The following chronology is based on Claude Warren's Lake Mojave, Pinto, Gypsum, Saratoga Springs, and Protohistoric Periods, which is partially based on time-sensitive projectile points and shell bead sequences (Warren 1984; Warren and Crabtree 1986).

Most Lake Mojave Period sites within the northern Mojave Desert and southwestern Great Basin are early Holocene lakeshore occupations. Sutton stated that the subsistence strategy during this period was presumably one of hunting and utilization of lacustrine resources (Sutton 1988:30). The best examples of sites from this period are associated with the shoreline of Pleistocene Lake Mojave (Campbell *et al.* 1937). Artifacts include percussion-flaked foliate points and knives, Lake Mojave and Silver Lake projectile points, and an unspecialized tool kit of scrapers, gravers, and perforating tools.

Some scholars have interpreted the association of Pinto Basin sites and a now extinct riverbed as indicative of occupation during a time of abundant moisture (Campbell and Campbell 1935). Settlement patterns appear to be associated with ephemeral lakes and now dry streams and springs (Warren 1984). Though the Pinto Period is roughly concurrent with the Altithermal climatic event --a time when human populations were supposedly reduced in size and more widely dispersed due to the desiccation of wetter habitats (Moratto 1984:546) --the occurrence of a milder, wetter, Little Pluvial period within the Altithermal has been noted by several archaeologists. The extent to which the Little Pluvial climatic period may coincide with Pinto Period sites is unknown.

Lithic materials utilized during the Pinto Period range from fine-grained basalts and obsidians to progressively poorer quality cherts, rhyolites, basalts, and quartz materials. The obsidian has been sourced to the Coso volcanic fields and is considered exotic, while most of the other materials are locally available. Norwood stated that "...basalts, rhyolites, and relatively tough materials" are typically favored, as demonstrated by the flaked lithic debitage (Norwood 1987:104). Norwood further noted that flake assemblages from Pinto Period sites appear to have a relatively high ratio of flakes to flaked-stone tools (Norwood 1987). Large scrapers and large cone-shaped cores occur frequently.

During the Gypsum Period evidence of a millingstone culture becomes much more common. During this period, the mortar and pestle is believed to have been introduced (Wallace 1955:222-223; Warren 1984:4163). Wallace (1977:121) noted evidence of expanded subsistence activities where late period peoples around Mesquite Flat were believed to have extended their food-collecting activities into the surrounding mountains.

Figure 2
Survey Area, View to the South

Figure 3
Survey Area, View to the East

Uto-Aztecan speakers, such as the Kawaiisu, appear to have entered the Mojave Desert from the east during the Gypsum Period. The Uto-Aztecan expansion in California coincides with the Gypsum Period, which is marked by millingstones, Humboldt, Elko, and Gypsum projectile points, and other traits introduced from the Southwest (Moratto 1984:559). Settlement patterns, during the Gypsum Period, were quite similar to those of the earlier Pinto Period. Certain sites indicate that a possible relationship between milling technology and mesquite thickets. This suggests evidence of the exploitation of a new resource not present in the archaeological record prior to the Gypsum Period. Wallace and Warren postulated annual reoccupation of seasonal camps at both Mesquite Flat and Corn Creek Dunes on the basis of the large size of the sites and a wide variety of artifactual evidence (Wallace 1977:121; Warren 1984:419).

A gradual transition from the use of large dart points to smaller projectile points associated with use of the bow and arrow occurred toward the end of the Gypsum Period. At roughly A.D. 500, the bow and arrow essentially replaced the atlatl (a device used for throwing spears or darts that consists of a rod with a hook at the rear end to hold the projectile in place until release) (Warren 1984:415). Shutler postulated that Anasazi ceramics were initially introduced into the eastern Mojave at about the same time (Shutler *et al* 1961). Diagnostic projectile points associated with the Gypsum Period include the Humboldt, Gypsum Cave, Elko Eared, and Elko Corner-notched types (Warren 1984:414-415). Other temporal designations, which may be correlated with Warren's Gypsum Period, include the Early and Middle Rose Spring Periods (Lanning 1963; Clewlow *et al.* 1970) and the Newberry Period (Bettinger and Taylor 1974).

The scant published literature reports relatively little local evidence of Gypsum material (Robinson 1977:45; Sutton 1988:38). Norwood, (1987:101-104) however, notes several isolated local examples of projectile points from this period. If isolated points are eliminated from the sample, the remaining 17 points from the Gypsum Period come from 16 sites. Radiocarbon data identifies another five Antelope Valley sites (LAN-82, LAN-192, KER-303, KER-526, and KER-533) with materials that fall within the Gypsum Period. Hydration readings suggest the possibility that a number of additional Gypsum Period sites are present. Therefore, a Gypsum presence in the area is well represented.

The Saratoga Springs Period is marked by what appears to be the establishment of large villages, or village complexes. This reflects a transition from the previous seasonal transhumance pattern into one of semi-, or fully-sedentary occupation within the Antelope Valley (Sutton 1988). This period also marks the beginning of the Shoshonean period, named for the Shoshonean peoples who occupied the Western Mojave Desert during this period (Robinson 1977). The Numic and Takic Shoshonean groups were expanding during this period. Both groups made use of a millingstone technology. Other aspects of their material culture include marine shell, bone, and perishable artifacts. Takic sociopolitical organizations differ from those of Northern Numic groups. The Kitanemuk (a Takic group) are reported as having well developed social ranking and prestige systems (Blackburn and Bean 1978). Grover Krantz postulated that the Takic expansion to the south was stimulated by Northern groups who

"...overran their neighbors for a considerable distance to the south" (Krantz 1978:64) in order to obtain acorn resources. This migration occurred at about 2000 B.P. (Sutton 1988:40).

A diffusion of Southwestern cultural traits into the southern Mojave Desert occurred late during the Saratoga Springs Period, and is termed the Hakataya intrusion. It replaced the earlier Anasazi influences in the eastern Mojave Desert, and eventually reached the eastern fringes of the Antelope Valley along the Mojave River (Warren 1984:420). However, Warren and Crabtree remarked that in comparison with the rest of the southern Mojave Desert, the Antelope Valley seems to have had less influence from the Southwest and more from the California coast, with cultural continuity visible from about 0 A.D (Warren and Crabtree 1986:192).

Time-sensitive projectile points from this period include the Rose Spring, Cottonwood, and Desert Side-Notched series. It has been argued that assemblages with Cottonwood points and no Desert Side-Notched points represent an earlier occupation than sites with both Cottonwood and Desert Side-notched points, and that the earlier occupation is associated with the Hakataya influence from the Southwest (Warren 1984:423-424; Warren and Crabtree 1986:191). In the western Mojave Desert, diagnostic materials from this period include various types or examples of poorly understood brownware pottery and desert side notch series projectile points (Warren and Crabtree 1986:191). The use of pottery in the Antelope Valley is poorly understood currently.

Warren (1984) used the term "Protohistoric" to describe the period, which reflects a transition from the prehistoric to historic eras. However, Arkush (1990:29), noting this term has distinct cultural implications, argued this time is more properly designated the "Late Archaic," while many archaeologists colloquially call this period the "Late Prehistoric." This period is also termed the "Shoshonean" Period (Warren 1984; Warren and Crabtree 1986), potentially clouding the culture history sequence by adding a name, which has cultural and linguistic meanings when describing modern groups. Whatever its name, the period markers are considered to be Desert Side-notched arrow points "...and various poorly defined types of brownware pottery including Owens Valley Brownware" (Warren and Crabtree 1986:191).

This period reflects a continuation of cultural developments established during the previous period, but with adaptive modifications. Trade along the Mojave River likely affected the people of the Eastern Antelope Valley, allowing active groups to acquire considerable amounts of wealth. Socioeconomic and sociopolitical organizations continued to increase in complexity. However, most Antelope Valley groups appear to have developed stronger ties with coastal groups rather than those of the eastern desert and Great Basin (Warren 1984:426). By approximately A.D. 1300, the Hakataya expansion reached its western extreme. Warren (1984) interprets the paucity of ceramic ware in Antelope Valley village sites as evidence that Hakatayan influence upon local groups was minimal.

Protohistoric populations utilized a greater variety of subsistence resources, including exploitation of large and small mammals and, in some areas, fish. The continuation of milling technologies reflects the continued importance of seed collecting. The frequency of special purpose sites increases proportionally with a growing awareness of resource availability and potential (McIntyre 1990).

The "contact" period is difficult to define in theory and to detect in practice. The earliest contact between the native populations of the New and Old Worlds traditionally dates to Columbus' landfall. From that time, Native Americans in a variety of ways felt Europeans' impact (and later, the Euro-Americans); direct, face-to-face contact was not necessary for their lives to be changed irrevocably. For example, trade items like guns, horses, metal, and cloth spread quickly, and were rapidly incorporated into the indigenous cultures, in some cases trade with Europeans altered an entire culture or dramatically shifting power balances between groups. Diseases to which Native Americans had little or no resistance preceded the Euro-Americans to the furthest corners of the continent, decimating entire populations within months (Cook 1955; Salisbury 1982). Such population shifts rippled across the continent, exacerbated by the expansion of European and Euro-American settlements.

Even word-of-mouth spread the news of alien people, goods, and events. In the archaeological record, clear evidence of contact takes three forms: a mix of aboriginal and Euro-American artifacts, aboriginal-style artifacts made from Euro-American materials (e.g., glass projectile points or thimble tinklers), or European forms, designs, and motifs utilized in aboriginal crafts (i.e. basketry or pottery). In rare cases, specific types of osteological damage or mass burials can indicate the onset of Euro-American diseases. However, such evidence has been elusive. Thus, "contact" in North America is usually perceived by anthropologists not as a single point in time, but rather, as a period of centuries, the beginning and ending points of which are frustratingly vague, and vary from region to region.

6.0 Ethnographic Background

Ethnographically, the Cajon Pass region was occupied by the Vanyume, occasionally referred to as "Serrano" in the literature (Kroeber 1925; Bean and Smith 1978). Kroeber stated they were found as far west as Barstow. However, King and Blackburn (1978:535) speculated that "the major portion of the Antelope Valley itself was probably held by Kitanemuk and Vanyume speakers." Further clouding the issue, Bean and Smith (1978:570), writing about the Vanyume in the same volume, stated the Vanyume language cannot be identified.

Whether they spoke a dialect of Serrano or a separate Takic language cannot be determined from the brief word list available (Bright 1975; Kroeber 1907:139-140). The number of Vanyume, never large, dwindled rapidly between 1820 and 1834 as the Spanish collected southern California Indians in various *asistencias* and missions (Beattie and Beattie 1939); well before 1900 the group was extinct.

Bean and Smith did not fully depict the Vanyume territory in their map. Harrington's notes revealed his Kitanemuk informants grouped the languages in the southern Antelope Valley and east to Cajon Pass under the name "Haminat." Dialect differences were noted, and conform to the Kitanemuk, Serrano, and Vanyume "language" divisions of earlier research (Earle 1990:98-99). This would indicate that an emphasis on determining (or despairing over) the ethnographic boundaries between these groups is wasted effort. A more productive approach, Earle argued (1990:101), is an examination of the chiefs, clans and/or moieties, and *naciónes,* or intermediate sociopolitical groups, which seem to have been hierarchical and reflected in inter-village organization.

The Vanyume or Serrano were hunter-gathers and fishers, depending on the environment in which they lived. In the mountain areas, such as Cajon Pass, the staple was pinion and acorns. Games animals, such as deer, mountain sheep, antelope, rabbits, were consumed. These animals were procured using a bow and arrow, throwing sticks, and deadfall traps.

Settlement location and size was limited by the availability of water. Two primary dwellings were built, family dwellings and ramadas. Family dwellings are typical southern California circular, domed brush dwellings, built of willow. Ramadas or arbors are wall-less structures that are constructed to provide shade. Four or more poles are placed vertically into the ground supporting a lattice roof of willow boughs. Communal structures were also built to provide shelter for partilineal leaders, known as *kika?*. Other village structures include granaries, for storing acorns or pinion nuts, and sweat lodges.

Serrano material culture is quite similar to their neighbors to the southwest, the Cahuilla. Most artifacts were made from plant fibers. Baskets, usually fashioned by coiling and often having black geometric designs woven on the sides, had the most varied cluster of forms. Among the more common styles were globular baskets used as utensils or containers for small objects, and round forms for food or seed storage. Shell, wood, bone, and stone were also used for various items, particularly for hunting, food processing, ritual needs, and architectural functions.

7.0 Field Procedures and Methods

On November 16, 2021, Scott M. Hudlow (for qualifications see Appendix I) conducted a pedestrian survey of the entire survey area. Hudlow surveyed in east/west transects at 10-meter (33 feet) intervals across the entire parcel. All archaeological material more than fifty years of age or earlier encountered during the inventory was recorded.

8.0 Report of Findings

No cultural resources were identified. The property is covered with modern trash, landscaping materials, and construction mounds.

9.0 Management Recommendations

At the request of RY Properties, a Phase I Cultural Resource Survey was conducted at a 30.22-acre site for a proposed single-family residential development, at the southwest corner of Mesa View Drive and Nyack Road, in the City of Victorville, California. The Phase I Cultural Resource Survey consisted of a pedestrian survey of the site and a cultural resource record search.

No cultural resources were identified; no further work is required. If cultural resources are encountered during the further course of construction, a qualified archaeologist should be consulted for further evaluation.

If human remains or potential human remains are observed during construction, work in the vicinity of the remains will cease, and they will be treated in accordance with the provisions of State Health and Safety Code Section 7050.5. The protection of human remains follows California Public Resources Codes, Sections 5097.94, 5097.98, and 5097.99.

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Appendix I

Scott M. Hudlow
1405 Sutter Lane
Bakersfield, California 93309
(661) 834-9183 (w)

Education

The George Washington University
M.A. American Studies, 1993
Specialization in Architectural History,
American Material Culture, and Folklife

University of California, Berkeley
B.A. History, 1987
B.A. Anthropology, 1987
Specialization in Colonial History
and Historical Archaeology

Public Service

3/94- *Historic Preservation Commission.* City of Bakersfield, Bakersfield, California 93305.

7/97- *Newsletter Editor. California History Action,* newsletter for the California Council for the Promotion of History.

Relevant Work Experience

8/96- *Adjutant Faculty.* Bakersfield College, 1801 Panorama Drive, Bakersfield, California, 93305. Teach History 17A, Introduction to American History and Anthropology 5, Introduction to North American Indians.

11/95- *Owner, Sole Proprietorship.* Hudlow Cultural Resource Associates. 1405 Sutter Lane, Bakersfield California 93309. Operate small cultural resource management business. Manage contracts, respond to RFP's, bill clients, manage temporary employees. Conduct Phase I architectural and archaeological surveys for private and public clients; including the survey, documentary photography, measured drawings, mapping of structures, filing of survey forms, historic research, assessing impact and writing reports. Evaluated properties in lieu of their eligibility for the National Register of Historic Places in association with Section 106 and 110 requirements of the National Historic Preservation Act of 1966 and CEQA (California Environmental Quality Act).

Full resume available upon request.

Appendix II

South Central Coastal Information Center
California State University, Fullerton
Department of Anthropology MH-426
800 North State College Boulevard
Fullerton, CA 92834-6846
657.278.5395 / FAX 657.278.5542
sccic@fullerton.edu
California Historical Resources Information System
Orange, Los Angeles, and Ventura Counties

1/25/2022 Records Search File No.: 23119.9305

Scott M. Hudlow
Hudlow Cultural Resource Associates
1405 Sutter Lane
Bakersfield, CA 93309

Re: Record Search Results for RY Properties 21-02

The South Central Coastal Information Center received your records search request for the project area referenced above, located on the Baldy Mesa, CA USGS 7.5' quadrangle(s). Due to the COVID-19 emergency, we have implemented new records search protocols, which limits the deliverables available to you at this time. **WE ARE ONLY PROVIDING DATA THAT IS ALREADY DIGITAL AT THIS TIME.** Please see the attached document on COVID-19 Emergency Protocols for what data is available and for future instructions on how to submit a records search request during the course of this crisis. If your selections on your data request form are in conflict with this document, we reserve the right to default to emergency protocols and provide you with what we stated on this document. You may receive more than you asked for or less than you wanted. The following reflects the results of the records search for the project area and a ½-mile radius:

As indicated on the data request form, the locations of archaeological resources are provided in the following format: ☒ custom GIS maps ☐ shape files ☐ hand-drawn maps

Resources within project area: 0	None
Resources within ½-mile radius: 4	SEE ATTACHED MAP or LIST
Reports within project area: 0	None
Reports within ½-mile radius: 2	SEE ATTACHED MAP or LIST

Resource Database Printout (list):	☒ enclosed	☐ not requested	☐ nothing listed
Resource Database Printout (details):	☐ enclosed	☒ not requested	☐ nothing listed
Resource Digital Database (spreadsheet):	☐ enclosed	☒ not requested	☐ nothing listed
Report Database Printout (list):	☒ enclosed	☐ not requested	☐ nothing listed
Report Database Printout (details):	☐ enclosed	☒ not requested	☐ nothing listed
Report Digital Database (spreadsheet):	☐ enclosed	☒ not requested	☐ nothing listed
Resource Record Copies:	☒ enclosed	☐ not requested	☐ nothing listed
Report Copies:	☐ enclosed	☒ not requested	☐ nothing listed

OHP Built Environment Resources Directory (BERD) 2019: ☒ available online; please go to https://ohp.parks.ca.gov/?page_id=30338
Archaeo Determinations of Eligibility 2012: ☐ enclosed ☒ not requested ☐ nothing listed
Historical Maps: ☒ not available at SCCIC; please go to https://ngmdb.usgs.gov/topoview/viewer/#4/39.98/-100.02
Ethnographic Information: ☒ not available at SCCIC
Historical Literature: ☒ not available at SCCIC
GLO and/or Rancho Plat Maps: ☒ not available at SCCIC
Caltrans Bridge Survey: ☒ not available at SCCIC; please go to http://www.dot.ca.gov/hq/structur/strmaint/historic.htm
Shipwreck Inventory: ☒ not available at SCCIC; please go to http://shipwrecks.slc.ca.gov/ShipwrecksDatabase/Shipwrecks_Database.asp
Soil Survey Maps: (see below) ☒ not available at SCCIC; please go to http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Requests made after initial invoicing will result in the preparation of a separate invoice.

Thank you for using the California Historical Resources Information System,

Isabela Kott   Digitally signed by Isabela Kott
Date: 2022.01.25 17:31:31 -08'00'

Isabela Kott
Assistant Coordinator, GIS Program Specialist

Enclosures:

(X) Covid-19 Emergency Protocols for San Bernardino County Records Searches – 2 pages

(X) Custom Maps – 1 page

(X) Resource Database Printout (list) – 1 page

(X) Report Database Printout (list) – 1 page

(X) Resource Record Copies – (all archaeological) 18 pages

UPDATED GEOTECHNICAL REPORT

FOR

PROPOSED SINGLE-FAMILY RESIDENTIAL DEVELOPMENT
TRACT NO. 17486
CITY OF VICTORVILLE, SAN BERNARDINO COUNTY, CALIFORNIA

PREPARED FOR

BEAZER HOMES
1800 EAST IMPERIAL HIGHWAY, SUITE 140
BREA, CALIFORNIA 92821

PREPARED BY

GEOTEK, INC.
710 E. PARKRIDGE AVENUE, SUITE 105
CORONA, CALIFORNIA 92879

PROJECT NO. 1474-CR MARCH 30, 2016

GEOTEK

GeoTek, Inc.
710 E. Parkridge Avenue, Suite 105, Corona, California 92879-1097
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

March 30, 2016
Project No. 1474-CR

Beazer Homes
1800 East Imperial Highway, Suite 140
Brea, California 92821

Attention: Mr. Rudy Provoost

Subject: Updated Geotechnical Report
Proposed Single-Family Residential Development
Tract No. 17486
City of Victorville, San Bernardino County, California

Dear Mr. Provoost:

We are pleased to provide our updated geotechnical report for proposed development at the subject property located in the city of Victorville, San Bernardino County, California. This report provides preliminary geotechnical recommendations for earthwork, foundation design, and construction.

In our opinion, site development appears feasible from a geotechnical viewpoint provided that the recommendations presented in this report are incorporated into the design and construction phases of the project.

GeoTek has reviewed the boring logs and results of the laboratory testing and now assumes responsibility as geotechnical consultant of record henceforth for the subject project.

The opportunity to be of service is sincerely appreciated. If you have any questions please do not hesitate to call our office.

Respectfully submitted,
GeoTek, Inc.

Paul Hyun Jin Kim
PE 77214, Exp. 06/30/17
Senior Project Engineer

Edward H. LaMont
CEG 1892, Exp. 07/31/16
Principal Geologist

Anna M. Scott
Project Geologist

Distribution: (1) Addressee via email (one PDF file)

G:\Projects\1451 to 1500\1474CR Beazer Homes Tract No 17486 Victorville\Updated Geotechnical Report\1474CR Updated Geotechnical Report Tract No. 17486.doc

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1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the existing geotechnical conditions for the currently proposed development. Services provided for this study included the following:

- Research and review of readily available geologic data and general information pertinent to the site, including a *Geotechnical Feasibility Investigation* report by Zeiser Kling Consultants, Inc. (Zeiser, 2005),
- Review and evaluation of site seismicity, and;
- Compilation of this updated geotechnical report which presents our recommendations for site development.

The intent of this report is to aid in the evaluation of the site for future proposed development from a geotechnical perspective. The professional opinions and geotechnical information contained in this report may need to be updated based upon our review of the final site development plans, and/or conditions encountered during rough grading of the site. Final site development plans should be provided to GeoTek, Inc. (GeoTek) for review when available.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The subject project is located southwest of the intersection of Nyack Road and Mesa View Drive in the city of Victorville, San Bernardino County, California (see Figure 1). Based on a recent site reconnaissance, the area to be developed is currently vacant land with scattered native weeds and brush. The irregular shaped site consists of approximately 40.36 acres and can be considered as having relatively flat to gently sloping terrain with elevations ranging from approximately 3261 to 3297 mean sea level (msl) generally sloping down to the north-northeast. The site is bounded by vacant land and a residential development to the north; Mesa View Drive, followed by a residential development to the east; and vacant land to the west and south. Based on our recent site reconnaissance on March 8, 2016, site conditions have remained similar to those conditions described by Zeiser Kling Consultants, Inc. (2005).

2.2 PROPOSED DEVELOPMENT

Based on review of a *Tentative Tract Map*, prepared DH Civil Engineering (prepared date October 25, 2005), proposed site improvements include 151 single-family residential lots, with associated roadways. Two retention basins may also be constructed as part of the site improvements. Specific development plans were not provided to us. This report is based on that the proposed one- to two-story structures will be of wood-framed construction, incorporate concrete slab-on-grade floors and will be supported by conventional shallow isolated and continuous foundations.

Due to the topography of the site, retaining wall construction and slopes are not anticipated. Cuts and fill of up to approximately five (5) feet are anticipated to bring the site to design grades.

If the site development differs from the noted information made in this report, the recommendations should be subject to further review and evaluation by GeoTek. Final site development plans should be reviewed by GeoTek when they become available.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 PREVIOUS FIELD EXPLORATION

A previous field exploration was conducted by Zeiser Kling Consultants, Inc. in March 2005 as documented in the referenced report (Zeiser Kling Constultants, Inc., 2005), and consisted of excavating eight (8) exploratory borings to depths of 6.5 to 55.25 feet. The logs of the exploratory borings by Zeiser Kling Consultants, Inc. (2005) are included in Appendix A. The approximate exploratory locations are shown on the Boring Location Map (Plate 1 by Zeiser Kling Consultants, Inc.). The map provided does not appear to depict the entire site, with the eastern edge of the site area missing and locations of two of the borings (Boring B-2 and B-4) not present.

3.2 LABORATORY TESTING

Laboratory testing was performed by Zeiser Kling Consultants, Inc. on soil samples collected during their field exploration. Results of their laboratory testing is included in Appendix B or on their exploratory logs in Appendix A.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The property is situated in the Mojave Desert geomorphic province. The Mojave Desert province is a wedge-shaped area that is enclosed on the southwest by the San Andreas fault zone, the Transverse Ranges province and the Colorado Desert province, on the north and northeast by the Garlock fault zone, the Tehachapi Mountains and the Basin and Range province, and on the east by the Nevada and Arizona state lines, and the Colorado River. The area is dominated by broad alluviated basins that are mostly aggrading surfaces that are receiving non-marine continental deposits from the adjacent upland areas.

The primary fault zones of the area are found in the western half of the province and have a general northwest-southeast trend. These zones are the San Andreas, Helendale, Lenwood and Lockhart in the subject site vicinity. In addition to these major zones, there are numerous secondary fault zones in the area and many smaller fault zones in the eastern half of the province. Many of the secondary fault zones in the province have a general east-west trend.

The site is located in an area geologically mapped to be underlain by alluvium (Dibblee, T.W, 1965).

No faults are shown in the immediate site vicinity on maps reviewed for the area nor are any faults mapped on the site by Zeiser Kling Consultants, Inc. (2005).

4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the earth materials reported to be on the site (Zeiser Kling Consultants, Inc., 2005) is presented in the following sections.

4.2.1 Alluvium

Alluvial materials were encountered in previous explorations (Zeiser Kling Consultants, Inc.) excavated on the site to a maximum depth of 51.25 feet. The alluvium is reported to consist predominantly of poorly graded sands and silty sands with gravels, which are loose and medium dense to very dense.

4.3 SURFACE AND GROUNDWATER

4.3.1 Surface Water

If encountered during earthwork operations, surface water on this site is the result of precipitation or surface run-off from surrounding areas. Overall surface drainage is generally to the north-northeast.

4.3.2 Groundwater

Regional groundwater was not encountered in previous exploratory excavations by others. Based on a review of groundwater levels (http://www.water.ca.gov/waterdatalibrary/) in the vicinity of the site, the depth to regional groundwater is greater than 100 feet.

4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is presently known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone. The nearest zoned fault is the San Andreas Fault, located approximately 14 miles to the southwest.

4.4.1 Seismic Design Parameters

The site is located at approximately 34.4799 Latitude and -117.4126 Longitude. Site spectral accelerations (S_s and S_1), for 0.2 and 1.0 second periods for a Class "D" site, were determined from the USGS Website, Earthquake Hazards Program, U.S. Seismic Design Maps for Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Response Accelerations for the Conterminous 48 States by Latitude/Longitude. The results are presented in the following table:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_s	1.500g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.600g
Site Coefficient for Site Class "D", F_a	1.0
Site Coefficient for Site Class "D", F_v	1.5
Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, S_{MS}	1.500g
Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, S_{M1}	0.900g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	1.000g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.600g
Peak Ground Acceleration Adjusted for Site Class Effects, PGA_M	0.500g

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

4.5 LIQUEFACTION AND SEISMICALLY INDUCED SETTLEMENT

The site is currently not located within an area designated by the County of San Bernardino (http://cms.sbcounty.gov/lus/Planning/ZoningOverlayMaps/GeologicHazardMaps.aspx) as potentially being liquefiable. Liquefaction and seismically induced settlement should not be a consideration in the design of the proposed structures due to the great depth to ground water.

4.7 OTHER SEISMIC HAZARDS

Evidence of ancient landslides or slope instabilities at this site was not observed during our site reconnaissance. Thus, the potential for landslides is considered negligible for design purposes.

The potential for secondary seismic hazards such as a seiche or tsunami is considered negligible due to site elevation and distance to an open body of water.

5 CONCLUSIONS AND RECOMMENDATIONS

5.2 GENERAL

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations, and those provided by this firm at a later date are properly incorporated into the design of the project. Final site development and grading plans should be reviewed by GeoTek when they become available.

5.3 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Victorville, the 2013 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix C outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix C.

5.2.1 Site Clearing and Demolition

In areas of planned grading and improvements, the site should be cleared of vegetation, roots, and any trash and debris. These materials should be properly disposed of off-site. Voids resulting from site clearing should be replaced with engineered fill materials with expansion characteristics similar to the on-site soils.

5.2.2 Removals/Overexcavations

In the areas of the building pads and associated improvements, the upper two (2) feet of alluvium should be removed prior to placement of engineered fill. This includes below building and hardscape areas, retaining wall and screen wall footings, and driveway and street areas.

In order to provide a uniform blanket of engineered fill, a minimum two (2) feet of engineered fill should be provided below the bottom of the proposed foundation. A representative of this firm should observe the bottom of all excavations.

The horizontal extent of removals should extend at least five (5) feet outside the footings and floor-slabs, or a distance equal to the depth of overexcavation below the bottom of the structural elements, whichever is greater.

A minimum of 12 inches of engineered fill should be provided below asphaltic concrete pavement and Portland cement concrete hardscape areas. The horizontal extent of removals should extend at least two (2) feet beyond the edge.

5.2.2.1 Preparation of Areas to Receive Engineered Fill

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils in areas to receive engineered fill should be scarified to a minimum depth of six (6) inches, moistened to at least optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

5.2.3 Engineered Fills

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. The undercut areas should be brought to the final subgrade elevations with fill materials that are placed in eight (8) inch or less loose lifts, moisture conditioned to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557). The upper 12 inches of pavement subgrade should be compacted to 95 percent (ASTM D 1557).

5.2.4 Excavation Characteristics

Excavation in the on-site materials is expected to be feasible utilizing heavy-duty grading equipment in good operating condition. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines. Temporary excavations within the on-site materials should be stable at 1:1 (horizontal:vertical) inclinations for cuts less than five (5) feet in height.

5.2.5 Shrinkage, Subsidence and Bulking

Several factors will impact earthwork balancing on the site, including shrinkage, subsidence, bulking, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage is primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 10 to 15 percent may be considered for the alluvium. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of site earthwork construction. Subsidence of up to 0.1 to 0.2 feet may occur due to the underlying materials within the vicinity of the proposed construction.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

Foundation design criteria for a conventional foundation system, in general conformance with the 2013 CBC, are presented below. The soils are reported to be classified as having a "very low" ($0 \leq EI \leq 20$) expansion potential in accordance with ASTM D 4829. Typical design criteria for the site based upon a "very low" expansion potential are tabulated below. These are minimal recommendations and are not intended to supersede the design by the project structural engineer.

The foundation elements for the proposed structures and other improvements should bear entirely in engineered fill soils. Foundations should be designed in accordance with the *2013 California Building Code* (CBC).

Expansion index and soluble sulfate testing of the soils should be performed during construction to evaluate the as-graded conditions. Final recommendations should be based upon the as-graded soils conditions.

A summary of our foundation design recommendations is presented in the following table:

GEOTECHNICAL RECOMMENDATIONS FOR FOUNDATION DESIGN

Design Parameter	"Very Low" Expansion Potential $0 \leq EI \leq 20$
Foundation Depth or Minimum Perimeter Beam Depth (inches below the lowest adjacent grade)	One-or two-story structures – 12
Minimum Foundation Width (inches)*	One- or two-story structures – 12
Minimum Slab Thickness (inches)	4 - Actual
Sand Blanket and Moisture Retardant membrane below On-Grade Building Slabs	2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand**
Minimum Slab Reinforcing	6" x 6" - W1.4/W1.4 welded wire fabric placed in the middle of slab
Minimum Footing Reinforcement for Continuous Footings, Grade Beams and Retaining Wall Footings	Two No. 4 reinforcing bars, one placed near the top and one near the bottom
Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches)	Minimum of 100% of the optimum moisture content to a depth of at least 12 inches prior to placing concrete

* Code minimums per Table 1809.7 of the 2013 CBC
** Sand should have a sand equivalent of at least 30

An allowable bearing capacity of 2000 pounds per square foot (psf) may be used for design of building and retaining wall footings. This value may be increased by 300 psf for each additional

12 inches of embedment depth and by 200 psf for each additional 12 inches in width to a maximum of 3000 psf. The allowable bearing capacity may be increased by one-third when considering short-term wind and seismic loads.

For footings designed in accordance with the recommendations presented in this report, we would anticipate a maximum settlement of less than 1-inch and a maximum differential settlement of less than ½ inch in a 30-foot span.

The passive earth pressure may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.40 may be used with dead load forces. The upper one foot of soil below the adjacent grade should not be used in calculating passive pressure. When combining passive and frictional resistance, the passive pressure component should be reduced by one-third.

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2013 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2013 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a six (6) mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level. Consideration should be given to consulting with an individual possessing specific expertise in this area for additional evaluation.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarders should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, and/or architect be consulted to evaluate the general and specific moisture vapor transmission paths and associated potential impact.

In addition, the recommendations in this report and our services in general are not intended to address mold prevention, since we along with geotechnical consultants in general, do not practice in areas of mold prevention. If specific recommendations are desired, a professional mold prevention consultant should be contacted.

5.3.2 Miscellaneous Foundation Recommendations

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.
- Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.
- Under-slab utility trenches should be compacted to project specifications. Compaction should be achieved with a mechanical compaction device. If soils to be used as backfill have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3.3 Foundation Setbacks

Minimum setbacks for all foundations should comply with the 2013 CBC or City of Victorville requirements, whichever is more stringent. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movements and/or differential settlements. If large enough, these movements can compromise the integrity of the improvements. The following recommendations are presented:

- The bottom of all footings for new structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall footing.

5.3.4 Retaining and Garden Wall Design and Construction

5.3.4.1 General Design Criteria

Recommendations presented in this report apply to typical masonry or concrete vertical retaining walls to a maximum height of up to six (6) feet. Additional review and recommendations should be requested for higher walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations should be embedded a minimum of 18 inches into engineered fill. Retaining wall foundations should be designed in accordance with Section 5.3.1 of this report. Structural needs may govern and should be evaluated by the project structural engineer.

All earth retention structure plans, as applicable, should be reviewed by this office prior to finalization.

Earthwork considerations, site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the designer. The backfill material placement for all earth retention structures should meet the requirement of Section 5.3.4.3 in this report.

In general, cantilever earth retention structures, which are designed to yield at least 0.001H, where H is equal to the height of the wall to the base of the footing, may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at top, such as typical basement walls) should be designed using the at-rest condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent building or traffic loading, should be considered in the design of the earth retention structures. Loads applied within a 1:1 (h:v) projection from the surcharge on the stem and footing of the earth retention structure should be considered in the design.

Final selection of the appropriate design parameters should be made by the designer of the earth retention structures.

5.3.4.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to six (6) feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

ACTIVE EARTH PRESSURES	
Surface Slope of Retained Materials (h:v)	Equivalent Fluid Pressure (pcf) * Select Backfill
Level	30
2:1	45

* The design pressures assume the backfill material has an expansion index less than or equal to 20. Backfill zone includes area between the back of the wall and footing to a plane (1:1 h:v) up from the bottom of the wall foundation to the ground surface.

5.3.4.3 Retaining Wall Backfill and Drainage

Retaining walls should be provided with an adequate pipe and gravel back drain system to help prevent buildup of hydrostatic pressures. Backdrains should consist of a four (4)-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one (1) cubic foot per linear foot of ¾- to 1-inch clean crushed rock or an approved equivalent, wrapped in filter fabric (Mirafi 140N or an approved equivalent). The drain system should be connected to a suitable outlet. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining wall backfill should be placed in lifts no greater than eight (8) inches in thickness and compacted to a minimum of 90% relative compaction in accordance with ASTM Test Method D 1557. The wall backfill should also include a minimum one (1) foot wide section of ¾- to 1-inch clean crushed rock (or an approved equivalent). The rock should be placed immediately adjacent to the back of the wall and extend up from a back drain to within approximately 24 inches of the finish grade. The upper 24 inches should consist of compacted on-site soil.

As an alternative to the drain rock and fabric, Miradrain 2000, or approved equivalent, may be used behind the retaining wall. The Miradrain 2000 should extend from the base of the wall to within 2 feet of the ground surface. A perforated pipe should be placed at the base of the wall in direct contact with the Miradrain 2000. The Miradrain fabric at the base of the Miradrain 2000 panel should be wrapped around the perforated pipe to prevent soil intrusion into the pipe.

The presence of other materials might necessitate revision to the parameters provided and modification of the wall designs. Proper surface drainage needs to be provided and maintained.

5.3.4.4 Restrained Retaining Walls

Retaining walls that will be restrained prior to placing and compacting backfill material or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 55 pcf, plus any applicable surcharge loading. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

5.3.4.5 Other Design Considerations

- Retaining and garden wall foundation elements should be designed in accordance with building code setback requirements. A minimum horizontal setback distance of five (5) feet as measured from the bottom outside edge of the footing to a sloped face is recommended.
- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved by the project geotechnical engineer or their authorized representative.
- Positive separations should be provided in garden walls at horizontal distances not exceeding 20 feet.

5.3.5 Soil Sulfate Content

Based on laboratory testing reported by Zeiser Klind Consultants, Inc. (2005) and included herein in Appendix B, indicate soluble sulfate contents of less than 0.1% by weight. Soluble sulfate contents of this level would be in the range of "not applicable" (i.e. negligible) per Table

4.2.1 of ACI 318. Based on the existing test results and Table 4.3.1 of ACI 318, no special concrete mix design would be necessary to resist sulfate attack.

5.3.6 Import Soils

Import soils should have expansion characteristics similar to the on-site soils. GeoTek also recommends that the proposed import soils be tested for expansion and corrosivity potential. GeoTek should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

5.3.7 Concrete Flatwork

5.3.7.1 Exterior Concrete Slabs, Sidewalks and Driveways

Exterior concrete slabs, sidewalks and driveways should be designed using a four (4) inch minimum thickness. No specific reinforcement is required from a geotechnical perspective. However, some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices commonly utilized in industrial construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils (typically “very low” expansion potential) should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, and driveways should be pre-saturated to a minimum of 100% of optimum moisture content to a depth of at least 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Victorville specifications, and under the observation and testing of GeoTek and a City inspector, if necessary.

5.3.7.2 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 0.125-inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete can also undergo chemical processes that are dependent upon a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two orthogonal directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

Exterior concrete flatwork (patios, walkways, driveways, etc.) is often some of the most visible aspects of site development. They are typically given the least level of quality control, being considered "non-structural" components. We suggest that the same standards of care be applied to these features as to the structures themselves.

5.4 POST CONSTRUCTION CONSIDERATIONS

5.4.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. Care should be taken when adding soil amendments to avoid excessive watering. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.
It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided.

5.4.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings. Soil areas within 10 feet of the proposed structure should slope at a minimum of 5-percent away from the building, if possible unless the area is paved. Paved areas are to be sloped at 2-percent away from the structure. Roof leaders and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.5 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that site grading, specifications and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. We also recommend that GeoTek representatives be present during site grading and foundation construction to observe and document proper implementation of the geotechnical recommendations. The owner/developer should verify that GeoTek representatives perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement, and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trench backfill. Also, perform field density testing of the fill materials.
- Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6 INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our report is limited to the boundaries of the subject property. This update does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by our client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client's needs, our fee estimate (Proposal No. P-0301716) dated March 10, 2016 and geotechnical engineering standards normally used on similar projects in this locality at the present.

7 LIMITATIONS

Our findings are based on site conditions observed and the stated sources. Thus, our comments are professional opinions that are limited to the extent of the available data.

GeoTek has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report.

Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty of any kind is expressed or implied. Standards of care/practice are subject to change with time.

8 SELECTED REFERENCES

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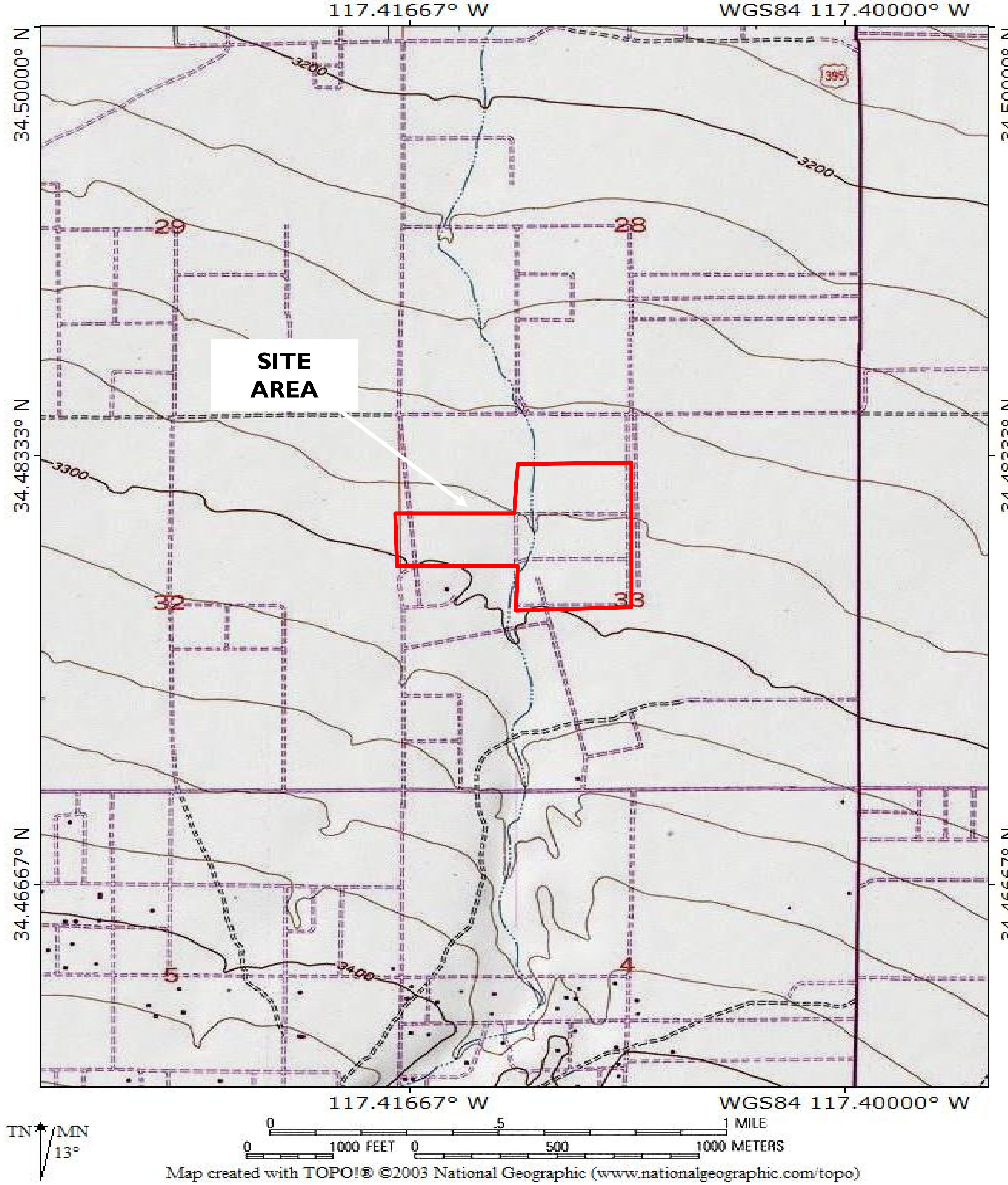

Beazer Homes
Proposed Single-Family Residential Development
Tract No. 17486
Victorville, San Bernardino County, California

Project No. 1474-CR

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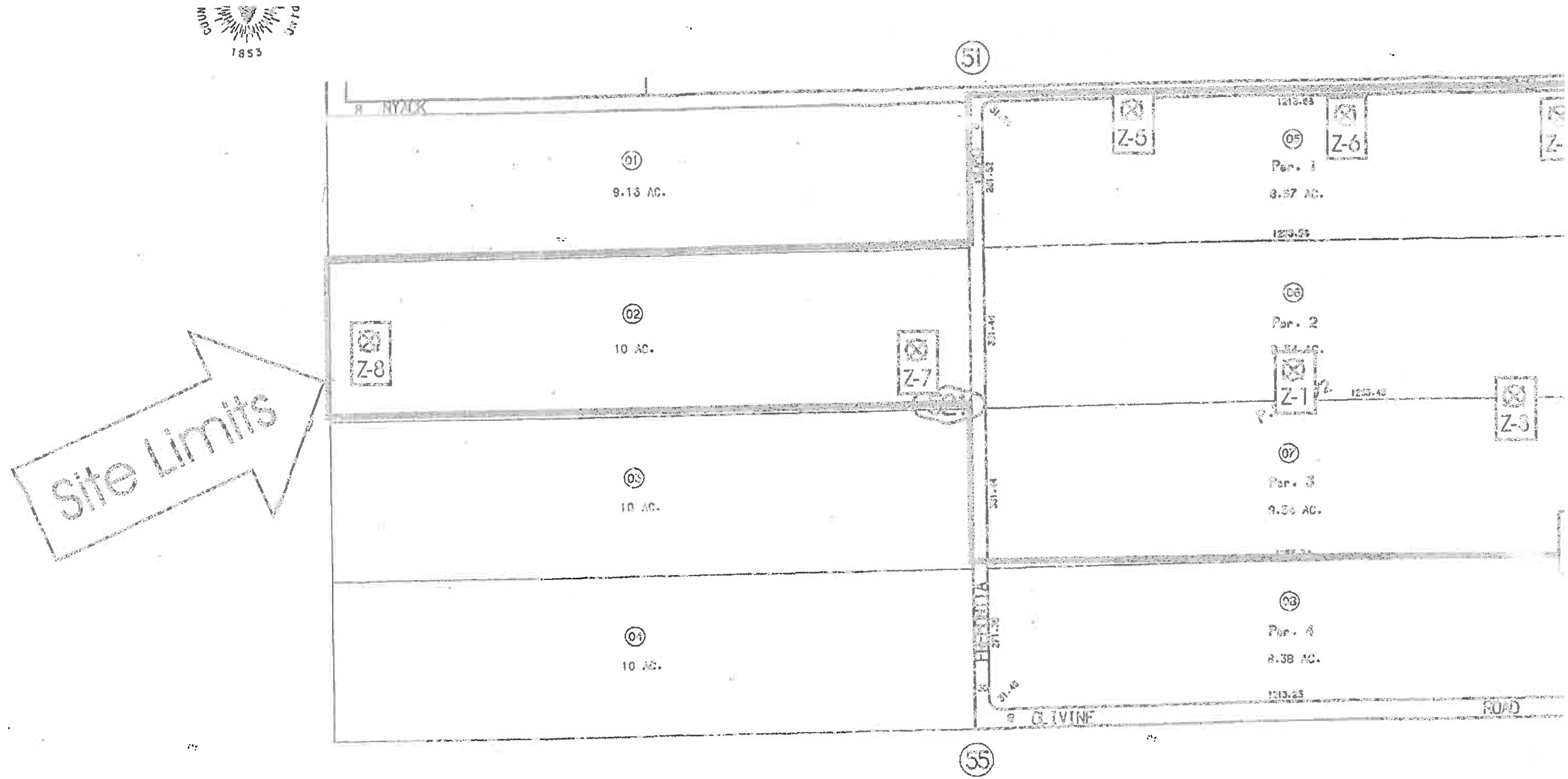
Modified from USGS
7.5 Topographic Map

Figure 1
Site Location and General Site Topography Map

GEOTEK



Parcel Map No. 2188, P.M. 19/2

DEC. 1991

Pt. N.W. 1/4, Sec. 33
T.5 N., R.5 W.

Assessor's Map
Book 3098 Page 52
San Bernardino County

Z-8 Approximate Location of Hollow-stem Auger Boring

Note: Base map provided by Beazer Homes.
All locations are approximate.

ZEISER KLING Consultants, Inc.

BORING LOCATION MAP
Geotechnical Feasibilty Study
Nyack Rd. & Mesa View Dr.
Victorville, California

Plate 1

GEOTEK

APPENDIX A

LOGS OF EXPLORATORY BORINGS (Zeiser Kling Consultants, Inc., 2005)

Tract No. 17486

City of Victorville, San Bernardino County, California

Project No. 1474-CR

GEOTEK

LOG OF EXPLORATORY BORING

Project:	Beazer Nyack&MesaView	Boring No.:	Z-1
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	G. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):(0 to 55-1/4 feet)			
			8 12 17	6.1	113	@ 2 feet: Silty SAND (SM):brown to light brown, fine to medium grained, moist to damp, medium dense.			
5			30 23 20	5.2	114	@ 5 feet: Silty SAND (SM):brown, medium to coarse grained, moist to damp, medium dense.		RV, SU	
			34 50	1.5	109	@ 8 feet: Silty SAND (SM):light brown to buff, medium to coarse grained, dry, very dense..			
10									
			50/2"	3.4	99	@ 12 feet: Silty SAND (SM):light brown to buff, fine grained, siltier than above, small amount of fine gravel, dry, very dense.			
15			50/2"			@ 15 feet: Silty SAND (SM):light reddish brown, fine grained, siltier than above, small amount of fine gravel, dry, very dense.			
20			23 20 36			@ 20 feet: No recovery. Assumed same as above.			
25			22 50/5"			@ 25 feet: Silty SAND (SM):light pink, fine grained, less silt than at 15 feet, fine subangular to rounded gravel up to 1/2 inch in diameter, dry, very dense.			

LOG OF EXPLORATORY BORING

Project:	Beazer Nyack&MesaView	Boring No.:	Z-1
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Sample types: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
			36 50/2"			@ 30 feet: Silty SAND (SM): light pink, fine grained, less silt than at 25 feet, subangular to rounded gravel up to 1 inch in diameter, dry, very dense.			
35			30 50/3"			@ 35 feet: Silty SAND (SM): light pink, fine grained, subangular to rounded gravel up to 1 inch in diameter, more abundant gravel than above, dry, very dense.			
40			50/5"			@ 40 feet: Silty SAND (SM): light pink, fine grained, more silt than at 35 feet, subangular to rounded gravel up to 1 inch in diameter, dry, very dense.			
45			50/6"			@ 45 feet: Silty SAND (SM): light brown, very fine sand, dry, very dense.			
50			50/6"			@ 50 feet: Silty SAND (SM): light brown, very fine sand, dry, very dense.			
55			50/3"			@ 55 feet: Silty SAND (SM): light brown, very fine sand, dry, very dense.			

Total depth = 55-1/4 feet below ground surface.
No groundwater encountered.
Hole caved to 30 feet below ground surface.
Backfilled with cuttings.

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Beazer Nyack&MesaView	Boring No.:	Z-2
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):(0 to 6-1/2 feet)			
			15 7 6	4.9	109	@ 2 feet: Poorly graded SAND (SP):reddish brown, coarse grained, moist, medium dense.			
5			4 4 8	4.6	107	@ 5 feet: Poorly graded SAND with gravel(SP):brown, coarse grained, gravel up to 2 inches in diameter, moist, dense.			
						Total depth = 6-1/2 feet below ground surface. Practical refusal at 6-1/2 feet below ground surface. No groundwater encountered. No caving encountered. Backfilled with cuttings.			

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Beazer Nyack&MesaView	Boring No.:	Z-3
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
0				Alluvium (Qal):(0 to 19 feet)			
2	5 5 6	4.4	106	@ 2 feet: Poorly graded SAND (SP):reddish brown, slightly silty, coarse to medium grained, moist, loose to medium dense.		DS, MAX	
5	7 7 8	2.9	112	@ 5 feet: Poorly graded SAND (SP):reddish brown, slightly silty, medium grained minor ammounts of gravel, moist, loose to medium dense.			
10	15 37 38	1.7	111	@ 10 feet: Poorly graded SAND with gravel (SP):mottled grayish brown, slightly silty, medium grained, gravel up to 1 inch in diameter, moist, loose to medium dense.			
15	31 46 50			@ 15 feet: Silty SAND (SM):light brown, fine grained, small amount of fine gravel, dry, very dense.			
18	33 50/3"			@ 18 feet: Practical refusal with auger. Sample recovered as: Poorly graded SAND (SP): reddish brown, coarse grained, dry, very dense.			

Total depth = 18 feet 9 inches below ground surface.
Practical refusal at 18 feet 9 inches below ground surface.
No groundwater encountered.
Backfilled with cuttings.

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	Beazer Nyack&MesaView	Boring No.:	Z-4
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lbs / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; California; Bulk Sample; Water Level ATD; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
0						Alluvium (Qal):(0 to 21 feet)			
2		California	4 4 6	4.2	112	@ 2 feet: Poorly graded SAND (SP):reddish brown, coarse to medium grained, up to 1 inch diameter gravel, moist, loose to medium dense.			
5		California	6 7 9	6.1	103	@ 5 feet: Poorly graded SAND (SP):reddish brown, coarse to medium grained, up to 1 inch diameter gravel, moist, medium dense.		WA	
10		California	22 19 26	5.1	111	@ 10 feet: Poorly graded SAND (SP):reddish brown, coarse to medium grained, more silt and less gravel than above, up to 1 inch diameter gravel, moist, very dense.			
15		California	17 37 27			@ 15 feet: Poorly graded SAND (SP):reddish brown, coarse to medium grained, more abundant gravel up to 2 inches in diameter, moist, very dense.			
20		Standard Split Spoon	27 46 50/2"			@ 20 feet: Poorly graded SAND (SP):reddish brown, coarse to medium grained, more abundant gravel up to 2 inches in diameter, moist, very dense.			

Total depth = 21 feet 2 inches below ground surface.
Practical Refusal at 21 feet 2 inches below ground surface.
No groundwater encountered.
Backfilled with cuttings.

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	Beazer Nyack&MesaView	Boring No.:	Z-5
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density, [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):(0 to 26-1/2 feet) From Cuttings: Silty SAND (SM): brown, fine to medium grained, moist.			
5		California	6 15 21	10.9	123	@ 5 feet: Silty SAND (SM):brown, fine to medium grained, slightly clayey, moist, medium dense.			
10		California	11 14 22	1.1		@ 10 feet: Silty SAND (SM):light brown, fine to medium grained, dry, dense.			
15		Standard Split Spoon	27 23 22			@ 15 feet: Silty SAND (SM):light brown, medium grained, less silt than above, dry, dense.			
20		Standard Split Spoon	44 31 29			@ 20 feet: Silty SAND (SM):light brown, medium grained, less silt than above, dry, very dense.			
25		Standard Split Spoon	10 14 17			@ 25 feet: Silty SAND (SM):light brown, fine to medium grained, dry, medium dense.			
						Total depth = 26-1/2 feet below ground surface. No groundwater encountered. Backfilled with cuttings.			

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project:	Beazer Nyack&MesaView	Boring No.:	Z-6
Project Number:	05014-00	Driller:	Jet Drilling
		Drill Type:	CME-75
Date Drilled:	2/15/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Sample types: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal) (0 to 16 feet) From Cuttings: Poorly graded SAND (SP): brown, fine to medium grained, moist.			
5			6 8 10			@ 5 feet: Poorly graded SAND (SP):reddish brown, coarse grained, moist, medium dense.			
10			24 22 30	3.9	114	@ 10 feet: Silty SAND (SM):light brown, fine to medium grained, dry, dense.			
15			21 35 50/2"			@ 15 feet: Silty SAND (SM):light brown, medium grained, less silt than above, dry, dense.			

Total depth = 16 feet 2 inches below ground surface.
No groundwater encountered.
Backfilled with cuttings.

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Project: Beazer Nyack&MesaView
Project Number: 05014-00
Date Drilled: 3/3/05
Logged By: C. Spitzer

Boring No.: Z-7
Driller: 2R Drilling
Drill Type: CME-75
Hammer Wt. / Drop: 140lb / 30in
Ground Elev. [ft]: ---

Standard Split Spoon | Shelby Tube | Water Level ATD | California | Bulk Sample | Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):(0 to 26-1/2 feet)			
			4 4 9	5.2	115	@ 2 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, slightly clayey, moist, loose.			
5			3 5 8			@ 5 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, slightly clayey, some fine gravel, slightly moist, loose.			
10			17 31 46	7.4	130	@ 10 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, slightly silty, some fine gravel, dry, very dense.			
15			12 13 18			@ 15 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, some fine gravel, dry, very dense.			
20			25 31 33	10.0	102	@ 20 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, more silt than above, some fine gravel, dry, very dense.			
25			10 9 15			@ 25 feet: Silty SAND (SM):light brown, fine to very fine grained, dry, medium dense.			
						Total depth = 26-1/2 feet below ground surface. No groundwater encountered. Backfilled with cuttings.			

ZEISER KLING Consultants, Inc.

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Project:	Beazer Nyack&MesaView	Boring No.:	Z-8
Project Number:	05014-00	Driller:	2R Drilling
		Drill Type:	CME-75
Date Drilled:	3/3/05	Hammer Wt. / Drop:	140lb / 30in
Logged By:	C. Spitzer	Ground Elev. [ft]:	---

Legend: Standard Split Spoon; Shelby Tube; Water Level ATD; California; Bulk Sample; Static Water Table

Depth [ft]	Graphic Log	Sample Type	Blows/6"	Moisture Content [%]	Dry Density [pcf]	SOIL DESCRIPTION and CLASSIFICATION (USCS)	Pocket Pen. [tsf]	Lab Tests	Remarks
						Alluvium (Qal):(0 to 26-1/2 feet)			
			10 12 13	10.4	127	@ 2 feet: Silty SAND (SM):reddish brown, fine to coarse grained, some fine gravel, some organics, moist, medium dense.			
5			3 5 7	6.4	107	@ 5 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, moist, loose.		MAX	
10			45 50/5"			@ 10 feet: Poorly Graded SAND (SP):reddish brown, medium to coarse grained, dry, very dense.			
15			15 26 42	1.1	104	@ 15 feet: Poorly Graded SAND (SP):reddish brown, fine grained, silty, dry, very dense.			
20			5 11 17			@ 20 feet: Poorly Graded SAND (SP):reddish brown, fine grained, very silty, dry, very dense.			
25			11 24 33	0.9	99	@ 25 feet: Poorly Graded SAND (SP):reddish brown, fine grained, very silty, gravel up to 3/4 inch in diameter, dry, very dense.			
						Total depth = 26-1/2 feet below ground surface. No groundwater encountered. Backfilled with cuttings.			

HC BA TT 05014-00.GPJ ZKCI.GDT 3/8/05

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APPENDIX B

LABORATORY TEST RESULTS (Zeiser Kling Consultants, Inc., 2005)

Tract No. 17486

City of Victorville, San Bernardino County, California

Project No. 1474-CR

APPENDIX C (CONT'D)

LABORATORY TEST RESULTS

Maximum Dry Density

Sample Location	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (percent)
Z-3 @ 0'-7'	Reddish Brown Poorly Graded Sand (SP)	133.5	7.5
Z-8 @ 0'-10'	Brown Silty Sand (SM)	129.5	9.5

Direct Shear

Sample Location	Soil Description	Cohesion (psf)	Friction Angle (degrees)
Z-3 @ 0'-7'	Brown Silty Sand (SM)	150	33

Soluble Sulfate

Sample Location	Soil Description	Soluble Sulfate (Percent)
Z-1 @ 0'-10'	Brown Silty Fine Sand (SM)	0.0025 (25 ppm)

R-Value

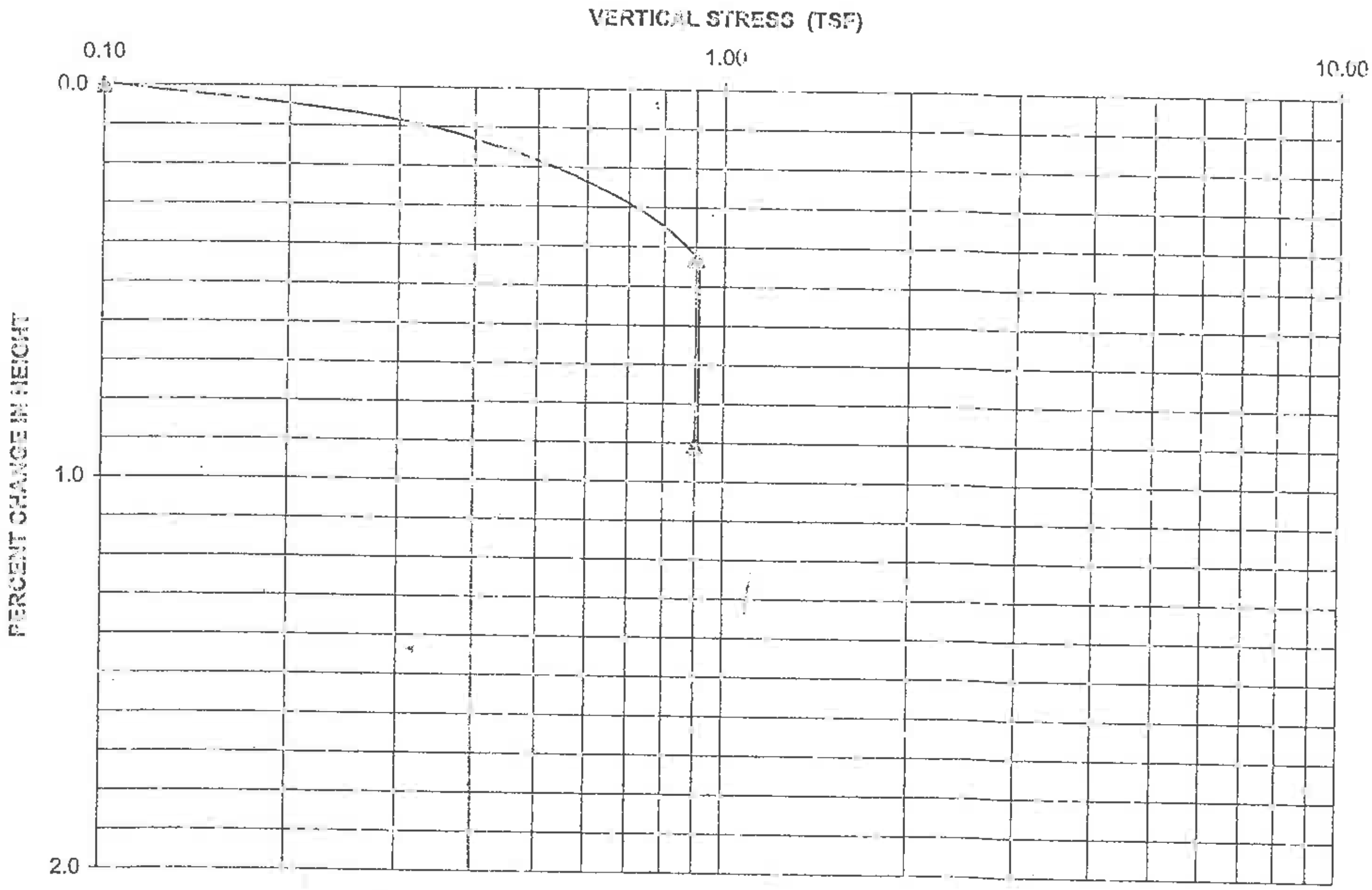
Sample Location	Soil Description	Percent Passing #200 Sieve	R-Value (By exudation)
Z-1 @ 0'-10'	Brown Silty Fine Sand (SM)	27.8	51

Percent Passing #200 Sieve

Sample Location	Soil Description	Percent Passing #200 Sieve
Z-4 @ 5'	Light Brown Poorly Graded Sand (SP)	3.9

PROJECT: [illegible]	NO.: [illegible]	MOISTURE & DENSITY DATA	BEFORE TEST	AFTER TEST
BORING NO.: [illegible]	SAMPLE NO. / DEPTH: [illegible]	WET WEIGHT + RING,(g)	[illegible]	[illegible]
APPROPRIATE VERTICAL STRESS [illegible] TSF		DRY WEIGHT + RING,(g)	103.68	[illegible]
FRAME NO.: [illegible]	TECHNICIAN: [illegible]	WEIGHT OF WATER,(g)	8	16.94
SOIL DESCRIPTIONS: [illegible]		WEIGHT OF RING,(g)		[illegible]
SPECIMEN TYPE: [illegible]	LIQUID LIMIT:	DRY WEIGHT OF SOIL,(g)	123.93	123.93
REMARKS: "Seat, load and inundate only - No time-rate"		MOISTURE CONTENT,(%)	6.5	13.7
Tap water was used / Use distilled water for I_e determination		DRY DENSITY,(Pcf)	103.5	104.4

DATE OF READING	TIME	LOAD (KG)	STRESS (TSF)	DIAL READING (INCHES)	% CONSOL	DATE OF READING	TIME	LOAD (KG)	STRESS (TSF)	DIAL READING (INCHES)	% CONSOL
3-Mar-05	[illegible]	[illegible]	[illegible]	[illegible]	0		3:08			0.2092	0.92
	[illegible]	[illegible]	[illegible]	[illegible]	0.42						
	[illegible]	[illegible]	[illegible]	[illegible]	0.43						
	[illegible]	[illegible]		[illegible]	0.43						
9-Mar-05	7:48			[illegible]	0.90						
	8:21			0.2092	0.92						



COLLAPSE POTENTIAL, I_c (%)	COLLAPSE INDEX$_{(2\ TSF)}$, I_e (%)	DEGREE OF COLLAPSE
[illegible]	[illegible]	[illegible]

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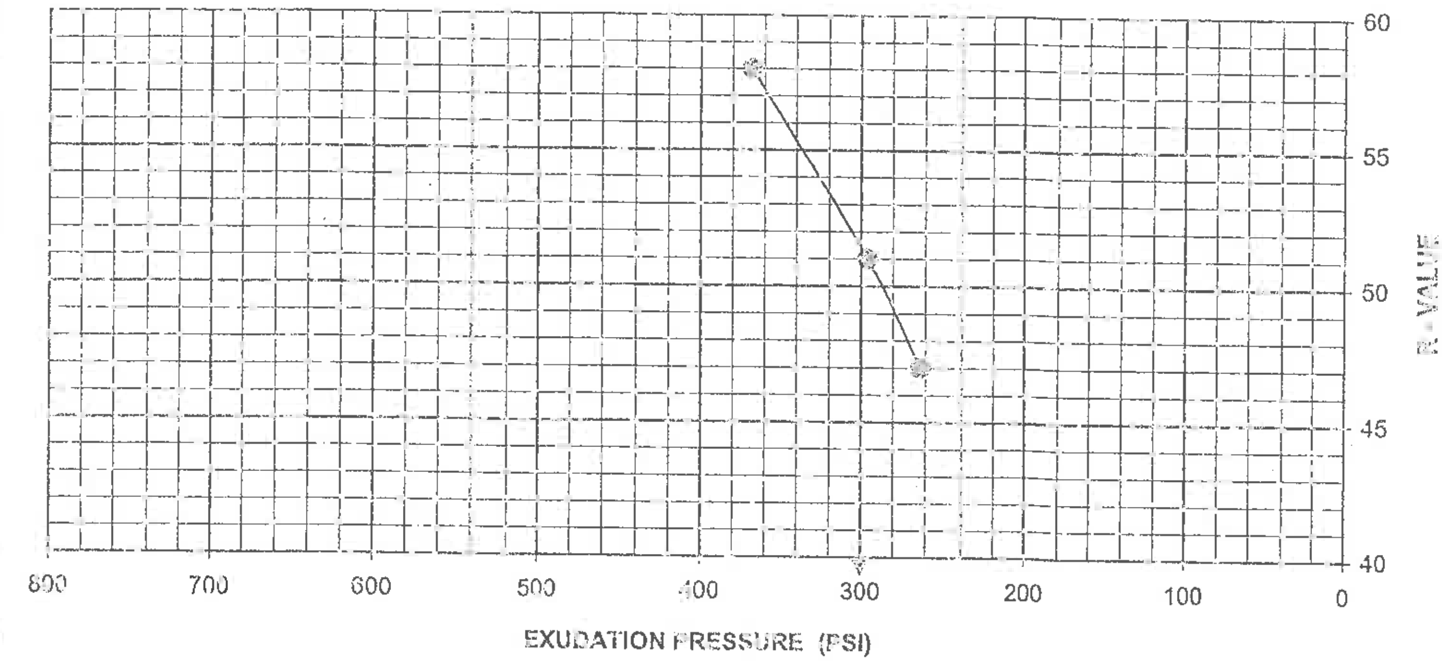
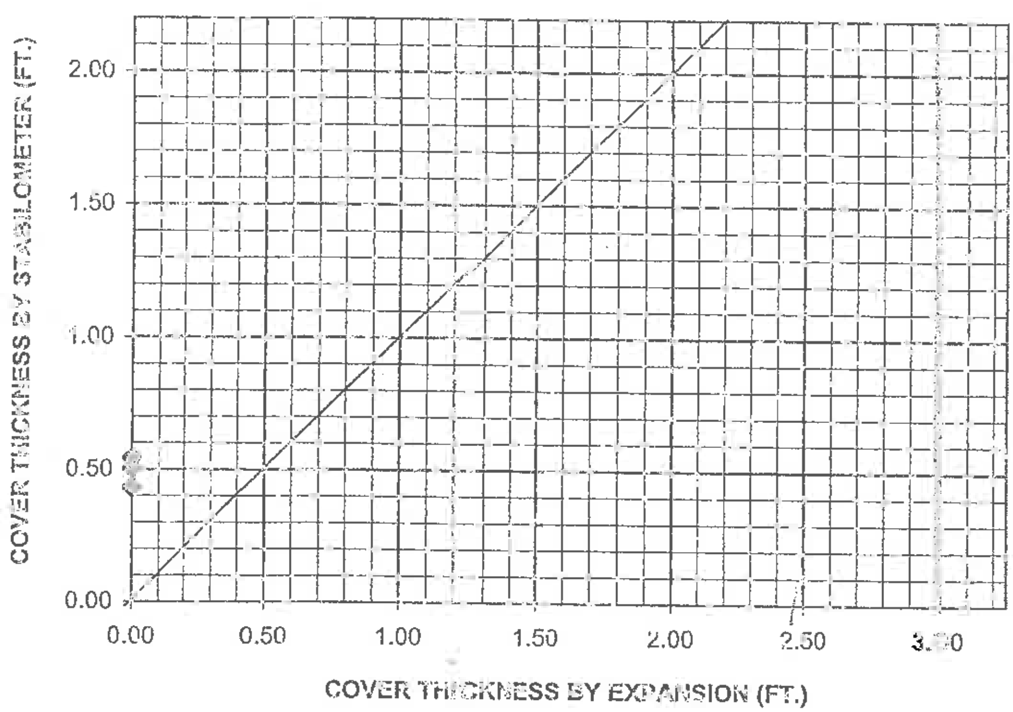
COLLAPSE POTENTIAL OF SOILS
(ASTM D5333-03)





R - VALUE CURVES

05014-00

PROJECT NUMBER

BEAZER HOMES

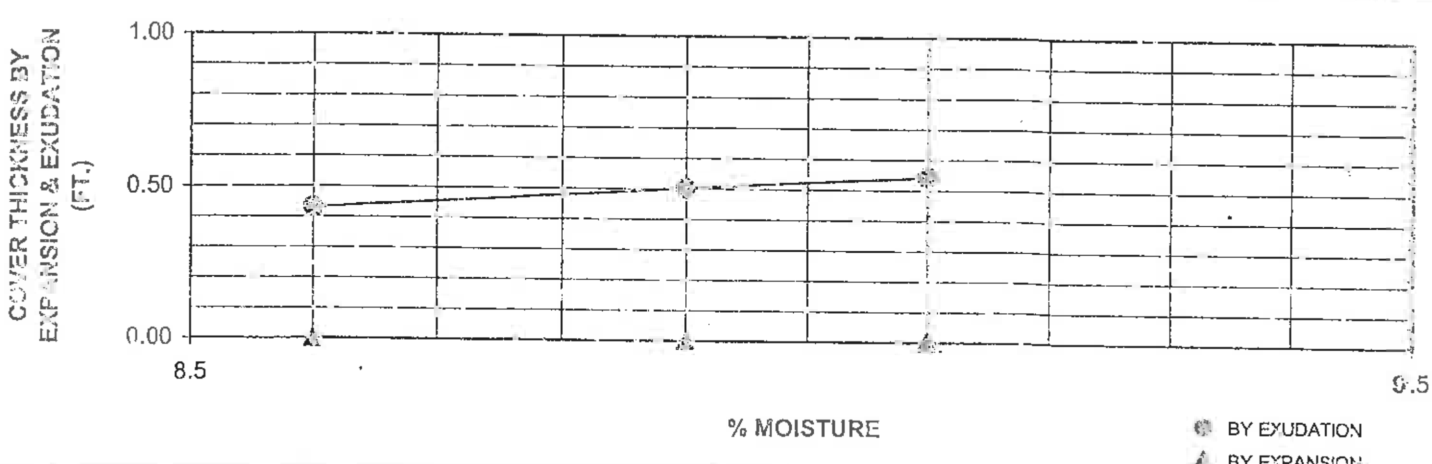
PROJECT NAME

Z-1 @ 0 - 10'

SAMPLE NO. / LOCATION

R - VALUES :

BY EXUDATION	51
BY EXPANSION	-
COVER THICKNESS (FT.)	



Project Name: [illegible]

Project No. : [illegible]

Date : 22-Feb-05

Tested By: RMC

Sample Location : [illegible] Depth : [illegible]

Sample Descriptions / Classification : BROWN SILTY SAND (SM)

APPLIED NORMAL LOAD (ksf)	1.0		2.0		4.0	
SHEAR STRESS (ksf)	0.768		1.416		2.532	
DENSITY AND SATURATION	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
WET WT. OF SOIL+RING (gms)	200.20	208.22	198.68	206.23	199.53	206.99
DRY WT. OF SOIL+RING (gms)		189.45		187.87		188.74
WEIGHT OF WATER (gms)	-	18.77	-	18.36	-	18.25
WEIGHT OF RING (gms)	-	46.64	-	44.03	-	44.93
WEIGHT OF DRY SOIL (gms)	-	143.81	-	143.84	-	143.80
MOISTURE CONTENT (%)	[illegible]	13.0	7.5	12.8	7.5	12.7
WET DENSITY (pcf)	129.1	135.7	129.1	135.4	129.1	135.3
DRY DENSITY (pcf)	-	120.0	-	120.1	-	120.0
SPEC.GRAVITY, G_s (Assumed)	2.68					
THICKNESS OF SPECIMEN, (in.)	1.00					
DEGREE OF SATURATION, (%)	51.1	88.9	51.2	87.0	51.1	86.5
VOID RATIO	-	0.393	-	0.393	-	0.393

Lateral Displacement, d_h 0.3050 (in.)

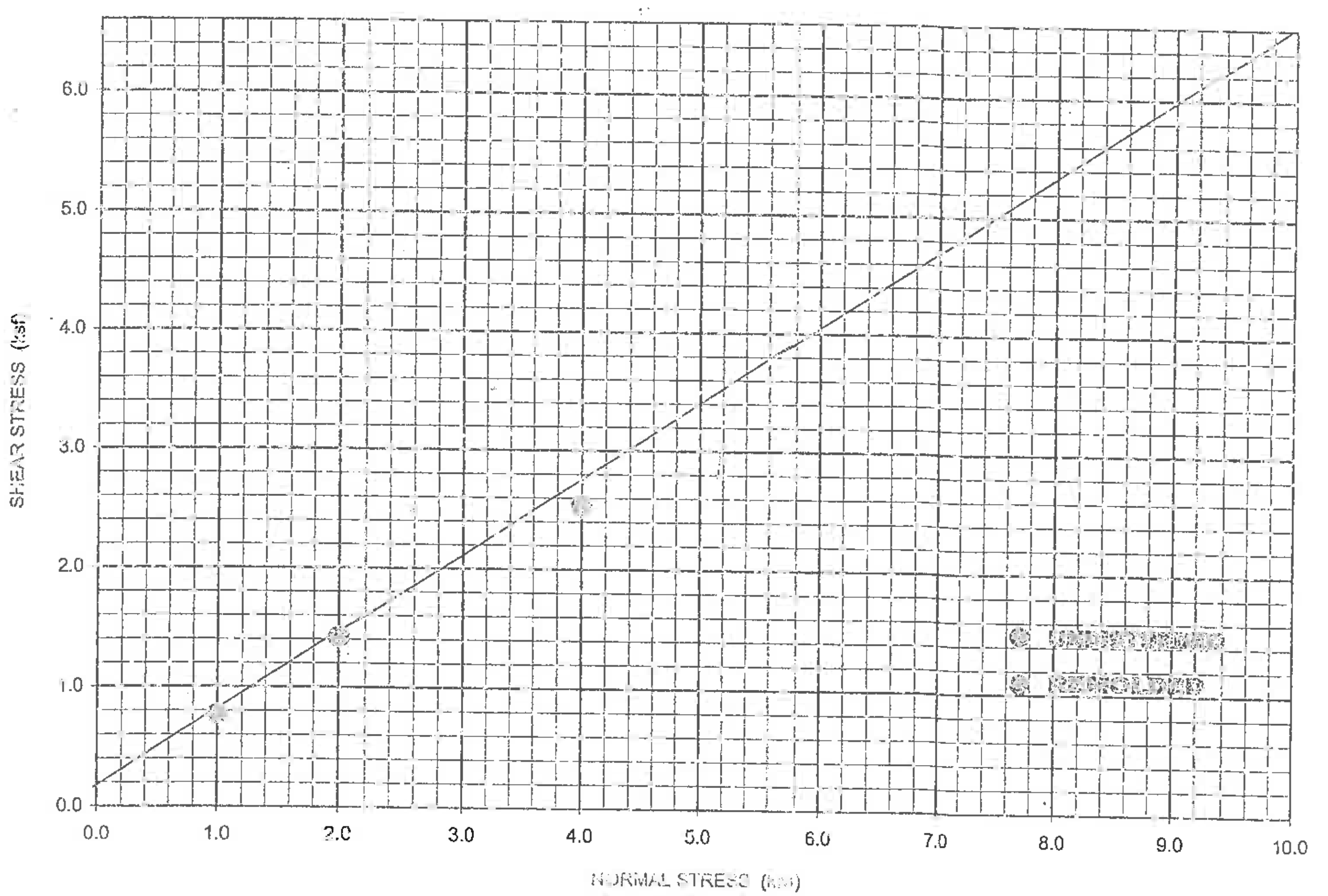
Displacement Rate, d_r 0.05 (in./min.)

Elapsed Time of Test, t_e 6.10 (min.)

Cohesion, (c) 150 (psf)

Friction Angle, (ϕ) 33 °

Remarks : Remolded to 90% Rel Comp. @ Optimum Moisture Content



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DIRECT SHEAR TEST
(ASTM D3080-03)

APPENDIX C

GENERAL EARTHWORK AND GRADING GUIDELINES

Tract No. 17486
City of Victorville, San Bernardino County, California
Project No. 1474-CR

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2013) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor’s overall level of efforts during grading. The contractor’s personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor’s responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.

5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
    a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
    b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.

2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
    a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
    b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
    a) They are not placed in concentrated pockets;
    b) There is a sufficient percentage of fine-grained material to surround the rocks;
    c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable

methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.

2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:

   a) shallow (12 + inches) under slab interior trenches and,

   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

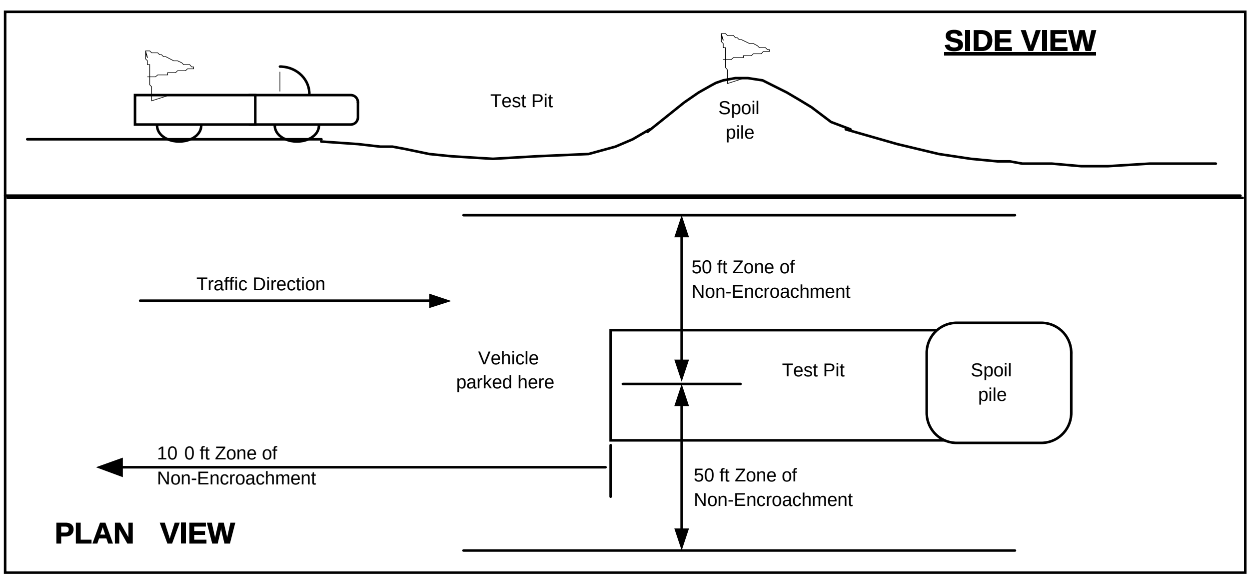
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

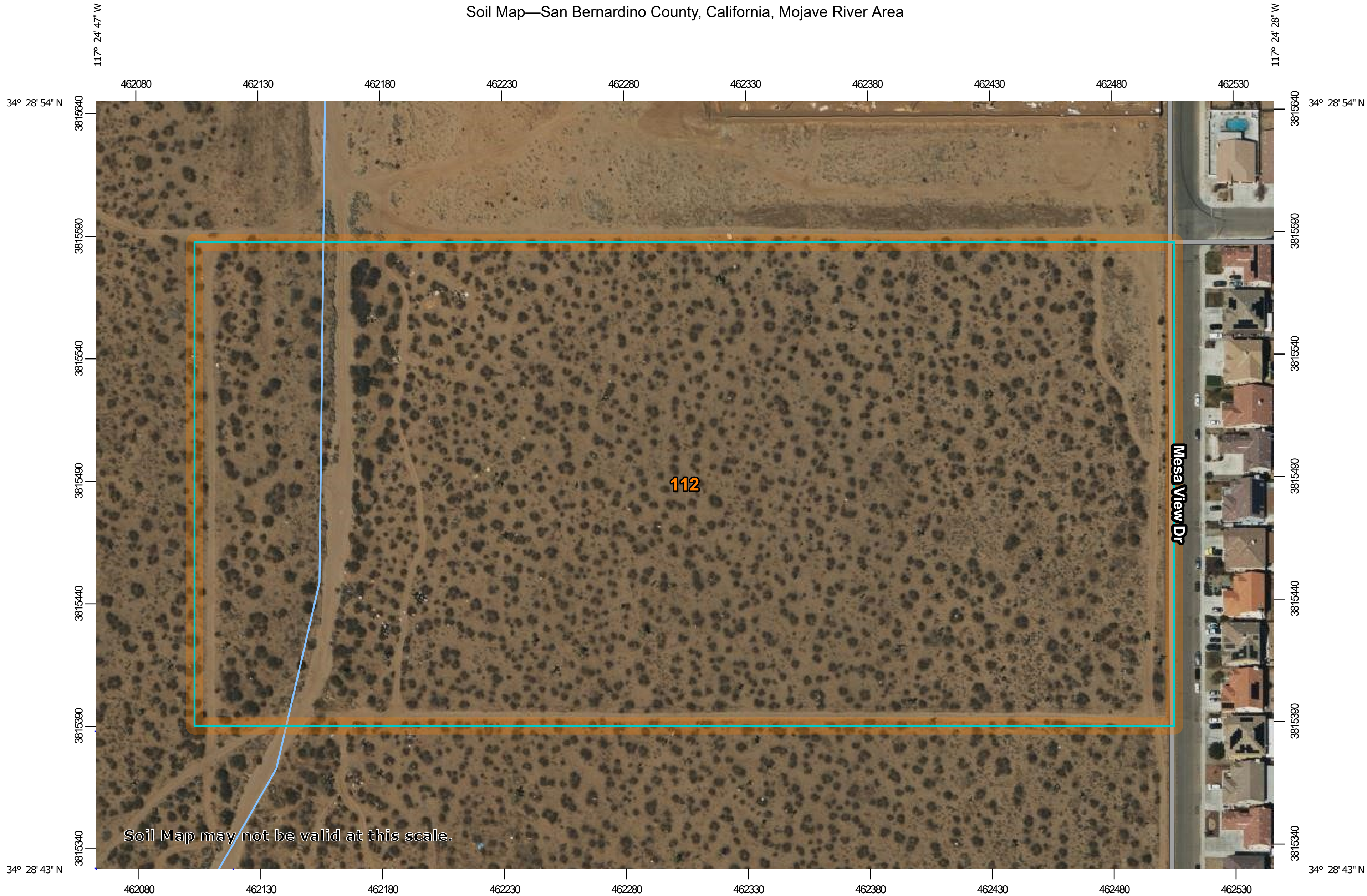
Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor’s representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

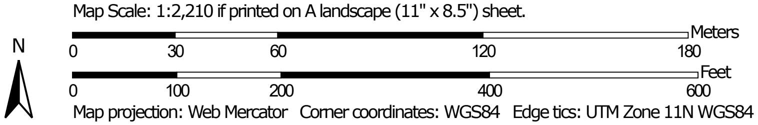
In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.



Map Scale: 1:2,210 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 13, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 27, 2021—May 24, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	19.7	100.0%
Totals for Area of Interest		**19.7**	**100.0%**

MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

FORMER TRACK 17486

PARCEL 1: APN 3134-021-05-0-000
PARCEL 2: APN 3134-021-02-0-000

Prepared for:

Bedford Opportunity Fund II, LLC

212 S. Palm Ave., Suite 200

Alhambra, CA, 91801

(626) 282-3100

Prepared by:

Ludwig Engineering Associates, Inc.

109 East Third Street

San Bernardino, CA, 82410

(909) 884-8217

Submittal Date: September 29, 2021

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Final Approval Date:_______________________

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for R.Y. Properties by Ludwig Engineering, Associates, Inc. The WQMP is intended to comply with the requirements of the City of Victorville and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	PARCEL 1: APN 3134-021-05-0-000 PARCEL 2: APN 3134-021-02-0-000	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

Owner's Signature			
Owner Name:	Bedford Opportunity Fund II, LLC		
Title			
Company	R.Y Properties		
Address	212 S. Palm Ave. Alhambra, CA, 91801		
Email			
Telephone #	(626) 2882-3100		
Signature		Date	

Preparer's Certification

Project Data				
Permit/Application Number(s):		Grading Permit Number(s):		
Tract/Parcel Map Number(s):	PARCEL 1: APN 3134-021-05-0-000 PARCEL 2: APN 3134-021-02-0-000	Building Permit Number(s):		
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):				

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: Jeff Ashbaker		PE Stamp Below
Title	Lead Engineer	
Company	Ludwig Engineering, Associates, Inc.	
Address	109 East Third Street, San Bernardino, CA, 92410	
Email	jashbaker@ludwigeng.com	
Telephone #	(909) 884-8217	
Signature		
Date		

Table of Contents

Forms

Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

<table>
<tr><th colspan="6">Form 1-1 Project Information</th></tr>
<tr><td>Project Name</td><td colspan="5">Former Tract 17486</td></tr>
<tr><td>Project Owner Contact Name:</td><td colspan="5">Bedford Opportunity Fund II, LLC</td></tr>
<tr><td>Mailing Address: 212 S. Palm Ave. Alhambra, CA, 91801</td><td>E-mail Address:</td><td></td><td>Telephone:</td><td colspan="2">(626) 2882-3100</td></tr>
<tr><td>Permit/Application Number(s):</td><td colspan="2"></td><td>Tract/Parcel Map Number(s):</td><td colspan="2">PARCEL 1: APN 3134-021-05-0-000
PARCEL 2: APN 3134-021-02-0-000</td></tr>
<tr><td>Additional Information/
Comments:</td><td colspan="5">The entire tract will be draining to two water quality basins to store the 2yr-24hr storm event, and mitigate the difference between the Pre and the Post 100yr volume runoff.</td></tr>
<tr><td>Description of Project:</td><td colspan="5">The Property is currently vacant and not in use. The project is bounded on the north by Tract no. 17090, on the East by Mesa View Drive, on the South by vacant land APN-313403102 and APN-31340310, and on the West by Vacant land APN-313402101 to APN-313402104.
Proposed land use is Residential (R-1) development.</td></tr>
<tr><td>Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.</td><td colspan="5">Project requires WQMP due to a new development containing more than 5,000 sqaure feet of impervious surfaces.</td></tr>
</table>

Section 2 Project Description

2.1 Project Information

The WQMP shall provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):					
☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site		☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface		☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface
☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) *Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.*					
2 Project Area (ft2):	1,090,963	3 Number of Dwelling Units:	110	4 SIC Code:	1521
5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*					

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management
Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
Owner (listed below) will be soley responsible for all BMP's Operation & Maintenance as specified in Section 5 of this report. Each individual homeowner will be responsible for management and maintenance of down-spouts, drainage swales, and all storm drain features within their property. Bedford Opportunity Fund II, LLC Contact: 212 S. Palm Ave., Suite 200 Alhambra, CA, 91801 Phone: (626) 282-3100 No stormwater infrastructure onsite is to be transferred to the City of Victorville.

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Sources include animal waste.
Nutrients - Phosphorous	E ☒	N ☐	Sources from urban runoff include fertilizers and eroded soils.
Nutrients - Nitrogen	E ☒	N ☐	Sources from urban runoff include fertilizers and eroded soils.
Noxious Aquatic Plants	E ☒	N ☐	Sources from urban runoff include fertilizers and eroded soils.
Sediment	E ☒	N ☐	Sources include eroded soils.
Metals	E ☐	N ☒	Not applicable.
Oil and Grease	E ☒	N ☐	Sources include petroleum hydrocarbon products, motor products from leaking vechicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.
Trash/Debris	E ☒	N ☐	Sources include paper, plastic, polystyrene packing foam, and aluminum materials.
Pesticides / Herbicides	E ☒	N ☐	Sources include fertizers and pest sprays
Organic Compounds	E ☒	N ☐	Sources include solvents and cleaning compounds.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed Drainage Management Areas (DMAs)) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet. A map presenting the DMAs must be included as an appendix to the WQMP document.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34°28'46.2"N	Longitude 117°24'37.9"W	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Desert

2 Does the site have more than one drainage area (DA): Yes☒ No☐ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 DMA A to Outlet 1	DA 1 DMA A flows to Infiltration basin in Lot B which overflows to Channel
DA1 DMA B to Outlet 1	DA 1 DMA B flows to infiltration trench which which overflows to Channel
DA2 to Outlet 2	DA 2 flows to Infiltration Basin in Lot C which overflows to Nyack Road

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	277,726			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	2			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	990.9			
6 Longest flowpath slope (ft/ft)	0.012			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Undeveloped Fair			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Fair			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 2

For Drainage Area 2's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	516,493			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	2			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	1050.1			
6 Longest flowpath slope (ft/ft)	0.013			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Undeveloped Fair			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Fair			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 3

For Drainage Area 3's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	522,239			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	2			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	1016.3			
6 Longest flowpath slope (ft/ft)	0.015			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Undeveloped Fair			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Fair			

Form 3-3 Watershed Description for Drainage Area	
Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mohave River (Upper Narrows to Lower Narrows to Below Lower Narrows)
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Boron, Chloride, Dissolved Oxygen, Fluoride, MTBE, Nitrate, Nitrite, Phosphate, Phosphorous, Sulfates, Total Dissolved Solids
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Fluoride, Sulfates, Total Dissolved Solids
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Desert Tortoise habitat cat 2, Mojave Ground Squirrel
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One: Included	Check One: Not Applicable	Describe BMP Implementation OR, if not applicable, state reason
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Project conditions of approval will require that the POA periodically provide environmental awareness education materials, made available by the municiapalities, to all members. Among other things, these materials will describe the use of chemicals (including household type) that shoukd be limeted to the property, with the discharge of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Educational materials available from the San Bernadino Stormwater Program and can be downloaded at: http://www.sbcountystormwater.org/gov_out.html
N2	Activity Restrictions	☒	☐	Owner shall control the discharge of the stormwater pollutants from this site through activity restrictions. Activities are to be limited to those allowed by the County of San Bernardino codes, regulations, and zoning ordinances.
N3	Landscape Management BMPs	☒	☐	Landscape plans will be consistent with the County of San Bernadino requirments for water conservation vegetation and drought tolerant vegetation will be utilized. The irrigation system will be inspected on a monthly basis for erosion and sediment buildup.
N4	BMP Maintenance	☒	☐	Maintenance of BMPs implemeneted at the project shall be performed at the frequency prescribed in this WQMP Form 5-1. Records of inspections and maintenance shall be maintained by the Owner and documented with the WQMP, and shall be available fro review upon request.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials to be allowed for this projec
N6	Local Water Quality Ordinances	☐	☒	No Ordinances apply
N7	Spill Contingency Plan	☐	☒	Does not apply to this land use.
N8	Underground Storage Tank Compliance	☐	☒	Project does not feature underground storage tanks

Form 4.1-1 Non-Structural Source Control BMPs				
N9	Hazardous Materials Disclosure Compliance	☐	☒	This project does not feature hazardous materials

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One: Included	Check One: Not Applicable	Describe BMP Implementation OR, if not applicable, state reason
N10	Uniform Fire Code Implementation	☐	☒	Does not apply to this land use.
N11	Litter/Debris Control Program	☒	☐	Property owner will implement a litter control program for common areas. Private waste receptacles will be place at the curb collection per local waste collection service provider.
N12	Employee Training	☒	☐	Employee training and education will be the responisbility of the owner
N13	Housekeeping of Loading Docks	☐	☒	This project does not feature loading docks.
N14	Catch Basin Inspection Program	☒	☐	Catch basin maintenance will be included in the Maintenance Covenant. Catch basins will be inspected visually on a monthly basis. The storm drain system will be inspected and cleaned prior to the start of the rainy season.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Private streets will be vacuum swept as waste accumulates as well as at least once prior to the start of the rainy season.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public agency project
N17	Comply with all other applicable NPDES permits	☐	☒	No other NPDES permits applicable to this project.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One: Included	Check One: Not Applicable	Describe BMP Implementation OR, If not applicable, state reason
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Storm drain system stencilly and signage will be in conformance with SD-13
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	Project does not include outdoor material storage areas
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Public trash enclosures will be covered by lids and located away from storm drains in conformance with SD-32. Individual homeowners will be provided educational material for their private waste receptacles.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation will be in conformance with SD-12. Irrigation system will be inspected and adjusted to prevent over watering.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	1" will be provided between top of curb/sidewalk and finish grade in landscape areas
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	SIte contains no slopes or channels
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	Project does not include Dock Areas
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Project does not include maintenace bays
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Project does not include vehicle wash arease
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	Project does not include outdoor processing areas

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Project does not include equipment wash areas
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Project does not include fueling areas
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Project does not include hillside landscaping
S14	Wash water control for food preparation areas	☐	☒	Project does not include food preparation areas
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Project does not include community car wash racks

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Site Design Practices Checklist
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: A large amount of permeable landscaping is included in the site design
Maximize natural infiltration capacity; Including improvement and maintenance of soil: ☒ No ☐ Yes Explanation: The site is proposing infiltration BMPs.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☒ Explanation: Site will be completely regraded to suit project purposes
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☐ No ☒ Explanation: Impervious areas consist primarily of streets and sidewalks
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Porous pavements will not be utilized
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: Existing vegetation will be removed during grading operations
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: Some areas will be re-vegetated using drought tolerant plants

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Over-compaction will be avoided in inflitration areas
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Project does not include rock-lined drainage swales. Most runoff is carried by streets to infiltation area
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Over-compaction will be avoided in landscaped areas
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: No provisions for rain barrels are made on a project-wide basis. Owner may implement at their discretion
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: Stream setbacks do not apply to this projet

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
1 Project area DA 1 (ft^2): 558,406	2 Imperviousness after applying preventative site design practices (Imp%): 58.0	3 Runoff Coefficient (Rc): _0.394 *R_c = 0.858(Imp%)^3-0.78(Imp%)^2+0.774(Imp%)+0.04*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.399 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.49 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 17,775 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

SEE ATTACHED RATIONAL METHOD AND UNIT HYDROGRAPHS

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)			
Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐ If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)* If "No," then proceed to Section 4.3 BMP Selection and Sizing			
Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 23,082 *Form 4.2-3 Item 12*	2 28.22 *Form 4.2-4 Item 13*	3 9.83 *Form 4.2-5 Item 10*
Post-developed	4 53,884 *Form 4.2-3 Item 13*	5 12.45 *Form 4.2-4 Item 14*	6 16.76 *Form 4.2-5 Item 14*
Difference	*30,802* *Item 4 – Item 1*	8 *15.77* *Item 2 – Item 5*	9 *6.93* *Item 6 – Item 3*
Difference (as % of pre-developed)	10 *133%* *Item 7 / Item 1*	11 *56%* *Item 8 / Item 2*	12 *70%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft^3):
*Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-4 Hydromodification Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), *S_o = Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) *T_c = Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet hydromodification requirement (min): *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14*								

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	9 Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	10 Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	12 Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	13 Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): $Q_{p-hydro}$ = *(Item 14 * 0.95) – Item 10*		

RATIONAL METHOD &

UNIT HYDROGRAPH HYDROLOGY

ONSITE POST-DEVELOPED

2-YEAR & 10-YEAR

STORM EVENTS

DRAINAGE AREA 1

```
               San Bernardino County Rational Hydrology Program

                   (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study       Date: 08/16/21
------------------------------------------------------------------------
2 Year Rational Analysis Post Development
Former Track 17486
Drainage Area 1
File: 17486Rat2PostA1.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
Computed rainfall intensity:
Storm year =     2.00   1 hour rainfall =     0.399 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   997.200(Ft.)
Top (of initial area) elevation =  3291.300(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =    10.300(Ft.)
Slope =    0.01033  s(%)=       1.03
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.369 min.
Rainfall intensity =      1.035(In/Hr) for a     2.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.559
Subarea runoff =      4.928(CFS)
Total initial stream area =        8.520(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.520(Ac.)
Runoff from this stream =      4.928(CFS)
Time of concentration =   15.37 min.
Rainfall intensity =     1.035(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   413.100(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00508  s(%)=       0.51
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.449 min.
Rainfall intensity =      1.200(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.606
Subarea runoff =      2.012(CFS)
Total initial stream area =        2.770(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.770(Ac.)
Runoff from this stream =      2.012(CFS)
Time of concentration =   12.45 min.
Rainfall intensity =     1.200(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   794.100(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3277.200(Ft.)
Difference in elevation =     5.900(Ft.)
Slope =    0.00743  s(%)=       0.74
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.987 min.
Rainfall intensity =      1.054(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.565
Subarea runoff =      0.910(CFS)
Total initial stream area =       1.530(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.530(Ac.)
```

```
Runoff from this stream =      0.910(CFS)
Time of concentration =   14.99 min.
Rainfall intensity =     1.054(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      4.93     8.520     15.37    0.393      1.035
2      2.01     2.770     12.45    0.393      1.200
3      0.91     1.530     14.99    0.393      1.054
Qmax(1) =
           1.000 *    1.000 *     4.928) +
           0.796 *    1.000 *     2.012) +
           0.972 *    1.000 *     0.910) + =      7.415
Qmax(2) =
           1.256 *    0.810 *     4.928) +
           1.000 *    1.000 *     2.012) +
           1.221 *    0.831 *     0.910) + =      7.949
Qmax(3) =
           1.029 *    0.975 *     4.928) +
           0.819 *    1.000 *     2.012) +
           1.000 *    1.000 *     0.910) + =      7.501

Total of 3 streams to confluence:
Flow rates before confluence point:
       4.928       2.012       0.910
Maximum flow rates at confluence using above data:
        7.415        7.949        7.501
Area of streams before confluence:
        8.520        2.770        1.530
Effective area values after confluence:
       12.820       10.942       12.608
Results of confluence:
Total flow rate =      7.949(CFS)
Time of concentration =    12.449 min.
Effective stream area after confluence =     10.942(Ac.)
Study area average Pervious fraction(Ap) =  0.500
Study area average soil loss rate(Fm) =    0.393(In/Hr)
Study area total (this main stream) =      12.82(Ac.)
End of computations, Total Study Area =          12.82 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500
```

Area averaged SCS curve number = 32.0

```
        U n i t   H y d r o g r a p h   A n a l y s i s

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                Study date  08/13/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
2 Year Unit Hydrograph Post Development
Former Track 17486
Drainage Area 1
File: 17486Hydr2PostA1.out
--------------------------------------------------------------------

        Storm Event Year = 2

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)            (hours)         (In)
Rainfall data for year 2
            12.82            1           0.40
--------------------------------------------------------------------
Rainfall data for year 2
            12.82            6           0.89
--------------------------------------------------------------------
Rainfall data for year 2
            12.82           24           1.64
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	52.0	12.82	1.000	0.785	0.420	0.330

Area-averaged adjusted loss rate Fm (In/Hr) = 0.330

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
5.38	0.420	32.0	52.0	8.20	0.000
7.44	0.580	98.0	98.0	0.20	0.865

Area-averaged catchment yield fraction, Y = 0.502
Area-averaged low loss fraction, Yb = 0.498
User entry of time of concentration =   0.207 (hours)
++
Watershed area =   12.82(Ac.)
Catchment Lag time =   0.166 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 50.2008
Hydrograph baseflow =   0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.330(In/Hr)
Average low loss rate fraction (Yb) = 0.498 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.189(In)
Computed peak 30-minute rainfall = 0.324(In)
Specified peak 1-hour rainfall = 0.399(In)
Computed peak 3-hour rainfall = 0.650(In)
Specified peak 6-hour rainfall = 0.885(In)
Specified peak 24-hour rainfall = 1.640(In)

Rainfall depth area reduction factors:
Using a total area of   12.82(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999   Adjusted rainfall = 0.189(In)
30-minute factor = 0.999   Adjusted rainfall = 0.324(In)
1-hour factor = 0.999   Adjusted rainfall = 0.399(In)
3-hour factor = 1.000   Adjusted rainfall = 0.650(In)
6-hour factor = 1.000   Adjusted rainfall = 0.885(In)
24-hour factor = 1.000   Adjusted rainfall = 1.640(In)

U n i t   H y d r o g r a p h
+++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 155.04 (CFS))	
1	3.989	6.184
2	30.749	41.489
3	60.742	46.502
4	73.911	20.417
5	81.558	11.856
6	86.696	7.967
7	90.250	5.510
8	92.844	4.021
9	94.808	3.045
10	96.299	2.312
11	97.388	1.687
12	98.073	1.063
13	98.630	0.863
14	99.232	0.933
15	99.674	0.686
16	100.000	0.505

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1892	0.1892
2	0.2330	0.0437
3	0.2631	0.0301
4	0.2868	0.0237
5	0.3067	0.0199
6	0.3239	0.0172
7	0.3392	0.0153
8	0.3531	0.0139
9	0.3658	0.0127
10	0.3775	0.0117
11	0.3885	0.0110
12	0.3988	0.0103
13	0.4132	0.0145
14	0.4271	0.0139
15	0.4404	0.0133
16	0.4532	0.0128
17	0.4656	0.0124
18	0.4776	0.0120
19	0.4893	0.0116
20	0.5006	0.0113
21	0.5115	0.0110
22	0.5222	0.0107
23	0.5327	0.0104
24	0.5429	0.0102
25	0.5528	0.0100
26	0.5626	0.0097

27	0.5721	0.0095
28	0.5814	0.0093
29	0.5906	0.0092
30	0.5996	0.0090
31	0.6084	0.0088
32	0.6170	0.0087
33	0.6255	0.0085
34	0.6339	0.0084
35	0.6421	0.0082
36	0.6502	0.0081
37	0.6582	0.0080
38	0.6661	0.0079
39	0.6738	0.0077
40	0.6814	0.0076
41	0.6889	0.0075
42	0.6964	0.0074
43	0.7037	0.0073
44	0.7109	0.0072
45	0.7181	0.0071
46	0.7251	0.0071
47	0.7321	0.0070
48	0.7390	0.0069
49	0.7458	0.0068
50	0.7525	0.0067
51	0.7592	0.0067
52	0.7657	0.0066
53	0.7723	0.0065
54	0.7787	0.0064
55	0.7851	0.0064
56	0.7914	0.0063
57	0.7976	0.0063
58	0.8038	0.0062
59	0.8100	0.0061
60	0.8161	0.0061
61	0.8221	0.0060
62	0.8280	0.0060
63	0.8339	0.0059
64	0.8398	0.0059
65	0.8456	0.0058
66	0.8514	0.0058
67	0.8571	0.0057
68	0.8628	0.0057
69	0.8684	0.0056
70	0.8739	0.0056
71	0.8795	0.0055
72	0.8850	0.0055
73	0.8904	0.0054
74	0.8958	0.0054
75	0.9012	0.0054
76	0.9065	0.0053

77	0.9118	0.0053
78	0.9171	0.0053
79	0.9223	0.0052
80	0.9274	0.0052
81	0.9326	0.0051
82	0.9377	0.0051
83	0.9428	0.0051
84	0.9478	0.0050
85	0.9528	0.0050
86	0.9578	0.0050
87	0.9627	0.0049
88	0.9676	0.0049
89	0.9725	0.0049
90	0.9773	0.0048
91	0.9822	0.0048
92	0.9870	0.0048
93	0.9917	0.0048
94	0.9964	0.0047
95	1.0011	0.0047
96	1.0058	0.0047
97	1.0105	0.0046
98	1.0151	0.0046
99	1.0197	0.0046
100	1.0243	0.0046
101	1.0288	0.0045
102	1.0333	0.0045
103	1.0378	0.0045
104	1.0423	0.0045
105	1.0467	0.0044
106	1.0512	0.0044
107	1.0556	0.0044
108	1.0599	0.0044
109	1.0643	0.0044
110	1.0686	0.0043
111	1.0730	0.0043
112	1.0772	0.0043
113	1.0815	0.0043
114	1.0858	0.0042
115	1.0900	0.0042
116	1.0942	0.0042
117	1.0984	0.0042
118	1.1026	0.0042
119	1.1067	0.0041
120	1.1108	0.0041
121	1.1149	0.0041
122	1.1190	0.0041
123	1.1231	0.0041
124	1.1272	0.0041
125	1.1312	0.0040
126	1.1352	0.0040

127	1.1392	0.0040
128	1.1432	0.0040
129	1.1472	0.0040
130	1.1511	0.0039
131	1.1550	0.0039
132	1.1590	0.0039
133	1.1629	0.0039
134	1.1667	0.0039
135	1.1706	0.0039
136	1.1745	0.0039
137	1.1783	0.0038
138	1.1821	0.0038
139	1.1859	0.0038
140	1.1897	0.0038
141	1.1935	0.0038
142	1.1972	0.0038
143	1.2010	0.0037
144	1.2047	0.0037
145	1.2084	0.0037
146	1.2121	0.0037
147	1.2158	0.0037
148	1.2195	0.0037
149	1.2231	0.0037
150	1.2268	0.0036
151	1.2304	0.0036
152	1.2340	0.0036
153	1.2376	0.0036
154	1.2412	0.0036
155	1.2448	0.0036
156	1.2484	0.0036
157	1.2519	0.0036
158	1.2555	0.0035
159	1.2590	0.0035
160	1.2625	0.0035
161	1.2660	0.0035
162	1.2695	0.0035
163	1.2730	0.0035
164	1.2765	0.0035
165	1.2799	0.0035
166	1.2834	0.0034
167	1.2868	0.0034
168	1.2902	0.0034
169	1.2937	0.0034
170	1.2971	0.0034
171	1.3004	0.0034
172	1.3038	0.0034
173	1.3072	0.0034
174	1.3106	0.0034
175	1.3139	0.0033
176	1.3172	0.0033

177	1.3206	0.0033
178	1.3239	0.0033
179	1.3272	0.0033
180	1.3305	0.0033
181	1.3338	0.0033
182	1.3370	0.0033
183	1.3403	0.0033
184	1.3435	0.0033
185	1.3468	0.0032
186	1.3500	0.0032
187	1.3533	0.0032
188	1.3565	0.0032
189	1.3597	0.0032
190	1.3629	0.0032
191	1.3661	0.0032
192	1.3692	0.0032
193	1.3724	0.0032
194	1.3756	0.0032
195	1.3787	0.0032
196	1.3819	0.0031
197	1.3850	0.0031
198	1.3881	0.0031
199	1.3912	0.0031
200	1.3943	0.0031
201	1.3974	0.0031
202	1.4005	0.0031
203	1.4036	0.0031
204	1.4067	0.0031
205	1.4097	0.0031
206	1.4128	0.0031
207	1.4158	0.0030
208	1.4189	0.0030
209	1.4219	0.0030
210	1.4249	0.0030
211	1.4280	0.0030
212	1.4310	0.0030
213	1.4340	0.0030
214	1.4370	0.0030
215	1.4399	0.0030
216	1.4429	0.0030
217	1.4459	0.0030
218	1.4488	0.0030
219	1.4518	0.0030
220	1.4547	0.0029
221	1.4577	0.0029
222	1.4606	0.0029
223	1.4635	0.0029
224	1.4665	0.0029
225	1.4694	0.0029
226	1.4723	0.0029

227	1.4752	0.0029
228	1.4781	0.0029
229	1.4809	0.0029
230	1.4838	0.0029
231	1.4867	0.0029
232	1.4895	0.0029
233	1.4924	0.0029
234	1.4952	0.0028
235	1.4981	0.0028
236	1.5009	0.0028
237	1.5037	0.0028
238	1.5066	0.0028
239	1.5094	0.0028
240	1.5122	0.0028
241	1.5150	0.0028
242	1.5178	0.0028
243	1.5206	0.0028
244	1.5233	0.0028
245	1.5261	0.0028
246	1.5289	0.0028
247	1.5316	0.0028
248	1.5344	0.0028
249	1.5372	0.0028
250	1.5399	0.0027
251	1.5426	0.0027
252	1.5454	0.0027
253	1.5481	0.0027
254	1.5508	0.0027
255	1.5535	0.0027
256	1.5562	0.0027
257	1.5589	0.0027
258	1.5616	0.0027
259	1.5643	0.0027
260	1.5670	0.0027
261	1.5697	0.0027
262	1.5724	0.0027
263	1.5750	0.0027
264	1.5777	0.0027
265	1.5803	0.0027
266	1.5830	0.0027
267	1.5856	0.0026
268	1.5883	0.0026
269	1.5909	0.0026
270	1.5935	0.0026
271	1.5962	0.0026
272	1.5988	0.0026
273	1.6014	0.0026
274	1.6040	0.0026
275	1.6066	0.0026
276	1.6092	0.0026

277	1.6118	0.0026
278	1.6144	0.0026
279	1.6170	0.0026
280	1.6195	0.0026
281	1.6221	0.0026
282	1.6247	0.0026
283	1.6272	0.0026
284	1.6298	0.0026
285	1.6323	0.0026
286	1.6349	0.0025
287	1.6374	0.0025
288	1.6400	0.0025

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0025	0.0013	0.0013
2	0.0025	0.0013	0.0013
3	0.0026	0.0013	0.0013
4	0.0026	0.0013	0.0013
5	0.0026	0.0013	0.0013
6	0.0026	0.0013	0.0013
7	0.0026	0.0013	0.0013
8	0.0026	0.0013	0.0013
9	0.0026	0.0013	0.0013
10	0.0026	0.0013	0.0013
11	0.0026	0.0013	0.0013
12	0.0026	0.0013	0.0013
13	0.0026	0.0013	0.0013
14	0.0026	0.0013	0.0013
15	0.0026	0.0013	0.0013
16	0.0027	0.0013	0.0013
17	0.0027	0.0013	0.0013
18	0.0027	0.0013	0.0013
19	0.0027	0.0013	0.0013
20	0.0027	0.0013	0.0013
21	0.0027	0.0013	0.0014
22	0.0027	0.0013	0.0014
23	0.0027	0.0014	0.0014
24	0.0027	0.0014	0.0014
25	0.0027	0.0014	0.0014
26	0.0027	0.0014	0.0014
27	0.0028	0.0014	0.0014
28	0.0028	0.0014	0.0014
29	0.0028	0.0014	0.0014
30	0.0028	0.0014	0.0014
31	0.0028	0.0014	0.0014
32	0.0028	0.0014	0.0014
33	0.0028	0.0014	0.0014

34	0.0028	0.0014	0.0014
35	0.0028	0.0014	0.0014
36	0.0028	0.0014	0.0014
37	0.0028	0.0014	0.0014
38	0.0029	0.0014	0.0014
39	0.0029	0.0014	0.0014
40	0.0029	0.0014	0.0014
41	0.0029	0.0014	0.0014
42	0.0029	0.0014	0.0015
43	0.0029	0.0015	0.0015
44	0.0029	0.0015	0.0015
45	0.0029	0.0015	0.0015
46	0.0029	0.0015	0.0015
47	0.0030	0.0015	0.0015
48	0.0030	0.0015	0.0015
49	0.0030	0.0015	0.0015
50	0.0030	0.0015	0.0015
51	0.0030	0.0015	0.0015
52	0.0030	0.0015	0.0015
53	0.0030	0.0015	0.0015
54	0.0030	0.0015	0.0015
55	0.0030	0.0015	0.0015
56	0.0031	0.0015	0.0015
57	0.0031	0.0015	0.0015
58	0.0031	0.0015	0.0015
59	0.0031	0.0015	0.0016
60	0.0031	0.0015	0.0016
61	0.0031	0.0016	0.0016
62	0.0031	0.0016	0.0016
63	0.0032	0.0016	0.0016
64	0.0032	0.0016	0.0016
65	0.0032	0.0016	0.0016
66	0.0032	0.0016	0.0016
67	0.0032	0.0016	0.0016
68	0.0032	0.0016	0.0016
69	0.0032	0.0016	0.0016
70	0.0032	0.0016	0.0016
71	0.0033	0.0016	0.0016
72	0.0033	0.0016	0.0016
73	0.0033	0.0016	0.0017
74	0.0033	0.0016	0.0017
75	0.0033	0.0017	0.0017
76	0.0033	0.0017	0.0017
77	0.0034	0.0017	0.0017
78	0.0034	0.0017	0.0017
79	0.0034	0.0017	0.0017
80	0.0034	0.0017	0.0017
81	0.0034	0.0017	0.0017
82	0.0034	0.0017	0.0017
83	0.0035	0.0017	0.0017

84	0.0035	0.0017	0.0017
85	0.0035	0.0017	0.0018
86	0.0035	0.0017	0.0018
87	0.0035	0.0018	0.0018
88	0.0035	0.0018	0.0018
89	0.0036	0.0018	0.0018
90	0.0036	0.0018	0.0018
91	0.0036	0.0018	0.0018
92	0.0036	0.0018	0.0018
93	0.0036	0.0018	0.0018
94	0.0037	0.0018	0.0018
95	0.0037	0.0018	0.0018
96	0.0037	0.0018	0.0019
97	0.0037	0.0019	0.0019
98	0.0037	0.0019	0.0019
99	0.0038	0.0019	0.0019
100	0.0038	0.0019	0.0019
101	0.0038	0.0019	0.0019
102	0.0038	0.0019	0.0019
103	0.0039	0.0019	0.0019
104	0.0039	0.0019	0.0019
105	0.0039	0.0020	0.0020
106	0.0039	0.0020	0.0020
107	0.0040	0.0020	0.0020
108	0.0040	0.0020	0.0020
109	0.0040	0.0020	0.0020
110	0.0040	0.0020	0.0020
111	0.0041	0.0020	0.0020
112	0.0041	0.0020	0.0021
113	0.0041	0.0021	0.0021
114	0.0041	0.0021	0.0021
115	0.0042	0.0021	0.0021
116	0.0042	0.0021	0.0021
117	0.0042	0.0021	0.0021
118	0.0043	0.0021	0.0021
119	0.0043	0.0021	0.0022
120	0.0043	0.0022	0.0022
121	0.0044	0.0022	0.0022
122	0.0044	0.0022	0.0022
123	0.0044	0.0022	0.0022
124	0.0045	0.0022	0.0022
125	0.0045	0.0023	0.0023
126	0.0045	0.0023	0.0023
127	0.0046	0.0023	0.0023
128	0.0046	0.0023	0.0023
129	0.0047	0.0023	0.0023
130	0.0047	0.0023	0.0024
131	0.0048	0.0024	0.0024
132	0.0048	0.0024	0.0024
133	0.0048	0.0024	0.0024

134	0.0049	0.0024	0.0024
135	0.0049	0.0025	0.0025
136	0.0050	0.0025	0.0025
137	0.0050	0.0025	0.0025
138	0.0051	0.0025	0.0025
139	0.0051	0.0026	0.0026
140	0.0052	0.0026	0.0026
141	0.0053	0.0026	0.0026
142	0.0053	0.0026	0.0027
143	0.0054	0.0027	0.0027
144	0.0054	0.0027	0.0027
145	0.0055	0.0027	0.0028
146	0.0055	0.0028	0.0028
147	0.0056	0.0028	0.0028
148	0.0057	0.0028	0.0028
149	0.0058	0.0029	0.0029
150	0.0058	0.0029	0.0029
151	0.0059	0.0029	0.0030
152	0.0060	0.0030	0.0030
153	0.0061	0.0030	0.0030
154	0.0061	0.0031	0.0031
155	0.0063	0.0031	0.0031
156	0.0063	0.0031	0.0032
157	0.0064	0.0032	0.0032
158	0.0065	0.0032	0.0033
159	0.0067	0.0033	0.0033
160	0.0067	0.0034	0.0034
161	0.0069	0.0034	0.0035
162	0.0070	0.0035	0.0035
163	0.0071	0.0036	0.0036
164	0.0072	0.0036	0.0036
165	0.0074	0.0037	0.0037
166	0.0075	0.0037	0.0038
167	0.0077	0.0039	0.0039
168	0.0079	0.0039	0.0039
169	0.0081	0.0040	0.0041
170	0.0082	0.0041	0.0041
171	0.0085	0.0042	0.0043
172	0.0087	0.0043	0.0043
173	0.0090	0.0045	0.0045
174	0.0092	0.0046	0.0046
175	0.0095	0.0047	0.0048
176	0.0097	0.0049	0.0049
177	0.0102	0.0051	0.0051
178	0.0104	0.0052	0.0052
179	0.0110	0.0055	0.0055
180	0.0113	0.0056	0.0057
181	0.0120	0.0060	0.0060
182	0.0124	0.0062	0.0062
183	0.0133	0.0066	0.0067

184	0.0139	0.0069	0.0070
185	0.0103	0.0051	0.0052
186	0.0110	0.0055	0.0055
187	0.0127	0.0063	0.0064
188	0.0139	0.0069	0.0070
189	0.0172	0.0086	0.0086
190	0.0199	0.0099	0.0100
191	0.0301	0.0150	0.0151
192	0.0437	0.0218	0.0219
193	0.1892	0.0275	0.1617
194	0.0237	0.0118	0.0119
195	0.0153	0.0076	0.0077
196	0.0117	0.0059	0.0059
197	0.0145	0.0072	0.0073
198	0.0128	0.0064	0.0064
199	0.0116	0.0058	0.0058
200	0.0107	0.0053	0.0054
201	0.0100	0.0050	0.0050
202	0.0093	0.0047	0.0047
203	0.0088	0.0044	0.0044
204	0.0084	0.0042	0.0042
205	0.0080	0.0040	0.0040
206	0.0076	0.0038	0.0038
207	0.0073	0.0037	0.0037
208	0.0071	0.0035	0.0035
209	0.0068	0.0034	0.0034
210	0.0066	0.0033	0.0033
211	0.0064	0.0032	0.0032
212	0.0062	0.0031	0.0031
213	0.0060	0.0030	0.0030
214	0.0059	0.0029	0.0029
215	0.0057	0.0028	0.0029
216	0.0056	0.0028	0.0028
217	0.0054	0.0027	0.0027
218	0.0053	0.0027	0.0027
219	0.0052	0.0026	0.0026
220	0.0051	0.0025	0.0026
221	0.0050	0.0025	0.0025
222	0.0049	0.0024	0.0025
223	0.0048	0.0024	0.0024
224	0.0047	0.0024	0.0024
225	0.0046	0.0023	0.0023
226	0.0046	0.0023	0.0023
227	0.0045	0.0022	0.0023
228	0.0044	0.0022	0.0022
229	0.0044	0.0022	0.0022
230	0.0043	0.0021	0.0022
231	0.0042	0.0021	0.0021
232	0.0042	0.0021	0.0021
233	0.0041	0.0020	0.0021

234	0.0041	0.0020	0.0020
235	0.0040	0.0020	0.0020
236	0.0039	0.0020	0.0020
237	0.0039	0.0019	0.0020
238	0.0039	0.0019	0.0019
239	0.0038	0.0019	0.0019
240	0.0038	0.0019	0.0019
241	0.0037	0.0019	0.0019
242	0.0037	0.0018	0.0018
243	0.0036	0.0018	0.0018
244	0.0036	0.0018	0.0018
245	0.0036	0.0018	0.0018
246	0.0035	0.0018	0.0018
247	0.0035	0.0017	0.0017
248	0.0034	0.0017	0.0017
249	0.0034	0.0017	0.0017
250	0.0034	0.0017	0.0017
251	0.0033	0.0017	0.0017
252	0.0033	0.0017	0.0017
253	0.0033	0.0016	0.0016
254	0.0033	0.0016	0.0016
255	0.0032	0.0016	0.0016
256	0.0032	0.0016	0.0016
257	0.0032	0.0016	0.0016
258	0.0031	0.0016	0.0016
259	0.0031	0.0016	0.0016
260	0.0031	0.0015	0.0015
261	0.0031	0.0015	0.0015
262	0.0030	0.0015	0.0015
263	0.0030	0.0015	0.0015
264	0.0030	0.0015	0.0015
265	0.0030	0.0015	0.0015
266	0.0029	0.0015	0.0015
267	0.0029	0.0015	0.0015
268	0.0029	0.0014	0.0015
269	0.0029	0.0014	0.0014
270	0.0029	0.0014	0.0014
271	0.0028	0.0014	0.0014
272	0.0028	0.0014	0.0014
273	0.0028	0.0014	0.0014
274	0.0028	0.0014	0.0014
275	0.0028	0.0014	0.0014
276	0.0027	0.0014	0.0014
277	0.0027	0.0014	0.0014
278	0.0027	0.0013	0.0014
279	0.0027	0.0013	0.0013
280	0.0027	0.0013	0.0013
281	0.0027	0.0013	0.0013
282	0.0026	0.0013	0.0013
283	0.0026	0.0013	0.0013

```
284              0.0026          0.0013            0.0013
285              0.0026          0.0013            0.0013
286              0.0026          0.0013            0.0013
287              0.0026          0.0013            0.0013
288              0.0025          0.0013            0.0013
--------------------------------------------------------------------
--------------------------------------------------------------------
Total soil rain loss =      0.75(In)
Total effective rainfall =      0.89(In)
Peak flow rate in flood hydrograph =      8.91(CFS)
---------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                   24 - H O U R   S T O R M
              R u n o f f     H y d r o g r a p h
--------------------------------------------------------------------
            Hydrograph in   5   Minute intervals ((CFS))

--------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0001      0.01  Q        |         |         |         |
  0+10       0.0005      0.06  Q        |         |         |         |
  0+15       0.0013      0.12  Q        |         |         |         |
  0+20       0.0023      0.15  Q        |         |         |         |
  0+25       0.0034      0.16  Q        |         |         |         |
  0+30       0.0046      0.17  Q        |         |         |         |
  0+35       0.0058      0.18  Q        |         |         |         |
  0+40       0.0071      0.19  Q        |         |         |         |
  0+45       0.0084      0.19  Q        |         |         |         |
  0+50       0.0098      0.19  Q        |         |         |         |
  0+55       0.0111      0.20  Q        |         |         |         |
  1+ 0       0.0125      0.20  Q        |         |         |         |
  1+ 5       0.0139      0.20  Q        |         |         |         |
  1+10       0.0152      0.20  Q        |         |         |         |
  1+15       0.0166      0.20  Q        |         |         |         |
  1+20       0.0181      0.20  Q        |         |         |         |
  1+25       0.0195      0.21  Q        |         |         |         |
  1+30       0.0209      0.21  Q        |         |         |         |
  1+35       0.0223      0.21  Q        |         |         |         |
  1+40       0.0237      0.21  Q        |         |         |         |
  1+45       0.0252      0.21  QV       |         |         |         |
  1+50       0.0266      0.21  QV       |         |         |         |
  1+55       0.0280      0.21  QV       |         |         |         |
  2+ 0       0.0295      0.21  QV       |         |         |         |
  2+ 5       0.0309      0.21  QV       |         |         |         |
  2+10       0.0324      0.21  QV       |         |         |         |
  2+15       0.0338      0.21  QV       |         |         |         |
  2+20       0.0353      0.21  QV       |         |         |         |
  2+25       0.0368      0.21  QV       |         |         |         |
  2+30       0.0382      0.21  QV       |         |         |         |
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2+35       0.0397      0.21  QV        |         |         |         |
2+40       0.0412      0.22  QV        |         |         |         |
2+45       0.0427      0.22  QV        |         |         |         |
2+50       0.0442      0.22  QV        |         |         |         |
2+55       0.0457      0.22  QV        |         |         |         |
3+ 0       0.0472      0.22  QV        |         |         |         |
3+ 5       0.0487      0.22  Q V       |         |         |         |
3+10       0.0502      0.22  Q V       |         |         |         |
3+15       0.0517      0.22  Q V       |         |         |         |
3+20       0.0532      0.22  Q V       |         |         |         |
3+25       0.0548      0.22  Q V       |         |         |         |
3+30       0.0563      0.22  Q V       |         |         |         |
3+35       0.0578      0.22  Q V       |         |         |         |
3+40       0.0594      0.22  Q V       |         |         |         |
3+45       0.0609      0.23  Q V       |         |         |         |
3+50       0.0625      0.23  Q V       |         |         |         |
3+55       0.0641      0.23  Q V       |         |         |         |
4+ 0       0.0656      0.23  Q V       |         |         |         |
4+ 5       0.0672      0.23  Q V       |         |         |         |
4+10       0.0688      0.23  Q V       |         |         |         |
4+15       0.0704      0.23  Q V       |         |         |         |
4+20       0.0720      0.23  Q  V      |         |         |         |
4+25       0.0736      0.23  Q  V      |         |         |         |
4+30       0.0752      0.23  Q  V      |         |         |         |
4+35       0.0768      0.23  Q  V      |         |         |         |
4+40       0.0784      0.24  Q  V      |         |         |         |
4+45       0.0800      0.24  Q  V      |         |         |         |
4+50       0.0817      0.24  Q  V      |         |         |         |
4+55       0.0833      0.24  Q  V      |         |         |         |
5+ 0       0.0849      0.24  Q  V      |         |         |         |
5+ 5       0.0866      0.24  Q  V      |         |         |         |
5+10       0.0883      0.24  Q  V      |         |         |         |
5+15       0.0899      0.24  Q  V      |         |         |         |
5+20       0.0916      0.24  Q  V      |         |         |         |
5+25       0.0933      0.24  Q  V      |         |         |         |
5+30       0.0950      0.24  Q  V      |         |         |         |
5+35       0.0967      0.25  Q   V     |         |         |         |
5+40       0.0984      0.25  Q   V     |         |         |         |
5+45       0.1001      0.25  Q   V     |         |         |         |
5+50       0.1018      0.25  Q   V     |         |         |         |
5+55       0.1035      0.25  |Q  V     |         |         |         |
6+ 0       0.1052      0.25  |Q  V     |         |         |         |
6+ 5       0.1070      0.25  |Q  V     |         |         |         |
6+10       0.1087      0.25  |Q  V     |         |         |         |
6+15       0.1105      0.25  |Q  V     |         |         |         |
6+20       0.1122      0.26  |Q  V     |         |         |         |
6+25       0.1140      0.26  |Q  V     |         |         |         |
6+30       0.1158      0.26  |Q  V     |         |         |         |
6+35       0.1176      0.26  |Q  V     |         |         |         |
6+40       0.1194      0.26  |Q   V    |         |         |         |
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 6+45       0.1212      0.26  |Q   V    |         |         |         |
 6+50       0.1230      0.26  |Q   V    |         |         |         |
 6+55       0.1248      0.26  |Q   V    |         |         |         |
 7+ 0       0.1267      0.27  |Q   V    |         |         |         |
 7+ 5       0.1285      0.27  |Q   V    |         |         |         |
 7+10       0.1304      0.27  |Q   V    |         |         |         |
 7+15       0.1322      0.27  |Q   V    |         |         |         |
 7+20       0.1341      0.27  |Q   V    |         |         |         |
 7+25       0.1360      0.27  |Q   V    |         |         |         |
 7+30       0.1379      0.27  |Q   V    |         |         |         |
 7+35       0.1398      0.28  |Q   V    |         |         |         |
 7+40       0.1417      0.28  |Q   V    |         |         |         |
 7+45       0.1436      0.28  |Q    V   |         |         |         |
 7+50       0.1455      0.28  |Q    V   |         |         |         |
 7+55       0.1475      0.28  |Q    V   |         |         |         |
 8+ 0       0.1494      0.28  |Q    V   |         |         |         |
 8+ 5       0.1514      0.29  |Q    V   |         |         |         |
 8+10       0.1533      0.29  |Q    V   |         |         |         |
 8+15       0.1553      0.29  |Q    V   |         |         |         |
 8+20       0.1573      0.29  |Q    V   |         |         |         |
 8+25       0.1593      0.29  |Q    V   |         |         |         |
 8+30       0.1614      0.29  |Q    V   |         |         |         |
 8+35       0.1634      0.30  |Q    V   |         |         |         |
 8+40       0.1654      0.30  |Q    V   |         |         |         |
 8+45       0.1675      0.30  |Q     V  |         |         |         |
 8+50       0.1696      0.30  |Q     V  |         |         |         |
 8+55       0.1716      0.30  |Q     V  |         |         |         |
 9+ 0       0.1737      0.30  |Q     V  |         |         |         |
 9+ 5       0.1758      0.31  |Q     V  |         |         |         |
 9+10       0.1780      0.31  |Q     V  |         |         |         |
 9+15       0.1801      0.31  |Q     V  |         |         |         |
 9+20       0.1823      0.31  |Q     V  |         |         |         |
 9+25       0.1844      0.31  |Q     V  |         |         |         |
 9+30       0.1866      0.32  |Q     V  |         |         |         |
 9+35       0.1888      0.32  |Q     V  |         |         |         |
 9+40       0.1910      0.32  |Q      V |         |         |         |
 9+45       0.1932      0.32  |Q      V |         |         |         |
 9+50       0.1955      0.33  |Q      V |         |         |         |
 9+55       0.1977      0.33  |Q      V |         |         |         |
10+ 0       0.2000      0.33  |Q      V |         |         |         |
10+ 5       0.2023      0.33  |Q      V |         |         |         |
10+10       0.2046      0.34  |Q      V |         |         |         |
10+15       0.2069      0.34  |Q      V |         |         |         |
10+20       0.2093      0.34  |Q      V |         |         |         |
10+25       0.2116      0.34  |Q      V |         |         |         |
10+30       0.2140      0.35  |Q       V|         |         |         |
10+35       0.2164      0.35  |Q       V|         |         |         |
10+40       0.2188      0.35  |Q       V|         |         |         |
10+45       0.2213      0.35  |Q       V|         |         |         |
10+50       0.2237      0.36  |Q       V|         |         |         |
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10+55       0.2262      0.36  |Q       V|         |         |         |
11+ 0       0.2287      0.36  |Q       V|         |         |         |
11+ 5       0.2313      0.37  |Q       V|         |         |         |
11+10       0.2338      0.37  |Q       V|         |         |         |
11+15       0.2364      0.37  |Q       V|         |         |         |
11+20       0.2390      0.38  |Q        V         |         |         |
11+25       0.2416      0.38  |Q        V         |         |         |
11+30       0.2442      0.38  |Q        V         |         |         |
11+35       0.2469      0.39  |Q        V         |         |         |
11+40       0.2496      0.39  |Q        V         |         |         |
11+45       0.2523      0.40  |Q        V         |         |         |
11+50       0.2551      0.40  |Q        V         |         |         |
11+55       0.2579      0.40  |Q        V         |         |         |
12+ 0       0.2607      0.41  |Q        V         |         |         |
12+ 5       0.2635      0.41  |Q        |V        |         |         |
12+10       0.2664      0.42  |Q        |V        |         |         |
12+15       0.2693      0.42  |Q        |V        |         |         |
12+20       0.2722      0.43  |Q        |V        |         |         |
12+25       0.2752      0.43  |Q        |V        |         |         |
12+30       0.2782      0.44  |Q        |V        |         |         |
12+35       0.2813      0.44  |Q        |V        |         |         |
12+40       0.2843      0.45  |Q        |V        |         |         |
12+45       0.2875      0.45  |Q        | V       |         |         |
12+50       0.2906      0.46  |Q        | V       |         |         |
12+55       0.2938      0.47  |Q        | V       |         |         |
13+ 0       0.2971      0.47  |Q        | V       |         |         |
13+ 5       0.3004      0.48  |Q        | V       |         |         |
13+10       0.3037      0.49  |Q        | V       |         |         |
13+15       0.3071      0.49  |Q        | V       |         |         |
13+20       0.3106      0.50  | Q       |  V      |         |         |
13+25       0.3141      0.51  | Q       |  V      |         |         |
13+30       0.3177      0.52  | Q       |  V      |         |         |
13+35       0.3213      0.53  | Q       |  V      |         |         |
13+40       0.3250      0.54  | Q       |  V      |         |         |
13+45       0.3287      0.55  | Q       |  V      |         |         |
13+50       0.3326      0.56  | Q       |   V     |         |         |
13+55       0.3365      0.57  | Q       |   V     |         |         |
14+ 0       0.3405      0.58  | Q       |   V     |         |         |
14+ 5       0.3445      0.59  | Q       |   V     |         |         |
14+10       0.3487      0.60  | Q       |   V     |         |         |
14+15       0.3529      0.62  | Q       |   V     |         |         |
14+20       0.3573      0.63  | Q       |    V    |         |         |
14+25       0.3617      0.65  | Q       |    V    |         |         |
14+30       0.3663      0.66  | Q       |    V    |         |         |
14+35       0.3710      0.68  | Q       |    V    |         |         |
14+40       0.3758      0.70  | Q       |    V    |         |         |
14+45       0.3808      0.72  | Q       |     V   |         |         |
14+50       0.3859      0.74  | Q       |     V   |         |         |
14+55       0.3912      0.77  |  Q      |     V   |         |         |
15+ 0       0.3967      0.80  |  Q      |     V   |         |         |
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15+ 5       0.4024      0.83  |  Q      |     V   |         |         |
15+10       0.4083      0.86  |  Q      |      V  |         |         |
15+15       0.4145      0.90  |  Q      |      V  |         |         |
15+20       0.4210      0.94  |  Q      |      V  |         |         |
15+25       0.4277      0.98  |  Q      |       V |         |         |
15+30       0.4342      0.94  |  Q      |       V |         |         |
15+35       0.4403      0.89  |  Q      |       V |         |         |
15+40       0.4466      0.92  |  Q      |       V |         |         |
15+45       0.4535      0.99  |  Q      |        V|         |         |
15+50       0.4611      1.11  |   Q     |        V|         |         |
15+55       0.4700      1.29  |    Q    |        V|         |         |
16+ 0       0.4814      1.66  |     Q   |         V         |         |
16+ 5       0.5027      3.10  |         | Q       |V        |         |
16+10       0.5608      8.43  |         |         |  V      |  Q      |
16+15       0.6221      8.91  |         |         |     V   |    Q    |
16+20       0.6549      4.75  |         |        Q|      V  |         |
16+25       0.6768      3.18  |         | Q       |       V |         |
16+30       0.6938      2.47  |        Q|         |        V|         |
16+35       0.7078      2.03  |       Q |         |        V|         |
16+40       0.7196      1.72  |     Q   |         |         V         |
16+45       0.7298      1.48  |    Q    |         |         V         |
16+50       0.7387      1.29  |    Q    |         |         |V        |
16+55       0.7465      1.13  |   Q     |         |         |V        |
17+ 0       0.7532      0.98  |  Q      |         |         |V        |
17+ 5       0.7594      0.90  |  Q      |         |         |V        |
17+10       0.7653      0.86  |  Q      |         |         | V       |
17+15       0.7707      0.78  |  Q      |         |         | V       |
17+20       0.7756      0.72  | Q       |         |         | V       |
17+25       0.7798      0.61  | Q       |         |         | V       |
17+30       0.7838      0.58  | Q       |         |         |  V      |
17+35       0.7876      0.56  | Q       |         |         |  V      |
17+40       0.7913      0.54  | Q       |         |         |  V      |
17+45       0.7949      0.52  | Q       |         |         |  V      |
17+50       0.7984      0.50  | Q       |         |         |  V      |
17+55       0.8017      0.49  |Q        |         |         |  V      |
18+ 0       0.8050      0.47  |Q        |         |         |  V      |
18+ 5       0.8081      0.46  |Q        |         |         |   V     |
18+10       0.8112      0.45  |Q        |         |         |   V     |
18+15       0.8142      0.44  |Q        |         |         |   V     |
18+20       0.8172      0.43  |Q        |         |         |   V     |
18+25       0.8200      0.42  |Q        |         |         |   V     |
18+30       0.8228      0.41  |Q        |         |         |   V     |
18+35       0.8256      0.40  |Q        |         |         |   V     |
18+40       0.8283      0.39  |Q        |         |         |   V     |
18+45       0.8309      0.38  |Q        |         |         |   V     |
18+50       0.8335      0.38  |Q        |         |         |    V    |
18+55       0.8360      0.37  |Q        |         |         |    V    |
19+ 0       0.8385      0.36  |Q        |         |         |    V    |
19+ 5       0.8410      0.36  |Q        |         |         |    V    |
19+10       0.8434      0.35  |Q        |         |         |    V    |
```

```
19+15       0.8458      0.34  |Q        |         |         |    V    |
19+20       0.8481      0.34  |Q        |         |         |    V    |
19+25       0.8504      0.33  |Q        |         |         |    V    |
19+30       0.8527      0.33  |Q        |         |         |    V    |
19+35       0.8549      0.32  |Q        |         |         |     V   |
19+40       0.8571      0.32  |Q        |         |         |     V   |
19+45       0.8593      0.32  |Q        |         |         |     V   |
19+50       0.8614      0.31  |Q        |         |         |     V   |
19+55       0.8635      0.31  |Q        |         |         |     V   |
20+ 0       0.8656      0.30  |Q        |         |         |     V   |
20+ 5       0.8677      0.30  |Q        |         |         |     V   |
20+10       0.8697      0.30  |Q        |         |         |     V   |
20+15       0.8718      0.29  |Q        |         |         |     V   |
20+20       0.8737      0.29  |Q        |         |         |     V   |
20+25       0.8757      0.29  |Q        |         |         |     V   |
20+30       0.8777      0.28  |Q        |         |         |     V   |
20+35       0.8796      0.28  |Q        |         |         |      V  |
20+40       0.8815      0.28  |Q        |         |         |      V  |
20+45       0.8834      0.27  |Q        |         |         |      V  |
20+50       0.8852      0.27  |Q        |         |         |      V  |
20+55       0.8871      0.27  |Q        |         |         |      V  |
21+ 0       0.8889      0.27  |Q        |         |         |      V  |
21+ 5       0.8907      0.26  |Q        |         |         |      V  |
21+10       0.8925      0.26  |Q        |         |         |      V  |
21+15       0.8943      0.26  |Q        |         |         |      V  |
21+20       0.8961      0.26  |Q        |         |         |      V  |
21+25       0.8978      0.25  |Q        |         |         |      V  |
21+30       0.8995      0.25  |Q        |         |         |      V  |
21+35       0.9012      0.25  Q         |         |         |      V  |
21+40       0.9029      0.25  Q         |         |         |       V |
21+45       0.9046      0.24  Q         |         |         |       V |
21+50       0.9063      0.24  Q         |         |         |       V |
21+55       0.9079      0.24  Q         |         |         |       V |
22+ 0       0.9096      0.24  Q         |         |         |       V |
22+ 5       0.9112      0.24  Q         |         |         |       V |
22+10       0.9128      0.23  Q         |         |         |       V |
22+15       0.9144      0.23  Q         |         |         |       V |
22+20       0.9160      0.23  Q         |         |         |       V |
22+25       0.9176      0.23  Q         |         |         |       V |
22+30       0.9192      0.23  Q         |         |         |       V |
22+35       0.9207      0.23  Q         |         |         |       V |
22+40       0.9223      0.22  Q         |         |         |       V |
22+45       0.9238      0.22  Q         |         |         |       V |
22+50       0.9253      0.22  Q         |         |         |       V |
22+55       0.9268      0.22  Q         |         |         |        V|
23+ 0       0.9283      0.22  Q         |         |         |        V|
23+ 5       0.9298      0.22  Q         |         |         |        V|
23+10       0.9313      0.21  Q         |         |         |        V|
23+15       0.9328      0.21  Q         |         |         |        V|
23+20       0.9342      0.21  Q         |         |         |        V|
```

```
   23+25        0.9357       0.21  Q          |         |         |        V|
   23+30        0.9371       0.21  Q          |         |         |        V|
   23+35        0.9386       0.21  Q          |         |         |        V|
   23+40        0.9400       0.21  Q          |         |         |        V|
   23+45        0.9414       0.21  Q          |         |         |        V|
   23+50        0.9428       0.20  Q          |         |         |        V|
   23+55        0.9442       0.20  Q          |         |         |        V|
   24+ 0        0.9456       0.20  Q          |         |         |        V|
-----------------------------------------------------------------------
```

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study       Date: 08/16/21
------------------------------------------------------------------------
10 Year Rational Analysis Post Development
Former Track 17486
Drainage Area 1
File: 17486Rat10PostA1.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.692 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   997.200(Ft.)
Top (of initial area) elevation =  3291.300(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =    10.300(Ft.)
Slope =    0.01033  s(%)=       1.03
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.369 min.
Rainfall intensity =      1.795(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.703
Subarea runoff =     10.757(CFS)
Total initial stream area =        8.520(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.520(Ac.)
Runoff from this stream =     10.757(CFS)
Time of concentration =   15.37 min.
Rainfall intensity =     1.795(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   413.100(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00508  s(%)=       0.51
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.449 min.
Rainfall intensity =      2.081(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =      4.209(CFS)
Total initial stream area =        2.770(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.770(Ac.)
Runoff from this stream =      4.209(CFS)
Time of concentration =   12.45 min.
Rainfall intensity =     2.081(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   794.100(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3277.200(Ft.)
Difference in elevation =     5.900(Ft.)
Slope =    0.00743  s(%)=       0.74
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.987 min.
Rainfall intensity =      1.827(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.707
Subarea runoff =      1.976(CFS)
Total initial stream area =       1.530(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.530(Ac.)
```

Runoff from this stream = 1.976(CFS)
Time of concentration = 14.99 min.
Rainfall intensity = 1.827(In/Hr)
Area averaged loss rate (Fm) = 0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	10.76	8.520	15.37	0.393	1.795
2	4.21	2.770	12.45	0.393	2.081
3	1.98	1.530	14.99	0.393	1.827

```
Qmax(1) =
          1.000 *    1.000 *    10.757) +
          0.831 *    1.000 *     4.209) +
          0.978 *    1.000 *     1.976) + =      16.186
Qmax(2) =
          1.203 *    0.810 *    10.757) +
          1.000 *    1.000 *     4.209) +
          1.177 *    0.831 *     1.976) + =      16.625
Qmax(3) =
          1.023 *    0.975 *    10.757) +
          0.850 *    1.000 *     4.209) +
          1.000 *    1.000 *     1.976) + =      16.280
```

Total of 3 streams to confluence:
Flow rates before confluence point:
10.757 4.209 1.976
Maximum flow rates at confluence using above data:
16.186 16.625 16.280
Area of streams before confluence:
8.520 2.770 1.530
Effective area values after confluence:
12.820 10.942 12.608
Results of confluence:
Total flow rate = 16.625(CFS)
Time of concentration = 12.449 min.
Effective stream area after confluence = 10.942(Ac.)
Study area average Pervious fraction(Ap) = 0.500
Study area average soil loss rate(Fm) = 0.393(In/Hr)
Study area total (this main stream) = 12.82(Ac.)
End of computations, Total Study Area = 12.82 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500

Area averaged SCS curve number = 32.0

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  08/13/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
10 Year Unit Hydrograph Post Development
Former Track 17486
Drainage Area 1
File: 17486Hydr10PostA1.out
--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area       Duration       Isohyetal
        (Ac.)           (hours)         (In)
Rainfall data for year 10
            12.82           1           0.69
--------------------------------------------------------------------
Rainfall data for year 10
            12.82           6           1.46
--------------------------------------------------------------------
Rainfall data for year 10
            12.82          24           2.97
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	52.0	12.82	1.000	0.785	0.420	0.330

Area-averaged adjusted loss rate Fm (In/Hr) = 0.330

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
5.38	0.420	32.0	52.0	9.23	0.041
7.44	0.580	98.0	98.0	0.20	0.922

Area-averaged catchment yield fraction, Y = 0.552
Area-averaged low loss fraction, Yb = 0.448
User entry of time of concentration =   0.207 (hours)
++
Watershed area =   12.82(Ac.)
Catchment Lag time =   0.166 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 50.2008
Hydrograph baseflow =   0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.330(In/Hr)
Average low loss rate fraction (Yb) = 0.448 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.328(In)
Computed peak 30-minute rainfall = 0.562(In)
Specified peak 1-hour rainfall = 0.692(In)
Computed peak 3-hour rainfall = 1.094(In)
Specified peak 6-hour rainfall = 1.460(In)
Specified peak 24-hour rainfall = 2.970(In)

Rainfall depth area reduction factors:
Using a total area of   12.82(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999   Adjusted rainfall = 0.328(In)
30-minute factor = 0.999   Adjusted rainfall = 0.562(In)
1-hour factor = 0.999   Adjusted rainfall = 0.692(In)
3-hour factor = 1.000   Adjusted rainfall = 1.094(In)
6-hour factor = 1.000   Adjusted rainfall = 1.460(In)
24-hour factor = 1.000   Adjusted rainfall = 2.970(In)

U n i t   H y d r o g r a p h
+++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 155.04 (CFS))	
1	3.989	6.184
2	30.749	41.489
3	60.742	46.502
4	73.911	20.417
5	81.558	11.856
6	86.696	7.967
7	90.250	5.510
8	92.844	4.021
9	94.808	3.045
10	96.299	2.312
11	97.388	1.687
12	98.073	1.063
13	98.630	0.863
14	99.232	0.933
15	99.674	0.686
16	100.000	0.505

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3282	0.3282
2	0.4040	0.0759
3	0.4563	0.0523
4	0.4974	0.0411
5	0.5318	0.0344
6	0.5617	0.0299
7	0.5883	0.0266
8	0.6124	0.0240
9	0.6344	0.0220
10	0.6548	0.0204
11	0.6738	0.0190
12	0.6916	0.0178
13	0.7151	0.0235
14	0.7375	0.0225
15	0.7591	0.0215
16	0.7798	0.0207
17	0.7997	0.0200
18	0.8190	0.0193
19	0.8377	0.0187
20	0.8558	0.0181
21	0.8734	0.0176
22	0.8906	0.0171
23	0.9072	0.0167
24	0.9235	0.0163
25	0.9393	0.0159
26	0.9548	0.0155

27	0.9700	0.0152
28	0.9848	0.0148
29	0.9993	0.0145
30	1.0136	0.0142
31	1.0275	0.0140
32	1.0412	0.0137
33	1.0547	0.0135
34	1.0679	0.0132
35	1.0809	0.0130
36	1.0937	0.0128
37	1.1062	0.0126
38	1.1186	0.0124
39	1.1308	0.0122
40	1.1428	0.0120
41	1.1546	0.0118
42	1.1662	0.0117
43	1.1777	0.0115
44	1.1891	0.0113
45	1.2002	0.0112
46	1.2113	0.0110
47	1.2222	0.0109
48	1.2330	0.0108
49	1.2436	0.0106
50	1.2541	0.0105
51	1.2645	0.0104
52	1.2748	0.0103
53	1.2849	0.0102
54	1.2950	0.0100
55	1.3049	0.0099
56	1.3148	0.0098
57	1.3245	0.0097
58	1.3341	0.0096
59	1.3437	0.0095
60	1.3531	0.0094
61	1.3625	0.0094
62	1.3717	0.0093
63	1.3809	0.0092
64	1.3900	0.0091
65	1.3990	0.0090
66	1.4080	0.0089
67	1.4168	0.0089
68	1.4256	0.0088
69	1.4343	0.0087
70	1.4429	0.0086
71	1.4515	0.0086
72	1.4599	0.0085
73	1.4703	0.0104
74	1.4806	0.0103
75	1.4908	0.0102
76	1.5009	0.0101

77	1.5110	0.0101
78	1.5210	0.0100
79	1.5310	0.0100
80	1.5409	0.0099
81	1.5507	0.0098
82	1.5605	0.0098
83	1.5702	0.0097
84	1.5799	0.0097
85	1.5895	0.0096
86	1.5991	0.0096
87	1.6086	0.0095
88	1.6180	0.0094
89	1.6274	0.0094
90	1.6367	0.0093
91	1.6460	0.0093
92	1.6553	0.0092
93	1.6645	0.0092
94	1.6736	0.0091
95	1.6827	0.0091
96	1.6918	0.0091
97	1.7008	0.0090
98	1.7097	0.0090
99	1.7186	0.0089
100	1.7275	0.0089
101	1.7363	0.0088
102	1.7451	0.0088
103	1.7539	0.0087
104	1.7626	0.0087
105	1.7712	0.0087
106	1.7798	0.0086
107	1.7884	0.0086
108	1.7970	0.0085
109	1.8055	0.0085
110	1.8139	0.0085
111	1.8224	0.0084
112	1.8308	0.0084
113	1.8391	0.0084
114	1.8474	0.0083
115	1.8557	0.0083
116	1.8640	0.0082
117	1.8722	0.0082
118	1.8804	0.0082
119	1.8885	0.0081
120	1.8966	0.0081
121	1.9047	0.0081
122	1.9127	0.0080
123	1.9208	0.0080
124	1.9287	0.0080
125	1.9367	0.0080
126	1.9446	0.0079

127	1.9525	0.0079
128	1.9604	0.0079
129	1.9682	0.0078
130	1.9760	0.0078
131	1.9838	0.0078
132	1.9915	0.0077
133	1.9992	0.0077
134	2.0069	0.0077
135	2.0146	0.0077
136	2.0222	0.0076
137	2.0298	0.0076
138	2.0374	0.0076
139	2.0449	0.0075
140	2.0525	0.0075
141	2.0600	0.0075
142	2.0674	0.0075
143	2.0749	0.0074
144	2.0823	0.0074
145	2.0897	0.0074
146	2.0971	0.0074
147	2.1044	0.0073
148	2.1117	0.0073
149	2.1190	0.0073
150	2.1263	0.0073
151	2.1335	0.0072
152	2.1408	0.0072
153	2.1480	0.0072
154	2.1552	0.0072
155	2.1623	0.0072
156	2.1695	0.0071
157	2.1766	0.0071
158	2.1837	0.0071
159	2.1907	0.0071
160	2.1978	0.0070
161	2.2048	0.0070
162	2.2118	0.0070
163	2.2188	0.0070
164	2.2257	0.0070
165	2.2327	0.0069
166	2.2396	0.0069
167	2.2465	0.0069
168	2.2534	0.0069
169	2.2603	0.0069
170	2.2671	0.0068
171	2.2739	0.0068
172	2.2807	0.0068
173	2.2875	0.0068
174	2.2943	0.0068
175	2.3010	0.0067
176	2.3077	0.0067

177	2.3144	0.0067
178	2.3211	0.0067
179	2.3278	0.0067
180	2.3345	0.0067
181	2.3411	0.0066
182	2.3477	0.0066
183	2.3543	0.0066
184	2.3609	0.0066
185	2.3675	0.0066
186	2.3740	0.0065
187	2.3805	0.0065
188	2.3870	0.0065
189	2.3935	0.0065
190	2.4000	0.0065
191	2.4065	0.0065
192	2.4129	0.0064
193	2.4194	0.0064
194	2.4258	0.0064
195	2.4322	0.0064
196	2.4385	0.0064
197	2.4449	0.0064
198	2.4513	0.0063
199	2.4576	0.0063
200	2.4639	0.0063
201	2.4702	0.0063
202	2.4765	0.0063
203	2.4828	0.0063
204	2.4890	0.0063
205	2.4953	0.0062
206	2.5015	0.0062
207	2.5077	0.0062
208	2.5139	0.0062
209	2.5201	0.0062
210	2.5263	0.0062
211	2.5324	0.0062
212	2.5386	0.0061
213	2.5447	0.0061
214	2.5508	0.0061
215	2.5569	0.0061
216	2.5630	0.0061
217	2.5691	0.0061
218	2.5751	0.0061
219	2.5812	0.0060
220	2.5872	0.0060
221	2.5932	0.0060
222	2.5992	0.0060
223	2.6052	0.0060
224	2.6112	0.0060
225	2.6172	0.0060
226	2.6231	0.0060

227	2.6290	0.0059
228	2.6350	0.0059
229	2.6409	0.0059
230	2.6468	0.0059
231	2.6527	0.0059
232	2.6586	0.0059
233	2.6644	0.0059
234	2.6703	0.0059
235	2.6761	0.0058
236	2.6819	0.0058
237	2.6878	0.0058
238	2.6936	0.0058
239	2.6993	0.0058
240	2.7051	0.0058
241	2.7109	0.0058
242	2.7167	0.0058
243	2.7224	0.0057
244	2.7281	0.0057
245	2.7339	0.0057
246	2.7396	0.0057
247	2.7453	0.0057
248	2.7509	0.0057
249	2.7566	0.0057
250	2.7623	0.0057
251	2.7679	0.0057
252	2.7736	0.0056
253	2.7792	0.0056
254	2.7848	0.0056
255	2.7905	0.0056
256	2.7961	0.0056
257	2.8016	0.0056
258	2.8072	0.0056
259	2.8128	0.0056
260	2.8184	0.0056
261	2.8239	0.0055
262	2.8294	0.0055
263	2.8350	0.0055
264	2.8405	0.0055
265	2.8460	0.0055
266	2.8515	0.0055
267	2.8570	0.0055
268	2.8624	0.0055
269	2.8679	0.0055
270	2.8734	0.0055
271	2.8788	0.0054
272	2.8843	0.0054
273	2.8897	0.0054
274	2.8951	0.0054
275	2.9005	0.0054
276	2.9059	0.0054

277	2.9113	0.0054
278	2.9167	0.0054
279	2.9220	0.0054
280	2.9274	0.0054
281	2.9328	0.0054
282	2.9381	0.0053
283	2.9434	0.0053
284	2.9487	0.0053
285	2.9541	0.0053
286	2.9594	0.0053
287	2.9647	0.0053
288	2.9700	0.0053

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0053	0.0024	0.0029
2	0.0053	0.0024	0.0029
3	0.0053	0.0024	0.0029
4	0.0053	0.0024	0.0029
5	0.0053	0.0024	0.0029
6	0.0054	0.0024	0.0030
7	0.0054	0.0024	0.0030
8	0.0054	0.0024	0.0030
9	0.0054	0.0024	0.0030
10	0.0054	0.0024	0.0030
11	0.0054	0.0024	0.0030
12	0.0054	0.0024	0.0030
13	0.0055	0.0024	0.0030
14	0.0055	0.0024	0.0030
15	0.0055	0.0025	0.0030
16	0.0055	0.0025	0.0030
17	0.0055	0.0025	0.0030
18	0.0055	0.0025	0.0031
19	0.0055	0.0025	0.0031
20	0.0056	0.0025	0.0031
21	0.0056	0.0025	0.0031
22	0.0056	0.0025	0.0031
23	0.0056	0.0025	0.0031
24	0.0056	0.0025	0.0031
25	0.0056	0.0025	0.0031
26	0.0057	0.0025	0.0031
27	0.0057	0.0025	0.0031
28	0.0057	0.0025	0.0031
29	0.0057	0.0026	0.0032
30	0.0057	0.0026	0.0032
31	0.0057	0.0026	0.0032
32	0.0058	0.0026	0.0032
33	0.0058	0.0026	0.0032

34	0.0058	0.0026	0.0032
35	0.0058	0.0026	0.0032
36	0.0058	0.0026	0.0032
37	0.0059	0.0026	0.0032
38	0.0059	0.0026	0.0032
39	0.0059	0.0026	0.0033
40	0.0059	0.0026	0.0033
41	0.0059	0.0027	0.0033
42	0.0059	0.0027	0.0033
43	0.0060	0.0027	0.0033
44	0.0060	0.0027	0.0033
45	0.0060	0.0027	0.0033
46	0.0060	0.0027	0.0033
47	0.0060	0.0027	0.0033
48	0.0061	0.0027	0.0033
49	0.0061	0.0027	0.0034
50	0.0061	0.0027	0.0034
51	0.0061	0.0027	0.0034
52	0.0061	0.0028	0.0034
53	0.0062	0.0028	0.0034
54	0.0062	0.0028	0.0034
55	0.0062	0.0028	0.0034
56	0.0062	0.0028	0.0034
57	0.0063	0.0028	0.0035
58	0.0063	0.0028	0.0035
59	0.0063	0.0028	0.0035
60	0.0063	0.0028	0.0035
61	0.0063	0.0028	0.0035
62	0.0064	0.0029	0.0035
63	0.0064	0.0029	0.0035
64	0.0064	0.0029	0.0035
65	0.0064	0.0029	0.0036
66	0.0065	0.0029	0.0036
67	0.0065	0.0029	0.0036
68	0.0065	0.0029	0.0036
69	0.0065	0.0029	0.0036
70	0.0066	0.0029	0.0036
71	0.0066	0.0030	0.0036
72	0.0066	0.0030	0.0037
73	0.0067	0.0030	0.0037
74	0.0067	0.0030	0.0037
75	0.0067	0.0030	0.0037
76	0.0067	0.0030	0.0037
77	0.0068	0.0030	0.0037
78	0.0068	0.0030	0.0037
79	0.0068	0.0031	0.0038
80	0.0068	0.0031	0.0038
81	0.0069	0.0031	0.0038
82	0.0069	0.0031	0.0038
83	0.0069	0.0031	0.0038

84	0.0070	0.0031	0.0038
85	0.0070	0.0031	0.0039
86	0.0070	0.0031	0.0039
87	0.0071	0.0032	0.0039
88	0.0071	0.0032	0.0039
89	0.0071	0.0032	0.0039
90	0.0072	0.0032	0.0040
91	0.0072	0.0032	0.0040
92	0.0072	0.0032	0.0040
93	0.0073	0.0033	0.0040
94	0.0073	0.0033	0.0040
95	0.0073	0.0033	0.0041
96	0.0074	0.0033	0.0041
97	0.0074	0.0033	0.0041
98	0.0074	0.0033	0.0041
99	0.0075	0.0034	0.0041
100	0.0075	0.0034	0.0042
101	0.0076	0.0034	0.0042
102	0.0076	0.0034	0.0042
103	0.0077	0.0034	0.0042
104	0.0077	0.0034	0.0042
105	0.0077	0.0035	0.0043
106	0.0078	0.0035	0.0043
107	0.0078	0.0035	0.0043
108	0.0079	0.0035	0.0043
109	0.0079	0.0035	0.0044
110	0.0080	0.0036	0.0044
111	0.0080	0.0036	0.0044
112	0.0080	0.0036	0.0044
113	0.0081	0.0036	0.0045
114	0.0081	0.0036	0.0045
115	0.0082	0.0037	0.0045
116	0.0082	0.0037	0.0046
117	0.0083	0.0037	0.0046
118	0.0084	0.0037	0.0046
119	0.0084	0.0038	0.0047
120	0.0085	0.0038	0.0047
121	0.0085	0.0038	0.0047
122	0.0086	0.0038	0.0047
123	0.0087	0.0039	0.0048
124	0.0087	0.0039	0.0048
125	0.0088	0.0039	0.0048
126	0.0088	0.0040	0.0049
127	0.0089	0.0040	0.0049
128	0.0090	0.0040	0.0049
129	0.0091	0.0041	0.0050
130	0.0091	0.0041	0.0050
131	0.0092	0.0041	0.0051
132	0.0092	0.0041	0.0051
133	0.0093	0.0042	0.0052

134	0.0094	0.0042	0.0052
135	0.0095	0.0043	0.0052
136	0.0096	0.0043	0.0053
137	0.0097	0.0043	0.0053
138	0.0097	0.0044	0.0054
139	0.0098	0.0044	0.0054
140	0.0099	0.0044	0.0055
141	0.0100	0.0045	0.0055
142	0.0101	0.0045	0.0056
143	0.0102	0.0046	0.0056
144	0.0103	0.0046	0.0057
145	0.0085	0.0038	0.0047
146	0.0086	0.0038	0.0047
147	0.0087	0.0039	0.0048
148	0.0088	0.0039	0.0048
149	0.0089	0.0040	0.0049
150	0.0090	0.0040	0.0050
151	0.0092	0.0041	0.0051
152	0.0093	0.0042	0.0051
153	0.0094	0.0042	0.0052
154	0.0095	0.0043	0.0053
155	0.0097	0.0044	0.0054
156	0.0098	0.0044	0.0054
157	0.0100	0.0045	0.0055
158	0.0102	0.0046	0.0056
159	0.0104	0.0047	0.0057
160	0.0105	0.0047	0.0058
161	0.0108	0.0048	0.0059
162	0.0109	0.0049	0.0060
163	0.0112	0.0050	0.0062
164	0.0113	0.0051	0.0063
165	0.0117	0.0052	0.0064
166	0.0118	0.0053	0.0065
167	0.0122	0.0055	0.0067
168	0.0124	0.0055	0.0068
169	0.0128	0.0057	0.0071
170	0.0130	0.0058	0.0072
171	0.0135	0.0060	0.0074
172	0.0137	0.0061	0.0076
173	0.0142	0.0064	0.0079
174	0.0145	0.0065	0.0080
175	0.0152	0.0068	0.0084
176	0.0155	0.0069	0.0086
177	0.0163	0.0073	0.0090
178	0.0167	0.0075	0.0092
179	0.0176	0.0079	0.0097
180	0.0181	0.0081	0.0100
181	0.0193	0.0086	0.0107
182	0.0200	0.0089	0.0110
183	0.0215	0.0096	0.0119

184	0.0225	0.0101	0.0124
185	0.0178	0.0080	0.0098
186	0.0190	0.0085	0.0105
187	0.0220	0.0099	0.0122
188	0.0240	0.0108	0.0133
189	0.0299	0.0134	0.0165
190	0.0344	0.0154	0.0190
191	0.0523	0.0234	0.0288
192	0.0759	0.0275	0.0484
193	0.3282	0.0275	0.3007
194	0.0411	0.0184	0.0227
195	0.0266	0.0119	0.0147
196	0.0204	0.0091	0.0112
197	0.0235	0.0105	0.0130
198	0.0207	0.0093	0.0114
199	0.0187	0.0084	0.0103
200	0.0171	0.0077	0.0094
201	0.0159	0.0071	0.0088
202	0.0148	0.0066	0.0082
203	0.0140	0.0063	0.0077
204	0.0132	0.0059	0.0073
205	0.0126	0.0056	0.0069
206	0.0120	0.0054	0.0066
207	0.0115	0.0051	0.0063
208	0.0110	0.0049	0.0061
209	0.0106	0.0048	0.0059
210	0.0103	0.0046	0.0057
211	0.0099	0.0045	0.0055
212	0.0096	0.0043	0.0053
213	0.0094	0.0042	0.0052
214	0.0091	0.0041	0.0050
215	0.0089	0.0040	0.0049
216	0.0086	0.0039	0.0048
217	0.0104	0.0046	0.0057
218	0.0101	0.0045	0.0056
219	0.0100	0.0045	0.0055
220	0.0098	0.0044	0.0054
221	0.0096	0.0043	0.0053
222	0.0094	0.0042	0.0052
223	0.0093	0.0042	0.0051
224	0.0091	0.0041	0.0050
225	0.0090	0.0040	0.0050
226	0.0089	0.0040	0.0049
227	0.0087	0.0039	0.0048
228	0.0086	0.0039	0.0048
229	0.0085	0.0038	0.0047
230	0.0084	0.0038	0.0046
231	0.0083	0.0037	0.0046
232	0.0082	0.0037	0.0045
233	0.0081	0.0036	0.0045

234	0.0080	0.0036	0.0044
235	0.0079	0.0035	0.0044
236	0.0078	0.0035	0.0043
237	0.0077	0.0035	0.0043
238	0.0076	0.0034	0.0042
239	0.0075	0.0034	0.0042
240	0.0075	0.0033	0.0041
241	0.0074	0.0033	0.0041
242	0.0073	0.0033	0.0040
243	0.0072	0.0032	0.0040
244	0.0072	0.0032	0.0040
245	0.0071	0.0032	0.0039
246	0.0070	0.0032	0.0039
247	0.0070	0.0031	0.0039
248	0.0069	0.0031	0.0038
249	0.0069	0.0031	0.0038
250	0.0068	0.0030	0.0038
251	0.0067	0.0030	0.0037
252	0.0067	0.0030	0.0037
253	0.0066	0.0030	0.0037
254	0.0066	0.0029	0.0036
255	0.0065	0.0029	0.0036
256	0.0065	0.0029	0.0036
257	0.0064	0.0029	0.0035
258	0.0064	0.0029	0.0035
259	0.0063	0.0028	0.0035
260	0.0063	0.0028	0.0035
261	0.0062	0.0028	0.0034
262	0.0062	0.0028	0.0034
263	0.0062	0.0028	0.0034
264	0.0061	0.0027	0.0034
265	0.0061	0.0027	0.0034
266	0.0060	0.0027	0.0033
267	0.0060	0.0027	0.0033
268	0.0060	0.0027	0.0033
269	0.0059	0.0026	0.0033
270	0.0059	0.0026	0.0032
271	0.0058	0.0026	0.0032
272	0.0058	0.0026	0.0032
273	0.0058	0.0026	0.0032
274	0.0057	0.0026	0.0032
275	0.0057	0.0026	0.0031
276	0.0057	0.0025	0.0031
277	0.0056	0.0025	0.0031
278	0.0056	0.0025	0.0031
279	0.0056	0.0025	0.0031
280	0.0055	0.0025	0.0031
281	0.0055	0.0025	0.0030
282	0.0055	0.0025	0.0030
283	0.0054	0.0024	0.0030

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     284              0.0054           0.0024             0.0030
     285              0.0054           0.0024             0.0030
     286              0.0054           0.0024             0.0030
     287              0.0053           0.0024             0.0029
     288              0.0053           0.0024             0.0029
     --------------------------------------------------------------------
     --------------------------------------------------------------------
     Total soil rain loss =      1.20(In)
     Total effective rainfall =      1.77(In)
     Peak flow rate in flood hydrograph =     16.76(CFS)
     ---------------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        24 - H O U R   S T O R M
                   R u n o f f     H y d r o g r a p h
     --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

     --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        5.0      10.0      15.0      20.0
-----------------------------------------------------------------------
  0+ 5       0.0001      0.02  Q        |         |         |         |
  0+10       0.0011      0.14  Q        |         |         |         |
  0+15       0.0030      0.28  Q        |         |         |         |
  0+20       0.0053      0.34  Q        |         |         |         |
  0+25       0.0078      0.37  Q        |         |         |         |
  0+30       0.0106      0.40  Q        |         |         |         |
  0+35       0.0134      0.41  Q        |         |         |         |
  0+40       0.0163      0.42  Q        |         |         |         |
  0+45       0.0193      0.43  Q        |         |         |         |
  0+50       0.0224      0.44  Q        |         |         |         |
  0+55       0.0255      0.45  Q        |         |         |         |
  1+ 0       0.0286      0.45  Q        |         |         |         |
  1+ 5       0.0317      0.46  Q        |         |         |         |
  1+10       0.0349      0.46  Q        |         |         |         |
  1+15       0.0381      0.46  Q        |         |         |         |
  1+20       0.0413      0.47  Q        |         |         |         |
  1+25       0.0445      0.47  Q        |         |         |         |
  1+30       0.0478      0.47  QV       |         |         |         |
  1+35       0.0510      0.47  QV       |         |         |         |
  1+40       0.0543      0.47  QV       |         |         |         |
  1+45       0.0575      0.47  QV       |         |         |         |
  1+50       0.0608      0.47  QV       |         |         |         |
  1+55       0.0641      0.48  QV       |         |         |         |
  2+ 0       0.0674      0.48  QV       |         |         |         |
  2+ 5       0.0707      0.48  QV       |         |         |         |
  2+10       0.0740      0.48  QV       |         |         |         |
  2+15       0.0773      0.48  QV       |         |         |         |
  2+20       0.0806      0.48  QV       |         |         |         |
  2+25       0.0839      0.48  QV       |         |         |         |
  2+30       0.0873      0.49  QV       |         |         |         |
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2+35       0.0906      0.49  QV         |         |         |         |
2+40       0.0940      0.49  QV         |         |         |         |
2+45       0.0974      0.49  Q V        |         |         |         |
2+50       0.1008      0.49  Q V        |         |         |         |
2+55       0.1042      0.49  Q V        |         |         |         |
3+ 0       0.1076      0.49  Q V        |         |         |         |
3+ 5       0.1110      0.50  Q V        |         |         |         |
3+10       0.1144      0.50  Q V        |         |         |         |
3+15       0.1179      0.50  Q V        |         |         |         |
3+20       0.1213      0.50  |QV        |         |         |         |
3+25       0.1248      0.50  |QV        |         |         |         |
3+30       0.1282      0.50  |QV        |         |         |         |
3+35       0.1317      0.51  |QV        |         |         |         |
3+40       0.1352      0.51  |QV        |         |         |         |
3+45       0.1387      0.51  |QV        |         |         |         |
3+50       0.1422      0.51  |Q V       |         |         |         |
3+55       0.1458      0.51  |Q V       |         |         |         |
4+ 0       0.1493      0.51  |Q V       |         |         |         |
4+ 5       0.1528      0.52  |Q V       |         |         |         |
4+10       0.1564      0.52  |Q V       |         |         |         |
4+15       0.1600      0.52  |Q V       |         |         |         |
4+20       0.1636      0.52  |Q V       |         |         |         |
4+25       0.1672      0.52  |Q V       |         |         |         |
4+30       0.1708      0.52  |Q V       |         |         |         |
4+35       0.1744      0.53  |Q V       |         |         |         |
4+40       0.1780      0.53  |Q V       |         |         |         |
4+45       0.1817      0.53  |Q V       |         |         |         |
4+50       0.1853      0.53  |Q V       |         |         |         |
4+55       0.1890      0.53  |Q  V      |         |         |         |
5+ 0       0.1927      0.54  |Q  V      |         |         |         |
5+ 5       0.1964      0.54  |Q  V      |         |         |         |
5+10       0.2001      0.54  |Q  V      |         |         |         |
5+15       0.2038      0.54  |Q  V      |         |         |         |
5+20       0.2076      0.54  |Q  V      |         |         |         |
5+25       0.2113      0.55  |Q  V      |         |         |         |
5+30       0.2151      0.55  |Q  V      |         |         |         |
5+35       0.2189      0.55  |Q  V      |         |         |         |
5+40       0.2227      0.55  |Q  V      |         |         |         |
5+45       0.2265      0.55  |Q  V      |         |         |         |
5+50       0.2303      0.56  |Q  V      |         |         |         |
5+55       0.2342      0.56  |Q  V      |         |         |         |
6+ 0       0.2380      0.56  |Q   V     |         |         |         |
6+ 5       0.2419      0.56  |Q   V     |         |         |         |
6+10       0.2458      0.56  |Q   V     |         |         |         |
6+15       0.2497      0.57  |Q   V     |         |         |         |
6+20       0.2536      0.57  |Q   V     |         |         |         |
6+25       0.2576      0.57  |Q   V     |         |         |         |
6+30       0.2615      0.57  |Q   V     |         |         |         |
6+35       0.2655      0.58  |Q   V     |         |         |         |
6+40       0.2695      0.58  |Q   V     |         |         |         |
```

```
 6+45       0.2735     0.58  |Q   V    |         |         |         |
 6+50       0.2775     0.58  |Q   V    |         |         |         |
 6+55       0.2815     0.59  |Q   V    |         |         |         |
 7+ 0       0.2856     0.59  |Q    V   |         |         |         |
 7+ 5       0.2896     0.59  |Q    V   |         |         |         |
 7+10       0.2937     0.59  |Q    V   |         |         |         |
 7+15       0.2978     0.60  |Q    V   |         |         |         |
 7+20       0.3020     0.60  |Q    V   |         |         |         |
 7+25       0.3061     0.60  |Q    V   |         |         |         |
 7+30       0.3103     0.60  |Q    V   |         |         |         |
 7+35       0.3145     0.61  |Q    V   |         |         |         |
 7+40       0.3187     0.61  |Q    V   |         |         |         |
 7+45       0.3229     0.61  |Q    V   |         |         |         |
 7+50       0.3271     0.62  |Q    V   |         |         |         |
 7+55       0.3314     0.62  |Q     V  |         |         |         |
 8+ 0       0.3357     0.62  |Q     V  |         |         |         |
 8+ 5       0.3400     0.63  |Q     V  |         |         |         |
 8+10       0.3443     0.63  |Q     V  |         |         |         |
 8+15       0.3487     0.63  |Q     V  |         |         |         |
 8+20       0.3531     0.63  |Q     V  |         |         |         |
 8+25       0.3574     0.64  |Q     V  |         |         |         |
 8+30       0.3619     0.64  |Q     V  |         |         |         |
 8+35       0.3663     0.64  |Q     V  |         |         |         |
 8+40       0.3708     0.65  |Q     V  |         |         |         |
 8+45       0.3753     0.65  |Q     V  |         |         |         |
 8+50       0.3798     0.66  |Q      V |         |         |         |
 8+55       0.3843     0.66  |Q      V |         |         |         |
 9+ 0       0.3889     0.66  |Q      V |         |         |         |
 9+ 5       0.3935     0.67  |Q      V |         |         |         |
 9+10       0.3981     0.67  |Q      V |         |         |         |
 9+15       0.4027     0.67  |Q      V |         |         |         |
 9+20       0.4074     0.68  |Q      V |         |         |         |
 9+25       0.4121     0.68  |Q      V |         |         |         |
 9+30       0.4168     0.69  |Q      V |         |         |         |
 9+35       0.4215     0.69  |Q      V |         |         |         |
 9+40       0.4263     0.69  |Q       V|         |         |         |
 9+45       0.4311     0.70  |Q       V|         |         |         |
 9+50       0.4360     0.70  |Q       V|         |         |         |
 9+55       0.4408     0.71  |Q       V|         |         |         |
10+ 0       0.4458     0.71  |Q       V|         |         |         |
10+ 5       0.4507     0.72  |Q       V|         |         |         |
10+10       0.4557     0.72  |Q       V|         |         |         |
10+15       0.4607     0.73  |Q       V|         |         |         |
10+20       0.4657     0.73  |Q       V|         |         |         |
10+25       0.4708     0.74  |Q       V|         |         |         |
10+30       0.4759     0.74  |Q        V         |         |         |
10+35       0.4810     0.75  |Q        V         |         |         |
10+40       0.4862     0.75  |Q        V         |         |         |
10+45       0.4914     0.76  |Q        V         |         |         |
10+50       0.4966     0.76  |Q        V         |         |         |
```

```
10+55       0.5019      0.77  |Q        V         |         |         |
11+ 0       0.5073      0.77  |Q        V         |         |         |
11+ 5       0.5126      0.78  |Q        V         |         |         |
11+10       0.5181      0.79  |Q        V         |         |         |
11+15       0.5235      0.79  |Q        |V        |         |         |
11+20       0.5290      0.80  |Q        |V        |         |         |
11+25       0.5346      0.81  |Q        |V        |         |         |
11+30       0.5402      0.81  |Q        |V        |         |         |
11+35       0.5458      0.82  |Q        |V        |         |         |
11+40       0.5515      0.83  |Q        |V        |         |         |
11+45       0.5573      0.83  |Q        |V        |         |         |
11+50       0.5630      0.84  |Q        |V        |         |         |
11+55       0.5689      0.85  |Q        | V       |         |         |
12+ 0       0.5748      0.86  |Q        | V       |         |         |
12+ 5       0.5807      0.86  |Q        | V       |         |         |
12+10       0.5864      0.82  |Q        | V       |         |         |
12+15       0.5918      0.78  |Q        | V       |         |         |
12+20       0.5971      0.77  |Q        | V       |         |         |
12+25       0.6023      0.77  |Q        | V       |         |         |
12+30       0.6076      0.77  |Q        | V       |         |         |
12+35       0.6129      0.77  |Q        |  V      |         |         |
12+40       0.6183      0.78  |Q        |  V      |         |         |
12+45       0.6237      0.78  |Q        |  V      |         |         |
12+50       0.6291      0.79  |Q        |  V      |         |         |
12+55       0.6346      0.80  |Q        |  V      |         |         |
13+ 0       0.6402      0.81  |Q        |  V      |         |         |
13+ 5       0.6459      0.82  |Q        |  V      |         |         |
13+10       0.6516      0.83  |Q        |  V      |         |         |
13+15       0.6575      0.85  |Q        |  V      |         |         |
13+20       0.6634      0.86  |Q        |   V     |         |         |
13+25       0.6694      0.87  |Q        |   V     |         |         |
13+30       0.6755      0.89  |Q        |   V     |         |         |
13+35       0.6818      0.91  |Q        |   V     |         |         |
13+40       0.6881      0.92  |Q        |   V     |         |         |
13+45       0.6946      0.94  |Q        |   V     |         |         |
13+50       0.7012      0.96  |Q        |   V     |         |         |
13+55       0.7079      0.98  |Q        |    V    |         |         |
14+ 0       0.7148      1.00  |Q        |    V    |         |         |
14+ 5       0.7218      1.02  | Q       |    V    |         |         |
14+10       0.7290      1.04  | Q       |    V    |         |         |
14+15       0.7364      1.07  | Q       |    V    |         |         |
14+20       0.7439      1.10  | Q       |    V    |         |         |
14+25       0.7517      1.12  | Q       |    V    |         |         |
14+30       0.7596      1.15  | Q       |     V   |         |         |
14+35       0.7678      1.19  | Q       |     V   |         |         |
14+40       0.7762      1.22  | Q       |     V   |         |         |
14+45       0.7849      1.26  | Q       |     V   |         |         |
14+50       0.7939      1.30  | Q       |     V   |         |         |
14+55       0.8032      1.35  | Q       |      V  |         |         |
15+ 0       0.8128      1.40  | Q       |      V  |         |         |
```

Time(h+min)	Volume (AC*FT)	Q(CFS)
15+ 5	0.8228	1.46
15+10	0.8333	1.52
15+15	0.8442	1.59
15+20	0.8557	1.67
15+25	0.8677	1.74
15+30	0.8794	1.70
15+35	0.8908	1.65
15+40	0.9026	1.72
15+45	0.9155	1.86
15+50	0.9299	2.10
15+55	0.9468	2.46
16+ 0	0.9688	3.19
16+ 5	1.0110	6.13
16+10	1.1216	16.05
16+15	1.2370	16.76
16+20	1.2989	8.98
16+25	1.3404	6.02
16+30	1.3723	4.64
16+35	1.3984	3.78
16+40	1.4202	3.17
16+45	1.4389	2.71
16+50	1.4550	2.35
16+55	1.4690	2.03
17+ 0	1.4811	1.75
17+ 5	1.4921	1.60
17+10	1.5027	1.53
17+15	1.5122	1.38
17+20	1.5209	1.25
17+25	1.5281	1.06
17+30	1.5351	1.01
17+35	1.5417	0.96
17+40	1.5481	0.93
17+45	1.5542	0.89
17+50	1.5602	0.86
17+55	1.5659	0.83
18+ 0	1.5715	0.81
18+ 5	1.5769	0.79
18+10	1.5825	0.81
18+15	1.5883	0.84
18+20	1.5942	0.85
18+25	1.6000	0.84
18+30	1.6057	0.83
18+35	1.6114	0.82
18+40	1.6170	0.81
18+45	1.6225	0.80
18+50	1.6279	0.79
18+55	1.6333	0.78
19+ 0	1.6386	0.77
19+ 5	1.6438	0.76
19+10	1.6490	0.75

Plot scale: 0, 5.0, 10, 15, 20

Q = 9.83 CFS

t = 16+6.86

Q = 16.76 CFS

t = 16+19.5

V = 0.5*(16.76 - 9.83)*
(16+19.5 - 16+6.86)*(60)
= 2,619 CU FT

Q = 9.83 CFS

```
19+15       1.6541      0.74  |Q        |         |         |    V    |
19+20       1.6591      0.73  |Q        |         |         |    V    |
19+25       1.6640      0.72  |Q        |         |         |    V    |
19+30       1.6689      0.71  |Q        |         |         |    V    |
19+35       1.6737      0.70  |Q        |         |         |    V    |
19+40       1.6785      0.69  |Q        |         |         |    V    |
19+45       1.6832      0.68  |Q        |         |         |    V    |
19+50       1.6879      0.68  |Q        |         |         |    V    |
19+55       1.6925      0.67  |Q        |         |         |    V    |
20+ 0       1.6970      0.66  |Q        |         |         |     V   |
20+ 5       1.7015      0.65  |Q        |         |         |     V   |
20+10       1.7060      0.65  |Q        |         |         |     V   |
20+15       1.7104      0.64  |Q        |         |         |     V   |
20+20       1.7148      0.63  |Q        |         |         |     V   |
20+25       1.7191      0.63  |Q        |         |         |     V   |
20+30       1.7234      0.62  |Q        |         |         |     V   |
20+35       1.7276      0.61  |Q        |         |         |     V   |
20+40       1.7318      0.61  |Q        |         |         |     V   |
20+45       1.7359      0.60  |Q        |         |         |     V   |
20+50       1.7401      0.60  |Q        |         |         |     V   |
20+55       1.7441      0.59  |Q        |         |         |      V  |
21+ 0       1.7482      0.59  |Q        |         |         |      V  |
21+ 5       1.7522      0.58  |Q        |         |         |      V  |
21+10       1.7562      0.58  |Q        |         |         |      V  |
21+15       1.7601      0.57  |Q        |         |         |      V  |
21+20       1.7640      0.57  |Q        |         |         |      V  |
21+25       1.7679      0.56  |Q        |         |         |      V  |
21+30       1.7718      0.56  |Q        |         |         |      V  |
21+35       1.7756      0.55  |Q        |         |         |      V  |
21+40       1.7794      0.55  |Q        |         |         |      V  |
21+45       1.7831      0.55  |Q        |         |         |      V  |
21+50       1.7869      0.54  |Q        |         |         |      V  |
21+55       1.7906      0.54  |Q        |         |         |      V  |
22+ 0       1.7943      0.53  |Q        |         |         |       V |
22+ 5       1.7979      0.53  |Q        |         |         |       V |
22+10       1.8015      0.53  |Q        |         |         |       V |
22+15       1.8051      0.52  |Q        |         |         |       V |
22+20       1.8087      0.52  |Q        |         |         |       V |
22+25       1.8123      0.52  |Q        |         |         |       V |
22+30       1.8158      0.51  |Q        |         |         |       V |
22+35       1.8193      0.51  |Q        |         |         |       V |
22+40       1.8228      0.51  |Q        |         |         |       V |
22+45       1.8263      0.50  |Q        |         |         |       V |
22+50       1.8297      0.50  Q         |         |         |       V |
22+55       1.8331      0.50  Q         |         |         |       V |
23+ 0       1.8365      0.49  Q         |         |         |       V |
23+ 5       1.8399      0.49  Q         |         |         |        V|
23+10       1.8433      0.49  Q         |         |         |        V|
23+15       1.8466      0.48  Q         |         |         |        V|
23+20       1.8499      0.48  Q         |         |         |        V|
```

```
  23+25        1.8532       0.48  Q          |         |         |        V|
  23+30        1.8565       0.48  Q          |         |         |        V|
  23+35        1.8598       0.47  Q          |         |         |        V|
  23+40        1.8630       0.47  Q          |         |         |        V|
  23+45        1.8663       0.47  Q          |         |         |        V|
  23+50        1.8695       0.47  Q          |         |         |        V|
  23+55        1.8727       0.46  Q          |         |         |        V|
  24+ 0        1.8758       0.46  Q          |         |         |        V|
-----------------------------------------------------------------------
```

RATIONAL METHOD &

UNIT HYDROGRAPH HYDROLOGY

ONSITE PRE-DEVELOPED

10-YEAR

STORM EVENTS

DRAINAGE AREA 1

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study        Date: 08/13/21
------------------------------------------------------------------------
10 Year Rational Analysis Pre Development
Former Track 17846
Drainage Area 2
File: 17486Rat10PreA2.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.692 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532(In/Hr)
Initial subarea data:
Initial area flow distance =   708.700(Ft.)
Top (of initial area) elevation =  3293.000(Ft.)
Bottom (of initial area) elevation =  3284.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01270  s(%)=       1.27
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   23.347 min.
Rainfall intensity =      1.340(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.542
Subarea runoff =      5.123(CFS)
Total initial stream area =       7.050(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.532(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.172(Ft.), Average velocity =   1.167(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.43
        2             60.04              0.00
        3            150.00              0.43
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      6.013(CFS)
  '     '        flow top width =     59.949(Ft.)
  '     '    velocity=    1.167(Ft/s)
  '     '        area =      5.151(Sq.Ft)
  '     '        Froude number =     0.702

Upstream point elevation =  3284.000(Ft.)
Downstream point elevation =  3279.000(Ft.)
Flow length =   341.400(Ft.)
Travel time  =    4.87 min.
Time of concentration =   28.22 min.
Depth of flow =   0.172(Ft.)
Average velocity =   1.167(Ft/s)
Total irregular channel flow =     6.013(CFS)
Irregular channel normal depth above invert elev. =   0.172(Ft.)
Average velocity of channel(s) =   1.167(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532(In/Hr)
Rainfall intensity =      1.173(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.492
Subarea runoff =      1.717(CFS) for    4.810(Ac.)
Total runoff =      6.840(CFS)
Effective area this stream =       11.86(Ac.)
Total Study Area (Main Stream No. 1) =       11.86(Ac.)
Area averaged Fm value =    0.532(In/Hr)
Depth of flow =   0.180(Ft.), Average velocity =   1.205(Ft/s)
End of computations, Total Study Area =           11.86 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  50.0
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  08/13/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
10 Year Unit Hydrograph Pre Development For HCOC
Former Track 17486
Drainage Area 2
File: 17486Hydr10PreA2.out
--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)            (hours)         (In)
Rainfall data for year 10
            12.82           1           0.69
--------------------------------------------------------------------
Rainfall data for year 10
            12.82           6           1.46
--------------------------------------------------------------------
Rainfall data for year 10
            12.82          24           2.97
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 50.0      70.0         12.82      1.000     0.532    1.000    0.532

Area-averaged adjusted loss rate Fm (In/Hr) =  0.532

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
    12.82   1.000         50.0      70.0       4.29     0.235

Area-averaged catchment yield fraction, Y =  0.235
Area-averaged low loss fraction, Yb =  0.765
User entry of time of concentration  =   0.470 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      12.82(Ac.)
Catchment Lag time =   0.376 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 22.1631
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.532(In/Hr)
Average low loss rate fraction (Yb) = 0.765 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.328(In)
Computed peak 30-minute rainfall =  0.562(In)
Specified peak 1-hour rainfall =  0.692(In)
Computed peak 3-hour rainfall =  1.094(In)
Specified peak 6-hour rainfall =  1.460(In)
Specified peak 24-hour rainfall =  2.970(In)


Rainfall depth area reduction factors:
Using a total area of      12.82(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.328(In)
30-minute factor = 0.999    Adjusted rainfall =  0.562(In)
1-hour factor = 0.999       Adjusted rainfall =  0.692(In)
3-hour factor = 1.000       Adjusted rainfall =  1.094(In)
6-hour factor = 1.000       Adjusted rainfall =  1.460(In)
24-hour factor = 1.000      Adjusted rainfall =  2.970(In)
---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
```

Number	Mean values	((CFS))
	(K = 155.04 (CFS))	
1	1.144	1.773
2	5.352	6.524
3	14.320	13.904
4	33.220	29.303
5	49.513	25.262
6	59.996	16.253
7	66.895	10.696
8	72.193	8.213
9	76.330	6.414
10	79.692	5.213
11	82.427	4.240
12	84.758	3.614
13	86.834	3.219
14	88.588	2.721
15	89.977	2.153
16	91.234	1.949
17	92.353	1.735
18	93.366	1.570
19	94.240	1.356
20	94.994	1.169
21	95.705	1.102
22	96.289	0.906
23	96.848	0.867
24	97.275	0.662
25	97.671	0.614
26	97.952	0.435
27	98.173	0.344
28	98.414	0.373
29	98.680	0.412
30	98.946	0.412
31	99.212	0.412
32	99.467	0.395
33	99.627	0.248
34	99.765	0.215
35	99.904	0.215
36	100.000	0.149

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3282	0.3282
2	0.4040	0.0759
3	0.4563	0.0523
4	0.4974	0.0411
5	0.5318	0.0344
6	0.5617	0.0299
7	0.5883	0.0266

8	0.6124	0.0240
9	0.6344	0.0220
10	0.6548	0.0204
11	0.6738	0.0190
12	0.6916	0.0178
13	0.7151	0.0235
14	0.7375	0.0225
15	0.7591	0.0215
16	0.7798	0.0207
17	0.7997	0.0200
18	0.8190	0.0193
19	0.8377	0.0187
20	0.8558	0.0181
21	0.8734	0.0176
22	0.8906	0.0171
23	0.9072	0.0167
24	0.9235	0.0163
25	0.9393	0.0159
26	0.9548	0.0155
27	0.9700	0.0152
28	0.9848	0.0148
29	0.9993	0.0145
30	1.0136	0.0142
31	1.0275	0.0140
32	1.0412	0.0137
33	1.0547	0.0135
34	1.0679	0.0132
35	1.0809	0.0130
36	1.0937	0.0128
37	1.1062	0.0126
38	1.1186	0.0124
39	1.1308	0.0122
40	1.1428	0.0120
41	1.1546	0.0118
42	1.1662	0.0117
43	1.1777	0.0115
44	1.1891	0.0113
45	1.2002	0.0112
46	1.2113	0.0110
47	1.2222	0.0109
48	1.2330	0.0108
49	1.2436	0.0106
50	1.2541	0.0105
51	1.2645	0.0104
52	1.2748	0.0103
53	1.2849	0.0102
54	1.2950	0.0100
55	1.3049	0.0099
56	1.3148	0.0098
57	1.3245	0.0097

58	1.3341	0.0096
59	1.3437	0.0095
60	1.3531	0.0094
61	1.3625	0.0094
62	1.3717	0.0093
63	1.3809	0.0092
64	1.3900	0.0091
65	1.3990	0.0090
66	1.4080	0.0089
67	1.4168	0.0089
68	1.4256	0.0088
69	1.4343	0.0087
70	1.4429	0.0086
71	1.4515	0.0086
72	1.4599	0.0085
73	1.4703	0.0104
74	1.4806	0.0103
75	1.4908	0.0102
76	1.5009	0.0101
77	1.5110	0.0101
78	1.5210	0.0100
79	1.5310	0.0100
80	1.5409	0.0099
81	1.5507	0.0098
82	1.5605	0.0098
83	1.5702	0.0097
84	1.5799	0.0097
85	1.5895	0.0096
86	1.5991	0.0096
87	1.6086	0.0095
88	1.6180	0.0094
89	1.6274	0.0094
90	1.6367	0.0093
91	1.6460	0.0093
92	1.6553	0.0092
93	1.6645	0.0092
94	1.6736	0.0091
95	1.6827	0.0091
96	1.6918	0.0091
97	1.7008	0.0090
98	1.7097	0.0090
99	1.7186	0.0089
100	1.7275	0.0089
101	1.7363	0.0088
102	1.7451	0.0088
103	1.7539	0.0087
104	1.7626	0.0087
105	1.7712	0.0087
106	1.7798	0.0086
107	1.7884	0.0086

108	1.7970	0.0085
109	1.8055	0.0085
110	1.8139	0.0085
111	1.8224	0.0084
112	1.8308	0.0084
113	1.8391	0.0084
114	1.8474	0.0083
115	1.8557	0.0083
116	1.8640	0.0082
117	1.8722	0.0082
118	1.8804	0.0082
119	1.8885	0.0081
120	1.8966	0.0081
121	1.9047	0.0081
122	1.9127	0.0080
123	1.9208	0.0080
124	1.9287	0.0080
125	1.9367	0.0080
126	1.9446	0.0079
127	1.9525	0.0079
128	1.9604	0.0079
129	1.9682	0.0078
130	1.9760	0.0078
131	1.9838	0.0078
132	1.9915	0.0077
133	1.9992	0.0077
134	2.0069	0.0077
135	2.0146	0.0077
136	2.0222	0.0076
137	2.0298	0.0076
138	2.0374	0.0076
139	2.0449	0.0075
140	2.0525	0.0075
141	2.0600	0.0075
142	2.0674	0.0075
143	2.0749	0.0074
144	2.0823	0.0074
145	2.0897	0.0074
146	2.0971	0.0074
147	2.1044	0.0073
148	2.1117	0.0073
149	2.1190	0.0073
150	2.1263	0.0073
151	2.1335	0.0072
152	2.1408	0.0072
153	2.1480	0.0072
154	2.1552	0.0072
155	2.1623	0.0072
156	2.1695	0.0071
157	2.1766	0.0071

158	2.1837	0.0071
159	2.1907	0.0071
160	2.1978	0.0070
161	2.2048	0.0070
162	2.2118	0.0070
163	2.2188	0.0070
164	2.2257	0.0070
165	2.2327	0.0069
166	2.2396	0.0069
167	2.2465	0.0069
168	2.2534	0.0069
169	2.2603	0.0069
170	2.2671	0.0068
171	2.2739	0.0068
172	2.2807	0.0068
173	2.2875	0.0068
174	2.2943	0.0068
175	2.3010	0.0067
176	2.3077	0.0067
177	2.3144	0.0067
178	2.3211	0.0067
179	2.3278	0.0067
180	2.3345	0.0067
181	2.3411	0.0066
182	2.3477	0.0066
183	2.3543	0.0066
184	2.3609	0.0066
185	2.3675	0.0066
186	2.3740	0.0065
187	2.3805	0.0065
188	2.3870	0.0065
189	2.3935	0.0065
190	2.4000	0.0065
191	2.4065	0.0065
192	2.4129	0.0064
193	2.4194	0.0064
194	2.4258	0.0064
195	2.4322	0.0064
196	2.4385	0.0064
197	2.4449	0.0064
198	2.4513	0.0063
199	2.4576	0.0063
200	2.4639	0.0063
201	2.4702	0.0063
202	2.4765	0.0063
203	2.4828	0.0063
204	2.4890	0.0063
205	2.4953	0.0062
206	2.5015	0.0062
207	2.5077	0.0062

208	2.5139	0.0062
209	2.5201	0.0062
210	2.5263	0.0062
211	2.5324	0.0062
212	2.5386	0.0061
213	2.5447	0.0061
214	2.5508	0.0061
215	2.5569	0.0061
216	2.5630	0.0061
217	2.5691	0.0061
218	2.5751	0.0061
219	2.5812	0.0060
220	2.5872	0.0060
221	2.5932	0.0060
222	2.5992	0.0060
223	2.6052	0.0060
224	2.6112	0.0060
225	2.6172	0.0060
226	2.6231	0.0060
227	2.6290	0.0059
228	2.6350	0.0059
229	2.6409	0.0059
230	2.6468	0.0059
231	2.6527	0.0059
232	2.6586	0.0059
233	2.6644	0.0059
234	2.6703	0.0059
235	2.6761	0.0058
236	2.6819	0.0058
237	2.6878	0.0058
238	2.6936	0.0058
239	2.6993	0.0058
240	2.7051	0.0058
241	2.7109	0.0058
242	2.7167	0.0058
243	2.7224	0.0057
244	2.7281	0.0057
245	2.7339	0.0057
246	2.7396	0.0057
247	2.7453	0.0057
248	2.7509	0.0057
249	2.7566	0.0057
250	2.7623	0.0057
251	2.7679	0.0057
252	2.7736	0.0056
253	2.7792	0.0056
254	2.7848	0.0056
255	2.7905	0.0056
256	2.7961	0.0056
257	2.8016	0.0056

258	2.8072	0.0056	
259	2.8128	0.0056	
260	2.8184	0.0056	
261	2.8239	0.0055	
262	2.8294	0.0055	
263	2.8350	0.0055	
264	2.8405	0.0055	
265	2.8460	0.0055	
266	2.8515	0.0055	
267	2.8570	0.0055	
268	2.8624	0.0055	
269	2.8679	0.0055	
270	2.8734	0.0055	
271	2.8788	0.0054	
272	2.8843	0.0054	
273	2.8897	0.0054	
274	2.8951	0.0054	
275	2.9005	0.0054	
276	2.9059	0.0054	
277	2.9113	0.0054	
278	2.9167	0.0054	
279	2.9220	0.0054	
280	2.9274	0.0054	
281	2.9328	0.0054	
282	2.9381	0.0053	
283	2.9434	0.0053	
284	2.9487	0.0053	
285	2.9541	0.0053	
286	2.9594	0.0053	
287	2.9647	0.0053	
288	2.9700	0.0053	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0053	0.0040	0.0012
2	0.0053	0.0041	0.0012
3	0.0053	0.0041	0.0012
4	0.0053	0.0041	0.0013
5	0.0053	0.0041	0.0013
6	0.0054	0.0041	0.0013
7	0.0054	0.0041	0.0013
8	0.0054	0.0041	0.0013
9	0.0054	0.0041	0.0013
10	0.0054	0.0041	0.0013
11	0.0054	0.0042	0.0013
12	0.0054	0.0042	0.0013
13	0.0055	0.0042	0.0013
14	0.0055	0.0042	0.0013

15	0.0055	0.0042	0.0013
16	0.0055	0.0042	0.0013
17	0.0055	0.0042	0.0013
18	0.0055	0.0042	0.0013
19	0.0055	0.0042	0.0013
20	0.0056	0.0043	0.0013
21	0.0056	0.0043	0.0013
22	0.0056	0.0043	0.0013
23	0.0056	0.0043	0.0013
24	0.0056	0.0043	0.0013
25	0.0056	0.0043	0.0013
26	0.0057	0.0043	0.0013
27	0.0057	0.0043	0.0013
28	0.0057	0.0044	0.0013
29	0.0057	0.0044	0.0013
30	0.0057	0.0044	0.0013
31	0.0057	0.0044	0.0013
32	0.0058	0.0044	0.0014
33	0.0058	0.0044	0.0014
34	0.0058	0.0044	0.0014
35	0.0058	0.0044	0.0014
36	0.0058	0.0045	0.0014
37	0.0059	0.0045	0.0014
38	0.0059	0.0045	0.0014
39	0.0059	0.0045	0.0014
40	0.0059	0.0045	0.0014
41	0.0059	0.0045	0.0014
42	0.0059	0.0045	0.0014
43	0.0060	0.0046	0.0014
44	0.0060	0.0046	0.0014
45	0.0060	0.0046	0.0014
46	0.0060	0.0046	0.0014
47	0.0060	0.0046	0.0014
48	0.0061	0.0046	0.0014
49	0.0061	0.0047	0.0014
50	0.0061	0.0047	0.0014
51	0.0061	0.0047	0.0014
52	0.0061	0.0047	0.0014
53	0.0062	0.0047	0.0014
54	0.0062	0.0047	0.0015
55	0.0062	0.0048	0.0015
56	0.0062	0.0048	0.0015
57	0.0063	0.0048	0.0015
58	0.0063	0.0048	0.0015
59	0.0063	0.0048	0.0015
60	0.0063	0.0048	0.0015
61	0.0063	0.0049	0.0015
62	0.0064	0.0049	0.0015
63	0.0064	0.0049	0.0015
64	0.0064	0.0049	0.0015

65	0.0064	0.0049	0.0015
66	0.0065	0.0049	0.0015
67	0.0065	0.0050	0.0015
68	0.0065	0.0050	0.0015
69	0.0065	0.0050	0.0015
70	0.0066	0.0050	0.0015
71	0.0066	0.0050	0.0016
72	0.0066	0.0051	0.0016
73	0.0067	0.0051	0.0016
74	0.0067	0.0051	0.0016
75	0.0067	0.0051	0.0016
76	0.0067	0.0051	0.0016
77	0.0068	0.0052	0.0016
78	0.0068	0.0052	0.0016
79	0.0068	0.0052	0.0016
80	0.0068	0.0052	0.0016
81	0.0069	0.0053	0.0016
82	0.0069	0.0053	0.0016
83	0.0069	0.0053	0.0016
84	0.0070	0.0053	0.0016
85	0.0070	0.0054	0.0016
86	0.0070	0.0054	0.0017
87	0.0071	0.0054	0.0017
88	0.0071	0.0054	0.0017
89	0.0071	0.0055	0.0017
90	0.0072	0.0055	0.0017
91	0.0072	0.0055	0.0017
92	0.0072	0.0055	0.0017
93	0.0073	0.0056	0.0017
94	0.0073	0.0056	0.0017
95	0.0073	0.0056	0.0017
96	0.0074	0.0056	0.0017
97	0.0074	0.0057	0.0017
98	0.0074	0.0057	0.0017
99	0.0075	0.0057	0.0018
100	0.0075	0.0058	0.0018
101	0.0076	0.0058	0.0018
102	0.0076	0.0058	0.0018
103	0.0077	0.0059	0.0018
104	0.0077	0.0059	0.0018
105	0.0077	0.0059	0.0018
106	0.0078	0.0059	0.0018
107	0.0078	0.0060	0.0018
108	0.0079	0.0060	0.0018
109	0.0079	0.0061	0.0019
110	0.0080	0.0061	0.0019
111	0.0080	0.0061	0.0019
112	0.0080	0.0062	0.0019
113	0.0081	0.0062	0.0019
114	0.0081	0.0062	0.0019

115	0.0082	0.0063	0.0019
116	0.0082	0.0063	0.0019
117	0.0083	0.0064	0.0020
118	0.0084	0.0064	0.0020
119	0.0084	0.0064	0.0020
120	0.0085	0.0065	0.0020
121	0.0085	0.0065	0.0020
122	0.0086	0.0066	0.0020
123	0.0087	0.0066	0.0020
124	0.0087	0.0067	0.0020
125	0.0088	0.0067	0.0021
126	0.0088	0.0068	0.0021
127	0.0089	0.0068	0.0021
128	0.0090	0.0069	0.0021
129	0.0091	0.0069	0.0021
130	0.0091	0.0070	0.0021
131	0.0092	0.0070	0.0022
132	0.0092	0.0071	0.0022
133	0.0093	0.0071	0.0022
134	0.0094	0.0072	0.0022
135	0.0095	0.0073	0.0022
136	0.0096	0.0073	0.0022
137	0.0097	0.0074	0.0023
138	0.0097	0.0074	0.0023
139	0.0098	0.0075	0.0023
140	0.0099	0.0076	0.0023
141	0.0100	0.0077	0.0024
142	0.0101	0.0077	0.0024
143	0.0102	0.0078	0.0024
144	0.0103	0.0079	0.0024
145	0.0085	0.0065	0.0020
146	0.0086	0.0065	0.0020
147	0.0087	0.0067	0.0020
148	0.0088	0.0067	0.0021
149	0.0089	0.0068	0.0021
150	0.0090	0.0069	0.0021
151	0.0092	0.0070	0.0022
152	0.0093	0.0071	0.0022
153	0.0094	0.0072	0.0022
154	0.0095	0.0073	0.0022
155	0.0097	0.0074	0.0023
156	0.0098	0.0075	0.0023
157	0.0100	0.0077	0.0024
158	0.0102	0.0078	0.0024
159	0.0104	0.0080	0.0024
160	0.0105	0.0080	0.0025
161	0.0108	0.0082	0.0025
162	0.0109	0.0083	0.0026
163	0.0112	0.0086	0.0026
164	0.0113	0.0087	0.0027

165	0.0117	0.0089	0.0027
166	0.0118	0.0090	0.0028
167	0.0122	0.0093	0.0029
168	0.0124	0.0095	0.0029
169	0.0128	0.0098	0.0030
170	0.0130	0.0099	0.0031
171	0.0135	0.0103	0.0032
172	0.0137	0.0105	0.0032
173	0.0142	0.0109	0.0033
174	0.0145	0.0111	0.0034
175	0.0152	0.0116	0.0036
176	0.0155	0.0119	0.0036
177	0.0163	0.0124	0.0038
178	0.0167	0.0128	0.0039
179	0.0176	0.0135	0.0041
180	0.0181	0.0139	0.0043
181	0.0193	0.0148	0.0045
182	0.0200	0.0153	0.0047
183	0.0215	0.0165	0.0051
184	0.0225	0.0172	0.0053
185	0.0178	0.0136	0.0042
186	0.0190	0.0145	0.0045
187	0.0220	0.0169	0.0052
188	0.0240	0.0184	0.0056
189	0.0299	0.0229	0.0070
190	0.0344	0.0263	0.0081
191	0.0523	0.0400	0.0123
192	0.0759	0.0444	0.0315
193	0.3282	0.0444	0.2838
194	0.0411	0.0315	0.0097
195	0.0266	0.0203	0.0062
196	0.0204	0.0156	0.0048
197	0.0235	0.0180	0.0055
198	0.0207	0.0158	0.0049
199	0.0187	0.0143	0.0044
200	0.0171	0.0131	0.0040
201	0.0159	0.0121	0.0037
202	0.0148	0.0113	0.0035
203	0.0140	0.0107	0.0033
204	0.0132	0.0101	0.0031
205	0.0126	0.0096	0.0030
206	0.0120	0.0092	0.0028
207	0.0115	0.0088	0.0027
208	0.0110	0.0084	0.0026
209	0.0106	0.0081	0.0025
210	0.0103	0.0079	0.0024
211	0.0099	0.0076	0.0023
212	0.0096	0.0074	0.0023
213	0.0094	0.0072	0.0022
214	0.0091	0.0070	0.0021

215	0.0089	0.0068	0.0021
216	0.0086	0.0066	0.0020
217	0.0104	0.0079	0.0024
218	0.0101	0.0078	0.0024
219	0.0100	0.0076	0.0023
220	0.0098	0.0075	0.0023
221	0.0096	0.0074	0.0023
222	0.0094	0.0072	0.0022
223	0.0093	0.0071	0.0022
224	0.0091	0.0070	0.0021
225	0.0090	0.0069	0.0021
226	0.0089	0.0068	0.0021
227	0.0087	0.0067	0.0021
228	0.0086	0.0066	0.0020
229	0.0085	0.0065	0.0020
230	0.0084	0.0064	0.0020
231	0.0083	0.0063	0.0019
232	0.0082	0.0063	0.0019
233	0.0081	0.0062	0.0019
234	0.0080	0.0061	0.0019
235	0.0079	0.0060	0.0019
236	0.0078	0.0060	0.0018
237	0.0077	0.0059	0.0018
238	0.0076	0.0058	0.0018
239	0.0075	0.0058	0.0018
240	0.0075	0.0057	0.0018
241	0.0074	0.0057	0.0017
242	0.0073	0.0056	0.0017
243	0.0072	0.0055	0.0017
244	0.0072	0.0055	0.0017
245	0.0071	0.0054	0.0017
246	0.0070	0.0054	0.0017
247	0.0070	0.0053	0.0016
248	0.0069	0.0053	0.0016
249	0.0069	0.0052	0.0016
250	0.0068	0.0052	0.0016
251	0.0067	0.0052	0.0016
252	0.0067	0.0051	0.0016
253	0.0066	0.0051	0.0016
254	0.0066	0.0050	0.0015
255	0.0065	0.0050	0.0015
256	0.0065	0.0050	0.0015
257	0.0064	0.0049	0.0015
258	0.0064	0.0049	0.0015
259	0.0063	0.0048	0.0015
260	0.0063	0.0048	0.0015
261	0.0062	0.0048	0.0015
262	0.0062	0.0047	0.0015
263	0.0062	0.0047	0.0014
264	0.0061	0.0047	0.0014

265	0.0061	0.0046	0.0014
266	0.0060	0.0046	0.0014
267	0.0060	0.0046	0.0014
268	0.0060	0.0046	0.0014
269	0.0059	0.0045	0.0014
270	0.0059	0.0045	0.0014
271	0.0058	0.0045	0.0014
272	0.0058	0.0044	0.0014
273	0.0058	0.0044	0.0014
274	0.0057	0.0044	0.0013
275	0.0057	0.0044	0.0013
276	0.0057	0.0043	0.0013
277	0.0056	0.0043	0.0013
278	0.0056	0.0043	0.0013
279	0.0056	0.0043	0.0013
280	0.0055	0.0042	0.0013
281	0.0055	0.0042	0.0013
282	0.0055	0.0042	0.0013
283	0.0054	0.0042	0.0013
284	0.0054	0.0041	0.0013
285	0.0054	0.0041	0.0013
286	0.0054	0.0041	0.0013
287	0.0053	0.0041	0.0013
288	0.0053	0.0041	0.0012

Total soil rain loss = 2.05(In)
Total effective rainfall = 0.92(In)
Peak flow rate in flood hydrograph = 9.83(CFS)

+++

24 - H O U R   S T O R M
R u n o f f   H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0003	0.03	Q	|	|	|	|
0+20	0.0007	0.06	Q	|	|	|	|
0+25	0.0014	0.10	Q	|	|	|	|
0+30	0.0022	0.12	Q	|	|	|	|
0+35	0.0031	0.13	Q	|	|	|	|
0+40	0.0040	0.14	Q	|	|	|	|
0+45	0.0051	0.15	Q	|	|	|	|
0+50	0.0061	0.16	Q	|	|	|	|
0+55	0.0072	0.16	Q	|	|	|	|

```
 1+ 0        0.0084       0.17  Q         |         |         |         |
 1+ 5        0.0095       0.17  Q         |         |         |         |
 1+10        0.0107       0.17  Q         |         |         |         |
 1+15        0.0120       0.18  Q         |         |         |         |
 1+20        0.0132       0.18  Q         |         |         |         |
 1+25        0.0145       0.18  Q         |         |         |         |
 1+30        0.0157       0.19  Q         |         |         |         |
 1+35        0.0170       0.19  Q         |         |         |         |
 1+40        0.0183       0.19  Q         |         |         |         |
 1+45        0.0197       0.19  Q         |         |         |         |
 1+50        0.0210       0.19  Q         |         |         |         |
 1+55        0.0223       0.19  Q         |         |         |         |
 2+ 0        0.0237       0.20  Q         |         |         |         |
 2+ 5        0.0250       0.20  QV        |         |         |         |
 2+10        0.0264       0.20  QV        |         |         |         |
 2+15        0.0278       0.20  QV        |         |         |         |
 2+20        0.0291       0.20  QV        |         |         |         |
 2+25        0.0305       0.20  QV        |         |         |         |
 2+30        0.0319       0.20  QV        |         |         |         |
 2+35        0.0333       0.20  QV        |         |         |         |
 2+40        0.0347       0.20  QV        |         |         |         |
 2+45        0.0362       0.21  QV        |         |         |         |
 2+50        0.0376       0.21  QV        |         |         |         |
 2+55        0.0390       0.21  QV        |         |         |         |
 3+ 0        0.0404       0.21  QV        |         |         |         |
 3+ 5        0.0419       0.21  QV        |         |         |         |
 3+10        0.0433       0.21  QV        |         |         |         |
 3+15        0.0448       0.21  QV        |         |         |         |
 3+20        0.0462       0.21  QV        |         |         |         |
 3+25        0.0477       0.21  QV        |         |         |         |
 3+30        0.0491       0.21  Q V       |         |         |         |
 3+35        0.0506       0.21  Q V       |         |         |         |
 3+40        0.0521       0.21  Q V       |         |         |         |
 3+45        0.0535       0.21  Q V       |         |         |         |
 3+50        0.0550       0.21  Q V       |         |         |         |
 3+55        0.0565       0.22  Q V       |         |         |         |
 4+ 0        0.0580       0.22  Q V       |         |         |         |
 4+ 5        0.0595       0.22  Q V       |         |         |         |
 4+10        0.0610       0.22  Q V       |         |         |         |
 4+15        0.0625       0.22  Q V       |         |         |         |
 4+20        0.0640       0.22  Q V       |         |         |         |
 4+25        0.0655       0.22  Q V       |         |         |         |
 4+30        0.0670       0.22  Q V       |         |         |         |
 4+35        0.0685       0.22  Q V       |         |         |         |
 4+40        0.0701       0.22  Q V       |         |         |         |
 4+45        0.0716       0.22  Q V       |         |         |         |
 4+50        0.0731       0.22  Q V       |         |         |         |
 4+55        0.0747       0.22  Q  V      |         |         |         |
 5+ 0        0.0762       0.22  Q  V      |         |         |         |
 5+ 5        0.0778       0.23  Q  V      |         |         |         |
```

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5+10       0.0794      0.23  Q  V       |         |         |         |
5+15       0.0809      0.23  Q  V       |         |         |         |
5+20       0.0825      0.23  Q  V       |         |         |         |
5+25       0.0841      0.23  Q  V       |         |         |         |
5+30       0.0857      0.23  Q  V       |         |         |         |
5+35       0.0872      0.23  Q  V       |         |         |         |
5+40       0.0888      0.23  Q  V       |         |         |         |
5+45       0.0904      0.23  Q  V       |         |         |         |
5+50       0.0920      0.23  Q  V       |         |         |         |
5+55       0.0937      0.23  Q  V       |         |         |         |
6+ 0       0.0953      0.24  Q  V       |         |         |         |
6+ 5       0.0969      0.24  Q  V       |         |         |         |
6+10       0.0985      0.24  Q   V      |         |         |         |
6+15       0.1002      0.24  Q   V      |         |         |         |
6+20       0.1018      0.24  Q   V      |         |         |         |
6+25       0.1035      0.24  Q   V      |         |         |         |
6+30       0.1051      0.24  Q   V      |         |         |         |
6+35       0.1068      0.24  Q   V      |         |         |         |
6+40       0.1085      0.24  Q   V      |         |         |         |
6+45       0.1101      0.24  Q   V      |         |         |         |
6+50       0.1118      0.24  Q   V      |         |         |         |
6+55       0.1135      0.25  Q   V      |         |         |         |
7+ 0       0.1152      0.25  Q   V      |         |         |         |
7+ 5       0.1169      0.25  Q   V      |         |         |         |
7+10       0.1186      0.25  Q   V      |         |         |         |
7+15       0.1204      0.25  Q   V      |         |         |         |
7+20       0.1221      0.25  |Q  V      |         |         |         |
7+25       0.1238      0.25  |Q   V     |         |         |         |
7+30       0.1256      0.25  |Q   V     |         |         |         |
7+35       0.1273      0.25  |Q   V     |         |         |         |
7+40       0.1291      0.26  |Q   V     |         |         |         |
7+45       0.1308      0.26  |Q   V     |         |         |         |
7+50       0.1326      0.26  |Q   V     |         |         |         |
7+55       0.1344      0.26  |Q   V     |         |         |         |
8+ 0       0.1362      0.26  |Q   V     |         |         |         |
8+ 5       0.1380      0.26  |Q   V     |         |         |         |
8+10       0.1398      0.26  |Q   V     |         |         |         |
8+15       0.1416      0.26  |Q   V     |         |         |         |
8+20       0.1435      0.27  |Q   V     |         |         |         |
8+25       0.1453      0.27  |Q   V     |         |         |         |
8+30       0.1471      0.27  |Q    V    |         |         |         |
8+35       0.1490      0.27  |Q    V    |         |         |         |
8+40       0.1509      0.27  |Q    V    |         |         |         |
8+45       0.1527      0.27  |Q    V    |         |         |         |
8+50       0.1546      0.27  |Q    V    |         |         |         |
8+55       0.1565      0.28  |Q    V    |         |         |         |
9+ 0       0.1584      0.28  |Q    V    |         |         |         |
9+ 5       0.1603      0.28  |Q    V    |         |         |         |
9+10       0.1623      0.28  |Q    V    |         |         |         |
9+15       0.1642      0.28  |Q    V    |         |         |         |
```

```
 9+20       0.1661      0.28  |Q    V   |         |         |         |
 9+25       0.1681      0.28  |Q    V   |         |         |         |
 9+30       0.1701      0.29  |Q    V   |         |         |         |
 9+35       0.1720      0.29  |Q     V  |         |         |         |
 9+40       0.1740      0.29  |Q     V  |         |         |         |
 9+45       0.1760      0.29  |Q     V  |         |         |         |
 9+50       0.1781      0.29  |Q     V  |         |         |         |
 9+55       0.1801      0.29  |Q     V  |         |         |         |
10+ 0       0.1821      0.30  |Q     V  |         |         |         |
10+ 5       0.1842      0.30  |Q     V  |         |         |         |
10+10       0.1862      0.30  |Q     V  |         |         |         |
10+15       0.1883      0.30  |Q     V  |         |         |         |
10+20       0.1904      0.30  |Q     V  |         |         |         |
10+25       0.1925      0.31  |Q     V  |         |         |         |
10+30       0.1946      0.31  |Q     V  |         |         |         |
10+35       0.1968      0.31  |Q      V |         |         |         |
10+40       0.1989      0.31  |Q      V |         |         |         |
10+45       0.2011      0.31  |Q      V |         |         |         |
10+50       0.2033      0.32  |Q      V |         |         |         |
10+55       0.2055      0.32  |Q      V |         |         |         |
11+ 0       0.2077      0.32  |Q      V |         |         |         |
11+ 5       0.2099      0.32  |Q      V |         |         |         |
11+10       0.2122      0.33  |Q      V |         |         |         |
11+15       0.2144      0.33  |Q      V |         |         |         |
11+20       0.2167      0.33  |Q      V |         |         |         |
11+25       0.2190      0.33  |Q      V |         |         |         |
11+30       0.2213      0.34  |Q       V|         |         |         |
11+35       0.2236      0.34  |Q       V|         |         |         |
11+40       0.2260      0.34  |Q       V|         |         |         |
11+45       0.2284      0.34  |Q       V|         |         |         |
11+50       0.2308      0.35  |Q       V|         |         |         |
11+55       0.2332      0.35  |Q       V|         |         |         |
12+ 0       0.2356      0.35  |Q       V|         |         |         |
12+ 5       0.2381      0.36  |Q       V|         |         |         |
12+10       0.2405      0.36  |Q       V|         |         |         |
12+15       0.2429      0.35  |Q       V|         |         |         |
12+20       0.2453      0.34  |Q        V         |         |         |
12+25       0.2476      0.34  |Q        V         |         |         |
12+30       0.2499      0.33  |Q        V         |         |         |
12+35       0.2522      0.33  |Q        V         |         |         |
12+40       0.2545      0.33  |Q        V         |         |         |
12+45       0.2567      0.33  |Q        V         |         |         |
12+50       0.2590      0.33  |Q        V         |         |         |
12+55       0.2614      0.34  |Q        V         |         |         |
13+ 0       0.2637      0.34  |Q        V         |         |         |
13+ 5       0.2660      0.34  |Q        V         |         |         |
13+10       0.2684      0.35  |Q        V         |         |         |
13+15       0.2708      0.35  |Q        |V        |         |         |
13+20       0.2733      0.35  |Q        |V        |         |         |
13+25       0.2757      0.36  |Q        |V        |         |         |
```

```
Time(h+min)  Volume (AC*FT)  Q(CFS)  0         2.5       5.0       7.5       10
  13+30        0.2782        0.36    |Q        |V        |         |         |
  13+35        0.2808        0.37    |Q        |V        |         |         |
  13+40        0.2834        0.37    |Q        |V        |         |         |
  13+45        0.2860        0.38    |Q        |V        |         |         |
  13+50        0.2886        0.39    |Q        |V        |         |         |
  13+55        0.2913        0.39    |Q        |V        |         |         |
  14+ 0        0.2941        0.40    |Q        | V       |         |         |
  14+ 5        0.2969        0.41    |Q        | V       |         |         |
  14+10        0.2998        0.42    |Q        | V       |         |         |
  14+15        0.3027        0.42    |Q        | V       |         |         |
  14+20        0.3057        0.43    |Q        | V       |         |         |
  14+25        0.3087        0.44    |Q        | V       |         |         |
  14+30        0.3119        0.45    |Q        | V       |         |         |
  14+35        0.3151        0.47    |Q        | V       |         |         |
  14+40        0.3184        0.48    |Q        | V       |         |         |
  14+45        0.3217        0.49    |Q        |  V      |         |         |
  14+50        0.3252        0.50    | Q       |  V      |         |         |
  14+55        0.3288        0.52    | Q       |  V      |         |         |
  15+ 0        0.3325        0.54    | Q       |  V      |         |         |
  15+ 5        0.3363        0.56    | Q       |  V      |         |         |
  15+10        0.3403        0.58    | Q       |  V      |         |         |
  15+15        0.3444        0.60    | Q       |   V     |         |         |
  15+20        0.3487        0.62    | Q       |   V     |         |         |
  15+25        0.3532        0.65    | Q       |   V     |         |         |
  15+30        0.3578        0.67    | Q       |   V     |         |         |
  15+35        0.3625        0.69    | Q       |   V     |         |         |
  15+40        0.3672        0.68    | Q       |   V     |         |         |
  15+45        0.3720        0.70    | Q       |    V    |         |         |
  15+50        0.3771        0.73    | Q       |    V    |         |         |
  15+55        0.3826        0.80    |  Q      |    V    |         |         |
  16+ 0        0.3891        0.94    |  Q      |    V    |         |         |
  16+ 5        0.4005        1.66    |     Q   |     V   |         |         |  Q = 9.83 CFS
  16+10        0.4230        3.27    |         |  Q   V  |         |         |
  16+15        0.4622        5.69    |         |       V |  Q      |         |
  16+20        0.5299        9.83    |         |         |V        |        Q|
  16+25        0.5885        8.50    |         |         |   V     |  Q      |
  16+30        0.6286        5.82    |         |         |  Q V    |         |
  16+35        0.6571        4.14    |         |     Q   |    V    |         |
  16+40        0.6802        3.35    |         |  Q      |     V   |         |
  16+45        0.6993        2.78    |         |Q        |      V  |         |
  16+50        0.7157        2.37    |        Q|         |       V|         |
  16+55        0.7297        2.04    |       Q |         |       V|         |
  17+ 0        0.7422        1.81    |      Q  |         |         V         |
  17+ 5        0.7536        1.65    |     Q   |         |         V         |
  17+10        0.7636        1.46    |    Q    |         |         |V        |
  17+15        0.7723        1.26    |    Q    |         |         |V        |
  17+20        0.7804        1.17    |   Q     |         |         |V        |
  17+25        0.7878        1.08    |   Q     |         |         | V       |
  17+30        0.7948        1.00    |   Q     |         |         | V       |
  17+35        0.8011        0.92    |  Q      |         |         | V       |
```

```
17+40       0.8069      0.84  |  Q      |         |         | V       |
17+45       0.8124      0.80  |  Q      |         |         |  V      |
17+50       0.8174      0.72  | Q       |         |         |  V      |
17+55       0.8221      0.69  | Q       |         |         |  V      |
18+ 0       0.8263      0.62  | Q       |         |         |  V      |
18+ 5       0.8304      0.58  | Q       |         |         |  V      |
18+10       0.8340      0.52  | Q       |         |         |   V     |
18+15       0.8374      0.49  |Q        |         |         |   V     |
18+20       0.8408      0.50  | Q       |         |         |   V     |
18+25       0.8443      0.51  | Q       |         |         |   V     |
18+30       0.8479      0.51  | Q       |         |         |   V     |
18+35       0.8513      0.51  | Q       |         |         |   V     |
18+40       0.8547      0.49  |Q        |         |         |   V     |
18+45       0.8578      0.44  |Q        |         |         |    V    |
18+50       0.8607      0.43  |Q        |         |         |    V    |
18+55       0.8636      0.42  |Q        |         |         |    V    |
19+ 0       0.8663      0.39  |Q        |         |         |    V    |
19+ 5       0.8687      0.34  |Q        |         |         |    V    |
19+10       0.8710      0.34  |Q        |         |         |    V    |
19+15       0.8733      0.33  |Q        |         |         |    V    |
19+20       0.8755      0.33  |Q        |         |         |    V    |
19+25       0.8778      0.32  |Q        |         |         |    V    |
19+30       0.8799      0.32  |Q        |         |         |    V    |
19+35       0.8821      0.31  |Q        |         |         |    V    |
19+40       0.8842      0.31  |Q        |         |         |     V   |
19+45       0.8863      0.31  |Q        |         |         |     V   |
19+50       0.8884      0.30  |Q        |         |         |     V   |
19+55       0.8905      0.30  |Q        |         |         |     V   |
20+ 0       0.8925      0.29  |Q        |         |         |     V   |
20+ 5       0.8945      0.29  |Q        |         |         |     V   |
20+10       0.8965      0.29  |Q        |         |         |     V   |
20+15       0.8984      0.28  |Q        |         |         |     V   |
20+20       0.9004      0.28  |Q        |         |         |     V   |
20+25       0.9023      0.28  |Q        |         |         |     V   |
20+30       0.9042      0.28  |Q        |         |         |     V   |
20+35       0.9061      0.27  |Q        |         |         |     V   |
20+40       0.9079      0.27  |Q        |         |         |      V  |
20+45       0.9098      0.27  |Q        |         |         |      V  |
20+50       0.9116      0.26  |Q        |         |         |      V  |
20+55       0.9134      0.26  |Q        |         |         |      V  |
21+ 0       0.9152      0.26  |Q        |         |         |      V  |
21+ 5       0.9170      0.26  |Q        |         |         |      V  |
21+10       0.9187      0.25  |Q        |         |         |      V  |
21+15       0.9205      0.25  |Q        |         |         |      V  |
21+20       0.9222      0.25  |Q        |         |         |      V  |
21+25       0.9239      0.25  Q         |         |         |      V  |
21+30       0.9256      0.25  Q         |         |         |      V  |
21+35       0.9273      0.24  Q         |         |         |      V  |
21+40       0.9289      0.24  Q         |         |         |      V  |
21+45       0.9306      0.24  Q         |         |         |      V  |
```

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  21+50       0.9322      0.24  Q         |         |         |      V |
  21+55       0.9339      0.24  Q         |         |         |      V |
  22+ 0       0.9355      0.23  Q         |         |         |      V |
  22+ 5       0.9371      0.23  Q         |         |         |      V |
  22+10       0.9387      0.23  Q         |         |         |      V |
  22+15       0.9402      0.23  Q         |         |         |      V |
  22+20       0.9418      0.23  Q         |         |         |      V |
  22+25       0.9434      0.23  Q         |         |         |      V |
  22+30       0.9449      0.22  Q         |         |         |      V |
  22+35       0.9465      0.22  Q         |         |         |      V |
  22+40       0.9480      0.22  Q         |         |         |      V |
  22+45       0.9495      0.22  Q         |         |         |      V |
  22+50       0.9510      0.22  Q         |         |         |      V |
  22+55       0.9525      0.22  Q         |         |         |      V |
  23+ 0       0.9540      0.22  Q         |         |         |      V |
  23+ 5       0.9554      0.21  Q         |         |         |      V |
  23+10       0.9569      0.21  Q         |         |         |       V|
  23+15       0.9584      0.21  Q         |         |         |       V|
  23+20       0.9598      0.21  Q         |         |         |       V|
  23+25       0.9613      0.21  Q         |         |         |       V|
  23+30       0.9627      0.21  Q         |         |         |       V|
  23+35       0.9641      0.21  Q         |         |         |       V|
  23+40       0.9655      0.21  Q         |         |         |       V|
  23+45       0.9669      0.20  Q         |         |         |       V|
  23+50       0.9683      0.20  Q         |         |         |       V|
  23+55       0.9697      0.20  Q         |         |         |       V|
  24+ 0       0.9711      0.20  Q         |         |         |       V|
-----------------------------------------------------------------------
```

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)		
1 Project area DA 2 (ft^2): 532,562	2 Imperviousness after applying preventative site design practices (Imp%): 60.0	3 Runoff Coefficient (Rc): _0.409 *$R_c = 0.858(Imp\%)^{3} - 0.78(Imp\%)^{2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.399 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.49 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7.** Compute design capture volume, DCV (ft3): **17,585 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

SEE ATTACHED RATIONAL METHOD AND UNIT HYDROGRAPHS

Form 4.2-2 Summary of Hydromodification Assessment (DA 2)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐
If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*
If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 22,878 *Form 4.2-3 Item 12*	2 26.05 *Form 4.2-4 Item 13*	3 10.22 *Form 4.2-5 Item 10*
Post-developed	4 52,2446 *Form 4.2-3 Item 13*	5 12.99 *Form 4.2-4 Item 14*	6 16.35 *Form 4.2-5 Item 14*
Difference	7 *29,568* *Item 4 – Item 1*	8 *13.06* *Item 2 – Item 5*	9 *6.13* *Item 6 – Item 3*
Difference (as % of pre-developed)	10 *129%* *Item 7 / Item 1*	11 *50%* *Item 8 / Item 2*	12 *60%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 2)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): *Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*
12 Pre-developed Volume (ft^3): *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*
13 Post-developed Volume (ft^3): *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*
14 Volume Reduction needed to meet hydromodification requirement, (ft^3): *Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-4 Hydromodification Assessment for Time of Concentration (D A 2)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), *S_o = Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) *T_c = Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet hydromodification requirement (min): *$T_{C-Hydro}$ = (Item 13 * 0.95) – Item 14*								

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA 2)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	9 Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	10 Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	12 Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	13 Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): $Q_{p\text{-}hydro}$ = *(Item 14 * 0.95) – Item 10*		

RATIONAL METHOD &

UNIT HYDROGRAPH HYDROLOGY

ONSITE POST-DEVELOPED

2-YEAR & 10-YEAR

STORM EVENTS

DRAINAGE AREA 2

```
              San Bernardino County Rational Hydrology Program

                  (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study       Date: 08/16/21
------------------------------------------------------------------------
2 Year Rational Analysis Post Development
Former Track 17486
Drainage Area 2
File: 17486Rat2PostA2.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is     2.0
Computed rainfall intensity:
Storm year =     2.00   1 hour rainfall =     0.399 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   997.200(Ft.)
Top (of initial area) elevation =  3291.300(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =    10.300(Ft.)
Slope =    0.01033  s(%)=       1.03
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.369 min.
Rainfall intensity =      1.035(In/Hr) for a     2.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.559
Subarea runoff =      4.471(CFS)
Total initial stream area =        7.730(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.730(Ac.)
Runoff from this stream =      4.471(CFS)
Time of concentration =   15.37 min.
Rainfall intensity =     1.035(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       5.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   443.400(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00474  s(%)=       0.47
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.989 min.
Rainfall intensity =      1.165(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.597
Subarea runoff =      3.127(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =      3.127(CFS)
Time of concentration =   12.99 min.
Rainfall intensity =     1.165(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      4.47     7.730     15.37    0.393      1.035
2      3.13     4.500     12.99    0.393      1.165
Qmax(1) =
           1.000 *    1.000 *     4.471) +
           0.832 *    1.000 *     3.127) + =       7.073
Qmax(2) =
           1.201 *    0.845 *     4.471) +
           1.000 *    1.000 *     3.127) + =       7.666

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.471       3.127
Maximum flow rates at confluence using above data:
        7.073        7.666
Area of streams before confluence:
        7.730        4.500
Effective area values after confluence:
       12.230      11.033
Results of confluence:
Total flow rate =      7.666(CFS)
Time of concentration =    12.989 min.
Effective stream area after confluence =     11.033(Ac.)
Study area average Pervious fraction(Ap) =  0.500
Study area average soil loss rate(Fm) =    0.393(In/Hr)
Study area total (this main stream) =      12.23(Ac.)
End of computations, Total Study Area =          12.23 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500
```

Area averaged SCS curve number = 32.0

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  08/13/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
2 Year Unit Hydrograph Post Development
Former Track 17486
Drainage Area 2
File: 17486Hydr2PostA2.out
--------------------------------------------------------------------

        Storm Event Year = 2

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area       Duration       Isohyetal
        (Ac.)           (hours)         (In)
Rainfall data for year 2
            12.23           1          0.40
--------------------------------------------------------------------
Rainfall data for year 2
            12.23           6          0.89
--------------------------------------------------------------------
Rainfall data for year 2
            12.23          24          1.64
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      52.0         12.23      1.000     0.785    0.397    0.312

Area-averaged adjusted loss rate Fm (In/Hr) =  0.312

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     4.86   0.397         32.0      52.0       8.20     0.000
     7.37   0.603         98.0      98.0       0.20     0.865

Area-averaged catchment yield fraction, Y =  0.521
Area-averaged low loss fraction, Yb =  0.479
User entry of time of concentration  =   0.217 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      12.23(Ac.)
Catchment Lag time =   0.173 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 48.1139
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.312(In/Hr)
Average low loss rate fraction (Yb) = 0.479 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.189(In)
Computed peak 30-minute rainfall =  0.324(In)
Specified peak 1-hour rainfall =  0.399(In)
Computed peak 3-hour rainfall =  0.650(In)
Specified peak 6-hour rainfall =  0.885(In)
Specified peak 24-hour rainfall =  1.640(In)


Rainfall depth area reduction factors:
Using a total area of      12.23(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.189(In)
30-minute factor = 0.999    Adjusted rainfall =  0.324(In)
1-hour factor = 0.999       Adjusted rainfall =  0.399(In)
3-hour factor = 1.000       Adjusted rainfall =  0.650(In)
6-hour factor = 1.000       Adjusted rainfall =  0.885(In)
24-hour factor = 1.000      Adjusted rainfall =  1.640(In)
---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 147.91 (CFS))	
1	3.719	5.500
2	28.282	36.331
3	58.794	45.129
4	72.457	20.208
5	80.398	11.746
6	85.662	7.786
7	89.432	5.576
8	92.102	3.950
9	94.181	3.075
10	95.760	2.335
11	96.964	1.780
12	97.797	1.233
13	98.328	0.785
14	98.894	0.838
15	99.444	0.812
16	99.786	0.506
17	100.000	0.316

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1892	0.1892
2	0.2330	0.0437
3	0.2631	0.0301
4	0.2868	0.0237
5	0.3067	0.0199
6	0.3239	0.0172
7	0.3392	0.0153
8	0.3531	0.0139
9	0.3658	0.0127
10	0.3775	0.0117
11	0.3885	0.0110
12	0.3988	0.0103
13	0.4132	0.0145
14	0.4271	0.0139
15	0.4404	0.0133
16	0.4532	0.0128
17	0.4656	0.0124
18	0.4776	0.0120
19	0.4893	0.0116
20	0.5006	0.0113
21	0.5116	0.0110
22	0.5223	0.0107
23	0.5327	0.0104
24	0.5429	0.0102
25	0.5528	0.0100

26	0.5626	0.0097
27	0.5721	0.0095
28	0.5814	0.0093
29	0.5906	0.0092
30	0.5996	0.0090
31	0.6084	0.0088
32	0.6170	0.0087
33	0.6255	0.0085
34	0.6339	0.0084
35	0.6421	0.0082
36	0.6502	0.0081
37	0.6582	0.0080
38	0.6661	0.0079
39	0.6738	0.0077
40	0.6814	0.0076
41	0.6889	0.0075
42	0.6964	0.0074
43	0.7037	0.0073
44	0.7109	0.0072
45	0.7181	0.0071
46	0.7251	0.0071
47	0.7321	0.0070
48	0.7390	0.0069
49	0.7458	0.0068
50	0.7525	0.0067
51	0.7592	0.0067
52	0.7657	0.0066
53	0.7723	0.0065
54	0.7787	0.0064
55	0.7851	0.0064
56	0.7914	0.0063
57	0.7977	0.0063
58	0.8038	0.0062
59	0.8100	0.0061
60	0.8161	0.0061
61	0.8221	0.0060
62	0.8280	0.0060
63	0.8340	0.0059
64	0.8398	0.0059
65	0.8456	0.0058
66	0.8514	0.0058
67	0.8571	0.0057
68	0.8628	0.0057
69	0.8684	0.0056
70	0.8739	0.0056
71	0.8795	0.0055
72	0.8850	0.0055
73	0.8904	0.0054
74	0.8958	0.0054
75	0.9012	0.0054

76	0.9065	0.0053
77	0.9118	0.0053
78	0.9171	0.0053
79	0.9223	0.0052
80	0.9274	0.0052
81	0.9326	0.0051
82	0.9377	0.0051
83	0.9428	0.0051
84	0.9478	0.0050
85	0.9528	0.0050
86	0.9578	0.0050
87	0.9627	0.0049
88	0.9676	0.0049
89	0.9725	0.0049
90	0.9774	0.0048
91	0.9822	0.0048
92	0.9870	0.0048
93	0.9917	0.0048
94	0.9964	0.0047
95	1.0012	0.0047
96	1.0058	0.0047
97	1.0105	0.0046
98	1.0151	0.0046
99	1.0197	0.0046
100	1.0243	0.0046
101	1.0288	0.0045
102	1.0333	0.0045
103	1.0378	0.0045
104	1.0423	0.0045
105	1.0467	0.0044
106	1.0512	0.0044
107	1.0556	0.0044
108	1.0600	0.0044
109	1.0643	0.0044
110	1.0686	0.0043
111	1.0730	0.0043
112	1.0772	0.0043
113	1.0815	0.0043
114	1.0858	0.0042
115	1.0900	0.0042
116	1.0942	0.0042
117	1.0984	0.0042
118	1.1026	0.0042
119	1.1067	0.0041
120	1.1108	0.0041
121	1.1149	0.0041
122	1.1190	0.0041
123	1.1231	0.0041
124	1.1272	0.0041
125	1.1312	0.0040

126	1.1352	0.0040
127	1.1392	0.0040
128	1.1432	0.0040
129	1.1472	0.0040
130	1.1511	0.0039
131	1.1550	0.0039
132	1.1590	0.0039
133	1.1629	0.0039
134	1.1667	0.0039
135	1.1706	0.0039
136	1.1745	0.0039
137	1.1783	0.0038
138	1.1821	0.0038
139	1.1859	0.0038
140	1.1897	0.0038
141	1.1935	0.0038
142	1.1972	0.0038
143	1.2010	0.0037
144	1.2047	0.0037
145	1.2084	0.0037
146	1.2121	0.0037
147	1.2158	0.0037
148	1.2195	0.0037
149	1.2231	0.0037
150	1.2268	0.0036
151	1.2304	0.0036
152	1.2340	0.0036
153	1.2377	0.0036
154	1.2412	0.0036
155	1.2448	0.0036
156	1.2484	0.0036
157	1.2519	0.0036
158	1.2555	0.0035
159	1.2590	0.0035
160	1.2625	0.0035
161	1.2660	0.0035
162	1.2695	0.0035
163	1.2730	0.0035
164	1.2765	0.0035
165	1.2799	0.0035
166	1.2834	0.0034
167	1.2868	0.0034
168	1.2902	0.0034
169	1.2937	0.0034
170	1.2971	0.0034
171	1.3004	0.0034
172	1.3038	0.0034
173	1.3072	0.0034
174	1.3106	0.0034
175	1.3139	0.0033

176	1.3172	0.0033
177	1.3206	0.0033
178	1.3239	0.0033
179	1.3272	0.0033
180	1.3305	0.0033
181	1.3338	0.0033
182	1.3370	0.0033
183	1.3403	0.0033
184	1.3435	0.0033
185	1.3468	0.0032
186	1.3500	0.0032
187	1.3533	0.0032
188	1.3565	0.0032
189	1.3597	0.0032
190	1.3629	0.0032
191	1.3661	0.0032
192	1.3692	0.0032
193	1.3724	0.0032
194	1.3756	0.0032
195	1.3787	0.0032
196	1.3819	0.0031
197	1.3850	0.0031
198	1.3881	0.0031
199	1.3912	0.0031
200	1.3943	0.0031
201	1.3974	0.0031
202	1.4005	0.0031
203	1.4036	0.0031
204	1.4067	0.0031
205	1.4097	0.0031
206	1.4128	0.0031
207	1.4158	0.0030
208	1.4189	0.0030
209	1.4219	0.0030
210	1.4249	0.0030
211	1.4280	0.0030
212	1.4310	0.0030
213	1.4340	0.0030
214	1.4370	0.0030
215	1.4399	0.0030
216	1.4429	0.0030
217	1.4459	0.0030
218	1.4488	0.0030
219	1.4518	0.0030
220	1.4547	0.0029
221	1.4577	0.0029
222	1.4606	0.0029
223	1.4635	0.0029
224	1.4665	0.0029
225	1.4694	0.0029

226	1.4723	0.0029
227	1.4752	0.0029
228	1.4781	0.0029
229	1.4809	0.0029
230	1.4838	0.0029
231	1.4867	0.0029
232	1.4895	0.0029
233	1.4924	0.0029
234	1.4952	0.0028
235	1.4981	0.0028
236	1.5009	0.0028
237	1.5037	0.0028
238	1.5066	0.0028
239	1.5094	0.0028
240	1.5122	0.0028
241	1.5150	0.0028
242	1.5178	0.0028
243	1.5206	0.0028
244	1.5233	0.0028
245	1.5261	0.0028
246	1.5289	0.0028
247	1.5316	0.0028
248	1.5344	0.0028
249	1.5372	0.0028
250	1.5399	0.0027
251	1.5426	0.0027
252	1.5454	0.0027
253	1.5481	0.0027
254	1.5508	0.0027
255	1.5535	0.0027
256	1.5562	0.0027
257	1.5589	0.0027
258	1.5616	0.0027
259	1.5643	0.0027
260	1.5670	0.0027
261	1.5697	0.0027
262	1.5724	0.0027
263	1.5750	0.0027
264	1.5777	0.0027
265	1.5803	0.0027
266	1.5830	0.0027
267	1.5856	0.0026
268	1.5883	0.0026
269	1.5909	0.0026
270	1.5935	0.0026
271	1.5962	0.0026
272	1.5988	0.0026
273	1.6014	0.0026
274	1.6040	0.0026
275	1.6066	0.0026

276	1.6092	0.0026
277	1.6118	0.0026
278	1.6144	0.0026
279	1.6170	0.0026
280	1.6195	0.0026
281	1.6221	0.0026
282	1.6247	0.0026
283	1.6272	0.0026
284	1.6298	0.0026
285	1.6324	0.0026
286	1.6349	0.0025
287	1.6374	0.0025
288	1.6400	0.0025

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0025	0.0012	0.0013
2	0.0025	0.0012	0.0013
3	0.0026	0.0012	0.0013
4	0.0026	0.0012	0.0013
5	0.0026	0.0012	0.0013
6	0.0026	0.0012	0.0013
7	0.0026	0.0012	0.0013
8	0.0026	0.0012	0.0013
9	0.0026	0.0012	0.0014
10	0.0026	0.0012	0.0014
11	0.0026	0.0013	0.0014
12	0.0026	0.0013	0.0014
13	0.0026	0.0013	0.0014
14	0.0026	0.0013	0.0014
15	0.0026	0.0013	0.0014
16	0.0027	0.0013	0.0014
17	0.0027	0.0013	0.0014
18	0.0027	0.0013	0.0014
19	0.0027	0.0013	0.0014
20	0.0027	0.0013	0.0014
21	0.0027	0.0013	0.0014
22	0.0027	0.0013	0.0014
23	0.0027	0.0013	0.0014
24	0.0027	0.0013	0.0014
25	0.0027	0.0013	0.0014
26	0.0027	0.0013	0.0014
27	0.0028	0.0013	0.0014
28	0.0028	0.0013	0.0014
29	0.0028	0.0013	0.0014
30	0.0028	0.0013	0.0014
31	0.0028	0.0013	0.0015
32	0.0028	0.0013	0.0015

33	0.0028	0.0013	0.0015
34	0.0028	0.0013	0.0015
35	0.0028	0.0014	0.0015
36	0.0028	0.0014	0.0015
37	0.0028	0.0014	0.0015
38	0.0029	0.0014	0.0015
39	0.0029	0.0014	0.0015
40	0.0029	0.0014	0.0015
41	0.0029	0.0014	0.0015
42	0.0029	0.0014	0.0015
43	0.0029	0.0014	0.0015
44	0.0029	0.0014	0.0015
45	0.0029	0.0014	0.0015
46	0.0029	0.0014	0.0015
47	0.0030	0.0014	0.0015
48	0.0030	0.0014	0.0015
49	0.0030	0.0014	0.0016
50	0.0030	0.0014	0.0016
51	0.0030	0.0014	0.0016
52	0.0030	0.0014	0.0016
53	0.0030	0.0014	0.0016
54	0.0030	0.0015	0.0016
55	0.0030	0.0015	0.0016
56	0.0031	0.0015	0.0016
57	0.0031	0.0015	0.0016
58	0.0031	0.0015	0.0016
59	0.0031	0.0015	0.0016
60	0.0031	0.0015	0.0016
61	0.0031	0.0015	0.0016
62	0.0031	0.0015	0.0016
63	0.0032	0.0015	0.0016
64	0.0032	0.0015	0.0016
65	0.0032	0.0015	0.0017
66	0.0032	0.0015	0.0017
67	0.0032	0.0015	0.0017
68	0.0032	0.0015	0.0017
69	0.0032	0.0015	0.0017
70	0.0032	0.0016	0.0017
71	0.0033	0.0016	0.0017
72	0.0033	0.0016	0.0017
73	0.0033	0.0016	0.0017
74	0.0033	0.0016	0.0017
75	0.0033	0.0016	0.0017
76	0.0033	0.0016	0.0017
77	0.0034	0.0016	0.0018
78	0.0034	0.0016	0.0018
79	0.0034	0.0016	0.0018
80	0.0034	0.0016	0.0018
81	0.0034	0.0016	0.0018
82	0.0034	0.0016	0.0018

83	0.0035	0.0017	0.0018
84	0.0035	0.0017	0.0018
85	0.0035	0.0017	0.0018
86	0.0035	0.0017	0.0018
87	0.0035	0.0017	0.0018
88	0.0035	0.0017	0.0018
89	0.0036	0.0017	0.0019
90	0.0036	0.0017	0.0019
91	0.0036	0.0017	0.0019
92	0.0036	0.0017	0.0019
93	0.0036	0.0017	0.0019
94	0.0037	0.0018	0.0019
95	0.0037	0.0018	0.0019
96	0.0037	0.0018	0.0019
97	0.0037	0.0018	0.0019
98	0.0037	0.0018	0.0020
99	0.0038	0.0018	0.0020
100	0.0038	0.0018	0.0020
101	0.0038	0.0018	0.0020
102	0.0038	0.0018	0.0020
103	0.0039	0.0019	0.0020
104	0.0039	0.0019	0.0020
105	0.0039	0.0019	0.0020
106	0.0039	0.0019	0.0021
107	0.0040	0.0019	0.0021
108	0.0040	0.0019	0.0021
109	0.0040	0.0019	0.0021
110	0.0040	0.0019	0.0021
111	0.0041	0.0019	0.0021
112	0.0041	0.0020	0.0021
113	0.0041	0.0020	0.0022
114	0.0041	0.0020	0.0022
115	0.0042	0.0020	0.0022
116	0.0042	0.0020	0.0022
117	0.0042	0.0020	0.0022
118	0.0043	0.0020	0.0022
119	0.0043	0.0021	0.0022
120	0.0043	0.0021	0.0023
121	0.0044	0.0021	0.0023
122	0.0044	0.0021	0.0023
123	0.0044	0.0021	0.0023
124	0.0045	0.0021	0.0023
125	0.0045	0.0022	0.0024
126	0.0045	0.0022	0.0024
127	0.0046	0.0022	0.0024
128	0.0046	0.0022	0.0024
129	0.0047	0.0022	0.0024
130	0.0047	0.0023	0.0025
131	0.0048	0.0023	0.0025
132	0.0048	0.0023	0.0025

133	0.0048	0.0023	0.0025
134	0.0049	0.0023	0.0025
135	0.0049	0.0024	0.0026
136	0.0050	0.0024	0.0026
137	0.0050	0.0024	0.0026
138	0.0051	0.0024	0.0026
139	0.0051	0.0025	0.0027
140	0.0052	0.0025	0.0027
141	0.0053	0.0025	0.0027
142	0.0053	0.0025	0.0028
143	0.0054	0.0026	0.0028
144	0.0054	0.0026	0.0028
145	0.0055	0.0026	0.0029
146	0.0055	0.0026	0.0029
147	0.0056	0.0027	0.0029
148	0.0057	0.0027	0.0030
149	0.0058	0.0028	0.0030
150	0.0058	0.0028	0.0030
151	0.0059	0.0028	0.0031
152	0.0060	0.0029	0.0031
153	0.0061	0.0029	0.0032
154	0.0061	0.0029	0.0032
155	0.0063	0.0030	0.0033
156	0.0063	0.0030	0.0033
157	0.0064	0.0031	0.0034
158	0.0065	0.0031	0.0034
159	0.0067	0.0032	0.0035
160	0.0067	0.0032	0.0035
161	0.0069	0.0033	0.0036
162	0.0070	0.0033	0.0036
163	0.0071	0.0034	0.0037
164	0.0072	0.0035	0.0038
165	0.0074	0.0036	0.0039
166	0.0075	0.0036	0.0039
167	0.0077	0.0037	0.0040
168	0.0079	0.0038	0.0041
169	0.0081	0.0039	0.0042
170	0.0082	0.0039	0.0043
171	0.0085	0.0041	0.0044
172	0.0087	0.0041	0.0045
173	0.0090	0.0043	0.0047
174	0.0092	0.0044	0.0048
175	0.0095	0.0046	0.0050
176	0.0097	0.0047	0.0051
177	0.0102	0.0049	0.0053
178	0.0104	0.0050	0.0054
179	0.0110	0.0053	0.0057
180	0.0113	0.0054	0.0059
181	0.0120	0.0057	0.0063
182	0.0124	0.0059	0.0065

183	0.0133	0.0064	0.0069
184	0.0139	0.0066	0.0072
185	0.0103	0.0049	0.0054
186	0.0110	0.0052	0.0057
187	0.0127	0.0061	0.0066
188	0.0139	0.0066	0.0072
189	0.0172	0.0083	0.0090
190	0.0199	0.0095	0.0104
191	0.0301	0.0144	0.0157
192	0.0437	0.0209	0.0228
193	0.1892	0.0260	0.1632
194	0.0237	0.0113	0.0124
195	0.0153	0.0073	0.0080
196	0.0117	0.0056	0.0061
197	0.0145	0.0069	0.0075
198	0.0128	0.0061	0.0067
199	0.0116	0.0056	0.0061
200	0.0107	0.0051	0.0056
201	0.0100	0.0048	0.0052
202	0.0093	0.0045	0.0049
203	0.0088	0.0042	0.0046
204	0.0084	0.0040	0.0044
205	0.0080	0.0038	0.0042
206	0.0076	0.0037	0.0040
207	0.0073	0.0035	0.0038
208	0.0071	0.0034	0.0037
209	0.0068	0.0033	0.0035
210	0.0066	0.0032	0.0034
211	0.0064	0.0031	0.0033
212	0.0062	0.0030	0.0032
213	0.0060	0.0029	0.0031
214	0.0059	0.0028	0.0031
215	0.0057	0.0027	0.0030
216	0.0056	0.0027	0.0029
217	0.0054	0.0026	0.0028
218	0.0053	0.0025	0.0028
219	0.0052	0.0025	0.0027
220	0.0051	0.0024	0.0027
221	0.0050	0.0024	0.0026
222	0.0049	0.0023	0.0026
223	0.0048	0.0023	0.0025
224	0.0047	0.0023	0.0025
225	0.0046	0.0022	0.0024
226	0.0046	0.0022	0.0024
227	0.0045	0.0022	0.0023
228	0.0044	0.0021	0.0023
229	0.0044	0.0021	0.0023
230	0.0043	0.0021	0.0022
231	0.0042	0.0020	0.0022
232	0.0042	0.0020	0.0022

233	0.0041	0.0020	0.0021
234	0.0041	0.0019	0.0021
235	0.0040	0.0019	0.0021
236	0.0039	0.0019	0.0021
237	0.0039	0.0019	0.0020
238	0.0039	0.0018	0.0020
239	0.0038	0.0018	0.0020
240	0.0038	0.0018	0.0020
241	0.0037	0.0018	0.0019
242	0.0037	0.0018	0.0019
243	0.0036	0.0017	0.0019
244	0.0036	0.0017	0.0019
245	0.0036	0.0017	0.0019
246	0.0035	0.0017	0.0018
247	0.0035	0.0017	0.0018
248	0.0034	0.0016	0.0018
249	0.0034	0.0016	0.0018
250	0.0034	0.0016	0.0018
251	0.0033	0.0016	0.0017
252	0.0033	0.0016	0.0017
253	0.0033	0.0016	0.0017
254	0.0033	0.0016	0.0017
255	0.0032	0.0015	0.0017
256	0.0032	0.0015	0.0017
257	0.0032	0.0015	0.0017
258	0.0031	0.0015	0.0016
259	0.0031	0.0015	0.0016
260	0.0031	0.0015	0.0016
261	0.0031	0.0015	0.0016
262	0.0030	0.0015	0.0016
263	0.0030	0.0014	0.0016
264	0.0030	0.0014	0.0016
265	0.0030	0.0014	0.0015
266	0.0029	0.0014	0.0015
267	0.0029	0.0014	0.0015
268	0.0029	0.0014	0.0015
269	0.0029	0.0014	0.0015
270	0.0029	0.0014	0.0015
271	0.0028	0.0014	0.0015
272	0.0028	0.0013	0.0015
273	0.0028	0.0013	0.0015
274	0.0028	0.0013	0.0015
275	0.0028	0.0013	0.0014
276	0.0027	0.0013	0.0014
277	0.0027	0.0013	0.0014
278	0.0027	0.0013	0.0014
279	0.0027	0.0013	0.0014
280	0.0027	0.0013	0.0014
281	0.0027	0.0013	0.0014
282	0.0026	0.0013	0.0014

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283              0.0026          0.0013            0.0014
284              0.0026          0.0012            0.0014
285              0.0026          0.0012            0.0014
286              0.0026          0.0012            0.0013
287              0.0026          0.0012            0.0013
288              0.0025          0.0012            0.0013
--------------------------------------------------------------------
--------------------------------------------------------------------
Total soil rain loss =      0.72(In)
Total effective rainfall =      0.92(In)
Peak flow rate in flood hydrograph =      8.74(CFS)
---------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                    24 - H O U R   S T O R M
               R u n o f f     H y d r o g r a p h
--------------------------------------------------------------------
            Hydrograph in   5   Minute intervals ((CFS))

--------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0001      0.01  Q        |         |         |         |
  0+10       0.0004      0.06  Q        |         |         |         |
  0+15       0.0012      0.12  Q        |         |         |         |
  0+20       0.0022      0.14  Q        |         |         |         |
  0+25       0.0033      0.16  Q        |         |         |         |
  0+30       0.0045      0.17  Q        |         |         |         |
  0+35       0.0057      0.18  Q        |         |         |         |
  0+40       0.0069      0.18  Q        |         |         |         |
  0+45       0.0082      0.19  Q        |         |         |         |
  0+50       0.0095      0.19  Q        |         |         |         |
  0+55       0.0109      0.19  Q        |         |         |         |
  1+ 0       0.0122      0.20  Q        |         |         |         |
  1+ 5       0.0136      0.20  Q        |         |         |         |
  1+10       0.0149      0.20  Q        |         |         |         |
  1+15       0.0163      0.20  Q        |         |         |         |
  1+20       0.0177      0.20  Q        |         |         |         |
  1+25       0.0191      0.20  Q        |         |         |         |
  1+30       0.0205      0.20  Q        |         |         |         |
  1+35       0.0219      0.20  Q        |         |         |         |
  1+40       0.0234      0.21  Q        |         |         |         |
  1+45       0.0248      0.21  QV       |         |         |         |
  1+50       0.0262      0.21  QV       |         |         |         |
  1+55       0.0276      0.21  QV       |         |         |         |
  2+ 0       0.0290      0.21  QV       |         |         |         |
  2+ 5       0.0305      0.21  QV       |         |         |         |
  2+10       0.0319      0.21  QV       |         |         |         |
  2+15       0.0334      0.21  QV       |         |         |         |
  2+20       0.0348      0.21  QV       |         |         |         |
  2+25       0.0363      0.21  QV       |         |         |         |
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2+30       0.0377      0.21  QV        |         |         |         |
2+35       0.0392      0.21  QV        |         |         |         |
2+40       0.0407      0.21  QV        |         |         |         |
2+45       0.0421      0.21  QV        |         |         |         |
2+50       0.0436      0.21  QV        |         |         |         |
2+55       0.0451      0.22  QV        |         |         |         |
3+ 0       0.0466      0.22  QV        |         |         |         |
3+ 5       0.0481      0.22  Q V       |         |         |         |
3+10       0.0496      0.22  Q V       |         |         |         |
3+15       0.0511      0.22  Q V       |         |         |         |
3+20       0.0526      0.22  Q V       |         |         |         |
3+25       0.0541      0.22  Q V       |         |         |         |
3+30       0.0556      0.22  Q V       |         |         |         |
3+35       0.0572      0.22  Q V       |         |         |         |
3+40       0.0587      0.22  Q V       |         |         |         |
3+45       0.0602      0.22  Q V       |         |         |         |
3+50       0.0618      0.22  Q V       |         |         |         |
3+55       0.0633      0.23  Q V       |         |         |         |
4+ 0       0.0649      0.23  Q V       |         |         |         |
4+ 5       0.0665      0.23  Q V       |         |         |         |
4+10       0.0680      0.23  Q V       |         |         |         |
4+15       0.0696      0.23  Q V       |         |         |         |
4+20       0.0712      0.23  Q  V      |         |         |         |
4+25       0.0728      0.23  Q  V      |         |         |         |
4+30       0.0744      0.23  Q  V      |         |         |         |
4+35       0.0760      0.23  Q  V      |         |         |         |
4+40       0.0776      0.23  Q  V      |         |         |         |
4+45       0.0792      0.23  Q  V      |         |         |         |
4+50       0.0808      0.23  Q  V      |         |         |         |
4+55       0.0824      0.24  Q  V      |         |         |         |
5+ 0       0.0840      0.24  Q  V      |         |         |         |
5+ 5       0.0857      0.24  Q  V      |         |         |         |
5+10       0.0873      0.24  Q  V      |         |         |         |
5+15       0.0890      0.24  Q  V      |         |         |         |
5+20       0.0906      0.24  Q  V      |         |         |         |
5+25       0.0923      0.24  Q  V      |         |         |         |
5+30       0.0940      0.24  Q   V     |         |         |         |
5+35       0.0957      0.24  Q   V     |         |         |         |
5+40       0.0973      0.24  Q   V     |         |         |         |
5+45       0.0990      0.25  Q   V     |         |         |         |
5+50       0.1007      0.25  Q   V     |         |         |         |
5+55       0.1024      0.25  Q   V     |         |         |         |
6+ 0       0.1042      0.25  Q   V     |         |         |         |
6+ 5       0.1059      0.25  |Q  V     |         |         |         |
6+10       0.1076      0.25  |Q  V     |         |         |         |
6+15       0.1094      0.25  |Q  V     |         |         |         |
6+20       0.1111      0.25  |Q  V     |         |         |         |
6+25       0.1129      0.26  |Q  V     |         |         |         |
6+30       0.1146      0.26  |Q  V     |         |         |         |
6+35       0.1164      0.26  |Q  V     |         |         |         |
```

```
 6+40       0.1182      0.26  |Q   V    |         |         |         |
 6+45       0.1200      0.26  |Q   V    |         |         |         |
 6+50       0.1218      0.26  |Q   V    |         |         |         |
 6+55       0.1236      0.26  |Q   V    |         |         |         |
 7+ 0       0.1254      0.26  |Q   V    |         |         |         |
 7+ 5       0.1272      0.27  |Q   V    |         |         |         |
 7+10       0.1291      0.27  |Q   V    |         |         |         |
 7+15       0.1309      0.27  |Q   V    |         |         |         |
 7+20       0.1327      0.27  |Q   V    |         |         |         |
 7+25       0.1346      0.27  |Q   V    |         |         |         |
 7+30       0.1365      0.27  |Q   V    |         |         |         |
 7+35       0.1384      0.27  |Q   V    |         |         |         |
 7+40       0.1403      0.27  |Q   V    |         |         |         |
 7+45       0.1422      0.28  |Q    V   |         |         |         |
 7+50       0.1441      0.28  |Q    V   |         |         |         |
 7+55       0.1460      0.28  |Q    V   |         |         |         |
 8+ 0       0.1479      0.28  |Q    V   |         |         |         |
 8+ 5       0.1499      0.28  |Q    V   |         |         |         |
 8+10       0.1518      0.28  |Q    V   |         |         |         |
 8+15       0.1538      0.29  |Q    V   |         |         |         |
 8+20       0.1558      0.29  |Q    V   |         |         |         |
 8+25       0.1578      0.29  |Q    V   |         |         |         |
 8+30       0.1598      0.29  |Q    V   |         |         |         |
 8+35       0.1618      0.29  |Q    V   |         |         |         |
 8+40       0.1638      0.29  |Q    V   |         |         |         |
 8+45       0.1659      0.30  |Q     V  |         |         |         |
 8+50       0.1679      0.30  |Q     V  |         |         |         |
 8+55       0.1700      0.30  |Q     V  |         |         |         |
 9+ 0       0.1721      0.30  |Q     V  |         |         |         |
 9+ 5       0.1741      0.30  |Q     V  |         |         |         |
 9+10       0.1762      0.31  |Q     V  |         |         |         |
 9+15       0.1784      0.31  |Q     V  |         |         |         |
 9+20       0.1805      0.31  |Q     V  |         |         |         |
 9+25       0.1826      0.31  |Q     V  |         |         |         |
 9+30       0.1848      0.31  |Q     V  |         |         |         |
 9+35       0.1870      0.32  |Q     V  |         |         |         |
 9+40       0.1892      0.32  |Q      V |         |         |         |
 9+45       0.1914      0.32  |Q      V |         |         |         |
 9+50       0.1936      0.32  |Q      V |         |         |         |
 9+55       0.1958      0.32  |Q      V |         |         |         |
10+ 0       0.1981      0.33  |Q      V |         |         |         |
10+ 5       0.2004      0.33  |Q      V |         |         |         |
10+10       0.2026      0.33  |Q      V |         |         |         |
10+15       0.2049      0.33  |Q      V |         |         |         |
10+20       0.2073      0.34  |Q      V |         |         |         |
10+25       0.2096      0.34  |Q      V |         |         |         |
10+30       0.2120      0.34  |Q       V|         |         |         |
10+35       0.2143      0.35  |Q       V|         |         |         |
10+40       0.2167      0.35  |Q       V|         |         |         |
10+45       0.2192      0.35  |Q       V|         |         |         |
```

```
10+50       0.2216      0.35  |Q       V|         |         |         |
10+55       0.2241      0.36  |Q       V|         |         |         |
11+ 0       0.2265      0.36  |Q       V|         |         |         |
11+ 5       0.2290      0.36  |Q       V|         |         |         |
11+10       0.2316      0.37  |Q       V|         |         |         |
11+15       0.2341      0.37  |Q       V|         |         |         |
11+20       0.2367      0.37  |Q        V         |         |         |
11+25       0.2393      0.38  |Q        V         |         |         |
11+30       0.2419      0.38  |Q        V         |         |         |
11+35       0.2445      0.38  |Q        V         |         |         |
11+40       0.2472      0.39  |Q        V         |         |         |
11+45       0.2499      0.39  |Q        V         |         |         |
11+50       0.2526      0.40  |Q        V         |         |         |
11+55       0.2554      0.40  |Q        V         |         |         |
12+ 0       0.2582      0.40  |Q        |V        |         |         |
12+ 5       0.2610      0.41  |Q        |V        |         |         |
12+10       0.2638      0.41  |Q        |V        |         |         |
12+15       0.2667      0.42  |Q        |V        |         |         |
12+20       0.2696      0.42  |Q        |V        |         |         |
12+25       0.2726      0.43  |Q        |V        |         |         |
12+30       0.2756      0.43  |Q        |V        |         |         |
12+35       0.2786      0.44  |Q        |V        |         |         |
12+40       0.2816      0.44  |Q        | V       |         |         |
12+45       0.2847      0.45  |Q        | V       |         |         |
12+50       0.2879      0.46  |Q        | V       |         |         |
12+55       0.2910      0.46  |Q        | V       |         |         |
13+ 0       0.2943      0.47  |Q        | V       |         |         |
13+ 5       0.2975      0.47  |Q        | V       |         |         |
13+10       0.3008      0.48  |Q        | V       |         |         |
13+15       0.3042      0.49  |Q        | V       |         |         |
13+20       0.3076      0.50  |Q        |  V      |         |         |
13+25       0.3111      0.50  | Q       |  V      |         |         |
13+30       0.3146      0.51  | Q       |  V      |         |         |
13+35       0.3182      0.52  | Q       |  V      |         |         |
13+40       0.3219      0.53  | Q       |  V      |         |         |
13+45       0.3256      0.54  | Q       |  V      |         |         |
13+50       0.3294      0.55  | Q       |   V     |         |         |
13+55       0.3332      0.56  | Q       |   V     |         |         |
14+ 0       0.3372      0.57  | Q       |   V     |         |         |
14+ 5       0.3412      0.58  | Q       |   V     |         |         |
14+10       0.3453      0.60  | Q       |   V     |         |         |
14+15       0.3495      0.61  | Q       |   V     |         |         |
14+20       0.3538      0.62  | Q       |    V    |         |         |
14+25       0.3582      0.64  | Q       |    V    |         |         |
14+30       0.3627      0.66  | Q       |    V    |         |         |
14+35       0.3674      0.67  | Q       |    V    |         |         |
14+40       0.3721      0.69  | Q       |    V    |         |         |
14+45       0.3770      0.71  | Q       |     V   |         |         |
14+50       0.3821      0.74  | Q       |     V   |         |         |
14+55       0.3873      0.76  |  Q      |     V   |         |         |
```

```
15+ 0       0.3927      0.79  |  Q      |     V   |         |         |
15+ 5       0.3984      0.82  |  Q      |      V  |         |         |
15+10       0.4042      0.85  |  Q      |      V  |         |         |
15+15       0.4103      0.89  |  Q      |      V  |         |         |
15+20       0.4168      0.93  |  Q      |      V  |         |         |
15+25       0.4234      0.97  |  Q      |       V |         |         |
15+30       0.4298      0.93  |  Q      |       V |         |         |
15+35       0.4359      0.88  |  Q      |       V |         |         |
15+40       0.4422      0.91  |  Q      |       V |         |         |
15+45       0.4489      0.98  |  Q      |        V|         |         |
15+50       0.4564      1.09  |   Q     |        V|         |         |
15+55       0.4651      1.27  |    Q    |        V|         |         |
16+ 0       0.4762      1.61  |     Q   |         V         |         |
16+ 5       0.4965      2.94  |         |Q        |V        |         |
16+10       0.5493      7.68  |         |         |  V      Q         |
16+15       0.6095      8.74  |         |         |     V   |   Q     |
16+20       0.6421      4.74  |         |       Q |      V  |         |
16+25       0.6641      3.18  |         | Q       |       V |         |
16+30       0.6809      2.45  |        Q|         |        V|         |
16+35       0.6950      2.05  |       Q |         |        V|         |
16+40       0.7068      1.71  |     Q   |         |         V         |
16+45       0.7171      1.49  |    Q    |         |         V         |
16+50       0.7260      1.30  |    Q    |         |         V         |
16+55       0.7339      1.15  |   Q     |         |         |V        |
17+ 0       0.7408      1.00  |   Q     |         |         |V        |
17+ 5       0.7469      0.89  |  Q      |         |         |V        |
17+10       0.7528      0.85  |  Q      |         |         | V       |
17+15       0.7583      0.81  |  Q      |         |         | V       |
17+20       0.7633      0.72  | Q       |         |         | V       |
17+25       0.7678      0.66  | Q       |         |         | V       |
17+30       0.7718      0.58  | Q       |         |         | V       |
17+35       0.7757      0.56  | Q       |         |         |  V      |
17+40       0.7793      0.54  | Q       |         |         |  V      |
17+45       0.7829      0.52  | Q       |         |         |  V      |
17+50       0.7864      0.50  | Q       |         |         |  V      |
17+55       0.7897      0.48  |Q        |         |         |  V      |
18+ 0       0.7929      0.47  |Q        |         |         |  V      |
18+ 5       0.7961      0.46  |Q        |         |         |  V      |
18+10       0.7992      0.45  |Q        |         |         |   V     |
18+15       0.8022      0.43  |Q        |         |         |   V     |
18+20       0.8051      0.42  |Q        |         |         |   V     |
18+25       0.8079      0.41  |Q        |         |         |   V     |
18+30       0.8107      0.41  |Q        |         |         |   V     |
18+35       0.8134      0.40  |Q        |         |         |   V     |
18+40       0.8161      0.39  |Q        |         |         |   V     |
18+45       0.8187      0.38  |Q        |         |         |   V     |
18+50       0.8213      0.37  |Q        |         |         |    V    |
18+55       0.8238      0.37  |Q        |         |         |    V    |
19+ 0       0.8263      0.36  |Q        |         |         |    V    |
19+ 5       0.8288      0.35  |Q        |         |         |    V    |
```

```
19+10       0.8312      0.35  |Q        |         |         |    V    |
19+15       0.8335      0.34  |Q        |         |         |    V    |
19+20       0.8358      0.34  |Q        |         |         |    V    |
19+25       0.8381      0.33  |Q        |         |         |    V    |
19+30       0.8404      0.33  |Q        |         |         |    V    |
19+35       0.8426      0.32  |Q        |         |         |    V    |
19+40       0.8448      0.32  |Q        |         |         |     V   |
19+45       0.8470      0.31  |Q        |         |         |     V   |
19+50       0.8491      0.31  |Q        |         |         |     V   |
19+55       0.8512      0.31  |Q        |         |         |     V   |
20+ 0       0.8533      0.30  |Q        |         |         |     V   |
20+ 5       0.8553      0.30  |Q        |         |         |     V   |
20+10       0.8574      0.29  |Q        |         |         |     V   |
20+15       0.8594      0.29  |Q        |         |         |     V   |
20+20       0.8613      0.29  |Q        |         |         |     V   |
20+25       0.8633      0.28  |Q        |         |         |     V   |
20+30       0.8652      0.28  |Q        |         |         |     V   |
20+35       0.8671      0.28  |Q        |         |         |      V  |
20+40       0.8690      0.27  |Q        |         |         |      V  |
20+45       0.8709      0.27  |Q        |         |         |      V  |
20+50       0.8728      0.27  |Q        |         |         |      V  |
20+55       0.8746      0.27  |Q        |         |         |      V  |
21+ 0       0.8764      0.26  |Q        |         |         |      V  |
21+ 5       0.8782      0.26  |Q        |         |         |      V  |
21+10       0.8800      0.26  |Q        |         |         |      V  |
21+15       0.8817      0.26  |Q        |         |         |      V  |
21+20       0.8835      0.25  |Q        |         |         |      V  |
21+25       0.8852      0.25  |Q        |         |         |      V  |
21+30       0.8869      0.25  Q         |         |         |      V  |
21+35       0.8886      0.25  Q         |         |         |      V  |
21+40       0.8903      0.24  Q         |         |         |       V |
21+45       0.8920      0.24  Q         |         |         |       V |
21+50       0.8937      0.24  Q         |         |         |       V |
21+55       0.8953      0.24  Q         |         |         |       V |
22+ 0       0.8969      0.24  Q         |         |         |       V |
22+ 5       0.8985      0.23  Q         |         |         |       V |
22+10       0.9001      0.23  Q         |         |         |       V |
22+15       0.9017      0.23  Q         |         |         |       V |
22+20       0.9033      0.23  Q         |         |         |       V |
22+25       0.9049      0.23  Q         |         |         |       V |
22+30       0.9064      0.23  Q         |         |         |       V |
22+35       0.9080      0.22  Q         |         |         |       V |
22+40       0.9095      0.22  Q         |         |         |       V |
22+45       0.9110      0.22  Q         |         |         |       V |
22+50       0.9125      0.22  Q         |         |         |       V |
22+55       0.9140      0.22  Q         |         |         |        V|
23+ 0       0.9155      0.22  Q         |         |         |        V|
23+ 5       0.9170      0.21  Q         |         |         |        V|
23+10       0.9185      0.21  Q         |         |         |        V|
23+15       0.9199      0.21  Q         |         |         |        V|
```

```
   23+20        0.9214       0.21  Q          |          |          |        V|
   23+25        0.9228       0.21  Q          |          |          |        V|
   23+30        0.9243       0.21  Q          |          |          |        V|
   23+35        0.9257       0.21  Q          |          |          |        V|
   23+40        0.9271       0.21  Q          |          |          |        V|
   23+45        0.9285       0.20  Q          |          |          |        V|
   23+50        0.9299       0.20  Q          |          |          |        V|
   23+55        0.9313       0.20  Q          |          |          |        V|
   24+ 0        0.9327       0.20  Q          |          |          |        V|
-----------------------------------------------------------------------
```

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study        Date: 08/13/21
------------------------------------------------------------------------
10 Year Rational Analysis Post Development
Former Track 17486
Drainage Area 2
File: 17486Rat10PostA2.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.692 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   997.200(Ft.)
Top (of initial area) elevation =  3291.300(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =    10.300(Ft.)
Slope =    0.01033  s(%)=       1.03
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.369 min.
Rainfall intensity =      1.795(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.703
Subarea runoff =      9.759(CFS)
Total initial stream area =        7.730(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.730(Ac.)
Runoff from this stream =      9.759(CFS)
Time of concentration =   15.37 min.
Rainfall intensity =     1.795(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   443.400(Ft.)
Top (of initial area) elevation =  3283.100(Ft.)
Bottom (of initial area) elevation =  3281.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00474  s(%)=       0.47
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.989 min.
Rainfall intensity =      2.020(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.725
Subarea runoff =      6.590(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =      6.590(CFS)
Time of concentration =   12.99 min.
Rainfall intensity =     2.020(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream Flow rate    Area    TC      Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)



1      9.76     7.730     15.37    0.393      1.795
2      6.59     4.500     12.99    0.393      2.020
Qmax(1) =
           1.000 *    1.000 *     9.759) +
           0.862 *    1.000 *     6.590) + =      15.441
Qmax(2) =
           1.160 *    0.845 *     9.759) +
           1.000 *    1.000 *     6.590) + =      16.158

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.759       6.590
Maximum flow rates at confluence using above data:
       15.441       16.158
Area of streams before confluence:
        7.730        4.500
Effective area values after confluence:
       12.230      11.033
Results of confluence:
Total flow rate =     16.158(CFS)
Time of concentration =    12.989 min.
Effective stream area after confluence =     11.033(Ac.)
Study area average Pervious fraction(Ap) =  0.500
Study area average soil loss rate(Fm) =    0.393(In/Hr)
Study area total (this main stream) =      12.23(Ac.)
End of computations, Total Study Area =           12.23 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500
```

Area averaged SCS curve number = 32.0

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  08/30/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
10 Year Unit Hydrograph Post Development
Former Track 17486
Drainage Area 2
File: 17486Hydr10PostA2.out
--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)            (hours)         (In)
Rainfall data for year 10
            12.23           1           0.69
--------------------------------------------------------------------
Rainfall data for year 10
            12.23           6           1.46
--------------------------------------------------------------------
Rainfall data for year 10
            12.23          24           2.97
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      52.0         12.23      1.000     0.785    0.400    0.314

Area-averaged adjusted loss rate Fm (In/Hr) =  0.314

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     4.89   0.400         32.0      52.0       9.23     0.041
     7.34   0.600         98.0      98.0       0.20     0.922

Area-averaged catchment yield fraction, Y =  0.570
Area-averaged low loss fraction, Yb =  0.430
User entry of time of concentration  =   0.217 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      12.23(Ac.)
Catchment Lag time =   0.173 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 48.1139
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.314(In/Hr)
Average low loss rate fraction (Yb) = 0.430 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.328(In)
Computed peak 30-minute rainfall =  0.562(In)
Specified peak 1-hour rainfall =  0.692(In)
Computed peak 3-hour rainfall =  1.094(In)
Specified peak 6-hour rainfall =  1.460(In)
Specified peak 24-hour rainfall =  2.970(In)


Rainfall depth area reduction factors:
Using a total area of      12.23(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.328(In)
30-minute factor = 0.999    Adjusted rainfall =  0.562(In)
1-hour factor = 0.999       Adjusted rainfall =  0.692(In)
3-hour factor = 1.000       Adjusted rainfall =  1.094(In)
6-hour factor = 1.000       Adjusted rainfall =  1.460(In)
24-hour factor = 1.000      Adjusted rainfall =  2.970(In)
---------------------------------------------------------------------

                        U n i t   H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 147.91 (CFS))	
1	3.719	5.500
2	28.282	36.331
3	58.794	45.129
4	72.457	20.208
5	80.398	11.746
6	85.662	7.786
7	89.432	5.576
8	92.102	3.950
9	94.181	3.075
10	95.760	2.335
11	96.964	1.780
12	97.797	1.233
13	98.328	0.785
14	98.894	0.838
15	99.444	0.812
16	99.786	0.506
17	100.000	0.316

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3282	0.3282
2	0.4040	0.0759
3	0.4563	0.0523
4	0.4974	0.0411
5	0.5319	0.0344
6	0.5618	0.0299
7	0.5883	0.0266
8	0.6124	0.0240
9	0.6344	0.0220
10	0.6548	0.0204
11	0.6738	0.0190
12	0.6916	0.0178
13	0.7151	0.0235
14	0.7375	0.0225
15	0.7591	0.0215
16	0.7798	0.0207
17	0.7998	0.0200
18	0.8191	0.0193
19	0.8377	0.0187
20	0.8559	0.0181
21	0.8735	0.0176
22	0.8906	0.0171
23	0.9072	0.0167
24	0.9235	0.0163
25	0.9393	0.0159

26	0.9548	0.0155
27	0.9700	0.0152
28	0.9848	0.0148
29	0.9993	0.0145
30	1.0136	0.0142
31	1.0275	0.0140
32	1.0412	0.0137
33	1.0547	0.0135
34	1.0679	0.0132
35	1.0809	0.0130
36	1.0937	0.0128
37	1.1062	0.0126
38	1.1186	0.0124
39	1.1308	0.0122
40	1.1428	0.0120
41	1.1546	0.0118
42	1.1662	0.0117
43	1.1777	0.0115
44	1.1891	0.0113
45	1.2002	0.0112
46	1.2113	0.0110
47	1.2222	0.0109
48	1.2330	0.0108
49	1.2436	0.0106
50	1.2541	0.0105
51	1.2645	0.0104
52	1.2748	0.0103
53	1.2850	0.0102
54	1.2950	0.0100
55	1.3049	0.0099
56	1.3148	0.0098
57	1.3245	0.0097
58	1.3341	0.0096
59	1.3437	0.0095
60	1.3531	0.0094
61	1.3625	0.0094
62	1.3717	0.0093
63	1.3809	0.0092
64	1.3900	0.0091
65	1.3990	0.0090
66	1.4080	0.0089
67	1.4168	0.0089
68	1.4256	0.0088
69	1.4343	0.0087
70	1.4429	0.0086
71	1.4515	0.0086
72	1.4599	0.0085
73	1.4703	0.0104
74	1.4806	0.0103
75	1.4908	0.0102

76	1.5009	0.0101
77	1.5110	0.0101
78	1.5211	0.0100
79	1.5310	0.0100
80	1.5409	0.0099
81	1.5507	0.0098
82	1.5605	0.0098
83	1.5702	0.0097
84	1.5799	0.0097
85	1.5895	0.0096
86	1.5991	0.0096
87	1.6086	0.0095
88	1.6180	0.0094
89	1.6274	0.0094
90	1.6367	0.0093
91	1.6460	0.0093
92	1.6553	0.0092
93	1.6645	0.0092
94	1.6736	0.0091
95	1.6827	0.0091
96	1.6918	0.0091
97	1.7008	0.0090
98	1.7097	0.0090
99	1.7186	0.0089
100	1.7275	0.0089
101	1.7363	0.0088
102	1.7451	0.0088
103	1.7539	0.0087
104	1.7626	0.0087
105	1.7712	0.0087
106	1.7798	0.0086
107	1.7884	0.0086
108	1.7970	0.0085
109	1.8055	0.0085
110	1.8139	0.0085
111	1.8224	0.0084
112	1.8308	0.0084
113	1.8391	0.0084
114	1.8474	0.0083
115	1.8557	0.0083
116	1.8640	0.0082
117	1.8722	0.0082
118	1.8804	0.0082
119	1.8885	0.0081
120	1.8966	0.0081
121	1.9047	0.0081
122	1.9128	0.0080
123	1.9208	0.0080
124	1.9288	0.0080
125	1.9367	0.0080

126	1.9446	0.0079
127	1.9525	0.0079
128	1.9604	0.0079
129	1.9682	0.0078
130	1.9760	0.0078
131	1.9838	0.0078
132	1.9915	0.0077
133	1.9992	0.0077
134	2.0069	0.0077
135	2.0146	0.0077
136	2.0222	0.0076
137	2.0298	0.0076
138	2.0374	0.0076
139	2.0449	0.0075
140	2.0525	0.0075
141	2.0600	0.0075
142	2.0674	0.0075
143	2.0749	0.0074
144	2.0823	0.0074
145	2.0897	0.0074
146	2.0971	0.0074
147	2.1044	0.0073
148	2.1117	0.0073
149	2.1190	0.0073
150	2.1263	0.0073
151	2.1336	0.0072
152	2.1408	0.0072
153	2.1480	0.0072
154	2.1552	0.0072
155	2.1623	0.0072
156	2.1695	0.0071
157	2.1766	0.0071
158	2.1837	0.0071
159	2.1907	0.0071
160	2.1978	0.0070
161	2.2048	0.0070
162	2.2118	0.0070
163	2.2188	0.0070
164	2.2258	0.0070
165	2.2327	0.0069
166	2.2396	0.0069
167	2.2465	0.0069
168	2.2534	0.0069
169	2.2603	0.0069
170	2.2671	0.0068
171	2.2739	0.0068
172	2.2807	0.0068
173	2.2875	0.0068
174	2.2943	0.0068
175	2.3010	0.0067

176	2.3077	0.0067
177	2.3144	0.0067
178	2.3211	0.0067
179	2.3278	0.0067
180	2.3345	0.0067
181	2.3411	0.0066
182	2.3477	0.0066
183	2.3543	0.0066
184	2.3609	0.0066
185	2.3675	0.0066
186	2.3740	0.0065
187	2.3805	0.0065
188	2.3870	0.0065
189	2.3935	0.0065
190	2.4000	0.0065
191	2.4065	0.0065
192	2.4129	0.0064
193	2.4194	0.0064
194	2.4258	0.0064
195	2.4322	0.0064
196	2.4386	0.0064
197	2.4449	0.0064
198	2.4513	0.0063
199	2.4576	0.0063
200	2.4639	0.0063
201	2.4702	0.0063
202	2.4765	0.0063
203	2.4828	0.0063
204	2.4890	0.0063
205	2.4953	0.0062
206	2.5015	0.0062
207	2.5077	0.0062
208	2.5139	0.0062
209	2.5201	0.0062
210	2.5263	0.0062
211	2.5324	0.0062
212	2.5386	0.0061
213	2.5447	0.0061
214	2.5508	0.0061
215	2.5569	0.0061
216	2.5630	0.0061
217	2.5691	0.0061
218	2.5751	0.0061
219	2.5812	0.0060
220	2.5872	0.0060
221	2.5932	0.0060
222	2.5992	0.0060
223	2.6052	0.0060
224	2.6112	0.0060
225	2.6172	0.0060

226	2.6231	0.0060
227	2.6290	0.0059
228	2.6350	0.0059
229	2.6409	0.0059
230	2.6468	0.0059
231	2.6527	0.0059
232	2.6586	0.0059
233	2.6644	0.0059
234	2.6703	0.0059
235	2.6761	0.0058
236	2.6819	0.0058
237	2.6878	0.0058
238	2.6936	0.0058
239	2.6994	0.0058
240	2.7051	0.0058
241	2.7109	0.0058
242	2.7167	0.0058
243	2.7224	0.0057
244	2.7281	0.0057
245	2.7339	0.0057
246	2.7396	0.0057
247	2.7453	0.0057
248	2.7510	0.0057
249	2.7566	0.0057
250	2.7623	0.0057
251	2.7679	0.0057
252	2.7736	0.0056
253	2.7792	0.0056
254	2.7848	0.0056
255	2.7905	0.0056
256	2.7961	0.0056
257	2.8016	0.0056
258	2.8072	0.0056
259	2.8128	0.0056
260	2.8184	0.0056
261	2.8239	0.0055
262	2.8294	0.0055
263	2.8350	0.0055
264	2.8405	0.0055
265	2.8460	0.0055
266	2.8515	0.0055
267	2.8570	0.0055
268	2.8624	0.0055
269	2.8679	0.0055
270	2.8734	0.0055
271	2.8788	0.0054
272	2.8843	0.0054
273	2.8897	0.0054
274	2.8951	0.0054
275	2.9005	0.0054

276	2.9059	0.0054
277	2.9113	0.0054
278	2.9167	0.0054
279	2.9220	0.0054
280	2.9274	0.0054
281	2.9328	0.0054
282	2.9381	0.0053
283	2.9434	0.0053
284	2.9488	0.0053
285	2.9541	0.0053
286	2.9594	0.0053
287	2.9647	0.0053
288	2.9700	0.0053

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0053	0.0023	0.0030
2	0.0053	0.0023	0.0030
3	0.0053	0.0023	0.0030
4	0.0053	0.0023	0.0030
5	0.0053	0.0023	0.0030
6	0.0054	0.0023	0.0030
7	0.0054	0.0023	0.0031
8	0.0054	0.0023	0.0031
9	0.0054	0.0023	0.0031
10	0.0054	0.0023	0.0031
11	0.0054	0.0023	0.0031
12	0.0054	0.0023	0.0031
13	0.0055	0.0023	0.0031
14	0.0055	0.0024	0.0031
15	0.0055	0.0024	0.0031
16	0.0055	0.0024	0.0031
17	0.0055	0.0024	0.0031
18	0.0055	0.0024	0.0031
19	0.0055	0.0024	0.0032
20	0.0056	0.0024	0.0032
21	0.0056	0.0024	0.0032
22	0.0056	0.0024	0.0032
23	0.0056	0.0024	0.0032
24	0.0056	0.0024	0.0032
25	0.0056	0.0024	0.0032
26	0.0057	0.0024	0.0032
27	0.0057	0.0024	0.0032
28	0.0057	0.0024	0.0032
29	0.0057	0.0025	0.0033
30	0.0057	0.0025	0.0033
31	0.0057	0.0025	0.0033
32	0.0058	0.0025	0.0033

33	0.0058	0.0025	0.0033
34	0.0058	0.0025	0.0033
35	0.0058	0.0025	0.0033
36	0.0058	0.0025	0.0033
37	0.0059	0.0025	0.0033
38	0.0059	0.0025	0.0033
39	0.0059	0.0025	0.0034
40	0.0059	0.0025	0.0034
41	0.0059	0.0026	0.0034
42	0.0059	0.0026	0.0034
43	0.0060	0.0026	0.0034
44	0.0060	0.0026	0.0034
45	0.0060	0.0026	0.0034
46	0.0060	0.0026	0.0034
47	0.0060	0.0026	0.0034
48	0.0061	0.0026	0.0035
49	0.0061	0.0026	0.0035
50	0.0061	0.0026	0.0035
51	0.0061	0.0026	0.0035
52	0.0061	0.0026	0.0035
53	0.0062	0.0027	0.0035
54	0.0062	0.0027	0.0035
55	0.0062	0.0027	0.0035
56	0.0062	0.0027	0.0035
57	0.0063	0.0027	0.0036
58	0.0063	0.0027	0.0036
59	0.0063	0.0027	0.0036
60	0.0063	0.0027	0.0036
61	0.0063	0.0027	0.0036
62	0.0064	0.0027	0.0036
63	0.0064	0.0028	0.0036
64	0.0064	0.0028	0.0037
65	0.0064	0.0028	0.0037
66	0.0065	0.0028	0.0037
67	0.0065	0.0028	0.0037
68	0.0065	0.0028	0.0037
69	0.0065	0.0028	0.0037
70	0.0066	0.0028	0.0037
71	0.0066	0.0028	0.0038
72	0.0066	0.0028	0.0038
73	0.0067	0.0029	0.0038
74	0.0067	0.0029	0.0038
75	0.0067	0.0029	0.0038
76	0.0067	0.0029	0.0038
77	0.0068	0.0029	0.0039
78	0.0068	0.0029	0.0039
79	0.0068	0.0029	0.0039
80	0.0068	0.0029	0.0039
81	0.0069	0.0030	0.0039
82	0.0069	0.0030	0.0039

83	0.0069	0.0030	0.0040
84	0.0070	0.0030	0.0040
85	0.0070	0.0030	0.0040
86	0.0070	0.0030	0.0040
87	0.0071	0.0030	0.0040
88	0.0071	0.0031	0.0040
89	0.0071	0.0031	0.0041
90	0.0072	0.0031	0.0041
91	0.0072	0.0031	0.0041
92	0.0072	0.0031	0.0041
93	0.0073	0.0031	0.0041
94	0.0073	0.0031	0.0042
95	0.0073	0.0032	0.0042
96	0.0074	0.0032	0.0042
97	0.0074	0.0032	0.0042
98	0.0074	0.0032	0.0042
99	0.0075	0.0032	0.0043
100	0.0075	0.0032	0.0043
101	0.0076	0.0033	0.0043
102	0.0076	0.0033	0.0043
103	0.0077	0.0033	0.0044
104	0.0077	0.0033	0.0044
105	0.0077	0.0033	0.0044
106	0.0078	0.0033	0.0044
107	0.0078	0.0034	0.0045
108	0.0079	0.0034	0.0045
109	0.0079	0.0034	0.0045
110	0.0080	0.0034	0.0045
111	0.0080	0.0034	0.0046
112	0.0080	0.0035	0.0046
113	0.0081	0.0035	0.0046
114	0.0081	0.0035	0.0046
115	0.0082	0.0035	0.0047
116	0.0082	0.0035	0.0047
117	0.0083	0.0036	0.0047
118	0.0084	0.0036	0.0048
119	0.0084	0.0036	0.0048
120	0.0085	0.0036	0.0048
121	0.0085	0.0037	0.0049
122	0.0086	0.0037	0.0049
123	0.0087	0.0037	0.0049
124	0.0087	0.0037	0.0050
125	0.0088	0.0038	0.0050
126	0.0088	0.0038	0.0050
127	0.0089	0.0038	0.0051
128	0.0090	0.0039	0.0051
129	0.0091	0.0039	0.0052
130	0.0091	0.0039	0.0052
131	0.0092	0.0040	0.0052
132	0.0092	0.0040	0.0053

133	0.0093	0.0040	0.0053
134	0.0094	0.0040	0.0054
135	0.0095	0.0041	0.0054
136	0.0096	0.0041	0.0054
137	0.0097	0.0042	0.0055
138	0.0097	0.0042	0.0055
139	0.0098	0.0042	0.0056
140	0.0099	0.0043	0.0056
141	0.0100	0.0043	0.0057
142	0.0101	0.0043	0.0057
143	0.0102	0.0044	0.0058
144	0.0103	0.0044	0.0059
145	0.0085	0.0037	0.0048
146	0.0086	0.0037	0.0049
147	0.0087	0.0037	0.0050
148	0.0088	0.0038	0.0050
149	0.0089	0.0038	0.0051
150	0.0090	0.0039	0.0051
151	0.0092	0.0039	0.0052
152	0.0093	0.0040	0.0053
153	0.0094	0.0041	0.0054
154	0.0095	0.0041	0.0054
155	0.0097	0.0042	0.0055
156	0.0098	0.0042	0.0056
157	0.0100	0.0043	0.0057
158	0.0102	0.0044	0.0058
159	0.0104	0.0045	0.0059
160	0.0105	0.0045	0.0060
161	0.0108	0.0046	0.0061
162	0.0109	0.0047	0.0062
163	0.0112	0.0048	0.0064
164	0.0113	0.0049	0.0065
165	0.0117	0.0050	0.0066
166	0.0118	0.0051	0.0067
167	0.0122	0.0052	0.0069
168	0.0124	0.0053	0.0070
169	0.0128	0.0055	0.0073
170	0.0130	0.0056	0.0074
171	0.0135	0.0058	0.0077
172	0.0137	0.0059	0.0078
173	0.0142	0.0061	0.0081
174	0.0145	0.0062	0.0083
175	0.0152	0.0065	0.0086
176	0.0155	0.0067	0.0088
177	0.0163	0.0070	0.0093
178	0.0167	0.0072	0.0095
179	0.0176	0.0076	0.0100
180	0.0181	0.0078	0.0103
181	0.0193	0.0083	0.0110
182	0.0200	0.0086	0.0114

183	0.0215	0.0093	0.0123
184	0.0225	0.0097	0.0128
185	0.0178	0.0077	0.0102
186	0.0190	0.0082	0.0108
187	0.0220	0.0095	0.0125
188	0.0240	0.0103	0.0137
189	0.0299	0.0129	0.0170
190	0.0344	0.0148	0.0196
191	0.0523	0.0225	0.0298
192	0.0759	0.0262	0.0497
193	0.3282	0.0262	0.3020
194	0.0411	0.0177	0.0234
195	0.0266	0.0114	0.0151
196	0.0204	0.0088	0.0116
197	0.0235	0.0101	0.0134
198	0.0207	0.0089	0.0118
199	0.0187	0.0080	0.0106
200	0.0171	0.0074	0.0097
201	0.0159	0.0068	0.0090
202	0.0148	0.0064	0.0084
203	0.0140	0.0060	0.0080
204	0.0132	0.0057	0.0075
205	0.0126	0.0054	0.0072
206	0.0120	0.0052	0.0068
207	0.0115	0.0049	0.0065
208	0.0110	0.0048	0.0063
209	0.0106	0.0046	0.0061
210	0.0103	0.0044	0.0059
211	0.0099	0.0043	0.0057
212	0.0096	0.0041	0.0055
213	0.0094	0.0040	0.0053
214	0.0091	0.0039	0.0052
215	0.0089	0.0038	0.0050
216	0.0086	0.0037	0.0049
217	0.0104	0.0045	0.0059
218	0.0101	0.0044	0.0058
219	0.0100	0.0043	0.0057
220	0.0098	0.0042	0.0056
221	0.0096	0.0041	0.0055
222	0.0094	0.0041	0.0054
223	0.0093	0.0040	0.0053
224	0.0091	0.0039	0.0052
225	0.0090	0.0039	0.0051
226	0.0089	0.0038	0.0051
227	0.0087	0.0038	0.0050
228	0.0086	0.0037	0.0049
229	0.0085	0.0037	0.0048
230	0.0084	0.0036	0.0048
231	0.0083	0.0036	0.0047
232	0.0082	0.0035	0.0047

233	0.0081	0.0035	0.0046
234	0.0080	0.0034	0.0045
235	0.0079	0.0034	0.0045
236	0.0078	0.0034	0.0044
237	0.0077	0.0033	0.0044
238	0.0076	0.0033	0.0043
239	0.0075	0.0032	0.0043
240	0.0075	0.0032	0.0043
241	0.0074	0.0032	0.0042
242	0.0073	0.0032	0.0042
243	0.0072	0.0031	0.0041
244	0.0072	0.0031	0.0041
245	0.0071	0.0031	0.0041
246	0.0070	0.0030	0.0040
247	0.0070	0.0030	0.0040
248	0.0069	0.0030	0.0039
249	0.0069	0.0030	0.0039
250	0.0068	0.0029	0.0039
251	0.0067	0.0029	0.0038
252	0.0067	0.0029	0.0038
253	0.0066	0.0029	0.0038
254	0.0066	0.0028	0.0037
255	0.0065	0.0028	0.0037
256	0.0065	0.0028	0.0037
257	0.0064	0.0028	0.0037
258	0.0064	0.0027	0.0036
259	0.0063	0.0027	0.0036
260	0.0063	0.0027	0.0036
261	0.0062	0.0027	0.0036
262	0.0062	0.0027	0.0035
263	0.0062	0.0026	0.0035
264	0.0061	0.0026	0.0035
265	0.0061	0.0026	0.0035
266	0.0060	0.0026	0.0034
267	0.0060	0.0026	0.0034
268	0.0060	0.0026	0.0034
269	0.0059	0.0025	0.0034
270	0.0059	0.0025	0.0033
271	0.0058	0.0025	0.0033
272	0.0058	0.0025	0.0033
273	0.0058	0.0025	0.0033
274	0.0057	0.0025	0.0033
275	0.0057	0.0025	0.0032
276	0.0057	0.0024	0.0032
277	0.0056	0.0024	0.0032
278	0.0056	0.0024	0.0032
279	0.0056	0.0024	0.0032
280	0.0055	0.0024	0.0032
281	0.0055	0.0024	0.0031
282	0.0055	0.0024	0.0031

```
       283              0.0054          0.0023             0.0031
       284              0.0054          0.0023             0.0031
       285              0.0054          0.0023             0.0031
       286              0.0054          0.0023             0.0031
       287              0.0053          0.0023             0.0030
       288              0.0053          0.0023             0.0030
       --------------------------------------------------------------------
       --------------------------------------------------------------------
       Total soil rain loss =      1.16(In)
       Total effective rainfall =      1.81(In)
       Peak flow rate in flood hydrograph =     16.35(CFS)
       ---------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R    S T O R M
                      R u n o f f     H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        5.0      10.0      15.0      20.0
 -----------------------------------------------------------------------
   0+ 5       0.0001      0.02  Q        |         |         |         |
   0+10       0.0010      0.13  Q        |         |         |         |
   0+15       0.0028      0.26  Q        |         |         |         |
   0+20       0.0050      0.32  Q        |         |         |         |
   0+25       0.0075      0.36  Q        |         |         |         |
   0+30       0.0101      0.38  Q        |         |         |         |
   0+35       0.0129      0.40  Q        |         |         |         |
   0+40       0.0158      0.41  Q        |         |         |         |
   0+45       0.0187      0.43  Q        |         |         |         |
   0+50       0.0217      0.43  Q        |         |         |         |
   0+55       0.0247      0.44  Q        |         |         |         |
   1+ 0       0.0278      0.44  Q        |         |         |         |
   1+ 5       0.0309      0.45  Q        |         |         |         |
   1+10       0.0340      0.45  Q        |         |         |         |
   1+15       0.0371      0.46  Q        |         |         |         |
   1+20       0.0403      0.46  Q        |         |         |         |
   1+25       0.0434      0.46  Q        |         |         |         |
   1+30       0.0466      0.46  QV       |         |         |         |
   1+35       0.0498      0.46  QV       |         |         |         |
   1+40       0.0530      0.46  QV       |         |         |         |
   1+45       0.0562      0.47  QV       |         |         |         |
   1+50       0.0594      0.47  QV       |         |         |         |
   1+55       0.0627      0.47  QV       |         |         |         |
   2+ 0       0.0659      0.47  QV       |         |         |         |
   2+ 5       0.0691      0.47  QV       |         |         |         |
   2+10       0.0724      0.47  QV       |         |         |         |
   2+15       0.0757      0.47  QV       |         |         |         |
   2+20       0.0789      0.48  QV       |         |         |         |
   2+25       0.0822      0.48  QV       |         |         |         |
```

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2+30       0.0855      0.48  QV         |         |         |         |
2+35       0.0888      0.48  QV         |         |         |         |
2+40       0.0921      0.48  QV         |         |         |         |
2+45       0.0954      0.48  Q V        |         |         |         |
2+50       0.0988      0.48  Q V        |         |         |         |
2+55       0.1021      0.49  Q V        |         |         |         |
3+ 0       0.1055      0.49  Q V        |         |         |         |
3+ 5       0.1088      0.49  Q V        |         |         |         |
3+10       0.1122      0.49  Q V        |         |         |         |
3+15       0.1156      0.49  Q V        |         |         |         |
3+20       0.1190      0.49  Q V        |         |         |         |
3+25       0.1224      0.49  Q V        |         |         |         |
3+30       0.1258      0.50  Q V        |         |         |         |
3+35       0.1292      0.50  Q V        |         |         |         |
3+40       0.1327      0.50  Q V        |         |         |         |
3+45       0.1361      0.50  |QV        |         |         |         |
3+50       0.1396      0.50  |Q V       |         |         |         |
3+55       0.1430      0.50  |Q V       |         |         |         |
4+ 0       0.1465      0.51  |Q V       |         |         |         |
4+ 5       0.1500      0.51  |Q V       |         |         |         |
4+10       0.1535      0.51  |Q V       |         |         |         |
4+15       0.1570      0.51  |Q V       |         |         |         |
4+20       0.1606      0.51  |Q V       |         |         |         |
4+25       0.1641      0.51  |Q V       |         |         |         |
4+30       0.1677      0.52  |Q V       |         |         |         |
4+35       0.1712      0.52  |Q V       |         |         |         |
4+40       0.1748      0.52  |Q V       |         |         |         |
4+45       0.1784      0.52  |Q V       |         |         |         |
4+50       0.1820      0.52  |Q V       |         |         |         |
4+55       0.1856      0.52  |Q  V      |         |         |         |
5+ 0       0.1892      0.53  |Q  V      |         |         |         |
5+ 5       0.1929      0.53  |Q  V      |         |         |         |
5+10       0.1965      0.53  |Q  V      |         |         |         |
5+15       0.2002      0.53  |Q  V      |         |         |         |
5+20       0.2039      0.53  |Q  V      |         |         |         |
5+25       0.2076      0.54  |Q  V      |         |         |         |
5+30       0.2113      0.54  |Q  V      |         |         |         |
5+35       0.2150      0.54  |Q  V      |         |         |         |
5+40       0.2187      0.54  |Q  V      |         |         |         |
5+45       0.2225      0.54  |Q  V      |         |         |         |
5+50       0.2263      0.55  |Q  V      |         |         |         |
5+55       0.2300      0.55  |Q  V      |         |         |         |
6+ 0       0.2338      0.55  |Q   V     |         |         |         |
6+ 5       0.2377      0.55  |Q   V     |         |         |         |
6+10       0.2415      0.56  |Q   V     |         |         |         |
6+15       0.2453      0.56  |Q   V     |         |         |         |
6+20       0.2492      0.56  |Q   V     |         |         |         |
6+25       0.2530      0.56  |Q   V     |         |         |         |
6+30       0.2569      0.56  |Q   V     |         |         |         |
6+35       0.2608      0.57  |Q   V     |         |         |         |
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 6+40       0.2648      0.57  |Q   V    |         |         |         |
 6+45       0.2687      0.57  |Q   V    |         |         |         |
 6+50       0.2727      0.57  |Q   V    |         |         |         |
 6+55       0.2766      0.58  |Q   V    |         |         |         |
 7+ 0       0.2806      0.58  |Q    V   |         |         |         |
 7+ 5       0.2846      0.58  |Q    V   |         |         |         |
 7+10       0.2887      0.58  |Q    V   |         |         |         |
 7+15       0.2927      0.59  |Q    V   |         |         |         |
 7+20       0.2968      0.59  |Q    V   |         |         |         |
 7+25       0.3008      0.59  |Q    V   |         |         |         |
 7+30       0.3049      0.60  |Q    V   |         |         |         |
 7+35       0.3090      0.60  |Q    V   |         |         |         |
 7+40       0.3132      0.60  |Q    V   |         |         |         |
 7+45       0.3173      0.60  |Q    V   |         |         |         |
 7+50       0.3215      0.61  |Q    V   |         |         |         |
 7+55       0.3257      0.61  |Q     V  |         |         |         |
 8+ 0       0.3299      0.61  |Q     V  |         |         |         |
 8+ 5       0.3342      0.62  |Q     V  |         |         |         |
 8+10       0.3384      0.62  |Q     V  |         |         |         |
 8+15       0.3427      0.62  |Q     V  |         |         |         |
 8+20       0.3470      0.62  |Q     V  |         |         |         |
 8+25       0.3513      0.63  |Q     V  |         |         |         |
 8+30       0.3557      0.63  |Q     V  |         |         |         |
 8+35       0.3600      0.63  |Q     V  |         |         |         |
 8+40       0.3644      0.64  |Q     V  |         |         |         |
 8+45       0.3689      0.64  |Q     V  |         |         |         |
 8+50       0.3733      0.64  |Q      V |         |         |         |
 8+55       0.3778      0.65  |Q      V |         |         |         |
 9+ 0       0.3822      0.65  |Q      V |         |         |         |
 9+ 5       0.3868      0.66  |Q      V |         |         |         |
 9+10       0.3913      0.66  |Q      V |         |         |         |
 9+15       0.3959      0.66  |Q      V |         |         |         |
 9+20       0.4005      0.67  |Q      V |         |         |         |
 9+25       0.4051      0.67  |Q      V |         |         |         |
 9+30       0.4097      0.67  |Q      V |         |         |         |
 9+35       0.4144      0.68  |Q      V |         |         |         |
 9+40       0.4191      0.68  |Q       V|         |         |         |
 9+45       0.4238      0.69  |Q       V|         |         |         |
 9+50       0.4286      0.69  |Q       V|         |         |         |
 9+55       0.4334      0.70  |Q       V|         |         |         |
10+ 0       0.4382      0.70  |Q       V|         |         |         |
10+ 5       0.4431      0.70  |Q       V|         |         |         |
10+10       0.4479      0.71  |Q       V|         |         |         |
10+15       0.4529      0.71  |Q       V|         |         |         |
10+20       0.4578      0.72  |Q       V|         |         |         |
10+25       0.4628      0.72  |Q        V         |         |         |
10+30       0.4678      0.73  |Q        V         |         |         |
10+35       0.4729      0.73  |Q        V         |         |         |
10+40       0.4780      0.74  |Q        V         |         |         |
10+45       0.4831      0.74  |Q        V         |         |         |
```

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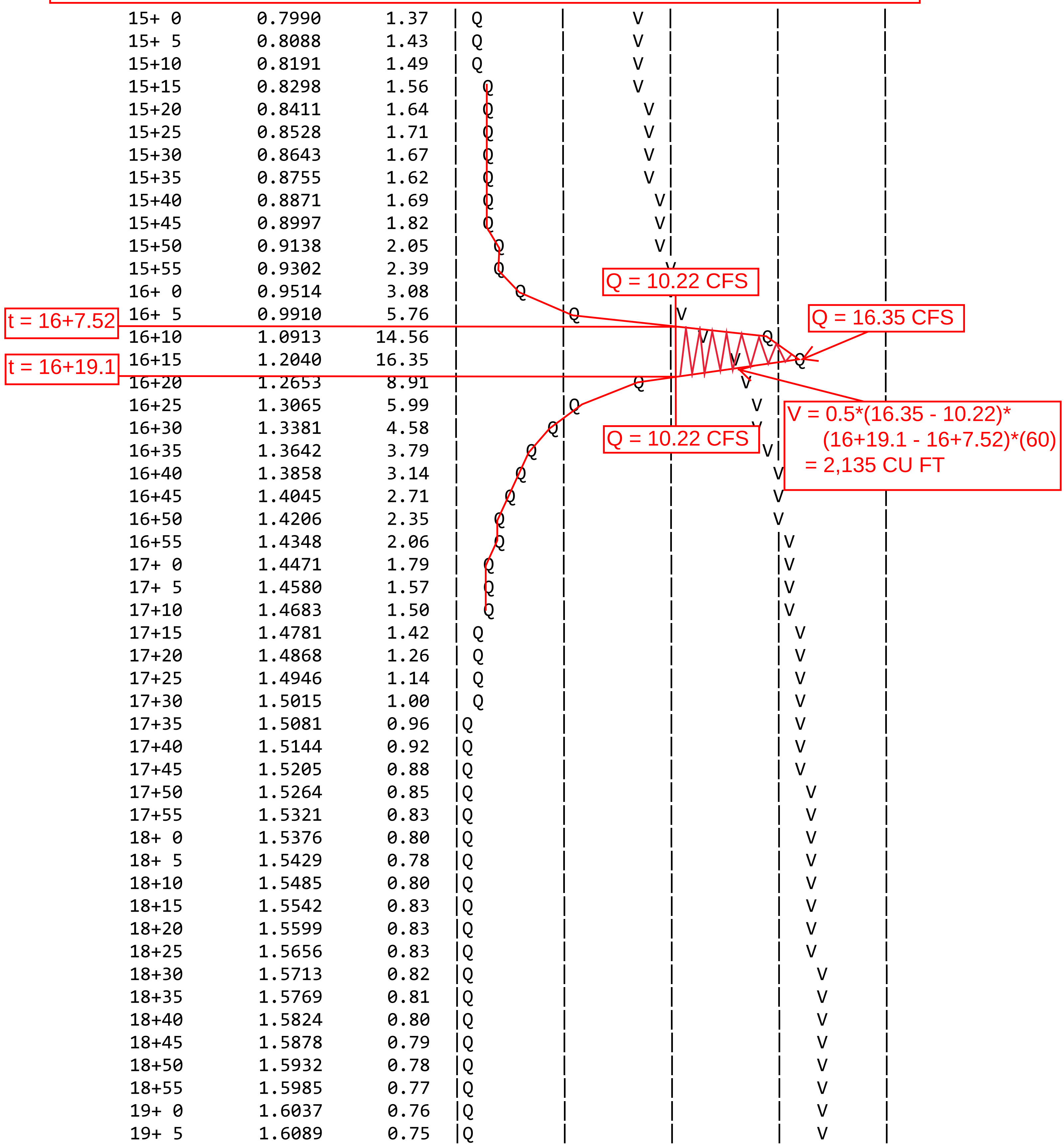
10+50       0.4883      0.75  |Q        V         |         |         |
10+55       0.4935      0.76  |Q        V         |         |         |
11+ 0       0.4987      0.76  |Q        V         |         |         |
11+ 5       0.5040      0.77  |Q        V         |         |         |
11+10       0.5093      0.77  |Q        |V        |         |         |
11+15       0.5147      0.78  |Q        |V        |         |         |
11+20       0.5201      0.79  |Q        |V        |         |         |
11+25       0.5256      0.79  |Q        |V        |         |         |
11+30       0.5311      0.80  |Q        |V        |         |         |
11+35       0.5366      0.81  |Q        |V        |         |         |
11+40       0.5422      0.81  |Q        |V        |         |         |
11+45       0.5479      0.82  |Q        |V        |         |         |
11+50       0.5536      0.83  |Q        |V        |         |         |
11+55       0.5593      0.84  |Q        | V       |         |         |
12+ 0       0.5651      0.84  |Q        | V       |         |         |
12+ 5       0.5709      0.85  |Q        | V       |         |         |
12+10       0.5765      0.81  |Q        | V       |         |         |
12+15       0.5819      0.77  |Q        | V       |         |         |
12+20       0.5871      0.76  |Q        | V       |         |         |
12+25       0.5923      0.75  |Q        | V       |         |         |
12+30       0.5975      0.76  |Q        | V       |         |         |
12+35       0.6027      0.76  |Q        |  V      |         |         |
12+40       0.6080      0.76  |Q        |  V      |         |         |
12+45       0.6133      0.77  |Q        |  V      |         |         |
12+50       0.6186      0.78  |Q        |  V      |         |         |
12+55       0.6241      0.79  |Q        |  V      |         |         |
13+ 0       0.6296      0.80  |Q        |  V      |         |         |
13+ 5       0.6351      0.81  |Q        |  V      |         |         |
13+10       0.6408      0.82  |Q        |  V      |         |         |
13+15       0.6465      0.83  |Q        |   V     |         |         |
13+20       0.6523      0.85  |Q        |   V     |         |         |
13+25       0.6583      0.86  |Q        |   V     |         |         |
13+30       0.6643      0.87  |Q        |   V     |         |         |
13+35       0.6704      0.89  |Q        |   V     |         |         |
13+40       0.6766      0.91  |Q        |   V     |         |         |
13+45       0.6830      0.92  |Q        |   V     |         |         |
13+50       0.6895      0.94  |Q        |   V     |         |         |
13+55       0.6961      0.96  |Q        |    V    |         |         |
14+ 0       0.7028      0.98  |Q        |    V    |         |         |
14+ 5       0.7097      1.00  | Q       |    V    |         |         |
14+10       0.7168      1.02  | Q       |    V    |         |         |
14+15       0.7240      1.05  | Q       |    V    |         |         |
14+20       0.7314      1.08  | Q       |    V    |         |         |
14+25       0.7390      1.10  | Q       |     V   |         |         |
14+30       0.7468      1.13  | Q       |     V   |         |         |
14+35       0.7549      1.16  | Q       |     V   |         |         |
14+40       0.7631      1.20  | Q       |     V   |         |         |
14+45       0.7716      1.24  | Q       |     V   |         |         |
14+50       0.7804      1.28  | Q       |     V   |         |         |
14+55       0.7895      1.32  | Q       |      V  |         |         |
```

Time(h+min)	Volume (AC*FT)	Q(CFS)
15+ 0	0.7990	1.37
15+ 5	0.8088	1.43
15+10	0.8191	1.49
15+15	0.8298	1.56
15+20	0.8411	1.64
15+25	0.8528	1.71
15+30	0.8643	1.67
15+35	0.8755	1.62
15+40	0.8871	1.69
15+45	0.8997	1.82
15+50	0.9138	2.05
15+55	0.9302	2.39
16+ 0	0.9514	3.08
16+ 5	0.9910	5.76
16+10	1.0913	14.56
16+15	1.2040	16.35
16+20	1.2653	8.91
16+25	1.3065	5.99
16+30	1.3381	4.58
16+35	1.3642	3.79
16+40	1.3858	3.14
16+45	1.4045	2.71
16+50	1.4206	2.35
16+55	1.4348	2.06
17+ 0	1.4471	1.79
17+ 5	1.4580	1.57
17+10	1.4683	1.50
17+15	1.4781	1.42
17+20	1.4868	1.26
17+25	1.4946	1.14
17+30	1.5015	1.00
17+35	1.5081	0.96
17+40	1.5144	0.92
17+45	1.5205	0.88
17+50	1.5264	0.85
17+55	1.5321	0.83
18+ 0	1.5376	0.80
18+ 5	1.5429	0.78
18+10	1.5485	0.80
18+15	1.5542	0.83
18+20	1.5599	0.83
18+25	1.5656	0.83
18+30	1.5713	0.82
18+35	1.5769	0.81
18+40	1.5824	0.80
18+45	1.5878	0.79
18+50	1.5932	0.78
18+55	1.5985	0.77
19+ 0	1.6037	0.76
19+ 5	1.6089	0.75



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19+10       1.6139      0.74  |Q        |         |         |   V     |
19+15       1.6190      0.73  |Q        |         |         |    V    |
19+20       1.6239      0.72  |Q        |         |         |    V    |
19+25       1.6288      0.71  |Q        |         |         |    V    |
19+30       1.6336      0.70  |Q        |         |         |    V    |
19+35       1.6384      0.69  |Q        |         |         |    V    |
19+40       1.6431      0.68  |Q        |         |         |    V    |
19+45       1.6477      0.67  |Q        |         |         |    V    |
19+50       1.6523      0.67  |Q        |         |         |    V    |
19+55       1.6569      0.66  |Q        |         |         |    V    |
20+ 0       1.6613      0.65  |Q        |         |         |    V    |
20+ 5       1.6658      0.64  |Q        |         |         |     V   |
20+10       1.6702      0.64  |Q        |         |         |     V   |
20+15       1.6745      0.63  |Q        |         |         |     V   |
20+20       1.6788      0.62  |Q        |         |         |     V   |
20+25       1.6831      0.62  |Q        |         |         |     V   |
20+30       1.6873      0.61  |Q        |         |         |     V   |
20+35       1.6915      0.61  |Q        |         |         |     V   |
20+40       1.6956      0.60  |Q        |         |         |     V   |
20+45       1.6997      0.59  |Q        |         |         |     V   |
20+50       1.7038      0.59  |Q        |         |         |     V   |
20+55       1.7078      0.58  |Q        |         |         |     V   |
21+ 0       1.7118      0.58  |Q        |         |         |      V  |
21+ 5       1.7157      0.57  |Q        |         |         |      V  |
21+10       1.7196      0.57  |Q        |         |         |      V  |
21+15       1.7235      0.56  |Q        |         |         |      V  |
21+20       1.7274      0.56  |Q        |         |         |      V  |
21+25       1.7312      0.56  |Q        |         |         |      V  |
21+30       1.7350      0.55  |Q        |         |         |      V  |
21+35       1.7388      0.55  |Q        |         |         |      V  |
21+40       1.7425      0.54  |Q        |         |         |      V  |
21+45       1.7462      0.54  |Q        |         |         |      V  |
21+50       1.7499      0.53  |Q        |         |         |      V  |
21+55       1.7535      0.53  |Q        |         |         |      V  |
22+ 0       1.7572      0.53  |Q        |         |         |       V |
22+ 5       1.7608      0.52  |Q        |         |         |       V |
22+10       1.7643      0.52  |Q        |         |         |       V |
22+15       1.7679      0.52  |Q        |         |         |       V |
22+20       1.7714      0.51  |Q        |         |         |       V |
22+25       1.7749      0.51  |Q        |         |         |       V |
22+30       1.7784      0.51  |Q        |         |         |       V |
22+35       1.7819      0.50  |Q        |         |         |       V |
22+40       1.7853      0.50  Q         |         |         |       V |
22+45       1.7887      0.50  Q         |         |         |       V |
22+50       1.7921      0.49  Q         |         |         |       V |
22+55       1.7955      0.49  Q         |         |         |       V |
23+ 0       1.7988      0.49  Q         |         |         |       V |
23+ 5       1.8022      0.48  Q         |         |         |        V|
23+10       1.8055      0.48  Q         |         |         |        V|
23+15       1.8088      0.48  Q         |         |         |        V|
```

```
    23+20       1.8120      0.47  Q          |         |         |       V|
    23+25       1.8153      0.47  Q          |         |         |       V|
    23+30       1.8185      0.47  Q          |         |         |       V|
    23+35       1.8217      0.47  Q          |         |         |       V|
    23+40       1.8249      0.46  Q          |         |         |       V|
    23+45       1.8281      0.46  Q          |         |         |       V|
    23+50       1.8313      0.46  Q          |         |         |       V|
    23+55       1.8344      0.46  Q          |         |         |       V|
    24+ 0       1.8375      0.45  Q          |         |         |       V|
-----------------------------------------------------------------------
```

RATIONAL METHOD &

UNIT HYDROGRAPH HYDROLOGY

ONSITE PRE-DEVELOPED

10-YEAR

STORM EVENTS

DRAINAGE AREA 2

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
        Rational Hydrology Study       Date: 08/13/21
------------------------------------------------------------------------
10 Year Rational Analysis Pre Development
Former Track 17846
Drainage Area 3
File: 17486Rat10PreA3.out
------------------------------------------------------------------------


Program License Serial Number 4070

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
Computed rainfall intensity:
Storm year =    10.00   1 hour rainfall =     0.692 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532(In/Hr)
Initial subarea data:
Initial area flow distance =   584.200(Ft.)
Top (of initial area) elevation =  3293.000(Ft.)
Bottom (of initial area) elevation =  3284.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01541  s(%)=       1.54
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.792 min.
Rainfall intensity =      1.453(In/Hr) for a    10.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.570
Subarea runoff =      4.598(CFS)
Total initial stream area =        5.550(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.532(In/Hr)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station       3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   0.227(Ft.), Average velocity =   1.369(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.91
        2             84.67              0.00
        3            158.70              0.91
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      6.163(CFS)
  '     '        flow top width =     39.624(Ft.)
  '     '    velocity=    1.369(Ft/s)
  '     '        area =      4.501(Sq.Ft)
  '     '        Froude number =     0.716

Upstream point elevation =  3284.000(Ft.)
Downstream point elevation =  3278.000(Ft.)
Flow length =   432.100(Ft.)
Travel time  =    5.26 min.
Time of concentration =   26.05 min.
Depth of flow =   0.227(Ft.)
Average velocity =   1.369(Ft/s)
Total irregular channel flow =     6.163(CFS)
Irregular channel normal depth above invert elev. =   0.227(Ft.)
Average velocity of channel(s) =   1.369(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532(In/Hr)
Rainfall intensity =      1.241(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.514
Subarea runoff =      3.046(CFS) for    6.440(Ac.)
Total runoff =      7.644(CFS)
Effective area this stream =       11.99(Ac.)
Total Study Area (Main Stream No. 1) =       11.99(Ac.)
Area averaged Fm value =    0.532(In/Hr)
Depth of flow =   0.246(Ft.), Average velocity =   1.445(Ft/s)
End of computations, Total Study Area =           11.99 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  50.0
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

                Study date  08/13/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4070

---------------------------------------------------------------------
10 Year Unit Hydrograph Pre Development for HCOC
Former Track 17486
Drainage Area 3
File: 17486Hydr10PreA3.out
--------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 3

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format




Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)            (hours)         (In)
Rainfall data for year 10
            12.23           1           0.69
--------------------------------------------------------------------
Rainfall data for year 10
            12.23           6           1.46
--------------------------------------------------------------------
Rainfall data for year 10
            12.23          24           2.97
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 50.0      70.0         12.23      1.000     0.532    1.000    0.532

Area-averaged adjusted loss rate Fm (In/Hr) =  0.532

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
    12.23   1.000         50.0      70.0       4.29     0.235

Area-averaged catchment yield fraction, Y =  0.235
Area-averaged low loss fraction, Yb =  0.765
User entry of time of concentration  =   0.434 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      12.23(Ac.)
Catchment Lag time =   0.347 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 24.0015
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.532(In/Hr)
Average low loss rate fraction (Yb) = 0.765 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.328(In)
Computed peak 30-minute rainfall =  0.562(In)
Specified peak 1-hour rainfall =  0.692(In)
Computed peak 3-hour rainfall =  1.094(In)
Specified peak 6-hour rainfall =  1.460(In)
Specified peak 24-hour rainfall =  2.970(In)


Rainfall depth area reduction factors:
Using a total area of      12.23(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.328(In)
30-minute factor = 0.999    Adjusted rainfall =  0.562(In)
1-hour factor = 0.999       Adjusted rainfall =  0.692(In)
3-hour factor = 1.000       Adjusted rainfall =  1.094(In)
6-hour factor = 1.000       Adjusted rainfall =  1.460(In)
24-hour factor = 1.000      Adjusted rainfall =  2.970(In)
---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
```

Number	Mean values	((CFS))
	(K = 147.91 (CFS))	
1	1.277	1.888
2	6.132	7.182
3	17.650	17.036
4	38.652	31.062
5	53.964	22.648
6	63.407	13.967
7	69.899	9.602
8	74.854	7.329
9	78.782	5.809
10	81.885	4.590
11	84.469	3.821
12	86.741	3.361
13	88.641	2.810
14	90.131	2.203
15	91.473	1.984
16	92.650	1.742
17	93.712	1.570
18	94.581	1.286
19	95.391	1.198
20	96.069	1.003
21	96.690	0.919
22	97.189	0.737
23	97.620	0.638
24	97.940	0.474
25	98.180	0.355
26	98.444	0.391
27	98.732	0.426
28	99.021	0.426
29	99.309	0.426
30	99.548	0.355
31	99.700	0.225
32	99.850	0.222
33	100.000	0.221

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3282	0.3282
2	0.4040	0.0759
3	0.4563	0.0523
4	0.4974	0.0411
5	0.5319	0.0344
6	0.5618	0.0299
7	0.5883	0.0266
8	0.6124	0.0240
9	0.6344	0.0220
10	0.6548	0.0204

11	0.6738	0.0190
12	0.6916	0.0178
13	0.7151	0.0235
14	0.7375	0.0225
15	0.7591	0.0215
16	0.7798	0.0207
17	0.7998	0.0200
18	0.8191	0.0193
19	0.8377	0.0187
20	0.8559	0.0181
21	0.8735	0.0176
22	0.8906	0.0171
23	0.9072	0.0167
24	0.9235	0.0163
25	0.9393	0.0159
26	0.9548	0.0155
27	0.9700	0.0152
28	0.9848	0.0148
29	0.9993	0.0145
30	1.0136	0.0142
31	1.0275	0.0140
32	1.0412	0.0137
33	1.0547	0.0135
34	1.0679	0.0132
35	1.0809	0.0130
36	1.0937	0.0128
37	1.1062	0.0126
38	1.1186	0.0124
39	1.1308	0.0122
40	1.1428	0.0120
41	1.1546	0.0118
42	1.1662	0.0117
43	1.1777	0.0115
44	1.1891	0.0113
45	1.2002	0.0112
46	1.2113	0.0110
47	1.2222	0.0109
48	1.2330	0.0108
49	1.2436	0.0106
50	1.2541	0.0105
51	1.2645	0.0104
52	1.2748	0.0103
53	1.2850	0.0102
54	1.2950	0.0100
55	1.3049	0.0099
56	1.3148	0.0098
57	1.3245	0.0097
58	1.3341	0.0096
59	1.3437	0.0095
60	1.3531	0.0094

61	1.3625	0.0094
62	1.3717	0.0093
63	1.3809	0.0092
64	1.3900	0.0091
65	1.3990	0.0090
66	1.4080	0.0089
67	1.4168	0.0089
68	1.4256	0.0088
69	1.4343	0.0087
70	1.4429	0.0086
71	1.4515	0.0086
72	1.4599	0.0085
73	1.4703	0.0104
74	1.4806	0.0103
75	1.4908	0.0102
76	1.5009	0.0101
77	1.5110	0.0101
78	1.5211	0.0100
79	1.5310	0.0100
80	1.5409	0.0099
81	1.5507	0.0098
82	1.5605	0.0098
83	1.5702	0.0097
84	1.5799	0.0097
85	1.5895	0.0096
86	1.5991	0.0096
87	1.6086	0.0095
88	1.6180	0.0094
89	1.6274	0.0094
90	1.6367	0.0093
91	1.6460	0.0093
92	1.6553	0.0092
93	1.6645	0.0092
94	1.6736	0.0091
95	1.6827	0.0091
96	1.6918	0.0091
97	1.7008	0.0090
98	1.7097	0.0090
99	1.7186	0.0089
100	1.7275	0.0089
101	1.7363	0.0088
102	1.7451	0.0088
103	1.7539	0.0087
104	1.7626	0.0087
105	1.7712	0.0087
106	1.7798	0.0086
107	1.7884	0.0086
108	1.7970	0.0085
109	1.8055	0.0085
110	1.8139	0.0085

111	1.8224	0.0084
112	1.8308	0.0084
113	1.8391	0.0084
114	1.8474	0.0083
115	1.8557	0.0083
116	1.8640	0.0082
117	1.8722	0.0082
118	1.8804	0.0082
119	1.8885	0.0081
120	1.8966	0.0081
121	1.9047	0.0081
122	1.9128	0.0080
123	1.9208	0.0080
124	1.9288	0.0080
125	1.9367	0.0080
126	1.9446	0.0079
127	1.9525	0.0079
128	1.9604	0.0079
129	1.9682	0.0078
130	1.9760	0.0078
131	1.9838	0.0078
132	1.9915	0.0077
133	1.9992	0.0077
134	2.0069	0.0077
135	2.0146	0.0077
136	2.0222	0.0076
137	2.0298	0.0076
138	2.0374	0.0076
139	2.0449	0.0075
140	2.0525	0.0075
141	2.0600	0.0075
142	2.0674	0.0075
143	2.0749	0.0074
144	2.0823	0.0074
145	2.0897	0.0074
146	2.0971	0.0074
147	2.1044	0.0073
148	2.1117	0.0073
149	2.1190	0.0073
150	2.1263	0.0073
151	2.1336	0.0072
152	2.1408	0.0072
153	2.1480	0.0072
154	2.1552	0.0072
155	2.1623	0.0072
156	2.1695	0.0071
157	2.1766	0.0071
158	2.1837	0.0071
159	2.1907	0.0071
160	2.1978	0.0070

161	2.2048	0.0070
162	2.2118	0.0070
163	2.2188	0.0070
164	2.2258	0.0070
165	2.2327	0.0069
166	2.2396	0.0069
167	2.2465	0.0069
168	2.2534	0.0069
169	2.2603	0.0069
170	2.2671	0.0068
171	2.2739	0.0068
172	2.2807	0.0068
173	2.2875	0.0068
174	2.2943	0.0068
175	2.3010	0.0067
176	2.3077	0.0067
177	2.3144	0.0067
178	2.3211	0.0067
179	2.3278	0.0067
180	2.3345	0.0067
181	2.3411	0.0066
182	2.3477	0.0066
183	2.3543	0.0066
184	2.3609	0.0066
185	2.3675	0.0066
186	2.3740	0.0065
187	2.3805	0.0065
188	2.3870	0.0065
189	2.3935	0.0065
190	2.4000	0.0065
191	2.4065	0.0065
192	2.4129	0.0064
193	2.4194	0.0064
194	2.4258	0.0064
195	2.4322	0.0064
196	2.4386	0.0064
197	2.4449	0.0064
198	2.4513	0.0063
199	2.4576	0.0063
200	2.4639	0.0063
201	2.4702	0.0063
202	2.4765	0.0063
203	2.4828	0.0063
204	2.4890	0.0063
205	2.4953	0.0062
206	2.5015	0.0062
207	2.5077	0.0062
208	2.5139	0.0062
209	2.5201	0.0062
210	2.5263	0.0062

211	2.5324	0.0062
212	2.5386	0.0061
213	2.5447	0.0061
214	2.5508	0.0061
215	2.5569	0.0061
216	2.5630	0.0061
217	2.5691	0.0061
218	2.5751	0.0061
219	2.5812	0.0060
220	2.5872	0.0060
221	2.5932	0.0060
222	2.5992	0.0060
223	2.6052	0.0060
224	2.6112	0.0060
225	2.6172	0.0060
226	2.6231	0.0060
227	2.6290	0.0059
228	2.6350	0.0059
229	2.6409	0.0059
230	2.6468	0.0059
231	2.6527	0.0059
232	2.6586	0.0059
233	2.6644	0.0059
234	2.6703	0.0059
235	2.6761	0.0058
236	2.6819	0.0058
237	2.6878	0.0058
238	2.6936	0.0058
239	2.6994	0.0058
240	2.7051	0.0058
241	2.7109	0.0058
242	2.7167	0.0058
243	2.7224	0.0057
244	2.7281	0.0057
245	2.7339	0.0057
246	2.7396	0.0057
247	2.7453	0.0057
248	2.7510	0.0057
249	2.7566	0.0057
250	2.7623	0.0057
251	2.7679	0.0057
252	2.7736	0.0056
253	2.7792	0.0056
254	2.7848	0.0056
255	2.7905	0.0056
256	2.7961	0.0056
257	2.8016	0.0056
258	2.8072	0.0056
259	2.8128	0.0056
260	2.8184	0.0056

261	2.8239	0.0055
262	2.8294	0.0055
263	2.8350	0.0055
264	2.8405	0.0055
265	2.8460	0.0055
266	2.8515	0.0055
267	2.8570	0.0055
268	2.8624	0.0055
269	2.8679	0.0055
270	2.8734	0.0055
271	2.8788	0.0054
272	2.8843	0.0054
273	2.8897	0.0054
274	2.8951	0.0054
275	2.9005	0.0054
276	2.9059	0.0054
277	2.9113	0.0054
278	2.9167	0.0054
279	2.9220	0.0054
280	2.9274	0.0054
281	2.9328	0.0054
282	2.9381	0.0053
283	2.9434	0.0053
284	2.9488	0.0053
285	2.9541	0.0053
286	2.9594	0.0053
287	2.9647	0.0053
288	2.9700	0.0053

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0053	0.0040	0.0012
2	0.0053	0.0041	0.0012
3	0.0053	0.0041	0.0012
4	0.0053	0.0041	0.0013
5	0.0053	0.0041	0.0013
6	0.0054	0.0041	0.0013
7	0.0054	0.0041	0.0013
8	0.0054	0.0041	0.0013
9	0.0054	0.0041	0.0013
10	0.0054	0.0041	0.0013
11	0.0054	0.0042	0.0013
12	0.0054	0.0042	0.0013
13	0.0055	0.0042	0.0013
14	0.0055	0.0042	0.0013
15	0.0055	0.0042	0.0013
16	0.0055	0.0042	0.0013
17	0.0055	0.0042	0.0013

18	0.0055	0.0042	0.0013
19	0.0055	0.0042	0.0013
20	0.0056	0.0043	0.0013
21	0.0056	0.0043	0.0013
22	0.0056	0.0043	0.0013
23	0.0056	0.0043	0.0013
24	0.0056	0.0043	0.0013
25	0.0056	0.0043	0.0013
26	0.0057	0.0043	0.0013
27	0.0057	0.0043	0.0013
28	0.0057	0.0044	0.0013
29	0.0057	0.0044	0.0013
30	0.0057	0.0044	0.0013
31	0.0057	0.0044	0.0013
32	0.0058	0.0044	0.0014
33	0.0058	0.0044	0.0014
34	0.0058	0.0044	0.0014
35	0.0058	0.0044	0.0014
36	0.0058	0.0045	0.0014
37	0.0059	0.0045	0.0014
38	0.0059	0.0045	0.0014
39	0.0059	0.0045	0.0014
40	0.0059	0.0045	0.0014
41	0.0059	0.0045	0.0014
42	0.0059	0.0045	0.0014
43	0.0060	0.0046	0.0014
44	0.0060	0.0046	0.0014
45	0.0060	0.0046	0.0014
46	0.0060	0.0046	0.0014
47	0.0060	0.0046	0.0014
48	0.0061	0.0046	0.0014
49	0.0061	0.0047	0.0014
50	0.0061	0.0047	0.0014
51	0.0061	0.0047	0.0014
52	0.0061	0.0047	0.0014
53	0.0062	0.0047	0.0014
54	0.0062	0.0047	0.0015
55	0.0062	0.0048	0.0015
56	0.0062	0.0048	0.0015
57	0.0063	0.0048	0.0015
58	0.0063	0.0048	0.0015
59	0.0063	0.0048	0.0015
60	0.0063	0.0048	0.0015
61	0.0063	0.0049	0.0015
62	0.0064	0.0049	0.0015
63	0.0064	0.0049	0.0015
64	0.0064	0.0049	0.0015
65	0.0064	0.0049	0.0015
66	0.0065	0.0049	0.0015
67	0.0065	0.0050	0.0015

68	0.0065	0.0050	0.0015
69	0.0065	0.0050	0.0015
70	0.0066	0.0050	0.0015
71	0.0066	0.0050	0.0016
72	0.0066	0.0051	0.0016
73	0.0067	0.0051	0.0016
74	0.0067	0.0051	0.0016
75	0.0067	0.0051	0.0016
76	0.0067	0.0051	0.0016
77	0.0068	0.0052	0.0016
78	0.0068	0.0052	0.0016
79	0.0068	0.0052	0.0016
80	0.0068	0.0052	0.0016
81	0.0069	0.0053	0.0016
82	0.0069	0.0053	0.0016
83	0.0069	0.0053	0.0016
84	0.0070	0.0053	0.0016
85	0.0070	0.0054	0.0016
86	0.0070	0.0054	0.0017
87	0.0071	0.0054	0.0017
88	0.0071	0.0054	0.0017
89	0.0071	0.0055	0.0017
90	0.0072	0.0055	0.0017
91	0.0072	0.0055	0.0017
92	0.0072	0.0055	0.0017
93	0.0073	0.0056	0.0017
94	0.0073	0.0056	0.0017
95	0.0073	0.0056	0.0017
96	0.0074	0.0056	0.0017
97	0.0074	0.0057	0.0017
98	0.0074	0.0057	0.0017
99	0.0075	0.0057	0.0018
100	0.0075	0.0058	0.0018
101	0.0076	0.0058	0.0018
102	0.0076	0.0058	0.0018
103	0.0077	0.0059	0.0018
104	0.0077	0.0059	0.0018
105	0.0077	0.0059	0.0018
106	0.0078	0.0059	0.0018
107	0.0078	0.0060	0.0018
108	0.0079	0.0060	0.0018
109	0.0079	0.0061	0.0019
110	0.0080	0.0061	0.0019
111	0.0080	0.0061	0.0019
112	0.0080	0.0062	0.0019
113	0.0081	0.0062	0.0019
114	0.0081	0.0062	0.0019
115	0.0082	0.0063	0.0019
116	0.0082	0.0063	0.0019
117	0.0083	0.0064	0.0020

118	0.0084	0.0064	0.0020
119	0.0084	0.0064	0.0020
120	0.0085	0.0065	0.0020
121	0.0085	0.0065	0.0020
122	0.0086	0.0066	0.0020
123	0.0087	0.0066	0.0020
124	0.0087	0.0067	0.0020
125	0.0088	0.0067	0.0021
126	0.0088	0.0068	0.0021
127	0.0089	0.0068	0.0021
128	0.0090	0.0069	0.0021
129	0.0091	0.0069	0.0021
130	0.0091	0.0070	0.0021
131	0.0092	0.0070	0.0022
132	0.0092	0.0071	0.0022
133	0.0093	0.0071	0.0022
134	0.0094	0.0072	0.0022
135	0.0095	0.0073	0.0022
136	0.0096	0.0073	0.0022
137	0.0097	0.0074	0.0023
138	0.0097	0.0074	0.0023
139	0.0098	0.0075	0.0023
140	0.0099	0.0076	0.0023
141	0.0100	0.0077	0.0024
142	0.0101	0.0077	0.0024
143	0.0102	0.0078	0.0024
144	0.0103	0.0079	0.0024
145	0.0085	0.0065	0.0020
146	0.0086	0.0065	0.0020
147	0.0087	0.0067	0.0020
148	0.0088	0.0067	0.0021
149	0.0089	0.0068	0.0021
150	0.0090	0.0069	0.0021
151	0.0092	0.0070	0.0022
152	0.0093	0.0071	0.0022
153	0.0094	0.0072	0.0022
154	0.0095	0.0073	0.0022
155	0.0097	0.0074	0.0023
156	0.0098	0.0075	0.0023
157	0.0100	0.0077	0.0024
158	0.0102	0.0078	0.0024
159	0.0104	0.0080	0.0024
160	0.0105	0.0080	0.0025
161	0.0108	0.0082	0.0025
162	0.0109	0.0083	0.0026
163	0.0112	0.0086	0.0026
164	0.0113	0.0087	0.0027
165	0.0117	0.0089	0.0027
166	0.0118	0.0090	0.0028
167	0.0122	0.0093	0.0029

168	0.0124	0.0095	0.0029
169	0.0128	0.0098	0.0030
170	0.0130	0.0099	0.0031
171	0.0135	0.0103	0.0032
172	0.0137	0.0105	0.0032
173	0.0142	0.0109	0.0033
174	0.0145	0.0111	0.0034
175	0.0152	0.0116	0.0036
176	0.0155	0.0119	0.0036
177	0.0163	0.0124	0.0038
178	0.0167	0.0128	0.0039
179	0.0176	0.0135	0.0041
180	0.0181	0.0139	0.0043
181	0.0193	0.0148	0.0045
182	0.0200	0.0153	0.0047
183	0.0215	0.0165	0.0051
184	0.0225	0.0172	0.0053
185	0.0178	0.0136	0.0042
186	0.0190	0.0145	0.0045
187	0.0220	0.0169	0.0052
188	0.0240	0.0184	0.0056
189	0.0299	0.0229	0.0070
190	0.0344	0.0263	0.0081
191	0.0523	0.0400	0.0123
192	0.0759	0.0444	0.0315
193	0.3282	0.0444	0.2838
194	0.0411	0.0315	0.0097
195	0.0266	0.0203	0.0062
196	0.0204	0.0156	0.0048
197	0.0235	0.0180	0.0055
198	0.0207	0.0158	0.0049
199	0.0187	0.0143	0.0044
200	0.0171	0.0131	0.0040
201	0.0159	0.0121	0.0037
202	0.0148	0.0113	0.0035
203	0.0140	0.0107	0.0033
204	0.0132	0.0101	0.0031
205	0.0126	0.0096	0.0030
206	0.0120	0.0092	0.0028
207	0.0115	0.0088	0.0027
208	0.0110	0.0084	0.0026
209	0.0106	0.0081	0.0025
210	0.0103	0.0079	0.0024
211	0.0099	0.0076	0.0023
212	0.0096	0.0074	0.0023
213	0.0094	0.0072	0.0022
214	0.0091	0.0070	0.0021
215	0.0089	0.0068	0.0021
216	0.0086	0.0066	0.0020
217	0.0104	0.0079	0.0024

218	0.0101	0.0078	0.0024
219	0.0100	0.0076	0.0023
220	0.0098	0.0075	0.0023
221	0.0096	0.0074	0.0023
222	0.0094	0.0072	0.0022
223	0.0093	0.0071	0.0022
224	0.0091	0.0070	0.0021
225	0.0090	0.0069	0.0021
226	0.0089	0.0068	0.0021
227	0.0087	0.0067	0.0021
228	0.0086	0.0066	0.0020
229	0.0085	0.0065	0.0020
230	0.0084	0.0064	0.0020
231	0.0083	0.0063	0.0019
232	0.0082	0.0063	0.0019
233	0.0081	0.0062	0.0019
234	0.0080	0.0061	0.0019
235	0.0079	0.0060	0.0019
236	0.0078	0.0060	0.0018
237	0.0077	0.0059	0.0018
238	0.0076	0.0058	0.0018
239	0.0075	0.0058	0.0018
240	0.0075	0.0057	0.0018
241	0.0074	0.0057	0.0017
242	0.0073	0.0056	0.0017
243	0.0072	0.0055	0.0017
244	0.0072	0.0055	0.0017
245	0.0071	0.0054	0.0017
246	0.0070	0.0054	0.0017
247	0.0070	0.0053	0.0016
248	0.0069	0.0053	0.0016
249	0.0069	0.0052	0.0016
250	0.0068	0.0052	0.0016
251	0.0067	0.0052	0.0016
252	0.0067	0.0051	0.0016
253	0.0066	0.0051	0.0016
254	0.0066	0.0050	0.0015
255	0.0065	0.0050	0.0015
256	0.0065	0.0050	0.0015
257	0.0064	0.0049	0.0015
258	0.0064	0.0049	0.0015
259	0.0063	0.0048	0.0015
260	0.0063	0.0048	0.0015
261	0.0062	0.0048	0.0015
262	0.0062	0.0047	0.0015
263	0.0062	0.0047	0.0014
264	0.0061	0.0047	0.0014
265	0.0061	0.0046	0.0014
266	0.0060	0.0046	0.0014
267	0.0060	0.0046	0.0014

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     268              0.0060           0.0046              0.0014
     269              0.0059           0.0045              0.0014
     270              0.0059           0.0045              0.0014
     271              0.0058           0.0045              0.0014
     272              0.0058           0.0044              0.0014
     273              0.0058           0.0044              0.0014
     274              0.0057           0.0044              0.0013
     275              0.0057           0.0044              0.0013
     276              0.0057           0.0043              0.0013
     277              0.0056           0.0043              0.0013
     278              0.0056           0.0043              0.0013
     279              0.0056           0.0043              0.0013
     280              0.0055           0.0042              0.0013
     281              0.0055           0.0042              0.0013
     282              0.0055           0.0042              0.0013
     283              0.0054           0.0042              0.0013
     284              0.0054           0.0041              0.0013
     285              0.0054           0.0041              0.0013
     286              0.0054           0.0041              0.0013
     287              0.0053           0.0041              0.0013
     288              0.0053           0.0041              0.0012
     --------------------------------------------------------------------
     --------------------------------------------------------------------
     Total soil rain loss =      2.05(In)
     Total effective rainfall =      0.92(In)
     Peak flow rate in flood hydrograph =     10.22(CFS)
     ---------------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                    R u n o f f     H y d r o g r a p h
     --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

     --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        5.0      10.0      15.0      20.0
-----------------------------------------------------------------------
  0+ 5      0.0000      0.00  Q         |         |         |         |
  0+10      0.0001      0.01  Q         |         |         |         |
  0+15      0.0003      0.03  Q         |         |         |         |
  0+20      0.0008      0.07  Q         |         |         |         |
  0+25      0.0015      0.10  Q         |         |         |         |
  0+30      0.0023      0.12  Q         |         |         |         |
  0+35      0.0032      0.13  Q         |         |         |         |
  0+40      0.0041      0.14  Q         |         |         |         |
  0+45      0.0051      0.15  Q         |         |         |         |
  0+50      0.0062      0.15  Q         |         |         |         |
  0+55      0.0073      0.16  Q         |         |         |         |
  1+ 0      0.0084      0.16  Q         |         |         |         |
  1+ 5      0.0095      0.17  Q         |         |         |         |
  1+10      0.0107      0.17  Q         |         |         |         |
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1+15        0.0119       0.17  Q          |          |          |          |
1+20        0.0131       0.17  Q          |          |          |          |
1+25        0.0143       0.18  Q          |          |          |          |
1+30        0.0155       0.18  Q          |          |          |          |
1+35        0.0168       0.18  Q          |          |          |          |
1+40        0.0181       0.18  Q          |          |          |          |
1+45        0.0193       0.18  Q          |          |          |          |
1+50        0.0206       0.19  Q          |          |          |          |
1+55        0.0219       0.19  Q          |          |          |          |
2+ 0        0.0232       0.19  Q          |          |          |          |
2+ 5        0.0245       0.19  QV         |          |          |          |
2+10        0.0258       0.19  QV         |          |          |          |
2+15        0.0271       0.19  QV         |          |          |          |
2+20        0.0284       0.19  QV         |          |          |          |
2+25        0.0298       0.19  QV         |          |          |          |
2+30        0.0311       0.19  QV         |          |          |          |
2+35        0.0325       0.20  QV         |          |          |          |
2+40        0.0338       0.20  QV         |          |          |          |
2+45        0.0352       0.20  QV         |          |          |          |
2+50        0.0365       0.20  QV         |          |          |          |
2+55        0.0379       0.20  QV         |          |          |          |
3+ 0        0.0393       0.20  QV         |          |          |          |
3+ 5        0.0406       0.20  QV         |          |          |          |
3+10        0.0420       0.20  QV         |          |          |          |
3+15        0.0434       0.20  QV         |          |          |          |
3+20        0.0448       0.20  QV         |          |          |          |
3+25        0.0462       0.20  QV         |          |          |          |
3+30        0.0476       0.20  Q V        |          |          |          |
3+35        0.0490       0.20  Q V        |          |          |          |
3+40        0.0504       0.20  Q V        |          |          |          |
3+45        0.0518       0.20  Q V        |          |          |          |
3+50        0.0532       0.21  Q V        |          |          |          |
3+55        0.0546       0.21  Q V        |          |          |          |
4+ 0        0.0560       0.21  Q V        |          |          |          |
4+ 5        0.0575       0.21  Q V        |          |          |          |
4+10        0.0589       0.21  Q V        |          |          |          |
4+15        0.0603       0.21  Q V        |          |          |          |
4+20        0.0618       0.21  Q V        |          |          |          |
4+25        0.0632       0.21  Q V        |          |          |          |
4+30        0.0647       0.21  Q V        |          |          |          |
4+35        0.0661       0.21  Q V        |          |          |          |
4+40        0.0676       0.21  Q V        |          |          |          |
4+45        0.0691       0.21  Q V        |          |          |          |
4+50        0.0705       0.21  Q  V       |          |          |          |
4+55        0.0720       0.21  Q  V       |          |          |          |
5+ 0        0.0735       0.21  Q  V       |          |          |          |
5+ 5        0.0750       0.22  Q  V       |          |          |          |
5+10        0.0765       0.22  Q  V       |          |          |          |
5+15        0.0780       0.22  Q  V       |          |          |          |
5+20        0.0795       0.22  Q  V       |          |          |          |
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5+25        0.0810      0.22  Q  V      |         |         |         |
5+30        0.0825      0.22  Q  V      |         |         |         |
5+35        0.0840      0.22  Q  V      |         |         |         |
5+40        0.0855      0.22  Q  V      |         |         |         |
5+45        0.0870      0.22  Q  V      |         |         |         |
5+50        0.0886      0.22  Q  V      |         |         |         |
5+55        0.0901      0.22  Q  V      |         |         |         |
6+ 0        0.0917      0.22  Q  V      |         |         |         |
6+ 5        0.0932      0.23  Q  V      |         |         |         |
6+10        0.0948      0.23  Q   V     |         |         |         |
6+15        0.0963      0.23  Q   V     |         |         |         |
6+20        0.0979      0.23  Q   V     |         |         |         |
6+25        0.0995      0.23  Q   V     |         |         |         |
6+30        0.1011      0.23  Q   V     |         |         |         |
6+35        0.1027      0.23  Q   V     |         |         |         |
6+40        0.1043      0.23  Q   V     |         |         |         |
6+45        0.1059      0.23  Q   V     |         |         |         |
6+50        0.1075      0.23  Q   V     |         |         |         |
6+55        0.1091      0.23  Q   V     |         |         |         |
7+ 0        0.1107      0.24  Q   V     |         |         |         |
7+ 5        0.1124      0.24  Q   V     |         |         |         |
7+10        0.1140      0.24  Q   V     |         |         |         |
7+15        0.1156      0.24  Q   V     |         |         |         |
7+20        0.1173      0.24  Q    V    |         |         |         |
7+25        0.1190      0.24  Q    V    |         |         |         |
7+30        0.1206      0.24  Q    V    |         |         |         |
7+35        0.1223      0.24  Q    V    |         |         |         |
7+40        0.1240      0.24  Q    V    |         |         |         |
7+45        0.1257      0.25  Q    V    |         |         |         |
7+50        0.1274      0.25  Q    V    |         |         |         |
7+55        0.1291      0.25  Q    V    |         |         |         |
8+ 0        0.1308      0.25  Q    V    |         |         |         |
8+ 5        0.1325      0.25  Q    V    |         |         |         |
8+10        0.1342      0.25  Q    V    |         |         |         |
8+15        0.1360      0.25  Q    V    |         |         |         |
8+20        0.1377      0.25  Q    V    |         |         |         |
8+25        0.1395      0.26  Q    V    |         |         |         |
8+30        0.1413      0.26  Q     V   |         |         |         |
8+35        0.1430      0.26  Q     V   |         |         |         |
8+40        0.1448      0.26  Q     V   |         |         |         |
8+45        0.1466      0.26  Q     V   |         |         |         |
8+50        0.1484      0.26  Q     V   |         |         |         |
8+55        0.1502      0.26  Q     V   |         |         |         |
9+ 0        0.1520      0.26  Q     V   |         |         |         |
9+ 5        0.1539      0.27  Q     V   |         |         |         |
9+10        0.1557      0.27  Q     V   |         |         |         |
9+15        0.1576      0.27  Q     V   |         |         |         |
9+20        0.1594      0.27  Q     V   |         |         |         |
9+25        0.1613      0.27  Q     V   |         |         |         |
9+30        0.1632      0.27  Q     V   |         |         |         |
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  9+35        0.1651       0.28  Q      V  |         |         |         |
  9+40        0.1670       0.28  Q      V  |         |         |         |
  9+45        0.1689       0.28  Q      V  |         |         |         |
  9+50        0.1708       0.28  Q      V  |         |         |         |
  9+55        0.1728       0.28  Q      V  |         |         |         |
 10+ 0        0.1747       0.28  Q      V  |         |         |         |
 10+ 5        0.1767       0.29  Q      V  |         |         |         |
 10+10        0.1787       0.29  Q      V  |         |         |         |
 10+15        0.1806       0.29  Q      V  |         |         |         |
 10+20        0.1827       0.29  Q      V  |         |         |         |
 10+25        0.1847       0.29  Q      V  |         |         |         |
 10+30        0.1867       0.29  Q      V  |         |         |         |
 10+35        0.1887       0.30  Q       V |         |         |         |
 10+40        0.1908       0.30  Q       V |         |         |         |
 10+45        0.1929       0.30  Q       V |         |         |         |
 10+50        0.1950       0.30  Q       V |         |         |         |
 10+55        0.1971       0.31  Q       V |         |         |         |
 11+ 0        0.1992       0.31  Q       V |         |         |         |
 11+ 5        0.2013       0.31  Q       V |         |         |         |
 11+10        0.2035       0.31  Q       V |         |         |         |
 11+15        0.2056       0.31  Q       V |         |         |         |
 11+20        0.2078       0.32  Q       V |         |         |         |
 11+25        0.2100       0.32  Q       V |         |         |         |
 11+30        0.2122       0.32  Q        V|         |         |         |
 11+35        0.2145       0.32  Q        V|         |         |         |
 11+40        0.2167       0.33  Q        V|         |         |         |
 11+45        0.2190       0.33  Q        V|         |         |         |
 11+50        0.2213       0.33  Q        V|         |         |         |
 11+55        0.2236       0.34  Q        V|         |         |         |
 12+ 0        0.2259       0.34  Q        V|         |         |         |
 12+ 5        0.2283       0.34  Q        V|         |         |         |
 12+10        0.2306       0.34  Q        V|         |         |         |
 12+15        0.2329       0.34  Q        V|         |         |         |
 12+20        0.2352       0.33  Q         V         |         |         |
 12+25        0.2374       0.32  Q         V         |         |         |
 12+30        0.2395       0.32  Q         V         |         |         |
 12+35        0.2417       0.32  Q         V         |         |         |
 12+40        0.2439       0.32  Q         V         |         |         |
 12+45        0.2461       0.32  Q         V         |         |         |
 12+50        0.2483       0.32  Q         V         |         |         |
 12+55        0.2505       0.32  Q         V         |         |         |
 13+ 0        0.2527       0.32  Q         V         |         |         |
 13+ 5        0.2549       0.33  Q         V         |         |         |
 13+10        0.2572       0.33  Q         |V        |         |         |
 13+15        0.2595       0.33  Q         |V        |         |         |
 13+20        0.2619       0.34  Q         |V        |         |         |
 13+25        0.2642       0.34  Q         |V        |         |         |
 13+30        0.2666       0.35  Q         |V        |         |         |
 13+35        0.2691       0.35  Q         |V        |         |         |
 13+40        0.2715       0.36  Q         |V        |         |         |
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Time(h+min)  Volume (AC*FT)  Q(CFS)  0         5.0       10        15        20
  13+45       0.2740       0.36  Q         |V        |         |         |
  13+50       0.2766       0.37  Q         |V        |         |         |
  13+55       0.2792       0.38  Q         |V        |         |         |
  14+ 0       0.2818       0.38  Q         | V       |         |         |
  14+ 5       0.2845       0.39  Q         | V       |         |         |
  14+10       0.2873       0.40  Q         | V       |         |         |
  14+15       0.2901       0.41  Q         | V       |         |         |
  14+20       0.2930       0.42  Q         | V       |         |         |
  14+25       0.2959       0.43  Q         | V       |         |         |
  14+30       0.2989       0.44  Q         | V       |         |         |
  14+35       0.3020       0.45  Q         | V       |         |         |
  14+40       0.3052       0.46  Q         |  V      |         |         |
  14+45       0.3084       0.47  Q         |  V      |         |         |
  14+50       0.3118       0.49  Q         |  V      |         |         |
  14+55       0.3153       0.50  |Q        |  V      |         |         |
  15+ 0       0.3188       0.52  |Q        |  V      |         |         |
  15+ 5       0.3225       0.54  |Q        |  V      |         |         |
  15+10       0.3264       0.56  |Q        |  V      |         |         |
  15+15       0.3304       0.58  |Q        |   V     |         |         |
  15+20       0.3345       0.60  |Q        |   V     |         |         |
  15+25       0.3388       0.63  |Q        |   V     |         |         |
  15+30       0.3433       0.65  |Q        |   V     |         |         |
  15+35       0.3479       0.66  |Q        |   V     |         |         |
  15+40       0.3524       0.66  |Q        |    V    |         |         |
  15+45       0.3570       0.67  |Q        |    V    |         |         |
  15+50       0.3619       0.71  |Q        |    V    |         |         |
  15+55       0.3673       0.79  |Q        |    V    |         |         |
  16+ 0       0.3738       0.93  |Q        |    V    |         |         |
  16+ 5       0.3855       1.70  |  Q      |     V   |         |         |
  16+10       0.4096       3.51  |      Q  |      V  |         |         |
  16+15       0.4548       6.56  |         |  Q     V|         |         |
  16+20       0.5252      10.22  |         |         Q V       |         |
  16+25       0.5780       7.68  |         |    Q    |   V     |         |
  16+30       0.6132       5.10  |         Q         |     V   |         |
  16+35       0.6391       3.76  |      Q  |         |      V  |         |
  16+40       0.6600       3.05  |     Q   |         |       V |         |
  16+45       0.6776       2.55  |    Q    |         |       V |         |
  16+50       0.6923       2.14  |   Q     |         |        V|         |
  16+55       0.7052       1.87  |  Q      |         |         V         |
  17+ 0       0.7168       1.69  |  Q      |         |         V         |
  17+ 5       0.7270       1.48  | Q       |         |         |V        |
  17+10       0.7358       1.27  | Q       |         |         |V        |
  17+15       0.7438       1.17  | Q       |         |         |V        |
  17+20       0.7512       1.07  | Q       |         |         | V       |
  17+25       0.7580       0.99  |Q        |         |         | V       |
  17+30       0.7641       0.89  |Q        |         |         | V       |
  17+35       0.7699       0.83  |Q        |         |         | V       |
  17+40       0.7751       0.76  |Q        |         |         |  V      |
  17+45       0.7800       0.71  |Q        |         |         |  V      |
  17+50       0.7844       0.64  |Q        |         |         |  V      |
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Q = 10.22 CFS

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17+55       0.7885      0.59  |Q        |         |         |  V      |
18+ 0       0.7921      0.53  |Q        |         |         |  V      |
18+ 5       0.7955      0.48  Q         |         |         |   V     |
18+10       0.7988      0.49  Q         |         |         |   V     |
18+15       0.8022      0.49  Q         |         |         |   V     |
18+20       0.8056      0.50  Q         |         |         |   V     |
18+25       0.8090      0.49  Q         |         |         |   V     |
18+30       0.8122      0.47  Q         |         |         |   V     |
18+35       0.8151      0.43  Q         |         |         |   V     |
18+40       0.8180      0.42  Q         |         |         |   V     |
18+45       0.8208      0.41  Q         |         |         |    V    |
18+50       0.8232      0.34  Q         |         |         |    V    |
18+55       0.8255      0.33  Q         |         |         |    V    |
19+ 0       0.8277      0.33  Q         |         |         |    V    |
19+ 5       0.8299      0.32  Q         |         |         |    V    |
19+10       0.8321      0.32  Q         |         |         |    V    |
19+15       0.8343      0.31  Q         |         |         |    V    |
19+20       0.8364      0.31  Q         |         |         |    V    |
19+25       0.8385      0.30  Q         |         |         |    V    |
19+30       0.8406      0.30  Q         |         |         |    V    |
19+35       0.8426      0.30  Q         |         |         |     V   |
19+40       0.8447      0.29  Q         |         |         |     V   |
19+45       0.8466      0.29  Q         |         |         |     V   |
19+50       0.8486      0.29  Q         |         |         |     V   |
19+55       0.8506      0.28  Q         |         |         |     V   |
20+ 0       0.8525      0.28  Q         |         |         |     V   |
20+ 5       0.8544      0.28  Q         |         |         |     V   |
20+10       0.8563      0.27  Q         |         |         |     V   |
20+15       0.8581      0.27  Q         |         |         |     V   |
20+20       0.8599      0.27  Q         |         |         |     V   |
20+25       0.8618      0.26  Q         |         |         |     V   |
20+30       0.8636      0.26  Q         |         |         |     V   |
20+35       0.8653      0.26  Q         |         |         |      V  |
20+40       0.8671      0.26  Q         |         |         |      V  |
20+45       0.8689      0.25  Q         |         |         |      V  |
20+50       0.8706      0.25  Q         |         |         |      V  |
20+55       0.8723      0.25  Q         |         |         |      V  |
21+ 0       0.8740      0.25  Q         |         |         |      V  |
21+ 5       0.8757      0.24  Q         |         |         |      V  |
21+10       0.8773      0.24  Q         |         |         |      V  |
21+15       0.8790      0.24  Q         |         |         |      V  |
21+20       0.8806      0.24  Q         |         |         |      V  |
21+25       0.8823      0.24  Q         |         |         |      V  |
21+30       0.8839      0.23  Q         |         |         |      V  |
21+35       0.8855      0.23  Q         |         |         |      V  |
21+40       0.8870      0.23  Q         |         |         |      V  |
21+45       0.8886      0.23  Q         |         |         |       V |
21+50       0.8902      0.23  Q         |         |         |       V |
21+55       0.8917      0.22  Q         |         |         |       V |
22+ 0       0.8933      0.22  Q         |         |         |       V |
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   22+ 5        0.8948       0.22  Q         |         |         |       V |
   22+10        0.8963       0.22  Q         |         |         |       V |
   22+15        0.8978       0.22  Q         |         |         |       V |
   22+20        0.8993       0.22  Q         |         |         |       V |
   22+25        0.9008       0.21  Q         |         |         |       V |
   22+30        0.9022       0.21  Q         |         |         |       V |
   22+35        0.9037       0.21  Q         |         |         |       V |
   22+40        0.9051       0.21  Q         |         |         |       V |
   22+45        0.9066       0.21  Q         |         |         |       V |
   22+50        0.9080       0.21  Q         |         |         |       V |
   22+55        0.9094       0.21  Q         |         |         |       V |
   23+ 0        0.9108       0.20  Q         |         |         |       V |
   23+ 5        0.9122       0.20  Q         |         |         |        V|
   23+10        0.9136       0.20  Q         |         |         |        V|
   23+15        0.9150       0.20  Q         |         |         |        V|
   23+20        0.9164       0.20  Q         |         |         |        V|
   23+25        0.9177       0.20  Q         |         |         |        V|
   23+30        0.9191       0.20  Q         |         |         |        V|
   23+35        0.9205       0.20  Q         |         |         |        V|
   23+40        0.9218       0.20  Q         |         |         |        V|
   23+45        0.9231       0.19  Q         |         |         |        V|
   23+50        0.9245       0.19  Q         |         |         |        V|
   23+55        0.9258       0.19  Q         |         |         |        V|
   24+ 0        0.9271       0.19  Q         |         |         |        V|
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4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

> Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is “Yes,” provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable Site Design BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1 & 2)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ *Refer to Section 5.3.2.1 of the TGD for WQMP*
If Yes, Provide basis: (attach)
2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ *See Section 3.5 of the TGD for WQMP and WAP*
If Yes, Provide basis: (attach)
7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.* *If no, then proceed to Item 8 below.* 8 Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.* *If no, then proceed to Item 9, below.* 9 All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Site Design BMPs.*

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1&2)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 0 $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): 0 $V_{retention}$ *=Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design BMPs (DA 1&2)

14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3): 0 *$V_{retention}$ = Sum of Item 17 for all BMPs*			
19 Total Retention Volume from Site Design BMPs: 0 *Sum of Items 5, 13 and 18*			

4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): 17,775 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type Infiltration Basin	DA 1 DMA B BMP Type Infiltration Trench	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	5.95	5.95	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	4.38	4.38	
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.36	1.36	
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4	0	
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	4	0	
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	5,004	2,144	
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0	1	
10 Amended soil porosity	0.3	0.3	
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0	2	
12 Gravel porosity	0.4	0.4	
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	21,715	3,087	
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			

16 Total Retention Volume from LID Infiltration BMPs: 24,802 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 140% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 2)

1 Remaining LID DCV not met by site design BMP (ft^3): 17,585 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 2 BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	5.95		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	4.38		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.36		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	4		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	5,240		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0		
10 Amended soil porosity	0.3		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0		
12 Gravel porosity	0		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	22,740		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0		

16 Total Retention Volume from LID Infiltration BMPs: 22,740

17 Fraction of DCV achieved with infiltration BMP: 129% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1&2)		
1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft³): *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-5 and 4.3-6 to compute treated volume* ☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow* ☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft³): *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft³): *Item 1 – Item 3*	5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-5 Volume Based Biotreatment (DA 1&2) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) *$V_{biotreated}$ = Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-6 Volume Based Biotreatment (DA 1&2) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (E.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} *= Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ *=(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V *=Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} *= (Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ *= (Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-7 Flow Based Biotreatment (DA 1&2)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item $2^{\wedge 1.67}$ * Item $3^{\wedge 0.5}$)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item $2^{\wedge 2}$)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)
1 Total LID DCV for the Project DA-1 (ft^3): 17,775 *Copy Item 7 in Form 4.2-1*
2 On-site retention with site design BMP (ft^3): 0 *Copy Item18 in Form 4.3-2*
3 On-site retention with LID infiltration BMP (ft^3): 24,802 *Copy Item 16 in Form 4.3-3*
4 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-4*
5 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-4*
6 LID BMP performance criteria are achieved if answer to any of the following is "Yes": • Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐ *If yes, sum of Items 2, 3, and 4 is greater than Item 1* • Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒ *If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized* ▪ On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒ *If yes, Form 4.3-1 Items 7 and 8 were both checked yes*
7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance: • Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐ *Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%* • Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: 1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐ 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐ 3) Equal or greater protection against shock loadings and spills; ☐ 4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 1)	
1 Volume reduction needed for hydromodification performance criteria (ft^3): 2,619 FROM HYDROGRAPH ANALYSIS *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	2 On-site retention with site design and infiltration, BMP (ft^3): 7,027 REMAINDER FROM FORM 4.3-8 (DA-1) *Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*	4 Volume capture provided by incorporating additional on-site BMPs (ft^3): 0
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:* • Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☒ • Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:* • Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒	

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 2)

1 Total LID DCV for the Project DA-2 (ft^3): 17,585 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): 0 *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 22,740 *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-4*

6 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*

- Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated:
  1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐
  2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐
  3) Equal or greater protection against shock loadings and spills; ☐
  4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 2)	
1 Volume reduction needed for hydromodification performance criteria (ft3): 2,135 FROM HYDROGRAPH ANALYSIS *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 5,155 REMAINDER FROM FROM 4.3-8 (DA-2) *Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): 0
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:* • Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☒ • Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:* • Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

Form 5-1 BMP Inspection and Maintenance
(use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration Basin	Owner	Maintain vegetation as needed	Ongoing, before annual storms and following rainfall events
Infiltration Basin (cont)	Owner	Remove debris and litter form entire basin to minimize clogging and improve aesthetics	Ongoing, before annual storms and following rainfall events
Infiltration Basin (cont)	Owner	Check for obvious problems & repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in basin bottom. There should be no long-term ponding water.	Ongoing, before annual storms and following rainfall events
Infiltration Basin (cont)	Owner	Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment integrity, as well as damage to any structural element.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.

Infiltratio n Basin (cont)	Owner	Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.
Infiltratio n Basin (cont)	Owner	Verify the basin bottom is allowing acceptable infiltration. Use disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.
Infiltration Trench	Owner	Remove trash and debris. Check for damage and surface standing water. Contact manufacturer for repair recommendations if trench becomes clogged.	Annually, before and after significant rainfall

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

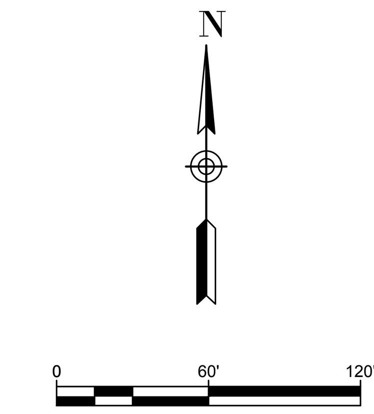
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements

Attachment 1 - Site Plan and Drainage Plan



LEGEND

- DRAINAGE AREAS
- SITE BOUNDARY
- FLOW LINE
- PROPOSED CONCRETE PAVING AREAS
- PROPOSED A/C PAVING AREAS
- PROPOSED STRUCTURES
- PROPOSED LANDSCAPING AREAS

DA - 1 / 6.5 AC / 80% IMP.
- INDICATES DRAINAGE AREA NUMBER
- INDICATES ACREAGE OF DRAINAGE AREA
- INDICATES PERCENTAGE OF IMPERVIOUS AREA

DA - 1 COVER INFORMATION:

COVER TYPE:	QTY.
ROOF:	199,229 SF.
CONCRETE:	50,695 SF.
ASPHALT:	74,185 SF.
LANDSCAPING:	234,293 SF.
TOTAL:	558,406 S.F.
%IMPERVIOUS:	58.0%
DCV:	17,775 CU.FT.
HCOC:	2,619 CU. FT.
TOTAL:	20,394 CU. FT.
LOT B BASIN VOL.:	20,049 CU. FT.
INFILTRATION TRENCH VOL.:	2,573 CU.FT.

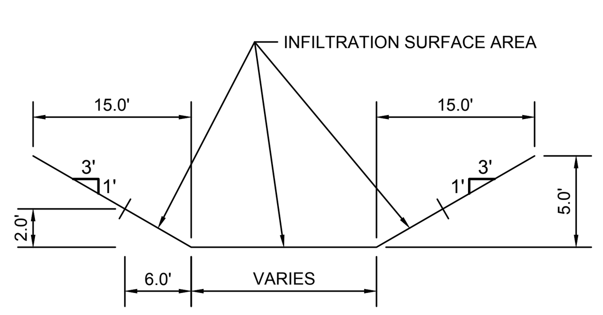
DA - 2 COVER INFORMATION:

COVER TYPE:	QTY.
ROOF:	191,443 SF
CONCRETE:	51,225 SF.
ASPHALT:	77,063 SF.
LANDSCAPING:	212,831 SF.
TOTAL:	532,562 S.F.
%IMPERVIOUS:	60.0%
DCV:	17,585 CU.FT.
HCOC:	2,135 CU. FT.
TOTAL:	19,720 CU. FT.
LOT C BASIN VOL.:	20,909 CU. FT.

PROPOSED TREATMENT CONTROL BMP'S:

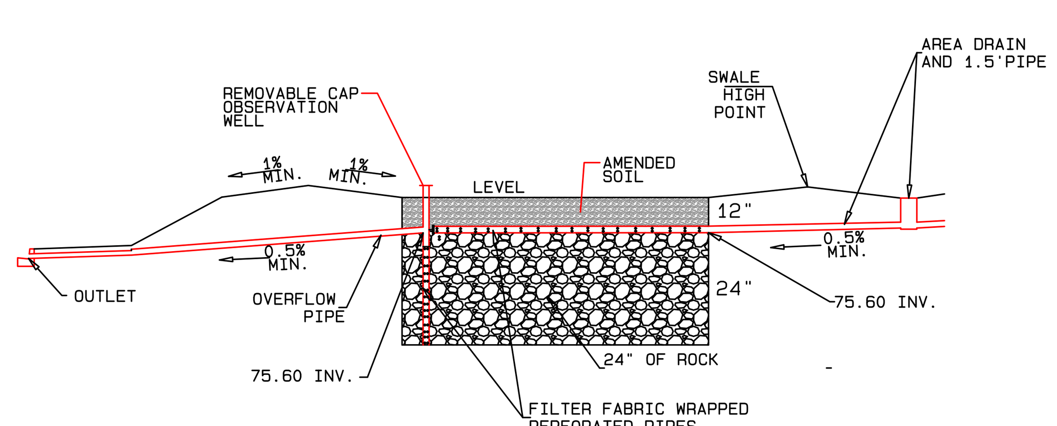
1 INFILTRATION BASIN

2 INFILTRATION TRENCH



INFILTRATION BASIN

N.T.S.



INFILTRATION TRENCH

N.T.S.

PLOT DATE: September 29, 2021

REV.	DESCRIPTION	DATE	BY

Ludwig Engineering Associates, Inc.
Civil Engineering • Surveying • Planning

109 East Third Street, San Bernardino, CA 92410, Phone: 909-884-8217, Fax: 909-889-0153
5890 Hwy. 95, Ste. B, Fort Mohave, AZ 88426, Phone: 928-768-1857, Fax: 928-768-7086
15252 Seneca Rd., Victorville, CA 92392, Phone: 760-951-7676, Fax: 760-241-0573
2126 McCulloch Blvd., Ste. 8, Lake Havasu City, AZ 86403, Phone: 928-680-6060, Fax: 928-854-6530

CITY OF VICTORVILLE
WQMP MAP
FROMER TRACK 17486

CLIENT:
R.Y. PROPERTIES
212 S. PALM AVE. ALHAMBRA, CA, 91801

SCALE 1" = 60'

SHEET 1 OF 1

DESIGNED BY:	DRAWN BY:	CHECKED BY:
MR	MR	JA

PLOT DATE: August 31, 2021

PROJECT LOCATION & NAME: V:\plans\TR 17486 (RY Properties)\engineering\drainage\acad\17486_Drainage_110 Lots.dwg PLOT TIME: Tuesday, August 31, 2021 4:12:38 PM LAYOUT: Drainage Post

PLOT STYLE: Ludwig.stb

REV.	DESCRIPTION	DATE	BY

Ludwig Engineering ASSOCIATES, INC.
Civil Engineering • Surveying • Planning

109 East Third Street, San Bernardino, CA 92410, Phone: 909-884-8217, Fax: 909-889-0153
5890 Hwy. 95, Ste. B, Fort Mohave, AZ 86426, Phone: 928-768-1857, Fax: 928-768-7086
15252 Seneca Rd., Victorville, CA 92392, Phone: 760-951-7676, Fax: 760-241-0573
2126 McCulloch Blvd., Ste. 8, Lake Havasu City, AZ 86403, Phone: 928-680-6060, Fax: 928-854-6530

CITY OF VICTORVILLE
DRAINAGE MAP POST DEVELOPMENT
FORMER TRACK 17486

CLIENT:
R.Y. PROPERTIES
212 S. PALM AVE, ALHAMBRA, CA, 91801

SCALE 1" = 60'
SHEET 1 OF 1

DESIGNED BY: MR | DRAWN BY: MR | CHECKED BY: JA

PLOT DATE: August 31, 2021

REV.	DESCRIPTION	DATE	BY

Ludwig Engineering ASSOCIATES, INC.
Civil Engineering • Surveying • Planning
109 East Third Street, San Bernardino, CA 92410, Phone: 909-884-8217, Fax: 909-889-0153
5890 Hwy. 95, Ste. B, Fort Mohave, AZ 86426, Phone: 928-768-1857, Fax: 928-768-7086
15252 Seneca Rd., Victorville, CA 92392, Phone: 760-951-7676, Fax: 760-241-0573
2126 McCulloch Blvd., Ste. 8, Lake Havasu City, AZ 86403, Phone: 928-680-6060, Fax: 928-854-6530

CITY OF VICTORVILLE
DRAINAGE PRE-DEVELOPMENT
FORMER TRACK 17486

CLIENT:
R.Y. PROPERTIES
212 S. PALM AVE. ALHAMBRA, CA, 91801

SCALE 1" = 60'
SHEET 1 OF 1

DESIGNED BY:	DRAWN BY:	CHECKED BY:
MR	MR	JA

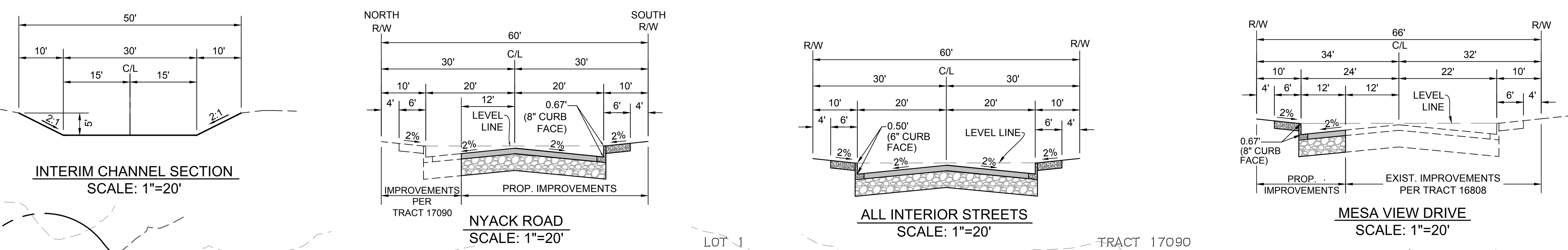
PLOT STYLE: NCS US Standard.stb PROJECT LOCATION & NAME: V:\pland\TR. 17486 (RY Properties)\engineering\drainage\acad\17486_Drainage_110 Lots.dwg PLOT TIME: Tuesday, August 31, 2021 2:17:45 PM LAYOUT: Drainage Pre

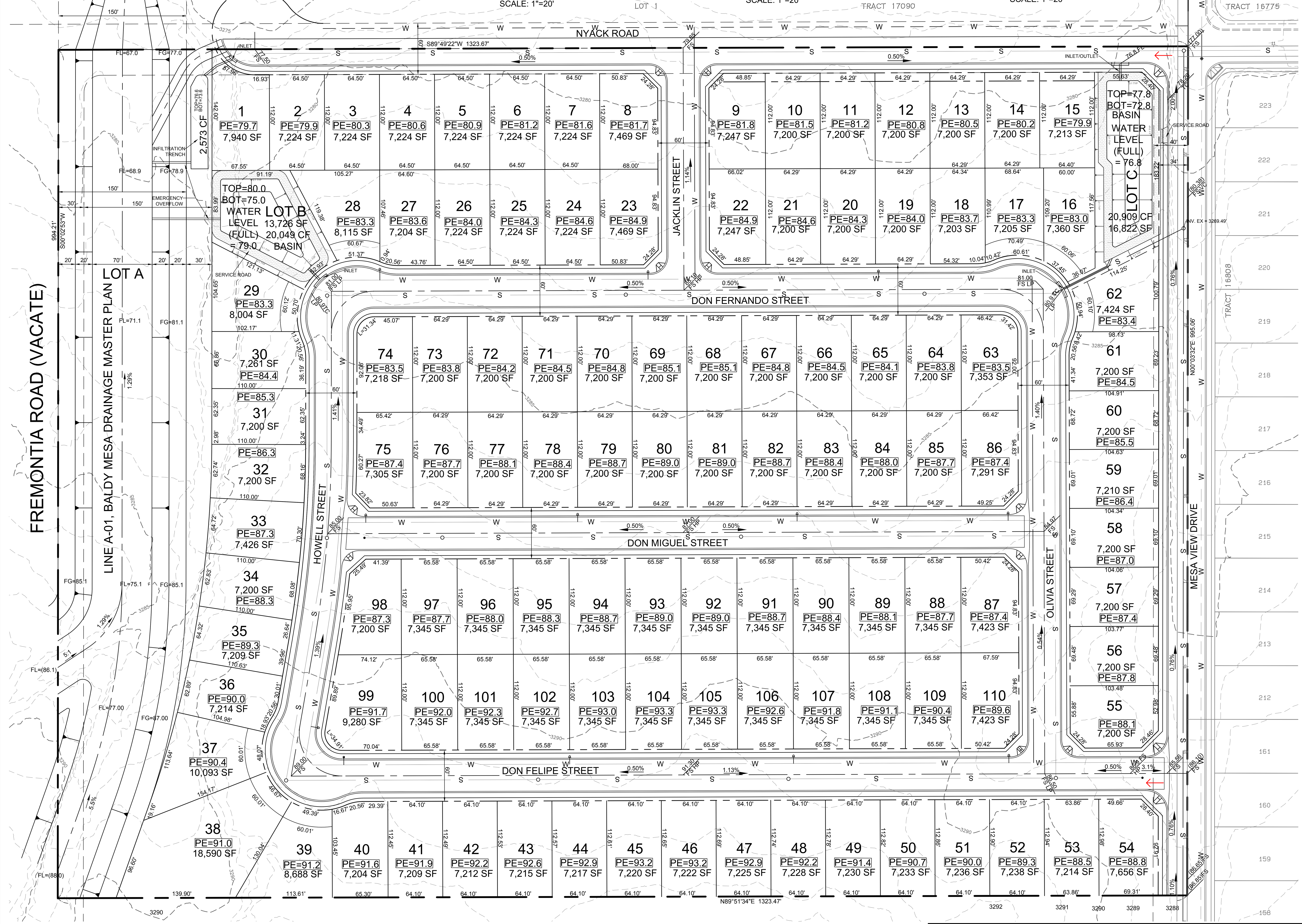
IN THE CITY OF VICTORVILLE, COUNTY OF SAN BERNARDINO, CALIFORNIA

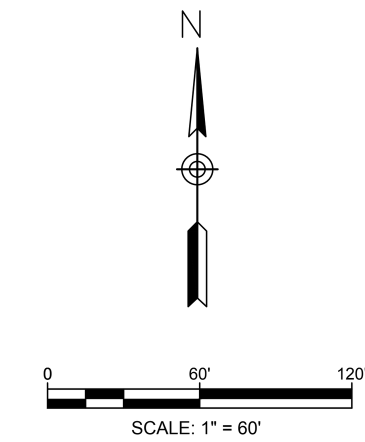
TENTATIVE TRACT MAP NO. 20454

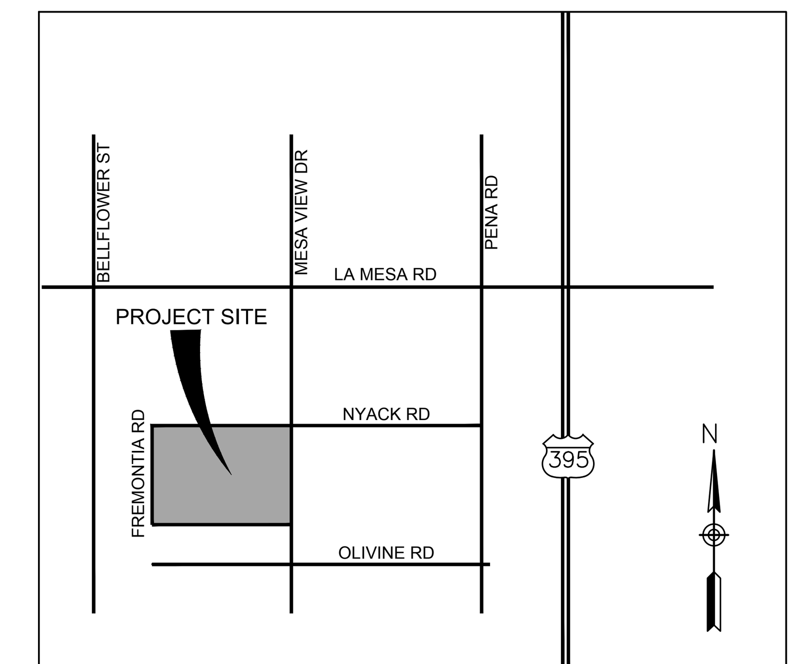
BEING A SUBDIVISION OF PARCELS 1 THROUGH 3, INCLUSIVE OF PARCEL MAP 2188, AS PER MAP RECORDED IN BOOK 19 OF PARCEL MAPS, PAGE 2

LUDWIG ENGINEERING JUNE 2021









VICINITY MAP (NTS)

OWNER/DEVELOPER

BEDFORD OPPORTUNITY FUND II, LLC
212 S. PALM AVE., SUITE 200
ALHAMBRA, CA 91801
(626)282-3100

ENGINEER

LUDWIG ENGINEERING ASSOCIATES, INC.
109 E. THIRD STREET
SAN BERNARDINO, CA 92410
(909) 884-8217

ASSESSOR'S PARCEL NO.

PARCEL 1: APN 3134-021-05-0-000, 3134-021-06-0-000 AND 3134-021-07-0-000
PARCEL 2: APN 3134-021-02-0-000

ZONING & LAND USE

R-1 (SINGLE-FAMILY RESIDENTIAL)

GENERAL PLAN DESIGNATION

LOW DENSITY RESIDENTIAL

SERVICES

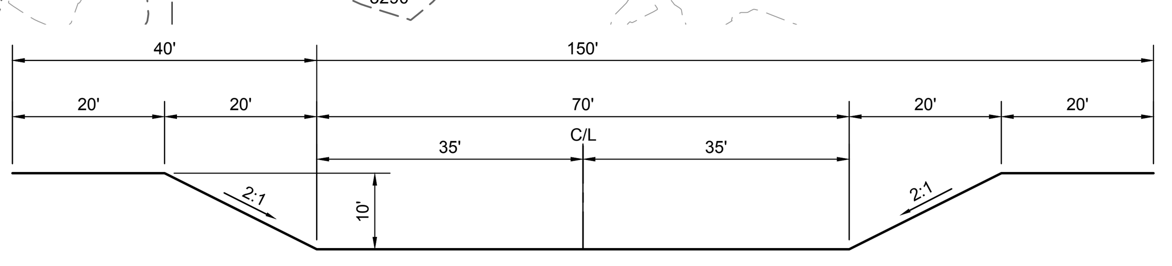
ELECTRICITY	SOUTH. CALIFORNIA EDISON COMPANY 12353 HESPERIA ROAD VICTORVILLE, CA 92392
WATER	VICTORVILLE VALLEY WATER DISTRICT 17185 YUMA STREET VICTORVILLE, CA 92392-5887
SEWER	CITY OF VICTORVILLE 14343 CIVIC DRIVE VICTORVILLE, CA 92392
GAS	SOUTHWEST GAS COMPANY 14950 CIRCLE DRIVE VICTORVILLE, CA 92392
TELEPHONE	VERIZON 16071 MOJAVE DRIVE VICTORVILLE, CA. 92392

AREAS

TOTAL ACREAGE: APPROX. 30.22 AC
TOTAL NUMBERED LOTS: 110
UNITS PER ACRE GROSS RES.: 3.64
MINIMUM LOT SIZE RES.: 7,200 SF
TOTAL LETTERED LOTS: 3 (LOT "A" EASEMENT FOR DRAINAGE PURPOSES, LOT B & C RETENTION BASINS)

NOTES

- THIS TRACT CONTAINS 5,644 L.F. OF NEW STREETS.
- UNLESS OTHERWISE INDICATED THE SURROUNDING LAND USE IS "VACANT".
- CONTOUR SOURCE: SAN BERNARDINO COUNTY 2014 LiDAR (NAVD 88) LOWERED TO PROJECT LOCATION FOR (NGVD 29)
- DEVELOPMENT OF SITE WILL HAVE MINIMAL EFFECT ON EXISTING DRAINAGE PATTERNS. STORM WATER RUNOFF WILL FOLLOW EXISTING AND NATURAL DRAINAGE COURSES OR BE CARRIED IN PROPOSED STREETS AND DRAINAGE FACILITIES AS INDICATED ON THE MAP AND OUTLINED IN ACCOMPANYING DRAINAGE STUDY.
- EARTHWORK WILL BE BALANCED ON SITE.
ESTIMATED EARTHWORK QUANTITY: RAW CUT: 76,422 CY RAW FILL: 38,669 CY
- IMPROVEMENTS ARE PER TYPICAL SUBDIVISION AND ARE TO BE BUILT ACCORDING TO CITY OF VICTORVILLE STANDARDS.
- SETBACKS: 20' - FRONT & REAR
10' - STREET SIDE YARD
5' - SIDE YARD
- THIS IS A CALCULATED MAP. LOT CLOSURES ARE AVAILABLE. THE DEVELOPER REQUESTS REVIEW FOR COMPLIANCE WITH CURRENT CODES AND POLICIES WITH REGARD TO GEOMETRICS.
- SECONDARY ACCESS TO BE PROVIDED WHERE NECESSARY.
- XX.X INDICATES PAD ELEVATION.



MASTER PLANNED CHANNEL SECTION
SCALE: 1"=20'

LEGEND AND ABBREVIATIONS

TRACT BOUNDARY	(80.0) EXIST. ELEVATIONS	FS	FINISHED SURFACE
(3280) EXIST. CONTOURS	80.0 PROP. ELEVATIONS	FL	FLOW LINE
EXIST. WATER	FIRE ACCESS TO SITE	PE	PAD ELEVATION
EXIST. SEWER	PROP. CATCH BASIN	GB	GRADE BREAK
PROP. WATER		HP	HIGH POINT
PROP. SEWER		LP	LOW POINT
		SF	SQUARE FOOT

REV.	DESCRIPTION	DATE	BY

Ludwig Engineering ASSOCIATES, INC.
Civil Engineering • Surveying • Planning
109 East Third Street, San Bernardino, CA 92410, Phone: 909-884-8217, Fax: 909-889-0153
5890 Hwy. 95, Ste. B, Fort Mohave, AZ 88426, Phone: 928-768-1857, Fax: 928-768-7086
15252 Seneca Rd., Victorville, CA 92392, Phone: 760-951-7676, Fax: 760-241-0573
2126 McCulloch Blvd., Ste. 8, Lake Havasu City, AZ 86403, Phone: 928-680-6060, Fax: 928-854-6530

CITY OF VICTORVILLE
FORMER TRACT 17486
CLIENT:
RY PROPERTIES
212 S. PALM AVE. ALHAMBRA, CA 91801

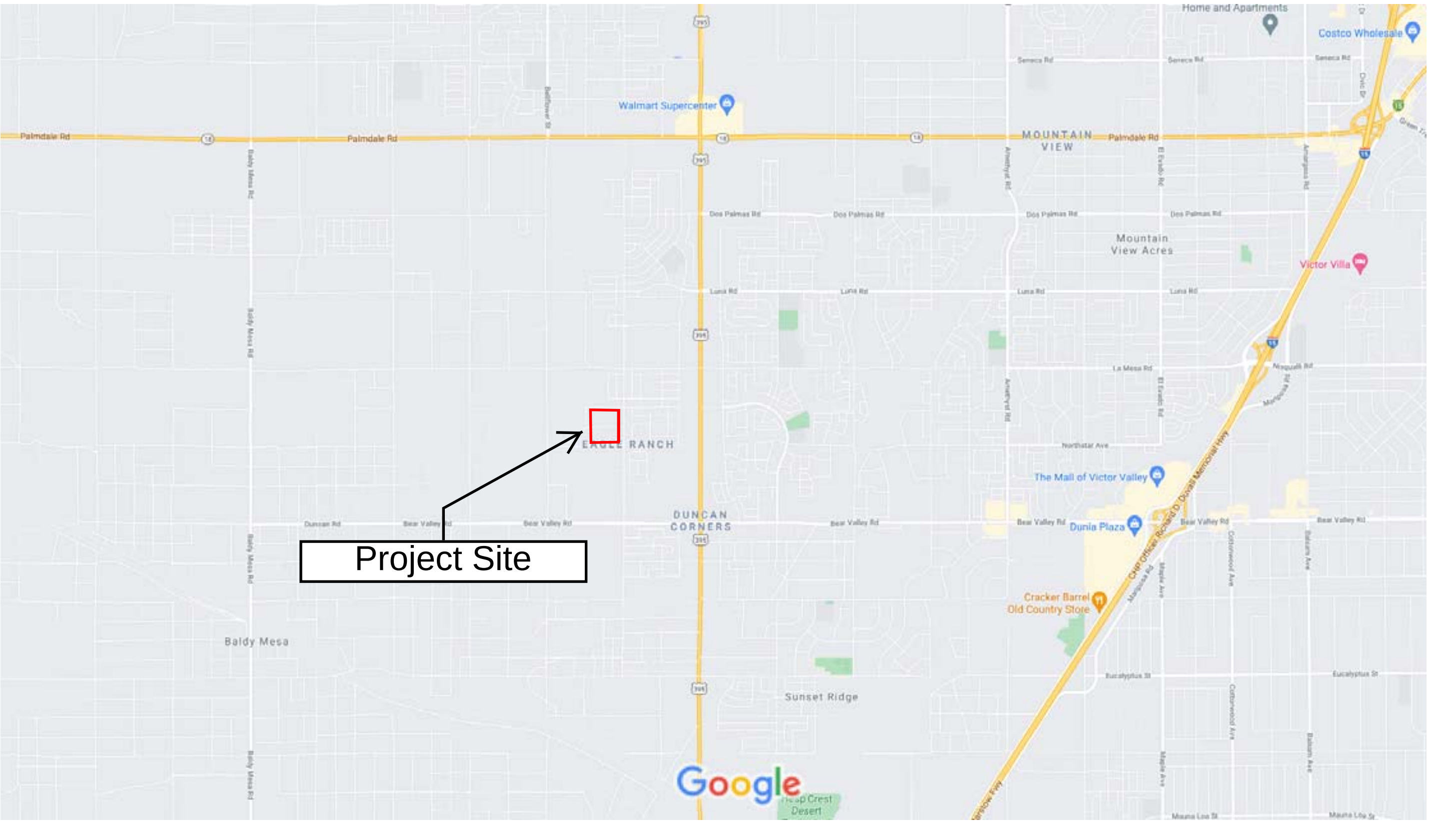
SCALE 1" = 60'
SHEET 1 OF 1

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KH	KH	JA

PROJECT LOCATION & NAME: V:\plans\TR. 17486 (RY Properties)\cad\tentative map.dwg PLOT TIME: Tuesday, August 31, 2021 4:09:40 PM LAYOUT: Sheet 1
PLOT STYLE: Ludwig.stb

Google Maps

VICINITY MAP



Map data ©2021 2000 ft

Attachment 2 - Electronic Data Submittal

This is a digital submittal. A separate electronic copy will not be provided.

Attachment 3 - Post Construction

Maintenance Agreement will be signed and notarized when requested by the reviewing agency.

Attachment 4 - Other Supporting Documentation

Track 17486

Looking Northwest from Mesa View Drive and Olivine Road

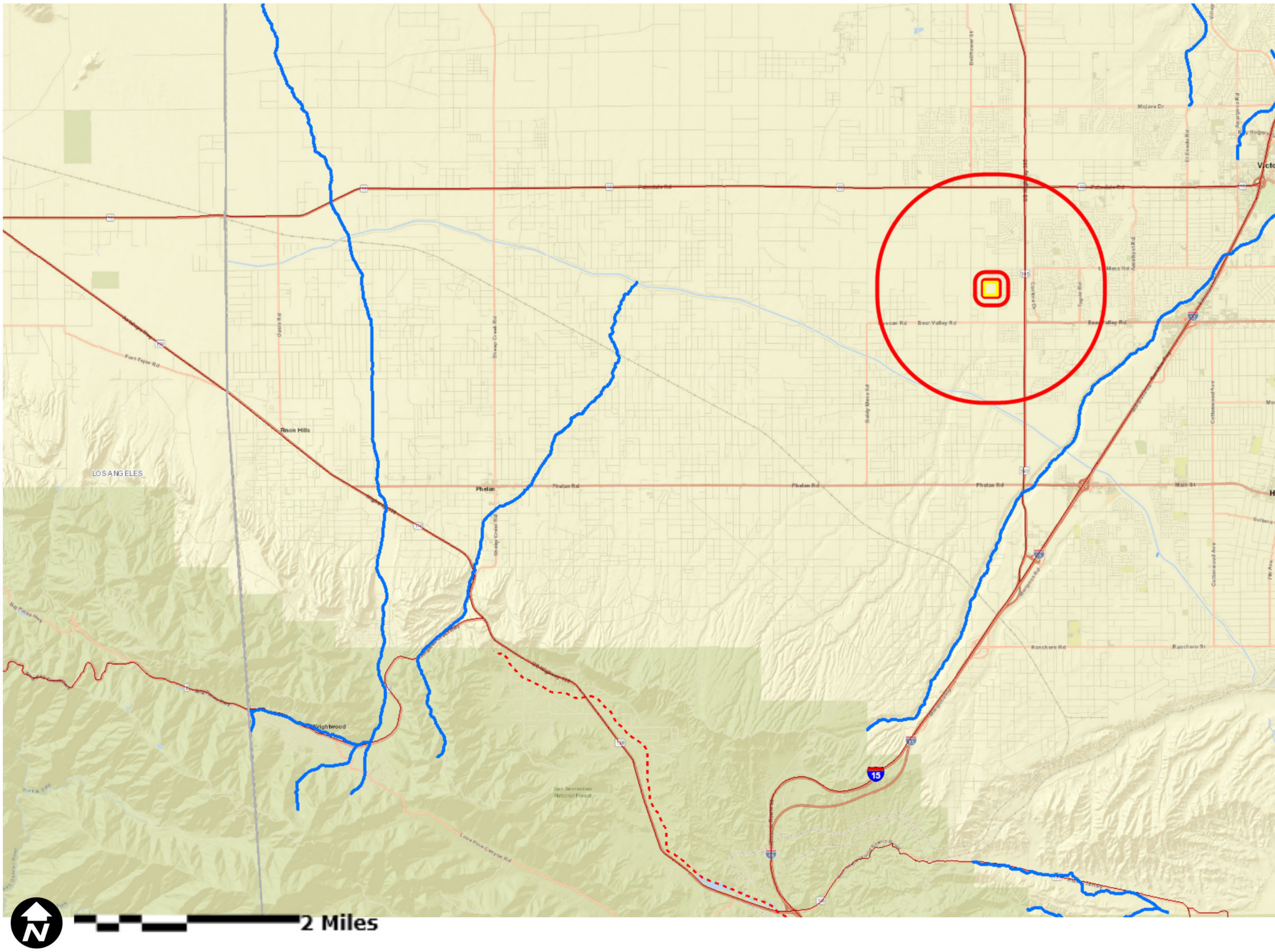
Track 17486

Looking Southwest from Mesa View Drive and Nyack Road


Track 17486
Looking West from Mesa View Drive
Legend
PROJECT SITE
MESA VIEW DRIVE
N
Google Earth
© 2021 Google
6.87 ft

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
1 Project Area DA # (sq ft)	**2** Imperviousness after applying preventative site design practices (Impervious %)	**3** Runoff Coefficient (Rc)
558406	58.04	0.394
4 Determine 1-hour rainfall depth for a 2-year return period P2yr-1hr (in) *click for hyperlink*		0.399
Climate Region (C1)	(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)	1.2371
5 Compute P_6, Mean 6-hr Precipitation (in)		0.49
6 Drawdown Rate (hours) *(48 hours typical)*		48
7 Compute design capture volume, DCV (cubic feet) *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		**17775.20**

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)		
1 Project Area DA # (sq ft)	**2** Imperviousness after applying preventative site design practices (Impervious %)	**3** Runoff Coefficient (Rc)
532562	60	0.409
4 Determine 1-hour rainfall depth for a 2-year return period P2yr-1hr (in) *click for hyperlink*		0.399
Climate Region (C1)	(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)	1.2371
5 Compute P_6, Mean 6-hr Precipitation (in)		0.49
6 Drawdown Rate (hours) *(48 hours typical)*		48
7 Compute design capture volume, DCV (cubic feet) *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		**17584.65**



Site Address: permitrack.sbcounty.gov/wap

WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Tuesday, August 10, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	313402108, 313402105, 313402107, 313402106
Project Site Acreage:	36.114
HCOC Exempt Area:	No
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - See Note **Facility Name** - See Note **Owner** - See Note
Closest channel segment's susceptibility to Hydromodification:	See Note
Highest downstream hydromodification susceptibility:	See Note
Is this drainage segment subject to TMDLs?	See Note
Are there downstream drainage segments subject to TMDLs?	See Note
Is this drainage segment a 303d listed stream?	See Note
Are there 303d listed streams downstream?	See Note
Are there unlined downstream waterbodies?	See Note
Project Site Onsite Soil Group(s):	A
Environmentally Sensitive Areas within 200':	DESERT TORTOISE HABITAT CAT 2
Groundwater Depth (FT):	No data available
Parcels with potential septic tanks within 1000':	No
Known Groundwater Contamination Plumes within 1000':	No
Studies and Reports Related to Project Site:	

Note: No drainage facilities located within 2 miles of site.


Figure ADD-1
Antecedent Moisture
Condition (AMC)
5-day Rainfall - NOAA Atlas 14
(50% of Total Rainfall Prior to Peak)*
*1/2 (11-day - 1-day) =
1/2 (([10-day] + (1/10 ([20-day] - [10-day]))) - [1-day])
5 0 5 10 15
Miles
N
W E
S
Growing Season
AMC I
AMC II
AMC III
SITE LOCATION
SITE LOCATION
STATE HWY 127
I-15
US HWY 395
I-40
STATE HWY 247
STATE HWY 62

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.48°, Longitude: -117.4103°
Elevation: 3286.6 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	**0.078** (0.064-0.095)	**0.112** (0.093-0.137)	**0.158** (0.130-0.194)	**0.195** (0.159-0.241)	**0.245** (0.194-0.314)	**0.284** (0.220-0.371)	**0.324** (0.244-0.433)	**0.364** (0.267-0.501)	**0.419** (0.295-0.601)	**0.462** (0.314-0.685)
10-min	**0.111** (0.092-0.136)	**0.161** (0.133-0.197)	**0.226** (0.186-0.278)	**0.279** (0.228-0.346)	**0.352** (0.278-0.450)	**0.407** (0.315-0.532)	**0.464** (0.350-0.621)	**0.522** (0.383-0.718)	**0.601** (0.423-0.862)	**0.662** (0.450-0.982)
15-min	**0.135** (0.111-0.165)	**0.195** (0.161-0.238)	**0.274** (0.225-0.336)	**0.338** (0.276-0.418)	**0.425** (0.336-0.544)	**0.493** (0.381-0.643)	**0.561** (0.424-0.751)	**0.631** (0.464-0.869)	**0.727** (0.512-1.04)	**0.800** (0.544-1.19)
30-min	**0.204** (0.169-0.249)	**0.295** (0.243-0.361)	**0.414** (0.341-0.508)	**0.511** (0.418-0.632)	**0.643** (0.508-0.823)	**0.745** (0.576-0.973)	**0.849** (0.641-1.14)	**0.955** (0.701-1.31)	**1.10** (0.774-1.58)	**1.21** (0.824-1.80)
60-min	**0.276** (0.228-0.337)	**0.399** (0.330-0.488)	**0.561** (0.462-0.688)	**0.692** (0.565-0.856)	**0.871** (0.688-1.11)	**1.01** (0.781-1.32)	**1.15** (0.868-1.54)	**1.29** (0.949-1.78)	**1.49** (1.05-2.13)	**1.64** (1.12-2.43)
2-hr	**0.388** (0.321-0.474)	**0.528** (0.436-0.646)	**0.718** (0.591-0.881)	**0.878** (0.717-1.09)	**1.10** (0.872-1.41)	**1.28** (0.993-1.68)	**1.47** (1.11-1.97)	**1.67** (1.23-2.30)	**1.95** (1.37-2.79)	**2.17** (1.48-3.22)
3-hr	**0.488** (0.403-0.596)	**0.652** (0.538-0.797)	**0.878** (0.723-1.08)	**1.07** (0.875-1.33)	**1.35** (1.07-1.73)	**1.57** (1.22-2.05)	**1.81** (1.37-2.42)	**2.07** (1.52-2.85)	**2.43** (1.71-3.49)	**2.73** (1.86-4.05)
6-hr	**0.669** (0.553-0.817)	**0.885** (0.731-1.08)	**1.19** (0.980-1.46)	**1.46** (1.19-1.80)	**1.85** (1.46-2.36)	**2.17** (1.68-2.83)	**2.51** (1.90-3.36)	**2.89** (2.12-3.98)	**3.45** (2.43-4.94)	**3.91** (2.66-5.80)
12-hr	**0.834** (0.690-1.02)	**1.15** (0.949-1.41)	**1.60** (1.31-1.96)	**1.98** (1.62-2.45)	**2.55** (2.02-3.26)	**3.02** (2.34-3.95)	**3.53** (2.67-4.73)	**4.09** (3.00-5.63)	**4.90** (3.45-7.03)	**5.58** (3.80-8.29)
24-hr	**1.14** (1.01-1.31)	**1.64** (1.46-1.89)	**2.35** (2.08-2.72)	**2.97** (2.60-3.46)	**3.87** (3.28-4.66)	**4.61** (3.83-5.67)	**5.41** (4.38-6.81)	**6.29** (4.95-8.14)	**7.56** (5.72-10.2)	**8.62** (6.30-12.0)
2-day	**1.23** (1.09-1.41)	**1.76** (1.56-2.02)	**2.51** (2.22-2.90)	**3.17** (2.77-3.69)	**4.13** (3.50-4.98)	**4.94** (4.10-6.07)	**5.82** (4.71-7.33)	**6.78** (5.34-8.78)	**8.20** (6.20-11.1)	**9.39** (6.86-13.1)
3-day	**1.31** (1.16-1.51)	**1.86** (1.65-2.14)	**2.64** (2.33-3.05)	**3.33** (2.92-3.88)	**4.34** (3.68-5.23)	**5.19** (4.31-6.38)	**6.12** (4.96-7.71)	**7.14** (5.63-9.25)	**8.65** (6.54-11.7)	**9.92** (7.24-13.9)
4-day	**1.41** (1.25-1.63)	**1.99** (1.76-2.30)	**2.82** (2.49-3.26)	**3.55** (3.11-4.14)	**4.63** (3.92-5.58)	**5.53** (4.59-6.80)	**6.51** (5.27-8.20)	**7.59** (5.98-9.84)	**9.19** (6.95-12.4)	**10.5** (7.69-14.7)
7-day	**1.54** (1.36-1.77)	**2.15** (1.90-2.47)	**3.01** (2.66-3.48)	**3.77** (3.31-4.40)	**4.89** (4.14-5.89)	**5.81** (4.82-7.15)	**6.81** (5.52-8.58)	**7.91** (6.23-10.2)	**9.52** (7.19-12.8)	**10.9** (7.93-15.2)
10-day	**1.64** (1.46-1.89)	**2.28** (2.02-2.63)	**3.19** (2.82-3.69)	**3.98** (3.49-4.64)	**5.14** (4.36-6.19)	**6.10** (5.06-7.50)	**7.13** (5.78-8.98)	**8.26** (6.51-10.7)	**9.90** (7.48-13.4)	**11.3** (8.23-15.7)
20-day	**1.99** (1.77-2.30)	**2.75** (2.44-3.17)	**3.82** (3.37-4.41)	**4.75** (4.16-5.53)	**6.11** (5.18-7.36)	**7.22** (6.00-8.88)	**8.42** (6.82-10.6)	**9.73** (7.66-12.6)	**11.6** (8.77-15.7)	**13.2** (9.61-18.4)
30-day	**2.34** (2.07-2.69)	**3.20** (2.83-3.68)	**4.41** (3.90-5.10)	**5.47** (4.79-6.38)	**7.02** (5.95-8.45)	**8.29** (6.88-10.2)	**9.65** (7.82-12.2)	**11.1** (8.76-14.4)	**13.2** (10.0-17.9)	**15.0** (10.9-20.9)
45-day	**2.75** (2.44-3.16)	**3.71** (3.28-4.27)	**5.07** (4.48-5.86)	**6.26** (5.48-7.29)	**8.00** (6.78-9.63)	**9.43** (7.82-11.6)	**11.0** (8.87-13.8)	**12.6** (9.93-16.3)	**15.0** (11.3-20.2)	**16.9** (12.4-23.6)
60-day	**3.10** (2.75-3.56)	**4.12** (3.65-4.75)	**5.58** (4.93-6.45)	**6.85** (6.00-7.98)	**8.72** (7.39-10.5)	**10.3** (8.51-12.6)	**11.9** (9.64-15.0)	**13.7** (10.8-17.7)	**16.2** (12.3-21.9)	**18.3** (13.4-25.6)

[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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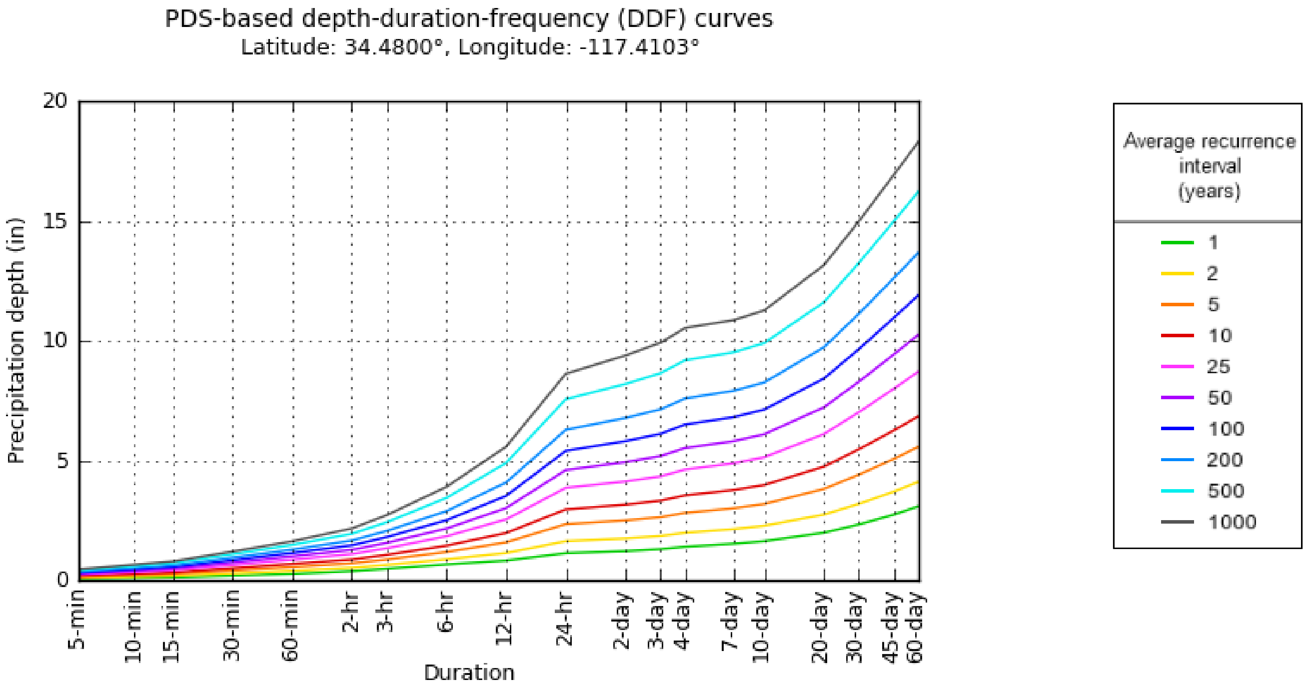
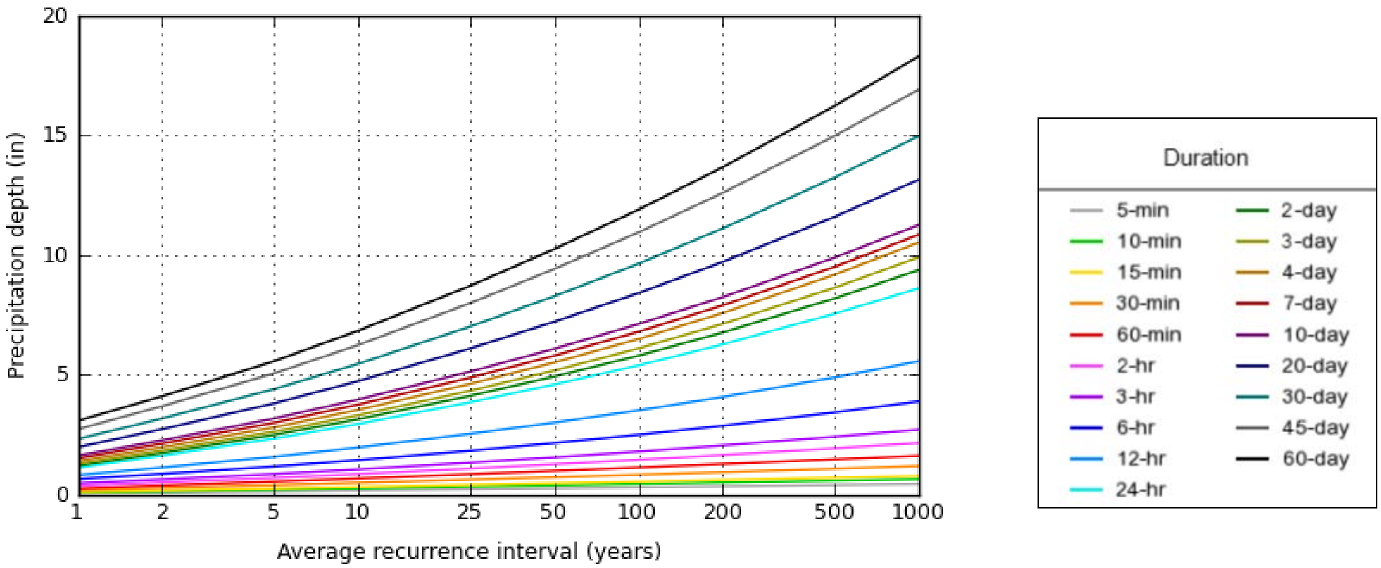
PF graphical





NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Aug 5 17:53:58 2021

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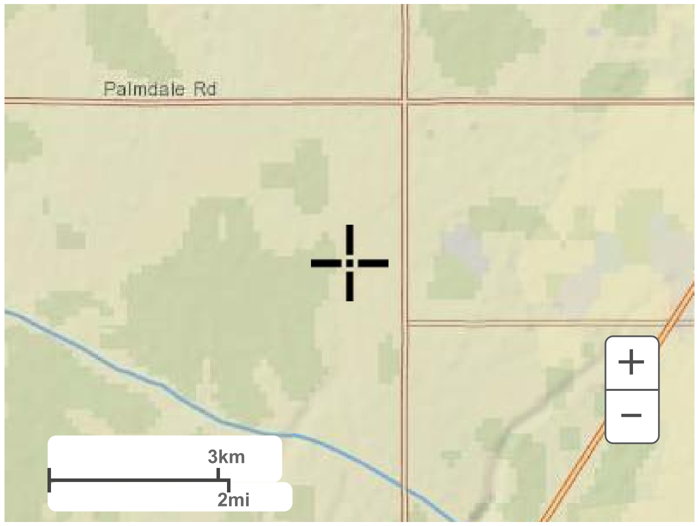
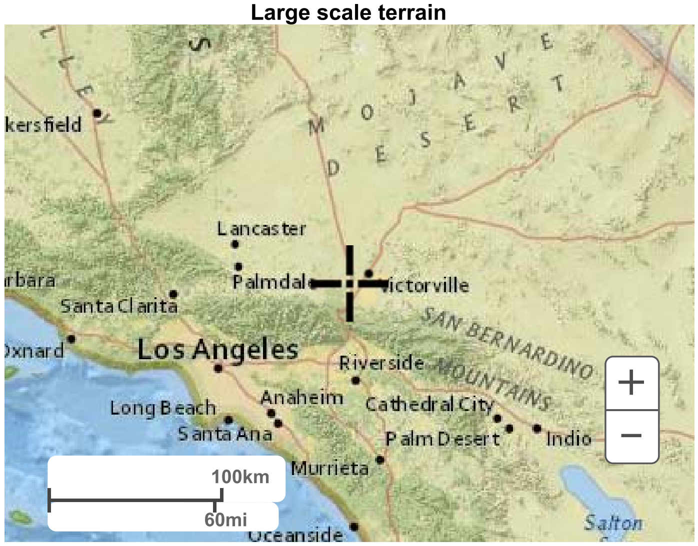
Maps & aerials

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

Disclaimer

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.5
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					4.38
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					5.95
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					1.36

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

A field exploration was conducted by Zeiser Kling Consultants, Inc. in March 2005 and consisted of excavating eight exploratory borings to depths of 6.5 to 55.25 ft. This exploration did not encounter any groundwater.
Infiltration rate was determined from a NRCS Custom Soil Resource Report.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

San Bernardino County, California, Mojave River Area

August 6, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


117° 24' 45" W
117° 24' 28" W
462150
462210
462270
462330
462390
462450
462510
34° 28' 54" N
34° 28' 36" N
3815660
3815600
3815540
3815480
3815420
3815360
3815300
3815240
3815180
3815120
112
Mesa View Dr
Olivine Rd
Soil Map may not be valid at this scale.
Map Scale: 1:2,690 if printed on A portrait (8.5" x 11") sheet.
Meters
0
35
70
140
210
Feet
0
100
200
400
600
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 12, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 26, 2019—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	33.3	100.0%
Totals for Area of Interest		**33.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Bernardino County, California, Mojave River Area

112—CAJON SAND, 0 TO 2 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrj
Elevation: 1,800 to 3,200 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 7 inches: sand
H2 - 7 to 25 inches: sand
H3 - 25 to 45 inches: gravelly sand
H4 - 45 to 60 inches: stratified sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 5 percent

Manet

Percent of map unit: 5 percent
Landform: Playas
Hydric soil rating: Yes

Kimberlina

Percent of map unit: 5 percent

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Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description
Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach
Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations
Designing New Installations
The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.

- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:

  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff

  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect

  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible

  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

☑ Contain Pollutants

Collect and Convey

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

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Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.

- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.

- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.

- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.

- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.

- Transfer waste from damaged containers into safe containers.

- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post “No Littering” signs and enforce anti-litter laws.

- Provide a sufficient number of litter receptacles for the facility.

- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.

- Secure solid waste containers; containers must be closed tightly when not in use.

- Do not fill waste containers with washout water or any other liquid.

- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training
- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)
Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs
Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance
- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP
Land Treatment System
Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.

- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Irrigate slowly to prevent runoff and then only as much as is needed.

- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.

- Train employees and contractors in proper techniques for spill containment and cleanup.

- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.

- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.

- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.

- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.

- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.

- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.

- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.

- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.

- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).

- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.

- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.

- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.

- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.

- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.

- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.

- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.

- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:

  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.

  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.

  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.

  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.

  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).

  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.

  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).

- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).

- Do not mix or prepare pesticides for application near storm drains.

- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.

- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Calibrate fertilizer and pesticide application equipment to avoid excessive application.

- Periodically test soils for determining proper fertilizer use.

- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).

- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.

- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.

- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.

- Use a training log or similar method to document training.

Spill Response and Prevention
- Refer to SC-11, Spill Prevention, Control & Cleanup

- Have spill cleanup materials readily available and in a know in location

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

Other Considerations
- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.

- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.

- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements
Costs
Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance
Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

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Photo Credit: Geoff Brosseau

Objectives

- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Approach

Suggested Protocols

Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

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- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Record the amount of waste collected.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect flushed effluent and pump to the sanitary sewer for treatment.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

Open Channel

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS

Illicit Connections and Discharges

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections
  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post “No Dumping” signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.

- Only properly trained individuals are allowed to handle hazardous materials/wastes.

- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.

- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.

- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

Spill Response and Prevention

- Refer to SC-11, Prevention, Control & Cleanup

- Have spill cleanup materials readily available and in a known location.

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

Other Considerations

- Cleanup activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and disposal of flushed effluent to sanitary sewer may be prohibited in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to re-collect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75 percent for organics and 55-65 percent for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm drain flushing.

Flow Management

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

Stream Corridor Planning

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for steam alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

<u>Corridor reservation</u> - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

<u>Bank treatment</u> - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

<u>Geomorphic restoration</u> – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

<u>Grade Control</u> - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to he reclaimed.

Examples

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

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Design Considerations

- Accumulation of Metals
- Clogged Soil Outlet Structures
- Vegetation/Landscape Maintenance

Targeted Constituents

☑	Sediment	■
☑	Nutrients	■
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

California Experience

Caltrans constructed two infiltration trenches at highway maintenance stations in Southern California. Of these, one failed to operate to the design standard because of average soil infiltration rates lower than that measured in the single infiltration test. This highlights the critical need for appropriate evaluation of the site. Once in operation, little maintenance was required at either site.

Advantages

- Provides 100% reduction in the load discharged to surface waters.

- An important benefit of infiltration trenches is the approximation of pre-development hydrology during which a significant portion of the average annual rainfall runoff is infiltrated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration trenches can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

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- As an underground BMP, trenches are unobtrusive and have little impact of site aesthetics.

Limitations

- Have a high failure rate if soil and subsurface conditions are not suitable.
- May not be appropriate for industrial sites or locations where spills may occur.
- The maximum contributing area to an individual infiltration practice should generally be less than 5 acres.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration trenches once clogged.

Design and Sizing Guidelines

- Provide pretreatment for infiltration trenches in order to reduce the sediment load. Pretreatment refers to design features that provide settling of large particles before runoff reaches a management practice, easing the long-term maintenance burden. Pretreatment is important for all structural stormwater management practices, but it is particularly important for infiltration practices. To ensure that pretreatment mechanisms are effective, designers should incorporate practices such as grassed swales, vegetated filter strips, detention, or a plunge pool in series.
- Specify locally available trench rock that is 1.5 to 2.5 inches in diameter.
- Determine the trench volume by assuming the WQV will fill the void space based on the computed porosity of the rock matrix (normally about 35%).
- Determine the bottom surface area needed to drain the trench within 72 hr by dividing the WQV by the infiltration rate.

$$d = \frac{WQV + RFV}{SA}$$

- Calculate trench depth using the following equation:

where:

D = Trench depth

WQV	=	Water quality volume
RFV	=	Rock fill volume
SA	=	Surface area of the trench bottom

- The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).
- Provide observation well to allow observation of drain time.
- May include a horizontal layer of filter fabric just below the surface of the trench to retain sediment and reduce the potential for clogging.

Construction/Inspection Considerations
Stabilize the entire area draining to the facility before construction begins. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction. Stabilize the entire contributing drainage area before allowing any runoff to enter once construction is complete.

Performance
Infiltration trenches eliminate the discharge of the water quality volume to surface receiving waters and consequently can be considered to have 100% removal of all pollutants within this volume. Transport of some of these constituents to groundwater is likely, although the attenuation in the soil and subsurface layers will be substantial for many constituents.

Infiltration trenches can be expected to remove up to 90 percent of sediments, metals, coliform bacteria and organic matter, and up to 60 percent of phosphorus and nitrogen in the infiltrated runoff (Schueler, 1992). Biochemical oxygen demand (BOD) removal is estimated to be between 70 to 80 percent. Lower removal rates for nitrate, chlorides and soluble metals should be expected, especially in sandy soils (Schueler, 1992). Pollutant removal efficiencies may be improved by using washed aggregate and adding organic matter and loam to the subsoil. The stone aggregate should be washed to remove dirt and fines before placement in the trench. The addition of organic material and loam to the trench subsoil may enhance metals removal through adsorption.

Siting Criteria
The use of infiltration trenches may be limited by a number of factors, including type of native soils, climate, and location of groundwater table. Site characteristics, such as excessive slope of the drainage area, fine-grained soil types, and proximate location of the water table and bedrock, may preclude the use of infiltration trenches. Generally, infiltration trenches are not suitable for areas with relatively impermeable soils containing clay and silt or in areas with fill.

As with any infiltration BMP, the potential for groundwater contamination must be carefully considered, especially if the groundwater is used for human consumption or agricultural purposes. The infiltration trench is not suitable for sites that use or store chemicals or hazardous materials unless hazardous and toxic materials are prevented from entering the trench. In these areas, other BMPs that do not allow interaction with the groundwater should be considered.

The potential for spills can be minimized by aggressive pollution prevention measures. Many municipalities and industries have developed comprehensive spill prevention control and countermeasure (SPCC) plans. These plans should be modified to include the infiltration trench and the contributing drainage area. For example, diversion structures can be used to prevent spills from entering the infiltration trench. Because of the potential to contaminate groundwater, extensive site investigation must be undertaken early in the site planning process to establish site suitability for the installation of an infiltration trench.

Longevity can be increased by careful geotechnical evaluation prior to construction and by designing and implementing an inspection and maintenance plan. Soil infiltration rates and the water table depth should be evaluated to ensure that conditions are satisfactory for proper operation of an infiltration trench. Pretreatment structures, such as a vegetated buffer strip or water quality inlet, can increase longevity by removing sediments, hydrocarbons, and other materials that may clog the trench. Regular maintenance, including the replacement of clogged aggregate, will also increase the effectiveness and life of the trench.

Evaluation of the viability of a particular site is the same as for infiltration basins and includes:

- Determine soil type (consider RCS soil type 'A, B or C' only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30 percent clay or more than 40 percent of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.

- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.

- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15 percent should not be considered.

- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.

- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.

- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.

- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.
- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Maintenance

Infiltration trenches required the least maintenance of any of the BMPs evaluated in the Caltrans study, with approximately 17 field hours spent on the operation and maintenance of each site. Inspection of the infiltration trench was the largest field activity, requiring approximately 8 hr/yr.

In addition to reduced water quality performance, clogged infiltration trenches with surface standing water can become a nuisance due to mosquito breeding. If the trench takes more than 72 hours to drain, then the rock fill should be removed and all dimensions of the trench should be increased by 2 inches to provide a fresh surface for infiltration.

Cost

Construction Cost

Infiltration trenches are somewhat expensive, when compared to other stormwater practices, in terms of cost per area treated. Typical construction costs, including contingency and design costs, are about \$5 per ft^3 of stormwater treated (SWRPC, 1991; Brown and Schueler, 1997). Actual construction costs may be much higher. The average construction cost of two infiltration trenches installed by Caltrans in southern California was about \$50/ft^3; however, these were constructed as retrofit installations.

Infiltration trenches typically consume about 2 to 3 percent of the site draining to them, which is relatively small. In addition, infiltration trenches can fit into thin, linear areas. Thus, they can generally fit into relatively unusable portions of a site.

Maintenance Cost

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly sited or maintained, infiltration trenches have a high failure rate. In general, maintenance costs for infiltration trenches are estimated at between 5 percent and 20 percent of the construction cost. More realistic values are probably closer to the 20-percent range, to ensure long-term functionality of the practice.

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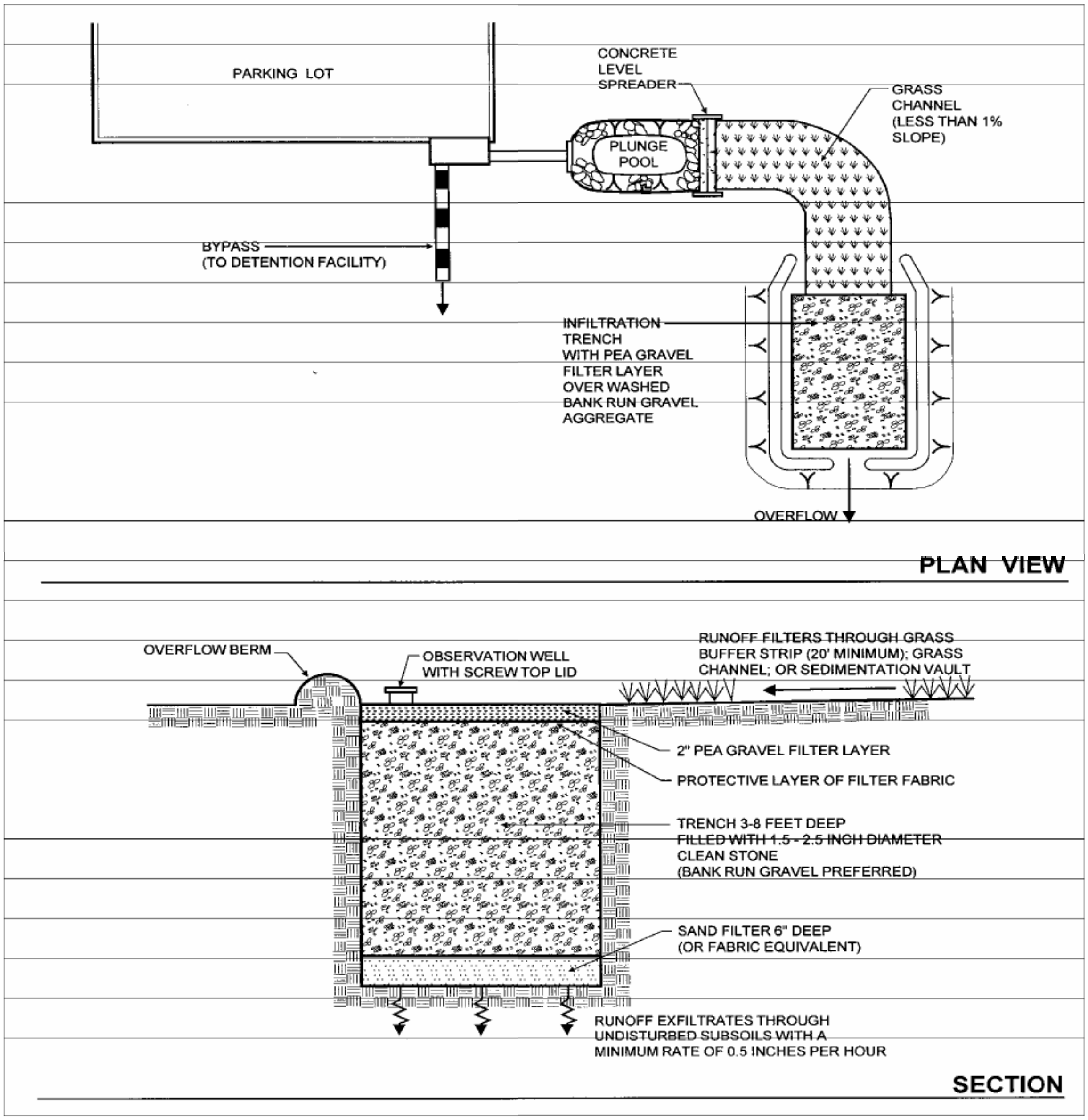

PARKING LOT
CONCRETE LEVEL SPREADER
GRASS CHANNEL (LESS THAN 1% SLOPE)
PLUNGE POOL
BYPASS (TO DETENTION FACILITY)
INFILTRATION TRENCH WITH PEA GRAVEL FILTER LAYER OVER WASHED BANK RUN GRAVEL AGGREGATE
OVERFLOW
PLAN VIEW
OVERFLOW BERM
OBSERVATION WELL WITH SCREW TOP LID
RUNOFF FILTERS THROUGH GRASS BUFFER STRIP (20' MINIMUM); GRASS CHANNEL; OR SEDIMENTATION VAULT
2" PEA GRAVEL FILTER LAYER
PROTECTIVE LAYER OF FILTER FABRIC
TRENCH 3-8 FEET DEEP FILLED WITH 1.5 - 2.5 INCH DIAMETER CLEAN STONE (BANK RUN GRAVEL PREFERRED)
SAND FILTER 6" DEEP (OR FABRIC EQUIVALENT)
RUNOFF EXFILTRATES THROUGH UNDISTURBED SUBSOILS WITH A MINIMUM RATE OF 0.5 INCHES PER HOUR
SECTION

significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

Design and Sizing Guidelines

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

Construction/Inspection Considerations

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabililized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide ("low pressure") tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type ‘A, B or C’ only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.

- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.

- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.

- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.

- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.

- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.

- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.

- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Additional Design Guidelines

(1) Basin Sizing - The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.

(2) Provide pretreatment if sediment loading is a maintenance concern for the basin.

(3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.

(4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m^2)

WQV = water quality volume (m^3)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time (48 hr)

(5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).

Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 72 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about $2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about $18/ft^3 for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

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Stormwater Pollution Prevention

Best Management Practices for Homeowner's Associations, Property Managers and Property Owners

Your Guide To Maintaining Water Friendly Standards In Your Community

» Table of Contents

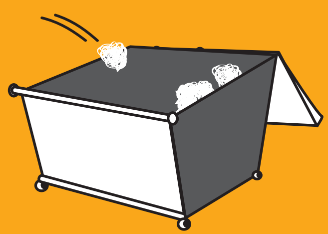
COMMERCIAL TRASH ENCLOSURES

FOLLOW THESE **REQUIREMENTS** TO **KEEP OUR WATERWAYS CLEAN**

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility. **These materials are NOT meant to go into our local lakes and rivers.**

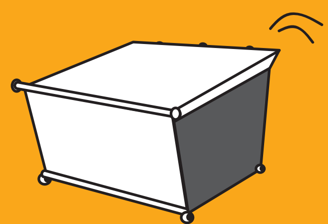
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

PUT TRASH INSIDE



Place trash inside the bin (preferably in sealed bags)

CLOSE THE LID



Prevent rain from entering the bin in order to avoid leakage of polluted water runoff

KEEP TOXICS OUT

- Paint
- Grease, fats and used oils
- Batteries, electronics and fluorescent lights

SOME ADDITIONAL GUIDELINES, INCLUDE

✓ **SWEEP FREQUENTLY**
Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

✓ **FIX LEAKS**
Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

✓ **CONSTRUCT ROOF**
Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!

San Bernardino County STORMWATER PROGRAM

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

CESQG PROGRAM

Conditionally Exempt Small Quantity Generator

WHAT IS A CESQG?

Businesses that generate 27 gallons or 220 lbs. of hazardous waste, or 2.2 lbs. of extremely hazardous waste per month are called "Conditionally Exempt Small Quantity Generators," or CESQGs. San Bernardino County Household Hazardous Program provides waste management services to CESQG businesses. The most common CESQGs in San Bernardino County are painters, print shops, auto shops, builders, agricultural operators and property managers, but there are many others. When you call, be ready to describe the types and amounts of waste your business generates in a typical month. If you generate hazardous waste on a regular basis, you must:

• Register with San Bernardino County Fire Department (909) 386-8401 as a hazardous waste generator.

• To obtain an EPA ID# and application form from the State visit www.dtsc.ca.gov.

• Manage hazardous waste in accordance with all applicable local, state and federal laws and regulations.

HOW DO I GET SERVICE?

To arrange an appointment for the CESQG Program, call 1-800-OILY CAT or 909-382-5401. Be ready to describe the type and amount of hazardous waste your business is ready to dispose of, and the types and size(s) of containers that the waste is in.

Waste Type and Cost

There is a small handling fee involved in the collection of hazardous waste from your business. Disposal costs depend on the type of waste.

Aerosols	$1.29/lb.
Automobile motor oil	$.73/gal.
Anti-freeze	$1.57/gal.
Contaminated oil	$4.48/gal.
Car batteries	$.62/ea.
Corrosive liquids, solids	$2.80/lb.
Flammable solids, liquids	$1.57/lb.
Latex Paint	$.73/lb.
Mercury	$10.08/lb.
NiCad/Alkaline Batteries	$2.13/lb.
Oil Base Paints	$1.00/lb.
Oil Filters	$.56/ea.
Oxidizers	$9.63/lb.
PCB Ballasts	$5.94/lb.
Pesticides (most)	$2.91/lb.
Photofixer, developer	$4.31/gal.
Television & Monitors	$11.20/ea.
Additional Handling	$138.00/hr.

Rates subject to change without notice

WE CANNOT ACCEPT

* Radioactives
* Water reactives
* Explosives
* Compressed gas cylinders
* Medical or biohazardous waste
* Asbestos
* Remediation wastes

HAZARDOUS WASTE

WHY IS THE FIRE DEPARTMENT COLLECTING HAZARDOUS WASTE?

Small Quantity Generators often have difficulty disposing of small quantities of hazardous waste. Hazardous waste companies usually have a minimum amount of waste that they will pick up, or charge a minimum fee for service. Typically, the minimum fee exceeds the cost of disposal for the hazardous waste. This leaves the small quantity generator in a difficult situation. Some respond by storing hazardous waste until it becomes economical for the hazardous waste transporter to pick it up, putting the business out of compliance by exceeding regulatory accumulation time limits. Other businesses simply store their hazardous wastes indefinitely, creating an unsafe work environment and exceeding accumulation time limits. Yet other businesses attempt to illegally dispose of their waste at household hazardous waste collection facilities. These facilities are not legally permitted to accept commercial wastes, nor are prepared to provide legal documentation for commercial hazardous waste disposal. In answer to the problems identified above, the San Bernardino County Fire Department Household Hazardous Program instituted the Conditionally Exempt Small Quantity Generator Program.

PAYMENT FOR SERVICES

The CESQG Program will prepare an invoice for your business at the time of service. You can pay at the time of service with cash or a check, or you can mail your payment to the Fire Department within 30 days. Please note that we do not accept credit card payments. The preferred method of payment is to handle payment at time of service. Additional charges may apply for accounts not paid within 30 days.

ARE THERE ANY OTHER WAYS THAT I CAN SAVE MONEY ON HAZARDOUS WASTE DISPOSAL?

Yes! First, start by reducing the amount of waste that you produce by changing processes or process chemicals, at your business. Next, examine if there is a way that you can recycle your waste back into your processes. Network with similar businesses or trade associations for waste minimization and pollution prevention solutions.

WHAT IF YOUR BUSINESS DOES NOT QUALIFY?

Call the San Bernardino County Fire Department Field Services Division for assistance with hazardous waste management at 909-386-8401. If you reduce the amount of waste you generate each month to 27 gallons or less, you may qualify in the future.

WHAT HAPPENS TO YOUR HAZARDOUS WASTE?

Hazardous waste collected by the CESQG Program is transported to a state permitted processing facility in San Bernardino. The waste is further processed at this point and packaged for off-site recycling (oil filters, oil, latex paint, antifreeze, and batteries) or destructive incineration (pesticides, corrosives, flammables, oil based paint).

San Bernardino County Fire Department
CESQG Program
2824 East "W" Street
San Bernardino, CA 92415-0799
Phone: 909-382-5401
Fax: 909-382-5413
www.sbcfire.org/hazmat/hhw.asp
Email: jschwab@sbcfire.org

WHEN WORKING OUTDOORS USE THE 3Cs

CUANDO TRABAJE AL AIRE LIBRE UTILICE LAS 3Cs

CONTROL | CONTROL

Locate the nearest storm drain and ensure nothing can enter or be discharged into it.

Ubique el desagüe de aguas pluviales más cercano y asegúrese de que nada pueda ingresar a éste ni descargarse en él.

CONTAIN | CONTENER

Isolate your area to prevent material from potentially flowing or being blown away.

Aísle su área para evitar que el material pueda discurrirse o ser llevado por el viento.

CAPTURE | CAPTURAR

Sweep up debris and place it in the trash. Clean up spills with an absorbent material (e.g. kitty litter) or vacuum with a Wet-Vac and dispose of properly.

Recoja los restos y colóquelos en la basura. Limpie los derrames con un material absorbente (como la arena para gatos) o aspírelos con una Wet-Vac (aspiradora de humedad) y deséchelos correctamente.

COMMERCIAL LANDSCAPE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to **prevent water pollution from landscaping activities.**

RECYCLE YARD WASTE

- Recycle leaves, grass clippings and other yard waste.
- Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- **Try grasscycling:** the natural recycling of grass by leaving clippings on the lawn when mowing.

  For more information, please visit: **www.calrecycle.ca.gov/organics/grasscycling**

USE FERTILIZERS, HERBICIDES AND PESTICIDES SAFELY

- Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural and non-toxic alternatives as often as possible.
- If you must use chemical fertilizers, herbicides or pesticides:
  - Spot apply, rather than blanketing entire areas.
  - Avoid applying near curbs and driveways, and **never** before a rain.
  - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
  - Follow the manufacturer's instructions carefully—this will not only give the best results, but will save money.

USE WATER WISELY

- Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- Periodically inspect, fix leaks and realign sprinkler heads.
- Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.

HOMEOWNERS

KEEP THESE TIPS IN MIND WHEN HIRING PROFESSIONAL LANDSCAPERS AND REMIND AS NECESSARY.

Leftover pesticides, fertilizers, and herbicides contaminate landfills and should be disposed of through a Hazardous Waste Facility.

For more information on proper disposal call,

(909) 382-5401 or 1-800-OILY CAT.

*FREE for San Bernardino County residents only. Businesses can call for cost inquiries and to schedule an appointment.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. Fountain water containing chlorine and copperbased algaecides is toxic to aquatic life. Proper inspection, cleaning, and repair of pedestrian areas and HOA owned surfaces and structures can reduce pollutant runoff from these areas. Maintaining these areas may involve one or more of the following activities:

1. **Surface Cleaning**
2. **Graffiti Cleaning**
3. **Sidewalk Repair**
4. **Controlling Litter**
5. **Fountain Maintenance**

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for sidewalk, plaza, and fountain maintenance and cleaning include:

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).
- Once per year, educate HOA staff and tenants on pollution prevention measures.

MODEL PROCEDURES:

1. Surface Cleaning

Discharges of wash water to the storm water drainage system from cleaning or hosing of impervious surfaces is prohibited.
Sidewalks, Plazas

✓ Use dry methods (e.g. sweeping, backpack blowers, vacuuming) whenever practical to clean sidewalks and plazas rather than hosing, pressure washing, or steam cleaning. DO NOT sweep or blow material into curb; use devices that contain the materials.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Parking Areas, Driveways, Drive-thru

✓ Parking facilities should be swept/vacuumed on a regular basis. Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Sweep all parking lots at least once before the onset of the wet season.

✓ Use absorbents to pick up oil; then dry sweep.

✓ Appropriately dispose of spilled materials and absorbents.

OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Building Surfaces, Decks, etc., without loose paint

✓ Use high-pressure water, no soap.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

Unpainted Building Surfaces, Wood Decks, etc.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Use biodegradable cleaning agents to remove deposits.

✓ Make sure pH is between 6.5 and 8.5 THEN discharge to landscaping (if cold water without a cleaning agent) otherwise dispose of properly.

2. Graffiti Cleaning

Graffiti Removal

✓ Avoid graffiti abatement activities during rain events.

✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal in the Roads, Streets, and Highway Operation and Maintenance procedure sheet.

✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.

OPTIONAL:

• Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

3. Sidewalk Repair

Surface Removal and Repair

✓ Schedule surface removal activities for dry weather if possible.

✓ Avoid creating excess dust when breaking asphalt or concrete.

✓ Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up material.

✓ Designate an area for clean up and proper disposal of excess materials.

✓ Remove and recycle as much of the broken pavement as possible.

✓ When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains shovel or vacuum the slurry, remove from site and dispose of properly.

✓ Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Discharge wash water to landscaping, pump to the sanitary sewer if permitted to do so or contain and dispose of properly.

Concrete Installation and Repair

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

✓ Wash concrete trucks off-site or in designated areas on-site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other storm water conveyance structures. (See Concrete Waste Management BMP WM – 8)

✓ Store dry and wet concrete materials under cover, protected from rainfall and runoff and away from drainage areas. After job is complete remove temporary stockpiles (asphalt materials, sand, etc.) and other materials as soon as possible.

✓ Return leftover materials to the transit mixer. Dispose of small amounts of excess concrete, grout, and mortar in the trash.

✓ When washing concrete to remove fine particles and expose the aggregate, contain the wash water for proper disposal.

✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.

✓ Protect applications of fresh concrete from rainfall and runoff until the material has hardened.

4. Litter Control

✓ Enforce anti-litter laws.

✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.

✓ Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

OPTIONAL:

• Post "No Littering" signs.

5. Fountain Maintenance

✓ Do not use copper-based algaecides. Control algae with chlorine or other alternatives, such as sodium bromide.

✓ Allow chlorine to dissipate for a few days and then recycle/reuse water by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present (concentration must be less than 0.1 ppm).

✓ Contact local agency for approval to drain into sewer or storm drain.

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

EQUIPMENT MAINTENANCE & REPAIR

Vehicle or equipment maintenance has the potential to be a significant source of stormwater pollution. Engine repair and service (parts cleaning, spilled fuel, oil, etc.), replacement of fluids, and outdoor equipment storage and parking (dripping engines) can all contaminate stormwater. Conducting the following activities in a controlled manner will reduce the potential for stormwater contamination:

1. **General Maintenance and Repair**
2. **Vehicle and Machine Repair**
3. **Waste Handling/Disposal**

Related vehicle maintenance activities are covered under the following program headings in this manual: "Vehicle and Equipment Cleaning", "Vehicle and Equipment Storage", and "Vehicle Fueling".

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for equipment maintenance and repair include:

- Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.

- Switch to non-toxic chemicals for maintenance when possible.

- Choose cleaning agents that can be recycled.

- Minimize use of solvents. Clean parts without using solvents whenever possible. Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.

- Once per year, educate HOA staff and tenants on pollution prevention measures.

MODEL PROCEDURES:

1. General Maintenance and Repair

General Guidelines

> ➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

- ✓ Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- ✓ Regularly inspect vehicles and equipment for leaks.
- ✓ Move activity indoors or cover repair area with a permanent roof if feasible.
- ✓ Minimize contact of stormwater with outside operations through berming the local sewering and drainage routing.
- ✓ Place curbs around the immediate boundaries of the process equipment.
- ✓ Clean yard storm drain inlets regularly and stencil them.

Good Housekeeping

- ✓ Avoid hosing down work areas. If work areas are washed and if discharge to the sanitary sewer is allowed, treat water with an appropriate treatment device (e.g. clarifier) before discharging. If discharge to the sanitary sewer is not permitted, pump water to a tank and dispose of properly.
- ✓ Collect leaking or dripping fluids in drip pans or container. Fluids are easier to recycle or dispose of properly if kept separate.
- ✓ Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, any discharge of or remove other parts. Place a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
- ✓ Educate employees on proper handling and disposal of engine fluids.
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- ✓ Post signs at sinks and stencil outdoor storm drain inlets.

2. Vehicle Repair

General Guidelines

- ✓ Perform vehicle fluid removal or changing inside of a building or in a contained covered area, where feasible, to prevent the run-on of stormwater and the runoff of spills.
- ✓ Regularly inspect vehicles and equipment for leaks, and repair as needed.

- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Immediately drain all fluids from wrecked vehicles. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- ✓ Oil filters disposed of in trash cans or dumpsters can leak oil. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- ✓ Store cracked batteries in a non-leaking secondary container and dispose of properly at recycling facilities or at County hazardous waste disposal site.

Vehicle Leak and Spill Control

- ✓ Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- ✓ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ✓ Sweep floor using dry absorbent material.

3. Machine Repair

- ✓ Keep equipment clean; don't allow excessive build-up of oil or grease.
- ✓ Minimize use of solvents.
- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Perform major equipment repairs at the corporation yard, when practical.
- ✓ Following good housekeeping measures in Vehicle Repair section.

4. Waste Handling/Disposal

Waste Reduction

- ✓ Prevent spills and drips of solvents and cleansers to the shop floor.
- ✓ Do liquid cleaning at a centralized station so the solvents and residues stay in one area. Recycle liquid cleaners when feasible.

✓ Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

OPTIONAL:

- If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:

  -Use non-caustic detergents instead of caustic cleaning for parts cleaning.

  -Use a water-based cleaning service and have tank cleaned. Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.

  -Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.

  -Choose cleaning agents that can be recycled.

Recycling

OPTIONAL:

- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.
- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).
- Purchase recycled products to support the market for recycled materials.

LIMITATIONS:

Space and time limitations may preclude all work being conducted indoors. It may not be possible to contain and clean up spills from vehicles/equipment brought on-site after working hours. Dry floor cleaning methods may not be sufficient for some spills – see spill prevention and control procedures sheet. Identification of engine leaks may require some use of solvents.

POOL MAINTENANCE

Pool chemicals and filter solids, when discharged to the City streets, gutters or storm drans, DO NOT GET TREATED before reaching the Santa Ana River. Chlorine, acid cleaning chemicals and metal-based algaecides used in pools can kill beneficial organisms in the food chain and pollute our drinking water.

When emptying your swimming pool, spa or fountain, please use one of the following best management practices to prevent water pollution:

- Reuse the water as landscape irrigation
- Empty the water into the sewer between midnight and 6:00 am
- Remove solids and floating debris and dispose of in the trash, de-chlorinate the water to a chlorine residual = 0, wait 24 hours, then discharge the water to the street or storm drain
- Try not to use metal-based algaecides (i.e. copper sulfate) in your pool or spa. If you have, empty your pool or spa into the sewer. *Prior to discharging pool water into the sanitary sewer system, contact your local agency.*
- If the pool contains algae and mosquito larvae, discharge the water to the sewer

When acid cleaning or other chemical cleaning:

- Neutralize the pool water to pH of 6.5 to 8.5, then discharge to the sewer

For swimming pool and spa filter backwash:

- Dispose of solids into trash bag, then wash filter into a landscape area
- Settle, dispose of solids in trash and discharge water to the sewer, never to the storm drain

» For Residents

The following is a preview of the information we have available to residents. For more fact sheets, visit ***sbcountystormwater.org***

Household Hazardous Waste Center Locations

TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE** (HHW) at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	LOCATION	DAYS OPEN	HOURS
Big Bear Lake (does not accept E-waste)	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m. - 2 p.m.
Chino	5050 Schaefer Ave. (cross: 4th St.)	2nd & 4th Sat.	8 a.m. - 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m. - 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m. - 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m. - 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m. - 12:30 p.m.
Rialto (does not accept E-waste)	246 Willow Ave. (cross: Rialto Ave.)	2nd & 4th Fri. & Sat.	8 a.m. - 12 p.m.
San Bernardino	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. – Fri.	9 a.m. - 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m. - 2 p.m.

San Bernardino County STORMWATER PROGRAM

To report illegal dumping, call (877) WASTE18
or visit sbcountystormwater.org

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

TAKE ONE

WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint and paint thinner. The County of San Bernardino offers 9 HHW Centers that accept paint and other household hazardous waste from residents FREE of charge. For a list of acceptable materials, location information, and hours of operation call 1-800-OILY CAT.

VEHICLE MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a sink, parking lot, driveway or street.

Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Preventing Leaks and Spills
Conduct all vehicle maintenance inside of a garage. Place drip pans underneath vehicle to capture fluids. Use absorbent materials instead of water to clean work areas.

Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). To report accidental spills into the street or storm drain call (877) WASTE18 or 911.

Proper Disposal of Hazardous Waste
Dispose of household hazardous waste by taking it to your nearest household hazardous waste center. For more information, call 1-800-OILY CAT or check out sbcountystormwater.org/Disposal.html

FREE
DOGGIE WASTE BAGS

Remember to pick up after your pet every time
to keep San Bernardino County clean and healthy!

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

» Get In Touch With Us Online!

» Website
sbcountystormwater.org

» eUpdates
sbcountystormwater.org/newsletter

» Facebook
facebook.com/sbcountystormwater

» YouTube
youtube.com/sbcountystormwater

» Report Pollution Violations
sbcountystormwater.org/report

» Email
info@sbcountystormwater.org

TRACT MAP NO. 20454
TRAFFIC IMPACT ANALYSIS

City of Victorville

December 31, 2021

ganddini

Traffic Engineering ● Transportation Planning ● Parking ● Noise & Vibration
Air Quality ● Global Climate Change ● Health Risk Assessment

TRACT MAP NO. 20454
TRAFFIC IMPACT ANALYSIS

City of Victorville

December 31, 2021

prepared by

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Project No. 19449

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EXECUTIVE SUMMARY

The purpose of this study is to evaluate the potential for transportation impacts resulting from development of the proposed project in the context of the City of Victorville's discretionary authority for conformance with locally established operational standards. Although this is a technical report, effort has been made to write the report clearly and concisely. A glossary is provided in Appendix A to assist the reader with technical terms.

This study was prepared in consultation with City of Victorville staff and in accordance with the procedures and methodologies for assessing transportation impacts established by the City. To assess the project's conformance with local operational standards, this study evaluates the project's effect on traffic operations and, if necessary, identifies recommended improvements or corrective measures to alleviate operational deficiencies substantially caused or worsened by the proposed project. For compliance with California Environmental Quality Act (CEQA) requirements, an assessment of the project's impact in terms of vehicle miles traveled (VMT) is provided in a separate document (see *Tract Map No. 20454 Vehicle Miles Traveled Assessment*, Ganddini Group, Inc., December 31, 2021).

Project Description

The 30.2-acre project site is located at the southwest corner of Mesa View Drive and Nyack Road in the City of Victorville.

The currently vacant site is proposed to be developed with 110 single-family residential dwelling units. The project proposes three full access driveways to Balsam Road, and one full access to Winona Street. For purposes of this analysis, the proposed project is anticipated to be constructed and fully operational by year 2023.

Project Trips

The proposed project is forecast to generate 1,038 daily trips, including 78 trips during the AM peak hour and 103 trips during the PM peak hour.

Traffic Signal Warrants

Traffic signal warrants 1-3 are currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions. Therefore, installation of a traffic signal control is warranted at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) based on Existing conditions.

Levels of Service

The study intersections currently operate within acceptable Levels of Service (D or better) during the peak hours for Existing conditions.

The study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Opening Year (2023) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Opening Year (2023) Without and With Project conditions during the peak hours.

The study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Future Year (2033) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Future Year (2033) Without and With Project conditions during the peak hours.

1. INTRODUCTION

This section describes the purpose of this study, the project description, and the general scope of the analysis. Although this is a technical report, effort has been made to write the report clearly and concisely. A glossary is provided in Appendix A to assist the reader with technical terms related to transportation engineering and planning.

This section describes the purpose of this traffic impact analysis, project location, proposed development, and study area.

PROJECT DESCRIPTION

The 30.2-acre project site is located at the southwest corner of Mesa View Drive and Nyack Road in the City of Victorville. Figure 1 shows the project location map.

The currently vacant site is proposed to be developed with 110 single-family residential dwelling units. The project proposes three full access driveways to Balsam Road, and one full access to Winona Street. For purposes of this analysis, the proposed project is anticipated to be constructed and fully operational by year 2023. Figure 2 illustrates the project site plan.

STUDY AREA

Based on the study intersections identified in the approved scoping agreement (see Appendix B), the study area consists of the following study intersections within the City of Victorville jurisdiction:

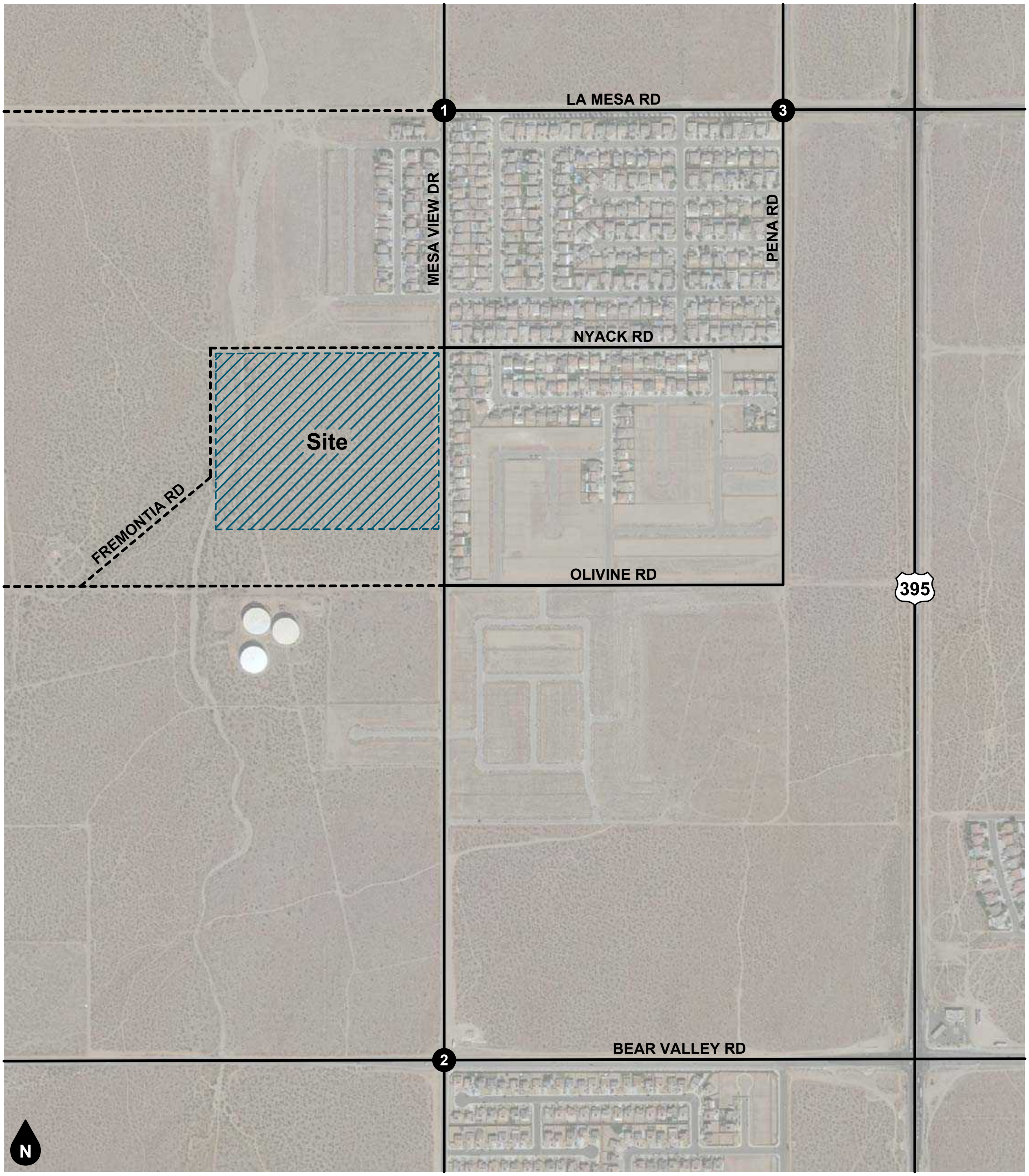
Study Intersections[1]	Jurisdiction
1. Mesa View Drive (NS) at La Mesa Road (EW)	City of Victorville
2. Mesa View Drive (NS) at Bear Valley Road (EW)	City of Victorville
3. Pena Road (NS) at La Mesa Road (EW)	City of Victorville

ANALYSIS SCENARIOS

The following scenarios are analyzed during typical weekday AM and PM peak hour conditions:

- Existing
- Opening Year (2023) Without Project
- Opening Year (2023) With Project
- Future Year (2033) Without Project
- Future Year (2033) With Project

[1] (NS) = north-south roadway; (EW) = east-west roadway; NB = Northbound



Legend

Study Intersection

Figure 1
Project Location Map

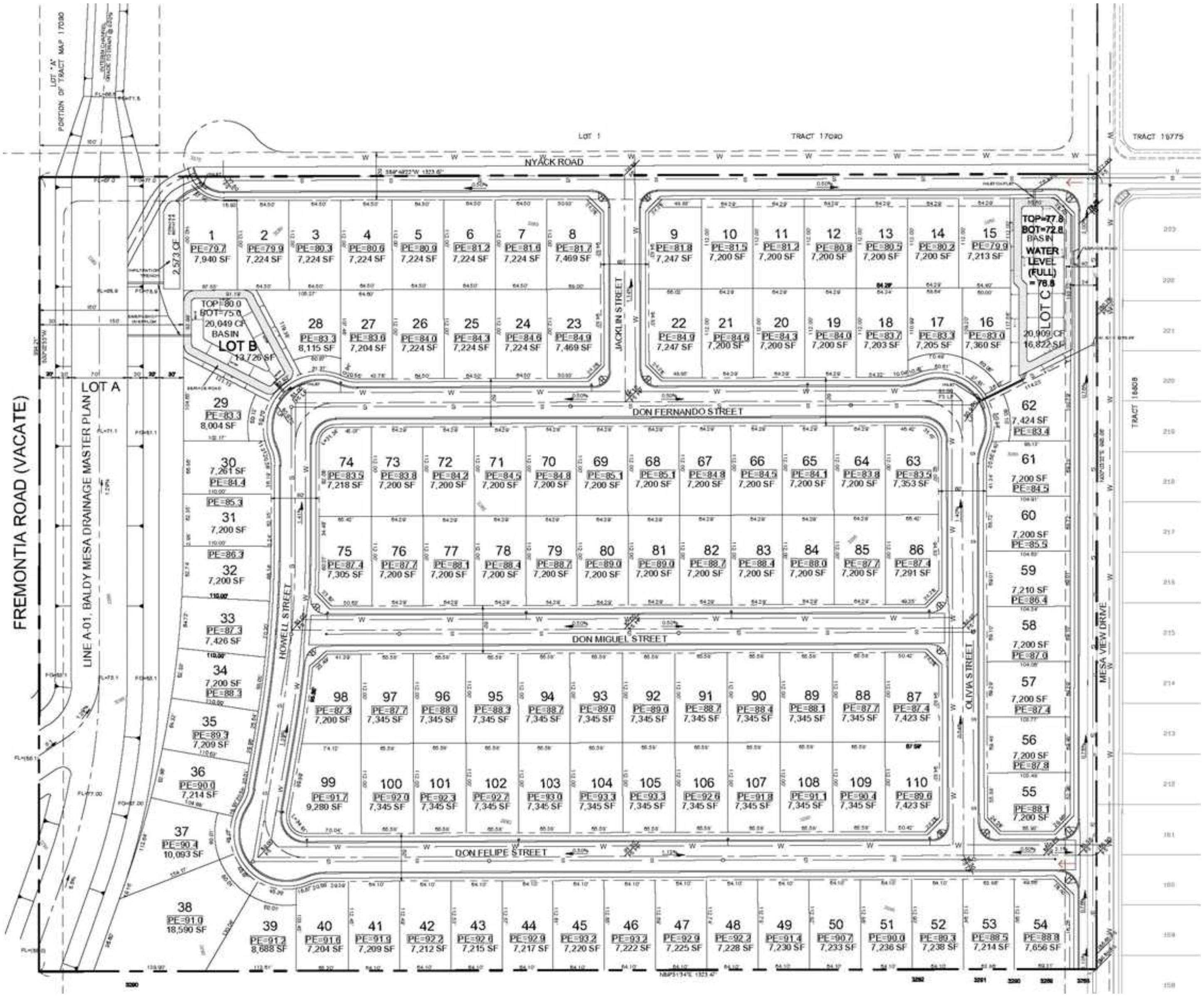


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Figure 2
Site Plan

2. METHODOLOGY

This section discusses the analysis methodologies used to assess transportation facility performance as adopted by the respective jurisdictional agencies. This traffic impact analysis was conducted in accordance with the guidelines established within the City of Victorville *General Guidelines for Conducting Traffic Studies and Determination of Intersection Level of Service and Improvement Needs* (December 22, 2004), City of Victorville Resolution No. 20-010, and the San Bernardino County *Transportation Impact Study Guidelines* (July 9, 2019).

LEVEL OF SERVICE/GENERAL PLAN CONFORMANCE (NON-CEQA)

Intersection Delay Methodology

The technique used to assess the performance of intersections is known as the intersection delay methodology based on the procedures contained in the *Highway Capacity Manual* (Transportation Research Board, 6th Edition). The methodology considers the traffic volume and distribution of movements, traffic composition, geometric characteristics, and signalization details to calculate the average control delay per vehicle and corresponding Level of Service (LOS). Control delay is defined as the portion of delay attributed to the intersection traffic control (such as a traffic signal or stop sign) and includes initial deceleration, queue move-up time, stopped delay, and final acceleration delay. The intersection control delay is then correlated to Level of Service based on the following thresholds:

Level of Service	Intersection Control Delay (Seconds / Vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10.0	≤ 10.0
B	> 10.0 to ≤ 20.0	> 10.0 to ≤ 15.0
C	> 20.0 to ≤ 35.0	> 15.0 to ≤ 25.0
D	> 35.0 to ≤ 55.0	> 25.0 to ≤ 35.0
E	> 55.0 to ≤ 80.0	> 35.0 to ≤ 50.0
F	> 80.0	> 50.0

Source: Transportation Research Board, Highway Capacity Manual (6th Edition).

Level of Service is used to qualitatively describe the performance of a roadway facility, ranging from Level of Service A (free-flow conditions) to Level of Service F (extreme congestion and system failure). At intersections with traffic signal or all way stop control, Level of Service is determined by the average control delay for the overall intersection. At intersections with cross street stop control (i.e., one- or two-way stop control), Level of Service is determined by the average control delay for the worst individual movement (or movements sharing a single lane).

In accordance with Section 3.4.1 of the San Bernardino County *Transportation Impact Study Guidelines* (July 9, 2019), Existing and Opening Year (2023) conditions were analyzed using optimized signal timing, four seconds of lost time per critical phase, and a heavy vehicle factor of two percent. The following saturation flow rates were utilized:

- 1,800 vehicles per hour for exclusive thru and exclusive right turn lanes
- 1,700 vehicles per hour for exclusive left turn lanes
- 1,600 vehicles per hour for exclusive dual left turn lanes
- 1,500 vehicles per hour for exclusive triple left turn lanes

For cumulative and general plan buildout scenarios (Future Year 2033) a peak hour factor of 0.95 was used along with the following saturation flow rates:

- 1,900 vehicles per hour for exclusive thru and exclusive right turn lanes
- 1,800 vehicles per hour for exclusive double right turn lanes
- 1,800 vehicles per hour for exclusive left turn lanes
- 1,700 vehicles per hour for exclusive dual left turn lanes
- 1,600 vehicles per hour for exclusive triple left turn lanes

Intersection delay analysis was performed using the Vistro software.

Performance Standards

The City of Victorville has established LOS D or better as acceptable LOS for all intersections along the designated street and highway system in the City's General Plan Circulation Element.

Requirements for Improvements

A project is required to provide improvements or corrective measures to City of Victorville intersection deficiencies under the following conditions:

- If the project contributes measurable traffic to an intersection or roadway segment operating at LOS D or better or a volume-to-capacity ratio of 0.95 or lower for without project conditions, and the addition of project trips causes intersection LOS to degrade to LOS E or worse, or volume-to-capacity ratio to increase it greater than 0.95.

- If a project contributes measurable traffic to an intersection or roadway segment operating at a deficient LOS (LOS E or F) for without project conditions.

Vehicle Miles Traveled Methodology (CEQA)

The methodology used to evaluate the impact of land use and transportation projects under CEQA is known as vehicle miles traveled (VMT). In general terms, VMT quantifies the amount and distance of automobile travel attributable to a project or region. Additional information and a project assessment is provided in the "Vehicle Miles Traveled" section presented later in this report.

3. EXISTING CONDITIONS

EXISTING ROADWAY SYSTEM

Figure 3 identifies the lane geometry and intersection traffic controls for Existing conditions based on a field survey of the study area. Regional access to the project site is provided by the I-15 Freeway located approximately 4 miles east of the project site. Key roadways providing local circulation include Mesa View Drive, Pena Road, La Mesa Road, Nyack Road, Olivine Road, and Bear Valley Road.

GENERAL PLAN CONTEXT

Figure 4 shows the City of Victorville General Plan Circulation Element roadway classifications map. This figure shows the nature and extent of arterial and collector highways that are needed to adequately serve the ultimate development depicted by the Land Use Element of the General Plan. The City of Victorville standard roadway cross-sections are illustrated on Figure 5.

TRANSIT SERVICE

Figure 6 shows Existing public transit facilities and routes in the project vicinity. As shown on Figure 6, the study area is currently served by Victor Valley Transit Routes 21P and 21W along Bear Valley Road. A bus stop is located for these routes on Bear Valley Road east of U.S. Route 395.

BICYCLE FACILITIES

The City of Victorville Non-Motorized Transportation Plan is illustrated on Figure 7. This plan shows existing and proposed bike paths within the City of Victorville. Mesa View Drive is a proposed Class 2 Bike Lane.

EXISTING PEDESTRIAN FACILITIES

Existing pedestrian facilities in the project vicinity are shown on Figure 8. Sidewalks are provided on the east side of Mesa View Drive adjacent to the project site.

EXISTING ROADWAY VOLUMES

Existing peak hour traffic conditions are based upon AM and PM peak period intersection turning movement counts obtained in December 2021 during typical weekday conditions. The weekday AM peak period was counted between 7:00 AM and 9:00 AM and the weekday PM peak period was counted between 4:00 PM and 6:00 PM. The actual peak hour within the peak period is the four consecutive 15 minute periods with the highest total volume when all movements are added together. Thus, the weekday PM peak hour at one intersection may be 4:45 PM to 5:45 PM if those four consecutive 15 minute periods have the highest combined volume. Intersection turning movement count worksheets are provided in Appendix D.

Figure 9 and Figure 10 show the Existing AM and PM peak hour intersection turning movement volumes.

EXISTING LEVEL OF SERVICE

The intersection Levels of Service for Existing conditions have been calculated and are shown in Table 1. Detailed intersection Level of Service worksheets are provided in Appendix C.

As shown in Table 1, the study intersections currently operate within acceptable Levels of Service (D or better) during the peak hours for Existing conditions.

EXISTING TRAFFIC SIGNAL WARRANTS

The need for a traffic control signal at the currently unsignalized study intersections of Mesa View Drive at La Mesa Road (#1) and Mesa View Drive at Bear Valley Road (#2) have been evaluated using the California Department of Transportation eight-hour vehicular volume (Warrant 1), four-hour vehicular volume (Warrant 2), and peak hour traffic signal warrant criteria (Warrant 3) in accordance with the California Manual on Uniform Traffic Control Devices (2014, Revision 6). Traffic signal warrant analysis worksheets are provided in Appendix D.

The eight-hour traffic signal warrant (Warrant 1) is not currently satisfied at the unsignalized study intersection of Mesa View Drive at La Mesa Road (#1) for Existing conditions. The eight-hour traffic signal warrant (Warrant 1) is currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions.

The four-hour traffic signal warrant (Warrant 2) is not currently satisfied at the unsignalized study intersection of Mesa View Drive at La Mesa Road (#1) for Existing conditions. The four-hour traffic signal warrant (Warrant 2) is currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions.

The peak hour traffic signal warrant (Warrant 3) is not currently satisfied at the unsignalized study intersection of Mesa View Drive at La Mesa Road (#1) for Existing conditions. The peak hour traffic signal warrant (Warrant 3) is currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions.

Traffic signal warrants 1-3 are currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions. Therefore, installation of a traffic signal control is warranted at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) based on Existing conditions.

EXISTING ALL WAY STOP WARRANTS

The need for an all way stop control at the currently unsignalized study intersections of Mesa View Drive at La Mesa Road (#1) and Pena Road at La Mesa Road (#3) have been evaluated using the California Department of Transportation multi-way stop warrant in accordance with the California Manual on Uniform Traffic Control Devices (2014, Revision 6). All way stop warrant analysis worksheets are provided in Appendix D.

The multi-way stop warrant is not currently satisfied at the unsignalized study intersections of Mesa View Drive at La Mesa Road (#1) and Pena Road at La Mesa Road (#3) for Existing conditions.

Table 1
Existing Intersection Levels of Service

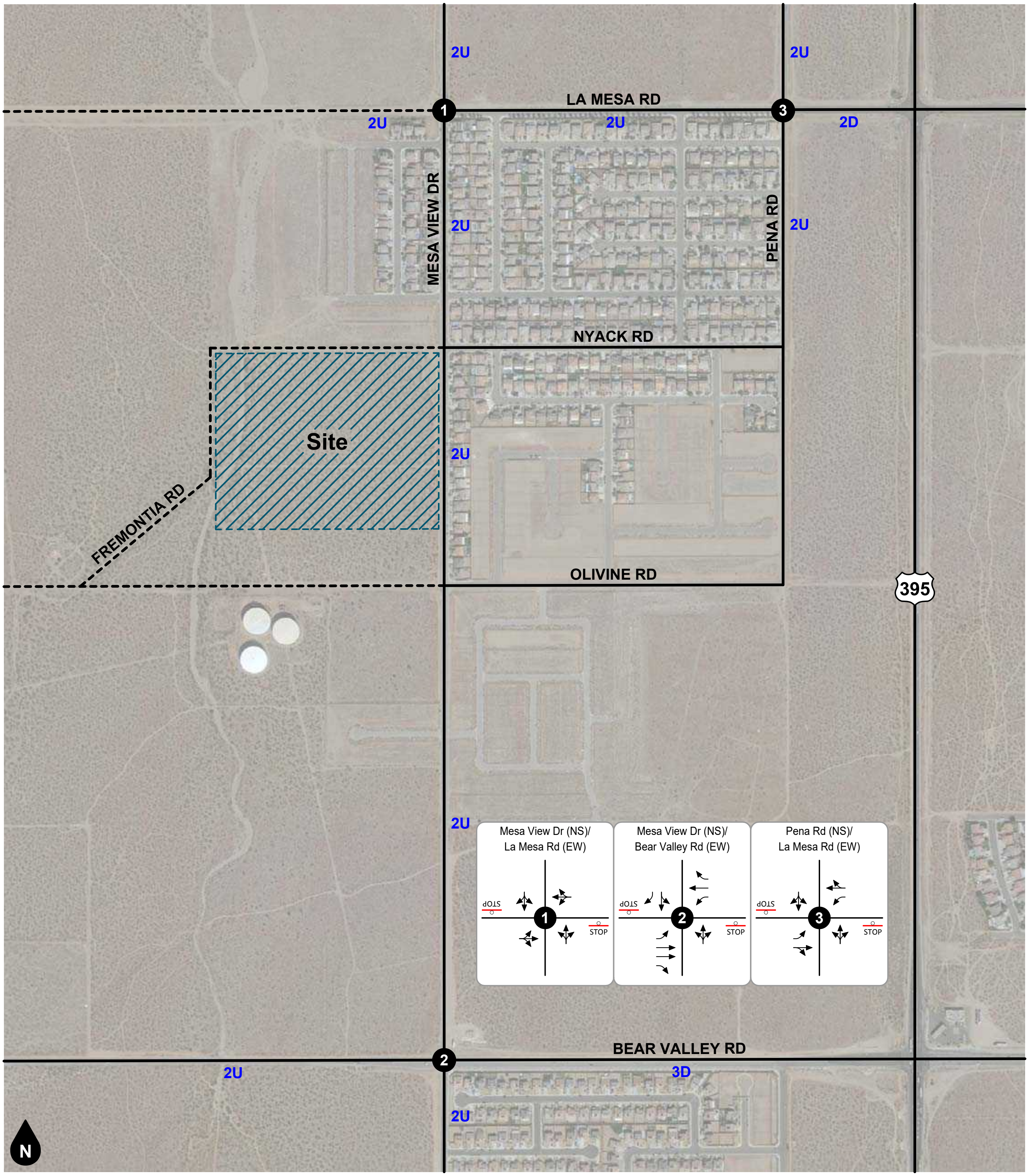
Study Intersection	Traffic Control[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS[3]	Delay[2]	LOS[3]
1. Mesa View Dr at La Mesa Rd	CSS	11.4	B	10.5	B
2. Mesa View Dr at Bear Valley Rd	CSS	22.5	C	34.8	D
3. Pena Rd at La Mesa Rd	CSS	11.2	B	10.3	B

Notes:

(1) CSS = Cross Street Stop

(2) Delay is shown in seconds/vehicle. For intersections with traffic signal or all way stop control, overall average intersection delay and LOS are shown. For intersections with cross street stop control, LOS is based on average delay of the worst individual approach.

(3) LOS = Level of Service



Legend

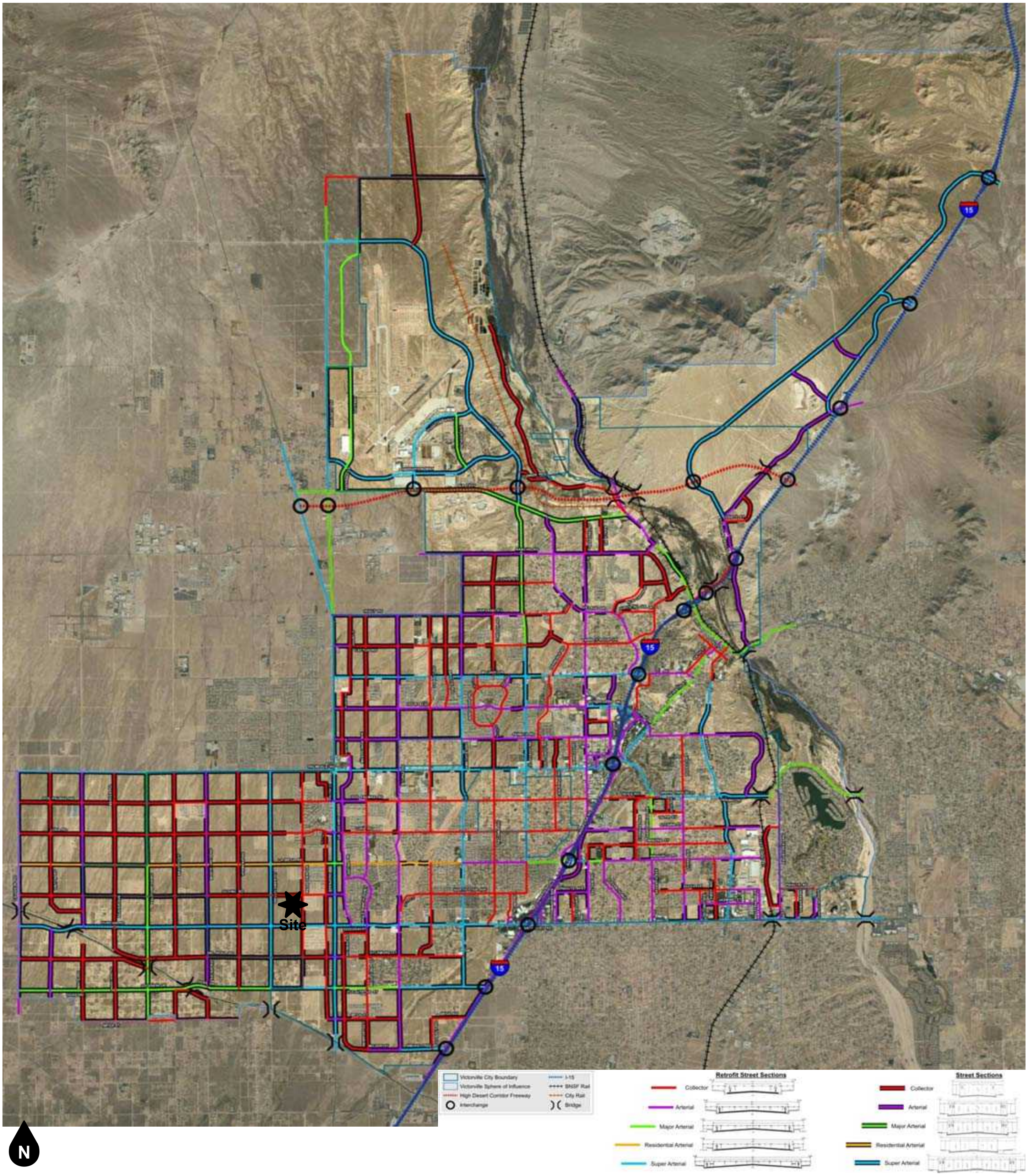
STOP Stop Sign

#D #-Lane Divided Roadway

#U #-Lane Undivided Roadway

Existing Lane

Figure 3
Existing Lane Geometry and Intersection Traffic Controls

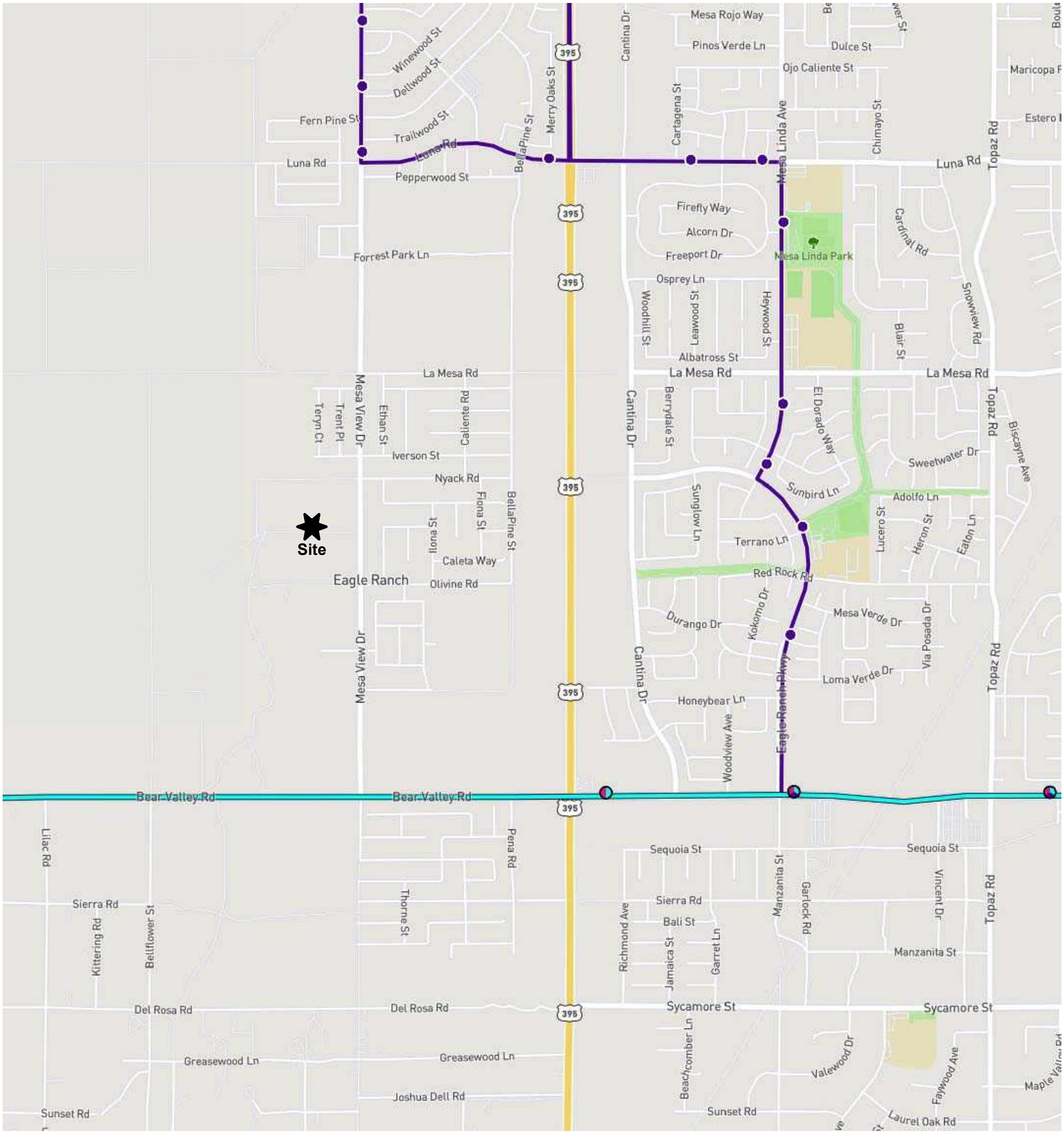


Source: City of Victorville

Figure 4
City of Victorville General Plan Circulation Element

Source: City of Victorville

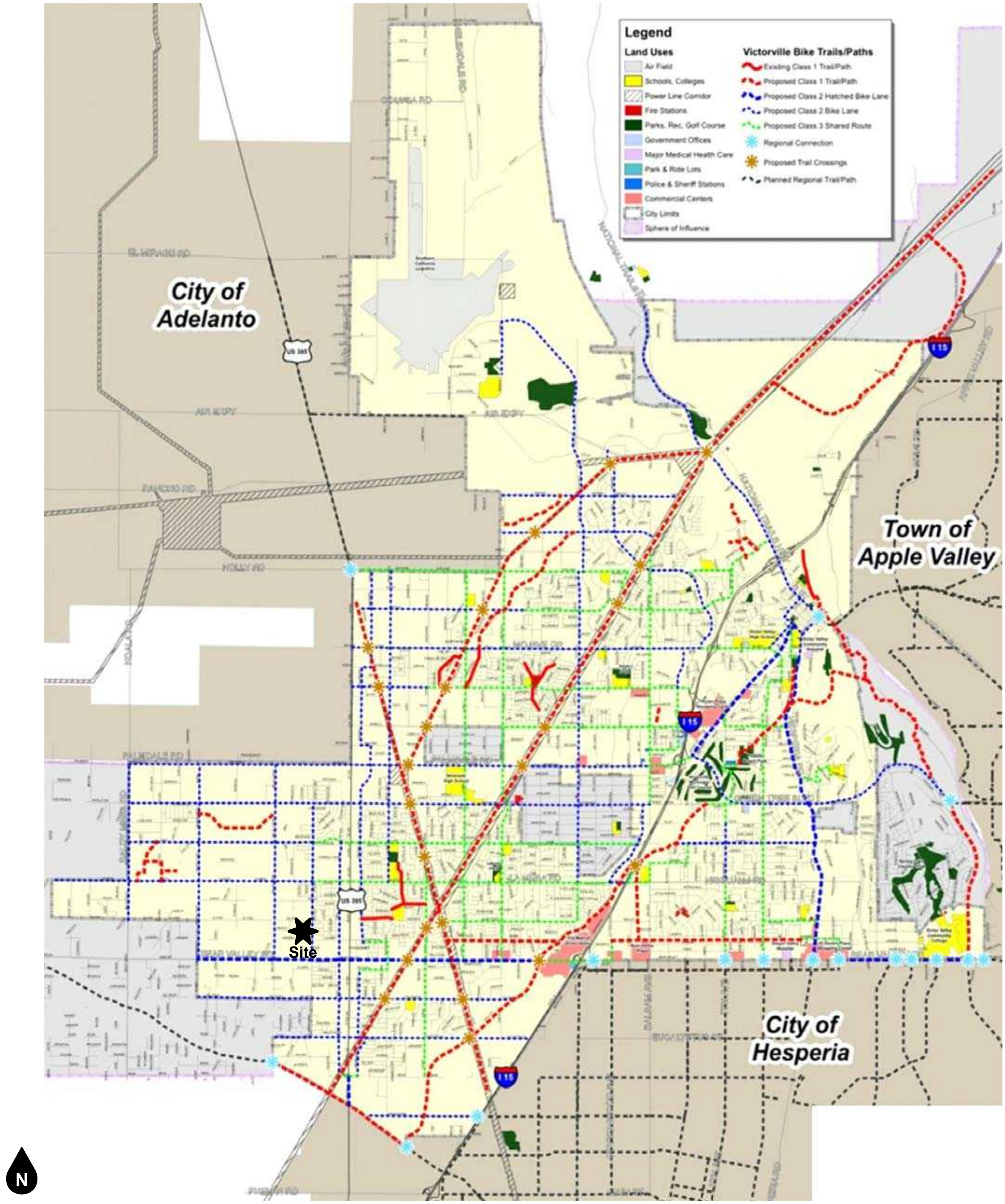
Figure 5
City of Victorville General Plan Roadway Cross-Sections



21P: Victor Valley Mall – Pinon Hills
54: Hwy 395-Palmdale - Victor Valley Mall

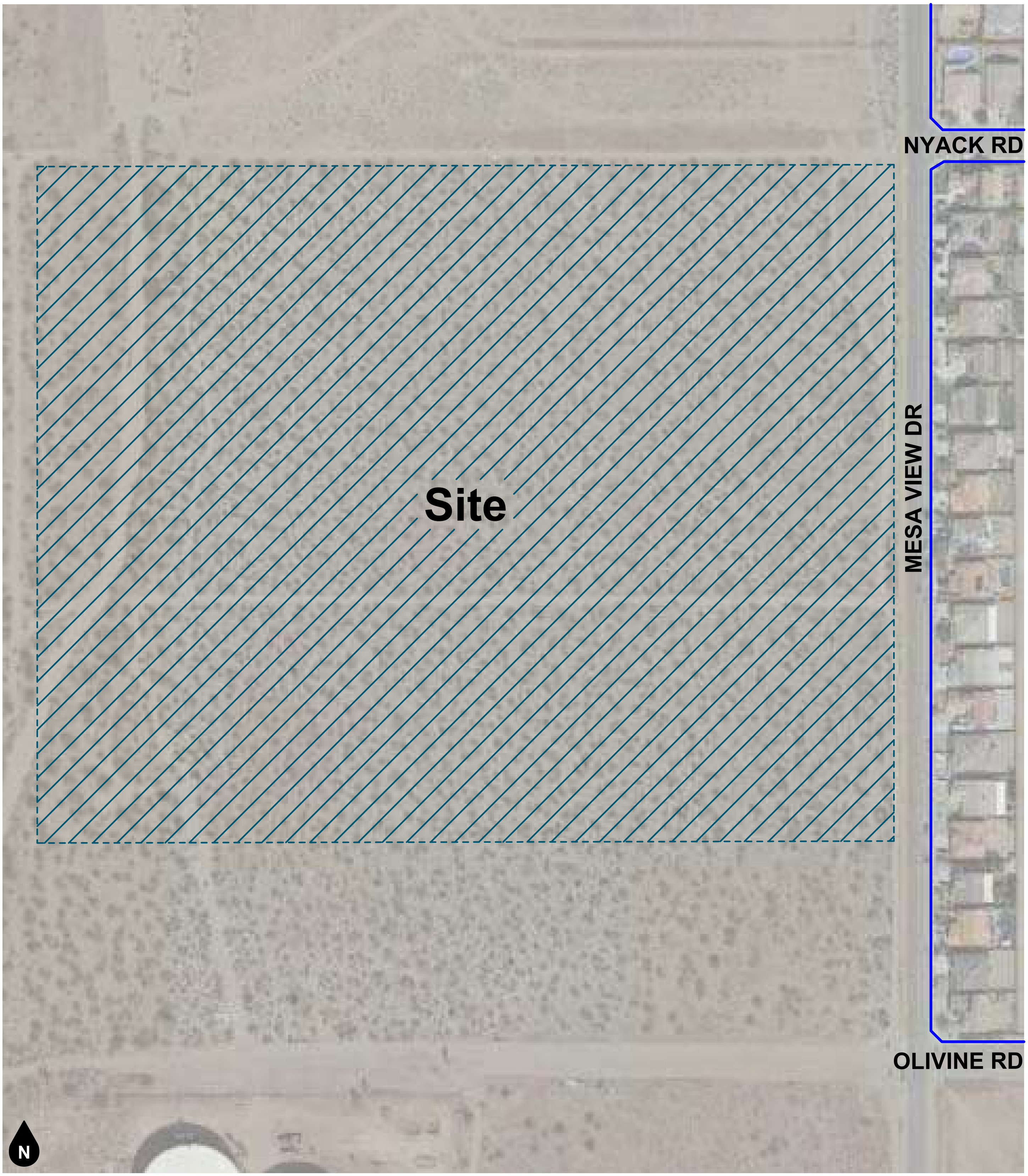
Source: Victor Valley Transit

Figure 6
Victor Valley Transit Routes



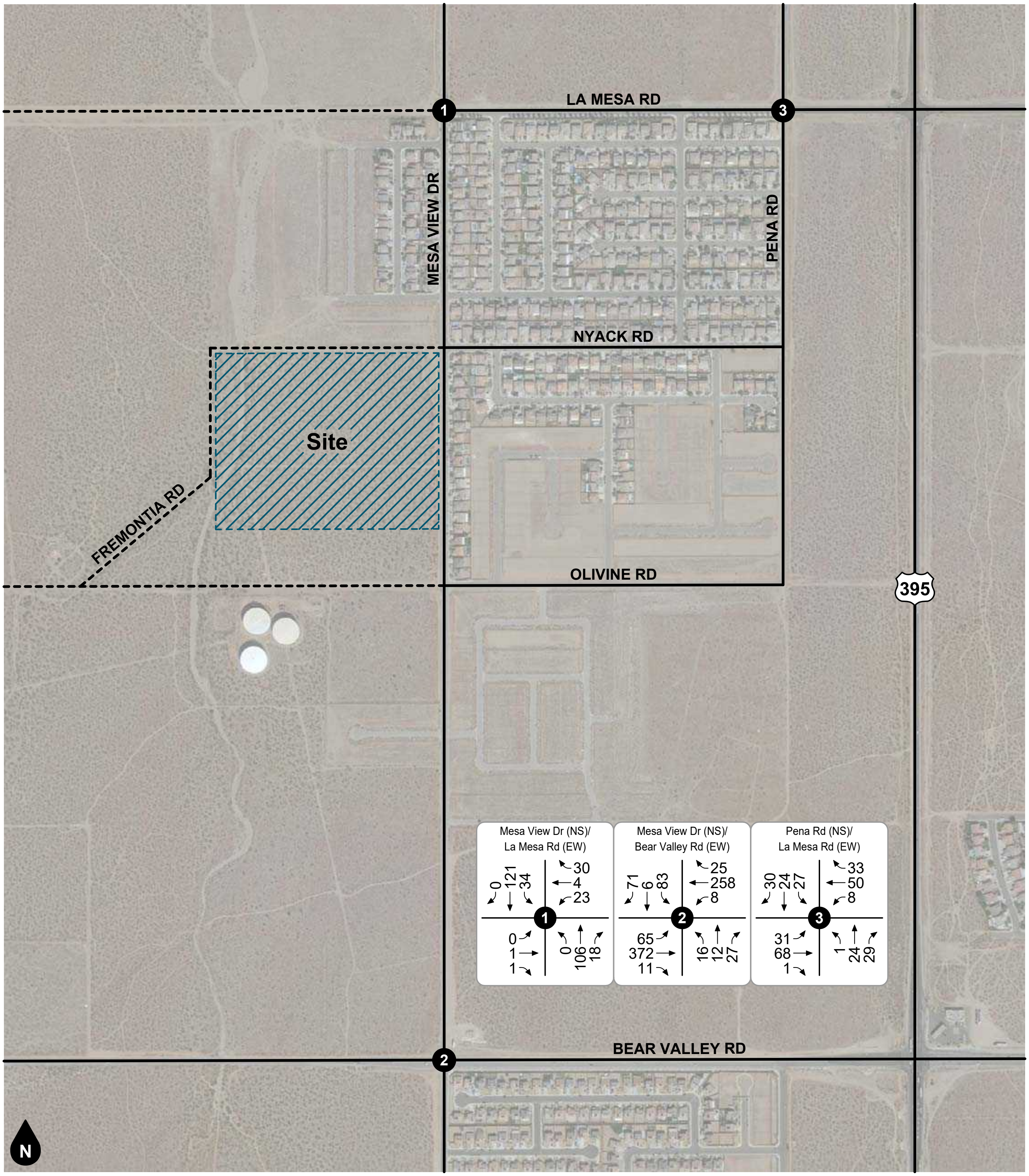
Source: City of Victorville

Figure 7
City of Victorville General Plan
Non-Motorized Transportation Plan Map



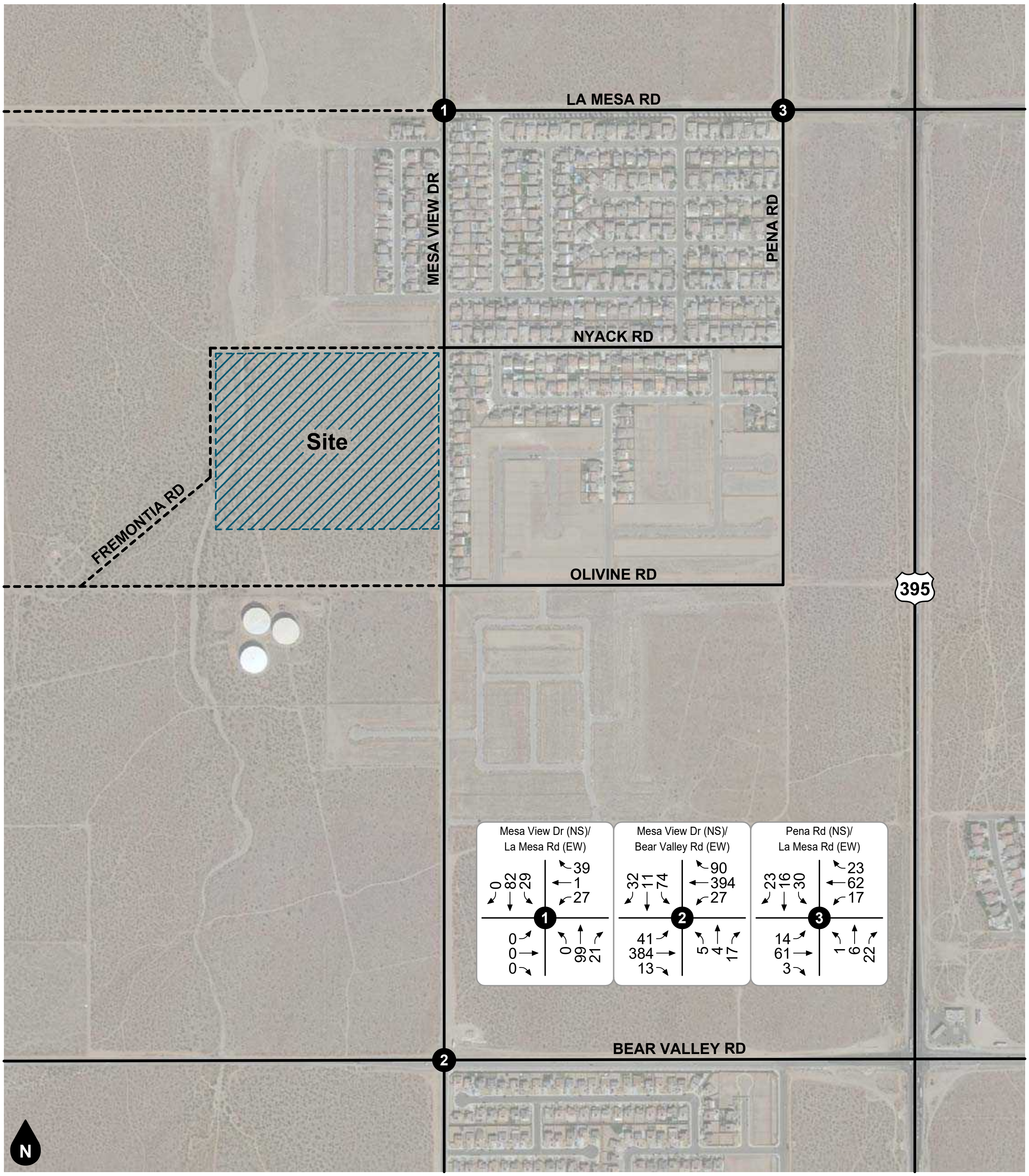
Legend
Sidewalk

Figure 8
Existing Pedestrian Facilities



Legend
\# Study Intersection

Figure 9
Existing AM Peak Hour Intersection Turning Movement Volumes



Legend

Study Intersection

Figure 10
Existing PM Peak Hour Intersection Turning Movement Volumes

4. PROJECT TRIP FORECASTS

This section describes how project trip generation, trip distribution, and trip assignment forecasts were developed. The forecast project volumes are illustrated on figures contained in this section.

PROJECT TRIP GENERATION

Table 2 shows the project trip generation based upon trip generation rates obtained from the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition, 2021). Trip generation rates were determined for daily trips, AM peak hour inbound and outbound trips, and PM peak hour inbound and outbound trips for the proposed land use. The number of trips forecast to be generated by the proposed project are determined by multiplying the trip generation rates by the land use quantity.

As shown in Table 2, the proposed project is forecast to generate 1,038 daily trips, including 78 trips during the AM peak hour and 103 trips during the PM peak hour.

PROJECT TRIP DISTRIBUTION AND ASSIGNMENT

Figure 11 shows the forecast directional distribution patterns for the project generated trips. The project trip distribution patterns were developed in consultation with City of Victorville staff and are based on review of existing volume data, surrounding land uses, and the local and regional roadway facilities in the project vicinity.

Project AM and PM peak hour intersection turning movement volumes expected from the project are depicted on Figure 12 and Figure 13, respectively.

Table 2
Project Trip Generation

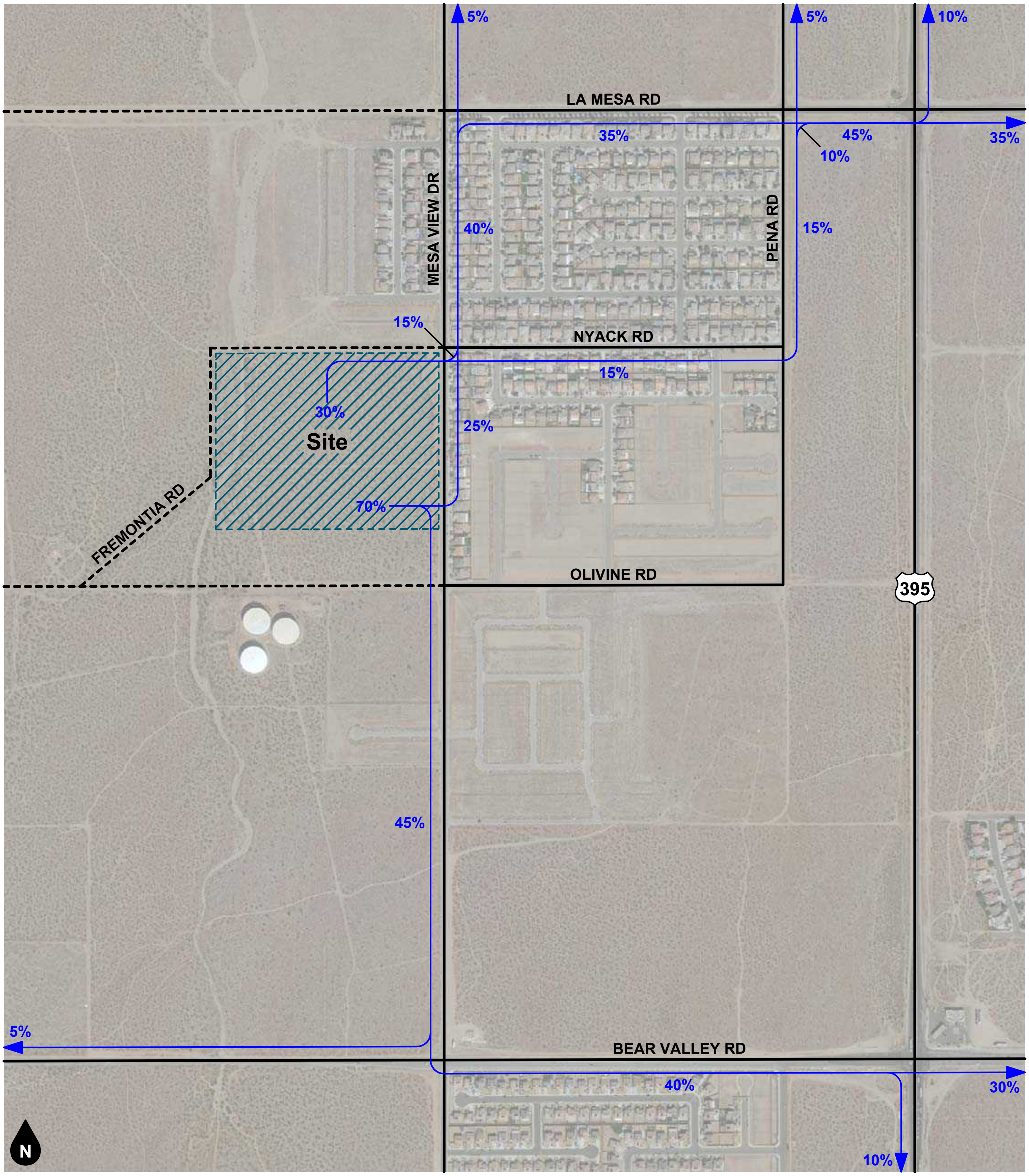
Trip Generation Rates									
			AM Peak Hour			PM Peak Hour			Daily
Land Use	Source[1]	Units[2]	% In	% Out	Rate	% In	% Out	Rate	Rate
Single-Family Detached Housing	ITE 210	DU	26%	74%	0.70	63%	37%	0.94	9.43

Trips Generated									
			AM Peak Hour			PM Peak Hour			
Land Use	Quantity	Units[2]	In	Out	Total	In	Out	Total	Daily
Single-Family Detached Housing	110	DU	21	57	78	65	38	103	1,038

Notes:

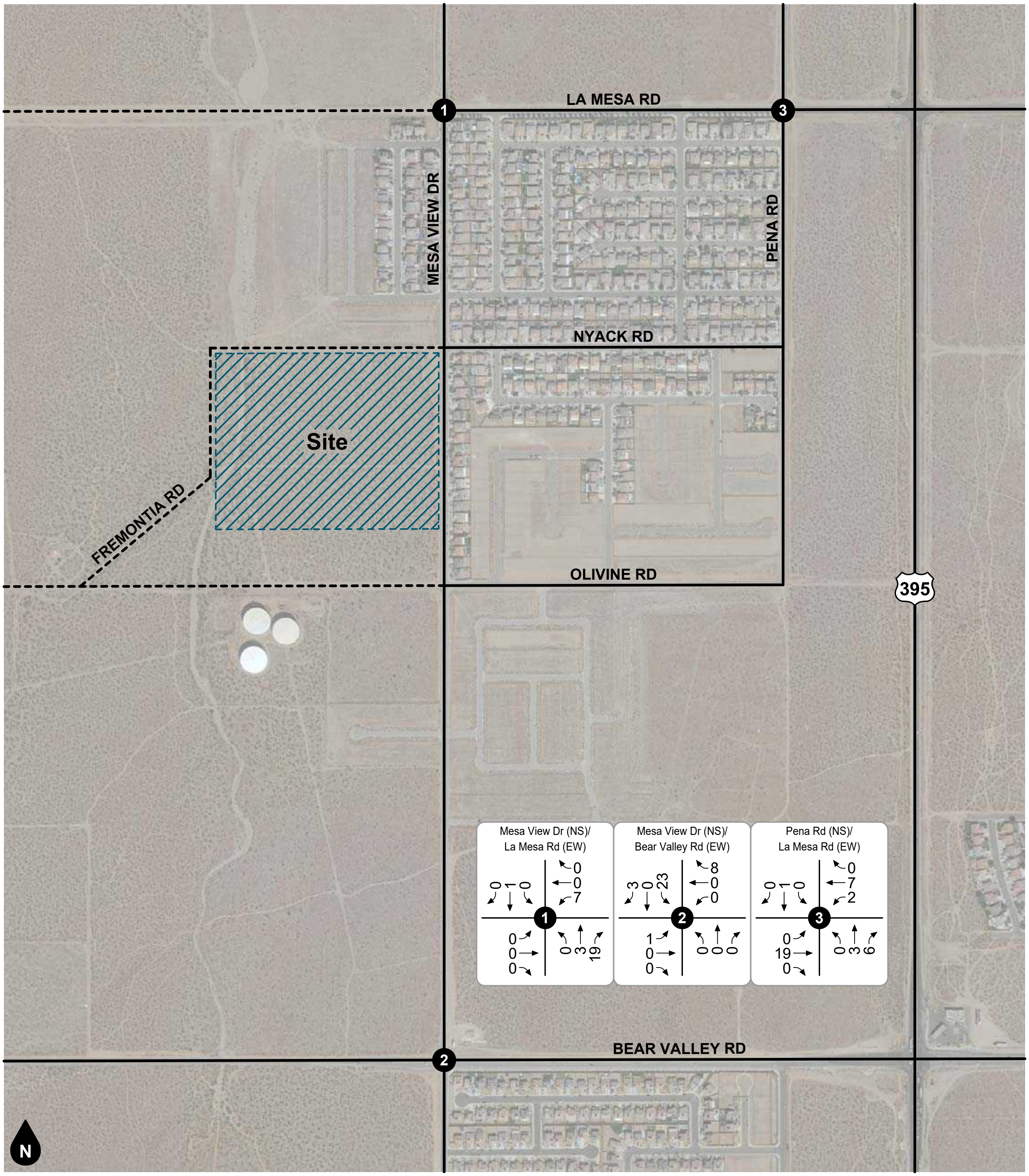
1) Source: ITE = Institute of Transportation Engineers *Trip Generation Manual* (11th Edition, 2021); ### = Land Use Code.

2) DU = Dwelling Units



Legend
10% Percent To/From Project

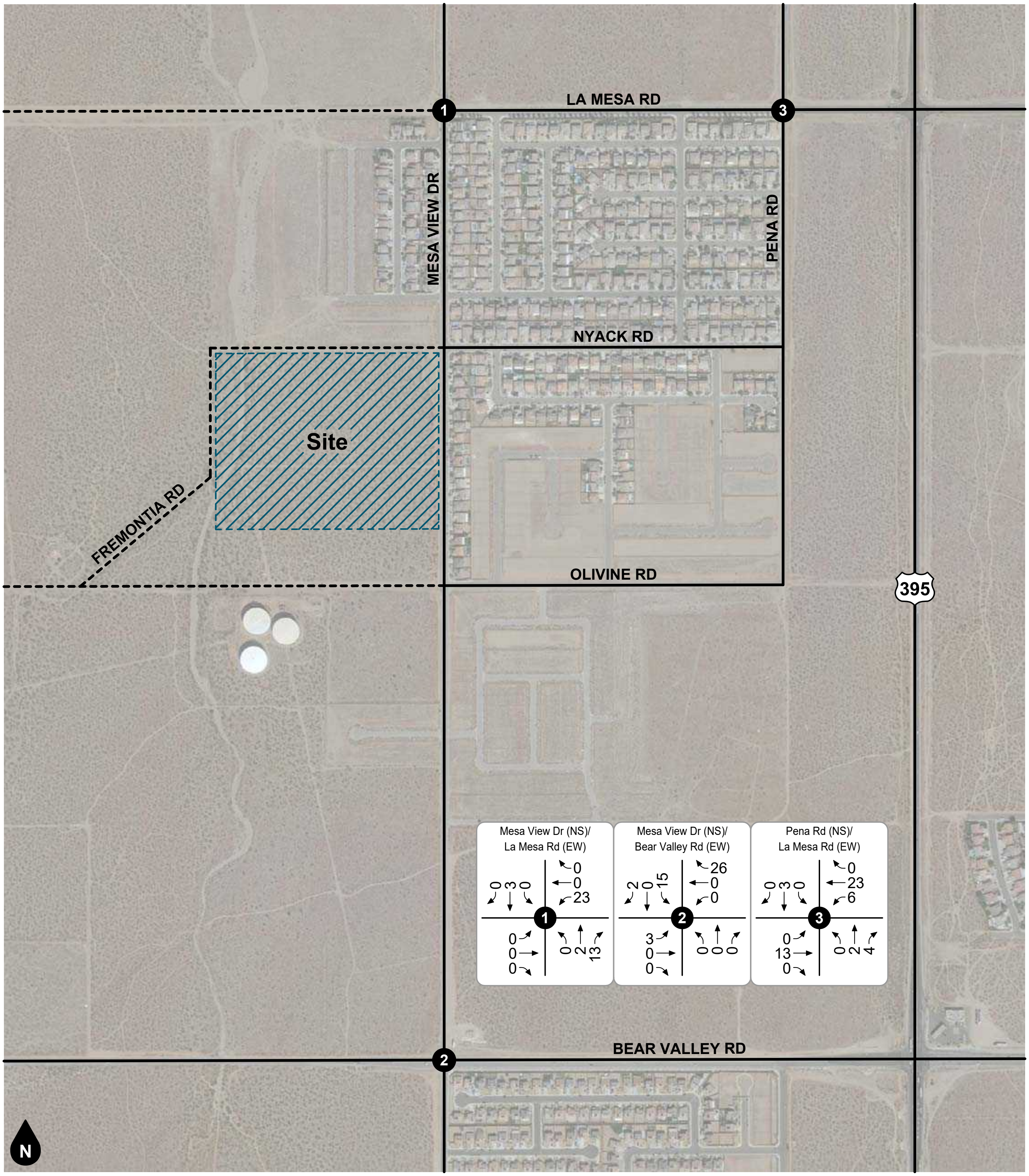
Figure 11
Project Trip Distribution



Legend

● # Study Intersection

Figure 12
Project AM Peak Hour Intersection Turning Movement Volumes



Legend

Study Intersection

Figure 13
Project PM Peak Hour Intersection Turning Movement Volumes

5. FUTURE VOLUME FORECASTS

This section describes how future volume forecasts for each analysis scenario were developed. Forecast study area volumes are illustrated on figures contained in this section.

CUMULATIVE TRIPS

Ambient Growth Rate

To account for ambient growth on roadways, existing 2021 volumes were increased by a growth rate of two percent (2%) per year over two years for Opening Year (2023) conditions; this equates to a total growth factor of approximately 1.04. Existing 2021 volumes were increased by a growth rate of two percent (2%) per year over twelve years for Future Year (2033) conditions; this equates to a total growth factor of approximately 1.27. The ambient growth rate was conservatively applied to all movements at the study intersections.

Other Development

To account for trips generated by future development, trips generated by pending or approved other development projects in the City of Victorville was added to the study area. Table 3 shows the other development project list for projects anticipated to contribute appreciable trips to the study area intersections and Figure 14 exhibits the other development location map.

Figure 15 and Figure 16 show the forecast AM and PM peak hour intersection turning movement volumes for trips generated by other developments.

ANALYSIS SCENARIO VOLUME FORECASTS

Opening Year (2023) Without Project

To develop Opening Year (2023) Without Project volume forecasts, existing volumes were combined with ambient growth and trips generated by other developments. Opening Year (2023) Without Project AM and PM peak hour intersection turning movement volumes are shown Figure 17 and Figure 18.

Opening Year (2023) With Project

Opening Year (2023) With Project volume forecasts were developed by adding project generated trips to the Opening Year (2023) Without Project forecast. Opening Year (2023) With Project AM and PM peak hour intersection turning movement volumes are shown on Figure 19 and Figure 20.

Future Year (2033) Without Project

To develop Future Year (2033) Without Project volume forecasts, Existing volumes were combined with ambient growth and trips generated by other developments. Future Year (2033) Without Project AM and PM peak hour intersection turning movement volumes are shown on Figure 21 and Figure 22.

Future Year (2033) With Project

Future Year (2033) With Project volume forecasts were developed by adding project generated trips to the Future Year (2033) Without Project forecast. Future Year (2033) With Project AM and PM peak hour intersection turning movement volumes are shown on Figure 23 and Figure 24.

Table 3
Other Development Trip Generation

Map ID	Project Name	Land Use	Quantity	Units[1]	Trips Generated[2] AM Peak Hour In	AM Out	AM Total	PM Peak Hour In	PM Out	PM Total	Daily
1	PLAN18-00039	Single-Family Detached Residential	195	DU	35	101	136	115	68	183	1,839
2	PLAN18-00051	Creation of Two Parcels from One Parcel	--	--	--	--	--	--	--	--	--
3	ADMN18-00080	Accessory Dwelling Unit	1	DU	--	--	--	--	--	--	--
4	PLAN19-00028	Single-Family Detached Residential	135	DU	25	70	95	80	47	127	1,273
5	ADMN19-00139	Single-Family Detached Residential	61	DU	11	32	43	36	21	57	575
6	ADMN20-00053	Single-Family Detached Residential	37	DU	7	19	26	22	13	35	349
7	ADMN20-00058	Front Yard Setback Deviation	--	--	--	--	--	--	--	--	--
8	PLAN21-00019	Commercial Project[3]	--	--	--	--	--	--	--	--	--
9	ADMN21-00022	Single-Family Detached Residential	150	DU	27	78	105	89	52	141	1,415
10	ADMN21-00003	Single-Family Detached Residential	112	DU	20	58	78	66	39	105	1,056
11	ADMN21-00079	Single-Family Detached Residential	67	DU	12	35	47	40	23	63	632
12	ADMN21-00170	Single-Family Detached Residential	148	DU	27	77	104	88	51	139	1,396
Total					164	470	634	536	314	850	8,535

Notes: Notes:
(1) DU = Dwelling Units

(2) Based on trip generation rates from the Institute of Transportation Engineers *Trip Generation Manual* (11th Edition, 2021).

(3) Project has not been included for analysis since the current status for the project is that corrections are required, and a search of City Planning Commission/City Council meetings and agendas does not record the project as being under consideration.

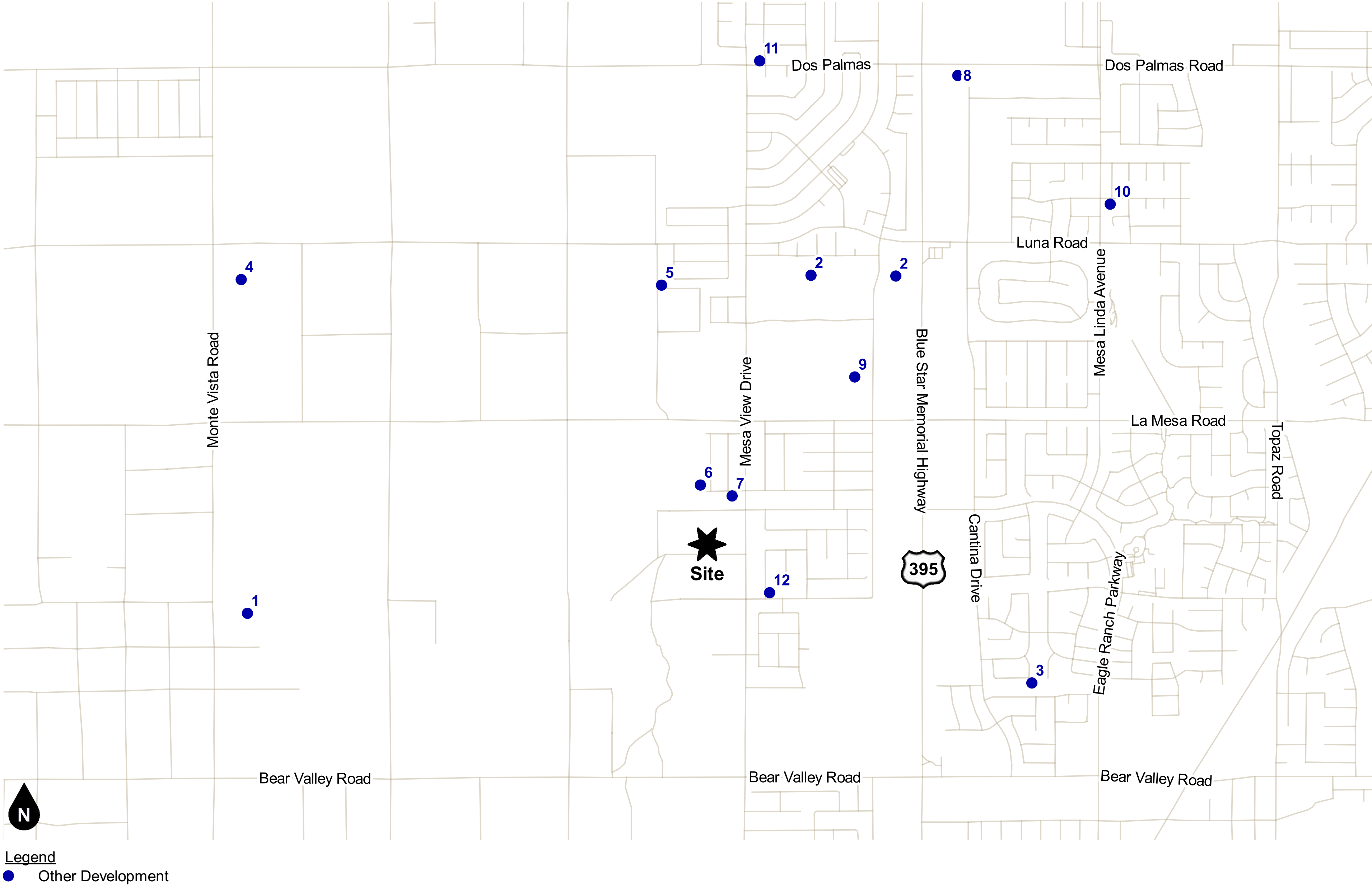
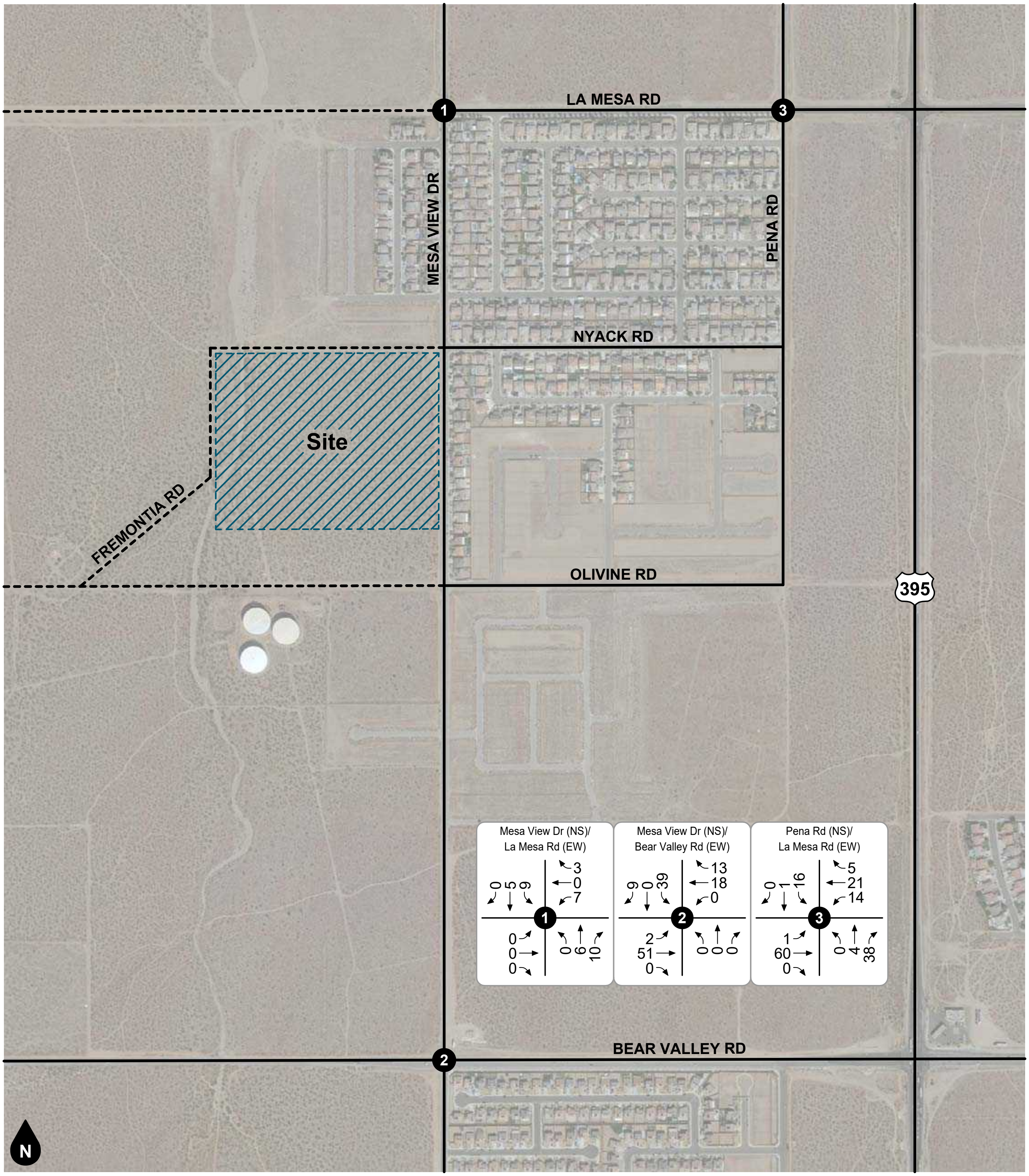


Figure 14
Other Development Location Map

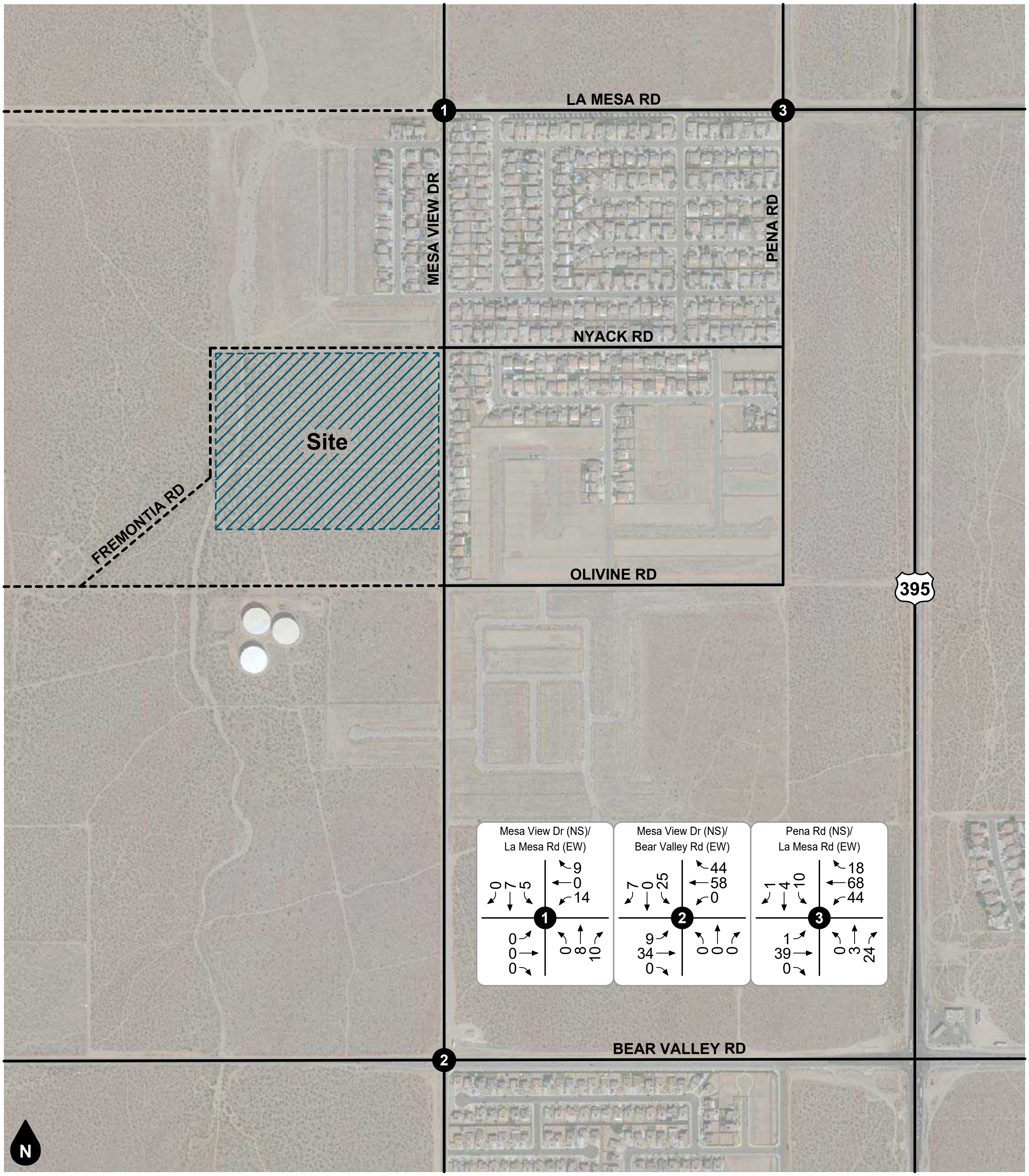
gandini



Legend

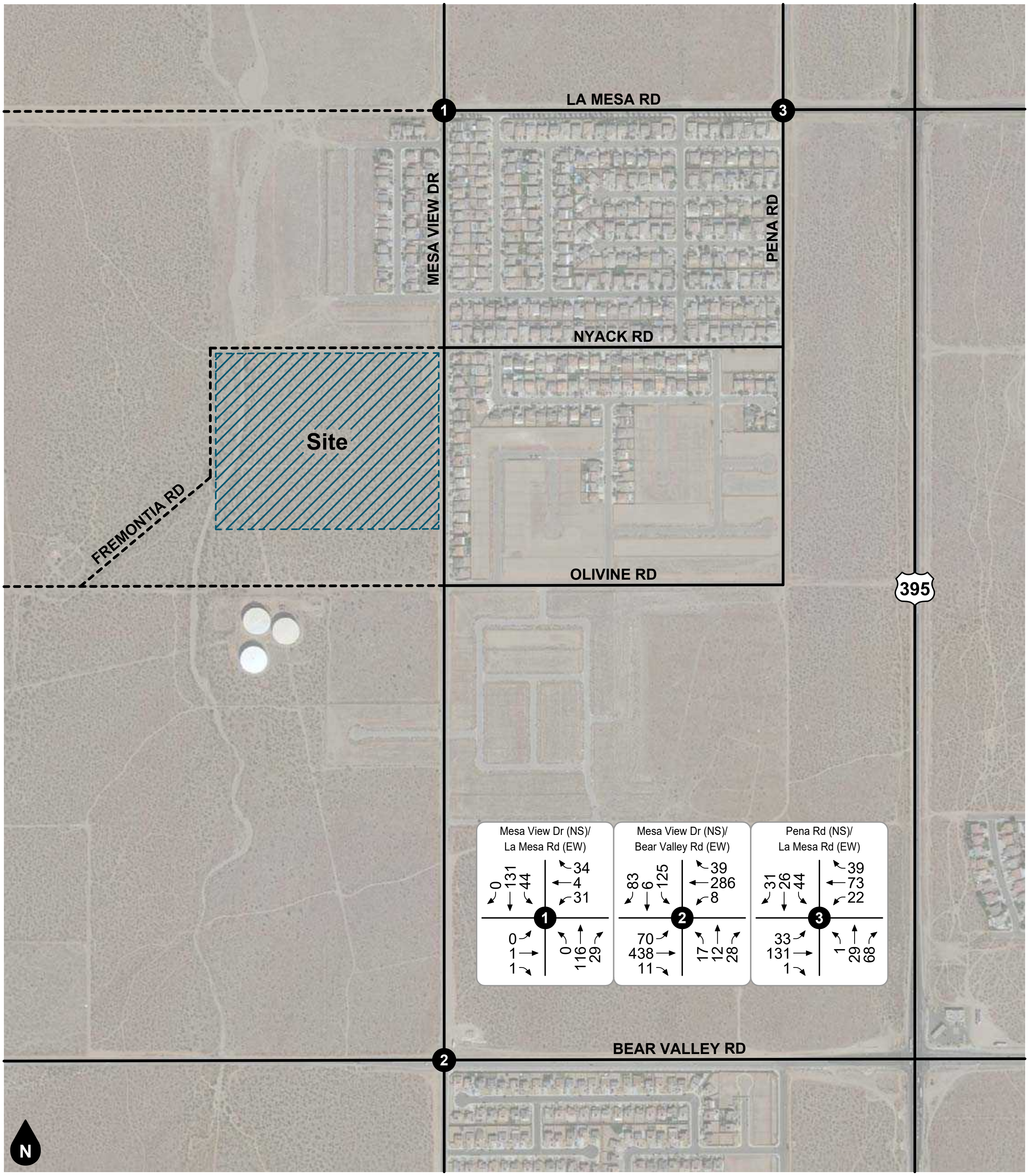
Study Intersection

Figure 15
Other Development
AM Peak Hour Intersection Turning Movement Volumes



Legend
Study Intersection

Figure 16
Other Development
PM Peak Hour Intersection Turning Movement Volumes



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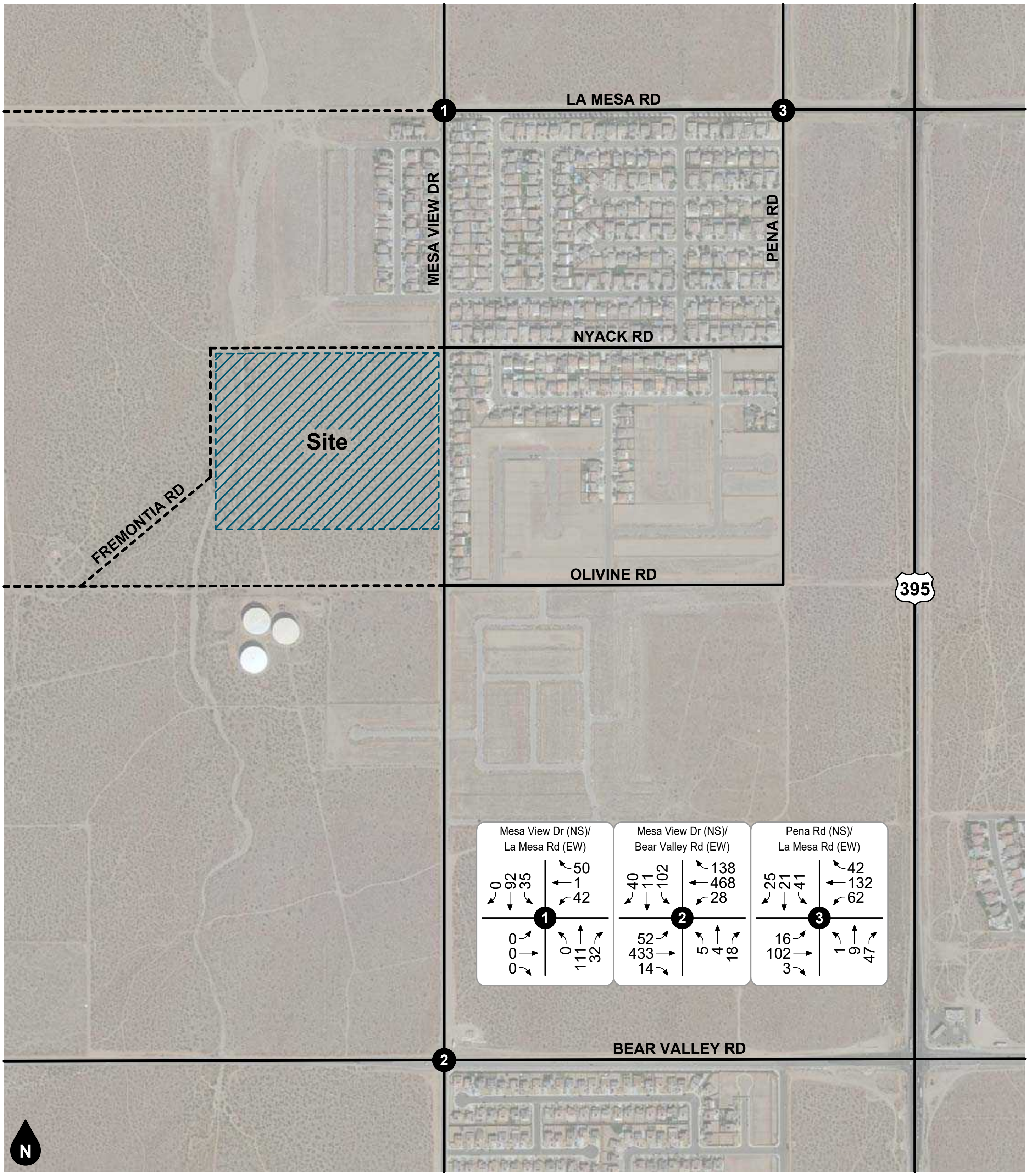
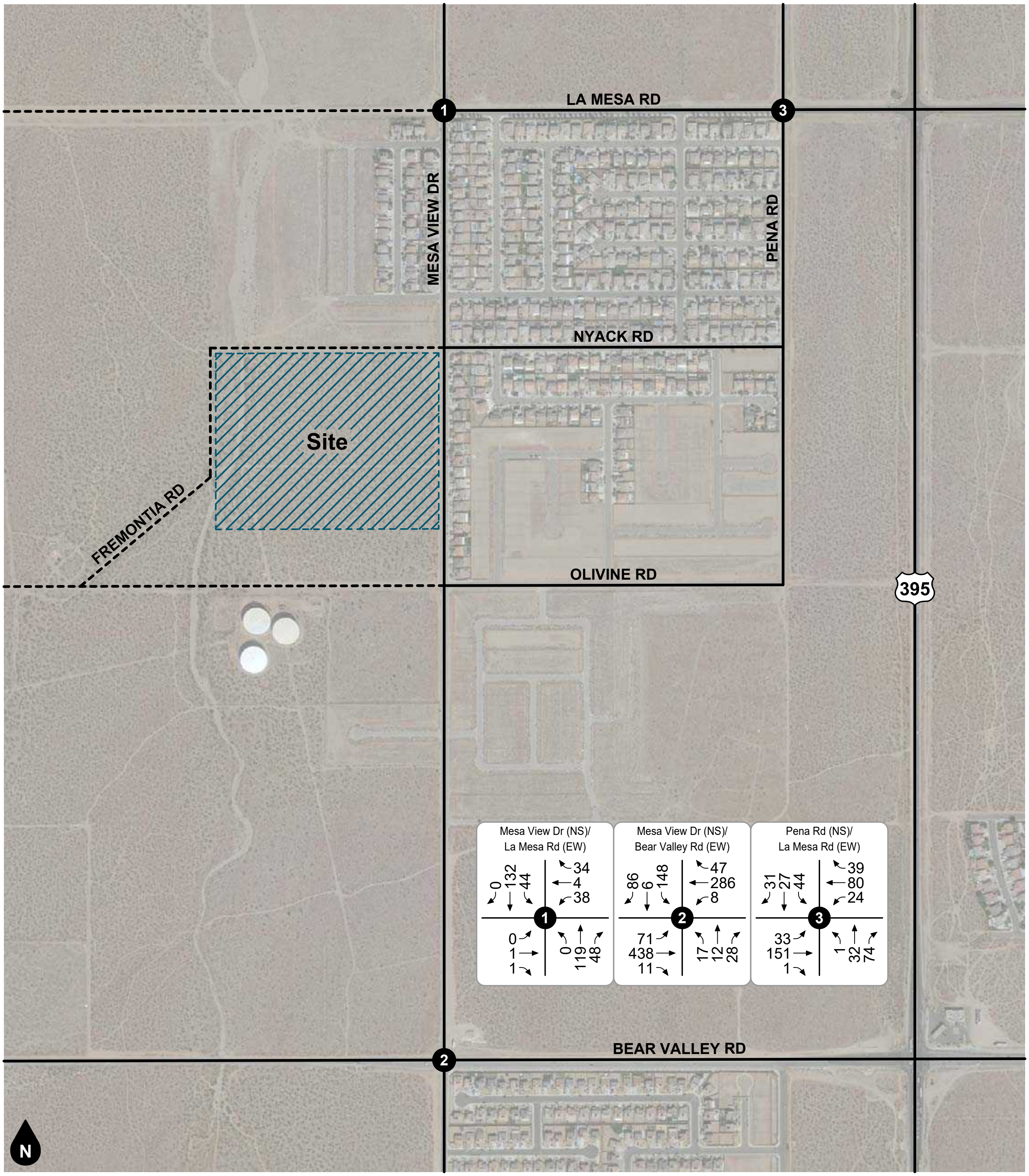
Study Intersection

Figure 17
Opening Year (2023) Without Project
AM Peak Hour Intersection Turning Movement Volumes



Legend
Study Intersection

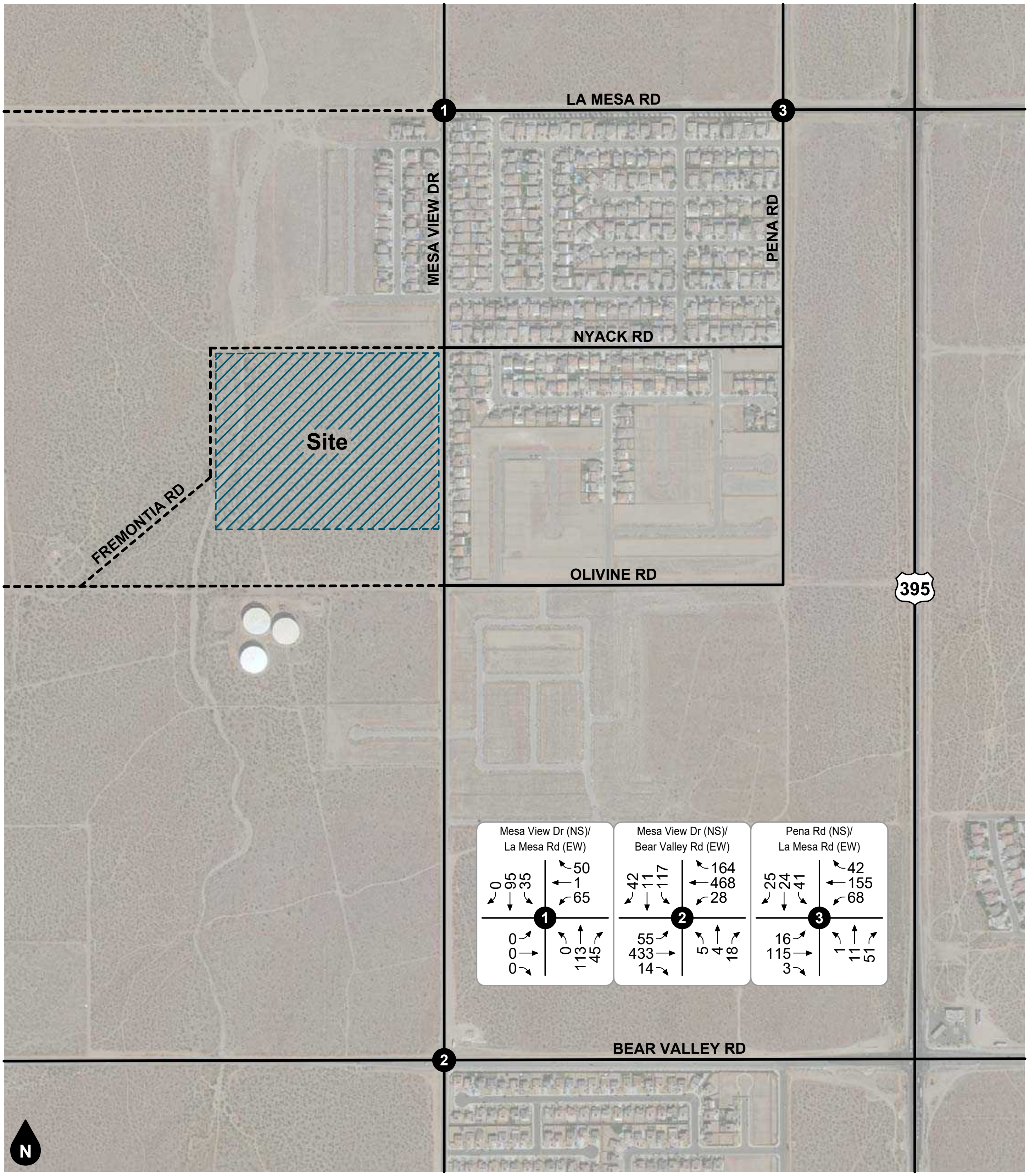
Figure 18
Opening Year (2023) Without Project
PM Peak Hour Intersection Turning Movement Volumes



Legend

\# Study Intersection

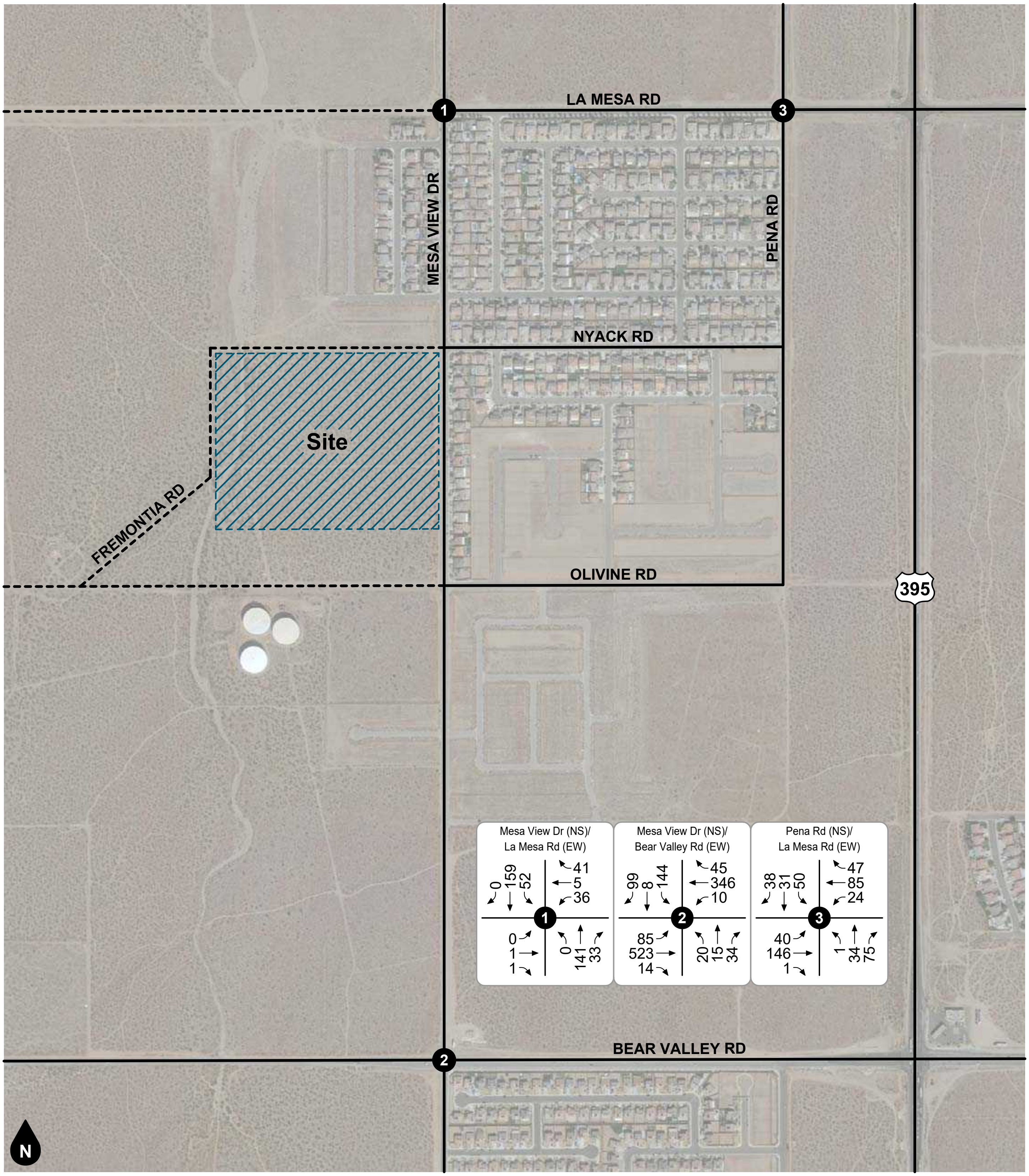
Figure 19
Opening Year (2023) With Project
AM Peak Hour Intersection Turning Movement Volumes



Legend

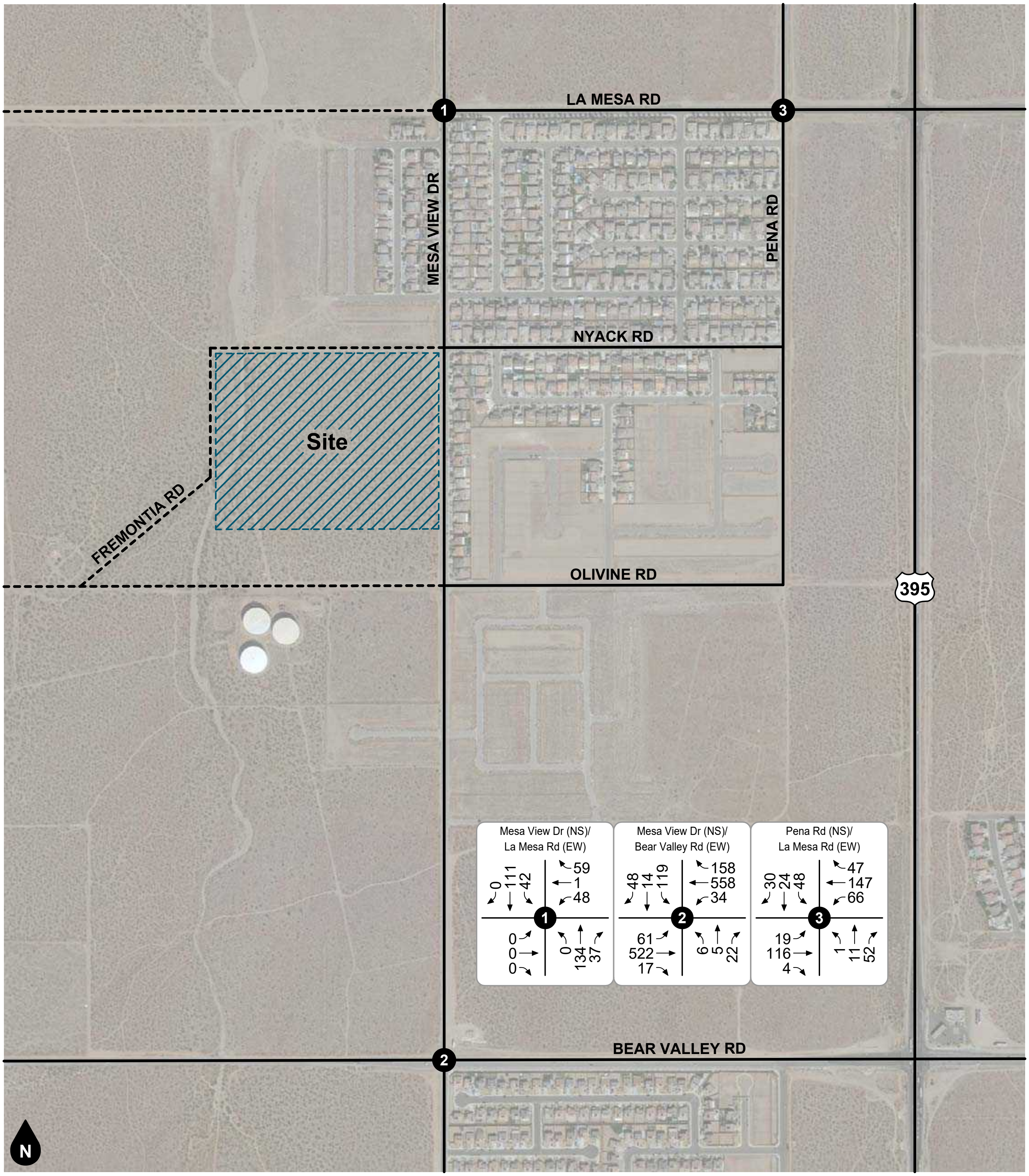
Study Intersection

Figure 20
Opening Year (2023) With Project
PM Peak Hour Intersection Turning Movement Volumes



Legend
Study Intersection

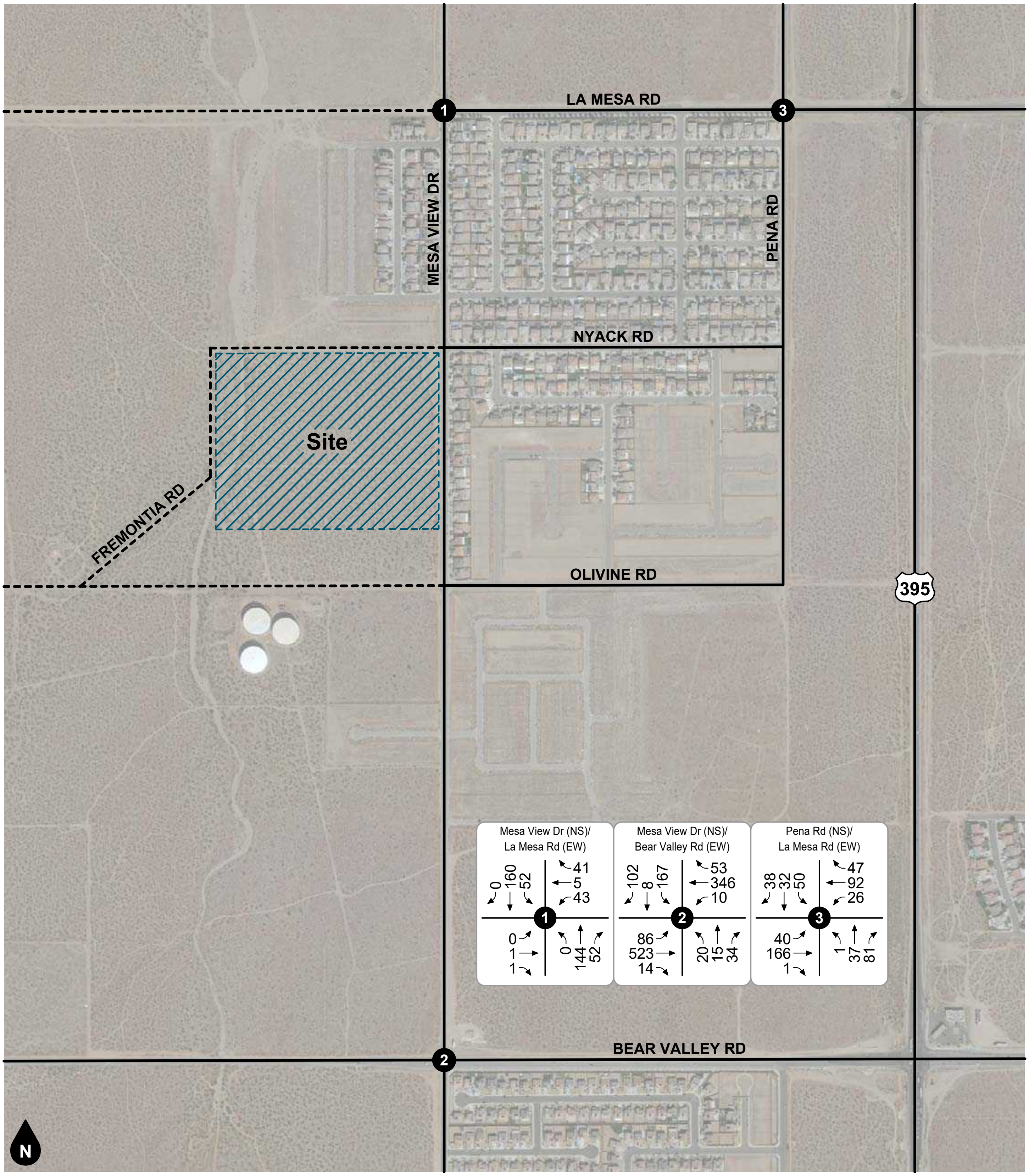
Figure 21
Future Year (2033) Without Project
AM Peak Hour Intersection Turning Movement Volumes



Legend

Study Intersection

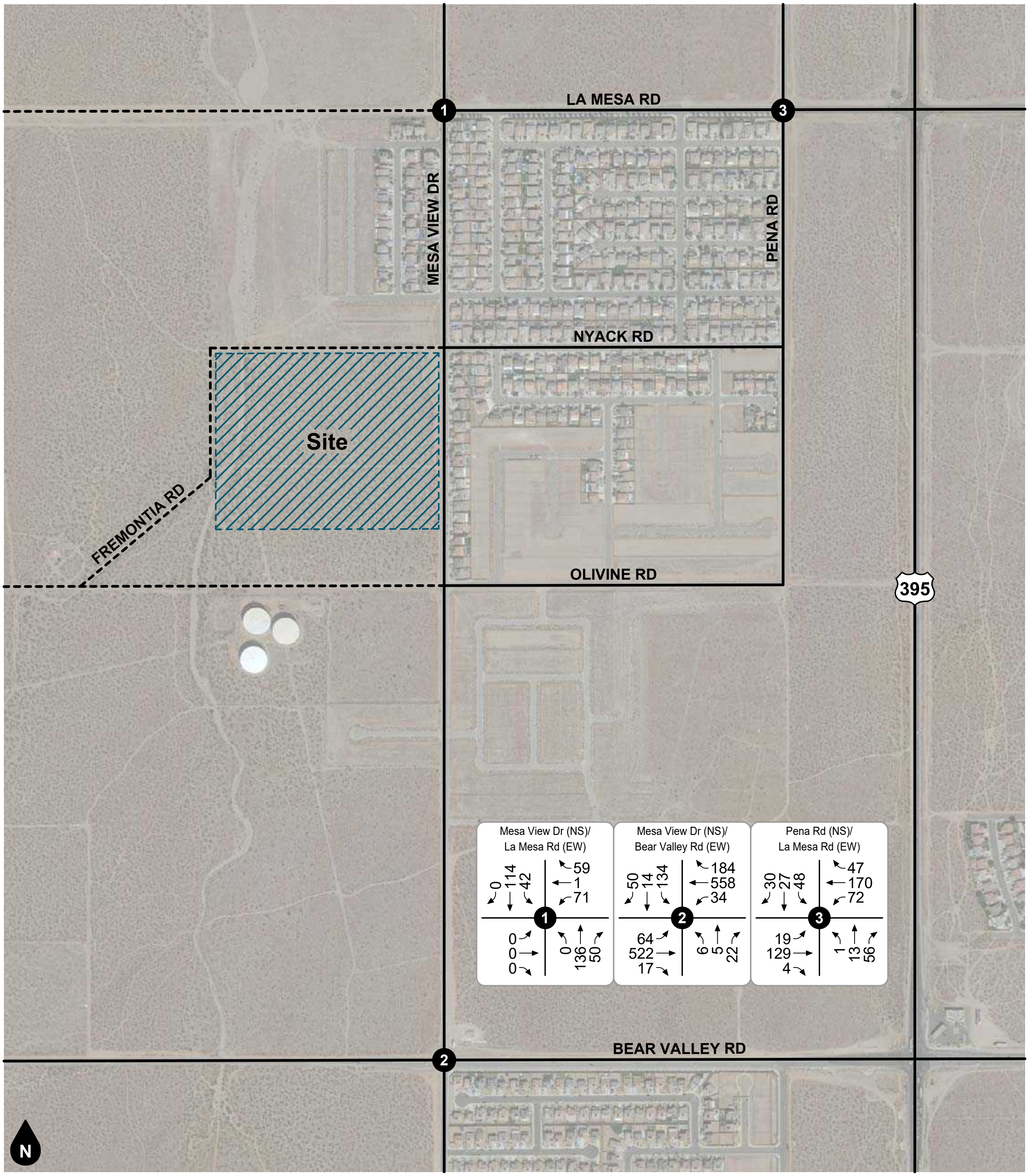
Figure 22
Future Year (2033) Without Project
PM Peak Hour Intersection Turning Movement Volumes



Legend

Study Intersection

Figure 23
Future Year (2033) With Project
AM Peak Hour Intersection Turning Movement Volumes



Legend

Study Intersection

Figure 24
Future Year (2033) With Project
PM Peak Hour Intersection Turning Movement Volumes

6. FUTURE OPERATIONAL ANALYSIS

Detailed intersection Level of Service calculation worksheets for each of the following analysis scenarios are provided in Appendix D.

OPENING YEAR (2023) WITHOUT PROJECT

The intersection Levels of Service for Opening Year (2023) Without Project conditions are shown in Table 4. As shown in Table 4, the study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Opening Year (2023) Without Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Opening Year (2023) Without Project conditions during the peak hours.

OPENING YEAR (2023) WITH PROJECT

The intersection Levels of Service for Opening Year (2023) With Project conditions are shown in Table 5. As shown in Table 5, the study intersections are projected to operate within acceptable Levels of Service (D or better) during the peak hours for Opening Year (2023) With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Opening Year (2023) With Project conditions during the peak hours.

FUTURE YEAR (2033) WITHOUT PROJECT

The intersection Levels of Service for Future Year (2033) Without Project conditions are shown in Table 6. As shown in Table 6, the study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Future Year (2033) Without Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Future Year (2033) Without Project conditions during the peak hours.

FUTURE YEAR (2033) WITH PROJECT

The intersection Levels of Service for Future Year (2033) With Project conditions are shown in Table 7. As shown in Table 7, the study intersections are projected to operate within acceptable Levels of Service (D or better) during the peak hours for Future Year (2033) With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Future Year (2033) With Project conditions during the peak hours.

PROJECT FAIR SHARE CONTRIBUTION

The project fair share contributions have been calculated for the improvement location. The project fair share contribution is based on the proportion of project peak hour intersection turning movement volumes contributed to the improvement location relative to the total new peak hour intersection turning movement volumes forecast for Future Year (2033) With Project conditions.

Table 8 presents a summary of improvement cost and project cost shares at the Future Year (2033) With Project study intersection improvement location. The intersection fair share cost calculations are typically based on the higher of the peak hour traffic volumes. As shown in Table 8, the project's fair share percentages of identified impacted intersections are approximately 15.3% to 15.8%. The fair share calculations are intended only for the discussion purposes of this traffic impact analysis, and do not imply any legal responsibility or formula for contributions or mitigation.

Table 4
Opening Year (2023) Without Project Intersection Levels of Service

Study Intersection	Traffic Control[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS[3]	Delay[2]	LOS[3]
1. Mesa View Dr at La Mesa Rd	CSS	12.2	B	11.3	B
2. Mesa View Dr at Bear Valley Rd	CSS	48.0	E	91.8	F
- With Improvements	TS	11.9	B	9.2	A
3. Pena Rd at La Mesa Rd	CSS	14.8	B	13.4	B

Notes:

(1) CSS = Cross Street Stop; TS = Traffic Signal

(2) Delay is shown in seconds/vehicle. For intersections with traffic signal or all way stop control, overall average intersection delay and LOS are shown. For intersections with cross street stop control, LOS is based on average delay of the worst individual approach.

(3) LOS = Level of Service

Table 5
Opening Year (2023) With Project Intersection Levels of Service

Study Intersection	Traffic Control[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS[3]	Delay[2]	LOS[3]
1. Mesa View Dr at La Mesa Rd	CSS	12.7	B	12.1	B
2. Mesa View Dr at Bear Valley Rd	CSS	68.1	E	125.2	F
- With Improvements	TS	12.4	B	9.6	A
3. Pena Rd at La Mesa Rd	CSS	15.9	B	14.4	B

Notes:

(1) CSS = Cross Street Stop; TS = Traffic Signal

(2) Delay is shown in seconds/vehicle. For intersections with traffic signal or all way stop control, overall average intersection delay and LOS are shown. For intersections with cross street stop control, LOS is based on average delay of the worst individual approach.

(3) LOS = Level of Service

Table 6
Future Year (2033) Without Project Intersection Levels of Service

Study Intersection	Traffic Control[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS[3]	Delay[2]	LOS[3]
1. Mesa View Dr at La Mesa Rd	CSS	12.2	B	11.9	B
2. Mesa View Dr at Bear Valley Rd	CSS	99.9	F	183.0	F
- With Improvements	TS	12.0	B	9.3	A
3. Pena Rd at La Mesa Rd	CSS	13.6	B	14.2	B

Notes:

(1) CSS = Cross Street Stop; TS = Traffic Signal

(2) Delay is shown in seconds/vehicle. For intersections with traffic signal or all way stop control, overall average intersection delay and LOS are shown. For intersections with cross street stop control, LOS is based on average delay of the worst individual approach.

(3) LOS = Level of Service

Table 7
Future Year (2033) With Project Intersection Levels of Service

Study Intersection	Traffic Control[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS[3]	Delay[2]	LOS[3]
1. Mesa View Dr at La Mesa Rd	CSS	12.7	B	12.8	B
2. Mesa View Dr at Bear Valley Rd	CSS	68.1	F	235.5	F
- With Improvements	TS	12.4	B	9.7	A
3. Pena Rd at La Mesa Rd	CSS	15.9	C	15.3	C

Notes:

(1) CSS = Cross Street Stop; TS = Traffic Signal

(2) Delay is shown in seconds/vehicle. For intersections with traffic signal or all way stop control, overall average intersection delay and LOS are shown. For intersections with cross street stop control, LOS is based on average delay of the worst individual approach.

(3) LOS = Level of Service

Table 8
Project Fair Share Contribution

Study Intersection	Peak Hour	Intersection Turning Movement Volumes				
		Existing	Future Year (2033) With Project	Project Trips	Total New Trips	Project Share of Total New Trips
2. Mesa View Dr at Bear Valley Rd	AM	954	1,378	35	221	15.8%
	PM	1,092	1,610	46	300	15.3%

7. SITE ACCESS AND CIRCULATION

This section includes a description of project improvements necessary to provide site access and an evaluation of site access and circulation.

PROJECT DESIGN FEATURES

This analysis assumes the following improvements will be constructed by the project as project design features to provide project site access:

- Construct Nyack Road from Mesa View Drive to its westerly terminus as identified on the project site plan and approved by City of Victorville staff.

- Construct Jacklin Street (NS) at Nyack Road (EW) to provide one inbound lane and one outbound lane with northbound stop-control and the following lane configurations:
  - Northbound: one shared left/right turn lane
  - Eastbound: one shared through/right lane
  - Westbound: one shared left/through turn lane

- Construct Mesa View Drive (NS) at Don Felipe Street (EW) to provide one inbound lane and one outbound lane with eastbound stop-control and the following lane configurations:
  - Northbound: one shared left/through lane
  - Southbound: one shared through/right turn lane
  - Eastbound: one shared left/right turn lane

This analysis also assumes the project shall comply with the following conditions as part of the City of Victorville standard development review process:

- A construction work site traffic control plan shall comply with State standards set forth in the California Manual of Uniform Traffic Control Devices and shall be submitted to the City for review and approval prior to the issuance of a grading permit or start of construction. The plan shall identify any roadway, sidewalk, bike route, or bus stop closures and detours as well as haul routes and hours of operation. All construction related trips shall be restricted to off-peak hours to the extent possible.

- All on-site and off-site roadway design, traffic signing and striping, and traffic control improvements relating to the proposed project shall be constructed in accordance with applicable State/Federal engineering standards and to the satisfaction of the City of Victorville.

- Site-adjacent roadways shall be constructed or repaired at their ultimate half-section width, including landscaping and parkway improvements in conjunction with development, or as otherwise required by the City of Victorville.

- Adequate off-street parking shall be provided to the satisfaction of City of Victorville.

- Adequate emergency vehicle access shall be provided to the satisfaction of the Victorville Fire Department.

- The final grading, landscaping, and street improvement plans shall demonstrate that sight distance requirements are met in accordance with applicable City of Victorville/California Department of Transportation sight distance standards.

8. CONCLUSIONS

This section summarizes the findings from the previous sections of this report.

PROJECT TRIPS

The proposed project is forecast to generate 1,038 daily trips, including 78 trips during the AM peak hour and 103 trips during the PM peak hour.

TRAFFIC SIGNAL WARRANTS

Traffic signal warrants 1-3 are currently satisfied at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) for Existing conditions. Therefore, installation of a traffic signal control is warranted at the unsignalized study intersection of Mesa View Drive at Bear Valley Road (#2) based on Existing conditions.

LEVELS OF SERVICE

The study intersections currently operate within acceptable Levels of Service (D or better) during the peak hours for Existing conditions.

The study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Opening Year (2023) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Opening Year (2023) Without and With Project conditions during the peak hours.

The study intersections are forecast to operate within acceptable Levels of Service (D or better) during the peak hours for Future Year (2033) Without and With Project conditions, except for the following study area intersection that is projected to operate at unacceptable LOS during the peak hours:

- Mesa View Drive at Bear Valley Road – #2 (AM peak hour – LOS E, PM peak hour – LOS F)

With installation of a traffic signal at the Mesa View Drive at Bear Valley Road intersection, the study intersections are forecast to operate within acceptable Levels of Service for Future Year (2033) Without and With Project conditions during the peak hours.

APPENDICES

APPENDIX A

GLOSSARY

GLOSSARY OF TERMS

ACRONYMS

AC	Acres
ADT	Average Daily Traffic
Caltrans	California Department of Transportation
DU	Dwelling Unit
ICU	Intersection Capacity Utilization
LOS	Level of Service
TSF	Thousand Square Feet
V/C	Volume/Capacity
VMT	Vehicle Miles Traveled

TERMS

AVERAGE DAILY TRAFFIC: The average 24-hour volume for a stated period divided by the number of days in that period. For example, Annual Average Daily Traffic is the total volume during a year divided by 365 days.

BANDWIDTH: The number of seconds of green time available for through traffic in a signal progression.

BOTTLENECK: A point of constriction along a roadway that limits the amount of traffic that can proceed downstream from its location.

CAPACITY: The maximum number of vehicles that can be reasonably expected to pass over a given section of a lane or a roadway in a given time period.

CHANNELIZATION: The separation or regulation of conflicting traffic movements into definite paths of travel by the use of pavement markings, raised islands, or other suitable means to facilitate the safe and orderly movements of both vehicles and pedestrians.

CLEARANCE INTERVAL: Nearly same as yellow time. If there is an all red interval after the end of a yellow, then that is also added into the clearance interval.

CONTROL DELAY: The component of delay, typically expressed in seconds per vehicle, resulting from the type of traffic control at an intersection. Control delay is measured by comparison with the uncontrolled condition; it includes delay incurred by slowing down, stopping/waiting, and speeding up.

CORDON: An imaginary line around an area across which vehicles, persons, or other items are counted (in and out).

CORNER SIGHT DISTANCE: The minimum sight distance required by the driver of a vehicle to cross or enter the lanes of the major roadway without requiring approaching traffic travelling at a given speed to radically alter their speed or trajectory. Corner sight distance is measured from the driver's eye at 42 inches above the pavement to an object height of 36 inches above the pavement in the center of the nearest approach lane.

CYCLE LENGTH: The time period in seconds required for a traffic signal to complete one full cycle of indications.

CUL-DE-SAC: A local street open at one end only and with special provisions for turning around.

DAILY CAPACITY: A theoretical value representing the daily traffic volume that will typically result in a peak hour volume equal to the capacity of the roadway.

DELAY: The time consumed while traffic is impeded in its movement by some element over which it has no control, usually expressed in seconds per vehicle.

DEMAND RESPONSIVE SIGNAL: Same as traffic-actuated signal.

DENSITY: The number of vehicles occupying in a unit length of the through traffic lanes of a roadway at any given instant. Usually expressed in vehicles per mile.

DETECTOR: A device that responds to a physical stimulus and transmits a resulting impulse to the signal controller.

DESIGN SPEED: A speed selected for purposes of design. Features of a highway, such as curvature, superelevation, and sight distance (upon which the safe operation of vehicles is dependent) are correlated to design speed.

DIRECTIONAL SPLIT: The percent of traffic in the peak direction at any point in time.

DIVERSION: The rerouting of peak hour traffic to avoid congestion.

FORCED FLOW: Opposite of free flow.

FREE FLOW: Volumes are well below capacity. Vehicles can maneuver freely and travel is unimpeded by other traffic.

GAP: Time or distance between successive vehicles in a traffic stream, rear bumper to front bumper.

HEADWAY: Time or distance spacing between successive vehicles in a traffic stream, front bumper to front bumper.

INTERCONNECTED SIGNAL SYSTEM: A number of intersections that are connected to achieve signal progression.

LEVEL OF SERVICE: A qualitative measure of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs.

LOOP DETECTOR: A vehicle detector consisting of a loop of wire embedded in the roadway, energized by alternating current and producing an output circuit closure when passed over by a vehicle.

MINIMUM ACCEPTABLE GAP: Smallest time headway between successive vehicles in a traffic stream into which another vehicle is willing and able to cross or merge.

MULTI-MODAL: More than one mode; such as automobile, bus transit, rail rapid transit, and bicycle transportation modes.

OFFSET: The time interval in seconds between the beginning of green at one intersection and the beginning of green at an adjacent intersection.

PLATOON: A closely grouped component of traffic that is composed of several vehicles moving, or standing ready to move, with clear spaces ahead and behind.

PASSENGER CAR EQUIVALENT (PCE): A metric used to assess the impact of larger vehicles, such as trucks, recreational vehicles, and buses, by converting the traffic volume of larger vehicles to an equivalent number of passenger cars.

PEAK HOUR: The 60 consecutive minutes with the highest number of vehicles.

PRETIMED SIGNAL: A type of traffic signal that directs traffic to stop and go on a predetermined time schedule without regard to traffic conditions. Also, fixed time signal.

PROGRESSION: A term used to describe the progressive movement of traffic through several signalized intersections.

QUEUE: The number of vehicles waiting at a service area such as a traffic signal, stop sign, or access gate.

QUEUE LENGTH: The length of vehicle queue, typically expressed in feet, waiting at a service area such as a traffic signal, stop sign, or access gate.

SCREEN-LINE: An imaginary line or physical feature across which all trips are counted, normally to verify the validity of mathematical traffic models.

SHARED/RECIPROCAL PARKING AGREEMENT: A written binding document executed between property owners to provide a designated number of off-street parking stalls within a designated area to be available for specified businesses or land uses.

SIGHT DISTANCE: The continuous length of roadway visible to a driver or roadway user.

SIGNAL CYCLE: The time period in seconds required for one complete sequence of signal indications.

SIGNAL PHASE: The part of the signal cycle allocated to one or more traffic movements.

STACKING DISTANCE: The length of area available behind a service area, such as a traffic signal or gate, for vehicle queueing to occur.

STARTING DELAY: The delay experienced in initiating the movement of queued traffic from a stop to an average running speed through an intersection.

STOPPING SIGHT DISTANCE: The minimum distance required by the driver of a vehicle on the major roadway travelling at a given speed to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eye at 42 inches above the pavement to an object height of 6 inches above the pavement.

TRAFFIC-ACTUATED SIGNAL: A type of traffic signal that directs traffic to stop and go in accordance with the demands of traffic, as registered by the actuation of detectors.

TRIP: The movement of a person or vehicle from one location (origin) to another (destination). For example, from home to store to home is two trips, not one.

TRIP-END: One end of a trip at either the origin or destination (i.e., each trip has two trip-ends). A trip-end occurs when a person, object, or message is transferred to or from a vehicle.

TRIP GENERATION RATE: The quantity of trips produced and/or attracted by a specific land use stated in terms of units such as per dwelling, per acre, and per 1,000 square feet of floor space.

TRUCK: A vehicle having dual tires on one or more axles, or having more than two axles.

TURNING RADIUS: The circular arc formed by the smallest turning path radius of the front outside tire of a vehicle, such as that performed by a U-turn maneuver. This is based on the length and width of the wheel base as well as the steering mechanism of the vehicle.

UNBALANCED FLOW: Heavier traffic flow in one direction than the other. On a daily basis, most facilities have balanced flow. During the peak hours, flow is seldom balanced in an urban area.

VEHICLE MILES OF TRAVEL: A measure of the amount of usage of a section of highway, obtained by multiplying the average daily traffic by length of facility in miles.

APPENDIX B

SCOPING AGREEMENT

MEMORANDUM OF UNDERSTANDING

TO: Mr. Anwar Wagdy | CITY OF VICTORVILLE

FROM: Bryan Crawford | GANDDINI GROUP, INC.

DATE: November 11, 2021

SUBJECT: Tract Map No. 20454 Traffic Study Scope
19449

INTRODUCTION

The purpose of this scoping document is to outline the proposed traffic analysis parameters and assumptions for review/concurrence by City of Victorville staff.

PROJECT DESCRIPTION

Figure 1 shows the project location map. The 30.2-acre project site is located at the southwest corner of Mesa View Drive and Nyack Road in the City of Victorville.

The site plan is illustrated on Figure 2. The project is site is currently vacant. The proposed project involves entitlements for a proposed tract map consisting of 110 numbered lots for future development of single-family residential use.

The project proposes three full accesses to Balsam Road, and one full access to Winona Street.

PROJECT TRIP GENERATION & DISTRIBUTION

Table 1 shows the project trip generation based upon rates obtained from the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021). As shown in Table 1, the proposed project is forecast to generate approximately 1,038 daily trips, including 78 trips during the AM peak hour and 103 trips during the PM peak hour.

Figure 3 illustrates the forecast directional distribution patterns of project-generated trips.

STUDY AREA

The study area is proposed to consist of the following three (3) study intersections:

Study Intersections

1. Mesa View Drive (NS) at La Mesa Road (EW)
2. Mesa View Drive (NS) at Bear Valley Road (EW)
3. La Mesa Road (NS) Pena Road (EW)

TRAFFIC COUNTS

New intersection turning movement counts will be collected at the study intersections during the AM peak period (7:00 AM – 9:00 AM) and PM peak period (4:00 PM – 6:00 PM) on a typical weekday (Tuesday, Wednesday, or Thursday).

ANALYSIS SCENARIOS

The traffic study shall evaluate the following analysis scenarios for weekday AM and PM peak hour conditions:

- Existing
- Opening Year (2023) Without Project
- Opening Year (2023) With Project
- Future Year (2033) Without Project
- Future Year (2033) With Project

ANALYSIS METHODOLOGY

To assess the performance of an intersection, the City of Victorville uses the intersection delay method based on procedures contained in the Highway Capacity Manual (Transportation Research Board, 6th Edition). The methodology considers the traffic volume and distribution of movements, traffic composition, geometric characteristics, and signalization details to calculate the average control delay per vehicle and corresponding Level of Service (LOS). Control delay is defined as the portion of delay attributed to the intersection traffic control (such as a traffic signal or stop sign) and includes initial deceleration, queue move-up time, stopped delay, and final acceleration delay. The intersection control delay is then correlated to Level of Service based on the following thresholds:

Level of Service	Intersection Control Delay (Seconds / Vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10.0	≤ 10.0
B	> 10.0 to ≤ 20.0	> 10.0 to ≤ 15.0
C	> 20.0 to ≤ 35.0	> 15.0 to ≤ 25.0
D	> 35.0 to ≤ 55.0	> 25.0 to ≤ 35.0
E	> 55.0 to ≤ 80.0	> 35.0 to ≤ 50.0
F	> 80.0	> 50.0

Source: Transportation Research Board, Highway Capacity Manual (6th Edition).

Level of Service is used to qualitatively describe the performance of a roadway facility, ranging from Level of Service A (free-flow conditions) to Level of Service F (extreme congestion and system failure). At intersections with traffic signal or all way stop control, Level of Service is determined by the average control delay for the overall intersection. At intersections with cross street stop control (i.e., one- or two-way stop control), Level of Service is determined by the average control delay for the worst individual movement (or movements sharing a single lane).

Intersection Level of Service analysis shall be performed using the Vistro software.

PERFORMANCE STANDARDS

City of Victorville

The City of Victorville has established LOS D or better as acceptable LOS for all intersections along the designated street and highway system in the City's General Plan Circulation Element.

OPERATIONAL THRESHOLDS

City of Victorville

City of Victorville intersection deficiencies would occur under the following conditions:

- If the project contributes measurable traffic to an intersection or roadway segment operating at LOS D or better or a volume-to-capacity ratio of 0.95 or lower for without project conditions, and the addition of project trips causes intersection LOS to degrade to LOS E or worse, or volume-to-capacity ratio to increase it greater than 0.95.
- If a project contributes measurable traffic to an intersection or roadway segment operating at a deficient LOS (LOS E or F) for without project conditions.

FORECASTING METHODOLOGY

To account for ambient growth, existing roadway volumes shall be increased by a growth rate of 2 percent (2%) per year over a two-year period for Opening Year (2023) conditions and a twelve-year period for Future Year (2033) conditions.

In addition, a list of pending and approved other development projects shall be requested from the City of Victorville. Trip forecasts for other development projects within the project study area shall be determined based on the Institute of Transportation Engineers (ITE), Trip Generation Manual, 11th Edition, 2021 and will be added to existing roadway volumes for the applicable analysis scenarios.

CONGESTION MANAGEMENT PROGRAM (CMP) ANALYSIS

State highway and CMP analysis guidelines are prescribed in Appendix B of the County of San Bernardino Congestion Management Program (2016 Update) (CMP), which state that a California Department of Transportation (Caltrans) or CMP analysis is required if the project is expected to contribute:

- 100 or more peak hour trips (two-way) to a freeway facility; or
- 50 or more peak hour trips to a CMP facility within another jurisdiction.

No CMP or Caltrans analysis is required if the project generates fewer than 100 peak hour trips.

Since the project is not forecast to contribute 100 peak hour trips to a freeway facility or 50 or more peak hour trips to a CMP facility, no further State highway or CMP analysis is required for the project.

TRAFFIC CONTROL WARRANT ANALYSIS

The intersections of Mesa View Drive at La Mesa Road and La Mesa Road at Pena Road will be analyzed for multi-way stop warrants based on the California Manual of Uniform Traffic Control Devices (CA MUTCD) standards.

The intersections of Mesa View Drive at La Mesa Road and Mesa View Drive at Bear Valley Road will be analyzed for traffic signal warrants based on the CA MUTCD 8-hourt, 4-hour, peak hour, and daily planning warrants.

Additional traffic counts will be obtained at the necessary locations to conduct this traffic control warrant analysis.

VEHICLES MILES TRAVELED (VMT) ANALYSIS

California Senate Bill 743 (SB 743) directs the State Office of Planning and Research (OPR) to amend the California Environmental Quality Act (CEQA) Guidelines for evaluating transportation impacts to provide alternatives to Level of Service that "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." In December 2018, the California Natural Resources Agency certified and adopted the updated CEQA Guidelines package. The amended CEQA Guidelines, specifically Section 15064.3, recommend the use of Vehicle Miles Travelled (VMT) as the primary metric for the evaluation of transportation impacts associated with land use and transportation projects. In general terms, VMT quantifies the amount and distance of automobile travel attributable to a project or region. Agencies may currently opt-in to applying the updated CEQA guidelines for VMT analysis and implementation is required State-wide by July 1, 2020.

The updated CEQA Guidelines allow for lead agency discretion in establishing methodologies and thresholds provided there is substantial evidence to demonstrate that the established procedures promote the intended goals of the legislation. Where quantitative models or methods are unavailable, Section 15064.3 allows agencies to assess VMT qualitatively using factors such as availability of transit and proximity to other destinations. The Technical Advisory on Evaluating Transportation Impacts in CEQA (State of California, December 2018) ["Technical Advisory"] provides technical considerations regarding methodologies and thresholds with a focus on office, residential, and retail developments as these projects tend to have the greatest influence on VMT.

The June 16, 2020 City Council meeting adopted Resolution No. 20-010 which provided guidelines for VMT thresholds of significance for analyzing traffic impacts under CEQA. Exhibit 1 of this resolution provides project screening criteria which exempts projects from conducting a detailed VMT analysis. The project screening includes a land use type screening whereas a single-family residential project up to 136 dwelling units is screened out and not required to conduct a VMT analysis.

The proposed project consists of 110 single-family residential dwelling units. Since this is less than the 136 dwelling unit threshold for single-family residential projects, the proposed project is screened out and exempt from a VMT analysis.

CONCLUSION

We appreciate the opportunity to provide this scoping document for your review. Should you have any questions or comments regarding the proposed scope, please contact Bryan Crawford at (714) 795-3100 x 104.

Table 1
Project Trip Generation

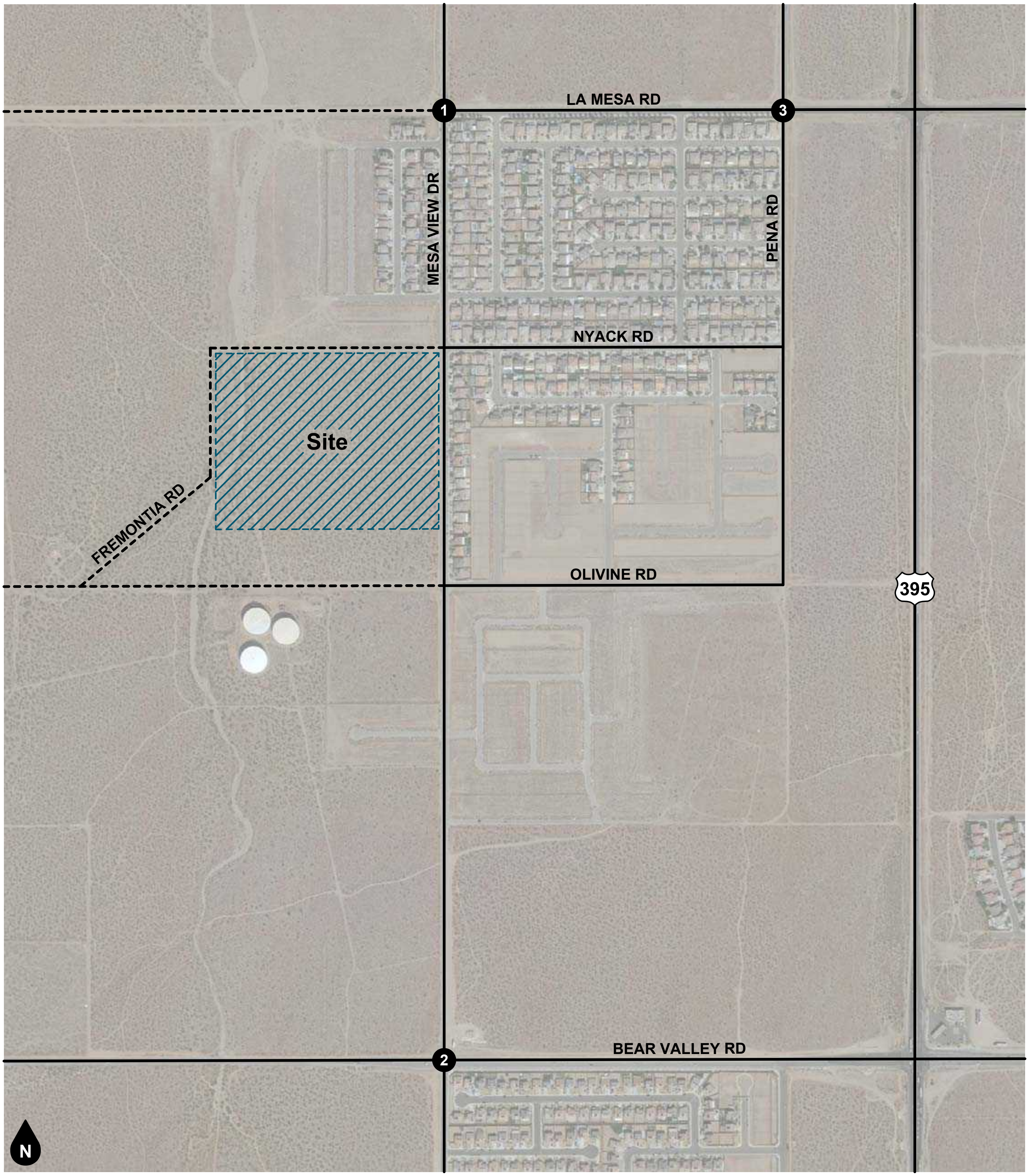
Trip Generation Rates									
			AM Peak Hour			PM Peak Hour			Daily
Land Use	Source[1]	Units[2]	% In	% Out	Rate	% In	% Out	Rate	Rate
Single-Family Detached Housing	ITE 210	DU	26%	74%	0.70	63%	37%	0.94	9.43

Trips Generated									
			AM Peak Hour			PM Peak Hour			
Land Use	Quantity	Units[2]	In	Out	Total	In	Out	Total	Daily
Single-Family Detached Housing	110	DU	21	57	78	65	38	103	1,038

Notes:

1) Sources:
ITE = Institute of Transportation Engineers *Trip Generation Manual* (11th Edition, 2021); ### = Land Use Code.

2) DU = Dwelling Units



Legend
Study Intersection

Figure 1
Project Location Map

ganddini

Tract Map No. 20454
Traffic Impact Analysis
19449

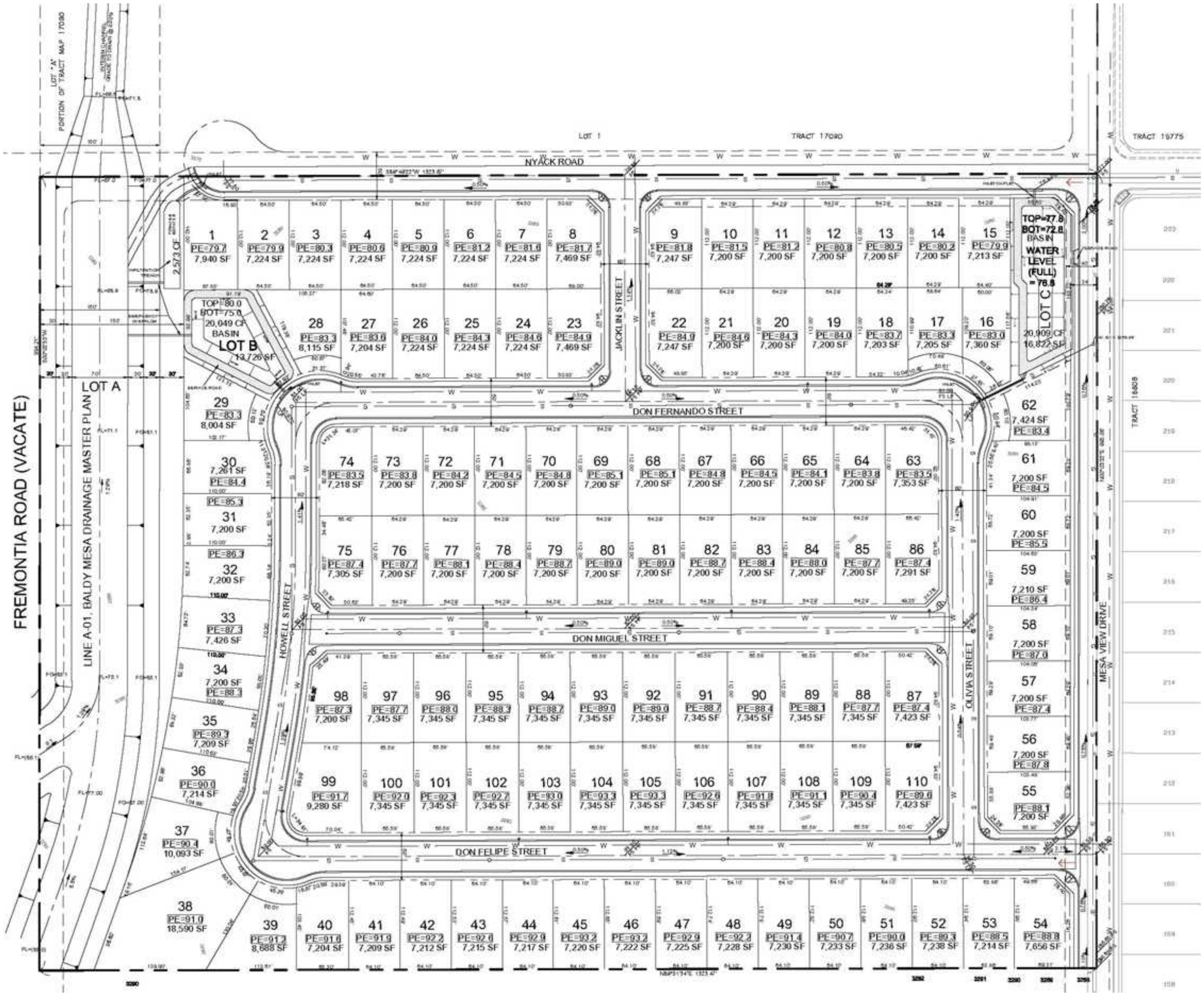


Figure 2
Site Plan

Tract Map No. 20454
Traffic Impact Analysis
19449

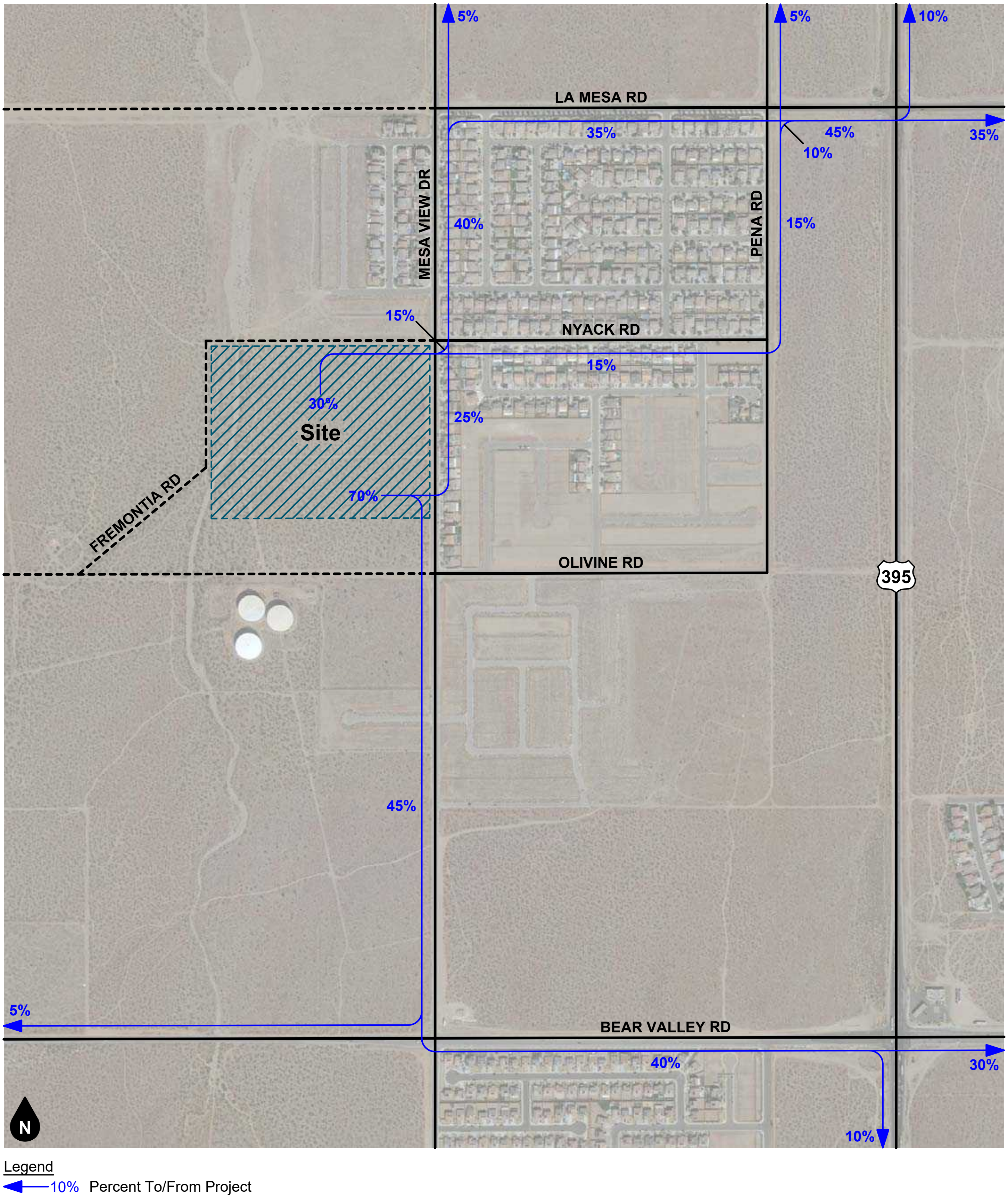


Figure 3
Project Trip Distribution

ganddini

Tract Map No. 20454
Traffic Impact Analysis
19449

Gmail **Bryan Crawford <bryandavidcrawford@gmail.com>**

Tract Map No. 20454 Scoping Agreement

2 messages

Bryan Crawford <bryan@ganddini.com> Thu, Nov 11, 2021 at 2:11 PM
To: Anwar Wagdy <awagdy@victorvilleca.gov>

Anwar,

Attached is the scoping agreement for Tract Map No. 20454. The study intersections are based on comments you made regarding our initial proposal, provided to use by Greg Quan. We are planning on having the intersections counted next week since we can't count the following week. Please review and let me know if there are any questions/comments/revisions to be made to the scoping agreement, or if it is approved as constructed.

Also, we will be preparing a separate VMT screening analysis document. Thank you.

--
Bryan Crawford
Senior Transportation Planner

We've moved! Please note our new address.

GANDDINI GROUP, INC.
555 Parkcenter Drive, Suite 225
Santa Ana, CA 92705
o. 714 795 3100 x 104
c. 714 376 0224
ganddini.com

19449sco_2021-1111.pdf
977K

Anwar Wagdy <awagdy@victorvilleca.gov> Mon, Nov 22, 2021 at 3:32 PM
To: Bryan Crawford <bryan@ganddini.com>

Hi Bryan,

Scoping agreement looks OK.

Thanks,

Anwar

From: Bryan Crawford <bryan@ganddini.com>
Sent: Thursday, November 11, 2021 12:12 PM
To: Anwar Wagdy <awagdy@victorvilleca.gov>
Subject: Tract Map No. 20454 Scoping Agreement

APPENDIX C

VOLUME COUNT WORKSHEETS

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Victorville	PROJECT #:	SC3216
Wed, Dec 8, 21	NORTH & SOUTH:	Mesa View	LOCATION #:	1
	EAST & WEST:	La Mesa	CONTROL:	STOP N/S

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W
E ►
S ▼

		NORTHBOUND Mesa View			SOUTHBOUND Mesa View			EASTBOUND La Mesa			WESTBOUND La Mesa			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	0	0	1	0	0	1	0	
AM	7:00 AM	0	13	5	2	17	0	0	0	0	4	0	1	42
AM	7:15 AM	0	17	1	3	24	0	0	0	0	7	0	2	54
AM	7:30 AM	0	28	6	18	37	0	0	0	0	4	1	3	97
AM	7:45 AM	0	38	6	8	32	0	0	0	0	5	2	16	107
AM	8:00 AM	0	22	4	5	30	0	0	1	0	6	0	5	73
AM	8:15 AM	0	18	2	3	22	0	0	0	1	8	1	6	61
AM	8:30 AM	1	17	5	7	25	0	0	1	0	4	0	3	63
AM	8:45 AM	0	13	5	2	17	1	0	0	1	4	0	5	48
AM	VOLUMES	1	166	34	48	204	1	0	2	2	42	4	41	545
AM	APPROACH %	0%	83%	17%	19%	81%	0%	0%	50%	50%	48%	5%	47%	
AM	APP/DEPART	201	/	207	253	/	248	4	/	84	87	/	6	0
AM	BEGIN PEAK HR		7:30 AM											
AM	VOLUMES	0	106	18	34	121	0	0	1	1	23	4	30	338
AM	APPROACH %	0%	85%	15%	22%	78%	0%	0%	50%	50%	40%	7%	53%	
AM	PEAK HR FACTOR		0.705			0.705			0.500			0.620		0.790
AM	APP/DEPART	124	/	136	155	/	145	2	/	53	57	/	4	0
PM	4:00 PM	0	24	11	8	15	0	0	0	0	6	0	6	70
PM	4:15 PM	0	20	5	11	16	0	0	0	0	7	0	12	71
PM	4:30 PM	0	20	7	8	22	0	0	0	0	8	0	11	76
PM	4:45 PM	0	24	4	7	19	0	0	0	0	6	1	9	70
PM	5:00 PM	0	35	5	3	25	0	0	0	0	6	0	7	81
PM	5:15 PM	0	19	3	3	13	0	0	0	0	5	0	4	47
PM	5:30 PM	0	28	2	4	13	0	0	0	0	8	0	6	61
PM	5:45 PM	1	27	3	6	20	0	1	0	0	4	0	5	67
PM	VOLUMES	1	197	40	50	143	0	1	0	0	50	1	60	544
PM	APPROACH %	0%	82%	17%	26%	74%	0%	100%	0%	0%	45%	1%	54%	
PM	APP/DEPART	239	/	258	193	/	194	1	/	90	111	/	2	0
PM	BEGIN PEAK HR		4:15 PM											
PM	VOLUMES	0	99	21	29	82	0	0	0	0	27	1	39	298
PM	APPROACH %	0%	83%	18%	26%	74%	0%	0%	0%	0%	40%	1%	58%	
PM	PEAK HR FACTOR		0.750			0.925			0.000			0.882		0.920
PM	APP/DEPART	120	/	138	111	/	109	0	/	50	67	/	1	0

AimTD LLC

TURNING MOVEMENT COUNTS

Victorville — SC3216 — ALL HOURS

Mesa View (north)

446	1	347	98	TOTAL	465
193	0	143	50	PM	258
253	1	204	48	AM	207

La Mesa (west)

TOTAL	PM	AM
8	2	6
1	1	0
2	0	2
2	0	2
5	1	4

La Mesa (east)

AM	PM	TOTAL
87	111	198
41	60	101
4	1	5
42	50	92
84	90	174

Mesa View (south)

248	AM	1	166	34	201
194	PM	1	197	40	239
442	TOTAL	2	363	74	440

PEAK HOUR

AM 7:30 AM

PM 4:15 PM

Mesa View (north)

266	0	203	63	TOTAL	274
111	0	82	29	PM	138
155	0	121	34	AM	136

La Mesa (west)

TOTAL	PM	AM
5	1	4
0	0	0
1	0	1
1	0	1
2	0	2

La Mesa (east)

AM	PM	TOTAL
57	67	124
30	39	69
4	1	5
23	27	50
53	50	103

Mesa View (south)

145	AM	0	106	18	124
109	PM	0	99	21	120
254	Total	0	205	39	244

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Victorville	PROJECT #:	SC3216
Wed, Dec 8, 21	NORTH & SOUTH:	Mesa View	LOCATION #:	2
	EAST & WEST:	Bear Valley	CONTROL:	STOP N/S

NOTES:

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		NORTHBOUND Mesa View			SOUTHBOUND Mesa View			EASTBOUND Bear Valley			WESTBOUND Bear Valley			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	1	1	2	1	1	1	1	
AM	7:00 AM	2	1	6	22	0	8	10	72	2	1	57	8	189
AM	7:15 AM	4	3	7	19	1	17	9	76	3	2	60	5	206
AM	7:30 AM	6	3	6	27	0	26	17	94	0	2	78	10	269
AM	7:45 AM	2	2	7	17	2	14	18	107	4	2	75	6	256
AM	8:00 AM	4	4	7	20	3	14	21	95	4	2	45	4	223
AM	8:15 AM	5	2	10	18	2	18	4	80	1	0	43	13	196
AM	8:30 AM	7	0	5	15	1	23	10	69	4	2	49	6	191
AM	8:45 AM	3	1	4	10	0	18	14	84	1	3	48	11	197
AM	VOLUMES	33	16	52	148	9	138	103	677	19	14	455	63	1,727
AM	APPROACH %	33%	16%	51%	50%	3%	47%	13%	85%	2%	3%	86%	12%	
AM	APP/DEPART	101	/	182	295	/	42	799	/	876	532	/	627	0
AM	BEGIN PEAK HR		7:15 AM											
AM	VOLUMES	16	12	27	83	6	71	65	372	11	8	258	25	954
AM	APPROACH %	29%	22%	49%	52%	4%	44%	15%	83%	2%	3%	89%	9%	
AM	PEAK HR FACTOR		0.917			0.755			0.868			0.808		0.887
AM	APP/DEPART	55	/	102	160	/	25	448	/	482	291	/	345	0
PM	4:00 PM	1	3	5	15	3	9	17	113	5	5	116	19	311
PM	4:15 PM	2	0	5	14	1	7	6	102	2	9	96	23	267
PM	4:30 PM	1	0	2	27	4	9	9	79	3	5	91	21	251
PM	4:45 PM	1	1	5	18	3	7	9	90	3	8	91	27	263
PM	5:00 PM	3	0	4	15	2	14	17	94	1	5	111	44	310
PM	5:15 PM	0	2	1	14	0	9	6	73	0	4	108	24	241
PM	5:30 PM	1	0	5	15	1	2	4	67	0	4	75	31	205
PM	5:45 PM	0	1	0	22	1	7	6	59	1	9	100	45	251
PM	VOLUMES	9	7	27	140	15	64	74	677	15	49	788	234	2,099
PM	APPROACH %	21%	16%	63%	64%	7%	29%	10%	88%	2%	5%	74%	22%	
PM	APP/DEPART	43	/	315	219	/	79	766	/	844	1,071	/	861	0
PM	BEGIN PEAK HR		4:00 PM											
PM	VOLUMES	5	4	17	74	11	32	41	384	13	27	394	90	1,092
PM	APPROACH %	19%	15%	65%	63%	9%	27%	9%	88%	3%	5%	77%	18%	
PM	PEAK HR FACTOR		0.722			0.731			0.811			0.913		0.878
PM	APP/DEPART	26	/	135	117	/	51	438	/	475	511	/	431	0

AimTD LLC

TURNING MOVEMENT COUNTS

Victorville

SC3216

ALL HOURS

Mesa View

TOTAL	514	202	24	288
PM	219	64	15	140
AM	295	138	9	148

TOTAL	497
PM	315
AM	182

Bear Valley

TOTAL	PM	AM
1,488	861	627
177	74	103
1,354	677	677
34	15	19
1,565	766	799

Bear Valley

AM	PM	TOTAL
532	1,071	1,603
63	234	297
455	788	1,243
14	49	63
876	844	1,720

Mesa View

42	AM	33	16	52	101
79	PM	9	7	27	43
121	TOTAL	42	23	79	144

PEAK HOUR

AM 7:15 AM

PM 4:00 PM

Mesa View

TOTAL	277	103	17	157
PM	117	32	11	74
AM	160	71	6	83

TOTAL	237
PM	135
AM	102

Bear Valley

TOTAL	PM	AM
776	431	345
106	41	65
756	384	372
24	13	11
886	438	448

Bear Valley

AM	PM	TOTAL
291	511	802
25	90	115
258	394	652
8	27	35
482	475	957

Mesa View

25	AM	16	12	27	55
51	PM	5	4	17	26
76	Total	21	16	44	81

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 cs@aimtd.com

DATE:	LOCATION:	Victorville	PROJECT #:	SC3216
Wed, Dec 8, 21	NORTH & SOUTH:	Pena	LOCATION #:	3
	EAST & WEST:	La Mesa	CONTROL:	STOP N/S

NOTES:

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		NORTHBOUND Pena			SOUTHBOUND Pena			EASTBOUND La Mesa			WESTBOUND La Mesa			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	0	1	1	0	1	1	0	
AM	7:00 AM	0	3	8	6	1	1	0	16	0	2	6	11	54
	7:15 AM	0	4	5	10	1	1	3	7	0	0	12	14	57
	7:30 AM	0	9	12	6	2	7	13	11	0	3	10	8	81
	7:45 AM	0	8	7	8	9	12	13	27	1	4	12	7	108
	8:00 AM	1	3	5	3	12	10	2	23	0	1	16	4	80
	8:15 AM	0	0	9	7	1	7	1	9	1	3	13	5	56
	8:30 AM	0	2	4	3	1	2	0	16	0	1	7	2	38
	8:45 AM	0	2	8	6	2	0	0	10	0	5	14	1	48
	VOLUMES	1	31	58	49	29	40	32	119	2	19	90	52	522
	APPROACH %	1%	34%	64%	42%	25%	34%	21%	78%	1%	12%	56%	32%	
	APP/DEPART	90	/	115	118	/	50	153	/	226	161	/	131	0
	BEGIN PEAK HR		7:15 AM											
	VOLUMES	1	24	29	27	24	30	31	68	1	8	50	33	326
	APPROACH %	2%	44%	54%	33%	30%	37%	31%	68%	1%	9%	55%	36%	
	PEAK HR FACTOR		0.643			0.698			0.610			0.875		0.755
	APP/DEPART	54	/	88	81	/	33	100	/	124	91	/	81	0
PM	4:00 PM	0	3	8	9	7	5	6	17	1	4	11	5	76
	4:15 PM	0	2	5	5	4	9	1	12	1	6	18	5	68
	4:30 PM	0	1	5	8	4	6	7	18	1	3	15	5	73
	4:45 PM	1	0	4	8	1	3	0	14	0	4	18	8	61
	5:00 PM	0	7	7	6	4	4	3	15	0	4	15	6	71
	5:15 PM	1	0	5	5	7	8	1	9	0	5	11	3	55
	5:30 PM	0	2	3	0	7	4	4	11	0	4	17	10	62
	5:45 PM	0	2	7	8	2	5	0	13	0	8	16	5	66
	VOLUMES	2	17	44	49	36	44	22	109	3	38	121	47	532
	APPROACH %	3%	27%	70%	38%	28%	34%	16%	81%	2%	18%	59%	23%	
	APP/DEPART	63	/	87	129	/	77	134	/	201	206	/	167	0
	BEGIN PEAK HR		4:00 PM											
	VOLUMES	1	6	22	30	16	23	14	61	3	17	62	23	278
	APPROACH %	3%	21%	76%	43%	23%	33%	18%	78%	4%	17%	61%	23%	
	PEAK HR FACTOR		0.659			0.821			0.750			0.850		0.914
	APP/DEPART	29	/	44	69	/	36	78	/	112	102	/	86	0

AimTD LLC

TURNING MOVEMENT COUNTS

Pena

247	**84**	**65**	**98**	**TOTAL**
129	44	36	49	**PM**
118	40	29	49	**AM**

202
87
115

La Mesa

TOTAL	PM	AM
298	167	131
54	22	32
228	109	119
5	3	2
287	**134**	**153**

Victorville

SC3216

ALL HOURS

La Mesa

AM	PM	TOTAL
161	**206**	**367**
52	47	**99**
90	121	**211**
19	38	**57**
226	201	**427**

Pena

AM	1	31	58	**90**
PM	2	17	44	**63**
TOTAL	**3**	**48**	**102**	**153**

50
77
127

Pena

150	**53**	**40**	**57**	**TOTAL**
69	23	16	30	**PM**
81	30	24	27	**AM**

132
44
88

La Mesa

TOTAL	PM	AM
167	86	81
45	14	31
129	61	68
4	3	1
178	**78**	**100**

PEAK HOUR

AM 7:15 AM

PM 4:00 PM

La Mesa

AM	PM	TOTAL
91	**102**	**193**
33	23	**56**
50	62	**112**
8	17	**25**
124	112	**236**

Pena

AM	1	24	29	**54**
PM	1	6	22	**29**
Total	**2**	**30**	**51**	**83**

33
36
69

ADT3 Mesa View north of La Mesa.

Prepared by AimTD LLC tel. 714 253 7888

AM Period	NB		SB			PM Period	NB		SB		
0:00	4		4			12:00	15		16		
0:15	3		0			12:15	15		19		
0:30	1		1			12:30	11		19		
0:45	2	10	3	8	18	12:45	19	60	17	71	131
1:00	2		7			13:00	19		28		
1:15	3		0			13:15	17		24		
1:30	2		3			13:30	14		22		
1:45	4	11	0	10	21	13:45	15	65	17	91	156
2:00	0		2			14:00	30		33		
2:15	3		2			14:15	32		20		
2:30	0		1			14:30	52		29		
2:45	5	8	5	10	18	14:45	29	143	46	128	271
3:00	1		3			15:00	30		28		
3:15	1		5			15:15	27		29		
3:30	0		3			15:30	23		29		
3:45	1	3	6	17	20	15:45	42	122	24	110	232
4:00	3		5			16:00	30		23		
4:15	2		14			16:15	32		27		
4:30	2		11			16:30	31		30		
4:45	4	11	15	45	56	16:45	33	126	26	106	232
5:00	7		20			17:00	42		28		
5:15	2		13			17:15	23		16		
5:30	0		22			17:30	34		17		
5:45	2	11	10	65	76	17:45	33	132	26	87	219
6:00	11		19			18:00	33		9		
6:15	7		27			18:15	30		18		
6:30	6		16			18:30	22		13		
6:45	14	38	22	84	122	18:45	24	109	12	52	161
7:00	14		19			19:00	21		8		
7:15	19		27			19:15	24		12		
7:30	31		55			19:30	16		8		
7:45	54	118	40	141	259	19:45	16	77	4	32	109
8:00	27		35			20:00	20		11		
8:15	24		25			20:15	24		8		
8:30	20		32			20:30	11		7		
8:45	18	89	20	112	201	20:45	14	69	10	36	105
9:00	23		32			21:00	14		8		
9:15	5		17			21:15	17		6		
9:30	14		18			21:30	13		10		
9:45	11	53	10	77	130	21:45	16	60	8	32	92
10:00	9		18			22:00	9		4		
10:15	8		18			22:15	10		5		
10:30	19		18			22:30	6		2		
10:45	13	49	23	77	126	22:45	5	30	2	13	43
11:00	8		19			23:00	6		0		
11:15	14		15			23:15	4		1		
11:30	22		16			23:30	7		6		
11:45	18	62	18	68	130	23:45	3	20	3	10	30
Total Vol.		463		714	**1177**			1013		768	**1781**

Daily Totals

NB	SB	Combined
1476	1482	**2958**

	AM			PM		
Split %	39.3%	60.7%	**39.8%**	56.9%	43.1%	**60.2%**
Peak Hour	7:30	7:15	**7:30**	14:00	14:30	**14:00**
Volume	136	157	**291**	143	132	**271**
P.H.F.	0.63	0.71	**0.77**	0.80	0.72	**0.84**

cs@aimtd.com Tell. 714 253 7888

ADT1 Mesa View south of La Mesa. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	NB		SB			PM Period	NB		SB		
0:00	3		6			12:00	13		18		
0:15	2		0			12:15	18		22		
0:30	1		2			12:30	14		21		
0:45	1	7	2	10	17	12:45	19	64	19	80	144
1:00	3		7			13:00	16		29		
1:15	3		1			13:15	20		20		
1:30	0		3			13:30	15		24		
1:45	2	8	0	11	19	13:45	18	69	21	94	163
2:00	0		0			14:00	26		30		
2:15	3		2			14:15	29		22		
2:30	0		2			14:30	46		32		
2:45	2	5	6	10	15	14:45	29	130	56	140	270
3:00	1		2			15:00	31		38		
3:15	0		5			15:15	30		38		
3:30	0		3			15:30	19		30		
3:45	0	1	5	15	16	15:45	43	123	22	128	251
4:00	2		5			16:00	35		21		
4:15	4		14			16:15	25		23		
4:30	2		9			16:30	27		30		
4:45	4	12	14	42	54	16:45	28	115	25	99	214
5:00	4		18			17:00	40		31		
5:15	4		14			17:15	22		18		
5:30	2		17			17:30	31		22		
5:45	7	17	12	61	78	17:45	31	124	24	95	219
6:00	13		20			18:00	33		12		
6:15	9		34			18:15	23		18		
6:30	11		22			18:30	19		15		
6:45	16	49	25	101	150	18:45	20	95	16	61	156
7:00	18		21			19:00	19		11		
7:15	18		31			19:15	22		12		
7:30	34		41			19:30	15		8		
7:45	44	114	37	130	244	19:45	17	73	9	40	113
8:00	26		36			20:00	15		15		
8:15	20		31			20:15	19		7		
8:30	23		29			20:30	10		9		
8:45	18	87	22	118	205	20:45	10	54	10	41	95
9:00	26		27			21:00	11		6		
9:15	6		17			21:15	13		7		
9:30	13		12			21:30	14		12		
9:45	12	57	8	64	121	21:45	13	51	8	33	84
10:00	10		14			22:00	9		5		
10:15	12		11			22:15	8		8		
10:30	21		22			22:30	6		2		
10:45	18	61	20	67	128	22:45	5	28	3	18	46
11:00	7		19			23:00	5		2		
11:15	14		15			23:15	3		1		
11:30	24		16			23:30	4		3		
11:45	14	59	16	66	125	23:45	2	14	2	8	22
Total Vol.		477		695	**1172**			940		837	**1777**

Daily Totals

NB	SB	Combined
1417	1532	**2949**

	AM			PM		
Split %	40.7%	59.3%	**39.7%**	52.9%	47.1%	**60.3%**
Peak Hour	7:30	7:15	**7:30**	14:30	14:30	**14:30**
Volume	124	145	**269**	136	164	**300**
P.H.F.	0.70	0.88	**0.83**	0.74	0.73	**0.88**

cs@aimtd.com Tell. 714 253 7888

Wednesday, December 08, 2021 CITY: Victorville PROJECT: SC3216

ADT9 Mesa View north of Bear Valley. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	NB		SB			PM Period	NB		SB		
0:00	3		3			12:00	13		27		
0:15	1		0			12:15	25		20		
0:30	1		2			12:30	20		22		
0:45	1	6	1	6	12	12:45	24	82	19	88	170
1:00	3		8			13:00	19		29		
1:15	5		4			13:15	31		19		
1:30	0		1			13:30	19		30		
1:45	4	12	2	15	27	13:45	23	92	31	109	201
2:00	2		1			14:00	23		26		
2:15	2		3			14:15	31		23		
2:30	0		2			14:30	47		33		
2:45	2	6	8	14	20	14:45	38	139	53	135	274
3:00	0		3			15:00	35		39		
3:15	1		5			15:15	47		41		
3:30	1		3			15:30	31		37		
3:45	1	3	11	22	25	15:45	56	169	22	139	308
4:00	3		7			16:00	39		27		
4:15	3		20			16:15	29		22		
4:30	3		16			16:30	30		40		
4:45	3	12	30	73	85	16:45	37	135	28	117	252
5:00	1		26			17:00	61		31		
5:15	1		24			17:15	32		23		
5:30	2		24			17:30	35		18		
5:45	5	9	27	101	110	17:45	52	180	30	102	282
6:00	13		24			18:00	34		20		
6:15	10		40			18:15	37		16		
6:30	6		31			18:30	30		17		
6:45	14	43	25	120	163	18:45	30	131	15	68	199
7:00	19		30			19:00	30		13		
7:15	17		37			19:15	32		15		
7:30	30		53			19:30	33		9		
7:45	26	92	33	153	245	19:45	24	119	8	45	164
8:00	29		37			20:00	34		11		
8:15	19		38			20:15	20		6		
8:30	17		39			20:30	19		8		
8:45	25	90	28	142	232	20:45	21	94	13	38	132
9:00	29		26			21:00	20		6		
9:15	12		26			21:15	19		5		
9:30	12		22			21:30	17		8		
9:45	10	63	12	86	149	21:45	19	75	8	27	102
10:00	6		8			22:00	13		3		
10:15	14		19			22:15	10		7		
10:30	18		27			22:30	8		1		
10:45	18	56	21	75	131	22:45	8	39	2	13	52
11:00	8		23			23:00	7		4		
11:15	11		18			23:15	9		4		
11:30	24		19			23:30	7		2		
11:45	15	58	21	81	139	23:45	5	28	2	12	40
Total Vol.		450		888	**1338**			1283		893	**2176**

Daily Totals

NB	SB	Combined
1733	1781	**3514**

	AM NB	AM SB	AM	PM NB	PM SB	PM
Split %	33.6%	66.4%	**38.1%**	59.0%	41.0%	**61.9%**
Peak Hour	7:30	7:30	**7:30**	17:00	14:45	**14:30**
Volume	104	161	**265**	180	170	**333**
P.H.F.	0.87	0.76	**0.80**	0.67	0.80	**0.91**

cs@aimtd.com Tell. 714 253 7888

Wednesday, December 08, 2021 CITY: Victorville PROJECT: SC3216

ADT10 Mesa View south of Bear Valley. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	NB		SB			PM Period	NB		SB		
0:00	1		2			12:00	7		7		
0:15	1		2			12:15	6		8		
0:30	0		0			12:30	11		3		
0:45	0	2	0	4	6	12:45	8	32	6	24	56
1:00	2		2			13:00	3		6		
1:15	0		2			13:15	12		6		
1:30	1		0			13:30	5		7		
1:45	1	4	0	4	8	13:45	9	29	8	27	56
2:00	1		1			14:00	14		9		
2:15	3		1			14:15	8		13		
2:30	1		1			14:30	16		11		
2:45	2	7	0	3	10	14:45	12	50	13	46	96
3:00	0		0			15:00	7		14		
3:15	0		1			15:15	12		12		
3:30	0		0			15:30	2		7		
3:45	3	3	2	3	6	15:45	6	27	12	45	72
4:00	3		1			16:00	9		13		
4:15	2		0			16:15	7		12		
4:30	5		2			16:30	3		12		
4:45	2	12	0	3	15	16:45	7	26	14	51	77
5:00	3		1			17:00	7		8		
5:15	2		1			17:15	3		4		
5:30	8		1			17:30	6		5		
5:45	5	18	1	4	22	17:45	1	17	11	28	45
6:00	7		1			18:00	8		5		
6:15	6		3			18:15	3		10		
6:30	3		3			18:30	7		6		
6:45	5	21	5	12	33	18:45	5	23	7	28	51
7:00	9		3			19:00	3		7		
7:15	14		6			19:15	3		7		
7:30	15		2			19:30	2		4		
7:45	11	49	8	19	68	19:45	1	9	13	31	40
8:00	15		9			20:00	1		5		
8:15	17		3			20:15	0		5		
8:30	12		7			20:30	1		3		
8:45	8	52	4	23	75	20:45	2	4	3	16	20
9:00	4		5			21:00	2		8		
9:15	3		1			21:15	0		5		
9:30	5		2			21:30	2		4		
9:45	3	15	4	12	27	21:45	0	4	2	19	23
10:00	3		3			22:00	0		1		
10:15	6		6			22:15	4		2		
10:30	3		1			22:30	1		2		
10:45	5	17	6	16	33	22:45	0	5	1	6	11
11:00	9		3			23:00	2		4		
11:15	5		8			23:15	0		1		
11:30	9		9			23:30	1		1		
11:45	5	28	3	23	51	23:45	1	4	0	6	10
Total Vol.		228		126	**354**			230		327	**557**

Daily Totals

NB	SB	Combined
458	453	**911**

	AM			PM		
Split %	64.4%	35.6%	**38.9%**	41.3%	58.7%	**61.1%**
Peak Hour	7:30	7:45	**7:45**	14:00	14:15	**14:30**
Volume	58	27	**82**	50	51	**97**
P.H.F.	0.85	0.75	**0.85**	0.84	0.91	**0.90**

cs@aimtd.com Tell. 714 253 7888

SPEED La Mesa between Caliente and Ethan.
Eastbound

Wednesday, December 08, 2021

Project# **SC3216**

PREPARED BY: AimTD 714 253 7888 cs@aimtd.com

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12:15:00 AM	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0.35%
12:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12:45:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.18%
1:00:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
1:15:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
1:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
1:45:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
2:00:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0.35%
2:15:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.18%
2:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
2:45:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
3:00:00 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0.35%
3:15:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
3:30:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.18%
3:45:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.18%
4:00:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.18%
4:15:00 AM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.35%
4:30:00 AM	0	0	0	0	1	0	0	1	1	0	0	0	0	0	3	0.53%
4:45:00 AM	0	0	0	0	0	0	1	2	1	0	0	0	0	0	4	0.70%
5:00:00 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0.35%
5:15:00 AM	0	0	0	0	0	0	2	2	1	0	0	0	0	0	5	0.88%
5:30:00 AM	0	0	0	0	0	0	0	3	3	1	0	0	0	0	7	1.23%
5:45:00 AM	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0.35%
6:00:00 AM	0	0	0	0	1	1	2	0	0	1	1	0	0	0	6	1.05%
6:15:00 AM	0	0	0	0	0	1	4	0	0	0	0	0	0	0	5	0.88%
6:30:00 AM	0	0	0	0	0	0	1	2	1	1	0	0	0	0	5	0.88%
6:45:00 AM	0	2	2	0	0	0	4	1	1	3	0	0	0	0	13	2.28%
7:00:00 AM	0	0	0	1	0	2	3	1	2	0	0	0	0	0	9	1.58%
7:15:00 AM	0	0	0	0	0	0	1	2	0	2	0	0	0	0	5	0.88%
7:30:00 AM	0	0	0	0	2	3	4	1	3	0	0	0	0	0	13	2.28%
7:45:00 AM	0	0	0	1	0	1	4	3	0	0	0	0	0	0	9	1.58%
8:00:00 AM	0	0	0	0	0	1	3	2	2	0	0	0	0	0	8	1.40%
8:15:00 AM	0	0	1	0	1	0	2	1	0	1	0	0	0	0	6	1.05%
8:30:00 AM	0	0	0	0	1	3	3	2	1	1	0	0	0	0	11	1.93%
8:45:00 AM	0	0	0	0	0	1	3	2	0	0	0	0	0	0	6	1.05%
9:00:00 AM	0	0	0	0	0	2	2	3	1	0	1	0	0	0	9	1.58%
9:15:00 AM	0	0	0	1	1	1	3	1	0	1	0	0	0	0	8	1.40%
9:30:00 AM	0	0	0	0	0	0	4	1	2	0	0	0	0	0	7	1.23%
9:45:00 AM	0	0	0	0	1	3	3	3	0	0	0	0	0	0	10	1.75%
10:00:00 AM	0	0	0	0	0	3	5	4	2	0	0	0	0	0	14	2.46%
10:15:00 AM	0	0	0	1	2	3	2	3	4	0	0	0	0	0	15	2.63%
10:30:00 AM	0	0	0	0	3	2	2	1	1	0	0	0	0	0	9	1.58%
10:45:00 AM	0	0	0	1	0	3	2	2	0	1	0	0	0	0	9	1.58%
11:00:00 AM	0	0	0	0	1	2	2	1	2	0	0	0	0	0	8	1.40%
11:15:00 AM	0	0	0	0	0	2	3	3	2	1	0	0	0	0	11	1.93%
11:30:00 AM	0	0	0	0	0	2	2	3	1	0	0	0	0	0	8	1.40%
11:45:00 AM	0	0	0	0	1	1	3	1	2	0	0	0	0	0	8	1.40%
AM TOTAL	0	2	3	7	16	38	75	53	38	14	2	0	0	0	248	43.51%
PERCENTAGE	0.0%	0.8%	1.2%	2.8%	6.5%	15.3%	30.2%	21.4%	15.3%	5.6%	0.8%	0.0%	0.0%	0.0%		
CUMULATIVE	0	2	5	12	28	66	141	194	232	246	248	248	248	248		
PERCENTAGE	0.0%	0.8%	2.0%	4.8%	11.3%	26.6%	56.9%	78.2%	93.5%	99.2%	100.0%	100.0%	100.0%	100.0%		

15th Percentile	33	Mean Speed Average	39
50th Percentile	40	10 MPH Pace Speed	36-45
85th Percentile	47	Number in Pace	141
95th Percentile	50	Percent in Pace	57%

SPEED La Mesa between Caliente and Ethan. Eastbound

Project# SC3216

Wednesday, December 08, 2021 | **PREPARED BY: AimTD 714 253 7888 cs@aimtd.com**

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 PM	0	0	0	0	0	1	1	3	1	1	0	0	0	0	7	1.23%
12:15:00 PM	0	0	0	1	0	3	3	4	2	0	0	0	0	0	13	2.28%
12:30:00 PM	0	0	0	0	1	2	4	1	0	1	0	0	0	0	9	1.58%
12:45:00 PM	0	0	0	1	0	2	2	2	1	0	0	0	0	0	8	1.40%
1:00:00 PM	0	0	0	0	0	3	3	2	1	0	0	0	0	0	9	1.58%
1:15:00 PM	0	0	0	0	0	1	4	3	0	0	0	0	0	0	8	1.40%
1:30:00 PM	0	0	0	0	1	1	1	2	1	1	0	0	0	0	7	1.23%
1:45:00 PM	0	0	0	0	2	2	1	4	1	1	1	0	0	0	12	2.11%
2:00:00 PM	0	0	0	1	0	0	2	5	0	0	1	0	0	0	9	1.58%
2:15:00 PM	0	0	0	0	1	1	1	2	1	0	0	0	0	0	6	1.05%
2:30:00 PM	0	0	0	0	1	3	1	2	1	0	0	0	0	0	8	1.40%
2:45:00 PM	0	0	0	0	2	3	2	3	2	0	0	0	0	0	12	2.11%
3:00:00 PM	0	0	0	0	1	0	3	2	1	1	0	0	0	0	8	1.40%
3:15:00 PM	0	0	1	1	2	0	1	2	1	0	0	0	0	0	8	1.40%
3:30:00 PM	0	0	0	0	0	2	2	4	2	0	0	0	0	0	10	1.75%
3:45:00 PM	0	0	0	0	0	2	1	4	0	0	0	0	0	0	7	1.23%
4:00:00 PM	0	0	0	0	1	2	2	2	2	0	0	0	0	0	9	1.58%
4:15:00 PM	0	0	0	3	1	1	0	1	1	0	0	0	0	0	7	1.23%
4:30:00 PM	0	0	1	3	2	7	4	2	0	0	0	0	0	0	19	3.33%
4:45:00 PM	0	0	0	0	2	0	1	3	2	1	1	0	0	0	10	1.75%
5:00:00 PM	0	0	0	0	0	0	1	2	2	1	0	0	0	0	6	1.05%
5:15:00 PM	0	0	0	0	2	2	0	3	0	0	0	0	0	0	7	1.23%
5:30:00 PM	0	0	0	2	0	1	3	2	1	0	0	0	0	0	9	1.58%
5:45:00 PM	0	0	1	0	0	1	2	4	2	1	0	0	0	0	11	1.93%
6:00:00 PM	0	0	0	0	2	0	0	3	0	1	0	0	0	0	6	1.05%
6:15:00 PM	0	0	0	0	0	1	2	2	3	0	0	0	0	0	8	1.40%
6:30:00 PM	0	0	0	0	0	0	3	4	1	1	2	0	0	0	11	1.93%
6:45:00 PM	0	0	0	1	0	2	2	0	1	0	0	0	0	0	6	1.05%
7:00:00 PM	0	1	0	1	1	3	0	2	0	0	0	0	0	0	8	1.40%
7:15:00 PM	0	0	0	0	0	2	2	4	0	1	0	0	0	0	9	1.58%
7:30:00 PM	0	0	0	0	0	0	0	0	3	1	0	0	0	0	4	0.70%
7:45:00 PM	0	0	0	0	0	0	0	1	0	1	1	0	0	0	3	0.53%
8:00:00 PM	0	0	0	0	0	1	0	2	0	1	0	0	0	0	4	0.70%
8:15:00 PM	0	0	0	0	0	1	0	2	2	0	0	0	0	0	5	0.88%
8:30:00 PM	0	0	0	0	0	0	1	1	1	2	0	0	0	0	5	0.88%
8:45:00 PM	0	0	0	0	0	2	0	2	2	0	0	0	0	0	6	1.05%
9:00:00 PM	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0.35%
9:15:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.18%
9:30:00 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2	0.35%
9:45:00 PM	0	0	0	1	0	1	0	0	1	1	0	0	0	0	4	0.70%
10:00:00 PM	0	0	0	0	0	0	0	3	0	1	0	0	0	0	4	0.70%
10:15:00 PM	0	0	0	0	0	0	3	1	0	1	1	0	0	0	6	1.05%
10:30:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.18%
10:45:00 PM	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0.35%
11:00:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11:15:00 PM	0	0	0	0	1	1	0	0	1	0	0	0	0	0	3	0.53%
11:30:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.18%
11:45:00 PM	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	0.35%
PM TOTAL	0	1	4	15	23	56	60	92	43	20	8	0	0	0	322	56.49%
PERCENTAGE	0.0%	0.3%	1.2%	4.7%	7.1%	17.4%	18.6%	28.6%	13.4%	6.2%	2.5%	0.0%	0.0%	0.0%		
CUMULATIVE	0	1	5	20	43	99	159	251	294	314	322	322	322	322		
PERCENTAGE	0.0%	0.3%	1.6%	6.2%	13.4%	30.7%	49.4%	78.0%	91.3%	97.5%	100.0%	100.0%	100.0%	100.0%		

15th Percentile	32	Mean Speed Average	40
50th Percentile	41	10 MPH Pace Speed	36-45
85th Percentile	47	Number in Pace	167
95th Percentile	52	Percent in Pace	52%

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	
DAY TOTAL	0	3	7	22	39	94	135	145	81	34	10	0	0	0	570	
PERCENTAGE	0.0%	0.5%	1.2%	3.9%	6.8%	16.5%	23.7%	25.4%	14.2%	6.0%	1.8%	0.0%	0.0%	0.0%	570	100.00%
	0.0%	0.5%	1.8%	5.6%	12.5%	28.9%	52.6%	78.1%	92.3%	98.2%	100.0%	100.0%	100.0%	100.0%		
85th Percentile	47															

SPEED La Mesa between Caliente and Ethan. Westbound

Project# **SC3216**

Wednesday, December 08, 2021

PREPARED BY: AimTD 714 253 7888 cs@aimtd.com

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.12%
12:15:00 AM	0	0	0	0	1	0	1	1	1	0	0	0	0	0	4	0.50%
12:30:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.12%
12:45:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0.25%
1:00:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.12%
1:15:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.12%
1:30:00 AM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.25%
1:45:00 AM	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0.25%
2:00:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
2:15:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.12%
2:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
2:45:00 AM	0	0	0	0	0	1	2	1	0	0	0	0	0	0	4	0.50%
3:00:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.12%
3:15:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.12%
3:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
3:45:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.12%
4:00:00 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0.25%
4:15:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
4:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
4:45:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0.25%
5:00:00 AM	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0.25%
5:15:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.12%
5:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
5:45:00 AM	0	0	1	0	0	0	0	1	1	0	0	0	0	0	3	0.37%
6:00:00 AM	0	0	0	0	1	3	1	0	1	0	0	0	0	0	6	0.75%
6:15:00 AM	0	0	0	1	3	1	1	4	1	0	0	0	0	0	11	1.37%
6:30:00 AM	0	0	0	1	0	2	2	2	1	0	0	0	0	0	8	1.00%
6:45:00 AM	0	0	0	0	2	1	3	2	1	0	0	0	0	0	9	1.12%
7:00:00 AM	0	0	0	0	0	1	1	1	0	0	0	1	0	0	4	0.50%
7:15:00 AM	0	0	0	0	1	1	1	2	1	3	0	0	0	0	9	1.12%
7:30:00 AM	0	0	0	1	6	1	3	2	1	0	0	0	0	0	14	1.74%
7:45:00 AM	0	0	0	0	2	1	3	3	2	0	0	0	0	0	11	1.37%
8:00:00 AM	0	0	0	1	3	2	4	2	1	1	0	0	0	0	14	1.74%
8:15:00 AM	0	0	0	1	1	3	2	2	1	0	0	0	0	0	10	1.25%
8:30:00 AM	0	0	0	1	2	2	6	3	2	1	0	0	0	0	17	2.12%
8:45:00 AM	0	0	0	0	2	3	5	4	1	0	0	0	0	0	15	1.87%
9:00:00 AM	0	0	0	1	0	2	3	2	1	1	1	0	0	0	11	1.37%
9:15:00 AM	0	0	0	0	1	2	4	2	0	0	0	0	0	0	9	1.12%
9:30:00 AM	0	0	0	1	1	1	2	0	1	0	0	0	0	0	6	0.75%
9:45:00 AM	0	0	0	0	0	1	5	2	1	0	0	0	0	0	9	1.12%
10:00:00 AM	0	0	0	1	1	1	4	3	0	2	0	0	0	0	12	1.49%
10:15:00 AM	0	0	1	0	0	1	1	2	1	0	0	0	0	0	6	0.75%
10:30:00 AM	0	0	0	1	1	0	2	2	2	0	0	0	0	0	8	1.00%
10:45:00 AM	0	0	0	0	1	2	2	0	0	1	0	0	0	0	6	0.75%
11:00:00 AM	0	0	0	0	0	3	4	2	2	0	0	0	0	0	11	1.37%
11:15:00 AM	0	0	0	2	1	3	3	3	1	0	0	0	0	0	13	1.62%
11:30:00 AM	0	0	0	1	1	3	5	2	1	0	1	0	0	0	14	1.74%
11:45:00 AM	0	0	0	0	2	4	5	3	2	0	0	0	0	0	16	1.99%
AM TOTAL	0	0	2	13	34	49	80	56	33	10	3	1	0	0	281	34.99%
PERCENTAGE	0.0%	0.0%	0.7%	4.6%	12.1%	17.4%	28.5%	19.9%	11.7%	3.6%	1.1%	0.4%	0.0%	0.0%		
CUMULATIVE	0	0	2	15	49	98	178	234	267	277	280	281	281	281		
PERCENTAGE	0.0%	0.0%	0.7%	5.3%	17.4%	34.9%	63.3%	83.3%	95.0%	98.6%	99.6%	100.0%	100.0%	100.0%		

15th Percentile	31	Mean Speed Average	38
50th Percentile	38	10 MPH Pace Speed	33-42
85th Percentile	46	Number in Pace	148
95th Percentile	50	Percent in Pace	53%

SPEED La Mesa between Caliente and Ethan. Westbound

Project# **SC3216**

Wednesday, December 08, 2021 **PREPARED BY: AimTD 714 253 7888 cs@aimtd.com**

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 PM	0	0	0	1	2	2	2	4	1	0	0	0	0	0	12	1.49%
12:15:00 PM	0	0	0	0	2	1	3	1	0	0	0	0	0	0	7	0.87%
12:30:00 PM	0	0	0	0	0	2	3	2	2	0	0	0	0	0	9	1.12%
12:45:00 PM	0	0	0	2	1	3	4	2	0	0	0	0	0	0	12	1.49%
1:00:00 PM	0	0	0	0	0	2	5	2	3	1	0	0	0	0	13	1.62%
1:15:00 PM	0	0	0	0	0	3	3	1	2	0	0	0	0	0	9	1.12%
1:30:00 PM	0	0	0	0	0	1	2	4	1	0	0	0	0	0	8	1.00%
1:45:00 PM	0	0	0	0	1	2	5	3	1	1	0	0	0	0	13	1.62%
2:00:00 PM	0	0	0	0	2	3	4	5	3	0	0	0	0	0	17	2.12%
2:15:00 PM	0	0	0	1	2	2	5	3	1	1	0	0	0	0	15	1.87%
2:30:00 PM	0	0	0	0	2	3	7	3	4	1	0	0	0	0	20	2.49%
2:45:00 PM	0	0	0	1	3	6	6	4	1	1	1	0	0	0	23	2.86%
3:00:00 PM	0	0	1	2	3	3	5	3	2	2	0	0	0	0	21	2.62%
3:15:00 PM	0	0	0	0	0	3	5	3	2	3	0	0	0	0	16	1.99%
3:30:00 PM	0	0	0	1	0	1	4	2	2	2	0	0	0	0	12	1.49%
3:45:00 PM	0	0	0	1	1	3	5	3	1	1	1	0	0	0	16	1.99%
4:00:00 PM	0	0	0	2	1	4	3	1	1	1	0	0	0	0	13	1.62%
4:15:00 PM	0	0	1	4	1	5	6	2	1	0	0	0	0	0	20	2.49%
4:30:00 PM	0	0	0	0	0	3	5	2	1	0	1	0	0	0	12	1.49%
4:45:00 PM	0	0	0	1	1	2	5	6	3	0	0	0	0	0	18	2.24%
5:00:00 PM	0	0	0	0	0	3	7	1	1	1	0	0	0	0	13	1.62%
5:15:00 PM	0	0	0	0	1	1	5	3	2	2	0	0	0	0	14	1.74%
5:30:00 PM	0	0	0	1	0	2	7	6	1	2	0	0	0	0	19	2.37%
5:45:00 PM	0	0	0	0	0	4	10	4	0	1	0	1	0	0	20	2.49%
6:00:00 PM	0	0	0	1	1	1	4	5	2	0	0	0	0	0	14	1.74%
6:15:00 PM	0	0	0	1	1	2	5	2	1	1	0	0	0	0	13	1.62%
6:30:00 PM	0	0	0	0	0	6	7	3	1	0	0	0	0	0	17	2.12%
6:45:00 PM	0	0	0	1	0	6	2	1	0	0	0	0	0	0	10	1.25%
7:00:00 PM	0	0	0	0	0	1	1	2	3	0	0	0	0	0	7	0.87%
7:15:00 PM	0	0	0	1	1	1	3	0	1	0	0	0	0	0	7	0.87%
7:30:00 PM	0	0	0	0	2	2	1	1	2	1	0	0	0	0	9	1.12%
7:45:00 PM	0	0	0	0	0	3	2	1	1	1	1	0	0	0	9	1.12%
8:00:00 PM	0	0	0	0	0	1	2	4	0	1	0	0	0	0	8	1.00%
8:15:00 PM	0	0	0	0	1	2	4	0	1	0	0	0	0	0	8	1.00%
8:30:00 PM	0	0	0	0	1	1	2	2	2	0	0	0	0	0	8	1.00%
8:45:00 PM	0	0	0	0	0	2	3	3	3	1	0	0	0	0	12	1.49%
9:00:00 PM	0	0	0	0	1	1	1	1	0	0	0	0	0	0	4	0.50%
9:15:00 PM	0	0	0	0	0	1	4	4	1	0	0	0	0	0	10	1.25%
9:30:00 PM	0	0	0	0	0	0	3	3	0	0	1	0	0	0	7	0.87%
9:45:00 PM	0	0	0	0	0	0	2	0	2	0	0	0	0	0	4	0.50%
10:00:00 PM	0	0	0	0	0	3	1	1	2	0	0	0	0	0	7	0.87%
10:15:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.12%
10:30:00 PM	0	0	0	0	1	0	1	0	1	0	0	0	0	0	3	0.37%
10:45:00 PM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0.25%
11:00:00 PM	0	0	0	0	0	0	2	1	1	0	0	0	0	0	4	0.50%
11:15:00 PM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.25%
11:30:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.12%
11:45:00 PM	0	0	0	0	0	0	1	1	0	1	0	0	0	0	3	0.37%
PM TOTAL	0	0	3	21	33	97	169	106	61	26	5	1	0	0	522	65.01%
PERCENTAGE	0.0%	0.0%	0.6%	4.0%	6.3%	18.6%	32.4%	20.3%	11.7%	5.0%	1.0%	0.2%	0.0%	0.0%		
CUMULATIVE	0	0	3	24	57	154	323	429	490	516	521	522	522	522		
PERCENTAGE	0.0%	0.0%	0.6%	4.6%	10.9%	29.5%	61.9%	82.2%	93.9%	98.9%	99.8%	100.0%	100.0%	100.0%		

15th Percentile	32	Mean Speed Average	39
50th Percentile	39	10 MPH Pace Speed	36-45
85th Percentile	46	Number in Pace	254
95th Percentile	51	Percent in Pace	49%

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
DAY TOTAL	0	0	5	34	67	146	249	162	94	36	8	2	0	0	803	
PERCENTAGE	0.0%	0.0%	0.6%	4.2%	8.3%	18.2%	31.0%	20.2%	11.7%	4.5%	1.0%	0.2%	0.0%	0.00%	803	100.00%
	0.0%	0.0%	0.6%	4.9%	13.2%	31.4%	62.4%	82.6%	94.3%	98.8%	99.8%	100.0%	100.0%	100.00%		
85th Percentile	46															

SPEED La Mesa between Caliente and Ethan. Combined

Project# **SC3216**

Wednesday, December 08, 2021

PREPARED BY: AimTD 714 253 7888 cs@aimtd.com

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.07%
12:15:00 AM	0	0	0	1	1	0	2	1	1	0	0	0	0	0	6	0.44%
12:30:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.07%
12:45:00 AM	0	0	0	0	1	1	0	1	0	0	0	0	0	0	3	0.22%
1:00:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.07%
1:15:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.07%
1:30:00 AM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.15%
1:45:00 AM	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0.15%
2:00:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0.15%
2:15:00 AM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0.15%
2:30:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
2:45:00 AM	0	0	0	0	0	1	2	1	0	0	0	0	0	0	4	0.29%
3:00:00 AM	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3	0.22%
3:15:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.07%
3:30:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.07%
3:45:00 AM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.15%
4:00:00 AM	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3	0.22%
4:15:00 AM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0.15%
4:30:00 AM	0	0	0	0	1	0	0	1	1	0	0	0	0	0	3	0.22%
4:45:00 AM	0	0	0	0	0	1	1	3	1	0	0	0	0	0	6	0.44%
5:00:00 AM	0	0	0	0	0	0	1	1	2	0	0	0	0	0	4	0.29%
5:15:00 AM	0	0	0	0	0	0	2	2	1	0	1	0	0	0	6	0.44%
5:30:00 AM	0	0	0	0	0	0	0	3	3	1	0	0	0	0	7	0.51%
5:45:00 AM	0	0	1	1	0	0	1	1	1	0	0	0	0	0	5	0.36%
6:00:00 AM	0	0	0	0	2	4	3	0	1	1	1	0	0	0	12	0.87%
6:15:00 AM	0	0	0	1	3	2	5	4	1	0	0	0	0	0	16	1.17%
6:30:00 AM	0	0	0	1	0	2	3	4	2	1	0	0	0	0	13	0.95%
6:45:00 AM	0	2	2	0	2	1	7	3	2	3	0	0	0	0	22	1.60%
7:00:00 AM	0	0	0	1	0	3	4	2	2	0	0	1	0	0	13	0.95%
7:15:00 AM	0	0	0	0	1	1	2	4	1	5	0	0	0	0	14	1.02%
7:30:00 AM	0	0	0	1	8	4	7	3	4	0	0	0	0	0	27	1.97%
7:45:00 AM	0	0	0	1	2	2	7	6	2	0	0	0	0	0	20	1.46%
8:00:00 AM	0	0	0	1	3	3	7	4	3	1	0	0	0	0	22	1.60%
8:15:00 AM	0	0	1	1	2	3	4	3	1	1	0	0	0	0	16	1.17%
8:30:00 AM	0	0	0	1	3	5	9	5	3	2	0	0	0	0	28	2.04%
8:45:00 AM	0	0	0	0	2	4	8	6	1	0	0	0	0	0	21	1.53%
9:00:00 AM	0	0	0	1	0	4	5	5	2	1	2	0	0	0	20	1.46%
9:15:00 AM	0	0	0	1	2	3	7	3	0	1	0	0	0	0	17	1.24%
9:30:00 AM	0	0	0	1	1	1	6	1	3	0	0	0	0	0	13	0.95%
9:45:00 AM	0	0	0	0	1	4	8	5	1	0	0	0	0	0	19	1.38%
10:00:00 AM	0	0	0	1	1	4	9	7	2	2	0	0	0	0	26	1.89%
10:15:00 AM	0	0	1	1	2	4	3	5	5	0	0	0	0	0	21	1.53%
10:30:00 AM	0	0	0	1	4	2	4	3	3	0	0	0	0	0	17	1.24%
10:45:00 AM	0	0	0	1	1	5	4	2	0	2	0	0	0	0	15	1.09%
11:00:00 AM	0	0	0	0	1	5	6	3	4	0	0	0	0	0	19	1.38%
11:15:00 AM	0	0	0	2	1	5	6	6	3	1	0	0	0	0	24	1.75%
11:30:00 AM	0	0	0	1	1	5	7	5	2	0	1	0	0	0	22	1.60%
11:45:00 AM	0	0	0	0	3	5	8	4	4	0	0	0	0	0	24	1.75%
AM TOTAL	0	2	5	20	50	87	155	109	71	24	5	1	0	0	529	38.53%
PERCENTAGE	0.0%	0.4%	0.9%	3.8%	9.5%	16.4%	29.3%	20.6%	13.4%	4.5%	0.9%	0.2%	0.0%	0.0%		
CUMULATIVE	0	2	7	27	77	164	319	428	499	523	528	529	529	529		
PERCENTAGE	0.0%	0.4%	1.3%	5.1%	14.6%	31.0%	60.3%	80.9%	94.3%	98.9%	99.8%	100.0%	100.0%	100.0%		

15th Percentile	31	Mean Speed Average	39
50th Percentile	39	10 MPH Pace Speed	36-45
85th Percentile	47	Number in Pace	255
95th Percentile	51	Percent in Pace	48%

SPEED La Mesa between Caliente and Ethan. **Project# SC3216**
Combined

Wednesday, December 08, 2021 **PREPARED BY: AimTD 714 253 7888 cs@aimtd.com**

Time	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
12:00:00 PM	0	0	0	1	2	3	3	7	2	1	0	0	0	0	19	1.38%
12:15:00 PM	0	0	0	1	2	4	6	5	2	0	0	0	0	0	20	1.46%
12:30:00 PM	0	0	0	0	1	4	7	3	2	1	0	0	0	0	18	1.31%
12:45:00 PM	0	0	0	3	1	5	6	4	1	0	0	0	0	0	20	1.46%
1:00:00 PM	0	0	0	0	0	5	8	4	4	1	0	0	0	0	22	1.60%
1:15:00 PM	0	0	0	0	0	4	7	4	2	0	0	0	0	0	17	1.24%
1:30:00 PM	0	0	0	0	1	2	3	6	2	1	0	0	0	0	15	1.09%
1:45:00 PM	0	0	0	0	3	4	6	7	2	2	1	0	0	0	25	1.82%
2:00:00 PM	0	0	0	1	2	3	6	10	3	0	1	0	0	0	26	1.89%
2:15:00 PM	0	0	0	1	3	3	6	5	2	1	0	0	0	0	21	1.53%
2:30:00 PM	0	0	0	0	3	6	8	5	5	1	0	0	0	0	28	2.04%
2:45:00 PM	0	0	0	1	5	9	8	7	3	1	1	0	0	0	35	2.55%
3:00:00 PM	0	0	1	2	4	3	8	5	3	3	0	0	0	0	29	2.11%
3:15:00 PM	0	0	1	1	2	3	6	5	3	3	0	0	0	0	24	1.75%
3:30:00 PM	0	0	0	1	0	3	6	6	4	2	0	0	0	0	22	1.60%
3:45:00 PM	0	0	0	1	1	5	6	7	1	1	1	0	0	0	23	1.68%
4:00:00 PM	0	0	0	2	2	6	5	3	3	1	0	0	0	0	22	1.60%
4:15:00 PM	0	0	1	7	2	6	6	3	2	0	0	0	0	0	27	1.97%
4:30:00 PM	0	0	1	3	2	10	9	4	1	0	1	0	0	0	31	2.26%
4:45:00 PM	0	0	0	1	3	2	6	9	5	1	1	0	0	0	28	2.04%
5:00:00 PM	0	0	0	0	0	3	8	3	3	2	0	0	0	0	19	1.38%
5:15:00 PM	0	0	0	0	3	3	5	6	2	2	0	0	0	0	21	1.53%
5:30:00 PM	0	0	0	3	0	3	10	8	2	2	0	0	0	0	28	2.04%
5:45:00 PM	0	0	1	0	0	5	12	8	2	2	0	1	0	0	31	2.26%
6:00:00 PM	0	0	0	1	3	1	4	8	2	1	0	0	0	0	20	1.46%
6:15:00 PM	0	0	0	1	1	3	7	4	4	1	0	0	0	0	21	1.53%
6:30:00 PM	0	0	0	0	0	6	10	7	2	1	2	0	0	0	28	2.04%
6:45:00 PM	0	0	0	2	0	8	4	1	1	0	0	0	0	0	16	1.17%
7:00:00 PM	0	1	0	1	1	4	1	4	3	0	0	0	0	0	15	1.09%
7:15:00 PM	0	0	0	1	1	3	5	4	1	1	0	0	0	0	16	1.17%
7:30:00 PM	0	0	0	0	2	2	1	1	5	2	0	0	0	0	13	0.95%
7:45:00 PM	0	0	0	0	0	3	2	2	1	2	2	0	0	0	12	0.87%
8:00:00 PM	0	0	0	0	0	2	2	6	0	2	0	0	0	0	12	0.87%
8:15:00 PM	0	0	0	0	1	3	4	2	3	0	0	0	0	0	13	0.95%
8:30:00 PM	0	0	0	0	1	1	3	3	3	2	0	0	0	0	13	0.95%
8:45:00 PM	0	0	0	0	0	4	3	5	5	1	0	0	0	0	18	1.31%
9:00:00 PM	0	0	0	0	1	2	1	1	1	0	0	0	0	0	6	0.44%
9:15:00 PM	0	0	0	0	0	1	5	4	1	0	0	0	0	0	11	0.80%
9:30:00 PM	0	0	1	0	0	0	3	3	0	1	1	0	0	0	9	0.66%
9:45:00 PM	0	0	0	1	0	1	2	0	3	1	0	0	0	0	8	0.58%
10:00:00 PM	0	0	0	0	0	3	1	4	2	1	0	0	0	0	11	0.80%
10:15:00 PM	0	0	0	0	0	0	3	2	0	1	1	0	0	0	7	0.51%
10:30:00 PM	0	0	0	0	1	0	2	0	1	0	0	0	0	0	4	0.29%
10:45:00 PM	0	0	1	0	0	0	1	1	1	0	0	0	0	0	4	0.29%
11:00:00 PM	0	0	0	0	0	0	2	1	1	0	0	0	0	0	4	0.29%
11:15:00 PM	0	0	0	0	1	1	1	0	2	0	0	0	0	0	5	0.36%
11:30:00 PM	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0.15%
11:45:00 PM	0	0	0	0	0	1	1	1	0	1	1	0	0	0	5	0.36%
PM TOTAL	0	1	7	36	56	153	229	198	104	46	13	1	0	0	844	61.47%
PERCENTAGE	0.0%	0.1%	0.8%	4.3%	6.6%	18.1%	27.1%	23.5%	12.3%	5.5%	1.5%	0.1%	0.0%	0.0%		
CUMULATIVE	0	1	8	44	100	253	482	680	784	830	843	844	844	844		
PERCENTAGE	0.0%	0.1%	0.9%	5.2%	11.8%	30.0%	57.1%	80.6%	92.9%	98.3%	99.9%	100.0%	100.0%	100.0%		

15th Percentile	31	Mean Speed Average	39
50th Percentile	40	10 MPH Pace Speed	34-43
85th Percentile	48	Number in Pace	281
95th Percentile	53	Percent in Pace	33%

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	TOTAL	%VEHICLES
DAY TOTAL	0	3	12	56	106	240	384	307	175	70	18	2	0	0	1,373	
PERCENTAGE	0.0%	0.2%	0.9%	4.1%	7.7%	17.5%	28.0%	22.4%	12.7%	5.1%	1.3%	0.1%	0.0%	0.0%	1,373	100.00%
	0.0%	0.2%	1.1%	5.2%	12.9%	30.4%	58.3%	80.7%	93.4%	98.5%	99.9%	100.0%	100.0%	100.0%		
85th Percentile	48															

SPEED La Mesa between Caliente and Ethan.

AimTD 714 253 7888 cs@aimtd.com

AM Period	EB		WB			PM Period	EB		WB		
0:00	0		1			12:00	7		12		
0:15	2		4			12:15	13		7		
0:30	0		1			12:30	9		9		
0:45	1	3	2	8	11	12:45	8	37	12	40	77
1:00	0		1			13:00	9		13		
1:15	0		1			13:15	8		9		
1:30	0		2			13:30	7		8		
1:45	0	0	2	6	6	13:45	12	36	13	43	79
2:00	2		0			14:00	9		17		
2:15	1		1			14:15	6		15		
2:30	0		0			14:30	8		20		
2:45	0	3	4	5	8	14:45	12	35	23	75	110
3:00	2		1			15:00	8		21		
3:15	0		1			15:15	8		16		
3:30	1		0			15:30	10		12		
3:45	1	4	1	3	7	15:45	7	33	16	65	98
4:00	1		2			16:00	9		13		
4:15	2		0			16:15	7		20		
4:30	3		0			16:30	19		12		
4:45	4	10	2	4	14	16:45	10	45	18	63	108
5:00	2		2			17:00	6		13		
5:15	5		1			17:15	7		14		
5:30	7		0			17:30	9		19		
5:45	2	16	3	6	22	17:45	11	33	20	66	99
6:00	6		6			18:00	6		14		
6:15	5		11			18:15	8		13		
6:30	5		8			18:30	11		17		
6:45	13	29	9	34	63	18:45	6	31	10	54	85
7:00	9		4			19:00	8		7		
7:15	5		9			19:15	9		7		
7:30	13		14			19:30	4		9		
7:45	9	36	11	38	74	19:45	3	24	9	32	56
8:00	8		14			20:00	4		8		
8:15	6		10			20:15	5		8		
8:30	11		17			20:30	5		8		
8:45	6	31	15	56	87	20:45	6	20	12	36	56
9:00	9		11			21:00	2		4		
9:15	8		9			21:15	1		10		
9:30	7		6			21:30	2		7		
9:45	10	34	9	35	69	21:45	4	9	4	25	34
10:00	14		12			22:00	4		7		
10:15	15		6			22:15	6		1		
10:30	9		8			22:30	1		3		
10:45	9	47	6	32	79	22:45	2	13	2	13	26
11:00	8		11			23:00	0		4		
11:15	11		13			23:15	3		2		
11:30	8		14			23:30	1		1		
11:45	8	35	16	54	89	23:45	2	6	3	10	16
Total Vol.		248		281	**529**			322		522	**844**

Daily Totals

EB	WB	Combined
570	803	**1373**

	AM EB	AM WB	AM Combined	PM EB	PM WB	PM Combined
Split %	46.9%	53.1%	**38.5%**	38.2%	61.8%	**61.5%**
Peak Hour	9:45	8:00	**11:00**	16:00	14:30	**14:30**
Volume	48	56	**89**	45	80	**116**
P.H.F.	0.80	0.82	**0.93**	0.59	0.87	**0.83**

PREPARED BY: AimTD 714 253 7888 cs@aimtd.com

ADT5 La Mesa east of Pena. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	EB		WB			PM Period	EB		WB		
0:00	1		6			12:00	16		21		
0:15	3		9			12:15	20		17		
0:30	1		3			12:30	23		16		
0:45	1	6	3	21	27	12:45	21	80	12	66	146
1:00	0		4			13:00	20		15		
1:15	1		2			13:15	32		16		
1:30	0		2			13:30	20		23		
1:45	2	3	3	11	14	13:45	16	88	28	82	170
2:00	3		3			14:00	30		29		
2:15	2		1			14:15	17		16		
2:30	0		0			14:30	23		30		
2:45	0	5	4	8	13	14:45	36	106	22	97	203
3:00	3		4			15:00	27		22		
3:15	5		2			15:15	27		30		
3:30	3		0			15:30	24		21		
3:45	6	17	1	7	24	15:45	35	113	21	94	207
4:00	7		6			16:00	34		20		
4:15	5		0			16:15	22		29		
4:30	8		0			16:30	30		23		
4:45	10	30	3	9	39	16:45	26	112	30	102	214
5:00	8		3			17:00	28		25		
5:15	15		4			17:15	19		19		
5:30	11		0			17:30	14		31		
5:45	9	43	5	12	55	17:45	28	89	29	104	193
6:00	17		13			18:00	17		22		
6:15	13		13			18:15	20		28		
6:30	18		18			18:30	11		21		
6:45	18	66	22	66	132	18:45	20	68	28	99	167
7:00	30		19			19:00	12		23		
7:15	22		26			19:15	9		17		
7:30	29		21			19:30	14		19		
7:45	42	123	23	89	212	19:45	8	43	21	80	123
8:00	31		21			20:00	5		13		
8:15	25		21			20:15	7		11		
8:30	23		10			20:30	13		14		
8:45	24	103	20	72	175	20:45	7	32	23	61	93
9:00	26		15			21:00	11		14		
9:15	17		14			21:15	8		17		
9:30	30		11			21:30	12		16		
9:45	23	96	17	57	153	21:45	6	37	16	63	100
10:00	28		11			22:00	2		8		
10:15	19		9			22:15	7		8		
10:30	15		20			22:30	5		7		
10:45	24	86	21	61	147	22:45	2	16	4	27	43
11:00	10		12			23:00	1		4		
11:15	30		13			23:15	5		6		
11:30	18		15			23:30	1		3		
11:45	27	85	17	57	142	23:45	2	9	5	18	27
Total Vol.		663		470	**1133**			793		893	**1686**

Daily Totals

EB	WB	Combined
1456	1363	**2819**

	AM			PM		
Split %	58.5%	41.5%	**40.2%**	47.0%	53.0%	**59.8%**
Peak Hour	7:30	7:15	**7:15**	15:45	17:30	**14:30**
Volume	127	91	**215**	121	110	**217**
P.H.F.	0.76	0.88	**0.83**	0.86	0.89	**0.94**

ADT4 Pena north of La Mesa.

Prepared by AimTD LLC tel. 714 253 7888

AM Period	NB		SB			PM Period	NB		SB		
0:00	0		1			12:00	6		9		
0:15	2		1			12:15	14		10		
0:30	2		0			12:30	8		12		
0:45	1	5	0	2	7	12:45	4	32	13	44	76
1:00	1		0			13:00	4		14		
1:15	0		1			13:15	6		8		
1:30	0		0			13:30	14		9		
1:45	1	2	1	2	4	13:45	12	36	7	38	74
2:00	3		1			14:00	9		10		
2:15	0		0			14:15	10		13		
2:30	0		0			14:30	14		16		
2:45	0	3	0	1	4	14:45	19	52	48	87	139
3:00	2		0			15:00	14		31		
3:15	0		2			15:15	10		29		
3:30	0		0			15:30	9		18		
3:45	0	2	2	4	6	15:45	6	39	22	100	139
4:00	1		2			16:00	14		21		
4:15	1		1			16:15	8		18		
4:30	2		2			16:30	14		18		
4:45	2	6	2	7	13	16:45	8	44	12	69	113
5:00	2		4			17:00	16		14		
5:15	1		5			17:15	4		20		
5:30	1		2			17:30	16		11		
5:45	5	9	7	18	27	17:45	7	43	15	60	103
6:00	6		3			18:00	5		13		
6:15	6		7			18:15	6		11		
6:30	10		7			18:30	9		5		
6:45	16	38	3	20	58	18:45	10	30	6	35	65
7:00	14		8			19:00	10		6		
7:15	21		12			19:15	11		9		
7:30	30		15			19:30	8		0		
7:45	28	93	29	64	157	19:45	7	36	4	19	55
8:00	9		25			20:00	3		7		
8:15	6		15			20:15	4		6		
8:30	4		6			20:30	5		5		
8:45	3	22	8	54	76	20:45	8	20	7	25	45
9:00	6		7			21:00	4		2		
9:15	7		9			21:15	6		4		
9:30	4		9			21:30	1		4		
9:45	10	27	10	35	62	21:45	10	21	3	13	34
10:00	6		15			22:00	2		1		
10:15	6		5			22:15	2		3		
10:30	7		7			22:30	3		5		
10:45	12	31	6	33	64	22:45	1	8	0	9	17
11:00	5		10			23:00	0		1		
11:15	10		18			23:15	3		4		
11:30	5		9			23:30	4		1		
11:45	6	26	8	45	71	23:45	3	10	1	7	17
Total Vol.		264		285	**549**			371		506	**877**

Daily Totals

NB	SB	Combined
635	791	**1426**

	AM NB	AM SB	AM	PM NB	PM SB	PM
Split %	48.1%	51.9%	**38.5%**	42.3%	57.7%	**61.5%**
Peak Hour	7:00	7:30	**7:15**	14:15	14:45	**14:30**
Volume	93	84	**169**	57	126	**181**
P.H.F.	0.78	0.72	**0.74**	0.82	0.66	**0.68**

ADT6 Pena south of La Mesa.

Prepared by AimTD LLC tel. 714 253 7888

AM Period	NB		SB			PM Period	NB		SB		
0:00	1		4			12:00	1		8		
0:15	2		5			12:15	10		7		
0:30	0		0			12:30	8		7		
0:45	1	4	0	9	13	12:45	8	27	6	28	55
1:00	0		0			13:00	5		2		
1:15	0		2			13:15	10		4		
1:30	0		0			13:30	6		8		
1:45	1	1	0	2	3	13:45	8	29	9	23	52
2:00	1		1			14:00	3		3		
2:15	1		0			14:15	7		5		
2:30	0		0			14:30	11		12		
2:45	0	2	0	1	3	14:45	16	37	22	42	79
3:00	1		0			15:00	9		12		
3:15	0		0			15:15	5		15		
3:30	0		0			15:30	7		9		
3:45	2	3	0	0	3	15:45	7	28	6	42	70
4:00	2		2			16:00	11		12		
4:15	1		0			16:15	7		11		
4:30	2		0			16:30	6		8		
4:45	5	10	1	3	13	16:45	5	29	5	36	65
5:00	3		0			17:00	14		8		
5:15	4		3			17:15	6		12		
5:30	0		0			17:30	5		11		
5:45	2	9	3	6	15	17:45	9	34	10	41	75
6:00	9		2			18:00	7		12		
6:15	4		1			18:15	4		5		
6:30	4		1			18:30	6		7		
6:45	5	22	0	4	26	18:45	13	30	7	31	61
7:00	11		3			19:00	5		12		
7:15	9		1			19:15	4		8		
7:30	21		5			19:30	4		4		
7:45	15	56	14	23	79	19:45	5	18	5	29	47
8:00	9		13			20:00	2		5		
8:15	9		5			20:15	4		4		
8:30	6		2			20:30	6		4		
8:45	10	34	7	27	61	20:45	3	15	15	28	43
9:00	6		3			21:00	4		4		
9:15	6		6			21:15	6		7		
9:30	10		4			21:30	3		10		
9:45	8	30	5	18	48	21:45	4	17	4	25	42
10:00	7		5			22:00	1		3		
10:15	3		4			22:15	3		2		
10:30	4		6			22:30	3		5		
10:45	9	23	1	16	39	22:45	1	8	1	11	19
11:00	5		11			23:00	0		0		
11:15	13		5			23:15	2		2		
11:30	6		8			23:30	2		0		
11:45	8	32	8	32	64	23:45	2	6	3	5	11
Total Vol.		226		141	**367**			278		341	**619**

Daily Totals

NB	SB	**Combined**
504	482	**986**

	AM			PM		
Split %	61.6%	38.4%	**37.2%**	44.9%	55.1%	**62.8%**
Peak Hour	7:00	7:30	**7:30**	14:15	14:30	**14:30**
Volume	56	37	**91**	43	61	**102**
P.H.F.	0.67	0.66	**0.78**	0.78	0.69	**0.67**

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ADT7 Bear Valley west of Mesa View. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	EB		WB			PM Period	EB		WB		
0:00	8		15			12:00	72		61		
0:15	9		9			12:15	56		72		
0:30	11		11			12:30	55		78		
0:45	9	37	7	42	79	12:45	73	256	73	284	540
1:00	6		10			13:00	68		83		
1:15	2		5			13:15	82		81		
1:30	2		5			13:30	59		79		
1:45	7	17	6	26	43	13:45	84	293	89	332	625
2:00	9		8			14:00	79		99		
2:15	9		9			14:15	98		105		
2:30	5		3			14:30	109		149		
2:45	12	35	6	26	61	14:45	100	386	125	478	864
3:00	13		7			15:00	115		106		
3:15	14		10			15:15	148		126		
3:30	16		12			15:30	90		111		
3:45	28	71	18	47	118	15:45	144	497	94	437	934
4:00	31		11			16:00	135		126		
4:15	38		11			16:15	110		105		
4:30	47		13			16:30	91		101		
4:45	49	165	19	54	219	16:45	102	438	99	431	869
5:00	39		21			17:00	112		128		
5:15	44		30			17:15	79		117		
5:30	40		49			17:30	71		78		
5:45	41	164	53	153	317	17:45	66	328	107	430	758
6:00	46		50			18:00	70		111		
6:15	23		86			18:15	55		82		
6:30	65		75			18:30	42		93		
6:45	83	217	45	256	473	18:45	42	209	63	349	558
7:00	84		67			19:00	33		69		
7:15	88		81			19:15	39		71		
7:30	111		110			19:30	36		72		
7:45	129	412	91	349	761	19:45	56	164	73	285	449
8:00	120		63			20:00	44		71		
8:15	85		66			20:15	38		55		
8:30	83		79			20:30	27		57		
8:45	99	387	70	278	665	20:45	25	134	63	246	380
9:00	106		43			21:00	22		44		
9:15	81		43			21:15	30		41		
9:30	61		50			21:30	20		45		
9:45	74	322	46	182	504	21:45	15	87	34	164	251
10:00	58		35			22:00	17		34		
10:15	59		45			22:15	13		30		
10:30	76		62			22:30	10		18		
10:45	68	261	75	217	478	22:45	13	53	20	102	155
11:00	64		76			23:00	9		23		
11:15	74		57			23:15	11		20		
11:30	74		69			23:30	7		19		
11:45	82	294	57	259	553	23:45	6	33	16	78	111
Total Vol.		2382		1889	**4271**			2878		3616	**6494**

Daily Totals

EB	WB	**Combined**
5260	5505	**10765**

	AM EB	AM WB	AM Combined	PM EB	PM WB	PM Combined
Split %	55.8%	44.2%	**39.7%**	44.3%	55.7%	**60.3%**
Peak Hour	7:15	7:00	**7:15**	15:15	14:30	**14:30**
Volume	448	349	**793**	517	506	**978**
P.H.F.	0.87	0.79	**0.90**	0.87	0.85	**0.89**

ADT8 Bear Valley east of Mesa View. **Prepared by AimTD LLC tel. 714 253 7888**

AM Period	EB		WB			PM Period	EB		WB		
0:00	11		19			12:00	96		71		
0:15	10		12			12:15	67		90		
0:30	13		12			12:30	76		89		
0:45	9	43	7	50	93	12:45	85	324	88	338	662
1:00	14		13			13:00	86		94		
1:15	5		11			13:15	95		100		
1:30	4		5			13:30	75		86		
1:45	10	33	10	39	72	13:45	98	354	94	374	728
2:00	11		11			14:00	88		100		
2:15	13		10			14:15	91		111		
2:30	8		4			14:30	106		155		
2:45	23	55	9	34	89	14:45	111	396	122	488	884
3:00	16		7			15:00	114		108		
3:15	19		12			15:15	147		131		
3:30	19		13			15:30	105		125		
3:45	39	93	18	50	143	15:45	131	497	121	485	982
4:00	38		12			16:00	133		140		
4:15	58		12			16:15	121		128		
4:30	64		14			16:30	108		117		
4:45	79	239	20	58	297	16:45	113	475	126	511	986
5:00	65		20			17:00	113		160		
5:15	67		29			17:15	88		136		
5:30	67		47			17:30	87		110		
5:45	59	258	45	141	399	17:45	81	369	154	560	929
6:00	52		39			18:00	83		135		
6:15	38		68			18:15	64		119		
6:30	79		64			18:30	62		125		
6:45	94	263	45	216	479	18:45	50	259	88	467	726
7:00	100		66			19:00	40		97		
7:15	102		67			19:15	48		101		
7:30	127		90			19:30	45		107		
7:45	131	460	83	306	766	19:45	54	187	99	404	591
8:00	122		51			20:00	43		97		
8:15	108		56			20:15	42		78		
8:30	88		57			20:30	34		77		
8:45	98	416	62	226	642	20:45	30	149	77	329	478
9:00	109		50			21:00	25		67		
9:15	102		48			21:15	31		61		
9:30	77		53			21:30	27		63		
9:45	81	369	52	203	572	21:45	17	100	49	240	340
10:00	63		38			22:00	20		48		
10:15	68		49			22:15	18		36		
10:30	94		69			22:30	12		28		
10:45	75	300	80	236	536	22:45	13	63	27	139	202
11:00	78		69			23:00	13		32		
11:15	82		61			23:15	11		26		
11:30	82		82			23:30	10		27		
11:45	102	344	69	281	625	23:45	8	42	20	105	147
Total Vol.		2873		1840	**4713**			3215		4440	**7655**

Daily Totals

EB	WB	Combined
6088	6280	**12368**

	AM			PM		
Split %	61.0%	39.0%	**38.1%**	42.0%	58.0%	**61.9%**
Peak Hour	7:30	11:45	**7:15**	15:15	17:00	**15:15**
Volume	488	319	**773**	516	560	**1033**
P.H.F.	0.93	0.89	**0.89**	0.88	0.88	**0.93**

APPENDIX D

TRAFFIC SIGNAL AND MULTI-WAY STOP WARRANTS

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

Count Date: 12/8/2021

Jurisdiction	Intersection				
City of Victorville	Mesa View Dr at Bear Valley Rd	Calc:	BC	Date:	12/17/2021
		Check:	GG	Date:	12/17/2021

Major St: Warner Avenue — Critical Approach Speed: 55 mph

Minor St: Brightwater Drive — Critical Approach Speed: 25 mph

Speed limit or critical speed on major street traffic > 40 mph .... ☑
or — RURAL (R)
In built up area of isolated community of < 10,000 population .... ☐

☐ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume

SATISFIED ☑ YES ☐ NO

(Condition A or Condition B or Combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume

100% SATISFIED ☐ YES ☑ NO

80% SATISFIED ☐ YES ☑ NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												
	Urban	Rural	Urban	Rural									
APPROACH LANES	1		2 or More		3:00 PM	4:00 PM	5:00 PM	2:00 PM	7:00 AM	6:00 PM	1:00 PM	8:00 AM	Hour
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	982	949	888	874	718	676	667	613	
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	139	117	102	135	153	68	109	142	

Condition B - Interruption of Continuous Traffic

100% SATISFIED ☑ YES ☐ NO

80% SATISFIED ☑ YES ☐ NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												
	Urban	Rural	Urban	Rural									
APPROACH LANES	1		2 or More		3:00 PM	4:00 PM	5:00 PM	2:00 PM	7:00 AM	6:00 PM	1:00 PM	8:00 AM	Hour
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	982	949	888	874	718	676	667	613	
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	139	117	102	135	153	68	109	142	

Combination of Conditions A & B

SATISFIED ☐ YES ☑ NO

REQUIREMENT	CONDITION	X	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. Minimum Vehicular Volume		☐ YES ☑ NO
	AND, B. Interruption of Continuous Traffic	X	
AND, an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems			☐ YES ☑ NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume

SATISFIED* ☑ YES ☐ NO

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	3:00 PM	2:00 PM	4:00 PM	7:00 AM	Hour
Both Approaches - Major Street	X		982	874	949	718	
Higher Approach - Minor Street	X		139	135	117	153	

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	☐ YES ☑ NO
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	☑ YES ☐ NO

WARRANT 3 - Peak Hour

SATISFIED ☑ YES ☐ NO

(Part A or Part B must be satisfied)

PART A

SATISFIED ☐ YES ☑ NO

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	☐ YES ☐ NO
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	☑ YES ☐ NO
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches	☑ YES ☐ NO

PART B

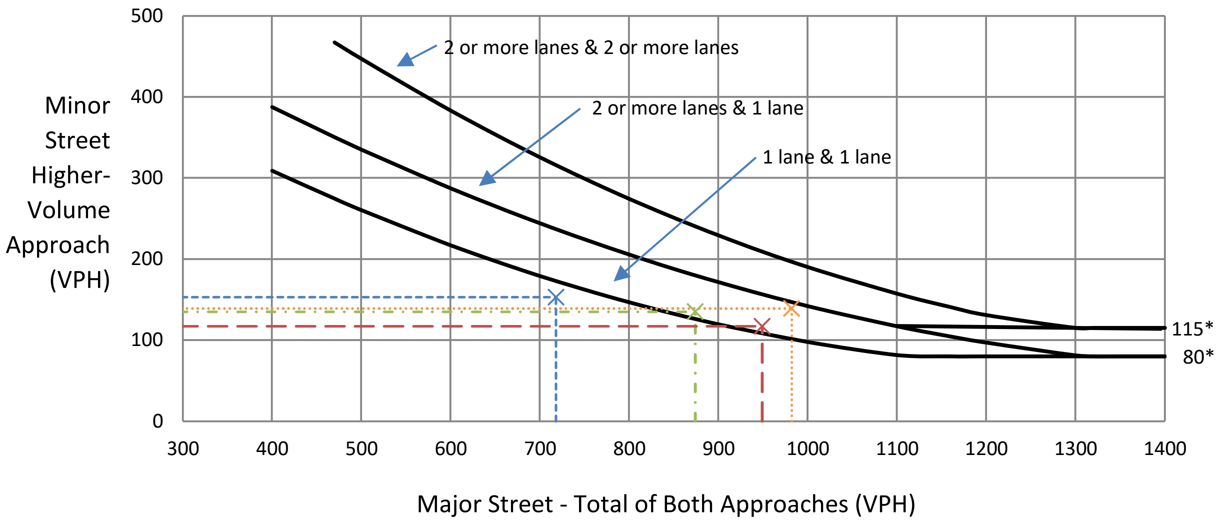
SATISFIED ☑ YES ☐ NO

APPROACH LANES	One	2 or More	3:00 PM
Both Approaches - Major Street	X		982
Higher Approach - Minor Street	X		139

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	☐ YES ☑ NO
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	☑ YES ☐ NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume

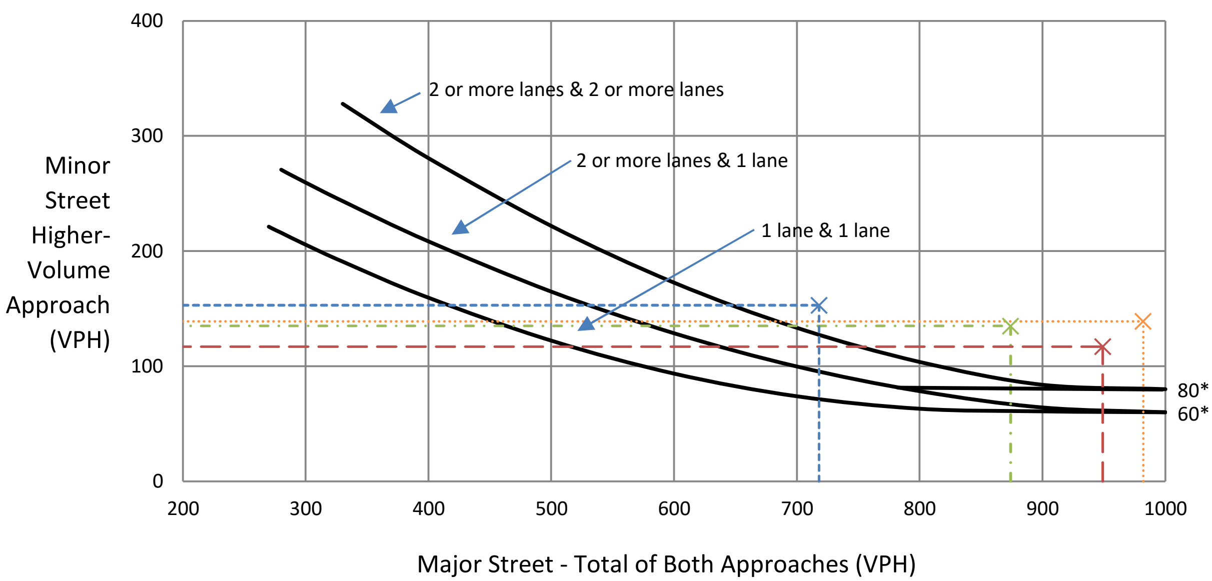


This figure is not applicable; see Figure 4C-2 below.

*Note: 115 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

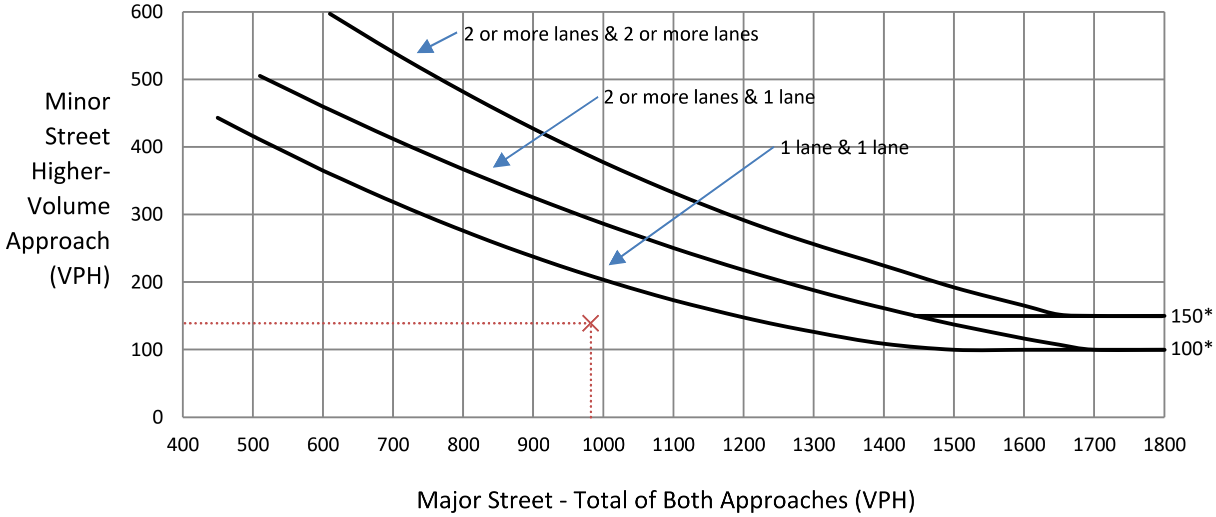
(Community less than 10,000 population or above 40 mph on the major street)



TRAFFIC SIGNAL WARRANT IS SATISFIED

*Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-3. Warrant 3, Peak Hour Vehicular Volume

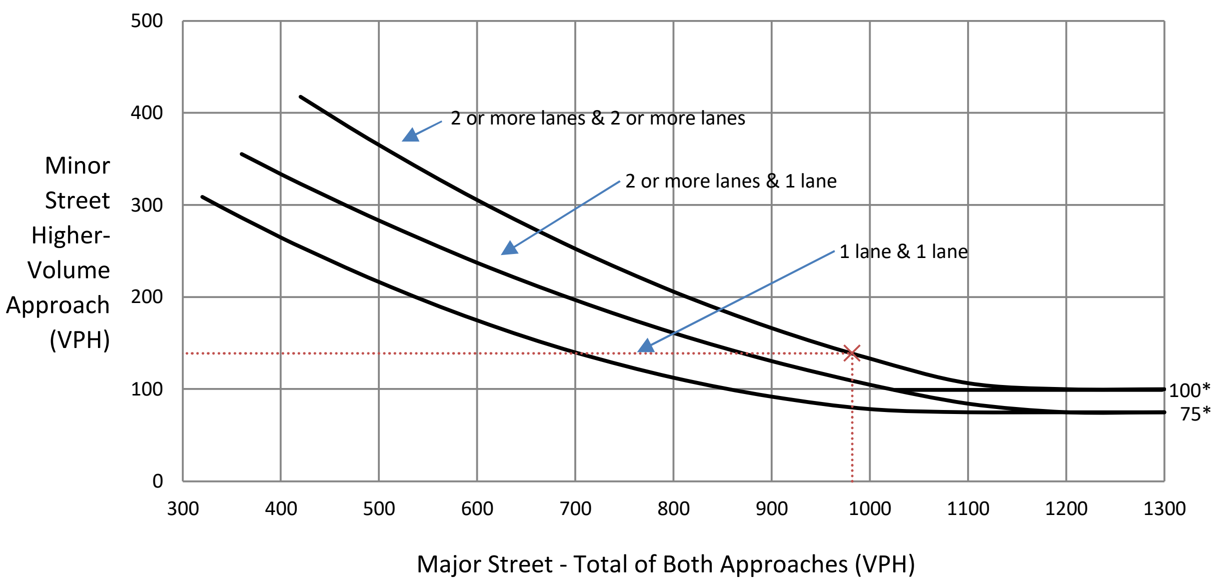


This figure is not applicable; see Figure 4C-4 below.

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour Vehicular Volume (70% Factor)

(Community less than 10,000 population or above 40 mph on the major street)



TRAFFIC SIGNAL WARRANT IS SATISFIED

*Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

Multi-Way Stop Evaluation

Jurisdiction:	City of Victorville			Date:	12/17/2021
Intersection:	Mesa View Dr at La Mesa Rd			By:	BC
Major Street:	Mesa View Dr	Critical Speed:	45	8-Hr Average Volume:	187
Minor Street:	La Mesa Rd	Critical Speed:	45	8-Hr Average Volume:	58
				8-Hr Average Minor Street Pedestrians:	0
				8-Hr Average Minor Street Bicycles:	0
				Signal Warranted:	No
				Crashes:	0

Required Conditions	Satisfied? Yes	Satisfied? No
CONDITION A (CA MUTCD Section 2B.07)		
Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.		X
CONDITION B (CA MUTCD Section 2B.07)		
Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.		X
CONDITION C (CA MUTCD Section 2B.07)		**X**
1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and		X
2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but		X
3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.	X	
CONDITION D (CA MUTCD Section 2B.07)		
Where no single criterion is satisfied, but where Criteria B, C.1 and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.		X

Recommendation:

None.

Notes:

(1) Data collected on: Wednesday, December 8, 2021.

(2) Critical speed for La Mesa Road was measured at 45 miles per hour on December 8, 2021.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

Count Date: 12/8/2021

City of Victorville	Mesa View Dr at La Mesa Rd	Calc: BC	Date: 12/17/2021
Jurisdiction	Intersection	Check: GG	Date: 12/17/2021

Major St: Mesa View Dr — Critical Approach Speed: 25 mph

Minor St: LA Mesa Rd — Critical Approach Speed: 25 mph

Speed limit or critical speed on major street traffic > 40 mph .... ☐
or — RURAL (R)
In built up area of isolated community of < 10,000 population .... ☑

☐ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume

SATISFIED ☐ YES ☑ NO

(Condition A or Condition B or Combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume

100% SATISFIED ☐ YES ☑ NO

80% SATISFIED ☐ YES ☑ NO

APPROACH LANES	Urban (1)	Rural (1)	Urban (2 or More)	Rural (2 or More)	2:00 PM	7:00 AM	3:00 PM	4:00 PM	5:00 PM	8:00 AM	1:00 PM	6:00 PM
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	258	255	233	221	211	199	160	147
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	75	38	65	63	66	56	43	54

MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS); Hour

Condition B - Interruption of Continuous Traffic

100% SATISFIED ☐ YES ☑ NO

80% SATISFIED ☐ YES ☑ NO

APPROACH LANES	Urban (1)	Rural (1)	Urban (2 or More)	Rural (2 or More)	2:00 PM	7:00 AM	3:00 PM	4:00 PM	5:00 PM	8:00 AM	1:00 PM	6:00 PM
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	258	255	233	221	211	199	160	147
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	75	38	65	63	66	56	43	54

MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS); Hour

Combination of Conditions A & B

SATISFIED ☐ YES ☑ NO

REQUIREMENT	CONDITION	X	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. Minimum Vehicular Volume		☐ YES ☑ NO
	AND, B. Interruption of Continuous Traffic		
AND, an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems			☐ YES ☑ NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume

SATISFIED* ☐ YES ☑ NO

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	2:00 PM	3:00 PM	5:00 PM	4:00 PM
Both Approaches - Major Street	X		258	233	211	221
Higher Approach - Minor Street	X		75	65	66	63

Hour

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	☐ YES	☑ NO
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	☐ YES	☑ NO

WARRANT 3 - Peak Hour

SATISFIED ☐ YES ☑ NO

(Part A or Part B must be satisfied)

PART A — **SATISFIED** ☐ YES ☑ NO

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	☐ YES	☐ NO
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	☐ YES	☑ NO
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches	☐ YES	☐ NO

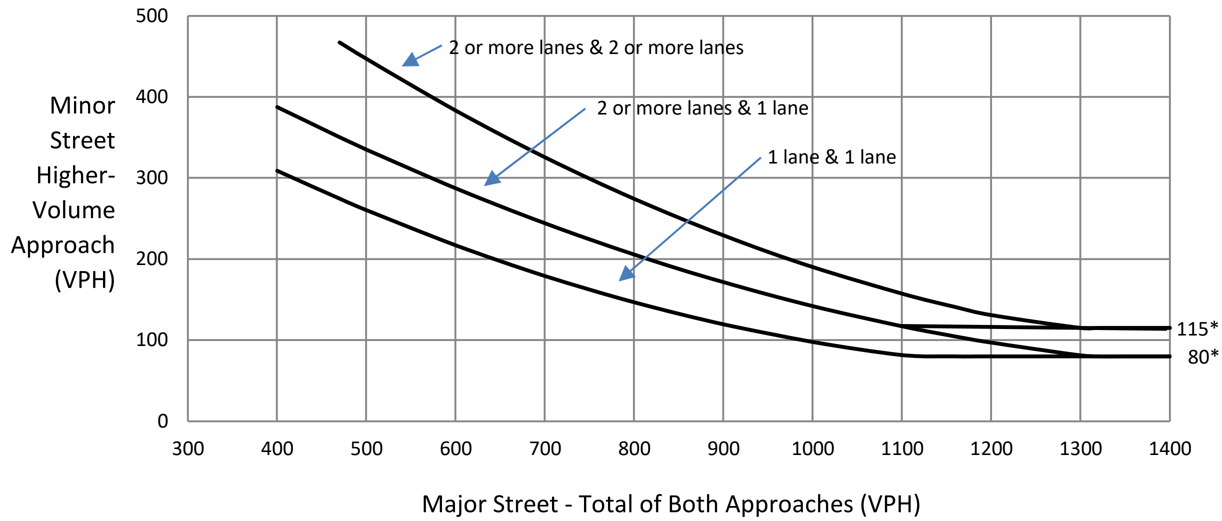
PART B — **SATISFIED** ☐ YES ☑ NO

APPROACH LANES	One	2 or More	2:00 PM
Both Approaches - Major Street	X		258
Higher Approach - Minor Street	X		75

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	☐ YES	☑ NO
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	☐ YES	☑ NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume

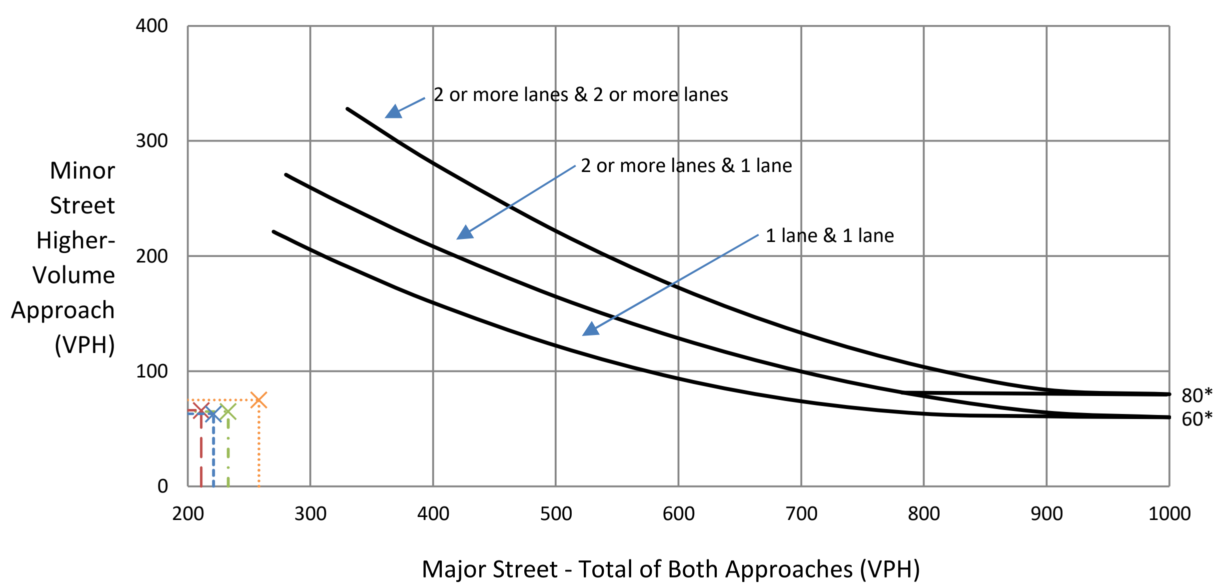


This figure is not applicable; see Figure 4C-2 below.

*Note: 115 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

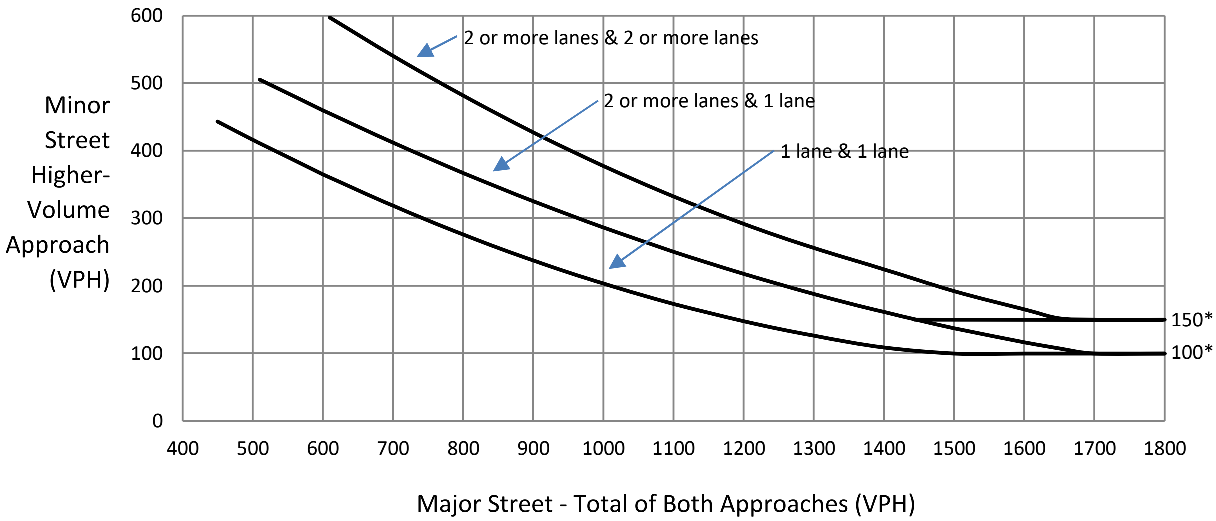
(Community less than 10,000 population or above 40 mph on the major street)



Traffic Signal Warrant Is NOT Satisfied

*Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-3. Warrant 3, Peak Hour Vehicular Volume

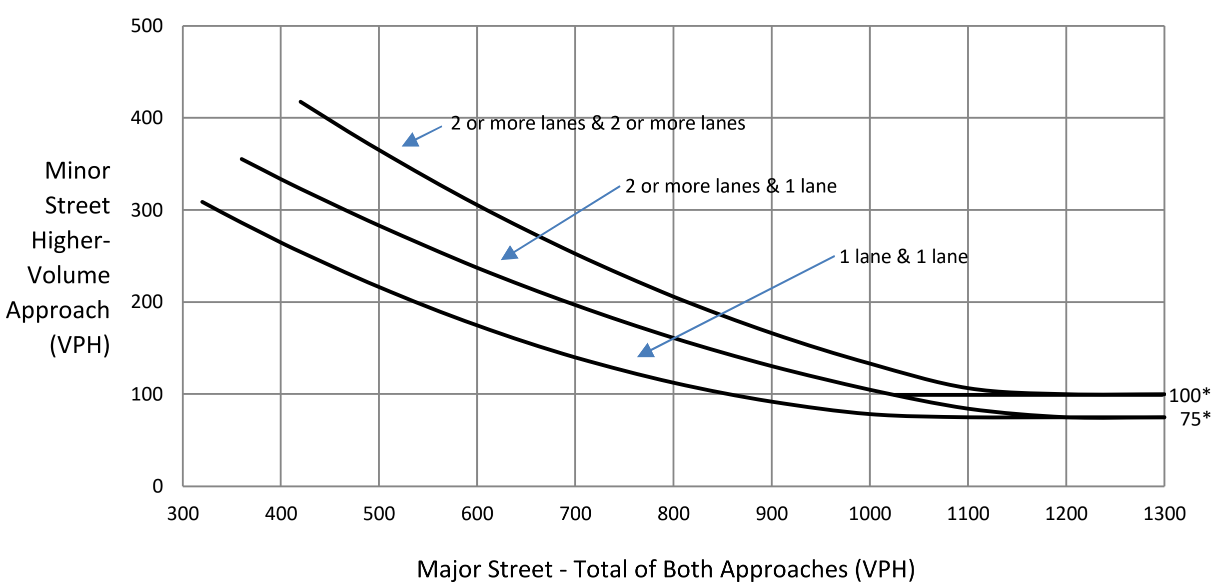


This figure is not applicable; see Figure 4C-4 below.

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour Vehicular Volume (70% Factor)

(Community less than 10,000 population or above 40 mph on the major street)



Traffic Signal Warrant Is NOT Satisfied

*Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

Multi-Way Stop Evaluation

Jurisdiction:	City of Victorville			Date:	12/17/2021
Intersection:	Pena Rd at La Mesa Rd			By:	BC
Major Street:	Mesa View Dr	Critical Speed:	45	8-Hr Average Volume:	124
Minor Street:	Pena Rd	Critical Speed:	45	8-Hr Average Volume:	91
				8-Hr Average Minor Street Pedestrians:	0
				8-Hr Average Minor Street Bicycles:	0
				Signal Warranted:	No
				Crashes:	0

Required Conditions	Satisfied? Yes	Satisfied? No
CONDITION A (CA MUTCD Section 2B.07)		
Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.		X
CONDITION B (CA MUTCD Section 2B.07)		
Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.		X
CONDITION C (CA MUTCD Section 2B.07)		**X**
1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and		X
2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but		X
3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.	X	
CONDITION D (CA MUTCD Section 2B.07)		
Where no single criterion is satisfied, but where Criteria B, C.1 and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.		X

Recommendation:

None.

Notes:

(1) Data collected on: Wednesday, December 8, 2021.

(2) Critical speed for La Mesa Road was measured at 45 miles per hour on December 8, 2021.

APPENDIX E

LEVEL OF SERVICE WORKSHEETS

EXISTING

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	12.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.064

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Peak Hour Factor	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	34	6	11	38	0	0	0	0	7	1	9
Total Analysis Volume [veh/h]	0	134	23	43	153	0	0	1	1	29	5	38
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.17	0.02	0.06	0.19	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	11.40	10.73	9.40	11.99	11.18	10.05	7.30	0.00	0.00	7.26	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.72	0.72	0.72	1.02	1.02	1.02	0.00	0.00	0.00	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	17.96	17.96	17.96	25.62	25.62	25.62	0.00	0.00	0.00	1.08	1.08	1.08
d_A, Approach Delay [s/veh]	10.54			11.36			0.00			2.93		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	9.58											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	32.2
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.409

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	3	8	23	2	20	18	105	3	2	73	7
Total Analysis Volume [veh/h]	18	14	30	94	7	80	73	419	12	9	291	28
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.09	0.05	0.05	0.41	0.03	0.11	0.06	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	25.08	21.44	13.22	32.15	30.08	10.39	8.08	0.00	0.00	8.22	0.00	0.00
Movement LOS	D	C	B	D	D	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.69	0.69	0.69	2.06	2.06	0.36	0.19	0.00	0.00	0.02	0.00	0.00
95th-Percentile Queue Length [ft/ln]	17.13	17.13	17.13	51.44	51.44	8.94	4.68	0.00	0.00	0.60	0.00	0.00
d_A, Approach Delay [s/veh]	18.52			22.45			1.17			0.23		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	5.47											
Intersection LOS	D											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	12.3
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.063

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Peak Hour Factor	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	8	10	9	8	10	10	23	0	3	17	11
Total Analysis Volume [veh/h]	1	32	38	36	32	40	41	90	1	11	66	44
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.05	0.04	0.06	0.05	0.04	0.03	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	11.85	11.64	9.23	12.30	11.94	9.69	7.50	0.00	0.00	7.41	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.32	0.32	0.32	0.56	0.56	0.56	0.09	0.00	0.00	0.02	0.00	0.00
95th-Percentile Queue Length [ft/ln]	7.89	7.89	7.89	13.90	13.90	13.90	2.14	0.00	0.00	0.55	0.00	0.00
d_A, Approach Delay [s/veh]	10.35			11.23			2.33			0.67		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	5.41											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	10.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.045

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	27	6	8	22	0	0	0	0	7	0	11
Total Analysis Volume [veh/h]	0	108	23	32	89	0	0	0	0	29	1	42
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.14	0.02	0.05	0.11	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	10.54	10.49	9.16	10.94	10.39	9.28	7.30	0.00	0.00	7.26	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.57	0.57	0.57	0.55	0.55	0.55	0.00	0.00	0.00	0.05	0.05	0.05
95th-Percentile Queue Length [ft/ln]	14.26	14.26	14.26	13.87	13.87	13.87	0.00	0.00	0.00	1.27	1.27	1.27
d_A, Approach Delay [s/veh]	10.26			10.54			2.43			2.92		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	8.73											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	43.9
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.458

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	5	21	3	9	12	109	4	8	112	26
Total Analysis Volume [veh/h]	6	5	19	84	13	36	47	437	15	31	449	103
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.03	0.03	0.46	0.06	0.06	0.05	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	29.29	25.68	12.03	43.88	41.50	11.27	8.71	0.00	0.00	8.34	0.00	0.00
Movement LOS	D	D	B	E	E	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.32	0.32	0.32	2.63	2.63	0.19	0.15	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	7.91	7.91	7.91	65.86	65.86	4.69	3.63	0.00	0.00	2.16	0.00	0.00
d_A, Approach Delay [s/veh]	17.76			34.82			0.82			0.44		
Approach LOS	C			D			A			A		
d_I, Intersection Delay [s/veh]	4.68											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	10.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.027

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Peak Hour Factor	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	2	6	8	4	6	4	17	1	5	17	6
Total Analysis Volume [veh/h]	1	7	24	33	18	25	15	67	3	19	68	25
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.02	0.05	0.03	0.03	0.01	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	10.51	10.65	8.77	10.77	10.95	9.21	7.42	0.00	0.00	7.38	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.11	0.11	0.11	0.33	0.33	0.33	0.03	0.00	0.00	0.04	0.00	0.00
95th-Percentile Queue Length [ft/ln]	2.82	2.82	2.82	8.36	8.36	8.36	0.76	0.00	0.00	0.94	0.00	0.00
d_A, Approach Delay [s/veh]	9.24			10.30			1.31			1.25		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	4.36											
Intersection LOS	B											

OPENING YEAR (2023) WITHOUT PROJECT

Intersection Level Of Service Report

Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	13.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.092

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	6	10	9	5	0	0	0	0	7	0	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	116	29	44	131	0	0	1	1	31	4	34
Peak Hour Factor	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	37	9	14	41	0	0	0	0	10	1	11
Total Analysis Volume [veh/h]	0	147	37	56	166	0	0	1	1	39	5	43
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.20	0.03	0.09	0.22	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	12.07	11.20	9.69	13.11	11.93	10.65	7.31	0.00	0.00	7.28	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.89	0.89	0.89	1.31	1.31	1.31	0.00	0.00	0.00	0.06	0.06	0.06
95th-Percentile Queue Length [ft/ln]	22.36	22.36	22.36	32.81	32.81	32.81	0.00	0.00	0.00	1.46	1.46	1.46
d_A, Approach Delay [s/veh]	10.90			12.23			0.00			3.26		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	10.11											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	71.8
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.756

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	39	0	9	2	51	0	0	18	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	12	28	125	6	83	70	438	11	8	286	39
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	3	8	35	2	23	20	123	3	2	81	11
Total Analysis Volume [veh/h]	19	14	32	141	7	94	79	494	12	9	322	44
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.07	0.06	0.76	0.03	0.13	0.07	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	31.55	25.92	15.38	71.77	68.54	10.76	8.23	0.00	0.00	8.43	0.00	0.00
Movement LOS	D	D	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.91	0.91	0.91	5.36	5.36	0.45	0.21	0.00	0.00	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]	22.79	22.79	22.79	134.03	134.03	11.22	5.31	0.00	0.00	0.64	0.00	0.00
d_A, Approach Delay [s/veh]	22.37			47.98			1.11			0.20		
Approach LOS	C			E			A			A		
d_I, Intersection Delay [s/veh]	10.88											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	16.9
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.151

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	4	38	16	1	0	1	60	0	14	21	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	29	68	44	26	31	33	131	1	22	73	39
Peak Hour Factor	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	10	23	15	9	10	11	43	0	7	24	13
Total Analysis Volume [veh/h]	1	38	90	58	34	41	44	174	1	29	97	52
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.08	0.10	0.15	0.07	0.04	0.03	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	14.56	13.91	10.34	16.94	15.04	11.46	7.59	0.00	0.00	7.62	0.00	0.00
Movement LOS	B	B	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.68	0.68	0.68	1.06	1.06	1.06	0.10	0.00	0.00	0.06	0.00	0.00
95th-Percentile Queue Length [ft/ln]	17.12	17.12	17.12	26.49	26.49	26.49	2.38	0.00	0.00	1.58	0.00	0.00
d_A, Approach Delay [s/veh]	11.43			14.76			1.53			1.24		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	6.06											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	12.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.061

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	8	10	5	7	0	0	0	0	14	0	9
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	111	32	35	92	0	0	0	0	42	1	50
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	30	9	10	25	0	0	0	0	11	0	14
Total Analysis Volume [veh/h]	0	121	35	38	100	0	0	0	0	46	1	54
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.17	0.03	0.06	0.13	0.00	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	11.32	11.13	9.46	11.95	11.03	9.66	7.32	0.00	0.00	7.28	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.74	0.74	0.74	0.72	0.72	0.72	0.00	0.00	0.00	0.08	0.08	0.08
95th-Percentile Queue Length [ft/ln]	18.54	18.54	18.54	17.91	17.91	17.91	0.00	0.00	0.00	1.99	1.99	1.99
d_A, Approach Delay [s/veh]	10.76			11.29			2.44			3.32		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	9.04											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	120.6
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.849

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	25	0	7	9	34	0	0	58	44
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	4	18	102	11	40	52	433	14	28	468	138
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	5	29	3	11	15	123	4	8	133	39
Total Analysis Volume [veh/h]	6	5	21	116	13	46	59	493	16	32	533	157
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	0.04	0.04	0.85	0.08	0.08	0.07	0.00	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	40.61	34.12	13.41	120.56	116.42	12.19	9.26	0.00	0.00	8.52	0.00	0.00
Movement LOS	E	D	B	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.44	0.44	0.44	6.36	6.36	0.27	0.21	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	10.99	10.99	10.99	159.07	159.07	6.86	5.22	0.00	0.00	2.34	0.00	0.00
d_A, Approach Delay [s/veh]	21.75			91.77			0.96			0.38		
Approach LOS	C			F			A			A		
d_I, Intersection Delay [s/veh]	11.74											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	14.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.103

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	3	24	10	4	1	1	39	0	44	68	18
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	9	47	41	21	25	16	102	3	62	132	42
Peak Hour Factor	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	2	13	11	6	7	4	28	1	17	36	11
Total Analysis Volume [veh/h]	1	10	51	45	23	27	18	112	3	68	144	46
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.05	0.10	0.05	0.03	0.01	0.00	0.00	0.05	0.00	0.00
d_M, Delay for Movement [s/veh]	13.49	13.22	9.22	14.73	14.15	10.63	7.64	0.00	0.00	7.56	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.25	0.25	0.25	0.66	0.66	0.66	0.04	0.00	0.00	0.14	0.00	0.00
95th-Percentile Queue Length [ft/ln]	6.36	6.36	6.36	16.48	16.48	16.48	0.99	0.00	0.00	3.62	0.00	0.00
d_A, Approach Delay [s/veh]	9.93			13.43			1.03			1.99		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	4.64											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	11.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.387

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	39	0	9	2	51	0	0	18	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	12	28	125	6	83	70	438	11	8	286	39
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	3	8	35	2	23	20	123	3	2	81	11
Total Analysis Volume [veh/h]	19	14	32	141	7	94	79	494	12	9	322	44
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	29	0	0	20	0	0	11	0	0	11	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	5	8	8	36	36	36	36	36	36
g / C, Green / Cycle	0.08	0.13	0.13	0.60	0.60	0.60	0.60	0.60	0.60
(v / s)_i Volume / Saturation Flow Rate	0.04	0.09	0.06	0.07	0.15	0.01	0.01	0.18	0.03
s, saturation flow rate [veh/h]	1608	1691	1506	1058	3373	1506	903	1772	1506
c, Capacity [veh/h]	127	214	190	615	2008	896	562	1054	896
d1, Uniform Delay [s]	26.59	25.16	24.49	9.19	5.77	4.97	7.91	6.02	5.08
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.16	3.99	1.98	0.43	0.29	0.03	0.05	0.75	0.10
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.69	0.49	0.13	0.25	0.01	0.02	0.31	0.05
d, Delay for Lane Group [s/veh]	29.76	29.15	26.47	9.62	6.07	5.00	7.96	6.77	5.18
Lane Group LOS	C	C	C	A	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.97	2.17	1.30	0.49	0.87	0.04	0.05	1.29	0.15
50th-Percentile Queue Length [ft/ln]	24.34	54.31	32.53	12.16	21.67	0.99	1.22	32.17	3.72
95th-Percentile Queue Length [veh/ln]	1.75	3.91	2.34	0.88	1.56	0.07	0.09	2.32	0.27
95th-Percentile Queue Length [ft/ln]	43.82	97.77	58.55	21.89	39.00	1.78	2.20	57.91	6.69

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	29.76	29.76	29.76	29.15	29.15	26.47	9.62	6.07	5.00	7.96	6.77	5.18
Movement LOS	C	C	C	C	C	C	A	A	A	A	A	A
d_A, Approach Delay [s/veh]	29.76			28.11			6.52			6.61		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	11.87											
Intersection LOS	B											
Intersection V/C	0.387											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	833	533	233	233
d_b, Bicycle Delay [s]	10.21	16.13	23.41	23.41
I_b,int, Bicycle LOS Score for Intersection	1.667	1.959	2.042	2.178
Bicycle LOS	A	A	B	B

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	9.2
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.496

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	25	0	7	9	34	0	0	58	44
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	4	18	102	11	40	52	433	14	28	468	138
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	5	29	3	11	15	123	4	8	133	39
Total Analysis Volume [veh/h]	6	5	21	116	13	46	59	493	16	32	533	157
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	27	0	0	11	0	0	22	0	0	22	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	7	7	38	38	38	38	38	38
g / C, Green / Cycle	0.05	0.11	0.11	0.64	0.64	0.64	0.64	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate	0.02	0.08	0.03	0.07	0.15	0.01	0.04	0.30	0.10
s, saturation flow rate [veh/h]	1574	1695	1506	871	3373	1506	904	1772	1506
c, Capacity [veh/h]	79	189	168	506	2156	963	610	1132	963
d1, Uniform Delay [s]	27.71	25.71	24.51	9.99	4.59	3.96	6.53	5.60	4.37
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.34	4.32	0.87	0.47	0.25	0.03	0.16	1.41	0.36
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.41	0.68	0.27	0.12	0.23	0.02	0.05	0.47	0.16
d, Delay for Lane Group [s/veh]	31.05	30.03	25.38	10.46	4.83	3.99	6.69	7.01	4.74
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.50	1.93	0.62	0.40	0.65	0.04	0.15	1.95	0.45
50th-Percentile Queue Length [ft/ln]	12.61	48.18	15.47	9.96	16.17	1.01	3.68	48.86	11.13
95th-Percentile Queue Length [veh/ln]	0.91	3.47	1.11	0.72	1.16	0.07	0.26	3.52	0.80
95th-Percentile Queue Length [ft/ln]	22.70	86.72	27.84	17.92	29.10	1.82	6.62	87.95	20.03

Movement, Approach, & Intersection Results

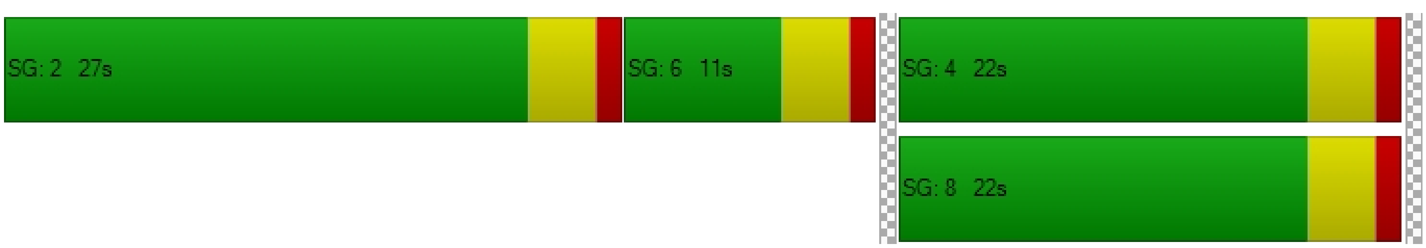
d_M, Delay for Movement [s/veh]	31.05	31.05	31.05	30.03	30.03	25.38	10.46	4.83	3.99	6.69	7.01	4.74
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	31.05			28.81			5.39			6.50		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	9.21											
Intersection LOS	A											
Intersection V/C	0.496											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	767	233	600	600
d_b, Bicycle Delay [s]	11.41	23.41	14.70	14.70
I_b,int, Bicycle LOS Score for Intersection	1.612	1.848	2.028	2.751
Bicycle LOS	A	A	B	C

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



OPENING YEAR (2023) WITH PROJECT

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	13.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.100

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	9	29	9	6	0	0	0	0	14	0	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	119	48	44	132	0	0	1	1	38	4	34
Peak Hour Factor	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	38	15	14	42	0	0	0	0	12	1	11
Total Analysis Volume [veh/h]	0	151	61	56	167	0	0	1	1	48	5	43
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.21	0.06	0.10	0.22	0.00	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	12.56	11.60	9.94	13.91	12.35	10.93	7.31	0.00	0.00	7.29	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.07	1.07	1.07	1.41	1.41	1.41	0.00	0.00	0.00	0.07	0.07	0.07
95th-Percentile Queue Length [ft/ln]	26.68	26.68	26.68	35.20	35.20	35.20	0.00	0.00	0.00	1.80	1.80	1.80
d_A, Approach Delay [s/veh]	11.12			12.74			0.00			3.64		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	10.41											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	100.2
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.900

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	62	0	12	3	51	0	0	18	21
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	12	28	148	6	86	71	438	11	8	286	47
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	3	8	42	2	24	20	123	3	2	81	13
Total Analysis Volume [veh/h]	19	14	32	167	7	97	80	494	12	9	322	53
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.07	0.06	0.90	0.03	0.13	0.07	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	32.10	26.32	15.51	100.24	96.99	10.79	8.26	0.00	0.00	8.43	0.00	0.00
Movement LOS	D	D	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.93	0.93	0.93	7.32	7.32	0.47	0.22	0.00	0.00	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]	23.18	23.18	23.18	182.99	182.99	11.63	5.43	0.00	0.00	0.64	0.00	0.00
d_A, Approach Delay [s/veh]	22.69			68.14			1.13			0.20		
Approach LOS	C			F			A			A		
d_I, Intersection Delay [s/veh]	15.83											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	18.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.167

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	7	44	16	2	0	1	80	0	16	28	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	32	74	44	27	31	33	151	1	24	80	39
Peak Hour Factor	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550	0.7550
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	11	25	15	9	10	11	50	0	8	26	13
Total Analysis Volume [veh/h]	1	42	98	58	36	41	44	200	1	32	106	52
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.10	0.12	0.17	0.08	0.04	0.03	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	15.48	14.64	10.77	18.48	16.03	12.06	7.61	0.00	0.00	7.69	0.00	0.00
Movement LOS	C	B	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.81	0.81	0.81	1.19	1.19	1.19	0.10	0.00	0.00	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	20.20	20.20	20.20	29.82	29.82	29.82	2.39	0.00	0.00	1.79	0.00	0.00
d_A, Approach Delay [s/veh]	11.96			15.88			1.37			1.29		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	6.20											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	13.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.069

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✛			✛			✛			✛		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	10	23	5	10	0	0	0	0	37	0	9
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	113	45	35	95	0	0	0	0	65	1	50
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	31	12	10	26	0	0	0	0	18	0	14
Total Analysis Volume [veh/h]	0	123	49	38	103	0	0	0	0	71	1	54
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.18	0.05	0.07	0.15	0.00	0.00	0.00	0.00	0.04	0.00	0.00
d_M, Delay for Movement [s/veh]	12.16	11.82	9.74	13.07	11.76	9.98	7.32	0.00	0.00	7.32	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.88	0.88	0.88	0.83	0.83	0.83	0.00	0.00	0.00	0.13	0.13	0.13
95th-Percentile Queue Length [ft/ln]	22.08	22.08	22.08	20.65	20.65	20.65	0.00	0.00	0.00	3.13	3.13	3.13
d_A, Approach Delay [s/veh]	11.23			12.11			2.44			4.12		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	9.48											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	162.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.992

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	40	0	9	12	34	0	0	58	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	4	18	117	11	42	55	433	14	28	468	164
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	5	33	3	12	16	123	4	8	133	47
Total Analysis Volume [veh/h]	6	5	21	133	13	48	63	493	16	32	533	187
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	0.04	0.04	0.99	0.08	0.09	0.07	0.00	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	42.45	35.96	13.59	162.67	158.40	12.22	9.40	0.00	0.00	8.52	0.00	0.00
Movement LOS	E	E	B	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.46	0.46	0.46	8.05	8.05	0.29	0.23	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	11.47	11.47	11.47	201.26	201.26	7.18	5.76	0.00	0.00	2.34	0.00	0.00
d_A, Approach Delay [s/veh]	22.50			125.16			1.04			0.36		
Approach LOS	C			F			A			A		
d_I, Intersection Delay [s/veh]	16.69											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	16.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.113

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	28	10	7	1	1	52	0	50	91	18
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	11	51	41	24	25	16	115	3	68	155	42
Peak Hour Factor	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140	0.9140
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	14	11	7	7	4	31	1	19	42	11
Total Analysis Volume [veh/h]	1	12	56	45	26	27	18	126	3	74	170	46
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.03	0.06	0.11	0.06	0.03	0.01	0.00	0.00	0.05	0.00	0.00
d_M, Delay for Movement [s/veh]	14.39	13.91	9.38	15.99	15.11	11.16	7.69	0.00	0.00	7.60	0.00	0.00
Movement LOS	B	B	A	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.30	0.30	0.30	0.76	0.76	0.76	0.04	0.00	0.00	0.16	0.00	0.00
95th-Percentile Queue Length [ft/ln]	7.51	7.51	7.51	18.97	18.97	18.97	1.01	0.00	0.00	4.01	0.00	0.00
d_A, Approach Delay [s/veh]	10.24			14.43			0.94			1.94		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	4.67											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	12.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.406

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	62	0	12	3	51	0	0	18	21
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	12	28	148	6	86	71	438	11	8	286	47
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	3	8	42	2	24	20	123	3	2	81	13
Total Analysis Volume [veh/h]	19	14	32	167	7	97	80	494	12	9	322	53
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	38	0	0	11	0	0	11	0	0	11	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	5	9	9	35	35	35	35	35	35
g / C, Green / Cycle	0.08	0.14	0.14	0.58	0.58	0.58	0.58	0.58	0.58
(v / s)_i Volume / Saturation Flow Rate	0.04	0.10	0.06	0.08	0.15	0.01	0.01	0.18	0.04
s, saturation flow rate [veh/h]	1608	1690	1506	1058	3373	1506	903	1772	1506
c, Capacity [veh/h]	127	242	215	593	1952	871	544	1025	871
d1, Uniform Delay [s]	26.59	24.64	23.62	9.91	6.26	5.38	8.52	6.53	5.53
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.16	4.02	1.48	0.47	0.31	0.03	0.06	0.80	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.72	0.45	0.13	0.25	0.01	0.02	0.31	0.06
d, Delay for Lane Group [s/veh]	29.76	28.66	25.10	10.39	6.57	5.41	8.58	7.33	5.67
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.97	2.53	1.30	0.53	0.95	0.04	0.05	1.40	0.20
50th-Percentile Queue Length [ft/ln]	24.34	63.29	32.43	13.14	23.74	1.08	1.30	35.11	4.91
95th-Percentile Queue Length [veh/ln]	1.75	4.56	2.33	0.95	1.71	0.08	0.09	2.53	0.35
95th-Percentile Queue Length [ft/ln]	43.82	113.92	58.37	23.64	42.73	1.94	2.34	63.20	8.84

Movement, Approach, & Intersection Results

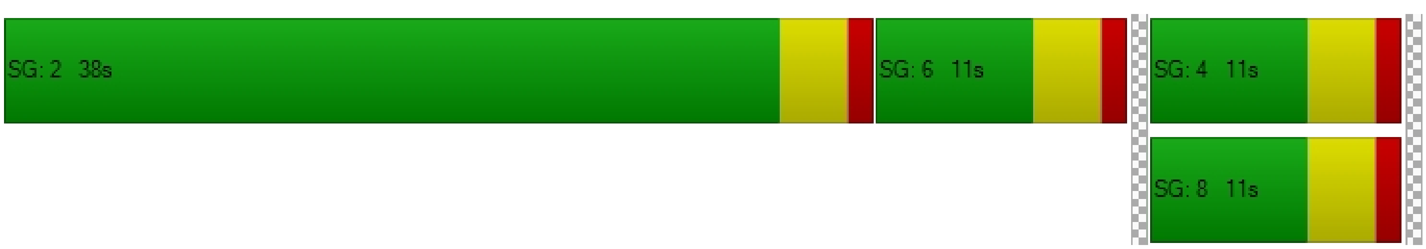
d_M, Delay for Movement [s/veh]	29.76	29.76	29.76	28.66	28.66	25.10	10.39	6.57	5.41	8.58	7.33	5.67
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	29.76			27.39			7.07			7.13		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	12.43											
Intersection LOS	B											
Intersection V/C	0.406											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1133	233	233	233
d_b, Bicycle Delay [s]	5.63	23.41	23.41	23.41
I_b,int, Bicycle LOS Score for Intersection	1.667	2.007	2.043	2.193
Bicycle LOS	A	B	B	B

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	9.6
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.509

Intersection Setup

Name												
Approach		Northbound			Southbound			Eastbound			Westbound	
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]		25.00			25.00			55.00			55.00	
Grade [%]		0.00			0.00			0.00			0.00	
Curb Present		No			No			No			No	
Crosswalk		No			No			No			No	

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	40	0	9	12	34	0	0	58	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	4	18	117	11	42	55	433	14	28	468	164
Peak Hour Factor	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	5	33	3	12	16	123	4	8	133	47
Total Analysis Volume [veh/h]	6	5	21	133	13	48	63	493	16	32	533	187
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing m		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing mi		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	17	0	0	14	0	0	29	0	0	29	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	7	7	38	38	38	38	38	38
g / C, Green / Cycle	0.05	0.12	0.12	0.63	0.63	0.63	0.63	0.63	0.63
(v / s)_i Volume / Saturation Flow Rate	0.02	0.09	0.03	0.07	0.15	0.01	0.04	0.30	0.12
s, saturation flow rate [veh/h]	1574	1694	1506	871	3373	1506	904	1772	1506
c, Capacity [veh/h]	79	201	179	498	2131	951	603	1119	951
d1, Uniform Delay [s]	27.71	25.56	24.13	10.37	4.78	4.12	6.74	5.84	4.66
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.34	4.91	0.80	0.52	0.25	0.03	0.17	1.45	0.46
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.41	0.73	0.27	0.13	0.23	0.02	0.05	0.48	0.20
d, Delay for Lane Group [s/veh]	31.05	30.47	24.93	10.89	5.03	4.16	6.91	7.29	5.12
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.50	2.20	0.64	0.44	0.68	0.04	0.15	2.06	0.57
50th-Percentile Queue Length [ft/ln]	12.61	55.02	15.93	10.98	17.08	1.07	3.79	51.45	14.30
95th-Percentile Queue Length [veh/ln]	0.91	3.96	1.15	0.79	1.23	0.08	0.27	3.70	1.03
95th-Percentile Queue Length [ft/ln]	22.70	99.04	28.68	19.76	30.75	1.92	6.82	92.60	25.74

Movement, Approach, & Intersection Results

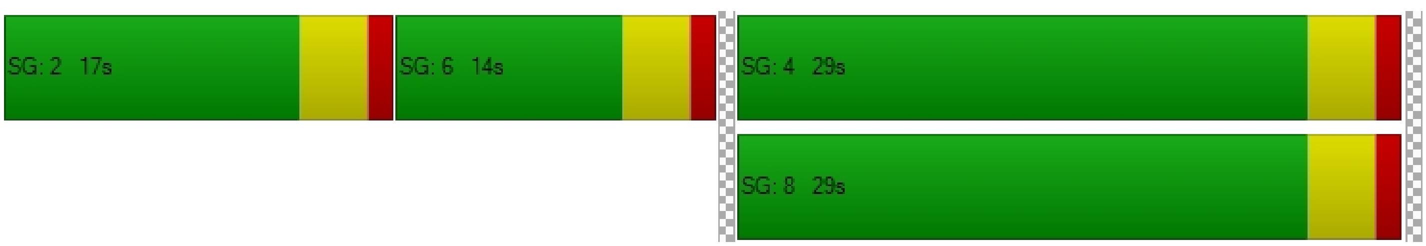
d_M, Delay for Movement [s/veh]	31.05	31.05	31.05	30.47	30.47	24.93	10.89	5.03	4.16	6.91	7.29	5.12
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	31.05			29.10			5.65			6.73		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	9.64											
Intersection LOS	A											
Intersection V/C	0.509											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	433	333	833	833
d_b, Bicycle Delay [s]	18.41	20.83	10.21	10.21
I_b,int, Bicycle LOS Score for Intersection	1.612	1.880	2.032	2.800
Bicycle LOS	A	A	B	C

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



FUTURE YEAR (2033) WITHOUT PROJECT

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	13.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.089

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	6	10	9	5	0	0	0	0	7	0	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	141	33	52	159	0	0	1	1	36	5	41
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	37	9	14	42	0	0	0	0	9	1	11
Total Analysis Volume [veh/h]	0	148	35	55	167	0	0	1	1	38	5	43
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.20	0.03	0.09	0.22	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	12.05	11.18	9.68	13.05	11.89	10.63	7.31	0.00	0.00	7.28	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.89	0.89	0.89	1.30	1.30	1.30	0.00	0.00	0.00	0.07	0.07	0.07
95th-Percentile Queue Length [ft/ln]	22.22	22.22	22.22	32.59	32.59	32.59	0.00	0.00	0.00	1.70	1.70	1.70
d_A, Approach Delay [s/veh]	10.89			12.18			0.00			3.21		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	10.09											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	157.8
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.037

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	39	0	9	2	51	0	0	18	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	34	144	8	99	85	523	14	10	346	45
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	9	38	2	26	22	138	4	3	91	12
Total Analysis Volume [veh/h]	21	16	36	152	8	104	89	551	15	11	364	47
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.17	0.09	0.07	1.04	0.04	0.15	0.08	0.01	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	41.37	32.80	19.30	157.75	152.56	11.24	8.40	0.00	0.00	8.62	0.00	0.00
Movement LOS	E	D	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.35	1.35	1.35	8.52	8.52	0.54	0.25	0.00	0.00	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]	33.77	33.77	33.77	213.08	213.08	13.42	6.29	0.00	0.00	0.83	0.00	0.00
d_A, Approach Delay [s/veh]	28.61			99.88			1.14			0.22		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	20.72											
Intersection LOS	F											

Intersection Level Of Service Report

Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	15.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.125

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	4	38	16	1	0	1	60	0	14	21	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	34	75	50	31	38	40	146	1	24	85	47
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	9	20	13	8	10	11	38	0	6	22	12
Total Analysis Volume [veh/h]	1	36	79	53	33	40	42	154	1	25	89	49
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.07	0.09	0.12	0.06	0.04	0.03	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	13.74	13.24	10.03	15.45	14.02	10.82	7.56	0.00	0.00	7.57	0.00	0.00
Movement LOS	B	B	B	C	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.58	0.58	0.58	0.89	0.89	0.89	0.09	0.00	0.00	0.05	0.00	0.00
95th-Percentile Queue Length [ft/ln]	14.53	14.53	14.53	22.24	22.24	22.24	2.24	0.00	0.00	1.34	0.00	0.00
d_A, Approach Delay [s/veh]	11.06			13.60			1.61			1.16		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	5.82											
Intersection LOS	C											

Intersection Level Of Service Report

Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	12.8
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.076

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	┼			┼			┼			┼		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	8	10	5	7	0	0	0	0	14	0	9
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	134	37	42	111	0	0	0	0	48	1	59
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	35	10	11	29	0	0	0	0	13	0	16
Total Analysis Volume [veh/h]	0	141	39	44	117	0	0	0	0	51	1	62
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.20	0.04	0.08	0.16	0.00	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	11.94	11.57	9.77	12.80	11.53	10.07	7.34	0.00	0.00	7.29	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.92	0.92	0.92	0.91	0.91	0.91	0.00	0.00	0.00	0.09	0.09	0.09
95th-Percentile Queue Length [ft/ln]	22.92	22.92	22.92	22.78	22.78	22.78	0.00	0.00	0.00	2.28	2.28	2.28
d_A, Approach Delay [s/veh]	11.18			11.88			2.45			3.26		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	9.44											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	245.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.151

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	25	0	7	9	34	0	0	58	44
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	5	22	119	14	48	61	522	17	34	558	158
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	6	31	4	13	16	137	4	9	147	42
Total Analysis Volume [veh/h]	6	5	23	125	15	51	64	549	18	36	587	166
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.05	0.04	1.15	0.11	0.10	0.07	0.01	0.00	0.04	0.01	0.00
d_M, Delay for Movement [s/veh]	52.23	41.46	15.02	245.69	239.52	12.85	9.54	0.00	0.00	8.72	0.00	0.00
Movement LOS	F	E	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.57	0.57	0.57	9.30	9.30	0.33	0.24	0.00	0.00	0.11	0.00	0.00
95th-Percentile Queue Length [ft/ln]	14.16	14.16	14.16	232.41	232.41	8.29	6.04	0.00	0.00	2.78	0.00	0.00
d_A, Approach Delay [s/veh]	25.48			183.03			0.97			0.40		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	22.34											
Intersection LOS	F											

Intersection Level Of Service Report

Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	15.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.123

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	3	24	10	4	1	1	39	0	44	68	18
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	11	52	48	24	30	19	116	4	66	147	47
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	14	13	6	8	5	31	1	17	39	12
Total Analysis Volume [veh/h]	1	12	55	51	25	32	20	122	4	69	155	49
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.03	0.06	0.12	0.06	0.04	0.01	0.00	0.00	0.05	0.00	0.00
d_M, Delay for Movement [s/veh]	14.10	13.64	9.34	15.68	14.91	11.14	7.67	0.00	0.00	7.59	0.00	0.00
Movement LOS	B	B	A	C	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.29	0.29	0.29	0.81	0.81	0.81	0.04	0.00	0.00	0.15	0.00	0.00
95th-Percentile Queue Length [ft/ln]	7.30	7.30	7.30	20.29	20.29	20.29	1.11	0.00	0.00	3.72	0.00	0.00
d_A, Approach Delay [s/veh]	10.17			14.16			1.05			1.92		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	4.87											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	12.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.409

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	39	0	9	2	51	0	0	18	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	34	144	8	99	85	523	14	10	346	45
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	9	38	2	26	22	138	4	3	91	12
Total Analysis Volume [veh/h]	21	16	36	152	8	104	89	551	15	11	364	47
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	29	0	0	20	0	0	11	0	0	11	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	5	8	8	35	35	35	35	35	35
g / C, Green / Cycle	0.08	0.13	0.13	0.59	0.59	0.59	0.59	0.59	0.59
(v / s)_i Volume / Saturation Flow Rate	0.04	0.09	0.07	0.09	0.15	0.01	0.01	0.19	0.03
s, saturation flow rate [veh/h]	1698	1785	1589	1018	3560	1589	857	1870	1589
c, Capacity [veh/h]	142	232	206	577	2090	933	527	1098	933
d1, Uniform Delay [s]	26.38	25.03	24.38	9.98	6.07	5.18	8.39	6.37	5.29
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.84	3.66	1.90	0.57	0.31	0.03	0.07	0.81	0.10
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.69	0.50	0.15	0.26	0.02	0.02	0.33	0.05
d, Delay for Lane Group [s/veh]	29.22	28.68	26.28	10.54	6.38	5.21	8.46	7.18	5.39
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.08	2.32	1.43	0.59	1.02	0.05	0.06	1.54	0.16
50th-Percentile Queue Length [ft/ln]	26.92	58.07	35.77	14.81	25.48	1.28	1.58	38.41	4.12
95th-Percentile Queue Length [veh/ln]	1.94	4.18	2.58	1.07	1.83	0.09	0.11	2.77	0.30
95th-Percentile Queue Length [ft/ln]	48.46	104.53	64.39	26.67	45.86	2.31	2.85	69.14	7.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	29.22	29.22	29.22	28.68	28.68	26.28	10.54	6.38	5.21	8.46	7.18	5.39
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	29.22			27.74			6.92			7.02		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	11.99											
Intersection LOS	B											
Intersection V/C	0.409											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	833	533	233	233
d_b, Bicycle Delay [s]	10.21	16.13	23.41	23.41
I_b,int, Bicycle LOS Score for Intersection	1.680	1.995	2.100	2.256
Bicycle LOS	A	A	B	B

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	9.3
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.516

Intersection Setup

Name												
Approach		Northbound			Southbound			Eastbound			Westbound	
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]		25.00			25.00			55.00			55.00	
Grade [%]		0.00			0.00			0.00			0.00	
Curb Present		No			No			No			No	
Crosswalk		No			No			No			No	

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	25	0	7	9	34	0	0	58	44
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	5	22	119	14	48	61	522	17	34	558	158
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	6	31	4	13	16	137	4	9	147	42
Total Analysis Volume [veh/h]	6	5	23	125	15	51	64	549	18	36	587	166
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing m		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing mi		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	12	0	0	11	0	0	37	0	0	37	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	7	7	38	38	38	38	38	38
g / C, Green / Cycle	0.05	0.11	0.11	0.64	0.64	0.64	0.64	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate	0.02	0.08	0.03	0.08	0.15	0.01	0.04	0.31	0.10
s, saturation flow rate [veh/h]	1657	1790	1589	829	3560	1589	858	1870	1589
c, Capacity [veh/h]	87	199	177	482	2267	1012	584	1191	1012
d1, Uniform Delay [s]	27.59	25.77	24.54	10.33	4.69	4.01	6.62	5.78	4.43
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.87	4.44	0.89	0.57	0.25	0.03	0.20	1.46	0.35
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.39	0.70	0.29	0.13	0.24	0.02	0.06	0.49	0.16
d, Delay for Lane Group [s/veh]	30.45	30.21	25.42	10.90	4.94	4.05	6.83	7.24	4.78
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.53	2.09	0.68	0.45	0.74	0.05	0.17	2.22	0.48
50th-Percentile Queue Length [ft/ln]	13.16	52.35	17.12	11.23	18.50	1.15	4.24	55.59	11.88
95th-Percentile Queue Length [veh/ln]	0.95	3.77	1.23	0.81	1.33	0.08	0.31	4.00	0.86
95th-Percentile Queue Length [ft/ln]	23.68	94.24	30.81	20.21	33.30	2.07	7.63	100.06	21.38

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	30.45	30.45	30.45	30.21	30.21	25.42	10.90	4.94	4.05	6.83	7.24	4.78
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	30.45			28.93			5.52			6.71		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	9.32											
Intersection LOS	A											
Intersection V/C	0.516											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	267	233	1100	1100
d_b, Bicycle Delay [s]	22.53	23.41	6.08	6.08
I_b,int, Bicycle LOS Score for Intersection	1.616	1.875	2.080	2.861
Bicycle LOS	A	A	B	C

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FUTURE YEAR (2033) WITH PROJECT

Intersection Level Of Service Report
Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	13.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.096

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	106	18	34	121	0	0	1	1	23	4	30
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	9	29	9	6	0	0	0	0	14	0	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	144	52	52	160	0	0	1	1	43	5	41
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	38	14	14	42	0	0	0	0	11	1	11
Total Analysis Volume [veh/h]	0	152	55	55	168	0	0	1	1	45	5	43
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.21	0.05	0.10	0.22	0.00	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	12.44	11.50	9.89	13.70	12.22	10.85	7.31	0.00	0.00	7.29	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.03	1.03	1.03	1.38	1.38	1.38	0.00	0.00	0.00	0.08	0.08	0.08
95th-Percentile Queue Length [ft/ln]	25.86	25.86	25.86	34.50	34.50	34.50	0.00	0.00	0.00	2.04	2.04	2.04
d_A, Approach Delay [s/veh]	11.07			12.58			0.00			3.53		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	10.33											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	218.5
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.213

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	62	0	12	3	51	0	0	18	21
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	34	167	8	102	86	523	14	10	346	53
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	9	44	2	27	23	138	4	3	91	14
Total Analysis Volume [veh/h]	21	16	36	176	8	107	91	551	15	11	364	56
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.17	0.09	0.07	1.21	0.04	0.16	0.08	0.01	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	42.38	33.54	19.63	218.54	213.26	11.27	8.43	0.00	0.00	8.62	0.00	0.00
Movement LOS	E	D	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.38	1.38	1.38	10.97	10.97	0.55	0.26	0.00	0.00	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]	34.56	34.56	34.56	274.35	274.35	13.87	6.50	0.00	0.00	0.83	0.00	0.00
d_A, Approach Delay [s/veh]	29.22			142.18			1.17			0.22		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	30.56											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	16.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.135

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	24	29	27	24	30	31	68	1	8	50	33
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	7	44	16	2	0	1	80	0	16	28	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	37	81	50	32	38	40	166	1	26	92	47
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	10	21	13	8	10	11	44	0	7	24	12
Total Analysis Volume [veh/h]	1	39	85	53	34	40	42	175	1	27	97	49
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.08	0.10	0.13	0.07	0.04	0.03	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	14.38	13.76	10.32	16.42	14.64	11.15	7.58	0.00	0.00	7.62	0.00	0.00
Movement LOS	B	B	B	C	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.66	0.66	0.66	0.97	0.97	0.97	0.09	0.00	0.00	0.06	0.00	0.00
95th-Percentile Queue Length [ft/ln]	16.58	16.58	16.58	24.13	24.13	24.13	2.26	0.00	0.00	1.47	0.00	0.00
d_A, Approach Delay [s/veh]	11.42			14.29			1.46			1.19		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	5.86											
Intersection LOS	C											

Intersection Level Of Service Report

Intersection 1: Mesa View Dr (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	14.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.086

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✢			✢			✢			✢		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	99	21	29	82	0	0	0	0	27	1	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	10	23	5	10	0	0	0	0	37	0	9
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	136	50	42	114	0	0	0	0	71	1	59
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	36	13	11	30	0	0	0	0	19	0	16
Total Analysis Volume [veh/h]	0	143	53	44	120	0	0	0	0	75	1	62
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.22	0.05	0.09	0.18	0.00	0.00	0.00	0.00	0.05	0.00	0.00
d_M, Delay for Movement [s/veh]	12.87	12.32	10.12	14.07	12.36	10.50	7.34	0.00	0.00	7.33	0.00	0.00
Movement LOS	B	B	B	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.08	1.08	1.08	1.05	1.05	1.05	0.00	0.00	0.00	0.14	0.14	0.14
95th-Percentile Queue Length [ft/ln]	27.07	27.07	27.07	26.27	26.27	26.27	0.00	0.00	0.00	3.43	3.43	3.43
d_A, Approach Delay [s/veh]	11.73			12.82			2.45			3.98		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	9.94											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	311.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.319

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	40	0	9	12	34	0	0	58	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	5	22	134	14	50	64	522	17	34	558	184
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	6	35	4	13	17	137	4	9	147	48
Total Analysis Volume [veh/h]	6	5	23	141	15	53	67	549	18	36	587	194
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.05	0.04	1.32	0.11	0.10	0.08	0.01	0.00	0.04	0.01	0.00
d_M, Delay for Movement [s/veh]	54.46	43.55	15.28	311.72	305.40	12.88	9.68	0.00	0.00	8.72	0.00	0.00
Movement LOS	F	E	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.59	0.59	0.59	11.14	11.14	0.35	0.26	0.00	0.00	0.11	0.00	0.00
95th-Percentile Queue Length [ft/ln]	14.74	14.74	14.74	278.59	278.59	8.65	6.51	0.00	0.00	2.78	0.00	0.00
d_A, Approach Delay [s/veh]	26.35			235.48			1.02			0.38		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	30.15											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: Pena Rd (NS) at La Mesa Rd (EW)

Control Type:	Two-way stop	Delay (sec / veh):	17.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.136

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	90.00	100.00	100.00	90.00	100.00	100.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	1	6	22	30	16	23	14	61	3	17	62	23
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	28	10	7	1	1	52	0	50	91	18
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	13	56	48	27	30	19	129	4	72	170	47
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	15	13	7	8	5	34	1	19	45	12
Total Analysis Volume [veh/h]	1	14	59	51	28	32	20	136	4	76	179	49
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.03	0.06	0.14	0.07	0.04	0.01	0.00	0.00	0.05	0.00	0.00
d_M, Delay for Movement [s/veh]	15.07	14.36	9.51	17.10	16.02	11.77	7.73	0.00	0.00	7.63	0.00	0.00
Movement LOS	C	B	A	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.34	0.34	0.34	0.93	0.93	0.93	0.05	0.00	0.00	0.17	0.00	0.00
95th-Percentile Queue Length [ft/ln]	8.46	8.46	8.46	23.34	23.34	23.34	1.14	0.00	0.00	4.16	0.00	0.00
d_A, Approach Delay [s/veh]	10.51			15.29			0.97			1.91		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	4.95											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	12.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.409

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	16	12	27	83	6	71	65	372	11	8	258	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	39	0	9	2	51	0	0	18	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	34	144	8	99	85	523	14	10	346	45
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	9	38	2	26	22	138	4	3	91	12
Total Analysis Volume [veh/h]	21	16	36	152	8	104	89	551	15	11	364	47
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	29	0	0	20	0	0	11	0	0	11	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	5	8	8	35	35	35	35	35	35
g / C, Green / Cycle	0.08	0.13	0.13	0.59	0.59	0.59	0.59	0.59	0.59
(v / s)_i Volume / Saturation Flow Rate	0.04	0.09	0.07	0.09	0.15	0.01	0.01	0.19	0.03
s, saturation flow rate [veh/h]	1698	1785	1589	1018	3560	1589	857	1870	1589
c, Capacity [veh/h]	142	232	206	577	2090	933	527	1098	933
d1, Uniform Delay [s]	26.38	25.03	24.38	9.98	6.07	5.18	8.39	6.37	5.29
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.84	3.66	1.90	0.57	0.31	0.03	0.07	0.81	0.10
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.69	0.50	0.15	0.26	0.02	0.02	0.33	0.05
d, Delay for Lane Group [s/veh]	29.22	28.68	26.28	10.54	6.38	5.21	8.46	7.18	5.39
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.08	2.32	1.43	0.59	1.02	0.05	0.06	1.54	0.16
50th-Percentile Queue Length [ft/ln]	26.92	58.07	35.77	14.81	25.48	1.28	1.58	38.41	4.12
95th-Percentile Queue Length [veh/ln]	1.94	4.18	2.58	1.07	1.83	0.09	0.11	2.77	0.30
95th-Percentile Queue Length [ft/ln]	48.46	104.53	64.39	26.67	45.86	2.31	2.85	69.14	7.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	29.22	29.22	29.22	28.68	28.68	26.28	10.54	6.38	5.21	8.46	7.18	5.39
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	29.22			27.74			6.92			7.02		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	11.99											
Intersection LOS	B											
Intersection V/C	0.409											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	833	533	233	233
d_b, Bicycle Delay [s]	10.21	16.13	23.41	23.41
I_b,int, Bicycle LOS Score for Intersection	1.680	1.995	2.100	2.256
Bicycle LOS	A	A	B	B

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report

Intersection 2: Mesa View Dr (NS) at Bear Valley Rd (EW)

Control Type:	Signalized	Delay (sec / veh):	9.7
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.527

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	225.00	100.00	100.00
Speed [mph]	25.00			25.00			55.00			55.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	5	4	17	74	11	32	41	384	13	27	394	90
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	40	0	9	12	34	0	0	58	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	5	22	134	14	50	64	522	17	34	558	184
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	6	35	4	13	17	137	4	9	147	48
Total Analysis Volume [veh/h]	6	5	23	141	15	53	67	549	18	36	587	194
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	60
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Split	Split	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	0	2	0	0	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	7	0	0	7	0	0	7	0	0	7	0
Maximum Green [s]	0	130	0	0	130	0	0	130	0	0	130	0
Amber [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	20	0	0	14	0	0	26	0	0	26	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R
C, Cycle Length [s]	60	60	60	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	7	7	38	38	38	38	38	38
g / C, Green / Cycle	0.05	0.12	0.12	0.63	0.63	0.63	0.63	0.63	0.63
(v / s)_i Volume / Saturation Flow Rate	0.02	0.09	0.03	0.08	0.15	0.01	0.04	0.31	0.12
s, saturation flow rate [veh/h]	1657	1789	1589	829	3560	1589	858	1870	1589
c, Capacity [veh/h]	87	218	194	464	2231	996	569	1172	996
d1, Uniform Delay [s]	27.59	25.42	24.00	11.18	4.96	4.24	7.12	6.12	4.78
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.87	4.35	0.76	0.65	0.26	0.03	0.21	1.53	0.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.39	0.72	0.27	0.14	0.25	0.02	0.06	0.50	0.19
d, Delay for Lane Group [s/veh]	30.45	29.77	24.76	11.84	5.23	4.28	7.33	7.65	5.22
Lane Group LOS	C	C	C	B	A	A	A	A	A
Critical Lane Group	Yes	Yes	No	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.53	2.32	0.70	0.50	0.79	0.05	0.18	2.38	0.61
50th-Percentile Queue Length [ft/ln]	13.16	57.89	17.48	12.53	19.83	1.23	4.52	59.38	15.14
95th-Percentile Queue Length [veh/ln]	0.95	4.17	1.26	0.90	1.43	0.09	0.33	4.28	1.09
95th-Percentile Queue Length [ft/ln]	23.68	104.21	31.46	22.55	35.70	2.21	8.13	106.88	27.25

Movement, Approach, & Intersection Results

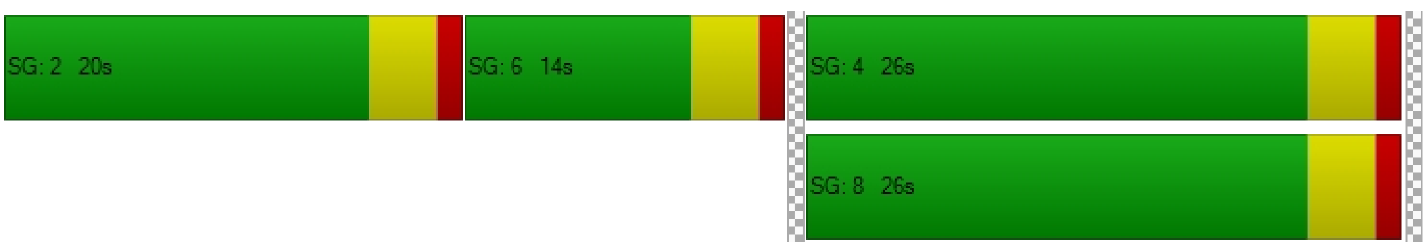
d_M, Delay for Movement [s/veh]	30.45	30.45	30.45	29.77	29.77	24.76	11.84	5.23	4.28	7.33	7.65	5.22
Movement LOS	C	C	C	C	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	30.45			28.50			5.90			7.06		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	9.74											
Intersection LOS	A											
Intersection V/C	0.527											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	533	333	733	733
d_b, Bicycle Delay [s]	16.13	20.83	12.03	12.03
I_b,int, Bicycle LOS Score for Intersection	1.616	1.904	2.083	2.908
Bicycle LOS	A	A	B	C

Sequence

Ring 1	2	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



GANDDINI GROUP INC.

714.795.3100 | ganddini.com

December 31, 2021

Mr. Greg Quan
BEDFORD OPPORTUNITY FUND II, LLC
212 South Palm Avenue, Suite 200
Alhambra, California 91801

RE: Tract Map No. 20454 Vehicle Miles Traveled Screening Assessment
Project No. 19449

Dear Mr. Quan:

Ganddini Group, Inc. is pleased to provide this Vehicle Miles Traveled Screening Assessment for the proposed Tract Map No. 20454 project. We trust the findings of this analysis will aid you and the City of Victorville in assessing the project.

PROJECT DESCRIPTION

The 30.2-acre project site is located at the southwest corner of Mesa View Drive and Nyack Road in the City of Victorville. Figure 1 shows the project location map.

The currently vacant site is proposed to be developed with 110 single-family residential dwelling units. The project proposes three full access driveways to Balsam Road, and one full access to Winona Street. For purposes of this analysis, the proposed project is anticipated to be constructed and fully operational by year 2023. Figure 2 illustrates the project site plan.

PROJECT TRIP GENERATION

Table 1 shows the project trip generation based upon trip generation rates obtained from the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition, 2021). Trip generation rates were determined for daily trips, AM peak hour inbound and outbound trips, and PM peak hour inbound and outbound trips for the proposed land use. The number of trips forecast to be generated by the proposed project are determined by multiplying the trip generation rates by the land use quantity.

As shown in Table 1, the proposed project is forecast to generate 1,038 daily trips, including 78 trips during the AM peak hour and 103 trips during the PM peak hour.

VEHICLE MILES TRAVELED (VMT) SCREENING ANALYSIS

The June 16, 2020 City Council meeting adopted Resolution No. 20-010 which provided guidelines for VMT thresholds of significance for analyzing traffic impacts under CEQA. Exhibit 1 of this resolution provides project screening criteria which exempts projects from conducting a detailed VMT analysis.

The project VMT impact has been assessed in accordance with the City TIA Guidelines. The City TIA Guidelines establish screening thresholds for certain types of projects that may be presumed to cause a less than significant VMT impact based on substantial evidence provided in the Office of Planning and Research (OPR) *Technical Advisory on Evaluating Transportation Impacts in CEQA* (December 2018).

The City TIA Guidelines specify the following two screening steps: 1) Daily Vehicle Trip Thresholds Screening; and 2) Land Use Types Screening.

Daily Vehicle Trip Screening

Projects that result in a net increase of 1,285 or less weekday daily trips are presumed to have a less than significant impact and are screened from a VMT analysis. The latest edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual* will be used to estimate daily trip generation.

Since the proposed project is forecast to generate fewer than 1,285 daily trips, the proposed project satisfies the City-established screening criteria for daily vehicle trips and may be presumed to result in a less than significant VMT impact.

Land Use Types Screening

Some project types have been identified as having the presumption of a less than significant impact as they are local serving by nature, or they are small enough to not warrant assessment. The following land use types will be used for screening:

- Single-family or multifamily residential – 136 dwelling units or less
- Office – 227,000 square feet
- Retail – 122,000 square feet
- Warehousing – 829,000 square feet
- Light industrial – 296,000 square feet
- K-12 public school
- Daycare/childcare/pre-k
- Affordable housing
- Student housing
- Community institutions, social services, and public buildings

Since the proposed project is less than 136 dwelling units of single-family residential, the proposed project satisfies the City-established screening criteria for land use types and may be presumed to result in a less than significant VMT impact.

CONCLUSION

The proposed project is forecast to generate approximately 1,038 daily vehicle trips, including 78 vehicle trips during the AM peak hour and 103 vehicle trips during the PM peak hour.

Since the proposed project is forecast to generate fewer than 1,285 daily trips, the proposed project satisfies the City-established screening criteria for daily vehicle trips and may be presumed to result in a less than significant VMT impact.

Since the proposed project is less than 136 dwelling units of single-family residential, the proposed project satisfies the City-established screening criteria for land use types and may be presumed to result in a less than significant VMT impact.

We appreciate the opportunity to assist you on this project. Should you have any questions or if we can be of further assistance, please do not hesitate to call at (714) 795-3100 x 103.

Sincerely,

GANDDINI GROUP, INC.
Bryan Crawford | Senior Associate
Giancarlo Ganddini, PE, PTP | Principal

Table 1
Project Trip Generation

Trip Generation Rates									
			AM Peak Hour			PM Peak Hour			Daily
Land Use	Source[1]	Units[2]	% In	% Out	Rate	% In	% Out	Rate	Rate
Single-Family Detached Housing	ITE 210	DU	26%	74%	0.70	63%	37%	0.94	9.43

Trips Generated									
			AM Peak Hour			PM Peak Hour			
Land Use	Quantity	Units[2]	In	Out	Total	In	Out	Total	Daily
Single-Family Detached Housing	110	DU	21	57	78	65	38	103	1,038

Notes:

1) Sources:
ITE = Institute of Transportation Engineers *Trip Generation Manual* (11th Edition, 2021); ### = Land Use Code.

2) DU = Dwelling Units

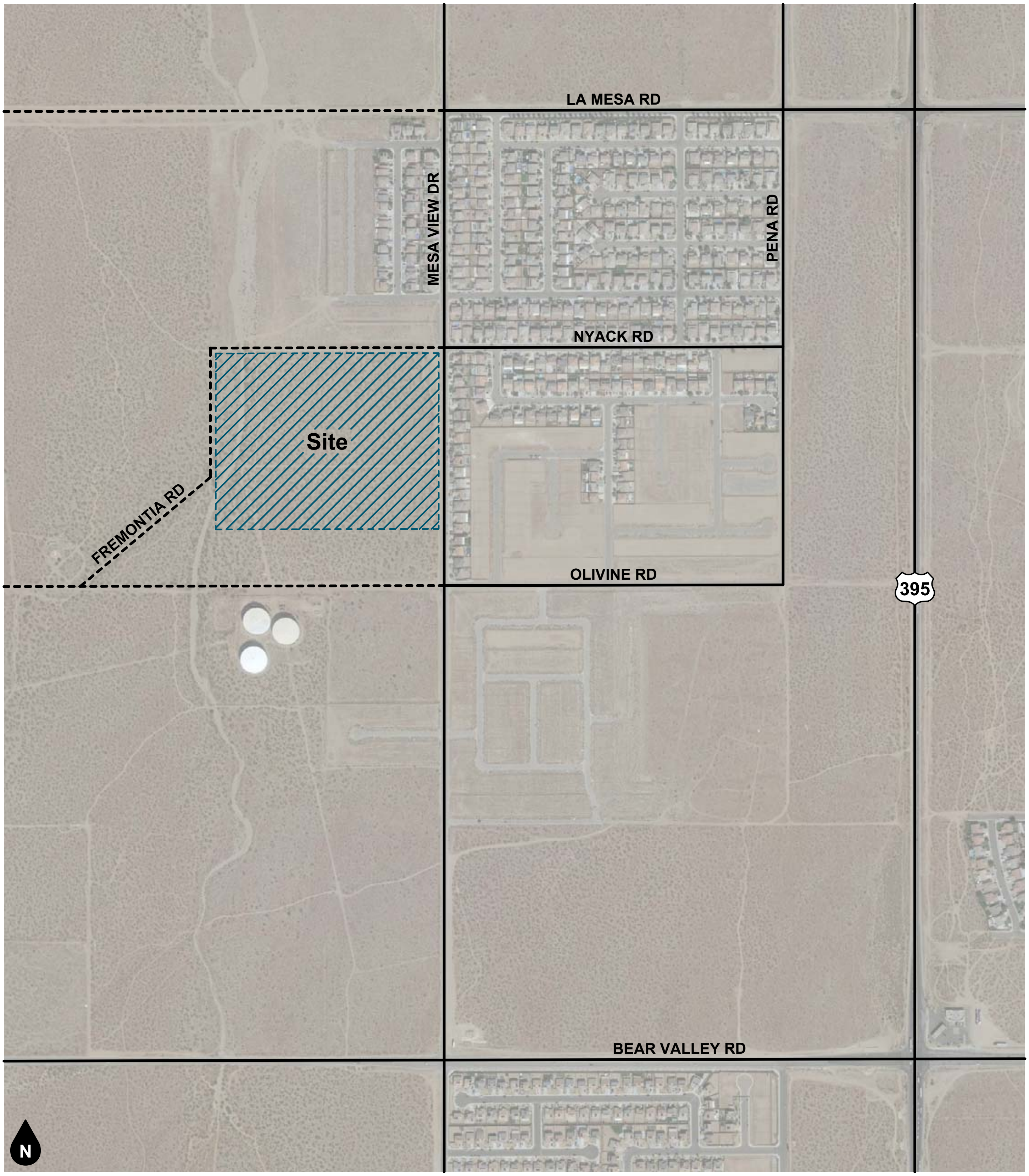


Figure 1
Project Location Map

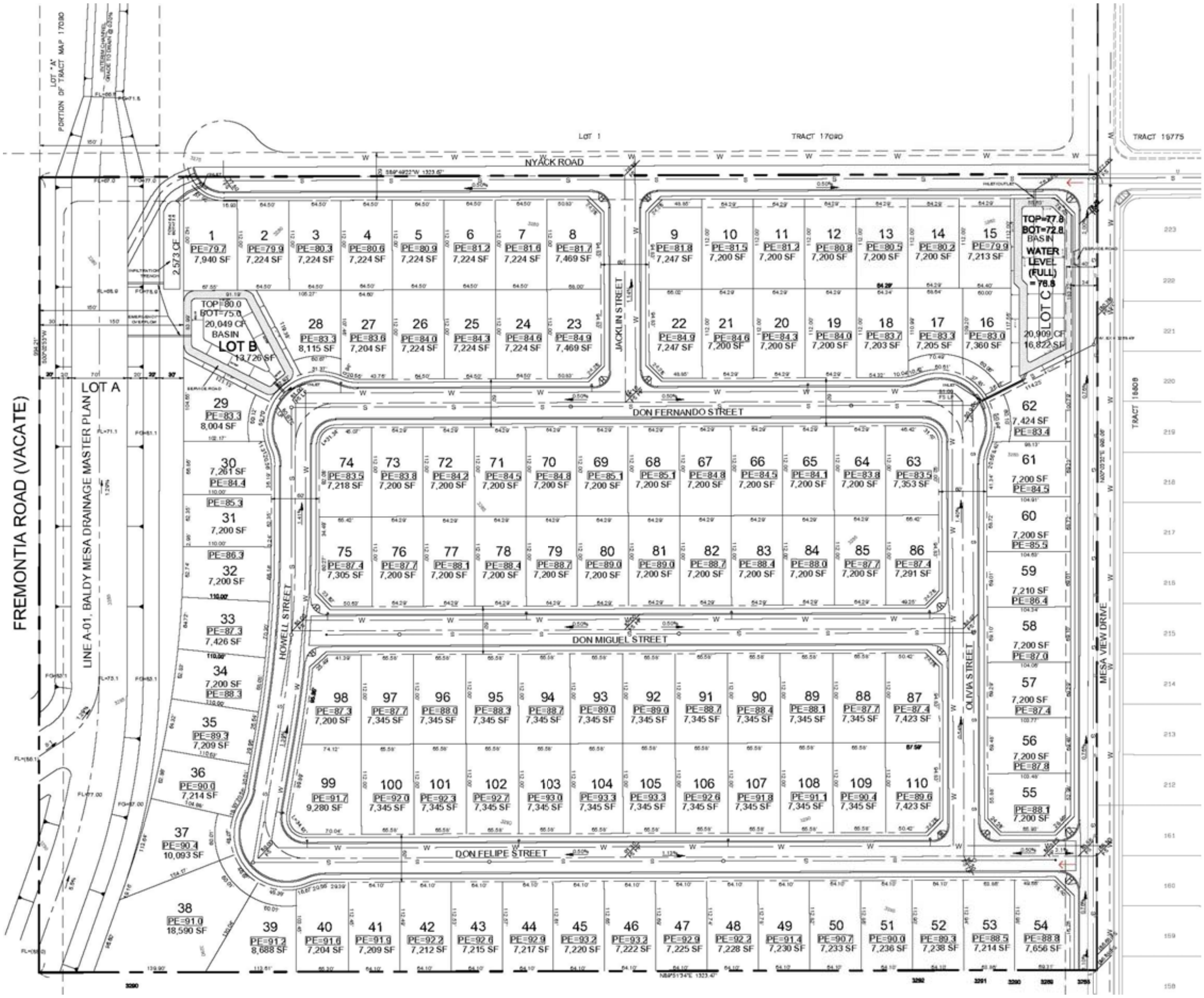


Figure 2
Site Plan