FINAL
ENVIRONMENTAL IMPACT REPORT
YORBA VILLAS RESIDENTIAL PROJECT
SAN BERNARDINO COUNTY, CALIFORNIA STATE CLEARINGHOUSE NO. 2021060049

PREPARED FOR:

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ACRONYMS AND ABBREVIATIONS

°C	degrees celsius
μg/m³	micrograms per cubic meter
AB 52	California Assembly Bill 52
ACM	asbestos-containing material
AF	acre-feet
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
amsl	above mean sea level
AQIA	Air Quality Impact Analyses
AQMP	Air Quality Management Plan
APN	Assessor's Parcel Number
ATCM	airborne toxic control measure
BAAQMD	Bay Area Air Quality Management District
BACM	best available control measure
BACT	best available control technology
Basin	South Coast Air Quality Basin
BAU	business as usual
BFE	base flood elevation
bgs	below ground surface
BMPs	Best Management Practices
CAA	Clean Air Act of 1970
CAAA	CAA Amendments of 1990
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CALGreen	California Green Building Standards Code
CAP	Climate Action Plan of 2013
CARB	California Air Resources Board
CBC	California Building Code
CCAA	California Clean Air Act of 1988
CDA	Chino Desalter Authority
CDFW	California Department of Fish and Wildlife
CC&Rs	Covenants, Conditions, and Restrictions
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGEU	California Gas and Electric Utilities 2016 California Gas Report
CGS	California Geological Survey
CH_4	methane
CHAPIS	Community Health Air Pollution Information System (CARB)
CHRIS	California Historical Resources Inventory System
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CRHR	California Register of Historical Resources
CTP	Clean Truck Program
CUP	Conditional Use Permit

dB	decibel
dBA	A-weighted decibels
DPM	diesel particulate matter
DTSC	Department of Toxic Substances Control
EIR	Environmental Impact Report
EMS	Emergency Medical Services
ESA	Environmental Site Assessment
FAR	floor area ratio
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act of 1973
FMMP	Farmland Mapping and Monitoring Program
gal/day	gallons per day
GHG	greenhouse gas
GWP	global warming potential
Handbook	Air Quality and Land Use Handbook: A Community Health Perspective (CARB 2005)
HAPs	hazardous air pollutants
HCM	Highway Capacity Manual
HCP	Habitat Conservation Plan
HDT	Heavy Duty Trucks
HFCs	hydroflourocarbons
Hot Spots Act	Air Toxics Hot Spots Information and Assessment Act of 1987
HP	horsepower
HPLV	High Pressure Low Volume
HVAC	heating, ventilating, and air conditioning
ICU	intersection capacity utilization
I	Interstate
IEUA	Inland Empire Utilities Agency
LBP	lead-based paint
LCFS	Low Carbon Fuel Standard
LEED	Leadership in Energy and Environmental Design
LEV	Low Emission Vehicle
LID	low impact development
LOS	level of service
LSTs	localized significance thresholds
MACT	maximum available control technology
MBTA	Migratory Bird Treaty Act of 1918
MCC	Material Culture Consulting
mgd	million gallons per day
MMRP	Mitigation Monitoring and Reporting Program
MMT	million metric tons
MPO	metropolitan planning organization
MT	metric tons
MT CO_2e	metric tons of carbon dioxide equivalent
NAAQS	National Ambient Air Quality Standards
N_2O	nitrous oxide
NAHC	Native American Heritage Commission
NALs	numeric action levels
NCCP	Natural Community Conservation Plan
NESHAP	national emissions standards for HAPs
NH_3	ammonia
NHPA	National Historic Preservation Act of 1966
NHTSA	National Highway Traffic and Safety Administration

NOP	Notice of Preparation
NO_2	nitrogen oxide
NO_x	nitrogen oxide
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	U.A. Department of Agriculture Natural Resources Conservation Service
O_3	ozone
Pb	lead
PDF	project design feature
PFCs	perflourocarbons
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
ppb	parts per billion
PPP	Plans, Programs, and Policies
PRC	Public Resources Code
PRIMP	Paleontological Resources Impact Mitigation Plan
PWS	public water supplier
REC	recognized environmental conditions
ROG	reactive organic gas
RP-5	IEUA Regional Water Recycling Plant No. 5
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SB 18	California Senate Bill 18, Ch. 905 (2004)
SC	Standard Condition
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCCIC	South Central Coastal Information Center
SCE	Southern California Edison Company
SCS	Sustainable Communities Strategy
SF	square feet
SF_6	sulfur hexaflouride
SIP	state implementation plan
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SO_4	sulfates
SoCalGas	Southern California Gas Company
SO_x	sulfur oxides
SP	Specific Plan
SR	State Route
SRA	Source Receptor Area
SWPPP	Storm Water Pollution Prevention Plan
SWQMP	Storm Water Quality Management Plan
SWRCB	Storm Water Resources Control Board
TACs	toxic air contaminants
TIA	Traffic Impact Analysis
tpy	tons per year
TTCP	traditional tribal cultural places
TUA	traditional use area
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

UTRs	utility tractors
UWMP	Urban Water Management Plan
VdB	velocity levels expressed in decibel notation
VMT	vehicle miles travelled
VOC	volatile organic compounds
WDR	Waste Discharge Requirements
WFA	Water Facilities Authority
Williamson Act	California Land Conservation Act of 1965
WQC	Water Quality Certification

1. Introduction

This Final Environmental Impact Report (FEIR; Final EIR) has been prepared in conformance with the environmental policy guidelines for the implementation of the California Environmental Quality Act (CEQA) to evaluate the environmental effects that may result from construction and operation of the proposed Yorba Villas Residential Project (proposed Project).

According to CEQA Guidelines Section 15132, the FEIR shall consist of:

(a) The Draft Environmental Impact Report (DEIR; Draft EIR) or a revision of the Draft EIR;

(b) Comments and recommendations received on the Draft EIR, either verbatim or in summary;

(c) A list of persons, organizations, and public agencies commenting on the Draft EIR;

(d) The responses of the lead agency to significant environmental points raised in the review and consultation process;

(e) Any other information added by the lead agency.

This document contains responses to comments received on the Draft EIR during the public review period, which began December 15, 2021 and ended on January 31, 2022. This document has been prepared in accordance with CEQA, the State CEQA Guidelines, and represents the independent judgment of the lead agency, San Bernardino County. This document and the circulated Draft EIR comprise the Final EIR in accordance with CEQA Guidelines, Section 15132.

1.1 Format of the Final EIR

The following chapters are contained within this document:

Chapter 1, Introduction. This chapter describes CEQA requirements and the content of the Final EIR.

Chapter 2, Response to Comments. This chapter provides a response to agencies and individuals who commented on the Draft EIR, as well as copies of their comment letters received during and following the public review period, and individual responses to their comments.

Chapter 3, Revisions to the Draft EIR. This chapter contains revisions made to the Draft EIR as a result of the comments received by agencies and organizations as described in Chapter 2, and/or errors and omissions discovered subsequent to release of the Draft EIR for public review.

San Bernardino County has determined that none of this material constitutes significant new information that requires recirculation of the Draft EIR for further public comment under CEQA Guidelines Section 15088.5. The additional material clarifies existing information prepared in the Draft EIR and does not present any new substantive information. None of this new material indicates that the project would result in a significant new environmental impact not previously disclosed in the Draft EIR. Additionally, none of this material indicates that there would be a substantial increase in the severity of a previously identified environmental impact that would not be mitigated, or that there would be any of the other circumstances requiring recirculation described in Section 15088.5.

Chapter 4, Mitigation, Monitoring, and Reporting Program. This chapter includes the Mitigation Monitoring and Reporting Program (MMRP). CEQA requires lead agencies to "adopt a reporting and mitigation monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment" (CEQA Section 21081.6, CEQA

Guidelines Section 15097). The MMRP was prepared based on the mitigation measures included in this Final EIR and has been included as Chapter 4.0.

1.2 CEQA Requirements Regarding Comments and Responses

CEQA Guidelines Section 15204(a) outlines parameters for submitting comments and reminds persons and public agencies that the focus of review and comment of Draft EIRs should be "*on the sufficiency of the document in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated. Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate the significant environmental effects. At the same time, reviewers should be aware that the adequacy of an EIR is determined in terms of what is reasonably feasible … CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. When responding to comments, lead agencies need only respond to significant environmental issues and do not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR.*"

CEQA Guidelines Section 15204(c) further advises, "*Reviewers should explain the basis for their comments, and should submit data or references offering facts, reasonable assumptions based on facts, or expert opinion supported by facts in support of the comments. Pursuant to Section 15064, an effect shall not be considered significant in the absence of substantial evidence." Section 15204 (d) also states, "Each responsible agency and trustee agency shall focus its comments on environmental information germane to that agency's statutory responsibility." Section 15204 (e) states, "This section shall not be used to restrict the ability of reviewers to comment on the general adequacy of a document or of the lead agency to reject comments not focused as recommended by this section.*"

In accordance with CEQA, Public Resources Code (PRC) Section 21092.5, copies of the written responses to public agencies are being forwarded to those agencies at least 10 days prior to certification of the Final EIR, with copies of this Final EIR document, which conforms to the legal standards established for response to comments on the Draft EIR pursuant to CEQA.

Comment Letter A1: City of Chino, dated January 27, 2022

EUNICE M. ULLOA
Mayor

MARC LUCIO
Mayor Pro Tem

CITY of CHINO

KAREN C. COMSTOCK
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WALT POCOCK
Council Members

MATTHEW C. BALLANTYNE
City Manager

January 27, 2022

Via Email & US Mail
Steven.Valdez@lus.sbcounty.gov

Steven Valdez
San Bernardino County Land Use Services Department
Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

RE: Notice of Availability of a Draft EIR: Yorba Villas (State Clearinghouse #2020120545) PROJ-2021-00008 (APN: 1013-211-21 & 22)

Dear Mr. Valdez:

Thank you for providing the City of Chino an opportunity to review and comment on the proposed Draft EIR (State Clearinghouse #202120545) for a General Plan Amendment (GPA), Zone Change (ZC), Planned Development Permit (PDP), and Tentative Tract Map (TTM) for the Project referred to as the Yorba Villas Residential Project that would allow for the development of 45 single-family homes at the northwest corner of Francis and Yorba Avenues. The City has reviewed the document, and this letter identifies major comments or concerns that should be addressed fully within the document and analyzed by the County of San Bernardino prior to adoption of the EIR or approval of the Project. A1.1

City of Chino General Plan and Future Annexation

1. The proposed Project is located within the City of Chino's Sphere of Influence (SOI), in an area with a City of Chino General Plan land use designation of RD2 (Residential/Agricultural). The RD2 land use designation is intended for semi-rural, large-lot residential developments, allowing one to two dwelling units per adjusted gross acre. As proposed, the information provided to the City identifies 45 single-family units on 13.35 acres of land resulting in a density of 3.37 dwelling units per acres. This density is inconsistent with the maximum densities allowed in the City's RD2 land use designation, which is two dwelling units per acre. Furthermore, the Project is not in conformance with other City codes and standards for the RD2 land use designation, such as, minimum lot size, lot dimensions, lot coverage and setbacks. A1.2

2. Since it is intended that this area will one day be annexed into the City's jurisdiction, the City has an interest in ensuring the proposed Project is consistent A1.3

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with all City requirements for the RD2 land use designation; when the property is annexed in the future, it should comply with the City's General Plan and Zoning Ordinance so we can avoid the proliferation of legal non-conforming properties. A1.3 Cont.

Infrastructure Improvements

3. Per the City of Chino Municipal Code, private streets are no longer allowed, and only public streets are accepted. This may create issues with maintenance and enforceability upon future annexation by the City of Chino. A1.4

4. The "Drainage" section (Pages 3-14) indicates that stormwater grate inlets would capture tributary flows that run toward the Project site and convey them around the Project site, but does not describe or address how these flows will impact the stormwater facilities downstream in the City of Chino. The EIR should be revised to clearly address downstream stormwater drainage impacts. A1.5

5. The "Water Infrastructure" section (Pages 3-14) is unclear and must be revised to show that the Project will need to tie into the existing water mains that are serviced and maintained by the Monte Vista Water District. Coordination with the agency is needed for proper connectivity.

6. The "Wastewater Infrastructure" section (Pages 3-15) should provide an alternative solution that addresses how the Project will continue should the proposed connection to Inland Empire Utilities Agency's trunk line end up being infeasible. Upon review of the document, it remains unclear how the Project will process wastewater, as the Monte Vista Water District is not a contracting agency with the Inland Empire Utilities Agency for sewage treatment and at this point does not have the ability to treat any wastewater it collects. This issue should be addressed fully within the EIR and Project-related documents, and in turn, reviewed by the City of Chino. A1.6

Traffic / VMT Analysis

7. In the Vehicle Miles Traveled (VMT) Analysis, the Project is said to be screened from further analysis because it meets the Low VMT Traffic Analysis Zone (TAZ) for both the San Bernardino County criteria and the City of Chino criteria. The City of Chino threshold criteria is based on 0% at horizon year. While this will not likely impact the results, the methodology is not correctly stated in the VMT Screening document and should be corrected. The sections from the VMT Screening Document identified below in **bold text** are inaccurate. A1.7

   a. *The City's guidelines include a screening threshold for projects located in a low VMT generating area. Low VMT generating area is defined as traffic analysis zones (TAZs) with a total daily VMT/Service Population (employment plus population) that is* ***15% less than the baseline level***

***for the County**. The project's site was evaluated using the SBCTA VMT Screening Tool (SBCTA VMT Screening Tool (arcgis.com)). As shown in Figure 4, the Countywide VMT/Service Population is **28.0** and the VMT/Service Population for the project zone is **19.7**. The VMT/Service Population of the project zone is approximately **29.6% below the County average**. Therefore, the project would meet Screening Criteria 2 and the VMT impact would be presumed to be less than significant. Additional VMT analysis would not be required.* A1.7 Cont.

8. The Office of Planning and Research recommends that screening criteria for Low VMT TAZ can be used if the Project is consistent with the surrounding land uses as it is likely that similar development is likely to result in similar VMT. As this Project intends to intensify the land use by increasing the number of residential dwelling units per acre, an argument can be made that this is not consistent with the surrounding land use within the TAZ and thus may not be screened based on the Low VMT TAZ criteria. Further evidence should be provided within the EIR and related documents if this finding is to be made.

To obtain additional information regarding the RD2 development standards, you can view the City's Municipal Code and Zoning Code at: https://library.municode.com/ca/chino/codes/code_of_ordinances. A1.8

If you have any questions, I can be contacted via phone at (909) 334-3332 or by email at wmorelion@cityofchino.org.

Respectfully,

Warren Morelion, AICP
City Planner

Response to Comment Letter A1: City of Chino, dated January 27, 2022

Comment A1.1: This comment states that the City of Chino has had the opportunity to review and comment on the proposed Draft EIR and identifies major comments or concerns that should be addressed fully within the document and analyzed by San Bernardino County.

Response A1.1: This comment is introductory in nature and does not identify any specific concerns with the adequacy of the Draft EIR. Thus, no further response is required.

Comment A1.2: This comment states that the Project is located within the City of Chino's sphere of influence with a City of Chino General Plan land use designation that allows for one to two dwelling units per adjusted gross acre. The comment identifies that the Project would result in 3.37 dwelling units per acre which is inconsistent with the maximum densities allowed in the City's RD2 land use designation. The comment also states that the Project is not in conformance with other City codes and standards for the RD2 land use designation including minimum lot size, lot dimensions, lot coverage and setbacks.

Response A1.2: Although the County works with cities and encourages projects located within sphere of influence areas to be consistent with the policies and standards for annexing cities, CEQA only requires an analysis of inconsistencies between a proposed project and an "applicable" general plan, specific plan and regional plans. CEQA Guidelines §15125(d). A plan is applicable when it has been adopted and the project is subject to it; if a plan does not regulate a proposed project, no analysis of plan consistency or inconsistency is required. Sierra Club v City of Orange (2008) 163 Cal. App.4th.523, 543; Chaparral Greens v. City of Chula Vista (1996) 50 Cal.App.4th 1134. The City of Chino's cited general plan and development standards do not regulate the Project and it is unknown when, if ever, the Project site will be annexed into the city, therefore the cited policies are not applicable and no analysis of plan consistency or inconsistency is required.

As discussed on page 5.7-3 in Section 5.7, Land Use and Planning, the Project is situated in the unincorporated area of San Bernardino County and is surrounded by built-out urbanized areas. As discussed on page 5.7-13 of the same Section 5.7, the proposed Project includes a Zoning Map Amendment that would be processed through the County and change the existing and applicable County zoning designation from RS-1 (Single Residential 1-Acre Minimum) to RS (Single Residential) to implement the proposed residential Project. As required by the applicable County Development Code, the proposed Project's development plans would be reviewed by the County to ensure consistency with applicable development standards. In addition, Figure 5.7-1 shows the Project's compatibility with the surrounding land use densities. The Project would be processed through the San Bernardino County and is consistent with the applicable County Development Code standards. Please also see pages 5.7-7 through 5.7-13 for a discussion of the Project's consistency with relevant goals and policies of the applicable San Bernardino County General Plan.

Comment A1.3: This comment states that the City has an interest in ensuring that the proposed Project is consistent with all City requirements for the RD2 land use designation. It also states that the Project should comply with the City's General Plan and Zoning Ordinance so there is an avoidance of legal non-conforming properties.

Response A1.3: As discussed in response A1.2 above, the Project is located in unincorporated San Bernardino County, is being processed through San Bernardino County and is subject to the applicable County Development Code and County General Plan. As shown on Figure 5.7-1, the Project is compatible with surrounding uses and densities. Lot sizes of various residential use are also shown; most in the area are consistent in size and type of use. Commercial, institutional, and significantly denser residential uses such as a mobile home park and smaller lot size subdivisions exist within a 0.3 mile radius of the Project. As discussed on page 5.7-7 of Section 5.7, *Land Use and Planning,* development of the Project site with single-family residential homes conforms with current and historic growth patterns in the region and would integrate into the planned development of these adjacent and nearby areas.

Comment A1.4: This comment states that private streets are no longer allowed per the City of Chino Municipal Code which may create issues with maintenance and enforceability upon future annexation by the City of Chino.

Response A1.4: The Project's private internal streets have been reviewed by the County to ensure appropriate access and circulation is included in the design of the private streets. As discussed above, the Project is located in unincorporated San Bernardino County and is being processed through San Bernardino County, which allows development of private streets. The Project is subject to the County's subdivision requirements. Pursuant to Section 87.06.050 of the County Code, a subdivision with private streets is required to have conditions, covenants, and restrictions approved by the County to provide for the maintenance of such private streets.

Comment A1.5: This comment states that the Drainage section on page 3-14 indicates that stormwater grate inlets would capture tributary flows that run toward the Project site and convey them around but does not describe or address how these flows will impact the stormwater facilities downstream in the City of Chino. The comment suggests that the EIR should be revised to clearly address downstream stormwater drainage impacts.

Response A1.5: The existing drainage pattern that is tributary to Francis Avenue flows generally from north to south with a slight trend to the west. Approximately one third of the tributary flows drain to Francis Avenue and then easterly to Yorba Avenue. The other two thirds of the tributary flows drain to Francis Avenue and then westerly in Francis Avenue to Ramona Avenue.

The project intercepts the tributary flows along the north property line maintaining the same division line between the two drainage areas upstream of the project. These flows are collected in a storm drain system and piped east and west; the east portion outlets onto Yorba Avenue and flows south in Yorba crossing Francis Avenue and continues south. The west portion is piped west and south to Francis Avenue and outlets to Francis Avenue where the storm flows drain westerly.

The in-tract storm flows are collected in an underground pipe system and piped to the detention/water quality basin at the southeast corner of the project. The storm waters are detained and outlet onto Francis Avenue at the southeast corner of the detention basin and drain easterly to Yorba Avenue and southerly in Yorba Avenue. Furthermore, the Project is designed with permeable pavers in the private streets to allow stormwater to infiltrate the streets and further reduce storm flows. The storm flows leaving the detention basin were detained so as to be 80% of the pre-development flows for the entire project. To further attenuate the storm flows, the Design Capture Volume of the Water Quality Management Plan was 23,282 cubic feet of water, all of which is infiltrated into the ground.

Comment A1.6: The comment states that the water infrastructure section is unclear and must be revised to show that the Project will need to tie into the existing water mains that are serviced by the Monte Vista Water District. The comment states that the Wastewater infrastructure section should provide an alternative solution that addresses how the Project would connect to the IEUA's trunk line and states that it remains unclear how the Project will process wastewater.

Response A1.6: As discussed on page 2-8 of Section 2, Introduction, the Project is located within the service area of the Monte Vista Water District (MVWD). MVWD would provide potable water service to the Project. As discussed on page 3-14, Project Description, MVWD currently operates and maintains an 8-inch potable water main that runs beneath Yorba Avenue and 12-inch potable water main that runs beneath Francis Avenue, both immediately adjacent to the Project site (MVWD Water Line). As discussed on page 3-14, the Project would construct an on-site 8-inch potable water line beneath the Project's internal roadways (On-Site Water Line). Each of the Project's residential lots would stub out to the On-Site Water Line. The Project would also construct an approximately 52-foot, 8-inch line beneath Yorba Avenue and approximately 30-foot, 8-inch line beneath Francis Avenue to connect the On-Site Water Line to the MVWD Water Line. All of the Project's potable water infrastructure would be constructed in coordination with MVWD and in accordance with applicable regulatory requirements, including but not limited to MVWD's technical specifications for new development. As explained on page 72 of the Project's Initial Study, the applicable MVWD Urban Water Management Plan indicates that the MVWD has adequate water supplies to serve its customers during normal, dry year, and multiple dry year demand through 2040 with projected population increases and accompanying increases in water demand.

As discussed on page 3-15, the Project's wastewater collection service would be provided by MVWD. Wastewater treatment service would ultimately be provided by the Inland Empire Utilities Agency (IEUA) under contract with MVWD, as discussed in more detail below. The entire MVWD service area is located within the boundaries of the IEUA service area. IEUA currently provides to sewage treatment services under the Chino Basin Regional Sewage Service Contract (Regional Contract) to the Cucamonga Valley Water District and the following cities: Chino; Chino Hills; Fontana; Montclair; Ontario; Upland. MVWD is an IEUA member agency.

IEUA operates an existing 21-inch sewer trunk line that runs immediately adjacent to the Project site underneath Yorba Avenue, which line connects to a 30-inch IEUA sewer trunk line at the intersection of Yorba Avenue and Francis Avenue immediately adjacent to the southeast corner of the Project site. As discussed on page 3-15, the Project would construct an on-site 8-inch sewer line beneath the Project's internal roadways (On-Site Sewer Line). Each of the Project's residential lots would stub out to the On-Site Sewer Line. The Project would also construct an approximately 123-foot, 4-inch force main (Off-Site Sewer Line) to connect the On-Site Sewer Line to the adjacent IEUA trunk line. All of the Project's sewer infrastructure would be constructed in coordination with MVWD and IEUA in accordance with applicable regulatory requirements, including but not limited to MVWD's and IEUA's technical specifications for new development. As discussed in the Initial Study, the IEUA Regional Water Recycling Plant No 1 would serve the Project. This Water Recycling Plant provides primary, secondary, and tertiary wastewater treatment for a design capacity of 44 million gallons of wastewater per day (mgd) and currently processes an average flow of 28 mgd of wastewater, resulting in a remaining capacity of approximately 16 mgd of wastewater. This remaining capacity is adequate to serve the Project and projected population increases and accompanying increases in sewage treatment demand.

Construction of the Off-Site Sewer Line would include trenching along the length of the sewer line, or approximately 123 feet, which would result in approximately 110 cubic yards of soil disturbance. Trenching would be minimal and would be required to comply with SCAQMD Rules, including Rule 403 for controlling fugitive dust, PM_{10}, and $PM_{2.5}$ emissions from construction activities. Rule 403 requirements include, but are not limited to, applying water in sufficient quantities to prevent the generation of visible dust plumes, applying soil binders to uncovered areas, reestablishing ground cover as quickly as possible, utilizing a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the Project site, covering all trucks hauling soil with a fabric cover and maintaining a freeboard height of 12-inches, and maintaining effective cover over exposed areas. Construction of the Off-site Sewer Line would generate less than the emissions generated during the grading phase of the proposed Project. Construction grading emissions are inclusive of emissions from trenching, and as discussed on Table AQ-1 and AQ-3 of the Initial Study, the Project’s estimated construction emissions are well below the regional and localized daily construction emission thresholds. Thus, construction emissions, inclusive of the Off-site Sewer Line, would not exceed SCAQMD construction emission thresholds and impacts would be less than significant.

MVWD does not currently provide wastewater collection service within its service area, but it has the latent authority to provide such service pursuant to Division 12 of the California Water Code. Acting in its capacity as a responsible agency, MVWD would apply to Local Agency Formation Commission for San Bernardino County (LAFCO) to authorize activation of MVWD's latent wastewater collection service authority. Following LAFCO approval, MVWD would enter into a contract with IEUA for sewer treatment service in accordance with the Regional Contract and apply to the State Water Resources Control Board (SWRCB) for coverage under the Statewide General Waste Discharge Requirements for wastewater collection agencies. Once these procedural steps are completed by these responsible agencies, MVWD would have full authority to provide wastewater collection service to the Project. To ensure that no alteration of the site or Project construction activity occurs prior to MVWD's completion of the procedural requirements to activate its latent wastewater collection authority, the County would impose a condition of approval on the Project that prohibits all on-site activity in furtherance of the Project that may alter the site or the issuance of any Project grading or building permits until such time as MVWD has fully activated such authority.

The County has considered other options for providing sewer service to the Project but none are viable. First, the Project cannot obtain retail sewer service from IEUA, as that agency does not provide retail sewer collection service within its service area. IEUA only provides wholesale sewer treatment service to IEUA member agencies under the Regional Contract. Second, the Project cannot obtain sewer service from the City of Chino because City of Chino City Council Resolution No. 2020-060 prohibits new and existing developments within its sphere of influence from applying for and receiving sewer service from the City unless they are developed in accordance with the City's General Plan and land use standards. As noted by the commenter, the City of Chino General Plan designates the Project site as RD2 (Residential/Agricultural), which is intended for semi-rural, large-lot residential developments, allowing one to two dwelling units per the acre. Since the Project proposed a residential density of 3.37 dwelling units per acre, current City of Chino policy prevents the Project from applying for and receiving sewer service from the City. Should MVWD be unsuccessful in obtaining authority to provide wastewater collection services to the Project, the Project would be unable to proceed based on the condition of approval discussed above. Similarly, should the applicant still wish to proceed with the Project and explore other options for wastewater collection service that may be available at that time, any and all alterations to the Project would require the submission of an application for a revision to an approved action which is a discretionary approval that would trigger the requirement of CEQA and an updated analysis of the potential environmental effects of the proposed modified project, if any.

Comment A1.7: This comment states that the VMT Screening document is incorrect and should state that the City of Chino threshold criteria is based on 0% at horizon year. The comment also states that since the Project intends to intensify the land use by increasing the number of residential dwelling units per acre, an argument can be made that it is not consistent with the surrounding land use within the TAZ and may not be screened based on the Low VMT TAZ criteria. The comment states that further evidence should be provided within the EIR and related documents if this finding is made.

Response A1.7: The City's guidelines contain one threshold for low-VMT area and another for total daily VMT which can both be used for VMT analyses. Page 16 of the City's December 2020 guidelines shows the Low VMT area screening threshold as "Presumed less than significant VMT impact for projects located in low VMT generating model traffic analysis zones (TAZs). These TAZs generate total daily VMT/SP that is 15% less than the baseline level for the County." The threshold indicated in the City's comment is the VMT analysis threshold shown on Page 17 of the City's guidelines. Page 16 and 17 of the City's guidelines are copied below.

EXHIBIT D – VMT ANALYSIS THRESHOLDS AND METHODOLOGY

Methods	Project Threshold	Cumulative Threshold
Land Use Plans (such as General Plans and Specific Plans)		
San Bernardino Traffic Analysis Model (SBTAM) forecast of total daily VMT/SP. - To capture project effect, the same cumulative year population and employment growth totals should be used. The 'project' only influences land use allocation.	A significant impact would occur if the project VMT/SP (for the land use plan) exceeds the Citywide average under General Plan Horizon Year Conditions.	A significant impact would occur if the project caused total daily VMT within the City to be higher than the no project alternative under cumulative conditions.
• Consistency check with SCAG RTP/SCS. - Is the proposed project within the growth projections in the RTP/SCS?	NA	A significant impact would occur if the project is determined to be inconsistent with the RTP/SCS.

TIA SB 743 VMT ANALYSIS THRESHOLDS AND METHODOLOGY

Methods	Project Threshold	Cumulative Threshold
• Project type screening.	Local serving retail projects (Per OPR's Technical Advisory less than 50,000 square feet) and neighborhood schools are presumed to have a less than significant VMT impact. Projects that generate less than 110 daily trips do not require VMT analysis.	Project presumption applies under cumulative conditions as long as project is consistent with SCAG RTP/SCS.
• VMT analysis using SBTAM forecast of total daily VMT/SP.	A significant impact would occur if the project VMT/SP exceeds the Citywide average under General Plan Horizon Year Conditions.	A significant impact would occur if the project is determined to be inconsistent with the RTP/SCS. A significant impact would occur if the project causes total daily VMT within the City to be higher than the no project alternative under cumulative conditions. This analysis should be performed using the 'project effect' or 'boundary' method.

Comment A1.8: This comment provides a link to additional information regarding the RD2 development standards.

Response A1.8: This comment is introductory in nature and does not identify any specific concerns with the adequacy of the Draft EIR. Thus, no further response is required.

Comment Letter I1: Priscilla Velasquez, dated January 15, 2022

January 15, 2022

Dear Mr. Valdez,

I1.1

I am writing in reference to the Yorba Villas Residential project located at 4570 Francis Ave in unit corporate San Bernardino County within the city of Chino Sphere of influence. My name is Priscilla Velasquez, my family and I have been residents in the 4500 block of Frances Ave for the past 23 years. We have invested in our future here for our current family as well as future generations; I actually purchased a home across the street from my parent's house because I love it as it is so much. I chose this parcel because of the open space and limited housing. I do not want additional homes added to this area to bring more traffic to our street. We love the current farm feel of the neighborhood, and current aesthetics of the look of the street. I grew up with horses, chickens and goats in my yard snd want that for my children as well, I want them to inherit the same home feel I grew up with. I love the quietness of being outside. Also, I feel the water quality will suffer. The building of homes will impact biological resources nearby. My family and I have invested a lot of money to make our home our final residence. It would be devastating to make changes to our neighborhood. Many residents have been here long term and feel the same way.There will be construction going up and down our street causing a nuisance. We have stables for livestock and additional noise will affect our animals and possibly cause illness and stress to them. Chino has become more crowded and crime has escalated as well. Our Sheriff Department does not need more people to serve in these trying times, they are already stretched thin and take a very long time to answer our calls. I want to be happy in my home for many years to come. I hope your decision will not affect our family's future with the implementation of more homes added to the area.

Thank you for your consideration,

Priscilla Velasquez
4543 Francis Ave
Chino, Ca 91710

Response to Comment Letter I1: Priscilla Velasquez, dated January 15, 2022

Comment I1.1: This comment states that they do not want additional homes added to the area that will bring more traffic to the street. The comment also states that they like the current aesthetics of the street and farm feel of the neighborhood. The comment states that the water quality will suffer and the building of homes will impact biological resources nearby. The comment also states that the family has invested a lot of money into their homes and it would be devastating to see the neighborhood change. The comment states that the construction will cause a nuisance and stress out the livestock and animals. The comment states that the Sheriff Department does not need more people to serve and states that they hope the decision does not affect their family's future.

Response I1.1: Senate Bill (SB) 743 changes include the elimination of auto delay, LOS, and similar measures of vehicular capacity or traffic congestion as the basis for determining significant impacts. As part of the 2019 amendments to the CEQA Guidelines, SB 743 directed that the revised CEQA Guidelines "shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses" (Public Resources Code Section 21099[b][1]); and that "automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment" (Public Resources Code Section 21099[b][2]). As such, pursuant to Public Resources Code Section 21099(b)(2), the Draft EIR is not required to analyze impacts related to traffic congestion. As discussed on page 5.2-11 of Section 5.2, *Biological Resources*, mitigation measure BIO-1 would ensure construction activities shall occur outside of the general bird nesting season. The mitigation measure would reduce potential impacts to a level that is less than significant.

As discussed on page 5.6-10 and 5.6-11 of Section 5.6, *Hydrology and Water Quality*, operation of the proposed Project would be required to comply with the requirements of the Santa Ana Regional Water Quality Control Board MS4 Permit that would include implementation of operational LID infrastructure and source and treatment control best management practices to protect surface water quality. As discussed in Section 5.8, *Noise,* construction and operational noise would be less than significant. As discussed in Appendix A, the additional 152 residents that are anticipated to be generated from full occupancy of the proposed Project would not require the construction or expansion of police facilities. Thus, impacts related to police services would be less than significant.

Comment Letter I2: Mr. and Mrs. Velasquez, dated January 13, 2022

January 15, 2022

Dear Mr. Valdez,

I1.1

I am writing in reference to the Yorba Villas Residential project located at 4570 Francis Ave in unit corporate San Bernardino County within the city of Chino Sphere of influence. My name is Priscilla Velasquez, my family and I have been residents in the 4500 block of Frances Ave for the past 23 years. We have invested in our future here for our current family as well as future generations; I actually purchased a home across the street from my parent's house because I love it as it is so much. I chose this parcel because of the open space and limited housing. I do not want additional homes added to this area to bring more traffic to our street. We love the current farm feel of the neighborhood, and current aesthetics of the look of the street. I grew up with horses, chickens and goats in my yard snd want that for my children as well, I want them to inherit the same home feel I grew up with. I love the quietness of being outside. Also, I feel the water quality will suffer. The building of homes will impact biological resources nearby. My family and I have invested a lot of money to make our home our final residence. It would be devastating to make changes to our neighborhood. Many residents have been here long term and feel the same way.There will be construction going up and down our street causing a nuisance. We have stables for livestock and additional noise will affect our animals and possibly cause illness and stress to them. Chino has become more crowded and crime has escalated as well. Our Sheriff Department does not need more people to serve in these trying times, they are already stretched thin and take a very long time to answer our calls. I want to be happy in my home for many years to come. I hope your decision will not affect our family's future with the implementation of more homes added to the area.

Thank you for your consideration,

Priscilla Velasquez
4543 Francis Ave
Chino, Ca 91710

Response to Comment Letter I2: Mr. and Mrs. Alberto Velasquez, dated January 13, 2022

Comment I2.1: This comment states that they do not want additional homes added to the area that will bring more traffic to the street and enjoy the farm feel of the neighborhood and current aesthetics of the look of the street. The comment states that they love the quietness of being outside and feel that the water quality will suffer. The building of homes will impact biological resources nearby. The comment states that the water quality will suffer and the building of homes will impact biological resources nearby. The comment also states that the family has invested a lot of money into their home and it would be devastating to see the neighborhood change. The comment states that the construction will cause a nuisance and stress out the livestock and animals. The comment states that the Sheriff Department does not need more people to serve and states that they hope the decision does not affect their family's future.

Response I2.1: Senate Bill (SB) 743 changes include the elimination of auto delay, LOS, and similar measures of vehicular capacity or traffic congestion as the basis for determining significant impacts. As part of the 2019 amendments to the CEQA Guidelines, SB 743 directed that the revised CEQA Guidelines "shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses" (Public Resources Code Section 21099[b][1]); and that "automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment" (Public Resources Code Section 21099[b][2]). As such, pursuant to Public Resources Code Section 21099(b)(2), the Draft EIR is not required to analyze impacts related to traffic congestion. As discussed on Page 5.2-11 of Section 5.2, *Biological Resources*, mitigation measure BIO-1 would ensure construction activities shall occur outside of the general bird nesting season. The mitigation measure would reduce potential impacts to a level that is less than significant.

As discussed on page 5.6-10 and 5.6-11 of Section 5.6, *Hydrology and Water Quality*, operation of the proposed Project would be required to comply with the requirements of the Santa Ana Regional Water Quality Control Board MS4 Permit that would include implementation of operational LID infrastructure and source and treatment control best management practices to protect surface water quality. As discussed in Section 5.8, *Noise,* construction and operational noise would be less than significant. As discussed in Appendix A, the additional 152 residents that are anticipated to be generated from full occupancy of the proposed Project would not require the construction or expansion of police facilities. Thus, impacts related to police services would be less than significant.

Chapter 3. Revisions to the Draft EIR

This section contains revisions to the Draft EIR based upon: (1) clarifications required to prepare a response to a specific comment; and/or (2) typographical errors. The provision of these changes does not alter any impact significance conclusions as disclosed in the Draft EIR. Changes made to the Draft EIR are identified here in strikeout text to indicate deletions and in underlined text to signify additions.

3.1 Revisions in Response to Written Comments and County Changes to Text

Chapter 3.0, Project Description

Page 3-14 of Section 3.0, Project Description, has been revised as follows:

Drainage

Storm water runoff in the Project vicinity currently flows from north to south. The Project would install new drainage infrastructure that would capture, convey, and/or infiltrate runoff, such that storm water runoff would not increase with implementation of the proposed Project. The Project would also install a series of grate inlets along the north property line that would route the offsite tributary storm water that flows toward the Project site from the north, into a drop grate inlet that would convey the runoff around the Project site. Runoff from onsite areas would be directed to onsite catch basins or onsite landscaped areas. The Project would include one detention and water quality basin near the southeast corner of the site. The water quality and detention basin would be designed as an infiltration basin. The stormwater would infiltrate through the bottom of the basin into the underlying soil. The flat bottom of the basin would have a top layer of sand, filter fabric, and an additional layer of sand with special criteria. Sand trenches would be also included. ~~There are two alternatives that provide similar water quality and stormwater detention systems. Alternative one would include at least three feet of bio filtration soil media at the bottom of the basin and a trench filled with gravel that would result in uniform infiltration. Additional storm water storage is available in the storm drain pipe system for larger storms. Alternative two would also include at least three feet of bio filtration soil that is underlain by a system of 10-inch diameter metal pipes which would allow for a uniform distribution of water below the bio filtration soil. Either alternative~~The infiltration basin would retain a 2-year 24-hour onsite storm flow and detain a 100-year 24-our storm flow.

Page 3-15 of Section 3.0, Project Description, has been revised as follows:

Wastewater Infrastructure

The proposed development would install new 8-inch private sewer line onsite that would use a lift station to connect to the existing 21-inch Inland Empire Utility Agency (IEUA) Regional Sewage System interceptor in Yorba Avenue. The Project will be conditioned on connecting to a sanitary sewer system. There are currently two adjacent sewer lines in Yorba Avenue accessible to the Project. One of the lines is owned by the IEUA and one is owned by the City of Chino. Upon ~~annexation~~ activation of the Yorba Avenue sewer collection system to the Monte Vista Water District and approval of the MVWD by the IEUA as a sewer collection agency, wastewater generated from the site would be treated by the Inland Empire Utilities Agency.

Chapter 5.6, Hydrology and Water Quality

Table HWQ-1: Types of BMPs Incorporated into the Project Design on Page 5.6-10, Section 5.6 Hydrology and Water Quality, has been revised as follows:

Type of BMP	Description of BMPs
LID Site Design	**Optimize the site design:** The site has been designed so that onsite runoff would be conveyed through proposed on-site storm drainpipes into the proposed infiltration/detention facilities which would detain precipitation from the 100-year storm event to 80 percent of the undeveloped storm flow conditions.
	Minimize impervious areas: The street widths have been designed to minimize impervious areas.
	Maximize natural infiltration: Underground infiltration chambers would promote natural infiltration.
	Preserve existing drainage patterns: Proposed development would match the existing drainage pattern and implement BMPs to aid in longer time of concentration by introducing more pervious areas and natural infiltrating capabilities.
	Install Pervious Pavers: The private streets would be constructed of pervious pavers to collect incident rainfall.

Page 5.6-11, Section 5.6 Hydrology and Water Quality, has been revised as follows:

The Project includes a water quality and detention basin ~~two basin alternatives~~ that would be designed as an infiltration basin. ~~provide similar water quality and stormwater detention systems. Both alternatives~~ The basin would incorporate post construction BMPs as described within Table HWQ-1, minimizing potential water quality impacts as a result of Project operation. The final WQMP, which would include operational LID infrastructure and non-structural, structural, and source control and treatment control BMPs to protect surface water quality, is required to be approved prior to the issuance of a building or grading permit. The Project's WQMP would be reviewed and approved by the County to ensure it complies with the Santa Ana RWQCB MS4 Permit regulations. In addition, the County's permitting process would ensure that all BMPs in the WQMP would be implemented with the Project.

Page 5.6-13, Section 5.6 Hydrology and Water Quality, has been revised as follows:

The Project site currently includes 4.76 acres of impermeable surfaces, which equates to 40 percent of the site. After completion of Project construction, the site would have a greater amount of impermeable surfaces (5.36 acres or 45 percent of the site). As shown on Table 5.6-2, the increase in impervious surfaces would result in an increase the 2-year, 24-hour storm volume by 5.0 ~~4.76~~ percent, peak runoff would increase by ~~22.92~~ 31.5 percent, and the time of concentration (Tc) would increase by ~~10.32~~ 10.0 percent.

~~Table 5.6-2: 2-Year, 24-Hour Storm Summary~~

~~Condition~~	~~Time of concentration (min)~~	~~Peak Runoff (cfs)~~	~~Volume (ft^3)~~
~~Pre-Development~~	~~27.41~~	~~9.73~~	~~49,737~~
~~Post-Development~~	~~30.24~~	~~11.96~~	~~52,106~~

~~**Difference**~~	~~+2.83~~	~~+2.23~~	~~+2,369~~
~~**Percent Change**~~	~~+10.32%~~	~~+22.92%~~	~~+4.76%~~

~~Source: WQMP, 2021~~

Table 5.6-2: 2-Year, 24-Hour Storm Summary

Condition	Time of concentration (min)	Peak Runoff (cfs)	Volume (ft^3)
Pre-Development	28.36	12.64	43,272
Post-Development	31.18	18.44	45,468
Difference	+2.82	+5.8	+2,196
Percent Change	+10.0%	+31.5%	+5.0%

Source: WQMP, 2022

Page 5.6-13, Section 5.6 Hydrology and Water Quality, has been revised as follows:

Operation

The existing topography of the Project site is relatively flat and generally drains from the north to the south. There is no existing storm drain system near the Project site and existing stormwater that does not infiltrate into the site's pervious surfaces runs via sheet flow onto Francis Avenue. The proposed Project would result in an increase of the 2-year, 24-hour storm volume and the time of concentration. As mentioned previously, the Project would manage the increased onsite runoff flows through a storm drain system that would discharge into proposed infiltration/detention facilities which would detain precipitation from the 100-year storm event to 80 percent of the undeveloped storm flow conditions. At the time of large flows, the stormwater would gravity flow through a standard County curb outlet structure onto Francis Avenue. The infiltration basin and storm drain system ~~(alternatives one and two)~~ would been designed to accommodate the increased volume pursuant to the County's MS4 permit requirements. Off-site runoff would be captured prior to entering the Project site and diverted via a proposed storm drain, which would ultimately be discharged to Francis Avenue. Therefore, the Project would not result in substantial alteration of the existing drainage pattern or the site and would contribute less stormwater than the existing conditions due to the proposed detention.

Chapter 5.7, Land Use and Planning

Table 5.7-2: Project Consistency with Applicable General Plan Policies, on Page 5.7-7, Section 5.7 Land Use and Planning, has been revised as follows:

Policy HZ-3.1 Health risk assessment. We require projects processed by the County to provide a health risk assessment when a project could potentially increase the incremental cancer risk by 10 in 1 million or more in unincorporated environmental justice focus areas, and we require such assessments to evaluate impacts of truck traffic from the project to freeways. We establish appropriate mitigation prior to the approval of new construction, rehabilitation, or expansion permits.	**Not Applicable.** The Project does not involve residential areas near a freeway, gas station, or truck stop. The Project is a residential development and would not attract the use of diesel engine trucks that would increase the risk of cancer from Diesel Particulate Matter.

Policy HZ-3.3 Community emissions reduction plans. We assist the air quality management districts in establishing community emissions reduction plans for unincorporated environmental justice focus areas and implement, as feasible, those parts of the plans, that are within the jurisdiction and authority of the County, with particular emphasis in addressing the types of pollution identified in the Hazard Element tables.	**Consistent.** The Project's maximum daily emissions for construction and operation of the Project would not exceed SCAQMD's regional thresholds of significance. In addition, all construction activities would comply with applicable SCAQMD rules and regulations, including Rule 403 to minimize fugitive PM dust emissions.
Policy ED-3.1 Countywide jobs-housing ratio. We strive to achieve countywide job growth in excess of household growth to improve the jobs-housing ratio, reduce out-commuting, and enhance quality of life	**Not Applicable.** As mentioned previously, the proposed Project would contribute to job growth by developing 45 single-family residences. However, the Project would develop housing in an area designated for residential housing and creating jobs is not consistent with a residentially zoned site. While Policy ED-3.1 is not applicable to the Project, construction of the proposed Project would create 172 temporary jobs within the County.

Appendix G, Preliminary Hydrology Study and Appendix H, Preliminary WQMP

Appendix G and Appendix H have been updated to reflect the approved WQMP and Hydrology Study that have been approved by the County. Appendix G and Appendix H are included herein.

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Chapter 4. Mitigation Monitoring and Reporting Program

4.1 Introduction

The California Environmental Quality Act (CEQA) requires a lead or public agency that approves or carries out a project for which an Environmental Impact Report has been certified which identifies one or more significant adverse environmental effects and where findings with respect to changes or alterations in the project have been made, to adopt a "…reporting or monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment" (CEQA, Public Resources Code Sections 21081, 21081.6).

A Mitigation Monitoring and Reporting Program (MMRP) is required to ensure that adopted mitigation measures are successfully implemented for the Yorba Villas Residential Project (Project). San Bernardino County is the Lead Agency for the Project and is responsible for implementation of the MMRP. This report describes the MMRP for the Project and identifies the parties that will be responsible for monitoring implementation of the individual mitigation measures in the MMRP.

4.2 Mitigation Monitoring and Reporting Program

The MMRP for the Project will be active through all phases of the Project, including design, construction, and operation. Table 4-1 identifies the mitigation program required to be implemented by the County for the Yorba Villas Residential Project. The table identifies the Regulatory Requirements (RRs) and Mitigation Measures required by San Bernardino County to mitigate or avoid significant adverse impacts associated with implementation of the Project, the timing of implementation, and the responsible party or parties for monitoring compliance.

The MMRP also includes a column that will be used by the compliance monitor (individual responsible for monitoring compliance) to document when implementation of the measure is completed. As Regulatory Requirements (RRs) and Mitigation Measures are completed, the compliance monitor will sign and date the MMRP, indicating that the required actions have been completed.

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TABLE 4-1: MITIGATION MONITORING AND REPORTING PROGRAM
YORBA VILLAS RESIDENTIAL PROJECT EIR

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
BIOLOGICAL RESOURCES			
MM BIO-1: Nesting Birds. To the extent possible, construction activities (i.e., demolition, earthwork, clearing, and grubbing) within the Project site and offsite infrastructure areas, shall occur outside of the general bird nesting season for migratory birds, which is March 15 through August 31 for songbirds and January 1 through August 31 for raptors. If construction activities (i.e., earthwork, clearing, and grubbing) must occur during the general bird nesting season for migratory songbirds (March 15 through August 31) and raptors (January 1 to August 31), a qualified biologist shall perform a pre-construction survey of potential nesting habitat to confirm the absence of active nests belonging to migratory birds and raptors afforded protection under the MBTA and California Fish & Game Code. The pre-construction survey shall be performed no more than three days prior to the commencement of construction activities. The results of the pre-construction survey shall be documented by the qualified biologist. If construction is inactive for more than seven days, an additional survey shall be conducted. If the qualified biologist determines that no active migratory bird or raptor nests occur, the activities shall be allowed to proceed without any further requirements. If the qualified biologist determines that an active migratory bird or raptor nest is present, no impacts within 300 feet (500 feet for raptors) of the active nest shall occur until the young have fledged the nest and the nest is confirmed to no longer be active, or as determined by the qualified biologist. The biological monitor may modify the buffer or propose other recommendations in order to minimize disturbance to nesting birds.	In Design Plans and Specifications. Prior to Grading Permits	San Bernardino County Building and Safety Division and Certified Biologist	
CULTURAL RESOURCES			
MM CUL-1: Archaeological Resources: Prior to the issuance of the first grading permit, the Applicant shall provide a letter to the San Bernardino County Planning Division, or designee, from a qualified professional	In Construction Plans and Specifications. Prior to Grading Permits.	San Bernardino County Building and Safety	

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
archeologist meeting the Secretary of Interior's Professional Qualifications for Archaeology as defined at 36 CFR Part 61, Appendix A stating that the archeologist has been retained to provide on-call services in the event archeological resources are discovered. The archeologist shall be present at the pregrading conference to establish procedures for archeological resource surveillance. In the event a previously unrecorded archaeological deposit is encountered during construction, all activity within 50 feet of the area of discovery shall cease and the County shall be immediately notified. The archeologist shall be contacted to flag the area in the field and shall determine, in consultation with the County and the Gabrieleño Band of Mission Indians Kizh-Nation, if the archaeological deposits meet the CEQA definition of historical (State CEQA Guidelines 15064.5(a)) and/or unique archaeological resource (Public Resources Code 21083.2(g)). If the find is considered a "resource" the archaeologist shall pursue either protection in place or recovery, salvage and treatment of the deposits. Recovery, salvage and treatment protocols shall be developed in accordance with applicable provisions of Public Resource Code Section 21083.2 and State CEQA Guidelines 15064.5 and 15126.4 in consultation with the County and the Gabrieleño Band of Mission Indians Kizh-Nation. Per CEQA Guidelines Section 15126.4(b)(3), preservation in place shall be the preferred means to avoid impacts to archaeological resources qualifying as historical resources. Consistent with CEQA Guidelines Section 15126.4(b)(3)(C). If unique archaeological resources cannot be preserved in place or left in an undisturbed state, recovery, salvage and treatment shall be required at the developer/applicant's expense. All recovered and salvaged resources shall be prepared to the point of identification and permanent preservation by the archaeologist. Resources shall be identified and curated into an established accredited professional repository. The archaeologist shall have a repository agreement in hand prior to initiating recovery of the resource. Excavation as a treatment option will be restricted to those parts of the unique archaeological resource that would be damaged or destroyed by the Project.			
GEOLOGY AND SOILS			

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
MM GEO-1: Paleontological Resources Prior to the issuance of the first grading permit, the Applicant shall provide a letter to the San Bernardino County Planning Division, or designee, from a paleontologist selected from the roll of qualified paleontologists maintained by the County, stating that the paleontologist has been retained to provide services for the Project. The paleontologist shall develop a Paleontological Resources Impact Mitigation Plan (PRIMP) to mitigate the potential impacts to unknown buried paleontological resources that may exist onsite for the review and approval by the County. The PRIMP shall require that the paleontologist be present at the pre-grading conference to establish procedures for paleontological resource surveillance. The PRIMP shall also require periodic paleontological spot checks if excavation reaches or exceeds depths of five feet in areas mapped as Quaternary alluvium. In the event paleontological resources are encountered, ground-disturbing activity within 50 feet of the area of the discovery shall cease. The paleontologist shall examine the materials encountered, assess the nature and extent of the find, and recommend a course of action to further investigate and protect or recover and salvage those resources that have been encountered. Criteria for discard of specific fossil specimens will be made explicit. If a qualified paleontologist determines that impacts to a sample containing significant paleontological resources cannot be avoided by Project planning, then recovery may be applied. Actions may include recovering a sample of the fossiliferous material prior to construction, monitoring work and halting construction if an important fossil needs to be recovered, and/or cleaning, identifying, and cataloging specimens for curation and research purposes. Recovery, salvage, and treatment shall be done at the Applicant's expense. All recovered and salvaged resources shall be prepared to the point of identification and permanent preservation by the paleontologist. Resources shall be identified and curated into an established accredited professional repository. The paleontologist shall have a repository agreement in hand prior to initiating recovery of the resource.	In Project Construction Plans and Specifications. Prior to Construction Permits.	San Bernardino County Building and Safety Division	

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
PPP GEO-1: CBC Compliance. The Project is required to comply with the California Building Standards Code (CBC) as included in the County's Code as Chapter 63.01, to preclude significant adverse effects associated with seismic and soils hazards. As part of CBC compliance, CBC related and geologist and/or civil engineer specifications for proposed development on the Project site shall be incorporated into grading plans and building specifications as a condition of construction permit approval. **PPP GEO-2**: Prior to grading permit issuance, the project developer shall have a Stormwater Pollution Prevention Plan (SWPPP) prepared by a QSD (Qualified SWPPP Developer) pursuant to the County's Development Code Section 85.11.030. The SWPPP shall incorporate all necessary Best Management Practices (BMPs) and other County requirements to comply with the National Pollutant Discharge Elimination System (NPDES) requirements to limit the potential of polluted runoff during construction activities. Project contractors shall be required to ensure compliance with the SWPPP and permit periodic inspection of the construction site by San Bernardino County staff or its designee to confirm compliance. **PPP GEO-3**: Prior to grading permit issuance, the project developer shall have a Water Quality Management Plan (WQMP) approved by the County for implementation. The project shall comply with the County's Development Code Section 85.11.030 and the Municipal Separate Storm Sewer System (MS4) permit requirements in effect for the Regional Water Quality Control Board (RWQCB) at the time of grading permit to control discharges of sediments and other pollutants during operations of the project.			
HAZARDS AND HAZARDOUS MATERIALS			

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
MM HAZ-1: Prior to issuance of a grading permit, a Site Management Plan (SMP) shall be prepared by a qualified hazardous materials consultant and shall detail procedures and protocols for excavation and disposal of onsite hazardous materials, including: • A certified hazardous waste hauler shall remove all potentially hazardous soils. Excavation of contaminated soils shall be to the depth of approximately 5 feet below the existing ground surface in areas identified in the Phase I and Phase II Environmental Site Assessment (Tetra Tech 2016). In addition, sampling of soil shall be conducted during excavation in the southern and western portions of the site, in areas identified in the Phase I and Phase II Environmental Site Assessment (Tetra Tech 2016), to ensure residential Regional Screening Levels are not exceeded. Excavated materials shall be transported per California Hazardous Waste Regulations to a landfill permitted by the state to accept hazardous materials. • Any subsurface materials exposed during construction activities that appear suspect of contamination, either from visual staining or suspect odors, shall require immediate cessation of excavation activities. Soils suspected of contamination shall be segregated from other soils to be tested for potential contamination. If contamination is found to be present per Environmental Screening Levels (ESLs), any further proposed groundbreaking activities within areas of identified or suspected contamination shall be conducted according to California Hazardous Waste Regulations. • A Health and Safety Plan (HSP) shall be prepared for each contractor that addresses potential safety and health hazards and includes the requirements and procedures for employee protection. The HSP shall also outline proper soil handling procedures and health and safety requirements to minimize worker and public exposure to hazardous materials during construction.	In Construction Plans and Specifications. Prior to Grading Permits	San Bernadino County Building and Safety Division	

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
• All SMP measures shall be printed on the construction documents, contracts, and Project plans prior to issuance of grading permits.			
HYDROLOGY AND WATER QUALITY			
PPP HYD-1: National Pollutant Discharge Elimination System (NPDES). Projects will be constructed in accordance with the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, NPDES No. CAS000002. Compliance requires a risk assessment, a SWPPP, and associated BMPs.	In Construction Plans and Specifications. Prior to Demolition, Grading, and Construction Permits	San Bernadino County Building and Safety Division	
PPP HYD-2: Santa Ana RWQCB MS4 Permit. Projects will be constructed and operated in accordance with the Santa Ana RWQCB Municipal Stormwater (MS4) Permit for the part of the Santa Ana Basin in San Bernardino County in 2010 (Order No. R8-2010-0036). The MS4 Permit requires new development and redevelopment projects to adopt a WQMP to: • Control contaminants into storm drain systems • Educate the public about stormwater impacts • Detect and eliminate illicit discharges • Control runoff from construction sites • Implement BMPs and site-specific runoff controls and treatments	In Construction Plans and Specifications. Prior to Demolition, Grading, and Construction Permits	San Bernadino County Building and Safety Division	
TRIBAL CULTURAL RESOURCES			
Mitigation Measure CUL-1: Archaeological Resources, listed previously.	In Construction Plans and Specifications. Prior to Grading and Construction Permits	San Bernadino County Planning Division and Building and Safety Division	

Mitigation Measure TCR-1: Prior to commencement of any excavation activities, or the issuance of a grading permit and/or action that would permit site disturbance (whichever occurs first), the Project developer/applicant shall provide a letter to the San Bernardino County Planning Division, or designee, and retain a Native American Monitor from the Gabrieleño Band of Mission Indians Kizh-Nation to: • Provide on-call services to address unanticipated prehistoric or tribal resources. The Native American Monitor shall be present at the pre-grading conference to establish procedures for tribal cultural resource surveillance. • Conduct a Native American Indian Sensitivity Training for construction personnel. The training session shall include a handout and focus on how to identify Native American resources encountered during earthmoving activities and the procedures followed if resources are discovered, the duties of the Native American Monitor of Gabrieleño Ancestry, and the general steps the Monitor would follow in conducting a salvage investigation. • Monitor all Project-related, ground-disturbing construction activities (e.g., pavement removal, auguring, boring, grading, excavation, potholing, trenching, and grubbing) of previously undisturbed native soils. The Native American Monitor(s) shall be present on-site during the construction phases that involve ground disturbing previously undisturbed native soils and shall complete monitoring logs on a daily basis. The logs shall provide descriptions of the daily activities, including construction activities, locations, soil, and any cultural materials identified. The monitor(s) shall possess Hazardous Waste Operations and Emergency Response (HAZWOPER) certification. The on-site monitoring shall end when the Project site grading and excavation activities of previously undisturbed native soils are completed, or when the Tribal Representatives and monitor have indicated that the site has a low potential for tribal cultural resources. (**HAZWOPER certification is needed only if the site has hazardous concerns related to Mitigation Measure HAZ-1).	In Construction Plans and Specifications. Prior to Grading and Construction Permits	San Bernadino County Planning Division and Building and Safety Division	

• Consult on unanticipated discovery of human remains and associated funerary objects: ○ Associated funerary objects are objects that, as part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later; other items made exclusively for burial purposes or to contain human remains can also be considered as associated funerary objects. If funerary objects are discovered during grading or archeological excavations, they shall be treated in the same manner as bone fragments that remain intact and the construction contractor and/or qualified archeologist shall consult with the Gabrieleno Band of Mission Indians – Kizh Nation (Tribe). ○ As specified by California Health and Safety Code Section 7050.5, if human remains are found on the Project site during construction or during archaeological work, the County Coroner's office shall be immediately notified and no further excavation or disturbance of the discovery or any nearby area reasonably suspected to overlie adjacent remains shall occur until the Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code 5097.98 The Coroner would determine within two working days of being notified, if the remains are subject to his or her authority. If the Coroner recognizes the remains to be Native American, he or she shall contact the Native American Heritage Commission (NAHC) within 24 hours. The NAHC would make a determination as to the Most Likely Descendent. In the case where discovered human remains cannot be fully documented and recovered on the same day, the remains shall be covered with muslin cloth and a steel plate that can be moved by heavy equipment placed over the excavation opening to protect the remains. If this type of steel plate is not available, a 24-hour guard shall be posted outside of working hours. If the remains are Native American, the Tribe shall make every effort to recommend diverting the Project			

and keeping the remains in situ and protected. If the Project cannot be diverted, it may be determined that burials shall be removed and the Project applicant/developer shall arrange a designated site location within the footprint of the project for the respectful reburial of the human remains and/or ceremonial objects, if possible. The Tribe shall work closely with the qualified archaeologist to ensure that the excavation is treated carefully, ethically and respectfully. If data recovery is approved by the Tribe, documentation shall be taken which includes at a minimum detailed descriptive notes and sketches. Additional types of documentation shall be approved by the Tribe for data recovery purposes. Cremations shall either be removed in bulk or by means as necessary to ensure completely recovery of all material. If the discovery of human remains includes 4 or more burials, the location is considered a cemetery and a separate treatment plan shall be created. The Project applicant/developer shall consult with the Tribe regarding avoidance of all cemetery sites. Once complete, a final report of all activities shall be submitted to the NAHC. The Tribe does NOT authorize any scientific study or the utilization of any invasive diagnostics on human remains. o Each occurrence of human remains and associated funerary objects shall be stored using opaque cloth bags. All human remains, funerary objects, sacred objects and objects of cultural patrimony shall be removed to a secure container on site if possible. These items shall be retained and reburied within six months of recovery. The site of reburial/repatriation shall be on the Project site but at a location mitigated between the Tribe and the landowner at a site to be protected in perpetuity. There shall be no publicity regarding any cultural materials recovered.			

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
MM TCR-1: Retain a Native American Monitor Prior to Commencement of Ground-Disturbing Activities A. The Project Applicant/Developer shall retain a Native American monitor from (or approved by) the San Manuel Band of Mission Indians and the Gabrieleno Band of Mission Indians-Kizh Nation ("Tribes"). The monitor shall be retained prior to the commencement of any "ground-disturbing activity" for the subject Project, at all Project locations (i.e., both on-site and any off-site locations that are included in the Project description/definition and/or required in connection with the Project, such as public improvement work). "Ground-disturbing activity" includes, but is not limited to, pavement removal, potholing, auguring, grubbing, tree removal, boring, grading, excavation, drilling, and trenching. Monitors from the San Manuel Band of Mission Indians and the Gabrieleno Band of Mission Indians-Kizh Nation shall provide Native America monitoring services on a rotating basis. B. The Project Applicant/Developer shall provide documentation of its retention of a Native American monitor, as provided in Mitigation Measure TCR-1, to the County Planning Department (?) prior to the earlier of the commencement of any ground-disturbing activity for the project, or the issuance of any permit necessary to commence a ground-disturbing activity. C. The Project Applicant/Developer shall provide the Tribe with a minimum of 15 days advance written notice of the commencement of any project ground-disturbing activity so that the Tribe has sufficient time to secure and schedule a monitor for the project. D. The Project Applicant/Developer shall hold at least one pre-construction sensitivity/educational meeting prior to the commencement of any ground-disturbing activities, where at a senior member of the Tribe(s) will inform and educate the Project's construction and managerial crew and staff members (including any Project subcontractors and consultants) about the TCR mitigation measures and compliance obligations, as well as places of significance located on the Project site (if any), the appearance of potential TCRs, and other informational and operational guidance to aid in the Project's compliance with the TCR mitigation measures. The Native American Tribe(s)	In Construction Plans and Specifications. Prior to Grading and Construction Permits	San Bernardino County Planning Division and Building and Safety Division	

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
shall be notified of and allowed to attend the pre-grading meeting with the County and Project construction contractors and/or monitor all Project mass grading and trenching activities. In the event that suspected tribal cultural resources are unearthed, the Native American Tribe(s) shall have the authority to redirect earth moving activities in the affected area. E. The monitor will complete daily monitoring logs that will provide descriptions of the relevant ground-disturbing activities, the type of construction activities performed, locations of ground-disturbing activities, soil types, cultural-related materials, and any other facts, conditions, materials, or discoveries of significance to the Tribe. Monitor logs will identify and describe any discovered TCRs, including but not limited to, Native American cultural and historical artifacts, remains, places of significance, etc., (collectively, tribal cultural resources, or "TCR"), as well as any discovered Native American (ancestral) human remains and burial goods. Copies of monitor logs will be provided to the Project applicant/Lead Agency upon written request. F. Native American monitoring for the Project shall conclude upon the latter of the following: (1) written confirmation from a designated Project point of contact to the Tribe representatives that all ground-disturbing activities and all phases that may involve ground-disturbing activities on the project site and at any off-site Project location are complete; or (2) written notice by the Tribe to the Project Applicant/Developer and the County Planning Department that no future, planned construction activity and/or development/construction phase (known by the Tribe at that time) at the Project site and at any off-site project location possesses the potential to impact TCRs. G. Any and all archaeological or cultural documents created as a part of the Project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the Project Applicant/Developer and the County Planning Department for dissemination to the San Manuel Band of Mission Indians and the Gabrieleno Band of Mission Indians-Kizh Nation. The County Planning Department and/or Project Applicant/Developer shall, in good faith, consult			

Regulatory Requirement / Mitigation Measure	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
with both Tribes until all ground disturbing activities of the Project are completed.			

PRELIMINARY HYDROLOGY STUDY

For

Vesting Tentative Tract No. 20394

A.P.N. 1013-211-21-0-000 AND A.P.N. 1013-211-22-0-000

Located in the Unincorporated Territory of
County of San Bernardino

Prepared Date: January 2021
Revised Date: November 2021
Revised Date: May 2022

Prepared For:
YORBA VILLAS, LLC
C/O BORSTEIN ENTERPRISES
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Los Angeles, CA 90025

Prepared By:

MDS CONSULTING
17320 Redhill Avenue, Suite 350
Irvine, CA 92614
(949) 251-8821

M D S CONSULTING
PLANNERS ENGINEERS SURVEYORS

REGISTERED PROFESSIONAL ENGINEER
STANLEY C. MORSE
No. 20596
Exp. 9-30-23
CIVIL
STATE OF CALIFORNIA

5/2022

Stanley C. Morse RCE 20596 Date

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PLANNERS ENGINEERS SURVEYORS

Vesting Tentative Tract No. 20394

Located in the Unincorporated Territory of County of San Bernardino

JN 897-04

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- Existing Condition
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A

A. Site/Project Description/Discussion

The existing drainage pattern that is tributary to the project and to Francis Avenue flows generally from north to south from Phillips Avenue to Francis Avenue, with a slight trend to the west. Approximately one third of the tributary flows drain to Yorba Avenue and Francis Avenue and then south in Yorba Avenue. The other two thirds of the tributary flows drain to Francis Avenue and then westerly in Francis Avenue to Ramona Avenue. The tributary area generally consists of large undeveloped parcels of land, most of which are under cultivation or pasture for large animals.

The westerly two thirds of the project and the westerly tributary area (25.77 acres, Q100=41.8 cfs) currently drain onto Francis Avenue and then westerly to Ramona Avenue and southerly in Ramona Avenue. The easterly one third of the project and the easterly tributary area (14.39 acres including the west half of Yorba Avenue, Q100= 22.8 cfs) drains onto Francis Avenue and then easterly to Yorba Avenue continuing south in Yorba Avenue. As a sidebar, the only existing downstream public storm drain systems are adjacent to the San Bernardino Freeway.

The proposed project intercepts all of the tributary flows along the project's north property line (25.67 acres) in a rectangular concrete channel and conveys all of the tributary storm waters westerly. The tributary flows leave the rectangular channel at the west property line in a concrete pipe which conveys the tributary flows southerly to Francis Avenue where it is outletted onto Francis Avenue and then flows westerly in Francis Avenue to Ramona Avenue. The Q100 storm flow entering Francis Avenue from the westerly and easterly tributary area is 41.20 cfs.

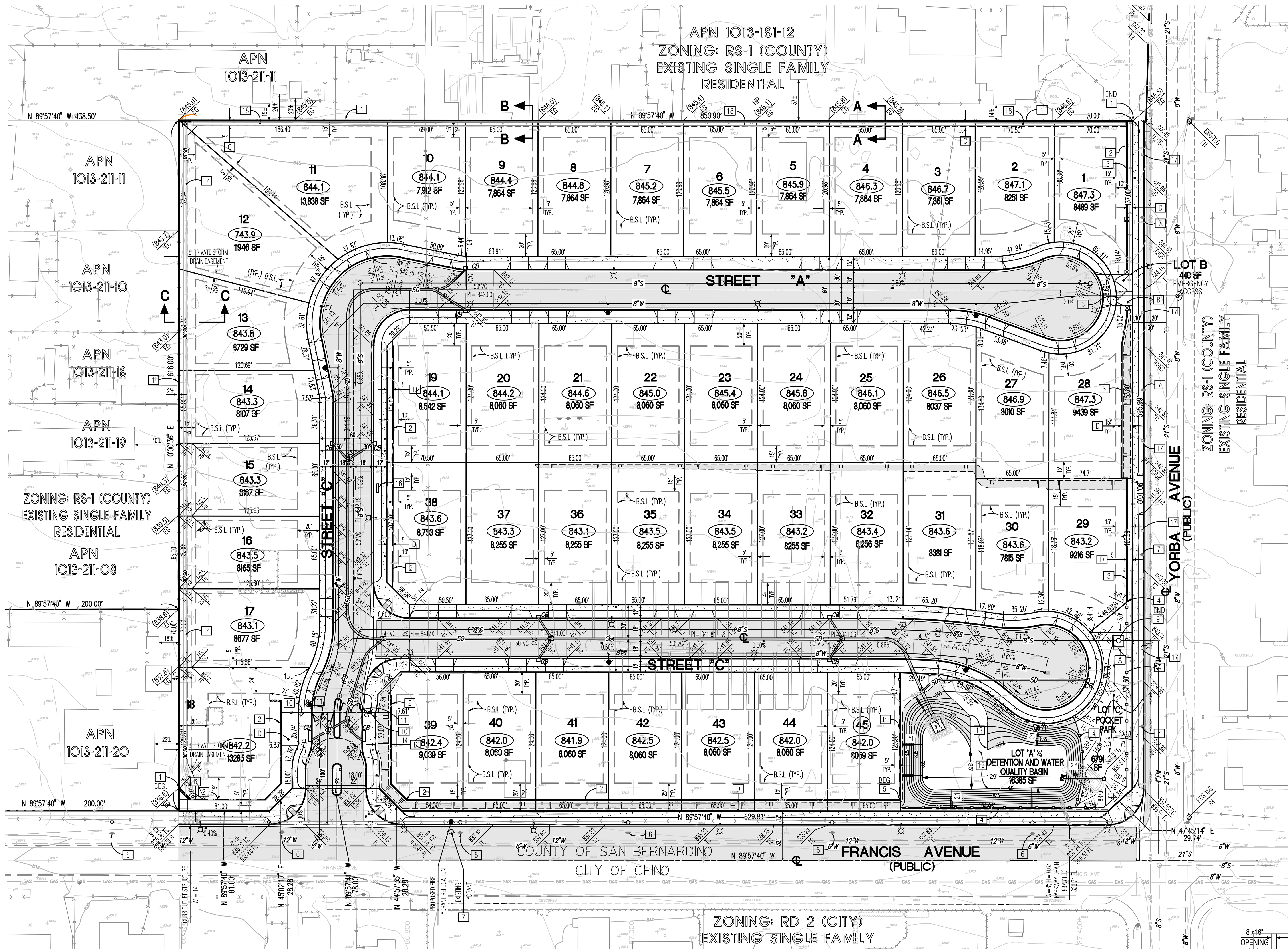
The in-tract storm waters are collected in a separate in-tract storm drain system (private) and conveyed to the detention/water quality basin at the southeast corner of the project. The basin is a dual-purpose basin; an Infiltration basin and a storm water detention basin. The storm flows will be outletted onto the bottom of the detention basin through an energy dissipater structure to minimize turbulence and related erosion of the bottom of the basin.

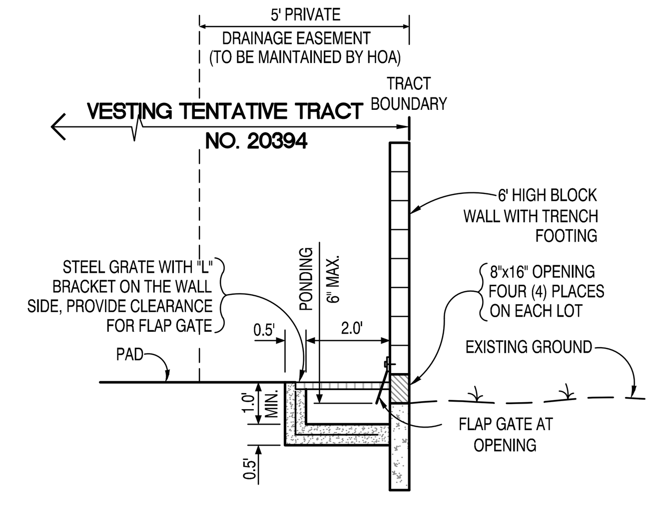
The difference for the 100-yr 24-hr stormwater runoff for pre and post development condiiton will be fully infiltrated in the basin to mitigate the increase in 100-yr storm runoff. The maximum out flow onto Francis Avenue was 11.66 cfs at hour 16.417. The maximum undeveloped Q100 24 hour storm flow at this corner was 17.7 cfs. The developed storm flows exiting the project is 66% of the undeveloped flow.

Advanced Engineering Software (AES) was used in running the Rational Method Hydrology. Civil Design Corporation software was used in running the synthetic unit hydrograph and the routing analysis. Parameters used for calculations are per the San Bernardino County Hydrology Manual. The Precipitations used are based on San Bernadino County Flood Control District Isohyetals for Valley Area. A copy of the soil type within the project site is also included in this report.

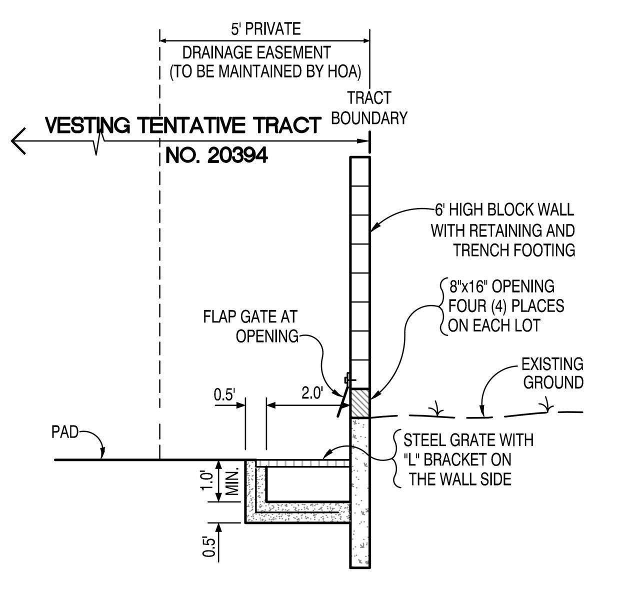
VICINITY MAP:

NTS

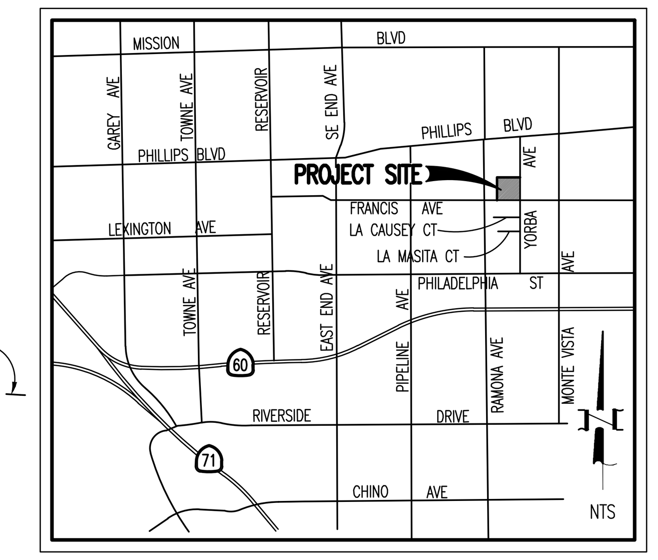




SECTION A-A
RECTANGULAR CHANNEL DETAIL
FOR LOTS 1 - 6
SCALE: 1"=3'



SECTION B-B
RECTANGULAR CHANNEL DETAIL
FOR LOTS 7 - 11
SCALE: 1"=3'



VICINITY MAP

FOR OFFICIAL USE ONLY:

PROJECT SCOPE:

THIS IS AN APPLICATION FOR A GENERAL PLAN AMENDMENT, A CHANGE OF ZONE, AND TENTATIVE TRACT MAP FOR A 13.35 ACRE (GROSS) PARCEL LOCATED AT THE NORTHWEST CORNER OF YORBA AVENUE AND FRANCIS AVENUE IN THE COUNTY OF SAN BERNARDINO. THE GENERAL PLAN AMENDMENT WOULD BE FROM RS-1 TO RS. THE CHANGE OF ZONE WOULD BE FROM RS-1 TO RS (MAXIMUM 4 DU/ACRE). THE PROJECT WILL BE A GATED COMMUNITY WITH 45 RESIDENTIAL LOTS RANGING IN SIZE FROM 7,813 SF TO 13,838 SQUARE FEET AVERAGING 8,509 SF TOGETHER WITH A DUAL PURPOSE WATER QUALITY AND DETENTION BASIN (LOT A, 0.53 ACRES) AND AN EMERGENCY ACCESS TO YORBA AVENUE (LOT B, 0.01 ACRES) THE LOTS RANGE IN WIDTH FROM 65 FEET TO 100 FEET AND DEPTH FROM 100 FEET TO 127 FEET. THE PROJECT WILL TAKE ACCESS FROM FRANCIS AVENUE WITH AN EMERGENCY ACCESS ONTO YORBA AVENUE. THE PERIMETER STREETS WILL HAVE AN ENHANCED LANDSCAPE EASEMENT BETWEEN THE SIDEWALK AND THE RESIDENTIAL LOTS AS WELL AS AN ENHANCED LANDSCAPE ENTRY TO THE PROJECT. THE DEVELOPER WILL BUILD THE PROJECT OUT WITH SINGLE STORY HOMES ON THE LARGE LOTS.

DEVELOPMENT STANDARDS

LOT AREA, MINIMUM	=7,800 SF
LOT WIDTH, MINIMUM	=65 FEET
LOT DEPTH, MINIMUM	=100 FEET
MAXIMUM DENSITY	4 DU/AC
LOT COVERAGE	60%
* FRONT BUILDING SETBACK. MINIMUM	20 FEET
REAR BUILDING SETBACK	15 FEET
* INTERIOR SIDE SETBACK MINIMUM	5 FEET ONE SIDE, 5 FEET OTHER
* LOCAL STREET SIDE SETBACK MINIMUM	10 FEET
COLLECTOR STREET SIDE SETBACK MINIMUM 25 FEET	25 FEET
STORIES	2
MAXIMUM BUILDING HEIGHT	35 FEET
STREET FRONTAGE MINIMUM FOR CUL-DE-SAC OR KNUCKLE LOT	45 FEET

* VARIANCE REQUIRED

LOT SIZES:

LARGEST LOT:	13,838 SF
SMALLEST LOT:	7,861 SF
AVERAGE LOT:	8,533 SF

BENCHMARK:

NO. 117-49 ELEVATION: 842.737
LOCATION
BRASS DISC SET IN CONCRETE, STAMPED CITY OF CHINO #117-49 LOCATED AT THE TOP OF CURB OF THE SOUTHWEST CORNER OF THE INTERSECTION OF FRANCIS AND MONTE VISTA AVENUES.

EARTHWORK NOTE

RAW CUT	2,450 C.Y.
RAW FILL	15,687 C.Y.
PAD OVEREXCAVATION	21,318 C.Y.
STREET OVER EXCAVATION	6,802 C.Y.
TOTAL EARTHWORK	49,300 C.Y.
IMPORT	19,483 C.Y.

EXISTING EASEMENTS AND DISPOSITION

SOUTHERN CALIFORNIA EDISON COMPANY EASEMENT PER BOOK 2422 PAGE227 OFFICIAL RECORDS SAN BERNARDINO COUNTY DATED JUNE 23, 1949. UNPLOTTABLE. TO BE QUITCLAIMED. SOUTHERN CALIFORNIA EDISON COMPANY EASEMENT PER BOOK 4262 PAGE 59 OFFICIAL RECORDS SAN BERNARDINO COUNTY DATED JUNE 21, 1957. UNPLOTTABLE. TO BE QUITCLAIMED

ACCOMPANYING ENTITLEMENTS

GENERAL PLAN AMENDMENT
ZONE CHANGE

BASIS OF BEARINGS

THE BEARINGS SHOWN HERON ARE BASED UPON THE CENTERLINE OF FRANCIS AVENUE AS SHOWN ON PARCEL MAP NO. 2464, ON FILE IN BOOK 221, PAGE 64, OF PARCEL MAPS, BEING NORTH 89'57'40" WEST.

LEGAL DESCRIPTION

PARCELS 2 AND 3 OF PARCEL MAP NO. 2464, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT FILED IN BOOK 21 OF PARCEL MAPS, PAGE 64, IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF SAN BERNARDINO.

WALL AND FENCING AND MISCELANEOUS NOTES :

1. 6' HIGH BLOCK WALL ON TOP OF 3' MAX. RETAINING WALL (PRECISION ON BOTH SIDE)
2. 6' HIGH ONE SIDE SPLIT FACE BLOCK WALL (PRECISION - SIDE FACES HOMEOWNER)
3. 3' MAX. RETAINING BLOCK WALL (SPLIT FACE ON STREET SIDE)
4. 5'-6" HIGH TUBULAR STEEL FENCE
5. EVA GATE WITH KNOX BOX
6. EXISTING POWER POLE TO BE RELOCATED
7. EXISTING POWER POLE TO REMAIN
8. EXISTING FIRE HYDRANT TO BE RELOCATED
9. SEWER LIFT STATION
10. PEDESTRIAN GATE
11. GATED VEHICULAR ENTRANCE
12. PROPOSED INFILTRATION BASIN, SEE PWQMP REPORT FOR DETAILS
13. PROPOSED 15' WIDE CONCRETE ACCESS RAMP (15% MAX. SLOPE), HEAVY BROOM FINISH
14. PROPOSED 36" PRIVATE STORM DRAIN FOR OFF-SITE RUN-OFF
16. PROPOSED NEIGHBORHOOD MAIL BOXES
17. EXISTING NEIGHBORHOOD MAIL BOXES TO BE RELOCATED
18. PROPOSED RECTANGULAR CHANNEL WITH STEEL GRATED COVER
19. PROPOSED RETAINING WALL ON LOT 45

GENERAL NOTES:

1. THIS PROJECT IS DESIGNED FOR A DEVELOPER BUILDOUT
2. THERE ARE 1,720 LINEAR FEET OF NEW STREETS.
3. THE SITE IS NOT SUBJECT TO FLOODING, OVERFLOW OR INUNDATION

COMPOSITE DEVELOPMENT PLAN (CDP) NOTE

THE BUILDING SETBACKS NOTED HEREON WILL BE DELINEATED ON THE CDP FOR THIS PROJECT. IN ADDITION, THE CDP WILL BE RECORDED AS A PART OF THE CC & R'S FOR THE PROJECT.

FEMA NOTE

THE PROJECT IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANGE FLOODPLAIN) PER FLOOD INSURANCE RATE MAP NUMBER 06071C8615H DATED AUGUST 28, 2008.

LAND USE SUMMARY:

LOTS 1-45	8.81	ACRES
LOT A	0.37	ACRES
LOT B	0.008	ACRES
LOT C	0.16	ACRES
STREETS "A", "B" & "C"	2.66	ACRES
YORBA AVENUE	0.41	ACRES
FRANCIS AVENUE	0.95	ACRES
TOTAL	13.348	ACRES
GROSS ACREAGE	13.35	ACRES (12.03 NET)
RESIDENTIAL LOTS	45	LOTS
GROSS DENSITY	3.37	DU/AC
EXISTING ZONING		RS-1
PROPOSED ZONING		RS

SERVICES

SEWER:
MONTE VISTA WATER DISTRICT
10575 CENTRAL AVENUE
MONTCLAIR, CA. 91763
PH: (909) 624-0035

WATER:
MONTE VISTA WATER DISTRICT
10575 CENTRAL AVENUE
MONTCLAIR, CA. 91763
PH: (909) 624-0035

GAS:
THE GAS COMPAY
PH: (800) 427-2200

CABLE:
TIME WARNER
5977 SYCAMORE COURT
CHINO, CA. 91710
PH: (800) 892-2253

TELEPHONE:
VERIZON CALIFORNIA
PH: (800) 483-4000

ELECTRIC:
SOUTHERN CALIFORNIA EDISON
1351 FRANCIS STREET
ONTARIO, CA. 91761
PH: (800) 655-4555

ASSESSOR'S PARCEL NUMBERS:

1013-211-21-0-000 AND 1013-211-22-0-000

APPLICANT:

YORBA VILLAS, LLC
11766 WILSHIRE BOULEVARD, SUITE 820
LOS ANGELES, CA 90025
ERIK PFAHLER
SENIOR VICE PRESIDENT
(310)-582-1991 EXT. 203
(310)-864-3330 MOBILE
Erik@borsteinenterprises.com

PROPERTY OWNERS:

YORBA VILLAS, LLC
11766 WILSHIRE BOULEVARD, SUITE 820
LOS ANGELES, CA 90025

PREPARED BY:

MDS CONSULTING
17320 REDHILL AVE, SUITE 350
IRVINE, CA 92614
(949) 251-8821
Email: smorse@mdsconsulting.net
STANLEY C MORSE, P.E., L.S.

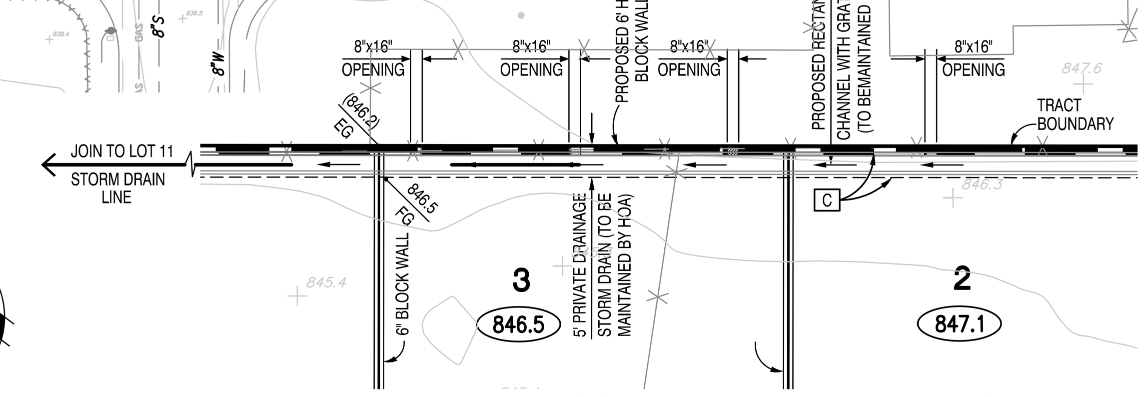
EASEMENT NOTES

- A SEWER EASEMENT
- B WATER EASEMENT
- C PRIVATE STORM DRAIN EASEMENT
- D PRIVATE LANDSCAPE EASEMENT

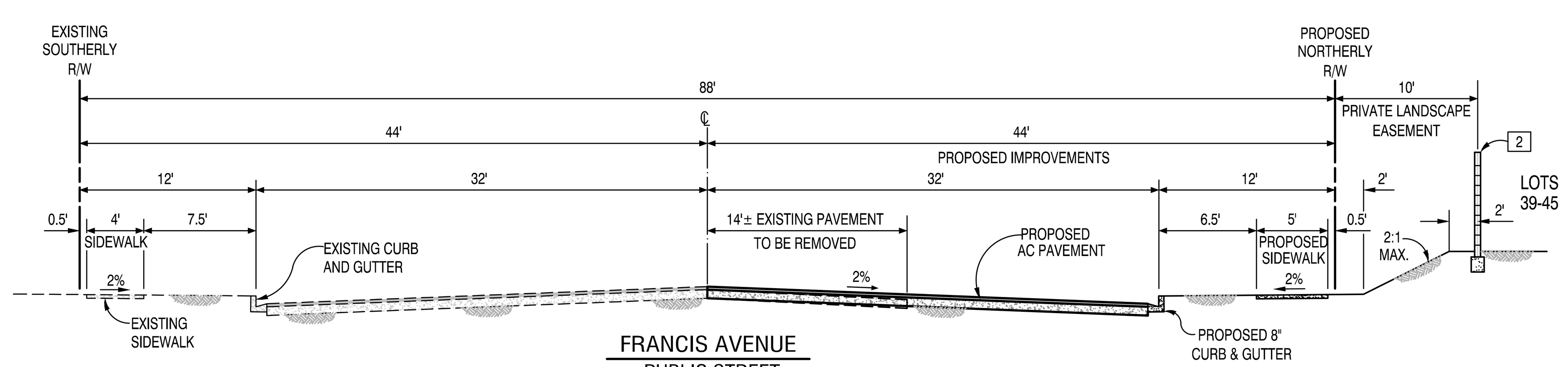
LEGEND/ABBREVIATIONS

RS-1	COUNTY OF SAN BERNARDINO ZONING
RD-2	CITY OF CHINO ZONING
BEG.	BEGIN
B.S.L	BUILDING SETBACK LINE
SF	FEET
FL	FLOW LINE
TC	TOP OF CURB
CF	FACE OF CURB
CB	CATCH BASIN
LP	LOW POINT
HP	HIGH POINT
VC	VERTICAL CURVE
BVC	BEGIN VERTICAL CURVE
MVC	MIDDLE OF VERTICAL CURVE
EVC	END OF VERTICAL CURVE
PI	POINT OF INTERSECTION
FS	FINISH SURFACE
TR	TRACT
FM	FORCE MAIN

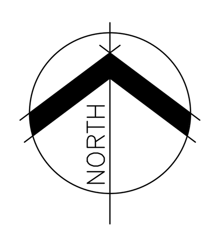
FIRE HYDRANT
PROPOSED STREET LIGHT
RELOCATED POWER POLE
EXISTING POWER POLE TO BE RELOCATED/REMOVED (BY OTHERS)
CB CATCH BASIN
8"S PROPOSED SEWER LINE
8"W PROPOSED MAIN WATER
SD PROPOSED STORM DRAIN
GAS EXISTING GAS LINE
8"W EXISTING WATER LINE
21"S EXISTING SEWER LINE

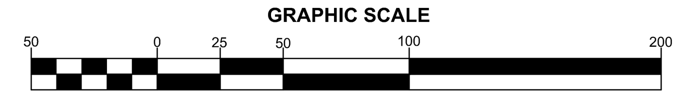


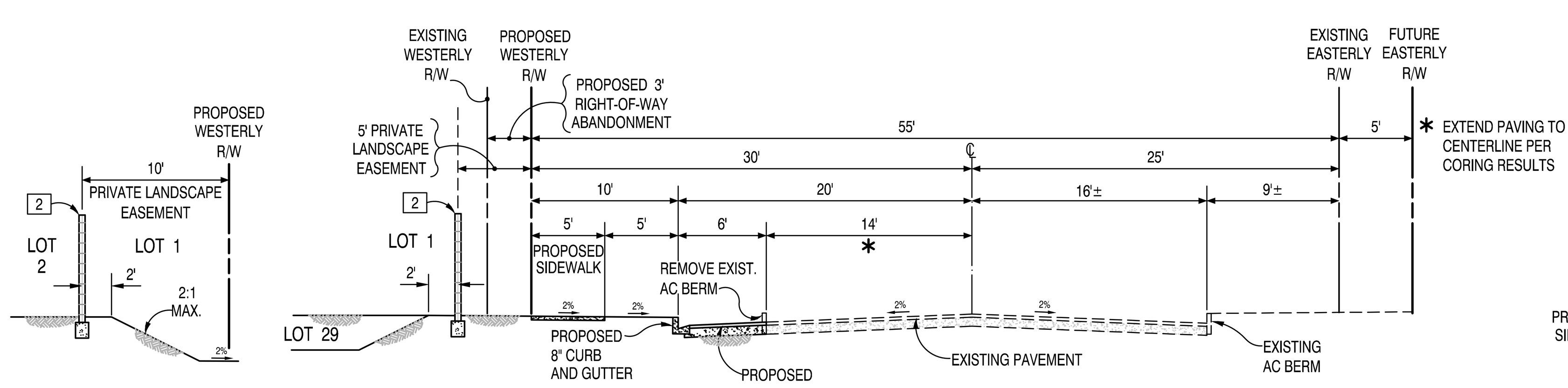
TYPICAL WALL AND DRAINAGE
FOR LOTS 1-11
SCALE: 1"=20'



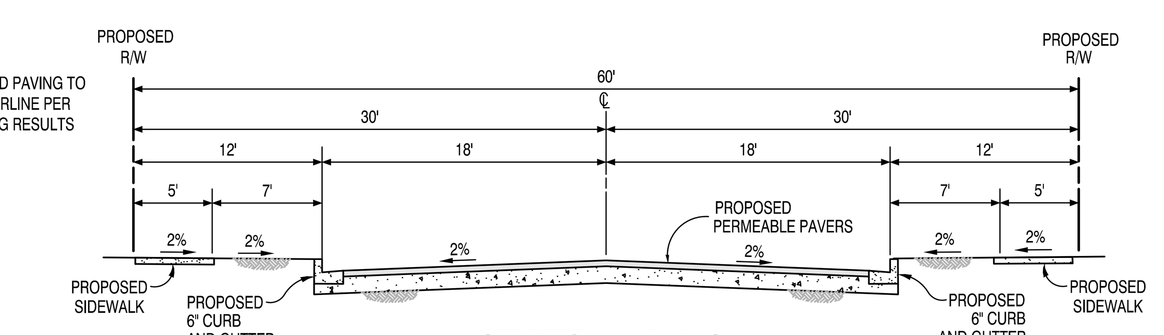
FRANCIS AVENUE
PUBLIC STREET
SCALE 1"=8'



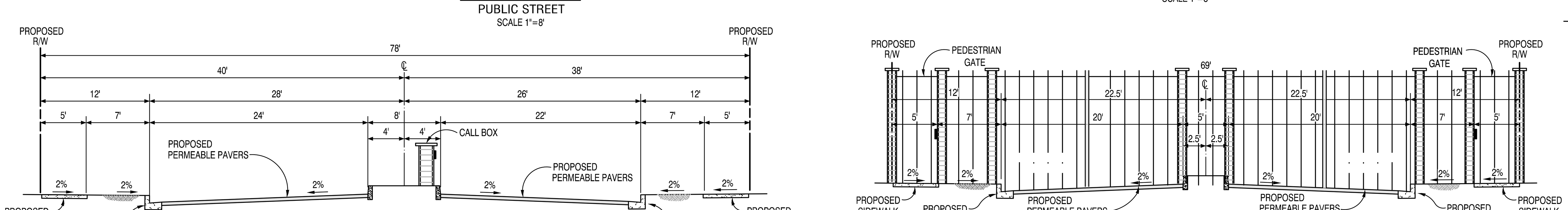




YORBA AVENUE
PUBLIC STREET
SCALE 1"=8'

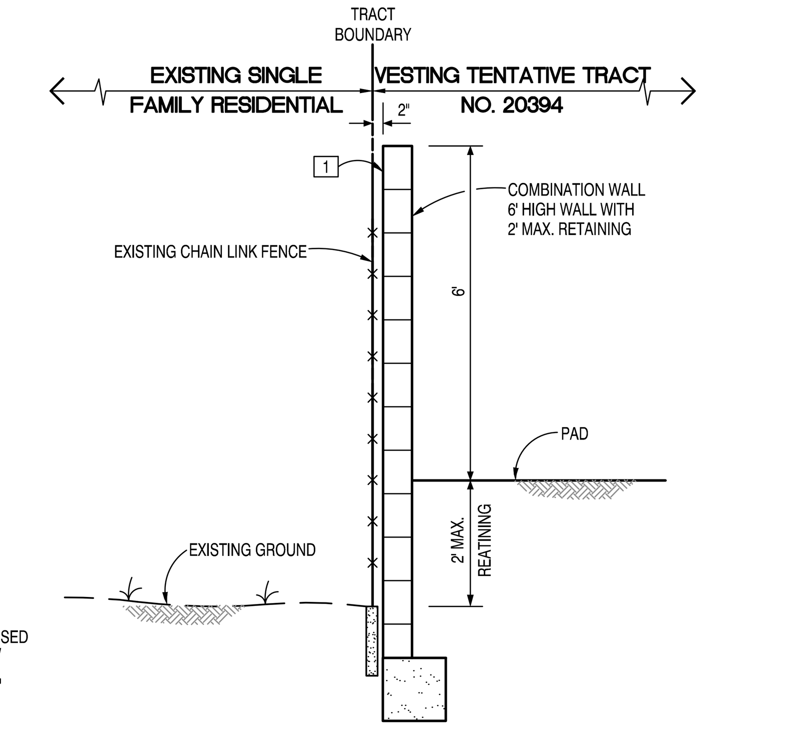


STREETS "A", "B" & "C"
PRIVATE STREET
SCALE 1"=8'



STREET B - ENTRANCE AT CALL BOX
PRIVATE
SCALE 1"=8'

STREET B - ENTRANCE AT GATES
PRIVATE
SCALE 1"=8'



SECTION C-C
SCALE: 1"=2'

REGISTERED PROFESSIONAL ENGINEER
STANLEY C. MORSE
No. 20596
Exp. 9-30-23
CIVIL
STATE OF CALIFORNIA

Stanley C Morse
STANLEY C. MORSE DATE: MAY 04, 2022

PREPARED FOR:

BORSTEIN ENTERPRISES
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PREPARED BY:

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PLANNERS ENGINEERS SURVEYORS

DATE PREPARED: MAY 04, 2022

VESTING TENTATIVE TRACT NO. 20394
COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA
SHEET 1 OF 1

TENTATIVE TRACT NO. 20056

I:\89704\PLANNING\Plans\TTM 20394.dwg 5/20/22

B

B. Rational Method Hydrology Calculations

- 2-Year Storm Pre-Developed Condition
- 100-Year Pre-Developed Condition
- 2-Year Storm Post-Developed Condition
- 10-Year Storm Post-Developed Condition
- 100-Year Storm Post-Developed Condition

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

                               MDS Consulting
             17320 Redhill Avenue, Suite 350, Irvine, CA 92614
                           Phone: (949) 251-8821
                     Email: mdsirvine@mdsconsulting.net

 ************************** DESCRIPTION OF STUDY **************************
* Existing Condition                                                       *
* 2-Year Storm                                                             *
*                                                                          *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\X.DAT
  TIME/DATE OF STUDY: 15:16 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        1.83      0.98     0.800    32   13.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
  FLOW VELOCITY(FEET/SEC) =   1.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.47   Tc(MIN.) =   23.21
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.21
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.061
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        5.94      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    1.50
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =       1.96

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     22.00 IS CODE =  52
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    847.00  DOWNSTREAM(FEET) =    837.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   606.00   CHANNEL SLOPE =  0.0165
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.96
  FLOW VELOCITY(FEET/SEC) =   2.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.59   Tc(MIN.) =   27.80
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     22.00 =    2125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.80
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.952
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        3.98      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  SUBAREA AREA(ACRES) =    3.98      SUBAREA RUNOFF(CFS) =    0.68
  EFFECTIVE AREA(ACRES) =     11.75   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =       11.8       PEAK FLOW RATE(CFS) =       2.01

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   27.80
  RAINFALL INTENSITY(INCH/HR) =   0.95
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =      11.75
  TOTAL STREAM AREA(ACRES) =      11.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.01

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.632
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.83      0.98     0.100    32   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.15
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.15

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   9.75   Tc(MIN.) =   21.07
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.124
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.81      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       2.44
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.47
  FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.07
  RAINFALL INTENSITY(INCH/HR) =   1.12
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.64
  TOTAL STREAM AREA(ACRES) =       2.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.44

  ** CONFLUENCE DATA **
   STREAM      Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       2.01   27.80    0.952  0.97( 0.78) 0.80      11.8      10.00
      2       2.44   21.07    1.124  0.98( 0.10) 0.10       2.6      20.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM      Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       4.45   21.07    1.124  0.97( 0.62) 0.64      11.5      20.00
      2       4.05   27.80    0.952  0.98( 0.65) 0.67      14.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.45    Tc(MIN.) =    21.07
  EFFECTIVE AREA(ACRES) =      11.54   AREA-AVERAGED Fm(INCH/HR) =  0.62
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.64
  TOTAL AREA(ACRES) =       14.4
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.349
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        6.77      0.98     0.800    32   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      3.47
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =      3.47

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    845.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1032.00   CHANNEL SLOPE =  0.0116
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.47
  FLOW VELOCITY(FEET/SEC) =   2.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.23   Tc(MIN.) =   23.78
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1762.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.78
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.046
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A       11.13      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =    2.66
  EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =       4.28

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    837.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.0127
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.28
```

```
  FLOW VELOCITY(FEET/SEC) =   2.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.58   Tc(MIN.) =   28.36
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =    2392.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   28.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.941
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                  A        1.30      0.42     1.000    78
  COMMERCIAL                A        6.57      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
  SUBAREA AREA(ACRES) =    7.87      SUBAREA RUNOFF(CFS) =    5.60
  EFFECTIVE AREA(ACRES) =     25.77   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.93  AREA-AVERAGED Ap =  0.63
  TOTAL AREA(ACRES) =       25.8       PEAK FLOW RATE(CFS) =       8.19
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.8  TC(MIN.) =     28.36
  EFFECTIVE AREA(ACRES) =     25.77  AREA-AVERAGED Fm(INCH/HR)=  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.93  AREA-AVERAGED Ap = 0.632
  PEAK FLOW RATE(CFS)   =       8.19
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
* Existing Condition                                                       *
* 100-Year Storm                                                           *
*                                                                          *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\X.DAT
  TIME/DATE OF STUDY: 15:22 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.148
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        1.83      0.74     0.800    52   13.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      4.21
  TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      4.21

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.21
  FLOW VELOCITY(FEET/SEC) =   2.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.15   Tc(MIN.) =   20.89
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   20.89
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.448
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        5.94      0.74     0.800    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    9.92
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =      12.97

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     22.00 IS CODE =  52
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    847.00  DOWNSTREAM(FEET) =    837.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   606.00   CHANNEL SLOPE =  0.0165
  CHANNEL FLOW THRU SUBAREA(CFS) =      12.97
  FLOW VELOCITY(FEET/SEC) =   3.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.94   Tc(MIN.) =   23.83
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     22.00 =    2125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.262
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        3.98      0.74     0.800    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    3.98      SUBAREA RUNOFF(CFS) =    5.98
  EFFECTIVE AREA(ACRES) =     11.75   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       11.8       PEAK FLOW RATE(CFS) =      17.65

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   23.83
  RAINFALL INTENSITY(INCH/HR) =   2.26
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =      11.75
  TOTAL STREAM AREA(ACRES) =      11.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.65

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00
```

```
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.536
SUBAREA Tc AND LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
COMMERCIAL                 A        0.83      0.74     0.100    52   11.32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =      2.59
TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      2.59

****************************************************************************
FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.018
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.62
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.39
  HALFSTREET FLOOD WIDTH(FEET) =   12.70
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.83
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.10
STREET FLOW TRAVEL TIME(MIN.) =   8.12   Tc(MIN.) =   19.44
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.556
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 A        1.81      0.74     0.100    52
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    4.04
EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       5.90

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  14.10
FLOW VELOCITY(FEET/SEC.) =  2.99   DEPTH*VELOCITY(FT*FT/SEC.) =   1.24
```

```
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   19.44
  RAINFALL INTENSITY(INCH/HR) =   2.56
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.64
  TOTAL STREAM AREA(ACRES) =       2.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.90

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       17.65   23.83    2.262  0.74( 0.59) 0.80      11.8      10.00
      2        5.90   19.44    2.556  0.74( 0.07) 0.10       2.6      20.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       22.83   19.44    2.556  0.74( 0.48) 0.65      12.2      20.00
      2       22.84   23.83    2.262  0.74( 0.50) 0.67      14.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.84    Tc(MIN.) =    23.83
  EFFECTIVE AREA(ACRES) =      14.39   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.67
  TOTAL AREA(ACRES) =      14.4
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.922
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "1 DWELLING/ACRE"          A        6.77      0.74     0.800    52   15.55
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA RUNOFF(CFS) =     14.19
 TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =     14.19

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    845.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1032.00   CHANNEL SLOPE =  0.0116
 CHANNEL FLOW THRU SUBAREA(CFS) =      14.19
 FLOW VELOCITY(FEET/SEC) =   2.95 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   5.83   Tc(MIN.) =   21.38
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1762.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   21.38
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.414
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "1 DWELLING/ACRE"          A       11.13      0.74     0.800    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =   18.24
 EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.59
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
 TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =      29.33

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    837.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.0127
 CHANNEL FLOW THRU SUBAREA(CFS) =      29.33
 FLOW VELOCITY(FEET/SEC) =   3.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =   24.18
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =    2392.00 FEET.
```

```
*****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  81
-----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=============================================================================
  MAINLINE Tc(MIN.) =   24.18
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.242
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   A        1.30      0.18     1.000    93
  COMMERCIAL                 A        6.57      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
  SUBAREA AREA(ACRES) =    7.87      SUBAREA RUNOFF(CFS) =   15.23
  EFFECTIVE AREA(ACRES) =     25.77   AREA-AVERAGED Fm(INCH/HR) =  0.44
  AREA-AVERAGED Fp(INCH/HR) =  0.70  AREA-AVERAGED Ap =  0.63
  TOTAL AREA(ACRES) =       25.8       PEAK FLOW RATE(CFS) =      41.80
=============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.8  TC(MIN.) =     24.18
  EFFECTIVE AREA(ACRES) =     25.77  AREA-AVERAGED Fm(INCH/HR)=  0.44
  AREA-AVERAGED Fp(INCH/HR) =  0.70  AREA-AVERAGED Ap = 0.632
  PEAK FLOW RATE(CFS)   =      41.80
=============================================================================
=============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

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                           Phone: (949) 251-8821
                     Email: mdsirvine@mdsconsulting.net

 ************************** DESCRIPTION OF STUDY **************************
* TENTATIVE TRACT 20394                                                    *
* PROPOSED HYDROLOGY                                                       *
* 2-YEAR STORM                                                             *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\89704.DAT
  TIME/DATE OF STUDY: 14:48 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   703.00
  ELEVATION DATA: UPSTREAM(FEET) =    847.30  DOWNSTREAM(FEET) =    842.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.074
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.374
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        4.53      0.98     0.600    32   15.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.22
  TOTAL AREA(ACRES) =      4.53   PEAK FLOW RATE(CFS) =      3.22

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.80
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.12
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.22
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =   15.96
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.96
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.53
  TOTAL STREAM AREA(ACRES) =       4.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.22

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =    844.10  DOWNSTREAM(FEET) =    840.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.830
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.676
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.54      0.98     0.600    32   10.83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.51
  TOTAL AREA(ACRES) =      1.54   PEAK FLOW RATE(CFS) =      1.51

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.83
  RAINFALL INTENSITY(INCH/HR) =   1.68
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.54
  TOTAL STREAM AREA(ACRES) =       1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.22   15.96    1.328  0.98( 0.59) 0.60       4.5       1.00
      2        1.51   10.83    1.676  0.97( 0.59) 0.60       1.5       3.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.72   10.83    1.676  0.98( 0.59) 0.60       4.6       3.00
      2        4.25   15.96    1.328  0.98( 0.59) 0.60       6.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.72    Tc(MIN.) =    10.83
```

```
  EFFECTIVE AREA(ACRES) =       4.61   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.80  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.72
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.60
  RAINFALL INTENSITY(INCH/HR) =   1.61
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.61
  TOTAL STREAM AREA(ACRES) =       6.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.72

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.133
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.744
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.02      0.98     0.600    32   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      1.06
 TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      1.06

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.10
 FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.03
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.06
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   10.40
 LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     382.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.40
 RAINFALL INTENSITY(INCH/HR) =   1.72
 AREA-AVERAGED Fm(INCH/HR) =  0.59
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       1.02
 TOTAL STREAM AREA(ACRES) =       1.02
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.06

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        4.72   11.60    1.608  0.98( 0.59) 0.60       4.6       3.00
     1        4.25   16.74    1.290  0.98( 0.59) 0.60       6.1       1.00
     2        1.06   10.40    1.717  0.98( 0.59) 0.60       1.0       5.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        5.74   10.40    1.717  0.98( 0.59) 0.60       5.2       5.00
     2        5.68   11.60    1.608  0.98( 0.59) 0.60       5.6       3.00
     3        4.91   16.74    1.290  0.98( 0.59) 0.60       7.1       1.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.74    Tc(MIN.) =    10.40
  EFFECTIVE AREA(ACRES) =       5.16   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        7.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.10  DOWNSTREAM(FEET) =   832.50
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.74
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =   11.01
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.01
  RAINFALL INTENSITY(INCH/HR) =   1.66
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.16
  TOTAL STREAM AREA(ACRES) =       7.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.74

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.959
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.878
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       A        1.78      0.98     0.600    32    8.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.07
  TOTAL AREA(ACRES) =      1.78   PEAK FLOW RATE(CFS) =      2.07

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.96
  RAINFALL INTENSITY(INCH/HR) =   1.88
  AREA-AVERAGED Fm(INCH/HR) =  0.58
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.78
  TOTAL STREAM AREA(ACRES) =       1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.07

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.74   11.01    1.660  0.98( 0.59) 0.60       5.2       5.00
      1        5.68   12.21    1.560  0.98( 0.59) 0.60       5.6       3.00
      1        4.91   17.36    1.263  0.98( 0.59) 0.60       7.1       1.00
      2        2.07    8.96    1.878  0.97( 0.58) 0.60       1.8       8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.70    8.96    1.878  0.97( 0.59) 0.60       6.0       8.00
      2        7.47   11.01    1.660  0.98( 0.59) 0.60       6.9       5.00
      3        7.24   12.21    1.560  0.98( 0.59) 0.60       7.4       3.00
      4        6.00   17.36    1.263  0.98( 0.59) 0.60       8.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.70    Tc(MIN.) =     8.96
  EFFECTIVE AREA(ACRES) =       5.98   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       8.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   832.50  DOWNSTREAM(FEET) =   831.60
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.70
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =    9.98
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.98
  RAINFALL INTENSITY(INCH/HR) =   1.76
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.98
  TOTAL STREAM AREA(ACRES) =       8.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.70

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   255.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.254
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.842
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.46      0.98     0.600    32    9.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      1.46   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
```

```
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    9.25
RAINFALL INTENSITY(INCH/HR) =   1.84
AREA-AVERAGED Fm(INCH/HR) =  0.59
AREA-AVERAGED Fp(INCH/HR) =  0.98
AREA-AVERAGED Ap =  0.60
EFFECTIVE STREAM AREA(ACRES) =       1.46
TOTAL STREAM AREA(ACRES) =       1.46
PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.65

** CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        7.70    9.98    1.760  0.97( 0.59) 0.60       6.0       8.00
    1        7.47   12.04    1.573  0.98( 0.59) 0.60       6.9       5.00
    1        7.24   13.24    1.486  0.98( 0.59) 0.60       7.4       3.00
    1        6.00   18.48    1.216  0.98( 0.59) 0.60       8.9       1.00
    2        1.65    9.25    1.842  0.98( 0.59) 0.60       1.5      10.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        9.28    9.25    1.842  0.97( 0.59) 0.60       7.0      10.00
    2        9.24    9.98    1.760  0.97( 0.59) 0.60       7.4       8.00
    3        8.76   12.04    1.573  0.98( 0.59) 0.60       8.4       5.00
    4        8.43   13.24    1.486  0.98( 0.59) 0.60       8.9       3.00
    5        6.83   18.48    1.216  0.98( 0.59) 0.60      10.3       1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       9.28    Tc(MIN.) =     9.25
EFFECTIVE AREA(ACRES) =       7.00   AREA-AVERAGED Fm(INCH/HR) =  0.59
AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.60
TOTAL AREA(ACRES) =       10.3
LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   831.60  DOWNSTREAM(FEET) =   831.20
  FLOW LENGTH(FEET) =    98.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.66
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.28
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    9.60
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     14.00 =    1611.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.60
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       7.00
  TOTAL STREAM AREA(ACRES) =      10.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.28

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   298.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.027
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.755
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        0.79      0.98     0.600    32   10.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.79   PEAK FLOW RATE(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   834.50  DOWNSTREAM(FEET) =   831.20
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.60
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.83
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   10.57
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     448.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.57
  RAINFALL INTENSITY(INCH/HR) =   1.70
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       0.79
  TOTAL STREAM AREA(ACRES) =       0.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.83

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.28    9.60    1.801  0.97( 0.59) 0.60       7.0      10.00
      1        9.24   10.33    1.724  0.97( 0.59) 0.60       7.4       8.00
      1        8.76   12.39    1.546  0.98( 0.59) 0.60       8.4       5.00
      1        8.43   13.59    1.462  0.98( 0.59) 0.60       8.9       3.00
      1        6.83   18.85    1.202  0.98( 0.59) 0.60      10.3       1.00
      2        0.83   10.57    1.701  0.98( 0.59) 0.60       0.8      12.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.11    9.60    1.801  0.97( 0.59) 0.60       7.7      10.00
      2       10.07   10.33    1.724  0.97( 0.59) 0.60       8.2       8.00
      3       10.02   10.57    1.701  0.97( 0.59) 0.60       8.3      12.00
      4        9.48   12.39    1.546  0.98( 0.59) 0.60       9.2       5.00
      5        9.08   13.59    1.462  0.98( 0.59) 0.60       9.7       3.00
      6        7.29   18.85    1.202  0.98( 0.59) 0.60      11.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.11    Tc(MIN.) =     9.60
  EFFECTIVE AREA(ACRES) =       7.72   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       11.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     14.00 =    1611.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   831.20  DOWNSTREAM(FEET) =   831.00
```

```
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.83
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.11
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    9.69
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.69
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.792
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                A        0.50      0.98     0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      10.11
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.632
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.83      0.98     0.100    32   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.15
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.15

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   9.75   Tc(MIN.) =   21.07
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.124
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.81      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       2.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.47
  FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

+--------------------------------------------------------------------------+
| Offsite area                                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
```

```
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
RESIDENTIAL
"1 DWELLING/ACRE"          A        1.83      0.98     0.800    32   13.74
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
SUBAREA RUNOFF(CFS) =      1.11
TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
  FLOW VELOCITY(FEET/SEC) =   1.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.47   Tc(MIN.) =   23.21
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     52.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.21
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.061
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        5.94      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    1.50
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =      1.96

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    843.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0030
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.96
  FLOW VELOCITY(FEET/SEC) =   0.94 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.87   Tc(MIN.) =   32.09
```

```
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   32.09
  RAINFALL INTENSITY(INCH/HR) =   0.87
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =       7.77
  TOTAL STREAM AREA(ACRES) =       7.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.96

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.349
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        6.77      0.98     0.800    32   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      3.47
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =      3.47

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    846.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1070.00   CHANNEL SLOPE =  0.0103
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.47
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.07   Tc(MIN.) =   24.62
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =    1800.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   24.62
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.024
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "1 DWELLING/ACRE"           A       11.13      0.98     0.800    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =    2.44
 EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
 TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =       3.93

****************************************************************************
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   24.62
 RAINFALL INTENSITY(INCH/HR) =   1.02
 AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.80
 EFFECTIVE STREAM AREA(ACRES) =      17.90
 TOTAL STREAM AREA(ACRES) =      17.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.93

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        1.96   32.09    0.873  0.97( 0.78) 0.80       7.8      50.00
     2        3.93   24.62    1.024  0.98( 0.78) 0.80      17.9      60.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        5.89   24.62    1.024  0.98( 0.78) 0.80      23.9      60.00
     2        4.78   32.09    0.873  0.98( 0.78) 0.80      25.7      50.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.89    Tc(MIN.) =    24.62
 EFFECTIVE AREA(ACRES) =      23.86   AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
```

```
  TOTAL AREA(ACRES) =       25.7
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     64.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    842.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   340.00   CHANNEL SLOPE =  0.0044
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.89
  FLOW VELOCITY(FEET/SEC) =   1.46 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.89   Tc(MIN.) =   28.51
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     64.00 =    2359.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   837.00  DOWNSTREAM(FEET) =   835.30
  FLOW LENGTH(FEET) =   596.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.73
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.89
  PIPE TRAVEL TIME(MIN.) =   2.67    Tc(MIN.) =   31.18
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    2955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   31.18
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.889
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.23      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    0.17
  EFFECTIVE AREA(ACRES) =     24.09   AREA-AVERAGED Fm(INCH/HR) =  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.79
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =       25.9       PEAK FLOW RATE(CFS) =       5.89
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.9  TC(MIN.) =     31.18
  EFFECTIVE AREA(ACRES) =     24.09  AREA-AVERAGED Fm(INCH/HR)=  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap = 0.793
  PEAK FLOW RATE(CFS)   =       5.89

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.89   31.18    0.889  0.97( 0.77) 0.79      24.1      60.00
      2        4.78   39.02    0.777  0.98( 0.77) 0.79      25.9      50.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
 * TENTATIVE TRACT 20394                                                    *
 * PROPOSED HYDROLOGY                                                       *
 * 10-YEAR STORM                                                            *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\89704.DAT
  TIME/DATE OF STUDY: 14:45 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===   =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   703.00
  ELEVATION DATA: UPSTREAM(FEET) =    847.30  DOWNSTREAM(FEET) =    842.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.074
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.062
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        4.53      0.98     0.600    32   15.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      6.02
  TOTAL AREA(ACRES) =      4.53   PEAK FLOW RATE(CFS) =      6.02

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.80
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.77
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.02
  PIPE TRAVEL TIME(MIN.) =   0.76    Tc(MIN.) =   15.84
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.84
  RAINFALL INTENSITY(INCH/HR) =   2.00
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.53
  TOTAL STREAM AREA(ACRES) =       4.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.02

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
 ELEVATION DATA: UPSTREAM(FEET) =    844.10  DOWNSTREAM(FEET) =    840.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.830
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.514
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       A        1.54      0.98     0.600    32   10.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      2.67
 TOTAL AREA(ACRES) =      1.54   PEAK FLOW RATE(CFS) =      2.67

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.83
 RAINFALL INTENSITY(INCH/HR) =   2.51
 AREA-AVERAGED Fm(INCH/HR) =  0.59
 AREA-AVERAGED Fp(INCH/HR) =  0.97
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       1.54
 TOTAL STREAM AREA(ACRES) =       1.54
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.67

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        6.02   15.84    2.001  0.98( 0.59) 0.60       4.5       1.00
     2        2.67   10.83    2.514  0.97( 0.59) 0.60       1.5       3.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        8.28   10.83    2.514  0.98( 0.59) 0.60       4.6       3.00
     2        7.98   15.84    2.001  0.98( 0.59) 0.60       6.1       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       8.28    Tc(MIN.) =    10.83
 EFFECTIVE AREA(ACRES) =       4.64   AREA-AVERAGED Fm(INCH/HR) =  0.59
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.80  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.48
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.28
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =   11.51
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.51
  RAINFALL INTENSITY(INCH/HR) =   2.42
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.64
  TOTAL STREAM AREA(ACRES) =       6.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.28

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.133
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.616
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.02      0.98     0.600    32   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
```

```
  SUBAREA RUNOFF(CFS) =      1.86
  TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      1.86

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.95
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.86
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   10.36
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.36
  RAINFALL INTENSITY(INCH/HR) =   2.58
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.02
  TOTAL STREAM AREA(ACRES) =       1.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.86

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        8.28   11.51    2.424  0.98( 0.59) 0.60       4.6       3.00
      1        7.98   16.52    1.952  0.98( 0.59) 0.60       6.1       1.00
      2        1.86   10.36    2.581  0.98( 0.59) 0.60       1.0       5.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.96   10.36    2.581  0.98( 0.59) 0.60       5.2       5.00
      2       10.00   11.51    2.424  0.98( 0.59) 0.60       5.7       3.00
      3        9.26   16.52    1.952  0.98( 0.59) 0.60       7.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      10.00    Tc(MIN.) =    11.51
  EFFECTIVE AREA(ACRES) =       5.66   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        7.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.10  DOWNSTREAM(FEET) =   832.50
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.83
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.00
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   12.03
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.03
  RAINFALL INTENSITY(INCH/HR) =   2.36
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.66
  TOTAL STREAM AREA(ACRES) =       7.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.00

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.959
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.817
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.78      0.98     0.600    32    8.96
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.58
  TOTAL AREA(ACRES) =      1.78   PEAK FLOW RATE(CFS) =      3.58

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.96
  RAINFALL INTENSITY(INCH/HR) =   2.82
  AREA-AVERAGED Fm(INCH/HR) =  0.58
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.78
  TOTAL STREAM AREA(ACRES) =       1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.58

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.96   10.88    2.507  0.98( 0.59) 0.60       5.2       5.00
      1       10.00   12.03    2.361  0.98( 0.59) 0.60       5.7       3.00
      1        9.26   17.06    1.914  0.98( 0.59) 0.60       7.1       1.00
      2        3.58    8.96    2.817  0.97( 0.58) 0.60       1.8       8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       13.10    8.96    2.817  0.98( 0.59) 0.60       6.1       8.00
      2       13.04   10.88    2.507  0.98( 0.59) 0.60       7.0       5.00
      3       12.84   12.03    2.361  0.98( 0.59) 0.60       7.4       3.00
      4       11.39   17.06    1.914  0.98( 0.59) 0.60       8.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.10    Tc(MIN.) =     8.96
  EFFECTIVE AREA(ACRES) =       6.06   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        8.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   832.50  DOWNSTREAM(FEET) =   831.60
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.89
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.10
  PIPE TRAVEL TIME(MIN.) =   0.89    Tc(MIN.) =    9.85
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.85
  RAINFALL INTENSITY(INCH/HR) =   2.66
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.06
  TOTAL STREAM AREA(ACRES) =       8.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.10

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   255.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.254
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.763
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.46      0.98     0.600    32    9.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.86
  TOTAL AREA(ACRES) =      1.46   PEAK FLOW RATE(CFS) =      2.86

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 9.25
RAINFALL INTENSITY(INCH/HR) = 2.76
AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.60
EFFECTIVE STREAM AREA(ACRES) = 1.46
TOTAL STREAM AREA(ACRES) = 1.46
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.86

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.10	9.85	2.662	0.98(0.59)	0.60	6.1	8.00
1	13.04	11.77	2.392	0.98(0.59)	0.60	7.0	5.00
1	12.84	12.95	2.259	0.98(0.59)	0.60	7.4	3.00
1	11.39	17.99	1.854	0.98(0.59)	0.60	8.9	1.00
2	2.86	9.25	2.763	0.98(0.59)	0.60	1.5	10.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	15.77	9.25	2.763	0.98(0.59)	0.60	7.2	10.00
2	15.83	9.85	2.662	0.98(0.59)	0.60	7.5	8.00
3	15.41	11.77	2.392	0.98(0.59)	0.60	8.4	5.00
4	15.04	12.95	2.259	0.98(0.59)	0.60	8.9	3.00
5	13.06	17.99	1.854	0.98(0.59)	0.60	10.3	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 15.83 Tc(MIN.) = 9.85
EFFECTIVE AREA(ACRES) = 7.52 AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.60
TOTAL AREA(ACRES) = 10.3
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 11.00 = 1513.00 FEET.

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

ELEVATION DATA: UPSTREAM(FEET) = 831.60 DOWNSTREAM(FEET) = 831.20
FLOW LENGTH(FEET) = 98.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.41
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 15.83
PIPE TRAVEL TIME(MIN.) = 0.30 Tc(MIN.) = 10.15
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1611.00 FEET.

```
****************************************************************************
```

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.15
  RAINFALL INTENSITY(INCH/HR) =   2.61
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       7.52
  TOTAL STREAM AREA(ACRES) =      10.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.83

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   298.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.027
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.633
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        0.79      0.98     0.600    32   10.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.46
  TOTAL AREA(ACRES) =      0.79   PEAK FLOW RATE(CFS) =      1.46

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   834.50  DOWNSTREAM(FEET) =   831.20
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.46
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   10.49
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     448.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.49
 RAINFALL INTENSITY(INCH/HR) =   2.56
 AREA-AVERAGED Fm(INCH/HR) =  0.59
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       0.79
 TOTAL STREAM AREA(ACRES) =       0.79
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.46

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       15.77    9.56    2.710  0.98( 0.59) 0.60       7.2      10.00
     1       15.83   10.15    2.614  0.98( 0.59) 0.60       7.5       8.00
     1       15.41   12.07    2.355  0.98( 0.59) 0.60       8.4       5.00
     1       15.04   13.25    2.227  0.98( 0.59) 0.60       8.9       3.00
     1       13.06   18.31    1.835  0.98( 0.59) 0.60      10.3       1.00
     2        1.46   10.49    2.563  0.98( 0.59) 0.60       0.8      12.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.20    9.56    2.710  0.98( 0.59) 0.60       7.9      10.00
     2       17.27   10.15    2.614  0.98( 0.59) 0.60       8.3       8.00
     3       17.21   10.49    2.563  0.98( 0.59) 0.60       8.5      12.00
     4       16.72   12.07    2.355  0.98( 0.59) 0.60       9.2       5.00
     5       16.25   13.25    2.227  0.98( 0.59) 0.60       9.7       3.00
     6       13.98   18.31    1.835  0.98( 0.59) 0.60      11.1       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.27    Tc(MIN.) =    10.15
 EFFECTIVE AREA(ACRES) =       8.28   AREA-AVERAGED Fm(INCH/HR) =  0.59
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       11.1
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     14.00 =    1611.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   831.20  DOWNSTREAM(FEET) =   831.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.53
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.27
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   10.22
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.22
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.602
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 A       0.50      0.98     0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    0.80
  EFFECTIVE AREA(ACRES) =      8.78   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      17.27
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.448
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A       0.83      0.98     0.100    32   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.76
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.76

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
```

```
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.10
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   10.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.91
  STREET FLOW TRAVEL TIME(MIN.) =   8.86   Tc(MIN.) =   20.18
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.730
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.81      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    2.66
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       3.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  11.76
  FLOW VELOCITY(FEET/SEC.) =  2.72   DEPTH*VELOCITY(FT*FT/SEC.) =   1.01
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

+--------------------------------------------------------------------------+
| Offsite area                                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.179
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        1.83      0.98     0.800    32   13.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      2.30
  TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      2.30

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.30
  FLOW VELOCITY(FEET/SEC) =   2.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.17   Tc(MIN.) =   21.91
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     52.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   21.91
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.647
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        5.94      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    4.64
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =       6.06

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    843.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0030
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.06
  FLOW VELOCITY(FEET/SEC) =   1.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.89   Tc(MIN.) =   28.80
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   28.80
  RAINFALL INTENSITY(INCH/HR) =   1.40
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =       7.77
  TOTAL STREAM AREA(ACRES) =       7.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.06

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.023
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        6.77      0.98     0.800    32   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      7.58
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =      7.58

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    846.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1070.00   CHANNEL SLOPE =  0.0103
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.58
  FLOW VELOCITY(FEET/SEC) =   2.36 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.54   Tc(MIN.) =   23.10
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =    1800.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.10
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.596
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A       11.13      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =    8.17
  EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =      13.14

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   23.10
  RAINFALL INTENSITY(INCH/HR) =   1.60
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =      17.90
  TOTAL STREAM AREA(ACRES) =      17.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.14

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.06   28.80    1.398  0.97( 0.78) 0.80       7.8      50.00
      2       13.14   23.10    1.596  0.98( 0.78) 0.80      17.9      60.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.21   23.10    1.596  0.98( 0.78) 0.80      24.1      60.00
      2       16.02   28.80    1.398  0.98( 0.78) 0.80      25.7      50.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.21    Tc(MIN.) =    23.10
  EFFECTIVE AREA(ACRES) =      24.13   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       25.7
```

```
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     64.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    842.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   340.00   CHANNEL SLOPE =  0.0044
  CHANNEL FLOW THRU SUBAREA(CFS) =      19.21
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.88   Tc(MIN.) =   25.97
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     64.00 =    2359.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   837.00  DOWNSTREAM(FEET) =   835.30
  FLOW LENGTH(FEET) =   596.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.21
  PIPE TRAVEL TIME(MIN.) =   2.02    Tc(MIN.) =   27.99
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    2955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.99
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.422
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A       0.23      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    0.27
  EFFECTIVE AREA(ACRES) =     24.36   AREA-AVERAGED Fm(INCH/HR) =  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =       25.9       PEAK FLOW RATE(CFS) =      19.21
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.9  TC(MIN.) =     27.99
  EFFECTIVE AREA(ACRES) =     24.36  AREA-AVERAGED Fm(INCH/HR)=  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.793
  PEAK FLOW RATE(CFS)   =      19.21
```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	19.21	27.99	1.422	0.98(0.77)	0.79	24.4	60.00
2	16.02	33.97	1.266	0.98(0.77)	0.79	25.9	50.00

==

==

END OF RATIONAL METHOD ANALYSIS

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* TENTATIVE TRACT 20394                                                    *
* PROPOSED HYDROLOGY                                                       *
* 100-YEAR STORM                                                           *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\89704.DAT
  TIME/DATE OF STUDY: 14:36 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   703.00
  ELEVATION DATA: UPSTREAM(FEET) =    847.30  DOWNSTREAM(FEET) =    842.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.074
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.978
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        4.53      0.74     0.600    52   15.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =     10.33
  TOTAL AREA(ACRES) =      4.53   PEAK FLOW RATE(CFS) =     10.33

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.80
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.33
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =   15.75
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.75
  RAINFALL INTENSITY(INCH/HR) =   2.90
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.53
  TOTAL STREAM AREA(ACRES) =       4.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.33

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =    844.10  DOWNSTREAM(FEET) =    840.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.830
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.631
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.54      0.74     0.600    52   10.83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.42
  TOTAL AREA(ACRES) =      1.54   PEAK FLOW RATE(CFS) =      4.42

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.83
  RAINFALL INTENSITY(INCH/HR) =   3.63
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.54
  TOTAL STREAM AREA(ACRES) =       1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.42

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       10.33   15.75    2.901  0.74( 0.45) 0.60       4.5       1.00
      2        4.42   10.83    3.631  0.74( 0.45) 0.60       1.5       3.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       13.63   10.83    3.631  0.74( 0.45) 0.60       4.7       3.00
      2       13.73   15.75    2.901  0.74( 0.45) 0.60       6.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.73    Tc(MIN.) =    15.75
  EFFECTIVE AREA(ACRES) =       6.07   AREA-AVERAGED Fm(INCH/HR) =  0.45
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.80  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.15
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.73
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =   16.34
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.34
  RAINFALL INTENSITY(INCH/HR) =   2.84
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       6.07
  TOTAL STREAM AREA(ACRES) =       6.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.73

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.133
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.779
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.02      0.74     0.600    52   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
```

```
  SUBAREA RUNOFF(CFS) =      3.06
  TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      3.06

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.86
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.06
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   10.33
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.33
  RAINFALL INTENSITY(INCH/HR) =   3.74
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.02
  TOTAL STREAM AREA(ACRES) =       1.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.06

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       13.63   11.44    3.514  0.74( 0.45) 0.60       4.7       3.00
      1       13.73   16.34    2.837  0.74( 0.45) 0.60       6.1       1.00
      2        3.06   10.33    3.735  0.74( 0.45) 0.60       1.0       5.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       16.26   10.33    3.735  0.74( 0.45) 0.60       5.2       5.00
      2       16.48   11.44    3.514  0.74( 0.45) 0.60       5.7       3.00
      3       15.95   16.34    2.837  0.74( 0.45) 0.60       7.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      16.48    Tc(MIN.) =    11.44
  EFFECTIVE AREA(ACRES) =       5.68   AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        7.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.10  DOWNSTREAM(FEET) =   832.50
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.48
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   11.90
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.90
  RAINFALL INTENSITY(INCH/HR) =   3.43
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.68
  TOTAL STREAM AREA(ACRES) =       7.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.48

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.959
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.069
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.78      0.74     0.600    52    8.96
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      5.81
  TOTAL AREA(ACRES) =      1.78   PEAK FLOW RATE(CFS) =      5.81

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.96
  RAINFALL INTENSITY(INCH/HR) =   4.07
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.78
  TOTAL STREAM AREA(ACRES) =       1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.81

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.26   10.80    3.638  0.74( 0.45) 0.60       5.2       5.00
      1       16.48   11.90    3.431  0.74( 0.45) 0.60       5.7       3.00
      1       15.95   16.80    2.790  0.74( 0.45) 0.60       7.1       1.00
      2        5.81    8.96    4.069  0.74( 0.45) 0.60       1.8       8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       21.12    8.96    4.069  0.74( 0.45) 0.60       6.1       8.00
      2       21.37   10.80    3.638  0.74( 0.45) 0.60       7.0       5.00
      3       21.27   11.90    3.431  0.74( 0.45) 0.60       7.5       3.00
      4       19.71   16.80    2.790  0.74( 0.45) 0.60       8.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.37    Tc(MIN.) =    10.80
  EFFECTIVE AREA(ACRES) =       7.00   AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       8.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   832.50  DOWNSTREAM(FEET) =   831.60
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.43
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.37
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =   11.59
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.59
  RAINFALL INTENSITY(INCH/HR) =   3.49
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       7.00
  TOTAL STREAM AREA(ACRES) =       8.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.37

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   255.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.254
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.991
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.46      0.74     0.600    52    9.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.66
  TOTAL AREA(ACRES) =      1.46   PEAK FLOW RATE(CFS) =      4.66

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
```

```
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.25
 RAINFALL INTENSITY(INCH/HR) =   3.99
 AREA-AVERAGED Fm(INCH/HR) =  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.74
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       1.46
 TOTAL STREAM AREA(ACRES) =       1.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       21.12    9.76    3.866  0.74( 0.45) 0.60       6.1       8.00
     1       21.37   11.59    3.486  0.74( 0.45) 0.60       7.0       5.00
     1       21.27   12.70    3.300  0.74( 0.45) 0.60       7.5       3.00
     1       19.71   17.61    2.713  0.74( 0.45) 0.60       8.9       1.00
     2        4.66    9.25    3.991  0.74( 0.45) 0.60       1.5      10.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       25.42    9.25    3.991  0.74( 0.45) 0.60       7.3      10.00
     2       25.61    9.76    3.866  0.74( 0.45) 0.60       7.6       8.00
     3       25.37   11.59    3.486  0.74( 0.45) 0.60       8.5       5.00
     4       25.02   12.70    3.300  0.74( 0.45) 0.60       8.9       3.00
     5       22.69   17.61    2.713  0.74( 0.45) 0.60      10.3       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      25.61    Tc(MIN.) =     9.76
 EFFECTIVE AREA(ACRES) =       7.58   AREA-AVERAGED Fm(INCH/HR) =  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       10.3
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   831.60  DOWNSTREAM(FEET) =   831.20
 FLOW LENGTH(FEET) =    98.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  21.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.13
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      25.61
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   10.02
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     14.00 =    1611.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.02
  RAINFALL INTENSITY(INCH/HR) =   3.80
  AREA-AVERAGED Fm(INCH/HR) =  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       7.58
  TOTAL STREAM AREA(ACRES) =      10.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      25.61

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   298.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.027
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.803
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        0.79      0.74     0.600    52   10.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.39
  TOTAL AREA(ACRES) =      0.79   PEAK FLOW RATE(CFS) =      2.39

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   834.50  DOWNSTREAM(FEET) =   831.20
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.27
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.39
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   10.43
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     448.00 FEET.

****************************************************************************
```

```
FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   10.43
RAINFALL INTENSITY(INCH/HR) =   3.72
AREA-AVERAGED Fm(INCH/HR) =  0.45
AREA-AVERAGED Fp(INCH/HR) =  0.74
AREA-AVERAGED Ap =  0.60
EFFECTIVE STREAM AREA(ACRES) =       0.79
TOTAL STREAM AREA(ACRES) =       0.79
PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.39
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	25.42	9.53	3.921	0.74(0.45)	0.60	7.3	10.00
1	25.61	10.02	3.804	0.74(0.45)	0.60	7.6	8.00
1	25.37	11.87	3.437	0.74(0.45)	0.60	8.5	5.00
1	25.02	12.98	3.258	0.74(0.45)	0.60	8.9	3.00
1	22.69	17.89	2.687	0.74(0.45)	0.60	10.3	1.00
2	2.39	10.43	3.715	0.74(0.45)	0.60	0.8	12.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.74	9.53	3.921	0.74(0.45)	0.60	8.0	10.00
2	27.97	10.02	3.804	0.74(0.45)	0.60	8.3	8.00
3	27.95	10.43	3.715	0.74(0.45)	0.60	8.6	12.00
4	27.55	11.87	3.437	0.74(0.45)	0.60	9.3	5.00
5	27.07	12.98	3.258	0.74(0.45)	0.60	9.7	3.00
6	24.33	17.89	2.687	0.74(0.45)	0.60	11.1	1.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      27.97    Tc(MIN.) =    10.02
EFFECTIVE AREA(ACRES) =       8.33   AREA-AVERAGED Fm(INCH/HR) =  0.45
AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.60
TOTAL AREA(ACRES) =       11.1
LONGEST FLOWPATH FROM NODE      1.00 TO NODE     14.00 =    1611.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   831.20  DOWNSTREAM(FEET) =   831.00
FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.47
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      27.97
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   10.09
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.09
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.788
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                A       0.50      0.74     0.850    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    1.42
  EFFECTIVE AREA(ACRES) =      8.83   AREA-AVERAGED Fm(INCH/HR) =  0.46
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      27.97
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.536
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A       0.83      0.74     0.100    52   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.59
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      2.59

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
```

```
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   12.70
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.10
  STREET FLOW TRAVEL TIME(MIN.) =   8.12   Tc(MIN.) =   19.44
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.556
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.81      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    4.04
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       5.90

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  14.10
  FLOW VELOCITY(FEET/SEC.) =  2.99   DEPTH*VELOCITY(FT*FT/SEC.) =   1.24
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

+--------------------------------------------------------------------------+
| Offsite area                                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.148
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        1.83      0.74     0.800    52   13.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      4.21
  TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      4.21

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.21
  FLOW VELOCITY(FEET/SEC) =   2.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.15   Tc(MIN.) =   20.89
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     52.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   20.89
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.448
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        5.94      0.74     0.800    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    9.92
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =      12.97

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    843.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0030
  CHANNEL FLOW THRU SUBAREA(CFS) =      12.97
  FLOW VELOCITY(FEET/SEC) =   1.46 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.69   Tc(MIN.) =   26.59
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   26.59
  RAINFALL INTENSITY(INCH/HR) =   2.12
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =       7.77
  TOTAL STREAM AREA(ACRES) =       7.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.97

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.922
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        6.77      0.74     0.800    52   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =     14.19
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =     14.19

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    846.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1070.00   CHANNEL SLOPE =  0.0103
  CHANNEL FLOW THRU SUBAREA(CFS) =      14.19
  FLOW VELOCITY(FEET/SEC) =   2.77 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.43   Tc(MIN.) =   21.98
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =    1800.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  81
```

```
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =   21.98
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.375
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A       11.13      0.74     0.800    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =   17.84
  EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =      28.69

********************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.98
  RAINFALL INTENSITY(INCH/HR) =   2.37
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =      17.90
  TOTAL STREAM AREA(ACRES) =      17.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.69

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.97   26.59    2.119  0.74( 0.59) 0.80       7.8      50.00
      2       28.69   21.98    2.375  0.74( 0.59) 0.80      17.9      60.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       41.22   21.98    2.375  0.74( 0.59) 0.80      24.3      60.00
      2       37.54   26.59    2.119  0.74( 0.59) 0.80      25.7      50.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      41.22    Tc(MIN.) =    21.98
  EFFECTIVE AREA(ACRES) =      24.33   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       25.7
```

```
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     64.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    842.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   340.00   CHANNEL SLOPE =  0.0044
  CHANNEL FLOW THRU SUBAREA(CFS) =      41.22
  FLOW VELOCITY(FEET/SEC) =   2.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.33   Tc(MIN.) =   24.31
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     64.00 =    2359.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   837.00  DOWNSTREAM(FEET) =   835.30
  FLOW LENGTH(FEET) =   596.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.90
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.22
  PIPE TRAVEL TIME(MIN.) =   1.68    Tc(MIN.) =   26.00
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    2955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   26.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.147
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A       0.23      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =     24.56   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =       25.9       PEAK FLOW RATE(CFS) =      41.22
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.9  TC(MIN.) =     26.00
  EFFECTIVE AREA(ACRES) =     24.56  AREA-AVERAGED Fm(INCH/HR)=  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.793
  PEAK FLOW RATE(CFS)   =      41.22
```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	41.22	26.00	2.147	0.74(0.59)	0.79	24.6	60.00
2	37.54	30.68	1.944	0.74(0.59)	0.79	25.9	50.00

==

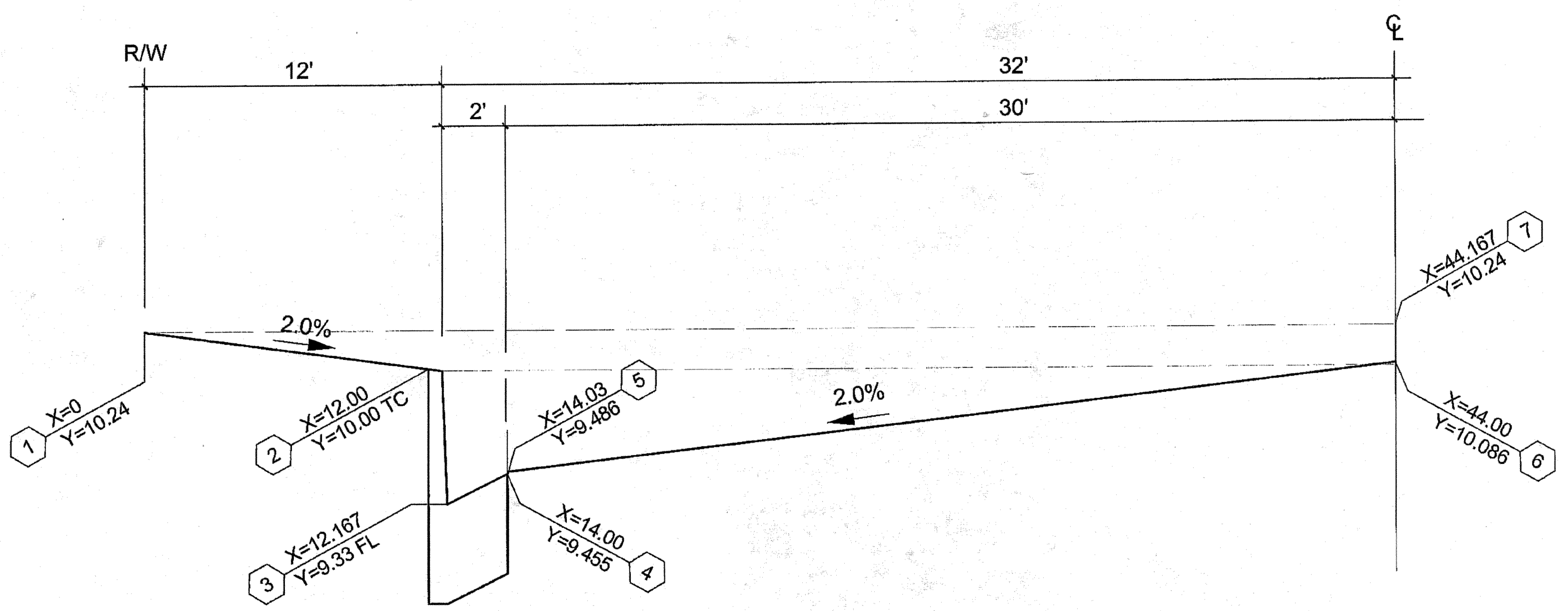
==

END OF RATIONAL METHOD ANALYSIS

C

C. Hydraulics Calculations

- Francis Avenue Street Capacity
- Yorba Avenue Street Capacity



LOCATION:	FRANCIS AVENUE (TT 20056)	
SLOPE =	0.004	
HALF STREET CAPACITY:	54 CFS	FLOW WITHIN R/W
	20.7 CFS	FLOW BELOW TC

JN: 89700

```
==========================================================================
                ** RESULTS OF IRREGULAR CHANNEL ANALYSIS **
                  CALCULATIONS BASED ON MANNINGS EQUATION
               WITH ALL DIMENSIONS IN FEET OR FEET AND SECONDS
==========================================================================
```


Analysis prepared by:

```
************************** DESCRIPTION OF STUDY **************************
* Half Street capacity                                                    *
* Flow Below Top of Curb                                                  *
* Q=20 CFS                                                                *
***************************************************************************

  TIME/DATE OF STUDY: 12:21 08/13/2019
--------------------------------------------------------------------------
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER  1 :
          NODE NUMBER        "X" COORDINATE      "Y" COORDINATE

               1                   0.00              10.24
               2                  12.00              10.00
               3                  12.17               9.33
               4                  14.00               9.44
               5                  14.03               9.49
               6                  44.00              10.09
               7                  44.17              10.24
          SUBCHANNEL SLOPE(FEET/FEET) = 0.004000
          SUBCHANNEL MANNINGS FRICTION FACTOR = 0.015000

..........................................................................
       SUBCHANNEL FLOW(CFS) =     20.7
       SUBCHANNEL FLOW AREA(SQUARE FEET) =        7.79
       SUBCHANNEL FLOW VELOCITY(FEET/SEC.) =     2.655
       SUBCHANNEL FROUDE NUMBER =  0.882
       SUBCHANNEL FLOW TOP-WIDTH(FEET) =       27.71
       SUBCHANNEL HYDRAULIC DEPTH(FEET) =     0.28

--------------------------------------------------------------------------
--------------------------------------------------------------------------
       TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED =        20.00
       COMPUTED IRREGULAR CHANNEL FLOW(CFS) =       20.69

       ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE
       ELEVATION............................       10.00

            NOTE: WATER SURFACE IS BELOW EXTREME
                  LEFT AND RIGHT BANK ELEVATIONS.
```

```
==========================================================================
              ** RESULTS OF IRREGULAR CHANNEL ANALYSIS **
                CALCULATIONS BASED ON MANNINGS EQUATION
             WITH ALL DIMENSIONS IN FEET OR FEET AND SECONDS

==========================================================================
```


Analysis prepared by:

```
************************** DESCRIPTION OF STUDY **************************
* Half Street Capacity                                                   *
* Flow Below ROW                                                         *
* Q=54 CFS                                                               *
**************************************************************************

   TIME/DATE OF STUDY: 12:33 08/13/2019
--------------------------------------------------------------------------
            * ENTERED INFORMATION FOR SUBCHANNEL NUMBER  1 :
            NODE NUMBER      "X" COORDINATE      "Y" COORDINATE

                 1                 0.00              10.24
                 2                12.00              10.00
                 3                12.17               9.33
                 4                14.00               9.45
                 5                14.03               9.49
                 6                44.00              10.09
                 7                44.17              10.24
            SUBCHANNEL SLOPE(FEET/FEET) = 0.004000
            SUBCHANNEL MANNINGS FRICTION FACTOR = 0.015000

..........................................................................
         SUBCHANNEL FLOW(CFS) =        54.4
         SUBCHANNEL FLOW AREA(SQUARE FEET) =       16.73
         SUBCHANNEL FLOW VELOCITY(FEET/SEC.) =     3.251
         SUBCHANNEL FROUDE NUMBER =  0.931
         SUBCHANNEL FLOW TOP-WIDTH(FEET) =       44.17
         SUBCHANNEL HYDRAULIC DEPTH(FEET) =     0.38

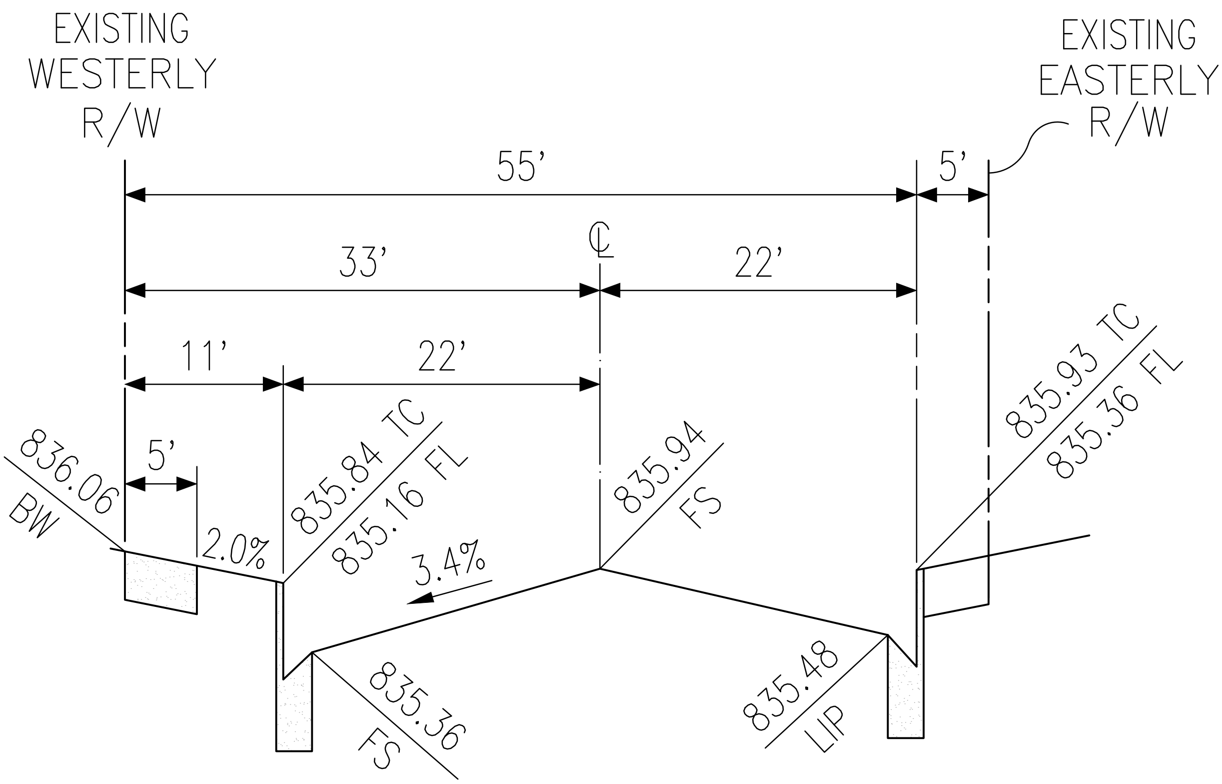
--------------------------------------------------------------------------
--------------------------------------------------------------------------
         TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED =        54.00
         COMPUTED IRREGULAR CHANNEL FLOW(CFS) =       54.39

         ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE
         ELEVATION............................       10.24

              NOTE: WATER SURFACE IS ABOVE LEFT OR RIGHT
                    BANK ELEVATIONS.

--------------------------------------------------------------------------
```

TYPICAL STREET SECTION



25+27.00

YORBA AVENUE

MDS CONSULTING
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FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS

```
================================================================================
                  ** RESULTS OF IRREGULAR CHANNEL ANALYSIS **
                    CALCULATIONS BASED ON MANNINGS EQUATION
                WITH ALL DIMENSIONS IN FEET OR FEET AND SECONDS

================================================================================
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                           Analysis prepared by:

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                           Phone: (949) 251-8821
                     Email: mdsirvine@mdsconsulting.net



 ************************** DESCRIPTION OF STUDY **************************
* TRACT NO. 20394                                                          *
* HALF STREET CAPACITY, YORBA AVENUE AT STA. 25+27                         *
* Q100 = 22.7 CFS, WITH S=0.0076                                           *
 **************************************************************************

    TIME/DATE OF STUDY: 08:36 11/08/2021
--------------------------------------------------------------------------------
            * ENTERED INFORMATION FOR SUBCHANNEL NUMBER  1 :
            NODE NUMBER      "X" COORDINATE     "Y" COORDINATE

                 1                  0.00            836.06
                 2                 11.00            835.84
                 3                 11.13            835.16
                 4                 13.00            835.36
                 5                 33.00            835.94
            SUBCHANNEL SLOPE(FEET/FEET) = 0.007600
            SUBCHANNEL MANNINGS FRICTION FACTOR = 0.015000

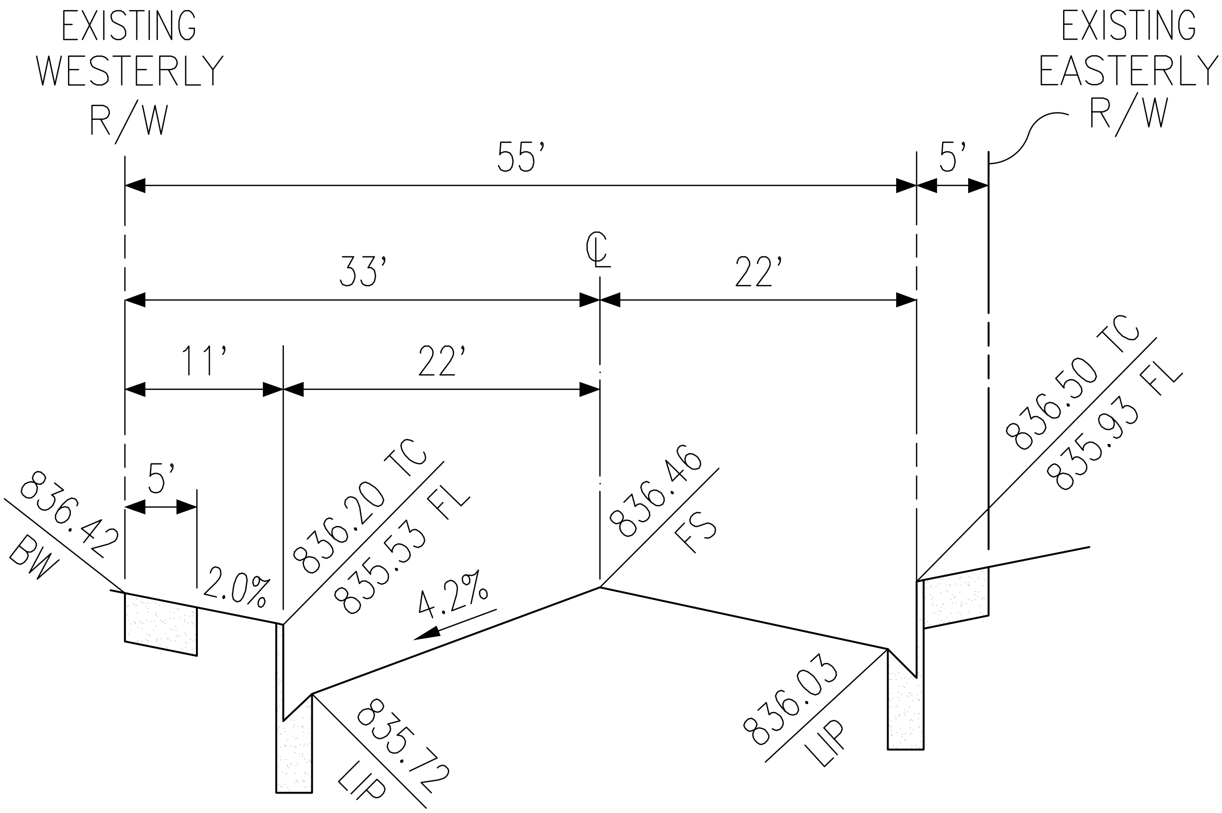
................................................................................
         SUBCHANNEL FLOW(CFS) =      23.5
         SUBCHANNEL FLOW AREA(SQUARE FEET) =       6.62
         SUBCHANNEL FLOW VELOCITY(FEET/SEC.) =    3.553
         SUBCHANNEL FROUDE NUMBER =  1.205
         SUBCHANNEL FLOW TOP-WIDTH(FEET) =      24.52
         SUBCHANNEL HYDRAULIC DEPTH(FEET) =    0.27

--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
         TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED =      22.70
         COMPUTED IRREGULAR CHANNEL FLOW(CFS) =      23.53

         ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE
         ELEVATION............................    835.91
```

NOTE: WATER SURFACE IS BELOW EXTREME
LEFT AND RIGHT BANK ELEVATIONS.

TYPICAL STREET SECTION



25+71.00

YORBA AVENUE

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```
================================================================================
                  ** RESULTS OF IRREGULAR CHANNEL ANALYSIS **
                    CALCULATIONS BASED ON MANNINGS EQUATION
                WITH ALL DIMENSIONS IN FEET OR FEET AND SECONDS

================================================================================
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                            Analysis prepared by:

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                            Phone: (949) 251-8821
                      Email: mdsirvine@mdsconsulting.net



 ************************** DESCRIPTION OF STUDY **************************
* TRACT NO. 20394                                                          *
* HALF STREET CAPACITY, YORBA AVENUE AT STA. 25+71                         *
* Q100 = 22.7 CFS, WITH S=0.0125                                           *
 **************************************************************************

    TIME/DATE OF STUDY: 13:21 11/08/2021
--------------------------------------------------------------------------------
            * ENTERED INFORMATION FOR SUBCHANNEL NUMBER  1 :
            NODE NUMBER      "X" COORDINATE     "Y" COORDINATE

                 1                 0.00            836.42
                 2                11.00            836.20
                 3                11.13            835.53
                 4                13.00            835.72
                 5                33.00            836.46
            SUBCHANNEL SLOPE(FEET/FEET) = 0.012500
            SUBCHANNEL MANNINGS FRICTION FACTOR = 0.015000

................................................................................
         SUBCHANNEL FLOW(CFS) =      23.1
         SUBCHANNEL FLOW AREA(SQUARE FEET) =       5.09
         SUBCHANNEL FLOW VELOCITY(FEET/SEC.) =    4.532
         SUBCHANNEL FROUDE NUMBER =  1.538
         SUBCHANNEL FLOW TOP-WIDTH(FEET) =      18.88
         SUBCHANNEL HYDRAULIC DEPTH(FEET) =    0.27

--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
         TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED =      22.70
         COMPUTED IRREGULAR CHANNEL FLOW(CFS) =      23.07

         ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE
         ELEVATION.............................    836.25
```

NOTE: WATER SURFACE IS BELOW EXTREME
LEFT AND RIGHT BANK ELEVATIONS.

D

D. Synthetic Unit Hydrograph

- 2-Year / 24-Hour
- 100-Year / 24-Hour

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        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  02/14/22

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San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4027

---------------------------------------------------------------------
Unit Hydrograph
Pre Development
2-year / 24-hour

--------------------------------------------------------------------

        Storm Event Year = 2

        Antecedent Moisture Condition = 2

 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
            11.60           1           0.60
--------------------------------------------------------------------
Rainfall data for year 2
            11.60           6           1.45
--------------------------------------------------------------------
Rainfall data for year 2
            11.60          24           2.50
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      32.0          3.30      0.284     0.978    0.800    0.782
 32.0      32.0          8.30      0.716     0.978    0.500    0.489

Area-averaged adjusted loss rate Fm (In/Hr) =  0.572

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
     2.64   0.228         32.0      32.0      12.50     0.000
     0.66   0.057         98.0      98.0       0.20     0.908

     4.15   0.358         32.0      32.0      12.50     0.000
     4.15   0.358         98.0      98.0       0.20     0.908

Area-averaged catchment yield fraction, Y =  0.377
Area-averaged low loss fraction, Yb =  0.623
User entry of time of concentration  =   0.258 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      11.60(Ac.)
Catchment Lag time =   0.206 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 40.3747
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.572(In/Hr)
Average low loss rate fraction (Yb) = 0.623 (decimal)
VALLEY DEVELOPED S-Graph Selected
```

Computed peak 5-minute rainfall = 0.222(In)
Computed peak 30-minute rainfall = 0.455(In)
Specified peak 1-hour rainfall = 0.600(In)
Computed peak 3-hour rainfall = 1.031(In)
Specified peak 6-hour rainfall = 1.450(In)
Specified peak 24-hour rainfall = 2.500(In)

Rainfall depth area reduction factors:
Using a total area of 11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.222(In)
30-minute factor = 0.999	Adjusted rainfall = 0.454(In)
1-hour factor = 0.999	Adjusted rainfall = 0.600(In)
3-hour factor = 1.000	Adjusted rainfall = 1.031(In)
6-hour factor = 1.000	Adjusted rainfall = 1.450(In)
24-hour factor = 1.000	Adjusted rainfall = 2.500(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 = 140.29 (CFS))	
1	3.087	4.330
2	19.928	23.626
3	50.442	42.807
4	78.567	39.456
5	91.525	18.179
6	96.879	7.512
7	98.524	2.307
8	99.251	1.019
9	100.000	0.510

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2219	0.2219
2	0.2929	0.0709
3	0.3444	0.0516
4	0.3864	0.0420
5	0.4225	0.0361
6	0.4545	0.0320
7	0.4834	0.0289
8	0.5099	0.0265
9	0.5345	0.0246
10	0.5575	0.0230
11	0.5792	0.0217
12	0.5997	0.0205
13	0.6238	0.0241
14	0.6470	0.0232
15	0.6694	0.0224
16	0.6910	0.0216
17	0.7120	0.0210
18	0.7323	0.0203
19	0.7521	0.0198
20	0.7714	0.0193
21	0.7901	0.0188
22	0.8085	0.0183
23	0.8264	0.0179
24	0.8439	0.0175
25	0.8611	0.0172
26	0.8779	0.0168
27	0.8943	0.0165
28	0.9105	0.0162
29	0.9264	0.0159
30	0.9420	0.0156
31	0.9574	0.0153
32	0.9725	0.0151
33	0.9873	0.0149
34	1.0020	0.0146
35	1.0164	0.0144
36	1.0306	0.0142
37	1.0446	0.0140
38	1.0584	0.0138
39	1.0720	0.0136
40	1.0855	0.0135
41	1.0988	0.0133
42	1.1119	0.0131
43	1.1249	0.0130
44	1.1377	0.0128
45	1.1503	0.0127

46	1.1628	0.0125
47	1.1752	0.0124
48	1.1875	0.0122
49	1.1996	0.0121
50	1.2116	0.0120
51	1.2235	0.0119
52	1.2352	0.0118
53	1.2469	0.0116
54	1.2584	0.0115
55	1.2698	0.0114
56	1.2811	0.0113
57	1.2924	0.0112
58	1.3035	0.0111
59	1.3145	0.0110
60	1.3254	0.0109
61	1.3363	0.0108
62	1.3470	0.0107
63	1.3577	0.0107
64	1.3682	0.0106
65	1.3787	0.0105
66	1.3891	0.0104
67	1.3994	0.0103
68	1.4097	0.0102
69	1.4199	0.0102
70	1.4300	0.0101
71	1.4400	0.0100
72	1.4499	0.0100
73	1.4578	0.0079
74	1.4656	0.0078
75	1.4734	0.0078
76	1.4811	0.0077
77	1.4887	0.0076
78	1.4963	0.0076
79	1.5038	0.0075
80	1.5112	0.0075
81	1.5186	0.0074
82	1.5260	0.0073
83	1.5333	0.0073
84	1.5405	0.0072
85	1.5477	0.0072
86	1.5548	0.0071
87	1.5619	0.0071
88	1.5689	0.0070
89	1.5759	0.0070
90	1.5828	0.0069
91	1.5897	0.0069
92	1.5966	0.0068
93	1.6034	0.0068
94	1.6101	0.0068
95	1.6168	0.0067
96	1.6235	0.0067
97	1.6301	0.0066
98	1.6367	0.0066
99	1.6432	0.0065
100	1.6497	0.0065
101	1.6562	0.0065
102	1.6626	0.0064
103	1.6690	0.0064
104	1.6754	0.0063
105	1.6817	0.0063
106	1.6879	0.0063
107	1.6942	0.0062
108	1.7004	0.0062
109	1.7066	0.0062
110	1.7127	0.0061
111	1.7188	0.0061
112	1.7249	0.0061
113	1.7309	0.0060
114	1.7369	0.0060
115	1.7429	0.0060
116	1.7488	0.0059
117	1.7547	0.0059
118	1.7606	0.0059
119	1.7664	0.0058
120	1.7723	0.0058
121	1.7781	0.0058
122	1.7838	0.0058
123	1.7895	0.0057
124	1.7952	0.0057
125	1.8009	0.0057
126	1.8066	0.0056
127	1.8122	0.0056
128	1.8178	0.0056

129	1.8234	0.0056
130	1.8289	0.0055
131	1.8344	0.0055
132	1.8399	0.0055
133	1.8454	0.0055
134	1.8508	0.0054
135	1.8562	0.0054
136	1.8616	0.0054
137	1.8670	0.0054
138	1.8723	0.0053
139	1.8776	0.0053
140	1.8829	0.0053
141	1.8882	0.0053
142	1.8935	0.0053
143	1.8987	0.0052
144	1.9039	0.0052
145	1.9091	0.0052
146	1.9142	0.0052
147	1.9194	0.0051
148	1.9245	0.0051
149	1.9296	0.0051
150	1.9347	0.0051
151	1.9397	0.0051
152	1.9448	0.0050
153	1.9498	0.0050
154	1.9548	0.0050
155	1.9598	0.0050
156	1.9647	0.0050
157	1.9697	0.0049
158	1.9746	0.0049
159	1.9795	0.0049
160	1.9844	0.0049
161	1.9892	0.0049
162	1.9941	0.0048
163	1.9989	0.0048
164	2.0037	0.0048
165	2.0085	0.0048
166	2.0133	0.0048
167	2.0180	0.0048
168	2.0228	0.0047
169	2.0275	0.0047
170	2.0322	0.0047
171	2.0369	0.0047
172	2.0416	0.0047
173	2.0462	0.0047
174	2.0509	0.0046
175	2.0555	0.0046
176	2.0601	0.0046
177	2.0647	0.0046
178	2.0693	0.0046
179	2.0738	0.0046
180	2.0784	0.0045
181	2.0829	0.0045
182	2.0874	0.0045
183	2.0919	0.0045
184	2.0964	0.0045
185	2.1009	0.0045
186	2.1053	0.0045
187	2.1098	0.0044
188	2.1142	0.0044
189	2.1186	0.0044
190	2.1230	0.0044
191	2.1274	0.0044
192	2.1318	0.0044
193	2.1361	0.0044
194	2.1405	0.0043
195	2.1448	0.0043
196	2.1491	0.0043
197	2.1534	0.0043
198	2.1577	0.0043
199	2.1620	0.0043
200	2.1662	0.0043
201	2.1705	0.0042
202	2.1747	0.0042
203	2.1789	0.0042
204	2.1832	0.0042
205	2.1874	0.0042
206	2.1915	0.0042
207	2.1957	0.0042
208	2.1999	0.0042
209	2.2040	0.0041
210	2.2082	0.0041
211	2.2123	0.0041

212	2.2164	0.0041
213	2.2205	0.0041
214	2.2246	0.0041
215	2.2287	0.0041
216	2.2327	0.0041
217	2.2368	0.0041
218	2.2408	0.0040
219	2.2449	0.0040
220	2.2489	0.0040
221	2.2529	0.0040
222	2.2569	0.0040
223	2.2609	0.0040
224	2.2649	0.0040
225	2.2688	0.0040
226	2.2728	0.0040
227	2.2768	0.0039
228	2.2807	0.0039
229	2.2846	0.0039
230	2.2885	0.0039
231	2.2924	0.0039
232	2.2963	0.0039
233	2.3002	0.0039
234	2.3041	0.0039
235	2.3079	0.0039
236	2.3118	0.0039
237	2.3156	0.0038
238	2.3195	0.0038
239	2.3233	0.0038
240	2.3271	0.0038
241	2.3309	0.0038
242	2.3347	0.0038
243	2.3385	0.0038
244	2.3423	0.0038
245	2.3461	0.0038
246	2.3498	0.0038
247	2.3536	0.0037
248	2.3573	0.0037
249	2.3610	0.0037
250	2.3648	0.0037
251	2.3685	0.0037
252	2.3722	0.0037
253	2.3759	0.0037
254	2.3795	0.0037
255	2.3832	0.0037
256	2.3869	0.0037
257	2.3906	0.0037
258	2.3942	0.0037
259	2.3978	0.0036
260	2.4015	0.0036
261	2.4051	0.0036
262	2.4087	0.0036
263	2.4123	0.0036
264	2.4159	0.0036
265	2.4195	0.0036
266	2.4231	0.0036
267	2.4267	0.0036
268	2.4302	0.0036
269	2.4338	0.0036
270	2.4374	0.0036
271	2.4409	0.0035
272	2.4444	0.0035
273	2.4480	0.0035
274	2.4515	0.0035
275	2.4550	0.0035
276	2.4585	0.0035
277	2.4620	0.0035
278	2.4655	0.0035
279	2.4690	0.0035
280	2.4724	0.0035
281	2.4759	0.0035
282	2.4794	0.0035
283	2.4828	0.0035
284	2.4863	0.0034
285	2.4897	0.0034
286	2.4931	0.0034
287	2.4965	0.0034
288	2.5000	0.0034

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0034	0.0021	0.0013

2	0.0034	0.0021	0.0013
3	0.0034	0.0021	0.0013
4	0.0034	0.0021	0.0013
5	0.0035	0.0022	0.0013
6	0.0035	0.0022	0.0013
7	0.0035	0.0022	0.0013
8	0.0035	0.0022	0.0013
9	0.0035	0.0022	0.0013
10	0.0035	0.0022	0.0013
11	0.0035	0.0022	0.0013
12	0.0035	0.0022	0.0013
13	0.0036	0.0022	0.0013
14	0.0036	0.0022	0.0013
15	0.0036	0.0022	0.0013
16	0.0036	0.0022	0.0013
17	0.0036	0.0022	0.0014
18	0.0036	0.0022	0.0014
19	0.0036	0.0023	0.0014
20	0.0036	0.0023	0.0014
21	0.0037	0.0023	0.0014
22	0.0037	0.0023	0.0014
23	0.0037	0.0023	0.0014
24	0.0037	0.0023	0.0014
25	0.0037	0.0023	0.0014
26	0.0037	0.0023	0.0014
27	0.0037	0.0023	0.0014
28	0.0037	0.0023	0.0014
29	0.0038	0.0023	0.0014
30	0.0038	0.0023	0.0014
31	0.0038	0.0024	0.0014
32	0.0038	0.0024	0.0014
33	0.0038	0.0024	0.0014
34	0.0038	0.0024	0.0014
35	0.0038	0.0024	0.0014
36	0.0039	0.0024	0.0015
37	0.0039	0.0024	0.0015
38	0.0039	0.0024	0.0015
39	0.0039	0.0024	0.0015
40	0.0039	0.0024	0.0015
41	0.0039	0.0025	0.0015
42	0.0039	0.0025	0.0015
43	0.0040	0.0025	0.0015
44	0.0040	0.0025	0.0015
45	0.0040	0.0025	0.0015
46	0.0040	0.0025	0.0015
47	0.0040	0.0025	0.0015
48	0.0040	0.0025	0.0015
49	0.0041	0.0025	0.0015
50	0.0041	0.0025	0.0015
51	0.0041	0.0026	0.0015
52	0.0041	0.0026	0.0015
53	0.0041	0.0026	0.0016
54	0.0041	0.0026	0.0016
55	0.0042	0.0026	0.0016
56	0.0042	0.0026	0.0016
57	0.0042	0.0026	0.0016
58	0.0042	0.0026	0.0016
59	0.0042	0.0026	0.0016
60	0.0043	0.0027	0.0016
61	0.0043	0.0027	0.0016
62	0.0043	0.0027	0.0016
63	0.0043	0.0027	0.0016
64	0.0043	0.0027	0.0016
65	0.0044	0.0027	0.0016
66	0.0044	0.0027	0.0017
67	0.0044	0.0028	0.0017
68	0.0044	0.0028	0.0017
69	0.0045	0.0028	0.0017
70	0.0045	0.0028	0.0017
71	0.0045	0.0028	0.0017
72	0.0045	0.0028	0.0017
73	0.0045	0.0028	0.0017
74	0.0046	0.0028	0.0017
75	0.0046	0.0029	0.0017
76	0.0046	0.0029	0.0017
77	0.0046	0.0029	0.0017
78	0.0047	0.0029	0.0018
79	0.0047	0.0029	0.0018
80	0.0047	0.0029	0.0018
81	0.0047	0.0030	0.0018
82	0.0048	0.0030	0.0018
83	0.0048	0.0030	0.0018
84	0.0048	0.0030	0.0018

85	0.0048	0.0030	0.0018
86	0.0049	0.0030	0.0018
87	0.0049	0.0031	0.0018
88	0.0049	0.0031	0.0019
89	0.0050	0.0031	0.0019
90	0.0050	0.0031	0.0019
91	0.0050	0.0031	0.0019
92	0.0050	0.0031	0.0019
93	0.0051	0.0032	0.0019
94	0.0051	0.0032	0.0019
95	0.0051	0.0032	0.0019
96	0.0052	0.0032	0.0019
97	0.0052	0.0032	0.0020
98	0.0052	0.0033	0.0020
99	0.0053	0.0033	0.0020
100	0.0053	0.0033	0.0020
101	0.0053	0.0033	0.0020
102	0.0054	0.0033	0.0020
103	0.0054	0.0034	0.0020
104	0.0054	0.0034	0.0020
105	0.0055	0.0034	0.0021
106	0.0055	0.0034	0.0021
107	0.0056	0.0035	0.0021
108	0.0056	0.0035	0.0021
109	0.0056	0.0035	0.0021
110	0.0057	0.0035	0.0021
111	0.0057	0.0036	0.0022
112	0.0058	0.0036	0.0022
113	0.0058	0.0036	0.0022
114	0.0058	0.0036	0.0022
115	0.0059	0.0037	0.0022
116	0.0059	0.0037	0.0022
117	0.0060	0.0037	0.0023
118	0.0060	0.0038	0.0023
119	0.0061	0.0038	0.0023
120	0.0061	0.0038	0.0023
121	0.0062	0.0039	0.0023
122	0.0062	0.0039	0.0024
123	0.0063	0.0039	0.0024
124	0.0063	0.0040	0.0024
125	0.0064	0.0040	0.0024
126	0.0065	0.0040	0.0024
127	0.0065	0.0041	0.0025
128	0.0066	0.0041	0.0025
129	0.0067	0.0042	0.0025
130	0.0067	0.0042	0.0025
131	0.0068	0.0042	0.0026
132	0.0068	0.0043	0.0026
133	0.0069	0.0043	0.0026
134	0.0070	0.0044	0.0026
135	0.0071	0.0044	0.0027
136	0.0071	0.0044	0.0027
137	0.0072	0.0045	0.0027
138	0.0073	0.0045	0.0027
139	0.0074	0.0046	0.0028
140	0.0075	0.0046	0.0028
141	0.0076	0.0047	0.0029
142	0.0076	0.0048	0.0029
143	0.0078	0.0048	0.0029
144	0.0078	0.0049	0.0029
145	0.0100	0.0062	0.0037
146	0.0100	0.0062	0.0038
147	0.0102	0.0063	0.0038
148	0.0102	0.0064	0.0039
149	0.0104	0.0065	0.0039
150	0.0105	0.0065	0.0040
151	0.0107	0.0066	0.0040
152	0.0107	0.0067	0.0040
153	0.0109	0.0068	0.0041
154	0.0110	0.0069	0.0042
155	0.0112	0.0070	0.0042
156	0.0113	0.0071	0.0043
157	0.0115	0.0072	0.0043
158	0.0116	0.0073	0.0044
159	0.0119	0.0074	0.0045
160	0.0120	0.0075	0.0045
161	0.0122	0.0076	0.0046
162	0.0124	0.0077	0.0047
163	0.0127	0.0079	0.0048
164	0.0128	0.0080	0.0048
165	0.0131	0.0082	0.0049
166	0.0133	0.0083	0.0050
167	0.0136	0.0085	0.0051

168	0.0138	0.0086	0.0052
169	0.0142	0.0089	0.0054
170	0.0144	0.0090	0.0054
171	0.0149	0.0093	0.0056
172	0.0151	0.0094	0.0057
173	0.0156	0.0097	0.0059
174	0.0159	0.0099	0.0060
175	0.0165	0.0103	0.0062
176	0.0168	0.0105	0.0063
177	0.0175	0.0109	0.0066
178	0.0179	0.0112	0.0067
179	0.0188	0.0117	0.0071
180	0.0193	0.0120	0.0073
181	0.0203	0.0127	0.0077
182	0.0210	0.0131	0.0079
183	0.0224	0.0140	0.0084
184	0.0232	0.0145	0.0087
185	0.0205	0.0128	0.0077
186	0.0217	0.0135	0.0082
187	0.0246	0.0153	0.0093
188	0.0265	0.0165	0.0100
189	0.0320	0.0199	0.0120
190	0.0361	0.0225	0.0136
191	0.0516	0.0321	0.0194
192	0.0709	0.0442	0.0267
193	0.2219	0.0477	0.1742
194	0.0420	0.0262	0.0158
195	0.0289	0.0180	0.0109
196	0.0230	0.0143	0.0087
197	0.0241	0.0150	0.0091
198	0.0216	0.0135	0.0081
199	0.0198	0.0123	0.0074
200	0.0183	0.0114	0.0069
201	0.0172	0.0107	0.0065
202	0.0162	0.0101	0.0061
203	0.0153	0.0096	0.0058
204	0.0146	0.0091	0.0055
205	0.0140	0.0087	0.0053
206	0.0135	0.0084	0.0051
207	0.0130	0.0081	0.0049
208	0.0125	0.0078	0.0047
209	0.0121	0.0076	0.0046
210	0.0118	0.0073	0.0044
211	0.0114	0.0071	0.0043
212	0.0111	0.0069	0.0042
213	0.0108	0.0068	0.0041
214	0.0106	0.0066	0.0040
215	0.0103	0.0064	0.0039
216	0.0101	0.0063	0.0038
217	0.0079	0.0049	0.0030
218	0.0077	0.0048	0.0029
219	0.0075	0.0047	0.0028
220	0.0073	0.0046	0.0028
221	0.0072	0.0045	0.0027
222	0.0070	0.0044	0.0026
223	0.0069	0.0043	0.0026
224	0.0068	0.0042	0.0025
225	0.0066	0.0041	0.0025
226	0.0065	0.0041	0.0024
227	0.0064	0.0040	0.0024
228	0.0063	0.0039	0.0024
229	0.0062	0.0038	0.0023
230	0.0061	0.0038	0.0023
231	0.0060	0.0037	0.0022
232	0.0059	0.0037	0.0022
233	0.0058	0.0036	0.0022
234	0.0057	0.0036	0.0021
235	0.0056	0.0035	0.0021
236	0.0055	0.0035	0.0021
237	0.0055	0.0034	0.0021
238	0.0054	0.0034	0.0020
239	0.0053	0.0033	0.0020
240	0.0053	0.0033	0.0020
241	0.0052	0.0032	0.0020
242	0.0051	0.0032	0.0019
243	0.0051	0.0032	0.0019
244	0.0050	0.0031	0.0019
245	0.0049	0.0031	0.0019
246	0.0049	0.0030	0.0018
247	0.0048	0.0030	0.0018
248	0.0048	0.0030	0.0018
249	0.0047	0.0029	0.0018
250	0.0047	0.0029	0.0018

251	0.0046	0.0029	0.0017
252	0.0046	0.0029	0.0017
253	0.0045	0.0028	0.0017
254	0.0045	0.0028	0.0017
255	0.0044	0.0028	0.0017
256	0.0044	0.0027	0.0017
257	0.0044	0.0027	0.0016
258	0.0043	0.0027	0.0016
259	0.0043	0.0027	0.0016
260	0.0042	0.0026	0.0016
261	0.0042	0.0026	0.0016
262	0.0042	0.0026	0.0016
263	0.0041	0.0026	0.0016
264	0.0041	0.0026	0.0015
265	0.0041	0.0025	0.0015
266	0.0040	0.0025	0.0015
267	0.0040	0.0025	0.0015
268	0.0040	0.0025	0.0015
269	0.0039	0.0024	0.0015
270	0.0039	0.0024	0.0015
271	0.0039	0.0024	0.0015
272	0.0038	0.0024	0.0014
273	0.0038	0.0024	0.0014
274	0.0038	0.0024	0.0014
275	0.0037	0.0023	0.0014
276	0.0037	0.0023	0.0014
277	0.0037	0.0023	0.0014
278	0.0037	0.0023	0.0014
279	0.0036	0.0023	0.0014
280	0.0036	0.0023	0.0014
281	0.0036	0.0022	0.0014
282	0.0036	0.0022	0.0013
283	0.0035	0.0022	0.0013
284	0.0035	0.0022	0.0013
285	0.0035	0.0022	0.0013
286	0.0035	0.0022	0.0013
287	0.0035	0.0022	0.0013
288	0.0034	0.0021	0.0013

```
--------------------------------------------------------------------
--------------------------------------------------------------------
Total soil rain loss =      1.47(In)
Total effective rainfall =      1.03(In)
Peak flow rate in flood hydrograph =      9.43(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      0.01  Q         |         |         |         |
  0+10      0.0003      0.04  Q         |         |         |         |
  0+15      0.0009      0.09  Q         |         |         |         |
  0+20      0.0019      0.14  Q         |         |         |         |
  0+25      0.0030      0.17  Q         |         |         |         |
  0+30      0.0042      0.18  Q         |         |         |         |
  0+35      0.0055      0.18  Q         |         |         |         |
  0+40      0.0067      0.18  Q         |         |         |         |
  0+45      0.0080      0.18  Q         |         |         |         |
  0+50      0.0093      0.18  Q         |         |         |         |
  0+55      0.0105      0.18  Q         |         |         |         |
  1+ 0      0.0118      0.18  Q         |         |         |         |
  1+ 5      0.0131      0.19  Q         |         |         |         |
  1+10      0.0144      0.19  Q         |         |         |         |
  1+15      0.0156      0.19  Q         |         |         |         |
  1+20      0.0169      0.19  Q         |         |         |         |
  1+25      0.0182      0.19  Q         |         |         |         |
  1+30      0.0195      0.19  Q         |         |         |         |
  1+35      0.0208      0.19  Q         |         |         |         |
  1+40      0.0221      0.19  Q         |         |         |         |
  1+45      0.0234      0.19  Q         |         |         |         |
  1+50      0.0247      0.19  Q         |         |         |         |
  1+55      0.0261      0.19  QV        |         |         |         |
  2+ 0      0.0274      0.19  QV        |         |         |         |
  2+ 5      0.0287      0.19  QV        |         |         |         |
  2+10      0.0301      0.19  QV        |         |         |         |
  2+15      0.0314      0.19  QV        |         |         |         |
  2+20      0.0327      0.20  QV        |         |         |         |
  2+25      0.0341      0.20  QV        |         |         |         |
  2+30      0.0354      0.20  QV        |         |         |         |
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2+35       0.0368      0.20  QV         |         |         |         |
2+40       0.0382      0.20  QV         |         |         |         |
2+45       0.0395      0.20  QV         |         |         |         |
2+50       0.0409      0.20  QV         |         |         |         |
2+55       0.0423      0.20  QV         |         |         |         |
3+ 0       0.0437      0.20  QV         |         |         |         |
3+ 5       0.0451      0.20  QV         |         |         |         |
3+10       0.0464      0.20  QV         |         |         |         |
3+15       0.0478      0.20  QV         |         |         |         |
3+20       0.0493      0.20  QV         |         |         |         |
3+25       0.0507      0.20  Q V        |         |         |         |
3+30       0.0521      0.21  Q V        |         |         |         |
3+35       0.0535      0.21  Q V        |         |         |         |
3+40       0.0549      0.21  Q V        |         |         |         |
3+45       0.0564      0.21  Q V        |         |         |         |
3+50       0.0578      0.21  Q V        |         |         |         |
3+55       0.0593      0.21  Q V        |         |         |         |
4+ 0       0.0607      0.21  Q V        |         |         |         |
4+ 5       0.0622      0.21  Q V        |         |         |         |
4+10       0.0636      0.21  Q V        |         |         |         |
4+15       0.0651      0.21  Q V        |         |         |         |
4+20       0.0666      0.21  Q V        |         |         |         |
4+25       0.0681      0.22  Q V        |         |         |         |
4+30       0.0695      0.22  Q V        |         |         |         |
4+35       0.0710      0.22  Q V        |         |         |         |
4+40       0.0725      0.22  Q V        |         |         |         |
4+45       0.0740      0.22  Q V        |         |         |         |
4+50       0.0756      0.22  Q  V       |         |         |         |
4+55       0.0771      0.22  Q  V       |         |         |         |
5+ 0       0.0786      0.22  Q  V       |         |         |         |
5+ 5       0.0801      0.22  Q  V       |         |         |         |
5+10       0.0817      0.22  Q  V       |         |         |         |
5+15       0.0832      0.22  Q  V       |         |         |         |
5+20       0.0848      0.23  Q  V       |         |         |         |
5+25       0.0864      0.23  Q  V       |         |         |         |
5+30       0.0879      0.23  Q  V       |         |         |         |
5+35       0.0895      0.23  Q  V       |         |         |         |
5+40       0.0911      0.23  Q  V       |         |         |         |
5+45       0.0927      0.23  Q  V       |         |         |         |
5+50       0.0943      0.23  Q  V       |         |         |         |
5+55       0.0959      0.23  Q  V       |         |         |         |
6+ 0       0.0975      0.23  Q  V       |         |         |         |
6+ 5       0.0991      0.24  Q  V       |         |         |         |
6+10       0.1008      0.24  Q   V      |         |         |         |
6+15       0.1024      0.24  Q   V      |         |         |         |
6+20       0.1041      0.24  Q   V      |         |         |         |
6+25       0.1057      0.24  Q   V      |         |         |         |
6+30       0.1074      0.24  Q   V      |         |         |         |
6+35       0.1091      0.24  Q   V      |         |         |         |
6+40       0.1107      0.24  Q   V      |         |         |         |
6+45       0.1124      0.25  Q   V      |         |         |         |
6+50       0.1141      0.25  Q   V      |         |         |         |
6+55       0.1159      0.25  Q   V      |         |         |         |
7+ 0       0.1176      0.25  Q   V      |         |         |         |
7+ 5       0.1193      0.25  |Q  V      |         |         |         |
7+10       0.1210      0.25  |Q  V      |         |         |         |
7+15       0.1228      0.25  |Q  V      |         |         |         |
7+20       0.1246      0.26  |Q   V     |         |         |         |
7+25       0.1263      0.26  |Q   V     |         |         |         |
7+30       0.1281      0.26  |Q   V     |         |         |         |
7+35       0.1299      0.26  |Q   V     |         |         |         |
7+40       0.1317      0.26  |Q   V     |         |         |         |
7+45       0.1335      0.26  |Q   V     |         |         |         |
7+50       0.1353      0.26  |Q   V     |         |         |         |
7+55       0.1372      0.27  |Q   V     |         |         |         |
8+ 0       0.1390      0.27  |Q   V     |         |         |         |
8+ 5       0.1409      0.27  |Q   V     |         |         |         |
8+10       0.1427      0.27  |Q   V     |         |         |         |
8+15       0.1446      0.27  |Q   V     |         |         |         |
8+20       0.1465      0.27  |Q   V     |         |         |         |
8+25       0.1484      0.28  |Q   V     |         |         |         |
8+30       0.1503      0.28  |Q    V    |         |         |         |
8+35       0.1522      0.28  |Q    V    |         |         |         |
8+40       0.1542      0.28  |Q    V    |         |         |         |
8+45       0.1561      0.28  |Q    V    |         |         |         |
8+50       0.1581      0.29  |Q    V    |         |         |         |
8+55       0.1601      0.29  |Q    V    |         |         |         |
9+ 0       0.1621      0.29  |Q    V    |         |         |         |
9+ 5       0.1641      0.29  |Q    V    |         |         |         |
9+10       0.1661      0.29  |Q    V    |         |         |         |
9+15       0.1681      0.30  |Q    V    |         |         |         |
9+20       0.1702      0.30  |Q    V    |         |         |         |
9+25       0.1722      0.30  |Q    V    |         |         |         |
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 9+30       0.1743      0.30   |Q     V  |         |         |         |
 9+35       0.1764      0.30   |Q     V  |         |         |         |
 9+40       0.1785      0.31   |Q     V  |         |         |         |
 9+45       0.1807      0.31   |Q     V  |         |         |         |
 9+50       0.1828      0.31   |Q     V  |         |         |         |
 9+55       0.1850      0.31   |Q     V  |         |         |         |
10+ 0       0.1872      0.32   |Q     V  |         |         |         |
10+ 5       0.1894      0.32   |Q     V  |         |         |         |
10+10       0.1916      0.32   |Q     V  |         |         |         |
10+15       0.1938      0.32   |Q     V  |         |         |         |
10+20       0.1961      0.33   |Q     V  |         |         |         |
10+25       0.1983      0.33   |Q     V  |         |         |         |
10+30       0.2006      0.33   |Q      V |         |         |         |
10+35       0.2029      0.34   |Q      V |         |         |         |
10+40       0.2053      0.34   |Q      V |         |         |         |
10+45       0.2076      0.34   |Q      V |         |         |         |
10+50       0.2100      0.35   |Q      V |         |         |         |
10+55       0.2124      0.35   |Q      V |         |         |         |
11+ 0       0.2148      0.35   |Q      V |         |         |         |
11+ 5       0.2173      0.36   |Q      V |         |         |         |
11+10       0.2197      0.36   |Q      V |         |         |         |
11+15       0.2222      0.36   |Q      V |         |         |         |
11+20       0.2248      0.37   |Q       V|         |         |         |
11+25       0.2273      0.37   |Q       V|         |         |         |
11+30       0.2299      0.37   |Q       V|         |         |         |
11+35       0.2325      0.38   |Q       V|         |         |         |
11+40       0.2351      0.38   |Q       V|         |         |         |
11+45       0.2378      0.39   |Q       V|         |         |         |
11+50       0.2405      0.39   |Q       V|         |         |         |
11+55       0.2432      0.39   |Q       V|         |         |         |
12+ 0       0.2459      0.40   |Q       V|         |         |         |
12+ 5       0.2487      0.41   |Q        V         |         |         |
12+10       0.2517      0.43   |Q        V         |         |         |
12+15       0.2549      0.47   |Q        V         |         |         |
12+20       0.2584      0.50   | Q       V         |         |         |
12+25       0.2620      0.52   | Q       V         |         |         |
12+30       0.2657      0.53   | Q       V         |         |         |
12+35       0.2694      0.54   | Q       V         |         |         |
12+40       0.2732      0.55   | Q       V         |         |         |
12+45       0.2770      0.56   | Q       |V        |         |         |
12+50       0.2809      0.56   | Q       |V        |         |         |
12+55       0.2848      0.57   | Q       |V        |         |         |
13+ 0       0.2888      0.58   | Q       |V        |         |         |
13+ 5       0.2928      0.58   | Q       |V        |         |         |
13+10       0.2969      0.59   | Q       |V        |         |         |
13+15       0.3010      0.60   | Q       | V       |         |         |
13+20       0.3052      0.61   | Q       | V       |         |         |
13+25       0.3095      0.62   | Q       | V       |         |         |
13+30       0.3138      0.63   | Q       | V       |         |         |
13+35       0.3182      0.64   | Q       | V       |         |         |
13+40       0.3227      0.65   | Q       | V       |         |         |
13+45       0.3272      0.66   | Q       |  V      |         |         |
13+50       0.3318      0.67   | Q       |  V      |         |         |
13+55       0.3365      0.68   | Q       |  V      |         |         |
14+ 0       0.3413      0.69   | Q       |  V      |         |         |
14+ 5       0.3461      0.71   | Q       |  V      |         |         |
14+10       0.3511      0.72   | Q       |   V     |         |         |
14+15       0.3562      0.74   | Q       |   V     |         |         |
14+20       0.3614      0.75   |  Q      |   V     |         |         |
14+25       0.3667      0.77   |  Q      |   V     |         |         |
14+30       0.3721      0.79   |  Q      |   V     |         |         |
14+35       0.3777      0.81   |  Q      |    V    |         |         |
14+40       0.3834      0.83   |  Q      |    V    |         |         |
14+45       0.3892      0.85   |  Q      |    V    |         |         |
14+50       0.3952      0.88   |  Q      |    V    |         |         |
14+55       0.4015      0.90   |  Q      |     V   |         |         |
15+ 0       0.4079      0.93   |  Q      |     V   |         |         |
15+ 5       0.4145      0.96   |  Q      |     V   |         |         |
15+10       0.4214      1.00   |   Q     |     V   |         |         |
15+15       0.4286      1.04   |   Q     |      V  |         |         |
15+20       0.4361      1.09   |   Q     |      V  |         |         |
15+25       0.4439      1.13   |   Q     |      V  |         |         |
15+30       0.4518      1.15   |   Q     |       V |         |         |
15+35       0.4597      1.15   |   Q     |       V |         |         |
15+40       0.4678      1.17   |   Q     |       V |         |         |
15+45       0.4764      1.24   |   Q     |        V|         |         |
15+50       0.4858      1.38   |    Q    |        V|         |         |
15+55       0.4967      1.58   |     Q   |        V|         |         |
16+ 0       0.5099      1.91   |      Q  |         V         |         |
16+ 5       0.5311      3.08   |         |  Q      |V        |         |
16+10       0.5756      6.47   |         |         |  V Q    |         |
16+15       0.6406      9.43   |         |         |    V    |      Q  |
16+20       0.6993      8.53   |         |         |       V |   Q     |
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16+25       0.7321      4.77  |         |        Q|        V|         |
16+30       0.7510      2.74  |         Q         |         V         |
16+35       0.7628      1.71  |     Q   |         |         V         |
16+40       0.7723      1.38  |    Q    |         |         |V        |
16+45       0.7805      1.19  |   Q     |         |         |V        |
16+50       0.7875      1.02  |   Q     |         |         |V        |
16+55       0.7941      0.95  |  Q      |         |         |V        |
17+ 0       0.8002      0.89  |  Q      |         |         | V       |
17+ 5       0.8060      0.84  |  Q      |         |         | V       |
17+10       0.8115      0.80  |  Q      |         |         | V       |
17+15       0.8167      0.76  |  Q      |         |         | V       |
17+20       0.8217      0.73  | Q       |         |         |  V      |
17+25       0.8266      0.70  | Q       |         |         |  V      |
17+30       0.8312      0.67  | Q       |         |         |  V      |
17+35       0.8357      0.65  | Q       |         |         |  V      |
17+40       0.8400      0.63  | Q       |         |         |  V      |
17+45       0.8443      0.61  | Q       |         |         |  V      |
17+50       0.8484      0.60  | Q       |         |         |   V     |
17+55       0.8524      0.58  | Q       |         |         |   V     |
18+ 0       0.8563      0.57  | Q       |         |         |   V     |
18+ 5       0.8600      0.55  | Q       |         |         |   V     |
18+10       0.8636      0.52  | Q       |         |         |   V     |
18+15       0.8669      0.47  |Q        |         |         |   V     |
18+20       0.8699      0.43  |Q        |         |         |    V    |
18+25       0.8727      0.41  |Q        |         |         |    V    |
18+30       0.8754      0.39  |Q        |         |         |    V    |
18+35       0.8781      0.38  |Q        |         |         |    V    |
18+40       0.8806      0.38  |Q        |         |         |    V    |
18+45       0.8832      0.37  |Q        |         |         |    V    |
18+50       0.8857      0.36  |Q        |         |         |    V    |
18+55       0.8881      0.35  |Q        |         |         |    V    |
19+ 0       0.8905      0.35  |Q        |         |         |    V    |
19+ 5       0.8928      0.34  |Q        |         |         |    V    |
19+10       0.8951      0.33  |Q        |         |         |     V   |
19+15       0.8974      0.33  |Q        |         |         |     V   |
19+20       0.8996      0.32  |Q        |         |         |     V   |
19+25       0.9018      0.32  |Q        |         |         |     V   |
19+30       0.9039      0.31  |Q        |         |         |     V   |
19+35       0.9060      0.31  |Q        |         |         |     V   |
19+40       0.9081      0.30  |Q        |         |         |     V   |
19+45       0.9102      0.30  |Q        |         |         |     V   |
19+50       0.9122      0.29  |Q        |         |         |     V   |
19+55       0.9142      0.29  |Q        |         |         |     V   |
20+ 0       0.9162      0.29  |Q        |         |         |     V   |
20+ 5       0.9181      0.28  |Q        |         |         |     V   |
20+10       0.9201      0.28  |Q        |         |         |      V  |
20+15       0.9219      0.28  |Q        |         |         |      V  |
20+20       0.9238      0.27  |Q        |         |         |      V  |
20+25       0.9257      0.27  |Q        |         |         |      V  |
20+30       0.9275      0.27  |Q        |         |         |      V  |
20+35       0.9293      0.26  |Q        |         |         |      V  |
20+40       0.9311      0.26  |Q        |         |         |      V  |
20+45       0.9328      0.26  |Q        |         |         |      V  |
20+50       0.9346      0.25  |Q        |         |         |      V  |
20+55       0.9363      0.25  |Q        |         |         |      V  |
21+ 0       0.9380      0.25  Q         |         |         |      V  |
21+ 5       0.9397      0.24  Q         |         |         |      V  |
21+10       0.9414      0.24  Q         |         |         |      V  |
21+15       0.9430      0.24  Q         |         |         |      V  |
21+20       0.9447      0.24  Q         |         |         |       V |
21+25       0.9463      0.24  Q         |         |         |       V |
21+30       0.9479      0.23  Q         |         |         |       V |
21+35       0.9495      0.23  Q         |         |         |       V |
21+40       0.9510      0.23  Q         |         |         |       V |
21+45       0.9526      0.23  Q         |         |         |       V |
21+50       0.9541      0.22  Q         |         |         |       V |
21+55       0.9557      0.22  Q         |         |         |       V |
22+ 0       0.9572      0.22  Q         |         |         |       V |
22+ 5       0.9587      0.22  Q         |         |         |       V |
22+10       0.9602      0.22  Q         |         |         |       V |
22+15       0.9617      0.21  Q         |         |         |       V |
22+20       0.9631      0.21  Q         |         |         |       V |
22+25       0.9646      0.21  Q         |         |         |       V |
22+30       0.9660      0.21  Q         |         |         |       V |
22+35       0.9675      0.21  Q         |         |         |       V |
22+40       0.9689      0.21  Q         |         |         |        V|
22+45       0.9703      0.20  Q         |         |         |        V|
22+50       0.9717      0.20  Q         |         |         |        V|
22+55       0.9731      0.20  Q         |         |         |        V|
23+ 0       0.9744      0.20  Q         |         |         |        V|
23+ 5       0.9758      0.20  Q         |         |         |        V|
23+10       0.9772      0.20  Q         |         |         |        V|
23+15       0.9785      0.20  Q         |         |         |        V|
```

```
  23+20        0.9798       0.19  Q         |         |         |        V|
  23+25        0.9812       0.19  Q         |         |         |        V|
  23+30        0.9825       0.19  Q         |         |         |        V|
  23+35        0.9838       0.19  Q         |         |         |        V|
  23+40        0.9851       0.19  Q         |         |         |        V|
  23+45        0.9864       0.19  Q         |         |         |        V|
  23+50        0.9877       0.19  Q         |         |         |        V|
  23+55        0.9889       0.18  Q         |         |         |        V|
  24+ 0        0.9902       0.18  Q         |         |         |        V|
  24+ 5        0.9914       0.18  Q         |         |         |        V|
  24+10        0.9924       0.15  Q         |         |         |        V|
  24+15        0.9930       0.09  Q         |         |         |        V|
  24+20        0.9933       0.04  Q         |         |         |        V|
  24+25        0.9934       0.01  Q         |         |         |        V|
  24+30        0.9934       0.00  Q         |         |         |        V|
  24+35        0.9934       0.00  Q         |         |         |        V|
  24+40        0.9934       0.00  Q         |         |         |        V|
-----------------------------------------------------------------------
```

```
       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 - 2012, Version 7.1

               Study date  05/16/22

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6328

---------------------------------------------------------------------
Unit Hydrograph
Post Development
2-yr / 24-hr Storm

--------------------------------------------------------------------

        Storm Event Year = 2

        Antecedent Moisture Condition = 2

 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
            11.60           1           0.60
--------------------------------------------------------------------
Rainfall data for year 2
            11.60           6           1.45
--------------------------------------------------------------------
Rainfall data for year 2
            11.60          24           2.50
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      32.0          2.09      0.180     0.978    0.850    0.831
 33.0      33.0          9.51      0.820     0.972    0.500    0.486

Area-averaged adjusted loss rate Fm (In/Hr) =  0.548

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
     1.78   0.153         32.0      32.0      12.50     0.000
     0.31   0.027         98.0      98.0       0.20     0.908

     4.75   0.410         33.0      33.0      12.50     0.000
     4.75   0.410         98.0      98.0       0.20     0.908

Area-averaged catchment yield fraction, Y =  0.397
Area-averaged low loss fraction, Yb =  0.603
Direct entry of lag time by user
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      11.60(Ac.)
Catchment Lag time =   0.157 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 53.0786
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.548(In/Hr)
Average low loss rate fraction (Yb) = 0.603 (decimal)
VALLEY DEVELOPED S-Graph Selected
```

Computed peak 5-minute rainfall = 0.222(In)
Computed peak 30-minute rainfall = 0.455(In)
Specified peak 1-hour rainfall = 0.600(In)
Computed peak 3-hour rainfall = 1.031(In)
Specified peak 6-hour rainfall = 1.450(In)
Specified peak 24-hour rainfall = 2.500(In)

Rainfall depth area reduction factors:
Using a total area of 11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.222(In)
30-minute factor = 0.999	Adjusted rainfall = 0.454(In)
1-hour factor = 0.999	Adjusted rainfall = 0.600(In)
3-hour factor = 1.000	Adjusted rainfall = 1.031(In)
6-hour factor = 1.000	Adjusted rainfall = 1.450(In)
24-hour factor = 1.000	Adjusted rainfall = 2.500(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 = 140.29 (CFS))	
1	5.135	7.204
2	33.307	39.522
3	73.471	56.345
4	92.153	26.209
5	97.775	7.886
6	99.055	1.796
7	100.000	1.326

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2219	0.2219
2	0.2929	0.0709
3	0.3444	0.0516
4	0.3864	0.0420
5	0.4225	0.0361
6	0.4545	0.0320
7	0.4834	0.0289
8	0.5099	0.0265
9	0.5345	0.0246
10	0.5575	0.0230
11	0.5792	0.0217
12	0.5997	0.0205
13	0.6238	0.0241
14	0.6470	0.0232
15	0.6694	0.0224
16	0.6910	0.0216
17	0.7120	0.0210
18	0.7323	0.0203
19	0.7521	0.0198
20	0.7714	0.0193
21	0.7901	0.0188
22	0.8085	0.0183
23	0.8264	0.0179
24	0.8439	0.0175
25	0.8611	0.0172
26	0.8779	0.0168
27	0.8943	0.0165
28	0.9105	0.0162
29	0.9264	0.0159
30	0.9420	0.0156
31	0.9574	0.0153
32	0.9725	0.0151
33	0.9873	0.0149
34	1.0020	0.0146
35	1.0164	0.0144
36	1.0306	0.0142
37	1.0446	0.0140
38	1.0584	0.0138
39	1.0720	0.0136
40	1.0855	0.0135
41	1.0988	0.0133
42	1.1119	0.0131
43	1.1249	0.0130
44	1.1377	0.0128
45	1.1503	0.0127
46	1.1628	0.0125
47	1.1752	0.0124

48	1.1875	0.0122
49	1.1996	0.0121
50	1.2116	0.0120
51	1.2235	0.0119
52	1.2352	0.0118
53	1.2469	0.0116
54	1.2584	0.0115
55	1.2698	0.0114
56	1.2811	0.0113
57	1.2924	0.0112
58	1.3035	0.0111
59	1.3145	0.0110
60	1.3254	0.0109
61	1.3363	0.0108
62	1.3470	0.0107
63	1.3577	0.0107
64	1.3682	0.0106
65	1.3787	0.0105
66	1.3891	0.0104
67	1.3994	0.0103
68	1.4097	0.0102
69	1.4199	0.0102
70	1.4300	0.0101
71	1.4400	0.0100
72	1.4499	0.0100
73	1.4578	0.0079
74	1.4656	0.0078
75	1.4734	0.0078
76	1.4811	0.0077
77	1.4887	0.0076
78	1.4963	0.0076
79	1.5038	0.0075
80	1.5112	0.0075
81	1.5186	0.0074
82	1.5260	0.0073
83	1.5333	0.0073
84	1.5405	0.0072
85	1.5477	0.0072
86	1.5548	0.0071
87	1.5619	0.0071
88	1.5689	0.0070
89	1.5759	0.0070
90	1.5828	0.0069
91	1.5897	0.0069
92	1.5966	0.0068
93	1.6034	0.0068
94	1.6101	0.0068
95	1.6168	0.0067
96	1.6235	0.0067
97	1.6301	0.0066
98	1.6367	0.0066
99	1.6432	0.0065
100	1.6497	0.0065
101	1.6562	0.0065
102	1.6626	0.0064
103	1.6690	0.0064
104	1.6754	0.0063
105	1.6817	0.0063
106	1.6879	0.0063
107	1.6942	0.0062
108	1.7004	0.0062
109	1.7066	0.0062
110	1.7127	0.0061
111	1.7188	0.0061
112	1.7249	0.0061
113	1.7309	0.0060
114	1.7369	0.0060
115	1.7429	0.0060
116	1.7488	0.0059
117	1.7547	0.0059
118	1.7606	0.0059
119	1.7664	0.0058
120	1.7723	0.0058
121	1.7781	0.0058
122	1.7838	0.0058
123	1.7895	0.0057
124	1.7952	0.0057
125	1.8009	0.0057
126	1.8066	0.0056
127	1.8122	0.0056
128	1.8178	0.0056
129	1.8234	0.0056
130	1.8289	0.0055

131	1.8344	0.0055
132	1.8399	0.0055
133	1.8454	0.0055
134	1.8508	0.0054
135	1.8562	0.0054
136	1.8616	0.0054
137	1.8670	0.0054
138	1.8723	0.0053
139	1.8776	0.0053
140	1.8829	0.0053
141	1.8882	0.0053
142	1.8935	0.0053
143	1.8987	0.0052
144	1.9039	0.0052
145	1.9091	0.0052
146	1.9142	0.0052
147	1.9194	0.0051
148	1.9245	0.0051
149	1.9296	0.0051
150	1.9347	0.0051
151	1.9397	0.0051
152	1.9448	0.0050
153	1.9498	0.0050
154	1.9548	0.0050
155	1.9598	0.0050
156	1.9647	0.0050
157	1.9697	0.0049
158	1.9746	0.0049
159	1.9795	0.0049
160	1.9844	0.0049
161	1.9892	0.0049
162	1.9941	0.0048
163	1.9989	0.0048
164	2.0037	0.0048
165	2.0085	0.0048
166	2.0133	0.0048
167	2.0180	0.0048
168	2.0228	0.0047
169	2.0275	0.0047
170	2.0322	0.0047
171	2.0369	0.0047
172	2.0416	0.0047
173	2.0462	0.0047
174	2.0509	0.0046
175	2.0555	0.0046
176	2.0601	0.0046
177	2.0647	0.0046
178	2.0693	0.0046
179	2.0738	0.0046
180	2.0784	0.0045
181	2.0829	0.0045
182	2.0874	0.0045
183	2.0919	0.0045
184	2.0964	0.0045
185	2.1009	0.0045
186	2.1053	0.0045
187	2.1098	0.0044
188	2.1142	0.0044
189	2.1186	0.0044
190	2.1230	0.0044
191	2.1274	0.0044
192	2.1318	0.0044
193	2.1361	0.0044
194	2.1405	0.0043
195	2.1448	0.0043
196	2.1491	0.0043
197	2.1534	0.0043
198	2.1577	0.0043
199	2.1620	0.0043
200	2.1662	0.0043
201	2.1705	0.0042
202	2.1747	0.0042
203	2.1789	0.0042
204	2.1832	0.0042
205	2.1874	0.0042
206	2.1915	0.0042
207	2.1957	0.0042
208	2.1999	0.0042
209	2.2040	0.0041
210	2.2082	0.0041
211	2.2123	0.0041
212	2.2164	0.0041
213	2.2205	0.0041

214	2.2246	0.0041
215	2.2287	0.0041
216	2.2327	0.0041
217	2.2368	0.0041
218	2.2408	0.0040
219	2.2449	0.0040
220	2.2489	0.0040
221	2.2529	0.0040
222	2.2569	0.0040
223	2.2609	0.0040
224	2.2649	0.0040
225	2.2688	0.0040
226	2.2728	0.0040
227	2.2768	0.0039
228	2.2807	0.0039
229	2.2846	0.0039
230	2.2885	0.0039
231	2.2924	0.0039
232	2.2963	0.0039
233	2.3002	0.0039
234	2.3041	0.0039
235	2.3079	0.0039
236	2.3118	0.0039
237	2.3156	0.0038
238	2.3195	0.0038
239	2.3233	0.0038
240	2.3271	0.0038
241	2.3309	0.0038
242	2.3347	0.0038
243	2.3385	0.0038
244	2.3423	0.0038
245	2.3461	0.0038
246	2.3498	0.0038
247	2.3536	0.0037
248	2.3573	0.0037
249	2.3610	0.0037
250	2.3648	0.0037
251	2.3685	0.0037
252	2.3722	0.0037
253	2.3759	0.0037
254	2.3795	0.0037
255	2.3832	0.0037
256	2.3869	0.0037
257	2.3906	0.0037
258	2.3942	0.0037
259	2.3978	0.0036
260	2.4015	0.0036
261	2.4051	0.0036
262	2.4087	0.0036
263	2.4123	0.0036
264	2.4159	0.0036
265	2.4195	0.0036
266	2.4231	0.0036
267	2.4267	0.0036
268	2.4302	0.0036
269	2.4338	0.0036
270	2.4374	0.0036
271	2.4409	0.0035
272	2.4444	0.0035
273	2.4480	0.0035
274	2.4515	0.0035
275	2.4550	0.0035
276	2.4585	0.0035
277	2.4620	0.0035
278	2.4655	0.0035
279	2.4690	0.0035
280	2.4724	0.0035
281	2.4759	0.0035
282	2.4794	0.0035
283	2.4828	0.0035
284	2.4863	0.0034
285	2.4897	0.0034
286	2.4931	0.0034
287	2.4965	0.0034
288	2.5000	0.0034

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0034	0.0021	0.0014
2	0.0034	0.0021	0.0014
3	0.0034	0.0021	0.0014

4	0.0034	0.0021	0.0014
5	0.0035	0.0021	0.0014
6	0.0035	0.0021	0.0014
7	0.0035	0.0021	0.0014
8	0.0035	0.0021	0.0014
9	0.0035	0.0021	0.0014
10	0.0035	0.0021	0.0014
11	0.0035	0.0021	0.0014
12	0.0035	0.0021	0.0014
13	0.0036	0.0021	0.0014
14	0.0036	0.0021	0.0014
15	0.0036	0.0022	0.0014
16	0.0036	0.0022	0.0014
17	0.0036	0.0022	0.0014
18	0.0036	0.0022	0.0014
19	0.0036	0.0022	0.0014
20	0.0036	0.0022	0.0014
21	0.0037	0.0022	0.0014
22	0.0037	0.0022	0.0015
23	0.0037	0.0022	0.0015
24	0.0037	0.0022	0.0015
25	0.0037	0.0022	0.0015
26	0.0037	0.0022	0.0015
27	0.0037	0.0023	0.0015
28	0.0037	0.0023	0.0015
29	0.0038	0.0023	0.0015
30	0.0038	0.0023	0.0015
31	0.0038	0.0023	0.0015
32	0.0038	0.0023	0.0015
33	0.0038	0.0023	0.0015
34	0.0038	0.0023	0.0015
35	0.0038	0.0023	0.0015
36	0.0039	0.0023	0.0015
37	0.0039	0.0023	0.0015
38	0.0039	0.0023	0.0015
39	0.0039	0.0024	0.0015
40	0.0039	0.0024	0.0016
41	0.0039	0.0024	0.0016
42	0.0039	0.0024	0.0016
43	0.0040	0.0024	0.0016
44	0.0040	0.0024	0.0016
45	0.0040	0.0024	0.0016
46	0.0040	0.0024	0.0016
47	0.0040	0.0024	0.0016
48	0.0040	0.0024	0.0016
49	0.0041	0.0025	0.0016
50	0.0041	0.0025	0.0016
51	0.0041	0.0025	0.0016
52	0.0041	0.0025	0.0016
53	0.0041	0.0025	0.0016
54	0.0041	0.0025	0.0016
55	0.0042	0.0025	0.0017
56	0.0042	0.0025	0.0017
57	0.0042	0.0025	0.0017
58	0.0042	0.0025	0.0017
59	0.0042	0.0026	0.0017
60	0.0043	0.0026	0.0017
61	0.0043	0.0026	0.0017
62	0.0043	0.0026	0.0017
63	0.0043	0.0026	0.0017
64	0.0043	0.0026	0.0017
65	0.0044	0.0026	0.0017
66	0.0044	0.0026	0.0017
67	0.0044	0.0027	0.0018
68	0.0044	0.0027	0.0018
69	0.0045	0.0027	0.0018
70	0.0045	0.0027	0.0018
71	0.0045	0.0027	0.0018
72	0.0045	0.0027	0.0018
73	0.0045	0.0027	0.0018
74	0.0046	0.0028	0.0018
75	0.0046	0.0028	0.0018
76	0.0046	0.0028	0.0018
77	0.0046	0.0028	0.0018
78	0.0047	0.0028	0.0018
79	0.0047	0.0028	0.0019
80	0.0047	0.0028	0.0019
81	0.0047	0.0029	0.0019
82	0.0048	0.0029	0.0019
83	0.0048	0.0029	0.0019
84	0.0048	0.0029	0.0019
85	0.0048	0.0029	0.0019
86	0.0049	0.0029	0.0019

87	0.0049	0.0030	0.0019
88	0.0049	0.0030	0.0020
89	0.0050	0.0030	0.0020
90	0.0050	0.0030	0.0020
91	0.0050	0.0030	0.0020
92	0.0050	0.0030	0.0020
93	0.0051	0.0031	0.0020
94	0.0051	0.0031	0.0020
95	0.0051	0.0031	0.0020
96	0.0052	0.0031	0.0020
97	0.0052	0.0031	0.0021
98	0.0052	0.0032	0.0021
99	0.0053	0.0032	0.0021
100	0.0053	0.0032	0.0021
101	0.0053	0.0032	0.0021
102	0.0054	0.0032	0.0021
103	0.0054	0.0033	0.0021
104	0.0054	0.0033	0.0022
105	0.0055	0.0033	0.0022
106	0.0055	0.0033	0.0022
107	0.0056	0.0034	0.0022
108	0.0056	0.0034	0.0022
109	0.0056	0.0034	0.0022
110	0.0057	0.0034	0.0023
111	0.0057	0.0035	0.0023
112	0.0058	0.0035	0.0023
113	0.0058	0.0035	0.0023
114	0.0058	0.0035	0.0023
115	0.0059	0.0036	0.0023
116	0.0059	0.0036	0.0024
117	0.0060	0.0036	0.0024
118	0.0060	0.0036	0.0024
119	0.0061	0.0037	0.0024
120	0.0061	0.0037	0.0024
121	0.0062	0.0037	0.0025
122	0.0062	0.0038	0.0025
123	0.0063	0.0038	0.0025
124	0.0063	0.0038	0.0025
125	0.0064	0.0039	0.0025
126	0.0065	0.0039	0.0026
127	0.0065	0.0039	0.0026
128	0.0066	0.0040	0.0026
129	0.0067	0.0040	0.0026
130	0.0067	0.0040	0.0027
131	0.0068	0.0041	0.0027
132	0.0068	0.0041	0.0027
133	0.0069	0.0042	0.0028
134	0.0070	0.0042	0.0028
135	0.0071	0.0043	0.0028
136	0.0071	0.0043	0.0028
137	0.0072	0.0044	0.0029
138	0.0073	0.0044	0.0029
139	0.0074	0.0045	0.0029
140	0.0075	0.0045	0.0030
141	0.0076	0.0046	0.0030
142	0.0076	0.0046	0.0030
143	0.0078	0.0047	0.0031
144	0.0078	0.0047	0.0031
145	0.0100	0.0060	0.0040
146	0.0100	0.0060	0.0040
147	0.0102	0.0061	0.0040
148	0.0102	0.0062	0.0041
149	0.0104	0.0063	0.0041
150	0.0105	0.0063	0.0042
151	0.0107	0.0064	0.0042
152	0.0107	0.0065	0.0043
153	0.0109	0.0066	0.0043
154	0.0110	0.0066	0.0044
155	0.0112	0.0068	0.0045
156	0.0113	0.0068	0.0045
157	0.0115	0.0070	0.0046
158	0.0116	0.0070	0.0046
159	0.0119	0.0072	0.0047
160	0.0120	0.0072	0.0048
161	0.0122	0.0074	0.0049
162	0.0124	0.0075	0.0049
163	0.0127	0.0076	0.0050
164	0.0128	0.0077	0.0051
165	0.0131	0.0079	0.0052
166	0.0133	0.0080	0.0053
167	0.0136	0.0082	0.0054
168	0.0138	0.0083	0.0055
169	0.0142	0.0086	0.0056

170	0.0144	0.0087	0.0057
171	0.0149	0.0090	0.0059
172	0.0151	0.0091	0.0060
173	0.0156	0.0094	0.0062
174	0.0159	0.0096	0.0063
175	0.0165	0.0099	0.0065
176	0.0168	0.0101	0.0067
177	0.0175	0.0106	0.0070
178	0.0179	0.0108	0.0071
179	0.0188	0.0113	0.0075
180	0.0193	0.0116	0.0076
181	0.0203	0.0123	0.0081
182	0.0210	0.0126	0.0083
183	0.0224	0.0135	0.0089
184	0.0232	0.0140	0.0092
185	0.0205	0.0124	0.0081
186	0.0217	0.0131	0.0086
187	0.0246	0.0148	0.0098
188	0.0265	0.0160	0.0105
189	0.0320	0.0193	0.0127
190	0.0361	0.0218	0.0143
191	0.0516	0.0311	0.0205
192	0.0709	0.0428	0.0281
193	0.2219	0.0457	0.1763
194	0.0420	0.0253	0.0167
195	0.0289	0.0174	0.0115
196	0.0230	0.0139	0.0091
197	0.0241	0.0146	0.0096
198	0.0216	0.0130	0.0086
199	0.0198	0.0119	0.0078
200	0.0183	0.0111	0.0073
201	0.0172	0.0103	0.0068
202	0.0162	0.0098	0.0064
203	0.0153	0.0093	0.0061
204	0.0146	0.0088	0.0058
205	0.0140	0.0084	0.0056
206	0.0135	0.0081	0.0053
207	0.0130	0.0078	0.0051
208	0.0125	0.0076	0.0050
209	0.0121	0.0073	0.0048
210	0.0118	0.0071	0.0047
211	0.0114	0.0069	0.0045
212	0.0111	0.0067	0.0044
213	0.0108	0.0065	0.0043
214	0.0106	0.0064	0.0042
215	0.0103	0.0062	0.0041
216	0.0101	0.0061	0.0040
217	0.0079	0.0048	0.0031
218	0.0077	0.0046	0.0031
219	0.0075	0.0045	0.0030
220	0.0073	0.0044	0.0029
221	0.0072	0.0043	0.0028
222	0.0070	0.0042	0.0028
223	0.0069	0.0042	0.0027
224	0.0068	0.0041	0.0027
225	0.0066	0.0040	0.0026
226	0.0065	0.0039	0.0026
227	0.0064	0.0039	0.0025
228	0.0063	0.0038	0.0025
229	0.0062	0.0037	0.0024
230	0.0061	0.0037	0.0024
231	0.0060	0.0036	0.0024
232	0.0059	0.0035	0.0023
233	0.0058	0.0035	0.0023
234	0.0057	0.0034	0.0023
235	0.0056	0.0034	0.0022
236	0.0055	0.0033	0.0022
237	0.0055	0.0033	0.0022
238	0.0054	0.0033	0.0021
239	0.0053	0.0032	0.0021
240	0.0053	0.0032	0.0021
241	0.0052	0.0031	0.0021
242	0.0051	0.0031	0.0020
243	0.0051	0.0031	0.0020
244	0.0050	0.0030	0.0020
245	0.0049	0.0030	0.0020
246	0.0049	0.0029	0.0019
247	0.0048	0.0029	0.0019
248	0.0048	0.0029	0.0019
249	0.0047	0.0028	0.0019
250	0.0047	0.0028	0.0019
251	0.0046	0.0028	0.0018
252	0.0046	0.0028	0.0018

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     253              0.0045           0.0027             0.0018
     254              0.0045           0.0027             0.0018
     255              0.0044           0.0027             0.0018
     256              0.0044           0.0027             0.0017
     257              0.0044           0.0026             0.0017
     258              0.0043           0.0026             0.0017
     259              0.0043           0.0026             0.0017
     260              0.0042           0.0026             0.0017
     261              0.0042           0.0025             0.0017
     262              0.0042           0.0025             0.0017
     263              0.0041           0.0025             0.0016
     264              0.0041           0.0025             0.0016
     265              0.0041           0.0024             0.0016
     266              0.0040           0.0024             0.0016
     267              0.0040           0.0024             0.0016
     268              0.0040           0.0024             0.0016
     269              0.0039           0.0024             0.0016
     270              0.0039           0.0023             0.0015
     271              0.0039           0.0023             0.0015
     272              0.0038           0.0023             0.0015
     273              0.0038           0.0023             0.0015
     274              0.0038           0.0023             0.0015
     275              0.0037           0.0023             0.0015
     276              0.0037           0.0022             0.0015
     277              0.0037           0.0022             0.0015
     278              0.0037           0.0022             0.0015
     279              0.0036           0.0022             0.0014
     280              0.0036           0.0022             0.0014
     281              0.0036           0.0022             0.0014
     282              0.0036           0.0022             0.0014
     283              0.0035           0.0021             0.0014
     284              0.0035           0.0021             0.0014
     285              0.0035           0.0021             0.0014
     286              0.0035           0.0021             0.0014
     287              0.0035           0.0021             0.0014
     288              0.0034           0.0021             0.0014
     --------------------------------------------------------------------
     --------------------------------------------------------------------
     Total soil rain loss =      1.42(In)
     Total effective rainfall =      1.08(In)
     Peak flow rate in flood hydrograph =     11.61(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      0.01  Q         |         |         |         |
  0+10       0.0005      0.06  Q         |         |         |         |
  0+15       0.0015      0.14  Q         |         |         |         |
  0+20       0.0027      0.18  Q         |         |         |         |
  0+25       0.0040      0.19  Q         |         |         |         |
  0+30       0.0053      0.19  Q         |         |         |         |
  0+35       0.0066      0.19  Q         |         |         |         |
  0+40       0.0079      0.19  Q         |         |         |         |
  0+45       0.0093      0.19  Q         |         |         |         |
  0+50       0.0106      0.19  Q         |         |         |         |
  0+55       0.0119      0.20  Q         |         |         |         |
  1+ 0       0.0133      0.20  Q         |         |         |         |
  1+ 5       0.0146      0.20  Q         |         |         |         |
  1+10       0.0160      0.20  Q         |         |         |         |
  1+15       0.0174      0.20  Q         |         |         |         |
  1+20       0.0187      0.20  Q         |         |         |         |
  1+25       0.0201      0.20  Q         |         |         |         |
  1+30       0.0215      0.20  Q         |         |         |         |
  1+35       0.0229      0.20  Q         |         |         |         |
  1+40       0.0242      0.20  Q         |         |         |         |
  1+45       0.0256      0.20  Q         |         |         |         |
  1+50       0.0270      0.20  QV        |         |         |         |
  1+55       0.0284      0.20  QV        |         |         |         |
  2+ 0       0.0298      0.20  QV        |         |         |         |
  2+ 5       0.0312      0.20  QV        |         |         |         |
  2+10       0.0326      0.21  QV        |         |         |         |
  2+15       0.0341      0.21  QV        |         |         |         |
  2+20       0.0355      0.21  QV        |         |         |         |
  2+25       0.0369      0.21  QV        |         |         |         |
  2+30       0.0384      0.21  QV        |         |         |         |
  2+35       0.0398      0.21  QV        |         |         |         |
  2+40       0.0412      0.21  QV        |         |         |         |
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2+45       0.0427      0.21  QV         |         |         |         |
2+50       0.0441      0.21  QV         |         |         |         |
2+55       0.0456      0.21  QV         |         |         |         |
3+ 0       0.0471      0.21  QV         |         |         |         |
3+ 5       0.0486      0.21  QV         |         |         |         |
3+10       0.0500      0.21  QV         |         |         |         |
3+15       0.0515      0.22  QV         |         |         |         |
3+20       0.0530      0.22  Q V        |         |         |         |
3+25       0.0545      0.22  Q V        |         |         |         |
3+30       0.0560      0.22  Q V        |         |         |         |
3+35       0.0575      0.22  Q V        |         |         |         |
3+40       0.0590      0.22  Q V        |         |         |         |
3+45       0.0605      0.22  Q V        |         |         |         |
3+50       0.0621      0.22  Q V        |         |         |         |
3+55       0.0636      0.22  Q V        |         |         |         |
4+ 0       0.0651      0.22  Q V        |         |         |         |
4+ 5       0.0667      0.22  Q V        |         |         |         |
4+10       0.0682      0.23  Q V        |         |         |         |
4+15       0.0698      0.23  Q V        |         |         |         |
4+20       0.0714      0.23  Q V        |         |         |         |
4+25       0.0729      0.23  Q V        |         |         |         |
4+30       0.0745      0.23  Q V        |         |         |         |
4+35       0.0761      0.23  Q V        |         |         |         |
4+40       0.0777      0.23  Q V        |         |         |         |
4+45       0.0793      0.23  Q  V       |         |         |         |
4+50       0.0809      0.23  Q  V       |         |         |         |
4+55       0.0825      0.23  Q  V       |         |         |         |
5+ 0       0.0841      0.24  Q  V       |         |         |         |
5+ 5       0.0858      0.24  Q  V       |         |         |         |
5+10       0.0874      0.24  Q  V       |         |         |         |
5+15       0.0890      0.24  Q  V       |         |         |         |
5+20       0.0907      0.24  Q  V       |         |         |         |
5+25       0.0924      0.24  Q  V       |         |         |         |
5+30       0.0940      0.24  Q  V       |         |         |         |
5+35       0.0957      0.24  Q  V       |         |         |         |
5+40       0.0974      0.24  Q  V       |         |         |         |
5+45       0.0991      0.25  Q  V       |         |         |         |
5+50       0.1008      0.25  Q  V       |         |         |         |
5+55       0.1025      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       0.1147      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       0.1237      0.26  Q   V      |         |         |         |
7+ 0       0.1255      0.27  Q   V      |         |         |         |
7+ 5       0.1273      0.27  Q   V      |         |         |         |
7+10       0.1292      0.27  Q   V      |         |         |         |
7+15       0.1310      0.27  Q    V     |         |         |         |
7+20       0.1329      0.27  Q    V     |         |         |         |
7+25       0.1348      0.27  Q    V     |         |         |         |
7+30       0.1366      0.27  Q    V     |         |         |         |
7+35       0.1385      0.28  Q    V     |         |         |         |
7+40       0.1405      0.28  Q    V     |         |         |         |
7+45       0.1424      0.28  Q    V     |         |         |         |
7+50       0.1443      0.28  Q    V     |         |         |         |
7+55       0.1463      0.28  Q    V     |         |         |         |
8+ 0       0.1482      0.28  Q    V     |         |         |         |
8+ 5       0.1502      0.29  Q    V     |         |         |         |
8+10       0.1522      0.29  Q    V     |         |         |         |
8+15       0.1542      0.29  Q    V     |         |         |         |
8+20       0.1562      0.29  Q    V     |         |         |         |
8+25       0.1582      0.29  Q     V    |         |         |         |
8+30       0.1602      0.30  Q     V    |         |         |         |
8+35       0.1623      0.30  Q     V    |         |         |         |
8+40       0.1643      0.30  Q     V    |         |         |         |
8+45       0.1664      0.30  Q     V    |         |         |         |
8+50       0.1685      0.30  Q     V    |         |         |         |
8+55       0.1706      0.31  Q     V    |         |         |         |
9+ 0       0.1727      0.31  Q     V    |         |         |         |
9+ 5       0.1748      0.31  Q     V    |         |         |         |
9+10       0.1770      0.31  Q     V    |         |         |         |
9+15       0.1792      0.31  Q     V    |         |         |         |
9+20       0.1813      0.32  Q     V    |         |         |         |
9+25       0.1835      0.32  Q      V   |         |         |         |
9+30       0.1857      0.32  Q      V   |         |         |         |
9+35       0.1880      0.32  Q      V   |         |         |         |
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 9+40       0.1902       0.33 Q      V  |         |         |         |
 9+45       0.1925       0.33 Q      V  |         |         |         |
 9+50       0.1948       0.33 Q      V  |         |         |         |
 9+55       0.1971       0.33 Q      V  |         |         |         |
10+ 0       0.1994       0.34 Q      V  |         |         |         |
10+ 5       0.2017       0.34 Q      V  |         |         |         |
10+10       0.2041       0.34 Q      V  |         |         |         |
10+15       0.2065       0.35 Q      V  |         |         |         |
10+20       0.2088       0.35 Q       V |         |         |         |
10+25       0.2113       0.35 Q       V |         |         |         |
10+30       0.2137       0.35 Q       V |         |         |         |
10+35       0.2162       0.36 Q       V |         |         |         |
10+40       0.2186       0.36 Q       V |         |         |         |
10+45       0.2212       0.36 Q       V |         |         |         |
10+50       0.2237       0.37 Q       V |         |         |         |
10+55       0.2262       0.37 Q       V |         |         |         |
11+ 0       0.2288       0.37 Q       V |         |         |         |
11+ 5       0.2314       0.38 Q       V |         |         |         |
11+10       0.2340       0.38 Q       V |         |         |         |
11+15       0.2367       0.39 Q        V|         |         |         |
11+20       0.2394       0.39 Q        V|         |         |         |
11+25       0.2421       0.39 Q        V|         |         |         |
11+30       0.2448       0.40 Q        V|         |         |         |
11+35       0.2476       0.40 Q        V|         |         |         |
11+40       0.2504       0.41 Q        V|         |         |         |
11+45       0.2532       0.41 Q        V|         |         |         |
11+50       0.2561       0.42 Q        V|         |         |         |
11+55       0.2590       0.42 Q        V|         |         |         |
12+ 0       0.2619       0.43 Q         V         |         |         |
12+ 5       0.2649       0.44 Q         V         |         |         |
12+10       0.2682       0.47 Q         V         |         |         |
12+15       0.2718       0.52 |Q        V         |         |         |
12+20       0.2756       0.55 |Q        V         |         |         |
12+25       0.2795       0.56 |Q        V         |         |         |
12+30       0.2834       0.57 |Q        V         |         |         |
12+35       0.2874       0.58 |Q        |V        |         |         |
12+40       0.2914       0.59 |Q        |V        |         |         |
12+45       0.2955       0.59 |Q        |V        |         |         |
12+50       0.2996       0.60 |Q        |V        |         |         |
12+55       0.3038       0.61 |Q        |V        |         |         |
13+ 0       0.3080       0.62 |Q        |V        |         |         |
13+ 5       0.3123       0.62 |Q        |V        |         |         |
13+10       0.3167       0.63 |Q        | V       |         |         |
13+15       0.3211       0.64 |Q        | V       |         |         |
13+20       0.3256       0.65 |Q        | V       |         |         |
13+25       0.3301       0.66 |Q        | V       |         |         |
13+30       0.3347       0.67 |Q        | V       |         |         |
13+35       0.3394       0.68 |Q        |  V      |         |         |
13+40       0.3442       0.69 |Q        |  V      |         |         |
13+45       0.3490       0.70 |Q        |  V      |         |         |
13+50       0.3540       0.72 |Q        |  V      |         |         |
13+55       0.3590       0.73 |Q        |  V      |         |         |
14+ 0       0.3641       0.74 |Q        |  V      |         |         |
14+ 5       0.3693       0.76 |Q        |   V     |         |         |
14+10       0.3746       0.77 |Q        |   V     |         |         |
14+15       0.3801       0.79 |Q        |   V     |         |         |
14+20       0.3856       0.81 |Q        |   V     |         |         |
14+25       0.3913       0.83 |Q        |   V     |         |         |
14+30       0.3971       0.85 |Q        |    V    |         |         |
14+35       0.4031       0.87 |Q        |    V    |         |         |
14+40       0.4092       0.89 |Q        |    V    |         |         |
14+45       0.4155       0.91 |Q        |    V    |         |         |
14+50       0.4220       0.94 |Q        |     V   |         |         |
14+55       0.4287       0.97 |Q        |     V   |         |         |
15+ 0       0.4356       1.00 | Q       |     V   |         |         |
15+ 5       0.4428       1.04 | Q       |     V   |         |         |
15+10       0.4502       1.08 | Q       |      V  |         |         |
15+15       0.4580       1.13 | Q       |      V  |         |         |
15+20       0.4662       1.18 | Q       |      V  |         |         |
15+25       0.4746       1.23 | Q       |       V |         |         |
15+30       0.4831       1.23 | Q       |       V |         |         |
15+35       0.4914       1.21 | Q       |       V |         |         |
15+40       0.5000       1.26 | Q       |        V|         |         |
15+45       0.5095       1.38 | Q       |        V|         |         |
15+50       0.5202       1.55 |  Q      |        V|         |         |
15+55       0.5326       1.81 |  Q      |         V         |         |
16+ 0       0.5482       2.26 |   Q     |         |V        |         |
16+ 5       0.5760       4.04 |       Q |         | V       |         |
16+10       0.6405       9.36 |         |       Q |   V     |         |
16+15       0.7205      11.61 |         |         |  Q   V  |         |
16+20       0.7642       6.36 |         | Q       |        V|         |
16+25       0.7848       2.98 |    Q    |         |         V         |
16+30       0.7968       1.74 |  Q      |         |         V         |
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16+35       0.8073      1.53  |  Q      |         |         V         |
16+40       0.8156      1.21  | Q       |         |         |V        |
16+45       0.8233      1.11  | Q       |         |         |V        |
16+50       0.8304      1.03  | Q       |         |         |V        |
16+55       0.8370      0.96  |Q        |         |         | V       |
17+ 0       0.8432      0.91  |Q        |         |         | V       |
17+ 5       0.8491      0.86  |Q        |         |         | V       |
17+10       0.8548      0.82  |Q        |         |         | V       |
17+15       0.8602      0.78  |Q        |         |         | V       |
17+20       0.8653      0.75  |Q        |         |         |  V      |
17+25       0.8703      0.72  |Q        |         |         |  V      |
17+30       0.8751      0.70  |Q        |         |         |  V      |
17+35       0.8798      0.68  |Q        |         |         |  V      |
17+40       0.8843      0.66  |Q        |         |         |  V      |
17+45       0.8887      0.64  |Q        |         |         |   V     |
17+50       0.8929      0.62  |Q        |         |         |   V     |
17+55       0.8971      0.60  |Q        |         |         |   V     |
18+ 0       0.9012      0.59  |Q        |         |         |   V     |
18+ 5       0.9051      0.57  |Q        |         |         |   V     |
18+10       0.9087      0.53  |Q        |         |         |   V     |
18+15       0.9119      0.47  Q         |         |         |   V     |
18+20       0.9149      0.44  Q         |         |         |    V    |
18+25       0.9178      0.42  Q         |         |         |    V    |
18+30       0.9207      0.41  Q         |         |         |    V    |
18+35       0.9234      0.40  Q         |         |         |    V    |
18+40       0.9261      0.39  Q         |         |         |    V    |
18+45       0.9288      0.38  Q         |         |         |    V    |
18+50       0.9313      0.38  Q         |         |         |    V    |
18+55       0.9339      0.37  Q         |         |         |    V    |
19+ 0       0.9364      0.36  Q         |         |         |    V    |
19+ 5       0.9388      0.36  Q         |         |         |    V    |
19+10       0.9412      0.35  Q         |         |         |     V   |
19+15       0.9436      0.34  Q         |         |         |     V   |
19+20       0.9459      0.34  Q         |         |         |     V   |
19+25       0.9482      0.33  Q         |         |         |     V   |
19+30       0.9505      0.33  Q         |         |         |     V   |
19+35       0.9527      0.32  Q         |         |         |     V   |
19+40       0.9549      0.32  Q         |         |         |     V   |
19+45       0.9570      0.31  Q         |         |         |     V   |
19+50       0.9592      0.31  Q         |         |         |     V   |
19+55       0.9613      0.30  Q         |         |         |     V   |
20+ 0       0.9633      0.30  Q         |         |         |     V   |
20+ 5       0.9654      0.30  Q         |         |         |     V   |
20+10       0.9674      0.29  Q         |         |         |      V  |
20+15       0.9694      0.29  Q         |         |         |      V  |
20+20       0.9713      0.29  Q         |         |         |      V  |
20+25       0.9733      0.28  Q         |         |         |      V  |
20+30       0.9752      0.28  Q         |         |         |      V  |
20+35       0.9771      0.28  Q         |         |         |      V  |
20+40       0.9790      0.27  Q         |         |         |      V  |
20+45       0.9808      0.27  Q         |         |         |      V  |
20+50       0.9826      0.27  Q         |         |         |      V  |
20+55       0.9845      0.26  Q         |         |         |      V  |
21+ 0       0.9862      0.26  Q         |         |         |      V  |
21+ 5       0.9880      0.26  Q         |         |         |      V  |
21+10       0.9898      0.25  Q         |         |         |      V  |
21+15       0.9915      0.25  Q         |         |         |      V  |
21+20       0.9932      0.25  Q         |         |         |       V |
21+25       0.9949      0.25  Q         |         |         |       V |
21+30       0.9966      0.24  Q         |         |         |       V |
21+35       0.9983      0.24  Q         |         |         |       V |
21+40       0.9999      0.24  Q         |         |         |       V |
21+45       1.0016      0.24  Q         |         |         |       V |
21+50       1.0032      0.24  Q         |         |         |       V |
21+55       1.0048      0.23  Q         |         |         |       V |
22+ 0       1.0064      0.23  Q         |         |         |       V |
22+ 5       1.0080      0.23  Q         |         |         |       V |
22+10       1.0096      0.23  Q         |         |         |       V |
22+15       1.0111      0.23  Q         |         |         |       V |
22+20       1.0127      0.22  Q         |         |         |       V |
22+25       1.0142      0.22  Q         |         |         |       V |
22+30       1.0157      0.22  Q         |         |         |       V |
22+35       1.0172      0.22  Q         |         |         |       V |
22+40       1.0187      0.22  Q         |         |         |        V|
22+45       1.0202      0.22  Q         |         |         |        V|
22+50       1.0217      0.21  Q         |         |         |        V|
22+55       1.0231      0.21  Q         |         |         |        V|
23+ 0       1.0246      0.21  Q         |         |         |        V|
23+ 5       1.0260      0.21  Q         |         |         |        V|
23+10       1.0274      0.21  Q         |         |         |        V|
23+15       1.0288      0.21  Q         |         |         |        V|
23+20       1.0303      0.20  Q         |         |         |        V|
23+25       1.0317      0.20  Q         |         |         |        V|
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   23+30       1.0330       0.20  Q         |         |         |        V|
   23+35       1.0344       0.20  Q         |         |         |        V|
   23+40       1.0358       0.20  Q         |         |         |        V|
   23+45       1.0371       0.20  Q         |         |         |        V|
   23+50       1.0385       0.20  Q         |         |         |        V|
   23+55       1.0398       0.19  Q         |         |         |        V|
   24+ 0       1.0412       0.19  Q         |         |         |        V|
   24+ 5       1.0424       0.18  Q         |         |         |        V|
   24+10       1.0433       0.13  Q         |         |         |        V|
   24+15       1.0437       0.05  Q         |         |         |        V|
   24+20       1.0438       0.02  Q         |         |         |        V|
   24+25       1.0438       0.00  Q         |         |         |        V|
   24+30       1.0438       0.00  Q         |         |         |         V
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U n i t   H y d r o g r a p h   A n a l y s i s

Study date 05/16/22

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6328

Unit Hydrograph
Pre Development
2-year / 24-hour

Storm Event Year = 100

Antecedent Moisture Condition = 2

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 (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
11.60	1	1.30
Rainfall data for year 100		
11.60	6	3.40
Rainfall data for year 100		
11.60	24	7.05

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	3.30	0.284	0.978	0.800	0.782
32.0	32.0	8.30	0.716	0.978	0.500	0.489

Area-averaged adjusted loss rate Fm (In/Hr) = 0.572

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
2.64	0.228	32.0	32.0	21.25	0.046
0.66	0.057	98.0	98.0	0.20	0.966
4.15	0.358	32.0	32.0	21.25	0.046
4.15	0.358	98.0	98.0	0.20	0.966

Area-averaged catchment yield fraction, Y = 0.428
Area-averaged low loss fraction, Yb = 0.572
User entry of time of concentration = 0.250 (hours)
++
Watershed area = 11.60(Ac.)
Catchment Lag time = 0.200 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 41.6667
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.572(In/Hr)
Average low loss rate fraction (Yb) = 0.572 (decimal)
VALLEY DEVELOPED S-Graph Selected

Computed peak 5-minute rainfall = 0.481(In)
Computed peak 30-minute rainfall = 0.985(In)
Specified peak 1-hour rainfall = 1.300(In)
Computed peak 3-hour rainfall = 2.344(In)
Specified peak 6-hour rainfall = 3.400(In)
Specified peak 24-hour rainfall = 7.050(In)

Rainfall depth area reduction factors:
Using a total area of 11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.481(In)
30-minute factor = 0.999	Adjusted rainfall = 0.985(In)
1-hour factor = 0.999	Adjusted rainfall = 1.299(In)
3-hour factor = 1.000	Adjusted rainfall = 2.344(In)
6-hour factor = 1.000	Adjusted rainfall = 3.400(In)
24-hour factor = 1.000	Adjusted rainfall = 7.050(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 =	140.29 (CFS))
1	3.260	4.574
2	21.153	25.102
3	53.240	45.013
4	80.596	38.378
5	92.540	16.755
6	97.357	6.759
7	98.675	1.849
8	99.425	1.052
9	100.000	0.807

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4809	0.4809
2	0.6345	0.1536
3	0.7462	0.1117
4	0.8373	0.0910
5	0.9154	0.0782
6	0.9847	0.0693
7	1.0473	0.0626
8	1.1048	0.0575
9	1.1581	0.0533
10	1.2079	0.0498
11	1.2548	0.0469
12	1.2993	0.0444
13	1.3564	0.0571
14	1.4114	0.0551
15	1.4647	0.0533
16	1.5164	0.0517
17	1.5665	0.0502
18	1.6154	0.0488
19	1.6629	0.0476
20	1.7094	0.0464
21	1.7548	0.0454
22	1.7992	0.0444
23	1.8426	0.0435
24	1.8852	0.0426
25	1.9270	0.0418
26	1.9680	0.0410
27	2.0083	0.0403
28	2.0479	0.0396
29	2.0869	0.0390
30	2.1252	0.0383
31	2.1630	0.0378
32	2.2002	0.0372
33	2.2368	0.0367
34	2.2730	0.0361
35	2.3086	0.0357
36	2.3438	0.0352
37	2.3785	0.0347
38	2.4128	0.0343
39	2.4467	0.0339
40	2.4802	0.0335
41	2.5132	0.0331
42	2.5459	0.0327
43	2.5783	0.0324
44	2.6103	0.0320
45	2.6420	0.0317

46	2.6733	0.0313
47	2.7043	0.0310
48	2.7351	0.0307
49	2.7655	0.0304
50	2.7956	0.0301
51	2.8255	0.0299
52	2.8551	0.0296
53	2.8844	0.0293
54	2.9135	0.0291
55	2.9424	0.0288
56	2.9709	0.0286
57	2.9993	0.0284
58	3.0274	0.0281
59	3.0553	0.0279
60	3.0830	0.0277
61	3.1105	0.0275
62	3.1377	0.0273
63	3.1648	0.0271
64	3.1916	0.0269
65	3.2183	0.0267
66	3.2448	0.0265
67	3.2711	0.0263
68	3.2972	0.0261
69	3.3231	0.0259
70	3.3489	0.0258
71	3.3745	0.0256
72	3.3999	0.0254
73	3.4246	0.0248
74	3.4492	0.0246
75	3.4737	0.0244
76	3.4980	0.0243
77	3.5221	0.0241
78	3.5461	0.0240
79	3.5699	0.0238
80	3.5936	0.0237
81	3.6172	0.0236
82	3.6406	0.0234
83	3.6639	0.0233
84	3.6871	0.0232
85	3.7101	0.0230
86	3.7330	0.0229
87	3.7558	0.0228
88	3.7784	0.0226
89	3.8009	0.0225
90	3.8233	0.0224
91	3.8456	0.0223
92	3.8678	0.0222
93	3.8899	0.0221
94	3.9118	0.0219
95	3.9337	0.0218
96	3.9554	0.0217
97	3.9770	0.0216
98	3.9985	0.0215
99	4.0199	0.0214
100	4.0412	0.0213
101	4.0625	0.0212
102	4.0836	0.0211
103	4.1046	0.0210
104	4.1255	0.0209
105	4.1463	0.0208
106	4.1670	0.0207
107	4.1877	0.0206
108	4.2082	0.0205
109	4.2287	0.0205
110	4.2490	0.0204
111	4.2693	0.0203
112	4.2895	0.0202
113	4.3096	0.0201
114	4.3296	0.0200
115	4.3496	0.0199
116	4.3694	0.0199
117	4.3892	0.0198
118	4.4089	0.0197
119	4.4285	0.0196
120	4.4480	0.0195
121	4.4675	0.0195
122	4.4869	0.0194
123	4.5062	0.0193
124	4.5254	0.0192
125	4.5446	0.0192
126	4.5637	0.0191
127	4.5827	0.0190
128	4.6017	0.0189

129	4.6205	0.0189
130	4.6393	0.0188
131	4.6581	0.0187
132	4.6767	0.0187
133	4.6954	0.0186
134	4.7139	0.0185
135	4.7324	0.0185
136	4.7508	0.0184
137	4.7691	0.0183
138	4.7874	0.0183
139	4.8056	0.0182
140	4.8238	0.0182
141	4.8419	0.0181
142	4.8599	0.0180
143	4.8779	0.0180
144	4.8958	0.0179
145	4.9136	0.0179
146	4.9314	0.0178
147	4.9492	0.0177
148	4.9669	0.0177
149	4.9845	0.0176
150	5.0021	0.0176
151	5.0196	0.0175
152	5.0370	0.0175
153	5.0544	0.0174
154	5.0718	0.0174
155	5.0891	0.0173
156	5.1063	0.0172
157	5.1235	0.0172
158	5.1407	0.0171
159	5.1578	0.0171
160	5.1748	0.0170
161	5.1918	0.0170
162	5.2087	0.0169
163	5.2256	0.0169
164	5.2425	0.0168
165	5.2593	0.0168
166	5.2760	0.0167
167	5.2927	0.0167
168	5.3093	0.0166
169	5.3259	0.0166
170	5.3425	0.0166
171	5.3590	0.0165
172	5.3755	0.0165
173	5.3919	0.0164
174	5.4083	0.0164
175	5.4246	0.0163
176	5.4409	0.0163
177	5.4571	0.0162
178	5.4733	0.0162
179	5.4895	0.0162
180	5.5056	0.0161
181	5.5217	0.0161
182	5.5377	0.0160
183	5.5537	0.0160
184	5.5696	0.0159
185	5.5855	0.0159
186	5.6014	0.0159
187	5.6172	0.0158
188	5.6330	0.0158
189	5.6487	0.0157
190	5.6644	0.0157
191	5.6801	0.0157
192	5.6957	0.0156
193	5.7113	0.0156
194	5.7268	0.0155
195	5.7424	0.0155
196	5.7578	0.0155
197	5.7733	0.0154
198	5.7887	0.0154
199	5.8040	0.0154
200	5.8194	0.0153
201	5.8346	0.0153
202	5.8499	0.0153
203	5.8651	0.0152
204	5.8803	0.0152
205	5.8954	0.0151
206	5.9105	0.0151
207	5.9256	0.0151
208	5.9407	0.0150
209	5.9557	0.0150
210	5.9706	0.0150
211	5.9856	0.0149

212	6.0005	0.0149
213	6.0154	0.0149
214	6.0302	0.0148
215	6.0450	0.0148
216	6.0598	0.0148
217	6.0745	0.0147
218	6.0892	0.0147
219	6.1039	0.0147
220	6.1186	0.0146
221	6.1332	0.0146
222	6.1478	0.0146
223	6.1623	0.0146
224	6.1768	0.0145
225	6.1913	0.0145
226	6.2058	0.0145
227	6.2202	0.0144
228	6.2346	0.0144
229	6.2490	0.0144
230	6.2633	0.0143
231	6.2776	0.0143
232	6.2919	0.0143
233	6.3062	0.0143
234	6.3204	0.0142
235	6.3346	0.0142
236	6.3488	0.0142
237	6.3629	0.0141
238	6.3770	0.0141
239	6.3911	0.0141
240	6.4051	0.0141
241	6.4192	0.0140
242	6.4332	0.0140
243	6.4471	0.0140
244	6.4611	0.0139
245	6.4750	0.0139
246	6.4889	0.0139
247	6.5027	0.0139
248	6.5166	0.0138
249	6.5304	0.0138
250	6.5442	0.0138
251	6.5579	0.0138
252	6.5717	0.0137
253	6.5854	0.0137
254	6.5991	0.0137
255	6.6127	0.0137
256	6.6263	0.0136
257	6.6399	0.0136
258	6.6535	0.0136
259	6.6671	0.0136
260	6.6806	0.0135
261	6.6941	0.0135
262	6.7076	0.0135
263	6.7210	0.0135
264	6.7345	0.0134
265	6.7479	0.0134
266	6.7613	0.0134
267	6.7746	0.0134
268	6.7880	0.0133
269	6.8013	0.0133
270	6.8146	0.0133
271	6.8278	0.0133
272	6.8411	0.0132
273	6.8543	0.0132
274	6.8675	0.0132
275	6.8807	0.0132
276	6.8938	0.0132
277	6.9069	0.0131
278	6.9200	0.0131
279	6.9331	0.0131
280	6.9462	0.0131
281	6.9592	0.0130
282	6.9722	0.0130
283	6.9852	0.0130
284	6.9982	0.0130
285	7.0112	0.0130
286	7.0241	0.0129
287	7.0370	0.0129
288	7.0499	0.0129

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0129	0.0074	0.0055

2	0.0129	0.0074	0.0055
3	0.0130	0.0074	0.0055
4	0.0130	0.0074	0.0055
5	0.0130	0.0075	0.0056
6	0.0130	0.0075	0.0056
7	0.0131	0.0075	0.0056
8	0.0131	0.0075	0.0056
9	0.0132	0.0075	0.0056
10	0.0132	0.0075	0.0056
11	0.0132	0.0076	0.0057
12	0.0132	0.0076	0.0057
13	0.0133	0.0076	0.0057
14	0.0133	0.0076	0.0057
15	0.0134	0.0076	0.0057
16	0.0134	0.0077	0.0057
17	0.0134	0.0077	0.0057
18	0.0135	0.0077	0.0058
19	0.0135	0.0077	0.0058
20	0.0135	0.0077	0.0058
21	0.0136	0.0078	0.0058
22	0.0136	0.0078	0.0058
23	0.0137	0.0078	0.0058
24	0.0137	0.0078	0.0059
25	0.0137	0.0079	0.0059
26	0.0138	0.0079	0.0059
27	0.0138	0.0079	0.0059
28	0.0138	0.0079	0.0059
29	0.0139	0.0079	0.0059
30	0.0139	0.0080	0.0060
31	0.0140	0.0080	0.0060
32	0.0140	0.0080	0.0060
33	0.0141	0.0080	0.0060
34	0.0141	0.0081	0.0060
35	0.0141	0.0081	0.0060
36	0.0142	0.0081	0.0061
37	0.0142	0.0081	0.0061
38	0.0143	0.0082	0.0061
39	0.0143	0.0082	0.0061
40	0.0143	0.0082	0.0061
41	0.0144	0.0082	0.0062
42	0.0144	0.0083	0.0062
43	0.0145	0.0083	0.0062
44	0.0145	0.0083	0.0062
45	0.0146	0.0083	0.0062
46	0.0146	0.0084	0.0063
47	0.0147	0.0084	0.0063
48	0.0147	0.0084	0.0063
49	0.0148	0.0085	0.0063
50	0.0148	0.0085	0.0063
51	0.0149	0.0085	0.0064
52	0.0149	0.0085	0.0064
53	0.0150	0.0086	0.0064
54	0.0150	0.0086	0.0064
55	0.0151	0.0086	0.0064
56	0.0151	0.0086	0.0065
57	0.0152	0.0087	0.0065
58	0.0152	0.0087	0.0065
59	0.0153	0.0088	0.0065
60	0.0153	0.0088	0.0066
61	0.0154	0.0088	0.0066
62	0.0154	0.0088	0.0066
63	0.0155	0.0089	0.0066
64	0.0155	0.0089	0.0066
65	0.0156	0.0089	0.0067
66	0.0157	0.0090	0.0067
67	0.0157	0.0090	0.0067
68	0.0158	0.0090	0.0067
69	0.0159	0.0091	0.0068
70	0.0159	0.0091	0.0068
71	0.0160	0.0091	0.0068
72	0.0160	0.0092	0.0069
73	0.0161	0.0092	0.0069
74	0.0162	0.0092	0.0069
75	0.0162	0.0093	0.0069
76	0.0163	0.0093	0.0070
77	0.0164	0.0094	0.0070
78	0.0164	0.0094	0.0070
79	0.0165	0.0094	0.0071
80	0.0166	0.0095	0.0071
81	0.0166	0.0095	0.0071
82	0.0167	0.0096	0.0071
83	0.0168	0.0096	0.0072
84	0.0168	0.0096	0.0072

85	0.0169	0.0097	0.0072
86	0.0170	0.0097	0.0073
87	0.0171	0.0098	0.0073
88	0.0171	0.0098	0.0073
89	0.0172	0.0099	0.0074
90	0.0173	0.0099	0.0074
91	0.0174	0.0100	0.0074
92	0.0175	0.0100	0.0075
93	0.0176	0.0101	0.0075
94	0.0176	0.0101	0.0075
95	0.0177	0.0102	0.0076
96	0.0178	0.0102	0.0076
97	0.0179	0.0103	0.0077
98	0.0180	0.0103	0.0077
99	0.0181	0.0104	0.0077
100	0.0182	0.0104	0.0078
101	0.0183	0.0105	0.0078
102	0.0183	0.0105	0.0078
103	0.0185	0.0106	0.0079
104	0.0185	0.0106	0.0079
105	0.0187	0.0107	0.0080
106	0.0187	0.0107	0.0080
107	0.0189	0.0108	0.0081
108	0.0189	0.0108	0.0081
109	0.0191	0.0109	0.0082
110	0.0192	0.0110	0.0082
111	0.0193	0.0111	0.0083
112	0.0194	0.0111	0.0083
113	0.0195	0.0112	0.0084
114	0.0196	0.0112	0.0084
115	0.0198	0.0113	0.0085
116	0.0199	0.0114	0.0085
117	0.0200	0.0115	0.0086
118	0.0201	0.0115	0.0086
119	0.0203	0.0116	0.0087
120	0.0204	0.0117	0.0087
121	0.0205	0.0118	0.0088
122	0.0206	0.0118	0.0088
123	0.0208	0.0119	0.0089
124	0.0209	0.0120	0.0089
125	0.0211	0.0121	0.0090
126	0.0212	0.0121	0.0091
127	0.0214	0.0123	0.0092
128	0.0215	0.0123	0.0092
129	0.0217	0.0124	0.0093
130	0.0218	0.0125	0.0093
131	0.0221	0.0126	0.0094
132	0.0222	0.0127	0.0095
133	0.0224	0.0128	0.0096
134	0.0225	0.0129	0.0096
135	0.0228	0.0130	0.0097
136	0.0229	0.0131	0.0098
137	0.0232	0.0133	0.0099
138	0.0233	0.0133	0.0100
139	0.0236	0.0135	0.0101
140	0.0237	0.0136	0.0101
141	0.0240	0.0137	0.0103
142	0.0241	0.0138	0.0103
143	0.0244	0.0140	0.0105
144	0.0246	0.0141	0.0105
145	0.0254	0.0145	0.0109
146	0.0256	0.0146	0.0109
147	0.0259	0.0148	0.0111
148	0.0261	0.0149	0.0112
149	0.0265	0.0152	0.0113
150	0.0267	0.0153	0.0114
151	0.0271	0.0155	0.0116
152	0.0273	0.0156	0.0117
153	0.0277	0.0158	0.0118
154	0.0279	0.0160	0.0119
155	0.0284	0.0162	0.0121
156	0.0286	0.0164	0.0122
157	0.0291	0.0166	0.0124
158	0.0293	0.0168	0.0125
159	0.0299	0.0171	0.0128
160	0.0301	0.0173	0.0129
161	0.0307	0.0176	0.0131
162	0.0310	0.0178	0.0133
163	0.0317	0.0181	0.0135
164	0.0320	0.0183	0.0137
165	0.0327	0.0187	0.0140
166	0.0331	0.0189	0.0141
167	0.0339	0.0194	0.0145

168	0.0343	0.0196	0.0147
169	0.0352	0.0201	0.0150
170	0.0357	0.0204	0.0152
171	0.0367	0.0210	0.0157
172	0.0372	0.0213	0.0159
173	0.0383	0.0219	0.0164
174	0.0390	0.0223	0.0167
175	0.0403	0.0231	0.0172
176	0.0410	0.0235	0.0175
177	0.0426	0.0244	0.0182
178	0.0435	0.0249	0.0186
179	0.0454	0.0260	0.0194
180	0.0464	0.0266	0.0199
181	0.0488	0.0279	0.0209
182	0.0502	0.0287	0.0215
183	0.0533	0.0305	0.0228
184	0.0551	0.0315	0.0235
185	0.0444	0.0254	0.0190
186	0.0469	0.0269	0.0201
187	0.0533	0.0305	0.0228
188	0.0575	0.0329	0.0246
189	0.0693	0.0396	0.0296
190	0.0782	0.0447	0.0334
191	0.1117	0.0477	0.0640
192	0.1536	0.0477	0.1059
193	0.4809	0.0477	0.4332
194	0.0910	0.0477	0.0433
195	0.0626	0.0358	0.0268
196	0.0498	0.0285	0.0213
197	0.0571	0.0327	0.0244
198	0.0517	0.0296	0.0221
199	0.0476	0.0272	0.0204
200	0.0444	0.0254	0.0190
201	0.0418	0.0239	0.0179
202	0.0396	0.0227	0.0169
203	0.0378	0.0216	0.0161
204	0.0361	0.0207	0.0155
205	0.0347	0.0199	0.0148
206	0.0335	0.0192	0.0143
207	0.0324	0.0185	0.0138
208	0.0313	0.0179	0.0134
209	0.0304	0.0174	0.0130
210	0.0296	0.0169	0.0127
211	0.0288	0.0165	0.0123
212	0.0281	0.0161	0.0120
213	0.0275	0.0157	0.0117
214	0.0269	0.0154	0.0115
215	0.0263	0.0150	0.0112
216	0.0258	0.0147	0.0110
217	0.0248	0.0142	0.0106
218	0.0243	0.0139	0.0104
219	0.0238	0.0136	0.0102
220	0.0234	0.0134	0.0100
221	0.0230	0.0132	0.0098
222	0.0226	0.0130	0.0097
223	0.0223	0.0128	0.0095
224	0.0219	0.0126	0.0094
225	0.0216	0.0124	0.0092
226	0.0213	0.0122	0.0091
227	0.0210	0.0120	0.0090
228	0.0207	0.0119	0.0089
229	0.0205	0.0117	0.0087
230	0.0202	0.0116	0.0086
231	0.0199	0.0114	0.0085
232	0.0197	0.0113	0.0084
233	0.0195	0.0111	0.0083
234	0.0192	0.0110	0.0082
235	0.0190	0.0109	0.0081
236	0.0188	0.0108	0.0080
237	0.0186	0.0106	0.0080
238	0.0184	0.0105	0.0079
239	0.0182	0.0104	0.0078
240	0.0180	0.0103	0.0077
241	0.0179	0.0102	0.0076
242	0.0177	0.0101	0.0076
243	0.0175	0.0100	0.0075
244	0.0174	0.0099	0.0074
245	0.0172	0.0098	0.0074
246	0.0170	0.0098	0.0073
247	0.0169	0.0097	0.0072
248	0.0167	0.0096	0.0072
249	0.0166	0.0095	0.0071
250	0.0165	0.0094	0.0070

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251             0.0163          0.0093              0.0070
252             0.0162          0.0093              0.0069
253             0.0161          0.0092              0.0069
254             0.0159          0.0091              0.0068
255             0.0158          0.0091              0.0068
256             0.0157          0.0090              0.0067
257             0.0156          0.0089              0.0067
258             0.0155          0.0089              0.0066
259             0.0154          0.0088              0.0066
260             0.0153          0.0087              0.0065
261             0.0151          0.0087              0.0065
262             0.0150          0.0086              0.0064
263             0.0149          0.0086              0.0064
264             0.0148          0.0085              0.0063
265             0.0147          0.0084              0.0063
266             0.0146          0.0084              0.0063
267             0.0146          0.0083              0.0062
268             0.0145          0.0083              0.0062
269             0.0144          0.0082              0.0061
270             0.0143          0.0082              0.0061
271             0.0142          0.0081              0.0061
272             0.0141          0.0081              0.0060
273             0.0140          0.0080              0.0060
274             0.0139          0.0080              0.0060
275             0.0139          0.0079              0.0059
276             0.0138          0.0079              0.0059
277             0.0137          0.0078              0.0059
278             0.0136          0.0078              0.0058
279             0.0136          0.0078              0.0058
280             0.0135          0.0077              0.0058
281             0.0134          0.0077              0.0057
282             0.0133          0.0076              0.0057
283             0.0133          0.0076              0.0057
284             0.0132          0.0076              0.0056
285             0.0131          0.0075              0.0056
286             0.0131          0.0075              0.0056
287             0.0130          0.0074              0.0056
288             0.0129          0.0074              0.0055
--------------------------------------------------------------------
--------------------------------------------------------------------
Total soil rain loss =      3.75(In)
Total effective rainfall =      3.30(In)
Peak flow rate in flood hydrograph =     26.17(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        7.5      15.0      22.5      30.0
----------------------------------------------------------------------
  0+ 5      0.0002      0.03  Q         |         |         |         |
  0+10      0.0013      0.16  Q         |         |         |         |
  0+15      0.0041      0.41  Q         |         |         |         |
  0+20      0.0084      0.62  Q         |         |         |         |
  0+25      0.0134      0.72  Q         |         |         |         |
  0+30      0.0186      0.76  VQ        |         |         |         |
  0+35      0.0239      0.77  VQ        |         |         |         |
  0+40      0.0293      0.78  VQ        |         |         |         |
  0+45      0.0346      0.78  VQ        |         |         |         |
  0+50      0.0401      0.79  VQ        |         |         |         |
  0+55      0.0455      0.79  VQ        |         |         |         |
  1+ 0      0.0509      0.79  VQ        |         |         |         |
  1+ 5      0.0564      0.79  VQ        |         |         |         |
  1+10      0.0618      0.79  VQ        |         |         |         |
  1+15      0.0673      0.80  VQ        |         |         |         |
  1+20      0.0728      0.80  VQ        |         |         |         |
  1+25      0.0783      0.80  VQ        |         |         |         |
  1+30      0.0839      0.80  |Q        |         |         |         |
  1+35      0.0894      0.80  |Q        |         |         |         |
  1+40      0.0949      0.81  |Q        |         |         |         |
  1+45      0.1005      0.81  |Q        |         |         |         |
  1+50      0.1061      0.81  |Q        |         |         |         |
  1+55      0.1117      0.81  |Q        |         |         |         |
  2+ 0      0.1173      0.82  |Q        |         |         |         |
  2+ 5      0.1229      0.82  |Q        |         |         |         |
  2+10      0.1286      0.82  |Q        |         |         |         |
  2+15      0.1343      0.82  |Q        |         |         |         |
  2+20      0.1399      0.82  |Q        |         |         |         |
  2+25      0.1456      0.83  |Q        |         |         |         |
  2+30      0.1513      0.83  |Q        |         |         |         |
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 2+35        0.1571       0.83  |Q         |         |         |         |
 2+40        0.1628       0.83  |QV        |         |         |         |
 2+45        0.1686       0.84  |QV        |         |         |         |
 2+50        0.1743       0.84  |QV        |         |         |         |
 2+55        0.1801       0.84  |QV        |         |         |         |
 3+ 0        0.1860       0.84  |QV        |         |         |         |
 3+ 5        0.1918       0.85  |QV        |         |         |         |
 3+10        0.1976       0.85  |QV        |         |         |         |
 3+15        0.2035       0.85  |QV        |         |         |         |
 3+20        0.2094       0.85  |QV        |         |         |         |
 3+25        0.2153       0.86  |QV        |         |         |         |
 3+30        0.2212       0.86  |QV        |         |         |         |
 3+35        0.2271       0.86  |QV        |         |         |         |
 3+40        0.2331       0.86  |QV        |         |         |         |
 3+45        0.2391       0.87  |QV        |         |         |         |
 3+50        0.2451       0.87  |Q V       |         |         |         |
 3+55        0.2511       0.87  |Q V       |         |         |         |
 4+ 0        0.2571       0.88  |Q V       |         |         |         |
 4+ 5        0.2632       0.88  |Q V       |         |         |         |
 4+10        0.2692       0.88  |Q V       |         |         |         |
 4+15        0.2753       0.88  |Q V       |         |         |         |
 4+20        0.2814       0.89  |Q V       |         |         |         |
 4+25        0.2876       0.89  |Q V       |         |         |         |
 4+30        0.2937       0.89  |Q V       |         |         |         |
 4+35        0.2999       0.90  |Q V       |         |         |         |
 4+40        0.3061       0.90  |Q V       |         |         |         |
 4+45        0.3123       0.90  |Q V       |         |         |         |
 4+50        0.3185       0.91  |Q V       |         |         |         |
 4+55        0.3248       0.91  |Q  V      |         |         |         |
 5+ 0        0.3311       0.91  |Q  V      |         |         |         |
 5+ 5        0.3374       0.91  |Q  V      |         |         |         |
 5+10        0.3437       0.92  |Q  V      |         |         |         |
 5+15        0.3500       0.92  |Q  V      |         |         |         |
 5+20        0.3564       0.92  |Q  V      |         |         |         |
 5+25        0.3628       0.93  |Q  V      |         |         |         |
 5+30        0.3692       0.93  |Q  V      |         |         |         |
 5+35        0.3756       0.94  |Q  V      |         |         |         |
 5+40        0.3821       0.94  |Q  V      |         |         |         |
 5+45        0.3886       0.94  |Q  V      |         |         |         |
 5+50        0.3951       0.95  |Q  V      |         |         |         |
 5+55        0.4016       0.95  |Q   V     |         |         |         |
 6+ 0        0.4082       0.95  |Q   V     |         |         |         |
 6+ 5        0.4148       0.96  |Q   V     |         |         |         |
 6+10        0.4214       0.96  |Q   V     |         |         |         |
 6+15        0.4281       0.96  |Q   V     |         |         |         |
 6+20        0.4347       0.97  |Q   V     |         |         |         |
 6+25        0.4414       0.97  |Q   V     |         |         |         |
 6+30        0.4481       0.98  |Q   V     |         |         |         |
 6+35        0.4549       0.98  |Q   V     |         |         |         |
 6+40        0.4616       0.98  |Q   V     |         |         |         |
 6+45        0.4684       0.99  |Q   V     |         |         |         |
 6+50        0.4753       0.99  |Q   V     |         |         |         |
 6+55        0.4821       1.00  |Q    V    |         |         |         |
 7+ 0        0.4890       1.00  |Q    V    |         |         |         |
 7+ 5        0.4959       1.00  |Q    V    |         |         |         |
 7+10        0.5029       1.01  |Q    V    |         |         |         |
 7+15        0.5099       1.01  |Q    V    |         |         |         |
 7+20        0.5169       1.02  |Q    V    |         |         |         |
 7+25        0.5239       1.02  |Q    V    |         |         |         |
 7+30        0.5310       1.03  |Q    V    |         |         |         |
 7+35        0.5381       1.03  |Q    V    |         |         |         |
 7+40        0.5452       1.04  |Q    V    |         |         |         |
 7+45        0.5524       1.04  |Q    V    |         |         |         |
 7+50        0.5596       1.05  |Q     V   |         |         |         |
 7+55        0.5668       1.05  |Q     V   |         |         |         |
 8+ 0        0.5741       1.06  |Q     V   |         |         |         |
 8+ 5        0.5814       1.06  |Q     V   |         |         |         |
 8+10        0.5888       1.07  |Q     V   |         |         |         |
 8+15        0.5961       1.07  |Q     V   |         |         |         |
 8+20        0.6035       1.08  |Q     V   |         |         |         |
 8+25        0.6110       1.08  |Q     V   |         |         |         |
 8+30        0.6185       1.09  |Q     V   |         |         |         |
 8+35        0.6260       1.09  |Q     V   |         |         |         |
 8+40        0.6336       1.10  |Q     V   |         |         |         |
 8+45        0.6412       1.10  |Q      V  |         |         |         |
 8+50        0.6488       1.11  |Q      V  |         |         |         |
 8+55        0.6565       1.12  |Q      V  |         |         |         |
 9+ 0        0.6642       1.12  |Q      V  |         |         |         |
 9+ 5        0.6720       1.13  |Q      V  |         |         |         |
 9+10        0.6798       1.13  |Q      V  |         |         |         |
 9+15        0.6877       1.14  |Q      V  |         |         |         |
 9+20        0.6956       1.15  |Q      V  |         |         |         |
 9+25        0.7035       1.15  |Q      V  |         |         |         |
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  9+30       0.7115      1.16  |Q      V |         |         |         |
  9+35       0.7196      1.17  |Q       V|         |         |         |
  9+40       0.7276      1.17  |Q       V|         |         |         |
  9+45       0.7358      1.18  |Q       V|         |         |         |
  9+50       0.7440      1.19  |Q       V|         |         |         |
  9+55       0.7522      1.20  |Q       V|         |         |         |
 10+ 0       0.7605      1.20  |Q       V|         |         |         |
 10+ 5       0.7688      1.21  |Q       V|         |         |         |
 10+10       0.7772      1.22  |Q       V|         |         |         |
 10+15       0.7857      1.23  |Q       V|         |         |         |
 10+20       0.7942      1.24  |Q       V|         |         |         |
 10+25       0.8028      1.24  |Q        V         |         |         |
 10+30       0.8114      1.25  |Q        V         |         |         |
 10+35       0.8201      1.26  |Q        V         |         |         |
 10+40       0.8288      1.27  |Q        V         |         |         |
 10+45       0.8376      1.28  |Q        V         |         |         |
 10+50       0.8465      1.29  |Q        V         |         |         |
 10+55       0.8554      1.30  |Q        V         |         |         |
 11+ 0       0.8644      1.31  |Q        V         |         |         |
 11+ 5       0.8735      1.32  |Q        V         |         |         |
 11+10       0.8826      1.33  |Q        |V        |         |         |
 11+15       0.8918      1.34  |Q        |V        |         |         |
 11+20       0.9011      1.35  |Q        |V        |         |         |
 11+25       0.9105      1.36  |Q        |V        |         |         |
 11+30       0.9199      1.37  |Q        |V        |         |         |
 11+35       0.9294      1.38  |Q        |V        |         |         |
 11+40       0.9390      1.39  |Q        |V        |         |         |
 11+45       0.9487      1.41  |Q        |V        |         |         |
 11+50       0.9584      1.42  |Q        | V       |         |         |
 11+55       0.9683      1.43  |Q        | V       |         |         |
 12+ 0       0.9782      1.44  |Q        | V       |         |         |
 12+ 5       0.9883      1.46  |Q        | V       |         |         |
 12+10       0.9984      1.48  |Q        | V       |         |         |
 12+15       1.0088      1.50  | Q       | V       |         |         |
 12+20       1.0193      1.52  | Q       | V       |         |         |
 12+25       1.0299      1.54  | Q       | V       |         |         |
 12+30       1.0406      1.56  | Q       |  V      |         |         |
 12+35       1.0515      1.58  | Q       |  V      |         |         |
 12+40       1.0625      1.59  | Q       |  V      |         |         |
 12+45       1.0736      1.61  | Q       |  V      |         |         |
 12+50       1.0848      1.63  | Q       |  V      |         |         |
 12+55       1.0961      1.65  | Q       |  V      |         |         |
 13+ 0       1.1076      1.67  | Q       |  V      |         |         |
 13+ 5       1.1193      1.69  | Q       |   V     |         |         |
 13+10       1.1310      1.71  | Q       |   V     |         |         |
 13+15       1.1429      1.73  | Q       |   V     |         |         |
 13+20       1.1550      1.75  | Q       |   V     |         |         |
 13+25       1.1672      1.78  | Q       |   V     |         |         |
 13+30       1.1796      1.80  | Q       |   V     |         |         |
 13+35       1.1922      1.83  | Q       |   V     |         |         |
 13+40       1.2050      1.85  | Q       |    V    |         |         |
 13+45       1.2179      1.88  | Q       |    V    |         |         |
 13+50       1.2311      1.91  | Q       |    V    |         |         |
 13+55       1.2444      1.94  | Q       |    V    |         |         |
 14+ 0       1.2580      1.97  | Q       |    V    |         |         |
 14+ 5       1.2719      2.01  | Q       |    V    |         |         |
 14+10       1.2859      2.05  | Q       |     V   |         |         |
 14+15       1.3003      2.08  | Q       |     V   |         |         |
 14+20       1.3149      2.13  | Q       |     V   |         |         |
 14+25       1.3299      2.17  | Q       |     V   |         |         |
 14+30       1.3451      2.22  | Q       |     V   |         |         |
 14+35       1.3607      2.27  |  Q      |      V  |         |         |
 14+40       1.3767      2.32  |  Q      |      V  |         |         |
 14+45       1.3931      2.38  |  Q      |      V  |         |         |
 14+50       1.4099      2.44  |  Q      |      V  |         |         |
 14+55       1.4272      2.51  |  Q      |      V  |         |         |
 15+ 0       1.4450      2.59  |  Q      |       V |         |         |
 15+ 5       1.4634      2.67  |  Q      |       V |         |         |
 15+10       1.4824      2.76  |  Q      |       V |         |         |
 15+15       1.5021      2.86  |  Q      |       V |         |         |
 15+20       1.5226      2.98  |  Q      |        V|         |         |
 15+25       1.5438      3.08  |   Q     |        V|         |         |
 15+30       1.5650      3.08  |   Q     |        V|         |         |
 15+35       1.5855      2.97  |  Q      |        V|         |         |
 15+40       1.6057      2.94  |  Q      |         V         |         |
 15+45       1.6271      3.11  |   Q     |         V         |         |
 15+50       1.6507      3.43  |   Q     |         V         |         |
 15+55       1.6783      4.00  |    Q    |         |V        |         |
 16+ 0       1.7153      5.38  |      Q  |         |V        |         |
 16+ 5       1.7811      9.55  |         | Q       | V       |         |
 16+10       1.9129     19.14  |         |         |  V Q    |         |
 16+15       2.0932     26.17  |         |         |     V   |   Q     |
 16+20       2.2424     21.66  |         |         |       Q |         |
```

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16+25       2.3227     11.67  |         |    Q    |        V|         |
16+30       2.3685      6.64  |       Q |         |        V|         |
16+35       2.3979      4.27  |    Q    |         |         V         |
16+40       2.4233      3.69  |   Q     |         |         V         |
16+45       2.4462      3.32  |   Q     |         |         V         |
16+50       2.4654      2.80  |  Q      |         |         V         |
16+55       2.4834      2.61  |  Q      |         |         |V        |
17+ 0       2.5004      2.46  |  Q      |         |         |V        |
17+ 5       2.5165      2.34  |  Q      |         |         |V        |
17+10       2.5319      2.23  | Q       |         |         |V        |
17+15       2.5466      2.14  | Q       |         |         |V        |
17+20       2.5608      2.06  | Q       |         |         | V       |
17+25       2.5744      1.98  | Q       |         |         | V       |
17+30       2.5876      1.92  | Q       |         |         | V       |
17+35       2.6005      1.86  | Q       |         |         | V       |
17+40       2.6129      1.81  | Q       |         |         | V       |
17+45       2.6250      1.76  | Q       |         |         | V       |
17+50       2.6368      1.71  | Q       |         |         |  V      |
17+55       2.6483      1.67  | Q       |         |         |  V      |
18+ 0       2.6596      1.63  | Q       |         |         |  V      |
18+ 5       2.6705      1.60  | Q       |         |         |  V      |
18+10       2.6813      1.56  | Q       |         |         |  V      |
18+15       2.6917      1.52  | Q       |         |         |  V      |
18+20       2.7019      1.48  |Q        |         |         |  V      |
18+25       2.7119      1.45  |Q        |         |         |  V      |
18+30       2.7217      1.42  |Q        |         |         |   V     |
18+35       2.7313      1.40  |Q        |         |         |   V     |
18+40       2.7407      1.37  |Q        |         |         |   V     |
18+45       2.7500      1.35  |Q        |         |         |   V     |
18+50       2.7592      1.33  |Q        |         |         |   V     |
18+55       2.7682      1.31  |Q        |         |         |   V     |
19+ 0       2.7771      1.29  |Q        |         |         |   V     |
19+ 5       2.7858      1.27  |Q        |         |         |   V     |
19+10       2.7945      1.25  |Q        |         |         |    V    |
19+15       2.8030      1.24  |Q        |         |         |    V    |
19+20       2.8114      1.22  |Q        |         |         |    V    |
19+25       2.8197      1.20  |Q        |         |         |    V    |
19+30       2.8279      1.19  |Q        |         |         |    V    |
19+35       2.8360      1.18  |Q        |         |         |    V    |
19+40       2.8440      1.16  |Q        |         |         |    V    |
19+45       2.8519      1.15  |Q        |         |         |    V    |
19+50       2.8597      1.14  |Q        |         |         |    V    |
19+55       2.8674      1.12  |Q        |         |         |    V    |
20+ 0       2.8751      1.11  |Q        |         |         |     V   |
20+ 5       2.8827      1.10  |Q        |         |         |     V   |
20+10       2.8901      1.09  |Q        |         |         |     V   |
20+15       2.8976      1.08  |Q        |         |         |     V   |
20+20       2.9049      1.07  |Q        |         |         |     V   |
20+25       2.9122      1.06  |Q        |         |         |     V   |
20+30       2.9194      1.05  |Q        |         |         |     V   |
20+35       2.9265      1.04  |Q        |         |         |     V   |
20+40       2.9336      1.03  |Q        |         |         |     V   |
20+45       2.9406      1.02  |Q        |         |         |     V   |
20+50       2.9476      1.01  |Q        |         |         |     V   |
20+55       2.9545      1.00  |Q        |         |         |      V  |
21+ 0       2.9613      0.99  |Q        |         |         |      V  |
21+ 5       2.9681      0.98  |Q        |         |         |      V  |
21+10       2.9748      0.98  |Q        |         |         |      V  |
21+15       2.9815      0.97  |Q        |         |         |      V  |
21+20       2.9881      0.96  |Q        |         |         |      V  |
21+25       2.9947      0.95  |Q        |         |         |      V  |
21+30       3.0012      0.95  |Q        |         |         |      V  |
21+35       3.0076      0.94  |Q        |         |         |      V  |
21+40       3.0141      0.93  |Q        |         |         |      V  |
21+45       3.0204      0.93  |Q        |         |         |      V  |
21+50       3.0268      0.92  |Q        |         |         |      V  |
21+55       3.0330      0.91  |Q        |         |         |       V |
22+ 0       3.0393      0.91  |Q        |         |         |       V |
22+ 5       3.0455      0.90  |Q        |         |         |       V |
22+10       3.0516      0.89  |Q        |         |         |       V |
22+15       3.0577      0.89  |Q        |         |         |       V |
22+20       3.0638      0.88  |Q        |         |         |       V |
22+25       3.0699      0.88  |Q        |         |         |       V |
22+30       3.0759      0.87  |Q        |         |         |       V |
22+35       3.0818      0.87  |Q        |         |         |       V |
22+40       3.0877      0.86  |Q        |         |         |       V |
22+45       3.0936      0.85  |Q        |         |         |       V |
22+50       3.0995      0.85  |Q        |         |         |       V |
22+55       3.1053      0.84  |Q        |         |         |       V |
23+ 0       3.1111      0.84  |Q        |         |         |       V |
23+ 5       3.1168      0.83  |Q        |         |         |        V|
23+10       3.1225      0.83  |Q        |         |         |        V|
23+15       3.1282      0.82  |Q        |         |         |        V|
```

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   23+20        3.1338       0.82  |Q         |         |         |        V|
   23+25        3.1395       0.82  |Q         |         |         |        V|
   23+30        3.1451       0.81  |Q         |         |         |        V|
   23+35        3.1506       0.81  |Q         |         |         |        V|
   23+40        3.1561       0.80  |Q         |         |         |        V|
   23+45        3.1616       0.80  |Q         |         |         |        V|
   23+50        3.1671       0.79  |Q         |         |         |        V|
   23+55        3.1725       0.79  |Q         |         |         |        V|
   24+ 0        3.1780       0.79  |Q         |         |         |        V|
   24+ 5        3.1832       0.76  |Q         |         |         |        V|
   24+10        3.1874       0.61  Q          |         |         |        V|
   24+15        3.1899       0.36  Q          |         |         |        V|
   24+20        3.1909       0.15  Q          |         |         |        V|
   24+25        3.1913       0.06  Q          |         |         |        V|
   24+30        3.1915       0.02  Q          |         |         |        V|
   24+35        3.1916       0.01  Q          |         |         |        V|
   24+40        3.1916       0.00  Q          |         |         |        V|
-----------------------------------------------------------------------
```

U n i t   H y d r o g r a p h   A n a l y s i s

Study date 05/16/22

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6328

---------------------------------------------------------------------
Unit Hydrograph
Post Development
100-year / 24-hour

--------------------------------------------------------------------

        Storm Event Year = 100

        Antecedent Moisture Condition = 2

 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 100
            11.60           1            1.30
--------------------------------------------------------------------
Rainfall data for year 100
            11.60           6            3.40
--------------------------------------------------------------------
Rainfall data for year 100
            11.60          24            7.05
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      32.0          2.09      0.180     0.978    0.850    0.831
 33.0      33.0          9.51      0.820     0.972    0.500    0.486

Area-averaged adjusted loss rate Fm (In/Hr) =  0.548

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
     1.78   0.153         32.0      32.0      21.25     0.046
     0.31   0.027         98.0      98.0       0.20     0.966

     4.75   0.410         33.0      33.0      20.30     0.054
     4.75   0.410         98.0      98.0       0.20     0.966

Area-averaged catchment yield fraction, Y =  0.452
Area-averaged low loss fraction, Yb =  0.548
Direct entry of lag time by user
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      11.60(Ac.)
Catchment Lag time =   0.156 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 53.4188
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.548(In/Hr)
Average low loss rate fraction (Yb) = 0.548 (decimal)
VALLEY DEVELOPED S-Graph Selected
```

```
Computed peak 5-minute rainfall =  0.481(In)
Computed peak 30-minute rainfall =  0.985(In)
Specified peak 1-hour rainfall =  1.300(In)
Computed peak 3-hour rainfall =  2.344(In)
Specified peak 6-hour rainfall =  3.400(In)
Specified peak 24-hour rainfall =  7.050(In)


Rainfall depth area reduction factors:
Using a total area of      11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.481(In)
30-minute factor = 0.999    Adjusted rainfall =  0.985(In)
1-hour factor = 0.999       Adjusted rainfall =  1.299(In)
3-hour factor = 1.000       Adjusted rainfall =  2.344(In)
6-hour factor = 1.000       Adjusted rainfall =  3.400(In)
24-hour factor = 1.000      Adjusted rainfall =  7.050(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 =       140.29 (CFS))

  1                5.200                  7.294
  2               33.698                 39.980
  3               73.967                 56.492
  4               92.355                 25.796
  5               97.840                  7.695
  6               99.088                  1.751
  7              100.000                  1.279
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number             (In)                 (In)
  1              0.4809               0.4809
  2              0.6345               0.1536
  3              0.7462               0.1117
  4              0.8373               0.0910
  5              0.9154               0.0782
  6              0.9847               0.0693
  7              1.0473               0.0626
  8              1.1048               0.0575
  9              1.1581               0.0533
 10              1.2079               0.0498
 11              1.2548               0.0469
 12              1.2993               0.0444
 13              1.3564               0.0571
 14              1.4114               0.0551
 15              1.4647               0.0533
 16              1.5164               0.0517
 17              1.5665               0.0502
 18              1.6154               0.0488
 19              1.6629               0.0476
 20              1.7094               0.0464
 21              1.7548               0.0454
 22              1.7992               0.0444
 23              1.8426               0.0435
 24              1.8852               0.0426
 25              1.9270               0.0418
 26              1.9680               0.0410
 27              2.0083               0.0403
 28              2.0479               0.0396
 29              2.0869               0.0390
 30              2.1252               0.0383
 31              2.1630               0.0378
 32              2.2002               0.0372
 33              2.2368               0.0367
 34              2.2730               0.0361
 35              2.3086               0.0357
 36              2.3438               0.0352
 37              2.3785               0.0347
 38              2.4128               0.0343
 39              2.4467               0.0339
 40              2.4802               0.0335
 41              2.5132               0.0331
 42              2.5459               0.0327
 43              2.5783               0.0324
 44              2.6103               0.0320
 45              2.6420               0.0317
 46              2.6733               0.0313
 47              2.7043               0.0310
```

48	2.7351	0.0307
49	2.7655	0.0304
50	2.7956	0.0301
51	2.8255	0.0299
52	2.8551	0.0296
53	2.8844	0.0293
54	2.9135	0.0291
55	2.9424	0.0288
56	2.9709	0.0286
57	2.9993	0.0284
58	3.0274	0.0281
59	3.0553	0.0279
60	3.0830	0.0277
61	3.1105	0.0275
62	3.1377	0.0273
63	3.1648	0.0271
64	3.1916	0.0269
65	3.2183	0.0267
66	3.2448	0.0265
67	3.2711	0.0263
68	3.2972	0.0261
69	3.3231	0.0259
70	3.3489	0.0258
71	3.3745	0.0256
72	3.3999	0.0254
73	3.4246	0.0248
74	3.4492	0.0246
75	3.4737	0.0244
76	3.4980	0.0243
77	3.5221	0.0241
78	3.5461	0.0240
79	3.5699	0.0238
80	3.5936	0.0237
81	3.6172	0.0236
82	3.6406	0.0234
83	3.6639	0.0233
84	3.6871	0.0232
85	3.7101	0.0230
86	3.7330	0.0229
87	3.7558	0.0228
88	3.7784	0.0226
89	3.8009	0.0225
90	3.8233	0.0224
91	3.8456	0.0223
92	3.8678	0.0222
93	3.8899	0.0221
94	3.9118	0.0219
95	3.9337	0.0218
96	3.9554	0.0217
97	3.9770	0.0216
98	3.9985	0.0215
99	4.0199	0.0214
100	4.0412	0.0213
101	4.0625	0.0212
102	4.0836	0.0211
103	4.1046	0.0210
104	4.1255	0.0209
105	4.1463	0.0208
106	4.1670	0.0207
107	4.1877	0.0206
108	4.2082	0.0205
109	4.2287	0.0205
110	4.2490	0.0204
111	4.2693	0.0203
112	4.2895	0.0202
113	4.3096	0.0201
114	4.3296	0.0200
115	4.3496	0.0199
116	4.3694	0.0199
117	4.3892	0.0198
118	4.4089	0.0197
119	4.4285	0.0196
120	4.4480	0.0195
121	4.4675	0.0195
122	4.4869	0.0194
123	4.5062	0.0193
124	4.5254	0.0192
125	4.5446	0.0192
126	4.5637	0.0191
127	4.5827	0.0190
128	4.6017	0.0189
129	4.6205	0.0189
130	4.6393	0.0188

131	4.6581	0.0187
132	4.6767	0.0187
133	4.6954	0.0186
134	4.7139	0.0185
135	4.7324	0.0185
136	4.7508	0.0184
137	4.7691	0.0183
138	4.7874	0.0183
139	4.8056	0.0182
140	4.8238	0.0182
141	4.8419	0.0181
142	4.8599	0.0180
143	4.8779	0.0180
144	4.8958	0.0179
145	4.9136	0.0179
146	4.9314	0.0178
147	4.9492	0.0177
148	4.9669	0.0177
149	4.9845	0.0176
150	5.0021	0.0176
151	5.0196	0.0175
152	5.0370	0.0175
153	5.0544	0.0174
154	5.0718	0.0174
155	5.0891	0.0173
156	5.1063	0.0172
157	5.1235	0.0172
158	5.1407	0.0171
159	5.1578	0.0171
160	5.1748	0.0170
161	5.1918	0.0170
162	5.2087	0.0169
163	5.2256	0.0169
164	5.2425	0.0168
165	5.2593	0.0168
166	5.2760	0.0167
167	5.2927	0.0167
168	5.3093	0.0166
169	5.3259	0.0166
170	5.3425	0.0166
171	5.3590	0.0165
172	5.3755	0.0165
173	5.3919	0.0164
174	5.4083	0.0164
175	5.4246	0.0163
176	5.4409	0.0163
177	5.4571	0.0162
178	5.4733	0.0162
179	5.4895	0.0162
180	5.5056	0.0161
181	5.5217	0.0161
182	5.5377	0.0160
183	5.5537	0.0160
184	5.5696	0.0159
185	5.5855	0.0159
186	5.6014	0.0159
187	5.6172	0.0158
188	5.6330	0.0158
189	5.6487	0.0157
190	5.6644	0.0157
191	5.6801	0.0157
192	5.6957	0.0156
193	5.7113	0.0156
194	5.7268	0.0155
195	5.7424	0.0155
196	5.7578	0.0155
197	5.7733	0.0154
198	5.7887	0.0154
199	5.8040	0.0154
200	5.8194	0.0153
201	5.8346	0.0153
202	5.8499	0.0153
203	5.8651	0.0152
204	5.8803	0.0152
205	5.8954	0.0151
206	5.9105	0.0151
207	5.9256	0.0151
208	5.9407	0.0150
209	5.9557	0.0150
210	5.9706	0.0150
211	5.9856	0.0149
212	6.0005	0.0149
213	6.0154	0.0149

214	6.0302	0.0148
215	6.0450	0.0148
216	6.0598	0.0148
217	6.0745	0.0147
218	6.0892	0.0147
219	6.1039	0.0147
220	6.1186	0.0146
221	6.1332	0.0146
222	6.1478	0.0146
223	6.1623	0.0146
224	6.1768	0.0145
225	6.1913	0.0145
226	6.2058	0.0145
227	6.2202	0.0144
228	6.2346	0.0144
229	6.2490	0.0144
230	6.2633	0.0143
231	6.2776	0.0143
232	6.2919	0.0143
233	6.3062	0.0143
234	6.3204	0.0142
235	6.3346	0.0142
236	6.3488	0.0142
237	6.3629	0.0141
238	6.3770	0.0141
239	6.3911	0.0141
240	6.4051	0.0141
241	6.4192	0.0140
242	6.4332	0.0140
243	6.4471	0.0140
244	6.4611	0.0139
245	6.4750	0.0139
246	6.4889	0.0139
247	6.5027	0.0139
248	6.5166	0.0138
249	6.5304	0.0138
250	6.5442	0.0138
251	6.5579	0.0138
252	6.5717	0.0137
253	6.5854	0.0137
254	6.5991	0.0137
255	6.6127	0.0137
256	6.6263	0.0136
257	6.6399	0.0136
258	6.6535	0.0136
259	6.6671	0.0136
260	6.6806	0.0135
261	6.6941	0.0135
262	6.7076	0.0135
263	6.7210	0.0135
264	6.7345	0.0134
265	6.7479	0.0134
266	6.7613	0.0134
267	6.7746	0.0134
268	6.7880	0.0133
269	6.8013	0.0133
270	6.8146	0.0133
271	6.8278	0.0133
272	6.8411	0.0132
273	6.8543	0.0132
274	6.8675	0.0132
275	6.8807	0.0132
276	6.8938	0.0132
277	6.9069	0.0131
278	6.9200	0.0131
279	6.9331	0.0131
280	6.9462	0.0131
281	6.9592	0.0130
282	6.9722	0.0130
283	6.9852	0.0130
284	6.9982	0.0130
285	7.0112	0.0130
286	7.0241	0.0129
287	7.0370	0.0129
288	7.0499	0.0129

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0129	0.0071	0.0058
2	0.0129	0.0071	0.0058
3	0.0130	0.0071	0.0058

4	0.0130	0.0071	0.0059
5	0.0130	0.0071	0.0059
6	0.0130	0.0072	0.0059
7	0.0131	0.0072	0.0059
8	0.0131	0.0072	0.0059
9	0.0132	0.0072	0.0059
10	0.0132	0.0072	0.0059
11	0.0132	0.0073	0.0060
12	0.0132	0.0073	0.0060
13	0.0133	0.0073	0.0060
14	0.0133	0.0073	0.0060
15	0.0134	0.0073	0.0060
16	0.0134	0.0073	0.0060
17	0.0134	0.0074	0.0061
18	0.0135	0.0074	0.0061
19	0.0135	0.0074	0.0061
20	0.0135	0.0074	0.0061
21	0.0136	0.0074	0.0061
22	0.0136	0.0075	0.0061
23	0.0137	0.0075	0.0062
24	0.0137	0.0075	0.0062
25	0.0137	0.0075	0.0062
26	0.0138	0.0075	0.0062
27	0.0138	0.0076	0.0062
28	0.0138	0.0076	0.0062
29	0.0139	0.0076	0.0063
30	0.0139	0.0076	0.0063
31	0.0140	0.0077	0.0063
32	0.0140	0.0077	0.0063
33	0.0141	0.0077	0.0063
34	0.0141	0.0077	0.0064
35	0.0141	0.0078	0.0064
36	0.0142	0.0078	0.0064
37	0.0142	0.0078	0.0064
38	0.0143	0.0078	0.0064
39	0.0143	0.0078	0.0065
40	0.0143	0.0079	0.0065
41	0.0144	0.0079	0.0065
42	0.0144	0.0079	0.0065
43	0.0145	0.0079	0.0065
44	0.0145	0.0080	0.0066
45	0.0146	0.0080	0.0066
46	0.0146	0.0080	0.0066
47	0.0147	0.0081	0.0066
48	0.0147	0.0081	0.0066
49	0.0148	0.0081	0.0067
50	0.0148	0.0081	0.0067
51	0.0149	0.0082	0.0067
52	0.0149	0.0082	0.0067
53	0.0150	0.0082	0.0068
54	0.0150	0.0082	0.0068
55	0.0151	0.0083	0.0068
56	0.0151	0.0083	0.0068
57	0.0152	0.0083	0.0069
58	0.0152	0.0083	0.0069
59	0.0153	0.0084	0.0069
60	0.0153	0.0084	0.0069
61	0.0154	0.0084	0.0070
62	0.0154	0.0085	0.0070
63	0.0155	0.0085	0.0070
64	0.0155	0.0085	0.0070
65	0.0156	0.0086	0.0071
66	0.0157	0.0086	0.0071
67	0.0157	0.0086	0.0071
68	0.0158	0.0087	0.0071
69	0.0159	0.0087	0.0072
70	0.0159	0.0087	0.0072
71	0.0160	0.0088	0.0072
72	0.0160	0.0088	0.0072
73	0.0161	0.0088	0.0073
74	0.0162	0.0089	0.0073
75	0.0162	0.0089	0.0073
76	0.0163	0.0089	0.0074
77	0.0164	0.0090	0.0074
78	0.0164	0.0090	0.0074
79	0.0165	0.0091	0.0075
80	0.0166	0.0091	0.0075
81	0.0166	0.0091	0.0075
82	0.0167	0.0092	0.0075
83	0.0168	0.0092	0.0076
84	0.0168	0.0092	0.0076
85	0.0169	0.0093	0.0076
86	0.0170	0.0093	0.0077

87	0.0171	0.0094	0.0077
88	0.0171	0.0094	0.0077
89	0.0172	0.0095	0.0078
90	0.0173	0.0095	0.0078
91	0.0174	0.0095	0.0079
92	0.0175	0.0096	0.0079
93	0.0176	0.0096	0.0079
94	0.0176	0.0097	0.0080
95	0.0177	0.0097	0.0080
96	0.0178	0.0098	0.0080
97	0.0179	0.0098	0.0081
98	0.0180	0.0099	0.0081
99	0.0181	0.0099	0.0082
100	0.0182	0.0100	0.0082
101	0.0183	0.0100	0.0083
102	0.0183	0.0101	0.0083
103	0.0185	0.0101	0.0083
104	0.0185	0.0102	0.0084
105	0.0187	0.0102	0.0084
106	0.0187	0.0103	0.0085
107	0.0189	0.0104	0.0085
108	0.0189	0.0104	0.0086
109	0.0191	0.0105	0.0086
110	0.0192	0.0105	0.0087
111	0.0193	0.0106	0.0087
112	0.0194	0.0106	0.0088
113	0.0195	0.0107	0.0088
114	0.0196	0.0108	0.0089
115	0.0198	0.0108	0.0089
116	0.0199	0.0109	0.0090
117	0.0200	0.0110	0.0090
118	0.0201	0.0110	0.0091
119	0.0203	0.0111	0.0092
120	0.0204	0.0112	0.0092
121	0.0205	0.0113	0.0093
122	0.0206	0.0113	0.0093
123	0.0208	0.0114	0.0094
124	0.0209	0.0115	0.0094
125	0.0211	0.0116	0.0095
126	0.0212	0.0116	0.0096
127	0.0214	0.0117	0.0097
128	0.0215	0.0118	0.0097
129	0.0217	0.0119	0.0098
130	0.0218	0.0120	0.0099
131	0.0221	0.0121	0.0100
132	0.0222	0.0122	0.0100
133	0.0224	0.0123	0.0101
134	0.0225	0.0124	0.0102
135	0.0228	0.0125	0.0103
136	0.0229	0.0126	0.0103
137	0.0232	0.0127	0.0105
138	0.0233	0.0128	0.0105
139	0.0236	0.0129	0.0106
140	0.0237	0.0130	0.0107
141	0.0240	0.0132	0.0108
142	0.0241	0.0132	0.0109
143	0.0244	0.0134	0.0110
144	0.0246	0.0135	0.0111
145	0.0254	0.0139	0.0115
146	0.0256	0.0140	0.0116
147	0.0259	0.0142	0.0117
148	0.0261	0.0143	0.0118
149	0.0265	0.0145	0.0120
150	0.0267	0.0146	0.0120
151	0.0271	0.0148	0.0122
152	0.0273	0.0150	0.0123
153	0.0277	0.0152	0.0125
154	0.0279	0.0153	0.0126
155	0.0284	0.0156	0.0128
156	0.0286	0.0157	0.0129
157	0.0291	0.0159	0.0131
158	0.0293	0.0161	0.0132
159	0.0299	0.0164	0.0135
160	0.0301	0.0165	0.0136
161	0.0307	0.0169	0.0139
162	0.0310	0.0170	0.0140
163	0.0317	0.0174	0.0143
164	0.0320	0.0176	0.0145
165	0.0327	0.0179	0.0148
166	0.0331	0.0181	0.0149
167	0.0339	0.0186	0.0153
168	0.0343	0.0188	0.0155
169	0.0352	0.0193	0.0159

170	0.0357	0.0196	0.0161
171	0.0367	0.0201	0.0166
172	0.0372	0.0204	0.0168
173	0.0383	0.0210	0.0173
174	0.0390	0.0214	0.0176
175	0.0403	0.0221	0.0182
176	0.0410	0.0225	0.0185
177	0.0426	0.0234	0.0192
178	0.0435	0.0238	0.0196
179	0.0454	0.0249	0.0205
180	0.0464	0.0255	0.0210
181	0.0488	0.0268	0.0220
182	0.0502	0.0275	0.0227
183	0.0533	0.0292	0.0241
184	0.0551	0.0302	0.0249
185	0.0444	0.0244	0.0201
186	0.0469	0.0257	0.0212
187	0.0533	0.0292	0.0241
188	0.0575	0.0315	0.0259
189	0.0693	0.0380	0.0313
190	0.0782	0.0429	0.0353
191	0.1117	0.0457	0.0661
192	0.1536	0.0457	0.1080
193	0.4809	0.0457	0.4352
194	0.0910	0.0457	0.0453
195	0.0626	0.0344	0.0283
196	0.0498	0.0273	0.0225
197	0.0571	0.0313	0.0258
198	0.0517	0.0283	0.0233
199	0.0476	0.0261	0.0215
200	0.0444	0.0243	0.0200
201	0.0418	0.0229	0.0189
202	0.0396	0.0217	0.0179
203	0.0378	0.0207	0.0170
204	0.0361	0.0198	0.0163
205	0.0347	0.0190	0.0157
206	0.0335	0.0184	0.0151
207	0.0324	0.0177	0.0146
208	0.0313	0.0172	0.0142
209	0.0304	0.0167	0.0137
210	0.0296	0.0162	0.0134
211	0.0288	0.0158	0.0130
212	0.0281	0.0154	0.0127
213	0.0275	0.0151	0.0124
214	0.0269	0.0147	0.0121
215	0.0263	0.0144	0.0119
216	0.0258	0.0141	0.0116
217	0.0248	0.0136	0.0112
218	0.0243	0.0133	0.0110
219	0.0238	0.0131	0.0108
220	0.0234	0.0128	0.0106
221	0.0230	0.0126	0.0104
222	0.0226	0.0124	0.0102
223	0.0223	0.0122	0.0101
224	0.0219	0.0120	0.0099
225	0.0216	0.0119	0.0098
226	0.0213	0.0117	0.0096
227	0.0210	0.0115	0.0095
228	0.0207	0.0114	0.0094
229	0.0205	0.0112	0.0092
230	0.0202	0.0111	0.0091
231	0.0199	0.0109	0.0090
232	0.0197	0.0108	0.0089
233	0.0195	0.0107	0.0088
234	0.0192	0.0106	0.0087
235	0.0190	0.0104	0.0086
236	0.0188	0.0103	0.0085
237	0.0186	0.0102	0.0084
238	0.0184	0.0101	0.0083
239	0.0182	0.0100	0.0082
240	0.0180	0.0099	0.0081
241	0.0179	0.0098	0.0081
242	0.0177	0.0097	0.0080
243	0.0175	0.0096	0.0079
244	0.0174	0.0095	0.0078
245	0.0172	0.0094	0.0078
246	0.0170	0.0093	0.0077
247	0.0169	0.0093	0.0076
248	0.0167	0.0092	0.0076
249	0.0166	0.0091	0.0075
250	0.0165	0.0090	0.0074
251	0.0163	0.0090	0.0074
252	0.0162	0.0089	0.0073

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253              0.0161          0.0088            0.0073
254              0.0159          0.0087            0.0072
255              0.0158          0.0087            0.0071
256              0.0157          0.0086            0.0071
257              0.0156          0.0085            0.0070
258              0.0155          0.0085            0.0070
259              0.0154          0.0084            0.0069
260              0.0153          0.0084            0.0069
261              0.0151          0.0083            0.0068
262              0.0150          0.0083            0.0068
263              0.0149          0.0082            0.0067
264              0.0148          0.0081            0.0067
265              0.0147          0.0081            0.0067
266              0.0146          0.0080            0.0066
267              0.0146          0.0080            0.0066
268              0.0145          0.0079            0.0065
269              0.0144          0.0079            0.0065
270              0.0143          0.0078            0.0064
271              0.0142          0.0078            0.0064
272              0.0141          0.0077            0.0064
273              0.0140          0.0077            0.0063
274              0.0139          0.0076            0.0063
275              0.0139          0.0076            0.0063
276              0.0138          0.0076            0.0062
277              0.0137          0.0075            0.0062
278              0.0136          0.0075            0.0062
279              0.0136          0.0074            0.0061
280              0.0135          0.0074            0.0061
281              0.0134          0.0074            0.0061
282              0.0133          0.0073            0.0060
283              0.0133          0.0073            0.0060
284              0.0132          0.0072            0.0060
285              0.0131          0.0072            0.0059
286              0.0131          0.0072            0.0059
287              0.0130          0.0071            0.0059
288              0.0129          0.0071            0.0058
--------------------------------------------------------------------
--------------------------------------------------------------------
Total soil rain loss =      3.59(In)
Total effective rainfall =      3.46(In)
Peak flow rate in flood hydrograph =     30.00(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        7.5      15.0      22.5      30.0
-----------------------------------------------------------------------
  0+ 5      0.0003      0.04  Q         |         |         |         |
  0+10      0.0022      0.28  Q         |         |         |         |
  0+15      0.0063      0.60  Q         |         |         |         |
  0+20      0.0116      0.76  VQ        |         |         |         |
  0+25      0.0171      0.80  VQ        |         |         |         |
  0+30      0.0227      0.81  VQ        |         |         |         |
  0+35      0.0284      0.82  VQ        |         |         |         |
  0+40      0.0341      0.83  VQ        |         |         |         |
  0+45      0.0398      0.83  VQ        |         |         |         |
  0+50      0.0455      0.83  VQ        |         |         |         |
  0+55      0.0512      0.83  VQ        |         |         |         |
  1+ 0      0.0570      0.83  VQ        |         |         |         |
  1+ 5      0.0627      0.84  VQ        |         |         |         |
  1+10      0.0685      0.84  VQ        |         |         |         |
  1+15      0.0743      0.84  VQ        |         |         |         |
  1+20      0.0801      0.84  VQ        |         |         |         |
  1+25      0.0859      0.85  |Q        |         |         |         |
  1+30      0.0918      0.85  |Q        |         |         |         |
  1+35      0.0976      0.85  |Q        |         |         |         |
  1+40      0.1035      0.85  |Q        |         |         |         |
  1+45      0.1094      0.86  |Q        |         |         |         |
  1+50      0.1153      0.86  |Q        |         |         |         |
  1+55      0.1212      0.86  |Q        |         |         |         |
  2+ 0      0.1272      0.86  |Q        |         |         |         |
  2+ 5      0.1331      0.86  |Q        |         |         |         |
  2+10      0.1391      0.87  |Q        |         |         |         |
  2+15      0.1451      0.87  |Q        |         |         |         |
  2+20      0.1511      0.87  |Q        |         |         |         |
  2+25      0.1571      0.87  |Q        |         |         |         |
  2+30      0.1632      0.88  |Q        |         |         |         |
  2+35      0.1692      0.88  |QV       |         |         |         |
  2+40      0.1753      0.88  |QV       |         |         |         |
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 2+45        0.1814       0.88   |QV       |         |         |         |
 2+50        0.1875       0.89   |QV       |         |         |         |
 2+55        0.1936       0.89   |QV       |         |         |         |
 3+ 0        0.1998       0.89   |QV       |         |         |         |
 3+ 5        0.2059       0.90   |QV       |         |         |         |
 3+10        0.2121       0.90   |QV       |         |         |         |
 3+15        0.2183       0.90   |QV       |         |         |         |
 3+20        0.2245       0.90   |QV       |         |         |         |
 3+25        0.2308       0.91   |QV       |         |         |         |
 3+30        0.2370       0.91   |QV       |         |         |         |
 3+35        0.2433       0.91   |QV       |         |         |         |
 3+40        0.2496       0.91   |QV       |         |         |         |
 3+45        0.2559       0.92   |Q V      |         |         |         |
 3+50        0.2623       0.92   |Q V      |         |         |         |
 3+55        0.2686       0.92   |Q V      |         |         |         |
 4+ 0        0.2750       0.93   |Q V      |         |         |         |
 4+ 5        0.2814       0.93   |Q V      |         |         |         |
 4+10        0.2878       0.93   |Q V      |         |         |         |
 4+15        0.2943       0.94   |Q V      |         |         |         |
 4+20        0.3007       0.94   |Q V      |         |         |         |
 4+25        0.3072       0.94   |Q V      |         |         |         |
 4+30        0.3137       0.94   |Q V      |         |         |         |
 4+35        0.3203       0.95   |Q V      |         |         |         |
 4+40        0.3268       0.95   |Q V      |         |         |         |
 4+45        0.3334       0.95   |Q V      |         |         |         |
 4+50        0.3400       0.96   |Q  V     |         |         |         |
 4+55        0.3466       0.96   |Q  V     |         |         |         |
 5+ 0        0.3532       0.96   |Q  V     |         |         |         |
 5+ 5        0.3599       0.97   |Q  V     |         |         |         |
 5+10        0.3666       0.97   |Q  V     |         |         |         |
 5+15        0.3733       0.97   |Q  V     |         |         |         |
 5+20        0.3800       0.98   |Q  V     |         |         |         |
 5+25        0.3868       0.98   |Q  V     |         |         |         |
 5+30        0.3936       0.99   |Q  V     |         |         |         |
 5+35        0.4004       0.99   |Q  V     |         |         |         |
 5+40        0.4072       0.99   |Q  V     |         |         |         |
 5+45        0.4141       1.00   |Q  V     |         |         |         |
 5+50        0.4210       1.00   |Q   V    |         |         |         |
 5+55        0.4279       1.00   |Q   V    |         |         |         |
 6+ 0        0.4349       1.01   |Q   V    |         |         |         |
 6+ 5        0.4418       1.01   |Q   V    |         |         |         |
 6+10        0.4488       1.02   |Q   V    |         |         |         |
 6+15        0.4558       1.02   |Q   V    |         |         |         |
 6+20        0.4629       1.02   |Q   V    |         |         |         |
 6+25        0.4700       1.03   |Q   V    |         |         |         |
 6+30        0.4771       1.03   |Q   V    |         |         |         |
 6+35        0.4842       1.04   |Q   V    |         |         |         |
 6+40        0.4914       1.04   |Q   V    |         |         |         |
 6+45        0.4986       1.05   |Q   V    |         |         |         |
 6+50        0.5058       1.05   |Q    V   |         |         |         |
 6+55        0.5131       1.05   |Q    V   |         |         |         |
 7+ 0        0.5204       1.06   |Q    V   |         |         |         |
 7+ 5        0.5277       1.06   |Q    V   |         |         |         |
 7+10        0.5350       1.07   |Q    V   |         |         |         |
 7+15        0.5424       1.07   |Q    V   |         |         |         |
 7+20        0.5498       1.08   |Q    V   |         |         |         |
 7+25        0.5573       1.08   |Q    V   |         |         |         |
 7+30        0.5648       1.09   |Q    V   |         |         |         |
 7+35        0.5723       1.09   |Q    V   |         |         |         |
 7+40        0.5799       1.10   |Q    V   |         |         |         |
 7+45        0.5874       1.10   |Q     V  |         |         |         |
 7+50        0.5951       1.11   |Q     V  |         |         |         |
 7+55        0.6027       1.11   |Q     V  |         |         |         |
 8+ 0        0.6104       1.12   |Q     V  |         |         |         |
 8+ 5        0.6182       1.12   |Q     V  |         |         |         |
 8+10        0.6259       1.13   |Q     V  |         |         |         |
 8+15        0.6337       1.13   |Q     V  |         |         |         |
 8+20        0.6416       1.14   |Q     V  |         |         |         |
 8+25        0.6495       1.15   |Q     V  |         |         |         |
 8+30        0.6574       1.15   |Q     V  |         |         |         |
 8+35        0.6654       1.16   |Q     V  |         |         |         |
 8+40        0.6734       1.16   |Q      V |         |         |         |
 8+45        0.6814       1.17   |Q      V |         |         |         |
 8+50        0.6895       1.18   |Q      V |         |         |         |
 8+55        0.6977       1.18   |Q      V |         |         |         |
 9+ 0        0.7059       1.19   |Q      V |         |         |         |
 9+ 5        0.7141       1.19   |Q      V |         |         |         |
 9+10        0.7224       1.20   |Q      V |         |         |         |
 9+15        0.7307       1.21   |Q      V |         |         |         |
 9+20        0.7390       1.22   |Q      V |         |         |         |
 9+25        0.7475       1.22   |Q      V |         |         |         |
 9+30        0.7559       1.23   |Q       V|         |         |         |
 9+35        0.7644       1.24   |Q       V|         |         |         |
```

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 9+40      0.7730      1.24  |Q       V|         |         |         |
 9+45      0.7816      1.25  |Q       V|         |         |         |
 9+50      0.7903      1.26  |Q       V|         |         |         |
 9+55      0.7990      1.27  |Q       V|         |         |         |
10+ 0      0.8078      1.28  |Q       V|         |         |         |
10+ 5      0.8166      1.28  |Q       V|         |         |         |
10+10      0.8255      1.29  |Q       V|         |         |         |
10+15      0.8345      1.30  |Q       V|         |         |         |
10+20      0.8435      1.31  |Q        V         |         |         |
10+25      0.8526      1.32  |Q        V         |         |         |
10+30      0.8617      1.33  |Q        V         |         |         |
10+35      0.8709      1.34  |Q        V         |         |         |
10+40      0.8802      1.35  |Q        V         |         |         |
10+45      0.8895      1.36  |Q        V         |         |         |
10+50      0.8989      1.36  |Q        V         |         |         |
10+55      0.9084      1.38  |Q        V         |         |         |
11+ 0      0.9179      1.39  |Q        V         |         |         |
11+ 5      0.9275      1.40  |Q        |V        |         |         |
11+10      0.9372      1.41  |Q        |V        |         |         |
11+15      0.9470      1.42  |Q        |V        |         |         |
11+20      0.9568      1.43  |Q        |V        |         |         |
11+25      0.9668      1.44  |Q        |V        |         |         |
11+30      0.9768      1.45  |Q        |V        |         |         |
11+35      0.9869      1.47  |Q        |V        |         |         |
11+40      0.9970      1.48  |Q        |V        |         |         |
11+45      1.0073      1.49  |Q        | V       |         |         |
11+50      1.0177      1.50  | Q       | V       |         |         |
11+55      1.0281      1.52  | Q       | V       |         |         |
12+ 0      1.0387      1.53  | Q       | V       |         |         |
12+ 5      1.0493      1.55  | Q       | V       |         |         |
12+10      1.0601      1.57  | Q       | V       |         |         |
12+15      1.0712      1.60  | Q       | V       |         |         |
12+20      1.0823      1.62  | Q       | V       |         |         |
12+25      1.0936      1.64  | Q       |  V      |         |         |
12+30      1.1050      1.66  | Q       |  V      |         |         |
12+35      1.1166      1.67  | Q       |  V      |         |         |
12+40      1.1282      1.69  | Q       |  V      |         |         |
12+45      1.1400      1.71  | Q       |  V      |         |         |
12+50      1.1519      1.73  | Q       |  V      |         |         |
12+55      1.1640      1.75  | Q       |  V      |         |         |
13+ 0      1.1762      1.77  | Q       |   V     |         |         |
13+ 5      1.1885      1.79  | Q       |   V     |         |         |
13+10      1.2011      1.82  | Q       |   V     |         |         |
13+15      1.2137      1.84  | Q       |   V     |         |         |
13+20      1.2266      1.86  | Q       |   V     |         |         |
13+25      1.2396      1.89  | Q       |   V     |         |         |
13+30      1.2527      1.92  | Q       |   V     |         |         |
13+35      1.2661      1.94  | Q       |    V    |         |         |
13+40      1.2797      1.97  | Q       |    V    |         |         |
13+45      1.2935      2.00  | Q       |    V    |         |         |
13+50      1.3075      2.03  | Q       |    V    |         |         |
13+55      1.3218      2.07  | Q       |    V    |         |         |
14+ 0      1.3362      2.10  | Q       |    V    |         |         |
14+ 5      1.3510      2.14  | Q       |     V   |         |         |
14+10      1.3660      2.18  | Q       |     V   |         |         |
14+15      1.3813      2.22  | Q       |     V   |         |         |
14+20      1.3969      2.27  |  Q      |     V   |         |         |
14+25      1.4129      2.32  |  Q      |     V   |         |         |
14+30      1.4292      2.37  |  Q      |      V  |         |         |
14+35      1.4459      2.42  |  Q      |      V  |         |         |
14+40      1.4630      2.48  |  Q      |      V  |         |         |
14+45      1.4805      2.55  |  Q      |      V  |         |         |
14+50      1.4985      2.61  |  Q      |      V  |         |         |
14+55      1.5171      2.69  |  Q      |       V |         |         |
15+ 0      1.5362      2.77  |  Q      |       V |         |         |
15+ 5      1.5559      2.87  |  Q      |       V |         |         |
15+10      1.5763      2.97  |  Q      |       V |         |         |
15+15      1.5976      3.08  |   Q     |        V|         |         |
15+20      1.6197      3.21  |   Q     |        V|         |         |
15+25      1.6426      3.32  |   Q     |        V|         |         |
15+30      1.6647      3.22  |   Q     |        V|         |         |
15+35      1.6858      3.05  |   Q     |         V         |         |
15+40      1.7073      3.13  |   Q     |         V         |         |
15+45      1.7307      3.40  |   Q     |         V         |         |
15+50      1.7571      3.82  |    Q    |         |V        |         |
15+55      1.7886      4.58  |     Q   |         |V        |         |
16+ 0      1.8333      6.50  |       Q |         |V        |         |
16+ 5      1.9191     12.45  |         |     Q   | V       |         |
16+10      2.0974     25.89  |         |         |    V    |   Q     |
16+15      2.3040     30.00  |         |         |      V  |        Q|
16+20      2.4147     16.07  |         |         |Q      V |         |
16+25      2.4662      7.48  |        Q|         |        V|         |
16+30      2.4968      4.45  |    Q    |         |        V|         |
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16+35       2.5242      3.98  |    Q    |         |         V         |
16+40       2.5468      3.27  |   Q     |         |         V         |
16+45       2.5676      3.03  |   Q     |         |         V         |
16+50       2.5871      2.82  |  Q      |         |         V         |
16+55       2.6054      2.66  |  Q      |         |         |V        |
17+ 0       2.6227      2.52  |  Q      |         |         |V        |
17+ 5       2.6393      2.40  |  Q      |         |         |V        |
17+10       2.6551      2.29  |  Q      |         |         |V        |
17+15       2.6702      2.20  | Q       |         |         |V        |
17+20       2.6849      2.12  | Q       |         |         | V       |
17+25       2.6990      2.05  | Q       |         |         | V       |
17+30       2.7127      1.99  | Q       |         |         | V       |
17+35       2.7260      1.93  | Q       |         |         | V       |
17+40       2.7389      1.88  | Q       |         |         | V       |
17+45       2.7515      1.83  | Q       |         |         | V       |
17+50       2.7638      1.78  | Q       |         |         |  V      |
17+55       2.7757      1.74  | Q       |         |         |  V      |
18+ 0       2.7875      1.70  | Q       |         |         |  V      |
18+ 5       2.7989      1.66  | Q       |         |         |  V      |
18+10       2.8101      1.62  | Q       |         |         |  V      |
18+15       2.8210      1.58  | Q       |         |         |  V      |
18+20       2.8316      1.54  | Q       |         |         |  V      |
18+25       2.8420      1.51  | Q       |         |         |   V     |
18+30       2.8522      1.48  |Q        |         |         |   V     |
18+35       2.8622      1.46  |Q        |         |         |   V     |
18+40       2.8721      1.43  |Q        |         |         |   V     |
18+45       2.8819      1.41  |Q        |         |         |   V     |
18+50       2.8914      1.39  |Q        |         |         |   V     |
18+55       2.9009      1.37  |Q        |         |         |   V     |
19+ 0       2.9102      1.35  |Q        |         |         |   V     |
19+ 5       2.9193      1.33  |Q        |         |         |   V     |
19+10       2.9284      1.31  |Q        |         |         |    V    |
19+15       2.9373      1.30  |Q        |         |         |    V    |
19+20       2.9461      1.28  |Q        |         |         |    V    |
19+25       2.9548      1.26  |Q        |         |         |    V    |
19+30       2.9634      1.25  |Q        |         |         |    V    |
19+35       2.9719      1.23  |Q        |         |         |    V    |
19+40       2.9803      1.22  |Q        |         |         |    V    |
19+45       2.9886      1.20  |Q        |         |         |    V    |
19+50       2.9968      1.19  |Q        |         |         |    V    |
19+55       3.0049      1.18  |Q        |         |         |    V    |
20+ 0       3.0129      1.17  |Q        |         |         |     V   |
20+ 5       3.0209      1.15  |Q        |         |         |     V   |
20+10       3.0287      1.14  |Q        |         |         |     V   |
20+15       3.0365      1.13  |Q        |         |         |     V   |
20+20       3.0442      1.12  |Q        |         |         |     V   |
20+25       3.0519      1.11  |Q        |         |         |     V   |
20+30       3.0594      1.10  |Q        |         |         |     V   |
20+35       3.0669      1.09  |Q        |         |         |     V   |
20+40       3.0744      1.08  |Q        |         |         |     V   |
20+45       3.0817      1.07  |Q        |         |         |     V   |
20+50       3.0890      1.06  |Q        |         |         |     V   |
20+55       3.0963      1.05  |Q        |         |         |      V  |
21+ 0       3.1035      1.04  |Q        |         |         |      V  |
21+ 5       3.1106      1.03  |Q        |         |         |      V  |
21+10       3.1177      1.03  |Q        |         |         |      V  |
21+15       3.1247      1.02  |Q        |         |         |      V  |
21+20       3.1316      1.01  |Q        |         |         |      V  |
21+25       3.1385      1.00  |Q        |         |         |      V  |
21+30       3.1454      0.99  |Q        |         |         |      V  |
21+35       3.1522      0.99  |Q        |         |         |      V  |
21+40       3.1589      0.98  |Q        |         |         |      V  |
21+45       3.1656      0.97  |Q        |         |         |      V  |
21+50       3.1723      0.97  |Q        |         |         |      V  |
21+55       3.1789      0.96  |Q        |         |         |       V |
22+ 0       3.1854      0.95  |Q        |         |         |       V |
22+ 5       3.1920      0.95  |Q        |         |         |       V |
22+10       3.1984      0.94  |Q        |         |         |       V |
22+15       3.2049      0.93  |Q        |         |         |       V |
22+20       3.2113      0.93  |Q        |         |         |       V |
22+25       3.2176      0.92  |Q        |         |         |       V |
22+30       3.2239      0.92  |Q        |         |         |       V |
22+35       3.2302      0.91  |Q        |         |         |       V |
22+40       3.2364      0.90  |Q        |         |         |       V |
22+45       3.2426      0.90  |Q        |         |         |       V |
22+50       3.2488      0.89  |Q        |         |         |       V |
22+55       3.2549      0.89  |Q        |         |         |       V |
23+ 0       3.2610      0.88  |Q        |         |         |        V|
23+ 5       3.2670      0.88  |Q        |         |         |        V|
23+10       3.2730      0.87  |Q        |         |         |        V|
23+15       3.2790      0.87  |Q        |         |         |        V|
23+20       3.2849      0.86  |Q        |         |         |        V|
23+25       3.2908      0.86  |Q        |         |         |        V|
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   23+30        3.2967       0.85  |Q         |         |         |        V|
   23+35        3.3026       0.85  |Q         |         |         |        V|
   23+40        3.3084       0.84  |Q         |         |         |        V|
   23+45        3.3142       0.84  |Q         |         |         |        V|
   23+50        3.3199       0.84  |Q         |         |         |        V|
   23+55        3.3257       0.83  |Q         |         |         |        V|
   24+ 0        3.3314       0.83  |Q         |         |         |        V|
   24+ 5        3.3367       0.78  |Q         |         |         |        V|
   24+10        3.3405       0.54  Q          |         |         |        V|
   24+15        3.3420       0.21  Q          |         |         |        V|
   24+20        3.3424       0.06  Q          |         |         |        V|
   24+25        3.3425       0.02  Q          |         |         |        V|
   24+30        3.3426       0.01  Q          |         |         |        V|
-----------------------------------------------------------------------
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TRACT 20394
DETENTION BASIN
STAGE-VOLUME-DISCHARGE RELATIONSHIP

			Total			**Cumulative**
Basin	**Elevation**	**Depth**	**Area**	**Volume**	**Volume**	**Volume**
	(ft)	(ft)	(sf)	(cf)	(ac-ft)	(ac-ft)
3'Lx8"H				7518	0.1726	
Opening	837.0	5.0	10367			0.8651
				9684	0.2223	
	836.0	4.0	9000			0.6428
				8550	0.1963	
	835.0	3.0	8100			0.4465
				7450	0.1710	
	834.0	2.0	6800			0.2755
				6400	0.1469	
	833.0	1.0	6000			0.1286
				5600	0.1286	
	832.0	0.0	5200			0.0000

835.33 3.33 max DCV depth

Basin Capacity = 22,271 c.f.
for Water Quality mitigation
at 48 hr drawdown

DCV = 21,842 c.f.

Basin Capacity for
2 and 100 yr stormwat
mitigation at 72 hr draw

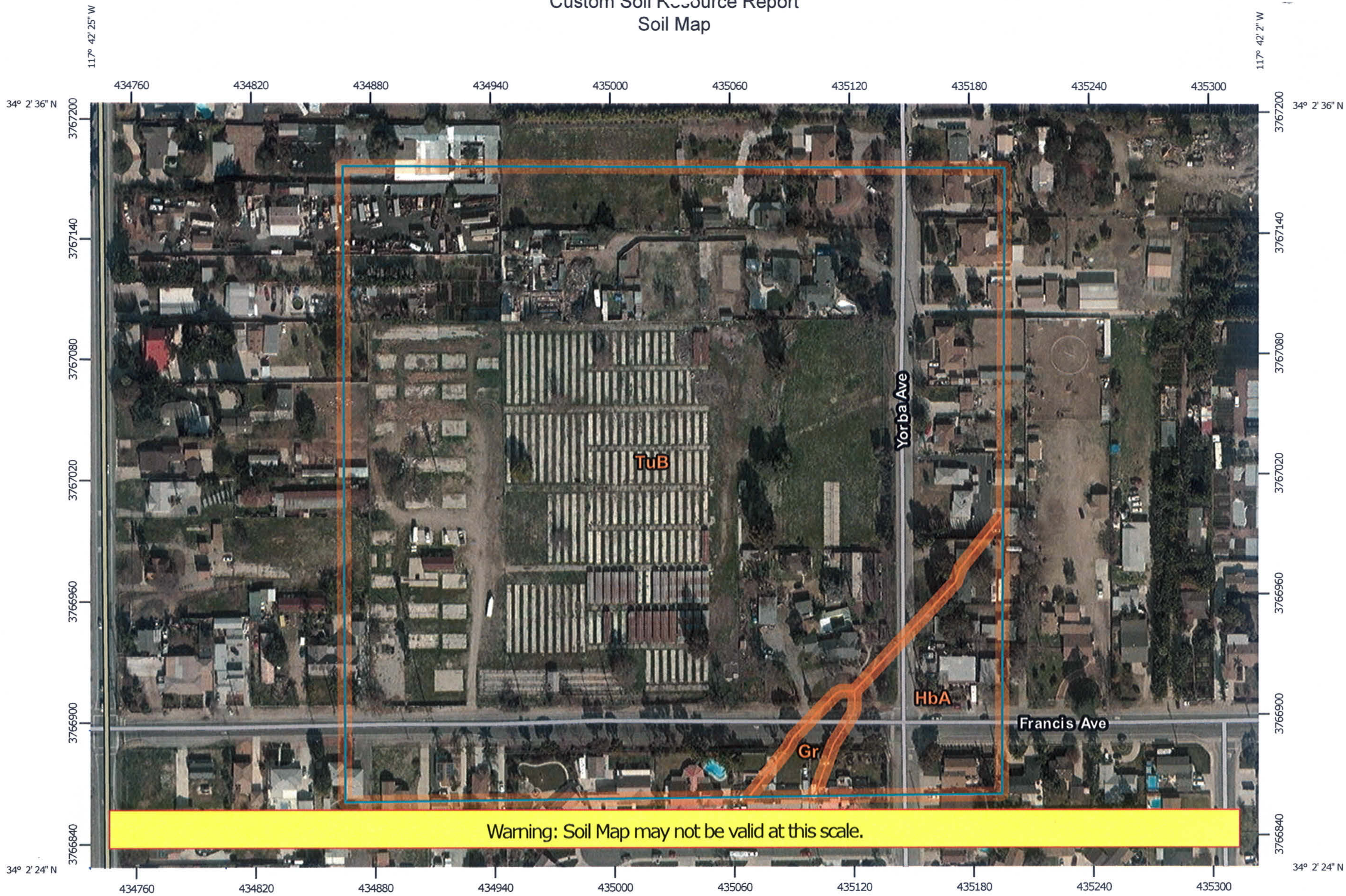
Note #1: outflow with Infiltration Rate =2.5" per hour (in-situ); F.S = 3.0
Note #2: outflow 3'L x 8"H opening when water reaches 5.0 ft at elevation 837.0
Note #3: Δ Volume for Pre and Post Development for 100 year storm = 6,577 c.f.; Stormwater Volume Difference will be fully infiltrated
Note #4: Δ Volume for Pre and Post Development for 2 year storm = 2,195 c.f.; Stormwater Volume Difference will be fully infiltrated

E

E. Hydrologic Soils Group Map

- Precipitation
- Geotechnical Investigation
- Hydrology Maps

Soil Map



Map Scale: 1:2,680 if printed on A landscape (11" x 8.5") sheet.

N

0 35 70 140 210 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

Available water storage in profile: Very high (about 20.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Greenfield, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford, steeper slopes

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

TuB—Tujunga loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hcl1
Elevation: 10 to 2,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga, Loamy Sand

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 6 inches: loamy sand
C1 - 6 to 18 inches: loamy sand
C2 - 18 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
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: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Tujunga, gravelly loamy sand

Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hanford, sandy loam

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Precipitation:

Storm Frequency.	Time Periods					
Year			1 (hr)		6 (hr)	24 (hr)
2			0.60		1.45	2.50
10			0.90			
100			1.30		3.40	7.05

L e g e n d

1.30	Reading from Precipitation Chart
1.30	Calculated Precipitation (inches)

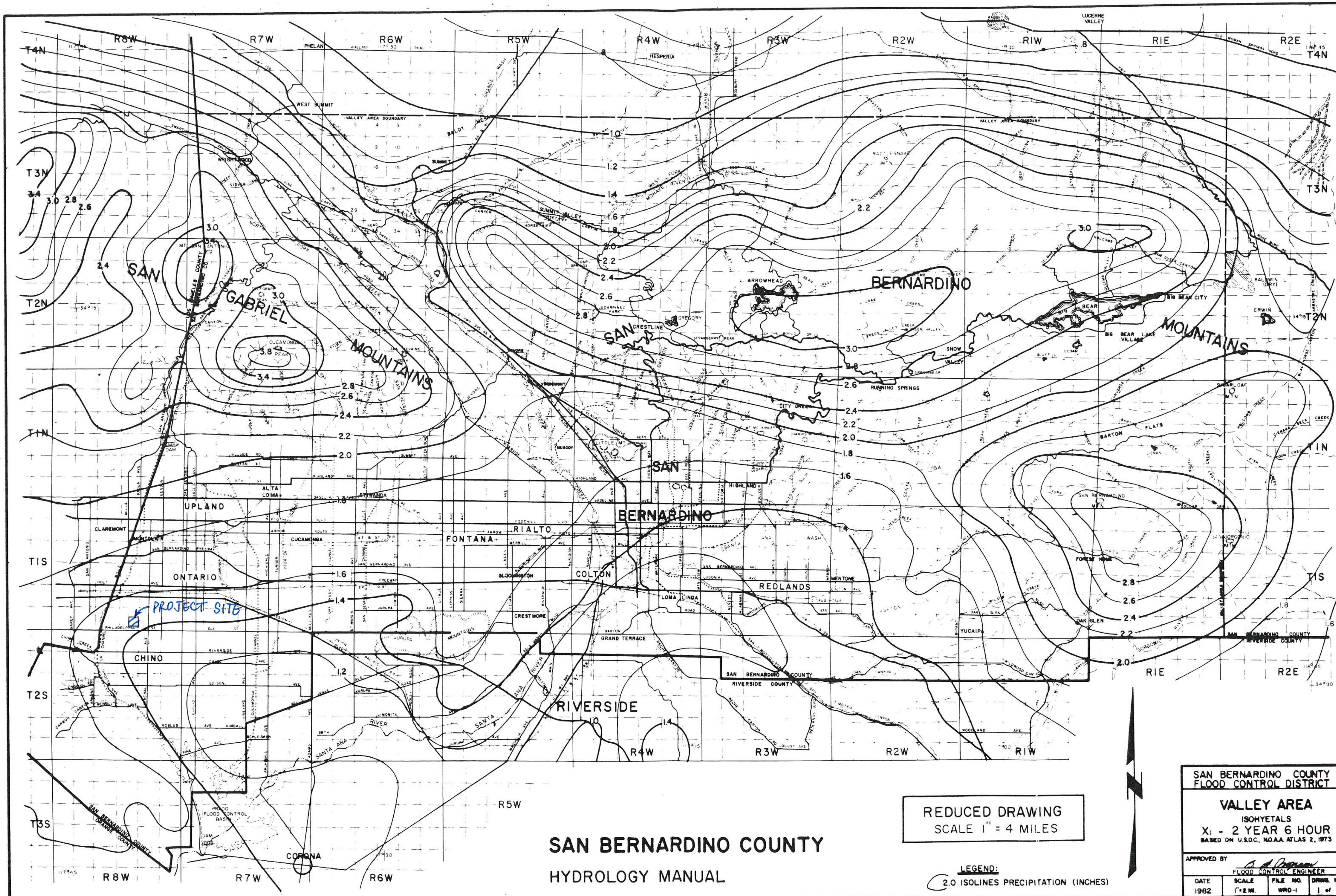
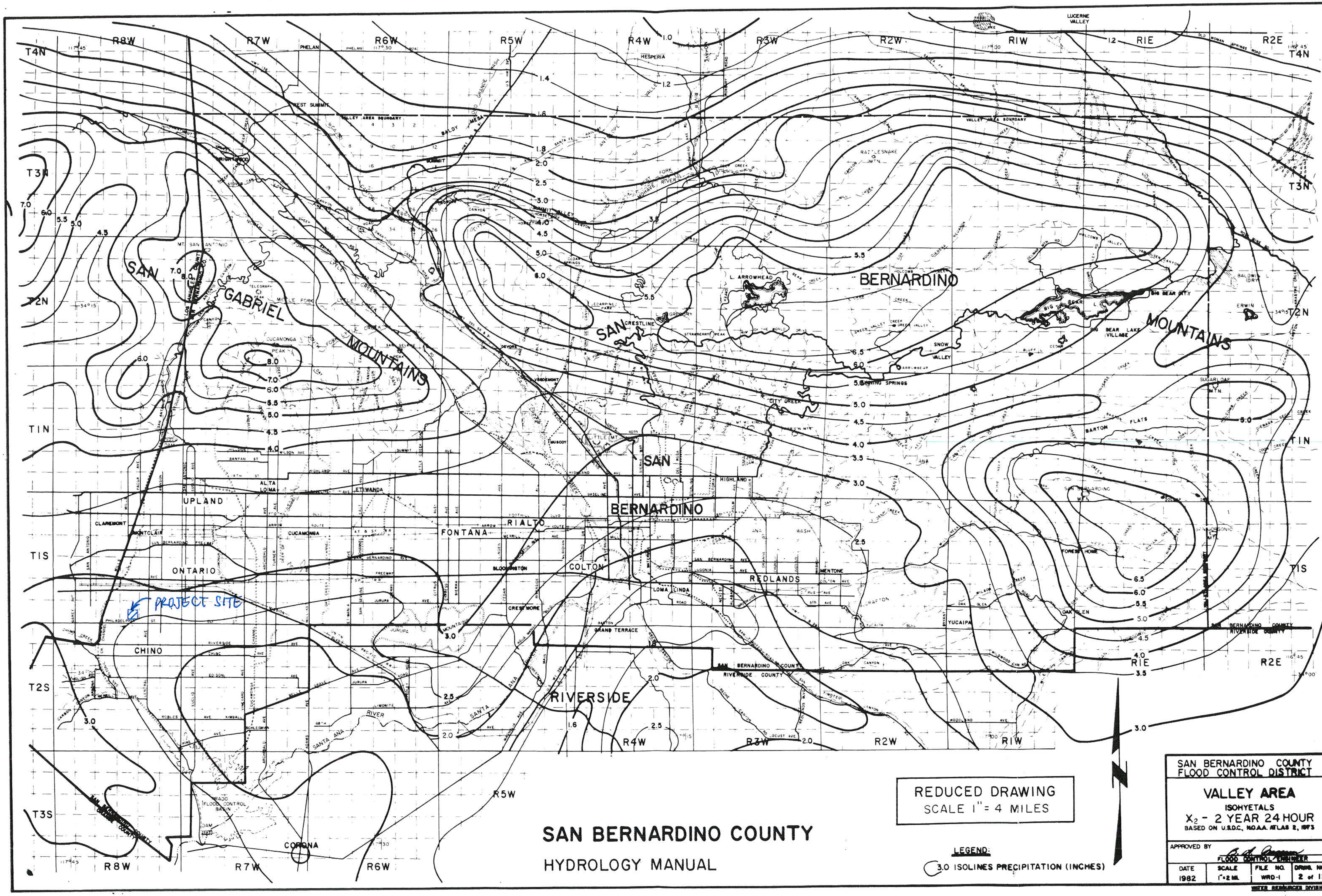
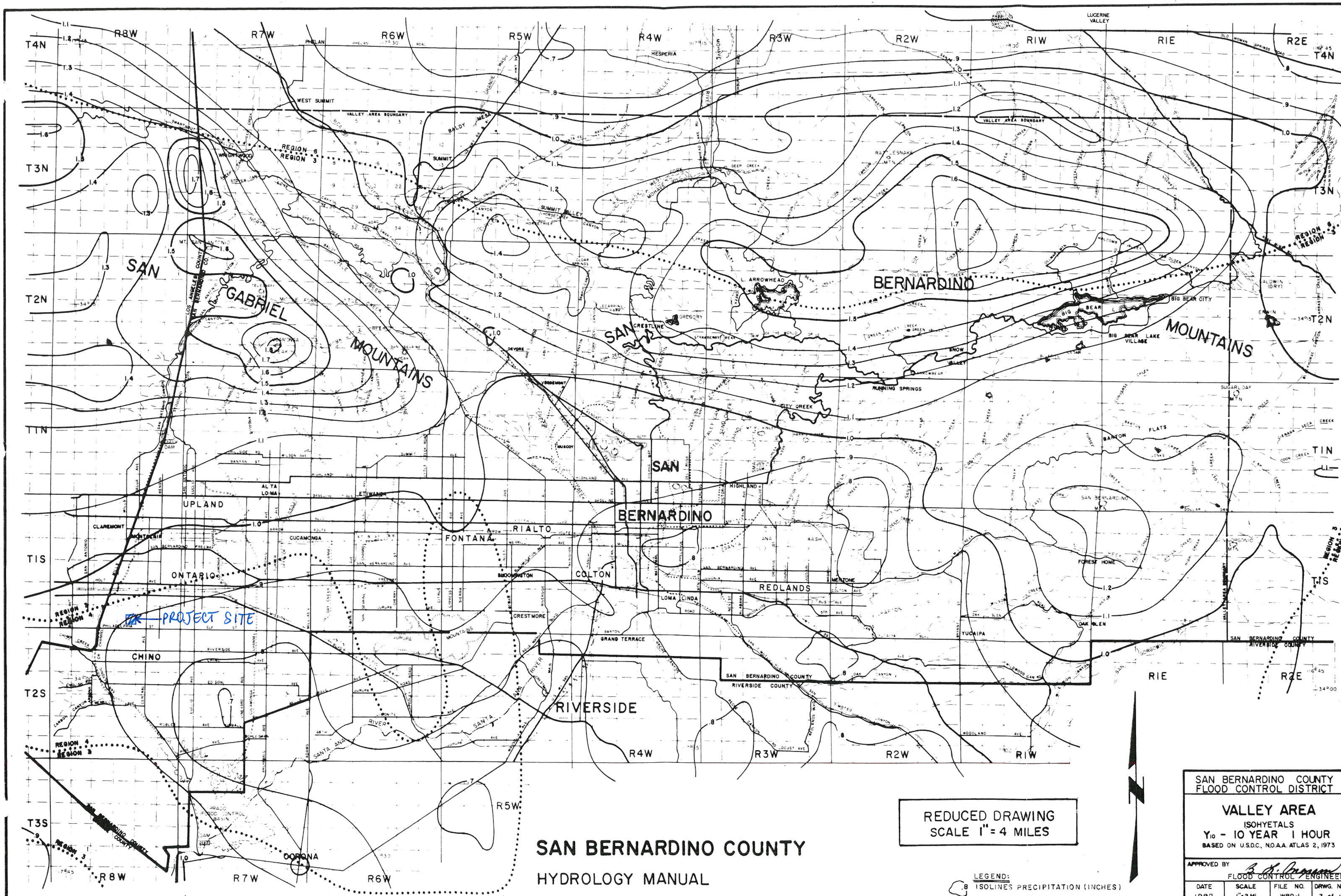

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
2.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X1 - 2 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1"=2 MI.
FILE NO.
WRD-1
DRWG. NO.
1 of 12
PROJECT SITE
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
CLAREMONT
MONTCLAIR
ONTARIO
CHINO
ALTA LOMA
CUCAMONGA
ETIWANDA
FONTANA
RIALTO
COLTON
BLOOMINGTON
LOMA LINDA
REDLANDS
MENTONE
YUCAIPA
GRAND TERRACE
CRESTMORE
RIVERSIDE
CORONA
HESPERIA
PHELAN
WEST SUMMIT
WRIGHTWOOD
CRESTLINE
RUNNING SPRINGS
BIG BEAR CITY
BIG BEAR LAKE VILLAGE
LAKE ARROWHEAD
FOREST HOME
OAK GLEN
VALLEY AREA BOUNDARY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
SAN BERNARDINO COUNTY
ORANGE COUNTY
PRADO FLOOD CONTROL BASIN
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S

FIGURE B-1


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
3.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X2 - 2 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1" = 2 MI.
FILE NO. WRD-1
DRWG. NO. 2 of 12
WATER RESOURCES DIVISION
PROJECT SITE
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
CORONA
LOMA LINDA
YUCAIPA
CLAREMONT
MONTCLAIR
CUCAMONGA
ALTA LOMA
BLOOMINGTON
GRAND TERRACE
MENTONE
BIG BEAR LAKE
L. ARROWHEAD
CRESTLINE
HESPERIA
WRIGHTWOOD
MT. SAN ANTONIO
CUCAMONGA PEAK
SUGARLOAF MTN
SAN BERNARDINO MTN.
FOREST HOME
OAK GLEN
LUCERNE VALLEY
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
.8 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y10 - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1" = 2 Mi.
FILE NO.
WRD-1
DRWG. NO.
3 of 12
PROJECT SITE
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
CORONA
CUCAMONGA
CLAREMONT
MONTCLAIR
LOMA LINDA
YUCAIPA
BIG BEAR LAKE
L. ARROWHEAD
LUCERNE VALLEY
HESPERIA
WRIGHTWOOD
REGION 6
REGION 3
REGION 4

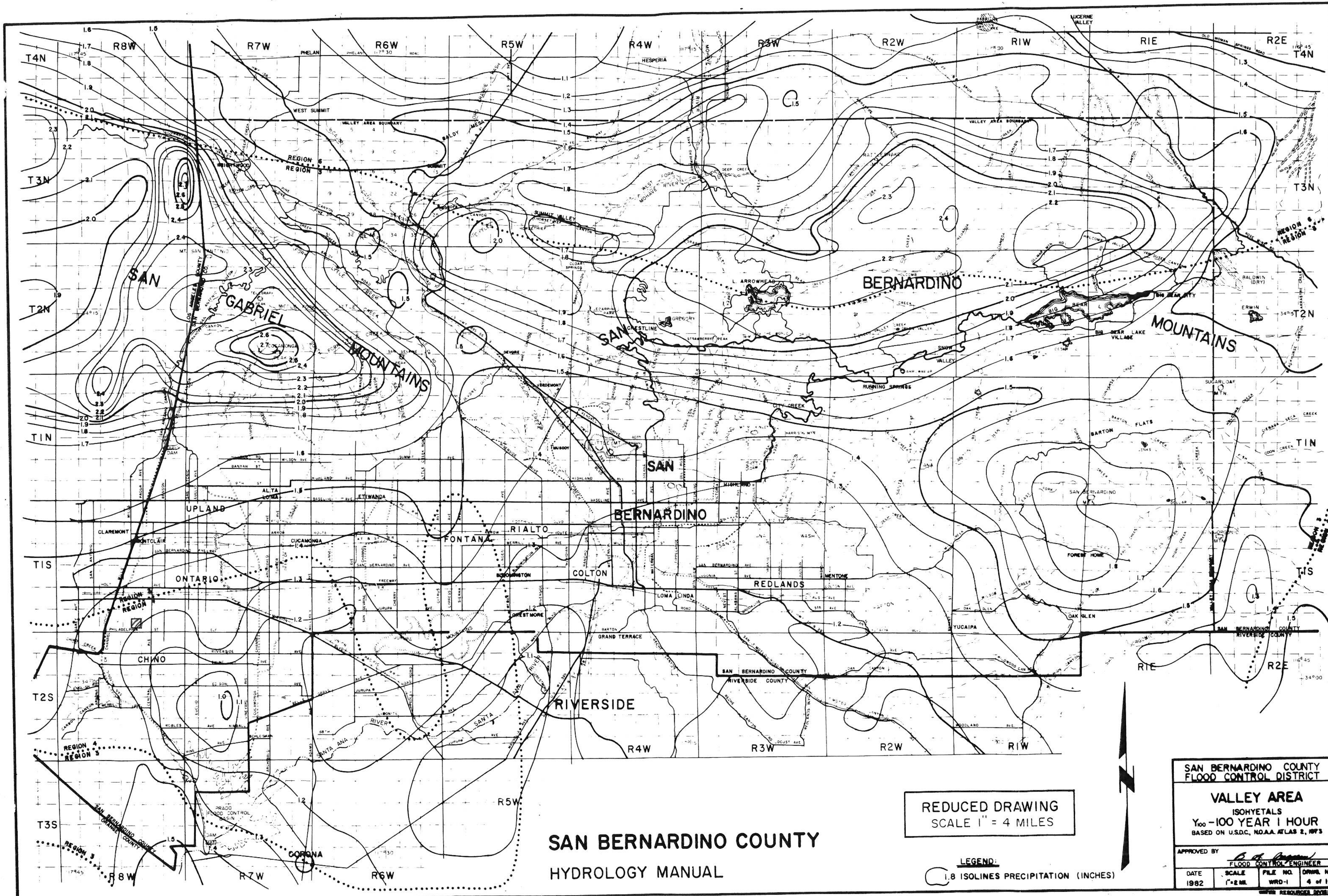
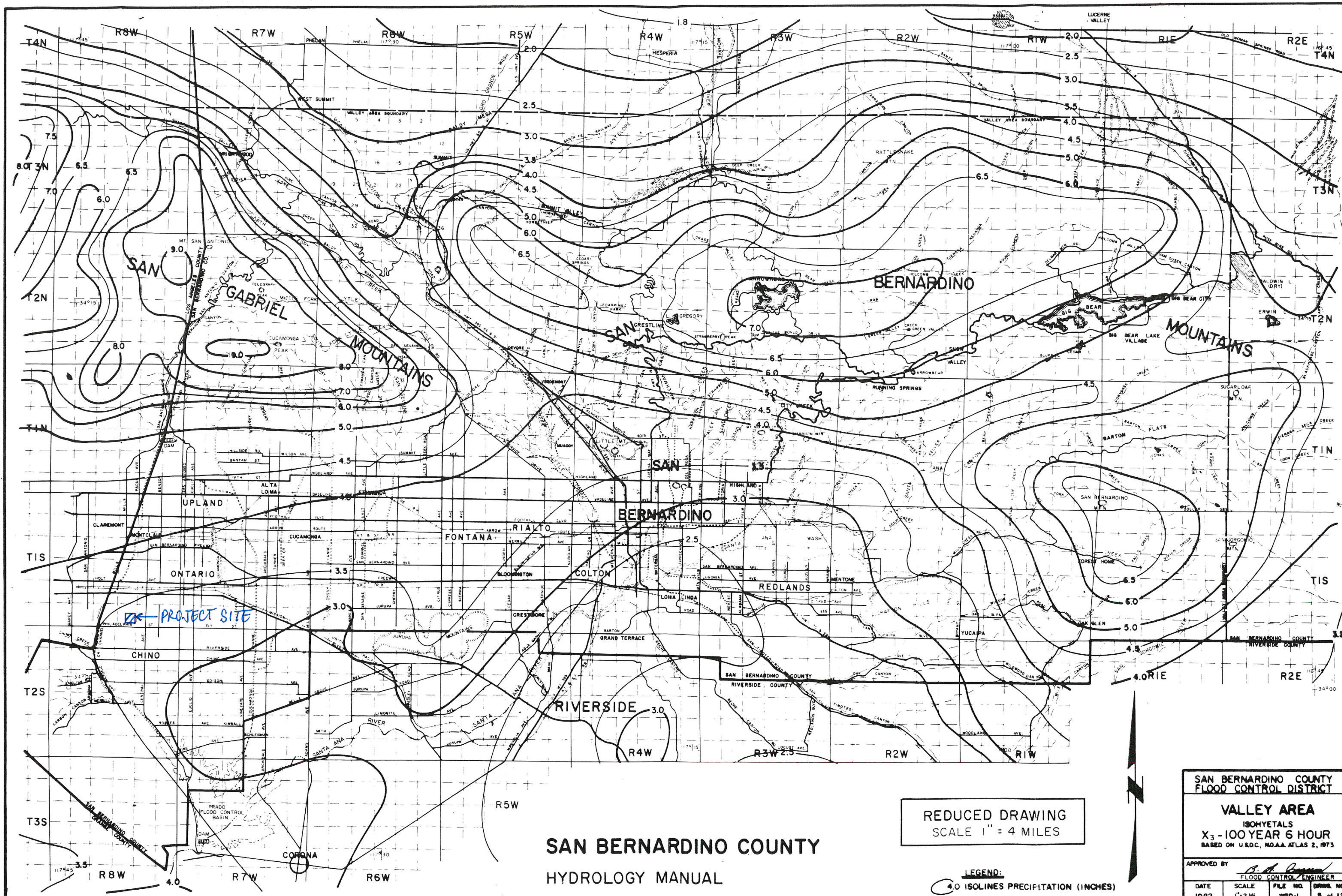
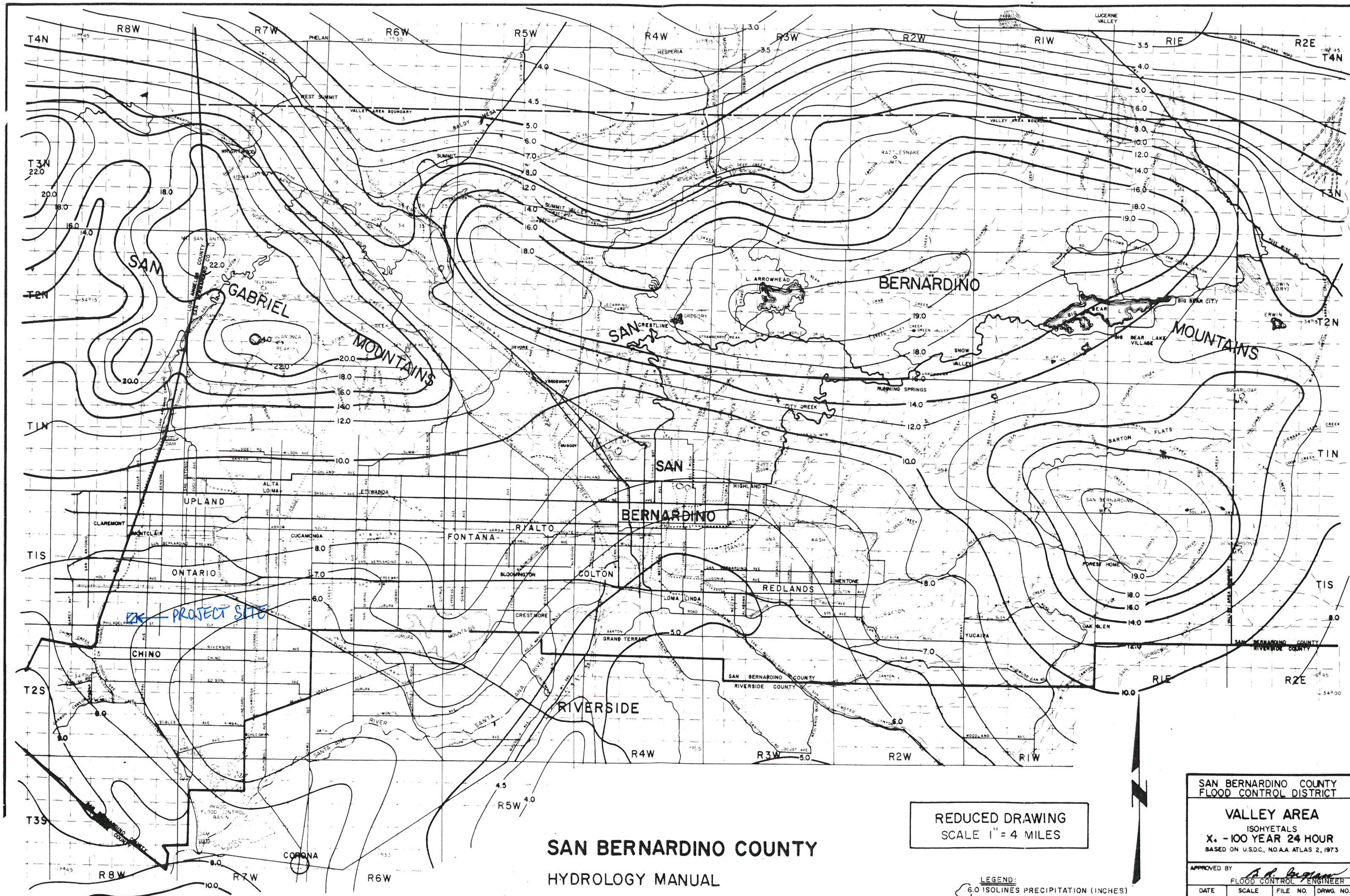

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1" = 2 MI.
FILE NO.
WRD-1
DRWG. NO.
4 of 12
WATER RESOURCES DIVISION
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
RIVERSIDE
CORONA
YUCAIPA
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S

FIGURE B-4


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X3 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1"=2 MI.
FILE NO.
WRD-1
DRWG. NO.
5 of 12
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
PROJECT SITE
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
CLAREMONT
MONTCLAIR
ONTARIO
CHINO
CUCAMONGA
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
YUCAIPA
RIVERSIDE
CORONA
ALTA LOMA
GRAND TERRACE
BLOOMINGTON
HESPERIA
PHELAN
LUCERNE VALLEY
RUNNING SPRINGS
CRESTLINE
BIG BEAR LAKE
BIG BEAR CITY
BIG BEAR LAKE VILLAGE
SUGARLOAF MTN.
SAN BERNARDINO MTN.
FOREST HOME
OAK GLEN
MT. SAN ANTONIO
CUCAMONGA PEAK
RATTLESNAKE MTN.
PRADO FLOOD CONTROL BASIN
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
ORANGE COUNTY
VALLEY AREA BOUNDARY
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X₄ - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1"=2 Mi.
FILE NO.
WRD-1
DRWG. NO.
6 of 12
PROJECT SITE
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
RIVERSIDE
CORONA
CLAREMONT
MONTCLAIR
CUCAMONGA
ALTA LOMA
ETIWANDA
BLOOMINGTON
GRAND TERRACE
YUCAIPA
MENTONE
HESPERIA
PHELAN
LUCERNE VALLEY
L. ARROWHEAD
BIG BEAR CITY
RUNNING SPRINGS
FOREST HOME
OAK GLEN
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
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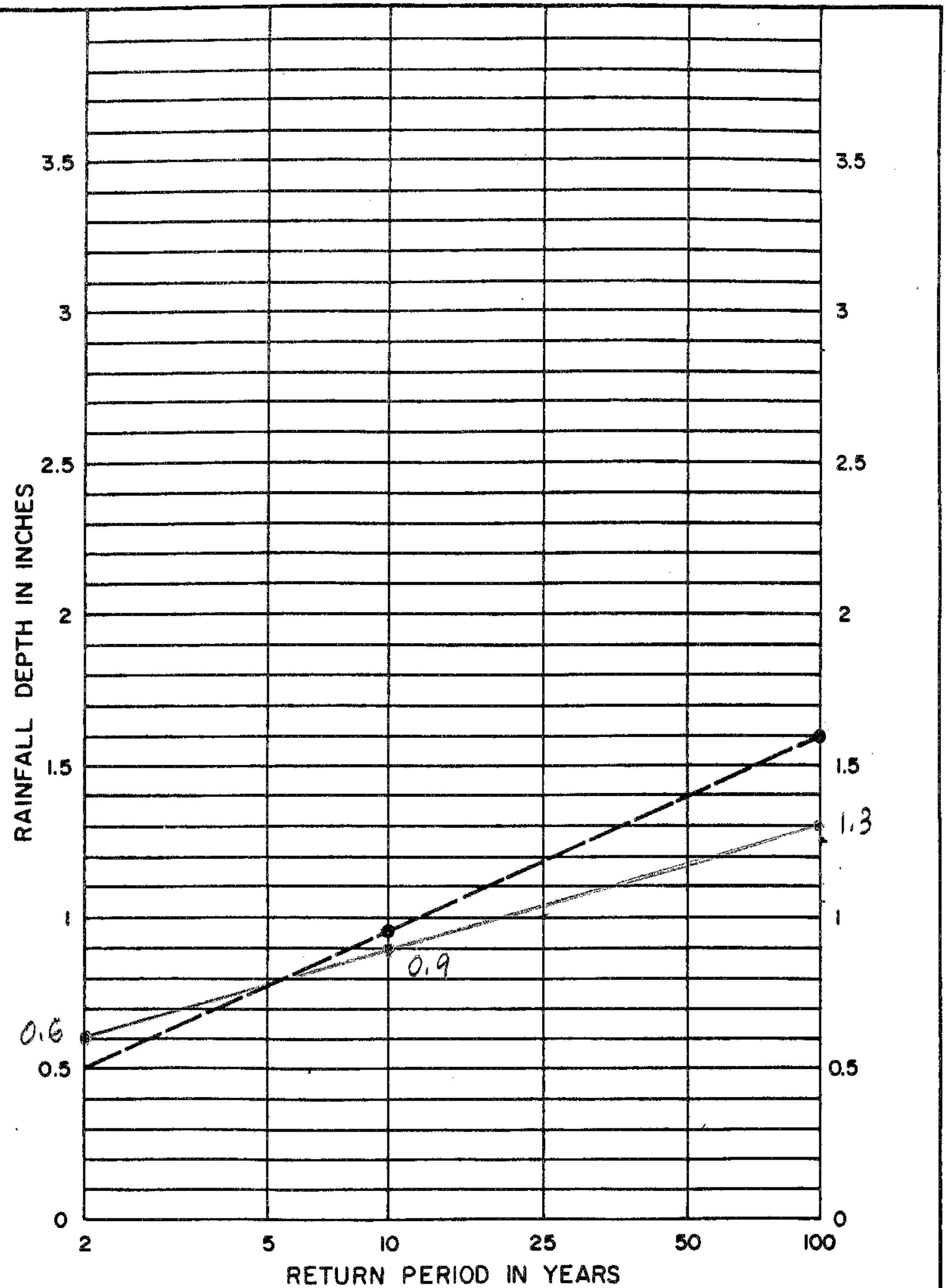
R1W
R1E
R2E



NOTE:

1. FOR INTERMEDIATE RETURN PERIODS PLOT 10-YEAR AND 100-YEAR ONE HOUR VALUES FROM MAPS, THEN CONNECT POINTS AND READ VALUE FOR DESIRED RETURN PERIOD. FOR EXAMPLE GIVEN 10-YEAR ONE HOUR = 0.95" AND 100-YEAR ONE HOUR = 1.60", 25-YEAR ONE HOUR = 1.18".

REFERENCE: NOAA ATLAS 2, VOLUME XI - CAL., 1973

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

FIGURE D-2

April 12, 2022

Project No. 10557.007

Yorba Villas, LLC
c/o Borstein Enterprises
11766 Wilshire Boulevard, Suite 280
Los Angeles, California 90025

Attention: Mr. Erik Pfahler
Senior Vice President

Subject: Updated Infiltration Testing and Recommendations for Proposed Infiltration Facilities
Yorba Villas Residential Development, Tentative Tract 20394
Northwest of Francis Avenue and Yorba Avenue
North of Chino, Unincorporated San Bernardino County, California

In accordance with your request and authorization, Leighton and Associates, Inc. (Leighton) has conducted infiltration testing within the proposed infiltration basin at the southeast corner of the proposed Yorba Villas residential development, located northwest of Francis Avenue and Yorba Avenue in unincorporated San Bernardino County, just north of the City of Chino, California. This report supersedes and replaces a previous report of infiltration (Leighton, 2022), based on our conversations with the County of San Bernardino reviewers for the water quality management plan (WQMP) aspects of the proposed project. The recommendations presented herein also supersede Leighton, 2021a.

We performed infiltration tests for the proposed basin during this current study. Based on the current and previous testing, we conclude that granular soils with permeability conducive to infiltration are located at shallow depths across much of the site, and, specifically at the proposed basin location, both at or slightly below the bottom of the proposed basin, and again at a depth generally deeper than approximately 35 to 40 feet below the existing ground surface (bgs). There are fine-grained soils of low permeability intervening and underlying these granular layers. We have considered the presence of these granular and fine-grained soil layers in development of the infiltration recommendations contained herein.

I N T R O D U C T I O N

Project Description

Based on the Preliminary Water Quality Management Plan Sheet 1 of 2 for *Vesting Tentative Tract No. 20394*, prepared by MDS Consulting, plot date April 11, 2022, we understand that the Yorba Villas residential development will consist of 45 single-family-residence lots with a main entry street off of Francis Avenue and two cul de sac streets. Permeable pavers for storm water infiltration are planned within portions of the streets. A retention/water quality basin is proposed within Lot "A", located at the southeast corner of the development. The proposed 6914-square-foot infiltration basin will have a bottom elevation of approximately 831 feet above mean sea level (msl), which is approximately 10 feet below existing grade. A 30-inch-diameter storm drain will empty into the basin via a forebay at the northwest corner of the basin. A basin overflow outlet will be located at the southeast corner of the basin, with a 3-foot-wide parkway drain flowing onto Francis Avenue. A maintenance ramp will be located on the north side of the basin. Public access to the basin will be blocked by fencing. A small park will be located directly east of the proposed basin.

Scope of Work

The scope of our current study has included the following tasks:

- Background Review: We reviewed available, relevant geotechnical geologic maps, reports, and aerial photographs available in our in-house library.

- Utility Coordination: We contacted Underground Services Alert (USA) at least 48 hours prior to drilling the borings to locate major utilities, underground services, and easements.

  Field Exploration: For this current study, we excavated, logged, and sampled six (6) hollow-stem auger borings (LC-4, 4A, 1B and LC-5, 5A, 5B) to depths ranging from approximately 40 to 81 feet below the existing ground surface. The borings were drilled using a subcontracted truck-mounted drill rig. The borings were logged and sampled by a member of our technical staff under supervision of a licensed Civil Engineer. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a Modified California split-barrel sampler lined with brass rings.

Logs of the geotechnical borings are attached in Appendix A. Approximate boring and well permeameter test locations are shown on Figure 1 - *Exploration Location Map*.

- Infiltration Testing: We conducted well permeameter tests within the borings to evaluate infiltration rates of the subsurface soils at the depths and locations tested. Only initial infiltration testing was conducted within Borings LC-4, 4A, 5, and 5A, since the initial testing showed slower infiltration results than what was considered feasible for basin infiltration, and, thus, these infiltration tests were terminated after initial observations. Within the remaining two borings, LC-4B and 5B, initial infiltration rates within the tests were favorable, and thus the tests were continued. The well permeameter tests were conducted based on the USBR 7300-89 method and in general accordance with San Bernardino County guidelines. The tests were conducted in two principal granular soil zones at depths greater than 35 feet bgs in Borings LC-4B and LC-5B to estimate infiltration rates in the soil zones tested. Water was obtained from a nearby fire hydrant by filling a 2000-gallon water truck and transporting to the site; the tests within Borings LC-4B and 5B used a total of roughly 3,000 gallons of water. Infiltration test logs are included in Appendix B.

  For clarity in the text of this current report, discussion of borings presented in this report and the two previous referenced reports are designated as shown in Table 1 below:

Table 1 – Boring Number Designations

Reference Report	Dates of Exploration	Boring Numbers as referred to in this Current Report
Leighton, 2021b (updated 9/27/2021)	12/13/2013	LB-1 through LB-5
Leighton, 2021a (7/26/21)	6/10/2021	LC-1 through LC-3 *(formerly designated LB-1 through -3)*
Current Report	12/23/2021 to 1/25/2022	LC-4 through LC-5B *(formerly designated LB-1 through -2B)*

- Engineering Analysis: Data obtained from our testing was evaluated and analyzed to provide the conclusions and recommendations presented in this report.

- Report Preparation: Results of our infiltration study and design recommendations have been summarized in this report.

FINDINGS

Site Description

The site of the Yorba Villas residential development consists of approximately 11.6 acres of land that was previously utilized as grazing land for a goat farm. The site is currently vacant, covered with seasonal grasses and containing scattered trees and bushes. The proposed infiltration basin is located in the southeastern corner of the site. Our previous geotechnical investigation (Leighton, 2021b) described a residence, a pool, and other structures in this portion of the site during the 2013 exploration. Those previous structures and the pool have since been demolished. The site typically drains gently to the south.

Previous Studies

Leighton conducted a geotechnical investigation for the Yorba Villas residential project (Leighton, 2021b) that included subsurface exploration and provided conclusions and recommendations for grading and construction. That geotechnical investigation included drilling exploratory borings and performing well permeameter tests.

Subsurface Soil Conditions

The alluvial soil encountered within our explorations across the site generally consisted of combinations of sand and silt, with some gravel interspersed (borings LB-1 through LB-5). The soil was generally moist and medium dense. The in-situ moisture content within the upper approximately 15 feet generally ranged from 1 to 10 percent.

Within the borings across site, with the exception of the borings in the basin location, silty sand to sand was encountered within the upper 15 feet, underlain by interspersed sequences of fine-grained soil (silt and clay) and coarser-grained soil (sand and silty sand). While LB-3 did have silty sand at shallow depths, this soil had significantly higher fines content than shallow soils within LB-1, 2, 4, and 5. The eastern side of the site appears to have more silty soils at shallow depths (boring LB-3 and the borings in the basin location).

Soils encountered within the borings in the proposed basin (borings LC-1 through -5B), consisted of alluvial soil deposits generally consisting of combinations of sand and silt, with some gravel. The soils encountered in this area generally consisted of slightly moist, stiff silt in the upper approximately 10 feet bgs. This upper layer was underlain by an approximately 5-foot-thick layer of slightly moist medium dense silty sand with low fines content to poorly graded sand; this granular extended to a depth of approximately 15 feet bgs. That granular layer was underlain by moist, stiff silt extending to depths ranging from approximately 30 to 40 feet bgs. Initial infiltration in LC-4, 4A, 5, and 5A near the bottom of those silty soils did not exhibit adequate infiltration rates for reliable disposal of storm water in the basin.

In general, soils encountered at depth in the basin area consisted of two coarse-grained dense sandy soil layers ranging from silty sand to poorly graded sand with gravel; these layers are referred to herein as Deep Granular Zones 1 and 2. These two zones were separated by a hard silt layer that extended from approximately 55 to 66 (or 70) feet.

The principal granular layers described above are summarized in the following table:

Table 2 – Description of Granular Soil Zones

Soil Zone	Soil Classification	Approx. Top of Zone (feet bgs)	Approx. Bottom of Zone (feet bgs)	Approx. Thickness (ft)
Western Shallow Granular Zone (borings LB-1, 2, 4, and 5; not LB-3 or at the basin)	Silty Sand generally less than 30% fines (SM) to Sand (SP	0	15	15
Basin Shallow Granular Zone (borings LC-1 to 3)	Silty Sand with up to ±15 fines content (SM) to Sand (SP)	10	15	5
Basin Deep Granular Zone 1 (borings LC-4B, 5B)	Sand to Silty Sand with Gravel	38 to 40	55	15 to 17
Basin Deep Granular Zone 2 (borings LC-4B, 5B)	Sand to Silty Sand with Gravel	66 to 70	81 or greater	15

More detailed descriptions of the subsurface conditions are presented on the boring logs (Appendix A).

Groundwater

Groundwater was not encountered in our borings excavated to a maximum depth of 81 feet below the existing ground surface (bgs). Historical groundwater mapping indicates that groundwater was approximately 150 feet bgs in 1933 (CDWR, 1970).

Regional data for water wells located within a 1½-mile radius of the site was reviewed to evaluate historical ground water levels. The shallowest historical groundwater levels encountered were on the order of 235 feet bgs in 1985 for a well maintained by the Chino Basin Watermaster (Local Well ID CHINO-1002741) located 1.2 miles southeast of the site. Recent water levels indicate groundwater is on the order of 258 feet bgs (CDWR, 2022). Shallow groundwater is not anticipated. Based on our review of historical data, we have estimated the historically highest groundwater to be on the order of 150 feet bgs.

Infiltration Testing

Previous infiltration testing within shallow soils in borings located within the western and central portions of the site, namely borings LB-1 and 5, ranged from 3.5 to 13 inches per hour (raw rates).

Boring LB-3 in the eastern portion of the site, had a tested infiltration rate 0.3 inch per hour (raw rate). Shallow soils encountered in the upper 10 feet at the basin location, also in the eastern portion of the site, were fine grained and were deemed to be of low permeability based on observation.

We conducted infiltration tests in the proposed basin to evaluate infiltration rates of the subsurface soils at the depths and locations tested. Soils in the Basin Shallow Granular Zone

As the Basin Shallow Granular Zone soils were limited in thickness, additional testing was performed at deeper depths. Only initial infiltration testing was conducted within Borings LC-4, 4A, 5, and 5A (shallower than approximately 35 feet bgs), since the initial testing showed slower infiltration results than what was considered feasible for large-scale basin infiltration, and, thus, these infiltration tests were terminated after initial observations.

Within the remaining two basin borings, LC-4B and 5B, initial infiltration rates within the tests were favorable, and thus the tests were continued. The tests were conducted within the two principal deep granular soil zones (described above) in Borings LC-4B and LC-5B. Water was obtained from a nearby fire hydrant by filling a 2000-gallon water truck and transporting to the site. The tests within Borings LC-4B and 5B used a total of roughly 3,000 gallons of water. Infiltration test logs are included in Appendix B. Our testing was a clean-water, small-scale test, and correction factors need to be applied. Constant-head tests were performed. The constant-head tests consisted of excavating a boring to the depth of the test. A slotted casing pipe was inserted into the boring prior to extracting the augers. As the augers were carefully extracted, Monterey #3 well pack sand was poured around the outside of the casing (annulus) within the test zones to prevent the boring from caving/collapsing or eroding when water was added. To test the soils in Granular Zone 1 in both borings, a casing packer was inserted within a stretch of solid pipe casing in the silt layer between the two granular zones; during test set up, the annulus was sealed off with bentonite in that silt layer. Water was added inside the casing pipe via a hose that extended to near the bottom of the test zone. The water truck pump provided a pressurized water source. The incremental infiltration rate as measured during intervals of the test was defined as the incremental flow rate of water infiltrated (volume divided by time), divided by the surface area of the infiltration interface, with resulting units of inches per hour.

Results of the infiltration testing are provided in Appendix B.

INFILTRATION RECOMMENDATIONS

Based on our observations of the soils encountered and the results of the infiltration tests performed, the onsite coarse-grained soils are feasible for infiltration within the tested zones described in Table 3 below. Factors of safety should be incorporated as discussed below.

Table 3 – Infiltration Rates of Granular Soil Zones

Soil Zone	Soil Classification	Approx. Top of Zone (feet bgs)	Approx. Bottom of Zone (feet bgs)	Approx. Thickness (ft)	Approximate Raw Infiltration Rate (in./hr)
Western Shallow Granular Zone (borings LB-1, 2, 3, and 5)	Silty Sand generally less than 30% fines (SM) to Sand (SP)	0	15	15	4
Basin Shallow Granular Zone (borings LC-1 to 3 of Leighton, 2021a)	Silty Sand with up to ±15% fines (SM) to Sand (SP)	10	15	5	2.5
Basin Deep Granular Zone 1 (borings LC-4B and 5B)	Sand to Silty Sand with Gravel	38 to 40	55	15 to 17	13

The small-scale raw infiltration rate should be divided by a correction factor of at least 3, but may need to be higher based on requirements of the *San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP).*

Basin Recommendations

Since the Basin Shallow Granular Zone may actually be slightly deeper than the bottom of the basin, the basin should be overexcavated until these granular soils are exposed. If overexcavation is needed, the overexcavated portion should be backfilled with highly permeable sand as described below. We recommend that basin overexcavation and backfill, if necessary, be performed after basin inlet/outlet structures are completed. In any case, operating heavy equipment in the basin bottom should be kept to a minimum to avoid compaction and fines contamination of the exposed granular soils.

Since the Basin Shallow Granular Zone is limited in thickness and to provide additionally robust infiltration, we recommend that two sand-filled trenches be excavated in the bottom of the basin extending into Basin Deep Granular Zone 1 (approximately 40 feet below the existing ground surface or approximately 30 feet below the basin bottom). The design of the basin may consider just the infiltration contribution of the Basin Shallow Granular Zone, ignoring the contribution of the sand trenches into the deeper granular soils. The sand trenches into the deeper granular soils is intended to provide a distributed, non-point source of infiltration into this thick, highly permeable granular zone. The trenches should be a minimum of 2 feet wide and 10 feet long at the bottom, and should be backfilled with highly permeable sand (described below). The bottom of the basin should incorporate a layer of sand and filter fabric, as described below, to provide a silt filter before the water flows into the basin bottom and sand-filled trenches, intended to promote a longer life of the sand-filled trenches and basin bottom.

The surface of the sand in the basin bottom acts as a filter, since, as silt accumulates at the surface, the caked silt creates a finer filter than the sand itself. However, before a cake of silt forms or if the sand surface gets disturbed (such as with maintenance, foot traffic, etc.), some silt washes into the sand. The underlying filter fabric is intended as a secondary filter.

Below is a general description of the recommended aspects of the construction of the basin with sand-filled trenches:

- Excavate the basin. Construct all structures. Clean the basin bottom of loose soils and debris.
- Construct two sand-filled trenches as follows:
  - Excavate the trench; dispose of the cuttings outside of the basin.
  - Clean the ground around the trench of loose soil and debris.
  - Backfill the trench with ASTM C33 Fine Aggregate with a special criterion of a maximum of 2 percent fines before transport (other options may be acceptable based on availability).
    - After the trench has been filled with sand, carefully jet the sand to consolidate the sand, until the sand no longer settles.
    - After sand consolidation, overfill the trench so excess sand pours/mounds onto the ground. Maintain this sand clean while excavating the next trench.
- Carefully cover the basin bottom with sand (same specification as above). This layer should be a minimum of 8 inches thick.
- Cover that layer of sand with non-woven Mirafi 140N filter fabric, or approved equivalent.
- Cover the filter fabric with a minimum of 6 inches of sand (same specification as above).

- o Some releveling of the sand surface may need to be done after the first rain event, as some additional sand consolidation may occur.
- o After the first rain event, check to see that the system functions properly. Similar checks should be done after each major storm.

To enhance the life of the basin, we recommend that the basin bottom be protected from unnecessary disturbance and foot traffic. When the basin infiltration rate slows down to less than acceptable, the top of the upper surface of sand should be carefully scalped off, being careful to not mix the silt into the underlying sand to remain; additional sand may need to be added to maintain the minimum 6 inches of sand over the filter fabric. At that time, the filter fabric should also be checked to see that it is not clogged; if clogged, the filter fabric and overlying sand may need to be replaced.

If, over the life of the project, the trenches get clogged with silt, new sand-filled trenches would need to be constructed; further geotechnical evaluation would need to be conducted at that time.

Leighton should review the infiltration plans as the project proceeds.

Permeable Pavers Recommendations

Pervious/permeable paver pavement sections should consist of the layers described in Table 4:

Table 4 – Recommended Permeable Pavers Pavement Section

Layer/Pavement Course	Description	Minimum Thickness, inches
Pavers	Interlocking concrete paver surface layer. Follow ASCE 58-16. Herringbone pattern, with soldier pattern at edges.	3-1/8

Bedding	Relatively fine-grained, permeable, and provides a workable surface. Manufacturer guidelines should be followed for the bedding layer, but in absence of such guidelines, this bedding layer should be crushed and washed stone such that it has angular particles that interlock, with particle sizes ranging from ¼ to 3/8 inch (Size #8 of AASHTO-M-43, Sizes of Coarse Aggregate). It should be free draining, so as to not restrict permeability of the pavement system. Should conform to recommendations in Interlocking Concrete Pavement Institute (ICPI) Tech Spec 17 and ASCE 58-16, or manufacturer recommendations if more stringent	1 (2 maximum)
Medium-grained base layer	AASHTO-M-43 #57 crushed (angular) and washed stone (roughly ¾-inch stone). This base layer is intended to provide separation between the bedding layer and the reservoir layer.	3 (4 maximum)
Coarse-grained reservoir layer	Open-graded (i.e., uniformly graded), larger, crushed (angular), washed stone, such as AASHTO-M-43 #2 (other sizes may be used, depending on availability, such as AASHTO-M-43 #3). 12 inches minimum thickness in order to develop proper interlocking between particles. This layer is similar to railroad ballast. This layer should be carefully pushed out over the underlying medium-grained base layer.	12
Medium-grained base layer	AASHTO-M-43 #57 crushed (angular) and washed stone (roughly ¾-inch stone). This base layer is intended to provide separation between the subgrade and the reservoir layer. This layer should be carefully pushed out over the subgrade soils. Limit vehicle traffic on this layer to those vehicles necessary to place this layer.	3 (4 maximum)
Granular, undisturbed subgrade soil	Uncompacted subgrade soil. Imperative that the subgrade soil underlying the pavement remain in a natural state without compaction. Vehicles and heavy equipment should not be allowed to drive on the subgrade. Leave streets fat until ready to place the pavement section. If fine-grained soils are exposed, additional evaluation would be required, possibly overexcavation and replacement with free-draining material.	-

It is critical that the bedding, base and reservoir layers consist of durable angular particles, so that the material is naturally self interlocking in order to successfully transfer traffic loads without significant shifting. Rounded stone particles (i.e., not crushed rock) are inappropriate, because these do not have a strong natural interlocking characteristics. Each layer should be well-bedded, interlocked, and unyielding to wheel loads prior to placing the subsequent layer.

Storage volume in the base and reservoir layers will depend on the actual materials used. However, for planning purposes, a void ratio of 20 to 30 percent may be assumed for #57 stone, and a void ratio of approximately 40 percent may be assumed for #2 stone.

The contractor should be careful not to contaminate the bedding, base, and reservoir materials with soil during construction.

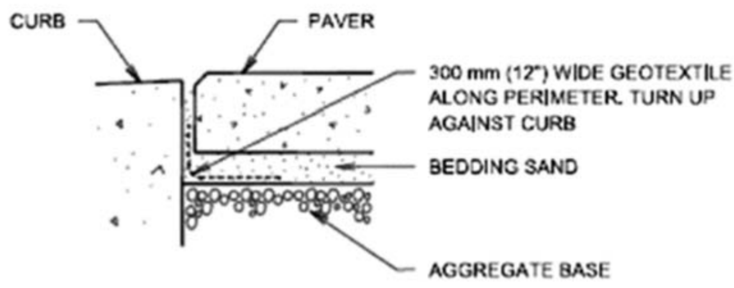
We recommend that a filter fabric (such as Mirafi 140N) be placed between the subgrade and subbase in transitional areas where a significantly sloping or vertical subgrade/base contact is present, such as near the edge of pavement, so that the adjacent soil does not migrate into the open-graded reservoir or base layers. A filter fabric is not needed over level subgrade soils.

Although we are not aware of design fill areas, if there are low areas planned for pervious pavement with infiltration into the subgrade soil, it is recommended that a thicker reservoir layer be used to attain design elevation.

Additional review of the permeable pavement should be conducted as the project proceeds.

Paver areas should be confined laterally by a curb and gutter on the sides, or by a concrete edge band where the pavers transition to asphalt pavement. The concrete edge band should be a minimum 12 inches thick and 8 inches wide, reinforced with two No. 4 rebar, with crack control joints at 12 feet on center. The edge band should be placed over a minimum of 4 inches of aggregate base. The 28-day design compressive strength of the concrete should be a minimum of 3,000 pounds per square inch. Pavers should be placed with a herringbone pattern, with a sailor or soldier course along the edges.

ASCE 58-16 recommends that a 12-inch-wide strip of non-woven geotextile filter fabric be placed along the perimeter, turned up against the curb, in order to prevent bedding sand from migrating into cracks that may develop in the concrete and into crack control joints, which migration could cause settlement of the pavers; see following the detail from ASCE 58-16:



Likewise, if pavers are placed over a concrete subslab or treated base (CTB or ATB; this is not anticipated for this project), ASCE 58-16 recommends that non-woven geotextile filter fabric be placed over the concrete or treated base prior to placement of bedding sand to prevent the bedding sand from migrating into cracks that may develop. Where such materials area used, 2-inch-diameter drain holes filled with clean angular aggregate are recommended at the lowest elevations, along with bedding sand drainage into catch basins, in accordance with ASCE 58-16 guidelines.

General Design Considerations:
The periodic flow of water carrying sediments into the infiltration facility, plus the introduction of wind-blown sediments and sediments from erosion, can eventually cause the infiltration facility to accumulate a layer of silt, which has the potential of significantly reducing the overall infiltration rate. Therefore, we recommend that significant amounts of silt/sediment not be allowed to flow into the infiltration facilities within storm water, especially during construction of the project and prior to achieving a mature landscape on site. As it is typically very difficult to remove silt from infiltration facilities, consideration should be given to installing an easily maintained, robust silt/sediment removal system for storm water before it enters the basin.

Infiltration facilities should not be constructed adjacent to or under buildings. Infiltration facilities should have a setback of at least 15 feet from buildings, but preferably more.

In general, the rate of infiltration reduces as the head of water in the infiltration facility reduces, and it also reduces with prolonged periods of infiltration. As such, water typically infiltrates much faster near the beginning of and/or immediately after storm events than at times well after a storm when the water level in the facility has receded, since the infiltration rate is then slower due to both lower head and longer overall duration of infiltration.

Estimating infiltration rates, especially based on small-scale testing, is inexact and indefinite, and often involves known and unknown soil complexities, potentially resulting in a condition where actual infiltration rates of the completed facility are significantly less than design rates.

Construction Considerations:

We recommend that Leighton evaluate the infiltration facility excavations, to confirm that granular, undisturbed alluvium is exposed to infiltration. Additional excavation or evaluation may be required if silty or clayey soils are exposed.

Heavy silting can occur from rain events during site construction, which will need to be removed from the surface. Measures to control silting during construction should be implemented.

Maintenance Considerations:

The infiltration facilities should be routinely monitored, especially before and during heavy rain storms, and corrective measures should be implemented as/when needed. Things to check for include proper upkeep, proper infiltration, absence of accumulated silt, and that de-silting filters/features are clean and functioning. Pretreatment desilting features should be cleaned and maintained per manufacturers' recommendations. Even with measures to prevent silt from flowing into the infiltration facility, accumulated silt will need to be removed occasionally as part of maintenance. As landscaping throughout the development matures over the years, silt inflows into the basin are anticipated to lessen.

LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples, and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions, and recommendations presented in this report are based on the assumption that Leighton and Associates, Inc. will provide geotechnical observation and testing during construction

This report was prepared for the sole use of Yorba Villas, LLC, for application to the design of the proposed residential development in accordance with generally accepted geotechnical engineering practices at this time in California.

C L O S I N G

We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

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AA/JAT/LP/SGO/JDH/rsm

Attachments: References
Figure 1 - Exploration Location Map, current study
Figure 2 - Test Location Map from Leighton, 2021b (2013 exploration)
Appendix A - Borings Logs
Appendix B - Infiltration Logs

Leighton

REFERENCES

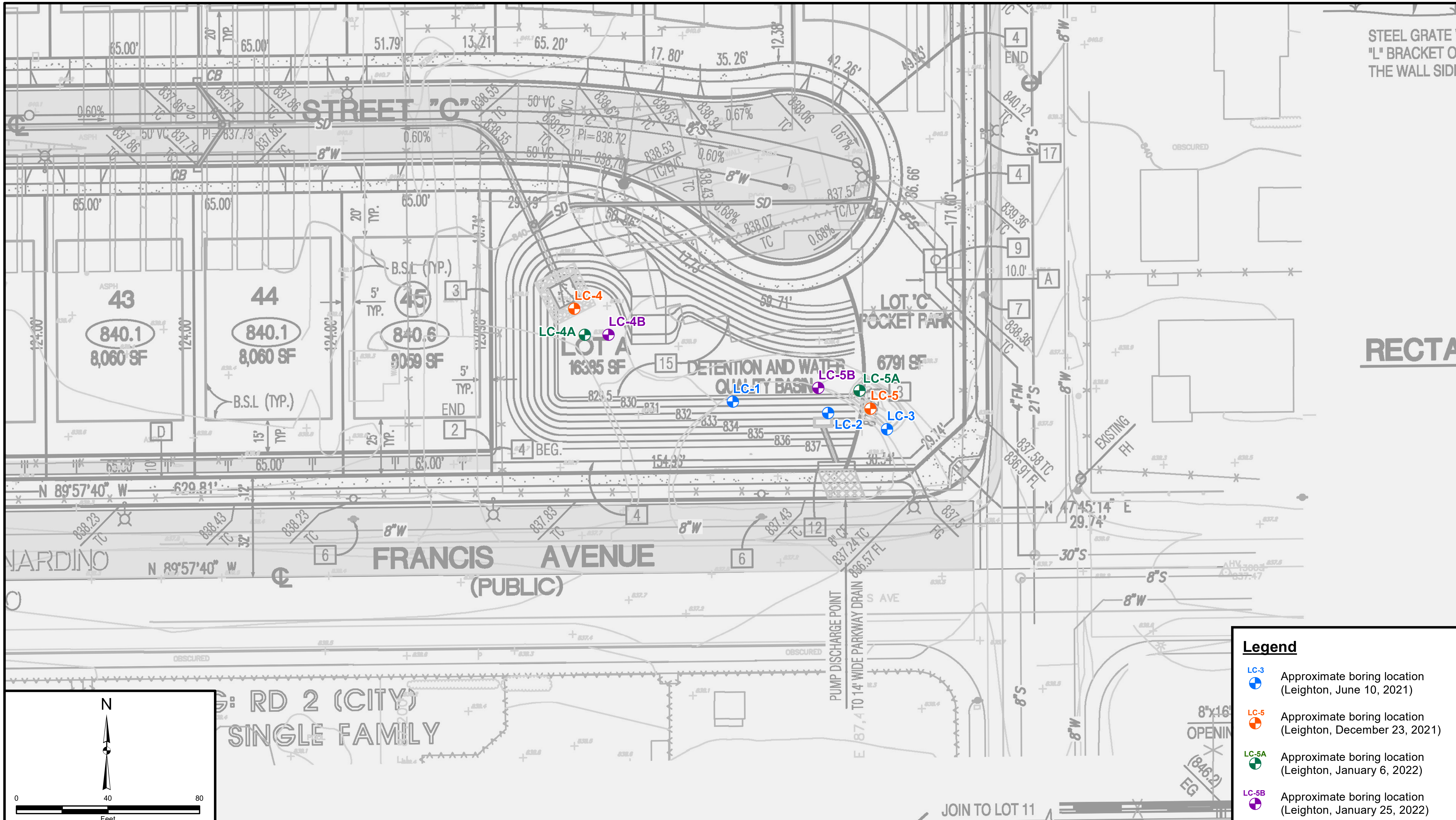
California Department of Water Resources (CDWR) of California, 1970, Meeting Water Demands in Chino-Riverside Area, Bulletin No. 104-3, September 1970.

______, 2021, Sustainable Groundwater Management Act Data Viewer (SGMA), http://www.water.ca.gov/waterdatalibrary/, accessed June 15, 2021.

Leighton and Associates, Inc., 2021a, {OBSOLETE, replaced by current report} Geotechnical Update Report of Infiltration Testing, Proposed Infiltration Basin, lot A, Yorba Villas Residential Development, Tract 20394, Northwest of Francis Avenue and Yorba Avenue, Chino Area of Unincorporated San Bernardino County, California, Project No. 10557.006, dated July 26, 2021.

Leighton and Associates, Inc., 2021b, Geotechnical Investigation, Proposed Residential Development, Tract 20394, APN's 1013-211-21 and 1013-211-22, Northwest of Francis Avenue and Yorba Avenue, Chino Area of San Bernardino County, California, Project No. 10557.004, dated August 26, 2016, updated September 27, 2021.

Leighton and Associates, Inc., 2022, {OBSOLETE, replaced by current report} Updated Infiltration Testing and Geotechnical Recommendations, Proposed Infiltration Basin, Lot A, Yorba Villas Residential Development, Tract 20394, Northwest of Francis Avenue and Yorba Avenue, Chino Area of Unincorporated San Bernardino County, California, Project No. 10557.007, dated February 16, 2022.



Project: 10557.007	Eng/Geol: JDH/SGO
Scale: 1 " = 40 '	Date: April 2022

Base Map: ESRI ArcGIS Online 2022

Author: KVM (kmanchikanti)

EXPLORATION LOCATION MAP

Yorba Villas Infiltration Testing
Northwest of Yorba Avenue and Francis Avenue
Chino, California

FIGURE 1

Leighton

Map Saved as J:\Drafting\10557\007\10557-007_Fig2_ELM_2022-02-07.mxd on 4/12/2022 2:55:10 PM

Project: 10557.004	Eng/Geol: JDH/PB
Scale: 1 " = 150 '	Date: August 2016

Base Map: ESRI ArcGIS Online 2016
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

TEST LOCATION MAP

Proposed Residential Development, Assessor Parcel Numbers 1013-211-21 and 1013-211-22, Northwest of Francis Avenue and Yorba Linda Avenue, City of Chino, California

Figure 2

Map Saved as V:\Drafting\10557\004\Maps\10557-004_F02_TLM_2016-08-24.mxd on 8/24/2016 1:17:20 PM

APPENDIX A

BORING LOGS

Borings from Current Study

GEOTECHNICAL BORING LOG LC-4

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B-1				ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft, tan, dry to moist, fine sand, non-plastic	
835				R-1	2 4 8				@2.5': SANDY SILT (ML); stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
	5			R-2	7 9 9				@5': Same as above, stiff, light brown	
830				R-3	5 6 10				@7.5': Same as above, stiff, light brown	
	10			R-4	10 8 12			SM	@10': SILTY SAND (SM), medium dense, brown, slightly moist, fine to medium sand, non-plastic	
825										
	15			R-5	6 9 14			ML	@15': SILT (ML), stiff, variegated, light brown, moist, fine-grained, slightly cemented	
820										
	20			S-1	8 11 14				@20': SANDY SILT (ML), very stiff, light brown, moist, fine to medium sand, slightly oxidized	
815										
	25			R-6	12 15 31				@25': SILT (ML), very stiff, light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LC-4

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-2	5 6 7			ML	@30': SANDY SILT (ML), stiff, light brown, moist, fine sand, slightly oxidized	
805										
	35			R-7	17 23 38				@35': Same as above, hard, highly oxidized	
800										
	40			S-3	17 21 30			SM	@40': SILTY SAND (SM), dense, variegated grayish to orangish brown, slightly moist, fine sand	
									TOTAL DEPTH: 41.5 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 36 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LC-4A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft, tan, dry to moist, fine sand, non-plastic	
835									@2.5': SANDY SILT (ML), brown, slightly moist, fine sand, non-plastic, rootlets	
	5								@5': Same as above, light brown	
830									@7.5': Same as above, light brown	
	10							SM	@10': SILTY SAND (SM), brown, slightly moist, fine to medium sand, non-plastic	
825										
	15							ML	@15': SILT (ML), variegated, light brown, moist, slightly cemented	
820										
	20								@20': SANDY SILT (ML), light brown, moist, fine to medium sand, slightly oxidized	
815										
	25								@25': SILT (ML), light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							ML	@30': SANDY SILT (ML), light brown, moist, fine sand, slightly oxidized	
805										
	35								@35': Same as above, highly oxidized	
800				R-1	22 39 40			SM	@38': SILTY SAND (SM), dense, mottled yellowish brown and light gray, moist, fine sand, 45% fines (field estimate), trace fine gravel up to 1/16 inches	
	40								**TOTAL DEPTH: 40 FEET** **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0							ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft tan, dry to moist, fine sand, non-plastic	
835									@2.5': SANDY SILT (ML), brown, slightly moist, fine sand, non-plastic, rootlets	
	5								@5': Same as above, light brown	
830									@7.5': Same as above, light brown	
	10							SM	@10': SILTY SAND (SM), brown, slightly moist, fine to medium sand, non-plastic	
825										
	15							ML	@15': SILT (ML), variegated, light brown, moist, slightly cemented	
820										
	20								@20': SANDY SILT (ML), light brown, moist, fine to medium sand, slightly oxidized	
815										
	25								@25': SILT (ML), light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							ML	@30': SANDY SILT (ML), light brown, moist, fine sand, slightly oxidized	
805										
	35			S-1	6 11 11			ML	@35': SANDY SILT (ML), very stiff, variegated light brown and orangish brown, moist, fine sand, non-plastic, 60% fines (field estimate), trace fine gravel up to 1/10 inches	
800										
	40			S-2	7 12 16			SM	@40': SILTY SAND (SM), dense, moist, light brown, fine sand, 30% fines (field estimate)	
795										
	45			S-3	7 12 17				@45': Same as above, trace gravel, 25% fines (field estimate)	
790										
	50			S-4	16 37 37			SP-SM	@50': SAND to SILTY SAND with gravel (SP-SM), dense, light brown, moist, fine sand, fine gravel, sub-angular, up to 1/2 inches, 10% fines (field estimate)	
785										
	55			S-5	10 13 14			ML	@55': SANDY SILT (ML), very stiff, variegated light to medium brown, fine sand, non-plastic, slight cementation, manganese oxide staining, 60% fines (field estimate)	
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	60			S-6	10 12 16			ML	@60': SANDY SILT (ML), very stiff, light brown, moist, very fine to fine sand, non-plastic, slight cementation, 70% fines (field estimate)	
775										
	65			S-7	11 12 16				@65': As above, non to low plasticity	
770										
	70			S-8	7 24 31			SM	@70': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace medium, low plasticity, 35% fines (field estimate)	
765										
	75			S-9	26 50/4			SP-SM	@75': SAND to SILTY SAND with gravel (SP-SM), dense, light tannish brown, moist, fine to coarse sand, fine gravel up to 1/4 inch, 10% fines (field estimate)	
760										
	80			S-10	32 50/4				@80': Same as above	
									TOTAL DEPTH: 81 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
755										
	85									
750										
	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0			B-1				ML	@ surface: dried grass, debris over SANDY SILT (ML), soft, tan, dry, fine grained	
				R-1	4 7 5				@2.5': SANDY SILT (ML), medium stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
835	5			R-2	5 7 4				@5': Same as above	
830				R-3	4 2 6				@7.5': Same as above	
	10			R-4	2 4 9			SM	@ 10': SILTY SAND (SM), loose, light brown, slightly moist, fine sand, micaceous	
825	15			S-1	2 2 4				@15': Same as above	
820	20			R-5	7 14 20			ML	@ 20': SILT with sand (ML), very stiff, variegated light gray, brown to orange brown, fine sand, fine gravel	
815	25			S-2	3 4 6			SM	@25': SILTY SAND (SM), loose, grayish brown, fine to medium sand, oxidized	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LC-5

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R-6	6 7 8			SM	@30': Same as above, loose	
805										
	35			S-3	16 24 32			SP-SM	@35': SAND with silt (SP-SM), dense, orange brown, fine to coarse sand, fine gravel	
800										
	40			R-7	22 24 38				@40': same as above	
									TOTAL DEPTH: 41.5 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 35 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-5A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							ML	@ surface: dried grass, debris over SANDY SILT (ML), soft, tan, dry, fine grained	
									@2.5': SANDY SILT (ML), medium stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
835										
	5								@5': Same as above	
									@7.5': Same as above	
830										
	10							SM	@ 10': SILTY SAND (SM), loose, light brown, slightly moist, fine sand, micaceous	
825										
	15								@15': Same as above	
820										
	20							ML	@ 20': SILT (ML), very stiff, variegated light gray, brown to orange brown, fine sand, fine gravel	
815										
	25							SM	@25': SILTY SAND (SM), loose, grayish brown, fine to medium sand, oxidized	
810										
	30									

SAMPLE TYPES:
B BULK SAMPLE
C CORE SAMPLE
G GRAB SAMPLE
R RING SAMPLE
S SPLIT SPOON SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
-200 % FINES PASSING
AL ATTERBERG LIMITS
CN CONSOLIDATION
CO COLLAPSE
CR CORROSION
CU UNDRAINED TRIAXIAL
DS DIRECT SHEAR
EI EXPANSION INDEX
H HYDROMETER
MD MAXIMUM DENSITY
PP POCKET PENETROMETER
RV R VALUE
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
SG SPECIFIC GRAVITY
UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-5A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30							SM	@30': Same as above, loose	
805										
	35			R-1	20 50/4			SP-SM	@35': SAND with silt and gravel (SP-SM), dense, light grayish brown, moist, upper half fine to medium sand, bottom half medium to coarse sand, fine to coarse gravel, 10% fines (field estimate)	
				R-2	30 24 25			SM	@37': SILTY SAND (SM), medium dense, light brown, moist, fine to medium sand, fine gravel up to 1 inch, 15-20% fines (field estimate)	
800				R-3	10 41 50/5				@38.5': As above, dark yellowish brown, fine sand, micaceous, 20-25% fines (field estimate), bottom grades to sand with silt and gravel	
	40			R-4	46 50/5			SM-SM	@40': SAND with silt and gravel (SP-SM), dense, medium yellowish brown, moist, fine to medium sand, fine gravel up to 1 inch	
									TOTAL DEPTH: 40.9 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							ML	@Surface: SANDY SILT (ML), soft, light brown, moist, fine sand, non-plastic, vegetation	
835	5			R-1	2 3 5			SM	@5': SILTY SAND (SM), loose, yellowish brown, moist, fine sand, 30-35% fines (field estimate)	
830	10			R-2	3 4 7			SM	@10': SILTY SAND (SM), loose, light olive brown, moist, fine sand, 30-35% fines (field estimate)	
825	15			R-3	4 12 15			SM	@15': As above, 35% fines (field estimate)	
								ML	@16': SILT (ML), stiff, tannish gray, dry to moist, fine grained, 70% fines (field estimate), non-plastic, slight cementation, visible laminated layering	
820	20			R-4	5 11 16			ML	@20': CLAYEY SILT (ML), stiff, variegated olive and tannish gray, moist, light plasticity, iron oxide staining, visible pores	
815	25			R-5	7 11 15			SM	@25': SILTY SAND (SM), medium dense, olive brown, moist, fine sand, 30% fines (field estimate)	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	30			R-6	6 13 20			SC	@30': CLAYEY SAND (SC), medium dense, moist, medium brown, fine to medium sand, low plasticity, fine gravel up to 1 inch, sub-angular, 20-25% fines (field estimate)	
805										
	35			R-7	21 41 47			SP-SC	@35': SAND to CLAYEY SAND with gravel (SP-SC), dense, fine to coarse sand, medium to reddish brown, fine gravel up to 1 inch, sub-angular, cemeted, 15% fines (field estimate)	
800										
	40			R-8	50/5			SM	@40': SILTY SAND with gravel (SM), dense, light to medium brown, moist, fine to coarse sand, gravel up to 2 inches, 15% fines (field estimate)	
795										
	45			R-9	29 28 29			SP	@45': SAND (SP), dense, moist, light brown, fine to medium sand, trace gravel, 5% fines (field estimate)	
								SM	@46': SILTY SAND (SM), dense, moist, light tannish brown, fine sand, trace medium, trace fine gravel, 25% fines (field estimate)	
790										
	50			R-10	47 47 50/6			SP	@50': SAND with gravel (SP), dense, light brown, moist, fine sand, trace coarse, fine gravel, 5% fines	
785										
	55			S-1	8 16 26			ML	@55': SANDY SILT (ML), hard, light brown, moist, fine sand, non-plastic, slight cementation	
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	60			R-11	18 15/5			ML	@60': SANDY SILT (ML), hard, variegated brown and light brown, moist, fine sand, 30-35% fines (field estimate)	
775										
	65			S-2	23 50/6			ML	@65': As above	
								SM	@66': SILTY SAND (SM), dense, light brown, moist, fine sand, trace medium, 25% fines (field estimate)	
770										
	70			S-3	20 50/6			SM	@70': SILTY SAND (SM), dense, medium brown, moist, fine to medium sand, trace fine gravel, 20% fines (field estimate)	
765										
	75			S-4	36 50/6			SP	@75': SAND with gravel (SP), dense, light brown, moist, fine to medium sand, trace coarse, fine gravel up to 1/2 inch	
760										
	80			S-5	6 12			SM	@80': SILTY SAND (SM), medium dense, light brown, moist, fine sand	
				S-6	10			ML	@81': SILT (ML), very stiff, light brown, moist, non-plastic	
									TOTAL DEPTH: 81.5 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 80 FEET BGS**	
755										
	85									
750										
	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
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- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
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- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Borings from Leighton, 2021a

GEOTECHNICAL BORING LOG LC-1

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	840'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0							ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835	5								@5': Moist	
830	10							SM	@10': SILTY SAND (SM), medium dense, light gray, slightly moist, fine sand, 10-15% fines	
				R-1	7 13 16			SM	@13.5': SILTY SAND (SM), medium dense, light gray, moist, fine sand, trace organics, 85% sand, 15% fines	SA
825	15								**TOTAL DEPTH = 15 FEET NO GROUNDWATER ENCOUNTERED CONVERTED TO INFILTRATION BORING FOR TESTING BACKFILLED TO SURFACE WITH SOIL CUTTINGS ON 6/11/21**	
820	20									
815	25									
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-2

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0			B-1				ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835	5			R-1	6 7 9				@5': As above, stiff, light brown	
				R-2	5 6 8				@7': As above, stiff, light brown, rootlets, pores	
830	10			R-3	6 10 20			SM	@10': SILTY SAND with gravel (SM), medium dense, light gray, slightly moist, fine sand, fine to coarse gravel, sub-angular, 10-15% fines	
				R-4	6 10 12	101	3	SP	@12': Poorly-graded SAND (SP), medium dense, light gray, slightly moist, fine sand	
825	15			R-5	5 6 12	95	18	ML	@15': SILT (ML), stiff, variegated light gray and orange brown, moist, fine-grained, non-plastic, slight cementation	
				R-6	5 6 13	96	20		@17': As above, variegated light gray, orange brown, and dark brown, trace clay	
820	20			R-7	5 9 14				@20': CLAYEY SILT (ML), stiff, light gray, trace orange, moist, fine, low-plasticity, trace rootlets, organic specs	
815	25			R-8	10 12 14				@25': SILT (ML), stiff, light gray to light brown, moist, 1-inch sand layer in sampler, light brown, fine-medium sand	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-2

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			R-9	10 13 18	123	12	SM	@30': SILTY SAND (SM), medium dense, variegated, light gray, orange brown, and dark brown, fine sand, trace medium, trace gravel up to 1/2-inch, subangular, iron-oxidized clasts, 36% fines	-200
805	35			R-10	37 50/5.5	117	4	SM-SP	@35': Poorly-graded SAND to SILTY SAND with gravel (SP-SM), very dense, light brown to medium brown, fine to medium sand, moist, trace coarse, 32% gravel, 60% sand, 8% fines	SA
800	40			R-11	20 15 21	102	10	SM	@40': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace coarse, bottom grades to: SANDY SILT (ML), stiff, moist, orange brown, fine sand, non-plastic, 33% fines	-200
795	45				50/4			SP	@45': No recovery, rig chatter on gravel	
790	50			R-12	9 50/6				@50': Poorly-graded SAND (SP), dense, medium brown, fine to medium sand, trace gravel, sub-angular, poor recovery	
									TOTAL DEPTH= 51 FEET **NO GROUNDWATER ENCOUNTERED** **BACKFILLED WITH SOIL CUTTINGS ON 6/10/21**	
785	55									
780	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-3

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835										
	5								@5': As above, stiff, light brown	
830										
	10							SM	@10': SILTY SAND with gravel (SM), medium dense, light gray, slightly moist, fine sand, fine to coarse gravel, sub-angular, 10-15% fines	
825										
	15							ML	@15': SILT (ML), stiff, variegated light gray and orange brown, moist, fine-grained, non-plastic	
820										
	20								@20': As above	
815										
	25									
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG LC-3

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							SM	@30': SILTY SAND (SM), medium dense, variegated, light gray, orange brown, and dark brown, fine sand, trace medium, trace gravel up to 1/2-inch, subangular, iron-oxidized clasts	
805										
	35							SP-SM	@35': Poorly-graded SAND to SILTY SAND with gravel (SP-SM), very dense, light brown to medium brown, fine to medium sand, moist, trace coarse	
800										
	40							SM	@40': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace coarse, bottom grades to: SANDY SILT (ML), stiff, moist, orange brown, fine sand, non-plastic	
795										
	45							SP-SM	@45': Rig chatter on gravel, cuttings show Poorly-graded SAND to SILTY SAND with gravel (SP-SM), medium brown, moist, fine to medium sand, gravel up to 2 inches	
790										
	50								**TOTAL DEPTH= 50 FEET NO GROUNDWATER ENCOUNTERED BACKFILLED TO 35.2 FEET AND CONVERTED TO INFILTRATION BORING FOR TESTING BACKFILLED TO SURFACE WITH SOIL CUTTINGS ON 6/11/21**	
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Borings from Leighton, 2021b (2013 exploration)

GEOTECHNICAL BORING LOG LB-1

Project No.	10557.004		**Date Drilled**	12-13-13
Project	Coastal Commerce Chino		**Logged By**	JMD
Drilling Co.	2R Drilling		**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop		**Ground Elevation**	849'
Location	See Figure 2		**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0			BULK					@Surface: dirt with some straw	
845				R-1	4 6 11	111	2	SM	@2.5' SILTY SAND, loose, light olive brown, dry to moist, fine sand, 30% fines (field estimate), trace rootlets, trace fine gravel	
	5			R-2	7 10 14	119	1	SP	@5' SAND, medium dense, light brown, dry, medium to coarse sand, trace fines, trace fine gravel, larger piece of gravel in ring sample	
840	10			R-3	10 15 21	121	2	SP	@10' SAND, medium dense, gray to brown, dry, medium sand, some gravel, 1.25" maximum gravel size	
835	15			R-4	7 12 17	108	10	ML	@15' SANDY SILT, very stiff, yellowish brown, dry to moist, homogenous	-200
830	20			S-5	6 8 10			ML SP	@20' SANDY SILT, very stiff, dark gray, dry to moist, fine sand @20.7' SAND, gray, dry to moist, fine to medium sand	
									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
825	25									
820	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-2

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	844'
Location	See Figure 2	**Sampled By**	JMD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0			BULK					@Surface: dirt with some grass	
				R-1	3 5 7	106	2	SM	@2.5' SILTY SAND, loose, light gray brown, dry, fine sand, 30% fines (field estimate), trace fine gravel	
840	5			R-2	7 9 10			SP	@5' SAND, medium dense, reddish brown, dry, medium to coarse sand, trace fines, some gravel, 1.25" maximum gravel size	
835	10			R-3	20 24 25	126	2	SP	@10' SAND, medium dense, light gray brown, dry, medium to coarse sand, angular, broken rocks up to 2.25" in sample	
830	15			S-4	7 8 9			SP	@15' SAND, medium dense, gray, dry to moist, medium sand	
825	20			R-5	17 23 45	111	15	ML	@20' SANDY SILT, very dense, olive, moist, some FeO2 staining	
820	25			S-6	7 12 11			ML-CL	@25' SILT to CLAY, very stiff, gray, dry to moist, with FeO2 staining @25.4' SAND, dry, fine to medium sand @25.6' SILT, gray, moist @25.9' CLAY, gray, moist	
815	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG LB-2

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	844'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-7	8 16 21			ML	@30' SILT, hard, olive brown, dry to moist, FeO2 staining, with some clay @30.5' SILT, olive brown, dry to moist, FeO2 staining @31' SAND, dark reddish brown to light gray, dry, fine to medium sand	
810										
	35			S-8	18 24 21			SP	@35' SAND, light brown, dry to moist, with large amounts of FeO2 staining, trace fine gravel, a 1.25" piece of gravel in the sampler tip	
805										
	40			S-9	12 10 20			CL	@40' CLAY with gravel, hard, reddish brown to olive brown, gravel up to 2" large, with some silt, some FeO2 staining @41.3' SAND with gravel, dry to moist, medium to coarse sand, gravel up to 2" large	
800										
	45			S-10	15 35 24			SM	@45' SILTY SAND, very dense, reddish brown, moist, angular, 20% fines (field estimate), with some gravel, 1" maximum gravel size	
795										
	50			S-11	9 11 16			ML	@50' SILT, very stiff, olive brown, moist, with FeO2 staining, homogenous	
									Total depth of 51.5' No groundwater encountered Bakfilled with soil cuttings	
790										
	55									
785										
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	852'
Location	See Figure 2	**Sampled By**	JMD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			BULK					@Surface: dry grass	
850				R-1	2 4 8	104	4	SM	@2.5' SILTY SAND, loose, light brown, dry, fine sand, 40% fines (field estimate), trace rootlets	
	5			R-2	8 11 14	111	5	SM	@5' SILTY SAND, medium dense, brown, moist, fine sand, 30% fines (field estimate)	
845										
	10			R-3	11 7 13	111	4	SM	@10' SILTY SAND, medium dense, light gray brown, moist, fine sand, 30% fines (field estimate), trace fine gravel	CO
840										
	15			R-4	11 17 19	93	9	ML	@15' SILT, very stiff, gray, moist, FeO2 staining, homongenous	AL
835										
	20			S-5	5 7 9			CL ML	@20' CLAY, very stiff, gray, moist, FeO2 staining @20.5' SILT, gray, moist, FeO2 staining	
830										
	25			S-6	5 5 11			ML		
825										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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GEOTECHNICAL BORING LOG LB-3

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	852'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-7	12 14 16			ML	@30' SANDY SILT, very stiff, gray, moist	
820								SM	@31.1' SILTY SAND, gray, dry, fine sand, 20% fines (field estimate),	
	35			S-8	17 13 8			SP	@35' SAND, medium dense, reddish brown, medium to coarse sand	
815								CL	@36.3' CLAY, olive brown, moist, large amount of FeO2 staining	
	40			S-9	9 14 26			ML	@40' SANDY SILT, hard, olive brown, moist, large amount of FeO2 staining	
810										
	45			S-10	6 8 9			ML	@45' SILT, very stiff, light brown, large amount of FeO2 staining, homogenous	
805										
	50			S-11	14 14 20			SP	@50' SAND, dense, light gray brown, dry to moist, fine sand, trace fines	
								ML	@51.2' SILT, light brown, large amount of FeO2 staining	
800									Total depth of 51.5' No groundwater encountered Backfilled with soil cuttings	
	55									
795										
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-4

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	850'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
850	0			BULK					@Surface: dirt	MD, CR
				R-1	5 8 8			SM	@2.5' SILTY SAND, loose, light brown to brown, dry, 20% fines (field estimate), with some gravel, 2" maximum gravel size	
845	5			R-2	6 11 10	121	2	SP-SM	@5' SAND to SILTY SAND, medium dense, light brown, dry to moist, 10% fines (field estimate), with some gravel, 1.25" maximum gravel size	-200
840	10			R-3	20 30 40			SP	@10' SAND, dense, gray, dry to moist, trace fines, some fine and medium sand, some gravel, 1.5" maximum gravel size	
835	15			S-4	6 7 7			SM	@15' SILTY SAND, medium dense, olive, moist, fine sand, 40% fines (field estimate), trace coarse sand	
830	20			R-5	10 19 26	100	19	CL	@20' CLAY, very stiff, olive, moist, with FeO2 staining. homogenous	
									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
825	25									
820	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-5

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	848'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			BULK					@Surface: dirt	
845										
	5			R-2	12 28 34	117	3	SP	@5' SAND, dense, gray brown, moist, medium sand, with some gravel, 1" maximum gravel size	
840										
	10			R-3	12 16 18	106	3	SP	@10' SAND, medium dense, gray to reddish brown, moist, medium sand, trace gravel, 2" maximum gravel size	
835										
	15			R-4	17 14 17	105	2	SP	@15' SAND, medium dense, olive, moist, trace fines, trace fine gravel, trace FeO2 staining	
830										
	20			S-5	7 6 6			SM	@20' SILTY SAND, medium dense, olive, dry to moist, fine sand, 40% fines (field estimate), some FeO2 staining	
825									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
	25									
820										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

APPENDIX B

INFILTRATION LOGS

Infiltration logs from Current Study

Leighton

Results of Well Permeameter, from USBR 7300-89 Method

Leighton

Project: 10557.007, Yorba Villas

Exploration #/Location: *LC-4B, Granular Zones 1 and 2 (tested separately)*

Depth Boring drilled to (ft): 80

Tested by: JAT

USCS Soil Type in test zone: SM/SP

Weather (start to finish): Sunny

Water Source/pH: H2O, Water Truck, Hydrant

Measured boring diameter: 6 in. 3 in. Well Radius

Approx Depth to GW BGS: 100 ft (GW or aquatarde)

Well Prep: Drill to 80' with 6" auger, set slotted 2" PVC well pipe with sand backfill, two test zones.

Initial estimated Depth to Water Surface (in.): 784

Average depth of water in well, "h" (in.): 174

approx. h/r: 58.2

Tu (Fig. 8) (ft): 34.6

Tu>3h?: No, Cannot use Condition I Equation, must re-eva

Cross-sectional area for vol calcs (in.^2): 13.1

	ft	*in.*	*Total (in.)*	w/packer
Depth to Bot of well measured from top of pilot tube	80.25 ft	0. in.	963	720 in.
Pilot Tube stickup (+ is above ground)	0. ft	4.13 in.	4.125	
Depth to top of sand outside of casing from top of pilot tube				

Use of Barrels: No

Use of Flow Meter: Yes

Use of DH Valve: No

Test Type: Constant Head

Flow Meter:

Meter ID:

Meter Col: Black

Meter Unit: Gallons

DL ID:

0.05 gallons/pulse

Field Data / **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of pilot tube)		Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Reading (cu-ft or gal)	Interval Pulse Count	ft	in.									from supply	from Δh	Total				
1/31/2022	8:50	Gallons																		
							Test of Granular Zone 2													
1/31/22	8:50	7612.6		72.54					0	866.4	96.6									
1/31/22	8:55	7621.28		73.1				5	5	873.1	89.9	-6.72	93	2005	88	2093	419	25118	0.9	13.0
1/31/22	9:00	7627.85		73.75				5	10	880.9	82.1	-7.8	86	1518	102	1620	324	19439	0.9	10.9
1/31/22	9:05	7633.66		74.1				5	15	885.1	77.9	-4.2	80	1342	55	1397	279	16766	0.9	10.1
1/31/22	9:20	7667.65		69.05			Adjust Pressure	15	30	824.5	138.5	60.6	108	7852	-795	7057	470	28229	0.9	12.6
1/31/22							Switch Meter													
1/31/22	9:40	124.45		67.01					50	800.0	163.0									
1/31/22	9:45	142.3		68				5	55	811.9	151.1	-11.88	157	4123	156	4279	856	51349	0.9	15.8
1/31/22	9:50	155.73		68.8				5	60	821.5	141.5	-9.6	146	3102	126	3228	646	38738	0.9	12.8
1/31/22	10:10	197.49		71.7			Adjust Valve	20	80	856.3	106.7	-34.8	124	9647	456	10103	505	30309	0.9	11.8
1/31/22	10:40	283.55		65.8			Adjust Valve	30	110	785.5	177.5	70.8	142	19880	-928	18952	632	37903	0.9	12.9
1/31/22	10:45	297.74		65.95			Remove Filter	5	115	787.3	175.7	-1.8	177	3278	24	3301	660	39618	0.9	10.9
1/31/22	10:50	313.49		66.1				5	120	789.1	173.9	-1.8	175	3638	24	3662	732	43942	0.9	12.2
1/31/22	10:55	328.87		66.35				5	125	792.1	170.9	-3	172	3553	39	3592	718	43105	0.9	12.1
1/31/22	11:00	344.4		66.35				5	130	792.1	170.9	0	171	3587	0	3587	717	43049	0.9	12.2
1/31/22	11:05	359.52		66.4				5	135	792.7	170.3	-0.6	171	3493	8	3501	700	42007	0.9	11.9
1/31/22	11:15	389.56		66.35				10	145	792.1	170.9	0.6	171	6939	-8	6931	693	41588	0.9	11.8
1/31/22	11:25	419.9		66.33				10	155	791.8	171.2	0.24	171	7009	-3	7005	701	42032	0.9	11.9
1/31/22	11:35	449.78		66.43				10	165	793.0	170.0	-1.2	171	6902	16	6918	692	41508	0.9	11.8
1/31/22	11:45	479.73		66.4				10	175	792.7	170.3	0.36	170	6918	-5	6914	691	41482	0.9	11.8
1/31/22	11:55	509.35		66.45				10	185	793.3	169.7	-0.6	170	6842	8	6850	685	41101	0.9	11.7
1/31/22	12:05	538.49		66.55				10	195	794.5	168.5	-1.2	169	6731	16	6747	675	40482	0.9	11.6
1/31/22	12:15	567.62		66.65				10	205	795.7	167.3	-1.2	168	6729	16	6745	674	40469	0.9	11.7
1/31/22	12:25	598.37		65.75			Adjust Valve	10	215	784.9	178.1	10.8	173	7103	-142	6962	696	41770	0.9	11.7
1/31/22	12:35	630.08		65.77				10	225	785.1	177.9	-0.24	178	7325	3	7328	733	43969	0.9	12.0
1/31/22	12:46	664.65		65.95				11	236	787.3	175.7	-2.16	177	7986	28	8014	729	43713	0.9	12.0
1/31/22	12:57	700.58		66				11	247	787.9	175.1	-0.6	175	8300	8	8308	755	45315	0.9	12.5
1/31/22	13:10	739.09		66.2				13	260	790.3	172.7	-2.4	174	8896	31	8927	687	41203	0.9	11.5
		Test of Granular Zone 1; installed packer below 55'																		
1/31/22	15:00	874.14		44.55					370	530.5	189.5									
1/31/22	15:05	894.73		45.17				5	375	537.9	182.1	-7.44	186	4756	98	4854	971	58246	0.9	15.2
1/31/22	15:10	913.15		44.4				5	380	528.7	191.3	9.24	187	4255	-121	4134	827	49606	0.9	12.9
1/31/22	15:15	935.89		43.73				5	385	520.6	199.4	8.04	195	5253	-105	5148	1030	61770	0.9	15.3
1/31/22	15:20	959.12		43.57				5	390	518.7	201.3	1.92	200	5366	-25	5341	1068	64091	0.9	15.5
1/31/22	15:25	981.91		43.46				5	395	517.4	202.6	1.32	202	5264	-17	5247	1049	62966	0.9	15.1
1/31/22	15:30	1006.26		43.3				5	400	515.5	204.5	1.92	204	5625	-25	5600	1120	67196	0.9	16.0
1/31/22	15:35	1027.75		43.2				5	405	514.3	205.7	1.2	205	4964	-16	4948	990	59381	0.9	14.1
1/31/22	15:40	1050.55		43.13				5	410	513.4	206.6	0.84	206	5267	-11	5256	1051	63069	0.9	14.9
1/31/22	15:45	1073.21		43.03				5	415	512.2	207.8	1.2	207	5234	-16	5219	1044	62625	0.9	14.7
1/31/22	15:55	1118.19		42.88				10	425	510.4	209.6	1.8	209	10390	-24	10367	1037	62201	0.9	14.5
1/31/22	16:05	1163.57		42.75				10	435	508.9	211.1	1.56	210	10483	-20	10462	1046	62774	0.9	14.5
1/31/22	16:15	1209.11		42.65				10	445	507.7	212.3	1.2	212	10520	-16	10504	1050	63024	0.9	14.5
1/31/22	16:25	1253.05		42.5				10	455	505.9	214.1	1.8	213	10150	-24	10127	1013	60759	0.9	13.8
1/31/22	16:35	1298.03		42.4				10	465	504.7	215.3	1.2	215	10390	-16	10375	1037	62248	0.9	14.1
1/31/22	16:45	1342.24		42.31				10	475	503.6	216.4	1.08	216	10213	-14	10198	1020	61190	0.9	13.8
1/31/22	16:55	1386.56		42.23				10	485	502.6	217.4	0.96	217	10238	-13	10225	1023	61352	0.9	13.7
														1182	gal					
												Raw Rate for design, prior to application of adjustment factors:								**18/11.5**

template updated: 8/5/21

Results of Well Permeameter, from USBR 7300-89 Method

Leighton

Project: 10557.007, Yorba Villas

Exploration #/Location:	*LC-5B, Granular Zones 1 and 2 (tested separately)*	Initial estimated Depth to Water Surface (in.):	804
Depth Boring drilled to (ft):	80	Average depth of water in well, "h" (in.):	159
Tested by:	JAT	approx. h/r:	53.0
USCS Soil Type in test zone:	SM/SP	Tu (Fig. 8) (ft):	33.0
Weather (start to finish):	Sunny	Tu>3h?:	No, Cannot use Condition I Equation, must re-eva
Water Source/pH:	H2O, Water Truck, Hydrant		
Measured boring diameter:	6 in. 3 in. Well Radius	Cross-sectional area for vol calcs (in.^2):	13.1
Approx Depth to GW BGS:	100 ft (GW or aquatarde)		

Well Prep: Drill to 80' with 6" auger, set slotted 2" PVC well pipe with sand backfill, two test zones.

	ft	in.	Total (in.)	w/packer
Depth to Bot of well measured from top of pilot tube	80.25 ft	0. in.	963	720 in.
Pilot Tube stickup (+ is above ground)	0. ft	0. in.	0	
Depth to top of sand outside of casing from top of pilot tube				

Use of Barrels: No
Use of Flow Meter: Yes
Use of DH Valve: No
Test Type: Constant Head

Flow Meter:

Meter ID
Meter Col Black
Meter Unit Gallons
DL ID
0.05 gallons/pulse

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 1/31/2022	Start time: 8:50	Gallons																		
						Test of Granular Zone 2														
1/31/22	9:50	837.46		68.36					60	820.3	142.7									
1/31/22	9:55	842.5		68.45				5	65	821.4	141.6	-1.08	142	1164	14	1178	236	14141	0.9	4.8
1/31/22	10:00	848.84		68.59				5	70	823.1	139.9	-1.68	141	1465	22	1487	297	17839	0.9	6.1
1/31/22	10:05	853.38		68.66				5	75	823.9	139.1	-0.84	140	1049	11	1060	212	12717	0.9	4.4
1/31/22	10:10	859.05		68.7				5	80	824.4	138.6	-0.48	139	1310	6	1316	263	15793	0.9	5.5
1/31/22							Adjust Pressure													
1/31/22							Troubleshoot													
1/31/22	10:44	900.14		68.01					114	816.1	146.9									
1/31/22	10:49	906.5		68.02				5	119	816.2	146.8	-0.12	147	1469	2	1471	294	17649	0.9	5.8
1/31/22	10:54	912.91		68.02				5	124	816.2	146.8	0	147	1481	0	1481	296	17769	0.9	5.9
1/31/22	10:59	919.22		68.03				5	129	816.4	146.6	-0.12	147	1458	2	1459	292	17510	0.9	5.8
1/31/22	11:04	925.18		68.11				5	134	817.3	145.7	-0.96	146	1377	13	1389	278	16672	0.9	5.5
1/31/22	11:09	931.33		68.14				5	139	817.7	145.3	-0.36	146	1421	5	1425	285	17104	0.9	5.7
1/31/22	11:14	937.71		68.19				5	144	818.3	144.7	-0.6	145	1474	8	1482	296	17780	0.9	5.9
1/31/22							Adjusted Pressure													
1/31/22	11:20	946.15		68.24					150	818.9	144.1									
1/31/22	11:25	951.21		68.25				5	155	819.0	144.0	-0.12	144	1169	2	1170	234	14045	0.9	4.7
1/31/22	11:30	957.18		68.26				5	160	819.1	143.9	-0.12	144	1379	2	1381	276	16568	0.9	5.6
1/31/22	11:35	963.9		68.31				5	165	819.7	143.3	-0.6	144	1552	8	1560	312	18722	0.9	6.3
1/31/22																				
1/31/22	11:50	984.3		67.92					180	815.0	148.0									
1/31/22	11:55	992.43		68.13				5.5	185.5	817.6	145.4	-2.52	147	1878	33	1911	347	20848	0.9	6.9
1/31/22	12:00	998.09		68.24				5	190.5	818.9	144.1	-1.32	145	1307	17	1325	265	15897	0.9	5.3
1/31/22	12:05	1003.22		68.28				4.5	195	819.4	143.6	-0.48	144	1185	6	1191	265	15884	0.9	5.3
		Test of Granular Zone 1; installed packer below 55'																		
1/31/22	14:10	1503.41		46.15					320	553.8	166.2									
1/31/22	14:15	1534.8		46.1				5	325	553.2	166.8	0.6	167	7251	-8	7243	1449	86919	0.9	25.3
1/31/22	14:20	1567.2		46				5	330	552.0	168.0	1.2	167	7484	-16	7469	1494	89624	0.9	26.0
1/31/22																				
1/31/22	14:53	1655.7		46.11					363	553.3	166.7									
1/31/22	14:58	1684.4		45.75				5	368	549.0	171.0	4.32	169	6630	-57	6573	1315	78877	0.9	22.6
1/31/22	15:03	1711.32		45.85				5	373	550.2	169.8	-1.2	170	6219	16	6234	1247	74811	0.9	21.3
1/31/22	15:08	1741.65		45.74				5	378	548.9	171.1	1.32	170	7006	-17	6989	1398	83867	0.9	23.9
1/31/22	15:13	1768.94		45.63				5	383	547.6	172.4	1.32	172	6304	-17	6287	1257	75440	0.9	21.3
1/31/22	15:18	1800.7		45.71				5	388	548.5	171.5	-0.96	172	7337	13	7349	1470	88190	0.9	24.9
1/31/22	15:23	1822.65		45.7				5	393	548.4	171.6	0.12	172	5070	-2	5069	1014	60827	0.9	17.2
1/31/22	15:33	1876.87		45.53				10	403	546.4	173.6	2.04	173	12525	-27	12498	1250	74988	0.9	21.1
1/31/22	15:43	1931.62		45.46				10	413	545.5	174.5	0.84	174	12647	-11	12636	1264	75817	0.9	21.1
1/31/22	15:53	1978.36		45.52				10	423	546.2	173.8	-0.72	174	10797	9	10806	1081	64838	0.9	18.1
1/31/22	16:03	2030.8		45.42				10	433	545.0	175.0	1.2	174	12114	-16	12098	1210	72587	0.9	20.2
1/31/22	16:13	2079.03		45.31				10	443	543.7	176.3	1.32	176	11141	-17	11124	1112	66743	0.9	18.4
1/31/22	16:23	2135.46		45.22				10	453	542.6	177.4	1.08	177	13035	-14	13021	1302	78127	0.9	21.4
1/31/22	16:35	2191.55		45.12				12	465	541.4	178.6	1.2	178	12957	-16	12941	1078	64705	0.9	17.6
1/31/22	16:43	2229.13		45.09				8	473	541.1	178.9	0.36	179	8681	-5	8676	1085	65072	0.9	17.7
1/31/22	16:53	2278.4		45.05				10	483	540.6	179.4	0.48	179	11381	-6	11375	1138	68250	0.9	18.5
												Raw Rate for design, prior to application of adjustment factors:								26/5.5

template updated: 8/5/21

Infiltration Logs from Leighton 2021a

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: 10557

Exploration #/Location:	LC-1	Initial estimated Depth to Water Surface (in.):	159
Depth Boring drilled to (ft):	15.15	Average depth of water in well, "h" (in.):	24
Tested by:	JAT	approx. h/r:	4.7
USCS Soil Type in test zone:	SM	Tu (Fig. 8) (ft):	86.8
Weather (start to finish):	Sunny	Tu>3h?:	yes, OK
Liquid Used/pH:	H2O		
Measured boring diameter:	10 in.	5 in. Well Radius	
Approx Depth to GW below GS:	100 ft	Cross-sectional area for vol calcs (in.^2):	78.5

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15.2 ft		182	
Pilot Tube stickup (+ is above ground)		5. in.	5	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	10. ft	8. in.	128	123 Depth below GS (in.)
Float Assembly ID		A		
Float assembly Extension length (in.)		24		

Flow Meter:

Meter ID	3242
Meter Col	Black
Meter Unit	Gallons
DL ID	* Used meter with water from barrels.
0.05	gallons/pulse

Field Data | **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Gallons																			
6/11/2021	8:45																				
-																					
6/11/21	8:45	7414		12.61					0	146.3	36.1										
6/11/21	8:50	7416.5		12.59				5	5	146.1	36.3	0.24	36	578	-19	559	112	6704	0.9	1.35	**5.08**
6/11/21	8:55	7419.4		12.61				5	10	146.3	36.1	-0.24	36	670	19	689	138	8265	0.9	1.68	**6.27**
6/11/21	9:00	7422.9		12.6				5	15	146.2	36.2	0.12	36	809	-9	799	160	9589	0.921	1.94	**7.28**
6/11/21	9:05	7424.7		12.59				5	20	146.1	36.3	0.12	36	416	-9	406	81	4877	0.9	0.98	**3.69**
6/11/21	9:10	7427.3		12.6				5	25	146.2	36.2	-0.12	36	601	9	610	122	7320	0.9	1.48	**5.54**
6/11/21	9:15	7429.8		12.6				5	30	146.2	36.2	0	36	578	0	578	116	6930	0.9	1.40	**5.25**
6/11/21	9:20	7432.5		12.59				5	35	146.1	36.3	0.12	36	624	-9	614	123	7371	0.9	1.48	**5.58**
6/11/21	9:25	7434.5		12.6				5	40	146.2	36.2	-0.12	36	462	9	471	94	5657	0.9	1.14	**4.28**
6/11/21																					
6/11/21	9:30	7435.1		13.5					45	157.0	25.4										
6/11/21	10:00	7436.1		14			Adjustment	30	75	163.0	19.4	-6	22	231	471	702	23	1404	0.9	0.77	**1.65**

template updated: 8/14/19

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: 10557

Exploration #/Location:	LC-1	
Depth Boring drilled to (ft):	15.15	
Tested by:	JAT	
USCS Soil Type in test zone:	SM	
Weather (start to finish):	Sunny	
Liquid Used/pH:	H2O	
Measured boring diameter:	10	in.
Approx Depth to GW below GS:	100	ft

5 in. Well Radius

Initial estimated Depth to Water Surface (in.):	154
Average depth of water in well, "h" (in.):	29
approx. h/r:	5.8
Tu (Fig. 8) (ft):	87.2
Tu>3h?:	yes, OK
Cross-sectional area for vol calcs (in.^2):	78.5

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15.2 ft		182	
Pilot Tube stickup (+ is above ground)		5. in.	5	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	9. ft	0. in.	108	103 Depth below GS (in.)
Float Assembly ID		A		
Float assembly Extension length (in.)		0		

Flow Meter:

Meter ID	
Meter Col	Black
Meter Unit	Gallons
DL ID	

0.05 gallons/pulse

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube): ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3): from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Gallons																			
6/11/2021	8:45																				
-																					
6/11/21	10:20	7447.5		11.8					95	136.6	45.8										
6/11/21	10:25	7451.3		11.85				5	100	137.2	45.2	-0.6	46	878	47	925	185	11099	0.9	1.60	**6.79**
6/11/21	10:30	7455		11.9				5	105	137.8	44.6	-0.6	45	855	47	902	180	10822	0.9	1.59	**6.70**
6/11/21	10:35	7458.6		11.9				5	110	137.8	44.6	0	45	832	0	832	166	9979	0.921	1.47	**6.22**
6/11/21							Switch Barrel														
6/11/21	10:40	7459.5		12.8					115	148.6	33.8										
6/11/21	10:45	7459.6		13.4				5	120	155.8	26.6	-7.2	30	23	565	588	118	7060	0.9	2.42	**6.34**
6/11/21																					
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Results of Falling Head Infiltration Test

Leighton

Project: 10557

Exploration #/Location: *LC-1*

Depth Boring drilled to (ft): 15.15

Tested by: JAT

USCS Soil Type in test zone: SM

Weather (start to finish): Sunny

Liquid Used/pH: H2O

Measured boring diameter: 10 in. 5 in. Well Radius

Approx Depth to GW below GS: 100 ft

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

Initial estimated Depth to Water Surface (in.): 150

Average depth of water in well, "h" (in.): 32

approx. h/r: 6.4

Tu (Fig. 8) (ft): 87.5

Tu>3h?: yes, OK

Cross-sectional area for vol calcs (in.^2): 37.4

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	15.2 ft		182
Pilot Tube stickup (+ is above ground)		5. in.	5
Depth to top of sand outside of casing from top of pilot tube			

Field Data **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																		
6/11/2021	9:35																		
6/11/21	11:12	9.4		65			97	107.8	74.6										
6/11/21	11:17	12.3				5	102	142.6	39.8	-34.8	57	0	1302	1302	260	15625	1875	1.0	**8.51**
6/11/21	11:22	13.4				5	107	155.8	26.6	-13.2	33	0	494	494	99	5927	1121	1.0	**5.40**
6/11/21	11:27	14				5	112	163.0	19.4	-7.2	23	0	269	269	54	3233	801	1.0	**4.12**
6/11/21					refill														
6/11/21	11:32	9.5					117	109.0	73.4										
6/11/21	11:37	12.4				5	122	143.8	38.6	-34.8	56	0	1302	1302	260	15625	1837	1.0	**8.69**
6/11/21	11:42	13.1				5	127	152.2	30.2	-8.4	34	0	314	314	63	3771	1159	1.0	**3.32**
6/11/21	11:47	13.8				5	132	160.6	21.8	-8.4	26	0	314	314	63	3771	895	1.0	**4.30**
6/11/21					refill														
6/11/21	11:53	9.81					138	112.7	69.7										
6/11/21	11:58	12.23				5	143	141.8	40.6	-29.04	55	0	1087	1087	217	13038	1811	1.0	**7.36**
6/11/21	12:03	13.21				5	148	153.5	28.9	-11.76	35	0	440	440	88	5280	1170	1.0	**4.61**
6/11/21	12:08	14.05				5	153	163.6	18.8	-10.08	24	0	377	377	75	4526	827	1.0	**5.59**
6/11/21					refill														
6/11/21	12:15	10.71					160	123.5	58.9										
6/11/21	12:20	12.59				5	165	146.1	36.3	-22.56	48	0	844	844	169	10129	1573	1.0	**6.58**
6/11/21	12:25	13.43				5	170	156.2	26.2	-10.08	31	0	377	377	75	4526	1061	1.0	**4.36**
6/11/21	12:30	14.06				5	175	163.7	18.7	-7.56	22	0	283	283	57	3394	784	1.0	**4.42**
6/11/21					refill														
6/11/21	12:37	10.21					182	117.5	64.9										
6/11/21	12:42	12.76				5	187	148.1	34.3	-30.6	50	0	1145	1145	229	13739	1635	1.0	**8.58**
6/11/21	12:47	13.34				5	192	155.1	27.3	-6.96	31	0	260	260	52	3125	1046	1.0	**3.05**
6/11/21	12:52	13.91				5	197	161.9	20.5	-6.84	24	0	256	256	51	3071	829	1.0	**3.78**
6/11/21	12:57	14.27				5	202	166.2	16.2	-4.32	18	0	162	162	32	1940	654	1.0	**3.03**
6/11/21					refill														
6/11/21	1:05	10.31					0	118.7	63.7										
6/11/21	1:10	12.42				5	0	144.0	38.4	-25.32	51	0	947	947	189	11368	1681	1.0	**6.91**
6/11/21	1:15	13.32				5	0	154.8	27.6	-10.8	33	0	404	404	81	4849	1113	1.0	**4.45**
6/11/21	1:20	13.81				5	0	160.7	21.7	-5.88	25	0	220	220	44	2640	852	1.0	**3.17**
6/11/21	1:25	14.06				5	0	163.7	18.7	-3	20	0	112	112	22	1347	712	1.0	**1.93**
6/11/21																			
6/11/21	13:29	9.75					234	112.0	70.4										
6/11/21	13:34	12.11				5	239	140.3	42.1	-28.32	56	0	1060	1060	212	12715	1844	1.0	**7.04**
6/11/21	13:39	13.15				5	244	152.8	29.6	-12.48	36	0	467	467	93	5603	1204	1.0	**4.75**
6/11/21	13:44	13.64				5	249	158.7	23.7	-5.88	27	0	220	220	44	2640	916	1.0	**2.95**
6/11/21	13:49	14.06				5	254	163.7	18.7	-5.04	21	0	189	189	38	2263	744	1.0	**3.11**
6/11/21	13:54	14.35				5	259	167.2	15.2	-3.48	17	0	130	130	26	1562	610	1.0	**2.61**

template updated: 6/30/2020

Results of Falling Head Infiltration Test

Leighton

Project: 10557
Exploration #/Location: LC-3
Depth Boring drilled to (ft): 35.3
Tested by: JAT
USCS Soil Type in test zone: SP-SM
Weather (start to finish): Sunny
Liquid Used/pH: H2O
Measured boring diameter: 8 in. — 4 in. Well Radius
Approx Depth to GW below GS: 100 ft
Well Prep: Drilled to 50', backfilled to 35.2', silt plug at bottom, placed #3 sand, placed 4" pipe (no pilot tube)

Initial estimated Depth to Water Surface (in.): 391
Average depth of water in well, "h" (in.): 33
approx. h/r: 8.2
Tu (Fig. 8) (ft): 67.4
Tu>3h?: yes, OK
Cross-sectional area for vol calcs (in.^2): 26.1

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	35.3 ft		424
Pilot Tube stickup (+ is above ground)	0. ft		0
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date: 6/11/2021	Start time: 9:35																		
6/11/21	9:55	27.6		65			20	331.2	92.4										
6/11/21	10:00	28.56				5	25	342.7	80.9	-11.52	87	0	301	301	60	3610	2176	1.0	**1.69**
6/11/21	10:05	30.57				5	30	366.8	56.8	-24.12	69	0	630	630	126	7558	1729	1.0	**4.47**
6/11/21	10:10	33.59				5	35	403.1	20.5	-36.24	39	0	946	946	189	11355	971	1.0	**11.95**
6/11/21					refill														
6/11/21	10:12	27.42					37	329.0	94.6										
6/11/21	10:17	32.01				5	42	384.1	39.5	-55.08	67	0	1438	1438	288	17258	1684	1.0	**10.47**
6/11/21	10:22	33.98				5	47	407.8	15.8	-23.64	28	0	617	617	123	7407	695	1.0	**10.89**
6/11/21	10:27	35.2				5	52	422.4	1.2	-14.64	9	0	382	382	76	4587	214	1.0	**21.89**
6/11/21					refill														
6/11/21	10:29	27.51					54	330.1	93.5										
6/11/21	10:34	32.02				5	59	384.2	39.4	-54.12	66	0	1413	1413	283	16958	1668	1.0	**10.38**
6/11/21	10:39	32.09				5	64	385.1	38.5	-0.84	39	0	22	22	4	263	978	1.0	**0.27**
6/11/21	10:44	32.23				5	69	386.8	36.8	-1.68	38	0	44	44	9	526	947	1.0	**0.57**
6/11/21	10:49	32.34				5	74	388.1	35.5	-1.32	36	0	34	34	7	414	909	1.0	**0.46**
6/11/21	10:54	33.59				5	79	403.1	20.5	-15	28	0	392	392	78	4700	704	1.0	**6.82**
6/11/21	10:59	34.05				5	84	408.6	15.0	-5.52	18	0	144	144	29	1730	446	1.0	**3.96**
6/11/21	11:04	34.51				5	89	414.1	9.5	-5.52	12	0	144	144	29	1730	307	1.0	**5.75**
6/11/21					refill														
6/11/21	11:07	29.81					92	357.7	65.9										
6/11/21	11:12	31.29				5	97	375.5	48.1	-17.76	57	0	464	464	93	5565	1432	1.0	**3.97**
6/11/21	11:17	31.78				5	102	381.4	42.2	-5.88	45	0	154	154	31	1842	1135	1.0	**1.66**
6/11/21	11:24	32.5				7	109	390.0	33.6	-8.64	38	0	226	226	32	1934	953	1.0	**2.07**
6/11/21	11:29	32.95				5	114	395.4	28.2	-5.4	31	0	141	141	28	1692	776	1.0	**2.23**
6/11/21	11:34	33.49				5	119	401.9	21.7	-6.48	25	0	169	169	34	2030	627	1.0	**3.31**
6/11/21	11:39	33.82				5	124	405.8	17.8	-3.96	20	0	103	103	21	1241	496	1.0	**2.56**
6/11/21	11:44	34.6				5	129	415.2	8.4	-9.36	13	0	244	244	49	2933	329	1.0	**9.12**
6/11/21					refill														
6/11/21	11:48	29.42					133	353.0	70.6										
6/11/21	11:53	30.92				5	138	371.0	52.6	-18	62	0	470	470	94	5640	1546	1.0	**3.73**
6/11/21	11:58	31.61				5	143	379.3	44.3	-8.28	48	0	216	216	43	2594	1216	1.0	**2.18**
6/11/21	12:03	32.11				5	148	385.3	38.3	-6	41	0	157	157	31	1880	1037	1.0	**1.85**
6/11/21	12:08	32.45				5	153	389.4	34.2	-4.08	36	0	107	107	21	1278	910	1.0	**1.43**
6/11/21	12:13	33.62				5	158	403.4	20.2	-14.04	27	0	367	367	73	4399	683	1.0	**6.58**
6/11/21	12:18	33.98				5	163	407.8	15.8	-4.32	18	0	113	113	23	1354	452	1.0	**3.06**
6/11/21	12:23	34.24				5	168	410.9	12.7	-3.12	14	0	81	81	16	978	359	1.0	**2.78**
6/11/21					refill														

template updated: 6/30/2020

Results of Falling Head Infiltration Test

Leighton

Project: 10557

Exploration #/Location:	*LC-3*	Initial estimated Depth to Water Surface (in.):	383
Depth Boring drilled to (ft):	35.3	Average depth of water in well, "h" (in.):	40
Tested by:	JAT	approx. h/r:	10.1
USCS Soil Type in test zone:	SP-SM	Tu (Fig. 8) (ft):	68.1
Weather (start to finish):	Sunny	Tu>3h?:	yes, OK
Liquid Used/pH:	H2O		
Measured boring diameter:	8 in.	4 in. Well Radius	
Approx Depth to GW below GS:	100 ft	Cross-sectional area for vol calcs (in.^2):	26.1

Well Prep: Drilled to 50', backfilled to 35.2', silt plug at bottom, placed #3 sand, placed 4" pipe (no pilot tube)

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentor	35.3 ft		424
Pilot Tube stickup (+ is above ground)	0. ft		0
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/min)	q, Flow (in^3/hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date 6/11/2021	Start time: 9:35																		
6/11/21	12:26	29.61		65	Refilled		171	355.3	68.3										
6/11/21	12:31	31.63				5	176	379.6	44.0	-24.24	56	0	633	633	127	7595	1411	1.0	**5.50**
6/11/21	12:36	32.86				5	181	394.3	29.3	-14.76	37	0	385	385	77	4625	921	1.0	**5.13**
6/11/21	12:41	33.43				5	186	401.2	22.4	-6.84	26	0	179	179	36	2143	650	1.0	**3.37**
6/11/21	12:46	33.85				5	191	406.2	17.4	-5.04	20	0	132	132	26	1579	500	1.0	**3.22**
6/11/21	12:51	34.25				5	196	411.0	12.6	-4.8	15	0	125	125	25	1504	377	1.0	**4.08**
6/11/21																			
6/11/21	12:53	27.18			Refilled		198	326.2	97.4										
6/11/21	12:59	30.05				6	204	360.6	63.0	-34.44	80	0	899	899	150	8993	2015	1.0	**4.56**
6/11/21	13:04	31.76				5	209	381.1	42.5	-20.52	53	0	536	536	107	6430	1325	1.0	**4.96**
6/11/21	13:09	31.85				5	214	382.2	41.4	-1.08	42	0	28	28	6	338	1054	1.0	**0.33**
6/11/21	13:14	32.31				5	219	387.7	35.9	-5.52	39	0	144	144	29	1730	971	1.0	**1.82**
6/11/21	13:19	32.54				5	224	390.5	33.1	-2.76	34	0	72	72	14	865	867	1.0	**1.02**
6/11/21	13:24	32.6				5	229	391.2	32.4	-0.72	33	0	19	19	4	226	823	1.0	**0.28**
6/11/21	13:29	32.73				5	234	392.8	30.8	-1.56	32	0	41	41	8	489	794	1.0	**0.63**
6/11/21	13:34	33.39				5	239	400.7	22.9	-7.92	27	0	207	207	41	2482	675	1.0	**3.75**
6/11/21	13:39	33.61				5	244	403.3	20.3	-2.64	22	0	69	69	14	827	543	1.0	**1.56**
6/11/21	13:44	33.78				5	249	405.4	18.2	-2.04	19	0	53	53	11	639	484	1.0	**1.35**
6/11/21	13:49	34.05				5	254	408.6	15.0	-3.24	17	0	85	85	17	1015	417	1.0	**2.48**
6/11/21																			
6/11/21	13:55	28.51					260	342.1	81.5										
6/11/21	14:00	29.88				5	265	358.6	65.0	-16.44	73	0	429	429	86	5151	1840	1.0	**2.86**
6/11/21	14:05	30.93				5	270	371.2	52.4	-12.6	59	0	329	329	66	3948	1476	1.0	**2.73**
6/11/21	14:10	31.81				5	275	381.7	41.9	-10.56	47	0	276	276	55	3309	1185	1.0	**2.85**
6/11/21	14:15	32.51				5	280	390.1	33.5	-8.4	38	0	219	219	44	2632	947	1.0	**2.84**
6/11/21	14:20	32.72				5	285	392.6	31.0	-2.52	32	0	66	66	13	790	809	1.0	**1.00**
6/11/21	14:25	32.95				5	290	395.4	28.2	-2.76	30	0	72	72	14	865	743	1.0	**1.19**
6/11/21	14:30	33.22				5	295	398.6	25.0	-3.24	27	0	85	85	17	1015	668	1.0	**1.55**
6/11/21																			
6/11/21	14:35	25.01					300	300.1	123.5										
6/11/21	14:40	27.62				5	305	331.4	92.2	-31.32	108	0	818	818	164	9814	2708	1.0	**3.70**
6/11/21	14:45	29.85				5	310	358.2	65.4	-26.76	79	0	699	699	140	8385	1979	1.0	**4.33**
6/11/21	14:50	31.04				5	315	372.5	51.1	-14.28	58	0	373	373	75	4474	1463	1.0	**3.12**
6/11/21	14:55	31.82				5	320	381.8	41.8	-9.36	46	0	244	244	49	2933	1167	1.0	**2.57**
6/11/21	15:00	32.46				5	325	389.5	34.1	-7.68	38	0	201	201	40	2406	953	1.0	**2.58**
6/11/21	15:05	32.67				5	330	392.0	31.6	-2.52	33	0	66	66	13	790	824	1.0	**0.98**
6/11/21	15:10	32.69				5	335	392.3	31.3	-0.24	31	0	6	6	1	75	790	1.0	**0.10**
6/11/21	15:15	32.72				5	340	392.6	31.0	-0.36	31	0	9	9	2	113	782	1.0	**0.15**
6/11/21	15:20	32.74				5	345	392.9	30.7	-0.24	31	0	6	6	1	75	775	1.0	**0.10**

template updated: 6/30/2020

Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Project Name: Yorba Villas Infiltration | Tested By: S. Felter | Date: 06/22/21

Project No.: 10557.006 | Checked By: J. Ward | Date: 06/24/21

Boring No.: LB-1 | Depth (feet): 13.5

Sample No.: R-1

Soil Identification: Gray silty sand (SM)

		Moisture Content of Total Air - Dry Soil	
Container No.:	923	Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	836.6	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.1	Wt. of Container No.______ (g)	1.0
Dry Wt. of Soil (g)	728.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	923
	Wt. of Dry Soil + Container (g)	760.2
	Wt. of Container (g)	108.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	652.1

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	2.2	99.7
#30	0.600	21.7	97.0
#50	0.300	153.1	79.0
#100	0.150	454.9	37.6
#200	0.075	617.1	15.3
PAN			

GRAVEL: **0 %**

SAND: **85 %**

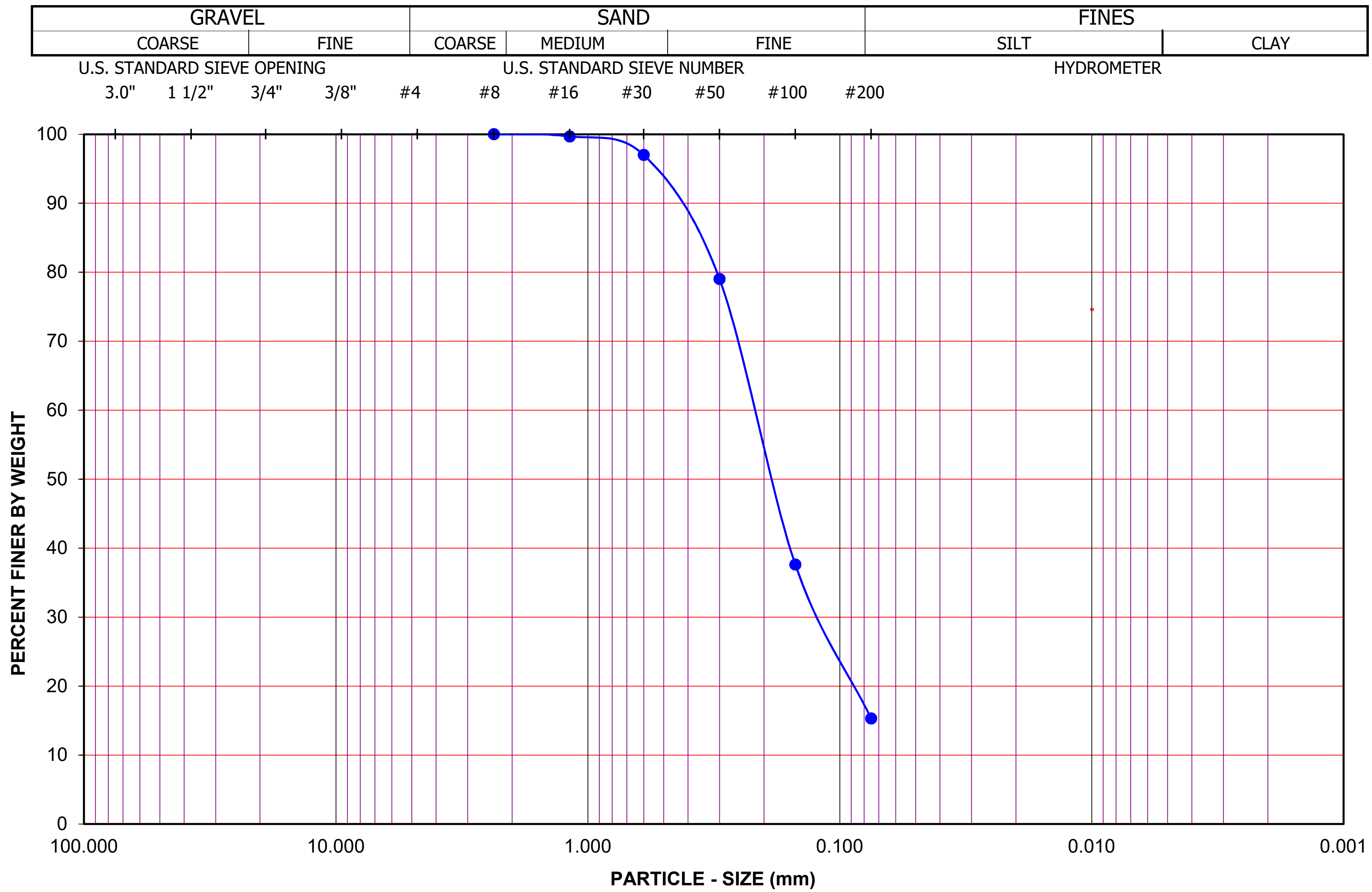
FINES: **15 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = ______

Cc = (D30)²/(D60*D10) = ______

Remarks:



Project Name: Yorba Villas Infiltration

Project No.: 10557.006

Boring No.: LB-1

Sample No.: R-1

Depth (feet): 13.5

Soil Type : SM

Soil Identification: Gray silty sand (SM)

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 0 : 85 : 15

Jun-21

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS
ASTM D 6913

Leighton

Project Name: Yorba Villas Infiltration
Tested By: S. Felter Date: 06/22/21
Project No.: 10557.006
Checked By: J. Ward Date: 06/24/21
Boring No.: LB-2
Depth (feet): 35.0
Sample No.: R-10
Soil Identification: Grayish brown poorly-graded sand with silt and gravel (SP-SM)g

		Moisture Content of Total Air - Dry Soil	
Container No.:	9554	Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	946.3	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.1	Wt. of Container No.______ (g)	1.0
Dry Wt. of Soil (g)	838.2	Moisture Content (%)	0.0

After Wet Sieve	Container No.	9554
	Wt. of Dry Soil + Container (g)	889.2
	Wt. of Container (g)	108.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	781.1

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
1 1/2"	37.5	0.0	100.0
1"	25.0	57.8	93.1
3/4"	19.0	112.1	86.6
1/2"	12.5	160.8	80.8
3/8"	9.5	189.3	77.4
#4	4.75	266.5	68.2
#8	2.36	344.0	59.0
#16	1.18	434.3	48.2
#30	0.600	539.4	35.6
#50	0.300	649.8	22.5
#100	0.150	725.1	13.5
#200	0.075	768.4	8.3
PAN			

GRAVEL: **32 %**

SAND: **60 %**

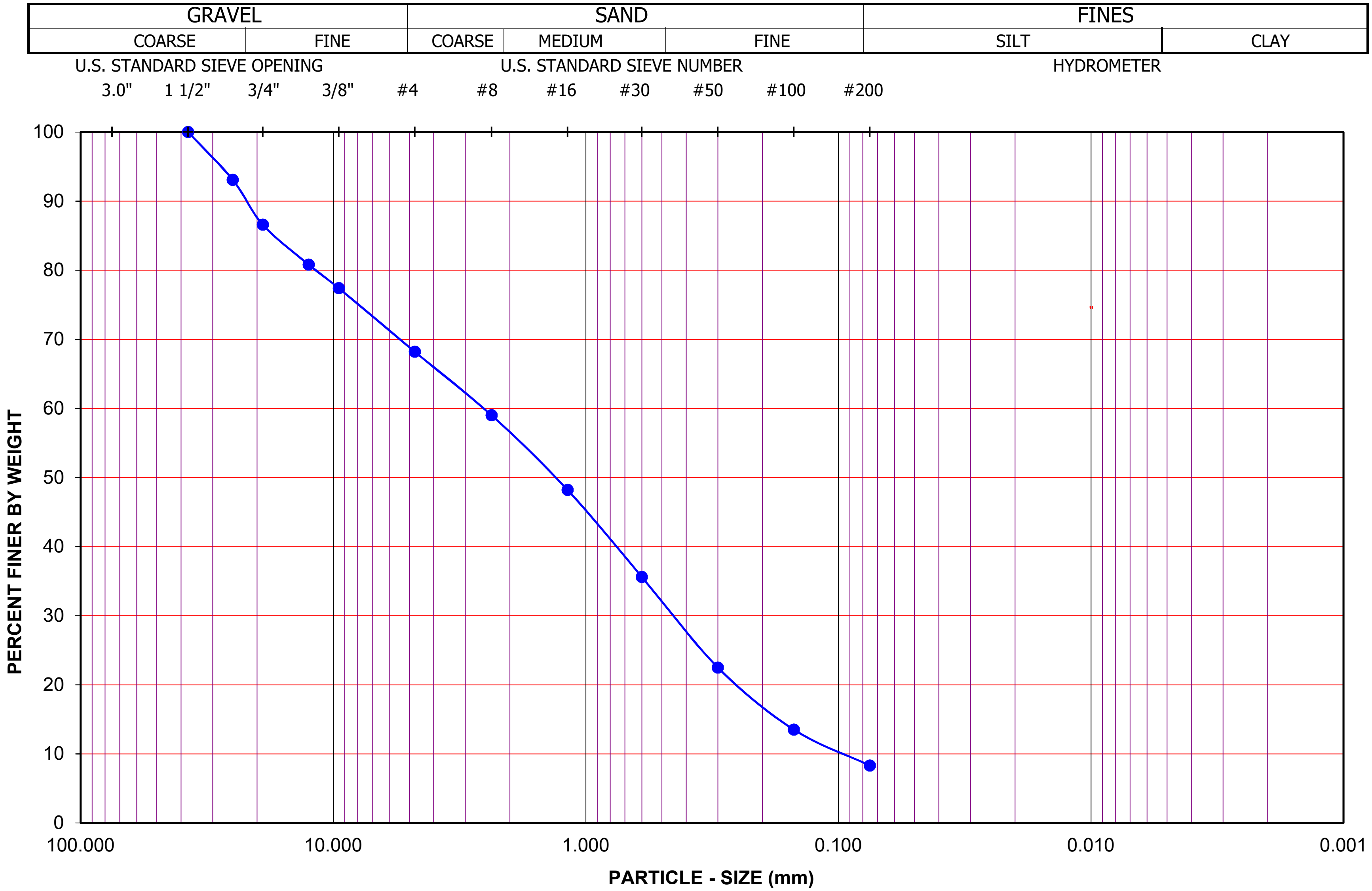
FINES: **8 %**

GROUP SYMBOL: **(SP-SM)g**

$Cu = D60/D10 =$ 26.60

$Cc = (D30)^2/(D60*D10) =$ 0.86

Remarks:



Project Name: Yorba Villas Infiltration

Project No.: 10557.006

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Boring No.: LB-2 Sample No.: R-10

Depth (feet): 35.0 Soil Type : (SP-SM)g

Soil Identification: Grayish brown poorly-graded sand with silt and gravel (SP-SM)g

GR:SA:FI : (%) 32 : 60 : 8

Jun-21

Boring No.	LB-2	LB-2						
Sample No.	R-9	R-11						
Depth (ft.)	30.0	40.0						
Sample Type	Ring	Ring						
Soil Identification	Brown silty sand (SM)	Brown silty sand (SM)						
Moisture Correction								
Wet Weight of Soil + Container (g)	0.0	0.0						
Dry Weight of Soil + Container (g)	0.0	0.0						
Weight of Container (g)	1.0	1.0						
Moisture Content (%)	0.0	0.0						
Sample Dry Weight Determination								
Weight of Sample + Container (g)	841.3	719.9						
Weight of Container (g)	106.4	107.3						
Weight of Dry Sample (g)	734.9	612.6						
Container No.:								
After Wash								
Method (A or B)	A	A						
Dry Weight of Sample + Cont. (g)	579.5	520.5						
Weight of Container (g)	106.4	107.3						
Dry Weight of Sample (g)	473.1	413.2						
% Passing No. 200 Sieve	**35.6**	**32.5**						
% Retained No. 200 Sieve	64.4	67.5						

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Yorba Villas Infiltration
Project No.: 10557.006
Tested By: S. Felter Date: 06/22/21

Infiltration from Leighton, 2021b (2013 exploration)

General Test Setup Data of Well Permeameter, from USBR 7300-89 Method.

Project: Coastal Commercial Chino, Project No. 10557.004

			LB-1		LB-2		LB-3		LB-4		LB-5			
	Exploration #/Location:		LB-1		LB-2		LB-3		LB-4		LB-5			
	Approx. Test Depth (ft):		6		4		6		6		5			
	Date Tested, start/finish:		12/16/2013		12/16/2013		12/16/2013		12/16/2013		12/16/2013			
	Tested by:		JMD		JMD		JMD		JMD		JMD			
	USCS Soil Type:													
	Weather (start to finish)		Warm, clear											
	Liquid Used/pH:		water from garden hose											
	Well Prep:		straight drill, tamp											
a.	**Diameter of barrel (in.):**		22.5		22.5		22.5		22.5		22.5		22.5	
b.	**No. of Supply barrels:**		1		1		1		1		1		1	
c.	**Measured boring diameter**	inches	9.5		9.5		9.5		9.5		10		13	
d.	Approx Depth to groundwater below GS	feet	200		200		200		200		200		200	
	Depths from string line (or top of ex. pavement):													
f.	to ground surface (=0 if no string line used)	ft/in.	0. ft		0. ft		0. ft		0. ft		0. ft			
g.	**to Bot of Boring** (or top of soil over Bentonite)	ft/in.	6. ft	1. in.	4. ft	3. in.	5. ft	7. in.	5. ft	8. in.	4. ft	10. in.		
i	to Top of Sand (bot of float assbly) (dry)	ft/in.	5. ft	10. in.	4. ft	2. in.	5. ft	4.5 in.	5. ft	5. in.	4. ft	6. in.		
k	to Top of casing after adding water (negative is above string line)	ft/in.	0. ft	-3. in.			0. ft	-0.75 in.			0. ft	-1. in.		
m	Top of Float assembly Rod, when pushed to bottom	ft/in.		34.75 in.				33.5 in.				14.88 in.		
n	**top of float assembly rod, floating, water level stable**	ft/in.		30.5 in.				25.13 in.				26.5 in.		
p	**Float Assembly (choose one)**		Long body				Long body				Long body			
q	Float Assembly extension (0=none)	inches	12				12				0			
s	free play in float assembly (water level stablized)	inches	2.5				1.25				2.5			
t	Length of float assembly (=lookup p)	inches	23		#N/A		23		#N/A		23		#N/A	
u	Length of float assembly plus extension (=q+t)	inches	35		#N/A		35		#N/A		23		#N/A	
v	**Ht from water surface to top of float rod (=lookup p)**	inches	16.75		#N/A		16.75		#N/A		16.75		#N/A	
w	range of float movement (=lookup p)	inches	6.75		#N/A		6.75		#N/A		6.75		#N/A	
x	Depth to Water Surface (=n+v)		47.3 in.		#N/A in.		41.9 in.		#N/A in.		43.3 in.		#N/A in.	
h	**Depth of water in Well, "h" (=g-x)**		**25.8 in=** 2.15 ft		**#N/A** #N/A		**25.1 in=** 2.09 ft		**#N/A** #N/A		**14.8 in=** 1.23 ft		**#N/A** #N/A	
y	Total Area of barrels (in.^2):		397		397		397		397		397		397	
r	**Well Radius, "r" (=c/2)**		**4.8** in.		**4.8** in.		**4.8** in.		**4.8** in.		**5.0** in.		**6.5** in.	

Results of Well Permeameter Test, from USBR 7300-89 Method.

Project: **Coastal Commercial Chino, Project No. 10557.004**

Leighton

Exploration #/Location: ***LB-1*** Initial Depth to top of float rod (in.) 30.5

Field Data **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed)		Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																
12/16/2013	12:52:00 PM		**ft**	**in.**													
12/16/13	12:52	29.25			**74**			25.75	5.4	0					0.9		
12/16/13	12:53	28						25.75	5.4	0	1	497	497	29805	0.9	10.01	**14.65**
12/16/13	12:54	27						25.75	5.4	0	1	397	397	23844	0.9	8.00	**11.72**
12/16/13	12:55	26.625						25.75	5.4	0	1	149	149	8942	0.9	3.00	**4.39**
12/16/13	12:57	25.875						25.75	5.4	0	2	298	149	8942	0.9	3.00	**4.39**
12/16/13	13:05	20.25						25.75	5.4	0	8	2235	279	16766	0.9	5.63	**8.24**
12/16/13	13:23	10.75			76			25.75	5.4	0	18	3775	210	12585	0.9	4.11	**6.02**
										0							
12/16/13	13:27	31.125			76			25.75	5.4	0					0.9		
12/16/13	13:49	20.25						25.75	5.4	0	22	4322	196	11787	0.9	3.85	**5.64**
12/16/13	14:01	14.25			77			25.75	5.4	0	12	2384	199	11922	0.9	3.85	**5.63**
										0							
12/16/13	14:06	31.375			77			25.75	5.4	0					0.9		
12/16/13	14:37	18.5			77			25.75	5.4	0	31	5117	165	9903	0.9	3.20	**4.68**
12/16/13	15:07	7.25			77			25.75	5.4	0	30	4471	149	8942	0.9	2.89	**4.22**
12/16/13	15:20	3						25.75	5.4	0	13	1689	130	7795	0.9	2.52	**3.68**
										0							

Results of Well Permeameter Test, from USBR 7300-89 Method.

Leighton

Project: **Coastal Commercial Chino, Project No. 10557.004**

Exploration #/Location: ***LB-3***

Initial Depth to top of float rod (in.) 25.125

Field Data | **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed) ft	in.	Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	Cumulative Vol (gal)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date 12/16/2013	Start time: 10:25:00 AM																	
12/16/13	10:25	30.25			**69**			25.125	5.3	0					0	1.0		
12/16/13	11:04	28.375			74			25.125	5.3		39	745	19	1146		0.9	0.40	**0.58**
12/16/13	11:35	27.375			77			25.125	5.3		31	397	13	769		0.9	0.26	**0.37**
12/16/13	12:27	25.75			79			25.125	5.3		52	646	12	745		0.8	0.24	**0.35**
12/16/13	13:09	24.5			81			25.125	5.3		42	497	12	710		0.8	0.23	**0.33**
12/16/13	13:53	23.25			81			25.125	5.3		44	497	11	677		0.8	0.22	**0.31**
12/16/13	14:49	20.75			82			25.125	5.3		56	994	18	1064		0.8	0.34	**0.49**
12/16/13	15:45	19.125			83			25.125	5.3		56	646	12	692		0.8	0.22	**0.31**

Results of Well Permeameter Test, from USBR 7300-89 Method.

Leighton

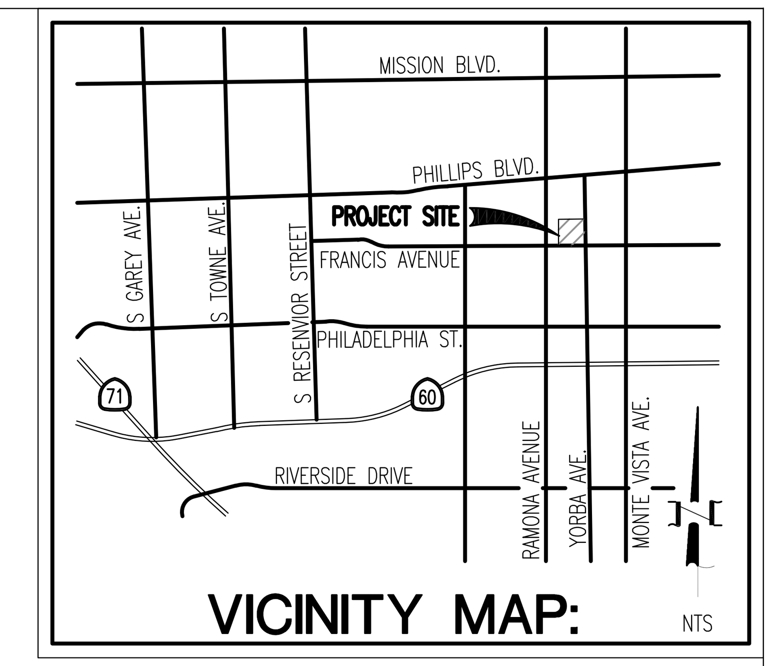
Project: **Coastal Commercial Chino, Project No. 10557.004**

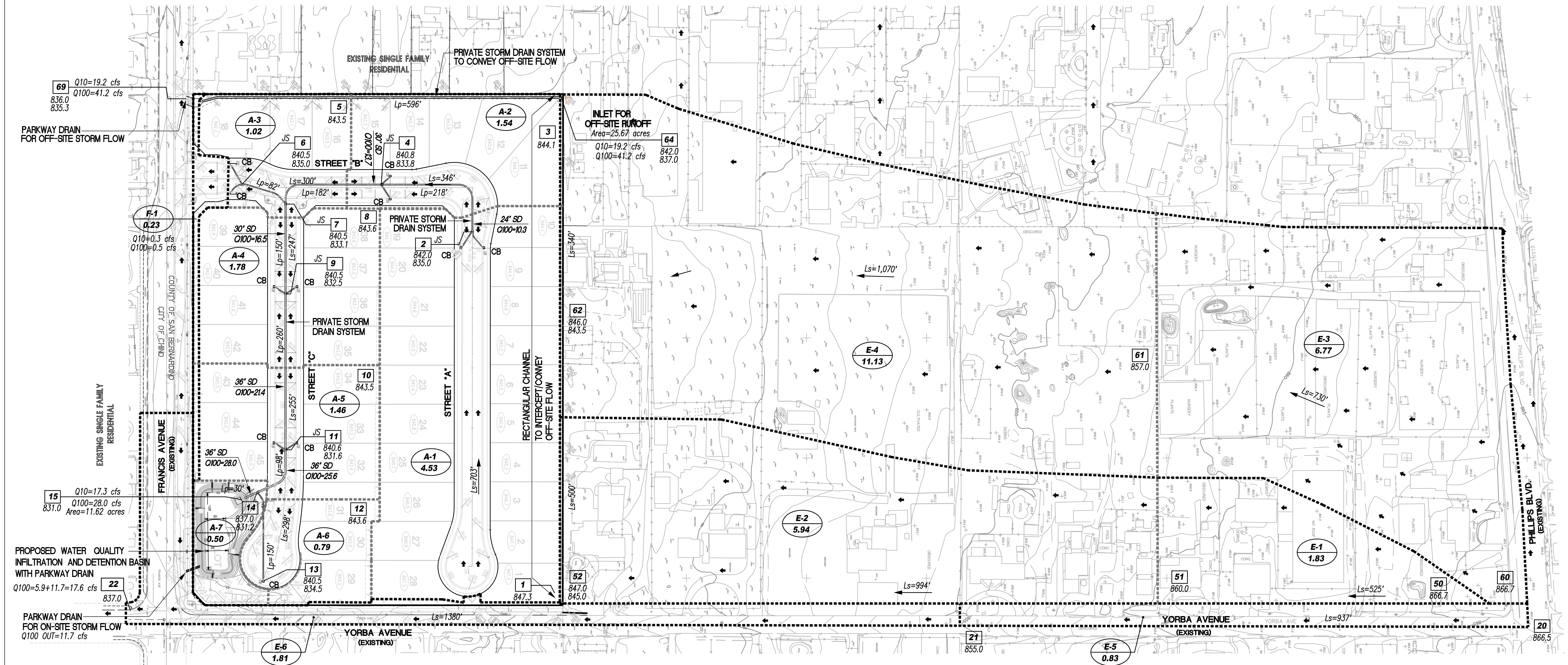
Exploration #/Location: ***LB-5***

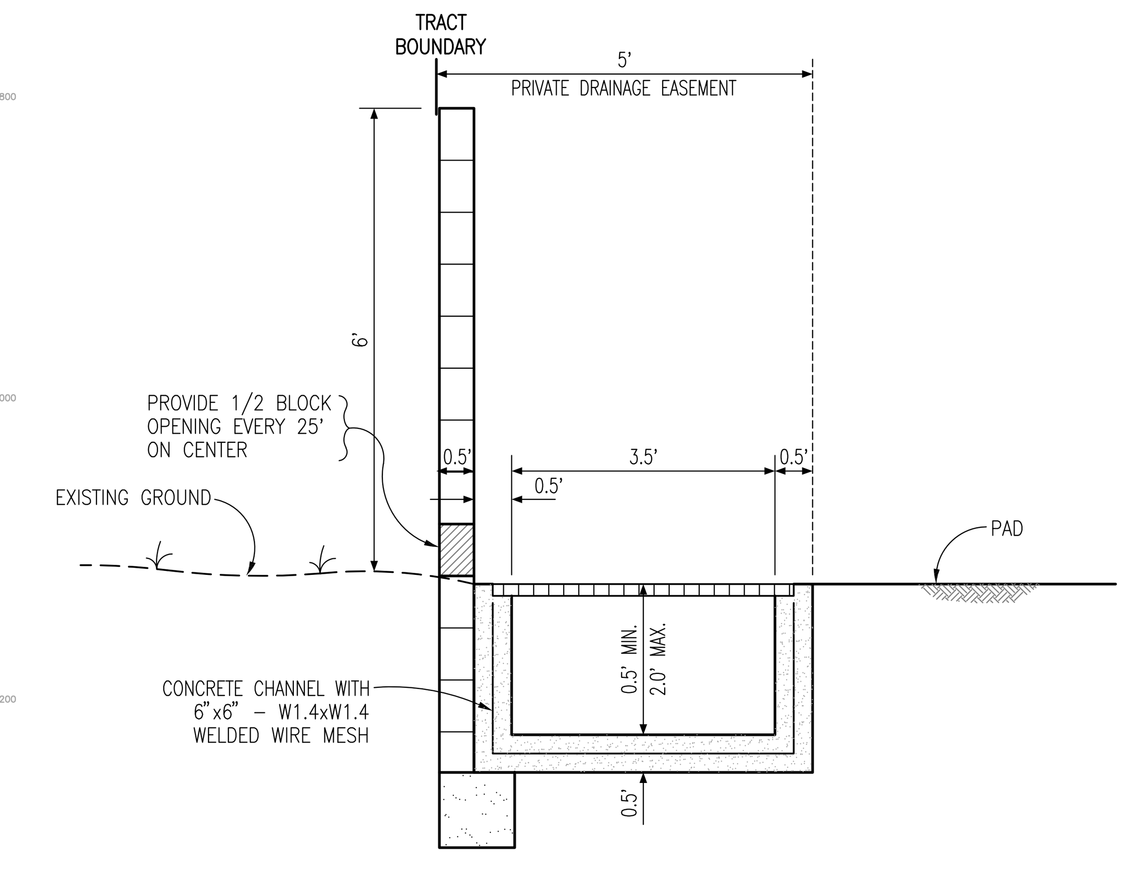
Initial Depth to top of float rod (in.) 26.5

Field Data / **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed)		Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	Cumulative Vol (gal)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																	
12/16/2013	2:25:00 PM		**ft**	**in.**						E	G	H						
12/16/13	14:25	31			**77**			14.75	3.0	0					0	0.9		
12/16/13	14:26	30						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:27	29.125						14.75	3.0		1	348	348	20864		0.9	14.29	**15.53**
12/16/13	14:28	28.125						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:29	27.25						14.75	3.0		1	348	348	20864		0.9	14.29	**15.53**
12/16/13	14:30	26.25						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:32	24.375						14.75	3.0		2	745	373	22354		0.9	15.31	**16.64**
12/16/13	14:42	15.375			77			14.75	3.0		10	3577	358	21460		0.9	14.70	**15.97**
12/16/13	14:53	6						14.75	3.0		11	3726	339	20322		0.9	13.92	**15.13**
12/16/13	15:01	25.125			79			14.75	3.0							0.8		
12/16/13	15:02	24.5						14.75	3.0		1	248	248	14903		0.8	9.96	**10.82**
12/16/13	15:24	7.75			79			14.75	3.0	0	22	6657	303	18154	0	0.8	12.13	**13.18**
12/16/13	15:31	2.375						14.75	3.0	0	7	2136	305	18309	0	0.8	12.23	**13.30**
										0					0			

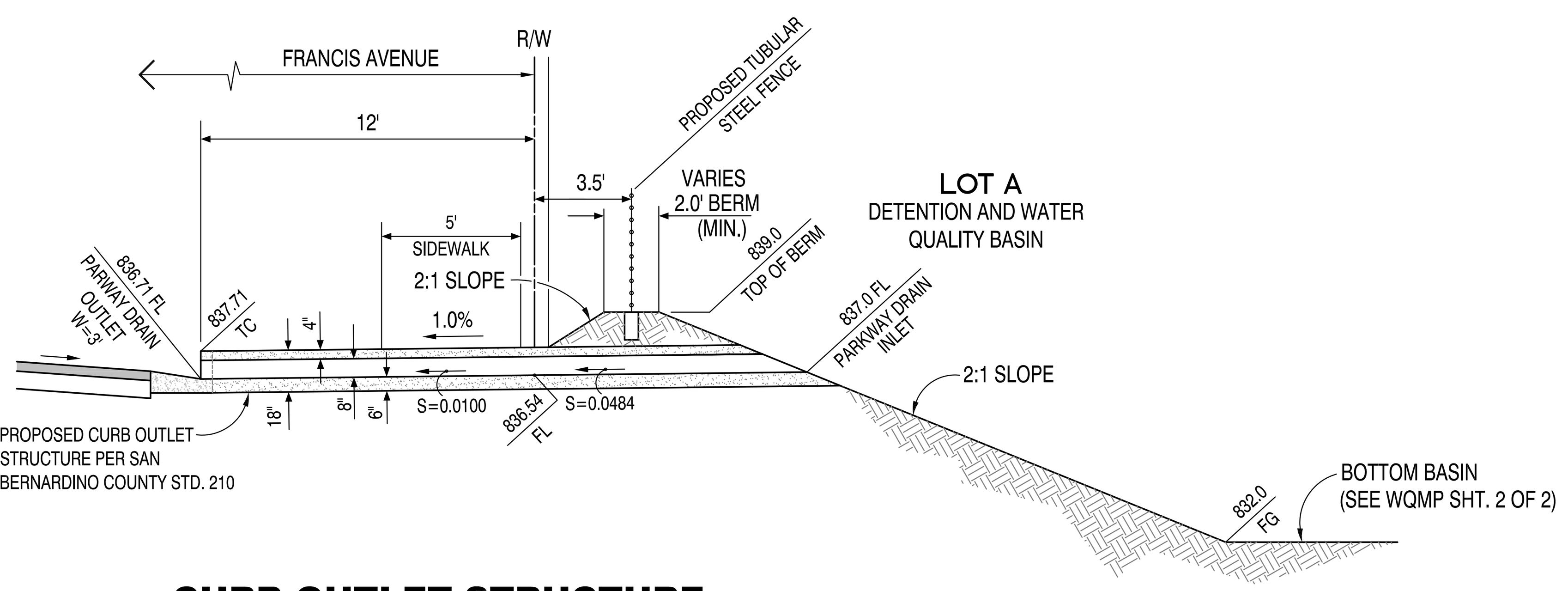






RECTANGULAR CHANNEL DETAIL

N.T.S.



CURB OUTLET STRUCTURE DETAIL

N.T.S.

NOTES:

1. SOILS TYPE "A"
2. HYDROLOGIC CONDITIONS OF CONCERN (HCOC) CALCULATIONS PER PWQMP REPORTS, 2-YEAR AND 100-YEAR STORMWATER RUNOFF DIFFERENCE FOR PRE AND POST DEVELOPMENT WILL BE INFILTRATED IN THE BASIN.
3. EXISTING SITE: AGRICULTURE USE, 40% IMPERVIOUS
4. THE PROPERTY LIES WITHIN FLOOD ZONE 'X' UNSHADED PER FEMA FLOOD MAP 0671C8615H, DATED AUGUST 28, 2008.
5. OFFSITE RUNOFF TO BYPASS ONSITE WATER QUALITY BIOFILTRATION BASIN WITH UNDERDRAIN
6. PEAK FLOW SHOWN ARE FOR 100-YEAR STORM UNLESS NOTED OTHERWISE

NORTH

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

LEGEND:

C.B.	CATCH BASIN
J.S.	JUNCTION STRUCTURE
Lp=XX'	LENGTH OF PIPE FLOW (feet)
X-Y / X.XX	SUB-AREA DESIGNATION / AREA (acres)
Q100=X.X	100-year STORM PEAK FLOW (cfs)
Q10=X.X	10-year STORM PEAK FLOW (cfs)
Ls=XXX'	SURFACE FLOW LENGTH (feet)
	DRAINAGE BOUNDARY
	SUB-AREA DRAINAGE BOUNDARY
	DIRECTION OF SURFACE FLOW
XX / XX.X / XX.X	NODE NUMBER / ELEVATION / INVERT

VESTING TENTATIVE TRACT NO. 20394
PRELIMINARY HYDROLOGY MAP DEVELOPED CONDITION
COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: May 2022

PREPARED FOR:

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C/O BORSTEIN ENTERPRISES
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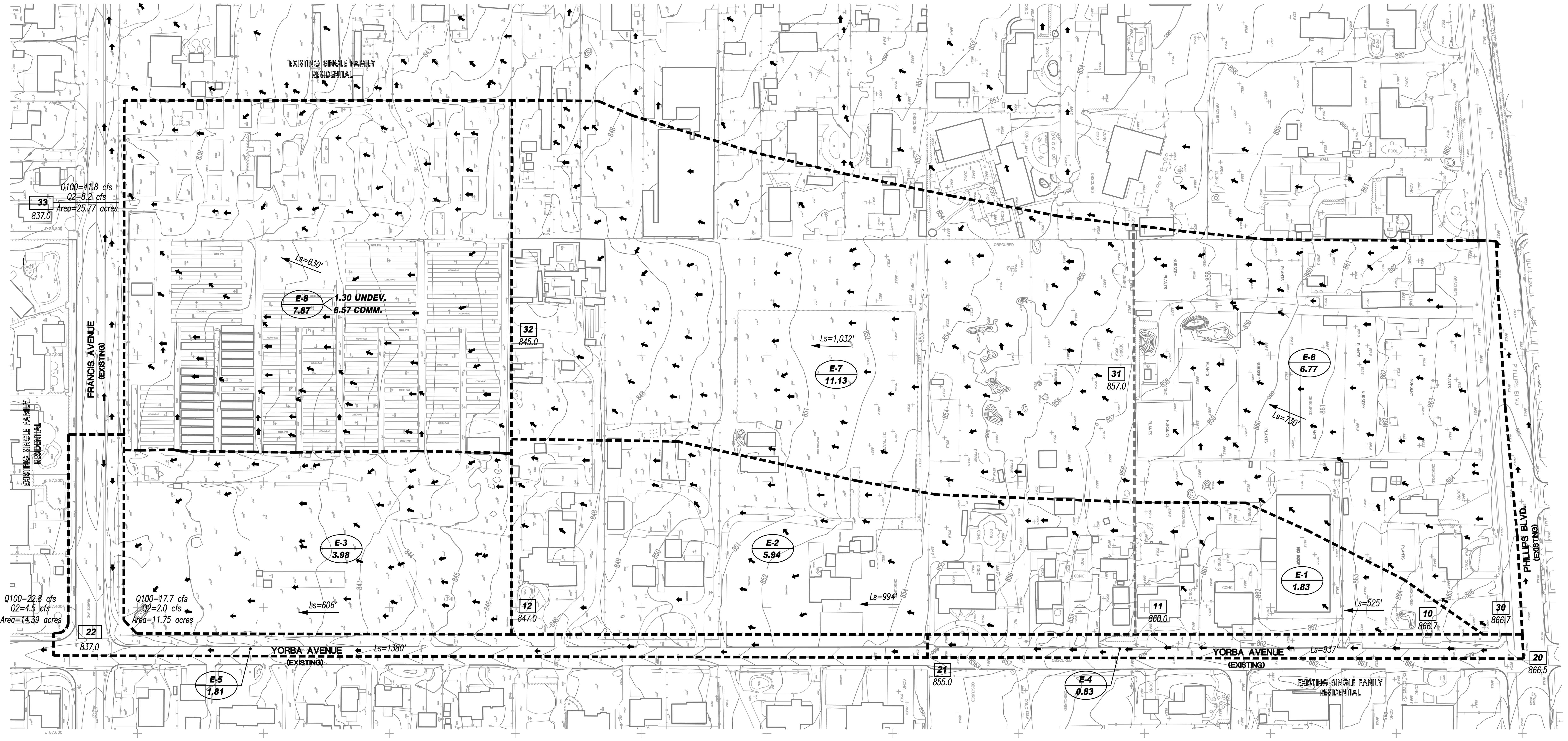
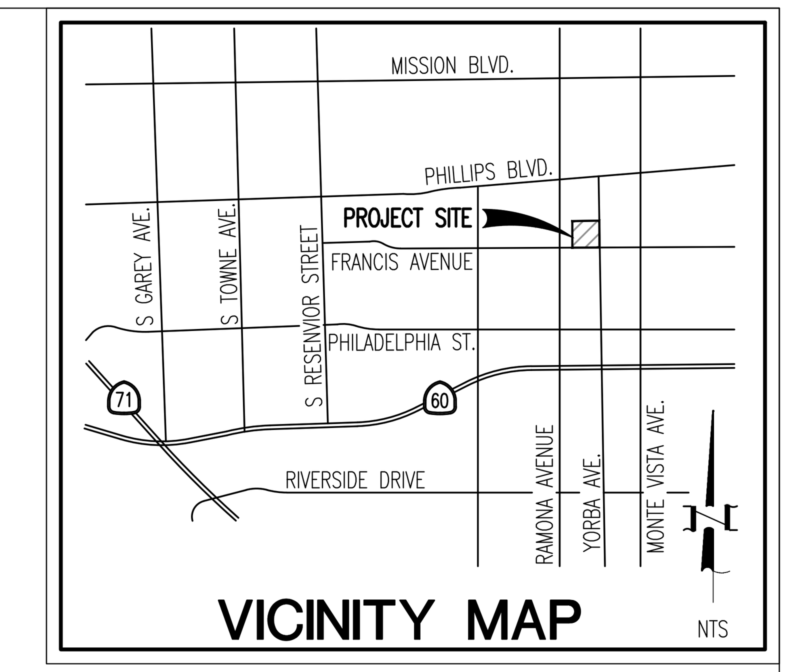
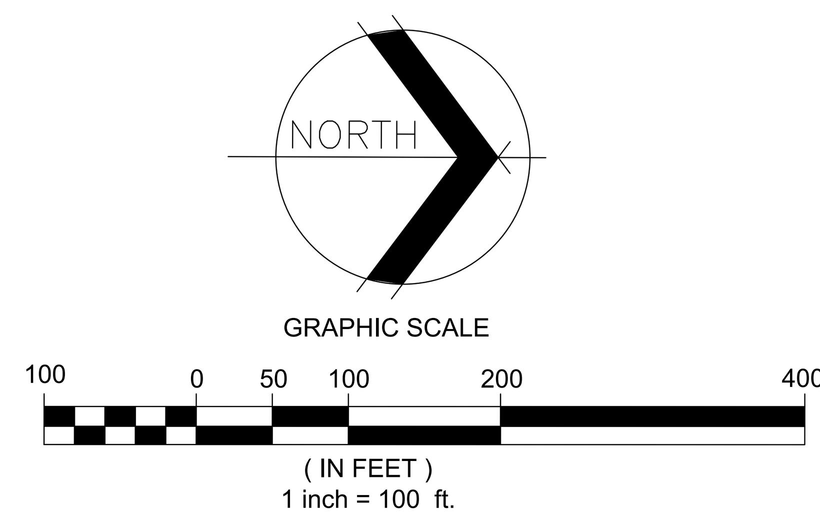




LEGEND:

C.B.	CATCH BASIN
J.S.	JUNCTION STRUCTURE
Lp=XX'	LENGTH OF PIPE FLOW (feet)
X-Y / X.XX	SUB-AREA DESIGNATION / AREA (acres)
Q100=X.X	100-year STORM PEAK FLOW (cfs)
Q10=X.X	10-year STORM PEAK FLOW (cfs)
Ls=XXX'	SURFACE FLOW LENGTH (feet)
	DRAINAGE BOUNDARY
	SUB-AREA DRAINAGE BOUNDARY
	DIRECTION OF SURFACE FLOW
XX / XX.X / XX.X	NODE NUMBER / ELEVATION / INVERT



VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY HYDROLOGY MAP EXISTING CONDITION

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: May 2022

PREPARED FOR:

BORSTEIN ENTERPRISES

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C/O BORSTEIN ENTERPRISES
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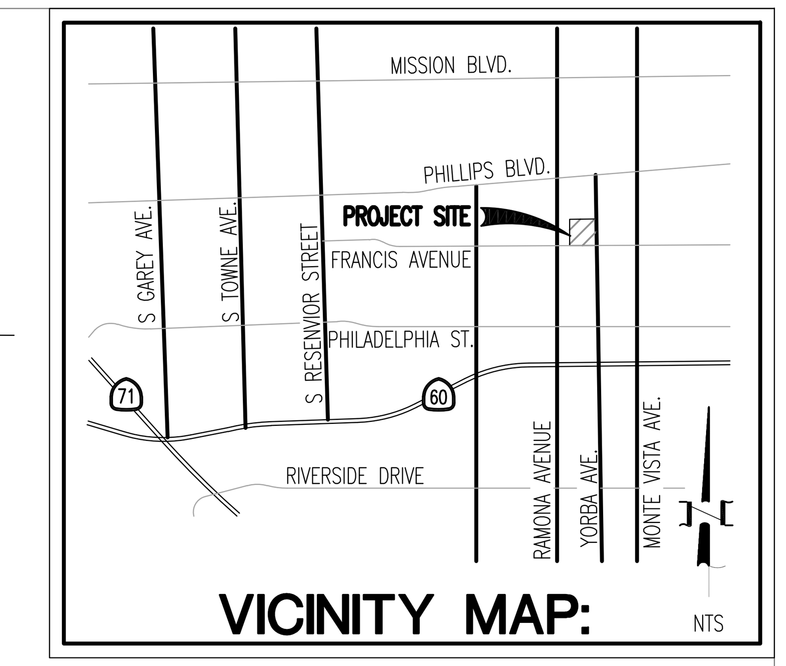
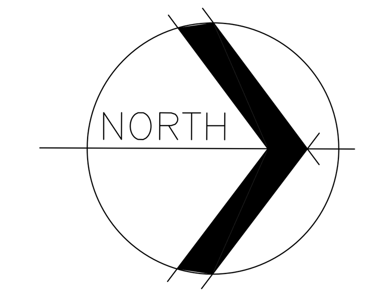
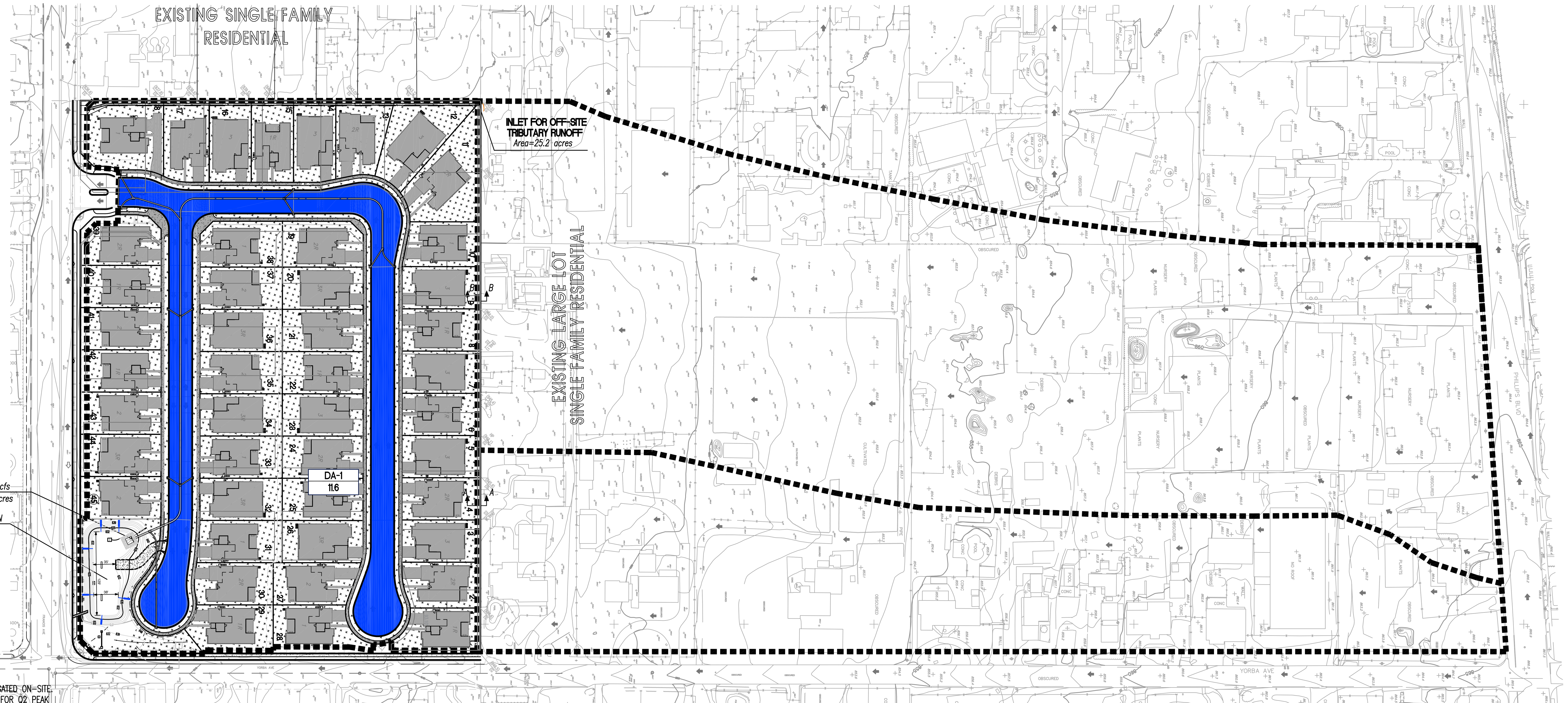


VICINITY MAP: NTS





Q2 PEAK FLOW WILL BE MITIGATED ON-SITE. POST-DEVELOPED CONDITION FOR Q2 PEAK FLOW WILL MATCH PRE-DEVELOPED CONDITION. *SEE NOTE 8.

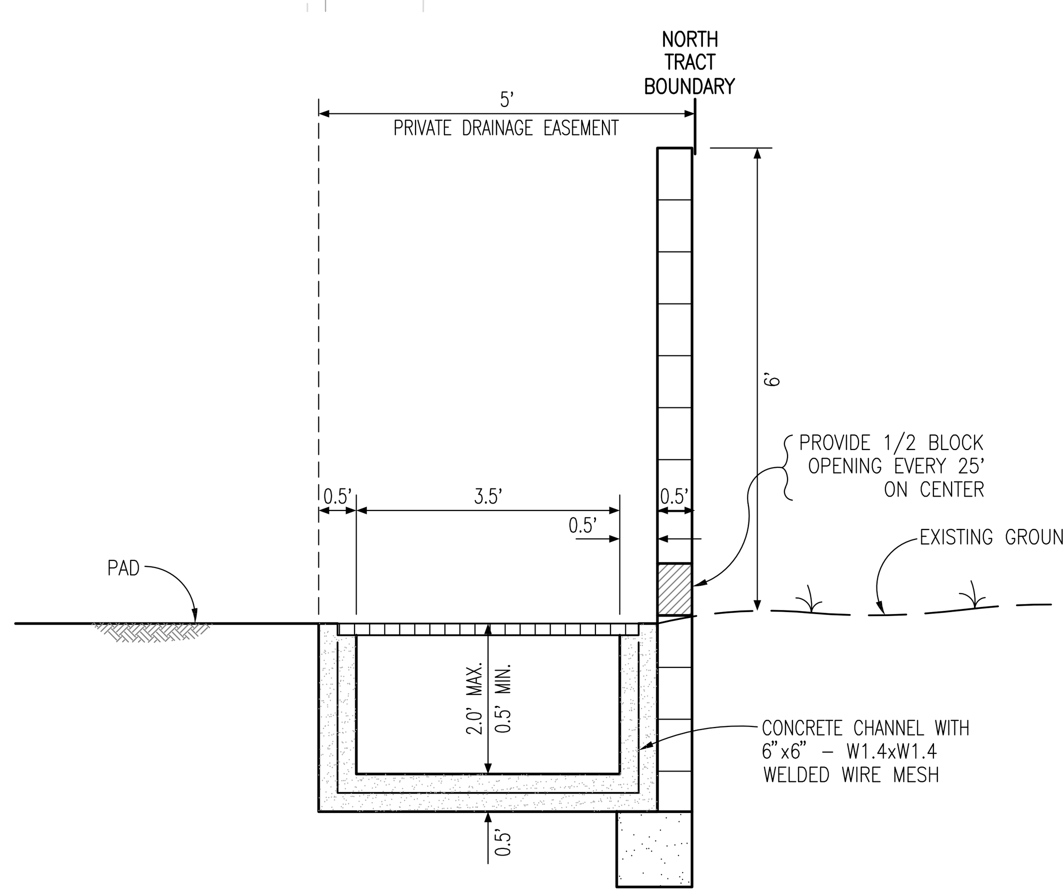
LEGEND:

- C.B. — CATCH BASIN WITH STENCIL
- TRACT BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM DRAIN
- PROPOSED CATCH BASIN WITH BMP SD-13 CATCH BASIN STENCILING
- Q2=X.X — 2-year STORM PEAK FLOW (cfs)
- DIRECTION OF SURFACE FLOW
- DA-1 — DRAINAGE AREA
- 11.6± — AREA (acres)
- LANDSCAPING (5.07 AC)
- IMPERVIOUS SURFACE (5.43 AC)
- PERMEABLE PAVERS (1.59 AC)

DA-1			
	AREA	RET. VOL.	% OF DCV
BASIN	6914	22,271	102%

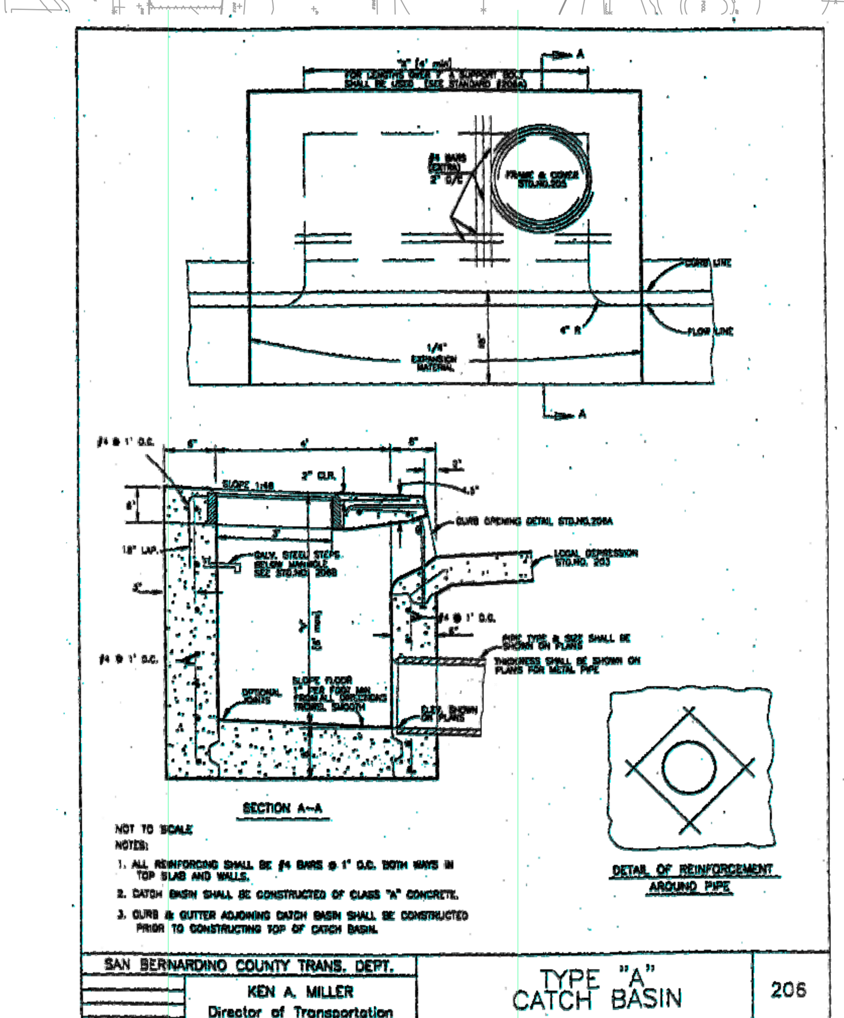
NOTES:

1. SOILS TYPE "A"
2. HYDROLOGIC CONDITIONS OF CONCERN (HCOC) CALCULATIONS PER PWQMP REPORTS, 2-YEAR AND 100-YEAR STORMWATER RUNOFF DIFFERENCE FOR PRE AND POST DEVELOPMENT WILL BE INFILTRATED IN THE BASIN.
3. EXISTING SITE: AGRICULTURE USE, 40% IMPERVIOUS
4. THE PROPERTY LIES WITHIN FLOOD ZONE 'X' UNSHADED PER FEMA FLOOD MAP 0671C8615H, DATED AUGUST 28, 2008.
5. OFFSITE RUNOFF TO BYPASS ONSITE WATER QUALITY BIOFILTRATION BASIN WITH UNDERDRAIN
6. PEAK FLOW SHOWN ARE FOR 100-YEAR STORM UNLESS NOTED OTHERWISE



RECTANGULAR CHANNEL DETAIL

NOT TO SCALE



TYPICAL CATCH BASIN DETAIL

NOT TO SCALE

CATCH BASIN STENCIL DETAIL

NOT TO SCALE

VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY WATER QUALITY MANAGEMENT PLAN SHEET 1 OF 2

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: MAY 2022

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

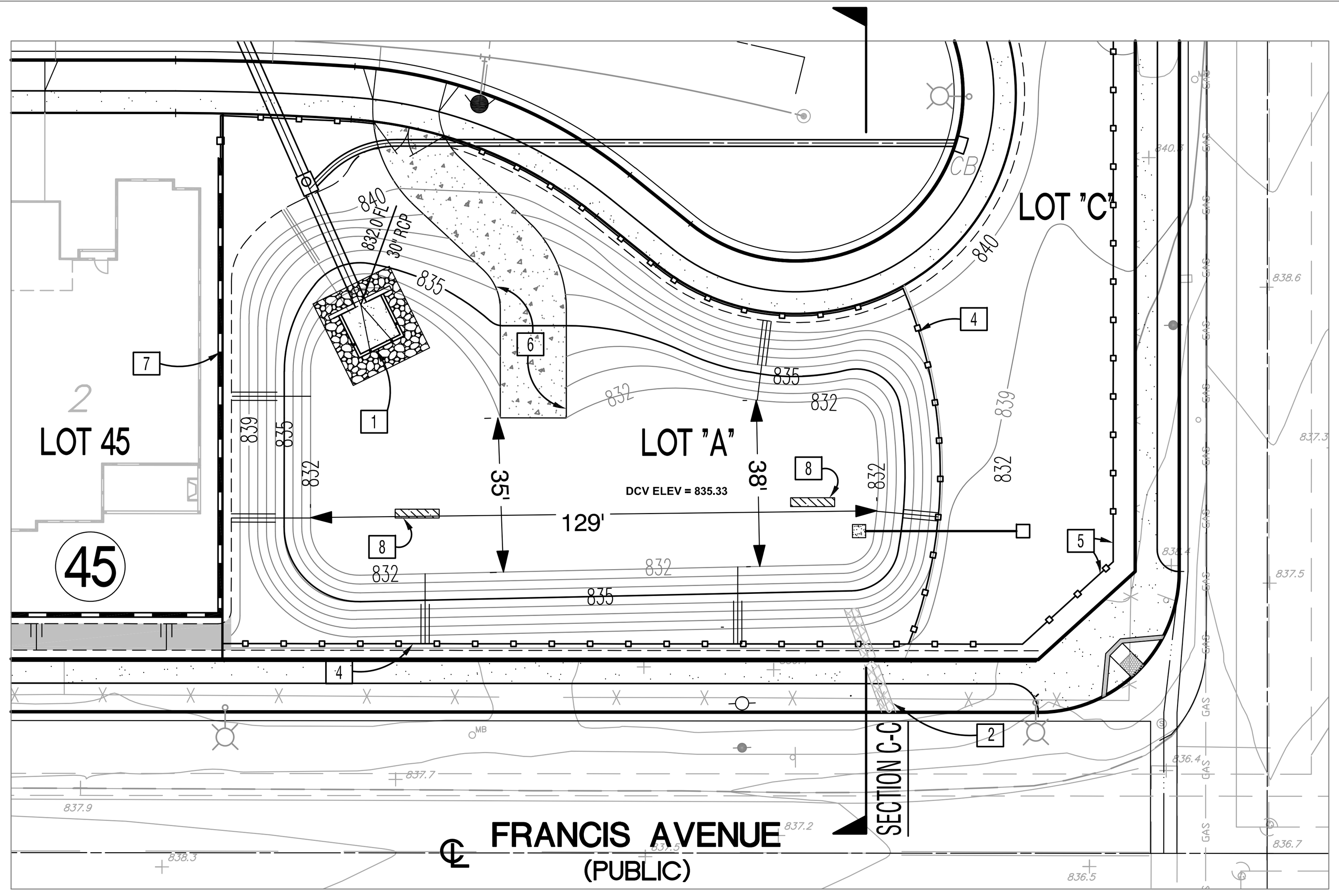
PREPARED FOR:

YORBA VILLAS, LLC
C/O BORSTEIN ENTERPRISES
11766 WILSHIRE BOULEVARD, SUITE 820
LOS ANGELES, CA 90025
CONTACT PERSON: ERIK PFAHLER
TELEPHONE: (310) 582-1991 EXT. 203
FAX: (310) 582-1999

BORSTEIN ENTERPRISES

PREPARED BY:

MDS CONSULTING
MORSE SCHULTZ
17320 Redhill Avenue
Suite 350
Irvine, CA 92614
Voice: 949-251-8821
FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS



WATER QUALITY BASIN DETAIL

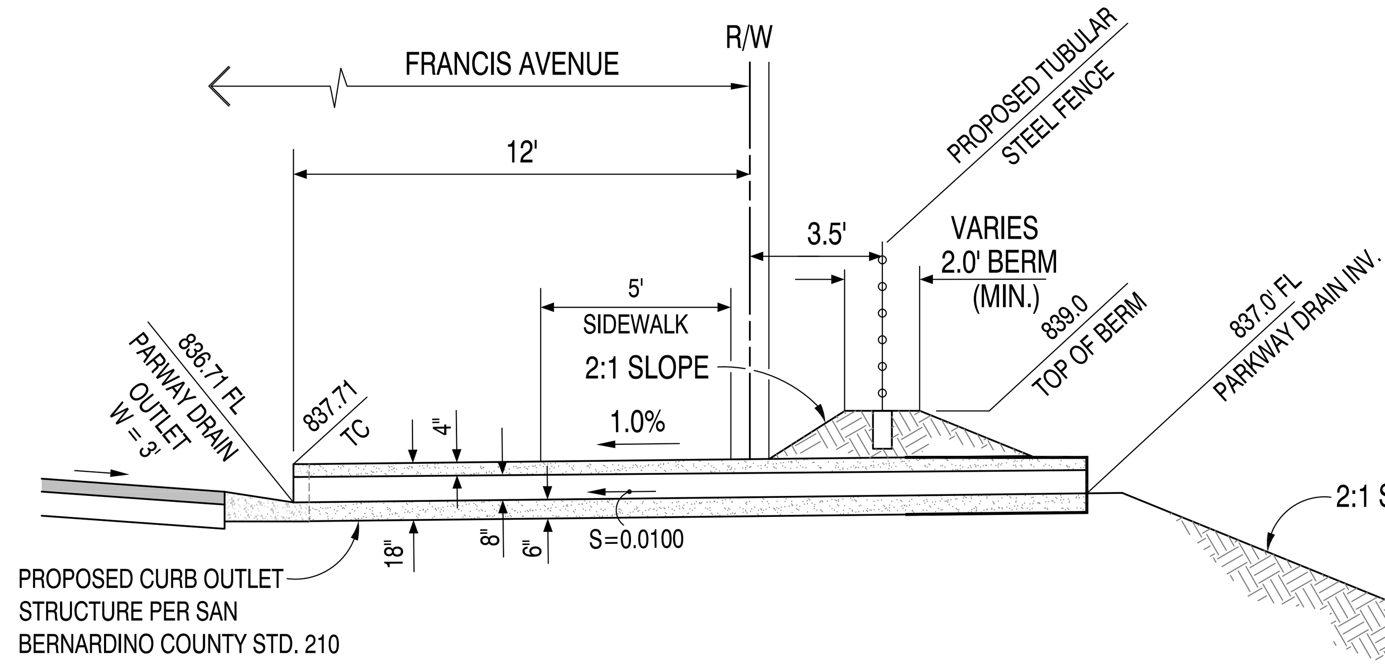
NORTH

SCALE: 1" = 30'

ADVISORY NOTES:

1 CONCRETE FOREBAY
2 3' X 8" PARKWAY DRAIN
3 NOT USED.
4 TUBULAR STEEL FENCE
5 NOT USED.
6 ACCESS RAMP (15% MAX SLOPE) HEAVY BROOM FINISH
7 RETAINING WALL ON LOT 45
8 2' X 10' X 30' SAND FILLED TRENCH PER GEOTECHNICAL ENGINEERS RECOMMENDATIONS*

* THE DESIGN OF THE BASIN CONSIDERS JUST THE INFILTRATION CONTRIBUTION OF THE SHALLOW GRANULAR ZONE, IGNORING THE CONTRIBUTION OF THE SAND TRENCHES INTO THE DEEPER GRANULAR, SOILS, PER SOILS ENGINEER'S SPECIFICATIONS.



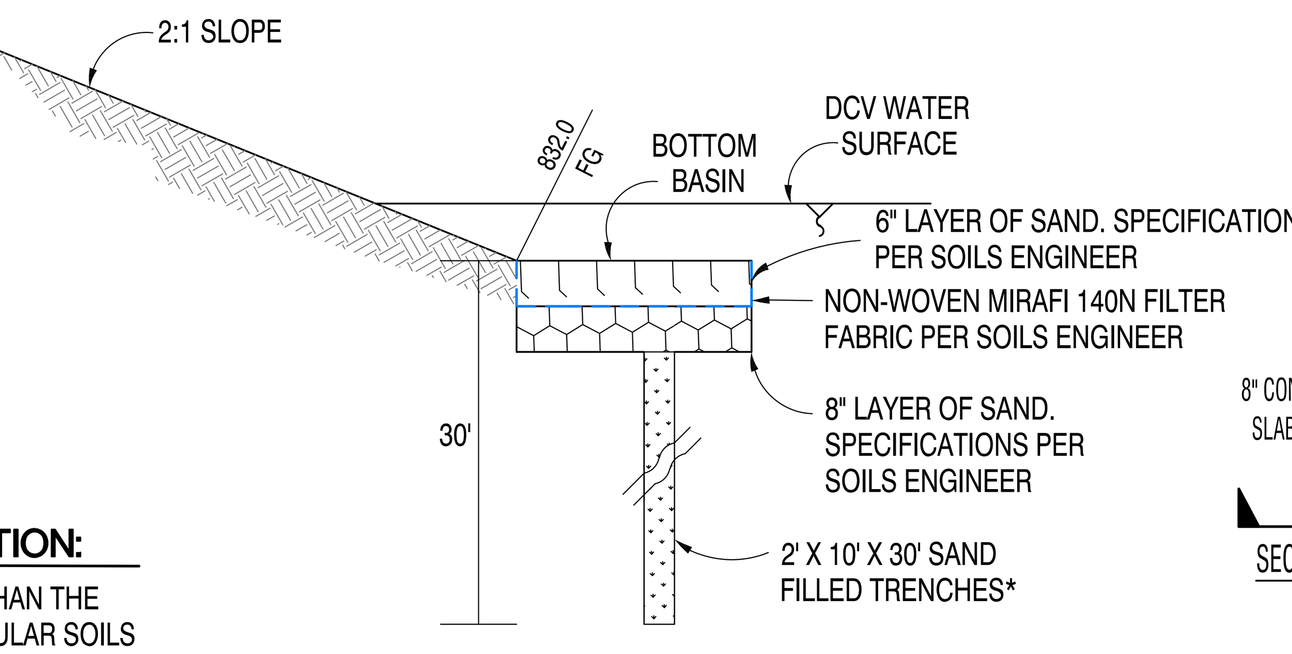
CURB OUTLET STRUCTURE DETAIL

N.T.S.

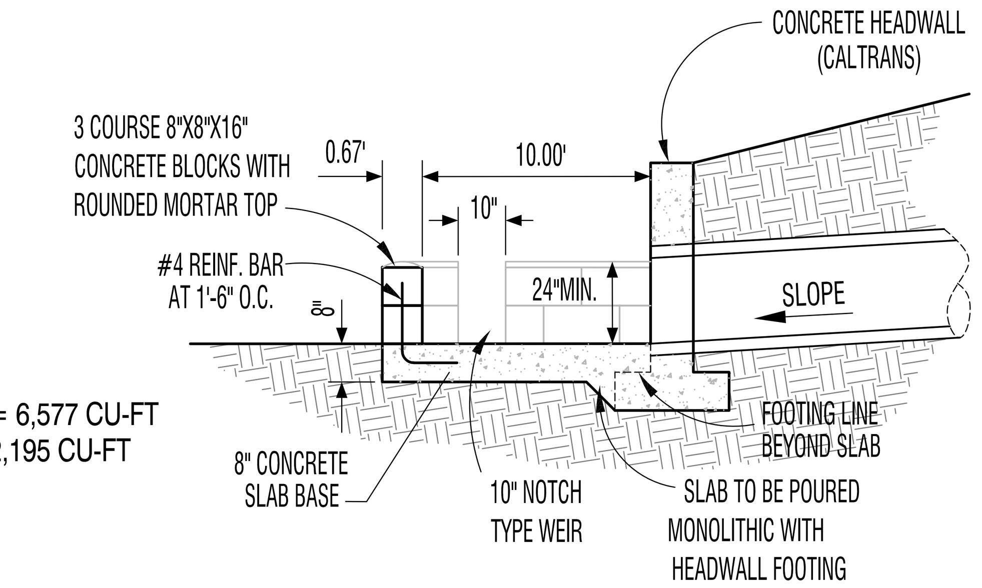
LOT A
DETENTION AND WATER QUALITY BASIN

NOTE:

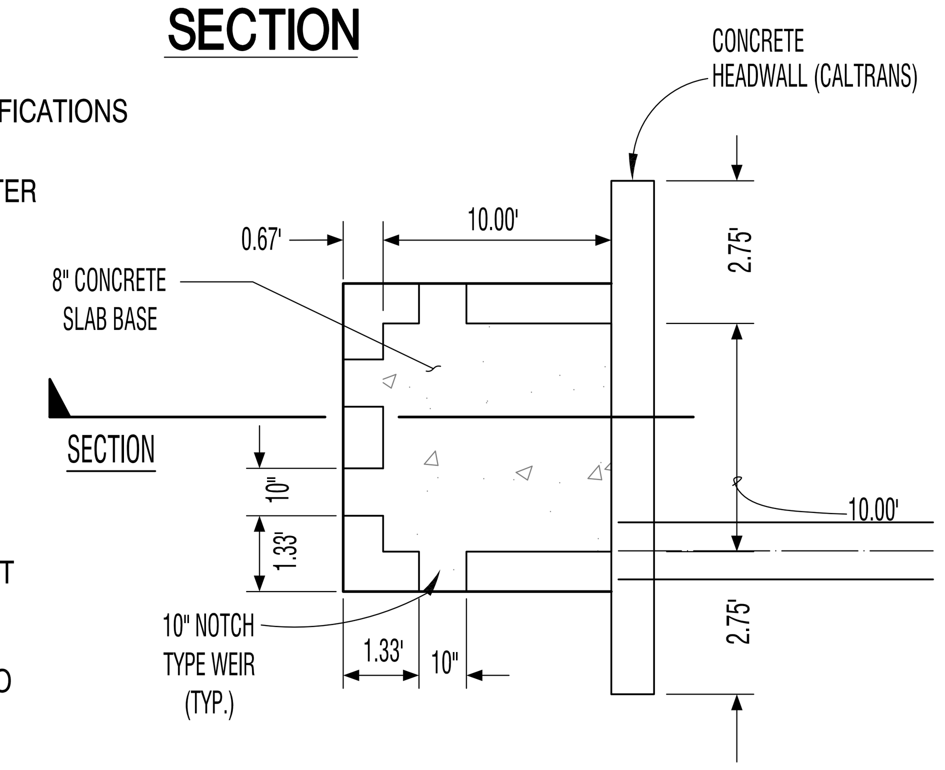
DCV WATER SURFACE = 835.33
DCV = 21,842 CU-FT
WQ BASIN CAPACITY = 22,271 CU-FT
△ VOLUME FOR PRE AND POST DEVELOPMENT FOR 100 YEAR STORM = 6,577 CU-FT
△ VOLUME FOR PRE AND POST DEVELOPMENT FOR 2 YEAR STORM = 2,195 CU-FT



* THE DESIGN OF THE BASIN CONSIDERS JUST THE INFILTRATION CONTRIBUTION OF THE SHALLOW GRANULAR ZONE, IGNORING THE CONTRIBUTION OF THE SAND TRENCHES INTO THE DEEPER GRANULAR SOILS, PER SOILS ENGINEER'S SPECIFICATIONS.



SECTION



PLAN

2 CONCRETE FOREBAY DETAIL

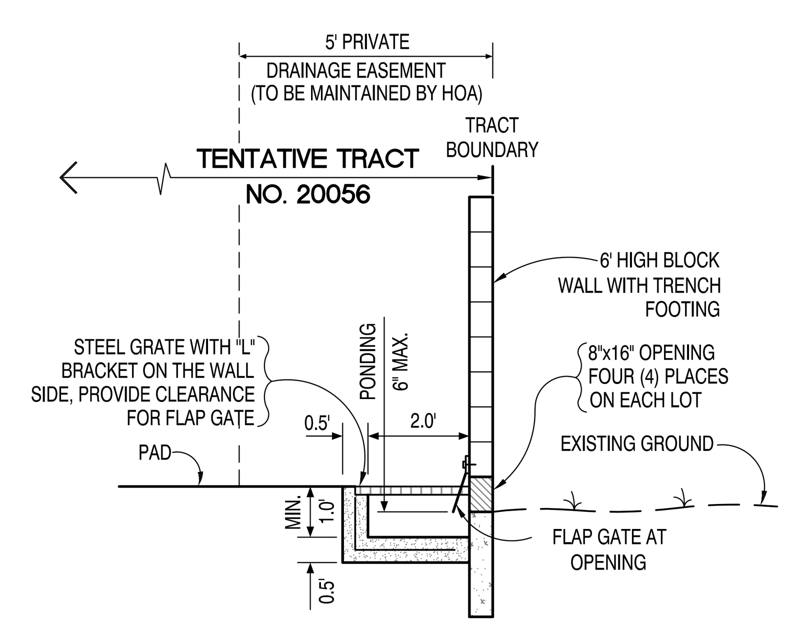
NOT TO SCALE

SOILS ENGINEER'S BASIN CONSTRUCTION RECOMMENDATION:

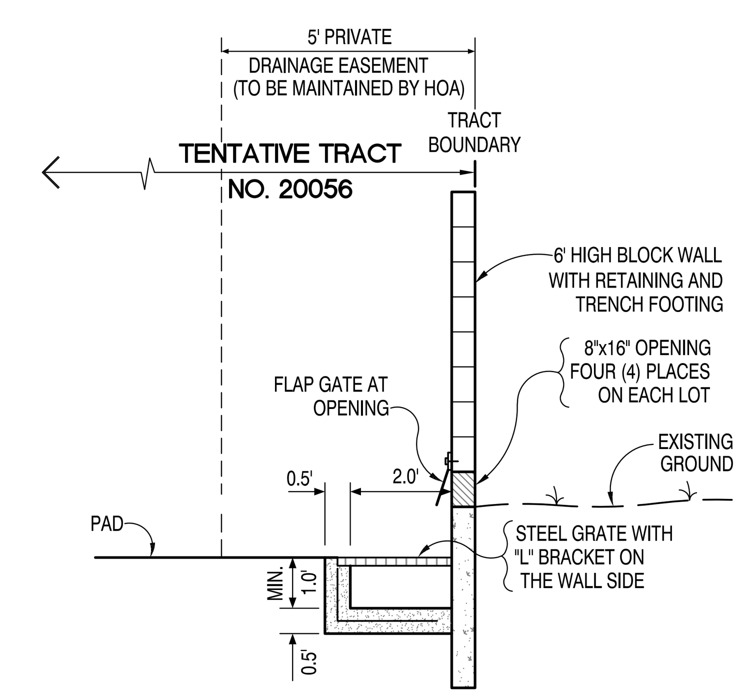
SINCE THE BASIN SHALLOW GRANULAR ZONE MAY ACTUALLY BE SLIGHTLY DEEPER THAN THE BOTTOM OF THE BASIN, THE BASIN SHOULD BE OVEREXCAVATED UNTIL THESE GRANULAR SOILS ARE EXPOSED. IF OVEREXCAVATION IS NEEDED, THE OVEREXCAVATED PORTION SHOULD BE BACKFILLED WITH HIGHLY PERMEABLE SAND AS DESCRIBED BELOW. WE RECOMMEND THAT BASIN OVEREXCAVATION AND BACKFILL, IF NECESSARY, BE PERFORMED AFTER BASIN INLET/OUTLET STRUCTURES ARE COMPLETED. IN ANY CASE, OPERATING HEAVY EQUIPMENT IN THE BASIN BOTTOM SHOULD BE KEPT TO A MINIMUM TO AVOID COMPACTION AND FINES CONTAMINATION OF THE EXPOSED GRANULAR SOILS.

BELOW IS A GENERAL DESCRIPTION OF THE RECOMMENDED ASPECTS OF THE CONSTRUCTION OF THE BASIN WITH SAND-FILLED TRENCHES:

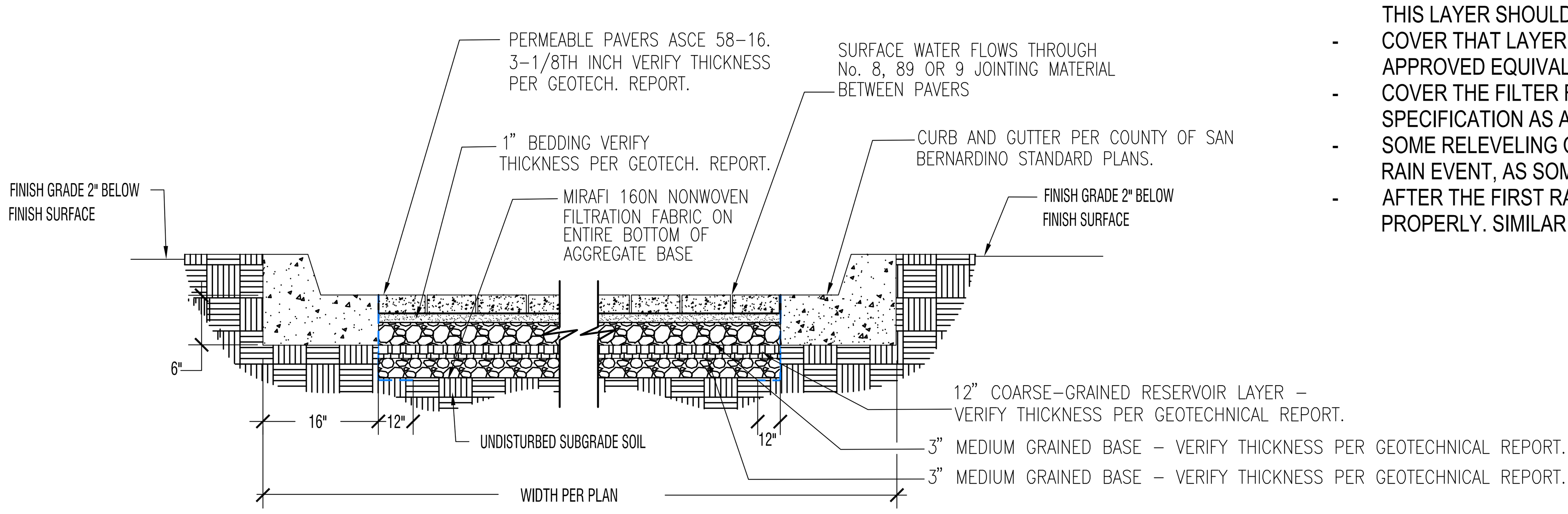
- EXCAVATE THE BASIN. CONSTRUCT ALL STRUCTURES. CLEAN THE BASIN BOTTOM OF LOOSE SOILS AND DEBRIS.
- CONSTRUCT TWO SAND-FILLED TRENCHES AS FOLLOWS:
- EXCAVATE THE TRENCH; DISPOSE OF THE CUTTINGS OUTSIDE OF THE BASIN.
- CLEAN THE GROUND AROUND THE TRENCH OF LOOSE SOIL AND DEBRIS.
- BACKFILL THE TRENCH WITH ASTM C33 FINE AGGREGATE WITH A SPECIAL CRITERION OF A MAXIMUM OF 2 PERCENT FINES BEFORE TRANSPORT (OTHER OPTIONS MAY BE ACCEPTABLE BASED ON AVAILABILITY).
- AFTER THE TRENCH HAS BEEN FILLED WITH SAND, CAREFULLY JET THE SAND TO CONSOLIDATE THE SAND, UNTIL THE SAND NO LONGER SETTLES.
- AFTER SAND CONSOLIDATION, OVERFILL THE TRENCH SO EXCESS SAND POURS/MOUNDS ONTO THE GROUND. MAINTAIN THIS SAND CLEAN WHILE EXCAVATING THE NEXT TRENCH.
- CAREFULLY COVER THE BASIN BOTTOM WITH SAND (SAME SPECIFICATION AS ABOVE). THIS LAYER SHOULD BE A MINIMUM OF 8 INCHES THICK.
- COVER THAT LAYER OF SAND WITH NON-WOVEN MIRAFI 140N FILTER FABRIC, OR APPROVED EQUIVALENT.
- COVER THE FILTER FABRIC WITH A MINIMUM OF 6 INCHES OF SAND (SAME SPECIFICATION AS ABOVE).
- SOME RELEVELING OF THE SAND SURFACE MAY NEED TO BE DONE AFTER THE FIRST RAIN EVENT, AS SOME ADDITIONAL SAND CONSOLIDATION MAY OCCUR.
- AFTER THE FIRST RAIN EVENT, CHECK TO SEE THAT THE SYSTEM FUNCTIONS PROPERLY. SIMILAR CHECKS SHOULD BE DONE AFTER EACH MAJOR STORM.



SECTION A-A
RECTANGULAR CHANNEL DETAIL
FOR LOTS 1 - 6
SCALE: 1"=3'



SECTION B-B
RECTANGULAR CHANNEL DETAIL
FOR LOTS 7 - 11
SCALE: 1"=3'



A TYPICAL STRUCTURAL SECTION
PERMEABLE PAVERS WITH BANDING
(FOR REFERENCE ONLY)
N.T.S.

VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY WATER QUALITY MANAGEMENT PLAN SHEET 2 OF 2

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: MAY 2022

I:\89704\DRAINAGE\WQMP\PRELIMINARY\wqmp maps\WQMP Areas\URW Site Plan 2.dwg 5/23/22

Preliminary Water Quality Management Plan

For:

Vesting Tentative Tract No. 20394

APN 1013-211-21 and 1013-211-22

County of San Bernardino, CA

Prepared for:
Yorba Villas, LLC
c/o Borstein Enterprises
11766 Wilshire Boulevard, Suite 820
Los Angeles, CA 90025
(310) 582-1991 x203

Prepared by:
MDS Consulting
17320 Redhill Avenue, Suite 350
Irvine, CA 92614
(949) 251-8821
Stanley C. Morse P.E., L.S.

WQMP Preparation Date

January 2021

WQMP Revision Date

1st: August 2021

2nd: November 2021

3rd : March 2022

Approval Date:______________

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Yorba Villas, LLC c/o Borstein Enterprises by MDS Consulting. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Area-wide Stormwater Program requiring the preparation of a WQMP. 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 San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county 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):	PROJ-2021-00008	Grading Permit Number(s):	TBA
Tract/Parcel Map Number(s):	VTTM 20394	Building Permit Number(s):	TBA
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 1013-211-21 and -22

Owner's Signature			
Owner Name: Erik Pfahler			
Title	Senior Vice President		
Company	Yorba Villas, LLC c/o Borstein Enterprises		
Address	11766 Wilshire Boulevard, Suite 820, Los Angeles, CA 90025		
Email	erik@borsteinenterprises.com		
Telephone #	(310) 582-1991 x203		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	PROJ-2021-00008	Grading Permit Number(s):	TBA
Tract/Parcel Map Number(s):	TTM 20394	Building Permit Number(s):	TBA
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 1013-211-21 and -22

"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 Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Stanley C. Morse P.E., L.S.		PE Stamp Below
Title	Principal	
Company	MDS Consulting	
Address	17320 Redhill Avenue, Suite 350, Irvine, CA 92614	
Email	smorse@mdsconsulting.net	
Telephone #	(949) 251-8821 x203	
Signature	Stanley Morse	
Date	November 2, 2021	

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Section 1 Discretionary Permit(s)

<table>
<tr><th colspan="6">Form 1-1 Project Information</th></tr>
<tr><td colspan="2">Project Name</td><td colspan="4">Vesting Tentative Tract No. 20394</td></tr>
<tr><td colspan="2">Project Owner Contact Name:</td><td colspan="4">Erik Pfahler</td></tr>
<tr><td>Mailing Address:</td><td>11766 Wilshire Boulevard, Suite 820
Los Angeles, CA 90025</td><td>E-mail Address:</td><td>erik@borsteinenterprises.com</td><td>Telephone:</td><td>(310) 582-1991 x203</td></tr>
<tr><td colspan="2">Permit/Application Number(s):</td><td>PROJ-2021-00008</td><td>Tract/Parcel Map Number(s):</td><td colspan="2">VTTM 20394</td></tr>
<tr><td colspan="2">Additional Information/Comments:</td><td colspan="4"></td></tr>
<tr><td colspan="2">Description of Project:</td><td colspan="4">The proposed project is a gated single family detached residential project located on 13.35 gross acres (to the centerline of perimeter streets) and 12.03 net acres (to the street’s right of way) at the northwest corner of Francis and Yorba Avenues in the unincorporated territory of the County of San Bernardino. The project will have 45 residential lots averaging 8,533 square feet at a gross density of 3.36 dwelling units per acre. The project will also have a combination stormwater detention and water quality basin. The detention basin is required due to the project lying within an area that has a Hydraulic Condition of Concern (HCOC) due to a lack of downstream storm water facilities. The project is also classified as an infill project as it is surrounded on all four sides by developed property. In addition to the detention basin, the project has expanded landscape lots along both Francis Avenue (10 feet) and Yorba Avenue (5 feet) providing more landscape areas for infiltration. Of particular interest on this project is the large tributary area to the north of the property. This 25.6-acre tributary area is composed of large lots that have been used for agricultural purposes and large animal corrals, commencing at the centerline of Phillips Avenue and continuing southerly to the north property line of the project. The lot sizes in this area range from 0.48 acres to 4.81 acres averaging 2 acres.

As per a separate submittal, the Preliminary Hydrology Study will determine the 10-year and 100-year storm flows emanating from the project as well as from the tributary area, keeping the two drainage area’s storm flows separate from each other. The tributary storm flows will be collected along the northerly boundary of the project conveyed through the project in a separate storm drain pipe system (private) and outletted onto Francis Avenue at the southwest corner of the project through a curb outlet drain. The in-tract storm flows will be collected in a separate in-tract storm drain pipe system (private) and conveyed to the detention/water quality basin at the southeast corner of the project. The basin is a dual-purpose basin; an Infiltration basin and a storm water detention basin. The storm flows will be outletted onto the bottom of the detention basin through an energy dissipater structure to minimize turbulence and related erosion of the bottom of the basin.

The private street will be constructed of pervious pavers to collect the incident rainfall. The paver areas will be used to increase perviousness on site. In turn, this will help in mitigating the increase in volume for the developed condition.</td></tr>
</table>

	The Water Quality and Detention basin will be designed as an infiltration basin. This flat earthen basin is designed to capture the design capture volume, and basin capacity is enough to mitigate the difference between the Existing and Proposed 2-yr and 100-yr storms. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72-hour drawdown period. Based on the recommendations of the Geotechnical Engineer, the flat bottom of the basin will a have 8-12” inch top layer of sand, a non-woven Mirafi 140N filter fabric, and a 6” layer of sand with the special criteria described in the geotechnical report. Sand Trenches are also recommended by the Geotechnical Engineer. These trenches will be 2’ wide, 10’ long, and 30’ deep. The design of the basin considers just the infiltration contribution of the shallow granular zone, ignoring the contribution of the sand trenches into the deeper granular soils, per soils engineers’ specifications.
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	None

Section 2 Project Description

2.1 Project Information

This section of the WQMP should 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.

Form 2.1-1 Description of Proposed Project					
1 Development Category (Select all that apply):					
☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site		☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539		☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.		☐ Parking lots of 5,000 ft^2 or more exposed to storm water		☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day
☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.					
2 Project Area (ft^2): Drainage Area (ft2):	523,909± 505992 ±	3 Number of Dwelling Units:	45	4 SIC Code:	6514 Single Family Residential
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.*					
6 Does Project include roads? Yes ☒ No ☐ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP) Transportation WQMP Template Not applicable to New Projects or Significant Projects required to prepare a WQMP*					

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:
During construction, developer shall be responsible for installing, inspecting, and maintaining all onsite post-construction BMPs. Yorba Villas, LLC c/o Borstein Enterprises shall also be responsible for the management of the project site plus implementation and maintenance of the BMPs required by this WQMP until such time as these responsibilities are turned over to and accepted for maintenance by the homeowner and the HOA. Post-construction, the HOA shall be responsible for long-term operation and maintenance, including funding of the project's post-construction BMPs. The HOA shall be responsible for maintaining all common private areas within the site. The HOA will be responsible for the maintenance of the Water Quality Basin. The HOA shall retain all inspection and maintenance records for the project's BMPs for a period of 5 years after the recorded inspection date for the lifetime of the project. The proposed Water Quality will be the maintenance responsibility of the HOA. All on-site storm drain system including the catch basins will be HOA maintained. <u>Owner and Developer Information:</u> Yorba Villas, LLC c/o Borstein Enterprises 11766 Wilshire Boulevard, Suite 820 Los Angeles, CA 90025 (310) 582-1991 x203 Contact: Erik Pfahler

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 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 ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Phosphorous	E ☒	N ☐	Expected pollutant for Residential area; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Nitrogen	E ☒	N ☐	Expected pollutant for Residential area; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Noxious Aquatic Plants	E ☐	N ☒	N/A
Sediment	E ☒	N ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Metals	E ☒	N ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Oil and Grease	E ☒	N ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Trash/Debris	E ☒	N ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Pesticides / Herbicides	E ☒	N ☐	Expected pollutant for Residential areas; the project site will implement on-site LID BMPs in order to treat expected pollutants of concern
Organic Compounds	E ☐	N ☒	N/A
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits			
1 Project Types that Qualify for Water Quality Credits: NONE			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐Vertical density [20%] ☐7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit *(Total all credit percentages up to a maximum allowable credit of 50 percent)* = **0**			
Description of Water Quality Credit Eligibility (if applicable)	**NONE**		

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP 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 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.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.041742	Longitude -117.703684	Thomas Bros Map page 641 F4
1 San Bernardino County climatic region: ☒ Valley ☐ Mountain			
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
	Project site has one drainage area only.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
	E-1	E-2		
1 DMA drainage area (ac)	3.3	8.7		
2 Existing site impervious area (ft^2)	28,750	189,486		
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II	II		
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	A	A		
5 Longest flowpath length (ft)	616	998		
6 Longest flowpath slope (ft/ft)	0.1230	0.0080		
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren and Residential	Barren and Commercial		
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*	Good	Fair		

Form 3-3 Watershed Description for Drainage Area	
Receiving waters *Refer to Watershed Mapping Tool -* *http://sbcounty.permitrack.com/WAP* *See 'Drainage Facilities" link at this website*	San Antonio Channel, Chino Creek Reach 2, Chino Creek Rach 1B, Prado Dam, Santa Ana River Reach 2, 1, Newport Slough, Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP* *and State Water Resources Control Board website –* *http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	San Antonio Creek: pH Chino Creek Reach 2: Indicator Bacteria, pH Chino Creek Reach 1B: COD, Indicator Bacteria, Nutrients Prado Flood Control Basin, pH
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	None
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	San Antonio Channel, Chino Creek Reach 1B
Hydrologic Conditions of Concern	☒ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☐ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

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.

Form 4.1-1 Non-Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR,
		Included	Not Applicable	if not applicable, state reason
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Educational Materials will be available to homeowners through HOA. HOA will periodically provide tenants with environmental awareness education materials which may include use of household chemicals, discharges of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. See attached Education Materials in section 6.4 of the WQMP report.
N2	Activity Restrictions	☒	☐	Once an owner assigns a HOA, certain restrictions may be enacted thru the formation of conditions, covenants and restrictions (CCRs) to protect surface water runoff. Some of the activity restrictions that would help promote water quality protection for residential areas are: 1. Requirement to keep trash receptacles covered at all times 2. Prohibiting discharges of paint of masonry wastes to streets or storm drains 3. Prohibit connections of pool/spa draining to streets or storm drains 4. Prohibiting blowing or sweeping of debris into streets or storm drains. 5. Keep dumpster lids closed at all times 6. Pesticide application shall be done by a certified applicator.
N3	Landscape Management BMPs	☒	☐	Standard landscaping maintenance activities, including trash removal, proper replacement of landscaping as needed and regular trimming should be followed at all times, See attached CASQA SD-12 in section 6.4 of the WQMP Report. 1. Proper irrigation practices should also be observed to prevent over-spraying. 2. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly 3. Adjust irrigation heads to eliminate overspray to hardscape areas 4. Verify irrigation timing and cycle lengths in accordance to water demands given time of the year, weather and day or night time temperatures. 5. Plants with similar water requirements will be grouped together in order to reduce excess irrigation runoff and promote surface infiltration. 6. Irrigation systems will be inspected on a monthly basis and maintained as needed. Proper sprinkler maintenance should be incorporated into landscape management. Landscape management shall commence immediately upon installation of landscaping and should be maintained twice a month. The HOA and homeowners will be responsible for landscape maintenance within private lots.

Form 4.1-1 Non-Structural Source Control BMPs

N4	BMP Maintenance	☒	☐	Maintenance of BMPs implemented at the project shall be performed at the frequency prescribed in this WQMP. Records of inspections and maintenance shall be maintained by the HOA and documented with the WQMP, and shall be available for review upon request.
N5	Title 22 CCR Compliance	☒	☐	No significant hazardous wastes will be generated and/or stored for the residential areas. Typical household hazardous products shall be disposed of properly. Motor oils and oil filters from household shall be recycled in a recycling centers or motor oil collection centers. Other household hazardous wastes such as unused, unwanted or expired medications, fertilizers, bug sprays, paint or other paint materials, batteries, household cleaners etc., are to be disposed of in hazardous waste collection centers.
N6	Local Water Quality Ordinances	☒	☐	Comply with Local Water Quality Ordinances through this WQMP.
N7	Spill Contingency Plan	☐	☒	Not applicable to proposed single-family homes. Hazardous material spills are not anticipated on-site. In the event of accidental leaks, dry cleaning of oil and grease will be employed.
N8	Underground Storage Tank Compliance	☐	☒	Not applicable to proposed single-family homes. No underground storage tanks proposed for this project.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Not applicable to proposed single-family homes. Hazardous materials in significant amounts are not anticipated on-site.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR,
		Included	Not Applicable	if not applicable, state reason
N10	Uniform Fire Code Implementation	☐	☒	Not applicable Project will not include a hazardous material storage facility or other area regulated by Article 80.

N11	Litter/Debris Control Program	☒	☐	Homeowners shall keep trash receptacles covered at all times and dumpster lids kept closed at all times. HOA will maintain private lots and provide trash receptacles. Common areas and perimeter fences or walls will be patrolled by employees on a weekly basis and litter will be collected as needed. Trash disposal violations by tenants and home owners will be reported to the HOA.
N12	Employee Training	☒	☐	Provide education for HOA employees and contractors on stormwater quality management within the first 3 months of hire and annually after.
N13	Housekeeping of Loading Docks	☐	☒	Not applicable to proposed for single-family homes. Loading docks are not anticipated on-site.
N14	Catch Basin Inspection Program	☒	☐	HOA will maintain and inspect proposed catchbasins. Cleaning shall be done in late summer/early fall prior to the start of the rainy season. Inspection shall also include storm drain pipes, inlets, and other storm drain appurtenances. A record of all employees or facility maintenance shall be logged by HOA and kept to closely monitor the inspection of catch basin and other drainage facilities connected to it. Any BMPs attached to it should also be monitored and inspected by HOA.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	HOA shall be in-charge of sweeping all streets on a bi-monthly schedule based on the Street Sweeping Map prepared by the county. Streets should be inspected and any litter or debris shall be removed. Oil spills shall be dry cleaned.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	None. No other non-structural measures will be included in this project which will be implemented for other Public agency Priority Project.
N17	Comply with all other applicable NPDES permits	☒	☐	The developer shall complete and file a SWPPP to the state regional boards and forward a copy of NOI to the county.

Form 4.1-2 Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	See CASQA Detail SD-13 in Section 6.4 of this WQMP. Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the antidumping message. Developer will provide initial stenciling and signage after which HOA shall be in charge of maintaining storm drain stenciling and signage.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor material storage proposed for this development
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash bins will be kept closed and equipped with water-tight lids.
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)	☒	☐	See CASQA Detail SD-12 in Section 6.4 of this WQMP for reference. See hereon for items applicable for proposed development. HOA and homeowner may employ any of the following: 1. Install rain shutoff devices to prevent irrigation after precipitation 2. Maintain and fix broken sprinklers or lines. 3. Implement landscape plan consistent with County Water Conservation Resolution or County Equivalent. 4. Group plants with similar water requirements. 5. Choose drought tolerant plants. 6. Design irrigation systems to each landscape area’s specific water requirements. Private lot areas shall be maintained by HOA.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	1” to 2” lip between landscaping and adjacent sidewalk/curb will be provided
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Disturbed slopes will implement permanent stabilization BMPs as soon as possible by planting slopes with drought tolerant vegetation. Disturbed hillside areas will be planted with deep-rooted, drought tolerant plant species selected for erosion control. Stormwater runoff will be treated in the Water Quality basins located in landscaped areas. Energy dissipaters will be installed at the outlets of new MS4s,

				culverts, conduits or channels that enter unlined channels to reduce erosion and minimize impacts to Receiving Waters.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	Not proposed for the development
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Not proposed for the development
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Not proposed for the development
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	Not proposed for the development

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)	☐	☒	Not proposed for the development
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Not proposed for the development
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Not proposed for the development
S14	Wash water control for food preparation areas	☐	☒	Not proposed for the development
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Not proposed for the development

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. 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 Preventative LID 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: Minimum street widths are proposed for this project thus minimizing impervious areas.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: The project site proposes to use permeable pavers and an infiltration basin thus promoting natural infiltration.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Proposed development will match the existing drainage pattern. The proposed BMPs for the project will aid in longer time of concentration for the post development condition by introducing more pervious areas.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Runoff from roofs located in the project site will flow through downspouts to pervious landscaping and yards.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: The site is proposed to be fully developed.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: Drought tolerant plants are proposed for the landscaped areas.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Proposed Water Quality Basin areas will be staked to prevent compaction during construction.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Project site will be fully developed utilizing street flows to Catch Basins.
Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐ Explanation: Areas where landscaping & Water Quality Basin is proposed will be staked.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the 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 of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program 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 HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

<table>
<tr><th colspan="4">Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA-1)</th></tr>
<tr><td>1 Project area DA-1 (ft^2):
505,992 ±</td><td>2 Imperviousness after applying preventative site design practices (Imp%): 43%</td><td colspan="2">3 Runoff Coefficient (Rc): 0.297
R_c = 0.858(Imp%)^3-0.78(Imp%)^2+0.774(Imp%)+0.04</td></tr>
<tr><td colspan="4">4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.601 <u>http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html</u></td></tr>
<tr><td colspan="4">5 Compute P_6, Mean 6-hr Precipitation (inches): 0.89
P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)</td></tr>
<tr><td colspan="3">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.</td><td>24-hrs ☐
48-hrs ☒</td></tr>
<tr><td colspan="4">7 Compute design capture volume, DCV (ft^3): 21,842 ±
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</td></tr>
</table>

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr 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)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 43,272 *Form 4.2-3 Item 12*	**2** 28.36 *Form 4.2-4 Item 13*	**3** 12.64 *Form 4.2-5 Item 10*
Post-developed	**4** 45,468 *Form 4.2-3 Item 13*	**5** 31.18 *Form 4.2-4 Item 14*	**6** 18.44 *Form 4.2-5 Item 14*
Difference	**7** 2196 *Item 4 – Item 1*	**8** 2.82 *Item 5 – Item 2*	**9** *5.8* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** 5.0% *Item 7 / Item 1*	**11** 10.0% *Item 8 / Item 2*	**12** 31.5% *Item 9 / Item 3*

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1269

                           Analysis prepared by:

                               MDS Consulting
             17320 Redhill Avenue, Suite 350, Irvine, CA 92614
                           Phone: (949) 251-8821
                     Email: mdsirvine@mdsconsulting.net

 ************************* DESCRIPTION OF STUDY *************************
* Existing Condition                                                        *
* 2-Year Storm                                                              *
*                                                                           *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\X.DAT
  TIME/DATE OF STUDY: 15:16 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        1.83      0.98     0.800    32   13.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
  FLOW VELOCITY(FEET/SEC) =   1.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.47   Tc(MIN.) =   23.21
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1519.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.21
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.061
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        5.94      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    1.50
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =       1.96

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     22.00 IS CODE =  52
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    847.00  DOWNSTREAM(FEET) =    837.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   606.00   CHANNEL SLOPE =  0.0165
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.96
  FLOW VELOCITY(FEET/SEC) =   2.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.59   Tc(MIN.) =   27.80
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     22.00 =    2125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.80
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.952
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        3.98      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  SUBAREA AREA(ACRES) =    3.98      SUBAREA RUNOFF(CFS) =    0.68
  EFFECTIVE AREA(ACRES) =     11.75   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =       11.8       PEAK FLOW RATE(CFS) =       2.01

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   27.80
  RAINFALL INTENSITY(INCH/HR) =   0.95
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =      11.75
  TOTAL STREAM AREA(ACRES) =      11.75
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.01

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.632
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.83      0.98     0.100    32   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.15
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.15

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   9.75   Tc(MIN.) =   21.07
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.124
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.81      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       2.44
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.47
  FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.07
  RAINFALL INTENSITY(INCH/HR) =   1.12
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.64
  TOTAL STREAM AREA(ACRES) =       2.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.44

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.01   27.80    0.952  0.97( 0.78) 0.80      11.8      10.00
      2        2.44   21.07    1.124  0.98( 0.10) 0.10       2.6      20.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.45   21.07    1.124  0.97( 0.62) 0.64      11.5      20.00
      2        4.05   27.80    0.952  0.98( 0.65) 0.67      14.4      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.45    Tc(MIN.) =    21.07
  EFFECTIVE AREA(ACRES) =      11.54   AREA-AVERAGED Fm(INCH/HR) =  0.62
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.64
  TOTAL AREA(ACRES) =       14.4
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.349
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        6.77      0.98     0.800    32   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      3.47
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =      3.47

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    845.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1032.00   CHANNEL SLOPE =  0.0116
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.47
  FLOW VELOCITY(FEET/SEC) =   2.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.23   Tc(MIN.) =   23.78
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1762.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   23.78
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.046
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"          A       11.13      0.98     0.800    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =    2.66
  EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =       4.28

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    837.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.0127
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.28
```

```
  FLOW VELOCITY(FEET/SEC) =   2.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.58   Tc(MIN.) =   28.36
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =    2392.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   28.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.941
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   A        1.30      0.42     1.000    78
  COMMERCIAL                 A        6.57      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.249
  SUBAREA AREA(ACRES) =    7.87      SUBAREA RUNOFF(CFS) =    5.60
  EFFECTIVE AREA(ACRES) =     25.77   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.93  AREA-AVERAGED Ap =  0.63
  TOTAL AREA(ACRES) =      25.8       PEAK FLOW RATE(CFS) =      8.19
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.8  TC(MIN.) =     28.36
  EFFECTIVE AREA(ACRES) =     25.77  AREA-AVERAGED Fm(INCH/HR)=  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.93  AREA-AVERAGED Ap = 0.632
  PEAK FLOW RATE(CFS)   =      8.19
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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 ************************** DESCRIPTION OF STUDY **************************
* TENTATIVE TRACT 20394                                                    *
* PROPOSED HYDROLOGY                                                       *
* 2-YEAR STORM                                                             *
 **************************************************************************

  FILE NAME: C:\AES2016\HYDROSFT\RATSCX\89704\89704.DAT
  TIME/DATE OF STUDY: 14:48 02/14/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   703.00
  ELEVATION DATA: UPSTREAM(FEET) =    847.30  DOWNSTREAM(FEET) =    842.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.074
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.374
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        4.53      0.98     0.600    32   15.07
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.22
  TOTAL AREA(ACRES) =      4.53   PEAK FLOW RATE(CFS) =      3.22

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.80
  FLOW LENGTH(FEET) =   218.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.12
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.22
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =   15.96
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.96
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.53
  TOTAL STREAM AREA(ACRES) =       4.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.22

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =    844.10  DOWNSTREAM(FEET) =    840.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.830
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.676
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.54      0.98     0.600    32   10.83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.51
  TOTAL AREA(ACRES) =      1.54   PEAK FLOW RATE(CFS) =      1.51

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.83
  RAINFALL INTENSITY(INCH/HR) =   1.68
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.54
  TOTAL STREAM AREA(ACRES) =       1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.22   15.96    1.328  0.98( 0.59) 0.60       4.5       1.00
      2        1.51   10.83    1.676  0.97( 0.59) 0.60       1.5       3.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.72   10.83    1.676  0.98( 0.59) 0.60       4.6       3.00
      2        4.25   15.96    1.328  0.98( 0.59) 0.60       6.1       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.72    Tc(MIN.) =    10.83
```

```
  EFFECTIVE AREA(ACRES) =       4.61   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     921.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.80  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =   182.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.72
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.60
  RAINFALL INTENSITY(INCH/HR) =   1.61
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       4.61
  TOTAL STREAM AREA(ACRES) =       6.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.72

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.133
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.744
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.02      0.98     0.600    32   10.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.06
  TOTAL AREA(ACRES) =      1.02   PEAK FLOW RATE(CFS) =      1.06

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   835.00  DOWNSTREAM(FEET) =   833.10
  FLOW LENGTH(FEET) =    82.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.03
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.06
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   10.40
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.40
  RAINFALL INTENSITY(INCH/HR) =   1.72
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.02
  TOTAL STREAM AREA(ACRES) =       1.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.06

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.72   11.60    1.608  0.98( 0.59) 0.60       4.6       3.00
      1        4.25   16.74    1.290  0.98( 0.59) 0.60       6.1       1.00
      2        1.06   10.40    1.717  0.98( 0.59) 0.60       1.0       5.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.74   10.40    1.717  0.98( 0.59) 0.60       5.2       5.00
      2        5.68   11.60    1.608  0.98( 0.59) 0.60       5.6       3.00
      3        4.91   16.74    1.290  0.98( 0.59) 0.60       7.1       1.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.74    Tc(MIN.) =    10.40
  EFFECTIVE AREA(ACRES) =       5.16   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        7.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   833.10  DOWNSTREAM(FEET) =   832.50
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.74
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =   11.01
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.01
  RAINFALL INTENSITY(INCH/HR) =   1.66
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.16
  TOTAL STREAM AREA(ACRES) =       7.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.74

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.959
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.878
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       A        1.78      0.98     0.600    32    8.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.07
  TOTAL AREA(ACRES) =      1.78   PEAK FLOW RATE(CFS) =      2.07

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.96
  RAINFALL INTENSITY(INCH/HR) =   1.88
  AREA-AVERAGED Fm(INCH/HR) =  0.58
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       1.78
  TOTAL STREAM AREA(ACRES) =       1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.07

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.74   11.01    1.660  0.98( 0.59) 0.60       5.2       5.00
      1        5.68   12.21    1.560  0.98( 0.59) 0.60       5.6       3.00
      1        4.91   17.36    1.263  0.98( 0.59) 0.60       7.1       1.00
      2        2.07    8.96    1.878  0.97( 0.58) 0.60       1.8       8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.70    8.96    1.878  0.97( 0.59) 0.60       6.0       8.00
      2        7.47   11.01    1.660  0.98( 0.59) 0.60       6.9       5.00
      3        7.24   12.21    1.560  0.98( 0.59) 0.60       7.4       3.00
      4        6.00   17.36    1.263  0.98( 0.59) 0.60       8.9       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.70    Tc(MIN.) =     8.96
  EFFECTIVE AREA(ACRES) =       5.98   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       8.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =    1253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   832.50  DOWNSTREAM(FEET) =   831.60
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.70
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =    9.98
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.98
  RAINFALL INTENSITY(INCH/HR) =   1.76
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.98
  TOTAL STREAM AREA(ACRES) =       8.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.70

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   255.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    840.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.254
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.842
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        1.46      0.98     0.600    32    9.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      1.46   PEAK FLOW RATE(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
```

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 9.25
RAINFALL INTENSITY(INCH/HR) = 1.84
AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.60
EFFECTIVE STREAM AREA(ACRES) = 1.46
TOTAL STREAM AREA(ACRES) = 1.46
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.65

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.70	9.98	1.760	0.97(0.59)	0.60	6.0	8.00
1	7.47	12.04	1.573	0.98(0.59)	0.60	6.9	5.00
1	7.24	13.24	1.486	0.98(0.59)	0.60	7.4	3.00
1	6.00	18.48	1.216	0.98(0.59)	0.60	8.9	1.00
2	1.65	9.25	1.842	0.98(0.59)	0.60	1.5	10.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.28	9.25	1.842	0.97(0.59)	0.60	7.0	10.00
2	9.24	9.98	1.760	0.97(0.59)	0.60	7.4	8.00
3	8.76	12.04	1.573	0.98(0.59)	0.60	8.4	5.00
4	8.43	13.24	1.486	0.98(0.59)	0.60	8.9	3.00
5	6.83	18.48	1.216	0.98(0.59)	0.60	10.3	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 9.28 Tc(MIN.) = 9.25
EFFECTIVE AREA(ACRES) = 7.00 AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.60
TOTAL AREA(ACRES) = 10.3
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 11.00 = 1513.00 FEET.

****
FLOW PROCESS FROM NODE 11.00 TO NODE 14.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==
ELEVATION DATA: UPSTREAM(FEET) = 831.60 DOWNSTREAM(FEET) = 831.20
FLOW LENGTH(FEET) = 98.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.66
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 9.28
PIPE TRAVEL TIME(MIN.) = 0.35 Tc(MIN.) = 9.60
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1611.00 FEET.

```
****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.60
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       7.00
  TOTAL STREAM AREA(ACRES) =      10.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.28

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   298.00
  ELEVATION DATA: UPSTREAM(FEET) =    843.60  DOWNSTREAM(FEET) =    840.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.027
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.755
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       A        0.79      0.98     0.600    32   10.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.79   PEAK FLOW RATE(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   834.50  DOWNSTREAM(FEET) =   831.20
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.60
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.83
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   10.57
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     448.00 FEET.
```

****

FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

==

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 10.57
RAINFALL INTENSITY(INCH/HR) = 1.70
AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.60
EFFECTIVE STREAM AREA(ACRES) = 0.79
TOTAL STREAM AREA(ACRES) = 0.79
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.83

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.28	9.60	1.801	0.97(0.59)	0.60	7.0	10.00
1	9.24	10.33	1.724	0.97(0.59)	0.60	7.4	8.00
1	8.76	12.39	1.546	0.98(0.59)	0.60	8.4	5.00
1	8.43	13.59	1.462	0.98(0.59)	0.60	8.9	3.00
1	6.83	18.85	1.202	0.98(0.59)	0.60	10.3	1.00
2	0.83	10.57	1.701	0.98(0.59)	0.60	0.8	12.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.11	9.60	1.801	0.97(0.59)	0.60	7.7	10.00
2	10.07	10.33	1.724	0.97(0.59)	0.60	8.2	8.00
3	10.02	10.57	1.701	0.97(0.59)	0.60	8.3	12.00
4	9.48	12.39	1.546	0.98(0.59)	0.60	9.2	5.00
5	9.08	13.59	1.462	0.98(0.59)	0.60	9.7	3.00
6	7.29	18.85	1.202	0.98(0.59)	0.60	11.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 10.11 Tc(MIN.) = 9.60
EFFECTIVE AREA(ACRES) = 7.72 AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.60
TOTAL AREA(ACRES) = 11.1
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1611.00 FEET.

****

FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 831.20 DOWNSTREAM(FEET) = 831.00

```
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.83
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.11
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    9.69
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.69
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.792
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                A        0.50      0.98     0.850    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    0.43
  EFFECTIVE AREA(ACRES) =      8.22   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      10.11
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   937.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.50  DOWNSTREAM(FEET) =    855.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.318
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.632
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.83      0.98     0.100    32   11.32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.15
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.15

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =  855.00  DOWNSTREAM ELEVATION(FEET) =  837.00
  STREET LENGTH(FEET) =  1380.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   9.75   Tc(MIN.) =   21.07
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.124
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   A        1.81      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.81      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      2.64    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       2.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.47
  FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    2317.00 FEET.

+--------------------------------------------------------------------------+
| Offsite area                                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    860.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.742
```

```
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "1 DWELLING/ACRE"          A        1.83      0.98     0.800    32   13.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA RUNOFF(CFS) =      1.11
 TOTAL AREA(ACRES) =      1.83   PEAK FLOW RATE(CFS) =      1.11

****************************************************************************
 FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    860.00  DOWNSTREAM(FEET) =    847.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   994.00   CHANNEL SLOPE =  0.0131
 CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
 FLOW VELOCITY(FEET/SEC) =   1.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   9.47   Tc(MIN.) =   23.21
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =    1519.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     52.00 TO NODE     52.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   23.21
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.061
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "1 DWELLING/ACRE"          A        5.94      0.98     0.800    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA AREA(ACRES) =    5.94      SUBAREA RUNOFF(CFS) =    1.50
 EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.80
 TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =       1.96

****************************************************************************
 FLOW PROCESS FROM NODE     52.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    843.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0030
 CHANNEL FLOW THRU SUBAREA(CFS) =       1.96
 FLOW VELOCITY(FEET/SEC) =   0.94 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   8.87   Tc(MIN.) =   32.09
```

```
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   32.09
  RAINFALL INTENSITY(INCH/HR) =   0.87
  AREA-AVERAGED Fm(INCH/HR) =  0.78
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.80
  EFFECTIVE STREAM AREA(ACRES) =       7.77
  TOTAL STREAM AREA(ACRES) =       7.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.96

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   730.00
  ELEVATION DATA: UPSTREAM(FEET) =    866.70  DOWNSTREAM(FEET) =    857.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.553
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.349
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"          A        6.77      0.98     0.800    32   15.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
  SUBAREA RUNOFF(CFS) =      3.47
  TOTAL AREA(ACRES) =      6.77   PEAK FLOW RATE(CFS) =      3.47

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    857.00  DOWNSTREAM(FEET) =    846.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1070.00   CHANNEL SLOPE =  0.0103
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.47
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.07   Tc(MIN.) =   24.62
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =    1800.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   24.62
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.024
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "1 DWELLING/ACRE"           A       11.13      0.98     0.800    32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.800
 SUBAREA AREA(ACRES) =   11.13      SUBAREA RUNOFF(CFS) =    2.44
 EFFECTIVE AREA(ACRES) =     17.90   AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
 TOTAL AREA(ACRES) =       17.9       PEAK FLOW RATE(CFS) =       3.93

****************************************************************************
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   24.62
 RAINFALL INTENSITY(INCH/HR) =   1.02
 AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.80
 EFFECTIVE STREAM AREA(ACRES) =      17.90
 TOTAL STREAM AREA(ACRES) =      17.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.93

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        1.96   32.09    0.873  0.97( 0.78) 0.80       7.8      50.00
     2        3.93   24.62    1.024  0.98( 0.78) 0.80      17.9      60.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        5.89   24.62    1.024  0.98( 0.78) 0.80      23.9      60.00
     2        4.78   32.09    0.873  0.98( 0.78) 0.80      25.7      50.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.89    Tc(MIN.) =    24.62
 EFFECTIVE AREA(ACRES) =      23.86   AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.80
```

```
  TOTAL AREA(ACRES) =       25.7
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     62.00 =    2019.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     64.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    843.50  DOWNSTREAM(FEET) =    842.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   340.00   CHANNEL SLOPE =  0.0044
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.89
  FLOW VELOCITY(FEET/SEC) =   1.46 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.89   Tc(MIN.) =   28.51
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     64.00 =    2359.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     69.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   837.00  DOWNSTREAM(FEET) =   835.30
  FLOW LENGTH(FEET) =   596.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.73
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.89
  PIPE TRAVEL TIME(MIN.) =   2.67    Tc(MIN.) =   31.18
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     69.00 =    2955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     69.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   31.18
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.889
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.23      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    0.17
  EFFECTIVE AREA(ACRES) =     24.09   AREA-AVERAGED Fm(INCH/HR) =  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.79
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =       25.9       PEAK FLOW RATE(CFS) =       5.89
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       25.9  TC(MIN.) =     31.18
  EFFECTIVE AREA(ACRES) =     24.09  AREA-AVERAGED Fm(INCH/HR)=  0.77
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap = 0.793
  PEAK FLOW RATE(CFS)   =       5.89

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.89   31.18    0.889  0.97( 0.77) 0.79      24.1      60.00
      2        4.78   39.02    0.777  0.98( 0.77) 0.79      25.9      50.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

♠
```

```
        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  02/14/22

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 4027

---------------------------------------------------------------------
Unit Hydrograph
Pre Development
2-year / 24-hour

--------------------------------------------------------------------

        Storm Event Year = 2

        Antecedent Moisture Condition = 2

 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
            11.60           1           0.60
--------------------------------------------------------------------
Rainfall data for year 2
            11.60           6           1.45
--------------------------------------------------------------------
Rainfall data for year 2
            11.60          24           2.50
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      32.0          3.30      0.284     0.978    0.800    0.782
 32.0      32.0          8.30      0.716     0.978    0.500    0.489

Area-averaged adjusted loss rate Fm (In/Hr) =  0.572

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
     2.64   0.228         32.0      32.0      12.50     0.000
     0.66   0.057         98.0      98.0       0.20     0.908

     4.15   0.358         32.0      32.0      12.50     0.000
     4.15   0.358         98.0      98.0       0.20     0.908

Area-averaged catchment yield fraction, Y =  0.377
Area-averaged low loss fraction, Yb =  0.623
User entry of time of concentration  =   0.258 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      11.60(Ac.)
Catchment Lag time =   0.206 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 40.3747
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.572(In/Hr)
Average low loss rate fraction (Yb) = 0.623 (decimal)
VALLEY DEVELOPED S-Graph Selected
```

Computed peak 5-minute rainfall = 0.222(In)
Computed peak 30-minute rainfall = 0.455(In)
Specified peak 1-hour rainfall = 0.600(In)
Computed peak 3-hour rainfall = 1.031(In)
Specified peak 6-hour rainfall = 1.450(In)
Specified peak 24-hour rainfall = 2.500(In)

Rainfall depth area reduction factors:
Using a total area of 11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.222(In)
30-minute factor = 0.999	Adjusted rainfall = 0.454(In)
1-hour factor = 0.999	Adjusted rainfall = 0.600(In)
3-hour factor = 1.000	Adjusted rainfall = 1.031(In)
6-hour factor = 1.000	Adjusted rainfall = 1.450(In)
24-hour factor = 1.000	Adjusted rainfall = 2.500(In)

U n i t H y d r o g r a p h

(K = 140.29 (CFS))

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
1	3.087	4.330
2	19.928	23.626
3	50.442	42.807
4	78.567	39.456
5	91.525	18.179
6	96.879	7.512
7	98.524	2.307
8	99.251	1.019
9	100.000	0.510

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2219	0.2219
2	0.2929	0.0709
3	0.3444	0.0516
4	0.3864	0.0420
5	0.4225	0.0361
6	0.4545	0.0320
7	0.4834	0.0289
8	0.5099	0.0265
9	0.5345	0.0246
10	0.5575	0.0230
11	0.5792	0.0217
12	0.5997	0.0205
13	0.6238	0.0241
14	0.6470	0.0232
15	0.6694	0.0224
16	0.6910	0.0216
17	0.7120	0.0210
18	0.7323	0.0203
19	0.7521	0.0198
20	0.7714	0.0193
21	0.7901	0.0188
22	0.8085	0.0183
23	0.8264	0.0179
24	0.8439	0.0175
25	0.8611	0.0172
26	0.8779	0.0168
27	0.8943	0.0165
28	0.9105	0.0162
29	0.9264	0.0159
30	0.9420	0.0156
31	0.9574	0.0153
32	0.9725	0.0151
33	0.9873	0.0149
34	1.0020	0.0146
35	1.0164	0.0144
36	1.0306	0.0142
37	1.0446	0.0140
38	1.0584	0.0138
39	1.0720	0.0136
40	1.0855	0.0135
41	1.0988	0.0133
42	1.1119	0.0131
43	1.1249	0.0130
44	1.1377	0.0128
45	1.1503	0.0127

46	1.1628	0.0125
47	1.1752	0.0124
48	1.1875	0.0122
49	1.1996	0.0121
50	1.2116	0.0120
51	1.2235	0.0119
52	1.2352	0.0118
53	1.2469	0.0116
54	1.2584	0.0115
55	1.2698	0.0114
56	1.2811	0.0113
57	1.2924	0.0112
58	1.3035	0.0111
59	1.3145	0.0110
60	1.3254	0.0109
61	1.3363	0.0108
62	1.3470	0.0107
63	1.3577	0.0107
64	1.3682	0.0106
65	1.3787	0.0105
66	1.3891	0.0104
67	1.3994	0.0103
68	1.4097	0.0102
69	1.4199	0.0102
70	1.4300	0.0101
71	1.4400	0.0100
72	1.4499	0.0100
73	1.4578	0.0079
74	1.4656	0.0078
75	1.4734	0.0078
76	1.4811	0.0077
77	1.4887	0.0076
78	1.4963	0.0076
79	1.5038	0.0075
80	1.5112	0.0075
81	1.5186	0.0074
82	1.5260	0.0073
83	1.5333	0.0073
84	1.5405	0.0072
85	1.5477	0.0072
86	1.5548	0.0071
87	1.5619	0.0071
88	1.5689	0.0070
89	1.5759	0.0070
90	1.5828	0.0069
91	1.5897	0.0069
92	1.5966	0.0068
93	1.6034	0.0068
94	1.6101	0.0068
95	1.6168	0.0067
96	1.6235	0.0067
97	1.6301	0.0066
98	1.6367	0.0066
99	1.6432	0.0065
100	1.6497	0.0065
101	1.6562	0.0065
102	1.6626	0.0064
103	1.6690	0.0064
104	1.6754	0.0063
105	1.6817	0.0063
106	1.6879	0.0063
107	1.6942	0.0062
108	1.7004	0.0062
109	1.7066	0.0062
110	1.7127	0.0061
111	1.7188	0.0061
112	1.7249	0.0061
113	1.7309	0.0060
114	1.7369	0.0060
115	1.7429	0.0060
116	1.7488	0.0059
117	1.7547	0.0059
118	1.7606	0.0059
119	1.7664	0.0058
120	1.7723	0.0058
121	1.7781	0.0058
122	1.7838	0.0058
123	1.7895	0.0057
124	1.7952	0.0057
125	1.8009	0.0057
126	1.8066	0.0056
127	1.8122	0.0056
128	1.8178	0.0056

129	1.8234	0.0056
130	1.8289	0.0055
131	1.8344	0.0055
132	1.8399	0.0055
133	1.8454	0.0055
134	1.8508	0.0054
135	1.8562	0.0054
136	1.8616	0.0054
137	1.8670	0.0054
138	1.8723	0.0053
139	1.8776	0.0053
140	1.8829	0.0053
141	1.8882	0.0053
142	1.8935	0.0053
143	1.8987	0.0052
144	1.9039	0.0052
145	1.9091	0.0052
146	1.9142	0.0052
147	1.9194	0.0051
148	1.9245	0.0051
149	1.9296	0.0051
150	1.9347	0.0051
151	1.9397	0.0051
152	1.9448	0.0050
153	1.9498	0.0050
154	1.9548	0.0050
155	1.9598	0.0050
156	1.9647	0.0050
157	1.9697	0.0049
158	1.9746	0.0049
159	1.9795	0.0049
160	1.9844	0.0049
161	1.9892	0.0049
162	1.9941	0.0048
163	1.9989	0.0048
164	2.0037	0.0048
165	2.0085	0.0048
166	2.0133	0.0048
167	2.0180	0.0048
168	2.0228	0.0047
169	2.0275	0.0047
170	2.0322	0.0047
171	2.0369	0.0047
172	2.0416	0.0047
173	2.0462	0.0047
174	2.0509	0.0046
175	2.0555	0.0046
176	2.0601	0.0046
177	2.0647	0.0046
178	2.0693	0.0046
179	2.0738	0.0046
180	2.0784	0.0045
181	2.0829	0.0045
182	2.0874	0.0045
183	2.0919	0.0045
184	2.0964	0.0045
185	2.1009	0.0045
186	2.1053	0.0045
187	2.1098	0.0044
188	2.1142	0.0044
189	2.1186	0.0044
190	2.1230	0.0044
191	2.1274	0.0044
192	2.1318	0.0044
193	2.1361	0.0044
194	2.1405	0.0043
195	2.1448	0.0043
196	2.1491	0.0043
197	2.1534	0.0043
198	2.1577	0.0043
199	2.1620	0.0043
200	2.1662	0.0043
201	2.1705	0.0042
202	2.1747	0.0042
203	2.1789	0.0042
204	2.1832	0.0042
205	2.1874	0.0042
206	2.1915	0.0042
207	2.1957	0.0042
208	2.1999	0.0042
209	2.2040	0.0041
210	2.2082	0.0041
211	2.2123	0.0041

212	2.2164	0.0041
213	2.2205	0.0041
214	2.2246	0.0041
215	2.2287	0.0041
216	2.2327	0.0041
217	2.2368	0.0041
218	2.2408	0.0040
219	2.2449	0.0040
220	2.2489	0.0040
221	2.2529	0.0040
222	2.2569	0.0040
223	2.2609	0.0040
224	2.2649	0.0040
225	2.2688	0.0040
226	2.2728	0.0040
227	2.2768	0.0039
228	2.2807	0.0039
229	2.2846	0.0039
230	2.2885	0.0039
231	2.2924	0.0039
232	2.2963	0.0039
233	2.3002	0.0039
234	2.3041	0.0039
235	2.3079	0.0039
236	2.3118	0.0039
237	2.3156	0.0038
238	2.3195	0.0038
239	2.3233	0.0038
240	2.3271	0.0038
241	2.3309	0.0038
242	2.3347	0.0038
243	2.3385	0.0038
244	2.3423	0.0038
245	2.3461	0.0038
246	2.3498	0.0038
247	2.3536	0.0037
248	2.3573	0.0037
249	2.3610	0.0037
250	2.3648	0.0037
251	2.3685	0.0037
252	2.3722	0.0037
253	2.3759	0.0037
254	2.3795	0.0037
255	2.3832	0.0037
256	2.3869	0.0037
257	2.3906	0.0037
258	2.3942	0.0037
259	2.3978	0.0036
260	2.4015	0.0036
261	2.4051	0.0036
262	2.4087	0.0036
263	2.4123	0.0036
264	2.4159	0.0036
265	2.4195	0.0036
266	2.4231	0.0036
267	2.4267	0.0036
268	2.4302	0.0036
269	2.4338	0.0036
270	2.4374	0.0036
271	2.4409	0.0035
272	2.4444	0.0035
273	2.4480	0.0035
274	2.4515	0.0035
275	2.4550	0.0035
276	2.4585	0.0035
277	2.4620	0.0035
278	2.4655	0.0035
279	2.4690	0.0035
280	2.4724	0.0035
281	2.4759	0.0035
282	2.4794	0.0035
283	2.4828	0.0035
284	2.4863	0.0034
285	2.4897	0.0034
286	2.4931	0.0034
287	2.4965	0.0034
288	2.5000	0.0034

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0034	0.0021	0.0013

2	0.0034	0.0021	0.0013
3	0.0034	0.0021	0.0013
4	0.0034	0.0021	0.0013
5	0.0035	0.0022	0.0013
6	0.0035	0.0022	0.0013
7	0.0035	0.0022	0.0013
8	0.0035	0.0022	0.0013
9	0.0035	0.0022	0.0013
10	0.0035	0.0022	0.0013
11	0.0035	0.0022	0.0013
12	0.0035	0.0022	0.0013
13	0.0036	0.0022	0.0013
14	0.0036	0.0022	0.0013
15	0.0036	0.0022	0.0013
16	0.0036	0.0022	0.0013
17	0.0036	0.0022	0.0014
18	0.0036	0.0022	0.0014
19	0.0036	0.0023	0.0014
20	0.0036	0.0023	0.0014
21	0.0037	0.0023	0.0014
22	0.0037	0.0023	0.0014
23	0.0037	0.0023	0.0014
24	0.0037	0.0023	0.0014
25	0.0037	0.0023	0.0014
26	0.0037	0.0023	0.0014
27	0.0037	0.0023	0.0014
28	0.0037	0.0023	0.0014
29	0.0038	0.0023	0.0014
30	0.0038	0.0023	0.0014
31	0.0038	0.0024	0.0014
32	0.0038	0.0024	0.0014
33	0.0038	0.0024	0.0014
34	0.0038	0.0024	0.0014
35	0.0038	0.0024	0.0014
36	0.0039	0.0024	0.0015
37	0.0039	0.0024	0.0015
38	0.0039	0.0024	0.0015
39	0.0039	0.0024	0.0015
40	0.0039	0.0024	0.0015
41	0.0039	0.0025	0.0015
42	0.0039	0.0025	0.0015
43	0.0040	0.0025	0.0015
44	0.0040	0.0025	0.0015
45	0.0040	0.0025	0.0015
46	0.0040	0.0025	0.0015
47	0.0040	0.0025	0.0015
48	0.0040	0.0025	0.0015
49	0.0041	0.0025	0.0015
50	0.0041	0.0025	0.0015
51	0.0041	0.0026	0.0015
52	0.0041	0.0026	0.0015
53	0.0041	0.0026	0.0016
54	0.0041	0.0026	0.0016
55	0.0042	0.0026	0.0016
56	0.0042	0.0026	0.0016
57	0.0042	0.0026	0.0016
58	0.0042	0.0026	0.0016
59	0.0042	0.0026	0.0016
60	0.0043	0.0027	0.0016
61	0.0043	0.0027	0.0016
62	0.0043	0.0027	0.0016
63	0.0043	0.0027	0.0016
64	0.0043	0.0027	0.0016
65	0.0044	0.0027	0.0016
66	0.0044	0.0027	0.0017
67	0.0044	0.0028	0.0017
68	0.0044	0.0028	0.0017
69	0.0045	0.0028	0.0017
70	0.0045	0.0028	0.0017
71	0.0045	0.0028	0.0017
72	0.0045	0.0028	0.0017
73	0.0045	0.0028	0.0017
74	0.0046	0.0028	0.0017
75	0.0046	0.0029	0.0017
76	0.0046	0.0029	0.0017
77	0.0046	0.0029	0.0017
78	0.0047	0.0029	0.0018
79	0.0047	0.0029	0.0018
80	0.0047	0.0029	0.0018
81	0.0047	0.0030	0.0018
82	0.0048	0.0030	0.0018
83	0.0048	0.0030	0.0018
84	0.0048	0.0030	0.0018

85	0.0048	0.0030	0.0018
86	0.0049	0.0030	0.0018
87	0.0049	0.0031	0.0018
88	0.0049	0.0031	0.0019
89	0.0050	0.0031	0.0019
90	0.0050	0.0031	0.0019
91	0.0050	0.0031	0.0019
92	0.0050	0.0031	0.0019
93	0.0051	0.0032	0.0019
94	0.0051	0.0032	0.0019
95	0.0051	0.0032	0.0019
96	0.0052	0.0032	0.0019
97	0.0052	0.0032	0.0020
98	0.0052	0.0033	0.0020
99	0.0053	0.0033	0.0020
100	0.0053	0.0033	0.0020
101	0.0053	0.0033	0.0020
102	0.0054	0.0033	0.0020
103	0.0054	0.0034	0.0020
104	0.0054	0.0034	0.0020
105	0.0055	0.0034	0.0021
106	0.0055	0.0034	0.0021
107	0.0056	0.0035	0.0021
108	0.0056	0.0035	0.0021
109	0.0056	0.0035	0.0021
110	0.0057	0.0035	0.0021
111	0.0057	0.0036	0.0022
112	0.0058	0.0036	0.0022
113	0.0058	0.0036	0.0022
114	0.0058	0.0036	0.0022
115	0.0059	0.0037	0.0022
116	0.0059	0.0037	0.0022
117	0.0060	0.0037	0.0023
118	0.0060	0.0038	0.0023
119	0.0061	0.0038	0.0023
120	0.0061	0.0038	0.0023
121	0.0062	0.0039	0.0023
122	0.0062	0.0039	0.0024
123	0.0063	0.0039	0.0024
124	0.0063	0.0040	0.0024
125	0.0064	0.0040	0.0024
126	0.0065	0.0040	0.0024
127	0.0065	0.0041	0.0025
128	0.0066	0.0041	0.0025
129	0.0067	0.0042	0.0025
130	0.0067	0.0042	0.0025
131	0.0068	0.0042	0.0026
132	0.0068	0.0043	0.0026
133	0.0069	0.0043	0.0026
134	0.0070	0.0044	0.0026
135	0.0071	0.0044	0.0027
136	0.0071	0.0044	0.0027
137	0.0072	0.0045	0.0027
138	0.0073	0.0045	0.0027
139	0.0074	0.0046	0.0028
140	0.0075	0.0046	0.0028
141	0.0076	0.0047	0.0029
142	0.0076	0.0048	0.0029
143	0.0078	0.0048	0.0029
144	0.0078	0.0049	0.0029
145	0.0100	0.0062	0.0037
146	0.0100	0.0062	0.0038
147	0.0102	0.0063	0.0038
148	0.0102	0.0064	0.0039
149	0.0104	0.0065	0.0039
150	0.0105	0.0065	0.0040
151	0.0107	0.0066	0.0040
152	0.0107	0.0067	0.0040
153	0.0109	0.0068	0.0041
154	0.0110	0.0069	0.0042
155	0.0112	0.0070	0.0042
156	0.0113	0.0071	0.0043
157	0.0115	0.0072	0.0043
158	0.0116	0.0073	0.0044
159	0.0119	0.0074	0.0045
160	0.0120	0.0075	0.0045
161	0.0122	0.0076	0.0046
162	0.0124	0.0077	0.0047
163	0.0127	0.0079	0.0048
164	0.0128	0.0080	0.0048
165	0.0131	0.0082	0.0049
166	0.0133	0.0083	0.0050
167	0.0136	0.0085	0.0051

168	0.0138	0.0086	0.0052
169	0.0142	0.0089	0.0054
170	0.0144	0.0090	0.0054
171	0.0149	0.0093	0.0056
172	0.0151	0.0094	0.0057
173	0.0156	0.0097	0.0059
174	0.0159	0.0099	0.0060
175	0.0165	0.0103	0.0062
176	0.0168	0.0105	0.0063
177	0.0175	0.0109	0.0066
178	0.0179	0.0112	0.0067
179	0.0188	0.0117	0.0071
180	0.0193	0.0120	0.0073
181	0.0203	0.0127	0.0077
182	0.0210	0.0131	0.0079
183	0.0224	0.0140	0.0084
184	0.0232	0.0145	0.0087
185	0.0205	0.0128	0.0077
186	0.0217	0.0135	0.0082
187	0.0246	0.0153	0.0093
188	0.0265	0.0165	0.0100
189	0.0320	0.0199	0.0120
190	0.0361	0.0225	0.0136
191	0.0516	0.0321	0.0194
192	0.0709	0.0442	0.0267
193	0.2219	0.0477	0.1742
194	0.0420	0.0262	0.0158
195	0.0289	0.0180	0.0109
196	0.0230	0.0143	0.0087
197	0.0241	0.0150	0.0091
198	0.0216	0.0135	0.0081
199	0.0198	0.0123	0.0074
200	0.0183	0.0114	0.0069
201	0.0172	0.0107	0.0065
202	0.0162	0.0101	0.0061
203	0.0153	0.0096	0.0058
204	0.0146	0.0091	0.0055
205	0.0140	0.0087	0.0053
206	0.0135	0.0084	0.0051
207	0.0130	0.0081	0.0049
208	0.0125	0.0078	0.0047
209	0.0121	0.0076	0.0046
210	0.0118	0.0073	0.0044
211	0.0114	0.0071	0.0043
212	0.0111	0.0069	0.0042
213	0.0108	0.0068	0.0041
214	0.0106	0.0066	0.0040
215	0.0103	0.0064	0.0039
216	0.0101	0.0063	0.0038
217	0.0079	0.0049	0.0030
218	0.0077	0.0048	0.0029
219	0.0075	0.0047	0.0028
220	0.0073	0.0046	0.0028
221	0.0072	0.0045	0.0027
222	0.0070	0.0044	0.0026
223	0.0069	0.0043	0.0026
224	0.0068	0.0042	0.0025
225	0.0066	0.0041	0.0025
226	0.0065	0.0041	0.0024
227	0.0064	0.0040	0.0024
228	0.0063	0.0039	0.0024
229	0.0062	0.0038	0.0023
230	0.0061	0.0038	0.0023
231	0.0060	0.0037	0.0022
232	0.0059	0.0037	0.0022
233	0.0058	0.0036	0.0022
234	0.0057	0.0036	0.0021
235	0.0056	0.0035	0.0021
236	0.0055	0.0035	0.0021
237	0.0055	0.0034	0.0021
238	0.0054	0.0034	0.0020
239	0.0053	0.0033	0.0020
240	0.0053	0.0033	0.0020
241	0.0052	0.0032	0.0020
242	0.0051	0.0032	0.0019
243	0.0051	0.0032	0.0019
244	0.0050	0.0031	0.0019
245	0.0049	0.0031	0.0019
246	0.0049	0.0030	0.0018
247	0.0048	0.0030	0.0018
248	0.0048	0.0030	0.0018
249	0.0047	0.0029	0.0018
250	0.0047	0.0029	0.0018

251	0.0046	0.0029	0.0017
252	0.0046	0.0029	0.0017
253	0.0045	0.0028	0.0017
254	0.0045	0.0028	0.0017
255	0.0044	0.0028	0.0017
256	0.0044	0.0027	0.0017
257	0.0044	0.0027	0.0016
258	0.0043	0.0027	0.0016
259	0.0043	0.0027	0.0016
260	0.0042	0.0026	0.0016
261	0.0042	0.0026	0.0016
262	0.0042	0.0026	0.0016
263	0.0041	0.0026	0.0016
264	0.0041	0.0026	0.0015
265	0.0041	0.0025	0.0015
266	0.0040	0.0025	0.0015
267	0.0040	0.0025	0.0015
268	0.0040	0.0025	0.0015
269	0.0039	0.0024	0.0015
270	0.0039	0.0024	0.0015
271	0.0039	0.0024	0.0015
272	0.0038	0.0024	0.0014
273	0.0038	0.0024	0.0014
274	0.0038	0.0024	0.0014
275	0.0037	0.0023	0.0014
276	0.0037	0.0023	0.0014
277	0.0037	0.0023	0.0014
278	0.0037	0.0023	0.0014
279	0.0036	0.0023	0.0014
280	0.0036	0.0023	0.0014
281	0.0036	0.0022	0.0014
282	0.0036	0.0022	0.0013
283	0.0035	0.0022	0.0013
284	0.0035	0.0022	0.0013
285	0.0035	0.0022	0.0013
286	0.0035	0.0022	0.0013
287	0.0035	0.0022	0.0013
288	0.0034	0.0021	0.0013

```
---------------------------------------------------------------------
---------------------------------------------------------------------
Total soil rain loss =      1.47(In)
Total effective rainfall =      1.03(In)
Peak flow rate in flood hydrograph =      9.43(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      0.01  Q          |         |         |         |
  0+10      0.0003      0.04  Q          |         |         |         |
  0+15      0.0009      0.09  Q          |         |         |         |
  0+20      0.0019      0.14  Q          |         |         |         |
  0+25      0.0030      0.17  Q          |         |         |         |
  0+30      0.0042      0.18  Q          |         |         |         |
  0+35      0.0055      0.18  Q          |         |         |         |
  0+40      0.0067      0.18  Q          |         |         |         |
  0+45      0.0080      0.18  Q          |         |         |         |
  0+50      0.0093      0.18  Q          |         |         |         |
  0+55      0.0105      0.18  Q          |         |         |         |
  1+ 0      0.0118      0.18  Q          |         |         |         |
  1+ 5      0.0131      0.19  Q          |         |         |         |
  1+10      0.0144      0.19  Q          |         |         |         |
  1+15      0.0156      0.19  Q          |         |         |         |
  1+20      0.0169      0.19  Q          |         |         |         |
  1+25      0.0182      0.19  Q          |         |         |         |
  1+30      0.0195      0.19  Q          |         |         |         |
  1+35      0.0208      0.19  Q          |         |         |         |
  1+40      0.0221      0.19  Q          |         |         |         |
  1+45      0.0234      0.19  Q          |         |         |         |
  1+50      0.0247      0.19  Q          |         |         |         |
  1+55      0.0261      0.19  QV         |         |         |         |
  2+ 0      0.0274      0.19  QV         |         |         |         |
  2+ 5      0.0287      0.19  QV         |         |         |         |
  2+10      0.0301      0.19  QV         |         |         |         |
  2+15      0.0314      0.19  QV         |         |         |         |
  2+20      0.0327      0.20  QV         |         |         |         |
  2+25      0.0341      0.20  QV         |         |         |         |
  2+30      0.0354      0.20  QV         |         |         |         |
```

```
 2+35        0.0368       0.20  QV        |           |           |           |
 2+40        0.0382       0.20  QV        |           |           |           |
 2+45        0.0395       0.20  QV        |           |           |           |
 2+50        0.0409       0.20  QV        |           |           |           |
 2+55        0.0423       0.20  QV        |           |           |           |
 3+ 0        0.0437       0.20  QV        |           |           |           |
 3+ 5        0.0451       0.20  QV        |           |           |           |
 3+10        0.0464       0.20  QV        |           |           |           |
 3+15        0.0478       0.20  QV        |           |           |           |
 3+20        0.0493       0.20  QV        |           |           |           |
 3+25        0.0507       0.20  Q V       |           |           |           |
 3+30        0.0521       0.21  Q V       |           |           |           |
 3+35        0.0535       0.21  Q V       |           |           |           |
 3+40        0.0549       0.21  Q V       |           |           |           |
 3+45        0.0564       0.21  Q V       |           |           |           |
 3+50        0.0578       0.21  Q V       |           |           |           |
 3+55        0.0593       0.21  Q V       |           |           |           |
 4+ 0        0.0607       0.21  Q V       |           |           |           |
 4+ 5        0.0622       0.21  Q V       |           |           |           |
 4+10        0.0636       0.21  Q V       |           |           |           |
 4+15        0.0651       0.21  Q V       |           |           |           |
 4+20        0.0666       0.21  Q V       |           |           |           |
 4+25        0.0681       0.22  Q V       |           |           |           |
 4+30        0.0695       0.22  Q V       |           |           |           |
 4+35        0.0710       0.22  Q V       |           |           |           |
 4+40        0.0725       0.22  Q V       |           |           |           |
 4+45        0.0740       0.22  Q V       |           |           |           |
 4+50        0.0756       0.22  Q  V      |           |           |           |
 4+55        0.0771       0.22  Q  V      |           |           |           |
 5+ 0        0.0786       0.22  Q  V      |           |           |           |
 5+ 5        0.0801       0.22  Q  V      |           |           |           |
 5+10        0.0817       0.22  Q  V      |           |           |           |
 5+15        0.0832       0.22  Q  V      |           |           |           |
 5+20        0.0848       0.23  Q  V      |           |           |           |
 5+25        0.0864       0.23  Q  V      |           |           |           |
 5+30        0.0879       0.23  Q  V      |           |           |           |
 5+35        0.0895       0.23  Q  V      |           |           |           |
 5+40        0.0911       0.23  Q  V      |           |           |           |
 5+45        0.0927       0.23  Q  V      |           |           |           |
 5+50        0.0943       0.23  Q  V      |           |           |           |
 5+55        0.0959       0.23  Q  V      |           |           |           |
 6+ 0        0.0975       0.23  Q  V      |           |           |           |
 6+ 5        0.0991       0.24  Q  V      |           |           |           |
 6+10        0.1008       0.24  Q   V     |           |           |           |
 6+15        0.1024       0.24  Q   V     |           |           |           |
 6+20        0.1041       0.24  Q   V     |           |           |           |
 6+25        0.1057       0.24  Q   V     |           |           |           |
 6+30        0.1074       0.24  Q   V     |           |           |           |
 6+35        0.1091       0.24  Q   V     |           |           |           |
 6+40        0.1107       0.24  Q   V     |           |           |           |
 6+45        0.1124       0.25  Q   V     |           |           |           |
 6+50        0.1141       0.25  Q   V     |           |           |           |
 6+55        0.1159       0.25  Q   V     |           |           |           |
 7+ 0        0.1176       0.25  Q   V     |           |           |           |
 7+ 5        0.1193       0.25  |Q  V     |           |           |           |
 7+10        0.1210       0.25  |Q  V     |           |           |           |
 7+15        0.1228       0.25  |Q  V     |           |           |           |
 7+20        0.1246       0.26  |Q   V    |           |           |           |
 7+25        0.1263       0.26  |Q   V    |           |           |           |
 7+30        0.1281       0.26  |Q   V    |           |           |           |
 7+35        0.1299       0.26  |Q   V    |           |           |           |
 7+40        0.1317       0.26  |Q   V    |           |           |           |
 7+45        0.1335       0.26  |Q   V    |           |           |           |
 7+50        0.1353       0.26  |Q   V    |           |           |           |
 7+55        0.1372       0.27  |Q   V    |           |           |           |
 8+ 0        0.1390       0.27  |Q   V    |           |           |           |
 8+ 5        0.1409       0.27  |Q   V    |           |           |           |
 8+10        0.1427       0.27  |Q   V    |           |           |           |
 8+15        0.1446       0.27  |Q   V    |           |           |           |
 8+20        0.1465       0.27  |Q   V    |           |           |           |
 8+25        0.1484       0.28  |Q   V    |           |           |           |
 8+30        0.1503       0.28  |Q    V   |           |           |           |
 8+35        0.1522       0.28  |Q    V   |           |           |           |
 8+40        0.1542       0.28  |Q    V   |           |           |           |
 8+45        0.1561       0.28  |Q    V   |           |           |           |
 8+50        0.1581       0.29  |Q    V   |           |           |           |
 8+55        0.1601       0.29  |Q    V   |           |           |           |
 9+ 0        0.1621       0.29  |Q    V   |           |           |           |
 9+ 5        0.1641       0.29  |Q    V   |           |           |           |
 9+10        0.1661       0.29  |Q    V   |           |           |           |
 9+15        0.1681       0.30  |Q    V   |           |           |           |
 9+20        0.1702       0.30  |Q    V   |           |           |           |
 9+25        0.1722       0.30  |Q    V   |           |           |           |
```

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 9+30       0.1743      0.30  |Q     V  |         |         |         |
 9+35       0.1764      0.30  |Q     V  |         |         |         |
 9+40       0.1785      0.31  |Q     V  |         |         |         |
 9+45       0.1807      0.31  |Q     V  |         |         |         |
 9+50       0.1828      0.31  |Q     V  |         |         |         |
 9+55       0.1850      0.31  |Q     V  |         |         |         |
10+ 0       0.1872      0.32  |Q     V  |         |         |         |
10+ 5       0.1894      0.32  |Q     V  |         |         |         |
10+10       0.1916      0.32  |Q     V  |         |         |         |
10+15       0.1938      0.32  |Q     V  |         |         |         |
10+20       0.1961      0.33  |Q     V  |         |         |         |
10+25       0.1983      0.33  |Q     V  |         |         |         |
10+30       0.2006      0.33  |Q      V |         |         |         |
10+35       0.2029      0.34  |Q      V |         |         |         |
10+40       0.2053      0.34  |Q      V |         |         |         |
10+45       0.2076      0.34  |Q      V |         |         |         |
10+50       0.2100      0.35  |Q      V |         |         |         |
10+55       0.2124      0.35  |Q      V |         |         |         |
11+ 0       0.2148      0.35  |Q      V |         |         |         |
11+ 5       0.2173      0.36  |Q      V |         |         |         |
11+10       0.2197      0.36  |Q      V |         |         |         |
11+15       0.2222      0.36  |Q      V |         |         |         |
11+20       0.2248      0.37  |Q       V|         |         |         |
11+25       0.2273      0.37  |Q       V|         |         |         |
11+30       0.2299      0.37  |Q       V|         |         |         |
11+35       0.2325      0.38  |Q       V|         |         |         |
11+40       0.2351      0.38  |Q       V|         |         |         |
11+45       0.2378      0.39  |Q       V|         |         |         |
11+50       0.2405      0.39  |Q       V|         |         |         |
11+55       0.2432      0.39  |Q       V|         |         |         |
12+ 0       0.2459      0.40  |Q       V|         |         |         |
12+ 5       0.2487      0.41  |Q        V         |         |         |
12+10       0.2517      0.43  |Q        V         |         |         |
12+15       0.2549      0.47  |Q        V         |         |         |
12+20       0.2584      0.50  | Q       V         |         |         |
12+25       0.2620      0.52  | Q       V         |         |         |
12+30       0.2657      0.53  | Q       V         |         |         |
12+35       0.2694      0.54  | Q       V         |         |         |
12+40       0.2732      0.55  | Q       V         |         |         |
12+45       0.2770      0.56  | Q       |V        |         |         |
12+50       0.2809      0.56  | Q       |V        |         |         |
12+55       0.2848      0.57  | Q       |V        |         |         |
13+ 0       0.2888      0.58  | Q       |V        |         |         |
13+ 5       0.2928      0.58  | Q       |V        |         |         |
13+10       0.2969      0.59  | Q       |V        |         |         |
13+15       0.3010      0.60  | Q       | V       |         |         |
13+20       0.3052      0.61  | Q       | V       |         |         |
13+25       0.3095      0.62  | Q       | V       |         |         |
13+30       0.3138      0.63  | Q       | V       |         |         |
13+35       0.3182      0.64  | Q       | V       |         |         |
13+40       0.3227      0.65  | Q       | V       |         |         |
13+45       0.3272      0.66  | Q       |  V      |         |         |
13+50       0.3318      0.67  | Q       |  V      |         |         |
13+55       0.3365      0.68  | Q       |  V      |         |         |
14+ 0       0.3413      0.69  | Q       |  V      |         |         |
14+ 5       0.3461      0.71  | Q       |  V      |         |         |
14+10       0.3511      0.72  | Q       |   V     |         |         |
14+15       0.3562      0.74  | Q       |   V     |         |         |
14+20       0.3614      0.75  |  Q      |   V     |         |         |
14+25       0.3667      0.77  |  Q      |   V     |         |         |
14+30       0.3721      0.79  |  Q      |   V     |         |         |
14+35       0.3777      0.81  |  Q      |    V    |         |         |
14+40       0.3834      0.83  |  Q      |    V    |         |         |
14+45       0.3892      0.85  |  Q      |    V    |         |         |
14+50       0.3952      0.88  |  Q      |    V    |         |         |
14+55       0.4015      0.90  |  Q      |     V   |         |         |
15+ 0       0.4079      0.93  |  Q      |     V   |         |         |
15+ 5       0.4145      0.96  |  Q      |     V   |         |         |
15+10       0.4214      1.00  |   Q     |     V   |         |         |
15+15       0.4286      1.04  |   Q     |      V  |         |         |
15+20       0.4361      1.09  |   Q     |      V  |         |         |
15+25       0.4439      1.13  |   Q     |      V  |         |         |
15+30       0.4518      1.15  |   Q     |       V |         |         |
15+35       0.4597      1.15  |   Q     |       V |         |         |
15+40       0.4678      1.17  |   Q     |       V |         |         |
15+45       0.4764      1.24  |   Q     |        V|         |         |
15+50       0.4858      1.38  |    Q    |        V|         |         |
15+55       0.4967      1.58  |     Q   |        V|         |         |
16+ 0       0.5099      1.91  |      Q  |         V         |         |
16+ 5       0.5311      3.08  |         | Q       |V        |         |
16+10       0.5756      6.47  |         |         |  V Q    |         |
16+15       0.6406      9.43  |         |         |    V    |      Q  |
16+20       0.6993      8.53  |         |         |       V |   Q     |
```

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16+25       0.7321      4.77  |         |        Q|        V|         |
16+30       0.7510      2.74  |         Q         |         V         |
16+35       0.7628      1.71  |     Q   |         |         V         |
16+40       0.7723      1.38  |    Q    |         |         |V        |
16+45       0.7805      1.19  |   Q     |         |         |V        |
16+50       0.7875      1.02  |   Q     |         |         |V        |
16+55       0.7941      0.95  |  Q      |         |         |V        |
17+ 0       0.8002      0.89  |  Q      |         |         | V       |
17+ 5       0.8060      0.84  |  Q      |         |         | V       |
17+10       0.8115      0.80  |  Q      |         |         | V       |
17+15       0.8167      0.76  |  Q      |         |         | V       |
17+20       0.8217      0.73  | Q       |         |         |  V      |
17+25       0.8266      0.70  | Q       |         |         |  V      |
17+30       0.8312      0.67  | Q       |         |         |  V      |
17+35       0.8357      0.65  | Q       |         |         |  V      |
17+40       0.8400      0.63  | Q       |         |         |  V      |
17+45       0.8443      0.61  | Q       |         |         |  V      |
17+50       0.8484      0.60  | Q       |         |         |   V     |
17+55       0.8524      0.58  | Q       |         |         |   V     |
18+ 0       0.8563      0.57  | Q       |         |         |   V     |
18+ 5       0.8600      0.55  | Q       |         |         |   V     |
18+10       0.8636      0.52  | Q       |         |         |   V     |
18+15       0.8669      0.47  |Q        |         |         |   V     |
18+20       0.8699      0.43  |Q        |         |         |    V    |
18+25       0.8727      0.41  |Q        |         |         |    V    |
18+30       0.8754      0.39  |Q        |         |         |    V    |
18+35       0.8781      0.38  |Q        |         |         |    V    |
18+40       0.8806      0.38  |Q        |         |         |    V    |
18+45       0.8832      0.37  |Q        |         |         |    V    |
18+50       0.8857      0.36  |Q        |         |         |    V    |
18+55       0.8881      0.35  |Q        |         |         |    V    |
19+ 0       0.8905      0.35  |Q        |         |         |    V    |
19+ 5       0.8928      0.34  |Q        |         |         |    V    |
19+10       0.8951      0.33  |Q        |         |         |     V   |
19+15       0.8974      0.33  |Q        |         |         |     V   |
19+20       0.8996      0.32  |Q        |         |         |     V   |
19+25       0.9018      0.32  |Q        |         |         |     V   |
19+30       0.9039      0.31  |Q        |         |         |     V   |
19+35       0.9060      0.31  |Q        |         |         |     V   |
19+40       0.9081      0.30  |Q        |         |         |     V   |
19+45       0.9102      0.30  |Q        |         |         |     V   |
19+50       0.9122      0.29  |Q        |         |         |     V   |
19+55       0.9142      0.29  |Q        |         |         |     V   |
20+ 0       0.9162      0.29  |Q        |         |         |     V   |
20+ 5       0.9181      0.28  |Q        |         |         |     V   |
20+10       0.9201      0.28  |Q        |         |         |      V  |
20+15       0.9219      0.28  |Q        |         |         |      V  |
20+20       0.9238      0.27  |Q        |         |         |      V  |
20+25       0.9257      0.27  |Q        |         |         |      V  |
20+30       0.9275      0.27  |Q        |         |         |      V  |
20+35       0.9293      0.26  |Q        |         |         |      V  |
20+40       0.9311      0.26  |Q        |         |         |      V  |
20+45       0.9328      0.26  |Q        |         |         |      V  |
20+50       0.9346      0.25  |Q        |         |         |      V  |
20+55       0.9363      0.25  |Q        |         |         |      V  |
21+ 0       0.9380      0.25  Q         |         |         |      V  |
21+ 5       0.9397      0.24  Q         |         |         |      V  |
21+10       0.9414      0.24  Q         |         |         |      V  |
21+15       0.9430      0.24  Q         |         |         |      V  |
21+20       0.9447      0.24  Q         |         |         |       V |
21+25       0.9463      0.24  Q         |         |         |       V |
21+30       0.9479      0.23  Q         |         |         |       V |
21+35       0.9495      0.23  Q         |         |         |       V |
21+40       0.9510      0.23  Q         |         |         |       V |
21+45       0.9526      0.23  Q         |         |         |       V |
21+50       0.9541      0.22  Q         |         |         |       V |
21+55       0.9557      0.22  Q         |         |         |       V |
22+ 0       0.9572      0.22  Q         |         |         |       V |
22+ 5       0.9587      0.22  Q         |         |         |       V |
22+10       0.9602      0.22  Q         |         |         |       V |
22+15       0.9617      0.21  Q         |         |         |       V |
22+20       0.9631      0.21  Q         |         |         |       V |
22+25       0.9646      0.21  Q         |         |         |       V |
22+30       0.9660      0.21  Q         |         |         |       V |
22+35       0.9675      0.21  Q         |         |         |       V |
22+40       0.9689      0.21  Q         |         |         |        V|
22+45       0.9703      0.20  Q         |         |         |        V|
22+50       0.9717      0.20  Q         |         |         |        V|
22+55       0.9731      0.20  Q         |         |         |        V|
23+ 0       0.9744      0.20  Q         |         |         |        V|
23+ 5       0.9758      0.20  Q         |         |         |        V|
23+10       0.9772      0.20  Q         |         |         |        V|
23+15       0.9785      0.20  Q         |         |         |        V|
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   23+20        0.9798       0.19  Q         |         |         |       V|
   23+25        0.9812       0.19  Q         |         |         |       V|
   23+30        0.9825       0.19  Q         |         |         |       V|
   23+35        0.9838       0.19  Q         |         |         |       V|
   23+40        0.9851       0.19  Q         |         |         |       V|
   23+45        0.9864       0.19  Q         |         |         |       V|
   23+50        0.9877       0.19  Q         |         |         |       V|
   23+55        0.9889       0.18  Q         |         |         |       V|
   24+ 0        0.9902       0.18  Q         |         |         |       V|
   24+ 5        0.9914       0.18  Q         |         |         |       V|
   24+10        0.9924       0.15  Q         |         |         |       V|
   24+15        0.9930       0.09  Q         |         |         |       V|
   24+20        0.9933       0.04  Q         |         |         |       V|
   24+25        0.9934       0.01  Q         |         |         |       V|
   24+30        0.9934       0.00  Q         |         |         |       V|
   24+35        0.9934       0.00  Q         |         |         |       V|
   24+40        0.9934       0.00  Q         |         |         |       V|
----------------------------------------------------------------------
```

U n i t   H y d r o g r a p h   A n a l y s i s

Study date 05/16/22

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6328

Unit Hydrograph
Post Development
2-yr / 24-hr Storm

Storm Event Year = 2

Antecedent Moisture Condition = 2

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 (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 2		
11.60	1	0.60
Rainfall data for year 2		
11.60	6	1.45
Rainfall data for year 2		
11.60	24	2.50

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	2.09	0.180	0.978	0.850	0.831
33.0	33.0	9.51	0.820	0.972	0.500	0.486

Area-averaged adjusted loss rate Fm (In/Hr) = 0.548

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
1.78	0.153	32.0	32.0	12.50	0.000
0.31	0.027	98.0	98.0	0.20	0.908
4.75	0.410	33.0	33.0	12.50	0.000
4.75	0.410	98.0	98.0	0.20	0.908

Area-averaged catchment yield fraction, Y = 0.397
Area-averaged low loss fraction, Yb = 0.603
Direct entry of lag time by user
++
Watershed area = 11.60(Ac.)
Catchment Lag time = 0.157 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 53.0786
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.548(In/Hr)
Average low loss rate fraction (Yb) = 0.603 (decimal)
VALLEY DEVELOPED S-Graph Selected

```
Computed peak 5-minute rainfall =  0.222(In)
Computed peak 30-minute rainfall =  0.455(In)
Specified peak 1-hour rainfall =  0.600(In)
Computed peak 3-hour rainfall =  1.031(In)
Specified peak 6-hour rainfall =  1.450(In)
Specified peak 24-hour rainfall =  2.500(In)


Rainfall depth area reduction factors:
Using a total area of      11.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.222(In)
30-minute factor = 0.999    Adjusted rainfall =  0.454(In)
1-hour factor = 0.999       Adjusted rainfall =  0.600(In)
3-hour factor = 1.000       Adjusted rainfall =  1.031(In)
6-hour factor = 1.000       Adjusted rainfall =  1.450(In)
24-hour factor = 1.000      Adjusted rainfall =  2.500(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 =       140.29 (CFS))

  1                5.135                  7.204
  2               33.307                 39.522
  3               73.471                 56.345
  4               92.153                 26.209
  5               97.775                  7.886
  6               99.055                  1.796
  7              100.000                  1.326
---------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number             (In)                 (In)
  1              0.2219               0.2219
  2              0.2929               0.0709
  3              0.3444               0.0516
  4              0.3864               0.0420
  5              0.4225               0.0361
  6              0.4545               0.0320
  7              0.4834               0.0289
  8              0.5099               0.0265
  9              0.5345               0.0246
 10              0.5575               0.0230
 11              0.5792               0.0217
 12              0.5997               0.0205
 13              0.6238               0.0241
 14              0.6470               0.0232
 15              0.6694               0.0224
 16              0.6910               0.0216
 17              0.7120               0.0210
 18              0.7323               0.0203
 19              0.7521               0.0198
 20              0.7714               0.0193
 21              0.7901               0.0188
 22              0.8085               0.0183
 23              0.8264               0.0179
 24              0.8439               0.0175
 25              0.8611               0.0172
 26              0.8779               0.0168
 27              0.8943               0.0165
 28              0.9105               0.0162
 29              0.9264               0.0159
 30              0.9420               0.0156
 31              0.9574               0.0153
 32              0.9725               0.0151
 33              0.9873               0.0149
 34              1.0020               0.0146
 35              1.0164               0.0144
 36              1.0306               0.0142
 37              1.0446               0.0140
 38              1.0584               0.0138
 39              1.0720               0.0136
 40              1.0855               0.0135
 41              1.0988               0.0133
 42              1.1119               0.0131
 43              1.1249               0.0130
 44              1.1377               0.0128
 45              1.1503               0.0127
 46              1.1628               0.0125
 47              1.1752               0.0124
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48	1.1875	0.0122
49	1.1996	0.0121
50	1.2116	0.0120
51	1.2235	0.0119
52	1.2352	0.0118
53	1.2469	0.0116
54	1.2584	0.0115
55	1.2698	0.0114
56	1.2811	0.0113
57	1.2924	0.0112
58	1.3035	0.0111
59	1.3145	0.0110
60	1.3254	0.0109
61	1.3363	0.0108
62	1.3470	0.0107
63	1.3577	0.0107
64	1.3682	0.0106
65	1.3787	0.0105
66	1.3891	0.0104
67	1.3994	0.0103
68	1.4097	0.0102
69	1.4199	0.0102
70	1.4300	0.0101
71	1.4400	0.0100
72	1.4499	0.0100
73	1.4578	0.0079
74	1.4656	0.0078
75	1.4734	0.0078
76	1.4811	0.0077
77	1.4887	0.0076
78	1.4963	0.0076
79	1.5038	0.0075
80	1.5112	0.0075
81	1.5186	0.0074
82	1.5260	0.0073
83	1.5333	0.0073
84	1.5405	0.0072
85	1.5477	0.0072
86	1.5548	0.0071
87	1.5619	0.0071
88	1.5689	0.0070
89	1.5759	0.0070
90	1.5828	0.0069
91	1.5897	0.0069
92	1.5966	0.0068
93	1.6034	0.0068
94	1.6101	0.0068
95	1.6168	0.0067
96	1.6235	0.0067
97	1.6301	0.0066
98	1.6367	0.0066
99	1.6432	0.0065
100	1.6497	0.0065
101	1.6562	0.0065
102	1.6626	0.0064
103	1.6690	0.0064
104	1.6754	0.0063
105	1.6817	0.0063
106	1.6879	0.0063
107	1.6942	0.0062
108	1.7004	0.0062
109	1.7066	0.0062
110	1.7127	0.0061
111	1.7188	0.0061
112	1.7249	0.0061
113	1.7309	0.0060
114	1.7369	0.0060
115	1.7429	0.0060
116	1.7488	0.0059
117	1.7547	0.0059
118	1.7606	0.0059
119	1.7664	0.0058
120	1.7723	0.0058
121	1.7781	0.0058
122	1.7838	0.0058
123	1.7895	0.0057
124	1.7952	0.0057
125	1.8009	0.0057
126	1.8066	0.0056
127	1.8122	0.0056
128	1.8178	0.0056
129	1.8234	0.0056
130	1.8289	0.0055

131	1.8344	0.0055
132	1.8399	0.0055
133	1.8454	0.0055
134	1.8508	0.0054
135	1.8562	0.0054
136	1.8616	0.0054
137	1.8670	0.0054
138	1.8723	0.0053
139	1.8776	0.0053
140	1.8829	0.0053
141	1.8882	0.0053
142	1.8935	0.0053
143	1.8987	0.0052
144	1.9039	0.0052
145	1.9091	0.0052
146	1.9142	0.0052
147	1.9194	0.0051
148	1.9245	0.0051
149	1.9296	0.0051
150	1.9347	0.0051
151	1.9397	0.0051
152	1.9448	0.0050
153	1.9498	0.0050
154	1.9548	0.0050
155	1.9598	0.0050
156	1.9647	0.0050
157	1.9697	0.0049
158	1.9746	0.0049
159	1.9795	0.0049
160	1.9844	0.0049
161	1.9892	0.0049
162	1.9941	0.0048
163	1.9989	0.0048
164	2.0037	0.0048
165	2.0085	0.0048
166	2.0133	0.0048
167	2.0180	0.0048
168	2.0228	0.0047
169	2.0275	0.0047
170	2.0322	0.0047
171	2.0369	0.0047
172	2.0416	0.0047
173	2.0462	0.0047
174	2.0509	0.0046
175	2.0555	0.0046
176	2.0601	0.0046
177	2.0647	0.0046
178	2.0693	0.0046
179	2.0738	0.0046
180	2.0784	0.0045
181	2.0829	0.0045
182	2.0874	0.0045
183	2.0919	0.0045
184	2.0964	0.0045
185	2.1009	0.0045
186	2.1053	0.0045
187	2.1098	0.0044
188	2.1142	0.0044
189	2.1186	0.0044
190	2.1230	0.0044
191	2.1274	0.0044
192	2.1318	0.0044
193	2.1361	0.0044
194	2.1405	0.0043
195	2.1448	0.0043
196	2.1491	0.0043
197	2.1534	0.0043
198	2.1577	0.0043
199	2.1620	0.0043
200	2.1662	0.0043
201	2.1705	0.0042
202	2.1747	0.0042
203	2.1789	0.0042
204	2.1832	0.0042
205	2.1874	0.0042
206	2.1915	0.0042
207	2.1957	0.0042
208	2.1999	0.0042
209	2.2040	0.0041
210	2.2082	0.0041
211	2.2123	0.0041
212	2.2164	0.0041
213	2.2205	0.0041

214	2.2246	0.0041
215	2.2287	0.0041
216	2.2327	0.0041
217	2.2368	0.0041
218	2.2408	0.0040
219	2.2449	0.0040
220	2.2489	0.0040
221	2.2529	0.0040
222	2.2569	0.0040
223	2.2609	0.0040
224	2.2649	0.0040
225	2.2688	0.0040
226	2.2728	0.0040
227	2.2768	0.0039
228	2.2807	0.0039
229	2.2846	0.0039
230	2.2885	0.0039
231	2.2924	0.0039
232	2.2963	0.0039
233	2.3002	0.0039
234	2.3041	0.0039
235	2.3079	0.0039
236	2.3118	0.0039
237	2.3156	0.0038
238	2.3195	0.0038
239	2.3233	0.0038
240	2.3271	0.0038
241	2.3309	0.0038
242	2.3347	0.0038
243	2.3385	0.0038
244	2.3423	0.0038
245	2.3461	0.0038
246	2.3498	0.0038
247	2.3536	0.0037
248	2.3573	0.0037
249	2.3610	0.0037
250	2.3648	0.0037
251	2.3685	0.0037
252	2.3722	0.0037
253	2.3759	0.0037
254	2.3795	0.0037
255	2.3832	0.0037
256	2.3869	0.0037
257	2.3906	0.0037
258	2.3942	0.0037
259	2.3978	0.0036
260	2.4015	0.0036
261	2.4051	0.0036
262	2.4087	0.0036
263	2.4123	0.0036
264	2.4159	0.0036
265	2.4195	0.0036
266	2.4231	0.0036
267	2.4267	0.0036
268	2.4302	0.0036
269	2.4338	0.0036
270	2.4374	0.0036
271	2.4409	0.0035
272	2.4444	0.0035
273	2.4480	0.0035
274	2.4515	0.0035
275	2.4550	0.0035
276	2.4585	0.0035
277	2.4620	0.0035
278	2.4655	0.0035
279	2.4690	0.0035
280	2.4724	0.0035
281	2.4759	0.0035
282	2.4794	0.0035
283	2.4828	0.0035
284	2.4863	0.0034
285	2.4897	0.0034
286	2.4931	0.0034
287	2.4965	0.0034
288	2.5000	0.0034

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0034	0.0021	0.0014
2	0.0034	0.0021	0.0014
3	0.0034	0.0021	0.0014

4	0.0034	0.0021	0.0014
5	0.0035	0.0021	0.0014
6	0.0035	0.0021	0.0014
7	0.0035	0.0021	0.0014
8	0.0035	0.0021	0.0014
9	0.0035	0.0021	0.0014
10	0.0035	0.0021	0.0014
11	0.0035	0.0021	0.0014
12	0.0035	0.0021	0.0014
13	0.0036	0.0021	0.0014
14	0.0036	0.0021	0.0014
15	0.0036	0.0022	0.0014
16	0.0036	0.0022	0.0014
17	0.0036	0.0022	0.0014
18	0.0036	0.0022	0.0014
19	0.0036	0.0022	0.0014
20	0.0036	0.0022	0.0014
21	0.0037	0.0022	0.0014
22	0.0037	0.0022	0.0015
23	0.0037	0.0022	0.0015
24	0.0037	0.0022	0.0015
25	0.0037	0.0022	0.0015
26	0.0037	0.0022	0.0015
27	0.0037	0.0023	0.0015
28	0.0037	0.0023	0.0015
29	0.0038	0.0023	0.0015
30	0.0038	0.0023	0.0015
31	0.0038	0.0023	0.0015
32	0.0038	0.0023	0.0015
33	0.0038	0.0023	0.0015
34	0.0038	0.0023	0.0015
35	0.0038	0.0023	0.0015
36	0.0039	0.0023	0.0015
37	0.0039	0.0023	0.0015
38	0.0039	0.0023	0.0015
39	0.0039	0.0024	0.0015
40	0.0039	0.0024	0.0016
41	0.0039	0.0024	0.0016
42	0.0039	0.0024	0.0016
43	0.0040	0.0024	0.0016
44	0.0040	0.0024	0.0016
45	0.0040	0.0024	0.0016
46	0.0040	0.0024	0.0016
47	0.0040	0.0024	0.0016
48	0.0040	0.0024	0.0016
49	0.0041	0.0025	0.0016
50	0.0041	0.0025	0.0016
51	0.0041	0.0025	0.0016
52	0.0041	0.0025	0.0016
53	0.0041	0.0025	0.0016
54	0.0041	0.0025	0.0016
55	0.0042	0.0025	0.0017
56	0.0042	0.0025	0.0017
57	0.0042	0.0025	0.0017
58	0.0042	0.0025	0.0017
59	0.0042	0.0026	0.0017
60	0.0043	0.0026	0.0017
61	0.0043	0.0026	0.0017
62	0.0043	0.0026	0.0017
63	0.0043	0.0026	0.0017
64	0.0043	0.0026	0.0017
65	0.0044	0.0026	0.0017
66	0.0044	0.0026	0.0017
67	0.0044	0.0027	0.0018
68	0.0044	0.0027	0.0018
69	0.0045	0.0027	0.0018
70	0.0045	0.0027	0.0018
71	0.0045	0.0027	0.0018
72	0.0045	0.0027	0.0018
73	0.0045	0.0027	0.0018
74	0.0046	0.0028	0.0018
75	0.0046	0.0028	0.0018
76	0.0046	0.0028	0.0018
77	0.0046	0.0028	0.0018
78	0.0047	0.0028	0.0018
79	0.0047	0.0028	0.0019
80	0.0047	0.0028	0.0019
81	0.0047	0.0029	0.0019
82	0.0048	0.0029	0.0019
83	0.0048	0.0029	0.0019
84	0.0048	0.0029	0.0019
85	0.0048	0.0029	0.0019
86	0.0049	0.0029	0.0019

87	0.0049	0.0030	0.0019
88	0.0049	0.0030	0.0020
89	0.0050	0.0030	0.0020
90	0.0050	0.0030	0.0020
91	0.0050	0.0030	0.0020
92	0.0050	0.0030	0.0020
93	0.0051	0.0031	0.0020
94	0.0051	0.0031	0.0020
95	0.0051	0.0031	0.0020
96	0.0052	0.0031	0.0020
97	0.0052	0.0031	0.0021
98	0.0052	0.0032	0.0021
99	0.0053	0.0032	0.0021
100	0.0053	0.0032	0.0021
101	0.0053	0.0032	0.0021
102	0.0054	0.0032	0.0021
103	0.0054	0.0033	0.0021
104	0.0054	0.0033	0.0022
105	0.0055	0.0033	0.0022
106	0.0055	0.0033	0.0022
107	0.0056	0.0034	0.0022
108	0.0056	0.0034	0.0022
109	0.0056	0.0034	0.0022
110	0.0057	0.0034	0.0023
111	0.0057	0.0035	0.0023
112	0.0058	0.0035	0.0023
113	0.0058	0.0035	0.0023
114	0.0058	0.0035	0.0023
115	0.0059	0.0036	0.0023
116	0.0059	0.0036	0.0024
117	0.0060	0.0036	0.0024
118	0.0060	0.0036	0.0024
119	0.0061	0.0037	0.0024
120	0.0061	0.0037	0.0024
121	0.0062	0.0037	0.0025
122	0.0062	0.0038	0.0025
123	0.0063	0.0038	0.0025
124	0.0063	0.0038	0.0025
125	0.0064	0.0039	0.0025
126	0.0065	0.0039	0.0026
127	0.0065	0.0039	0.0026
128	0.0066	0.0040	0.0026
129	0.0067	0.0040	0.0026
130	0.0067	0.0040	0.0027
131	0.0068	0.0041	0.0027
132	0.0068	0.0041	0.0027
133	0.0069	0.0042	0.0028
134	0.0070	0.0042	0.0028
135	0.0071	0.0043	0.0028
136	0.0071	0.0043	0.0028
137	0.0072	0.0044	0.0029
138	0.0073	0.0044	0.0029
139	0.0074	0.0045	0.0029
140	0.0075	0.0045	0.0030
141	0.0076	0.0046	0.0030
142	0.0076	0.0046	0.0030
143	0.0078	0.0047	0.0031
144	0.0078	0.0047	0.0031
145	0.0100	0.0060	0.0040
146	0.0100	0.0060	0.0040
147	0.0102	0.0061	0.0040
148	0.0102	0.0062	0.0041
149	0.0104	0.0063	0.0041
150	0.0105	0.0063	0.0042
151	0.0107	0.0064	0.0042
152	0.0107	0.0065	0.0043
153	0.0109	0.0066	0.0043
154	0.0110	0.0066	0.0044
155	0.0112	0.0068	0.0045
156	0.0113	0.0068	0.0045
157	0.0115	0.0070	0.0046
158	0.0116	0.0070	0.0046
159	0.0119	0.0072	0.0047
160	0.0120	0.0072	0.0048
161	0.0122	0.0074	0.0049
162	0.0124	0.0075	0.0049
163	0.0127	0.0076	0.0050
164	0.0128	0.0077	0.0051
165	0.0131	0.0079	0.0052
166	0.0133	0.0080	0.0053
167	0.0136	0.0082	0.0054
168	0.0138	0.0083	0.0055
169	0.0142	0.0086	0.0056

170	0.0144	0.0087	0.0057
171	0.0149	0.0090	0.0059
172	0.0151	0.0091	0.0060
173	0.0156	0.0094	0.0062
174	0.0159	0.0096	0.0063
175	0.0165	0.0099	0.0065
176	0.0168	0.0101	0.0067
177	0.0175	0.0106	0.0070
178	0.0179	0.0108	0.0071
179	0.0188	0.0113	0.0075
180	0.0193	0.0116	0.0076
181	0.0203	0.0123	0.0081
182	0.0210	0.0126	0.0083
183	0.0224	0.0135	0.0089
184	0.0232	0.0140	0.0092
185	0.0205	0.0124	0.0081
186	0.0217	0.0131	0.0086
187	0.0246	0.0148	0.0098
188	0.0265	0.0160	0.0105
189	0.0320	0.0193	0.0127
190	0.0361	0.0218	0.0143
191	0.0516	0.0311	0.0205
192	0.0709	0.0428	0.0281
193	0.2219	0.0457	0.1763
194	0.0420	0.0253	0.0167
195	0.0289	0.0174	0.0115
196	0.0230	0.0139	0.0091
197	0.0241	0.0146	0.0096
198	0.0216	0.0130	0.0086
199	0.0198	0.0119	0.0078
200	0.0183	0.0111	0.0073
201	0.0172	0.0103	0.0068
202	0.0162	0.0098	0.0064
203	0.0153	0.0093	0.0061
204	0.0146	0.0088	0.0058
205	0.0140	0.0084	0.0056
206	0.0135	0.0081	0.0053
207	0.0130	0.0078	0.0051
208	0.0125	0.0076	0.0050
209	0.0121	0.0073	0.0048
210	0.0118	0.0071	0.0047
211	0.0114	0.0069	0.0045
212	0.0111	0.0067	0.0044
213	0.0108	0.0065	0.0043
214	0.0106	0.0064	0.0042
215	0.0103	0.0062	0.0041
216	0.0101	0.0061	0.0040
217	0.0079	0.0048	0.0031
218	0.0077	0.0046	0.0031
219	0.0075	0.0045	0.0030
220	0.0073	0.0044	0.0029
221	0.0072	0.0043	0.0028
222	0.0070	0.0042	0.0028
223	0.0069	0.0042	0.0027
224	0.0068	0.0041	0.0027
225	0.0066	0.0040	0.0026
226	0.0065	0.0039	0.0026
227	0.0064	0.0039	0.0025
228	0.0063	0.0038	0.0025
229	0.0062	0.0037	0.0024
230	0.0061	0.0037	0.0024
231	0.0060	0.0036	0.0024
232	0.0059	0.0035	0.0023
233	0.0058	0.0035	0.0023
234	0.0057	0.0034	0.0023
235	0.0056	0.0034	0.0022
236	0.0055	0.0033	0.0022
237	0.0055	0.0033	0.0022
238	0.0054	0.0033	0.0021
239	0.0053	0.0032	0.0021
240	0.0053	0.0032	0.0021
241	0.0052	0.0031	0.0021
242	0.0051	0.0031	0.0020
243	0.0051	0.0031	0.0020
244	0.0050	0.0030	0.0020
245	0.0049	0.0030	0.0020
246	0.0049	0.0029	0.0019
247	0.0048	0.0029	0.0019
248	0.0048	0.0029	0.0019
249	0.0047	0.0028	0.0019
250	0.0047	0.0028	0.0019
251	0.0046	0.0028	0.0018
252	0.0046	0.0028	0.0018

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253            0.0045          0.0027            0.0018
254            0.0045          0.0027            0.0018
255            0.0044          0.0027            0.0018
256            0.0044          0.0027            0.0017
257            0.0044          0.0026            0.0017
258            0.0043          0.0026            0.0017
259            0.0043          0.0026            0.0017
260            0.0042          0.0026            0.0017
261            0.0042          0.0025            0.0017
262            0.0042          0.0025            0.0017
263            0.0041          0.0025            0.0016
264            0.0041          0.0025            0.0016
265            0.0041          0.0024            0.0016
266            0.0040          0.0024            0.0016
267            0.0040          0.0024            0.0016
268            0.0040          0.0024            0.0016
269            0.0039          0.0024            0.0016
270            0.0039          0.0023            0.0015
271            0.0039          0.0023            0.0015
272            0.0038          0.0023            0.0015
273            0.0038          0.0023            0.0015
274            0.0038          0.0023            0.0015
275            0.0037          0.0023            0.0015
276            0.0037          0.0022            0.0015
277            0.0037          0.0022            0.0015
278            0.0037          0.0022            0.0015
279            0.0036          0.0022            0.0014
280            0.0036          0.0022            0.0014
281            0.0036          0.0022            0.0014
282            0.0036          0.0022            0.0014
283            0.0035          0.0021            0.0014
284            0.0035          0.0021            0.0014
285            0.0035          0.0021            0.0014
286            0.0035          0.0021            0.0014
287            0.0035          0.0021            0.0014
288            0.0034          0.0021            0.0014
---------------------------------------------------------------------
---------------------------------------------------------------------
Total soil rain loss =      1.42(In)
Total effective rainfall =      1.08(In)
Peak flow rate in flood hydrograph =     11.61(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      0.01  Q         |         |         |         |
  0+10      0.0005      0.06  Q         |         |         |         |
  0+15      0.0015      0.14  Q         |         |         |         |
  0+20      0.0027      0.18  Q         |         |         |         |
  0+25      0.0040      0.19  Q         |         |         |         |
  0+30      0.0053      0.19  Q         |         |         |         |
  0+35      0.0066      0.19  Q         |         |         |         |
  0+40      0.0079      0.19  Q         |         |         |         |
  0+45      0.0093      0.19  Q         |         |         |         |
  0+50      0.0106      0.19  Q         |         |         |         |
  0+55      0.0119      0.20  Q         |         |         |         |
  1+ 0      0.0133      0.20  Q         |         |         |         |
  1+ 5      0.0146      0.20  Q         |         |         |         |
  1+10      0.0160      0.20  Q         |         |         |         |
  1+15      0.0174      0.20  Q         |         |         |         |
  1+20      0.0187      0.20  Q         |         |         |         |
  1+25      0.0201      0.20  Q         |         |         |         |
  1+30      0.0215      0.20  Q         |         |         |         |
  1+35      0.0229      0.20  Q         |         |         |         |
  1+40      0.0242      0.20  Q         |         |         |         |
  1+45      0.0256      0.20  Q         |         |         |         |
  1+50      0.0270      0.20  QV        |         |         |         |
  1+55      0.0284      0.20  QV        |         |         |         |
  2+ 0      0.0298      0.20  QV        |         |         |         |
  2+ 5      0.0312      0.20  QV        |         |         |         |
  2+10      0.0326      0.21  QV        |         |         |         |
  2+15      0.0341      0.21  QV        |         |         |         |
  2+20      0.0355      0.21  QV        |         |         |         |
  2+25      0.0369      0.21  QV        |         |         |         |
  2+30      0.0384      0.21  QV        |         |         |         |
  2+35      0.0398      0.21  QV        |         |         |         |
  2+40      0.0412      0.21  QV        |         |         |         |
```

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2+45       0.0427      0.21  QV        |         |         |         |
2+50       0.0441      0.21  QV        |         |         |         |
2+55       0.0456      0.21  QV        |         |         |         |
3+ 0       0.0471      0.21  QV        |         |         |         |
3+ 5       0.0486      0.21  QV        |         |         |         |
3+10       0.0500      0.21  QV        |         |         |         |
3+15       0.0515      0.22  QV        |         |         |         |
3+20       0.0530      0.22  Q V       |         |         |         |
3+25       0.0545      0.22  Q V       |         |         |         |
3+30       0.0560      0.22  Q V       |         |         |         |
3+35       0.0575      0.22  Q V       |         |         |         |
3+40       0.0590      0.22  Q V       |         |         |         |
3+45       0.0605      0.22  Q V       |         |         |         |
3+50       0.0621      0.22  Q V       |         |         |         |
3+55       0.0636      0.22  Q V       |         |         |         |
4+ 0       0.0651      0.22  Q V       |         |         |         |
4+ 5       0.0667      0.22  Q V       |         |         |         |
4+10       0.0682      0.23  Q V       |         |         |         |
4+15       0.0698      0.23  Q V       |         |         |         |
4+20       0.0714      0.23  Q V       |         |         |         |
4+25       0.0729      0.23  Q V       |         |         |         |
4+30       0.0745      0.23  Q V       |         |         |         |
4+35       0.0761      0.23  Q V       |         |         |         |
4+40       0.0777      0.23  Q V       |         |         |         |
4+45       0.0793      0.23  Q  V      |         |         |         |
4+50       0.0809      0.23  Q  V      |         |         |         |
4+55       0.0825      0.23  Q  V      |         |         |         |
5+ 0       0.0841      0.24  Q  V      |         |         |         |
5+ 5       0.0858      0.24  Q  V      |         |         |         |
5+10       0.0874      0.24  Q  V      |         |         |         |
5+15       0.0890      0.24  Q  V      |         |         |         |
5+20       0.0907      0.24  Q  V      |         |         |         |
5+25       0.0924      0.24  Q  V      |         |         |         |
5+30       0.0940      0.24  Q  V      |         |         |         |
5+35       0.0957      0.24  Q  V      |         |         |         |
5+40       0.0974      0.24  Q  V      |         |         |         |
5+45       0.0991      0.25  Q  V      |         |         |         |
5+50       0.1008      0.25  Q  V      |         |         |         |
5+55       0.1025      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       0.1147      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       0.1237      0.26  Q   V     |         |         |         |
7+ 0       0.1255      0.27  Q   V     |         |         |         |
7+ 5       0.1273      0.27  Q   V     |         |         |         |
7+10       0.1292      0.27  Q   V     |         |         |         |
7+15       0.1310      0.27  Q    V    |         |         |         |
7+20       0.1329      0.27  Q    V    |         |         |         |
7+25       0.1348      0.27  Q    V    |         |         |         |
7+30       0.1366      0.27  Q    V    |         |         |         |
7+35       0.1385      0.28  Q    V    |         |         |         |
7+40       0.1405      0.28  Q    V    |         |         |         |
7+45       0.1424      0.28  Q    V    |         |         |         |
7+50       0.1443      0.28  Q    V    |         |         |         |
7+55       0.1463      0.28  Q    V    |         |         |         |
8+ 0       0.1482      0.28  Q    V    |         |         |         |
8+ 5       0.1502      0.29  Q    V    |         |         |         |
8+10       0.1522      0.29  Q    V    |         |         |         |
8+15       0.1542      0.29  Q    V    |         |         |         |
8+20       0.1562      0.29  Q    V    |         |         |         |
8+25       0.1582      0.29  Q     V   |         |         |         |
8+30       0.1602      0.30  Q     V   |         |         |         |
8+35       0.1623      0.30  Q     V   |         |         |         |
8+40       0.1643      0.30  Q     V   |         |         |         |
8+45       0.1664      0.30  Q     V   |         |         |         |
8+50       0.1685      0.30  Q     V   |         |         |         |
8+55       0.1706      0.31  Q     V   |         |         |         |
9+ 0       0.1727      0.31  Q     V   |         |         |         |
9+ 5       0.1748      0.31  Q     V   |         |         |         |
9+10       0.1770      0.31  Q     V   |         |         |         |
9+15       0.1792      0.31  Q     V   |         |         |         |
9+20       0.1813      0.32  Q     V   |         |         |         |
9+25       0.1835      0.32  Q      V  |         |         |         |
9+30       0.1857      0.32  Q      V  |         |         |         |
9+35       0.1880      0.32  Q      V  |         |         |         |
```

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 9+40       0.1902      0.33  Q      V  |         |         |         |
 9+45       0.1925      0.33  Q      V  |         |         |         |
 9+50       0.1948      0.33  Q      V  |         |         |         |
 9+55       0.1971      0.33  Q      V  |         |         |         |
10+ 0       0.1994      0.34  Q      V  |         |         |         |
10+ 5       0.2017      0.34  Q      V  |         |         |         |
10+10       0.2041      0.34  Q      V  |         |         |         |
10+15       0.2065      0.35  Q      V  |         |         |         |
10+20       0.2088      0.35  Q       V |         |         |         |
10+25       0.2113      0.35  Q       V |         |         |         |
10+30       0.2137      0.35  Q       V |         |         |         |
10+35       0.2162      0.36  Q       V |         |         |         |
10+40       0.2186      0.36  Q       V |         |         |         |
10+45       0.2212      0.36  Q       V |         |         |         |
10+50       0.2237      0.37  Q       V |         |         |         |
10+55       0.2262      0.37  Q       V |         |         |         |
11+ 0       0.2288      0.37  Q       V |         |         |         |
11+ 5       0.2314      0.38  Q       V |         |         |         |
11+10       0.2340      0.38  Q       V |         |         |         |
11+15       0.2367      0.39  Q        V|         |         |         |
11+20       0.2394      0.39  Q        V|         |         |         |
11+25       0.2421      0.39  Q        V|         |         |         |
11+30       0.2448      0.40  Q        V|         |         |         |
11+35       0.2476      0.40  Q        V|         |         |         |
11+40       0.2504      0.41  Q        V|         |         |         |
11+45       0.2532      0.41  Q        V|         |         |         |
11+50       0.2561      0.42  Q        V|         |         |         |
11+55       0.2590      0.42  Q        V|         |         |         |
12+ 0       0.2619      0.43  Q         V         |         |         |
12+ 5       0.2649      0.44  Q         V         |         |         |
12+10       0.2682      0.47  Q         V         |         |         |
12+15       0.2718      0.52  |Q        V         |         |         |
12+20       0.2756      0.55  |Q        V         |         |         |
12+25       0.2795      0.56  |Q        V         |         |         |
12+30       0.2834      0.57  |Q        V         |         |         |
12+35       0.2874      0.58  |Q        |V        |         |         |
12+40       0.2914      0.59  |Q        |V        |         |         |
12+45       0.2955      0.59  |Q        |V        |         |         |
12+50       0.2996      0.60  |Q        |V        |         |         |
12+55       0.3038      0.61  |Q        |V        |         |         |
13+ 0       0.3080      0.62  |Q        |V        |         |         |
13+ 5       0.3123      0.62  |Q        |V        |         |         |
13+10       0.3167      0.63  |Q        | V       |         |         |
13+15       0.3211      0.64  |Q        | V       |         |         |
13+20       0.3256      0.65  |Q        | V       |         |         |
13+25       0.3301      0.66  |Q        | V       |         |         |
13+30       0.3347      0.67  |Q        | V       |         |         |
13+35       0.3394      0.68  |Q        |  V      |         |         |
13+40       0.3442      0.69  |Q        |  V      |         |         |
13+45       0.3490      0.70  |Q        |  V      |         |         |
13+50       0.3540      0.72  |Q        |  V      |         |         |
13+55       0.3590      0.73  |Q        |  V      |         |         |
14+ 0       0.3641      0.74  |Q        |  V      |         |         |
14+ 5       0.3693      0.76  |Q        |   V     |         |         |
14+10       0.3746      0.77  |Q        |   V     |         |         |
14+15       0.3801      0.79  |Q        |   V     |         |         |
14+20       0.3856      0.81  |Q        |   V     |         |         |
14+25       0.3913      0.83  |Q        |   V     |         |         |
14+30       0.3971      0.85  |Q        |    V    |         |         |
14+35       0.4031      0.87  |Q        |    V    |         |         |
14+40       0.4092      0.89  |Q        |    V    |         |         |
14+45       0.4155      0.91  |Q        |    V    |         |         |
14+50       0.4220      0.94  |Q        |     V   |         |         |
14+55       0.4287      0.97  |Q        |     V   |         |         |
15+ 0       0.4356      1.00  | Q       |     V   |         |         |
15+ 5       0.4428      1.04  | Q       |     V   |         |         |
15+10       0.4502      1.08  | Q       |      V  |         |         |
15+15       0.4580      1.13  | Q       |      V  |         |         |
15+20       0.4662      1.18  | Q       |      V  |         |         |
15+25       0.4746      1.23  | Q       |       V |         |         |
15+30       0.4831      1.23  | Q       |       V |         |         |
15+35       0.4914      1.21  | Q       |       V |         |         |
15+40       0.5000      1.26  | Q       |        V|         |         |
15+45       0.5095      1.38  | Q       |        V|         |         |
15+50       0.5202      1.55  |  Q      |        V|         |         |
15+55       0.5326      1.81  |  Q      |         V         |         |
16+ 0       0.5482      2.26  |   Q     |         |V        |         |
16+ 5       0.5760      4.04  |       Q |         | V       |         |
16+10       0.6405      9.36  |         |       Q |   V     |         |
16+15       0.7205     11.61  |         |         |  Q   V  |         |
16+20       0.7642      6.36  |         | Q       |        V|         |
16+25       0.7848      2.98  |    Q    |         |         V         |
16+30       0.7968      1.74  |  Q      |         |         V         |
```

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16+35       0.8073      1.53  |  Q      |         |         V         |
16+40       0.8156      1.21  | Q       |         |         |V        |
16+45       0.8233      1.11  | Q       |         |         |V        |
16+50       0.8304      1.03  | Q       |         |         |V        |
16+55       0.8370      0.96  |Q        |         |         | V       |
17+ 0       0.8432      0.91  |Q        |         |         | V       |
17+ 5       0.8491      0.86  |Q        |         |         | V       |
17+10       0.8548      0.82  |Q        |         |         | V       |
17+15       0.8602      0.78  |Q        |         |         | V       |
17+20       0.8653      0.75  |Q        |         |         |  V      |
17+25       0.8703      0.72  |Q        |         |         |  V      |
17+30       0.8751      0.70  |Q        |         |         |  V      |
17+35       0.8798      0.68  |Q        |         |         |  V      |
17+40       0.8843      0.66  |Q        |         |         |  V      |
17+45       0.8887      0.64  |Q        |         |         |   V     |
17+50       0.8929      0.62  |Q        |         |         |   V     |
17+55       0.8971      0.60  |Q        |         |         |   V     |
18+ 0       0.9012      0.59  |Q        |         |         |   V     |
18+ 5       0.9051      0.57  |Q        |         |         |   V     |
18+10       0.9087      0.53  |Q        |         |         |   V     |
18+15       0.9119      0.47  Q         |         |         |   V     |
18+20       0.9149      0.44  Q         |         |         |    V    |
18+25       0.9178      0.42  Q         |         |         |    V    |
18+30       0.9207      0.41  Q         |         |         |    V    |
18+35       0.9234      0.40  Q         |         |         |    V    |
18+40       0.9261      0.39  Q         |         |         |    V    |
18+45       0.9288      0.38  Q         |         |         |    V    |
18+50       0.9313      0.38  Q         |         |         |    V    |
18+55       0.9339      0.37  Q         |         |         |    V    |
19+ 0       0.9364      0.36  Q         |         |         |    V    |
19+ 5       0.9388      0.36  Q         |         |         |    V    |
19+10       0.9412      0.35  Q         |         |         |     V   |
19+15       0.9436      0.34  Q         |         |         |     V   |
19+20       0.9459      0.34  Q         |         |         |     V   |
19+25       0.9482      0.33  Q         |         |         |     V   |
19+30       0.9505      0.33  Q         |         |         |     V   |
19+35       0.9527      0.32  Q         |         |         |     V   |
19+40       0.9549      0.32  Q         |         |         |     V   |
19+45       0.9570      0.31  Q         |         |         |     V   |
19+50       0.9592      0.31  Q         |         |         |     V   |
19+55       0.9613      0.30  Q         |         |         |     V   |
20+ 0       0.9633      0.30  Q         |         |         |     V   |
20+ 5       0.9654      0.30  Q         |         |         |     V   |
20+10       0.9674      0.29  Q         |         |         |      V  |
20+15       0.9694      0.29  Q         |         |         |      V  |
20+20       0.9713      0.29  Q         |         |         |      V  |
20+25       0.9733      0.28  Q         |         |         |      V  |
20+30       0.9752      0.28  Q         |         |         |      V  |
20+35       0.9771      0.28  Q         |         |         |      V  |
20+40       0.9790      0.27  Q         |         |         |      V  |
20+45       0.9808      0.27  Q         |         |         |      V  |
20+50       0.9826      0.27  Q         |         |         |      V  |
20+55       0.9845      0.26  Q         |         |         |      V  |
21+ 0       0.9862      0.26  Q         |         |         |      V  |
21+ 5       0.9880      0.26  Q         |         |         |      V  |
21+10       0.9898      0.25  Q         |         |         |      V  |
21+15       0.9915      0.25  Q         |         |         |      V  |
21+20       0.9932      0.25  Q         |         |         |       V |
21+25       0.9949      0.25  Q         |         |         |       V |
21+30       0.9966      0.24  Q         |         |         |       V |
21+35       0.9983      0.24  Q         |         |         |       V |
21+40       0.9999      0.24  Q         |         |         |       V |
21+45       1.0016      0.24  Q         |         |         |       V |
21+50       1.0032      0.24  Q         |         |         |       V |
21+55       1.0048      0.23  Q         |         |         |       V |
22+ 0       1.0064      0.23  Q         |         |         |       V |
22+ 5       1.0080      0.23  Q         |         |         |       V |
22+10       1.0096      0.23  Q         |         |         |       V |
22+15       1.0111      0.23  Q         |         |         |       V |
22+20       1.0127      0.22  Q         |         |         |       V |
22+25       1.0142      0.22  Q         |         |         |       V |
22+30       1.0157      0.22  Q         |         |         |       V |
22+35       1.0172      0.22  Q         |         |         |       V |
22+40       1.0187      0.22  Q         |         |         |        V|
22+45       1.0202      0.22  Q         |         |         |        V|
22+50       1.0217      0.21  Q         |         |         |        V|
22+55       1.0231      0.21  Q         |         |         |        V|
23+ 0       1.0246      0.21  Q         |         |         |        V|
23+ 5       1.0260      0.21  Q         |         |         |        V|
23+10       1.0274      0.21  Q         |         |         |        V|
23+15       1.0288      0.21  Q         |         |         |        V|
23+20       1.0303      0.20  Q         |         |         |        V|
23+25       1.0317      0.20  Q         |         |         |        V|
```

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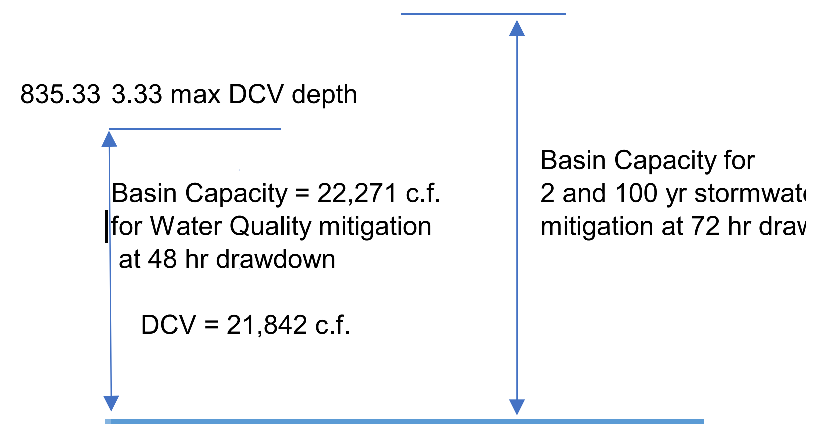
  23+30       1.0330      0.20  Q         |         |         |        V|
  23+35       1.0344      0.20  Q         |         |         |        V|
  23+40       1.0358      0.20  Q         |         |         |        V|
  23+45       1.0371      0.20  Q         |         |         |        V|
  23+50       1.0385      0.20  Q         |         |         |        V|
  23+55       1.0398      0.19  Q         |         |         |        V|
  24+ 0       1.0412      0.19  Q         |         |         |        V|
  24+ 5       1.0424      0.18  Q         |         |         |        V|
  24+10       1.0433      0.13  Q         |         |         |        V|
  24+15       1.0437      0.05  Q         |         |         |        V|
  24+20       1.0438      0.02  Q         |         |         |        V|
  24+25       1.0438      0.00  Q         |         |         |        V|
  24+30       1.0438      0.00  Q         |         |         |         V
-----------------------------------------------------------------------
```

TRACT 20394
DETENTION BASIN
STAGE-VOLUME-DISCHARGE RELATIONSHIP

Basin	Elevation	Depth	Total Area	Volume	Volume	Cumulative Volume
	(ft)	(ft)	(sf)	(cf)	(ac-ft)	(ac-ft)
3'Lx8"H				7518	0.1726	
Opening	837.0	5.0	10367			0.8651
				9684	0.2223	
	836.0	4.0	9000			0.6428
				8550	0.1963	
	835.0	3.0	8100			0.4465
				7450	0.1710	
	834.0	2.0	6800			0.2755
				6400	0.1469	
	833.0	1.0	6000			0.1286
				5600	0.1286	
	832.0	0.0	5200			0.0000



Note #1: outflow with Infiltration Rate =2.5" per hour (in-situ); F.S = 3.0
Note #2: outflow 3'L x 8"H opening when water reaches 5.0 ft at elevation 837.0
Note #3: Δ Volume for Pre and Post Development for 100 year storm = 6,577 c.f.; Stormwater Volume Difference will be fully infiltrated
Note #4: Δ Volume for Pre and Post Development for 2 year storm = 2,195 c.f.; Stormwater Volume Difference will be fully infiltrated

Worksheet H: Factor of Safety and Design Infiltration Rate 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	2	0.50
		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, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	2	0.50
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.00
Combined Safety Factor, $S_{TOT} = S_A \times S_B$ 1.50 x 2.00 =					3.0
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					2.5
Design Infiltration Rate, in/hr, $K_{DESIGN} = Km / S_{TOT}$ = 2.5/3.375					0.833

Supporting Data

Form 4.2-3 HCOC 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, ft² *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, ft² *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 2 yr, 24 hr storm (in):~~
~~*Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*~~

12 Pre-developed Volume **43,272 cu-ft**
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume **45,468 cu-ft**
*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 HCOC Requirement, (ft³): **-77.4 cu-ft**
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC 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* **28.36 mins**

14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA* **31.18 mins**

15 Additional time of concentration needed to meet HCOC requirement (min): *T_{C-HCOC} = (Item 14 * 0.95) – Item 13* **1.26 mins**

Form 4.2-5 HCOC 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 - 0.6 LOG Form 4.2-4 Item 5 /60)*~~		—	—	—	—	—	—
~~2 Drainage Area of each DMA (ft^2)~~ ~~*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): **12.64 cfs**		
~~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) *:* **18.44 cfs**		
15 Peak runoff reduction needed to meet HCOC Requirement (cfs): $Q_{p\text{-}HCOC}$ = *(Item 14 * 0.95) – Item 10* **4.89 cfs**		

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the 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 MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

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 5.3.2.1 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 Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use 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 HSC 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 LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

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 eight 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:

[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:

[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) N/A

[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, Harvest and Use BMP. If no, then proceed to Item 9 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, Hydrologic Source Control BMP. If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No": Yes ☒ 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, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC 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 HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC 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 HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.
See attached Summary of Form 4.3-2.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)			
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): $V_{retention}$ *=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 1 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)~~		—	—
~~9 Surface area of amended soil/gravel (ft^2)~~		—	—
~~10 Average depth of amended soil/gravel (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 :* **0**			

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	~~DA DMA BMP Type~~	~~DA DMA BMP Type~~	~~DA DMA BMP Type~~ ~~*(Use additional forms for more BMPs)*~~
~~15 Rooftop area planned for ET BMP (ft²)~~	—	—	—
~~16 Average wet season ET demand (in/day)~~ ~~*Use local values, typical ~ 0.1*~~	—	—	—
~~17 Daily ET demand (ft³/day)~~ ~~*Item 15 * (Item 16 / 12)*~~	—	—	—
~~18 Drawdown time (hrs)~~ ~~*Copy Item 6 in Form 4.2-1*~~	—	—	—
~~19 Retention Volume (ft³)~~ ~~*$V_{retention}$ = Item 17 * (Item 18 / 24)*~~	—	—	—
~~20~~ Runoff volume retention from evapotranspiration BMPs (ft³): **0** *$V_{retention}$ =Sum of Item 19 for all BMPs:* **0**			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 20-2. If no, proceed to Item 24*	~~DA 1 DMA BMP Type~~	~~DA DMA BMP Type~~	~~DA DMA BMP Type~~ ~~*(Use additional forms for more BMPs)*~~
~~22 Number of Street Trees~~		—	—
~~23 Average canopy cover over impervious area (ft²)~~		—	—
~~24 Runoff volume retention from street trees (ft³)~~ ~~*$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*~~	—	—	—
25 Runoff volume retention from street tree BMPs (ft³): **0** *$V_{retention}$ = Sum of Item 24 for all BMPs* **0**			
26 Implementation of residential rain barrels/cisterns: Yes☐ No ☒ *If yes, complete Items 27-28; If no, proceed to Item 29*	~~DA DMA BMP Type~~	~~DA DMA BMP Type~~	~~DA DMA BMP Type~~ ~~*(Use additional forms for more BMPs)*~~
~~27 Number of rain barrels/cisterns~~	—	—	—
~~28 Runoff volume retention from rain barrels/cisterns (ft³)~~ ~~*$V_{retention}$ = Item 27 * 3*~~	—	—	—
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): **0** *$V_{retention}$ =Sum of Item 28 for all BMPs:* **0**			
~~30~~ Total Retention Volume from Site Design Hydrologic Source Control BMPs: *Sum of Items 5, 13, 20, 25 and 29:*			

4.3.2 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 D 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 5.5.1 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).

See attached Summary of Form 4.3-3.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

[1] Remaining LID DCV not met by site design HSC BMP (ft^3): 21,842 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

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*	Infiltration		
[2] Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	2.5		
[3] Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	3.0		
[4] Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.833	*Design rate	Per geotechnical report
[5] Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48 Hours		
[6] Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	5'		
[7] Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.33'		
[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*	9250		
[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*	-		
[10] Amended soil porosity	-		
[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*	-		
[12] Gravel porosity	-		
[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))]*	**22,956**	See volume At height	Provided in basin Including 3 hr filling time
[15] Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			

[16] Total Retention Volume from LID Infiltration BMPs: 22,956 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

[17] Fraction of DCV achieved with infiltration BMP: 105.1 % *Retention% = Item 16 / Form 4.2-1 Item 7*

[18] Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and 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.

~~4.3.3 Harvest and Use BMP~~

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*			
~~BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*~~	~~DA DMA~~ ~~BMP Type~~	~~DA DMA~~ ~~BMP Type~~	~~DA DMA~~ ~~BMP Type~~ ~~*(Use additional forms for more BMPs)*~~
~~2 Describe cistern or runoff detention facility~~	—	—	—
~~3 Storage volume for proposed detention type (ft^3) *Volume of cistern*~~	—	—	—
~~4 Landscaped area planned for use of harvested stormwater (ft^2)~~	—	—	—
~~5 Average wet season daily irrigation demand (in/day)~~ ~~Use local values, typical ~ 0.1 in/day~~	—	—	—
~~6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*~~	—	—	—
~~7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*~~	—	—	—
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*	—	—	—
9 Total Retention Volume (ft^3) from Harvest and Use BMP : **0 (zero)** *Sum of Item 8 for all harvest and use BMP included in plan*			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. 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 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

<table>
<tr><th colspan="3">Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)</th></tr>
<tr><td>1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9</td><td colspan="2">N/A</td></tr>
<tr><td rowspan="2">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)</td><td>Volume-based biotreatment
Use Forms 4.3-6 and 4.3-7 to compute treated volume</td><td><s>Flow-based biotreatment</s>
<s>Use Form 4.3-8 to compute treated volume</s></td></tr>
<tr><td>☐ Bioretention with underdrain
☐ Planter box with underdrain
☐ Constructed wetlands
☐ Wet extended detention
☐ Dry extended detention</td><td>☐ <s>Vegetated swale (added to treat DMA-B)</s>
☐ <s>Vegetated filter strip</s>
☐ <s>Proprietary biotreatment</s>
<s>PRE TREATMENT ONLY</s></td></tr>
<tr><td>3 Volume biotreated in volume based biotreatment BMP (ft^3): Form 4.3-6 Item 15 + Form 4.3-7 Item 13</td><td>4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): Item 1 – Item 3</td><td>5 <s>Remaining fraction of LID DCV for sizing flow based biotreatment BMP:</s>
<s>0 %</s> <s>Item 4 / Item 1</s></td></tr>
<tr><td colspan="3"><s>6 Flow-based biotreatment BMP capacity provided (cfs):</s> <s>0</s> <s>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)</s></td></tr>
<tr><td colspan="3">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.</td></tr>
</table>

~~Form 4.3-6 Volume Based Biotreatment (DA 1) – 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 4.3-7 Volume Based Biotreatment (DA 1) – 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 (ft²)~~ *~~A_{bottom} = Item 2 * Item 3~~*	—	—	—	—
~~5 Side slope (ft/ft)~~	—	—	—	—
~~6 Depth of storage (ft)~~	—	—	—	—
~~7 Water surface area (ft²)~~ *~~$A_{surface}$ =(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))~~*	—	—	—	—
~~8 Storage volume (ft³)~~ *~~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 (ft³)~~ *~~$V_{biotreated}$ = (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 4.3-8 Flow Based Biotreatment (DA 1)~~			
~~Biotreatment BMP Type~~ *~~Vegetated swale, vegetated filter strip, or other comparable proprietary BMP~~*			
~~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 $2^{1.67}$ * Item $3^{0.5}$)~~*			
~~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 2^2)~~*			
~~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 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, 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 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA-1)
1 Total LID DCV for the Project DA-1 (ft^3): **21,842** *Copy Item 7 in Form 4.2-1*
2 On-site retention with site design hydrologic source control LID BMP (ft^3): **0** *Copy Item 30 in Form 4.3-2*
3 On-site retention with LID infiltration BMP (ft^3): **22,956** *Copy Item 16 in Form 4.3-3:*
4 On-site retention with LID harvest and use BMP (ft^3): **0** *Copy Item 9 in Form 4.3-4*
5 On-site biotreatment with volume based biotreatment BMP (ft^3): **0** *Copy Item 3 in Form 4.3-5*
6 Flow capacity provided by flow based biotreatment BMP (cfs): **0** *Copy Item 6 in Form 4.3-5*
7 LID BMP performance criteria are achieved if answer to any of the following is "Yes": • Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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*
8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ *Checked yes for Form 4.3-5 Item 7, 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)%* • An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ *Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed*

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): **-77.4** *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): **22,956** *Sum of Form 4.3-9 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 HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): **0** *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): x *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐ Tc for Post developed condition is more than Pre developed

If yes, HCOC 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 or off-site retention BMP ☒
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- 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 ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, HCOC 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 or off-site retention BMPs ☒
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, 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 compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post-Construction BMP

All BMP 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 may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Responsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Education	HOA	Provide educational materials to homeowners regarding their actions on storm water runoff and the quality of receiving waters.	Upon turn-over, annually thereafter.
Employee Training/ Education Program	HOA	Provide training regarding the impacts of improper disposal of hazardous and waste materials, improper watering, fertilizers, pesticides, and maintenance activities on water quality through the San Bernardino County website.	Upon initial hiring, annually thereafter.
Stormdrain Stenciling	HOA	All storm drain inlets and catch basins will have stenciling that states "NO DUMPING ONLY RAIN IN THE DRAIN" or approved similar. Signs with prohibitive language regarding illegal dumping will be posted at public access points along the channel/creek. HOA will be responsible for maintaining the stenciling and signage for the storm drain inlets and catch basins on an annual basis. Signage at the channel/creek will be maintained by HOA on an annual basis.	Yearly and as needed
Sweeping Private Streets	HOA	Private streets utilizing a vacuum assisted sweeper will be swept on a weekly basis. Parking lots will be swept at least quarterly, including just prior to the start of the rain season, October 1st	Weekly
Landscape Planning and Site Design	HOA/Homeowners (private)	Inspect all Common landscape areas and replace dead vegetation and remove trash. Properly manage pesticides and fertilizers per County Ordinances. Replace mulch as necessary. Inspect, adjust, and repair irrigation system.	Weekly.

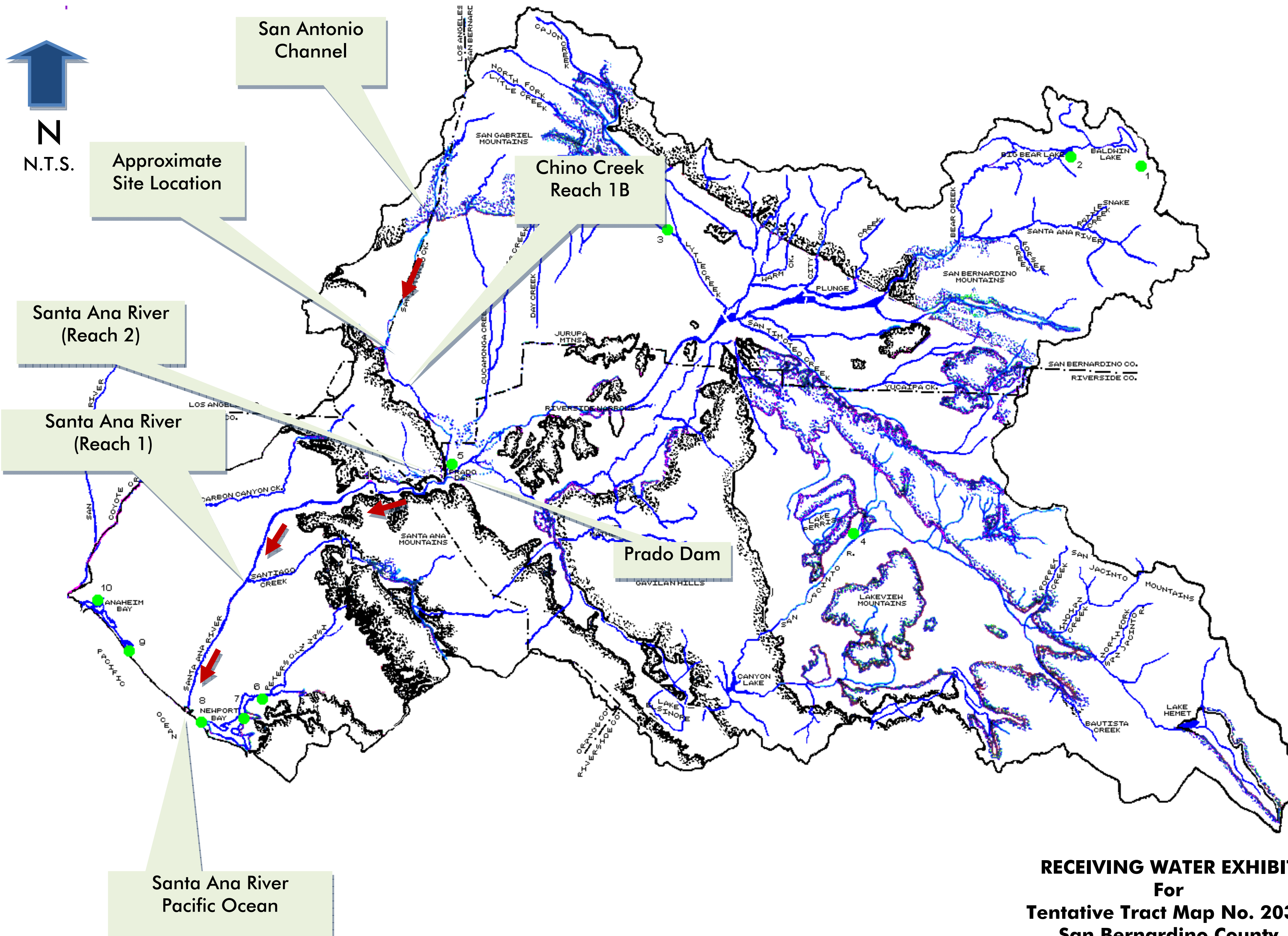
		Planting will comply with County Landscape Ordinance.	
Roof Runoff Controls	HOA / Homeowner	Inspect roof drains for accumulated debris and obstructions. Clean as needed.	Bi-annually
Concrete Channel	HOA	Inspect channel for accumulated debris and obstructions. Clean as needed.	Weekly.
Efficient Irrigation	HOA/Homeowners (private)	Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures.	Minimum monthly or as needed together with landscape maintenance
Infiltration Basin	HOA	Inspect for sediment and debris accumulation. Remove trash and debris surrounding grate inlets. Observe for ponding water near grate inlets. Observe for unusual depression of soil near or around the location of the Infiltration basin.	Inspect twice per year (October to May) and after heavy runoff events.
Common Area Litter Control	HOA	Trash receptacles will be provided in common areas and emptied on a weekly basis. Common areas and perimeter fences or walls will be patrolled by employees on a weekly basis and litter will be collected as needed. Trash disposal violations by tenants and home owners will be reported to the HOA for investigation.	Weekly
Catch Basin Inspection	HOA	Inspect all catch basins; remove litter and debris as necessary. Routine maintenance of drainage facilities, such as the catch basins and storm drain inlets. Catch basin and inlets will be cleaned if accumulated sediment/debris fills 25% or more of the sediment/debris storage capacity. Routine inspections of drainage facilities will be inspected annually and cleaned as needed.	Quarterly, prior to the "rainy season" (October 1st through April 30th), and after significant storm events; inspect for accumulation of any debris. Clean as necessary to ensure optimal function.

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



RECEIVING WATER EXHIBIT
For
Tentative Tract Map No. 20394
San Bernardino County

I:\89704\DRAINAGE\WQMP\PRELIMINARY\references\RECEIVING WATER.doc 8/17/2021 11:28 AM

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

Operation and Maintenance Plans and Maintenance Agreements for BMPs within the WQMP, CC&R's.

RECORDING REQUESTED BY:
County of San Bernardino
Department of Public Works

AND WHEN RECORDED MAIL TO:
County of San Bernardino
Department of Public Works
825 E. Third Street, Room 117
San Bernardino, CA 92415-0835

SPACE ABOVE THIS LINE FOR RECORDER'S USE

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN AND STORMWATER BEST MANAGEMENT PRACTICES TRANSFER, ACCESS AND MAINTENANCE

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

Covenant and Agreement Regarding Water Quality Management Plan and Stormwater Best Management Practices
Transfer, Access and Maintenance

OWNER NAME: ______________________________

PROPERTY ADDRESS: ______________________________

____

APN: ______________________________

THIS AGREEMENT is made and entered into in

______________________________ ,California, this ________ day of

______________________________ , by and between

______________________________ , hereinafter

referred to as Owner, and the COUNTY OF SAN BERNARDINO, a political subdivision of the State of California, hereinafter referred to as “the County”;

WHEREAS, the Owner owns real property (“Property”) in the County of San Bernardino, State of California, more specifically described in Exhibit “A” and depicted in Exhibit “B”, each of which exhibits is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of initial approval of development project known as

______________________________ within the Property described herein, the County required the project to employ Best Management Practices, hereinafter referred to as “BMPs,” to minimize pollutants in urban runoff; and

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, dated ____________________, on file with the County and incorporated herein by this reference, hereinafter referred to as “WQMP”, to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff; and

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the County; and

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs.

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner shall comply with the WQMP.

2. All maintenance or replacement of BMPs proposed as part of the WQMP are the sole responsibility of the Owner in accordance with the terms of this Agreement.

3. Owner hereby provides the County's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the County Director of Public Works, no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 5 below. The County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property. Denial of access to any premises or facility that contains WQMP features is a breach of this Agreement and may also be a violation of the County's Pollutant Discharge Elimination System regulations, which on the effective date of this Agreement are found in County Code Sections 35.0101 et seq. If there is reasonable cause to believe that an illicit discharge or breach of this Agreement is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions. Owner recognizes that the County may perform routine and regular inspections, as well as emergency inspections, of the BMPs. Owner or Owner's successors or assigns shall pay County for all costs incurred by County in the inspection, sampling, testing of the BMPs within thirty (30) calendar days of County invoice.

4. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the County, the Owner shall provide the County with documentation identifying the material(s) removed, the quantity, and disposal destination), testing construction or reconstruction.

5. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) business days of being given written notice by the County , the County is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense against the Property and/or to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the County Code from the date of the notice of expense until paid in full. Owner or Owner's successors or assigns shall pay County within thirty (30) calendar days of County invoice.

6. The County may require the owner to post security in form and for a time period satisfactory to the County to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under the Agreement, the County may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the surety(ies) to perform the obligations of this Agreement.

7. The County agrees, from time to time, within ten (10) business days after request of Owner, to execute and deliver to Owner, or Owner's designee, an estoppel certificate requested by Owner, stating that this Agreement is in full force and effect, and that Owner is not in default hereunder with regard to any maintenance or payment obligations (or specifying in detail the nature of Owner's default). Owner shall pay all costs and expenses incurred by the County in its investigation of whether to issue an estoppel certificate within thirty (30) calendar days after receipt of a County invoice and prior to the County's issuance of such certificate. Where the County cannot issue an estoppel certificate, Owner shall pay the County within thirty (30) calendar days of receipt of a County invoice.

8. Owner shall not change any BMPs identified in the WQMP without an amendment to this Agreement approved by authorized representatives of both the County and the Owner.

9. County and Owner shall comply with all applicable laws, ordinances, rules, regulations, court orders and government agency orders now or hereinafter in effect in carrying out the terms of this Agreement. If a provision of this Agreement is terminated or held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall remain in full effect.

10. In addition to any remedy available to County under this Agreement, if Owner violates any term of this Agreement and does not cure the violation within the time already provided in this Agreement, or, if not provided, within thirty (30) calendar days, or within such time authorized by the County if said cure reasonably requires more than the subject time, the County may bring an action at law or in equity in a court of competent jurisdiction to enforce compliance by the Owner with the terms of this Agreement. In such action, the County may recover any damages to which the County may be entitled for the violation, enjoin the violation by temporary or permanent injunction without the necessity of proving actual damages or the inadequacy of otherwise available legal remedies, or obtain other equitable relief, including, but not limited to, the restoration of the Property and/or the BMPs identified in the WQMP to the condition in which it/they existed prior to any such violation or injury.

11. This Agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the County, including interest as herein above set forth, subject to foreclosure in event of default in payment.

12. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to hold the County harmless and pay all costs incurred by the County in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

13. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

14. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an

interest in all or part of the Property. Owner shall provide a copy of such notice to the County at the same time such notice is provided to the successor.

15. Time is of the essence in the performance of this Agreement.

16. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

17. Owner agrees to indemnify, defend (with counsel reasonably approved by the County) and hold harmless the County and its authorized officers, employees, agents and volunteers from any and all claims, actions, losses, damages, and/or liability arising out of this Agreement from any cause whatsoever, including the acts, errors or omissions of any person and for any costs or expenses incurred by the County on account of any claim except where such indemnification is prohibited by law. This indemnification provision shall apply regardless of the existence or degree of fault of indemnitees. The Owner's indemnification obligation applies to the County's "active" as well as "passive" negligence but does not apply to the County's "sole negligence" or "willful misconduct" within the meaning of Civil Code Section 2782, or to any claims, actions, losses, damages, and/or liabilities, to the extent caused by the acts or omissions of any third party contractors undertaking any work (other than field inspections) or other maintenance on the Property on behalf of the County under this Agreement..

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IF TO COUNTY :

Director of Public Works

825 E. Third Street, Room 117

San Bernardino, CA 92415-0835

IF TO OWNER:

____

____

____

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

<u>OWNER:</u>

Company/Trust:__________________________

Signature: _____________________________

Name: _______________________________

Title: _______________________________

Date: _______________________________

<u>OWNER:</u>

Company/Trust:__________________________

Signature: _____________________________

Name: _______________________________

Title: _______________________________

Date: _______________________________

FOR: Maintenance Agreement, dated __________________________, for the project known as ____________________________________ ____________________________________ (APN)______________________________, As described in the WQMP dated __________________________________.

<u>NOTARIES ON FOLLOWING PAGE</u>

A notary acknowledgement is required for recordation.

ACCEPTED BY:

____

BRENDON BIGGS, M.S., P.E., Director of Public Works

Date: __________________________________

Attachment: Notary Acknowledgement

ATTACHMENT 1
Notary Acknowledgement)

EXHIBIT A

(Legal Description)

EXHIBIT B
(Map/illustration)

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction /CC&R's

April 12, 2022

Project No. 10557.007

Yorba Villas, LLC
c/o Borstein Enterprises
11766 Wilshire Boulevard, Suite 280
Los Angeles, California 90025

Attention: Mr. Erik Pfahler
Senior Vice President

**Subject: Updated Infiltration Testing and Recommendations for Proposed Infiltration Facilities
Yorba Villas Residential Development, Tentative Tract 20394
Northwest of Francis Avenue and Yorba Avenue
North of Chino, Unincorporated San Bernardino County, California**

In accordance with your request and authorization, Leighton and Associates, Inc. (Leighton) has conducted infiltration testing within the proposed infiltration basin at the southeast corner of the proposed Yorba Villas residential development, located northwest of Francis Avenue and Yorba Avenue in unincorporated San Bernardino County, just north of the City of Chino, California. This report supersedes and replaces a previous report of infiltration (Leighton, 2022), based on our conversations with the County of San Bernardino reviewers for the water quality management plan (WQMP) aspects of the proposed project. The recommendations presented herein also supersede Leighton, 2021a.

We performed infiltration tests for the proposed basin during this current study. Based on the current and previous testing, we conclude that granular soils with permeability conducive to infiltration are located at shallow depths across much of the site, and, specifically at the proposed basin location, both at or slightly below the bottom of the proposed basin, and again at a depth generally deeper than approximately 35 to 40 feet below the existing ground surface (bgs). There are fine-grained soils of low permeability intervening and underlying these granular layers. We have considered the presence of these granular and fine-grained soil layers in development of the infiltration recommendations contained herein.

I N T R O D U C T I O N

Project Description

Based on the Preliminary Water Quality Management Plan Sheet 1 of 2 for *Vesting Tentative Tract No. 20394*, prepared by MDS Consulting, plot date April 11, 2022, we understand that the Yorba Villas residential development will consist of 45 single-family-residence lots with a main entry street off of Francis Avenue and two cul de sac streets. Permeable pavers for storm water infiltration are planned within portions of the streets. A retention/water quality basin is proposed within Lot "A", located at the southeast corner of the development. The proposed 6914-square-foot infiltration basin will have a bottom elevation of approximately 831 feet above mean sea level (msl), which is approximately 10 feet below existing grade. A 30-inch-diameter storm drain will empty into the basin via a forebay at the northwest corner of the basin. A basin overflow outlet will be located at the southeast corner of the basin, with a 3-foot-wide parkway drain flowing onto Francis Avenue. A maintenance ramp will be located on the north side of the basin. Public access to the basin will be blocked by fencing. A small park will be located directly east of the proposed basin.

Scope of Work

The scope of our current study has included the following tasks:

- Background Review: We reviewed available, relevant geotechnical geologic maps, reports, and aerial photographs available in our in-house library.

- Utility Coordination: We contacted Underground Services Alert (USA) at least 48 hours prior to drilling the borings to locate major utilities, underground services, and easements.

  Field Exploration: For this current study, we excavated, logged, and sampled six (6) hollow-stem auger borings (LC-4, 4A, 1B and LC-5, 5A, 5B) to depths ranging from approximately 40 to 81 feet below the existing ground surface. The borings were drilled using a subcontracted truck-mounted drill rig. The borings were logged and sampled by a member of our technical staff under supervision of a licensed Civil Engineer. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a Modified California split-barrel sampler lined with brass rings.

Logs of the geotechnical borings are attached in Appendix A. Approximate boring and well permeameter test locations are shown on Figure 1 - *Exploration Location Map*.

- Infiltration Testing: We conducted well permeameter tests within the borings to evaluate infiltration rates of the subsurface soils at the depths and locations tested. Only initial infiltration testing was conducted within Borings LC-4, 4A, 5, and 5A, since the initial testing showed slower infiltration results than what was considered feasible for basin infiltration, and, thus, these infiltration tests were terminated after initial observations. Within the remaining two borings, LC-4B and 5B, initial infiltration rates within the tests were favorable, and thus the tests were continued. The well permeameter tests were conducted based on the USBR 7300-89 method and in general accordance with San Bernardino County guidelines. The tests were conducted in two principal granular soil zones at depths greater than 35 feet bgs in Borings LC-4B and LC-5B to estimate infiltration rates in the soil zones tested. Water was obtained from a nearby fire hydrant by filling a 2000-gallon water truck and transporting to the site; the tests within Borings LC-4B and 5B used a total of roughly 3,000 gallons of water. Infiltration test logs are included in Appendix B.

  For clarity in the text of this current report, discussion of borings presented in this report and the two previous referenced reports are designated as shown in Table 1 below:

Table 1 – Boring Number Designations

Reference Report	Dates of Exploration	Boring Numbers as referred to in this Current Report
Leighton, 2021b (updated 9/27/2021)	12/13/2013	LB-1 through LB-5
Leighton, 2021a (7/26/21)	6/10/2021	LC-1 through LC-3 *(formerly designated LB-1 through -3)*
Current Report	12/23/2021 to 1/25/2022	LC-4 through LC-5B *(formerly designated LB-1 through -2B)*

- Engineering Analysis: Data obtained from our testing was evaluated and analyzed to provide the conclusions and recommendations presented in this report.

- Report Preparation: Results of our infiltration study and design recommendations have been summarized in this report.

FINDINGS

Site Description

The site of the Yorba Villas residential development consists of approximately 11.6 acres of land that was previously utilized as grazing land for a goat farm. The site is currently vacant, covered with seasonal grasses and containing scattered trees and bushes. The proposed infiltration basin is located in the southeastern corner of the site. Our previous geotechnical investigation (Leighton, 2021b) described a residence, a pool, and other structures in this portion of the site during the 2013 exploration. Those previous structures and the pool have since been demolished. The site typically drains gently to the south.

Previous Studies

Leighton conducted a geotechnical investigation for the Yorba Villas residential project (Leighton, 2021b) that included subsurface exploration and provided conclusions and recommendations for grading and construction. That geotechnical investigation included drilling exploratory borings and performing well permeameter tests.

Subsurface Soil Conditions

The alluvial soil encountered within our explorations across the site generally consisted of combinations of sand and silt, with some gravel interspersed (borings LB-1 through LB-5). The soil was generally moist and medium dense. The in-situ moisture content within the upper approximately 15 feet generally ranged from 1 to 10 percent.

Within the borings across site, with the exception of the borings in the basin location, silty sand to sand was encountered within the upper 15 feet, underlain by interspersed sequences of fine-grained soil (silt and clay) and coarser-grained soil (sand and silty sand). While LB-3 did have silty sand at shallow depths, this soil had significantly higher fines content than shallow soils within LB-1, 2, 4, and 5. The eastern side of the site appears to have more silty soils at shallow depths (boring LB-3 and the borings in the basin location).

Soils encountered within the borings in the proposed basin (borings LC-1 through -5B), consisted of alluvial soil deposits generally consisting of combinations of sand and silt, with some gravel. The soils encountered in this area generally consisted of slightly moist, stiff silt in the upper approximately 10 feet bgs. This upper layer was underlain by an approximately 5-foot-thick layer of slightly moist medium dense silty sand with low fines content to poorly graded sand; this granular extended to a depth of approximately 15 feet bgs. That granular layer was underlain by moist, stiff silt extending to depths ranging from approximately 30 to 40 feet bgs. Initial infiltration in LC-4, 4A, 5, and 5A near the bottom of those silty soils did not exhibit adequate infiltration rates for reliable disposal of storm water in the basin.

In general, soils encountered at depth in the basin area consisted of two coarse-grained dense sandy soil layers ranging from silty sand to poorly graded sand with gravel; these layers are referred to herein as Deep Granular Zones 1 and 2. These two zones were separated by a hard silt layer that extended from approximately 55 to 66 (or 70) feet.

The principal granular layers described above are summarized in the following table:

Table 2 – Description of Granular Soil Zones

Soil Zone	Soil Classification	Approx. Top of Zone (feet bgs)	Approx. Bottom of Zone (feet bgs)	Approx. Thickness (ft)
Western Shallow Granular Zone (borings LB-1, 2, 4, and 5; not LB-3 or at the basin)	Silty Sand generally less than 30% fines (SM) to Sand (SP	0	15	15
Basin Shallow Granular Zone (borings LC-1 to 3)	Silty Sand with up to ±15 fines content (SM) to Sand (SP)	10	15	5
Basin Deep Granular Zone 1 (borings LC-4B, 5B)	Sand to Silty Sand with Gravel	38 to 40	55	15 to 17
Basin Deep Granular Zone 2 (borings LC-4B, 5B)	Sand to Silty Sand with Gravel	66 to 70	81 or greater	15

More detailed descriptions of the subsurface conditions are presented on the boring logs (Appendix A).

Groundwater

Groundwater was not encountered in our borings excavated to a maximum depth of 81 feet below the existing ground surface (bgs). Historical groundwater mapping indicates that groundwater was approximately 150 feet bgs in 1933 (CDWR, 1970).

Regional data for water wells located within a 1½-mile radius of the site was reviewed to evaluate historical ground water levels. The shallowest historical groundwater levels encountered were on the order of 235 feet bgs in 1985 for a well maintained by the Chino Basin Watermaster (Local Well ID CHINO-1002741) located 1.2 miles southeast of the site. Recent water levels indicate groundwater is on the order of 258 feet bgs (CDWR, 2022). Shallow groundwater is not anticipated. Based on our review of historical data, we have estimated the historically highest groundwater to be on the order of 150 feet bgs.

Infiltration Testing

Previous infiltration testing within shallow soils in borings located within the western and central portions of the site, namely borings LB-1 and 5, ranged from 3.5 to 13 inches per hour (raw rates).

Boring LB-3 in the eastern portion of the site, had a tested infiltration rate 0.3 inch per hour (raw rate). Shallow soils encountered in the upper 10 feet at the basin location, also in the eastern portion of the site, were fine grained and were deemed to be of low permeability based on observation.

We conducted infiltration tests in the proposed basin to evaluate infiltration rates of the subsurface soils at the depths and locations tested. Soils in the Basin Shallow Granular Zone

As the Basin Shallow Granular Zone soils were limited in thickness, additional testing was performed at deeper depths. Only initial infiltration testing was conducted within Borings LC-4, 4A, 5, and 5A (shallower than approximately 35 feet bgs), since the initial testing showed slower infiltration results than what was considered feasible for large-scale basin infiltration, and, thus, these infiltration tests were terminated after initial observations.

Within the remaining two basin borings, LC-4B and 5B, initial infiltration rates within the tests were favorable, and thus the tests were continued. The tests were conducted within the two principal deep granular soil zones (described above) in Borings LC-4B and LC-5B. Water was obtained from a nearby fire hydrant by filling a 2000-gallon water truck and transporting to the site. The tests within Borings LC-4B and 5B used a total of roughly 3,000 gallons of water. Infiltration test logs are included in Appendix B. Our testing was a clean-water, small-scale test, and correction factors need to be applied. Constant-head tests were performed. The constant-head tests consisted of excavating a boring to the depth of the test. A slotted casing pipe was inserted into the boring prior to extracting the augers. As the augers were carefully extracted, Monterey #3 well pack sand was poured around the outside of the casing (annulus) within the test zones to prevent the boring from caving/collapsing or eroding when water was added. To test the soils in Granular Zone 1 in both borings, a casing packer was inserted within a stretch of solid pipe casing in the silt layer between the two granular zones; during test set up, the annulus was sealed off with bentonite in that silt layer. Water was added inside the casing pipe via a hose that extended to near the bottom of the test zone. The water truck pump provided a pressurized water source. The incremental infiltration rate as measured during intervals of the test was defined as the incremental flow rate of water infiltrated (volume divided by time), divided by the surface area of the infiltration interface, with resulting units of inches per hour.

Results of the infiltration testing are provided in Appendix B.

INFILTRATION RECOMMENDATIONS

Based on our observations of the soils encountered and the results of the infiltration tests performed, the onsite coarse-grained soils are feasible for infiltration within the tested zones described in Table 3 below. Factors of safety should be incorporated as discussed below.

Table 3 – Infiltration Rates of Granular Soil Zones

Soil Zone	Soil Classification	Approx. Top of Zone (feet bgs)	Approx. Bottom of Zone (feet bgs)	Approx. Thickness (ft)	Approximate Raw Infiltration Rate (in./hr)
Western Shallow Granular Zone (borings LB-1, 2, 3, and 5)	Silty Sand generally less than 30% fines (SM) to Sand (SP)	0	15	15	4
Basin Shallow Granular Zone (borings LC-1 to 3 of Leighton, 2021a)	Silty Sand with up to ±15% fines (SM) to Sand (SP)	10	15	5	2.5
Basin Deep Granular Zone 1 (borings LC-4B and 5B)	Sand to Silty Sand with Gravel	38 to 40	55	15 to 17	13

The small-scale raw infiltration rate should be divided by a correction factor of at least 3, but may need to be higher based on requirements of the *San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP).*

<u>Basin Recommendations</u>

Since the Basin Shallow Granular Zone may actually be slightly deeper than the bottom of the basin, the basin should be overexcavated until these granular soils are exposed. If overexcavation is needed, the overexcavated portion should be backfilled with highly permeable sand as described below. We recommend that basin overexcavation and backfill, if necessary, be performed after basin inlet/outlet structures are completed. In any case, operating heavy equipment in the basin bottom should be kept to a minimum to avoid compaction and fines contamination of the exposed granular soils.

Since the Basin Shallow Granular Zone is limited in thickness and to provide additionally robust infiltration, we recommend that two sand-filled trenches be excavated in the bottom of the basin extending into Basin Deep Granular Zone 1 (approximately 40 feet below the existing ground surface or approximately 30 feet below the basin bottom). The design of the basin may consider just the infiltration contribution of the Basin Shallow Granular Zone, ignoring the contribution of the sand trenches into the deeper granular soils. The sand trenches into the deeper granular soils is intended to provide a distributed, non-point source of infiltration into this thick, highly permeable granular zone. The trenches should be a minimum of 2 feet wide and 10 feet long at the bottom, and should be backfilled with highly permeable sand (described below). The bottom of the basin should incorporate a layer of sand and filter fabric, as described below, to provide a silt filter before the water flows into the basin bottom and sand-filled trenches, intended to promote a longer life of the sand-filled trenches and basin bottom.

The surface of the sand in the basin bottom acts as a filter, since, as silt accumulates at the surface, the caked silt creates a finer filter than the sand itself. However, before a cake of silt forms or if the sand surface gets disturbed (such as with maintenance, foot traffic, etc.), some silt washes into the sand. The underlying filter fabric is intended as a secondary filter.

Below is a general description of the recommended aspects of the construction of the basin with sand-filled trenches:

- Excavate the basin. Construct all structures. Clean the basin bottom of loose soils and debris.
- Construct two sand-filled trenches as follows:
  - Excavate the trench; dispose of the cuttings outside of the basin.
  - Clean the ground around the trench of loose soil and debris.
  - Backfill the trench with ASTM C33 Fine Aggregate with a special criterion of a maximum of 2 percent fines before transport (other options may be acceptable based on availability).
    - After the trench has been filled with sand, carefully jet the sand to consolidate the sand, until the sand no longer settles.
    - After sand consolidation, overfill the trench so excess sand pours/mounds onto the ground. Maintain this sand clean while excavating the next trench.
- Carefully cover the basin bottom with sand (same specification as above). This layer should be a minimum of 8 inches thick.
- Cover that layer of sand with non-woven Mirafi 140N filter fabric, or approved equivalent.
- Cover the filter fabric with a minimum of 6 inches of sand (same specification as above).

- Some releveling of the sand surface may need to be done after the first rain event, as some additional sand consolidation may occur.
- After the first rain event, check to see that the system functions properly. Similar checks should be done after each major storm.

To enhance the life of the basin, we recommend that the basin bottom be protected from unnecessary disturbance and foot traffic. When the basin infiltration rate slows down to less than acceptable, the top of the upper surface of sand should be carefully scalped off, being careful to not mix the silt into the underlying sand to remain; additional sand may need to be added to maintain the minimum 6 inches of sand over the filter fabric. At that time, the filter fabric should also be checked to see that it is not clogged; if clogged, the filter fabric and overlying sand may need to be replaced.

If, over the life of the project, the trenches get clogged with silt, new sand-filled trenches would need to be constructed; further geotechnical evaluation would need to be conducted at that time.

Leighton should review the infiltration plans as the project proceeds.

Permeable Pavers Recommendations

Pervious/permeable paver pavement sections should consist of the layers described in Table 4:

Table 4 – Recommended Permeable Pavers Pavement Section

Layer/Pavement Course	Description	Minimum Thickness, inches
Pavers	Interlocking concrete paver surface layer. Follow ASCE 58-16. Herringbone pattern, with soldier pattern at edges.	3-1/8

Bedding	Relatively fine-grained, permeable, and provides a workable surface. Manufacturer guidelines should be followed for the bedding layer, but in absence of such guidelines, this bedding layer should be crushed and washed stone such that it has angular particles that interlock, with particle sizes ranging from ¼ to 3/8 inch (Size #8 of AASHTO-M-43, Sizes of Coarse Aggregate). It should be free draining, so as to not restrict permeability of the pavement system. Should conform to recommendations in Interlocking Concrete Pavement Institute (ICPI) Tech Spec 17 and ASCE 58-16, or manufacturer recommendations if more stringent	1 (2 maximum)
Medium-grained base layer	AASHTO-M-43 #57 crushed (angular) and washed stone (roughly ¾-inch stone). This base layer is intended to provide separation between the bedding layer and the reservoir layer.	3 (4 maximum)
Coarse-grained reservoir layer	Open-graded (i.e., uniformly graded), larger, crushed (angular), washed stone, such as AASHTO-M-43 #2 (other sizes may be used, depending on availability, such as AASHTO-M-43 #3). 12 inches minimum thickness in order to develop proper interlocking between particles. This layer is similar to railroad ballast. This layer should be carefully pushed out over the underlying medium-grained base layer.	12
Medium-grained base layer	AASHTO-M-43 #57 crushed (angular) and washed stone (roughly ¾-inch stone). This base layer is intended to provide separation between the subgrade and the reservoir layer. This layer should be carefully pushed out over the subgrade soils. Limit vehicle traffic on this layer to those vehicles necessary to place this layer.	3 (4 maximum)
Granular, undisturbed subgrade soil	Uncompacted subgrade soil. Imperative that the subgrade soil underlying the pavement remain in a natural state without compaction. Vehicles and heavy equipment should not be allowed to drive on the subgrade. Leave streets fat until ready to place the pavement section. If fine-grained soils are exposed, additional evaluation would be required, possibly overexcavation and replacement with free-draining material.	-

It is critical that the bedding, base and reservoir layers consist of durable angular particles, so that the material is naturally self interlocking in order to successfully transfer traffic loads without significant shifting. Rounded stone particles (i.e., not crushed rock) are inappropriate, because these do not have a strong natural interlocking characteristics. Each layer should be well-bedded, interlocked, and unyielding to wheel loads prior to placing the subsequent layer.

Storage volume in the base and reservoir layers will depend on the actual materials used. However, for planning purposes, a void ratio of 20 to 30 percent may be assumed for #57 stone, and a void ratio of approximately 40 percent may be assumed for #2 stone.

The contractor should be careful not to contaminate the bedding, base, and reservoir materials with soil during construction.

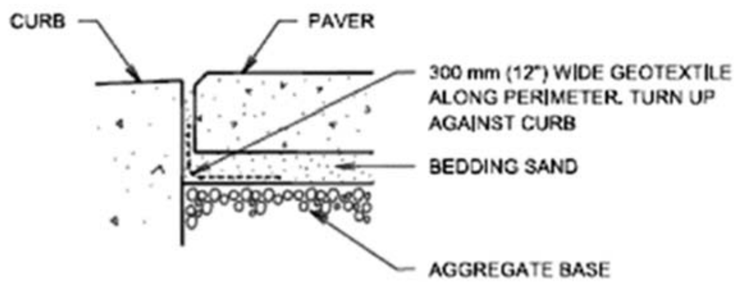
We recommend that a filter fabric (such as Mirafi 140N) be placed between the subgrade and subbase in transitional areas where a significantly sloping or vertical subgrade/base contact is present, such as near the edge of pavement, so that the adjacent soil does not migrate into the open-graded reservoir or base layers. A filter fabric is not needed over level subgrade soils.

Although we are not aware of design fill areas, if there are low areas planned for pervious pavement with infiltration into the subgrade soil, it is recommended that a thicker reservoir layer be used to attain design elevation.

Additional review of the permeable pavement should be conducted as the project proceeds.

Paver areas should be confined laterally by a curb and gutter on the sides, or by a concrete edge band where the pavers transition to asphalt pavement. The concrete edge band should be a minimum 12 inches thick and 8 inches wide, reinforced with two No. 4 rebar, with crack control joints at 12 feet on center. The edge band should be placed over a minimum of 4 inches of aggregate base. The 28-day design compressive strength of the concrete should be a minimum of 3,000 pounds per square inch. Pavers should be placed with a herringbone pattern, with a sailor or soldier course along the edges.

ASCE 58-16 recommends that a 12-inch-wide strip of non-woven geotextile filter fabric be placed along the perimeter, turned up against the curb, in order to prevent bedding sand from migrating into cracks that may develop in the concrete and into crack control joints, which migration could cause settlement of the pavers; see following the detail from ASCE 58-16:



Likewise, if pavers are placed over a concrete subslab or treated base (CTB or ATB; this is not anticipated for this project), ASCE 58-16 recommends that non-woven geotextile filter fabric be placed over the concrete or treated base prior to placement of bedding sand to prevent the bedding sand from migrating into cracks that may develop. Where such materials area used, 2-inch-diameter drain holes filled with clean angular aggregate are recommended at the lowest elevations, along with bedding sand drainage into catch basins, in accordance with ASCE 58-16 guidelines.

<u>General Design Considerations:</u>

The periodic flow of water carrying sediments into the infiltration facility, plus the introduction of wind-blown sediments and sediments from erosion, can eventually cause the infiltration facility to accumulate a layer of silt, which has the potential of significantly reducing the overall infiltration rate. Therefore, we recommend that significant amounts of silt/sediment not be allowed to flow into the infiltration facilities within storm water, especially during construction of the project and prior to achieving a mature landscape on site. As it is typically very difficult to remove silt from infiltration facilities, consideration should be given to installing an easily maintained, robust silt/sediment removal system for storm water before it enters the basin.

Infiltration facilities should not be constructed adjacent to or under buildings. Infiltration facilities should have a setback of at least 15 feet from buildings, but preferably more.

In general, the rate of infiltration reduces as the head of water in the infiltration facility reduces, and it also reduces with prolonged periods of infiltration. As such, water typically infiltrates much faster near the beginning of and/or immediately after storm events than at times well after a storm when the water level in the facility has receded, since the infiltration rate is then slower due to both lower head and longer overall duration of infiltration.

Estimating infiltration rates, especially based on small-scale testing, is inexact and indefinite, and often involves known and unknown soil complexities, potentially resulting in a condition where actual infiltration rates of the completed facility are significantly less than design rates.

Construction Considerations:

We recommend that Leighton evaluate the infiltration facility excavations, to confirm that granular, undisturbed alluvium is exposed to infiltration. Additional excavation or evaluation may be required if silty or clayey soils are exposed.

Heavy silting can occur from rain events during site construction, which will need to be removed from the surface. Measures to control silting during construction should be implemented.

Maintenance Considerations:

The infiltration facilities should be routinely monitored, especially before and during heavy rain storms, and corrective measures should be implemented as/when needed. Things to check for include proper upkeep, proper infiltration, absence of accumulated silt, and that de-silting filters/features are clean and functioning. Pretreatment desilting features should be cleaned and maintained per manufacturers' recommendations. Even with measures to prevent silt from flowing into the infiltration facility, accumulated silt will need to be removed occasionally as part of maintenance. As landscaping throughout the development matures over the years, silt inflows into the basin are anticipated to lessen.

LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples, and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions, and recommendations presented in this report are based on the assumption that Leighton and Associates, Inc. will provide geotechnical observation and testing during construction

This report was prepared for the sole use of Yorba Villas, LLC, for application to the design of the proposed residential development in accordance with generally accepted geotechnical engineering practices at this time in California.

CLOSING

We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

Luis Perez-Milicua, PE 89389
Senior Project Engineer

Jose A. Tapia, PE 91630
Project Engineer

Jason D. Hertzberg, GE 2711
Principal Engineer

AA/JAT/LP/SGO/JDH/rsm

Attachments: References
- Figure 1 - Exploration Location Map, current study
- Figure 2 - Test Location Map from Leighton, 2021b (2013 exploration)
- Appendix A - Borings Logs
- Appendix B - Infiltration Logs

REFERENCES

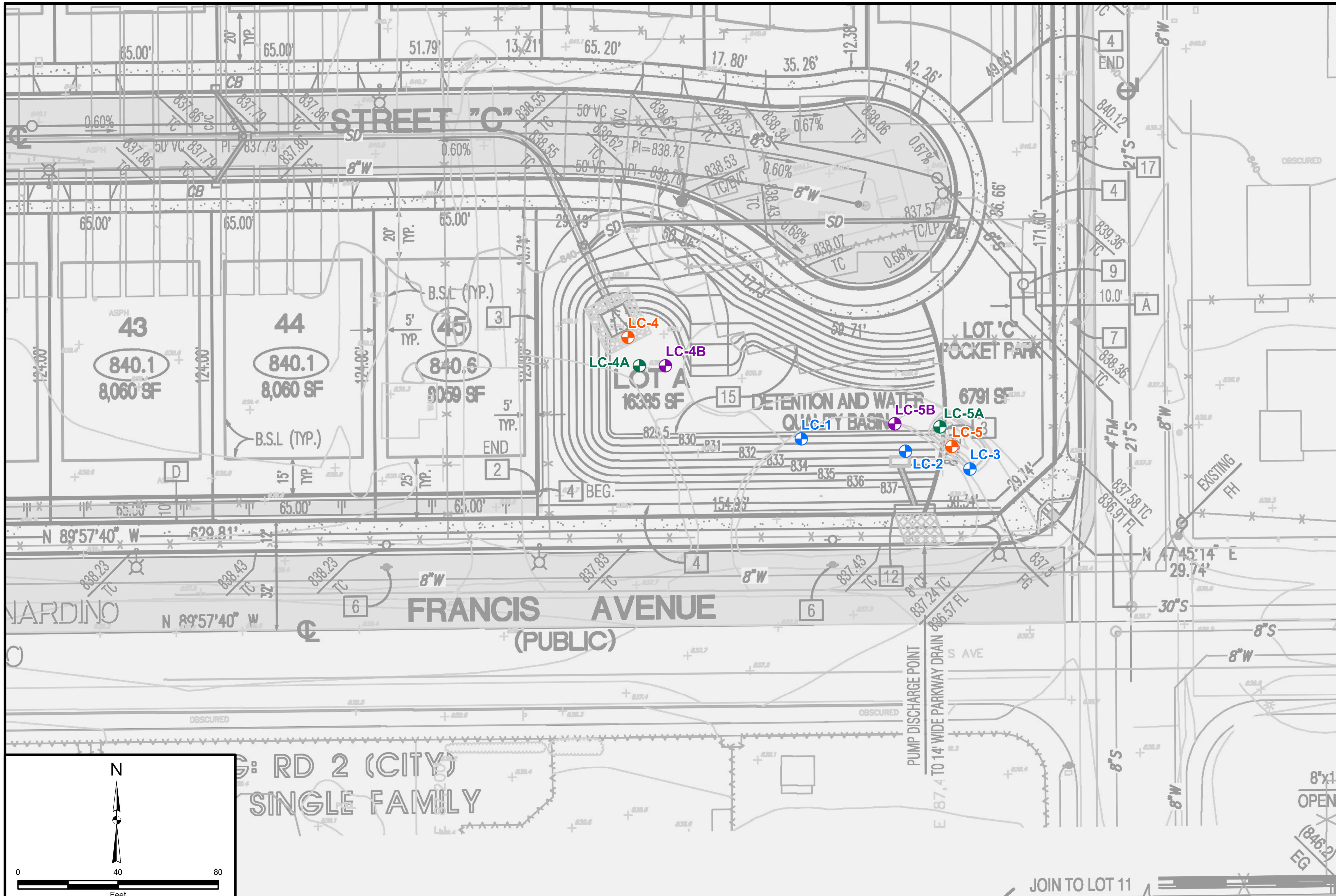
California Department of Water Resources (CDWR) of California, 1970, Meeting Water Demands in Chino-Riverside Area, Bulletin No. 104-3, September 1970.

______, 2021, Sustainable Groundwater Management Act Data Viewer (SGMA), http://www.water.ca.gov/waterdatalibrary/, accessed June 15, 2021.

Leighton and Associates, Inc., 2021a, {OBSOLETE, replaced by current report} Geotechnical Update Report of Infiltration Testing, Proposed Infiltration Basin, lot A, Yorba Villas Residential Development, Tract 20394, Northwest of Francis Avenue and Yorba Avenue, Chino Area of Unincorporated San Bernardino County, California, Project No. 10557.006, dated July 26, 2021.

Leighton and Associates, Inc., 2021b, Geotechnical Investigation, Proposed Residential Development, Tract 20394, APN's 1013-211-21 and 1013-211-22, Northwest of Francis Avenue and Yorba Avenue, Chino Area of San Bernardino County, California, Project No. 10557.004, dated August 26, 2016, updated September 27, 2021.

Leighton and Associates, Inc., 2022, {OBSOLETE, replaced by current report} Updated Infiltration Testing and Geotechnical Recommendations, Proposed Infiltration Basin, Lot A, Yorba Villas Residential Development, Tract 20394, Northwest of Francis Avenue and Yorba Avenue, Chino Area of Unincorporated San Bernardino County, California, Project No. 10557.007, dated February 16, 2022.



Legend

- LC-3 Approximate boring location (Leighton, June 10, 2021)
- LC-5 Approximate boring location (Leighton, December 23, 2021)
- LC-5A Approximate boring location (Leighton, January 6, 2022)
- LC-5B Approximate boring location (Leighton, January 25, 2022)

Project: 10557.007	Eng/Geol: JDH/SGO
Scale: 1 " = 40 '	Date: April 2022

Base Map: ESRI ArcGIS Online 2022

Author: KVM (kmanchikanti)

EXPLORATION LOCATION MAP

Yorba Villas Infiltration Testing
Northwest of Yorba Avenue and Francis Avenue
Chino, California

FIGURE 1

Leighton

Map Saved as J:\Drafting\10557\007\10557-007_Fig2_ELM_2022-02-07.mxd on 4/12/2022 2:55:10 PM

Project: 10557.004	Eng/Geol: JDH/PB
Scale: 1 " = 150 '	Date: August 2016

Base Map: ESRI ArcGIS Online 2016
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

TEST LOCATION MAP

Proposed Residential Development, Assessor Parcel Numbers 1013-211-21 and 1013-211-22, Northwest of Francis Avenue and Yorba Linda Avenue, City of Chino, California

Figure 2

Map Saved as V:\Drafting\10557\004\Maps\10557-004_F02_TLM_2016-08-24.mxd on 8/24/2016 1:17:20 PM

APPENDIX A

BORING LOGS

Borings from Current Study

GEOTECHNICAL BORING LOG LC-4

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B-1				ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft, tan, dry to moist, fine sand, non-plastic	
835				R-1	2 4 8				@2.5': SANDY SILT (ML); stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
	5			R-2	7 9 9				@5': Same as above, stiff, light brown	
830				R-3	5 6 10				@7.5': Same as above, stiff, light brown	
	10			R-4	10 8 12			SM	@10': SILTY SAND (SM), medium dense, brown, slightly moist, fine to medium sand, non-plastic	
825										
	15			R-5	6 9 14			ML	@15': SILT (ML), stiff, variegated, light brown, moist, fine-grained, slightly cemented	
820										
	20			S-1	8 11 14				@20': SANDY SILT (ML), very stiff, light brown, moist, fine to medium sand, slightly oxidized	
815										
	25			R-6	12 15 31				@25': SILT (ML), very stiff, light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-2	5 6 7			ML	@30': SANDY SILT (ML), stiff, light brown, moist, fine sand, slightly oxidized	
805										
	35			R-7	17 23 38				@35': Same as above, hard, highly oxidized	
800										
	40			S-3	17 21 30			SM	@40': SILTY SAND (SM), dense, variegated grayish to orangish brown, slightly moist, fine sand	
									TOTAL DEPTH: 41.5 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 36 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft, tan, dry to moist, fine sand, non-plastic	
835									@2.5': SANDY SILT (ML), brown, slightly moist, fine sand, non-plastic, rootlets	
	5								@5': Same as above, light brown	
830									@7.5': Same as above, light brown	
	10							SM	@10': SILTY SAND (SM), brown, slightly moist, fine to medium sand, non-plastic	
825										
	15							ML	@15': SILT (ML), variegated, light brown, moist, slightly cemented	
820										
	20								@20': SANDY SILT (ML), light brown, moist, fine to medium sand, slightly oxidized	
815										
	25								@25': SILT (ML), light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							ML	@30': SANDY SILT (ML), light brown, moist, fine sand, slightly oxidized	
805										
	35								@35': Same as above, highly oxidized	
800				R-1	22 39 40			SM	@38': SILTY SAND (SM), dense, mottled yellowish brown and light gray, moist, fine sand, 45% fines (field estimate), trace fine gravel up to 1/16 inches	
	40								**TOTAL DEPTH: 40 FEET** **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							ML	@ Surface, dried grass, debris over SANDY SILT (ML), soft tan, dry to moist, fine sand, non-plastic	
835									@2.5': SANDY SILT (ML), brown, slightly moist, fine sand, non-plastic, rootlets	
	5								@5': Same as above, light brown	
830									@7.5': Same as above, light brown	
	10							SM	@10': SILTY SAND (SM), brown, slightly moist, fine to medium sand, non-plastic	
825										
	15							ML	@15': SILT (ML), variegated, light brown, moist, slightly cemented	
820										
	20								@20': SANDY SILT (ML), light brown, moist, fine to medium sand, slightly oxidized	
815										
	25								@25': SILT (ML), light gray, moist, slight cementation, oxidized	
810										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30							ML	@30': SANDY SILT (ML), light brown, moist, fine sand, slightly oxidized	
805										
	35			S-1	6 11 11			ML	@35': SANDY SILT (ML), very stiff, variegated light brown and orangish brown, moist, fine sand, non-plastic, 60% fines (field estimate), trace fine gravel up to 1/10 inches	
800										
	40			S-2	7 12 16			SM	@40': SILTY SAND (SM), dense, moist, light brown, fine sand, 30% fines (field estimate)	
795										
	45			S-3	7 12 17				@45': Same as above, trace gravel, 25% fines (field estimate)	
790										
	50			S-4	16 37 37			SP-SM	@50': SAND to SILTY SAND with gravel (SP-SM), dense, light brown, moist, fine sand, fine gravel, sub-angular, up to 1/2 inches, 10% fines (field estimate)	
785										
	55			S-5	10 13 14			ML	@55': SANDY SILT (ML), very stiff, variegated light to medium brown, fine sand, non-plastic, slight cementation, manganese oxide staining, 60% fines (field estimate)	
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LC-4B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	838'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	60			S-6	10 12 16			ML	@60': SANDY SILT (ML), very stiff, light brown, moist, very fine to fine sand, non-plastic, slight cementation, 70% fines (field estimate)	
775										
	65			S-7	11 12 16				@65': As above, non to low plasticity	
770										
	70			S-8	7 24 31			SM	@70': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace medium, low plasticity, 35% fines (field estimate)	
765										
	75			S-9	26 50/4			SP-SM	@75': SAND to SILTY SAND with gravel (SP-SM), dense, light tannish brown, moist, fine to coarse sand, fine gravel up to 1/4 inch, 10% fines (field estimate)	
760										
	80			S-10	32 50/4				@80': Same as above	
									TOTAL DEPTH: 81 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
755										
	85									
750										
	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1				ML	@ surface: dried grass, debris over SANDY SILT (ML), soft, tan, dry, fine grained	
				R-1	4 7 5				@2.5': SANDY SILT (ML), medium stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
835	5			R-2	5 7 4				@5': Same as above	
				R-3	4 2 6				@7.5': Same as above	
830	10			R-4	2 4 9			SM	@ 10': SILTY SAND (SM), loose, light brown, slightly moist, fine sand, micaceous	
825	15			S-1	2 2 4				@15': Same as above	
820	20			R-5	7 14 20			ML	@ 20': SILT with sand (ML), very stiff, variegated light gray, brown to orange brown, fine sand, fine gravel	
815	25			S-2	3 4 6			SM	@25': SILTY SAND (SM), loose, grayish brown, fine to medium sand, oxidized	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LC-5

Project No.	10557.007	**Date Drilled**	12-23-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			R-6	6 7 8			SM	@30': Same as above, loose	
805										
	35			S-3	16 24 32			SP-SM	@35': SAND with silt (SP-SM), dense, orange brown, fine to coarse sand, fine gravel	
800										
	40			R-7	22 24 38				@40': same as above	
									TOTAL DEPTH: 41.5 FEET NO GROUNDWATER ENCOUNTERED DURING DRILLING CONVERTED TO INFILTRATION BORING. WELL SET AT 35 FEET BGS	
795										
	45									
790										
	50									
785										
	55									
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							ML	@ surface: dried grass, debris over SANDY SILT (ML), soft, tan, dry, fine grained	
									@2.5': SANDY SILT (ML), medium stiff, brown, slightly moist, fine sand, non-plastic, rootlets	
835	5								@5': Same as above	
									@7.5': Same as above	
830	10							SM	@ 10': SILTY SAND (SM), loose, light brown, slightly moist, fine sand, micaceous	
825	15								@15': Same as above	
820	20							ML	@ 20': SILT (ML), very stiff, variegated light gray, brown to orange brown, fine sand, fine gravel	
815	25							SM	@25': SILTY SAND (SM), loose, grayish brown, fine to medium sand, oxidized	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5A

Project No.	10557.007	**Date Drilled**	1-6-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							SM	@30': Same as above, loose	
805										
	35			R-1	20 50/4			SP-SM	@35': SAND with silt and gravel (SP-SM), dense, light grayish brown, moist, upper half fine to medium sand, bottom half medium to coarse sand, fine to coarse gravel, 10% fines (field estimate)	
				R-2	30 24 25			SM	@37': SILTY SAND (SM), medium dense, light brown, moist, fine to medium sand, fine gravel up to 1 inch, 15-20% fines (field estimate)	
800				R-3	10 41 50/5				@38.5': As above, dark yellowish brown, fine sand, micaceous, 20-25% fines (field estimate), bottom grades to sand with silt and gravel	
	40			R-4	46 50/5			SM-SM	@40': SAND with silt and gravel (SP-SM), dense, medium yellowish brown, moist, fine to medium sand, fine gravel up to 1 inch	
									TOTAL DEPTH: 40.9 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 40 FEET BGS**	
795	45									
790	50									
785	55									
780	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N – S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0							ML	@Surface: SANDY SILT (ML), soft, light brown, moist, fine sand, non-plastic, vegetation	
835	5			R-1	2 3 5			SM	@5': SILTY SAND (SM), loose, yellowish brown, moist, fine sand, 30-35% fines (field estimate)	
830	10			R-2	3 4 7			SM	@10': SILTY SAND (SM), loose, light olive brown, moist, fine sand, 30-35% fines (field estimate)	
825	15			R-3	4 12 15			SM	@15': As above, 35% fines (field estimate)	
								ML	@16': SILT (ML), stiff, tannish gray, dry to moist, fine grained, 70% fines (field estimate), non-plastic, slight cementation, visible laminated layering	
820	20			R-4	5 11 16			ML	@20': CLAYEY SILT (ML), stiff, variegated olive and tannish gray, moist, light plasticity, iron oxide staining, visible pores	
815	25			R-5	7 11 15			SM	@25': SILTY SAND (SM), medium dense, olive brown, moist, fine sand, 30% fines (field estimate)	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			R-6	6 13 20			SC	@30': CLAYEY SAND (SC), medium dense, moist, medium brown, fine to medium sand, low plasticity, fine gravel up to 1 inch, sub-angular, 20-25% fines (field estimate)	
805										
	35			R-7	21 41 47			SP-SC	@35': SAND to CLAYEY SAND with gravel (SP-SC), dense, fine to coarse sand, medium to reddish brown, fine gravel up to 1 inch, sub-angular, cemeted, 15% fines (field estimate)	
800										
	40			R-8	50/5			SM	@40': SILTY SAND with gravel (SM), dense, light to medium brown, moist, fine to coarse sand, gravel up to 2 inches, 15% fines (field estimate)	
795										
	45			R-9	29 28 29			SP SM	@45': SAND (SP), dense, moist, light brown, fine to medium sand, trace gravel, 5% fines (field estimate) @46': SILTY SAND (SM), dense, moist, light tannish brown, fine sand, trace medium, trace fine gravel, 25% fines (field estimate)	
790										
	50			R-10	47 47 50/6			SP	@50': SAND with gravel (SP), dense, light brown, moist, fine sand, trace coarse, fine gravel, 5% fines	
785										
	55			S-1	8 16 26			ML	@55': SANDY SILT (ML), hard, light brown, moist, fine sand, non-plastic, slight cementation	
780										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LC-5B

Project No.	10557.007	**Date Drilled**	1-25-22
Project	Yorba Villas	**Logged By**	JAT
Drilling Co.	Martini	**Hole Diameter**	8"
Drilling Method	Hollow-Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JAT

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	60			R-11	18 15/5			ML	@60': SANDY SILT (ML), hard, variegated brown and light brown, moist, fine sand, 30-35% fines (field estimate)	
775										
	65			S-2	23 50/6			ML	@65': As above	
								SM	@66': SILTY SAND (SM), dense, light brown, moist, fine sand, trace medium, 25% fines (field estimate)	
770										
	70			S-3	20 50/6			SM	@70': SILTY SAND (SM), dense, medium brown, moist, fine to medium sand, trace fine gravel, 20% fines (field estimate)	
765										
	75			S-4	36 50/6			SP	@75': SAND with gravel (SP), dense, light brown, moist, fine to medium sand, trace coarse, fine gravel up to 1/2 inch	
760										
	80			S-5	6 12			SM	@80': SILTY SAND (SM), medium dense, light brown, moist, fine sand	
				S-6	10			ML	@81': SILT (ML), very stiff, light brown, moist, non-plastic	
									TOTAL DEPTH: 81.5 FEET **NO GROUNDWATER ENCOUNTERED DURING DRILLING** **CONVERTED TO INFILTRATION BORING. WELL SET AT 80 FEET BGS**	
755										
	85									
750										
	90									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Borings from Leighton, 2021a

Leighton

GEOTECHNICAL BORING LOG LC-1

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	840'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
840	0							ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835	5								@5': Moist	
830	10							SM	@10': SILTY SAND (SM), medium dense, light gray, slightly moist, fine sand, 10-15% fines	
				R-1	7 13 16			SM	@13.5': SILTY SAND (SM), medium dense, light gray, moist, fine sand, trace organics, 85% sand, 15% fines	SA
825	15								**TOTAL DEPTH = 15 FEET** **NO GROUNDWATER ENCOUNTERED** **CONVERTED TO INFILTRATION BORING FOR TESTING** **BACKFILLED TO SURFACE WITH SOIL CUTTINGS ON 6/11/21**	
820	20									
815	25									
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LC-2

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1				ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835	5			R-1	6 7 9				@5': As above, stiff, light brown	
				R-2	5 6 8				@7': As above, stiff, light brown, rootlets, pores	
830	10			R-3	6 10 20			SM	@10': SILTY SAND with gravel (SM), medium dense, light gray, slightly moist, fine sand, fine to coarse gravel, sub-angular, 10-15% fines	
				R-4	6 10 12	101	3	SP	@12': Poorly-graded SAND (SP), medium dense, light gray, slightly moist, fine sand	
825	15			R-5	5 6 12	95	18	ML	@15': SILT (ML), stiff, variegated light gray and orange brown, moist, fine-grained, non-plastic, slight cementation	
				R-6	5 6 13	96	20		@17': As above, variegated light gray, orange brown, and dark brown, trace clay	
820	20			R-7	5 9 14				@20': CLAYEY SILT (ML), stiff, light gray, trace orange, moist, fine, low-plasticity, trace rootlets, organic specs	
815	25			R-8	10 12 14				@25': SILT (ML), stiff, light gray to light brown, moist, 1-inch sand layer in sampler, light brown, fine-medium sand	
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-2

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			R-9	10 13 18	123	12	SM	@30': SILTY SAND (SM), medium dense, variegated, light gray, orange brown, and dark brown, fine sand, trace medium, trace gravel up to 1/2-inch, subangular, iron-oxidized clasts, 36% fines	-200
805										
	35			R-10	37 50/5.5	117	4	SM-SP	@35': Poorly-graded SAND to SILTY SAND with gravel (SP-SM), very dense, light brown to medium brown, fine to medium sand, moist, trace coarse, 32% gravel, 60% sand, 8% fines	SA
800										
	40			R-11	20 15 21	102	10	SM	@40': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace coarse, bottom grades to: SANDY SILT (ML), stiff, moist, orange brown, fine sand, non-plastic, 33% fines	-200
795										
	45				50/4			SP	@45': No recovery, rig chatter on gravel	
790										
	50			R-12	9 50/6				@50': Poorly-graded SAND (SP), dense, medium brown, fine to medium sand, trace gravel, sub-angular, poor recovery	
									TOTAL DEPTH= 51 FEET **NO GROUNDWATER ENCOUNTERED** **BACKFILLED WITH SOIL CUTTINGS ON 6/10/21**	
785	55									
780	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-3

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0							ML	@Surface: SANDY SILT (ML), stiff, light brown, slightly moist, fine sand, non-plastic, organics	
835	5								@5': As above, stiff, light brown	
830	10							SM	@10': SILTY SAND with gravel (SM), medium dense, light gray, slightly moist, fine sand, fine to coarse gravel, sub-angular, 10-15% fines	
825	15							ML	@15': SILT (ML), stiff, variegated light gray and orange brown, moist, fine-grained, non-plastic	
820	20								@20': As above	
815	25									
810	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LC-3

Project No.	10557.006	**Date Drilled**	6-10-21
Project	Yorba Villas	**Logged By**	JP
Drilling Co.	2R	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 150lb - Autohammer - 30" Drop	**Ground Elevation**	839'
Location	See Figure 2 - Boring Location Map	**Sampled By**	JP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30							SM	@30': SILTY SAND (SM), medium dense, variegated, light gray, orange brown, and dark brown, fine sand, trace medium, trace gravel up to 1/2-inch, subangular, iron-oxidized clasts	
805										
	35							SP-SM	@35': Poorly-graded SAND to SILTY SAND with gravel (SP-SM), very dense, light brown to medium brown, fine to medium sand, moist, trace coarse	
800										
	40							SM	@40': SILTY SAND (SM), dense, medium brown, moist, fine sand, trace coarse, bottom grades to: SANDY SILT (ML), stiff, moist, orange brown, fine sand, non-plastic	
795										
	45							SP-SM	@45': Rig chatter on gravel, cuttings show Poorly-graded SAND to SILTY SAND with gravel (SP-SM), medium brown, moist, fine to medium sand, gravel up to 2 inches	
790										
	50								**TOTAL DEPTH= 50 FEET** **NO GROUNDWATER ENCOUNTERED** **BACKFILLED TO 35.2 FEET AND CONVERTED TO INFILTRATION BORING FOR TESTING** **BACKFILLED TO SURFACE WITH SOIL CUTTINGS ON 6/11/21**	
785										
	55									
780										
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Borings from Leighton, 2021b (2013 exploration)

GEOTECHNICAL BORING LOG LB-1

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	849'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			BULK					@Surface: dirt with some straw	
845				R-1	4 6 11	111	2	SM	@2.5' SILTY SAND, loose, light olive brown, dry to moist, fine sand, 30% fines (field estimate), trace rootlets, trace fine gravel	
	5			R-2	7 10 14	119	1	SP	@5' SAND, medium dense, light brown, dry, medium to coarse sand, trace fines, trace fine gravel, larger piece of gravel in ring sample	
840	10			R-3	10 15 21	121	2	SP	@10' SAND, medium dense, gray to brown, dry, medium sand, some gravel, 1.25" maximum gravel size	
835	15			R-4	7 12 17	108	10	ML	@15' SANDY SILT, very stiff, yellowish brown, dry to moist, homogenous	-200
830	20			S-5	6 8 10			ML SP	@20' SANDY SILT, very stiff, dark gray, dry to moist, fine sand @20.7' SAND, gray, dry to moist, fine to medium sand	
									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
825	25									
820	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-2

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	844'
Location	See Figure 2	**Sampled By**	JMD

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			BULK					@Surface: dirt with some grass	
				R-1	3 5 7	106	2	SM	@2.5' SILTY SAND, loose, light gray brown, dry, fine sand, 30% fines (field estimate), trace fine gravel	
840	5			R-2	7 9 10			SP	@5' SAND, medium dense, reddish brown, dry, medium to coarse sand, trace fines, some gravel, 1.25" maximum gravel size	
835	10			R-3	20 24 25	126	2	SP	@10' SAND, medium dense, light gray brown, dry, medium to coarse sand, angular, broken rocks up to 2.25" in sample	
830	15			S-4	7 8 9			SP	@15' SAND, medium dense, gray, dry to moist, medium sand	
825	20			R-5	17 23 45	111	15	ML	@20' SANDY SILT, very dense, olive, moist, some FeO2 staining	
820	25			S-6	7 12 11			ML-CL	@25' SILT to CLAY, very stiff, gray, dry to moist, with FeO2 staining @25.4' SAND, dry, fine to medium sand @25.6' SILT, gray, moist @25.9' CLAY, gray, moist	
815	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
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- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	844'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-7	8 16 21			ML	@30' SILT, hard, olive brown, dry to moist, FeO2 staining, with some clay @30.5' SILT, olive brown, dry to moist, FeO2 staining @31' SAND, dark reddish brown to light gray, dry, fine to medium sand	
810										
	35			S-8	18 24 21			SP	@35' SAND, light brown, dry to moist, with large amounts of FeO2 staining, trace fine gravel, a 1.25" piece of gravel in the sampler tip	
805										
	40			S-9	12 10 20			CL	@40' CLAY with gravel, hard, reddish brown to olive brown, gravel up to 2" large, with some silt, some FeO2 staining @41.3' SAND with gravel, dry to moist, medium to coarse sand, gravel up to 2" large	
800										
	45			S-10	15 35 24			SM	@45' SILTY SAND, very dense, reddish brown, moist, angular, 20% fines (field estimate), with some gravel, 1" maximum gravel size	
795										
	50			S-11	9 11 16			ML	@50' SILT, very stiff, olive brown, moist, with FeO2 staining, homogenous	
									Total depth of 51.5' No groundwater encountered Bakfilled with soil cuttings	
790										
	55									
785										
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-3

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	852'
Location	See Figure 2	**Sampled By**	JMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			BULK					@Surface: dry grass	
850				R-1	2 4 8	104	4	SM	@2.5' SILTY SAND, loose, light brown, dry, fine sand, 40% fines (field estimate), trace rootlets	
	5			R-2	8 11 14	111	5	SM	@5' SILTY SAND, medium dense, brown, moist, fine sand, 30% fines (field estimate)	
845										
	10			R-3	11 7 13	111	4	SM	@10' SILTY SAND, medium dense, light gray brown, moist, fine sand, 30% fines (field estimate), trace fine gravel	CO
840										
	15			R-4	11 17 19	93	9	ML	@15' SILT, very stiff, gray, moist, FeO2 staining, homongenous	AL
835										
	20			S-5	5 7 9			CL ML	@20' CLAY, very stiff, gray, moist, FeO2 staining @20.5' SILT, gray, moist, FeO2 staining	
830										
	25			S-6	5 5 11			ML		
825										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
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GEOTECHNICAL BORING LOG LB-3

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	852'
Location	See Figure 2	**Sampled By**	JMD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-7	12 14 16			ML	@30' SANDY SILT, very stiff, gray, moist	
820								SM	@31.1' SILTY SAND, gray, dry, fine sand, 20% fines (field estimate),	
	35			S-8	17 13 8			SP	@35' SAND, medium dense, reddish brown, medium to coarse sand	
815								CL	@36.3' CLAY, olive brown, moist, large amount of FeO2 staining	
	40			S-9	9 14 26			ML	@40' SANDY SILT, hard, olive brown, moist, large amount of FeO2 staining	
810										
	45			S-10	6 8 9			ML	@45' SILT, very stiff, light brown, large amount of FeO2 staining, homogenous	
805										
	50			S-11	14 14 20			SP	@50' SAND, dense, light gray brown, dry to moist, fine sand, trace fines	
								ML	@51.2' SILT, light brown, large amount of FeO2 staining	
800									Total depth of 51.5' No groundwater encountered Backfilled with soil cuttings	
	55									
795										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	9.5"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	850'
Location	See Figure 2	**Sampled By**	JMD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
850	0			BULK					@Surface: dirt	MD, CR
				R-1	5 8 8			SM	@2.5' SILTY SAND, loose, light brown to brown, dry, 20% fines (field estimate), with some gravel, 2" maximum gravel size	
845	5			R-2	6 11 10	121	2	SP-SM	@5' SAND to SILTY SAND, medium dense, light brown, dry to moist, 10% fines (field estimate), with some gravel, 1.25" maximum gravel size	-200
840	10			R-3	20 30 40			SP	@10' SAND, dense, gray, dry to moist, trace fines, some fine and medium sand, some gravel, 1.5" maximum gravel size	
835	15			S-4	6 7 7			SM	@15' SILTY SAND, medium dense, olive, moist, fine sand, 40% fines (field estimate), trace coarse sand	
830	20			R-5	10 19 26	100	19	CL	@20' CLAY, very stiff, olive, moist, with FeO2 staining. homogenous	
									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
825	25									
820	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-5

Project No.	10557.004	**Date Drilled**	12-13-13
Project	Coastal Commerce Chino	**Logged By**	JMD
Drilling Co.	2R Drilling	**Hole Diameter**	10"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	848'
Location	See Figure 2	**Sampled By**	JMD

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	0			BULK					@Surface: dirt	
845										
	5			R-2	12 28 34	117	3	SP	@5' SAND, dense, gray brown, moist, medium sand, with some gravel, 1" maximum gravel size	
840										
	10			R-3	12 16 18	106	3	SP	@10' SAND, medium dense, gray to reddish brown, moist, medium sand, trace gravel, 2" maximum gravel size	
835										
	15			R-4	17 14 17	105	2	SP	@15' SAND, medium dense, olive, moist, trace fines, trace fine gravel, trace FeO2 staining	
830										
	20			S-5	7 6 6			SM	@20' SILTY SAND, medium dense, olive, dry to moist, fine sand, 40% fines (field estimate), some FeO2 staining	
									Total depth of 21.5' No groundwater encountered Backfilled with soil cuttings	
825										
	25									
820										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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APPENDIX B

INFILTRATION LOGS

Infiltration logs from Current Study

Results of Well Permeameter, from USBR 7300-89 Method

Leighton

Project: 10557.007, Yorba Villas

Exploration #/Location: *LC-4B, Granular Zones 1 and 2 (tested separately)*

Depth Boring drilled to (ft): 80

Tested by: JAT

USCS Soil Type in test zone: SM/SP

Weather (start to finish): Sunny

Water Source/pH: H2O, Water Truck, Hydrant

Measured boring diameter: 6 in. 3 in. Well Radius

Approx Depth to GW BGS: 100 ft (GW or aquatarde)

Well Prep: Drill to 80' with 6" auger, set slotted 2" PVC well pipe with sand backfill, two test zones.

Initial estimated Depth to Water Surface (in.): 784

Average depth of water in well, "h" (in.): 174

approx. h/r: 58.2

Tu (Fig. 8) (ft): 34.6

Tu>3h?: No, Cannot use Condition I Equation, must re-eva

Cross-sectional area for vol calcs (in.^2): 13.1

	ft	in.	Total (in.)	
Depth to Bot of well measured from top of pilot tube	80.25 ft	0. in.	963	w/packer 720 in.
Pilot Tube stickup (+ is above ground)	0. ft	4.13 in.	4.125	
Depth to top of sand outside of casing from top of pilot tube				

Use of Barrels: No

Use of Flow Meter: Yes

Use of DH Valve: No

Test Type: Constant Head

Flow Meter:

Meter ID:

Meter Color: Black

Meter Units: Gallons

DL ID:

0.05 gallons/pulse

Field Data **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 1/31/2022	Start time: 8:50	Gallons		ft	in.															
						Test of Granular Zone 2														
1/31/22	8:50	7612.6		72.54					0	866.4	96.6									
1/31/22	8:55	7621.28		73.1				5	5	873.1	89.9	-6.72	93	2005	88	2093	419	25118	0.9	13.0
1/31/22	9:00	7627.85		73.75				5	10	880.9	82.1	-7.8	86	1518	102	1620	324	19439	0.9	10.9
1/31/22	9:05	7633.66		74.1				5	15	885.1	77.9	-4.2	80	1342	55	1397	279	16766	0.9	10.1
1/31/22	9:20	7667.65		69.05			Adjust Pressure	15	30	824.5	138.5	60.6	108	7852	-795	7057	470	28229	0.9	12.6
1/31/22							Switch Meter													
1/31/22	9:40	124.45		67.01					50	800.0	163.0									
1/31/22	9:45	142.3		68				5	55	811.9	151.1	-11.88	157	4123	156	4279	856	51349	0.9	15.8
1/31/22	9:50	155.73		68.8				5	60	821.5	141.5	-9.6	146	3102	126	3228	646	38738	0.9	12.8
1/31/22	10:10	197.49		71.7			Adjust Valve	20	80	856.3	106.7	-34.8	124	9647	456	10103	505	30309	0.9	11.8
1/31/22	10:40	283.55		65.8			Adjust Valve	30	110	785.5	177.5	70.8	142	19880	-928	18952	632	37903	0.9	12.9
1/31/22	10:45	297.74		65.95			Remove Filter	5	115	787.3	175.7	-1.8	177	3278	24	3301	660	39618	0.9	10.9
1/31/22	10:50	313.49		66.1				5	120	789.1	173.9	-1.8	175	3638	24	3662	732	43942	0.9	12.2
1/31/22	10:55	328.87		66.35				5	125	792.1	170.9	-3	172	3553	39	3592	718	43105	0.9	12.1
1/31/22	11:00	344.4		66.35				5	130	792.1	170.9	0	171	3587	0	3587	717	43049	0.9	12.2
1/31/22	11:05	359.52		66.4				5	135	792.7	170.3	-0.6	171	3493	8	3501	700	42007	0.9	11.9
1/31/22	11:15	389.56		66.35				10	145	792.1	170.9	0.6	171	6939	-8	6931	693	41588	0.9	11.8
1/31/22	11:25	419.9		66.33				10	155	791.8	171.2	0.24	171	7009	-3	7005	701	42032	0.9	11.9
1/31/22	11:35	449.78		66.43				10	165	793.0	170.0	-1.2	171	6902	16	6918	692	41508	0.9	11.8
1/31/22	11:45	479.73		66.4				10	175	792.7	170.3	0.36	170	6918	-5	6914	691	41482	0.9	11.8
1/31/22	11:55	509.35		66.45				10	185	793.3	169.7	-0.6	170	6842	8	6850	685	41101	0.9	11.7
1/31/22	12:05	538.49		66.55				10	195	794.5	168.5	-1.2	169	6731	16	6747	675	40482	0.9	11.6
1/31/22	12:15	567.62		66.65				10	205	795.7	167.3	-1.2	168	6729	16	6745	674	40469	0.9	11.7
1/31/22	12:25	598.37		65.75			Adjust Valve	10	215	784.9	178.1	10.8	173	7103	-142	6962	696	41770	0.9	11.7
1/31/22	12:35	630.08		65.77				10	225	785.1	177.9	-0.24	178	7325	3	7328	733	43969	0.9	12.0
1/31/22	12:46	664.65		65.95				11	236	787.3	175.7	-2.16	177	7986	28	8014	729	43713	0.9	12.0
1/31/22	12:57	700.58		66				11	247	787.9	175.1	-0.6	175	8300	8	8308	755	45315	0.9	12.5
1/31/22	13:10	739.09		66.2				13	260	790.3	172.7	-2.4	174	8896	31	8927	687	41203	0.9	11.5
		Test of Granular Zone 1; installed packer below 55'																		
1/31/22	15:00	874.14		44.55					370	530.5	189.5									
1/31/22	15:05	894.73		45.17				5	375	537.9	182.1	-7.44	186	4756	98	4854	971	58246	0.9	15.2
1/31/22	15:10	913.15		44.4				5	380	528.7	191.3	9.24	187	4255	-121	4134	827	49606	0.9	12.9
1/31/22	15:15	935.89		43.73				5	385	520.6	199.4	8.04	195	5253	-105	5148	1030	61770	0.9	15.3
1/31/22	15:20	959.12		43.57				5	390	518.7	201.3	1.92	200	5366	-25	5341	1068	64091	0.9	15.5
1/31/22	15:25	981.91		43.46				5	395	517.4	202.6	1.32	202	5264	-17	5247	1049	62966	0.9	15.1
1/31/22	15:30	1006.26		43.3				5	400	515.5	204.5	1.92	204	5625	-25	5600	1120	67196	0.9	16.0
1/31/22	15:35	1027.75		43.2				5	405	514.3	205.7	1.2	205	4964	-16	4948	990	59381	0.9	14.1
1/31/22	15:40	1050.55		43.13				5	410	513.4	206.6	0.84	206	5267	-11	5256	1051	63069	0.9	14.9
1/31/22	15:45	1073.21		43.03				5	415	512.2	207.8	1.2	207	5234	-16	5219	1044	62625	0.9	14.7
1/31/22	15:55	1118.19		42.88				10	425	510.4	209.6	1.8	209	10390	-24	10367	1037	62201	0.9	14.5
1/31/22	16:05	1163.57		42.75				10	435	508.9	211.1	1.56	210	10483	-20	10462	1046	62774	0.9	14.5
1/31/22	16:15	1209.11		42.65				10	445	507.7	212.3	1.2	212	10520	-16	10504	1050	63024	0.9	14.5
1/31/22	16:25	1253.05		42.5				10	455	505.9	214.1	1.8	213	10150	-24	10127	1013	60759	0.9	13.8
1/31/22	16:35	1298.03		42.4				10	465	504.7	215.3	1.2	215	10390	-16	10375	1037	62248	0.9	14.1
1/31/22	16:45	1342.24		42.31				10	475	503.6	216.4	1.08	216	10213	-14	10198	1020	61190	0.9	13.8
1/31/22	16:55	1386.56		42.23				10	485	502.6	217.4	0.96	217	10238	-13	10225	1023	61352	0.9	13.7
																			Raw Rate for design, prior to application of adjustment factors:	18/11.5

template updated: 8/5/21

Results of Well Permeameter, from USBR 7300-89 Method

Leighton

Project:	10557.007, Yorba Villas	Initial estimated Depth to Water Surface (in.):	804
Exploration #/Location:	*LC-5B, Granular Zones 1 and 2 (tested separately)*	Average depth of water in well, "h" (in.):	159
Depth Boring drilled to (ft):	80	approx. h/r:	53.0
Tested by:	JAT	Tu (Fig. 8) (ft):	33.0
USCS Soil Type in test zone:	SM/SP	Tu>3h?:	No, Cannot use Condition I Equation, must re-eva
Weather (start to finish):	Sunny		
Water Source/pH:	H2O, Water Truck, Hydrant		
Measured boring diameter:	6 in. 3 in. Well Radius	Cross-sectional area for vol calcs (in.^2):	13.1
Approx Depth to GW BGS:	100 ft (GW or aquatarde)		
Well Prep:	Drill to 80' with 6" auger, set slotted 2" PVC well pipe with sand backfill, two test zones.	Use of Barrels:	No

	ft	in.	Total (in.)	w/packer
Depth to Bot of well measured from top of pilot tube	80.25 ft	0. in.	963	720 in.
Pilot Tube stickup (+ is above ground)	0. ft	0. in.	0	
Depth to top of sand outside of casing from top of pilot tube				

Use of Flow Meter: Yes
Use of DH Valve: No
Test Type: Constant Head

Flow Meter:

Meter ID
Meter Col Black
Meter Unit Gallons
DL ID
0.05 gallons/pulse

Field Data **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 1/31/2022	Start time: 8:50	Gallons																		
							Test of Granular Zone 2													
1/31/22	9:50	837.46		68.36					60	820.3	142.7									
1/31/22	9:55	842.5		68.45				5	65	821.4	141.6	-1.08	142	1164	14	1178	236	14141	0.9	4.8
1/31/22	10:00	848.84		68.59				5	70	823.1	139.9	-1.68	141	1465	22	1487	297	17839	0.9	6.1
1/31/22	10:05	853.38		68.66				5	75	823.9	139.1	-0.84	140	1049	11	1060	212	12717	0.9	4.4
1/31/22	10:10	859.05		68.7				5	80	824.4	138.6	-0.48	139	1310	6	1316	263	15793	0.9	5.5
1/31/22							Adjust Pressure													
1/31/22							Troubleshoot													
1/31/22	10:44	900.14		68.01					114	816.1	146.9									
1/31/22	10:49	906.5		68.02				5	119	816.2	146.8	-0.12	147	1469	2	1471	294	17649	0.9	5.8
1/31/22	10:54	912.91		68.02				5	124	816.2	146.8	0	147	1481	0	1481	296	17769	0.9	5.9
1/31/22	10:59	919.22		68.03				5	129	816.4	146.6	-0.12	147	1458	2	1459	292	17510	0.9	5.8
1/31/22	11:04	925.18		68.11				5	134	817.3	145.7	-0.96	146	1377	13	1389	278	16672	0.9	5.5
1/31/22	11:09	931.33		68.14				5	139	817.7	145.3	-0.36	146	1421	5	1425	285	17104	0.9	5.7
1/31/22	11:14	937.71		68.19				5	144	818.3	144.7	-0.6	145	1474	8	1482	296	17780	0.9	5.9
1/31/22							Adjusted Pressure													
1/31/22	11:20	946.15		68.24					150	818.9	144.1									
1/31/22	11:25	951.21		68.25				5	155	819.0	144.0	-0.12	144	1169	2	1170	234	14045	0.9	4.7
1/31/22	11:30	957.18		68.26				5	160	819.1	143.9	-0.12	144	1379	2	1381	276	16568	0.9	5.6
1/31/22	11:35	963.9		68.31				5	165	819.7	143.3	-0.6	144	1552	8	1560	312	18722	0.9	6.3
1/31/22																				
1/31/22	11:50	984.3		67.92					180	815.0	148.0									
1/31/22	11:55	992.43		68.13				5.5	185.5	817.6	145.4	-2.52	147	1878	33	1911	347	20848	0.9	6.9
1/31/22	12:00	998.09		68.24				5	190.5	818.9	144.1	-1.32	145	1307	17	1325	265	15897	0.9	5.3
1/31/22	12:05	1003.22		68.28				4.5	195	819.4	143.6	-0.48	144	1185	6	1191	265	15884	0.9	5.3
		Test of Granular Zone 1; installed packer below 55'																		
1/31/22	14:10	1503.41		46.15					320	553.8	166.2									
1/31/22	14:15	1534.8		46.1				5	325	553.2	166.8	0.6	167	7251	-8	7243	1449	86919	0.9	25.3
1/31/22	14:20	1567.2		46				5	330	552.0	168.0	1.2	167	7484	-16	7469	1494	89624	0.9	26.0
1/31/22																				
1/31/22	14:53	1655.7		46.11					363	553.3	166.7									
1/31/22	14:58	1684.4		45.75				5	368	549.0	171.0	4.32	169	6630	-57	6573	1315	78877	0.9	22.6
1/31/22	15:03	1711.32		45.85				5	373	550.2	169.8	-1.2	170	6219	16	6234	1247	74811	0.9	21.3
1/31/22	15:08	1741.65		45.74				5	378	548.9	171.1	1.32	170	7006	-17	6989	1398	83867	0.9	23.9
1/31/22	15:13	1768.94		45.63				5	383	547.6	172.4	1.32	172	6304	-17	6287	1257	75440	0.9	21.3
1/31/22	15:18	1800.7		45.71				5	388	548.5	171.5	-0.96	172	7337	13	7349	1470	88190	0.9	24.9
1/31/22	15:23	1822.65		45.7				5	393	548.4	171.6	0.12	172	5070	-2	5069	1014	60827	0.9	17.2
1/31/22	15:33	1876.87		45.53				10	403	546.4	173.6	2.04	173	12525	-27	12498	1250	74988	0.9	21.1
1/31/22	15:43	1931.62		45.46				10	413	545.5	174.5	0.84	174	12647	-11	12636	1264	75817	0.9	21.1
1/31/22	15:53	1978.36		45.52				10	423	546.2	173.8	-0.72	174	10797	9	10806	1081	64838	0.9	18.1
1/31/22	16:03	2030.8		45.42				10	433	545.0	175.0	1.2	174	12114	-16	12098	1210	72587	0.9	20.2
1/31/22	16:13	2079.03		45.31				10	443	543.7	176.3	1.32	176	11141	-17	11124	1112	66743	0.9	18.4
1/31/22	16:23	2135.46		45.22				10	453	542.6	177.4	1.08	177	13035	-14	13021	1302	78127	0.9	21.4
1/31/22	16:35	2191.55		45.12				12	465	541.4	178.6	1.2	178	12957	-16	12941	1078	64705	0.9	17.6
1/31/22	16:43	2229.13		45.09				8	473	541.1	178.9	0.36	179	8681	-5	8676	1085	65072	0.9	17.7
1/31/22	16:53	2278.4		45.05				10	483	540.6	179.4	0.48	179	11381	-6	11375	1138	68250	0.9	18.5
												Raw Rate for design, prior to application of adjustment factors:								**26/5.5**

template updated: 8/5/21

Infiltration Logs from Leighton 2021a

Leighton

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: 10557

Exploration #/Location:	LC-1
Depth Boring drilled to (ft):	15.15
Tested by:	JAT
USCS Soil Type in test zone:	SM
Weather (start to finish):	Sunny
Liquid Used/pH:	H2O
Measured boring diameter:	10 in.
Approx Depth to GW below GS:	100 ft

5 in. Well Radius

Initial estimated Depth to Water Surface (in.):	159
Average depth of water in well, "h" (in.):	24
approx. h/r:	4.7
Tu (Fig. 8) (ft):	86.8
Tu>3h?:	yes, OK

Cross-sectional area for vol calcs (in.^2): 78.5

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15.2 ft		182	
Pilot Tube stickup (+ is above ground)		5. in.	5	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	10. ft	8. in.	128	123 Depth below GS (in.)
Float Assembly ID		A		
Float assembly Extension length (in.)		24		

Flow Meter:

Meter ID	3242
Meter Col	Black
Meter Unit	Gallons
DL ID	* Used meter with water from barrels.

0.05 gallons/pulse

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	from Δh	Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 6/11/2021	Start time: 8:45	Gallons																			
-																					
6/11/21	8:45	7414		12.61					0	146.3	36.1										
6/11/21	8:50	7416.5		12.59				5	5	146.1	36.3	0.24	36	578	-19	559	112	6704	0.9	1.35	**5.08**
6/11/21	8:55	7419.4		12.61				5	10	146.3	36.1	-0.24	36	670	19	689	138	8265	0.9	1.68	**6.27**
6/11/21	9:00	7422.9		12.6				5	15	146.2	36.2	0.12	36	809	-9	799	160	9589	0.921	1.94	**7.28**
6/11/21	9:05	7424.7		12.59				5	20	146.1	36.3	0.12	36	416	-9	406	81	4877	0.9	0.98	**3.69**
6/11/21	9:10	7427.3		12.6				5	25	146.2	36.2	-0.12	36	601	9	610	122	7320	0.9	1.48	**5.54**
6/11/21	9:15	7429.8		12.6				5	30	146.2	36.2	0	36	578	0	578	116	6930	0.9	1.40	**5.25**
6/11/21	9:20	7432.5		12.59				5	35	146.1	36.3	0.12	36	624	-9	614	123	7371	0.9	1.48	**5.58**
6/11/21	9:25	7434.5		12.6				5	40	146.2	36.2	-0.12	36	462	9	471	94	5657	0.9	1.14	**4.28**
6/11/21																					
6/11/21	9:30	7435.1		13.5					45	157.0	25.4										
6/11/21	10:00	7436.1		14			Adjustment	30	75	163.0	19.4	-6	22	231	471	702	23	1404	0.9	0.77	**1.65**

Results of Well Permeameter, from USBR 7300-89 Method.

Leighton

Project: 10557

Exploration #/Location:	LC-1		
Depth Boring drilled to (ft):	15.15		
Tested by:	JAT		
USCS Soil Type in test zone:	SM		
Weather (start to finish):	Sunny		
Liquid Used/pH:	H2O		
Measured boring diameter:	10	in.	5 in. Well Radius
Approx Depth to GW below GS:	100	ft	

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

Initial estimated Depth to Water Surface (in.):	154
Average depth of water in well, "h" (in.):	29
approx. h/r:	5.8
Tu (Fig. 8) (ft):	87.2
Tu>3h?:	yes, OK
Cross-sectional area for vol calcs (in.^2):	78.5

	ft	in.	Total (in.)	
Depth to Bot of well (or top of soil over Bentonite)	15.2 ft		182	
Pilot Tube stickup (+ is above ground)		5. in.	5	
Depth to top of sand outside of casing from top of pilot tube				
Depth to top of float assembly from top of pilot tube	9. ft	0. in.	108	103 Depth below GS (in.)
Float Assembly ID		A		
Float assembly Extension length (in.)		0		

Flow Meter:

Meter ID	
Meter Col	Black
Meter Unit	Gallons
DL ID	

0.05 gallons/pulse

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (cu-ft or gal)	Data from Flow Meter: Interval Pulse Count	Depth to WL in Boring (measured from top of pilot tube) ft	Depth to WL in Boring in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 6/11/2021	Start time: 8:45	Gallons																			
-																					
6/11/21	10:20	7447.5		11.8					95	136.6	45.8										
6/11/21	10:25	7451.3		11.85				5	100	137.2	45.2	-0.6	46	878	47	925	185	11099	0.9	1.60	**6.79**
6/11/21	10:30	7455		11.9				5	105	137.8	44.6	-0.6	45	855	47	902	180	10822	0.9	1.59	**6.70**
6/11/21	10:35	7458.6		11.9				5	110	137.8	44.6	0	45	832	0	832	166	9979	0.921	1.47	**6.22**
6/11/21							Switch Barrel														
6/11/21	10:40	7459.5		12.8					115	148.6	33.8										
6/11/21	10:45	7459.6		13.4				5	120	155.8	26.6	-7.2	30	23	565	588	118	7060	0.9	2.42	**6.34**
6/11/21																					
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Results of Falling Head Infiltration Test

Leighton

Project: 10557

Exploration #/Location:	*LC-1*	Initial estimated Depth to Water Surface (in.):	150
Depth Boring drilled to (ft):	15.15	Average depth of water in well, "h" (in.):	32
Tested by:	JAT	approx. h/r:	6.4
USCS Soil Type in test zone:	SM	Tu (Fig. 8) (ft):	87.5
Weather (start to finish):	Sunny	Tu>3h?:	yes, OK
Liquid Used/pH:	H2O		
Measured boring diameter:	10 in.	Cross-sectional area for vol calcs (in.^2):	37.4
Approx Depth to GW below GS:	100 ft		

5 in. Well Radius

Well Prep: Drilled to 15' bgs with 10" auger, placed #3 sand and 4" pipe with sand around test zone.

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentor	15.2 ft		182
Pilot Tube stickup (+ is above ground)		5. in.	5
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change (in.^3) from Δh	Vol Change (in.^3) Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																		
6/11/2021	9:35	ft	in.																
6/11/21	11:12	9.4		65			97	107.8	74.6										
6/11/21	11:17	12.3				5	102	142.6	39.8	-34.8	57	0	1302	1302	260	15625	1875	1.0	**8.51**
6/11/21	11:22	13.4				5	107	155.8	26.6	-13.2	33	0	494	494	99	5927	1121	1.0	**5.40**
6/11/21	11:27	14				5	112	163.0	19.4	-7.2	23	0	269	269	54	3233	801	1.0	**4.12**
6/11/21					refill														
6/11/21	11:32	9.5					117	109.0	73.4										
6/11/21	11:37	12.4				5	122	143.8	38.6	-34.8	56	0	1302	1302	260	15625	1837	1.0	**8.69**
6/11/21	11:42	13.1				5	127	152.2	30.2	-8.4	34	0	314	314	63	3771	1159	1.0	**3.32**
6/11/21	11:47	13.8				5	132	160.6	21.8	-8.4	26	0	314	314	63	3771	895	1.0	**4.30**
6/11/21					refill														
6/11/21	11:53	9.81					138	112.7	69.7										
6/11/21	11:58	12.23				5	143	141.8	40.6	-29.04	55	0	1087	1087	217	13038	1811	1.0	**7.36**
6/11/21	12:03	13.21				5	148	153.5	28.9	-11.76	35	0	440	440	88	5280	1170	1.0	**4.61**
6/11/21	12:08	14.05				5	153	163.6	18.8	-10.08	24	0	377	377	75	4526	827	1.0	**5.59**
6/11/21					refill														
6/11/21	12:15	10.71					160	123.5	58.9										
6/11/21	12:20	12.59				5	165	146.1	36.3	-22.56	48	0	844	844	169	10129	1573	1.0	**6.58**
6/11/21	12:25	13.43				5	170	156.2	26.2	-10.08	31	0	377	377	75	4526	1061	1.0	**4.36**
6/11/21	12:30	14.06				5	175	163.7	18.7	-7.56	22	0	283	283	57	3394	784	1.0	**4.42**
6/11/21					refill														
6/11/21	12:37	10.21					182	117.5	64.9										
6/11/21	12:42	12.76				5	187	148.1	34.3	-30.6	50	0	1145	1145	229	13739	1635	1.0	**8.58**
6/11/21	12:47	13.34				5	192	155.1	27.3	-6.96	31	0	260	260	52	3125	1046	1.0	**3.05**
6/11/21	12:52	13.91				5	197	161.9	20.5	-6.84	24	0	256	256	51	3071	829	1.0	**3.78**
6/11/21	12:57	14.27				5	202	166.2	16.2	-4.32	18	0	162	162	32	1940	654	1.0	**3.03**
6/11/21					refill														
6/11/21	1:05	10.31					0	118.7	63.7										
6/11/21	1:10	12.42				5	0	144.0	38.4	-25.32	51	0	947	947	189	11368	1681	1.0	**6.91**
6/11/21	1:15	13.32				5	0	154.8	27.6	-10.8	33	0	404	404	81	4849	1113	1.0	**4.45**
6/11/21	1:20	13.81				5	0	160.7	21.7	-5.88	25	0	220	220	44	2640	852	1.0	**3.17**
6/11/21	1:25	14.06				5	0	163.7	18.7	-3	20	0	112	112	22	1347	712	1.0	**1.93**
6/11/21																			
6/11/21	13:29	9.75					234	112.0	70.4										
6/11/21	13:34	12.11				5	239	140.3	42.1	-28.32	56	0	1060	1060	212	12715	1844	1.0	**7.04**
6/11/21	13:39	13.15				5	244	152.8	29.6	-12.48	36	0	467	467	93	5603	1204	1.0	**4.75**
6/11/21	13:44	13.64				5	249	158.7	23.7	-5.88	27	0	220	220	44	2640	916	1.0	**2.95**
6/11/21	13:49	14.06				5	254	163.7	18.7	-5.04	21	0	189	189	38	2263	744	1.0	**3.11**
6/11/21	13:54	14.35				5	259	167.2	15.2	-3.48	17	0	130	130	26	1562	610	1.0	**2.61**

template updated: 6/30/2020

Results of Falling Head Infiltration Test

Leighton

Project:	10557	Initial estimated Depth to Water Surface (in.):	391
Exploration #/Location:	*LC-3*	Average depth of water in well, "h" (in.):	33
Depth Boring drilled to (ft):	35.3	approx. h/r:	8.2
Tested by:	JAT	Tu (Fig. 8) (ft):	67.4
USCS Soil Type in test zone:	SP-SM	Tu>3h?:	yes, OK
Weather (start to finish):	Sunny		
Liquid Used/pH:	H2O		
Measured boring diameter:	8 in.	4 in. Well Radius	Cross-sectional area for vol calcs (in.^2): 26.1
Approx Depth to GW below GS:	100 ft		
Well Prep:	Drilled to 50', backfilled to 35.2', silt plug at bottom, placed #3 sand, placed 4" pipe (no pilot tube)		

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	35.3 ft		424
Pilot Tube stickup (+ is above ground)	0. ft		0
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:																		
6/11/2021	9:35																		
6/11/21	9:55	27.6		65			20	331.2	92.4										
6/11/21	10:00	28.56				5	25	342.7	80.9	-11.52	87	0	301	301	60	3610	2176	1.0	**1.69**
6/11/21	10:05	30.57				5	30	366.8	56.8	-24.12	69	0	630	630	126	7558	1729	1.0	**4.47**
6/11/21	10:10	33.59				5	35	403.1	20.5	-36.24	39	0	946	946	189	11355	971	1.0	**11.95**
6/11/21					refill														
6/11/21	10:12	27.42					37	329.0	94.6										
6/11/21	10:17	32.01				5	42	384.1	39.5	-55.08	67	0	1438	1438	288	17258	1684	1.0	**10.47**
6/11/21	10:22	33.98				5	47	407.8	15.8	-23.64	28	0	617	617	123	7407	695	1.0	**10.89**
6/11/21	10:27	35.2				5	52	422.4	1.2	-14.64	9	0	382	382	76	4587	214	1.0	**21.89**
6/11/21					refill														
6/11/21	10:29	27.51					54	330.1	93.5										
6/11/21	10:34	32.02				5	59	384.2	39.4	-54.12	66	0	1413	1413	283	16958	1668	1.0	**10.38**
6/11/21	10:39	32.09				5	64	385.1	38.5	-0.84	39	0	22	22	4	263	978	1.0	**0.27**
6/11/21	10:44	32.23				5	69	386.8	36.8	-1.68	38	0	44	44	9	526	947	1.0	**0.57**
6/11/21	10:49	32.34				5	74	388.1	35.5	-1.32	36	0	34	34	7	414	909	1.0	**0.46**
6/11/21	10:54	33.59				5	79	403.1	20.5	-15	28	0	392	392	78	4700	704	1.0	**6.82**
6/11/21	10:59	34.05				5	84	408.6	15.0	-5.52	18	0	144	144	29	1730	446	1.0	**3.96**
6/11/21	11:04	34.51				5	89	414.1	9.5	-5.52	12	0	144	144	29	1730	307	1.0	**5.75**
6/11/21					refill														
6/11/21	11:07	29.81					92	357.7	65.9										
6/11/21	11:12	31.29				5	97	375.5	48.1	-17.76	57	0	464	464	93	5565	1432	1.0	**3.97**
6/11/21	11:17	31.78				5	102	381.4	42.2	-5.88	45	0	154	154	31	1842	1135	1.0	**1.66**
6/11/21	11:24	32.5				7	109	390.0	33.6	-8.64	38	0	226	226	32	1934	953	1.0	**2.07**
6/11/21	11:29	32.95				5	114	395.4	28.2	-5.4	31	0	141	141	28	1692	776	1.0	**2.23**
6/11/21	11:34	33.49				5	119	401.9	21.7	-6.48	25	0	169	169	34	2030	627	1.0	**3.31**
6/11/21	11:39	33.82				5	124	405.8	17.8	-3.96	20	0	103	103	21	1241	496	1.0	**2.56**
6/11/21	11:44	34.6				5	129	415.2	8.4	-9.36	13	0	244	244	49	2933	329	1.0	**9.12**
6/11/21					refill														
6/11/21	11:48	29.42					133	353.0	70.6										
6/11/21	11:53	30.92				5	138	371.0	52.6	-18	62	0	470	470	94	5640	1546	1.0	**3.73**
6/11/21	11:58	31.61				5	143	379.3	44.3	-8.28	48	0	216	216	43	2594	1216	1.0	**2.18**
6/11/21	12:03	32.11				5	148	385.3	38.3	-6	41	0	157	157	31	1880	1037	1.0	**1.85**
6/11/21	12:08	32.45				5	153	389.4	34.2	-4.08	36	0	107	107	21	1278	910	1.0	**1.43**
6/11/21	12:13	33.62				5	158	403.4	20.2	-14.04	27	0	367	367	73	4399	683	1.0	**6.58**
6/11/21	12:18	33.98				5	163	407.8	15.8	-4.32	18	0	113	113	23	1354	452	1.0	**3.06**
6/11/21	12:23	34.24				5	168	410.9	12.7	-3.12	14	0	81	81	16	978	359	1.0	**2.78**
6/11/21					refill														

template updated: 6/30/2020

Results of Falling Head Infiltration Test

Leighton

Project: 10557
Exploration #/Location: *LC-3*
Depth Boring drilled to (ft): 35.3
Tested by: JAT
USCS Soil Type in test zone: SP-SM
Weather (start to finish): Sunny
Liquid Used/pH: H2O
Measured boring diameter: 8 in. 4 in. Well Radius
Approx Depth to GW below GS: 100 ft
Well Prep: Drilled to 50', backfilled to 35.2', silt plug at bottom, placed #3 sand, placed 4" pipe (no pilot tube)

Initial estimated Depth to Water Surface (in.): 383
Average depth of water in well, "h" (in.): 40
approx. h/r: 10.1
Tu (Fig. 8) (ft): 68.1
Tu>3h?: yes, OK
Cross-sectional area for vol calcs (in.^2): 26.1

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentor	35.3 ft		424
Pilot Tube stickup (+ is above ground)	0. ft		0
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change from Δh	Vol Change Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date 6/11/2021	Start time: 9:35																		
6/11/21	12:26	29.61		65	Refilled		171	355.3	68.3										
6/11/21	12:31	31.63				5	176	379.6	44.0	-24.24	56	0	633	633	127	7595	1411	1.0	**5.50**
6/11/21	12:36	32.86				5	181	394.3	29.3	-14.76	37	0	385	385	77	4625	921	1.0	**5.13**
6/11/21	12:41	33.43				5	186	401.2	22.4	-6.84	26	0	179	179	36	2143	650	1.0	**3.37**
6/11/21	12:46	33.85				5	191	406.2	17.4	-5.04	20	0	132	132	26	1579	500	1.0	**3.22**
6/11/21	12:51	34.25				5	196	411.0	12.6	-4.8	15	0	125	125	25	1504	377	1.0	**4.08**
6/11/21																			
6/11/21	12:53	27.18			Refilled		198	326.2	97.4										
6/11/21	12:59	30.05				6	204	360.6	63.0	-34.44	80	0	899	899	150	8993	2015	1.0	**4.56**
6/11/21	13:04	31.76				5	209	381.1	42.5	-20.52	53	0	536	536	107	6430	1325	1.0	**4.96**
6/11/21	13:09	31.85				5	214	382.2	41.4	-1.08	42	0	28	28	6	338	1054	1.0	**0.33**
6/11/21	13:14	32.31				5	219	387.7	35.9	-5.52	39	0	144	144	29	1730	971	1.0	**1.82**
6/11/21	13:19	32.54				5	224	390.5	33.1	-2.76	34	0	72	72	14	865	867	1.0	**1.02**
6/11/21	13:24	32.6				5	229	391.2	32.4	-0.72	33	0	19	19	4	226	823	1.0	**0.28**
6/11/21	13:29	32.73				5	234	392.8	30.8	-1.56	32	0	41	41	8	489	794	1.0	**0.63**
6/11/21	13:34	33.39				5	239	400.7	22.9	-7.92	27	0	207	207	41	2482	675	1.0	**3.75**
6/11/21	13:39	33.61				5	244	403.3	20.3	-2.64	22	0	69	69	14	827	543	1.0	**1.56**
6/11/21	13:44	33.78				5	249	405.4	18.2	-2.04	19	0	53	53	11	639	484	1.0	**1.35**
6/11/21	13:49	34.05				5	254	408.6	15.0	-3.24	17	0	85	85	17	1015	417	1.0	**2.48**
6/11/21																			
6/11/21	13:55	28.51					260	342.1	81.5										
6/11/21	14:00	29.88				5	265	358.6	65.0	-16.44	73	0	429	429	86	5151	1840	1.0	**2.86**
6/11/21	14:05	30.93				5	270	371.2	52.4	-12.6	59	0	329	329	66	3948	1476	1.0	**2.73**
6/11/21	14:10	31.81				5	275	381.7	41.9	-10.56	47	0	276	276	55	3309	1185	1.0	**2.85**
6/11/21	14:15	32.51				5	280	390.1	33.5	-8.4	38	0	219	219	44	2632	947	1.0	**2.84**
6/11/21	14:20	32.72				5	285	392.6	31.0	-2.52	32	0	66	66	13	790	809	1.0	**1.00**
6/11/21	14:25	32.95				5	290	395.4	28.2	-2.76	30	0	72	72	14	865	743	1.0	**1.19**
6/11/21	14:30	33.22				5	295	398.6	25.0	-3.24	27	0	85	85	17	1015	668	1.0	**1.55**
6/11/21																			
6/11/21	14:35	25.01					300	300.1	123.5										
6/11/21	14:40	27.62				5	305	331.4	92.2	-31.32	108	0	818	818	164	9814	2708	1.0	**3.70**
6/11/21	14:45	29.85				5	310	358.2	65.4	-26.76	79	0	699	699	140	8385	1979	1.0	**4.33**
6/11/21	14:50	31.04				5	315	372.5	51.1	-14.28	58	0	373	373	75	4474	1463	1.0	**3.12**
6/11/21	14:55	31.82				5	320	381.8	41.8	-9.36	46	0	244	244	49	2933	1167	1.0	**2.57**
6/11/21	15:00	32.46				5	325	389.5	34.1	-7.68	38	0	201	201	40	2406	953	1.0	**2.58**
6/11/21	15:05	32.67				5	330	392.0	31.6	-2.52	33	0	66	66	13	790	824	1.0	**0.98**
6/11/21	15:10	32.69				5	335	392.3	31.3	-0.24	31	0	6	6	1	75	790	1.0	**0.10**
6/11/21	15:15	32.72				5	340	392.6	31.0	-0.36	31	0	9	9	2	113	782	1.0	**0.15**
6/11/21	15:20	32.74				5	345	392.9	30.7	-0.24	31	0	6	6	1	75	775	1.0	**0.10**

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Leighton

Project Name:	Yorba Villas Infiltration	Tested By:	S. Felter	Date:	06/22/21
Project No.:	10557.006	Checked By:	J. Ward	Date:	06/24/21
Boring No.:	LB-1	Depth (feet):	13.5		
Sample No.:	R-1				
Soil Identification:	Gray silty sand (SM)				

		Moisture Content of Total Air - Dry Soil	
Container No.:	923	Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	836.6	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.1	Wt. of Container No.______ (g)	1.0
Dry Wt. of Soil (g)	728.5	Moisture Content (%)	0.0

After Wet Sieve	Container No.	923
	Wt. of Dry Soil + Container (g)	760.2
	Wt. of Container (g)	108.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	652.1

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
1 1/2"	37.5		
1"	25.0		
3/4"	19.0		
1/2"	12.5		
3/8"	9.5		
#4	4.75		
#8	2.36	0.0	100.0
#16	1.18	2.2	99.7
#30	0.600	21.7	97.0
#50	0.300	153.1	79.0
#100	0.150	454.9	37.6
#200	0.075	617.1	15.3
PAN			

GRAVEL: **0 %**

SAND: **85 %**

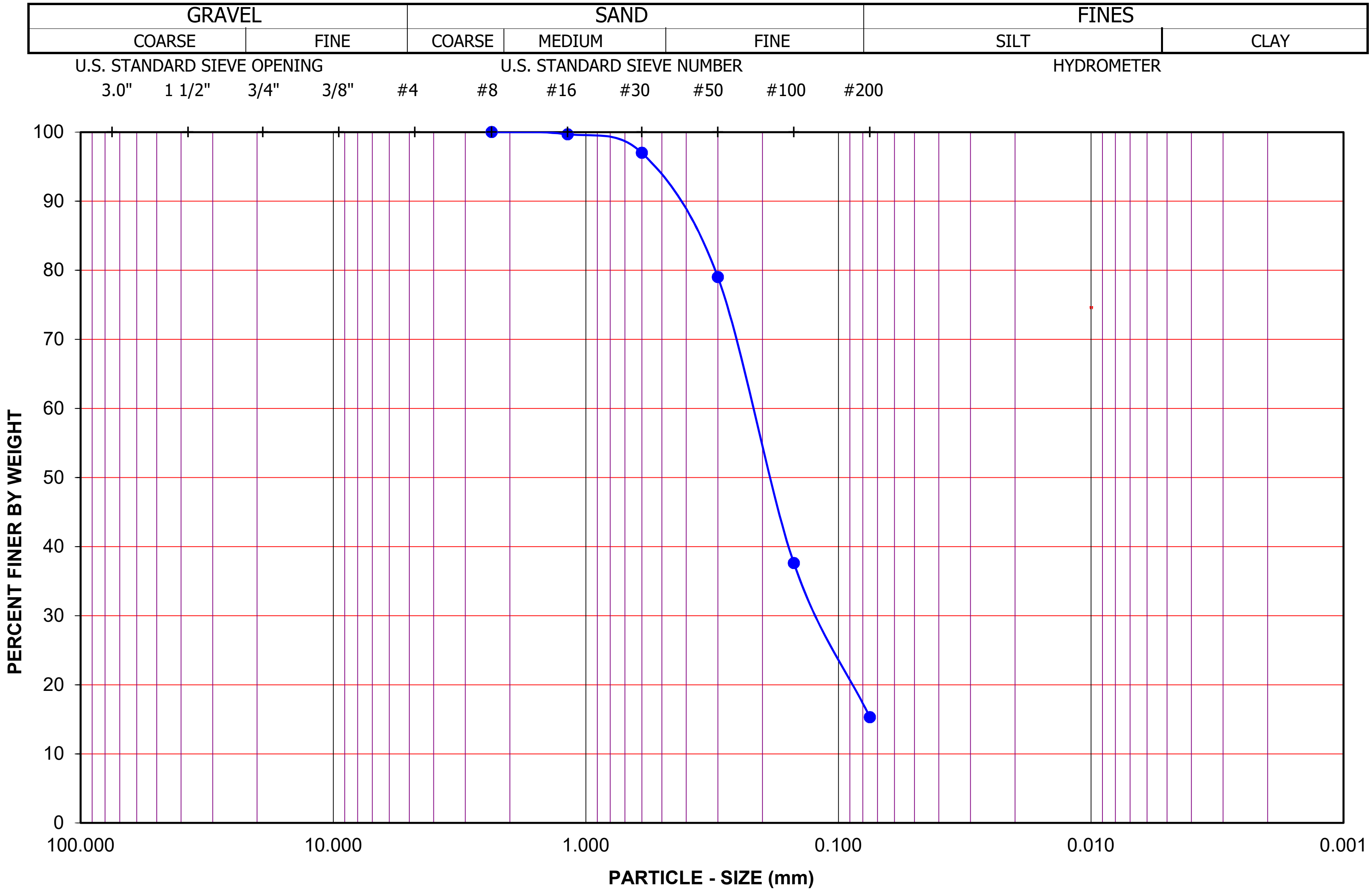
FINES: **15 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = ______

Cc = $(D30)^2/(D60*D10)$ = ______

Remarks:



Project Name: Yorba Villas Infiltration

Project No.: 10557.006

Boring No.: LB-1

Sample No.: R-1

Depth (feet): 13.5

Soil Type : SM

Soil Identification: Gray silty sand (SM)

GR:SA:FI : (%) 0 : 85 : 15

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Jun-21

Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS
ASTM D 6913

Project Name: Yorba Villas Infiltration
Tested By: S. Felter Date: 06/22/21
Project No.: 10557.006
Checked By: J. Ward Date: 06/24/21
Boring No.: LB-2
Depth (feet): 35.0
Sample No.: R-10
Soil Identification: Grayish brown poorly-graded sand with silt and gravel (SP-SM)g

		Moisture Content of Total Air - Dry Soil	
Container No.:	9554	Wt. of Air-Dry Soil + Cont. (g)	0.0
Wt. of Air-Dried Soil + Cont.(g)	946.3	Wt. of Dry Soil + Cont. (g)	0.0
Wt. of Container (g)	108.1	Wt. of Container No.______ (g)	1.0
Dry Wt. of Soil (g)	838.2	Moisture Content (%)	0.0

After Wet Sieve	Container No.	9554
	Wt. of Dry Soil + Container (g)	889.2
	Wt. of Container (g)	108.1
	Dry Wt. of Soil Retained on # 200 Sieve (g)	781.1

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
1 1/2"	37.5	0.0	100.0
1"	25.0	57.8	93.1
3/4"	19.0	112.1	86.6
1/2"	12.5	160.8	80.8
3/8"	9.5	189.3	77.4
#4	4.75	266.5	68.2
#8	2.36	344.0	59.0
#16	1.18	434.3	48.2
#30	0.600	539.4	35.6
#50	0.300	649.8	22.5
#100	0.150	725.1	13.5
#200	0.075	768.4	8.3
PAN			

GRAVEL: **32 %**

SAND: **60 %**

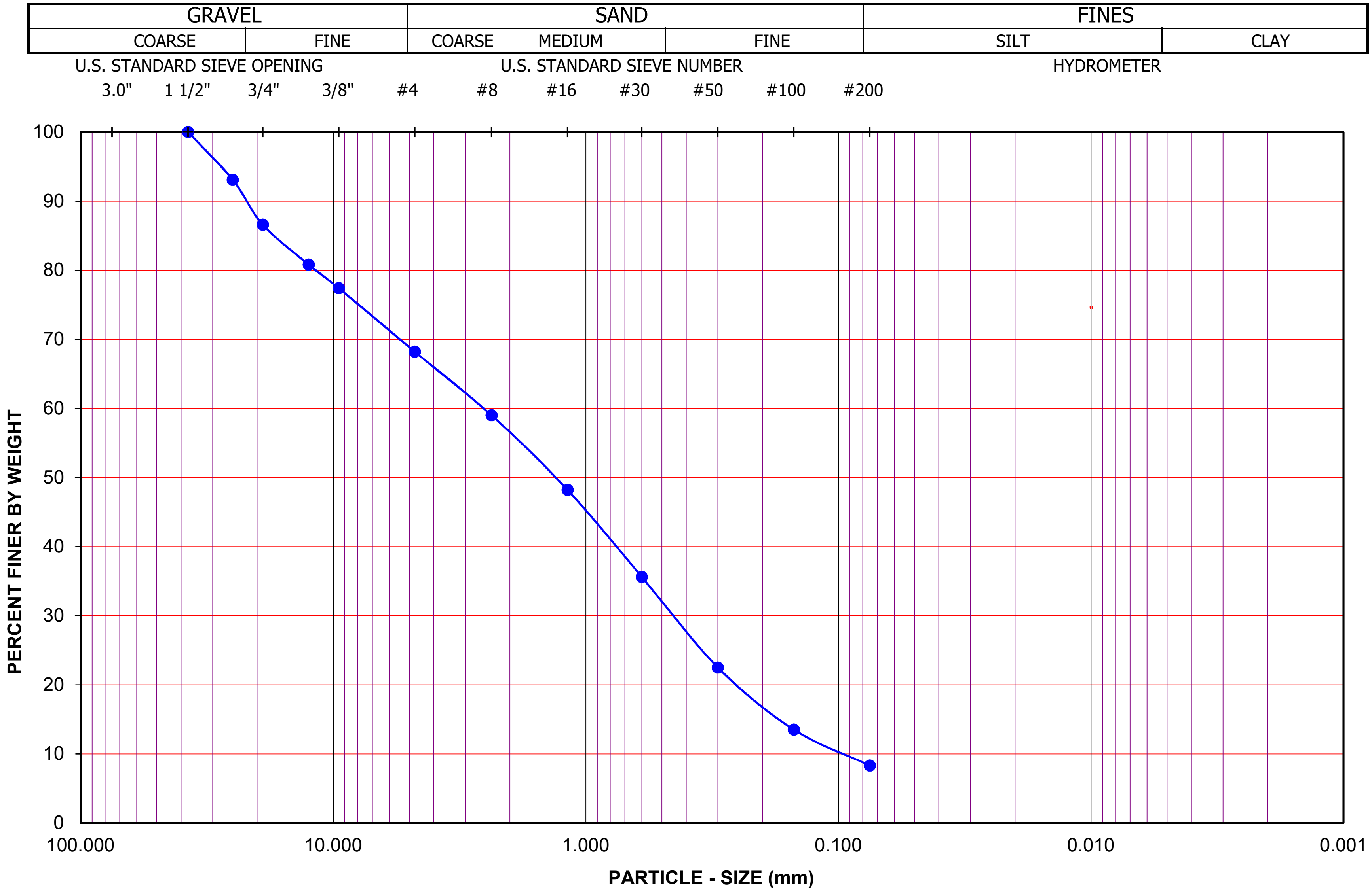
FINES: **8 %**

GROUP SYMBOL: **(SP-SM)g**

Cu = D60/D10 = 26.60

Cc = $(D30)^2/(D60*D10)$ = 0.86

Remarks:



Project Name: Yorba Villas Infiltration

Project No.: 10557.006

Boring No.: LB-2 Sample No.: R-10

Depth (feet): 35.0 Soil Type : (SP-SM)g

Soil Identification: Grayish brown poorly-graded sand with silt and gravel (SP-SM)g

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

GR:SA:FI : (%) 32 : 60 : 8

Jun-21

Boring No.	LB-2	LB-2							
Sample No.	R-9	R-11							
Depth (ft.)	30.0	40.0							
Sample Type	Ring	Ring							
Soil Identification	Brown silty sand (SM)	Brown silty sand (SM)							
Moisture Correction									
Wet Weight of Soil + Container (g)	0.0	0.0							
Dry Weight of Soil + Container (g)	0.0	0.0							
Weight of Container (g)	1.0	1.0							
Moisture Content (%)	0.0	0.0							
Sample Dry Weight Determination									
Weight of Sample + Container (g)	841.3	719.9							
Weight of Container (g)	106.4	107.3							
Weight of Dry Sample (g)	734.9	612.6							
Container No.:									
After Wash									
Method (A or B)	A	A							
Dry Weight of Sample + Cont. (g)	579.5	520.5							
Weight of Container (g)	106.4	107.3							
Dry Weight of Sample (g)	473.1	413.2							
% Passing No. 200 Sieve	**35.6**	**32.5**							
% Retained No. 200 Sieve	64.4	67.5							

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Yorba Villas Infiltration
Project No.: 10557.006
Tested By: S. Felter Date: 06/22/21

Infiltration from Leighton, 2021b (2013 exploration)

General Test Setup Data of Well Permeameter, from USBR 7300-89 Method.

Project: Coastal Commercial Chino, Project No. 10557.004

		Units												
	Exploration #/Location:		LB-1		LB-2		LB-3		LB-4		LB-5			
	Approx. Test Depth (ft):		6		4		6		6		5			
	Date Tested, start/finish:		12/16/2013		12/16/2013		12/16/2013		12/16/2013		12/16/2013			
	Tested by:		JMD		JMD		JMD		JMD		JMD			
	USCS Soil Type:													
	Weather (start to finish)		Warm, clear											
	Liquid Used/pH:		water from garden hose											
	Well Prep:		straight drill, tamp											
a.	Diameter of barrel (in.):		22.5		22.5		22.5		22.5		22.5		22.5	
b.	No. of Supply barrels:		1		1		1		1		1		1	
c.	Measured boring diameter	inches	9.5		9.5		9.5		9.5		10		13	
d.	Approx Depth to groundwater below GS	feet	200		200		200		200		200		200	
	Depths from string line (or top of ex. pavement):													
f.	to ground surface (=0 if no string line used)	ft/in.	0. ft		0. ft		0. ft		0. ft		0. ft			
g.	to Bot of Boring (or top of soil over Bentonite)	ft/in.	6. ft	1. in.	4. ft	3. in.	5. ft	7. in.	5. ft	8. in.	4. ft	10. in.		
i	to Top of Sand (bot of float assbly) (dry)	ft/in.	5. ft	10. in.	4. ft	2. in.	5. ft	4.5 in.	5. ft	5. in.	4. ft	6. in.		
k	to Top of casing after adding water (negative is above string line)	ft/in.	0. ft	-3. in.			0. ft	-0.75 in.			0. ft	-1. in.		
m	Top of Float assembly Rod, when pushed to bottom	ft/in.		34.75 in.				33.5 in.				14.88 in.		
n	top of float assembly rod, floating, water level stable	ft/in.		30.5 in.				25.13 in.				26.5 in.		
p	Float Assembly (choose one)		Long body				Long body				Long body			
q	Float Assembly extension (0=none)	inches	12				12				0			
s	free play in float assembly (water level stablized)	inches	2.5				1.25				2.5			
t	Length of float assembly (=lookup p)	inches	23		#N/A		23		#N/A		23		#N/A	
u	Length of float assembly plus extension (=q+t)	inches	35		#N/A		35		#N/A		23		#N/A	
v	**Ht from water surface to top of float rod (=lookup p)**	inches	16.75		#N/A		16.75		#N/A		16.75		#N/A	
w	range of float movement (=lookup p)	inches	6.75		#N/A		6.75		#N/A		6.75		#N/A	
x	Depth to Water Surface (=n+v)		47.3	in.	#N/A	in.	41.9	in.	#N/A	in.	43.3	in.	#N/A	in.
h	**Depth of water in Well, "h" (=g-x)**		**25.8 in=**	2.15 ft	**#N/A**	#N/A	**25.1 in=**	2.09 ft	**#N/A**	#N/A	**14.8 in=**	1.23 ft	**#N/A**	#N/A
y	Total Area of barrels (in.^2):		397		397		397		397		397		397	
r	**Well Radius, "r" (=c/2)**		**4.8**	in.	**4.8**	in.	**4.8**	in.	**4.8**	in.	**5.0**	in.	**6.5**	in.

Results of Well Permeameter Test, from USBR 7300-89 Method.

Project: Coastal Commercial Chino, Project No. 10557.004

Leighton

Exploration #/Location: ***LB-1***

Initial Depth to top of float rod (in.) 30.5

Field Data / **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed)		Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																
12/16/2013	12:52:00 PM		**ft**	**in.**													
12/16/13	12:52	29.25			**74**			25.75	5.4	0					0.9		
12/16/13	12:53	28						25.75	5.4	0	1	497	497	29805	0.9	10.01	**14.65**
12/16/13	12:54	27						25.75	5.4	0	1	397	397	23844	0.9	8.00	**11.72**
12/16/13	12:55	26.625						25.75	5.4	0	1	149	149	8942	0.9	3.00	**4.39**
12/16/13	12:57	25.875						25.75	5.4	0	2	298	149	8942	0.9	3.00	**4.39**
12/16/13	13:05	20.25						25.75	5.4	0	8	2235	279	16766	0.9	5.63	**8.24**
12/16/13	13:23	10.75			76			25.75	5.4	0	18	3775	210	12585	0.9	4.11	**6.02**
										0							
12/16/13	13:27	31.125			76			25.75	5.4	0					0.9		
12/16/13	13:49	20.25						25.75	5.4	0	22	4322	196	11787	0.9	3.85	**5.64**
12/16/13	14:01	14.25			77			25.75	5.4	0	12	2384	199	11922	0.9	3.85	**5.63**
										0							
12/16/13	14:06	31.375			77			25.75	5.4	0					0.9		
12/16/13	14:37	18.5			77			25.75	5.4	0	31	5117	165	9903	0.9	3.20	**4.68**
12/16/13	15:07	7.25			77			25.75	5.4	0	30	4471	149	8942	0.9	2.89	**4.22**
12/16/13	15:20	3						25.75	5.4	0	13	1689	130	7795	0.9	2.52	**3.68**
										0							

Results of Well Permeameter Test, from USBR 7300-89 Method.

Leighton

Project: **Coastal Commercial Chino, Project No. 10557.004**

Exploration #/Location: ***LB-3***

Initial Depth to top of float rod (in.) 25.125

Field Data | **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed)		Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	Cumulative Vol (gal)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:		**ft**	**in.**														
12/16/2013	10:25:00 AM																	
12/16/13	10:25	30.25			**69**			25.125	5.3	0					0	1.0		
12/16/13	11:04	28.375			74			25.125	5.3		39	745	19	1146		0.9	0.40	**0.58**
12/16/13	11:35	27.375			77			25.125	5.3		31	397	13	769		0.9	0.26	**0.37**
12/16/13	12:27	25.75			79			25.125	5.3		52	646	12	745		0.8	0.24	**0.35**
12/16/13	13:09	24.5			81			25.125	5.3		42	497	12	710		0.8	0.23	**0.33**
12/16/13	13:53	23.25			81			25.125	5.3		44	497	11	677		0.8	0.22	**0.31**
12/16/13	14:49	20.75			82			25.125	5.3		56	994	18	1064		0.8	0.34	**0.49**
12/16/13	15:45	19.125			83			25.125	5.3		56	646	12	692		0.8	0.22	**0.31**

Results of Well Permeameter Test, from USBR 7300-89 Method.

Project: **Coastal Commercial Chino, Project No. 10557.004**

Leighton

Exploration #/Location: ***LB-5***

Initial Depth to top of float rod (in.) 26.5

Field Data | **Calculations**

Date (and comments)	Time	**Water Level in Supply Barrel (in.)**	Depth to top of float rod (when changed) ft	in.	Water Temp in Barrel (deg F)	DL Interpre-tation? ("Y")	DL -- Head of Water in Barrel (in.)	h, Height of Water in Well (in.)	h/r	Total Elapsed Time (minutes)	Δt (min)	Vol Change (in.^3)	Flow (in^3/min)	q, Flow (in^3/hr)	Cumulative Vol (gal)	V (Fig 9)	K20, Coef. Of Permeability at 20 deg C (in./hr)	**Infiltration Rate [flow/surf area] (in./hr) (FS=1)**
Start Date	Start time:																	
12/16/2013	2:25:00 PM																	
12/16/13	14:25	31			**77**			14.75	3.0	0					0	0.9		
12/16/13	14:26	30						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:27	29.125						14.75	3.0		1	348	348	20864		0.9	14.29	**15.53**
12/16/13	14:28	28.125						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:29	27.25						14.75	3.0		1	348	348	20864		0.9	14.29	**15.53**
12/16/13	14:30	26.25						14.75	3.0		1	397	397	23844		0.9	16.33	**17.75**
12/16/13	14:32	24.375						14.75	3.0		2	745	373	22354		0.9	15.31	**16.64**
12/16/13	14:42	15.375			77			14.75	3.0		10	3577	358	21460		0.9	14.70	**15.97**
12/16/13	14:53	6						14.75	3.0		11	3726	339	20322		0.9	13.92	**15.13**
12/16/13	15:01	25.125			79			14.75	3.0							0.8		
12/16/13	15:02	24.5						14.75	3.0		1	248	248	14903		0.8	9.96	**10.82**
12/16/13	15:24	7.75			79			14.75	3.0	0	22	6657	303	18154	0	0.8	12.13	**13.18**
12/16/13	15:31	2.375						14.75	3.0	0	7	2136	305	18309	0	0.8	12.23	**13.30**
										0					0			

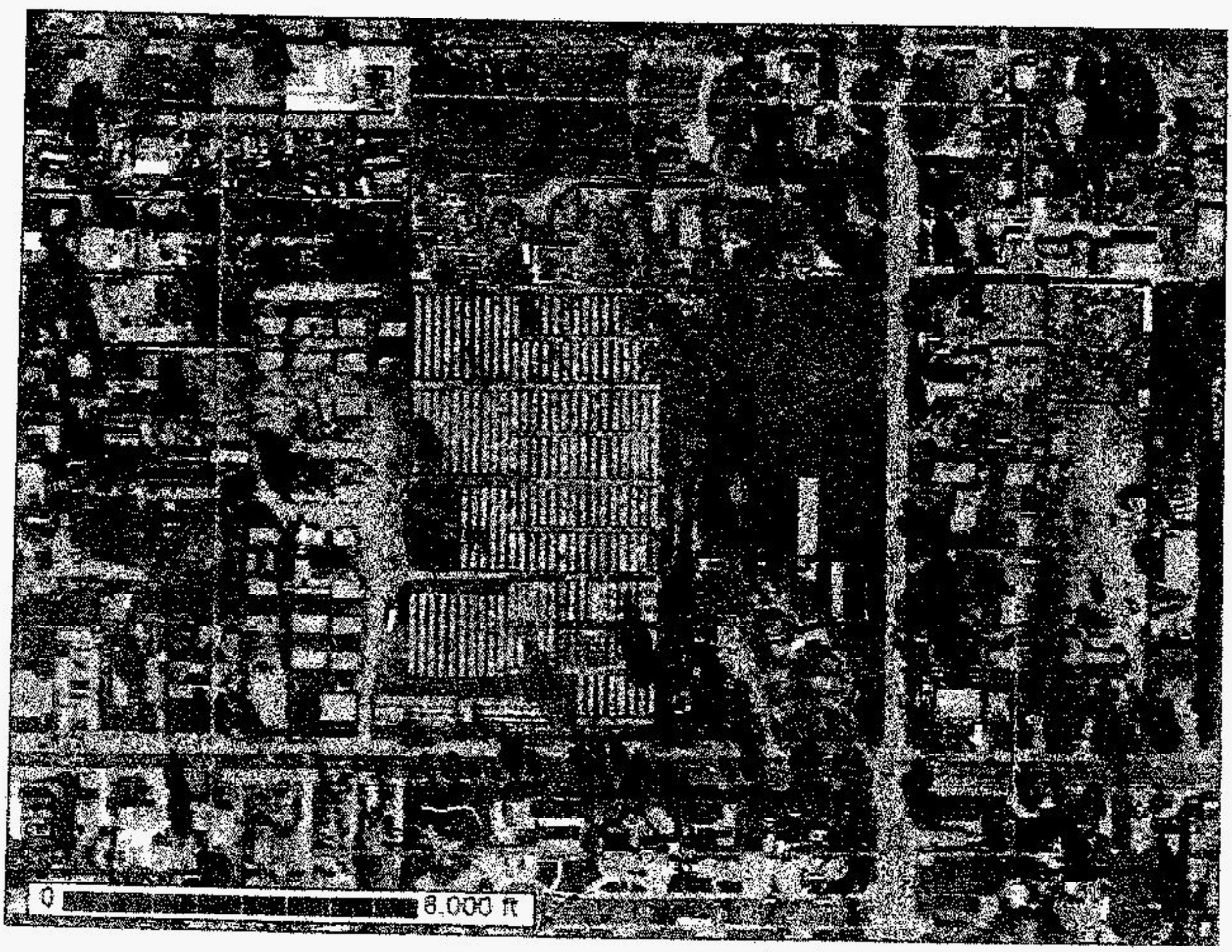
USDA United States Department of Agriculture

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 Southwestern Part, California



October 21, 2016

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 (http://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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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.

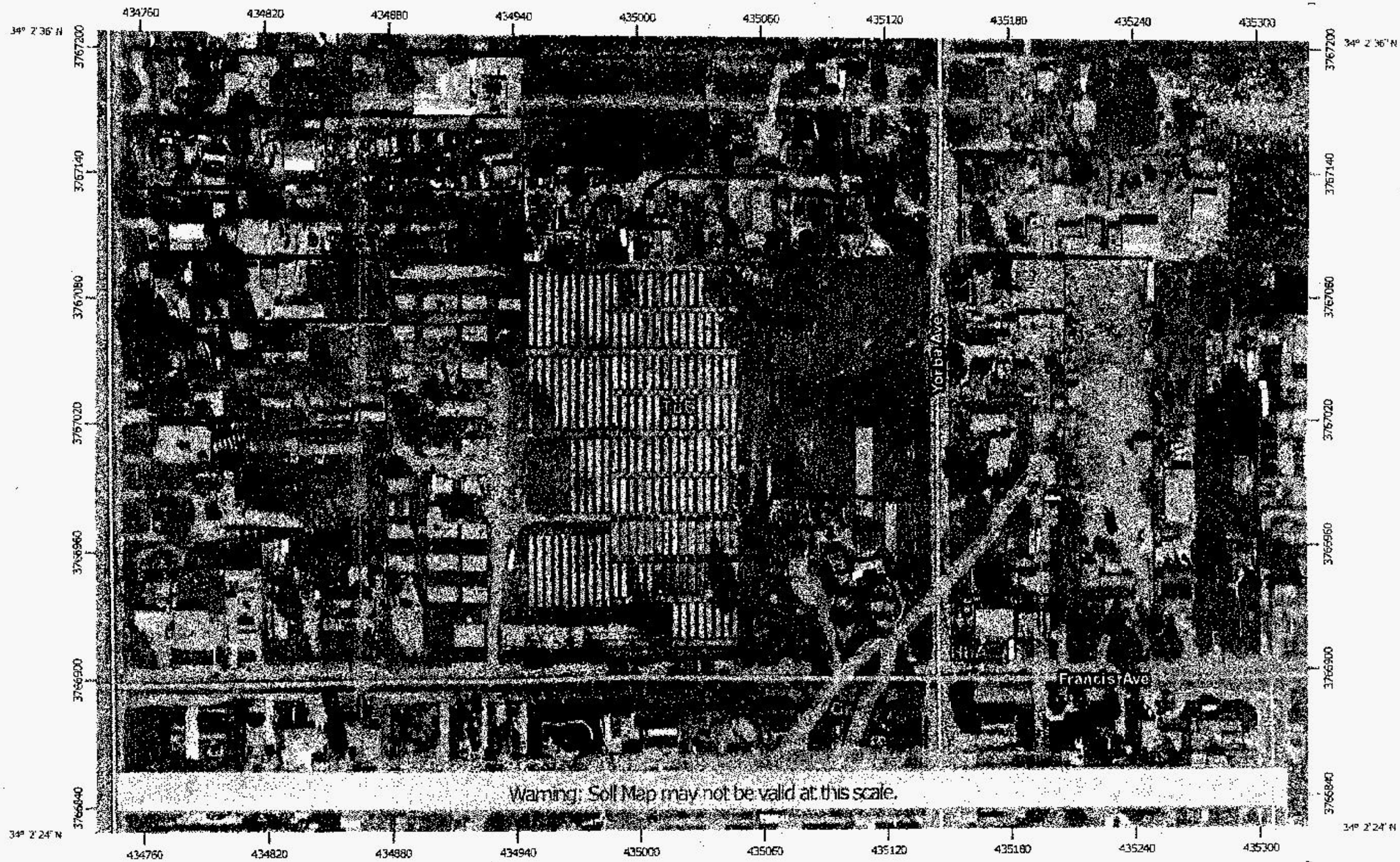
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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



Map Scale: 1:2,680 if printed on A landscape (11" x 8.5") 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: http://websoilsurvey.nrcs.usda.gov
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 Southwestern Part, California
Survey Area Data: Version 7, Sep 3, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 5, 2015—Jan 18, 2015

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

San Bernardino County Southwestern Part, California (CA677)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Gr	Grangeville fine sandy loam	0.3	1.1%
HbA	Hanford sandy loam, 0 to 2 percent slopes	1.8	7.1%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	23.6	91.8%
Totals for Area of Interest		**25.7**	**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 Southwestern Part, California

Gr—Grangeville fine sandy loam

Map Unit Setting

National map unit symbol: hcjy
Elevation: 0 to 1,800 feet
Mean annual precipitation: 7 to 16 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Grangeville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grangeville

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

Typical profile

H1 - 0 to 12 inches: fine sandy loam
H2 - 12 to 60 inches: sandy loam, fine sandy loam, loam
H2 - 12 to 60 inches:
H2 - 12 to 60 inches:

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Available water storage in profile: Very high (about 21.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent

Landform: Depressions
Hydric soil rating: Yes

San emigdio, fine sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Chino
Percent of map unit: 5 percent
Hydric soil rating: No

HbA—Hanford sandy loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: hck5
Elevation: 150 to 900 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

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

Typical profile
H1 - 0 to 12 inches: sandy loam
H2 - 12 to 60 inches: fine sandy loam, sandy loam, coarse sandy loam
H2 - 12 to 60 inches:
H2 - 12 to 60 inches:

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None

Available water storage in profile: Very high (about 20.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Greenfield, sandy loam

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford, steeper slopes

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

TuB—Tujunga loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hcl1
Elevation: 10 to 2,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga, Loamy Sand

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 6 inches: loamy sand
C1 - 6 to 18 inches: loamy sand
C2 - 18 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
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: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Tujunga, gravelly loamy sand

Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hanford, sandy loam

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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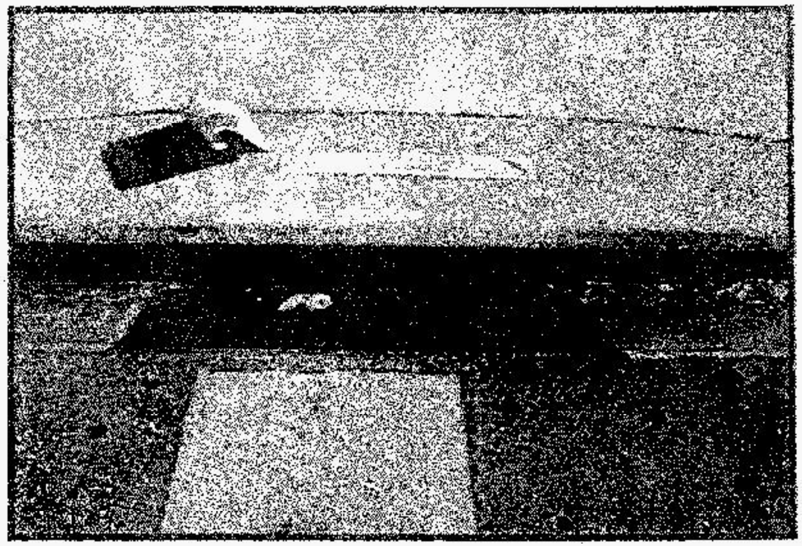
Storm Drain Signage SD-13



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.

Infiltration Basin TC-11

Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Targeted Constituents

☑	Sediment	■
☑	Nutrients	■
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

Advantages

- Provides 100% reduction in the load discharged to surface waters.

- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a

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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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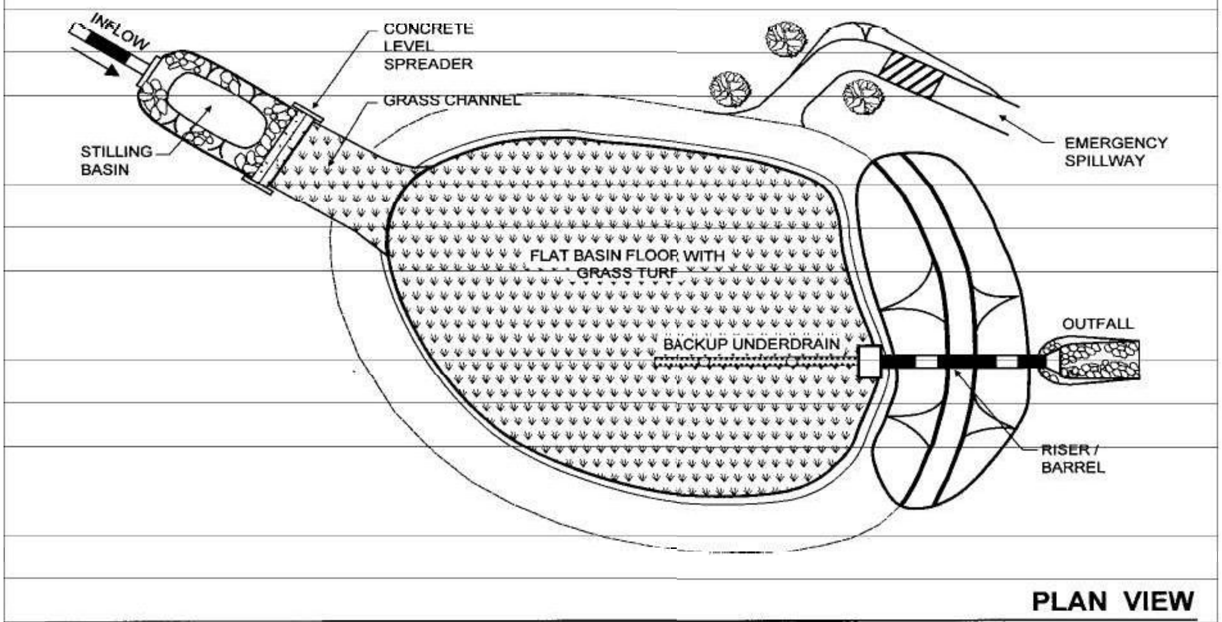
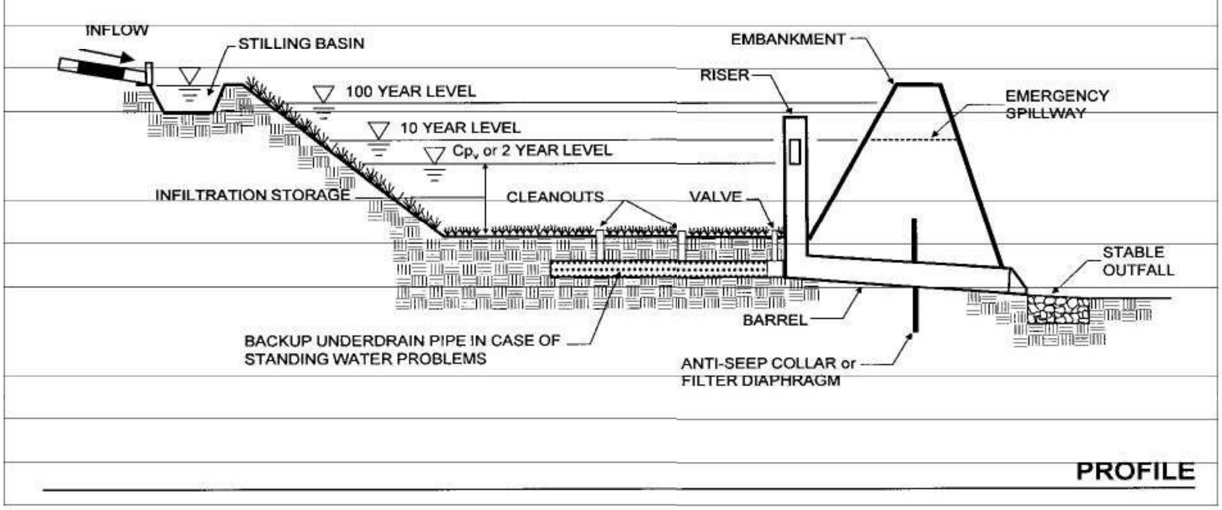

INFLOW
CONCRETE LEVEL SPREADER
GRASS CHANNEL
STILLING BASIN
EMERGENCY SPILLWAY
FLAT BASIN FLOOR WITH GRASS TURF
OUTFALL
BACKUP UNDERDRAIN
RISER / BARREL
PLAN VIEW


INFLOW
STILLING BASIN
EMBANKMENT
RISER
100 YEAR LEVEL
EMERGENCY SPILLWAY
10 YEAR LEVEL
Cp$_v$ or 2 YEAR LEVEL
INFILTRATION STORAGE
CLEANOUTS
VALVE
STABLE OUTFALL
BARREL
BACKUP UNDERDRAIN PIPE IN CASE OF STANDING WATER PROBLEMS
ANTI-SEEP COLLAR or FILTER DIAPHRAGM
PROFILE

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

sbcountystormwater.org

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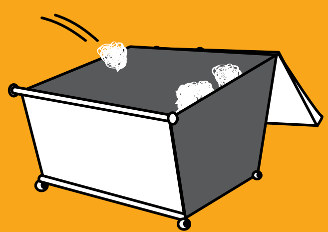
COMMERCIAL TRASH ENCLOSURES

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.**

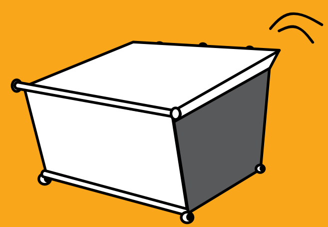
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

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 Bernardino 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 Bernardino • San Bernardino County • San Bernardino 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) 386-8400 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 909-386-8400.

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/ofm/hhw/HouseholdHazardousWaste.aspx
Email: mvangese@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.

In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino 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 Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa

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.

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.

✓ If using a biodegradable or other cleaning agent to remove deposits contain and 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)

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

✓ 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.

EQUIPMENT MAINTENANCE & REPAIR

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

DO YOU HAVE THE FOLLOWING ITEMS IN YOUR HOME?

Automotive Fluids
Batteries
Cooking Oil
Fertilizers & Pesticides
Fluorescent Bulbs
Household Cleaners
Medicine
Motor Oil & Filters
Paint Products
Pool Chemicals

PROTECT YOUR COMMUNITY!
Take your toxic products to a local waste collection center:

Big Bear Lake
Chino
Fontana
Ontario
Rancho Cucamonga
Redlands
Rialto
San Bernardino
Upland

**No business waste accepted. Must be a San Bernardino County resident.*

Find locations and a full list of items, visit
tootoxictotrash.com

SAN BERNARDINO COUNTY STORMWATER PROGRAM
WHERE WATER MEETS COMMUNITY

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 visit TooToxicToTrash.com.

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 TooToxicToTrash.com.

PET WASTE DISPOSAL

» 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

LANDSCAPE MAINTENANCE

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.

MANTENIMIENTO DE JARDINERÍA

LAS DESCARGAS A LOS DESAGUES PLUVIALES, DE MANERA ACCIDENTAL O NO, PUEDEN INDUCIR A LA APLICACIÓN DE MULTAS Y OTRAS MEDIDAS.

Siga las mejores prácticas descritas debajo para evitar la contaminación del agua por actividades de jardinería.

RECICLAJE DE LOS DESECHOS DE JARDÍN

- Reciclar las hojas, recortes de césped y otros desechos de jardín.
- No soplar, barrer, o usar la manguera para empujar los desechos de jardín a la calle.
- **Poner a prueba el reciclaje de césped (grasscycling): la manera natural de reciclar el césped dejando los recortes sobre el césped cuando son cortados. Para más información, visite la página web: www.calrecycle.ca.gov/organics/grasscycling**

USAR FERTILIZANTES, HERBICIDAS Y PESTICIDAS DE MANERA SEGURA

- Los fertilizantes, herbicidas y pesticidas son arrastrados con frecuencia hacia el sistema de desagüe pluvial mediante el escurrimiento de los rociadores. Use alternativas naturales no tóxicas siempre que sea posible.
- Si tiene que usar fertilizantes, herbicidas o pesticidas químicos:
  Aplicar solo en el sitio necesario, en lugar de cubrir todas las áreas.
  Evitar aplicar cerca de los bordillos y las calzadas, y nunca antes de que llueva.
  Aplicar los fertilizantes cuando sea necesario: esto es, cuando las plantas mejor podrían usarlo y el posible escurrimiento sea bajo.
  Seguir las instrucciones del fabricante cuidadosamente – esto no solo le proporcionará los mejores resultados, pero le permitirá ahorrar dinero.

USAR EL AGUA DE MANERA PRUDENTE

- Controlar la cantidad de agua y la orientación de los rociadores. Los rociadores deben ser **solo lo suficientemente largos como para** permitir que el agua remoje el suelo, pero no tan largos que causen un escurrimiento.
- Inspeccione, repare los escapes y alinee los aspersores periódicamente.
- Siembre plantas nativas para reducir el uso de agua, fertilizantes, herbicidas y pesticidas.

PROPIETARIOS DE HOGARES

Tengan en cuenta estos consejos cuando contraten a paisajistas profesionales y recuérdenselos según sea necesario.

Los sobrantes de pesticidas, fertilizantes y herbicidas contaminan los vertederos y deben ser desechados a través de Plantas de Tratamiento para Residuos Peligrosos.

Para más información sobre el manejo adecuado de residuos peligrosos, llame a **(909) 382-5401 o 1-800-OILY CAT.**

*GRATIS únicamente para los residentes del Condado de San Bernardino. Las empresas pueden llamar para indagar sobre los costos y concertar una cita

Para denunciar el vertido ilegal de basura, llame al (877) WASTE18 o visite sbcountystormwater.org
Para denunciar derrames tóxicos, llame al 1(800) 33 TOXIC
Para desechar residuos peligrosos, llame al 1(800) OILY CAT

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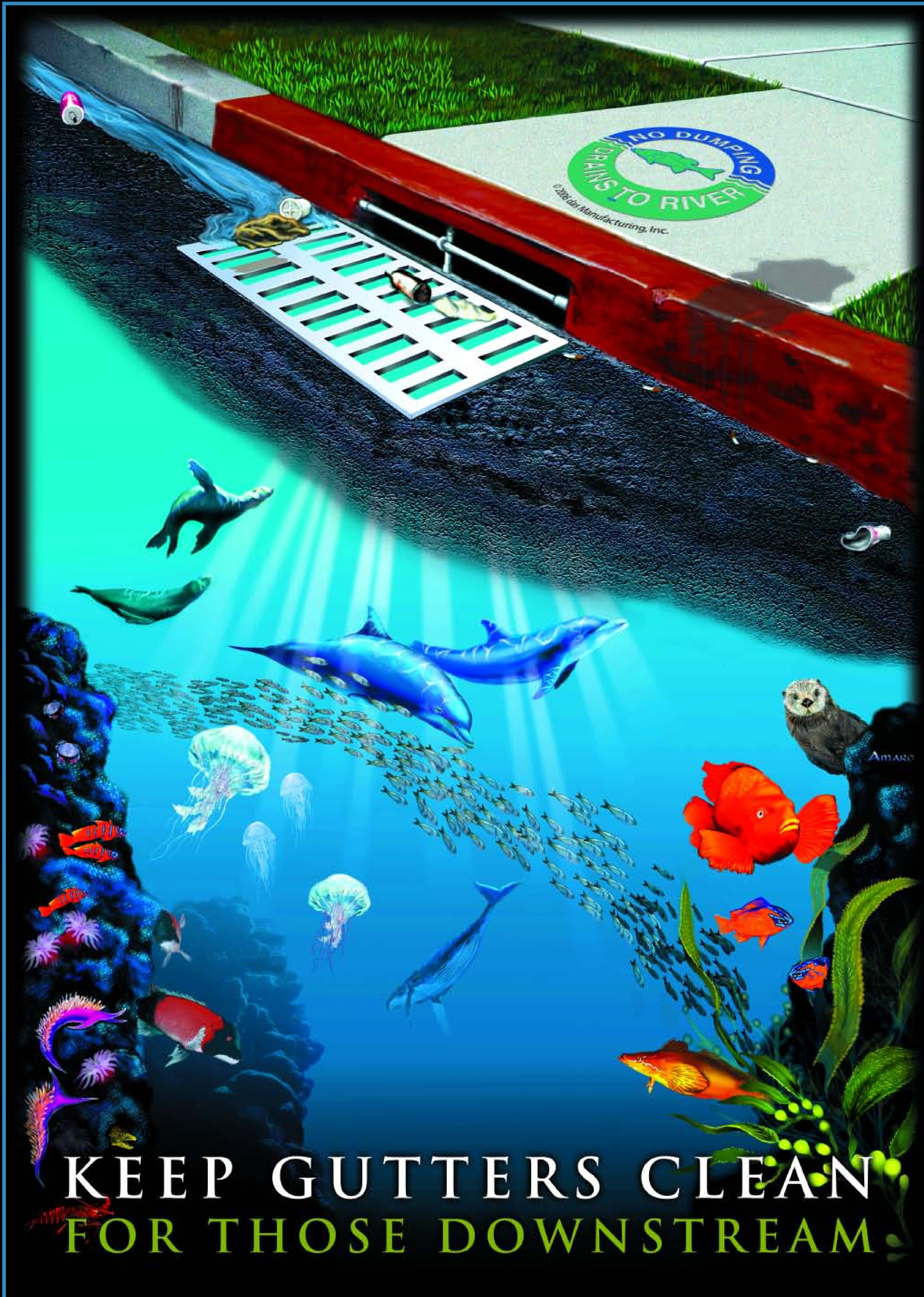
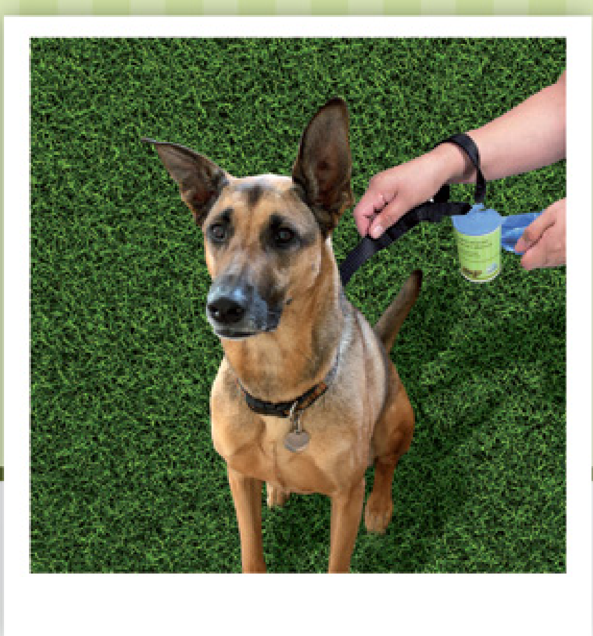


FOR MORE INFORMATION ON PREVENTING STORMWATER POLLUTION

CALL 1(800) CLEANUP OR VISIT WWW.SBCOUNTY.GOV/STORMWATER

The San Bernardino County Stormwater Program is a cooperative effort including the Flood Control District, the County of San Bernardino, and the cities of Big Bear Lake, Chino, Chino Hills, Colton, Fontana, Grand Terrace, Highland, Loma Linda, Montclair, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino, Upland, and Yucaipa.



For more information about current campaigns visit **sbcountystormwater.org/dog**

facebook.com/sbcountystormwater

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PICK UP After Your Pet!

Protect the health of your pet and the environment

San Bernardino County Stormwater Program

WHY IT MATTERS

PROTECT
YOUR FAMILY AND YOUR PET

- Dog waste can infect children and adults with disease-causing bacteria and parasites.
- Your dog can get infected from the waste of other dogs.

PROTECT
OUR ENVIRONMENT

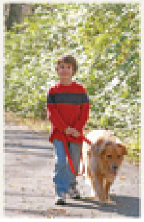
Leaving dog waste on the streets or on your property can have a negative impact on water quality. Pet waste that's not disposed of properly flows untreated through the storm drain system and directly into our local water bodies. Pet waste is a pollutant that contains nutrients, parasites and bacteria that can affect the quality of our rivers and the ocean and make the water unsafe for swimming, drinking or fishing.

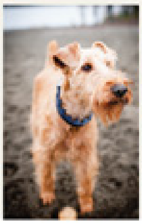
BAG IT AND TRASH IT

It's that simple to protect our health and the environment!

- Keep a supply of bags near your dog leash or tie them to the leash
- Use a poop scooper
- Bring several plastic bags with you
- Reuse plastic grocery bags or purchase special doggie waste bags at pet supplies stores
- Make sure your pet's waste gets into a trash can

Encourage your neighbors and other pet owners to do the right thing and pick up after their pets.






Si desea más información, visite
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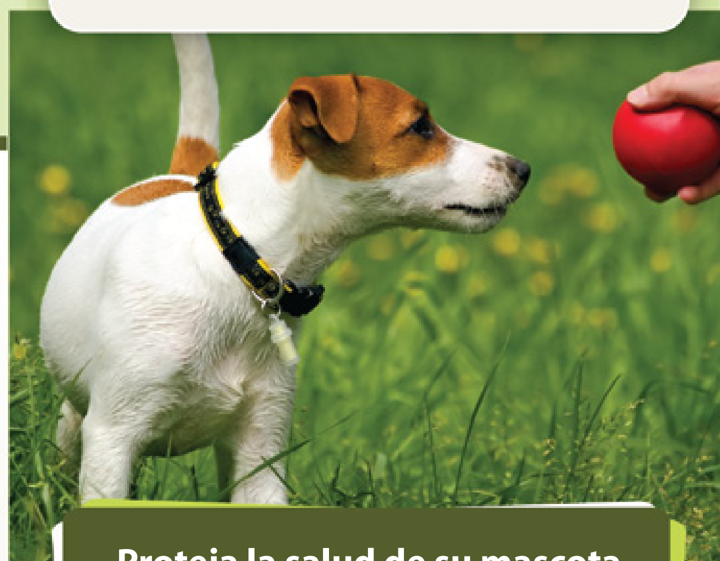
¡RECOJA los desechos de sus mascotas!



Proteja la salud de su mascota y el medio ambiente

San Bernardino County Stormwater Program

POR QUÉ ES IMPORTANTE

PROTEJA
A SU FAMILIA Y A SU MASCOTA

- Los desechos de los perros pueden infectar a niños y adultos con enfermedades causadas por bacterias y parásitos.
- Su perro puede contraer una infección de los desechos de otros perros.

PROTEJA
EL MEDIO AMBIENTE

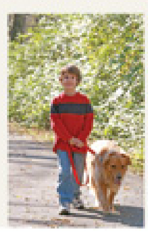
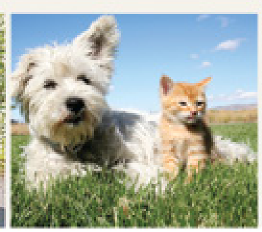
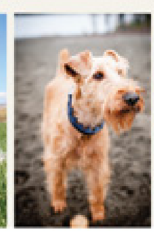
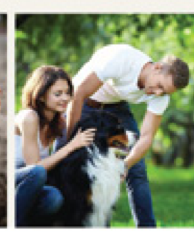
Dejar desechos de perros en la calle o en su propiedad puede tener un impacto negativo en la calidad del agua. Los desechos de mascotas que no se eliminan de la propiedad fluyen sin tratamiento por el sistema de drenaje de tormentas y llegan directamente a las masas de agua locales. Los desechos de mascotas son agentes contaminantes que contienen nutrientes, parásitos y bacterias que pueden afectar la calidad de nuestros ríos y océanos, y hacer que el agua no sea segura para nadar, beber o pescar.

COLÓQUELA EN UNA BOLSA Y TÍRELA EN LA BASURA

Así de simple es proteger nuestra salud y el medio ambiente.

- Guarde algunas bolsas cerca de la correa de su perro o átelas a la correa;
- Use una cuchara para recojer el desecho;
- Lleve varias bolsas plásticas;
- Reutilice bolsas plásticas de comestibles o compre bolsas especiales para desechos de perros en las tiendas para mascotas;
- Asegúrese de tirar los desechos de su perro en un cesto de basura.

Aliente a sus vecinos y otros dueños de mascotas a hacer lo correcto y levantar los desechos de sus mascotas.

Mobile vehicle maintenance

Wash in a designated area that has been bermed up to contain the wash water.

Common water control devices are: recycling systems; pretreatment or sewer discharge systems; limited recycling systems; wash pits(portable vinyl wash pads), vacuum sludge filtering systems; wet-dry vacuums, sump pumps; drain covers; portable dams; vacu-brooms; oil absorbent pads, booms, pillows, and tubes; plastic sheeting; filter tubs; buckets; pans; and squeegees.

When cleaning engines using chemical additives like soaps, solvents or degreasers, the cleaning must be performed at a facility that has the equipment to properly process the contaminated wastewater runoff, or using a leak-proof ground cover device that will catch and contain all contaminated wastewater runoff for later disposal in a manner that complies with city, county, state and federal codes.

Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer

WASH YOUR CAR THE ECO-FRIENDLY WAY!

When possible, wash in a professional car wash.

1. **Locate** the nearest storm drain and ensure that wash water does not flow into it.

2. **Wash** in a contained area or on grass*, gravel or other permeable surface. Dispose of excess soapy water into the sanitary sewer *(ie. sink or toilet)* or onto grass.

3. **Use** eco-friendly cleaning products (*non-toxic, phosphate free or biodegradable*). Use as little soap as possible and wipe brake dust off tires with a rag before washing.

4. **Conserve** water by using a high pressure hose and turn off the water when not in use.

**Some local ordinances may not allow a car to be parked on the front lawn. Check with your City's Building and Code department if you are unsure.*

How Does Eco Car Washing Help Local Waterways?

When excess wash water travels through the street it has the potential to pick up oil, grease and other chemicals along the way before it ends up in the curb, gutter and the storm drain system. **This contaminated water then travels to our creeks and the Santa Ana River making it unsafe for people and wildlife**.

To report illegal dumping, call **(877) WASTE18** or visit **sbcountystormwater.org**
To find a Hazardous Waste Facility, call **(800) OILY CAT**

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¡LAVE SU AUTO DE MANERA ECOLÓGICA!

Cuando sea posible, lávelo en un lavadero profesional de autos.

1. **Ubique** el desagüe pluvial más cercano y asegúrese de que nada pueda entrar en él o que pueda descargarse allí.

2. **Lave** su auto sobre el cesped, grava u otras superficies permeables. Elimine el exceso de agua jabonosa en un drenaje sanitario *(por ejemplo, lavamanos o inodoro)* o en el césped.

3. **Use** productos de limpieza ecológicos *(no tóxicos, sin fosfato o biodegradables)*. Use la menor cantidad de jabón posible y limpie el polvo de frenos de los neumáticos con un trapo antes de lavar.

4. **Conserve** agua usando una manguera de alta presión y cierre el agua cuando no la use.

** Es posible que algunas ordenanzas locales no permitan estacionar sobre el césped en el frente de la casa. Consulte con el departamento de Código Urbano y Edificación de su ciudad si no está seguro.*

¿De qué Manera el Lavado de Autos Ecológico Ayuda a Proteger los Canales Fluviales Locales?

Cuando el exceso de agua de lavado viaja por la calle, es posible que recoja aceite, grasa y otros elementos químicos en el camino antes de que llegue en el desagüe pluvial y el sistema de la boca de tormenta. **Esa agua contaminada luego viaja hacia nuestros arroyos y al Río Santa Ana, haciendo que sea inseguro para la gente y los animales.**

Para reportar actividades ilegales, llame a **(877) WASTE18** o visite **sbcountystormwater.org**. Para encontrar un establecimiento de Desechos Peligrosos, llame al **(800) OILY CAT**

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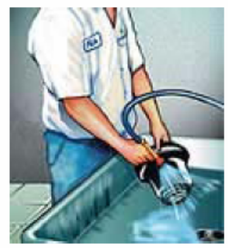
Automotive services

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, protect public health and avoid fines or legal action.

- **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.
- **Proper Disposal of Hazardous Waste**: Recycle used motor oil and oil filters, anti-freeze and other hazardous automotive fluids, batteries, tires and metal filings collected from grinding/polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call (909) 386-8401.



- **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 sink or the fluid holding tank. Do not wash parts or equipment in a parking lot, driveway or street.
- **Preventing Leaks and Spills:** Place drip pans underneath to capture fluids. Use absorbent cleaning agents instead of water to clean work areas.
- **Metal Grinding & Polishing:** Keep a bin under your lathe or grinder to capture metal filings. Send uncontaminated filings to a scrap metal recycler for reclamation. Store metal filings in a covered container or indoors.
- **Cleaning Spills:** Follow your hazardous materials response plan, as filed with your local fire department or other hazardous materials authority. Be sure that all employees are aware of the plan and are capable of implementing each phase of the plan. Use dry methods for spill cleanup (sweeping, absorbent materials, etc.). To report serious spills, call 911.
- **Washing vehicles:** Wash vehicles where the wash water can soak into grass, gravel or be diverted to nearby landscaping, away from the street and storm drains. Wash vehicles at a designated wash rack that is connected to the sanitary sewer or take vehicles to a professional car wash. Use soaps, cleaners and detergents that are labeled phosphate free or biodegradable. The safest products for the environment are vegetable based or citrus-based soaps.

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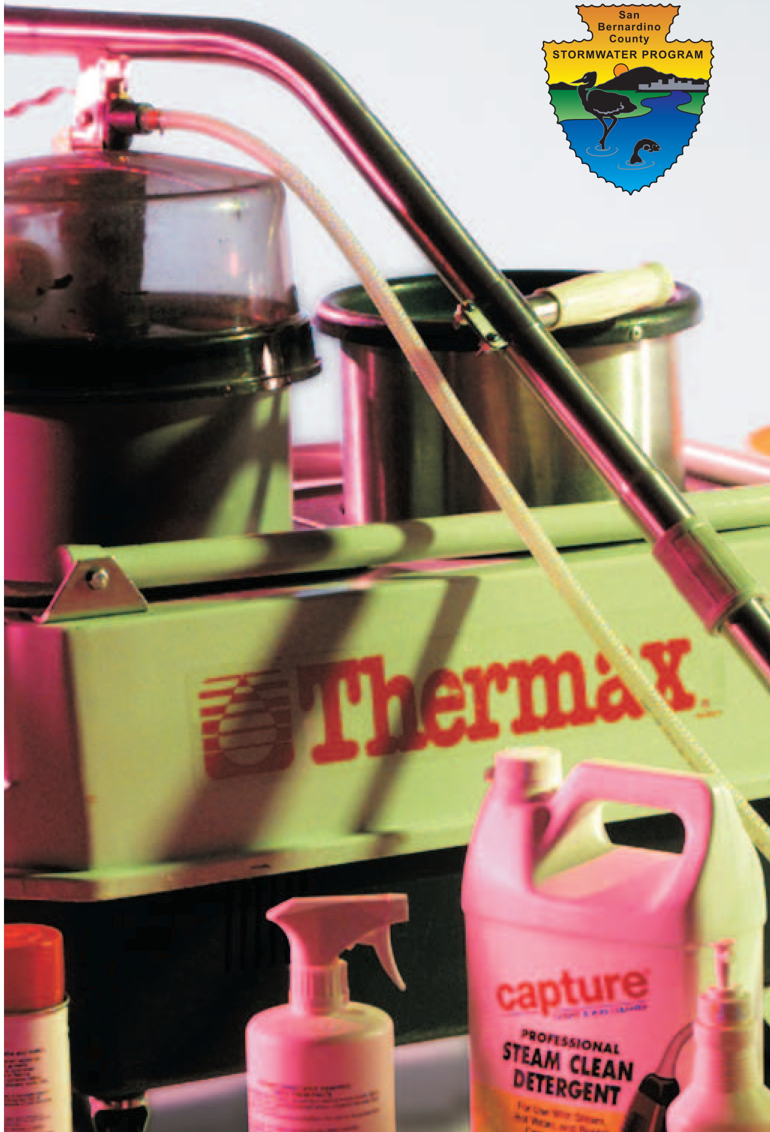
Pollution Prevention

CARPET CLEANING ACTIVITIES



STORMWATER
Pollution Prevention

Stormwater Management Practices for Carpet Cleaning Activities

Toxic chemicals and discharged waste water from carpet, drapery, furniture and window cleaning 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 local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

These guidelines apply even if the cleaning products are labeled "nontoxic" or "biodegradable". Although these products may be less harmful to the environment, they can still have harmful effects if they enter the storm drain untreated.

Dispose of Wastewater Properly

Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer system within sanitary sewer discharge limits, hauled off and disposed of properly, or may be discharged to a pervious area, for example, a lawn area, as long as it does not overflow into the street, gutter, parking lot or storm drain. Wastewater should never be discharged into a street, gutter, parking lot or storm drain.

Filter Wastewater

Carpet cleaning wastewater should be filtered before discharging it to the sanitary sewer since fibers and other debris in the wastewater can clog pipes. The filtered material can be disposed of in the garbage, provided that the waste is not contaminated with hazardous pollutants.

To report illegal dumping call
(877) WASTE18
or visit our website:
sbcountystormwater.org

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Pollution Prevention

LANDSCAPE MAINTENANCE

San Bernardino County STORMWATER PROGRAM

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San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

Stormwater Management Practices for Commercial Landscape Maintenance

Yard waste, sediments, and toxic lawn/garden chemicals used in commercial landscape maintenance 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 local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

Recycle Yard Waste

Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Try grasscycling – the natural recycling of grass by leaving clippings on the lawn when mowing. Grass clippings will quickly decompose, returning valuable nutrients to the soil. Further information can be obtained at www.ciwmb.ca.gov/Organics.

Use Fertilizers, Herbicides and Pesticides Safely

Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use of natural, non-toxic alternatives to the traditional fertilizers, herbicides and pesticides is highly recommended. If you must use chemical fertilizers, herbicides, or pesticides:

- Spot apply pesticides and herbicides, rather than blanketing entire areas.
- Avoid applying near curbs and driveways, and never apply before a rain.
- Apply fertilizers as needed, when plants can best use it, and when the potential for it being carried away by runoff is low.

Recycle Hazardous Waste

Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility, which accepts these types of materials. For information on proper disposal call, (909) 386-8401.

Use Water Wisely

Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should 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.

Prevent Erosion

Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways.

- Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff.
- Avoid excavation or grading during wet weather.

Store Materials Safely

Keep landscaping materials and debris away from the street, gutter and storm drains. On-site stockpiles of materials must be covered with plastic sheeting to protect from rain, wind and runoff.

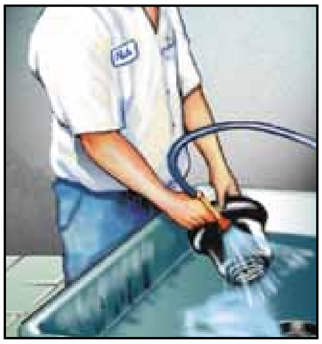
To report illegal dumping call
(877) WASTE18
or visit our website:
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER
Pollution Prevention

AUTO 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.

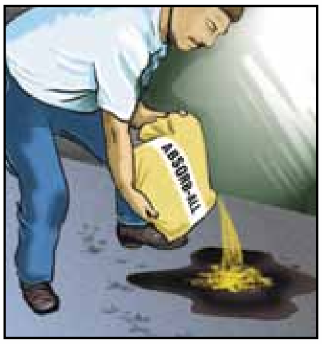


Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a shop sink, parking lot, driveway or street.

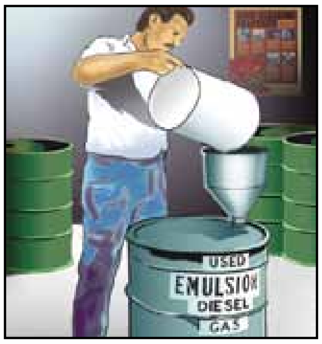
Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Metal Grinding and Polishing
Keep a bin under your lathe or grinder to capture metal filings. Send uncontaminated filings to a scrap metal recycler for reclamation. Store metal filings in a covered container or indoors.

Preventing Leaks and Spills
Place drip pans underneath to capture fluids. Use absorbent cleaning agents instead of water to clean work areas.



Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). Follow your hazardous materials response plan, as filed with your local fire department or other hazardous materials authority. Be sure that all employees are aware of the plan and are capable of implementing each phase. To report serious toxic spills, call 911.



Proper Disposal of Hazardous Waste
Recycle used motor oil and oil filters, anti-freeze and other hazardous automotive fluids, batteries, tires and metal filings collected from grinding or polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call (909) 386-8401.

To report illegal dumping call

(877) WASTE18

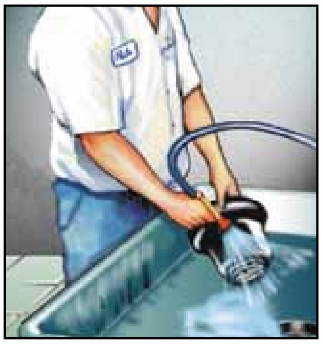
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

MANTENIMIENTO DE AUTO

Aceite, grasa, anti-congelantes y otros liquidos toxicos para el auto acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

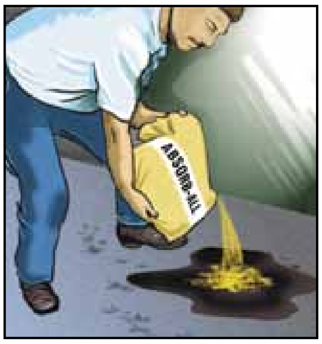


Limpiar Partes De Autos
Limpia las partes de auto con un cepillo de alambres o usa un limpiador de hornos en vez de usar limpiadores líquidos. Arregla las graseras, perchas para secar y tablas de escurrir para que los líquidos sean dirigidos al lavadero o recipientes para guardar líquidos. No laves las partes de auto o herramientas en el estacionamiento, la cochera o la calle.

Almacenando Desechos Peligrosos
Manten los desechos líquidos separados. Varios líquidos pueden ser reciclados por compañias que se especializan en desechos tóxicos si aun no estan mezclados. Guarda y cubre todos los materiales dentro de un lugar para prevenir la contaminación del desagüe.

Desechos de Metal & Pulidos
Manten un recipiente debajo de las maquinas de tornos o amoladoras para colectar desechos de metal. Manda los desechos de metal a un centro de reciclaje de metales. Guarda los desechos de metal en un recipiente cuvierto o dentro del local.

Prevenir Goteaduras & Derrames
Utilisa caserolas para el goteo de líquidos. Use limpiadores absorbentes en lugar de agua para limpiar el área de trabajo.



Limpiando Derrames
Sigue tu plan de como actuar sobre los materiales tóxicos, como esta indicado en el departamento de bomberos local u otras autoridades de materiales tóxicos. Asegurate que todos los empleados estén informados y capaz de aplicar cada fase del plan. Usa métodos secos para limpiar derramamientos (barriendo, materiales absorbentes, etc.).

Manera Correcta de Depositar los Desechos Peligrosos
Recicla el aceite de motor y filtros de aceite usados, anti-congelante, baterias, lubricantes, y desechos de metal y partes de auto pulidas. Llama a un colector de desechos tóxicos para disponer de absorbentes saturados. Mas iformación sobre reciclaje, llama al (909) 386-8401.

Para reportar actividades ilegales llamar al:

(877) WASTE18
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

■ Construction & development:

Soil, cement wash, asphalt, oil and other hazardous debris from construction sites often make their way into the San Bernardino County storm drain system, and flow untreated into local waterways. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- **Store Materials Safely:** Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.
- **Preventing Erosion:** Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydro mulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets. For more information on erosion control, call (909) 799-7407.

- **Cleaning & Preventing Spills:** Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.
- **Maintaining Vehicles & Equipment:** Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, and brake and radiator fluids.
- **Ordering Materials & Recycling Waste:** Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Dispose of hazardous materials through a hazardous waste hauler or other means in accordance with the construction permit. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.
- **Concrete and mortar application:** Never dispose of cement washout into driveways, streets, gutters or drainage ditches. Wash concrete mixers and equipment only in specified washout areas, where the water flows into lined containment ponds. Cement wash water can be recycled by pumping it back into cement mixers for reuse.

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

GOT COOKING OIL? RECYCLE IT!

RECYCLE YOUR LEFTOVER LIQUID COOKING OIL TO AVOID THE HASSLE OF DEALING WITH CLOGGED PIPES AND OTHER SEWER PROBLEMS.

FOLLOW THESE SIMPLE STEPS TO RECYCLE YOUR COOKING OIL:

1. Let oil cool to a safe temperature and filter it to remove leftover food
2. Pour oil into a jar or plastic container with a tight-fitting lid
3. Take the oil to your nearest HHW collection center

DID YOU KNOW?

Recycled cooking oil is used to produce alternative fuels such as biodiesel, which is better for the environment.

For more information and a list of HHW collection centers near you, visit **sbcountystormwater.org/cookingoil** or call **1.800.OILY CAT (645.9228)**.

San Bernardino County STORMWATER PROGRAM

STORMWATER
Pollution Prevention

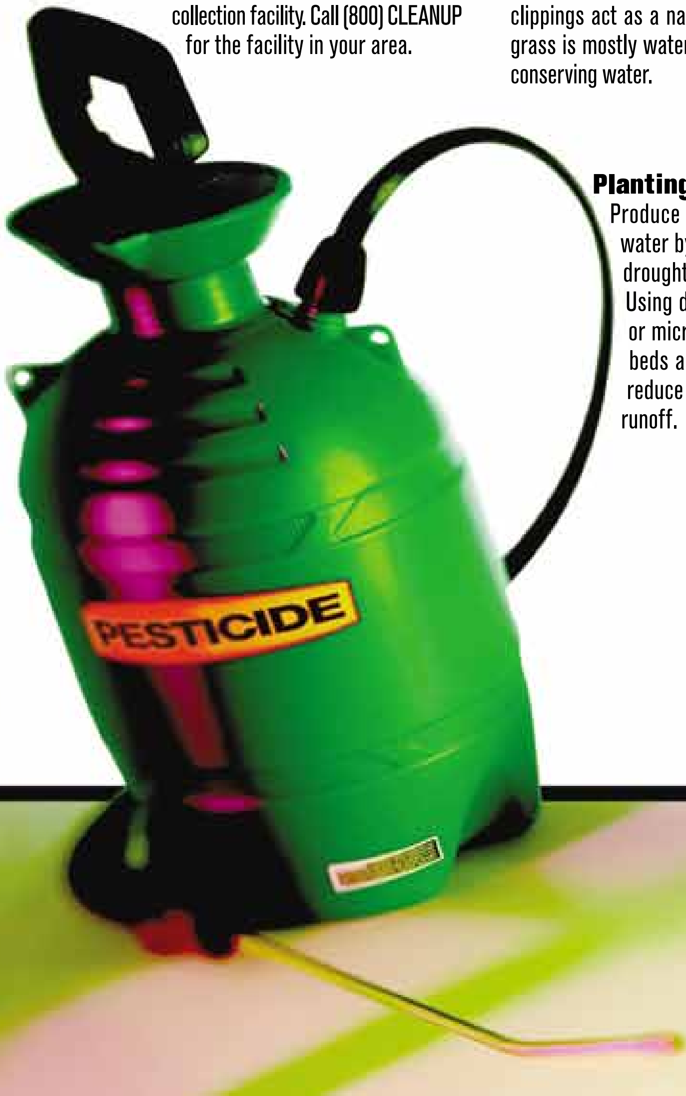
HOME & GARDEN

Yard waste and household toxics like paints and pesticides 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 simple tips to prevent pollution and protect your health.

Recycle Household Hazardous Waste
Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.

Disposing of Yard Waste
Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.

Use Fertilizers & Pesticides Safely
Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard
Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.

Use Water Wisely
Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping call
(877) WASTE18
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

JARDIN

Basura del jardín y otros toxicos caseros como pintura, pesticidas y otros mas acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Disponiendo Desechos del Jardin
Recicla hojas, pasto y otras basuras del jardín en ves de soplarlas, barrerlas hacia la calle. El pasto sirve como fertilizante, y como el pasta es la mayoria agua tambien riega tu jardín, ahorrandote agua.

Reciclando Materiales del Hogar Peligrosos
Limpiadores del hogar como pintura, pesticidas, solventes y limpiadores son demasiado toxicos para tirarlos en la basura. Desechalos en unlugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.

Usando Fertilizantes & Pesticidas Adecuadamente
Fertilizantes y pesticidas muchas veces terminan en los drenajes. Usa alternativas que no sean toxicas. Si tu usas fertilizantes y pesticidas con quimicos, no los uses cerca de las banquetas y cocheras y nunca los uses en tiempos de lluvia.

Cembrando en el Jardin
Reduce la basura del jardín y ahorra agua plantando arboles y plantas de bajo mantenimiento. Riega moderadamente con mangueras u otros metodos para las flores o vegetacion asi reduciras tu pago del mes y previenes el desagüe.

Usando el Agua Adecuadamente
Reduce el pago del agua y previene el desagüe controlando la cantidad y direccion de tus regaderas para el jardin. Solo necesitas regar de 10 a 20 minutos a la semana. Durante la primavera y otoño es la mitad. Las regaderas del jardin deverian estar ajustadas a que rieguen lo suficinete y evitar el desagüe.

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

A SAFE GARDEN:
A LOT DEPENDS ON IT.

Protect your family and community when using pesticides and fertilizers.

- **STRATEGICALLY** apply products on your lawn only when rain is not expected.
- **SPOT-APPLY** directly on the problem instead of the whole area.
- **SAFELY** dispose of unwanted products. The County of San Bernardino offers 9 HHW Centers that accept pesticides, fertilizers and other toxic waste FREE of charge.

To report illegal dumping, call
(877) WASTE18 or visit
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

UN JARDÍN SANO:
MUCHO DEPENDE DE ÉL.

Proteja a su familia y a su comunidad cuando utilice pesticidas y fertilizantes.

- **ESTRATÉGICAMENTE** aplique productos en su césped solamente cuando no se espera lluvia.
- **ESCASAMENTE** aplique los productos directamente en el área en donde exista el problema en lugar de distribuirlo en todo el jardín.
- **ELIMINE** productos tóxicos sanamente. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pesticidas, fertilizantes y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al
(877) WASTE18 o visite
sbcountystormwater.org

San Bernardino County
STORMWATER PROGRAM

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

SPOT-APPLY

pesticides directly on the problem rather than blanketing the whole area.

sbcountystormwater.org

A SAFE GARDEN:
A LOT DEPENDS ON IT.

San Bernardino County
STORMWATER PROGRAM

(877) WASTE18

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

ESCASAMENTE

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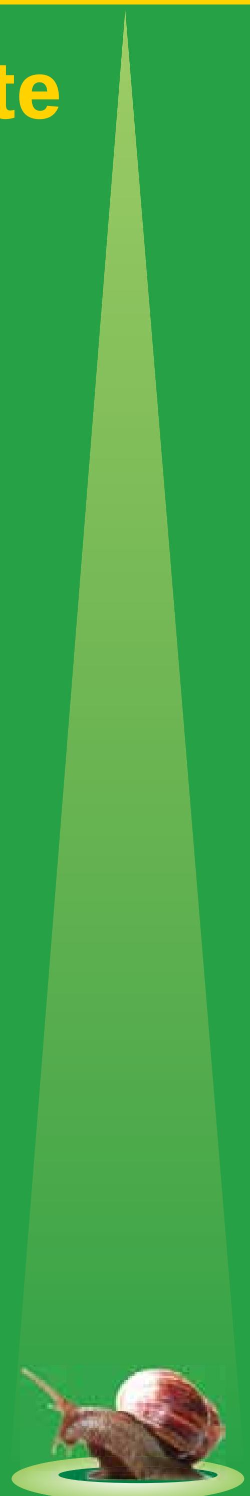

sbcountystormwater.org

UN JARDÍN SANO:

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San Bernardino County STORMWATER PROGRAM

(877) WASTE18

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San Bernardino County
STORMWATER PROGRAM

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

TRÁIGANOS SUS RESIDUOS TÓXICOS

Lleve sus productos tóxicos domésticos a un centro de recolección cerca de usted.

ES FÁCIL

1. Asegúrese que los productos estén **correctamente sellados, etiquetados**, y **protegidos contra derrames.***
2. Llévelos GRATIS a un centro de recolección en:

Big Bear Lake
Chino
Fontana
Ontario
Rancho Cucamonga
Redlands
Rialto
San Bernardino
Upland

PRODUCTOS DOMÉSTICOS TÓXICOS INCLUYEN:

Líquidos Automotrices
Baterías
Aceite de Cocina
Fertilizantes y Pesticidas
Bombillas Fluorescentes
Productos de Limpieza
Medicina
Aceite de Motor y Filtros
Productos de Pintura
Productos Químicos para Piscinas

¿POR QUÉ NO PUEDO ECHAR ESTOS ARTÍCULOS EN LA BASURA?

Es ilegal y representa riesgos para la salud de los seres humanos, mascotas, medioambiente y nuestras fuentes de agua.

Para obtener más información y una lista completa de los centros y productos, visite

tootoxictotrash.com

* *Por visita, usted puede traer 15 galones o 125 libras en contenedores no más grandes que 5 galones. No se aceptan desechos comerciales. Debe ser un residente del Condado de San Bernardino.*

SAN BERNARDINO COUNTY STORMWATER PROGRAM
WHERE WATER MEETS COMMUNITY

BRING US YOUR TOXIC WASTE

Take toxic household products to your local household hazardous waste collection center.

IT'S EASY!

1. Make sure products are **properly sealed**, **labeled**, and **spill-proof**.*
2. Take them to a **FREE** collection center in:

- Big Bear Lake
- Chino
- Fontana
- Ontario
- Rancho Cucamonga
- Redlands
- Rialto
- San Bernardino
- Upland

TOXIC HOUSEHOLD PRODUCTS INCLUDE:

- Automotive Fluids
- Batteries
- Cooking Oil
- Fertilizers & Pesticides
- Fluorescent Bulbs
- Household Cleaners
- Medicine
- Motor Oil & Filters
- Paint Products
- Pool Chemicals

WHY CAN'T I THROW THESE ITEMS IN THE TRASH?

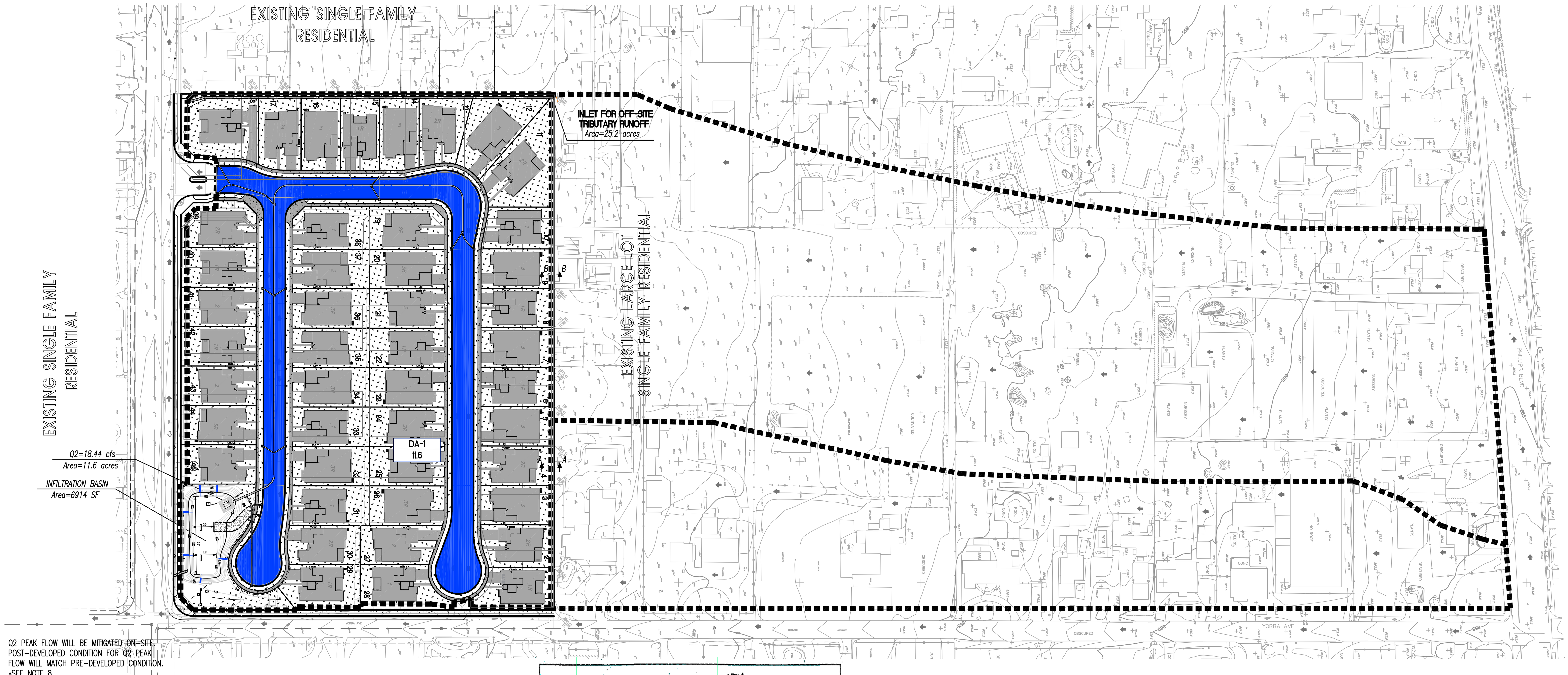
It is illegal and poses health risks to humans, pets, the environment, and our waterways.

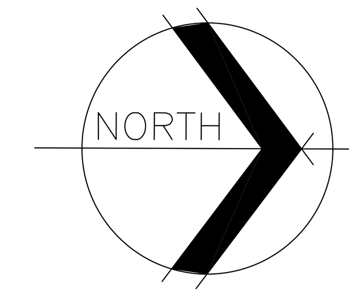
For more information, locations and a full list of items, visit

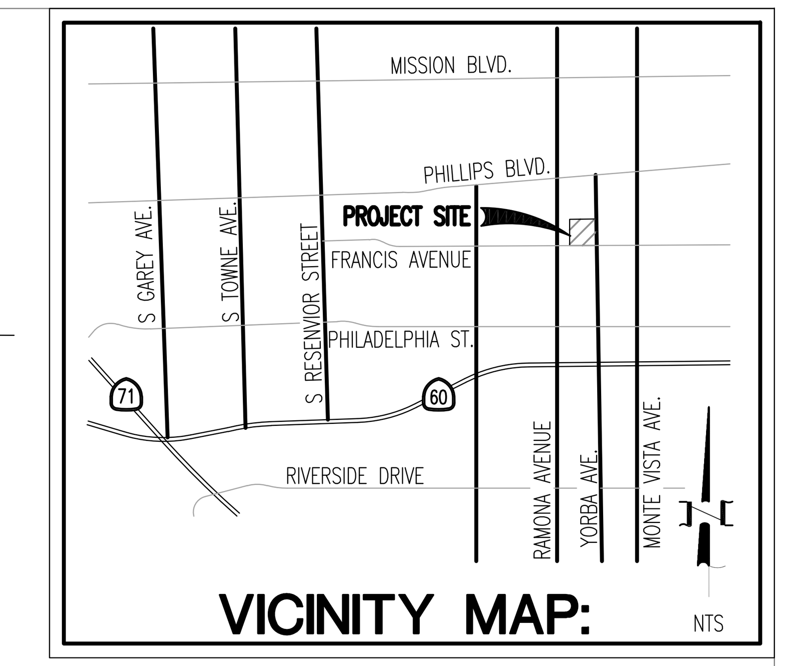
tootoxictotrash.com

** You can bring 15 gallons or 125 pounds in containers no larger than 5 gallons per visit. No business waste accepted. Must be a San Bernardino County resident.*

SAN BERNARDINO COUNTY STORMWATER PROGRAM
WHERE WATER MEETS COMMUNITY







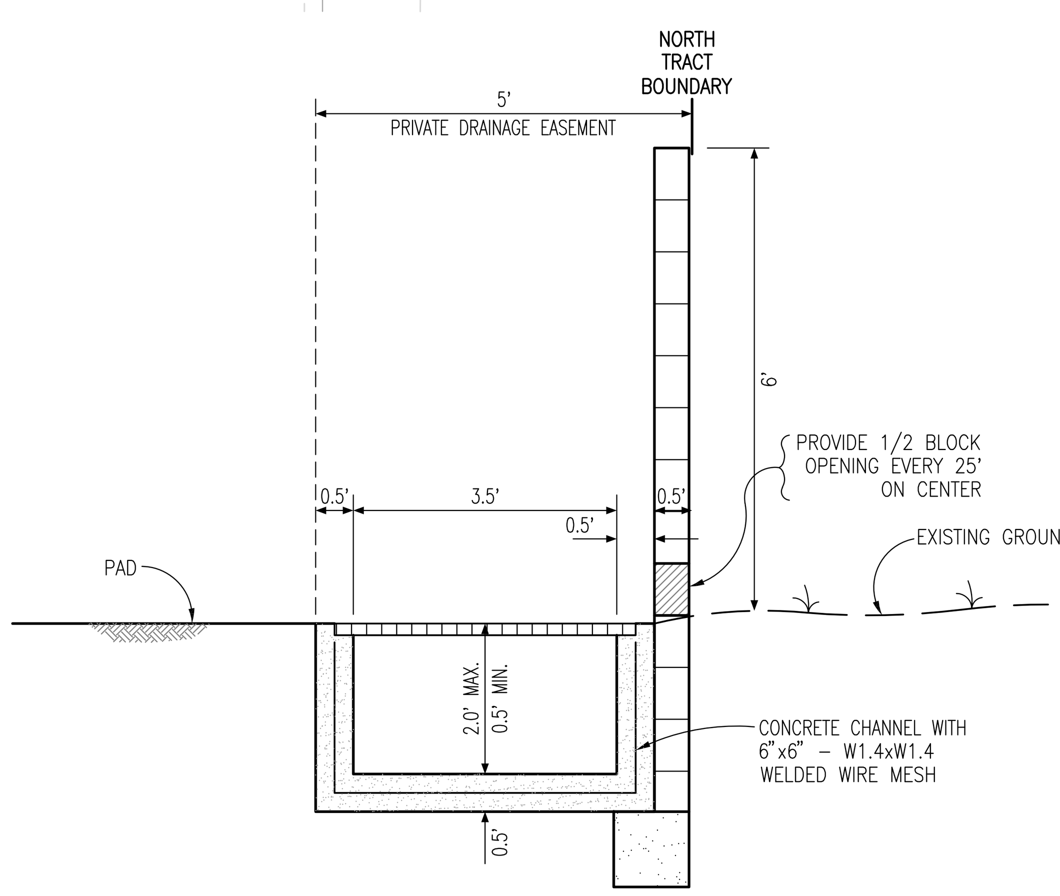
LEGEND:

C.B.	CATCH BASIN WITH STENCIL
	TRACT BOUNDARY
	DRAINAGE AREA BOUNDARY
	PROPOSED STORM DRAIN
	PROPOSED CATCH BASIN WITH BMP SD-13 CATCH BASIN STENCILING
Q2=X.X	2-year STORM PEAK FLOW (cfs)
	DIRECTION OF SURFACE FLOW
DA-1	DRAINAGE AREA
11.6±	AREA (acres)
	LANDSCAPING (5.07 AC)
	IMPERVIOUS SURFACE (5.43 AC)
	PERMEABLE PAVERS (1.59 AC)

DA-1			
	AREA	RET. VOL.	% OF DCV
BASIN	6914	22,271	102%

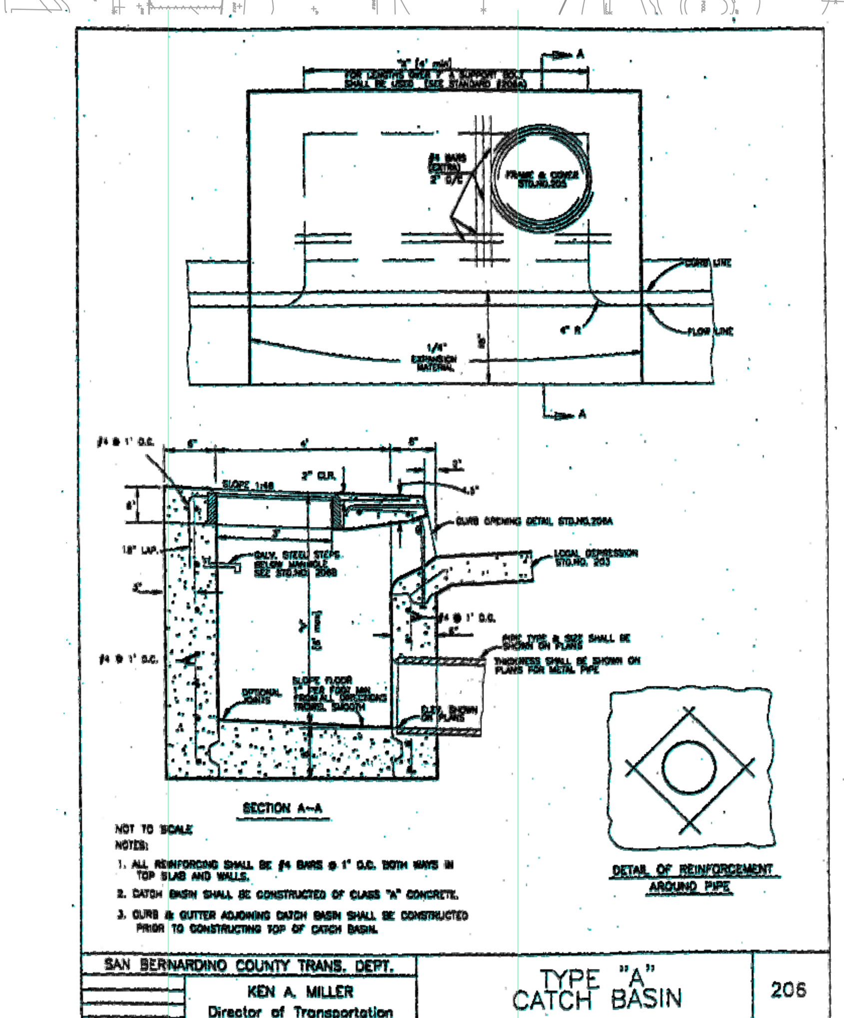
NOTES:

1. SOILS TYPE "A"
2. HYDROLOGIC CONDITIONS OF CONCERN (HCOC) CALCULATIONS PER PWQMP REPORTS, 2-YEAR AND 100-YEAR STORMWATER RUNOFF DIFFERENCE FOR PRE AND POST DEVELOPMENT WILL BE INFILTRATED IN THE BASIN.
3. EXISTING SITE: AGRICULTURE USE, 40% IMPERVIOUS
4. THE PROPERTY LIES WITHIN FLOOD ZONE 'X' UNSHADED PER FEMA FLOOD MAP 0671C8615H, DATED AUGUST 28, 2008.
5. OFFSITE RUNOFF TO BYPASS ONSITE WATER QUALITY BIOFILTRATION BASIN WITH UNDERDRAIN
6. PEAK FLOW SHOWN ARE FOR 100-YEAR STORM UNLESS NOTED OTHERWISE



RECTANGULAR CHANNEL DETAIL

NOT TO SCALE



TYPICAL CATCH BASIN DETAIL

NOT TO SCALE

CATCH BASIN STENCIL DETAIL

NOT TO SCALE

VESTING TENTATIVE TRACT NO. 20394
PRELIMINARY WATER QUALITY MANAGEMENT PLAN SHEET 1 OF 2
COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: MAY 2022

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

PREPARED FOR:

YORBA VILLAS, LLC
C/O BORSTEIN ENTERPRISES
11766 WILSHIRE BOULEVARD, SUITE 820
LOS ANGELES, CA 90025
CONTACT PERSON: ERIK PFAHLER
TELEPHONE: (310) 582-1991 EXT. 203
FAX: (310) 582-1999

BORSTEIN ENTERPRISES

PREPARED BY:

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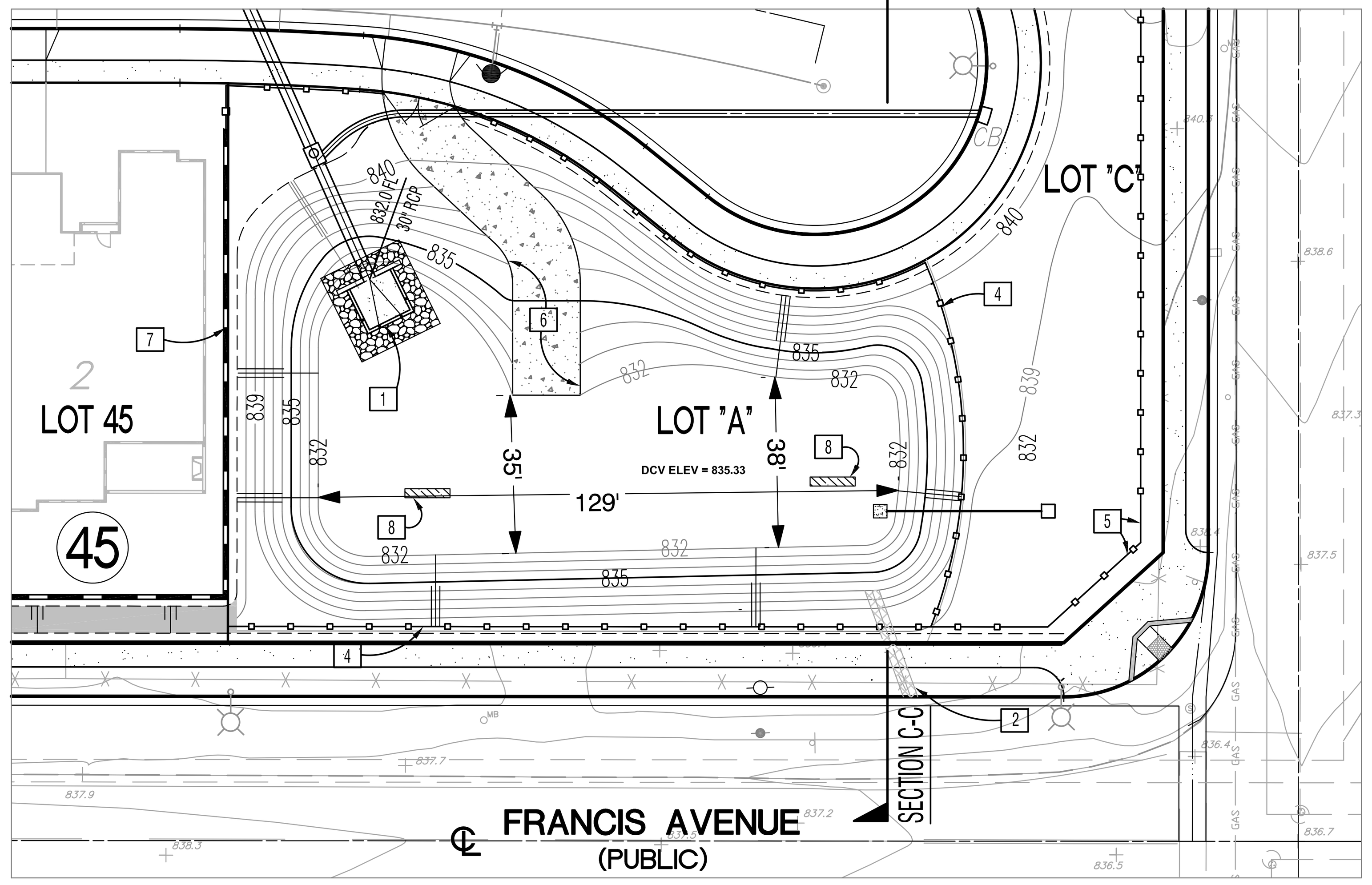
17320 Redhill Avenue
Suite 350
Irvine, CA 92614
Voice: 949-251-8821
FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS

I:\89704\DRAINAGE\WQMP\PRELIMINARY\wqmp maps\WQMP Areas YORW.dwg 5/23/22



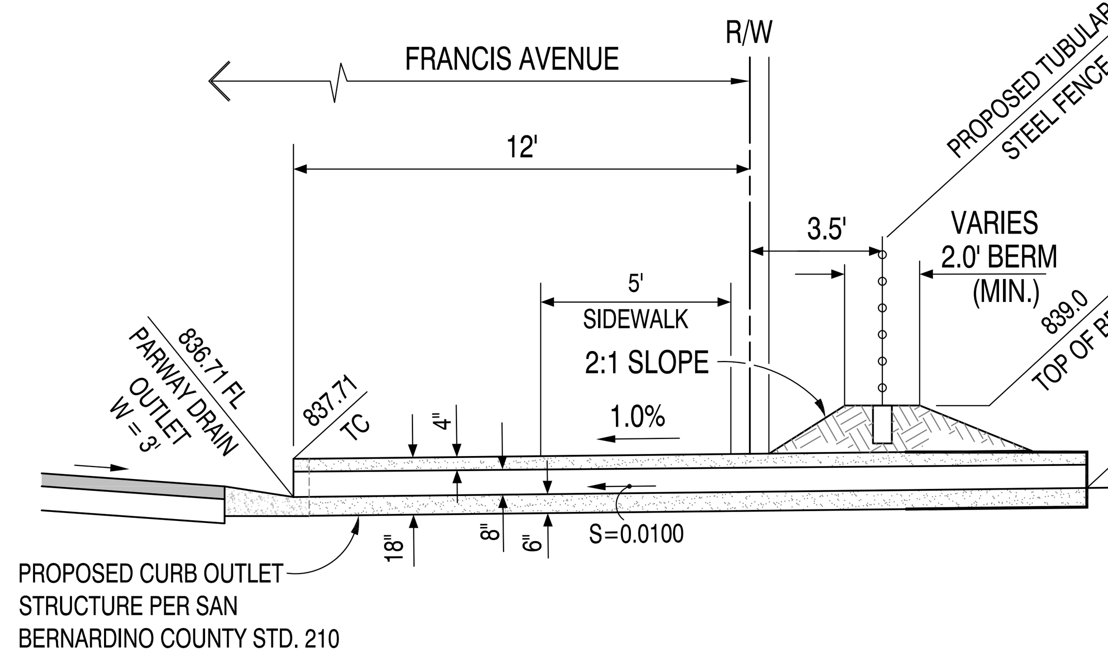
WATER QUALITY BASIN DETAIL

SCALE: 1" = 30'

ADVISORY NOTES:

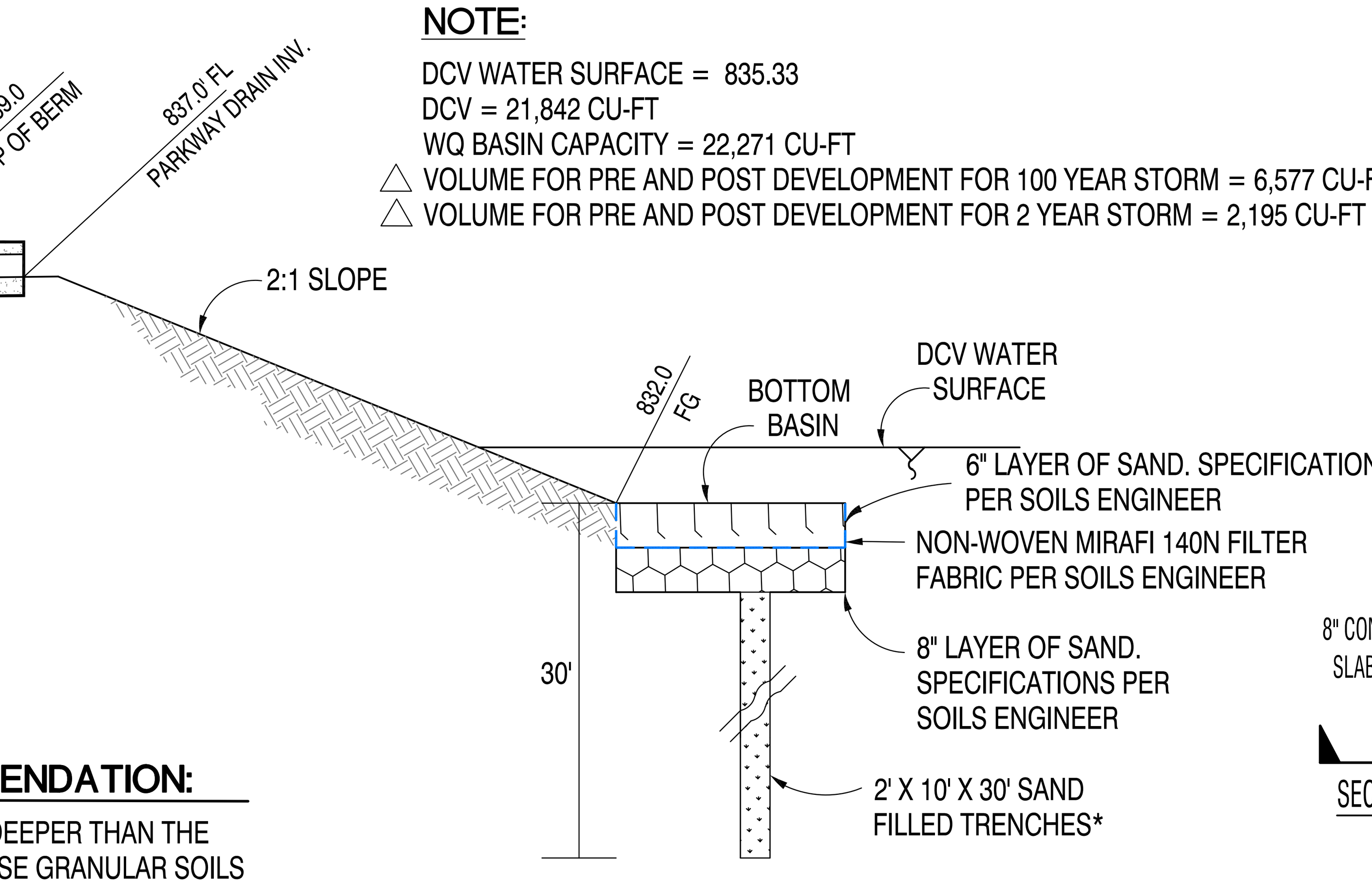
1. CONCRETE FOREBAY
2. 3' X 8' PARKWAY DRAIN
3. NOT USED.
4. TUBULAR STEEL FENCE
5. NOT USED.
6. ACCESS RAMP (15% MAX SLOPE) HEAVY BROOM FINISH
7. RETAINING WALL ON LOT 45
8. 2' X 10' X 30' SAND FILLED TRENCH PER GEOTECHNICAL ENGINEERS RECOMMENDATIONS*

* THE DESIGN OF THE BASIN CONSIDERS JUST THE INFILTRATION CONTRIBUTION OF THE SHALLOW GRANULAR ZONE, IGNORING THE CONTRIBUTION OF THE SAND TRENCHES INTO THE DEEPER GRANULAR, SOILS, PER SOILS ENGINEER'S SPECIFICATIONS.



CURB OUTLET STRUCTURE DETAIL

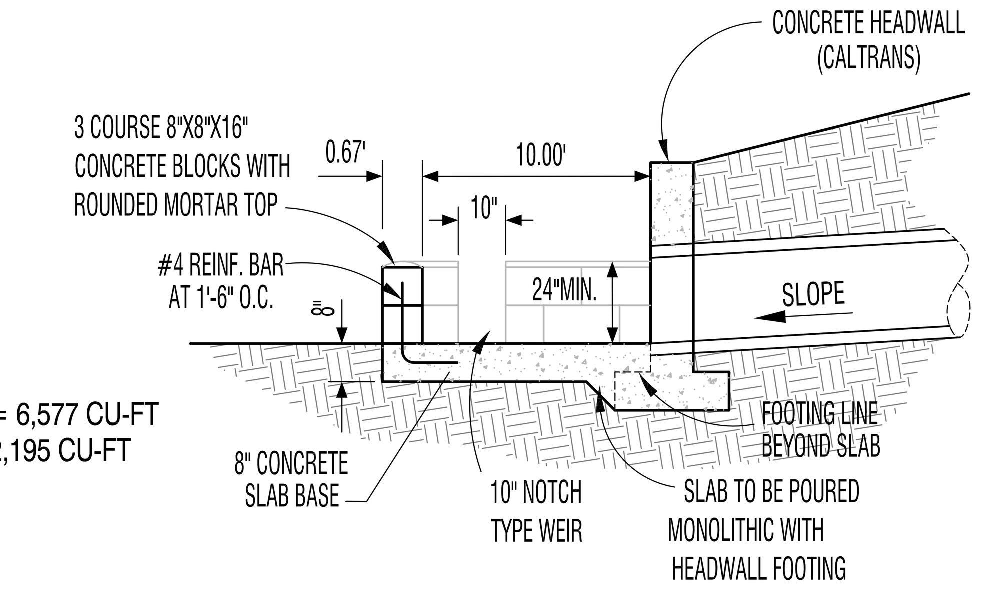
N.T.S.



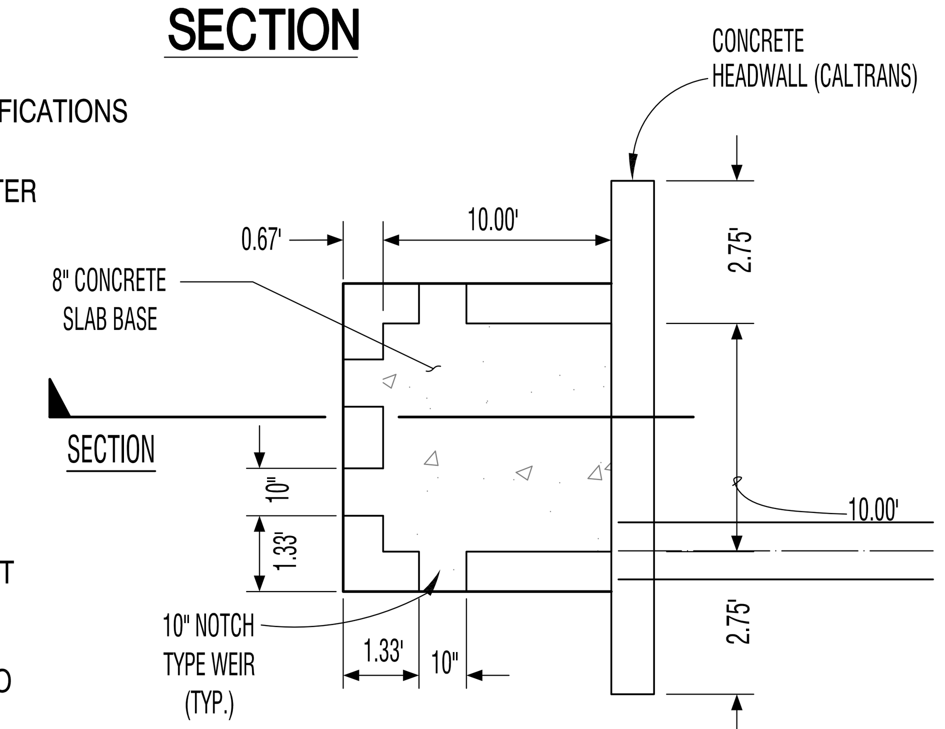
NOTE:

DCV WATER SURFACE = 835.33
DCV = 21,842 CU-FT
WQ BASIN CAPACITY = 22,271 CU-FT
△ VOLUME FOR PRE AND POST DEVELOPMENT FOR 100 YEAR STORM = 6,577 CU-FT
△ VOLUME FOR PRE AND POST DEVELOPMENT FOR 2 YEAR STORM = 2,195 CU-FT

* THE DESIGN OF THE BASIN CONSIDERS JUST THE INFILTRATION CONTRIBUTION OF THE SHALLOW GRANULAR ZONE, IGNORING THE CONTRIBUTION OF THE SAND TRENCHES INTO THE DEEPER GRANULAR SOILS, PER SOILS ENGINEER'S SPECIFICATIONS.



SECTION



PLAN

2 CONCRETE FOREBAY DETAIL

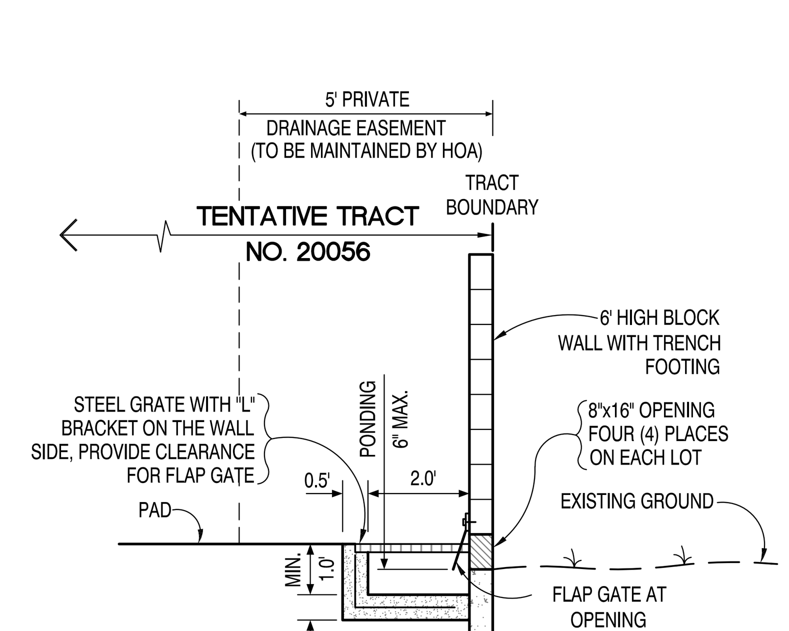
NOT TO SCALE

SOILS ENGINEER'S BASIN CONSTRUCTION RECOMMENDATION:

SINCE THE BASIN SHALLOW GRANULAR ZONE MAY ACTUALLY BE SLIGHTLY DEEPER THAN THE BOTTOM OF THE BASIN, THE BASIN SHOULD BE OVEREXCAVATED UNTIL THESE GRANULAR SOILS ARE EXPOSED. IF OVEREXCAVATION IS NEEDED, THE OVEREXCAVATED PORTION SHOULD BE BACKFILLED WITH HIGHLY PERMEABLE SAND AS DESCRIBED BELOW. WE RECOMMEND THAT BASIN OVEREXCAVATION AND BACKFILL, IF NECESSARY, BE PERFORMED AFTER BASIN INLET/OUTLET STRUCTURES ARE COMPLETED. IN ANY CASE, OPERATING HEAVY EQUIPMENT IN THE BASIN BOTTOM SHOULD BE KEPT TO A MINIMUM TO AVOID COMPACTION AND FINES CONTAMINATION OF THE EXPOSED GRANULAR SOILS.

BELOW IS A GENERAL DESCRIPTION OF THE RECOMMENDED ASPECTS OF THE CONSTRUCTION OF THE BASIN WITH SAND-FILLED TRENCHES:

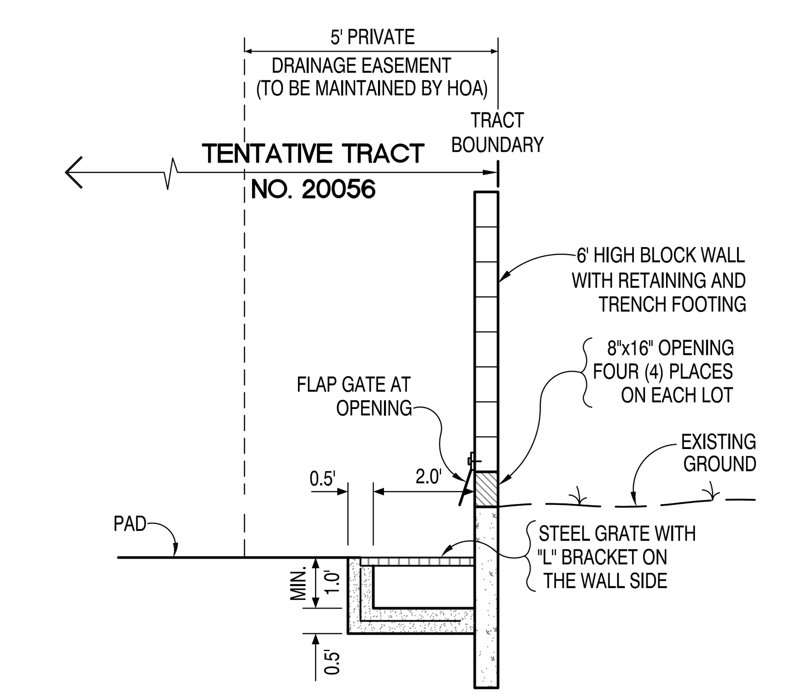
- EXCAVATE THE BASIN. CONSTRUCT ALL STRUCTURES. CLEAN THE BASIN BOTTOM OF LOOSE SOILS AND DEBRIS.
- CONSTRUCT TWO SAND-FILLED TRENCHES AS FOLLOWS:
- EXCAVATE THE TRENCH; DISPOSE OF THE CUTTINGS OUTSIDE OF THE BASIN.
- CLEAN THE GROUND AROUND THE TRENCH OF LOOSE SOIL AND DEBRIS.
- BACKFILL THE TRENCH WITH ASTM C33 FINE AGGREGATE WITH A SPECIAL CRITERION OF A MAXIMUM OF 2 PERCENT FINES BEFORE TRANSPORT (OTHER OPTIONS MAY BE ACCEPTABLE BASED ON AVAILABILITY).
- AFTER THE TRENCH HAS BEEN FILLED WITH SAND, CAREFULLY JET THE SAND TO CONSOLIDATE THE SAND, UNTIL THE SAND NO LONGER SETTLES.
- AFTER SAND CONSOLIDATION, OVERFILL THE TRENCH SO EXCESS SAND POURS/MOUNDS ONTO THE GROUND. MAINTAIN THIS SAND CLEAN WHILE EXCAVATING THE NEXT TRENCH.
- CAREFULLY COVER THE BASIN BOTTOM WITH SAND (SAME SPECIFICATION AS ABOVE). THIS LAYER SHOULD BE A MINIMUM OF 8 INCHES THICK.
- COVER THAT LAYER OF SAND WITH NON-WOVEN MIRAFI 140N FILTER FABRIC, OR APPROVED EQUIVALENT.
- COVER THE FILTER FABRIC WITH A MINIMUM OF 6 INCHES OF SAND (SAME SPECIFICATION AS ABOVE).
- SOME RELEVELING OF THE SAND SURFACE MAY NEED TO BE DONE AFTER THE FIRST RAIN EVENT, AS SOME ADDITIONAL SAND CONSOLIDATION MAY OCCUR.
- AFTER THE FIRST RAIN EVENT, CHECK TO SEE THAT THE SYSTEM FUNCTIONS PROPERLY. SIMILAR CHECKS SHOULD BE DONE AFTER EACH MAJOR STORM.



SECTION A-A RECTANGULAR CHANNEL DETAIL

FOR LOTS 1 - 6

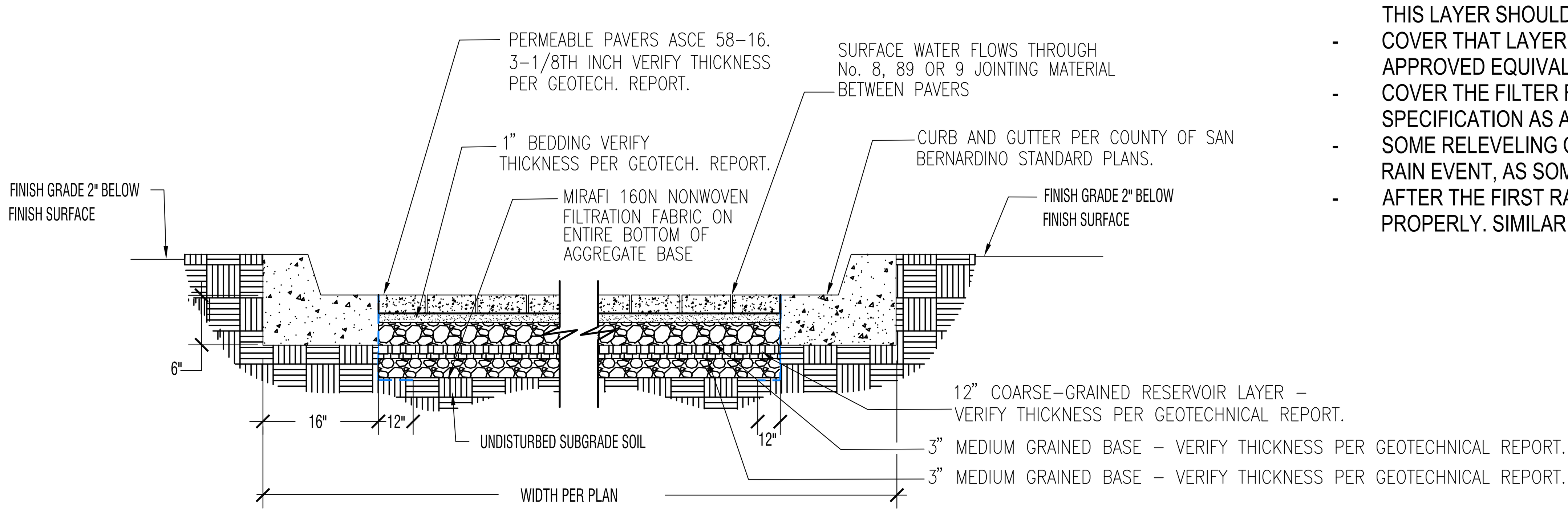
SCALE: 1"=3'



SECTION B-B RECTANGULAR CHANNEL DETAIL

FOR LOTS 7 - 11

SCALE: 1"=3'



A TYPICAL STRUCTURAL SECTION PERMEABLE PAVERS WITH BANDING (FOR REFERENCE ONLY)

N.T.S.

VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY WATER QUALITY MANAGEMENT PLAN SHEET 2 OF 2

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: MAY 2022

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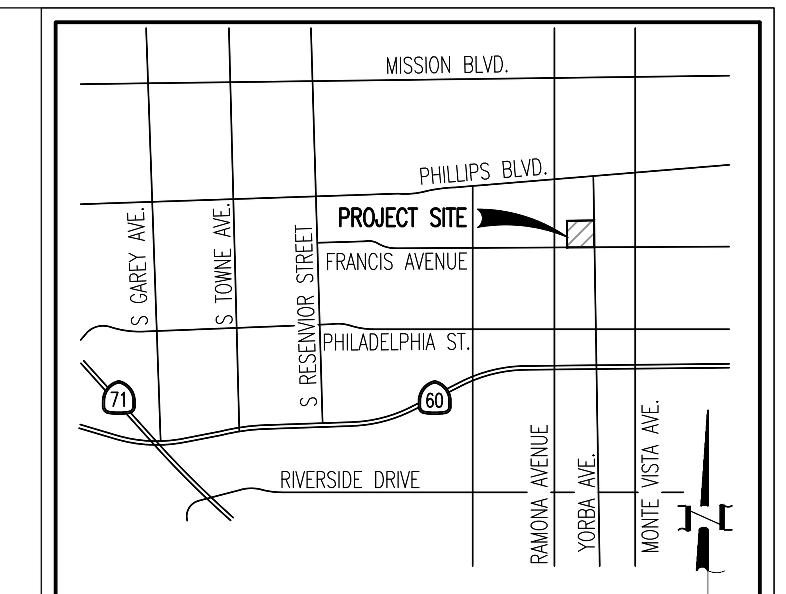
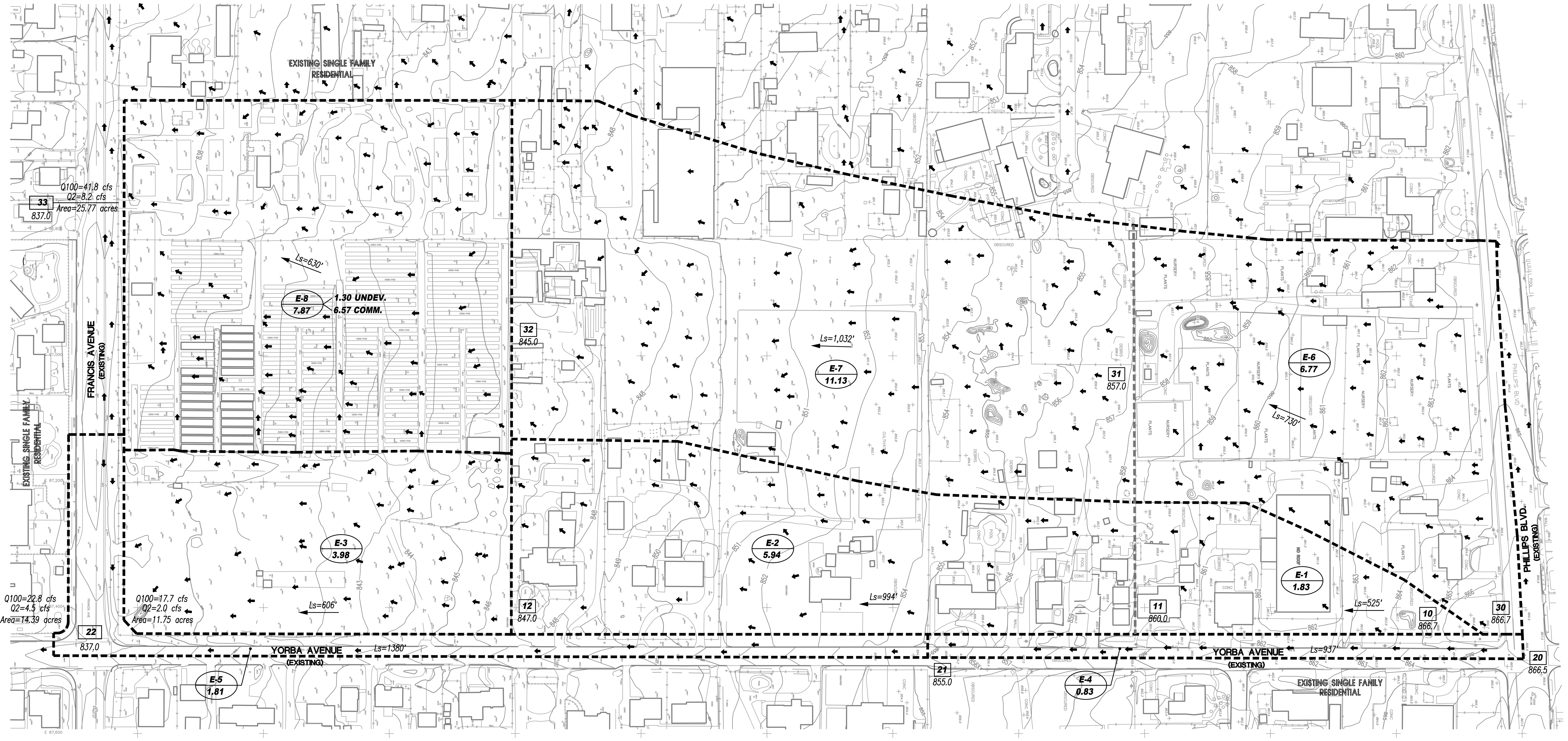


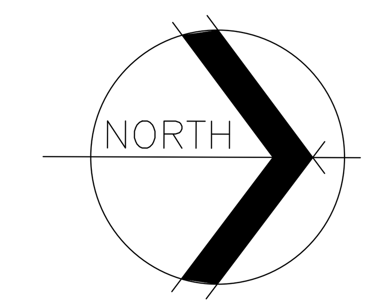
VICINITY MAP

NTS

LEGEND:

C.B.	CATCH BASIN
J.S.	JUNCTION STRUCTURE
Lp=XX'	LENGTH OF PIPE FLOW (feet)
X-Y / X.XX	SUB-AREA DESIGNATION / AREA (acres)
Q100=X.X	100-year STORM PEAK FLOW (cfs)
Q10=X.X	10-year STORM PEAK FLOW (cfs)
Ls=XXX'	SURFACE FLOW LENGTH (feet)
	DRAINAGE BOUNDARY
	SUB-AREA DRAINAGE BOUNDARY
	DIRECTION OF SURFACE FLOW
XX / XX.X / XX.X	NODE NUMBER / ELEVATION / INVERT





GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY HYDROLOGY MAP EXISTING CONDITION

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: May 2022

PREPARED FOR:

BORSTEIN ENTERPRISES
YORBA VILLAS, LLC
C/O BORSTEIN ENTERPRISES
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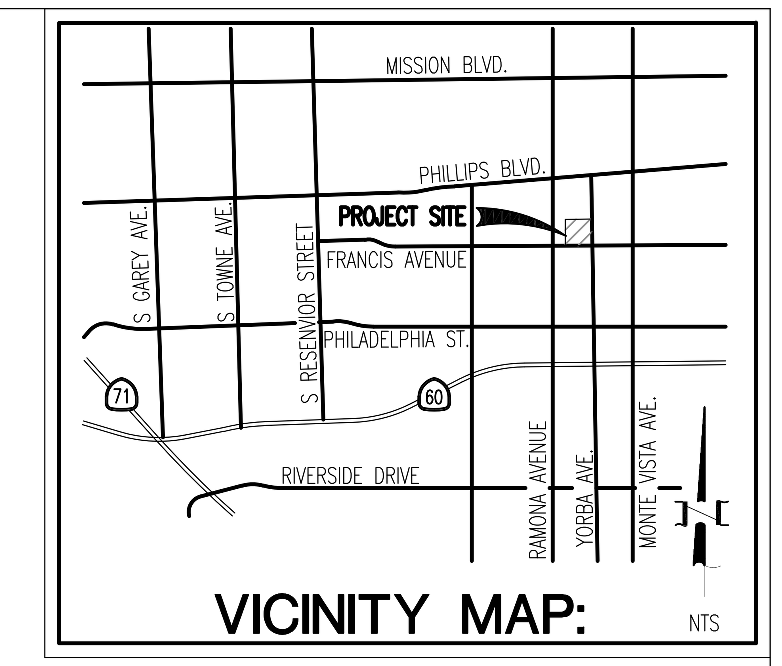
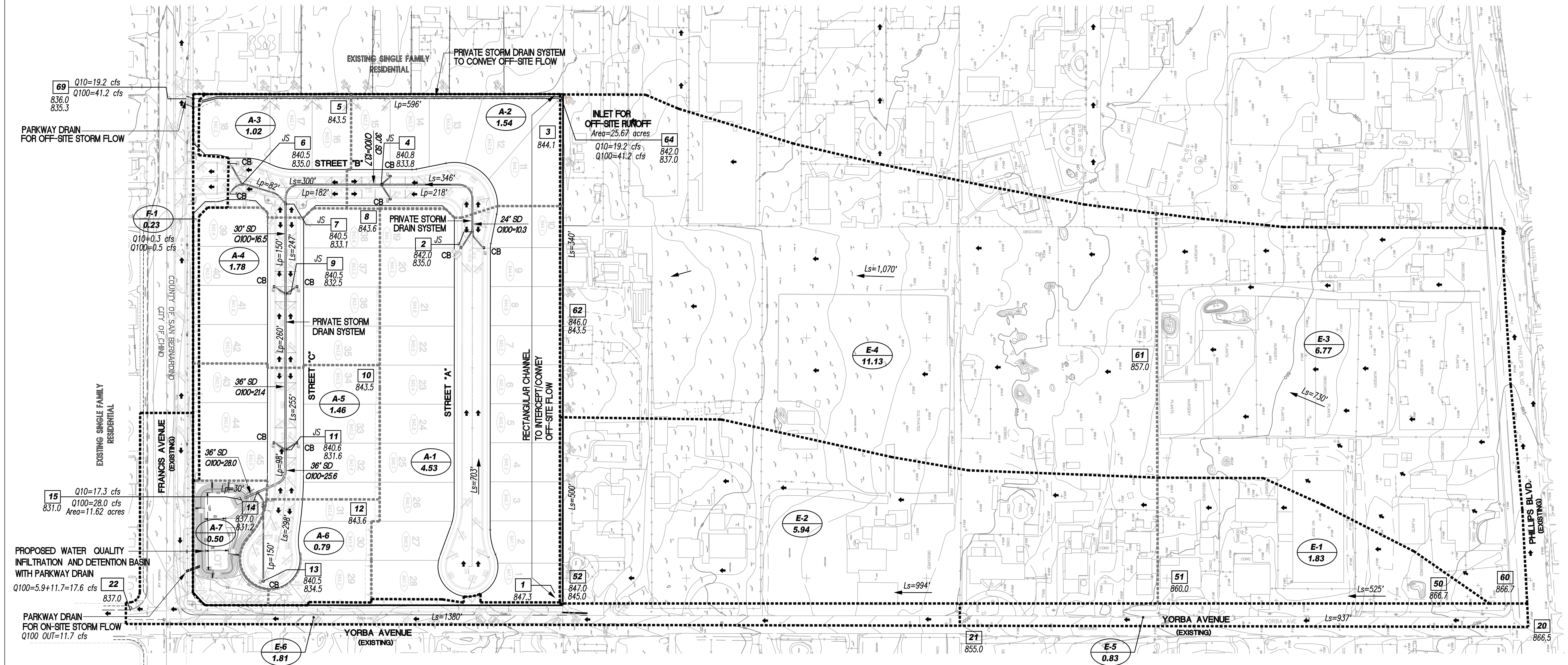
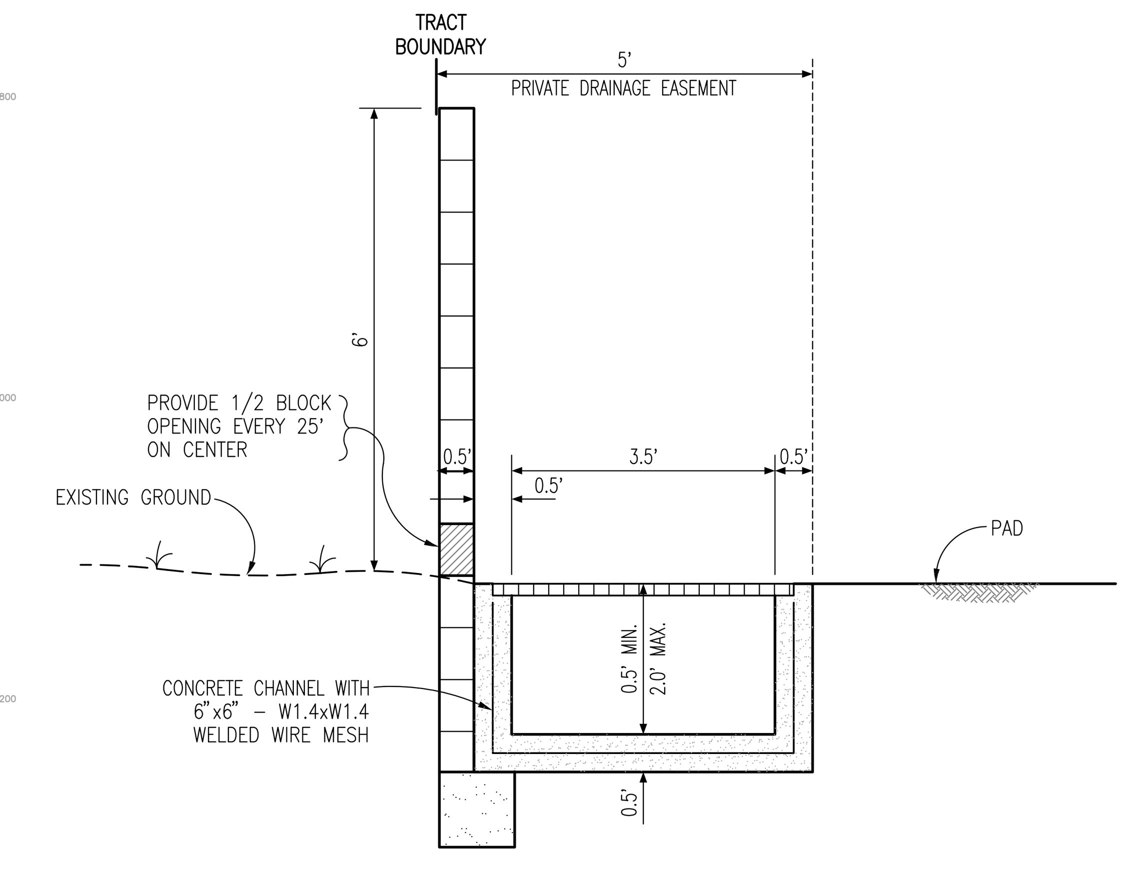
FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS







RECTANGULAR CHANNEL DETAIL

N.T.S.

NOTES:

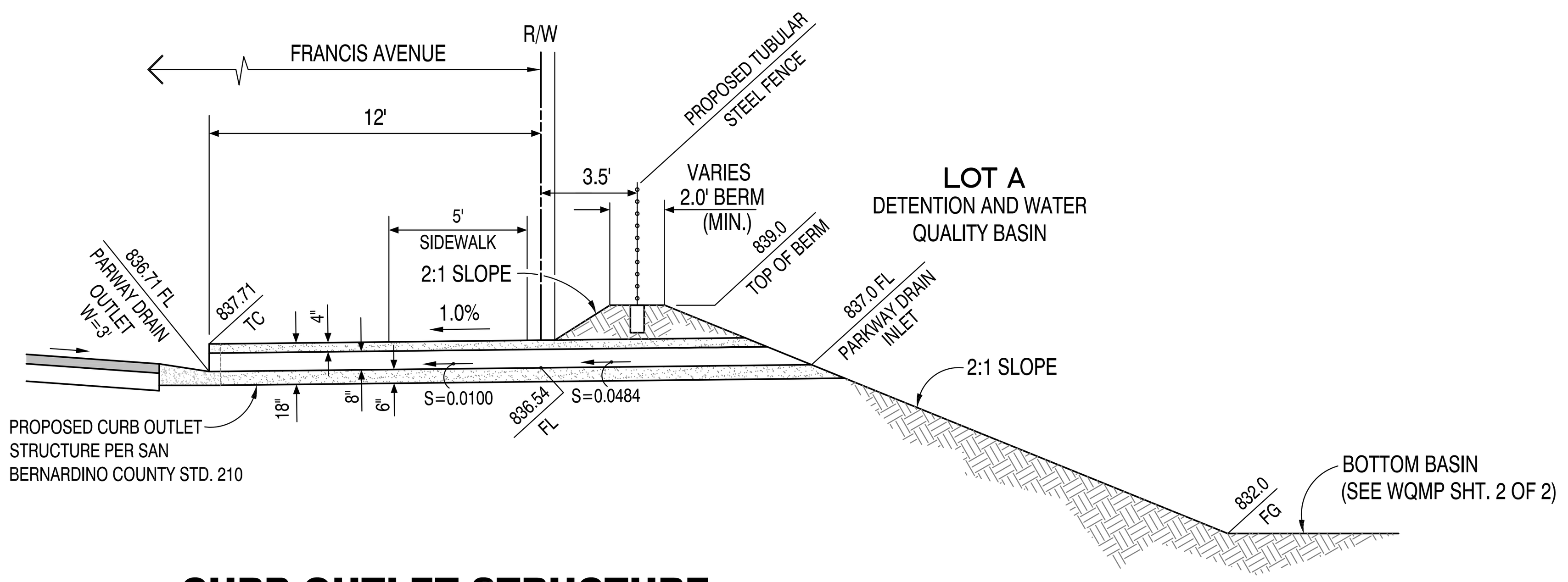
1. SOILS TYPE "A"
2. HYDROLOGIC CONDITIONS OF CONCERN (HCOC) CALCULATIONS PER PWQMP REPORTS, 2-YEAR AND 100-YEAR STORMWATER RUNOFF DIFFERENCE FOR PRE AND POST DEVELOPMENT WILL BE INFILTRATED IN THE BASIN.
3. EXISTING SITE: AGRICULTURE USE, 40% IMPERVIOUS
4. THE PROPERTY LIES WITHIN FLOOD ZONE 'X' UNSHADED PER FEMA FLOOD MAP 0671C8615H, DATED AUGUST 28, 2008.
5. OFFSITE RUNOFF TO BYPASS ONSITE WATER QUALITY BIOFILTRATION BASIN WITH UNDERDRAIN
6. PEAK FLOW SHOWN ARE FOR 100-YEAR STORM UNLESS NOTED OTHERWISE

NORTH

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.



CURB OUTLET STRUCTURE DETAIL

N.T.S.

LEGEND:

C.B.	CATCH BASIN
J.S.	JUNCTION STRUCTURE
Lp=XX'	LENGTH OF PIPE FLOW (feet)
X-Y X.XX	SUB-AREA DESIGNATION AREA (acres)
Q100=X.X	100-year STORM PEAK FLOW (cfs)
Q10=X.X	10-year STORM PEAK FLOW (cfs)
Ls=XXX'	SURFACE FLOW LENGTH (feet)
	DRAINAGE BOUNDARY
	SUB-AREA DRAINAGE BOUNDARY
	DIRECTION OF SURFACE FLOW
XX XX.X XX.X	NODE NUMBER ELEVATION INVERT

VESTING TENTATIVE TRACT NO. 20394

PRELIMINARY HYDROLOGY MAP DEVELOPED CONDITION

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

Prepared: May 2022

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