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BY MB DATE 12/13/18

D & D ENGINEERING, INC.

CHINO PARCEL DELIVERY FACILITY

PRELIMINARY HYDROLOGY REPORT

October 18, 2018
May 18, 2018
January 16, 2018

D & D Engineering, Inc.
8901 S. La Cienega Blvd.
Inglewood, CA 90301
424.351.6800

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I. Introduction

The Chino Parcel Delivery Facility (Project) is located within the City of Chino in San Bernardino County, California. The Project is approximately 75 acres bounded by Merrill Avenue to the north, Flight Avenue to the east, Remington Avenue to the south, and Comet Avenue to the west, as shown in Figure 1-Vicinity Map and Figure 2 - Site Map in Figures.

The Project is a parcel delivery facility that includes a new commercial/industrial building surrounded by asphalt concrete pavements in parking and drive lanes, Portland cement concrete pavement in the loading dock areas. The Project also includes landscaping along Merrill and Flight Avenues, water quality best management practices (BMPs), and one detention basin.

The purpose of this study is to adequately size the Project flood control facilities such that downstream infrastructure is not negatively impacted.

This study also intends to analyze Merrill Avenue hydrologic condition and hydraulic capacity to confirm street capacity for 100-year storm event prior to City of Ontario Master Plan drainage facilities are designed and constructed. This analysis is under Appendix E of this report.

II. EXISTING CONDITIONS

The Project is located within the City of Chino Master Plan of Drainage, Subarea 2, Chino Agricultural Preserve Area (MPD), spanning Drainage Basins D and J, as shown in the Figure 4-MPD Map in Figures.

The Project site spans portions of drainage basins D and J between Merrill Avenue and Remingthon Avenue. The site generally drains southerly. Flight Avenue is a mild ridgeline and precludes runoff from entering the project site from the east side. Offsite tributary area from north of Merrill Avenue is located within City of Ontario “Master Plan of Drainage” subarea XII as shown in the Exhibit 7 of the City of Ontario MDP in Appendix D. Merrill Ave carries drainage from the north, easterly of Grove Avenue, in an eastern direction beyond Flight Avenue. There, at the intersection of Merrill Avenue and Flight Avenue, Ontario’s master planned storm drain Line A convey the runoff southerly until joining the Cucamonga Creek Channel. No runoff is received from Merrill Avenue east of Grove Avenue. Please refer to City of Chino MPD Drainage Area D existing conditions section in Appendix D.

At Merrill Avenue and Grove Avenue, runoff from the north and west of Grove Avenue (drainage area XIII per City of Ontario MDP) converge into tratezodial earthen channel. The runoff then surface flows accross south of Merrill Avenue into a 10’x (wide) by 6’ (high) TEC, then through dual 6’ by 10’ box culverts under the Chino Airport Runway. Runoff is conveyed south and west in Chino Master Plan Line "J" in open channels to Prado Reservoir. Three culvert crossings exist to convey water under Kimball Avenue, Bickmore Avenue, and Pine Avenue. Additionally an existing 60" and 72" reinforced concrete pipe (RCP) were constructed along Flight Avenue as shown on Figure 2 to convey MPD Basin B runoff south to confluence point at Kimball Avenue. Flood control and/or water quality facilities exist at the intersections of Kimball and Mill Creek Avenue, and Bickmore and Rinco Meadows Avenue.

The Project site is in an area that is exempt from the San Bernardino County Hydrologic Conditions of Concern (HCOC) requirements. The Project site areas are currently irrigated croplands and diary/intensive livestock land uses. The Project is located in FEMA Flood Zone "X" (outside of the 500-year flood and protected by levee from 100-year flood) and shaded Zone "X" (between the limits of the 100-year and 500-year floods), Firmettes are includes in Appendix C.

III. PROJECT (PROPOSED) CONDITIONS

The Project site sits at the upstream end of basins D and J within the City of Chino MPD, Subarea 2.

Offsite tributary area from north of Merrill Avenue is located within City of Ontario Master Plan of Drainage drainage area XII as shown in the Exhibit 7 of the City of Ontario MDP in Appendix D. As discussed in Existing Conditions section and discribed in City of Chino MPD, Merrill Avenue serves as an existing ridgeline and no runoff from the north is received from Merrill Avenue east of Grove Avenue. With proposed Merrill Avenue improvements required for the project site development these conditions will remain. The Project site will be even further protected from receiving any offsite runoff by proposed screen wall that will be constructed along Merrill Avenue, Flight Avenue and portion of Comet Ave. Please see site plan Figure 2 for reference. Therefore, in both Existing Conditions before and after construction of the proposed storm drain facilities per City of Ontario MDP, the project site is protected and no upstream flows will be received by the project site. Additionally, as discussed in Existing Conditions section, Flight Avenue precludes runoff from entering the project site from the east side. Areas west of Comet Avenue are draining southwest and no runoff will be received from the west side. The site is additionally protected along the westerly boundary by proposed screen wall south of Merrill Avenue for approximately 250' and continued southerly earthen ditch to Remington Avenue.

In summary, based on the existing conditions, proposed screen walls and drainage improvements along Merrill Avenue, Flight Avenue and Comet Avenue, no offsite runoffs will be received by the project site.

To maintain existing and master planned flow patterns proposed storm drain system will convey the project stormwater runoff to existing double ten-foot-wide by six-foot-high (10'WX6'H) RCB and ultimately to MPD Line J, diverting a portion of the MDP Drainage Area D to Line J instead of Line D. Portion of the MPD Area D between Merrill Avenue and Remington Avenue that will be diverted to Line J consist sub-areas T1 to T5 of MPD hydrology map for subarea 2 amendment of drainage areas D & J.

Based on the MPD hydrology analysis, runoff from these sub-areas at node 6 is 62.38 cfs from 40.1 acres. Please refer to City of Chino MPD and subarea 2 amendment of drainage areas D & J hydrology map in Appendix D. It is proposed that the runoff from these areas will be directed to the detention basin located on the southwest corner of the project to reduce and control the discharge from the project site to downstream MPD storm drain system. Therefore the runoff of 62.38 cfs from 40.1 acres will be diverted from MPD Line D to Line J.

MPD facilities are sized to support full build-out conditions of the Study Area. Based on the MPD Land Use Map included in Appendix D, the Project is in an area designated as "Public Facility;" listed uses include minor utility facilities, row crops, museums, places of worship, and cemeteries. Pervious Area factor was estimated to be 25%.

The Project is a commercial/industrial facility with a pervious area factor of 15%. Due to the anticipated increase in impervious area and diversion of a portion of Drainage Area D to Line J, the Project will implement peak flood mitigation measures. Mitigation measures shall reduce outflow from the Project such that flows from the Project areas located within Drainage Areas J and D together are less than existing from project areas located within Drainage Area J. This will ensure that peak flows resulting from diversion and increased impervious percent will not negatively impact existing downstream MPD facilities.

Based on the existing conditions, the hydrology calculation 100-year peak flow from project areas located within Drainage Area J (node 23) is 56.20 cfs and project mitigation measures will be designed to control the peak discharges from the project site to be less than 56.20 cfs. Please refer to existing conditions hydrology calculations in Appendix B. Since the peak discharge from both Drainage Areas J and D together will be less than the existing peak runof from drainage area J, the runoff from project areas located within portion of MPD drainage area D will be actually detain on the site and will not contribute additional flow to MPD storm drain Line J.

Because the MPD shows that Drainage Basins D and J confluence at Kimball Avenue, the Project does not significantly change planned or existing flow patterns. Additionally, with the proposed mitigation measures the outflow from the Project site will be controlled and reduced to existing flow from drainage area J and will detain the flow from drainage area D. Therefore, the proposed detention basin will effectively mitigate peak flows prior to discharge to City of Chino MPD storm drain system and will not negatively impact downstream MPD facilities. Furthermore, it will reduce full build-out peak flows from the project site to drainage Lines D and J with 62.38 cfs and 27.98 cfs, respectfully. The proposed detention basin located within the project limits will be privately owned and maintained.

IV. HYDROLOGY METHODOLOGY

The hydrologic analysis was performed in accordance with the San Bernardino County Flood Control District (SBCFCD) Hydrology Manual dated August 1986, using the 2016 version of the Advanced Engineering Software (AES) RatSCx: Rational Method Analysis and CH1: Small Area Unit Hydrograph Method & Routing Models. Antecedent Moisture Condition (AMC) was assumed to be Condition III for the 100-year storm.

The Project is located in the southwestern portion of San Bernardino County, therefore a slope of 0.6 was used for the Intensity Duration Curve. Existing condition hydrology maps and calculation are included in Appendix A. The Project condition hydrology maps and calculations are included in Appendix B.

Soil Classifications

The SBCFCD classifies soil in four types: A, B, C, and D. Type A is most pervious, resulting in the lowest runoff potential, and Type D is the least pervious, resulting in the highest runoff potential. Soil Types A, B, and C are found within the Project site, as shown in Figure 3-Soil Map in Figures.

Land Uses Analysis

An existing and proposed condition land use analysis was completed based on MPD Land Use Map, included in Appendix D and summarized in Table 1. Per MPD, “current land use for dairies does not allow stormwater to percolate into the soil and consequently achieves saturation very quickly…dairy soil has no vegetation to promote retention of rainfall and stormwater becomes runoff quite rapidly.” For this reason, the areas currently used for dairy are designated as commercial, with a pervious percentage of 10% for computational purposes.

TABLE 1: Existing Conditions Land Use Analysis Parameters

Table 1: Existing Condition Land Use Analysis Parameters							
Land Use Designation	Soil	Area	Rational Method AES	CN (AMC I)	CN (AMC II)	CN (AMC III)	AP
Dairy & Intensive Livestock	C	0.587	01: Commercial	36	56	86	0.1
Dairy & Intensive Livestock	B	19.73	01: Commercial	50	69	76	0.1
Irrigated Cropland	A	2.08	45: Pasture, Irrigated, Fair cover	26	44	64	1.0
Irrigated Cropland	C	13.83	45: Pasture, Irrigated, Fair cover	45	65	92	1.0
Irrigated Cropland	B	38.77	45: Pasture, Irrigated, Fair cover	59	77	83	1.0
Rural Res. Low. Den.	B	0.94	11: 0.4 Dwelling/Acre	56	74	90	0.9
Total Area		75.9					

Proposed condition landuse is Commercial, with a site-specific computed 15% pervious area.

TABLE 2: Proposed Condition Land Use Analysis Parameters

Table 2: Proposed Condition Land Use Analysis Parameters							
Land Use Designation	Soil	Area	Rational Method AES	CN (AMC I)	CN (AMC II)	CN (AMC III)	AP
Commercial/Industrial - 15% Pervious	A	1.87	01: Commercial	16	32	52	0.15
Commercial/Industrial - 15% Pervious	B	58.96	01: Commercial	36	56	76	0.15
Commercial/Industrial - 15% Pervious	C	14.21	01: Commercial	50	69	86	0.15
Total Area		75.08					

Rainfall Data

Rainfall data is taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2, Point Precipitation Frequency Estimates for the project area. Table 3 summarizes the point precipitation values used for the hydrology analyses:

TABLE 3: NOAA Atlas Point Precipitation values Summary

Table 3: NOAA Atlas Point Precipitation Values Summary						
Duration	5-min	30-min	1-hr	3-hr	6-hr	24-hr
100-Year Point Precipitation (in)	0.367	0.942	1.39	2.46	3.42	6.26

Basin Routing

Proposed Basin includes a standpipe outflow structure. A stage-storage-outflow rating table was developed assuming a 36-inch-diameter standpipe and low flow 6” orifice openings at different levels. Outflow calculations are included in Appendix B.

TABLE 4: Basin Routing Table

Table 4: Basin Outflow Rating Table			
Elev	Depth	Basin Volume	Total Outflow
[INV]	[feet]	[ac-feet]	[cfs]
630.0	0.0	0.0	0.0
631.0	1.0	1.89	1.42
632.0	2.0	3.90	3.17
633.0	3.0	6.05	6.71
634.0	4.0	8.27	11.32
635.0	5.0	10.59	20.84
636.0	6.0	14.26	33.24
637.0	7.0	19.67	69.57
638.0	8.0	25.23	95.90

The basin outflow structure will convey the project controlled runoff to the existing double 10'WX6'H RCB west of the Project through a proposed private 42" RCP within a proposed utility easement as shown on the utility plan sheet 5 of 6.

V. HYDROLOGY ANALYSIS RESULTS

Existing and proposed conditions were analyzed using the rational method and small area hydrograph methods. Existing Condition Hydrology Map can be found in Appendix A. The Proposed Condition Hydrology Map can be found in Appendix B. The 100-year storm event was used for preliminary hydrology calculations and basin sizing. Other smaller storm event analysis may be used during detailed onsite design for catch basins and storm drain design.

Rational Method Summary

Tables 5 and 6 summarize the 100-year rational Method analysis:

TABLE 5: Existing Condition Rational Method

Table 5: Existing Condition Rational Method					
Watershed	MPD Drainage Area	Node	Tc [min]	Total Area [ac]	100 yr Peak Flow [cfs]
A (Sub-areas A1 - A3)	D	13	42.83	37.1	47.29
B (Sub-Areas A4 - A6)	J	23	34.88	38.9	56.20
Total Rational Method					100.81

TABLE 6: Proposed Condition Rational Method Hydrology Summary

Table 6: Proposed Condition Rational Method Hydrology Summary					
Watershed	MPD Drainage Area	Node	Tc [min]	Total Area [ac]	100 yr Peak Flow [cfs]
A (Sub-areas A1 – A8)	D&J	500	18.13	75.1	198.00

Small Area Hydrograph Method Summary

In order to demonstrate that the project will control and reduce the project site runoff and not negatively affect downstream MPD facilities, small area unit hydrograph was developed for the existing and proposed condition, including proposed basin routing. Small area unit hydrology results are summarized in Tables 7 and 8. Hydrographs were developed with the following goals:

To compare the peak discharge to MPD Line J with the project condition peak discharge to MPD Line J

To compare total existing condition peak discharge to total the project condition peak discharge

TABLE 7: Existing Condition Small Area Hydrography Summary

Table 7: Existing Condition Small Area Hydrograph Summary					
Watershed	MPD Drainage Area	Tributary to MPD Line	Tc [min]	Total Area [ac]	100 yr Peak Flow [cfs]
A & B	D & J	J & D	34.97	76.0	100.50

In the existing condition, 38.9 acres are tributary to MPD Line J, and the 100-year peak discharge is 56.20 cubic feet per second (cfs). Total existing conditions peak discharge from the project site is 100.80 cfs from 76.0 acres.

TABLE 8: Proposed Condition Small Area Hydrography Summary

Table 8: Proposed Condition Small Area Hydrograph Summary					
Watershed	MPD Drainage Area	Tributary to MPD Line	Tc [min]	Total Area [ac]	100 yr Peak Flow [cfs]
Basin 1	D&J	J	18.13	75.10	198.04

In the proposed condition, the total 100-year outflow from the basin is 54.6 cfs, which is 2.85% less than the 56.20 cfs that flows to MPD Line J in the existing condition. In addition, the total proposed condition outflow is 44.3% less than the total peak runoff in the existing condition and 72.4% less than the peak runoff from the proposed conditions, see Tables 9 and 10.

TABLE 9: Small Area Hydrograph – MPD Line J Comparison Summary

Table 9: Small Area Hydrograph - MPD Line J Comparison Summary			
Storm Event	Existing Condition	Proposed Condition - Basin Routing	Percent Change
[Year]	[cfs]	[cfs]	[%]
100	56.20	54.60	-2.85

TABLE 10: Small Area Hydrograph – total Project Area Comparison Summary

Table 10: Small Area Hydrograph – Total Project Area Comparison Summary					
Storm Event	Existing Condition	Proposed Condition	Proposed Condition - Basin Routing Outflow	Percent Change Existing Conditions	Percent Change Existing Conditions
[Year]	[cfs]	[cfs]	[cfs]	[%]	[%]
100	100.81	198.00	54.60	-44.3	-72.4

VI. CONCLUSION

The proposed detention basin adequately mitigates an increase in 100-year peak discharge due to additional diverted area and an increase in impervious percent when compared to the MPD build-out land use and drainage pattern. The basin decreases 100-year peak discharge 2.85% when comparing tributary flows to MPD Line J in the existing condition. Overall, the basin decreases 100-year peak discharge 44.3 % and 72.4% from the total catchment area when compared to the existing and proposed condition, respectfully. The proposed detention basin will effectively mitigate peak flows prior to discharge to the City of Chino MPD storm drain system and will reduce MPD full build-out peak flows from the project site to MPD drainage Lines D and J with 62.38 cfs and 27.98 cfs, respectfully.

In summary with proposed mitigation measures the project site will not negatively impact the existing downstream MPD facilities at all.

VII. REFERENCES

The following references were used in preparation of this document:

Amendment to Master Plan of Drainage Subarea 2 Chino Sphere of Influence Chino Agricultural Preserve Area, LD

King. July 2004.

County of San Bernardino Hydrology Manual, Williamson and Schmid, Irvine, CA. 1986

Precipitation Frequency Data Server. NOAA's National Weather Service. 5 July 2007.

http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html.

Storm Drain Master Plan Update report, City of Chino – Subarea 2 Chino Agricultural Perserve Area, Bureau Veritas, North America, Inc. December 2007

FIGURES

1. Vicinity Map
2. Site Map
3. Soil Map
4. Master Plan of Drainage Map
5. Pre-Development Hydrology Map

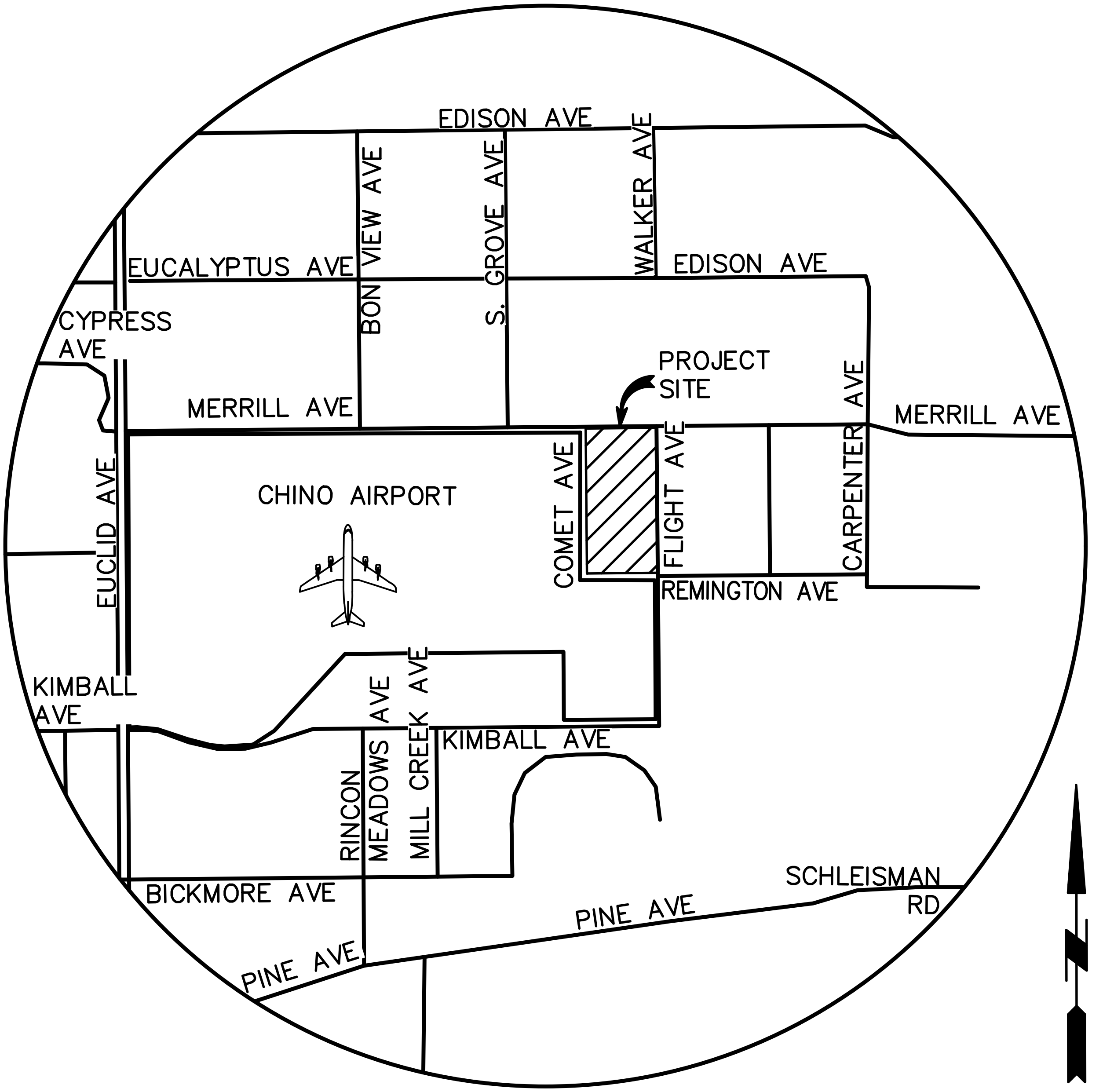

FIGURE 1

D & D ENGINEERING, INC. 8901 S. LA CIENEGA BLVD, SUITE 106 INGLEWOOD, CA 90301 Phone: 424-351-6800	CHINO PARCEL DELIVERY FACILITY	SCALE: 1" = 3000'
		DATE: 05/02/18
	VICINITY MAP	SHT NO.: 01 OF 01

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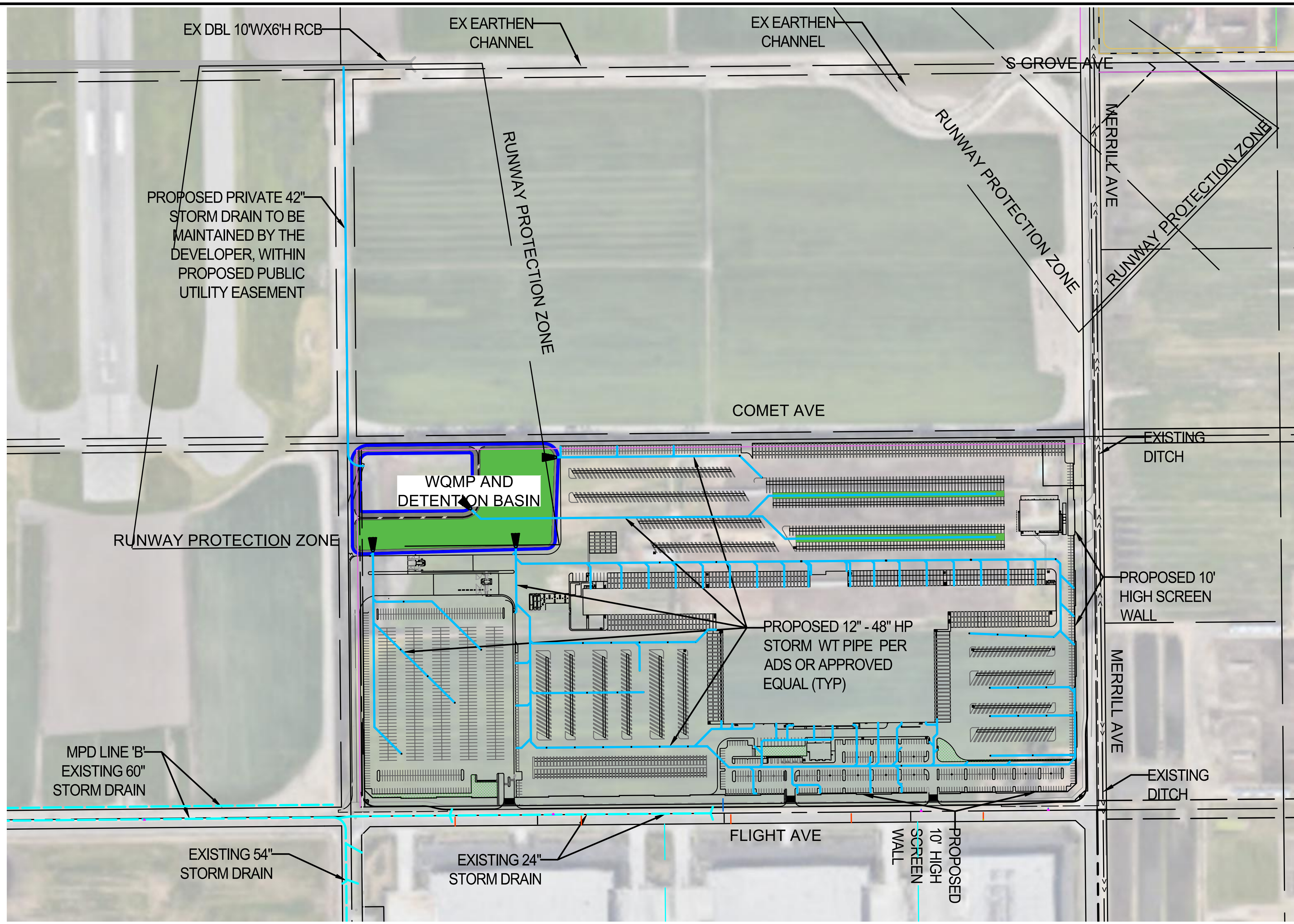
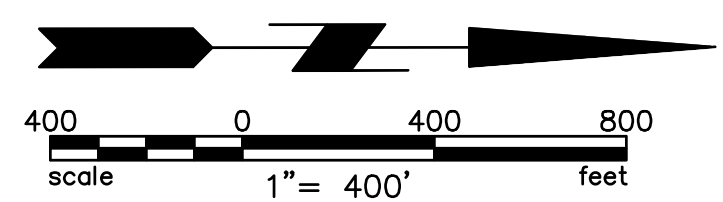
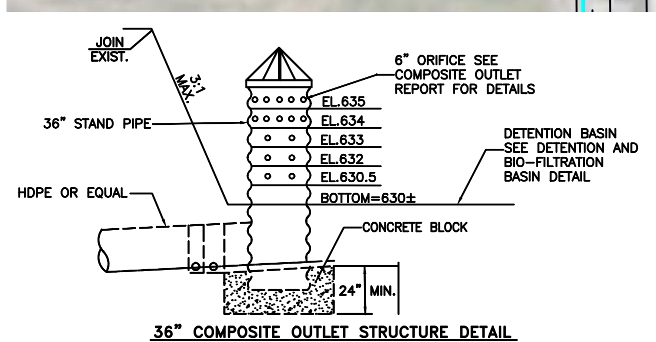
Last Opened: Oct 17, 2018 – 10:25am by: Erika



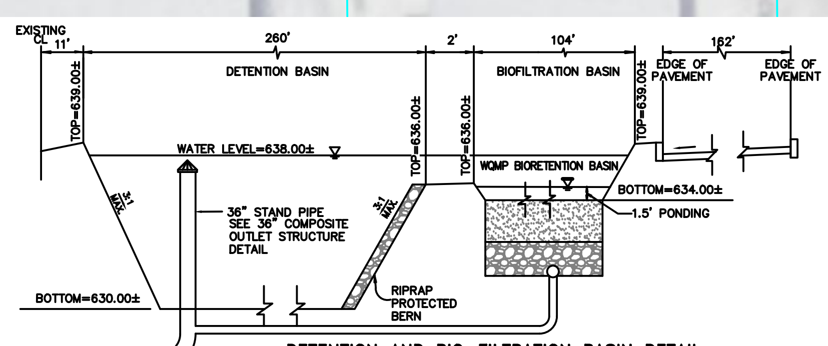
LEGEND

- PROPOSED STORM DRAIN
- PROPOSED LANDSCAPE AREA
- PROPOSED WATER QUALITY BMP
- PROPOSED FLOOD CONTROL BASIN
- EXISTING STORM DRAIN





36" COMPOSITE OUTLET STRUCTURE DETAIL
NOT TO SCALE



DETENTION AND BIO-FILTRATION BASIN DETAIL
NOT TO SCALE

FIGURE 2

D & D ENGINEERING, INC. 8901 S. LA CIENEGA BLVD, SUITE 106 INGLEWOOD, CA 90301 Phone: 424-351-6800	CHINO PARCEL DELIVERY FACILITY	SCALE: 1" = 300'
	SITE MAP	DATE: 10/17/2018
		SHT NO.: 01 OF 01

Drawing Name: M:\17004\Eng\Hm\Hydrology\Site Map - Figure 2.dwg
Last Opened: Oct 17, 2018 - 3:06pm by: Erika

LEGEND

PROJECT BOUNDARY

SOIL TYPE A

SOIL TYPE B

SOIL TYPE C

SOURCE: SAN BERNARDINO STORMWATER FACILITY MAPPING TOOL
http://permitrack.sbcounty.gov/wap/

300 0 300 600
scale 1"= 300' feet

FIGURE 3

D & D ENGINEERING, INC. 8901 S. LA CIENEGA BLVD, SUITE 106 INGLEWOOD, CA 90301 Phone: 424-351-6800	CHINO PARCEL DELIVERY FACILITY SOILS MAP	SCALE: 1" = 300' DATE: 05/02/18 SHT NO.: 01 OF 01

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Last Opened: Oct 17, 2018 – 3:24pm by: Erika

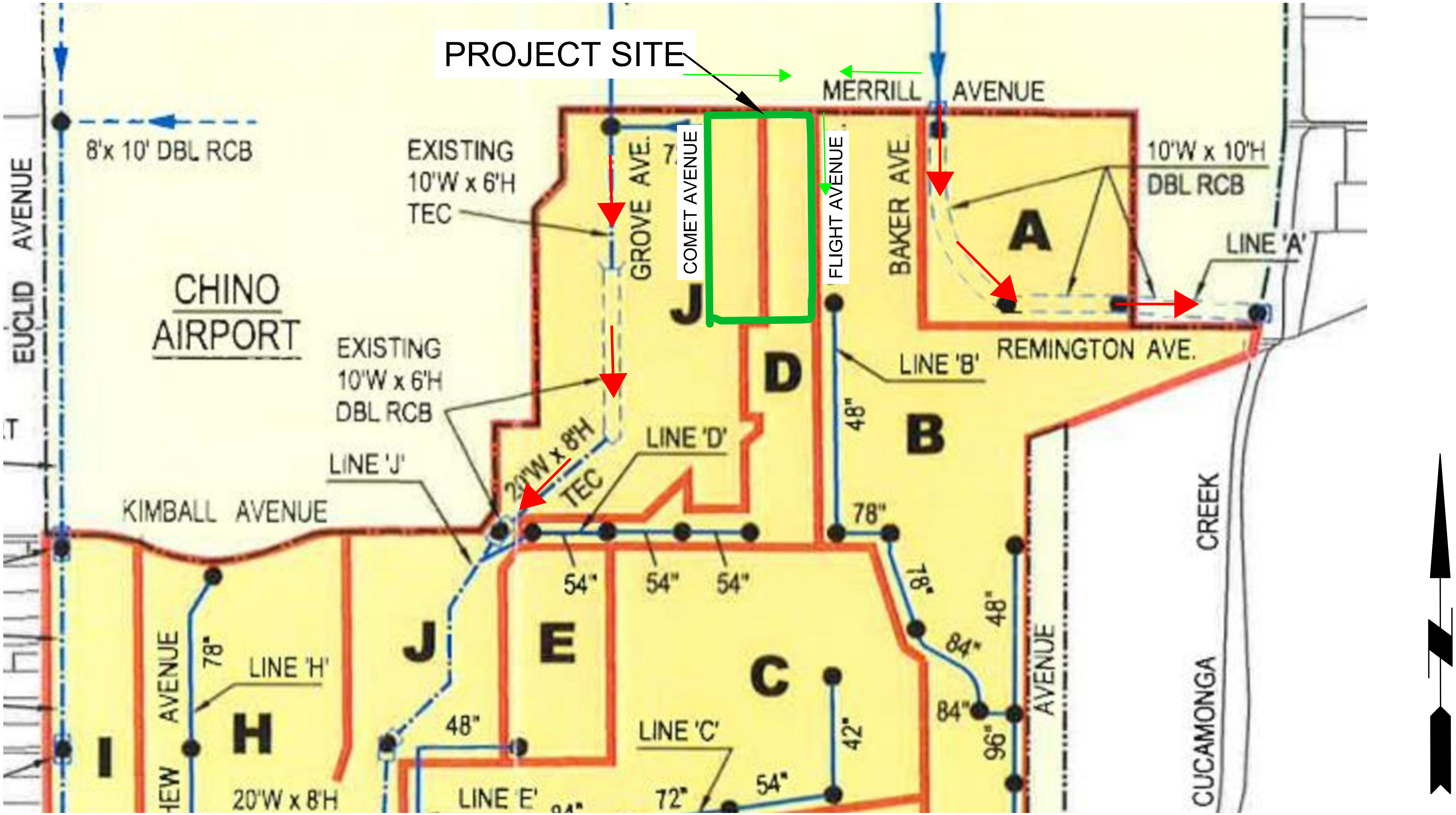

FIGURE 4

NOTE:
TEC = TRATEZODIAL EARTHEN CHANNEL

D & D ENGINEERING, INC. 8901 S. LA CIENEGA BLVD, SUITE 106 INGLEWOOD, CA 90301 Phone: 424-393-4122	CHINO PARCEL DELIVERY FACILITY	SCALE: NOT TO SCALE
	MASTER PLAN OF DRAINAGE MAP	DATE: 05/02/18
		SHT NO.: 01 OF 01

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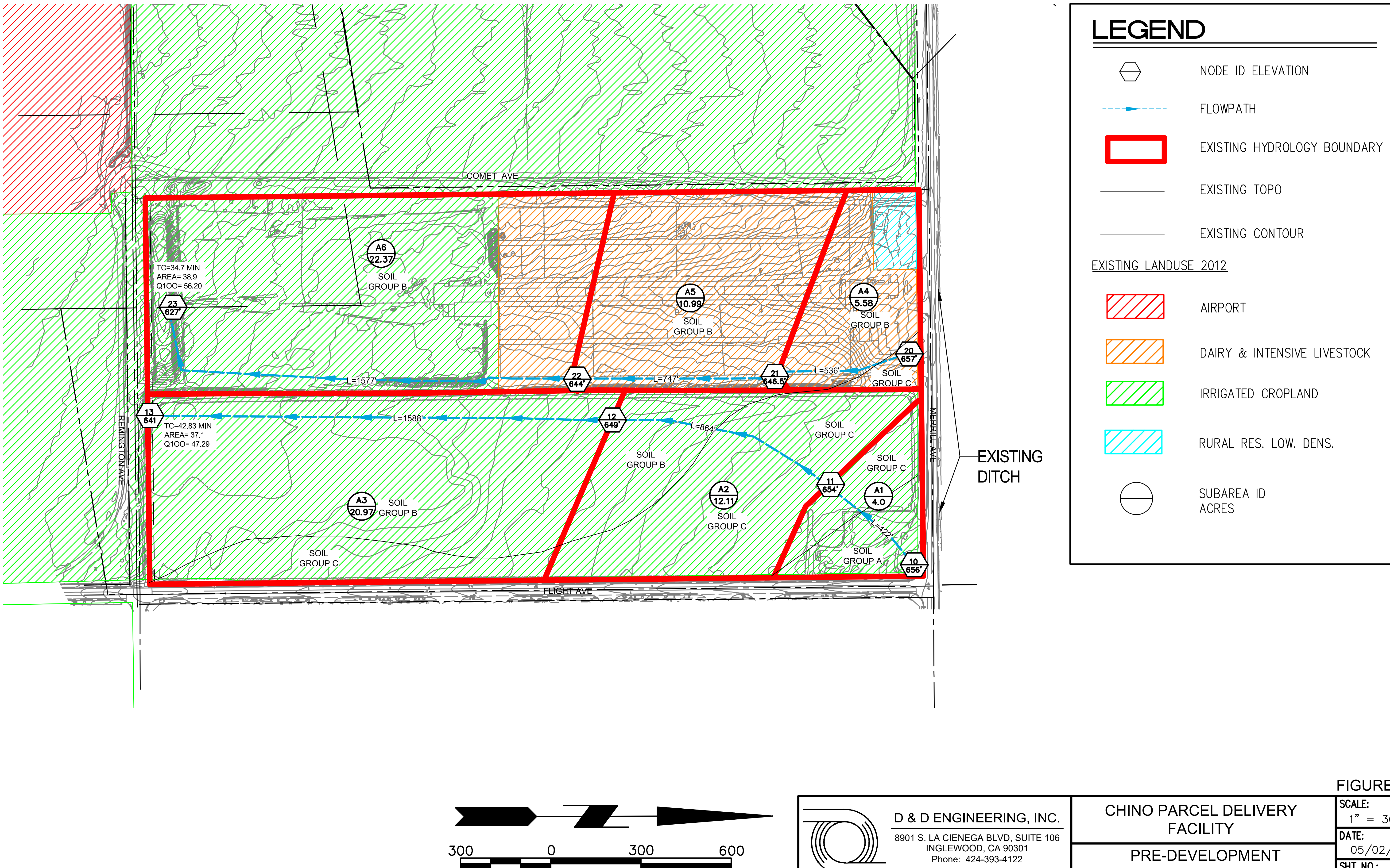

FIGURE 5

D & D ENGINEERING, INC.
8901 S. LA CIENEGA BLVD, SUITE 106
INGLEWOOD, CA 90301
Phone: 424-393-4122

CHINO PARCEL DELIVERY FACILITY

PRE-DEVELOPMENT HYDROLOGY MAP

SCALE: 1" = 300'
DATE: 05/02/18
SHT NO.: 01 OF 01

Drawing Name: M:\17004\Eng\17004\Hm\Hydrology\Pre-Development -Figure 5.dwg
Last Opened: May 03, 2018 - 5:52pm by: Erika

Appendix A

1. Existing Condition Hydrology Map -Rational Method
2. 100-Year Rational Method Calculations – Existing Condition
3. 100-Year Loss Rate Calculations – Existing Condition
4. 100-Year Small Area Hydrograph Calculations – Existing 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 1687

                            Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* CHINO PARCEL DELIVERY FACILITY                                           *
* EXISTING CONDITIONS                                                      *
* RATIONAL METHOD - 100 YEAR                                               *
 **************************************************************************

  FILE NAME: CH-EX2.DAT
  TIME/DATE OF STUDY: 14:08 04/26/2018
============================================================================
  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 = 0.90
  *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) = 1.3900

  *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 0.0312 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) =   422.00
  ELEVATION DATA: UPSTREAM(FEET) =    656.00  DOWNSTREAM(FEET) =    654.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   23.109
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.464
  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.)
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        A        1.93      0.57     1.000    64   23.11
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        C        2.07      0.19     1.000    92   23.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      7.52
  TOTAL AREA(ACRES) =      4.00   PEAK FLOW RATE(CFS) =      7.52

********************************************************************************
  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) =    654.00  DOWNSTREAM(FEET) =    649.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   864.00   CHANNEL SLOPE =  0.0058
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.52
  FLOW VELOCITY(FEET/SEC) =   1.77 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.13   Tc(MIN.) =   31.24
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1286.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =   31.24
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.056
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        B        3.62      0.32     1.000    83
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        C        8.49      0.19     1.000    92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   12.11      SUBAREA RUNOFF(CFS) =   19.92
  EFFECTIVE AREA(ACRES) =     16.11   AREA-AVERAGED Fm(INCH/HR) =  0.27
  AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       16.1       PEAK FLOW RATE(CFS) =      25.97

********************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  52
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    649.00  DOWNSTREAM(FEET) =    641.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1588.00   CHANNEL SLOPE =  0.0050
  CHANNEL FLOW THRU SUBAREA(CFS) =      25.97
  FLOW VELOCITY(FEET/SEC) =   2.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.59   Tc(MIN.) =   42.83
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    2874.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   42.83
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.702
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        B       17.60      0.32     1.000    83
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        C        3.37      0.19     1.000    92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   20.97      SUBAREA RUNOFF(CFS) =   26.47
  EFFECTIVE AREA(ACRES) =     37.08   AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       37.1       PEAK FLOW RATE(CFS) =      47.29

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 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.) =   42.83
  RAINFALL INTENSITY(INCH/HR) =   1.70
  AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.28
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      37.08
  TOTAL STREAM AREA(ACRES) =      37.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      47.29

****************************************************************************
  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) =   536.00
  ELEVATION DATA: UPSTREAM(FEET) =    657.00  DOWNSTREAM(FEET) =    646.50
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.145
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.758
  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.)
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        B        5.00      0.32     1.000    83   19.15
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        C        0.58      0.19     1.000    92   19.15
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     12.31
  TOTAL AREA(ACRES) =      5.58   PEAK FLOW RATE(CFS) =     12.31

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    646.50  DOWNSTREAM(FEET) =    644.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   747.00   CHANNEL SLOPE =  0.0033
  CHANNEL FLOW THRU SUBAREA(CFS) =      12.31
  FLOW VELOCITY(FEET/SEC) =   1.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.16   Tc(MIN.) =   27.31
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1283.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.31
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.229
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        B       10.99      0.32     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   10.99      SUBAREA RUNOFF(CFS) =   18.88
  EFFECTIVE AREA(ACRES) =     16.57   AREA-AVERAGED Fm(INCH/HR) =  0.32
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       16.6       PEAK FLOW RATE(CFS) =      28.54

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    644.00  DOWNSTREAM(FEET) =    627.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1577.00   CHANNEL SLOPE =  0.0108
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =      28.54
  FLOW VELOCITY(FEET/SEC) =   3.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.67   Tc(MIN.) =   34.97
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =    2860.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   34.97
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.922
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL FAIR COVER
  "PASTURE,IRRIGATED"        B       22.37      0.32     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   22.37      SUBAREA RUNOFF(CFS) =   32.24
  EFFECTIVE AREA(ACRES) =     38.94   AREA-AVERAGED Fm(INCH/HR) =  0.32
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       38.9       PEAK FLOW RATE(CFS) =      56.20

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     13.00 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.) =   34.97
  RAINFALL INTENSITY(INCH/HR) =   1.92
  AREA-AVERAGED Fm(INCH/HR) =  0.32
  AREA-AVERAGED Fp(INCH/HR) =  0.32
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      38.94
  TOTAL STREAM AREA(ACRES) =      38.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      56.20

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       47.29   42.83    1.702  0.28( 0.28) 1.00      37.1      10.00
      2       56.20   34.97    1.922  0.32( 0.32) 1.00      38.9      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      100.81   34.97    1.922  0.30( 0.30) 1.00      69.2      20.00
      2       95.78   42.83    1.702  0.30( 0.30) 1.00      76.0      10.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     100.81    Tc(MIN.) =    34.97
  EFFECTIVE AREA(ACRES) =      69.22   AREA-AVERAGED Fm(INCH/HR) =  0.30
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       76.0
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    2874.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       76.0  TC(MIN.) =     34.97
  EFFECTIVE AREA(ACRES) =     69.22  AREA-AVERAGED Fm(INCH/HR)=  0.30
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     100.81

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
      1      100.81   34.97    1.922  0.30( 0.30) 1.00      69.2      20.00
      2       95.78   42.83    1.702  0.30( 0.30) 1.00      76.0      10.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Existing Condition Loss Calculations								
Land Use	Area	Soil	CN Number	Area Fraction	Fp	AP	Soil Loss, Fm, in/hr	P24 - Low loss fraction Y-bar
			AMC III		AMC III	(FIG C.4)	AMC III	100
								6.26
Dairy & Intensive Livestoke	0.587	C	86	0.01	0.42	0.1	0.02	0.74
Dairy & Intensive Livestoke	19.73	B	76	0.26	0.27	0.1	0.53	0.58
Irrigated Cropland	2.075	A	64	0.03	0.57	1	1.18	0.39
Irrigated Cropland	13.828	C	92	0.18	0.19	1	2.63	0.85
Irrigated Cropland	38.77	B	83	0.51	0.32	1	12.41	0.7
Rural Res. Low Den.	0.938	B	90	0.01	0.22	0.9	0.19	0.82
Total Area	75.928						0.01	0.31

```
****************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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          Ver. 23.0  Release Date: 07/01/2016  License ID 1687

                         Analysis prepared by:




****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  CHINO PARCEL DELIVERY FACILITY
  EXISTING CONDITIONS SMALL AREA HYDROGRAPH
  100- YEAR
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.75
    TOTAL CATCHMENT AREA(ACRES) =   76.00
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.010
    LOW LOSS FRACTION = 0.310
    TIME OF CONCENTRATION(MIN.) = 34.97
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.37
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.94
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.39
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.46
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.42
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.26

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =    28.71
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =    10.94

****************************************************************************
  TIME     VOLUME       Q    0.        27.5      55.0      82.5     110.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.26      0.0649      5.96  . Q       .         .         .         .
  0.85      0.3533      6.01  . Q       .         .         .         .
  1.43      0.6476      6.21  . Q       .         .         .         .
  2.01      0.9490      6.31  . Q       .         .         .         .
```

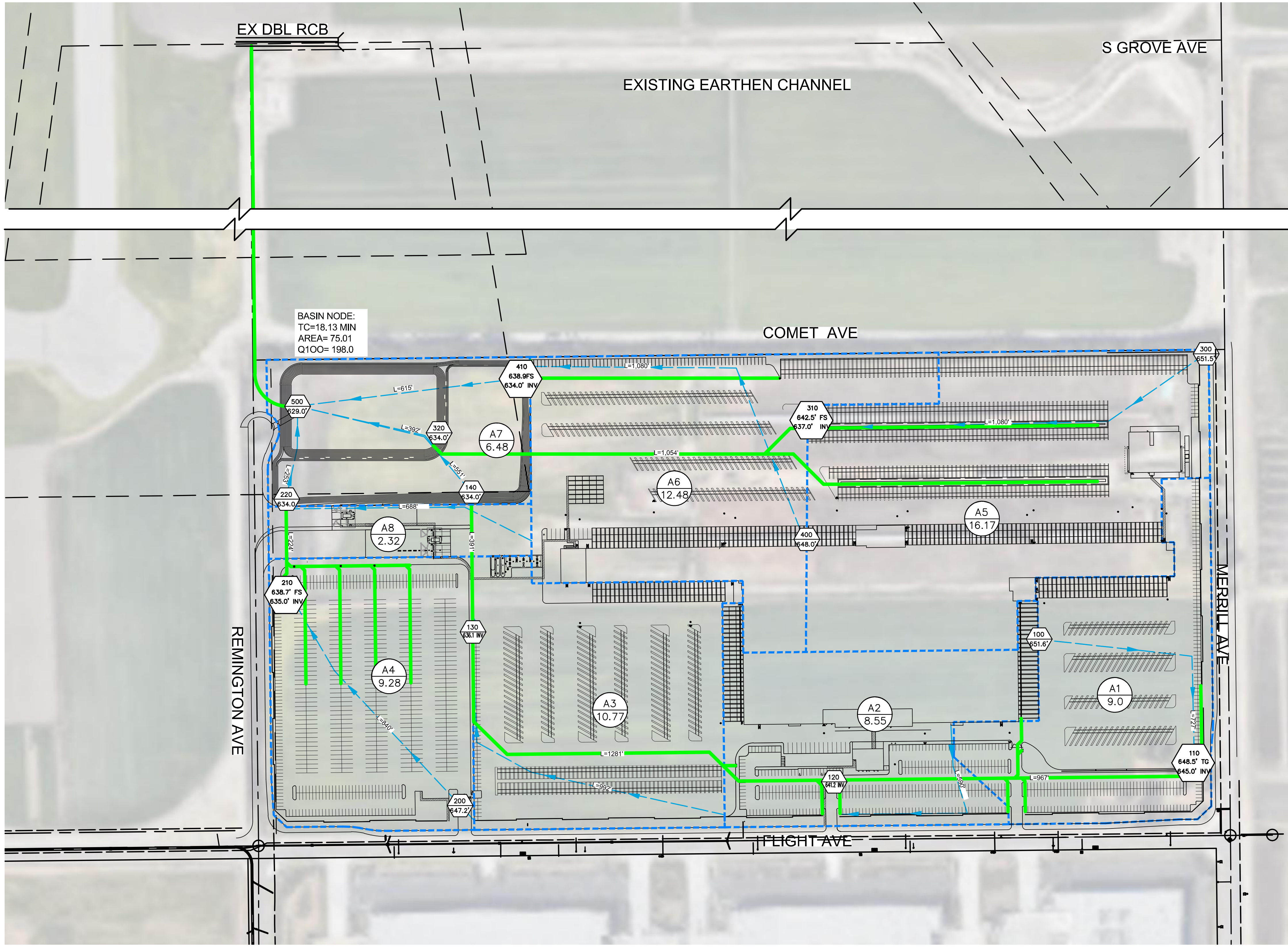
```
   2.59      1.2579      6.52  . Q       .         .         .         .
   3.18      1.5749      6.64  . Q       .         .         .         .
   3.76      1.9006      6.89  . Q       .         .         .         .
   4.34      2.2354      7.02  . Q       .         .         .         .
   4.93      2.5803      7.30  . Q       .         .         .         .
   5.51      2.9359      7.46  . Q       .         .         .         .
   6.09      3.3032      7.79  . Q       .         .         .         .
   6.67      3.6831      7.98  . Q       .         .         .         .
   7.26      4.0772      8.38  .  Q      .         .         .         .
   7.84      4.4862      8.60  .  Q      .         .         .         .
   8.42      4.9126      9.10  .  Q      .         .         .         .
   9.01      5.3575      9.38  .  Q      .         .         .         .
   9.59      5.8242     10.00  .  Q      .         .         .         .
  10.17      6.3146     10.36  .  Q      .         .         .         .
  10.75      6.8335     11.19  .   Q     .         .         .         .
  11.34      7.3839     11.67  .   Q     .         .         .         .
  11.92      7.9740     12.83  .   Q     .         .         .         .
  12.50      8.6181     13.91  .    Q    .         .         .         .
  13.09      9.3536     16.62  .     Q   .         .         .         .
  13.67     10.1825     17.79  .     Q   .         .         .         .
  14.25     11.1254     21.36  .      Q  .         .         .         .
  14.83     12.2550     25.54  .        Q.         .         .         .
  15.42     13.6934     34.18  .         . Q       .         .         .
  16.00     15.6376     46.55  .         .     Q   .         .         .
  16.58     19.1791    100.50  .         .         .         .     Q   .
  17.17     22.2961     28.92  .         Q         .         .         .
  17.75     23.4558     19.23  .     Q   .         .         .         .
  18.33     24.2958     15.65  .    Q    .         .         .         .
  18.91     24.9668     12.21  .   Q     .         .         .         .
  19.50     25.5199     10.75  .  Q      .         .         .         .
  20.08     26.0119      9.68  .  Q      .         .         .         .
  20.66     26.4579      8.84  .  Q      .         .         .         .
  21.25     26.8677      8.17  . Q       .         .         .         .
  21.83     27.2481      7.62  . Q       .         .         .         .
  22.41     27.6040      7.16  . Q       .         .         .         .
  22.99     27.9392      6.76  . Q       .         .         .         .
  23.58     28.2564      6.41  . Q       .         .         .         .
  24.16     28.5579      6.11  . Q       .         .         .         .
  24.74     28.7050      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
-----------------------------------------------------------------------------
---
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             1468.7
             10%                              594.5
             20%                              209.8
```

30%	104.9
40%	69.9
50%	35.0
60%	35.0
70%	35.0
80%	35.0
90%	35.0

Appendix B

1. Proposed Condition Hydrology Map -Rational Method
2. 100-Year Rational Method Calculations – Proposed Condition
3. 100-Year Loss Rate Calculations – Proposed Condition
4. 100-Year Small Area Hydrograph and Basin Routing Calculations – Proposed Condition
5. Detention Basin Routing Calculations
6. Basin Stage Storage Report
7. Basin Composite Outlet Structure Report



LEGEND

- NODE ID ELEVATION
- PROPOSED HYDROLOGY BOUNDARY
- PROPOSED FLOW PATH
- PROPOSED STORM DRAIN
- PROPOSED IMPERVIOUS
- PROPOSED PERVIOUS
- XX / 1 AC — SUBAREA ID ACRES

300 0 300 600
scale 1"= 300' feet

FIGURE 6

D & D ENGINEERING, INC. 8901 S. LA CIENEGA BLVD, SUITE 106 INGLEWOOD, CA 90301 Phone: 424-393-4122	CHINO PARCEL DELIVERY FACILITY PROPOSED CONDITIONS	SCALE: 1" = 300' DATE: 05/02/18 SHT NO.: 1 OF 1

Drawing Name: M:\17004\Eng\17004\Hm\Hydrology\Post-Development-Figure 6.dwg
Last Opened: May 04, 2018 - 3:18pm by: Boris

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____________________________________________________________________________
****************************************************************************
             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 1687

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* CHINO PARCEL DELIVERY FACILITY                                           *
* PROPOSED CONDITIONS HYDROLOGY                                             *
* PATIONAL METHOD - 100-YEAR                                               *
 **************************************************************************

  FILE NAME: CH-PR.DAT
  TIME/DATE OF STUDY: 15:28 04/27/2018
============================================================================
  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 = 0.90
  *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) = 1.3900

  *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    100.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   727.00
  ELEVATION DATA: UPSTREAM(FEET) =    651.60  DOWNSTREAM(FEET) =    648.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.633
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.540
  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        1.86      0.74     0.100    52   12.63
  COMMERCIAL                 B        0.53      0.42     0.100    76   12.63
  COMMERCIAL                 C        6.61      0.27     0.100    86   12.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     28.37
  TOTAL AREA(ACRES) =      9.00   PEAK FLOW RATE(CFS) =     28.37

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   645.00  DOWNSTREAM(FEET) =   641.20
  FLOW LENGTH(FEET) =   967.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.99
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.37
  PIPE TRAVEL TIME(MIN.) =   2.69    Tc(MIN.) =   15.32
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =    1694.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   15.32
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.153
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        4.14      0.42     0.100    76
  COMMERCIAL                 C        4.41      0.27     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    8.55      SUBAREA RUNOFF(CFS) =   24.00
  EFFECTIVE AREA(ACRES) =     17.55   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.36  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       17.5       PEAK FLOW RATE(CFS) =      49.23

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   641.20  DOWNSTREAM(FEET) =   636.10
  FLOW LENGTH(FEET) =  1281.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.79
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      49.23
  PIPE TRAVEL TIME(MIN.) =   3.14    Tc(MIN.) =   18.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =    2975.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   18.47
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.819
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        9.08      0.42     0.100    76
  COMMERCIAL                 C        1.69      0.27     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   10.77      SUBAREA RUNOFF(CFS) =   26.94
  EFFECTIVE AREA(ACRES) =     28.32   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.38  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       28.3       PEAK FLOW RATE(CFS) =      70.89

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   636.10  DOWNSTREAM(FEET) =   634.00
  FLOW LENGTH(FEET) =   391.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  31.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.53
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      70.89
  PIPE TRAVEL TIME(MIN.) =   0.76    Tc(MIN.) =   19.23
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    140.00 =    3366.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    500.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    634.00  DOWNSTREAM(FEET) =    629.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   551.00   CHANNEL SLOPE =  0.0091
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =      70.89
  FLOW VELOCITY(FEET/SEC.) =   2.20   FLOW DEPTH(FEET) =   0.32
  TRAVEL TIME(MIN.) =   4.17   Tc(MIN.) =   23.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    500.00 =    3917.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   23.40
  RAINFALL INTENSITY(INCH/HR) =   2.45
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.38
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      28.32
  TOTAL STREAM AREA(ACRES) =      28.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      70.89

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   840.00
  ELEVATION DATA: UPSTREAM(FEET) =    647.20  DOWNSTREAM(FEET) =    638.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.260
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.793
  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                 B        8.01      0.42     0.100    76   11.26
  COMMERCIAL                 C        1.27      0.27     0.100    86   11.26
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     31.34
  TOTAL AREA(ACRES) =      9.28   PEAK FLOW RATE(CFS) =     31.34

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   635.00  DOWNSTREAM(FEET) =   634.00
  FLOW LENGTH(FEET) =   224.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.41
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.34
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   11.84
```

```
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =    1064.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.84
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.680
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        2.32      0.42     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.32      SUBAREA RUNOFF(CFS) =    7.60
  EFFECTIVE AREA(ACRES) =     11.60   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.41  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      37.99

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    230.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    634.00  DOWNSTREAM(FEET) =    629.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.0198
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      37.99
  FLOW VELOCITY(FEET/SEC.) =   2.19   FLOW DEPTH(FEET) =   0.17
  TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =   13.77
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =    1317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.77
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.361
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        6.48      0.42     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    6.48      SUBAREA RUNOFF(CFS) =   19.36
  EFFECTIVE AREA(ACRES) =     18.08   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.41  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       18.1       PEAK FLOW RATE(CFS) =      54.03

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.77
  RAINFALL INTENSITY(INCH/HR) =   3.36
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.41
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      18.08
  TOTAL STREAM AREA(ACRES) =      18.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      54.03

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1080.00
  ELEVATION DATA: UPSTREAM(FEET) =    651.50  DOWNSTREAM(FEET) =    642.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.944
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.489
  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                 B       15.92      0.42     0.100    76   12.94
  COMMERCIAL                 C        0.25      0.27     0.100    86   12.94
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     50.16
  TOTAL AREA(ACRES) =     16.17   PEAK FLOW RATE(CFS) =     50.16

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   637.00  DOWNSTREAM(FEET) =   630.00
  FLOW LENGTH(FEET) =  1054.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.31
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      50.16
  PIPE TRAVEL TIME(MIN.) =   2.11    Tc(MIN.) =   15.06
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    320.00 =    2134.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    500.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    634.00  DOWNSTREAM(FEET) =    629.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   392.00   CHANNEL SLOPE =  0.0128
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      50.16
  FLOW VELOCITY(FEET/SEC.) =   2.13   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   3.07   Tc(MIN.) =   18.13
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    500.00 =    2526.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   18.13
  RAINFALL INTENSITY(INCH/HR) =   2.85
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      16.17
  TOTAL STREAM AREA(ACRES) =      16.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      50.16

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1080.00
  ELEVATION DATA: UPSTREAM(FEET) =    648.00  DOWNSTREAM(FEET) =    638.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.916
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.493
  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                 B       12.48      0.42     0.100    76   12.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     38.76
  TOTAL AREA(ACRES) =     12.48   PEAK FLOW RATE(CFS) =     38.76

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    420.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    634.00  DOWNSTREAM(FEET) =    629.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   615.00   CHANNEL SLOPE =  0.0081
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =      38.76
  FLOW VELOCITY(FEET/SEC.) =   1.66   FLOW DEPTH(FEET) =   0.23
  TRAVEL TIME(MIN.) =   6.18   Tc(MIN.) =   19.10
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    420.00 =    1695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    500.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =   19.10
  RAINFALL INTENSITY(INCH/HR) =   2.76
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =      12.48
  TOTAL STREAM AREA(ACRES) =      12.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      38.76

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       54.03   13.77    3.361  0.41( 0.04) 0.10      18.1     200.00
      2       70.89   23.40    2.446  0.38( 0.04) 0.10      28.3     100.00
      3       50.16   18.13    2.850  0.42( 0.04) 0.10      16.2     300.00
      4       38.76   19.10    2.762  0.42( 0.04) 0.10      12.5     400.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      190.76   13.77    3.361  0.41( 0.04) 0.10      56.0     200.00
      2      198.00   18.13    2.850  0.40( 0.04) 0.10      68.0     300.00
      3      197.11   19.10    2.762  0.40( 0.04) 0.10      69.9     400.00
      4      187.21   23.40    2.446  0.40( 0.04) 0.10      75.1     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     198.00    Tc(MIN.) =    18.13
  EFFECTIVE AREA(ACRES) =      68.04   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       75.1
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    500.00 =    3917.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       75.1  TC(MIN.) =     18.13
  EFFECTIVE AREA(ACRES) =     68.04  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =     198.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1      190.76   13.77    3.361  0.41( 0.04) 0.10      56.0     200.00
     2      198.00   18.13    2.850  0.40( 0.04) 0.10      68.0     300.00
     3      197.11   19.10    2.762  0.40( 0.04) 0.10      69.9     400.00
     4      187.21   23.40    2.446  0.40( 0.04) 0.10      75.1     100.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Project Condition Loss Calculations								
Land Use	Area	Soil	CN Number	Area Fraction	Fp	AP	Soil Loss, Fm, in/hr	P24 - Low loss fraction Y-bar
			AMC III		AMC III	(FIG C.4)	AMC III	100
								6.26
Commercial/Industrial - 15% Pervious	1.87	A	52	0.025	0.73	0.15	0.20	0.23
Commercial/Industrial - 15% Pervious	58.96	B	76	0.186	0.42	0.15	3.71	0.58
Commercial/Industrial - 15% Pervious	14.23	C	86	0.789	0.29	0.15	0.62	0.74
Total Area	75.06						0.06	0.30

```
******************************************************************************
                       SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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                            Analysis prepared by:




******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  CHINO PARCEL DELIVERY FACILITY
  PROPOSED CONDITIONS INFLOW HYDROGRAPH AND BASIN ROUTING
  100-YEAR
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    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.13
    TOTAL CATCHMENT AREA(ACRES) =   75.10
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.060
    LOW LOSS FRACTION = 0.300
    TIME OF CONCENTRATION(MIN.) = 18.13
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.37
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.94
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.39
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.46
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.42
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.26

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    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =    35.63
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     3.55

******************************************************************************
  TIME     VOLUME       Q    0.        50.0     100.0     150.0     200.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.29      0.0845      6.77  .Q        .         .         .         .
  0.59      0.2545      6.85  .Q        .         .         .         .
  0.89      0.4263      6.90  .Q        .         .         .         .
  1.19      0.5999      7.01  .Q        .         .         .         .
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 1.50      0.7755      7.06  .Q        .         .         .         .
 1.80      0.9532      7.17  .Q        .         .         .         .
 2.10      1.1329      7.23  .Q        .         .         .         .
 2.40      1.3149      7.35  .Q        .         .         .         .
 2.70      1.4991      7.41  .Q        .         .         .         .
 3.01      1.6856      7.53  .Q        .         .         .         .
 3.31      1.8746      7.60  .Q        .         .         .         .
 3.61      2.0660      7.73  .Q        .         .         .         .
 3.91      2.2601      7.81  .Q        .         .         .         .
 4.22      2.4568      7.95  .Q        .         .         .         .
 4.52      2.6564      8.03  .Q        .         .         .         .
 4.82      2.8588      8.19  .Q        .         .         .         .
 5.12      3.0643      8.27  .Q        .         .         .         .
 5.42      3.2730      8.44  .Q        .         .         .         .
 5.73      3.4850      8.53  .Q        .         .         .         .
 6.03      3.7005      8.72  .Q        .         .         .         .
 6.33      3.9196      8.82  .Q        .         .         .         .
 6.63      4.1425      9.03  .Q        .         .         .         .
 6.94      4.3693      9.14  .Q        .         .         .         .
 7.24      4.6004      9.37  .Q        .         .         .         .
 7.54      4.8358      9.49  .Q        .         .         .         .
 7.84      5.0760      9.74  .Q        .         .         .         .
 8.14      5.3210      9.88  .Q        .         .         .         .
 8.45      5.5713     10.17  . Q       .         .         .         .
 8.75      5.8270     10.32  . Q       .         .         .         .
 9.05      6.0887     10.64  . Q       .         .         .         .
 9.35      6.3566     10.81  . Q       .         .         .         .
 9.65      6.6313     11.18  . Q       .         .         .         .
 9.96      6.9131     11.38  . Q       .         .         .         .
10.26      7.2027     11.81  . Q       .         .         .         .
10.56      7.5014     12.11  . Q       .         .         .         .
10.86      7.8130     12.83  . Q       .         .         .         .
11.17      8.1384     13.23  . Q       .         .         .         .
11.47      8.4795     14.09  . Q       .         .         .         .
11.77      8.8374     14.57  . Q       .         .         .         .
12.07      9.2144     15.63  .  Q      .         .         .         .
12.37      9.6324     17.85  .  Q      .         .         .         .
12.68     10.0986     19.48  .  Q      .         .         .         .
12.98     10.5946     20.25  .   Q     .         .         .         .
13.28     11.1225     22.03  .   Q     .         .         .         .
13.58     11.6856     23.07  .   Q     .         .         .         .
13.88     12.2925     25.54  .    Q    .         .         .         .
14.19     12.9490     27.04  .    Q    .         .         .         .
14.49     13.7097     33.88  .     Q   .         .         .         .
14.79     14.5861     36.30  .      Q  .         .         .         .
15.09     15.5760     42.98  .       Q .         .         .         .
15.40     16.7103     47.87  .        Q.         .         .         .
15.70     18.1877     70.45  .         .   Q     .         .         .
16.00     20.1358     85.57  .         .      Q  .         .         .
16.30     23.6771    198.04  .         .         .         .        Q.
16.60     26.8534     56.35  .         .Q        .         .         .
16.91     28.0472     39.26  .      Q  .         .         .         .
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  17.21     28.9323     31.63  .     Q    .         .         .         .
  17.51     29.6298     24.23  .   Q      .         .         .         .
  17.81     30.1957     21.10  .   Q      .         .         .         .
  18.12     30.6935     18.77  .  Q       .         .         .         .
  18.42     31.1162     15.08  .  Q       .         .         .         .
  18.72     31.4749     13.65  . Q        .         .         .         .
  19.02     31.8009     12.46  . Q        .         .         .         .
  19.32     32.1013     11.59  . Q        .         .         .         .
  19.63     32.3833     10.99  . Q        .         .         .         .
  19.93     32.6514     10.48  . Q        .         .         .         .
  20.23     32.9073     10.02  . Q        .         .         .         .
  20.53     33.1524      9.61  .Q         .         .         .         .
  20.83     33.3880      9.25  .Q         .         .         .         .
  21.14     33.6149      8.92  .Q         .         .         .         .
  21.44     33.8341      8.63  .Q         .         .         .         .
  21.74     34.0461      8.36  .Q         .         .         .         .
  22.04     34.2517      8.11  .Q         .         .         .         .
  22.35     34.4513      7.88  .Q         .         .         .         .
  22.65     34.6454      7.67  .Q         .         .         .         .
  22.95     34.8343      7.47  .Q         .         .         .         .
  23.25     35.0186      7.29  .Q         .         .         .         .
  23.55     35.1984      7.11  .Q         .         .         .         .
  23.86     35.3740      6.95  .Q         .         .         .         .
  24.16     35.5457      6.80  .Q         .         .         .         .
  24.46     35.6307      0.00  Q          .         .         .         .
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    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                           1450.4
              10%                            308.2
              20%                            108.8
              30%                             54.4
              40%                             36.3
              50%                             18.1
              60%                             18.1
              70%                             18.1
              80%                             18.1
              90%                             18.1

  Problem Descriptions:
   CHINO PARCEL DELIVERY FACILITY
   PROPOSED CONDITIONS INFLOW HYDROGRAPH AND BASIN ROUTING
   100-YEAR
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FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 18.130
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00

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               INFLOW
                 |
                 |
                 |
                 V               __effective depth
           -------------          |   (and volume)
           |           |     |    |
           | detention |     |....V.............
           |   basin   |<-->|         outflow
           |           |     |.........__________
           -------------     |         |   \
                 |           | storage |    basin outlet
                 V           -----------
              OUTFLOW
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DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 9

BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)
0.000	0.000	0.000	1.000	1.890	1.420
2.000	3.900	3.170	3.000	6.050	6.710
4.000	8.270	11.320	5.000	10.590	20.840
6.000	14.260	33.240	7.000	19.670	69.570
8.000	25.230	95.900			

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	1.00	1.87227	1.90773
3	2.00	3.86042	3.93958
4	3.00	5.96622	6.13378
5	4.00	8.12866	8.41134
6	5.00	10.32979	10.85021
7	6.00	13.84496	14.67504
8	7.00	18.80133	20.53867
9	8.00	24.03257	26.42743

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.287	0.000	6.77	0.09	0.06	0.167
0.590	0.000	6.85	0.18	0.19	0.334
0.892	0.000	6.90	0.26	0.31	0.498
1.194	0.000	7.01	0.35	0.44	0.662
1.496	0.000	7.06	0.44	0.56	0.825
1.798	0.000	7.17	0.52	0.68	0.987
2.100	0.000	7.23	0.61	0.80	1.147
2.403	0.000	7.35	0.69	0.92	1.308
2.705	0.000	7.41	0.78	1.04	1.467
3.007	0.000	7.53	0.86	1.16	1.626
3.309	0.000	7.60	0.94	1.28	1.783
3.611	0.000	7.73	1.03	1.40	1.942
3.913	0.000	7.81	1.10	1.53	2.098
4.216	0.000	7.95	1.18	1.67	2.255
4.518	0.000	8.03	1.26	1.81	2.411
4.820	0.000	8.19	1.34	1.94	2.567
5.122	0.000	8.27	1.41	2.08	2.721
5.424	0.000	8.44	1.49	2.21	2.877
5.726	0.000	8.53	1.57	2.35	3.031
6.029	0.000	8.72	1.65	2.48	3.187
6.331	0.000	8.82	1.72	2.62	3.342
6.633	0.000	9.03	1.80	2.75	3.499
6.935	0.000	9.14	1.88	2.89	3.655
7.237	0.000	9.37	1.96	3.03	3.813
7.539	0.000	9.49	2.03	3.19	3.971
7.842	0.000	9.74	2.11	3.42	4.129
8.144	0.000	9.88	2.18	3.67	4.284
8.446	0.000	10.17	2.25	3.93	4.439
8.748	0.000	10.32	2.32	4.18	4.592
9.050	0.000	10.64	2.39	4.44	4.747
9.352	0.000	10.81	2.47	4.69	4.900
9.655	0.000	11.18	2.54	4.95	5.056
9.957	0.000	11.38	2.61	5.20	5.211
10.259	0.000	11.81	2.68	5.46	5.369
10.561	0.000	12.11	2.76	5.72	5.529
10.863	0.000	12.83	2.84	5.99	5.700
11.165	0.000	13.23	2.92	6.28	5.873
11.467	0.000	14.09	3.00	6.58	6.061
11.770	0.000	14.57	3.09	6.93	6.252
12.072	0.000	15.63	3.18	7.34	6.459
12.374	0.000	17.85	3.30	7.82	6.709
12.676	0.000	19.48	3.42	8.37	6.987
12.978	0.000	20.25	3.55	8.95	7.269
13.281	0.000	22.03	3.69	9.56	7.580
13.583	0.000	23.07	3.83	10.22	7.901

13.885	0.000	25.54	4.00	10.93	8.266
14.187	0.000	27.04	4.16	12.07	8.639
14.489	0.000	33.88	4.37	13.86	9.139
14.791	0.000	36.30	4.59	15.93	9.648
15.094	0.000	42.98	4.86	18.24	10.266
15.396	0.000	47.87	5.10	20.77	10.943
15.698	0.000	70.45	5.41	23.99	12.103
16.000	0.000	85.57	5.80	28.36	13.531
16.302	0.000	198.04	6.58	42.60	17.413
16.604	0.000	56.35	6.59	54.56	17.458
16.906	0.000	39.26	6.53	53.52	17.102
17.209	0.000	31.63	6.44	50.72	16.625
17.511	0.000	24.23	6.33	47.20	16.051
17.813	0.000	21.10	6.23	43.40	15.494
18.115	0.000	18.77	6.13	39.77	14.970
18.417	0.000	15.08	6.03	36.23	14.442
18.720	0.000	13.65	5.92	33.33	13.950
19.022	0.000	12.46	5.79	31.39	13.478
19.324	0.000	11.59	5.66	29.83	13.022
19.626	0.000	10.99	5.54	28.33	12.589
19.928	0.000	10.48	5.43	26.90	12.179
20.230	0.000	10.02	5.33	25.55	11.791
20.532	0.000	9.61	5.23	24.28	11.425
20.835	0.000	9.25	5.13	23.08	11.080
21.137	0.000	8.92	5.04	21.95	10.755
21.439	0.000	8.63	4.94	20.83	10.450
21.741	0.000	8.36	4.82	19.68	10.167
22.043	0.000	8.11	4.71	18.57	9.906
22.345	0.000	7.88	4.60	17.54	9.664
22.648	0.000	7.67	4.51	16.59	9.442
22.950	0.000	7.47	4.42	15.71	9.236
23.252	0.000	7.29	4.33	14.89	9.046
23.554	0.000	7.11	4.26	14.14	8.870
23.856	0.000	6.95	4.19	13.45	8.708
24.159	0.000	6.80	4.12	12.81	8.558
24.461	0.000	0.00	4.00	11.90	8.261
24.763	0.000	0.00	3.87	11.02	7.986
25.065	0.000	0.00	3.75	10.46	7.725
25.367	0.000	0.00	3.64	9.93	7.477
25.669	0.000	0.00	3.54	9.43	7.241
25.971	0.000	0.00	3.44	8.95	7.018
26.274	0.000	0.00	3.34	8.50	6.805
26.576	0.000	0.00	3.25	8.07	6.604
26.878	0.000	0.00	3.16	7.66	6.413
27.180	0.000	0.00	3.08	7.27	6.231
27.482	0.000	0.00	3.00	6.91	6.058
27.784	0.000	0.00	2.93	6.59	5.894
28.087	0.000	0.00	2.85	6.32	5.736
28.389	0.000	0.00	2.78	6.07	5.584
28.691	0.000	0.00	2.72	5.82	5.439
28.993	0.000	0.00	2.65	5.59	5.299
29.295	0.000	0.00	2.59	5.36	5.165

29.597	0.000	0.00	2.53	5.15	5.037
29.900	0.000	0.00	2.47	4.94	4.914
30.202	0.000	0.00	2.42	4.74	4.795
30.504	0.000	0.00	2.36	4.55	4.682
30.806	0.000	0.00	2.31	4.37	4.572
31.108	0.000	0.00	2.26	4.19	4.468
31.410	0.000	0.00	2.22	4.02	4.367
31.713	0.000	0.00	2.17	3.86	4.271
32.015	0.000	0.00	2.13	3.70	4.178
32.317	0.000	0.00	2.09	3.56	4.090
32.619	0.000	0.00	2.05	3.41	4.004
32.921	0.000	0.00	2.01	3.27	3.923
33.223	0.000	0.00	1.97	3.16	3.844
33.526	0.000	0.00	1.93	3.09	3.767
33.828	0.000	0.00	1.90	3.02	3.691
34.130	0.000	0.00	1.86	2.96	3.617
34.432	0.000	0.00	1.82	2.89	3.545
34.734	0.000	0.00	1.79	2.83	3.474
35.036	0.000	0.00	1.75	2.77	3.405
35.339	0.000	0.00	1.72	2.71	3.338
35.641	0.000	0.00	1.69	2.65	3.271
35.943	0.000	0.00	1.66	2.59	3.207
36.245	0.000	0.00	1.62	2.54	3.143
36.547	0.000	0.00	1.59	2.48	3.081
36.849	0.000	0.00	1.56	2.43	3.020
37.152	0.000	0.00	1.53	2.38	2.961
37.454	0.000	0.00	1.50	2.33	2.903
37.756	0.000	0.00	1.48	2.28	2.846
38.058	0.000	0.00	1.45	2.23	2.790
38.360	0.000	0.00	1.42	2.18	2.736
38.662	0.000	0.00	1.39	2.13	2.683
38.965	0.000	0.00	1.37	2.09	2.631
39.267	0.000	0.00	1.34	2.04	2.580
39.569	0.000	0.00	1.32	2.00	2.530
39.871	0.000	0.00	1.29	1.96	2.481
40.173	0.000	0.00	1.27	1.91	2.433
40.475	0.000	0.00	1.25	1.87	2.386
40.778	0.000	0.00	1.22	1.83	2.341
41.080	0.000	0.00	1.20	1.79	2.296
41.382	0.000	0.00	1.18	1.75	2.252
41.684	0.000	0.00	1.16	1.72	2.209
41.986	0.000	0.00	1.14	1.68	2.167
42.288	0.000	0.00	1.12	1.64	2.126
42.591	0.000	0.00	1.10	1.61	2.086
42.893	0.000	0.00	1.08	1.57	2.047
43.195	0.000	0.00	1.06	1.54	2.008
43.497	0.000	0.00	1.04	1.51	1.971
43.799	0.000	0.00	1.02	1.47	1.934
44.101	0.000	0.00	1.00	1.44	1.898
44.404	0.000	0.00	0.99	1.41	1.862
44.706	0.000	0.00	0.97	1.39	1.828
45.008	0.000	0.00	0.95	1.36	1.794

45.310	0.000	0.00	0.93	1.34	1.761
45.612	0.000	0.00	0.91	1.31	1.728
45.914	0.000	0.00	0.90	1.29	1.696
46.217	0.000	0.00	0.88	1.26	1.664
46.519	0.000	0.00	0.86	1.24	1.633
46.821	0.000	0.00	0.85	1.22	1.603
47.123	0.000	0.00	0.83	1.19	1.573
47.425	0.000	0.00	0.82	1.17	1.544
47.727	0.000	0.00	0.80	1.15	1.515
48.030	0.000	0.00	0.79	1.13	1.487
48.332	0.000	0.00	0.77	1.11	1.459
48.634	0.000	0.00	0.76	1.09	1.432
48.936	0.000	0.00	0.74	1.07	1.406
49.238	0.000	0.00	0.73	1.05	1.379
49.540	0.000	0.00	0.72	1.03	1.354
49.843	0.000	0.00	0.70	1.01	1.329
50.145	0.000	0.00	0.69	0.99	1.304
50.447	0.000	0.00	0.68	0.97	1.280
50.749	0.000	0.00	0.66	0.95	1.256
51.051	0.000	0.00	0.65	0.93	1.233
51.353	0.000	0.00	0.64	0.92	1.210
51.656	0.000	0.00	0.63	0.90	1.187
51.958	0.000	0.00	0.62	0.88	1.165
52.260	0.000	0.00	0.61	0.87	1.143
52.562	0.000	0.00	0.59	0.85	1.122
52.864	0.000	0.00	0.58	0.84	1.101
53.166	0.000	0.00	0.57	0.82	1.081
53.469	0.000	0.00	0.56	0.80	1.061
53.771	0.000	0.00	0.55	0.79	1.041
54.073	0.000	0.00	0.54	0.77	1.022
54.375	0.000	0.00	0.53	0.76	1.003
54.677	0.000	0.00	0.52	0.75	0.984
54.979	0.000	0.00	0.51	0.73	0.966
55.282	0.000	0.00	0.50	0.72	0.948
55.584	0.000	0.00	0.49	0.71	0.930
55.886	0.000	0.00	0.48	0.69	0.913
56.188	0.000	0.00	0.47	0.68	0.896
56.490	0.000	0.00	0.47	0.67	0.879
56.792	0.000	0.00	0.46	0.65	0.863
57.095	0.000	0.00	0.45	0.64	0.847
57.397	0.000	0.00	0.44	0.63	0.831
57.699	0.000	0.00	0.43	0.62	0.816
58.001	0.000	0.00	0.42	0.61	0.801
58.303	0.000	0.00	0.42	0.60	0.786
58.605	0.000	0.00	0.41	0.58	0.771
58.908	0.000	0.00	0.40	0.57	0.757
59.210	0.000	0.00	0.39	0.56	0.743
59.512	0.000	0.00	0.39	0.55	0.729
59.814	0.000	0.00	0.38	0.54	0.715
60.116	0.000	0.00	0.37	0.53	0.702
60.418	0.000	0.00	0.36	0.52	0.689
60.721	0.000	0.00	0.36	0.51	0.676

61.023	0.000	0.00	0.35	0.50	0.664
61.325	0.000	0.00	0.34	0.49	0.651
61.627	0.000	0.00	0.34	0.48	0.639
61.929	0.000	0.00	0.33	0.48	0.627
62.231	0.000	0.00	0.33	0.47	0.616
62.534	0.000	0.00	0.32	0.46	0.604
62.836	0.000	0.00	0.31	0.45	0.593
63.138	0.000	0.00	0.31	0.44	0.582
63.440	0.000	0.00	0.30	0.43	0.571
63.742	0.000	0.00	0.30	0.43	0.560
64.044	0.000	0.00	0.29	0.42	0.550
64.347	0.000	0.00	0.29	0.41	0.540
64.649	0.000	0.00	0.28	0.40	0.530
64.951	0.000	0.00	0.28	0.39	0.520
65.253	0.000	0.00	0.27	0.39	0.510
65.555	0.000	0.00	0.26	0.38	0.501
65.857	0.000	0.00	0.26	0.37	0.492
66.160	0.000	0.00	0.26	0.37	0.482
66.462	0.000	0.00	0.25	0.36	0.473
66.764	0.000	0.00	0.25	0.35	0.465
67.066	0.000	0.00	0.24	0.35	0.456
67.368	0.000	0.00	0.24	0.34	0.447
67.670	0.000	0.00	0.23	0.33	0.439
67.973	0.000	0.00	0.23	0.33	0.431
68.275	0.000	0.00	0.22	0.32	0.423
68.577	0.000	0.00	0.22	0.31	0.415
68.879	0.000	0.00	0.22	0.31	0.407
69.181	0.000	0.00	0.21	0.30	0.400
69.483	0.000	0.00	0.21	0.30	0.392
69.786	0.000	0.00	0.20	0.29	0.385
70.088	0.000	0.00	0.20	0.29	0.378
70.390	0.000	0.00	0.20	0.28	0.371
70.692	0.000	0.00	0.19	0.28	0.364
70.994	0.000	0.00	0.19	0.27	0.357
71.296	0.000	0.00	0.19	0.27	0.351
71.599	0.000	0.00	0.18	0.26	0.344
71.901	0.000	0.00	0.18	0.26	0.338
72.203	0.000	0.00	0.18	0.25	0.331
72.505	0.000	0.00	0.17	0.25	0.325
72.807	0.000	0.00	0.17	0.24	0.319
73.110	0.000	0.00	0.17	0.24	0.313
73.412	0.000	0.00	0.16	0.23	0.307
73.714	0.000	0.00	0.16	0.23	0.302
74.016	0.000	0.00	0.16	0.22	0.296
74.318	0.000	0.00	0.15	0.22	0.291
74.620	0.000	0.00	0.15	0.22	0.285
74.923	0.000	0.00	0.15	0.21	0.280
75.225	0.000	0.00	0.15	0.21	0.275
75.527	0.000	0.00	0.14	0.20	0.270
75.829	0.000	0.00	0.14	0.20	0.265
76.131	0.000	0.00	0.14	0.20	0.260
76.433	0.000	0.00	0.13	0.19	0.255

76.736	0.000	0.00	0.13	0.19	0.250
77.038	0.000	0.00	0.13	0.19	0.245
77.340	0.000	0.00	0.13	0.18	0.241
77.642	0.000	0.00	0.13	0.18	0.236
77.944	0.000	0.00	0.12	0.18	0.232
78.246	0.000	0.00	0.12	0.17	0.228
78.549	0.000	0.00	0.12	0.17	0.224
78.851	0.000	0.00	0.12	0.17	0.219
79.153	0.000	0.00	0.11	0.16	0.215
79.455	0.000	0.00	0.11	0.16	0.211
79.757	0.000	0.00	0.11	0.16	0.207
80.059	0.000	0.00	0.11	0.15	0.203
80.362	0.000	0.00	0.11	0.15	0.200
80.664	0.000	0.00	0.10	0.15	0.196
80.966	0.000	0.00	0.10	0.15	0.192
81.268	0.000	0.00	0.10	0.14	0.189
81.570	0.000	0.00	0.10	0.14	0.185
81.872	0.000	0.00	0.10	0.14	0.182
82.175	0.000	0.00	0.09	0.14	0.178
82.477	0.000	0.00	0.09	0.13	0.175
82.779	0.000	0.00	0.09	0.13	0.172
83.081	0.000	0.00	0.09	0.13	0.169
83.383	0.000	0.00	0.09	0.13	0.166
83.685	0.000	0.00	0.09	0.12	0.162
83.988	0.000	0.00	0.08	0.12	0.159
84.290	0.000	0.00	0.08	0.12	0.156
84.592	0.000	0.00	0.08	0.12	0.154
84.894	0.000	0.00	0.08	0.11	0.151
85.196	0.000	0.00	0.08	0.11	0.148
85.498	0.000	0.00	0.08	0.11	0.145
85.801	0.000	0.00	0.08	0.11	0.142
86.103	0.000	0.00	0.07	0.11	0.140
86.405	0.000	0.00	0.07	0.10	0.137
86.707	0.000	0.00	0.07	0.10	0.135
87.009	0.000	0.00	0.07	0.10	0.132
87.311	0.000	0.00	0.07	0.10	0.130
87.614	0.000	0.00	0.07	0.10	0.127
87.916	0.000	0.00	0.07	0.09	0.125
88.218	0.000	0.00	0.06	0.09	0.123
88.520	0.000	0.00	0.06	0.09	0.120
88.822	0.000	0.00	0.06	0.09	0.118
89.125	0.000	0.00	0.06	0.09	0.116
89.427	0.000	0.00	0.06	0.09	0.114
89.729	0.000	0.00	0.06	0.08	0.112
90.031	0.000	0.00	0.06	0.08	0.110
90.333	0.000	0.00	0.06	0.08	0.108
90.635	0.000	0.00	0.06	0.08	0.106
90.938	0.000	0.00	0.05	0.08	0.104
91.240	0.000	0.00	0.05	0.08	0.102
91.542	0.000	0.00	0.05	0.08	0.100
91.844	0.000	0.00	0.05	0.07	0.098
92.146	0.000	0.00	0.05	0.07	0.096

92.448	0.000	0.00	0.05	0.07	0.094
92.751	0.000	0.00	0.05	0.07	0.093
93.053	0.000	0.00	0.05	0.07	0.091
93.355	0.000	0.00	0.05	0.07	0.089
93.657	0.000	0.00	0.05	0.07	0.087
93.959	0.000	0.00	0.05	0.07	0.086
94.261	0.000	0.00	0.04	0.06	0.084
94.564	0.000	0.00	0.04	0.06	0.083
94.866	0.000	0.00	0.04	0.06	0.081
95.168	0.000	0.00	0.04	0.06	0.080
95.470	0.000	0.00	0.04	0.06	0.078
95.772	0.000	0.00	0.04	0.06	0.077
96.074	0.000	0.00	0.04	0.06	0.075
96.377	0.000	0.00	0.04	0.06	0.074
96.679	0.000	0.00	0.04	0.05	0.073
96.981	0.000	0.00	0.04	0.05	0.071
97.283	0.000	0.00	0.04	0.05	0.070
97.585	0.000	0.00	0.04	0.05	0.069
97.887	0.000	0.00	0.04	0.05	0.067
98.190	0.000	0.00	0.03	0.05	0.066
98.492	0.000	0.00	0.03	0.05	0.065
98.794	0.000	0.00	0.03	0.05	0.064
99.096	0.000	0.00	0.03	0.05	0.062
99.398	0.000	0.00	0.03	0.05	0.061
99.700	0.000	0.00	0.03	0.05	0.060
100.003	0.000	0.00	0.03	0.04	0.059
100.305	0.000	0.00	0.03	0.04	0.058
100.607	0.000	0.00	0.03	0.04	0.057
100.909	0.000	0.00	0.03	0.04	0.056
101.211	0.000	0.00	0.03	0.04	0.055
101.513	0.000	0.00	0.03	0.04	0.054
101.816	0.000	0.00	0.03	0.04	0.053
102.118	0.000	0.00	0.03	0.04	0.052
102.420	0.000	0.00	0.03	0.04	0.051
102.722	0.000	0.00	0.03	0.04	0.050
103.024	0.000	0.00	0.03	0.04	0.049
103.326	0.000	0.00	0.03	0.04	0.048
103.629	0.000	0.00	0.02	0.04	0.047
103.931	0.000	0.00	0.02	0.04	0.046
104.233	0.000	0.00	0.02	0.03	0.045
104.535	0.000	0.00	0.02	0.03	0.045
104.837	0.000	0.00	0.02	0.03	0.044
105.140	0.000	0.00	0.02	0.03	0.043
105.442	0.000	0.00	0.02	0.03	0.042
105.744	0.000	0.00	0.02	0.03	0.041
106.046	0.000	0.00	0.02	0.03	0.041
106.348	0.000	0.00	0.02	0.03	0.040
106.650	0.000	0.00	0.02	0.03	0.039
106.953	0.000	0.00	0.02	0.03	0.038
107.255	0.000	0.00	0.02	0.03	0.038
107.557	0.000	0.00	0.02	0.03	0.037
107.859	0.000	0.00	0.02	0.03	0.036

108.161	0.000	0.00	0.02	0.03	0.036
108.463	0.000	0.00	0.02	0.03	0.035
108.766	0.000	0.00	0.02	0.03	0.034
109.068	0.000	0.00	0.02	0.03	0.034
109.370	0.000	0.00	0.02	0.03	0.033
109.672	0.000	0.00	0.02	0.02	0.032
109.974	0.000	0.00	0.02	0.02	0.032
110.276	0.000	0.00	0.02	0.02	0.031
110.579	0.000	0.00	0.02	0.02	0.031
110.881	0.000	0.00	0.02	0.02	0.030
111.183	0.000	0.00	0.02	0.02	0.029
111.485	0.000	0.00	0.02	0.02	0.029
111.787	0.000	0.00	0.02	0.02	0.028
112.089	0.000	0.00	0.01	0.02	0.028
112.392	0.000	0.00	0.01	0.02	0.027
112.694	0.000	0.00	0.01	0.02	0.027
112.996	0.000	0.00	0.01	0.02	0.026
113.298	0.000	0.00	0.01	0.02	0.026
113.600	0.000	0.00	0.01	0.02	0.025
113.902	0.000	0.00	0.01	0.02	0.025
114.205	0.000	0.00	0.01	0.02	0.024
114.507	0.000	0.00	0.01	0.02	0.024
114.809	0.000	0.00	0.01	0.02	0.024
115.111	0.000	0.00	0.01	0.02	0.023
115.413	0.000	0.00	0.01	0.02	0.023
115.715	0.000	0.00	0.01	0.02	0.022
116.018	0.000	0.00	0.01	0.02	0.022
116.320	0.000	0.00	0.01	0.02	0.021
116.622	0.000	0.00	0.01	0.02	0.021
116.924	0.000	0.00	0.01	0.02	0.021
117.226	0.000	0.00	0.01	0.02	0.020
117.528	0.000	0.00	0.01	0.02	0.020
117.831	0.000	0.00	0.01	0.01	0.019
118.133	0.000	0.00	0.01	0.01	0.019
118.435	0.000	0.00	0.01	0.01	0.019
118.737	0.000	0.00	0.01	0.01	0.018
119.039	0.000	0.00	0.01	0.01	0.018
119.341	0.000	0.00	0.01	0.01	0.018
119.644	0.000	0.00	0.01	0.01	0.017
119.946	0.000	0.00	0.01	0.01	0.017
120.248	0.000	0.00	0.01	0.01	0.017
120.550	0.000	0.00	0.01	0.01	0.016
120.852	0.000	0.00	0.01	0.01	0.016
121.155	0.000	0.00	0.01	0.01	0.016
121.457	0.000	0.00	0.01	0.01	0.016
121.759	0.000	0.00	0.01	0.01	0.015
122.061	0.000	0.00	0.01	0.01	0.015
122.363	0.000	0.00	0.01	0.01	0.015
122.665	0.000	0.00	0.01	0.01	0.014
122.968	0.000	0.00	0.01	0.01	0.014
123.270	0.000	0.00	0.01	0.01	0.014
123.572	0.000	0.00	0.01	0.01	0.014

123.874	0.000	0.00	0.01	0.01	0.013
124.176	0.000	0.00	0.01	0.01	0.013
124.478	0.000	0.00	0.01	0.01	0.013
124.781	0.000	0.00	0.01	0.01	0.013
125.083	0.000	0.00	0.01	0.01	0.012
125.385	0.000	0.00	0.01	0.01	0.012
125.687	0.000	0.00	0.01	0.01	0.012
125.989	0.000	0.00	0.01	0.01	0.012
126.291	0.000	0.00	0.01	0.01	0.012
126.594	0.000	0.00	0.01	0.01	0.011
126.896	0.000	0.00	0.01	0.01	0.011
127.198	0.000	0.00	0.01	0.01	0.011
127.500	0.000	0.00	0.01	0.01	0.011
127.802	0.000	0.00	0.01	0.01	0.010
128.104	0.000	0.00	0.01	0.01	0.010
128.407	0.000	0.00	0.01	0.01	0.010
128.709	0.000	0.00	0.01	0.01	0.010
129.011	0.000	0.00	0.01	0.01	0.010
129.313	0.000	0.00	0.01	0.01	0.010
129.615	0.000	0.00	0.00	0.01	0.009
129.917	0.000	0.00	0.00	0.01	0.009
130.220	0.000	0.00	0.00	0.01	0.009
130.522	0.000	0.00	0.00	0.01	0.009
130.824	0.000	0.00	0.00	0.01	0.009
131.126	0.000	0.00	0.00	0.01	0.009
131.428	0.000	0.00	0.00	0.01	0.008
131.730	0.000	0.00	0.00	0.01	0.008
132.033	0.000	0.00	0.00	0.01	0.008
132.335	0.000	0.00	0.00	0.01	0.008
132.637	0.000	0.00	0.00	0.01	0.008
132.939	0.000	0.00	0.00	0.01	0.008
133.241	0.000	0.00	0.00	0.01	0.007
133.543	0.000	0.00	0.00	0.01	0.007
133.846	0.000	0.00	0.00	0.01	0.007
134.148	0.000	0.00	0.00	0.01	0.007
134.450	0.000	0.00	0.00	0.01	0.007
134.752	0.000	0.00	0.00	0.01	0.007
135.054	0.000	0.00	0.00	0.01	0.007
135.356	0.000	0.00	0.00	0.00	0.007
135.659	0.000	0.00	0.00	0.00	0.006
135.961	0.000	0.00	0.00	0.00	0.006
136.263	0.000	0.00	0.00	0.00	0.006
136.565	0.000	0.00	0.00	0.00	0.006
136.867	0.000	0.00	0.00	0.00	0.006
137.169	0.000	0.00	0.00	0.00	0.006
137.472	0.000	0.00	0.00	0.00	0.006
137.774	0.000	0.00	0.00	0.00	0.006
138.076	0.000	0.00	0.00	0.00	0.006
138.378	0.000	0.00	0.00	0.00	0.005
138.680	0.000	0.00	0.00	0.00	0.005
138.983	0.000	0.00	0.00	0.00	0.005
139.285	0.000	0.00	0.00	0.00	0.005

139.587	0.000	0.00	0.00	0.00	0.005
139.889	0.000	0.00	0.00	0.00	0.005
140.191	0.000	0.00	0.00	0.00	0.005
140.493	0.000	0.00	0.00	0.00	0.005
140.796	0.000	0.00	0.00	0.00	0.005
141.098	0.000	0.00	0.00	0.00	0.005
141.400	0.000	0.00	0.00	0.00	0.005
141.702	0.000	0.00	0.00	0.00	0.004
142.004	0.000	0.00	0.00	0.00	0.004
142.306	0.000	0.00	0.00	0.00	0.004
142.609	0.000	0.00	0.00	0.00	0.004
142.911	0.000	0.00	0.00	0.00	0.004
143.213	0.000	0.00	0.00	0.00	0.004
143.515	0.000	0.00	0.00	0.00	0.004
143.817	0.000	0.00	0.00	0.00	0.004
144.119	0.000	0.00	0.00	0.00	0.004
144.422	0.000	0.00	0.00	0.00	0.004
144.724	0.000	0.00	0.00	0.00	0.004
145.026	0.000	0.00	0.00	0.00	0.004
145.328	0.000	0.00	0.00	0.00	0.004
145.630	0.000	0.00	0.00	0.00	0.003
145.932	0.000	0.00	0.00	0.00	0.003
146.235	0.000	0.00	0.00	0.00	0.003
146.537	0.000	0.00	0.00	0.00	0.003
146.839	0.000	0.00	0.00	0.00	0.003
147.141	0.000	0.00	0.00	0.00	0.003
147.443	0.000	0.00	0.00	0.00	0.003
147.745	0.000	0.00	0.00	0.00	0.003
148.048	0.000	0.00	0.00	0.00	0.003
148.350	0.000	0.00	0.00	0.00	0.003
148.652	0.000	0.00	0.00	0.00	0.003
148.954	0.000	0.00	0.00	0.00	0.003
149.256	0.000	0.00	0.00	0.00	0.003
149.558	0.000	0.00	0.00	0.00	0.003
149.861	0.000	0.00	0.00	0.00	0.003
150.163	0.000	0.00	0.00	0.00	0.003
150.465	0.000	0.00	0.00	0.00	0.003
150.767	0.000	0.00	0.00	0.00	0.003
151.069	0.000	0.00	0.00	0.00	0.002
151.371	0.000	0.00	0.00	0.00	0.002
151.674	0.000	0.00	0.00	0.00	0.002
151.976	0.000	0.00	0.00	0.00	0.002
152.278	0.000	0.00	0.00	0.00	0.002
152.580	0.000	0.00	0.00	0.00	0.002
152.882	0.000	0.00	0.00	0.00	0.002
153.184	0.000	0.00	0.00	0.00	0.002
153.487	0.000	0.00	0.00	0.00	0.002
153.789	0.000	0.00	0.00	0.00	0.002
154.091	0.000	0.00	0.00	0.00	0.002
154.393	0.000	0.00	0.00	0.00	0.002
154.695	0.000	0.00	0.00	0.00	0.002
154.998	0.000	0.00	0.00	0.00	0.002

155.300	0.000	0.00	0.00	0.00	0.002
155.602	0.000	0.00	0.00	0.00	0.002
155.904	0.000	0.00	0.00	0.00	0.002
156.206	0.000	0.00	0.00	0.00	0.002
156.508	0.000	0.00	0.00	0.00	0.002
156.811	0.000	0.00	0.00	0.00	0.002
157.113	0.000	0.00	0.00	0.00	0.002
157.415	0.000	0.00	0.00	0.00	0.002
157.717	0.000	0.00	0.00	0.00	0.002
158.019	0.000	0.00	0.00	0.00	0.002
158.321	0.000	0.00	0.00	0.00	0.002
158.624	0.000	0.00	0.00	0.00	0.002
158.926	0.000	0.00	0.00	0.00	0.002
159.228	0.000	0.00	0.00	0.00	0.001
159.530	0.000	0.00	0.00	0.00	0.001
159.832	0.000	0.00	0.00	0.00	0.001
160.134	0.000	0.00	0.00	0.00	0.001
160.437	0.000	0.00	0.00	0.00	0.001
160.739	0.000	0.00	0.00	0.00	0.001
161.041	0.000	0.00	0.00	0.00	0.001
161.343	0.000	0.00	0.00	0.00	0.001
161.645	0.000	0.00	0.00	0.00	0.001
161.947	0.000	0.00	0.00	0.00	0.001
162.250	0.000	0.00	0.00	0.00	0.001
162.552	0.000	0.00	0.00	0.00	0.001
162.854	0.000	0.00	0.00	0.00	0.001
163.156	0.000	0.00	0.00	0.00	0.001
163.458	0.000	0.00	0.00	0.00	0.001
163.760	0.000	0.00	0.00	0.00	0.001
164.063	0.000	0.00	0.00	0.00	0.001
164.365	0.000	0.00	0.00	0.00	0.001
164.667	0.000	0.00	0.00	0.00	0.001
164.969	0.000	0.00	0.00	0.00	0.001
165.271	0.000	0.00	0.00	0.00	0.001
165.573	0.000	0.00	0.00	0.00	0.001

CHINO PARCEL DELIVERY FACILITY DETENTION BASIN STAGE-VOLUME TABLE					
Contour Elev (ft)	Contour Area (sq.ft.)	Depth (ft)	Incremential Volume Avd. End (cu.ft)	Cumulative Volume Avd. End (cu.ft)	Cumulative Volume Avd. End (ac-feet)
630	80,689	1	0	0	0.00
631	84,216	1	82,446	82,446	1.89
632	91,440	1	87,803	170,249	3.91
633	95,137	1	93,283	263,532	6.05
634	98,891	1	97,008	360,540	8.27
635	102,701	1	100,790	461,330	10.59
636	228,327	1	161,387	622,717	14.26
637	239,441	1	233,862	856,579	19.67
638	245,522	1	242,475	1,099,054	25.23
639	251,660	1	248,585	1,347,639	30.94

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

Element Details

Label	Chino Basin Outlet Composite Structure	Notes	

Headwater Range

Headwater Type	User Defined Headwater	Increment (Headwater)	1.00 ft
Minimum (Headwater)	630.00 ft	Maximum (Headwater)	638.50 ft

SpotElevation (ft)

Tailwater Setup

Tailwater Type	Free Outfall

Tailwater Tolerances

Maximum Iterations	30	Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft	Flow Tolerance (Minimum)	0.001 ft³/s
Headwater Tolerance (Maximum)	0.50 ft	Flow Tolerance (Maximum)	10.000 ft³/s
Tailwater Tolerance (Minimum)	0.01 ft		

Outlet Structure

Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 1	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

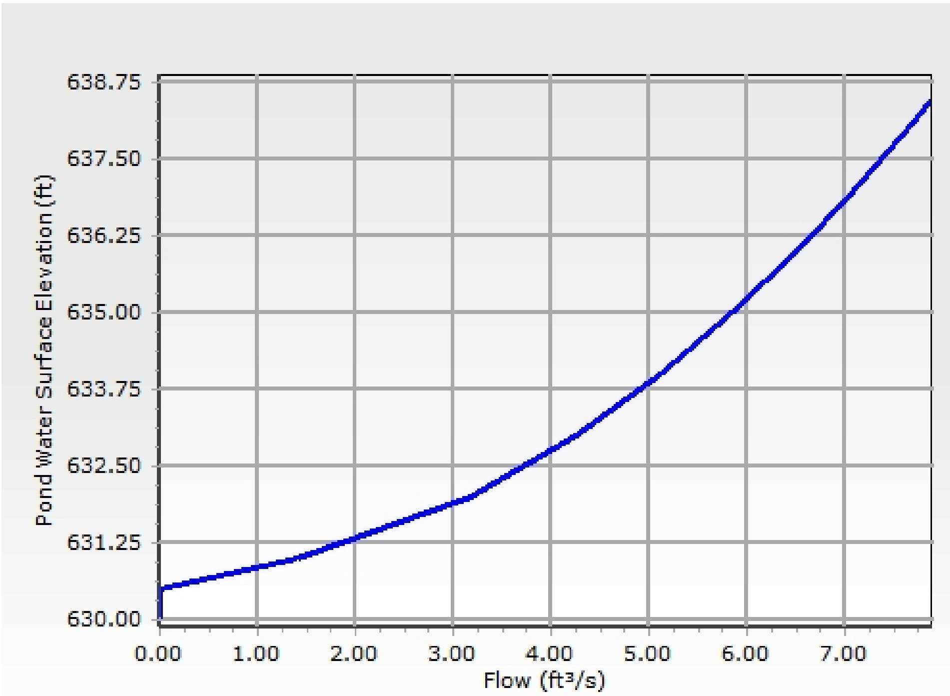
Outlet Structure (Orifice)

Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	3	Orifice Diameter	6.0 in

Outlet Structure (Common)

Elevation	630.50 ft

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	1.42	(N/A)	0.00
632.00	3.17	(N/A)	0.00
633.00	4.25	(N/A)	0.00
634.00	5.11	(N/A)	0.00
635.00	5.84	(N/A)	0.00
636.00	6.50	(N/A)	0.00
637.00	7.09	(N/A)	0.00
638.00	7.63	(N/A)	0.00
638.50	7.89	(N/A)	0.00

Computation Messages
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
H =.25

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =1.25
H =2.25
H =3.25
H =4.25
H =5.25
H =6.25
H =7.25
H =7.75

Outlet Structure

Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 2	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

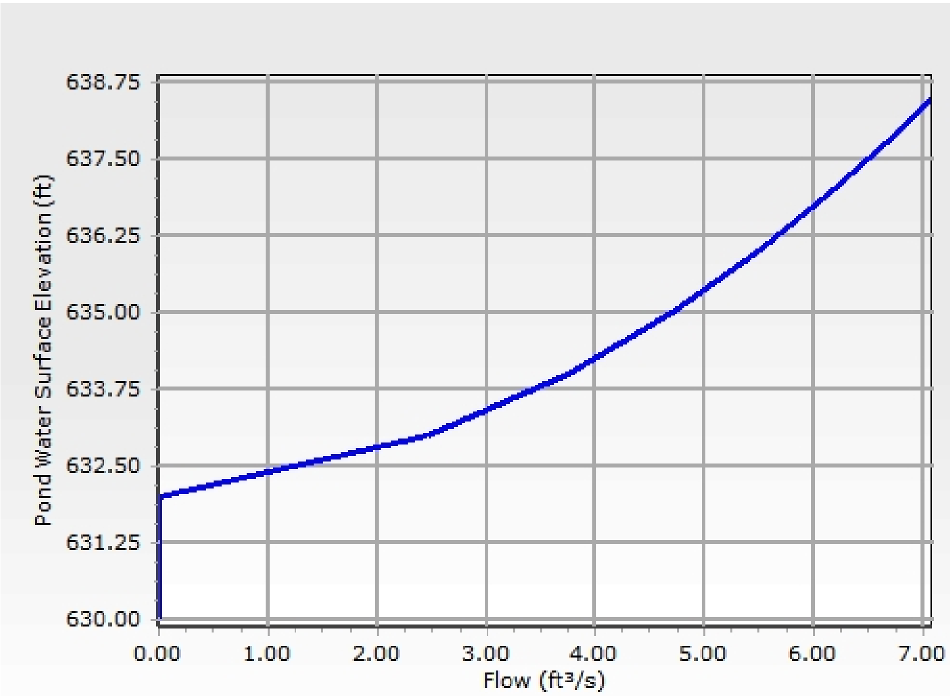
Outlet Structure (Orifice)

Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	3	Orifice Diameter	6.0 in

Outlet Structure (Common)

Elevation	632.00 ft

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	0.00	(N/A)	0.00
632.00	0.00	(N/A)	0.00
633.00	2.46	(N/A)	0.00
634.00	3.75	(N/A)	0.00
635.00	4.70	(N/A)	0.00
636.00	5.49	(N/A)	0.00
637.00	6.18	(N/A)	0.00
638.00	6.80	(N/A)	0.00
638.50	7.09	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
Upstream HW & DNstream TW < Inv.El
H =.75
H =1.75
H =2.75
H =3.75
H =4.75
H =5.75
H =6.25

Outlet Structure

Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 3	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

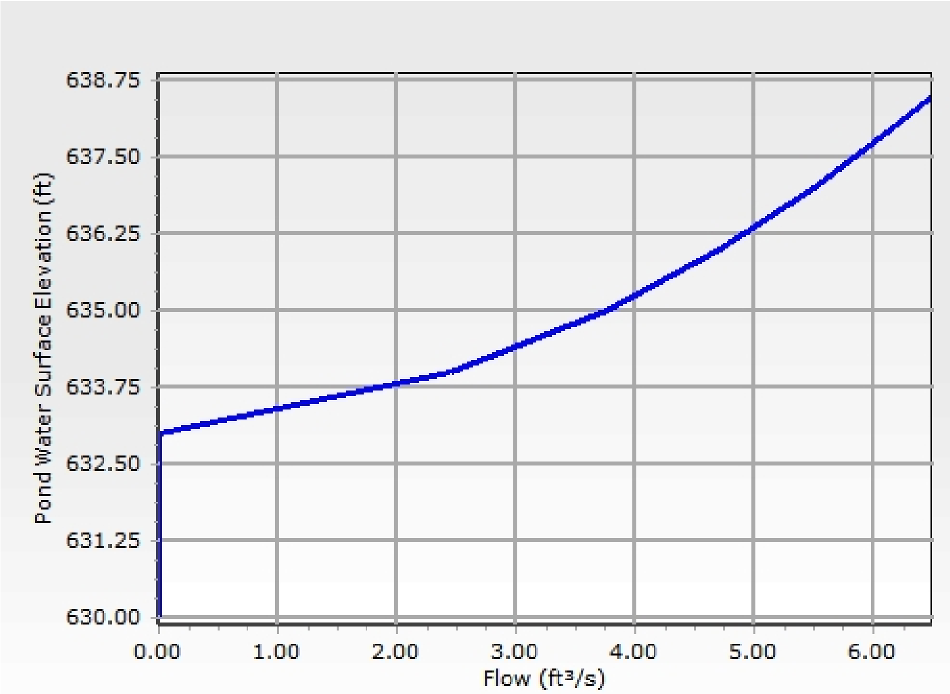
Outlet Structure (Orifice)

Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	3	Orifice Diameter	6.0 in

Outlet Structure (Common)

Elevation	633.00 ft

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	0.00	(N/A)	0.00
632.00	0.00	(N/A)	0.00
633.00	0.00	(N/A)	0.00
634.00	2.46	(N/A)	0.00
635.00	3.75	(N/A)	0.00
636.00	4.70	(N/A)	0.00
637.00	5.49	(N/A)	0.00
638.00	6.18	(N/A)	0.00
638.50	6.50	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
H =.75
H =1.75
H =2.75
H =3.75
H =4.75
H =5.25

Outlet Structure

Outlet Structure Type	Orifice		

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 4	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

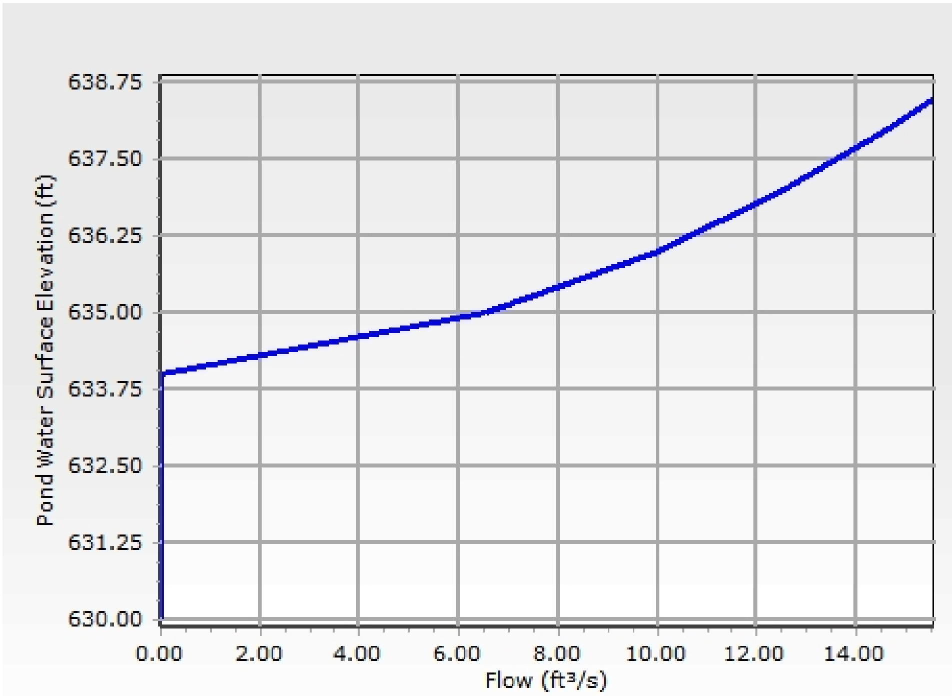
Outlet Structure (Orifice)

Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	8	Orifice Diameter	6.0 in

Outlet Structure (Common)

Elevation	634.00 ft		

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 4 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	0.00	(N/A)	0.00
632.00	0.00	(N/A)	0.00
633.00	0.00	(N/A)	0.00
634.00	0.00	(N/A)	0.00
635.00	6.55	(N/A)	0.00
636.00	10.00	(N/A)	0.00
637.00	12.54	(N/A)	0.00
638.00	14.64	(N/A)	0.00
638.50	15.59	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 4 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
H =.75
H =1.75
H =2.75
H =3.75
H =4.25

Outlet Structure

Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 5	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

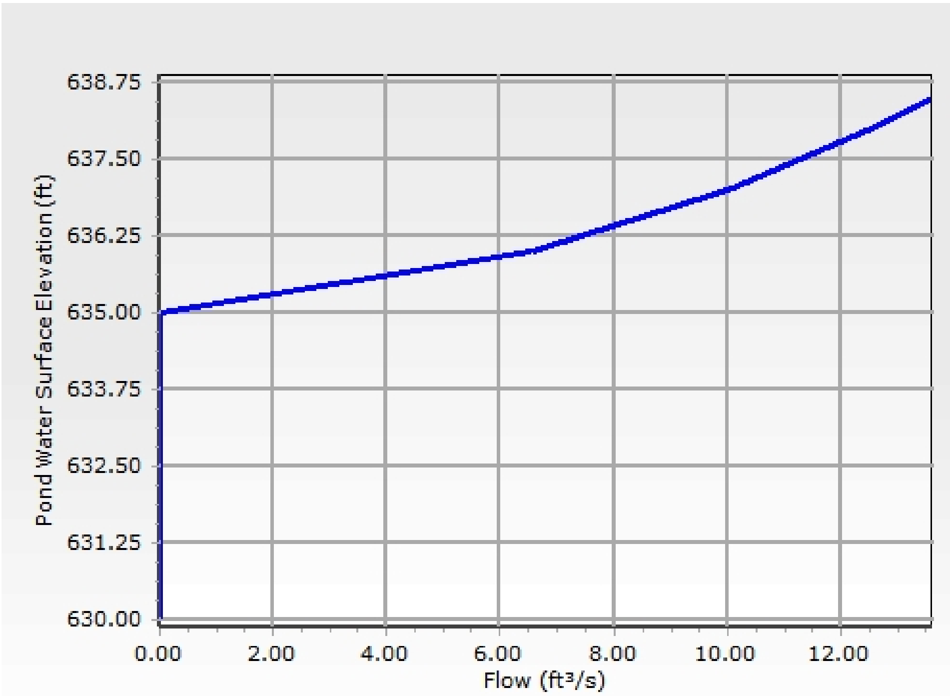
Outlet Structure (Orifice)

Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	8	Orifice Diameter	6.0 in

Outlet Structure (Common)

Elevation	635.00 ft

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 5 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	0.00	(N/A)	0.00
632.00	0.00	(N/A)	0.00
633.00	0.00	(N/A)	0.00
634.00	0.00	(N/A)	0.00
635.00	0.00	(N/A)	0.00
636.00	6.55	(N/A)	0.00
637.00	10.00	(N/A)	0.00
638.00	12.54	(N/A)	0.00
638.50	13.63	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 5 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
H =.75
H =1.75
H =2.75
H =3.25

Outlet Structure			
Outlet Structure Type	Riser		

Outlet Structure (IDs and Direction)			
Outlet ID	Riser - 1	Downstream ID	Tailwater
Flow Direction	Forward and Reverse Flow	Notes	

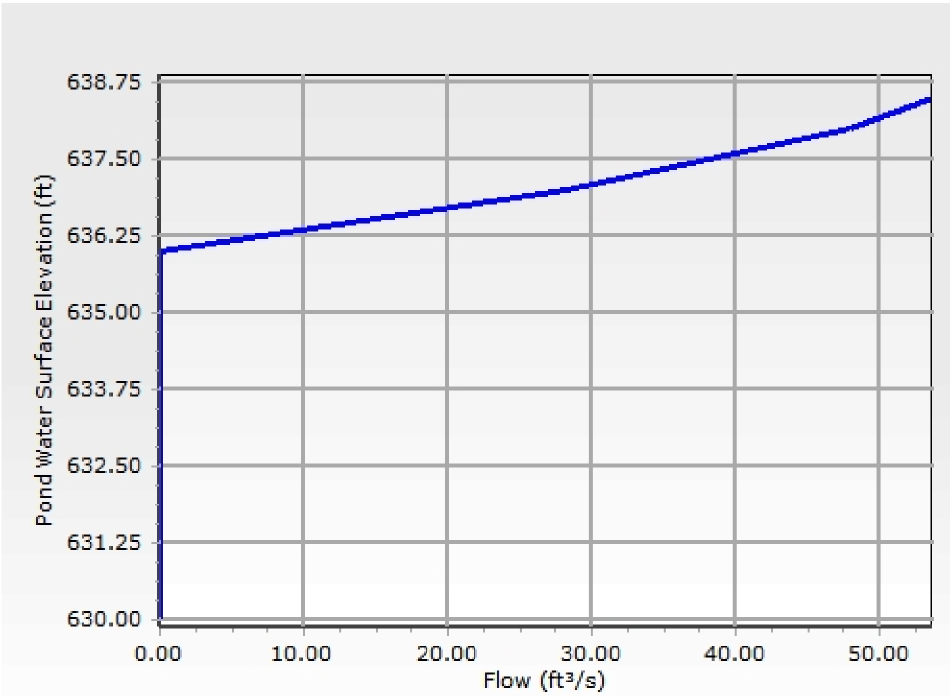
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Riser)			
Riser	Stand Pipe	Transition Elevation	0.00 ft
Diameter	36.0 in	Transition Height	0.00 ft
Weir Coefficient	3.00 (ft^0.5)/s	K Reverse	1.000
Orifice Coefficient	0.600		

Outlet Structure (Common)	
Elevation	636.00 ft

Outlet Structure (Riser, Advanced)			
Use Orifice Depth to Crest?	True	Use Submerged Weir Equation?	False

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	0.00	(N/A)	0.00
632.00	0.00	(N/A)	0.00
633.00	0.00	(N/A)	0.00
634.00	0.00	(N/A)	0.00
635.00	0.00	(N/A)	0.00
636.00	0.00	(N/A)	0.00
637.00	28.27	(N/A)	0.00
638.00	48.11	(N/A)	0.00
638.50	53.79	(N/A)	0.00

Computation Messages
HW & TW < Inv.El.=636.000
HW & TW < Inv.El.=636.000
HW & TW < Inv.El.=636.000

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW < Inv.El.=636.000
HW & TW < Inv.El.=636.000
HW & TW < Inv.El.=636.000
HW & TW < Inv.El.=636.000
Weir: H =0ft
Weir: H =1ft
Orifice: H =2.00; Riser orifice equation controlling.
Orifice: H =2.50; Riser orifice equation controlling.

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure

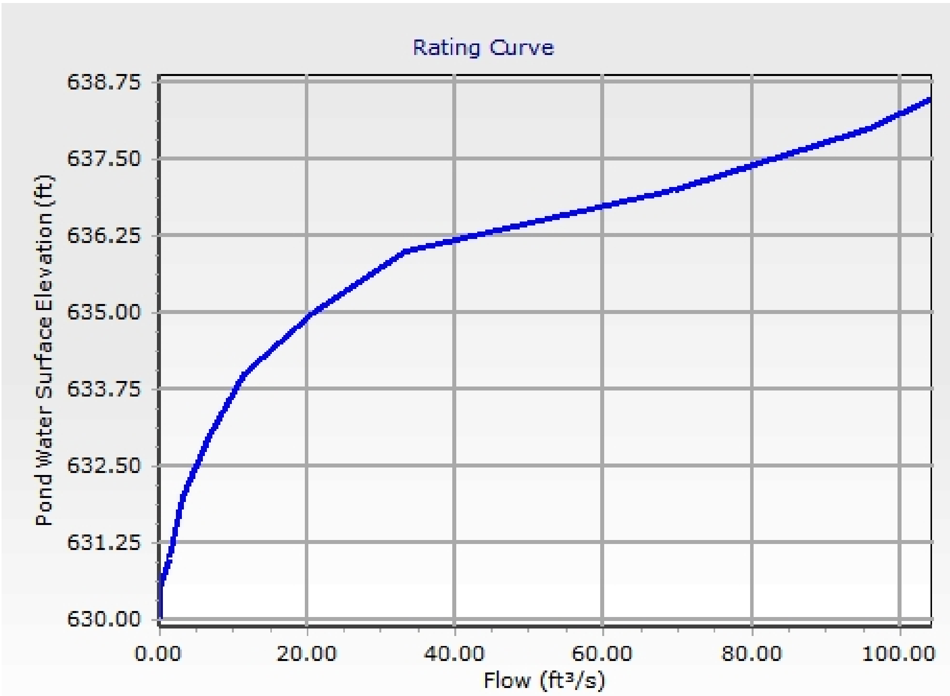
Composite Rating Table

Tailwater Elevation = Free Outfall (Chino Basin Outlet Composite Structure)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
630.00	0.00	(N/A)	0.00
630.50	0.00	(N/A)	0.00
631.00	1.42	(N/A)	0.00
632.00	3.17	(N/A)	0.00
633.00	6.71	(N/A)	0.00
634.00	11.32	(N/A)	0.00
635.00	20.84	(N/A)	0.00
636.00	33.24	(N/A)	0.00
637.00	69.57	(N/A)	0.00
638.00	95.90	(N/A)	0.00
638.50	104.48	(N/A)	0.00

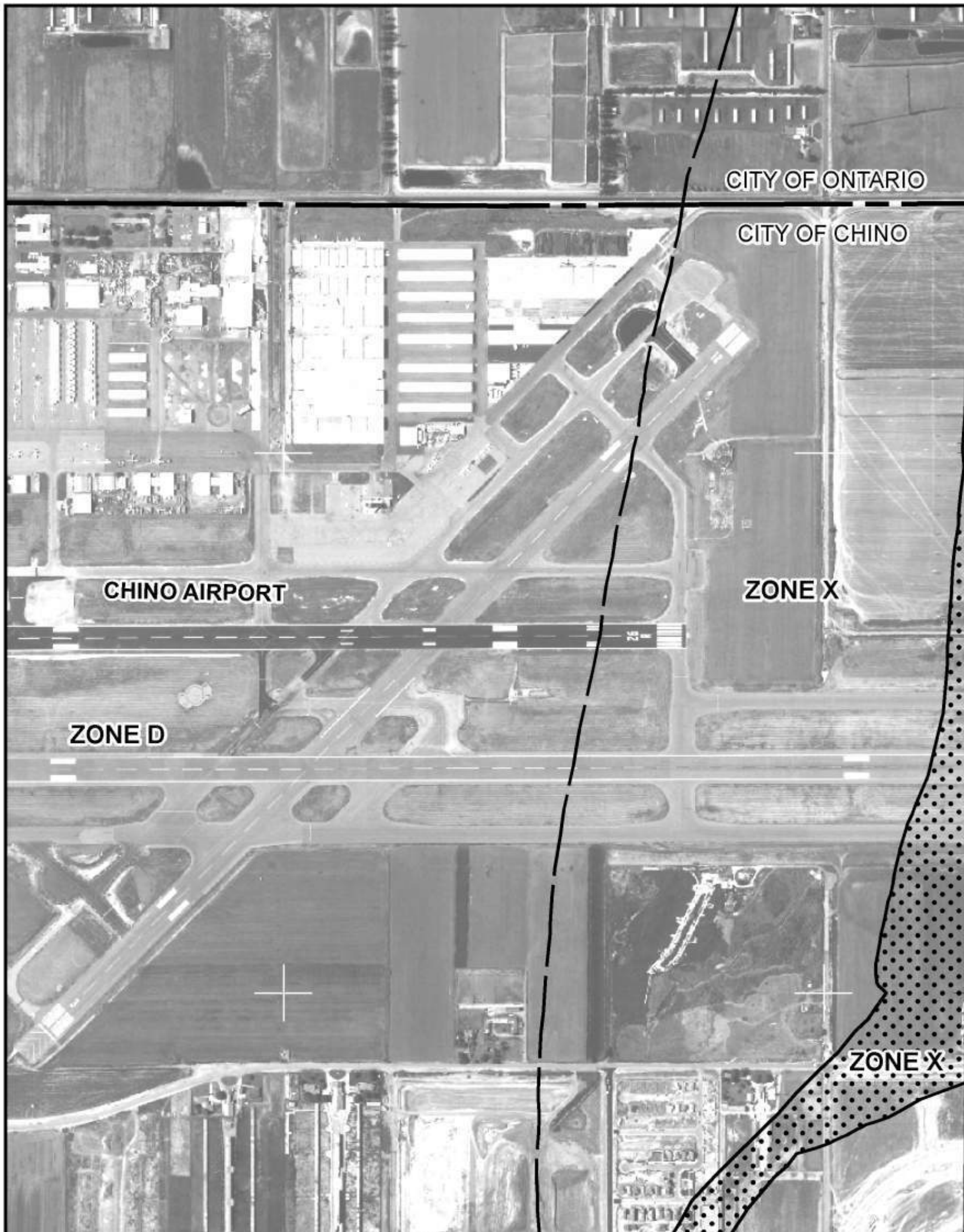
Contributing Structures
None Contributing
None Contributing
Orifice - 1
Orifice - 1
Orifice - 2 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 4 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 4 + Orifice - 5 + Riser - 1 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 4 + Orifice - 5 + Riser - 1 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 4 + Orifice - 5 + Riser - 1 + Orifice - 1
Orifice - 2 + Orifice - 3 + Orifice - 4 + Orifice - 5 + Riser - 1 + Orifice - 1

Composite Outlet Structure Detailed Report: Chino Basin Outlet Composite Structure



Appendix C

1. FEMA FIRM 06071C9335H, Revised August 28, 2008
2. FEMA FIRM 06071C9375H, Revised August 28, 2008



37 60 000m N

37 59 000m N

JOINS PANEL 9375

tional Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 1000'

00 0 1000 2000 FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 9335H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 9335 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHINO HILLS, CITY OF	060754	9335	H
CHINO, CITY OF	060272	9335	H
ONTARIO, CITY OF	060278	9335	H

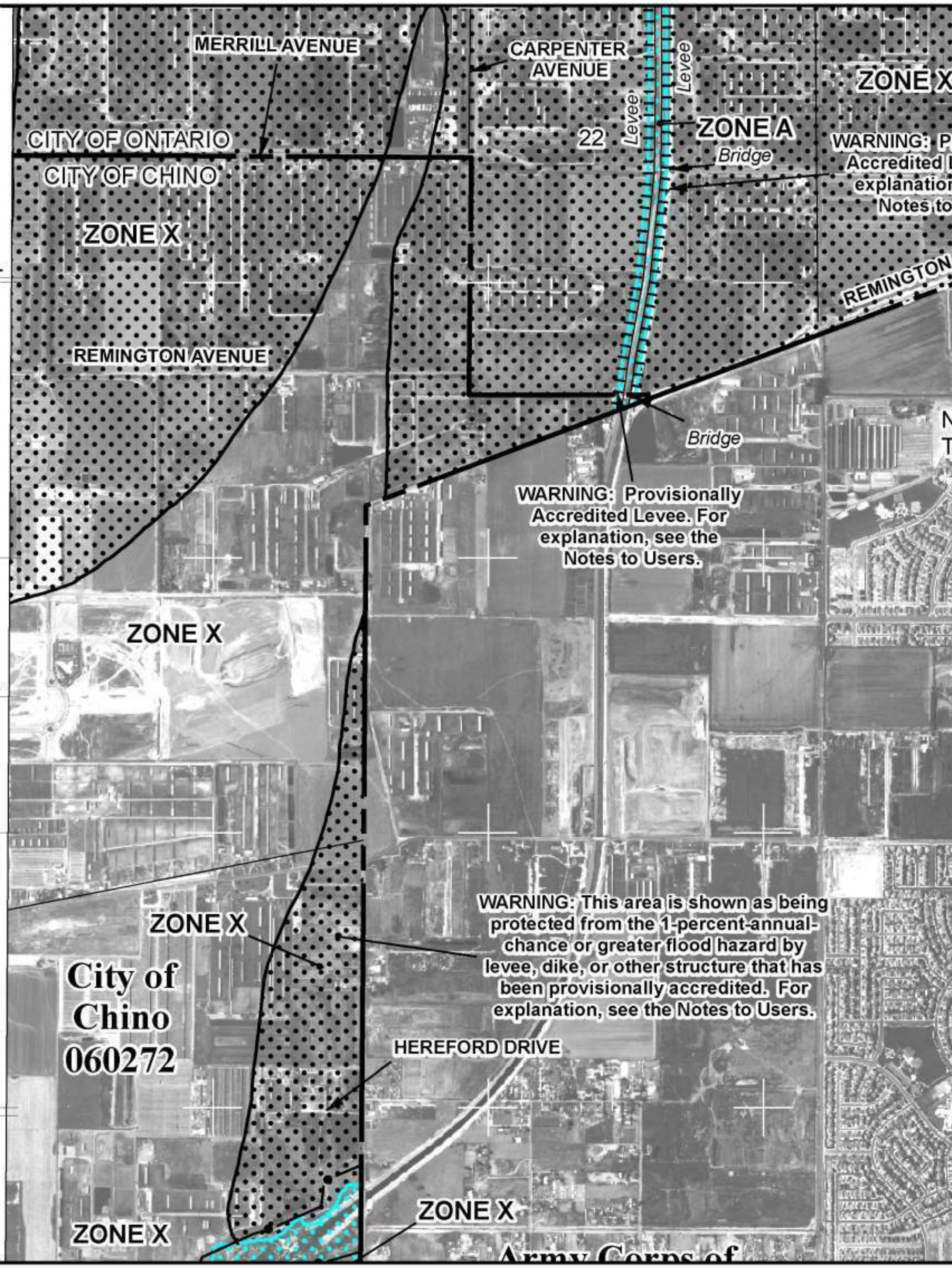
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06071C9335H

MAP REVISED AUGUST 28, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov ational Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 9375H

FIRM
FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 9375 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHINO, CITY OF	060272	9375	H
ONTARIO, CITY OF	060278	9375	H

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

U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER
06071C9375H

MAP REVISED
AUGUST 28, 2008

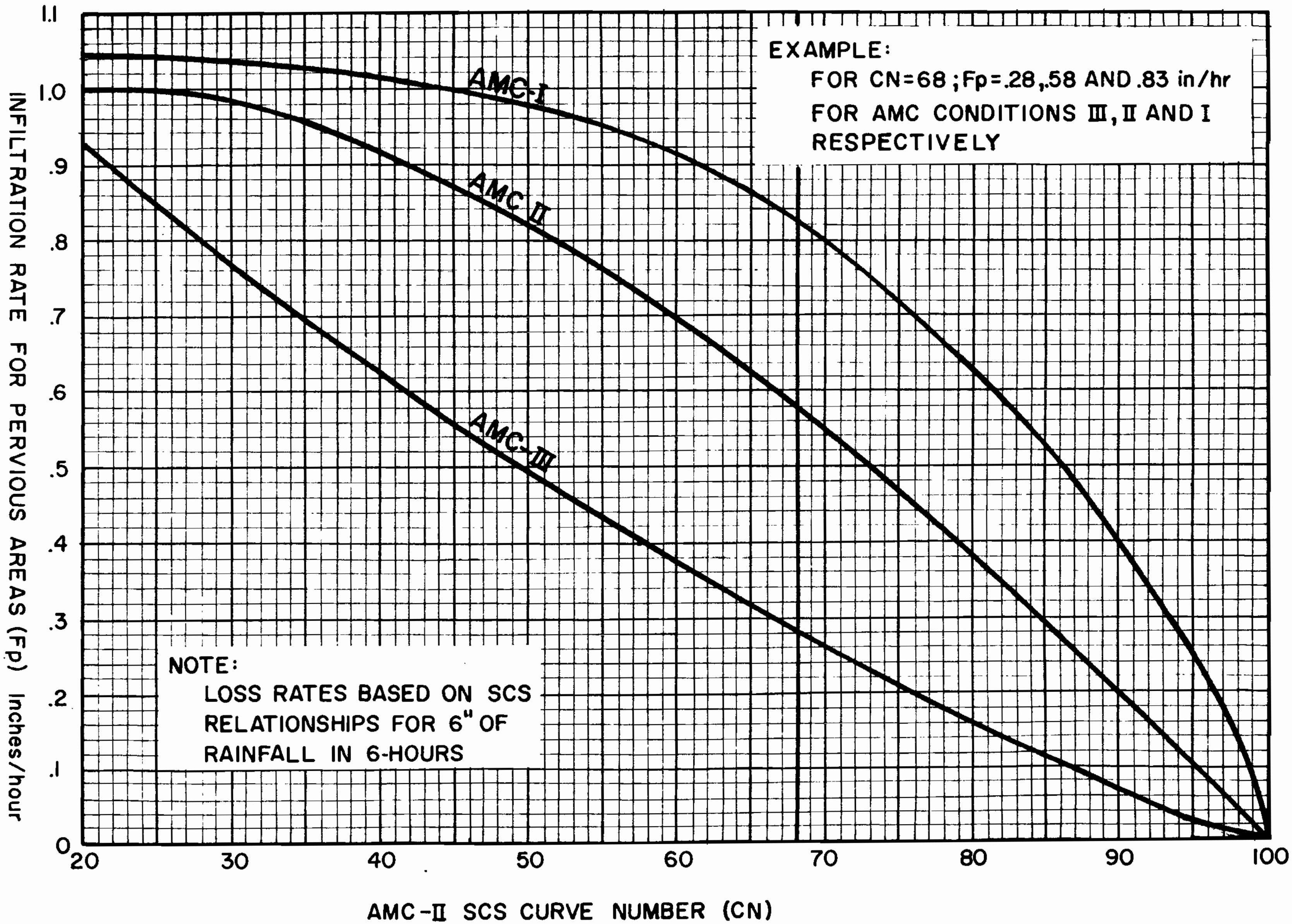
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix D

1. San Bernardino County Hydrology Manual - Figure C-6
2. San Bernardino County Hydrology Manual - Figure C-3
3. San Bernardino County Hydrology Manual - Figure C-4
4. NOAA Atlas 14 Volume 6, Version 2 Point Precipitation Tables
5. Storm Drain Master Plan of Drainage Update - Subarea 2, December 2007
   - -Land Use Map Figure No. 2
   - -Hydrology Map - Basins D & J
6. Amendment to Master Plan of Drainage Subarea 2, July 8, 2004
7. Results of Additional Infiltration Testing

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL



INFILTRATION RATE FOR
PERVIOUS AREAS VERSUS
SCS CURVE NUMBERS

Figure C-6

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II					
Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

   Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

NOAA Atlas 14, Volume 6, Version 2
Location name: Chino, California, USA*
Latitude: 33.9809°, Longitude: -117.6244°
Elevation: 651.33 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.114 (0.095–0.138)	0.150 (0.125–0.182)	0.198 (0.164–0.240)	0.236 (0.195–0.289)	0.288 (0.229–0.365)	0.327 (0.255–0.424)	0.367 (0.279–0.489)	0.409 (0.301–0.560)	0.465 (0.328–0.665)	0.509 (0.346–0.754)
10-min	0.163 (0.137–0.198)	0.216 (0.180–0.261)	0.283 (0.236–0.344)	0.338 (0.279–0.414)	0.412 (0.328–0.523)	0.469 (0.365–0.608)	0.527 (0.400–0.700)	0.586 (0.432–0.803)	0.666 (0.470–0.953)	0.729 (0.496–1.08)
15-min	0.198 (0.165–0.239)	0.261 (0.217–0.316)	0.343 (0.285–0.416)	0.409 (0.337–0.501)	0.498 (0.397–0.632)	0.567 (0.442–0.735)	0.637 (0.484–0.847)	0.709 (0.522–0.971)	0.806 (0.569–1.15)	0.882 (0.600–1.31)
30-min	0.293 (0.244–0.354)	0.386 (0.322–0.467)	0.507 (0.422–0.615)	0.605 (0.499–0.741)	0.737 (0.587–0.935)	0.839 (0.654–1.09)	0.942 (0.715–1.25)	1.05 (0.773–1.44)	1.19 (0.842–1.71)	1.30 (0.888–1.94)
60-min	0.431 (0.360–0.521)	0.569 (0.474–0.689)	0.747 (0.622–0.907)	0.892 (0.735–1.09)	1.09 (0.866–1.38)	1.24 (0.964–1.60)	1.39 (1.06–1.85)	1.55 (1.14–2.12)	1.76 (1.24–2.52)	1.92 (1.31–2.85)
2-hr	0.642 (0.537–0.777)	0.845 (0.705–1.02)	1.10 (0.917–1.34)	1.31 (1.08–1.60)	1.58 (1.26–2.01)	1.79 (1.39–2.32)	1.99 (1.51–2.65)	2.20 (1.62–3.01)	2.47 (1.75–3.54)	2.68 (1.83–3.98)
3-hr	0.805 (0.673–0.974)	1.06 (0.882–1.28)	1.38 (1.15–1.67)	1.63 (1.34–2.00)	1.96 (1.56–2.49)	2.21 (1.72–2.87)	2.46 (1.87–3.27)	2.71 (2.00–3.71)	3.04 (2.15–4.35)	3.29 (2.24–4.88)
6-hr	1.13 (0.943–1.37)	1.48 (1.24–1.80)	1.93 (1.60–2.34)	2.28 (1.88–2.79)	2.74 (2.18–3.48)	3.08 (2.40–4.00)	3.42 (2.60–4.55)	3.76 (2.77–5.15)	4.21 (2.97–6.02)	4.55 (3.10–6.75)
12-hr	1.48 (1.23–1.79)	1.95 (1.62–2.36)	2.54 (2.11–3.08)	3.01 (2.48–3.69)	3.63 (2.89–4.61)	4.10 (3.19–5.31)	4.56 (3.46–6.06)	5.02 (3.70–6.87)	5.63 (3.97–8.05)	6.09 (4.15–9.03)
24-hr	1.94 (1.72–2.24)	2.58 (2.28–2.98)	3.40 (3.00–3.94)	4.06 (3.55–4.74)	4.94 (4.18–5.95)	5.60 (4.64–6.89)	6.26 (5.07–7.89)	6.93 (5.46–8.97)	7.82 (5.92–10.6)	8.51 (6.22–11.9)
2-day	2.35 (2.08–2.71)	3.18 (2.81–3.67)	4.26 (3.76–4.93)	5.14 (4.50–6.00)	6.33 (5.36–7.63)	7.25 (6.01–8.92)	8.18 (6.62–10.3)	9.14 (7.20–11.8)	10.4 (7.90–14.1)	11.5 (8.38–16.0)
3-day	2.53 (2.24–2.92)	3.46 (3.06–4.00)	4.69 (4.14–5.43)	5.70 (4.99–6.66)	7.09 (6.00–8.54)	8.16 (6.77–10.0)	9.26 (7.50–11.7)	10.4 (8.20–13.5)	12.0 (9.06–16.1)	13.2 (9.66–18.4)
4-day	2.73 (2.42–3.15)	3.77 (3.33–4.35)	5.14 (4.53–5.95)	6.27 (5.48–7.32)	7.82 (6.62–9.43)	9.03 (7.49–11.1)	10.3 (8.31–12.9)	11.5 (9.10–15.0)	13.3 (10.1–18.0)	14.7 (10.8–20.5)
7-day	3.16 (2.79–3.64)	4.37 (3.86–5.05)	5.98 (5.27–6.92)	7.31 (6.39–8.52)	9.12 (7.72–11.0)	10.5 (8.74–13.0)	12.0 (9.70–15.1)	13.5 (10.6–17.5)	15.5 (11.8–21.0)	17.2 (12.6–23.9)
10-day	3.43 (3.04–3.96)	4.77 (4.21–5.50)	6.54 (5.76–7.57)	8.00 (6.99–9.33)	10.0 (8.46–12.1)	11.6 (9.58–14.2)	13.2 (10.7–16.6)	14.8 (11.7–19.2)	17.1 (12.9–23.1)	18.9 (13.8–26.3)
20-day	4.11 (3.64–4.74)	5.77 (5.10–6.66)	7.98 (7.04–9.24)	9.83 (8.60–11.5)	12.4 (10.5–14.9)	14.4 (12.0–17.7)	16.5 (13.4–20.8)	18.7 (14.7–24.2)	21.7 (16.5–29.3)	24.2 (17.7–33.7)
30-day	4.85 (4.29–5.60)	6.83 (6.03–7.88)	9.50 (8.38–11.0)	11.8 (10.3–13.7)	14.9 (12.6–18.0)	17.5 (14.5–21.5)	20.1 (16.3–25.3)	22.9 (18.0–29.7)	26.8 (20.3–36.2)	30.0 (21.9–41.8)
45-day	5.76 (5.10–6.65)	8.08 (7.14–9.33)	11.3 (9.94–13.1)	14.0 (12.3–16.3)	17.9 (15.2–21.6)	21.1 (17.5–25.9)	24.4 (19.8–30.8)	28.0 (22.1–36.3)	33.2 (25.1–44.7)	37.3 (27.3–52.1)
60-day	6.67 (5.90–7.69)	9.28 (8.20–10.7)	12.9 (11.4–15.0)	16.1 (14.1–18.8)	20.7 (17.5–24.9)	24.4 (20.2–30.0)	28.4 (23.0–35.8)	32.8 (25.8–42.5)	39.1 (29.6–52.7)	44.3 (32.4–61.8)

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

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

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.37 (1.14–1.66)	1.80 (1.50–2.18)	2.38 (1.97–2.88)	2.83 (2.34–3.47)	3.46 (2.75–4.38)	3.92 (3.06–5.09)	4.40 (3.35–5.87)	4.91 (3.61–6.72)	5.58 (3.94–7.98)	6.11 (4.15–9.05)
10-min	0.978 (0.822–1.19)	1.30 (1.08–1.57)	1.70 (1.42–2.06)	2.03 (1.67–2.48)	2.47 (1.97–3.14)	2.81 (2.19–3.65)	3.16 (2.40–4.20)	3.52 (2.59–4.82)	4.00 (2.82–5.72)	4.37 (2.98–6.49)
15-min	0.792 (0.660–0.956)	1.04 (0.868–1.26)	1.37 (1.14–1.66)	1.64 (1.35–2.00)	1.99 (1.59–2.53)	2.27 (1.77–2.94)	2.55 (1.94–3.39)	2.84 (2.09–3.88)	3.22 (2.28–4.61)	3.53 (2.40–5.23)
30-min	0.586 (0.488–0.708)	0.772 (0.644–0.934)	1.01 (0.844–1.23)	1.21 (0.998–1.48)	1.47 (1.17–1.87)	1.68 (1.31–2.18)	1.88 (1.43–2.51)	2.10 (1.55–2.87)	2.39 (1.68–3.41)	2.61 (1.78–3.87)
60-min	0.431 (0.360–0.521)	0.569 (0.474–0.689)	0.747 (0.622–0.907)	0.892 (0.735–1.09)	1.09 (0.866–1.38)	1.24 (0.964–1.60)	1.39 (1.06–1.85)	1.55 (1.14–2.12)	1.76 (1.24–2.52)	1.92 (1.31–2.85)
2-hr	0.321 (0.268–0.388)	0.422 (0.352–0.512)	0.552 (0.458–0.670)	0.654 (0.540–0.801)	0.790 (0.630–1.00)	0.892 (0.696–1.16)	0.995 (0.756–1.32)	1.10 (0.810–1.50)	1.24 (0.872–1.77)	1.34 (0.913–1.99)
3-hr	0.268 (0.224–0.324)	0.352 (0.294–0.426)	0.459 (0.381–0.557)	0.543 (0.448–0.665)	0.654 (0.521–0.829)	0.737 (0.574–0.955)	0.819 (0.622–1.09)	0.902 (0.665–1.24)	1.01 (0.715–1.45)	1.10 (0.746–1.63)
6-hr	0.189 (0.157–0.228)	0.247 (0.207–0.300)	0.322 (0.268–0.391)	0.381 (0.314–0.466)	0.458 (0.364–0.580)	0.515 (0.401–0.667)	0.571 (0.434–0.760)	0.628 (0.463–0.861)	0.703 (0.496–1.01)	0.760 (0.517–1.13)
12-hr	0.123 (0.102–0.148)	0.161 (0.135–0.195)	0.211 (0.175–0.256)	0.250 (0.206–0.306)	0.301 (0.240–0.382)	0.340 (0.265–0.441)	0.378 (0.287–0.503)	0.416 (0.307–0.570)	0.467 (0.330–0.668)	0.505 (0.344–0.750)
24-hr	0.081 (0.072–0.093)	0.108 (0.095–0.124)	0.142 (0.125–0.164)	0.169 (0.148–0.197)	0.206 (0.174–0.248)	0.233 (0.193–0.287)	0.261 (0.211–0.329)	0.289 (0.228–0.374)	0.326 (0.247–0.440)	0.355 (0.259–0.495)
2-day	0.049 (0.043–0.057)	0.066 (0.059–0.076)	0.089 (0.078–0.103)	0.107 (0.094–0.125)	0.132 (0.112–0.159)	0.151 (0.125–0.186)	0.170 (0.138–0.215)	0.190 (0.150–0.247)	0.217 (0.165–0.293)	0.239 (0.175–0.333)
3-day	0.035 (0.031–0.041)	0.048 (0.043–0.056)	0.065 (0.057–0.075)	0.079 (0.069–0.092)	0.098 (0.083–0.119)	0.113 (0.094–0.139)	0.129 (0.104–0.162)	0.145 (0.114–0.187)	0.166 (0.126–0.224)	0.183 (0.134–0.256)
4-day	0.028 (0.025–0.033)	0.039 (0.035–0.045)	0.054 (0.047–0.062)	0.065 (0.057–0.076)	0.081 (0.069–0.098)	0.094 (0.078–0.116)	0.107 (0.087–0.135)	0.120 (0.095–0.156)	0.139 (0.105–0.187)	0.153 (0.112–0.214)
7-day	0.019 (0.017–0.022)	0.026 (0.023–0.030)	0.036 (0.031–0.041)	0.043 (0.038–0.051)	0.054 (0.046–0.065)	0.063 (0.052–0.077)	0.071 (0.058–0.090)	0.080 (0.063–0.104)	0.093 (0.070–0.125)	0.102 (0.075–0.142)
10-day	0.014 (0.013–0.016)	0.020 (0.018–0.023)	0.027 (0.024–0.032)	0.033 (0.029–0.039)	0.042 (0.035–0.050)	0.048 (0.040–0.059)	0.055 (0.044–0.069)	0.062 (0.049–0.080)	0.071 (0.054–0.096)	0.079 (0.058–0.110)
20-day	0.009 (0.008–0.010)	0.012 (0.011–0.014)	0.017 (0.015–0.019)	0.020 (0.018–0.024)	0.026 (0.022–0.031)	0.030 (0.025–0.037)	0.034 (0.028–0.043)	0.039 (0.031–0.050)	0.045 (0.034–0.061)	0.050 (0.037–0.070)
30-day	0.007 (0.006–0.008)	0.009 (0.008–0.011)	0.013 (0.012–0.015)	0.016 (0.014–0.019)	0.021 (0.018–0.025)	0.024 (0.020–0.030)	0.028 (0.023–0.035)	0.032 (0.025–0.041)	0.037 (0.028–0.050)	0.042 (0.030–0.058)
45-day	0.005 (0.005–0.006)	0.007 (0.007–0.009)	0.010 (0.009–0.012)	0.013 (0.011–0.015)	0.017 (0.014–0.020)	0.020 (0.016–0.024)	0.023 (0.018–0.028)	0.026 (0.020–0.034)	0.031 (0.023–0.041)	0.035 (0.025–0.048)
60-day	0.005 (0.004–0.005)	0.006 (0.006–0.007)	0.009 (0.008–0.010)	0.011 (0.010–0.013)	0.014 (0.012–0.017)	0.017 (0.014–0.021)	0.020 (0.016–0.025)	0.023 (0.018–0.029)	0.027 (0.021–0.037)	0.031 (0.023–0.043)

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

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BUREAU VERITAS

Bureau Veritas North America, Inc.

Storm Drain
Master Plan Update Report

Subarea 2
Chino Agricultural Preserve Area

CHINO

City of Chino

Final Report
December 2007

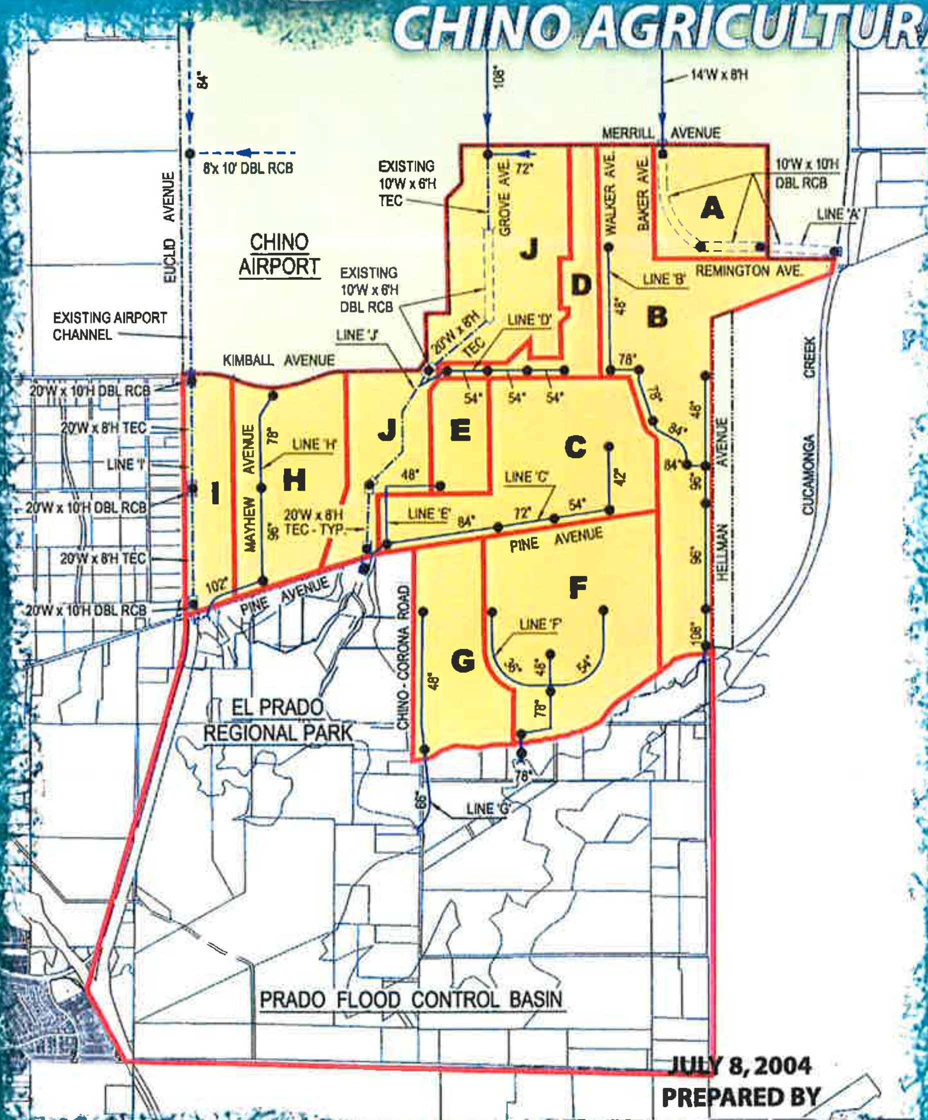
AMENDMENT TO

MASTER PLAN OF DRAINAGE

SUBAREA 2

CHINO SPHERE OF INFLUENCE

CHINO AGRICULTURAL PRESERVE AREA



JULY 8, 2004

PREPARED BY

LDKING

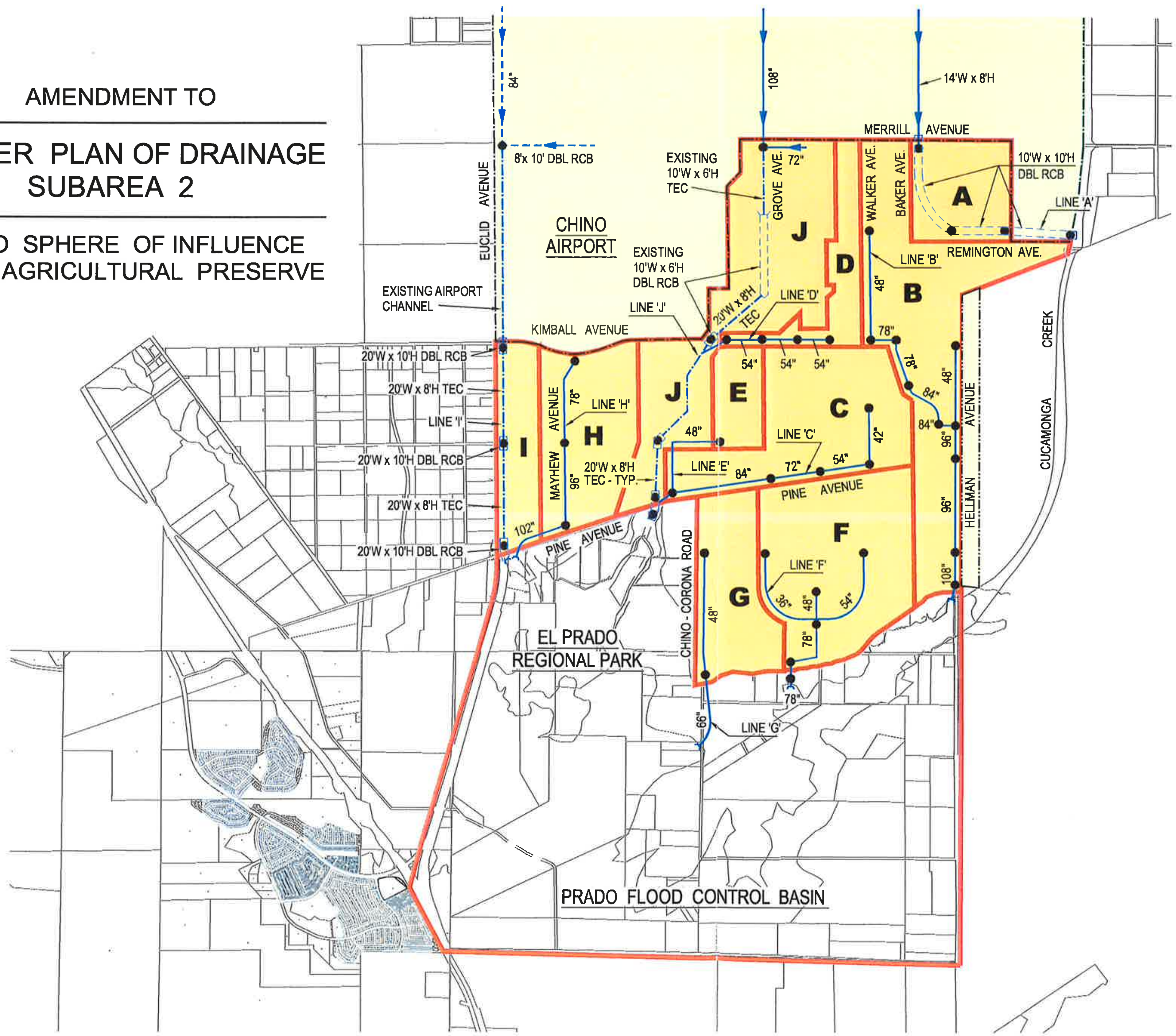
ENGINEERS / PLANNERS / SURVEYORS

2151 Convention Center Way, Suite 100 Ontario, California 91764-4464 (909) 937-0200

AMENDMENT TO

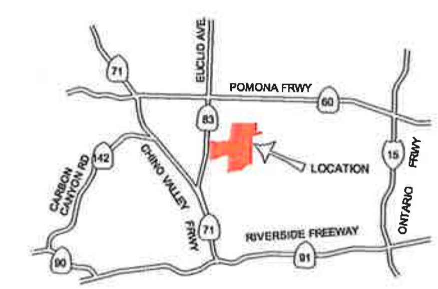
MASTER PLAN OF DRAINAGE SUBAREA 2

CHINO SPHERE OF INFLUENCE
CHINO AGRICULTURAL PRESERVE



LEGEND

LINE 'D'	STORM DRAIN SYSTEM
	STORM BASINS
	STUDY AREA BOUNDARY
	OFF-SITE TRIBUTARY AREAS
D	DRAINAGE BASIN IDENTIFICATION
	MAINLINE STORM DRAINS
	DOUBLE RCB
	TRAPEZOIDAL EARTHEN CHANNEL (TEC)
	EXISTING STORM DRAIN



VICINITY MAP
Not to Scale

SCALE 1"=3000'

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JN 48131 Lewis Operating Corp
E:\dwg\48131\CFD Storm\48131MP Drainage Amendment.dwg, Plotted: Jul 22, 2004 - 3:16pm

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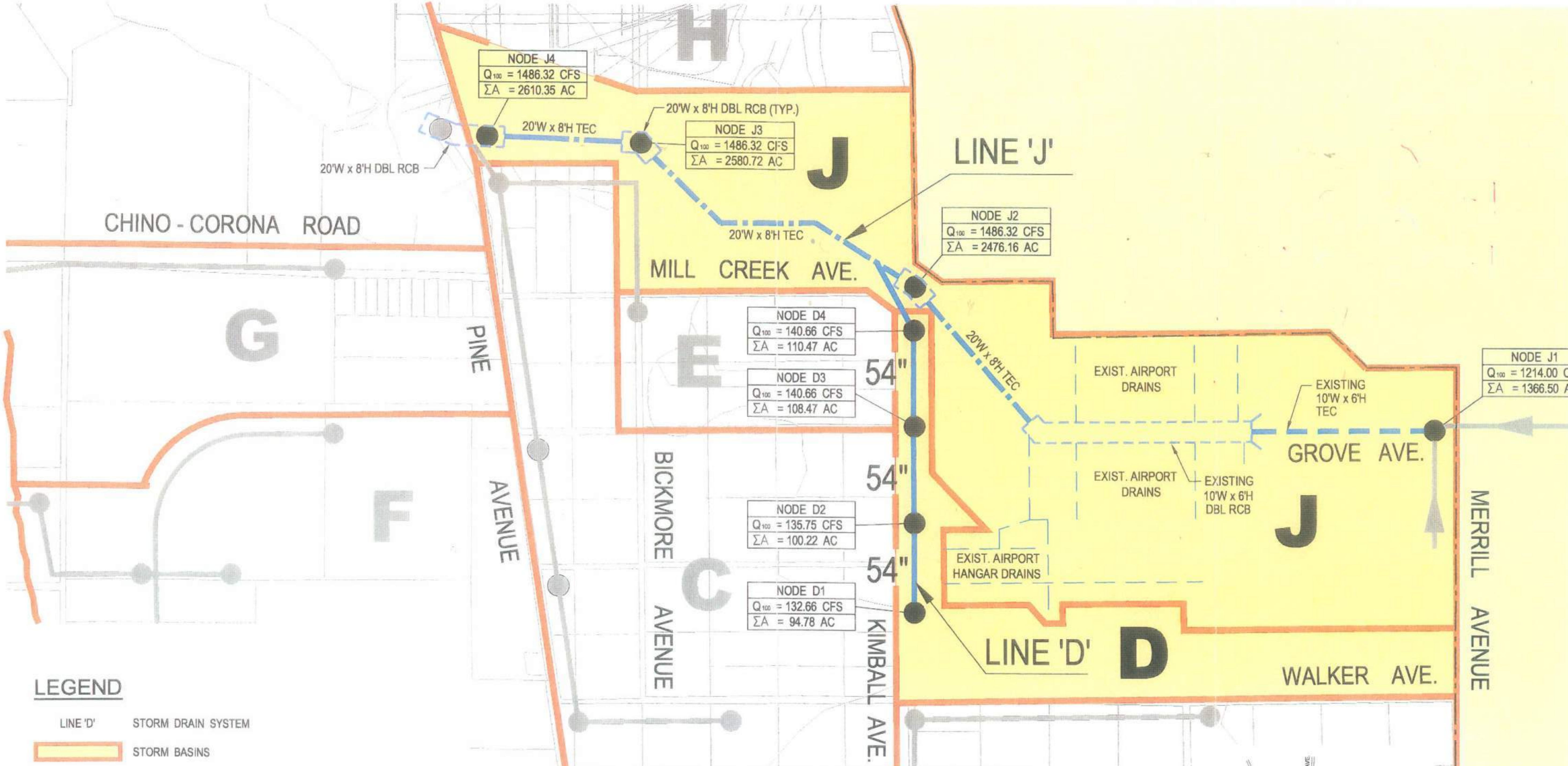


LEGEND

LINE 'D'	STORM DRAIN SYSTEM
	STORM BASINS
	STUDY AREA BOUNDARY
	OFF-SITE TRIBUTARY AREAS
D	DRAINAGE BASIN IDENTIFICATION
	MAINLINE STORM DRAINS
	DOUBLE RCB
	TRAPEZOIDAL EARTHEN CHANNEL (TEC)
	EXISTING STORM DRAIN

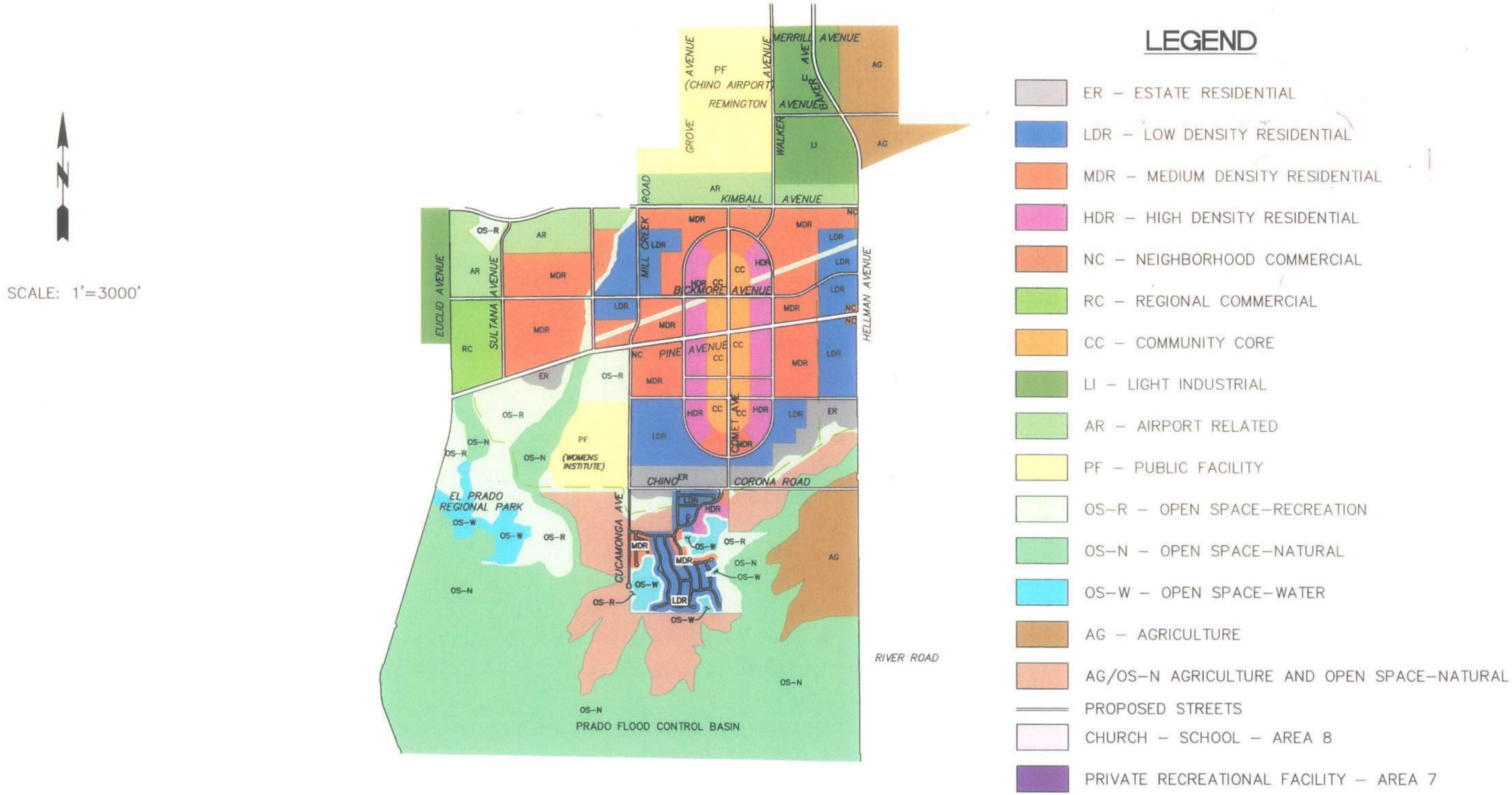
NODE XXX	CONCENTRATION NODE NO.
Q_{100} = 000.00 CFS	DESIGN FLOW
ΣA = 000.00 AC	CUMULATIVE WATERSHED AREA

AMENDMENT TO HYDROLOGY MAP
BASINS D & J

VICINITY MAP
Not to Scale

SCALE: 1"=1000'

LDKING
Engineers/Planners/Surveyors
2151 Convention Center Way
Suite 100 B
Ontario, California 91764-4464
Phone: (909) 937-0200
Fax: (909) 937-0202



Bureau Veritas North America, Inc.
2001 East First Street
Santa Ana, CA 92705-4020
Tel: (714) 568-7300
Fax: (714) 836-5906
www.us.bureauveritas.com

CITY OF CHINO
SUBAREA 2

STORM DRAINAGE MASTER PLAN UPDATE REPORT

LAND USE MAP

FIGURE NO. 2

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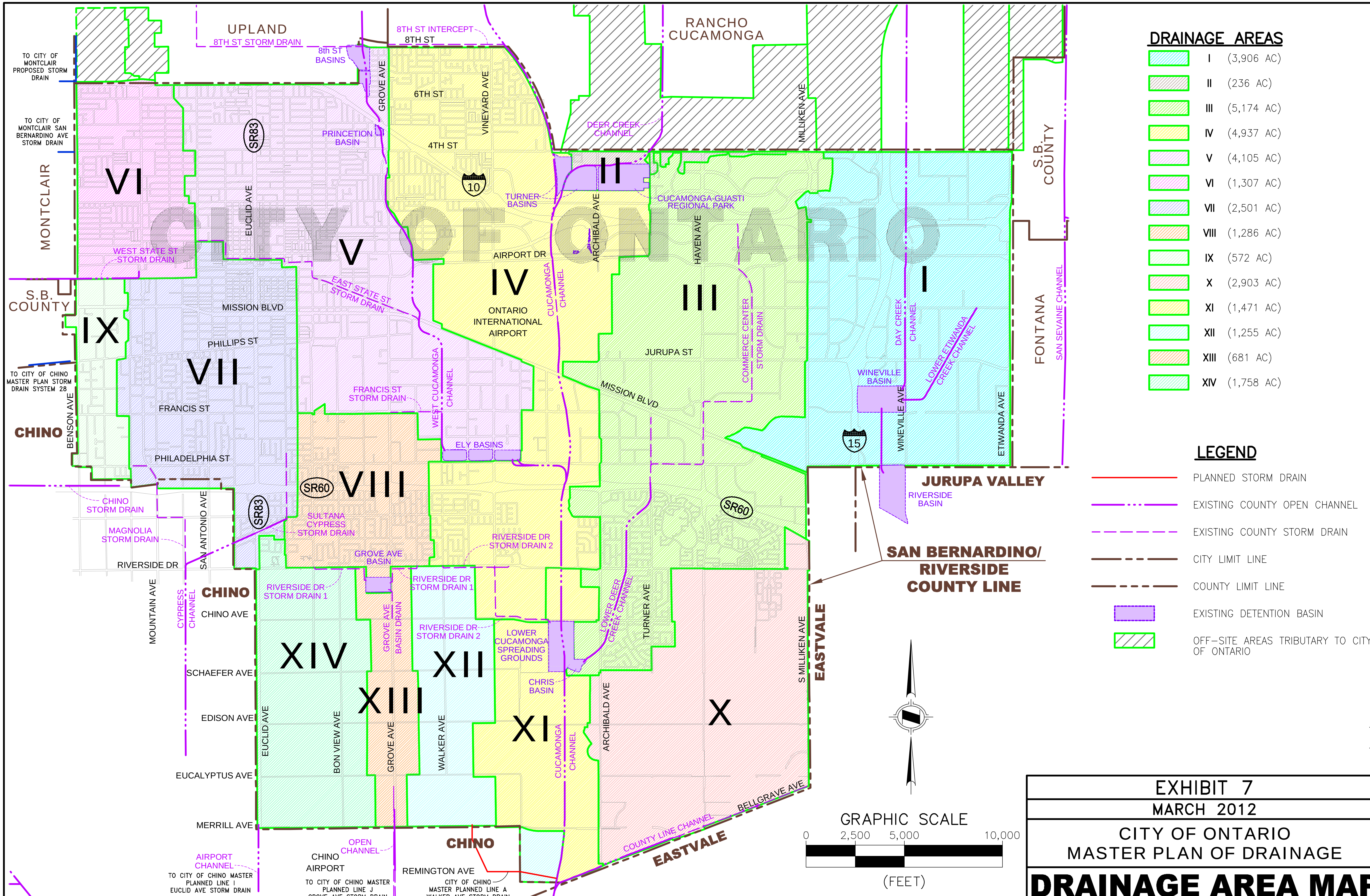


EXHIBIT 7

MARCH 2012

CITY OF ONTARIO
MASTER PLAN OF DRAINAGE

DRAINAGE AREA MAP

MASTER PLAN OF DRAINAGE - SUBAREA 2 – AMENDMENT

PURPOSE

This "Amendment" has been prepared to update the *City of Chino Master Plan of Drainage - Subarea 2, Chino Sphere of Influence, Chino Agricultural Preserve Area,* dated October 2003. This "Amendment" contains hydrology study information for Drainage Basin Areas D, J, and B.

The hydrologic studies estimate the storm water runoff for a 100-year recurrence interval magnitude storm event from each of the Drainage Basin Areas D, J, and B, as described in the original Master Plan of Drainage and revised herein. Tributary storm water runoff has been routed within the drainage basin areas with respect to current existing geographical diversions. Based on the flow pattern of surface runoff, the study area has been defined into ten (10) Drainage Basin Areas (A thru J per Master Plan), as shown on the preceding exhibit. Only Drainage Basin Areas D, J, and B have been revised in this "Amendment".

This "Amendment" presents revised storm water drainage infrastructure facilities for the ultimate build-out development of the Chino Agricultural Preserve Area within the three Drainage Basin Areas, D, J, and B only. All other drainage basin areas covered in the original Master Plan of Drainage remain unchanged. This "Amendment" must be used in conjunction with the original.

Basin hydrology maps delineating the tributary watersheds for each area are provided in Appendix A. A detailed description of the rationale used to determine drainage basin boundaries follows within this report.

Infrastructure drainage facilities are sized for the peak flow rates at concentration nodes along each storm drain line servicing a drainage basin area. Storm drain facilities and recommended sizes for this "Amendment" have been based on hydrologic calculations using the Rational Method. In some cases, an integration between the Rational Method and Unit Hydrograph Method was utilized on a node-to-node basis where tributary areas and times of concentration were not suitable for the Rational Method alone. A Summary of the hydraulic data for the proposed facilities are presented in Tables 1B, 1D, and 1J, Facility Data Summary Table, provided in Appendix B.

Facilities and sizes in the original Master Plan of Drainage were determined using preliminary hydraulic calculations of friction losses (major losses) in the mainline conduits. The maximum hydraulic gradients of the conduits were set at 85% of the design slope, which was assumed to parallel the existing average ground elevations between concentration nodes. The 15% available capacity of the hydraulic gradient was provided to cover minor losses at junctions, manholes, transitions and bends.

Capital Cost Estimates are outlined and summed in Appendix C. Each drainage facility has a detailed breakdown of construction quantities and capital costs describing each of the recommended storm drain systems. Estimates of construction costs and project costs have been developed using February 2001 construction costs, based on ENR Construction Cost Index of 6,270 for the recommended storm drain facilities shown on the Basin Hydrology Maps. Each Construction Cost total incorporates an additional contingency of 20%. Each of the Capital Cost totals includes an additional 10% of Construction Costs to cover engineering and administration.

Appendix D contains the Hydrologic Calculations and Hydrology Study Maps for each Drainage Basin Area studied and amended, D, J, and B.

EXISTING CONDITIONS

Drainage Area "D" Currently in Drainage Basin "D", as defined by the original Master Plan, facilities belonging to the Chino Airport occupy the central-western one-third and central-southern one-quarter. Midway between Kimball Avenue and Remington Street, along the west side of Basin D, Chino Airport runways protrude easterly into Basin D about one-third of the width of Basin D. North of Kimball Avenue at the intersection of Comet Avenue, aircraft hangers belonging to Chino Airport extend northward to the runways.

Drainage Basin "D" generally drains southerly at less than 1% slope. A mild topographic ridgeline along Walker Avenue precludes runoff from entering the watershed from the east side. East of Walker Avenue, the runoff traverses southeasterly.

Along the northern drainage basin boundary, Merrill Avenue serves as an existing diversion structure to carry all runoff from the north, easterly of Grove Avenue, in an eastern direction beyond Baker Avenue. There, at the intersection of Merrill Avenue and Baker Avenue, Ontario's master planned storm drain; Line "A" passes by the east boundary of Drainage Area "A" conveying storm runoff from approximately 1,362 acres with a peak flow of 1,620 cfs. No runoff is received from Merrill Avenue east of Grove Avenue.

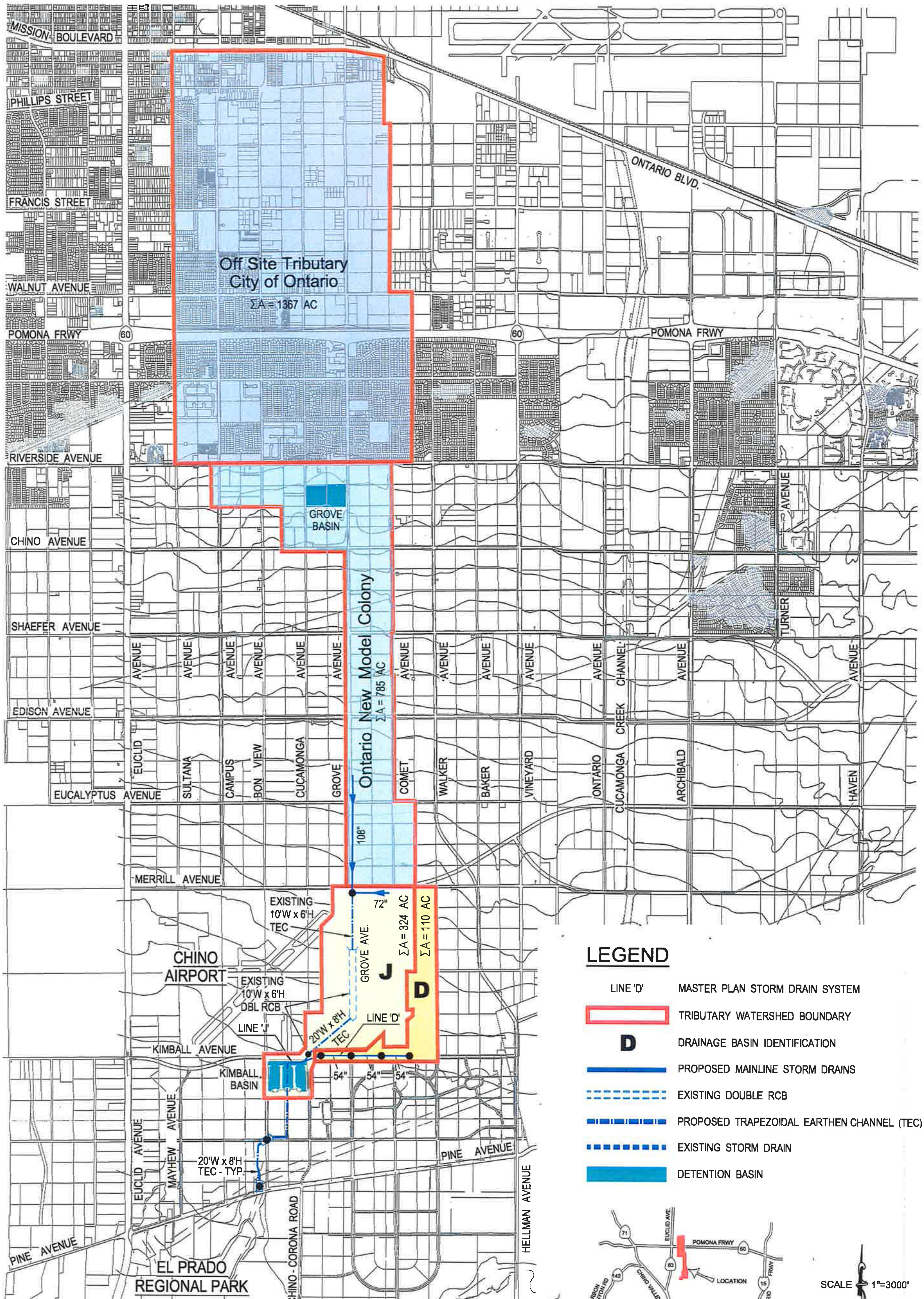
Drainage Area "J" West of Grove Avenue and north of Merrill Avenue is City of Ontario's New Model Colony Drainage Area "B". Historically, Grove Avenue has served as a major storm drainage channel to transport the storm water from the New Model Colony and the City of Ontario northerly of Merrill Avenue. Two-foot tall curbs have been constructed along both sides of Grove Avenue and also Merrill Avenue, in the proximity of Grove Avenue, to help carry the storm water received from the north to the Chino Airport at the south side.

At Merrill Avenue, runoff from the north and west converge into a trapezoidal concrete channel (TCC), which replaces Grove Avenue when it crosses the Chino Airport, south of Merrill Avenue. This flow will eventually be transported south in Grove Avenue to that portion of Drainage Area "D" owned by the Chino Airport via Ontario's master planned Line "B". The storm drain system, with a tributary area of 1,367 acres, has a peak design flow of 1,214 cfs as it enters Drainage Area "D" with additional storm drain interception as it crosses the Airport.

The concentrated flow then travels south of Merrill Avenue across the Chino Airport in a 10'(wide) by 6'(high) TCC, then through dual 6' by 10' box culverts under Runway 8R/26L, then discharges into existing vacant land west of the northern terminus of Grove Avenue.

At the south side of the Airport, the storm water emerges from double 6' x 10' box culverts, and then traverses diagonally southwesterly across a vacant Section of land to arrive at Kimball Avenue just west of Mill Creek Avenue (Cucamonga Avenue).

This naturally vegetated Section of land south of the airport serves as an unimproved storm detention area. The Master Plan of Drainage proposes Channel "J" cross this Section of vacant property owned by the Chino Airport and carry the flow southwesterly to Kimball Avenue.



TRIBUTARY WATERSHEDS
TO THE
KIMBALL DETENTION BASINS

LDKING
Engineers/Planners/Surveyors
2151 Convention Center Way
Suite 100 B
Ontario, California 91764-4464
Phone: (909) 937-0200
Fax: (909) 937-0202

1st Check:

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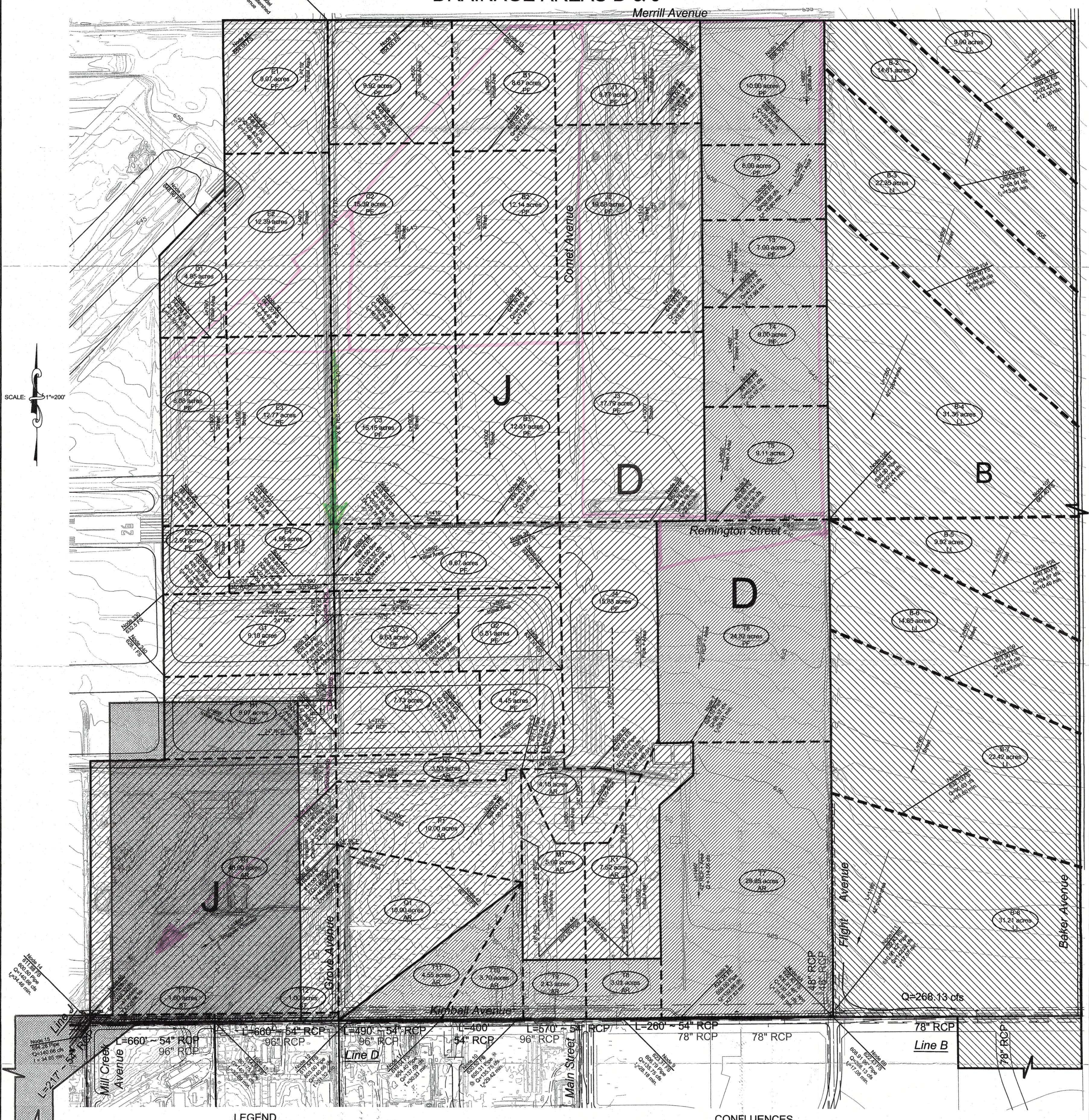
MASTER PLAN OF DRAINAGE
FOR
SUBAREA 2 AMENDMENT
OF
DRAINAGE AREAS D & J



LEGEND

OWNER
LEWIS – STG CHELSEA, LLC
PETE T. WASSENAAR AND JULIE I. WASSENAAR
JOHN WILLIAM RIDDER AND JENNIE MARY RIDDER
LEWIS INVESTMENT COMPANY, LLC

DEVELOPER
MR. GERRY BRYAN
LEWIS INVESTMENT COMPANY, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
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UPLAND, CALIFORNIA 91785
(909) 946-7513

ENGINEER
L.D. KING, INC.
2151 CONVENTION CENTER WY.
SUITE 100
ONTARIO, CALIFORNIA 91764
(909) 937-0200

New Drainage Boundary B Tributary to Phase II SD
New Drainage Boundary D Tributary to Kimball Ave. SD
Off-site Drainage Boundary J Tributary to Kimball Ave. Box Culverts
Previous Drainage Boundary D
Previous Drainage Boundary J

Node 20	Flow Path Node Number
605.32 FS	Elevation of Finished Surface
597.7 pipe	Storm Drain Pipe Invert Elevation
Tc= 12.4min	Time of Concentration for Peak Flow
Q= 6.5cfs	100-Year Runoff Rate
L=530'	Length of Drainage Course and Drainage Direction
Street	Drainage Type
A2	Drainage Sub-Area Name
6.07 acres	Acreage of Drainage Sub-Area
MDR	Proposed Land Use for the Drainage Sub-Area

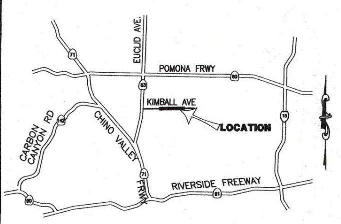
New Drainage Area Boundary
New Drainage Sub-Area Boundary
Previous Drainage Area Boundary
Existing Drainage Structures

J — New Boundary Identification
J — Previous Boundary Identification

54" RCP — New Storm Drain Pipe Size
96" RCP — Previous Storm Drain Pipe Size

LAND USE DESIGNATIONS

AR=	Airport Related
ST=	Public Street
LDR=	Low Density Residential 5.5 DU/AC
MDR=	Medium Density Residential 10 DU/AC
HDR=	High Density Residential 16 DU/AC
*MDR=	Assumed Medium Density Residential
LI=	Light Industrial
PF=	Public Facility



VICINITY MAP
Not to Scale

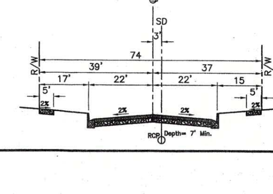
CONFLUENCES

Node 16 to 17	Q_{100}=60.31cfs
Node 20 to 17	Q_{100}=76.11cfs
Node 17 Confluence Σ Area= 73.78 AC	Q_{100}=133.36cfs
Node 17 to 21	Q_{100}=133.36cfs
Node 22 to 21	Q_{100}=1214.73cfs
Node 27 to 21	Q_{100}=97.35cfs
Node 32 to 21	Q_{100}=24.76cfs
Node 21 Confluence Σ Area= 1487.01 AC	Q_{100}=1323.32cfs
Node 26 to 27	Q_{100}=30.72cfs
Node 31 to 27	Q_{100}=67.70cfs
Node 27 Confluence Σ Area= 54.74 AC	Q_{100}=96.33cfs
Node 21 to 33	Q_{100}=1323.32cfs
Node 330 to 33	Q_{100}=21.86cfs
Node 332 to 33	Q_{100}=30.93cfs
Node 33 Confluence Σ Area= 1508.25 AC	Q_{100}=1339.11cfs
Node 33 to 34	Q_{100}=1339.11cfs
Node 340 to 34	Q_{100}=20.32cfs
Node 342 to 34	Q_{100}=30.02cfs
Node 34 Confluence Σ Area= 1529.50 AC	Q_{100}=1356.80cfs
Node 34 to 35	Q_{100}=1356.80cfs
Node 43 to 35	Q_{100}=133.24cfs
Node 45 to 35	Q_{100}=22.83cfs
Node 35 Confluence Σ Area= 1623.38 AC	Q_{100}=1466.92cfs
Node 39 to 40	Q_{100}=104.71cfs
Node 41 to 40	Q_{100}=13.90cfs
Node 42 to 40	Q_{100}=12.31cfs
Node 40 Confluence Σ Area= 1487.01 AC	Q_{100}=124.10cfs
Node 40 to 43	Q_{100}=124.10cfs
Node 44 to 43	Q_{100}=11.60cfs
Node 43 Confluence Σ Area= 80.35 AC	Q_{100}=133.24cfs
Node 35 to 46	Q_{100}=1466.92cfs
Node 47 to 46	Q_{100}=30.64cfs
Node 46 Confluence Σ Area= 1650.56 AC	Q_{100}=1469.13cfs

HYDROLOGY STUDIES

westpipe2	kimballbox2
westpipe10	kimballbox10
westpipe25	kimballbox25
westpipe100	kimballbox100

COMMERCIAL COLLECTOR STREET



REGISTERED PROFESSIONAL ENGINEER
RONALD N. KLINKEBIEL
No. 54277
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

GRAPHIC SCALE
200 0 100 200 400 800
(IN FEET)
1 inch = 200 ft.

JN 48131 Lewis Operating Corp
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All runoff west of Grove Avenue and south of the airport drains in a southwesterly direction across natural vegetation toward the intersection of Mill Creek Avenue (Cucamonga Avenue) and Kimball Avenue. At this crossing Channel "J" is proposed by the Master Plan to transport the runoff southerly from of Kimball Avenue and westerly from Mill Creek Avenue (Cucamonga Avenue) to a location near Pine Avenue and Rincon Meadows Avenue (Bon View Avenue).
As the natural geographical channel crosses a depressed portion of Kimball Avenue at Mill Creek Avenue, a sump exists causing the stormwater to flow across Kimball Avenue even during minor storm events.

Drainage Area "B" According to the original Master Plan, Drainage Basin "B" is bounded by Baker Avenue, Kimball Avenue, the San Bernardino County-Riverside County Line, and the Mill Creek Channel. In general, the drainage flow path runs in a southerly direction.

EXISTING DRAINAGE FACILITIES

Drainage Area "D" Storm Drain "Line D" serves the Drainage Area "D", which originally was bounded by Grove Avenue, Merrill Avenue, Baker Avenue and Kimball Avenue. Detailed investigation has determined with certainty that Drainage Area "D" must be redefined more precisely. In August of 1995, the Chino Airport constructed "7,000' Parallel Runway 8R/26L. This runway and the pair of parallel taxiways now cross Grove Avenue and enter into the westerly portion of Drainage Area "D", as it was originally defined by the Master Plan of Drainage. In doing so, a double 6' x 10' concrete box culverts and a matrix of storm drains were constructed under the runway/taxi-ways along the previous Grove Avenue alignment. The "As built Plans" set for this Project Number 10524 were acquired from the County of San Bernardino Architectural and Engineering Department and were researched and referenced during the preparation of this "Amendment".

In addition to the double 6' x 10' box culverts aligned with Grove Avenue under the runway/taxi-ways, a matrix of 24-inch and 36-inch diameter storm drain pipes were installed on the west and east sides to drain water away from the new runway/taxi-ways to the box culverts. This matrix of storm drains also intercepts the flow from the tributary areas north of the runway/taxi-ways and carries it through the box culverts. Hence, the areas north of the runway/taxi-ways on both east and west sides drain into the box culverts and consequently are tributary to Drainage Area "J", rather than Drainage Area "D". The intercepted storm water enters "Channel J", as it is referred to in the Master Plan, which will cross Kimball Avenue, then Bickmore Avenue, then Pine Avenue, as it travels south toward the Prado Flood Control Basin.

At the east side of the originally defined Drainage Area "D", the Master Plan delineated Baker Avenue as being the eastern boundary. It proposes that the land area south of Merrill Avenue, north of Kimball Avenue, east of Walker Avenue, and west of Baker Avenue, should drain west in Kimball Avenue in a 96-inch diameter storm drain. Close inspection of the in-situ conditions ascertains that this area actually drains east in Kimball Avenue now, in the existing condition, and would also do so in a developed condition.

The Master Plan of Drainage for Subarea 2 originally indicated the accumulated land area to total 469.80 acres at Node D4, although it is 467.02 acres by accurate measurement. Actually, 211.65 of those acres on the west side are tributary to Drainage Area "J". 146.90 of those acres on the east side are actually tributary to Drainage Area "B". The remainder of Drainage Area "D totals to 108.47 acres. This "Amendment to the Master Plan of Drainage Subarea 2" has been prepared for the City of Chino to clarify the land tributary to these three drainage basin areas.

The Kimball Avenue Storm Drain proposed in the Master Plan will drain the storm water flow from the Subarea "D", acreage. The flow from the acreage previously a part of Area "D" and now added to Area "J" will be drained by the Channel "J" facility. The storm water flow from the eastern portion of the subarea acreage between Walker Avenue and Baker Avenue will be added to Subarea "B". The storm water flow will be transported east in a storm drain in Kimball Avenue from Walker Avenue to Meadow Valley Avenue, then southeasterly to Hellman Avenue, then south to Mill Creek (Cucamonga Creek Channel), which is tributary to the Prado Flood Control Basin. Ultimately the storm water arrives at the same location originally proposed in the Master Plan, Prado Dam.

Drainage Area "J" Existing storm drainage facilities within Drainage Area "D" are primarily in the west, south and central portion of the drainage area and service the needs of Chino Airport facilities. There now exists a double barrel 10-foot wide by 6-foot high reinforced concrete box that extends north across the Chino Airport Runway/Taxi-ways 8R/26L, thence as a trapezoidal concrete channel, extends north across the airport property to Merrill Avenue. There, it intercepts the City of Ontario's stormwater from New Model Colony's Drainage Area "B". The Unit Hydrograph peak flow of 1,214 cfs is transported through Drainage Area "D" in this Grove Avenue Storm Drain Channel and box culvert with additional flow intercepted from the new Runway/Taxi-ways 8R/26L and their associated storm drain matrix, as discussed previously.

The existing Chino Airport hangers in the south-central portion of Drainage Area "D", as defined by the original Master Plan, just north of Kimball Avenue, have their own storm drain system that drains first north to a 24 feet wide concrete trapezoidal channel, then west in a 42-inch CMP culvert and a 36-inch RCP storm drain to the double 6' x 10' box culvert at the existing Grove Avenue alignment under Runway 8R/26L.

The concrete trapezoidal channel just north of the hangers also intercepts all flow from the original Drainage Area "D" that is due north of it, all the way north to Merrill Avenue. It diverts all flow in the central portion of the original Drainage Area "D" to the Grove Avenue double 6' x 10' box culvert, which in turn transports the flow through Drainage Area "J". Thereto, this area is tributary to Drainage Basin Area "J", rather than "D".

From Kimball Avenue northward along Grove Avenue, the grade of Grove Avenue drops northerly, draining toward the runways. An existing grated sump inlet immediately east of the Grove Avenue northern terminus and south of the runways allows runoff to drop into a short lateral that discharges into the interior of the existing double 6' x 10' RC Box culverts. At about 200 feet south of the airport and 600 feet north of Kimball Avenue a 24" RCP culvert crosses Grove Avenue from the east side to the west side. No runoff drains toward Kimball Avenue east of Grove Avenue and west of the airport hangers. The area south of the airport, north of Kimball Avenue, east of Grove Avenue, and west of the airport hangers, all drains north and west to the vacant airport property in Drainage Area "J". For these reasons, it is not proposed to extend a storm drain lateral northward in Grove Avenue. Rather, it is concluded the property north of Kimball Avenue, south of the runways, east of Grove Avenue, and west of the airport hangers will continue to be drained northwesterly to the proposed "Channel "J" in Drainage Area "J".

Record Drawings and As-built plan sheets for these Airport facilities have been provided in conjunction with this "Amendment" as back-up data for reference and as documentation of the true definition of the boundaries of Drainage Area "D". Referring to Sheet D-32 of the "7000' Parallel Runway 8R/26L, Chino Airport" plan set, note the 24-inch reinforced concrete pipe (RCP) culvert crossing Grove Avenue. The now existing culvert is about 600' north of Kimball Avenue centerline and 200' south of the northerly terminus of Grove Avenue, just south of the south Taxi-way 8R/26L. The RCP culvert carries the flow from that portion of the original Drainage Area "D" west of the Airport hangers, north of Kimball Avenue, and south of Runway/Taxi-ways 8R/26L, westerly across Grove Avenue to Drainage Area "J", which transports the flow south via "Channel J".

Drainage Area "B" As a revision to the Master Plan of Drainage for Subarea 2, the portion of Drainage Area "D" east of Walker Avenue and West of Baker Avenue actually drains east in Kimball Avenue rather than west. That area north of Kimball Avenue to Merrill Avenue is tributary to Mill Creek (Cucamonga Creek Channel) via the new alignment of Meadow Valley Avenue, which will carry the storm water southwesterly to Hellman Avenue, then south to Mill Creek (Cucamonga Creek Channel). This street did not exist during the inception of the original Master Plan of Drainage, but is more correct than diverting the flow west along Kimball Avenue.

In Walker Avenue, north of Kimball Avenue, the original Master Plan proposed a 48-inch RCP lateral pipe. The Hydrology Study in this "Amendment" report has been performed in a manner to determine and verify the 48-inch diameter size.

As Drainage Area "D", as proposed in this "Amendment", slopes southerly from Merrill Avenue toward Kimball Avenue all runoff between Walker Avenue at the west boundary, to Baker Avenue at the east boundary, will be intercepted by a 78-inch RCP Storm Drain in Kimball Avenue and carried southeasterly.

The portion of Drainage Area "D" defined by the original Master Plan southerly of Merrill Avenue to Kimball Avenue and from Walker Avenue on the west, to Baker Avenue on the east, is tributary to Drainage Basin "B" and should outfall at Mill Creek, as does Basin B". All areas south of Kimball Avenue and east of Walker Avenue slope southeasterly toward Mill Creek. Ultimately, the stormwater will eventually arrive in Prado Flood Control Basin.

Original Drainage Areas versus Amended Drainage Areas Drainage Area "D", in the original Master Plan, is bounded by Grove Avenue, Merrill Avenue, Walker Avenue, and Kimball Avenue. The acreage covered was 470 acres with a flowrate of 722 cfs. Pipe sizes began with 48" RCP and transitioned to 96" RCP.

The Master Plan Amendment shows Drainage Area "D" covering 110 acres that yield 141 cfs of runoff. The boundaries are approximately 920 feet west of Walker Avenue, Merrill Avenue, Walker Avenue, and Kimball Avenue. The Master Plan Amendment facilities for Drainage Area "D" recommend 54" RCP for the entire line in Kimball Avenue west to the detention basins.

Drainage Area "J" in the original Master Plan receives 1214 cfs from 2152 acres north of Merrill Avenue, including 785 acres of Ontario's "New Model Colony" and 1367 acres north of the Grove Avenue Detention Basin at Riverside Avenue. The boundary for Drainage Area "J" runs from Merrill Avenue, at the north end, to Pine Avenue at the south end. The overall acreage is 2,836 acres with a flowrate of 2132 cfs.

In the Master Plan Amendment, the west boundary extends from Grove Avenue to 660 feet west of Walker Avenue. The Amendment delineates the drainage areas with regard to airport runway and taxi-way storm drain improvements, constructed as ultimate developed condition facilities. Drainage Area "J", as defined in the Amendment, will yield 1486 cfs from 2610 acres during the 100-year recurrence interval storm.

Drainage Area "B" in the original Master Plan estimated 429 cfs of runoff from 442 acres. The Master Plan Amendment calculates 720 cfs of runoff yielded fdrom 510 acres. The additional acreage is derived from acknowledging that flow bounded by Walker Avenue, Merrill Avenue, Baker Avenue, and Kimball Avenue travels east along Kimball Avenue, rather than west. The original Master Plan proposes 48" RCP, to 66" RCP, to 72" RCP, while the Master Plan Amendment proposes 48" RCP to 78" RCP, to 84" RCP, to 96" RCP, to 108" RCP. The Amendment storm drain has a 72" lateral in Hellman Avenue confluencing with the main line at Bickmore Avenue.

Rational Method Hydrology Hydrologic calculations were prepared using the Rational Method and the San Bernardino County Hydrology Manual. This study includes calculations for the 100-year, 1-hour storm event. Proposed storm drain systems were sized with the capacity to carry the runoff flow from the 100-year, 1-hour storm event.

The Rational Method was used to calculate the peak runoff at each concentration node along the path of Storm Drain Line "D" and "Line "B". Surface characteristics of pervious areas were based on ultimate development built-out conditions, having well-landscaped urban covers and saturated antecedent moisture condition, AMC III. Point rainfall data was based on the Isohyetal Maps for Valley areas, provided in the San Bernardino County Hydrology Manual.

Land Use Land Use zoning indicates the property immediately north of Kimball Avenue is zoned AR that will be developed into "Airport Related" improvements. South of Merrill Avenue, west of Baker Avenue, and north of the existing runways, the property is zoned PF for development of "Public Facilities". East of Walker Avenue, west of Baker Avenue, and south of Merrill Avenue, the property is zoned LI for development of "Light Industrial" facilities. All three of these Land Use zones are proposed to be non-urban and non-commercial land uses with well-landscaped development. The impervious area is intended to average at 75% or less for all three Land Use designations, according to the interpretation of "The Preserve Specific Plan".

Although development of the property north of Kimball Avenue will increase the impervious area, the stormwater runoff will increase only slightly, as a result the increase of landscaping. The current land use for dairies does not allow stormwater to percolate into the soil and consequently achieves saturation very quickly. The condition of the existing dairy soil has no vegetation to promote retention of rainfall and storm water becomes runoff quite rapidly. With the assumption of Antecedent Moisture Condition III used in this study, as required by the County Hydrology Manual, saturation of the soil is a given for the Developed Condition. In the Developed Condition, the increase of vegetation in the landscaping of the pervious area will provide greater retention of rainfall and therefore reduced runoff. As the designated Land Uses for this property are all to be well landscaped and 25% pervious, only moderate increases in stormwater runoff are anticipated when the property attains ultimate developed condition.

The Hydrology Map for amended "Basin D" is included following in this report as Figure 5. The original Master Plan of Drainage showed "Basin D" as the drainage area north of Kimball Avenue, east of Grove Avenue, south of Merrill Avenue and west of Baker Avenue. "Basin D" is generally bounded on the north side of Kimball Avenue by land that is currently vacant natural vegetation; Chino Airport related uses or agricultural land. The western boundary of "Basin D" was an extension of Grove Avenue from Kimball Avenue on the south to Merrill Avenue on the north, although no through street crosses the eastern 20% of Chino Airport's east-west runway. Baker Avenue was at the original eastern boundary. There, no street exists, as the land is all open dairy pasture sloping in a southeasterly direction. This "Amendment" relocates the eastern boundary in its true location along the subtle rise of Walker Avenue. This report amends the original Master Plan, providing true boundary limits for Drainage Areas "D", "J", and "B".

The Master Planned Kimball Avenue Storm Drain "Line D" is proposed to extend east to intercept flows draining from as far north as Merrill Avenue and from as far east as Walker Avenue. The original Master Plan proposed a 96-inch diameter Reinforced Concrete Pipe in Kimball Avenue from Mill Creek Avenue (Cucamonga Avenue), at the westerly outfall, easterly to Main Street, which is centered just south of the Chino Airport hangers. In Kimball Avenue from Main Street to Walker Avenue, the original Master Plan proposed a 78-inch RCP.

OFF-SITE DRAINAGE FACILITIES

Drainage Area "D", as defined by the "Master Plan of Drainage – Subarea 2" has been redefined to include only flow tributary to Kimball Avenue west of Walker Avenue and east of Grove Avenue. Stormwater runoff tributary to the proposed storm drain system includes 108.47 acres. Currently, storm water from properties north of the drainage area watershed are intercepted by Merrill Avenue and diverted easterly to the existing concrete trapezoidal channel in Grove Avenue or from easterly of Grove Avenue, will be diverted easterly to Baker Avenue.

Storm water runoff from the City of Ontario to the north, bypasses Drainage Area "D", along both east and west boundaries. The "*Master Plan of Drainage - Subarea 2*", for the City of Chino, proposes two storm drain systems to further aid this process. Ultimate 100-year storm runoff from Ontario's Master Plan of Drainage for New Model Colony, prepared by L.D. King, Inc., will be conveyed to downstream regional drainage facilities. Line "A", a 14' wide and 8' high reinforced concrete box storm drain is proposed to cross Merrill Avenue in Baker Avenue, conveying 1,620 cfs peak flow from 1,362 acres. It will divert flow from north of Merrill Avenue eastward from Baker Avenue as it passes Drainage Basin D.

Line "B", a 108" RCP storm drain proposed for Grove Avenue north of Merrill Avenue, plus a 72" RCP lateral storm drain in Merrill Avenue west of Grove Avenue, will drain to the existing 10' wide by 6' high Grove Avenue trapezoidal concrete channel (TCC) crossing the Chino Airport property. These two storm drains combined will discharge 1,214 cfs into the Grove Avenue TCC where it will by-pass Drainage Area "D" along the western boundary.

LAND USE

Land Use zoning and the associated development requirements have been extracted from "The Preserve Specific Plan" prepared for the City of Chino and dated March 2003. The identical land uses for these properties are shown in Figure No. 2, Land Use Map, in the *Master Plan of Drainage- Subarea 2.*

Between Grove Avenue and Baker Avenue, immediately north of Kimball Avenue, the designated Land Use is Airport Related. North of that property which is fronting on Kimball Avenue, the Land Use is Public Facility west of Walker Avenue and Light Industrial east of Walker Avenue.

PEAK RUNOFF FLOWS

Hydrology calculations were prepared using the Rational Method and the San Bernardino County Manual. This study includes hydrology calculations for the 100-year, 1-hour storm event. The storm drain system was sized using hydraulic calculations to provide the capacity to transport peak flows from the 100-year, 1-hour frequency storm, while ensuring at minimum, a hydraulic grade line 0.5-foot lower in elevation than the gutter flowline along Kimball Avenue. "The Preserve Specific Plan" was referenced to determine criteria for the Runoff Coefficient "C" to be used in the Rational Method formula, Q = CIA, for each of the three zoned Land Uses.

For Light Industrial (LI) land, permitted uses included light manufacturing, office parks, cemeteries, kennels and catteries. The minimum allowable landscape coverage is 15%. Based on the permissible land uses including large open vegetated areas, such as cemeteries and parkscapes, the Pervious Area factor was estimated to be around 25%. For Soil Type B, the SCS Curve Number for Antecedent Moisture Condition III was calculated at 75.80 with a Max loss rate (Fm) of 0.110 (in./Hr.). The hydrologic calculations produced an average Effective Runoff Coefficient "C" of 0.854 for Light Industrial land use.

For Airport Related (AR) land use, the permitted uses included business parks, hotels, cemeteries, kennels and catteries. The minimum allowable landscape coverage is 15%. Based on the permissible land uses including large open vegetated areas, such as cemeteries and parkscapes, the Pervious Area factor was estimated to be around 25%. For Soil Type B, the SCS Curve Number for Antecedent Moisture Condition III was calculated at 75.80 with a Maximum loss rate (Fm) of 0.110 (in./Hr.). The hydrologic calculations produced an average Effective Runoff Coefficient "C" of 0.854 for Airport Related land use.

For Public Facilities (PF) land use, the permitted uses included minor utility facilities, row crops, museums, places of worship and cemeteries. Based on the permissible land uses including large open vegetated areas, such as cemeteries and parkscapes, the Pervious Area factor was estimated to be around 25%. For Soil Type B, the SCS Curve Number for Antecedent Moisture Condition III was calculated at 75.80 with a Maximum loss rate (Fm) of 0.110 (in./Hr.). The hydrologic calculations produced an average Effective Runoff Coefficient "C" of 0.854 for Public Facilities.

In conclusion, by referencing "The Preserve Specific Plan" to determine criteria for the Runoff Coefficient "C" to be used in the Rational Method formula, Q = CIA, the Pervious Area factor, soil type, and degree of saturation are identical for all three of the zoned Land Uses. Therefore, for Public Facilities (PF), Airport Related (AR), and Light Industrial (LI) land uses, an average Effective Runoff Coefficient "C" of 0.854 should be used in the Rational Method formula for all.

PROPOSED DRAINAGE FACILITIES

This *Master Plan of Drainage – Subarea 2 Amendment* report provides a Hydrology Map for Drainage Basin D that estimates the acreage and ultimate peak runoff at nodes D1 thru D4. Node D1 is at the northerly/upstream end near Merrill Avenue and Node D4 is at the outfall.

The calculations determined the need for a 54" reinforced Concrete pipe (RCP) for the main line from just west of Walker Avenue to Mill Creek Avenue (Cucamonga Avenue) at the outfall. The ultimate peak runoff discharge at the outfall calculated to be Q100 = 140.664 cfs. As a result of the storm drain flowing under pressure in this reach, the pipe size was increased to 54" to keep the hydraulic grade line (HGL) a few feet below gutter flowline.

The calculations did verify the need for a future 48" RCP in Walker Avenue to be constructed by others when the land north of Kimball Avenue is developed. The original Master Plan recommended a 78" RCP draining from Walker Avenue into the west bound Kimball Avenue storm drain and now that main line will drain east, rather than west.

The storm flows intercepted along Kimball Avenue will be conveyed westerly by a 54-inch diameter storm drain, as proposed by this "Amendment". This 54-inch RCP storm drain will carry runoff to Channel "J", southwesterly of the intersection of Kimball Avenue and Mill Creek Avenue (Cucamonga Avenue), in accordance with the original Master Plan of Drainage.

The results of the study calculations for this "Amendment" provides 54" RCP storm drain for the full length of Kimball Avenue draining west as Line "D" and 78" RCP for Line "B" line draining east. The drainage facilities proposed for Drainage Basin Area "J" remain as proposed in the original Master Plan of Drainage. Channel "J" will be a 20' wide, by 8' high Trapezoidal Earthen Channel with 20' x 8' double reinforced concrete box culverts crossing Kimball Avenue, Bickmore and Pine Avenue.

FACILITY DATA COMPARISON

AMENDMENT NO. 1

MASTER PLAN OF DRAINAGE – CHINO SPHERE OF INFLUENCE – SUBAREA 2

Ref: original Master Plan of Drainage-Subarea 2

LINE	NODE		LENGTH	PIPE	CONST.	CONST.	ENGR./	TOTAL	TOTAL
	FROM	TO		SIZE	COST	COST	ADMIN.	COST	CAPITAL
#	#	#	ft	in	$/LF				COST
B	B1	B2	3100	48	356	$1,103,600	$ 110,360	$1,213,960	
	B2	B3	2400	66	459	$1,101,600	$ 110,160	$1,211,760	
	B3	B4	1100	72	510	$561,000	$ 56,100	$617,100	
	B4	OUTLET	500	72	510	$255,000	$ 25,500	$280,500	
OUTLET STRUCTURE						$20,000	$ 2,000	$22,000	
									$3,345,320
D	D1	D2	2800	48	356	$996,800	$ 99,680	$1,096,480	
	D2	D3	1300	78	554	$720,200	$ 72,020	$792,220	
	D3	D4	1300	96	662	$860,600	$ 86,060	$946,660	
	D4	OUTLET	1300	96	662	$860,600	$ 86,060	$946,660	
OUTLET STRUCTURE						$20,000	$ 2,000	$22,000	
									$3,804,020

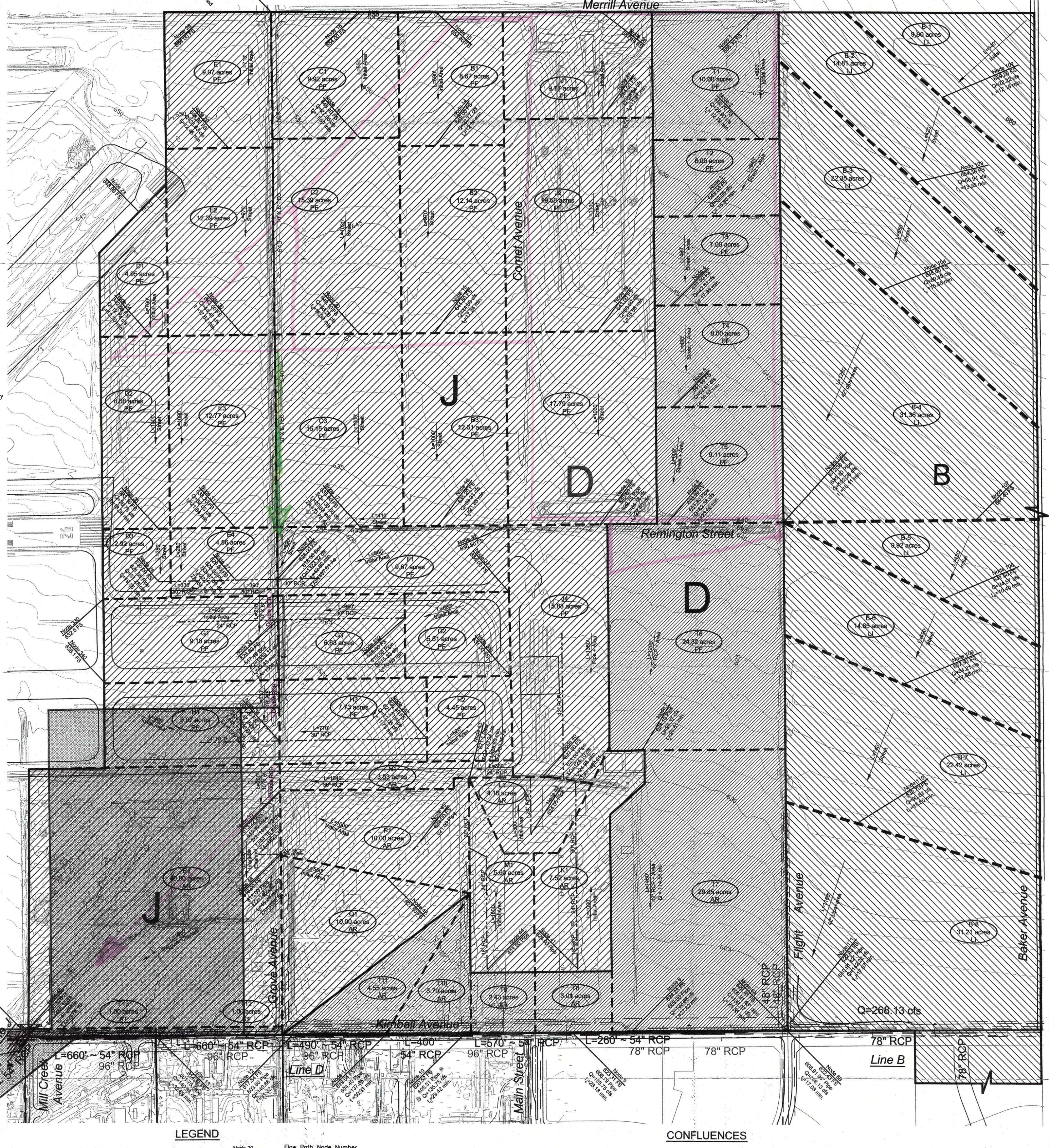
Ref: amendment to Master Plan of Drainage-Subarea 2

LINE	NODE		LENGTH	PIPE	CONST.	CONST.	ENGR./	TOTAL	TOTAL
	FROM	TO		SIZE	COST	. COST	ADMIN.	COST	CAPITAL
#	#	#	ft	in	$/LF				COST
B	B1	B2	2650	48	356	$943,400	$ 94,340	$1,037,740	
	B2	B3	900	78	554	$498,600	$ 49,860	$548,460	
	B3	B4	1350	78	554	$747,900	$ 74,790	$822,690	
	B4	B5	1050	84	614	$644,700	$ 64,470	$709,170	
	B5	B7	600	84	614	$368,400	$ 36,840	$405,240	
	B6	B7	2300	72	510	$1,173,000	$ 117,300	$1,290,300	
	B7	B8	900	96	662	$595,800	$ 59,580	$655,380	
	B8	B9	2500	96	662	$1,655,000	$ 165,500	$1,820,500	
	B9	B10	900	108	765	$688,500	$ 68,850	$757,350	
	B10	OUTLET	800	108	765	$612,000	$ 61,200	$673,200	
OUTLET STRUCTURE						$20,000	$ 2,000	$22,000	
									$8,742,030
D	D1	D2	870	54	378	$328,860	$32,886.0	$361,746	
	D2	D3	940	54	378	$355,320	$35,532.0	$390,852	
	D3	D4	1320	54	378	$498,960	$49,896.0	$548,856	
	D4	OUTLET	150	54	378	$56,700	$5,670.0	$62,370	
OUTLET STRUCTURE						$20,000	$ 2,000	$22,000	
									$1,385,824

HYDROLOGY MAP

LINE D AND J

MASTER PLAN OF DRAINAGE
FOR
SUBAREA 2 AMENDMENT
OF
DRAINAGE AREAS D & J



LEGEND

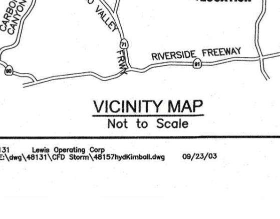
OWNER
LEWIS – STG CHELSEA, LLC
PETE T. WASSENAAR AND JULIE I. WASSENAAR
JOHN WILLIAM RIDDER AND JENNIE MARY RIDDER
LEWIS INVESTMENT COMPANY, LLC

DEVELOPER
MR. GERRY BRYAN
LEWIS INVESTMENT COMPANY, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
1156 N. MOUNTAIN AVE.
UPLAND, CALIFORNIA 91785
(909) 946-7513

ENGINEER
L.D. KING, INC.
2151 CONVENTION CENTER WY.
SUITE 100
ONTARIO, CALIFORNIA 91764
(909) 937-0200

New Drainage Boundary B Tributary to Phase II SD
New Drainage Boundary D Tributary to Kimball Ave. SD
Off-site Drainage Boundary J Tributary to Kimball Ave. Box Culverts
Previous Drainage Boundary D
Previous Drainage Boundary J

Node 20	Flow Path Node Number
605.32 FS	Elevation of Finished Surface
597.7 pipe	Storm Drain Pipe Invert Elevation
Tc= 12.4min	Time of Concentration for Peak Flow
Q= 6.5cfs	100-Year Runoff Rate
L=530' Street	Length of Drainage Course and Drainage Direction, Drainage Type
A2	Drainage Sub-Area Name
6.07 acres	Acreage of Drainage Sub-Area
MDR	Proposed Land Use for the Drainage Sub-Area
	New Drainage Area Boundary
	New Drainage Sub-Area Boundary
	Previous Drainage Area Boundary
	Existing Drainage Structures
J	New Boundary Identification
J	Previous Boundary Identification
54" RCP	New Storm Drain Pipe Size
96" RCP	Previous Storm Drain Pipe Size



VICINITY MAP
Not to Scale

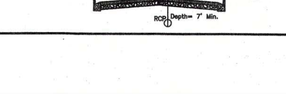
LAND USE DESIGNATIONS

AR=	Airport Related
ST=	Public Street
LDR=	Low Density Residential 5.5 DU/AC
MDR=	Medium Density Residential 10 DU/AC
HDR=	High Density Residential 16 DU/AC
*MDR=	Assumed Medium Density Residential
LI=	Light Industrial
PF=	Public Facility

CONFLUENCES

Node 16 to 17	Q_{100}=60.31cfs
Node 20 to 17	Q_{100}=76.11cfs
Node 17 Confluence Σ Area= 73.78 AC	Q_{100}=133.36cfs
Node 17 to 21	Q_{100}=133.36cfs
Node 22 to 21	Q_{100}=1214.73cfs
Node 27 to 21	Q_{100}=97.35cfs
Node 32 to 21	Q_{100}=24.76cfs
Node 21 Confluence Σ Area= 1487.01 AC	Q_{100}=1323.32cfs
Node 26 to 27	Q_{100}=30.72cfs
Node 31 to 27	Q_{100}=67.70cfs
Node 27 Confluence Σ Area= 54.74 AC	Q_{100}=96.33cfs
Node 21 to 33	Q_{100}=1323.32cfs
Node 330 to 33	Q_{100}=21.86cfs
Node 332 to 33	Q_{100}=30.93cfs
Node 33 Confluence Σ Area= 1508.25 AC	Q_{100}=1339.11cfs
Node 33 to 34	Q_{100}=1339.11cfs
Node 340 to 34	Q_{100}=20.32cfs
Node 342 to 34	Q_{100}=30.02cfs
Node 34 Confluence Σ Area= 1529.50 AC	Q_{100}=1356.80cfs
Node 34 to 35	Q_{100}=1356.80cfs
Node 43 to 35	Q_{100}=133.24cfs
Node 45 to 35	Q_{100}=22.83cfs
Node 35 Confluence Σ Area= 1623.38 AC	Q_{100}=1466.92cfs
Node 39 to 40	Q_{100}=104.71cfs
Node 41 to 40	Q_{100}=13.90cfs
Node 42 to 40	Q_{100}=12.31cfs
Node 40 Confluence Σ Area= 1487.01 AC	Q_{100}=124.10cfs
Node 40 to 43	Q_{100}=124.10cfs
Node 44 to 43	Q_{100}=11.60cfs
Node 43 Confluence Σ Area= 80.35 AC	Q_{100}=133.24cfs
Node 35 to 46	Q_{100}=1466.92cfs
Node 47 to 46	Q_{100}=30.64cfs
Node 46 Confluence Σ Area= 1650.56 AC	Q_{100}=1469.13cfs

COMMERCIAL COLLECTOR STREET



HYDROLOGY STUDIES

westpipe2	kimballbox2
westpipe10	kimballbox10
westpipe25	kimballbox25
westpipe100	kimballbox100

REGISTERED PROFESSIONAL ENGINEER
RONALD N. KLINKEBIEL
No. 54277
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

GRAPHIC SCALE

(IN FEET)
1 inch = 200 ft.

JN 48131 Lewis Operating Corp
File: E:\dwg\48131\CFD Storm\48157hydKimball.dwg 09/23/03

HYDROLOGY CALCULATIONS
DRAINAGE AREA D

```
               San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

    CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-1999 Version 6.2
         Rational Hydrology Study        Date: 07/07/04
-------------------------------------------------------------------------
MASTER PLAN OF DRAINAGE-SUBAREA 2 AMENDMENT
KIMBALL AVENUE STORM DRAIN
Drainage Area 'D'
100-Year Storm
File westpipe100
-------------------------------------------------------------------------
L. D. King, Inc., Ontario, California - S/N   566
-------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

-------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.050 (In.)
Slope used for rainfall intensity curve b =  0.6000
Soil antecedent moisture condition (AMC) = 3


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Initial subarea data:
Initial area flow distance =   660.000(Ft.)
Top (of initial area) elevation =   656.300(Ft.)
Bottom (of initial area) elevation =   652.700(Ft.)
Difference in elevation =     3.600(Ft.)
Slope =    0.00545  s(%)=      0.55
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.794 min.
Rainfall intensity =      2.654(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =     22.895(CFS)
Total initial stream area =        10.000(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.110(In/Hr)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   652.700(Ft.)
End of street segment elevation =   649.000(Ft.)
```

T-1

```
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      29.764(CFS)
Depth of flow =   0.567(Ft.), Average velocity =   2.991(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   2.99(Ft/s)
Travel time =    3.01 min.     TC =   15.80  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =       2.338(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =       9.189(CFS) for    6.000(Ac.)
Total runoff =      32.084(CFS)
Effective area this stream =        16.00(Ac.)
Total Study Area (Main Stream No. 1) =       16.00(Ac.)
Area averaged Fm value =    0.110(In/Hr)
Street flow at end of street =      32.084(CFS)
Half street flow at end of street =      16.042(CFS)
Depth of flow =   0.577(Ft.), Average velocity =   3.082(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  22.000(Ft.)
```

T-2

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   649.000(Ft.)
End of street segment elevation =   644.500(Ft.)
Length of street segment  =   480.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
```

```
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.102(CFS)
Depth of flow =   0.583(Ft.), Average velocity =   3.664(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   3.66(Ft/s)
Travel time =    2.18 min.      TC =    17.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =      2.163(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.854
Subarea runoff =     10.421(CFS) for    7.000(Ac.)
Total runoff =     42.505(CFS)
Effective area this stream =       23.00(Ac.)
Total Study Area (Main Stream No. 1) =       23.00(Ac.)
Area averaged Fm value =    0.110(In/Hr)
Street flow at end of street =     42.505(CFS)
Half street flow at end of street =     21.252(CFS)
Depth of flow =   0.596(Ft.), Average velocity =   3.788(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  22.000(Ft.)
```

T-3

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   644.500(Ft.)
End of street segment elevation =   641.600(Ft.)
Length of street segment  =   530.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     49.897(CFS)
Depth of flow =   0.673(Ft.), Average velocity =   3.413(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.32(Ft.)
```

```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =    3.41(Ft/s)
Travel time =     2.59 min.      TC =    20.57  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =       1.996(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =      10.106(CFS) for    8.000(Ac.)
Total runoff =     52.611(CFS)
Effective area this stream =        31.00(Ac.)
Total Study Area (Main Stream No. 1) =        31.00(Ac.)
Area averaged Fm value =    0.110(In/Hr)
Street flow at end of street =      52.611(CFS)
Half street flow at end of street =      26.306(CFS)
Depth of flow =    0.688(Ft.), Average velocity =    3.443(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =     1.05(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)
```

T-4

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   641.600(Ft.)
End of street segment elevation =   638.800(Ft.)
Length of street segment  =    600.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.083
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      60.342(CFS)
Depth of flow =    0.748(Ft.), Average velocity =    3.304(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =     4.08(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =    3.30(Ft/s)
Travel time =     3.03 min.      TC =    23.60  min.
 Adding area flow to street
```

```
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Rainfall intensity =       1.838(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.846
Subarea runoff =       9.766(CFS) for    9.110(Ac.)                    T-5
Total runoff =      62.378(CFS)
Effective area this stream =        40.11(Ac.)
Total Study Area (Main Stream No. 1) =        40.11(Ac.)
Area averaged Fm value =    0.110(In/Hr)
Street flow at end of street =      62.378(CFS)
Half street flow at end of street =      31.189(CFS)
Depth of flow =   0.758(Ft.), Average velocity =   3.325(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =     4.56(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   631.800(Ft.)
Downstream point/station elevation =   624.100(Ft.)
Pipe length  =  1200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     62.378(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =     62.378(CFS)
Normal flow depth in pipe =    30.14(In.)
Flow top width inside pipe =    32.68(In.)
Critical Depth =   30.23(In.)
Pipe flow velocity =       9.07(Ft/s)
Travel time through pipe =    2.21 min.
Time of concentration (TC) =    25.81 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** SUBAREA FLOW ADDITION ****

Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    25.81 min.
Rainfall intensity =       1.742(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.843                                   T-6
Subarea runoff =      32.993(CFS) for   24.820(Ac.)
Total runoff =      95.371(CFS)
Effective area this stream =        64.93(Ac.)
Total Study Area (Main Stream No. 1) =        64.93(Ac.)
```

```
Area averaged Fm value =    0.110(In/Hr)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    624.100(Ft.)
Downstream point/station elevation =    609.000(Ft.)
Pipe length  =  1460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    95.371(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    95.371(CFS)
Normal flow depth in pipe =   32.11(In.)
Flow top width inside pipe =   35.64(In.)
Critical Depth =   36.16(In.)
Pipe flow velocity =     12.08(Ft/s)
Travel time through pipe =    2.01 min.
Time of concentration (TC) =    27.82 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    27.82 min.
Rainfall intensity =      1.665(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.841
Subarea runoff =      37.293(CFS) for   29.850(Ac.)                    T-7
Total runoff =    132.664(CFS)
Effective area this stream =       94.78(Ac.)
Total Study Area (Main Stream No. 1) =       94.78(Ac.)
Area averaged Fm value =    0.110(In/Hr)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    609.000(Ft.)
Downstream point/station elevation =    606.790(Ft.)
Pipe length  =   260.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   132.664(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   132.664(CFS)
Normal flow depth in pipe =   39.38(In.)
Flow top width inside pipe =   36.86(In.)
Critical Depth =   41.29(In.)
Pipe flow velocity =     12.01(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    28.18 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       8.000 to Point/Station       9.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    28.18 min.
Rainfall intensity =      1.652(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =      3.085(CFS) for    3.010(Ac.)
Total runoff =    135.748(CFS)
Effective area this stream =       97.79(Ac.)
Total Study Area (Main Stream No. 1) =       97.79(Ac.)
Area averaged Fm value =    0.110(In/Hr)
```

T-8

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       9.000 to Point/Station      10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   606.790(Ft.)
Downstream point/station elevation =   605.310(Ft.)
Pipe length  =   570.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   135.748(CFS)
Nearest computed pipe diameter  =    60.00(In.)
Calculated individual pipe flow  =  135.748(CFS)
Normal flow depth in pipe =   50.53(In.)
Flow top width inside pipe =   43.75(In.)
Critical Depth =   40.03(In.)
Pipe flow velocity =      7.69(Ft/s)
Travel time through pipe =    1.23 min.
Time of concentration (TC) =    29.42 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       9.000 to Point/Station      10.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    135.336(CFS)
therefore the upstream flow rate of Q =    135.748(CFS) is being used
Time of concentration =    29.42 min.
Rainfall intensity =      1.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =      0.000(CFS) for    2.430(Ac.)
```

T-9

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Total runoff =     135.748(CFS)
Effective area this stream =       100.22(Ac.)
Total Study Area (Main Stream No. 1) =       100.22(Ac.)
Area averaged Fm value =     0.110(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    605.310(Ft.)
Downstream point/station elevation =    604.400(Ft.)
Pipe length  =   400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   135.748(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   135.748(CFS)
Normal flow depth in pipe =   49.50(In.)
Flow top width inside pipe =   51.70(In.)
Critical Depth =   39.47(In.)
Pipe flow velocity =       7.44(Ft/s)
Travel time through pipe =    0.90 min.
Time of concentration (TC) =    30.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      11.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    30.31 min.
Rainfall intensity =       1.582(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =       1.897(CFS) for    3.700(Ac.)                  T-10
Total runoff =     137.646(CFS)
Effective area this stream =       103.92(Ac.)
Total Study Area (Main Stream No. 1) =       103.92(Ac.)
Area averaged Fm value =     0.110(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station      12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    604.400(Ft.)
Downstream point/station elevation =    603.000(Ft.)
Pipe length  =   490.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   137.646(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   137.646(CFS)
Normal flow depth in pipe =   48.56(In.)
Flow top width inside pipe =   47.14(In.)
Critical Depth =   40.31(In.)
```

```
Pipe flow velocity =       8.08(Ft/s)
Travel time through pipe =     1.01 min.
Time of concentration (TC) =    31.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station      12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
Time of concentration =    31.32 min.
Rainfall intensity =      1.551(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.836
Subarea runoff =      3.018(CFS) for    4.550(Ac.)
Total runoff =    140.664(CFS)
Effective area this stream =       108.47(Ac.)
Total Study Area (Main Stream No. 1) =      108.47(Ac.)
Area averaged Fm value =    0.110(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station      13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   603.000(Ft.)
Downstream point/station elevation =   601.750(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   140.664(CFS)
Nearest computed pipe diameter  =    66.00(In.)
Calculated individual pipe flow  =   140.664(CFS)
Normal flow depth in pipe =   52.03(In.)
Flow top width inside pipe =   53.92(In.)
Critical Depth =   39.65(In.)
Pipe flow velocity =      7.01(Ft/s)
Travel time through pipe =    1.57 min.
Time of concentration (TC) =    32.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station      13.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    137.542(CFS)
therefore the upstream flow rate of Q =    140.664(CFS) is being used
Time of concentration =    32.89 min.
Rainfall intensity =      1.506(In/Hr) for a   100.0 year storm
```

T-11

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =       0.000(CFS) for    1.000(Ac.)
Total runoff =     140.664(CFS)
Effective area this stream =      109.47(Ac.)
Total Study Area (Main Stream No. 1) =      109.47(Ac.)
Area averaged Fm value =    0.110(In/Hr)
```

T-12

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station      14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   601.750(Ft.)
Downstream point/station elevation =   600.500(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   140.664(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   140.664(CFS)
Normal flow depth in pipe =   52.03(In.)
Flow top width inside pipe =   53.92(In.)
Critical Depth =   39.65(In.)
Pipe flow velocity =      7.01(Ft/s)
Travel time through pipe =    1.57 min.
Time of concentration (TC) =    34.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.110(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     134.667(CFS)
therefore the upstream flow rate of Q =    140.664(CFS) is being used
Time of concentration =    34.46 min.
Rainfall intensity =      1.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =       0.000(CFS) for    1.000(Ac.)
Total runoff =     140.664(CFS)
Effective area this stream =      110.47(Ac.)
Total Study Area (Main Stream No. 1) =      110.47(Ac.)
Area averaged Fm value =    0.110(In/Hr)
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T-13

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   600.500(Ft.)
Downstream point/station elevation =   594.280(Ft.)
Pipe length  =   217.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    140.664(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   140.664(CFS)
Normal flow depth in pipe =   32.16(In.)
Flow top width inside pipe =   29.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.21(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    34.65 min.
End of computations, Total Study Area =          110.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.250
Area averaged SCS curve number =  56.0
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August 8, 2016

David Evans & Associates
25152 Springfield Court, Suite 350
Santa Clarita, California 91355

Attention: Mr. Jose Cruz, PE, MS, QSD
Project Manager

Project No.: **16G173-2**

Subject: **Results of Infiltration Testing**
Proposed Commercial/Industrial Development
SWC Merrill Avenue and Flight Avenue
Chino, California

Reference: Geotechnical Investigation, Proposed Commercial/Industrial Development, SWC Merrill Avenue and Flight Avenue, Chino, California, prepared for David Evans & Associates, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 16G173-1, dated August 8, 2016.

Gentlemen:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 16P182, dated March 17, 2016. The scope of services included surface reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the Technical Guidance Document for Water Quality Management Plans prepared for the County of San Bernardino Areawide Stormwater Program dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Site and Project Description

The subject site is located at the southwest corner of Merrill Avenue and Flight Avenue in Chino, California. The site is bounded to the north by Merrill Avenue, to the east by Flight Avenue, to the south by Remington Avenue, and to the west by the Chino Municipal Airport. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of two nearly rectangular shaped parcels, which total 81± acres in size. The eastern half of the eastern parcel is currently being utilized for row crops. The crops were being irrigated at the time of our investigation and no access for our personnel or equipment was available. The western half of the eastern parcel is currently being utilized as a dairy farm. Two

(2) cattle pens are located in the northern area of this portion of the parcel. Two single family residences, a milking barn, and several other structures associated with the dairy operation are located in the northern portion of this parcel. The southern portion of the western half of the east parcel appears to be utilized as an infiltration field for the dairy operation. North-south trending berms, approximately 1 to 2± feet in height are located throughout this area. The ground surface cover consists of exposed soil and manure in the cattle pen areas, turf grass and concrete flatwork in the areas surrounding the structures, and exposed soil with moderate native grass and weed growth in the southern area of this portion of the parcel. Several large trees are present in the northeast corner of the eastern parcel. A row of large trees separates the eastern and western parcels of the subject site.

The western parcel is currently being utilized as a sod farm. The western parcel is vacant and undeveloped with ground surface cover consisting of planted turf grasses, exposed soil, and a small area of weathered asphaltic concrete pavement in the southwest corner of the parcel. The pavement is in very poor condition with severe cracking throughout. A wash channel trending north to south, 8 to 10± feet deep and 60 to 70± feet wide extends from Merrill Avenue south and terminates at a box culvert located in the southwestern corner of the site.

Detailed topographic information was not available at the time of this report. Based on visual observations, the site topography slopes downward to the southwest at an estimated gradient of less than 2 percent. There was estimated to be 15 to 20± feet of elevation differential across the site with some variations within the cattle pens.

<u>Proposed Development</u>

Based on a site plan prepared by David Evans and Associates, Inc., the site will be developed with a new commercial/industrial building. The building will be located in the north-central area of the site and will be 745,478± ft² in size. The building will include four rows of loading docks on the west side of the building. The building is expected to be surrounded by asphaltic concrete pavements in the parking and drive lane areas, Portland cement concrete pavements in the loading dock areas, with some areas of concrete flatwork and several landscape planters throughout. Areas designated as runway protection zones for the adjacent airport will be left undeveloped in the northwest and southwest areas of the project site.

We understand the subject site will utilize an on-site storm water infiltration system to dispose of storm water. Based on an infiltration test location plan provided to our office by the client, the storm water infiltration system will consist of two (2) infiltration basins and a below grade infiltration system. Infiltration Basin 1 will be located in the southcentral area of the site and Infiltration Basin 2 will be located in the southwest corner of the site. The below grade chamber system will be located in the southeastern area of the site. The bottoms of the proposed infiltration basins and chambers will range from 10 to 20± feet below the existing grades.

<u>Concurrent Study</u>

Southern California Geotechnical, Inc. (SCG) is currently conducting a geotechnical investigation at the subject site. As a part of this study, six (6) borings were advanced to depths of 20 to 50± feet below existing site grades. In addition to the six borings, a total of four (4) trenches were excavated at the site to depths of 9 to 10± feet below existing site grades. All of the borings and trenches were logged during drilling and excavation by a member of our staff.

Manure was present at the ground surface at one of the trench locations within the cattle pens of the dairy farm with a thickness of 3± inches. Topsoil was encountered at the ground surface at one of the trench locations with a thickness of 4± inches. Artificial fill soils were encountered at the ground surface at some of the boring and trench locations, extending to depths of ¼± foot to 5± feet below the existing site grades. The fill soils generally consist of loose to medium dense silty fine sands, fine sandy silts, and fine sands with varying amounts of silt, medium sand, and fine gravel.

Native alluvial soils were encountered at the ground surface at several of the boring locations and beneath the fill soils and manure materials at all of the boring locations extending to at least the maximum depth explored of 50± feet below existing site grades. The alluvial soils generally consist of medium stiff to very stiff fine sandy clays, loose to medium dense clayey fine sands, silty fine sands, fine sandy silts, and fine sands with varying amounts of medium to coarse sands and fine gravel. Occasional samples of the alluvium from various depths possess slight to moderate porosity. Free water was not encountered during the drilling of any of the borings.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for this project consisted of a total of three (3) infiltration test borings. The borings were advanced to depths of 10 to 20± feet below existing site grades. All three borings were advanced using a truck-mounted drilling rig, equipped with 8-inch diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration borings (identified as I-1, I-2, and I-3) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of each infiltration boring, the bottom of the test holes were covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Infiltration Boring No. I-3 was drilled through existing pavement. The pavement at this boring location consists of 4± inches of asphaltic concrete with 4± inches of underlying aggregate base. Native alluvium was encountered beneath the pavement at Infiltration Boring No. I-3 and at the ground surface at Infiltration Boring Nos. I-1 and I-2, extending to at least the maximum explored depth of 20± feet below existing site grades. The alluvial soils generally consist of stiff fine sandy clays, stiff to very stiff clayey silts, loose to medium dense fine sandy silts, and medium dense to dense silty fine sands with little medium sand and varying clay content. The Boring Logs, which illustrate the conditions encountered at the boring locations, are included with this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the proposed storm water infiltration system that will be used to dispose of storm water at the subject site. As previously stated, the infiltration testing was performed in general accordance with Technical Guidance Document for Water Quality Management Plans, prepared for the County of San Bernardino Areawide Stormwater Program, dated June 7, 2013.

Pre-soaking

In accordance with the county infiltration standards for non-sandy soils, each infiltration test boring was pre-soaked on June 30, 2016, one (1) day prior to infiltration testing. The pre-soaking procedure consisted of filling the test borings with clean potable water to a depth of at least 5 times the radius of the hole. In accordance with the San Bernardino County guidelines, since at least 6 inches of water did not infiltrate into the surrounding soils at Infiltration Test Boring Nos. I-1 and I-2 in less than 25 minutes for 2 consecutive readings, infiltration testing was conducted at least 15 hours after initiating the pre-soaking procedure. However, sandy soils were encountered at the bottom of Infiltration Test Boring No. I-3, where 6 inches of water did infiltrate into the soil within 25 minutes for 2 consecutive readings. Therefore, different infiltration procedures were used during the infiltration testing at the infiltration boring locations.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of the test hole prior to each test interval. Based on the results of the pre-saturation process, readings were taken at 30 minute intervals during the infiltration testing at Infiltration Boring Nos. I-1 and I-2, and 10 minute intervals for Infiltration Boring No. I-3. After each reading, water was added to the boring so that the depth of the water was at least 5 times the radius of the hole. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration test be used for design. The rate is summarized below:

Infiltration Test No.	**Depth (ft)**	**Soil Description**	**Infiltration Rate (inches/hour)**
I-1	10	Fine to medium Sandy Silt	0.2
I-2	18	Silty fine Sand to fine Sandy Silt, little medium Sand, trace Clay	0.3
I-3	20	Silty fine Sand, little medium Sand	1.9

Laboratory Testing

Grain Size Analysis

The grain size distribution of selected soils taken from the base of the infiltration test boring has been determined using a range of wire mesh screens. The analysis was performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the analysis are presented at the end of this report.

Design Recommendations

A total of three (3) infiltration tests were performed at the subject site. As noted above, the infiltration rates range from 0.2 to 1.9 inches per hour. The primary factor affecting the infiltration rates was the silt content of the encountered soils, which vary at different depths and locations at the subject site. In general, higher silt content was observed within the soil exposed at the bottom of Infiltration Boring Nos. I-1 and I-2, which exhibited slower infiltration rates.

Based on the infiltration test results, no significant infiltration should be expected for Infiltration Basin 1 and the proposed below grade infiltration system located in the southeastern area of the site and 2 inches per hour for Infiltration Basin 2 located in the southwest corner of the site.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed below-grade chamber system to identify the soil classification at the base of the infiltration system. It should be confirmed that the soils at the base of the proposed below-grade chamber system correspond with those presented in this report to ensure that the performance of the system will be consistent with the rates reported herein.

The design of the proposed infiltration system should be performed by the project civil engineer, in accordance with the city of Chino and/or San Bernardino County guidelines. **It is recommended that the project civil engineer apply an appropriate factor of safety.** It is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rates. **The infiltration rate recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rate.** It should be noted that the recommended infiltration rates are based on infiltration testing at three (3) discrete locations and that the overall infiltration rate of the infiltration system could vary considerably.

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rate presented herein was determined in accordance with the San

Bernardino County guidelines, and is considered valid for the time and place of the actual test. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of subgrade soils. If possible, the proposed infiltration system for this site should be located at least 25 feet away from any structures, including retaining walls. Even with this provision of locating the infiltration system at least 25 feet from the buildings, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

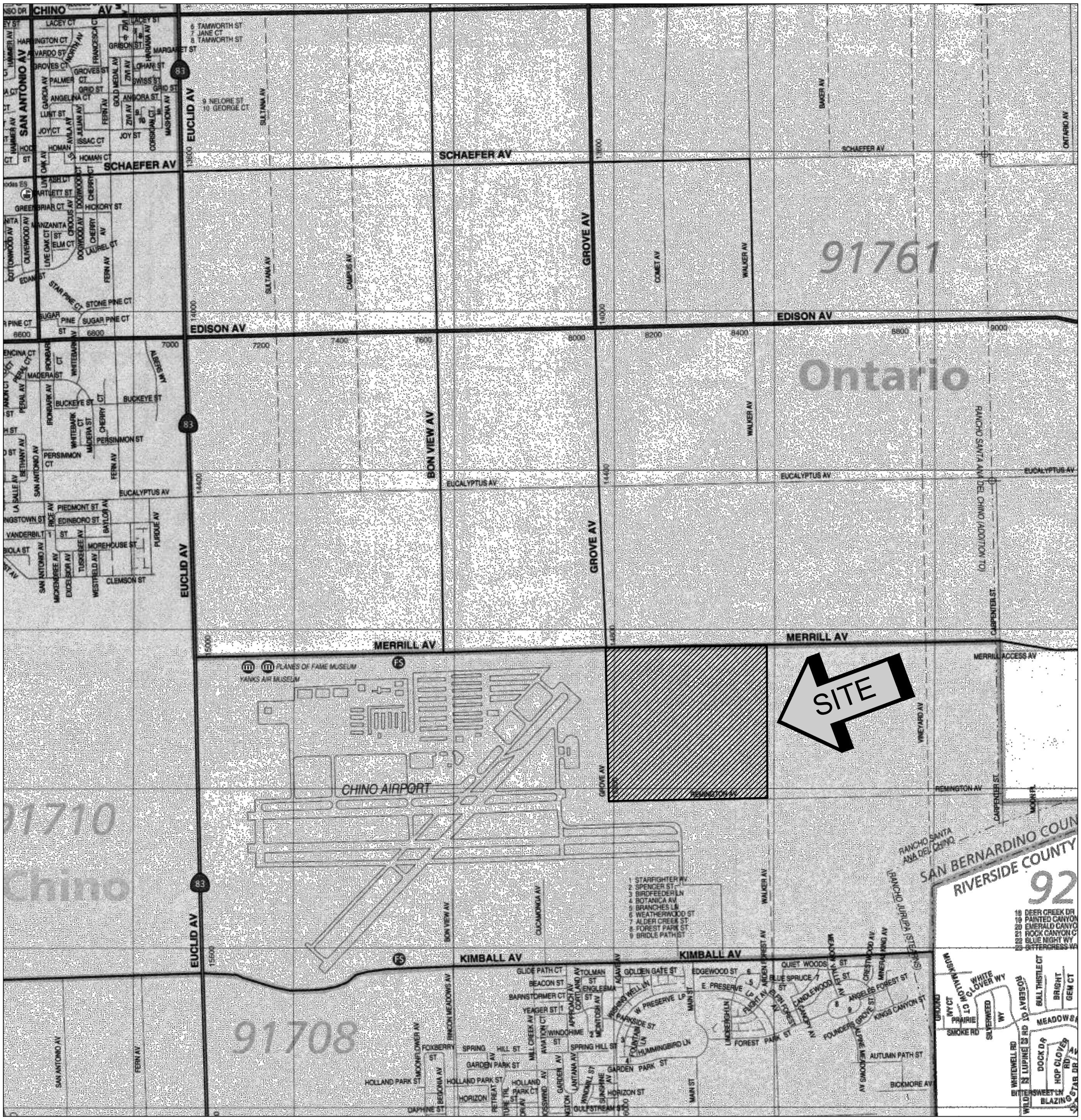
Scott McCann
Staff Scientist

Robert G. Trazo, M.Sc., GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
No. 2655
GEOTECHNICAL
STATE OF CALIFORNIA

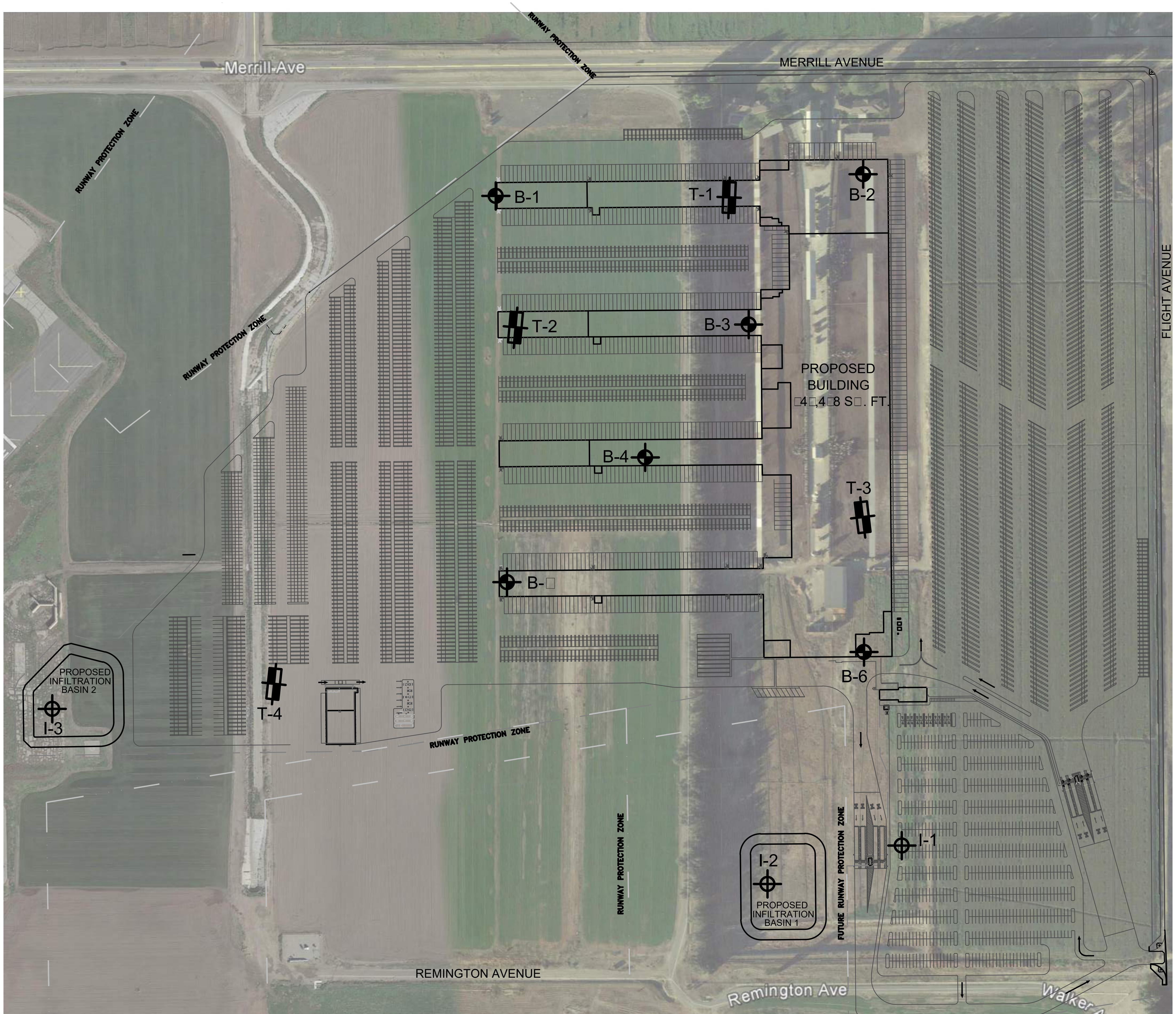
Distribution: (1) Addressee

Enclosures:
Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (5 pages)
Infiltration Test Results Spreadsheet (3 pages)
Grain Size Distribution Graph (3 pages)



SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP	
PROPOSED COMMERCIAL□INDUSTRIAL DEVELOPMENT	
CHINO, CALIFORNIA	
SCALE: 1" □2400□	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: AL CH□D: RGT	
SCG PROJECT 16G1□3-2	
PLATE 1	



NORTH

SoCalGeo

GEOTECHNICAL LEGEND

- APPRO□IMATE INFILTRATION TEST LOCATION
- APPRO□IMATE BORING LOCATION FROM CONCURRENT STUDY □SCG PROJECT NO. 16G1□3-1□
- APPRO□IMATE TRENCH LOCATION FROM CONCURRENT STUDY □SCG PROJECT NO. 16G1□3-1□

NOTE: BASE MAP PREPARED BY DAVID EVANS AND ASSOCIATES, INC.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH

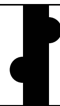
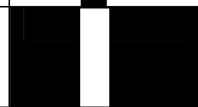
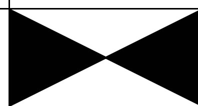
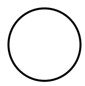
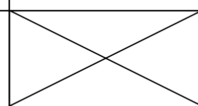
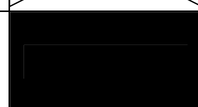
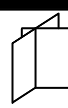
INFILTRATION TEST LOCATION PLAN

PROPOSED COMMERCIAL□INDUSTRIAL DEVELOPMENT

CHINO, CALIFORNIA

SCALE: 1" □300□	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLH CH□D: RGT	
SCG PROJECT 16G1□3-2	
PLATE 2	

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3” indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING NO. I-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 16G173-2
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 6/30/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH:
CAVE DEPTH:
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Gray fine Sandy Silt to Silty fine Sand, trace fine root fibers, medium dense-damp to moist							
	X	24					12					
					Light Gray Brown fine to medium Sandy Silt, trace calcareous veining, loose to medium dense-moist							
	X	11					18					
5												
	X	9					17					
	X	9					16					
10					Boring Terminated at 10'							

TBL 16G173-2.GPJ SOCALGEO.GDT 8/8/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 16G173-2	DRILLING DATE: 6/30/16	WATER DEPTH:
PROJECT: Proposed C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH:
LOCATION: Chino, California	LOGGED BY: Jason Hiskey	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	29			ALLUVIUM: Light Gray Brown fine Sandy Silt, trace calcareous veining, trace fine root fibers, trace Iron oxide staining, loose to medium dense-damp to moist		11					
	X	10					15					
5												
	X	11					12					
	X	14			Light Gray Brown fine Sandy Clay, trace Silt, little calcareous nodules, stiff-moist		17					
10												
					Brown Silty fine Sand to fine Sandy Silt, little medium Sand, trace Clay, some Iron oxide staining, medium dense-damp to moist							
	X	22					10					
15												
	X	21					11					

Boring Terminated at 18'

TBL 16G173-2.GPJ SOCALGEO.GDT 8/8/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 16G173-2
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 6/30/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH:
CAVE DEPTH:
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					4± inches Asphaltic concrete, 4± inches Aggregate base							
	X	19			ALLUVIUM: Light Gray Brown Clayey Silt, trace fine Sand, trace fine root fibers, occasional to little calcareous veining, slightly porous, stiff to very stiff-damp		8					
	X	12					9					
5												
	X	13					11					
	X	16					11					
10												
					Light Brown Silty fine Sand, little medium Sand, abundant Iron oxide staining, medium dense to dense-damp to moist							
	X	28					10					
15												
	X	34					6					
20												
					Boring Terminated at 20'							

TBL 16G173-2.GPJ SOCALGEO.GDT 8/8/16

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Chino, CA
Project Number	16G173-2
Engineer	SM

Test Hole Radius	4	(in)
Test Depth	9.5	(ft)

Infiltration Test Hole	I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
1	Initial	7:30 AM	30.0	7.29	0.39	2.02	0.72	Infiltration Testing
	Final	8:00 AM		7.68				
2	Initial	8:01 AM	30.0	7.29	0.13	2.15	0.22	
	Final	8:31 AM		7.42				
3	Initial	8:32 AM	30.0	7.30	0.12	2.14	0.21	
	Final	9:02 AM		7.42				
4	Initial	9:03 AM	30.0	7.31	0.12	2.13	0.21	
	Final	9:33 AM		7.43				
5	Initial	9:34 AM	30.0	7.31	0.12	2.13	0.21	
	Final	10:04 AM		7.43				
6	Initial	10:05 AM	30.0	7.30	0.12	2.14	0.21	
	Final	10:35 AM		7.42				
7	Initial	10:36 AM	30.0	7.29	0.12	2.15	0.21	
	Final	11:06 AM		7.41				
8	Initial	11:07 AM	30.0	7.30	0.11	2.15	0.19	
	Final	11:37 AM		7.41				
9	Initial	11:38 AM	30.0	7.33	0.12	2.11	0.21	
	Final	12:08 PM		7.45				
10	Initial	12:09 PM	30.0	7.32	0.12	2.12	0.21	
	Final	12:39 PM		7.44				
11	Initial	12:40 PM	30.0	7.35	0.12	2.09	0.21	
	Final	1:10 PM		7.47				
12	Initial	1:11 PM	30.0	7.37	0.12	2.07	0.21	
	Final	1:41 PM		7.49				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)

ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval H above GS= 0.5

H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Chino, CA
Project Number	16G173-2
Engineer	SM

Test Hole Radius	4	(in)
Test Depth	18.0	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	7:45 AM	30.0	15.54	0.22	2.35	0.35
	Final	8:15 AM		15.76			
2	Initial	8:16 AM	30.0	15.58	0.21	2.32	0.34
	Final	8:46 AM		15.79			
3	Initial	8:47 AM	30.0	15.62	0.20	2.28	0.33
	Final	9:17 AM		15.82			
4	Initial	9:18 AM	30.0	15.51	0.17	2.41	0.26
	Final	9:48 AM		15.68			
5	Initial	9:49 AM	30.0	15.55	0.18	2.36	0.28
	Final	10:19 AM		15.73			
6	Initial	10:20 AM	30.0	15.54	0.18	2.37	0.28
	Final	10:50 AM		15.72			
7	Initial	10:51 AM	30.0	15.66	0.19	2.25	0.32
	Final	11:21 AM		15.85			
8	Initial	11:22 AM	30.0	15.67	0.18	2.24	0.30
	Final	11:52 AM		15.85			
9	Initial	11:53 AM	30.0	15.71	0.18	2.20	0.30
	Final	12:23 PM		15.89			
10	Initial	12:24 PM	30.0	15.73	0.18	2.18	0.31
	Final	12:54 PM		15.91			
11	Initial	12:55 PM	30.0	15.72	0.18	2.19	0.31
	Final	1:25 PM		15.90			
12	Initial	1:26 PM	30.0	15.76	0.18	2.15	0.31
	Final	1:56 PM		15.94			

Infiltration Testing

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 1.8
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Chino, CA
Project Number	16G173-2
Engineer	SM

Test Hole Radius	4	(in)
Test Depth	19.1	(ft)

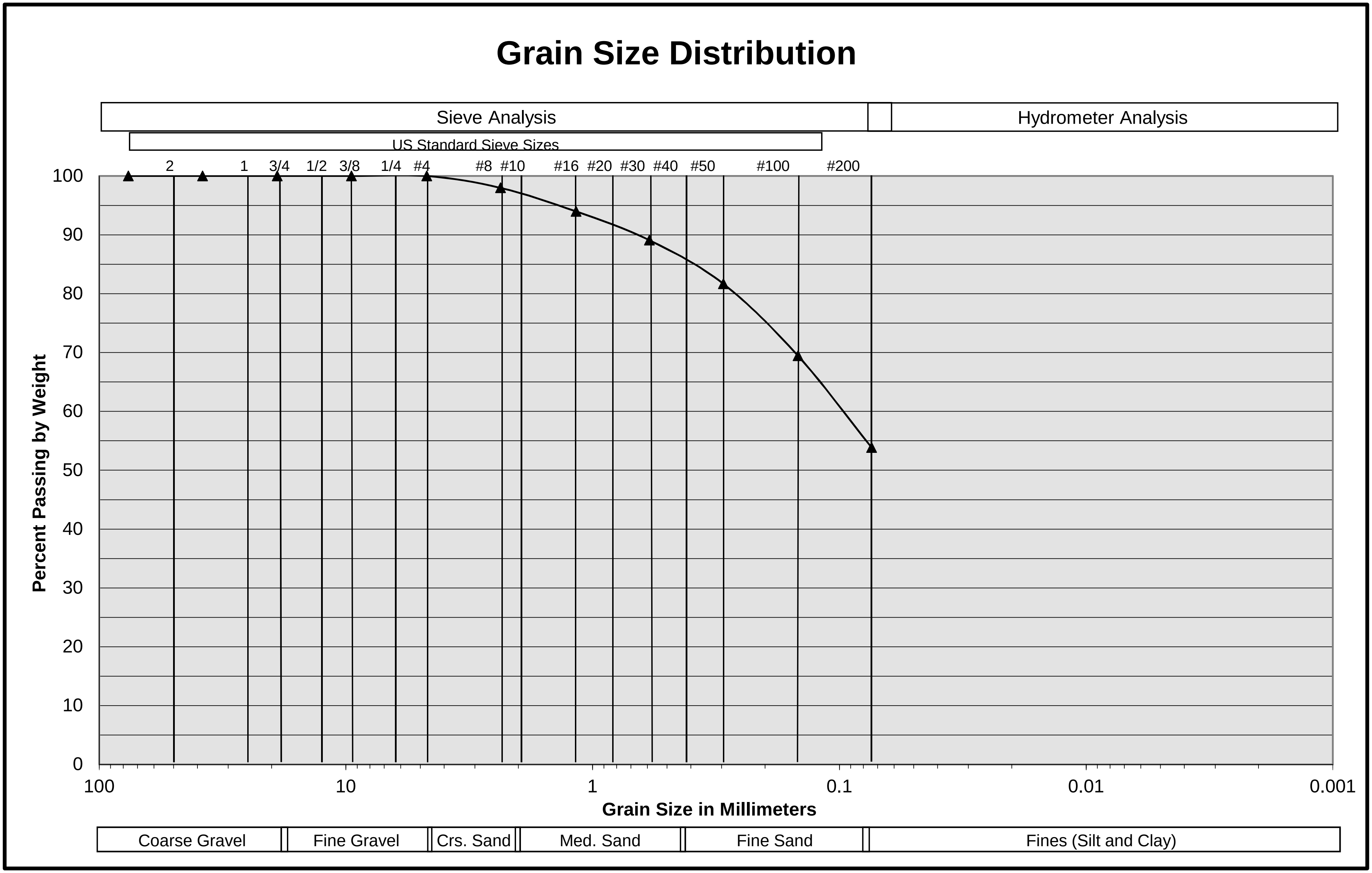
Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	2:00 PM	15.0	17.00	0.58	1.81	2.35	Pre-Sat
	Final	2:15 PM		17.58				
P2	Initial	2:16 PM	15.0	17.00	0.51	1.85	2.03	
	Final	2:31 PM		17.51				
1	Initial	2:32 PM	10.0	17.00	0.33	1.94	1.88	Infiltration Testing
	Final	2:42 PM		17.33				
2	Initial	2:43 PM	10.0	17.03	0.32	1.91	1.85	
	Final	2:53 PM		17.35				
3	Initial	2:54 PM	10.0	17.00	0.31	1.95	1.76	
	Final	3:04 PM		17.31				
4	Initial	3:05 PM	10.0	17.00	0.31	1.95	1.76	
	Final	3:15 PM		17.31				
5	Initial	3:16 PM	10.0	17.00	0.30	1.95	1.70	
	Final	3:26 PM		17.30				
6	Initial	3:27 PM	10.0	17.18	0.30	1.77	1.86	
	Final	3:37 PM		17.48				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval — H above GS= 0.5
- H_{avg} = Average Head Height over the time interval

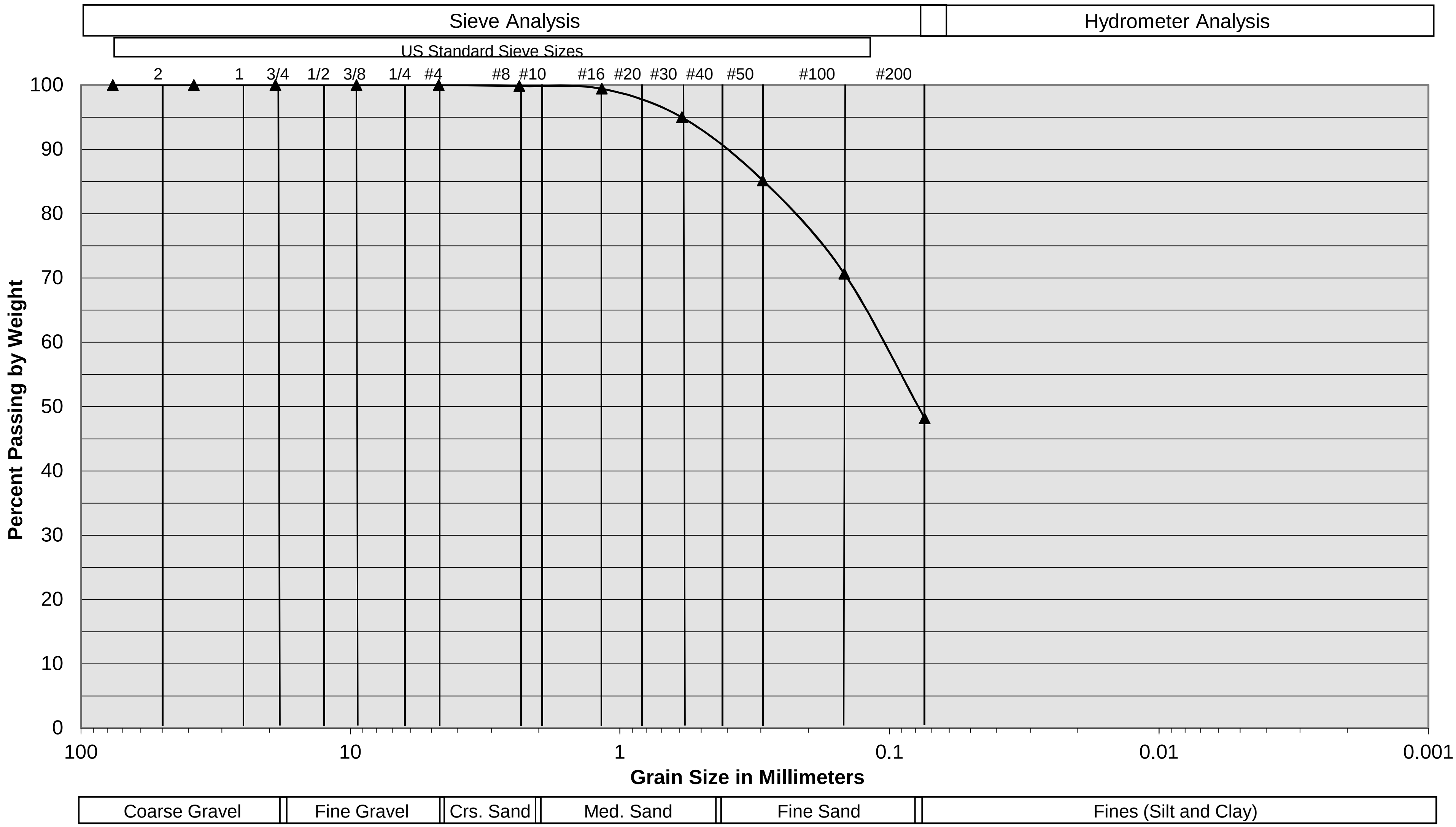


Sample Description	I-1 @ 8.5 feet
Soil Classification	Light Gray Brown fine to medium Sandy Silt

Proposed Commercial / Industrial Development
Chino, California
Project No. 16G173-2
PLATE C-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

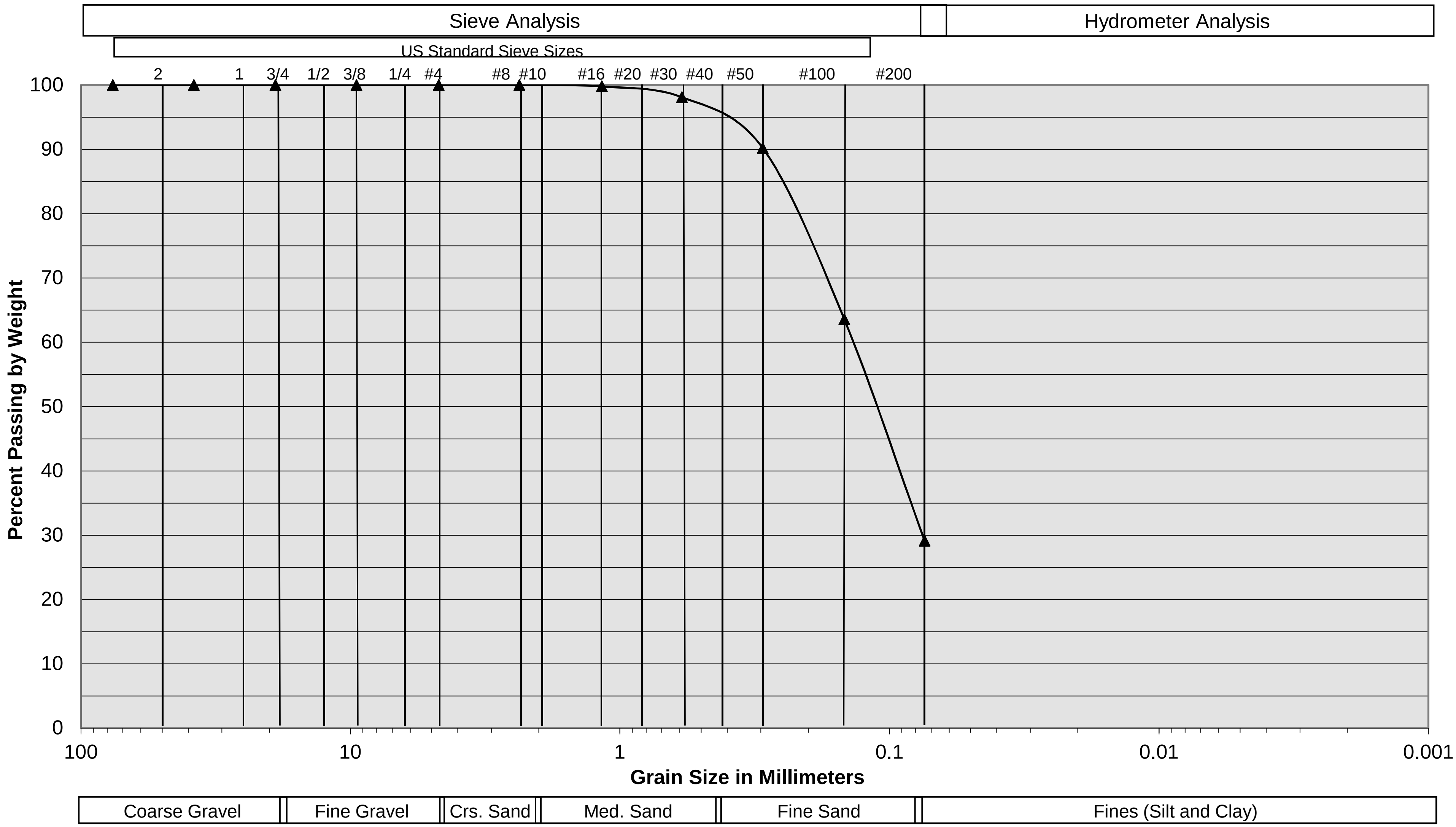


Sample Description	I-2 @ 16.5 feet
Soil Classification	Brown Silty fine Sand to fine Sandy Silt, little medium Sand, trace Clay

Proposed Commercial / Industrial Development
Chino, California
Project No. 16G173-2
PLATE C-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



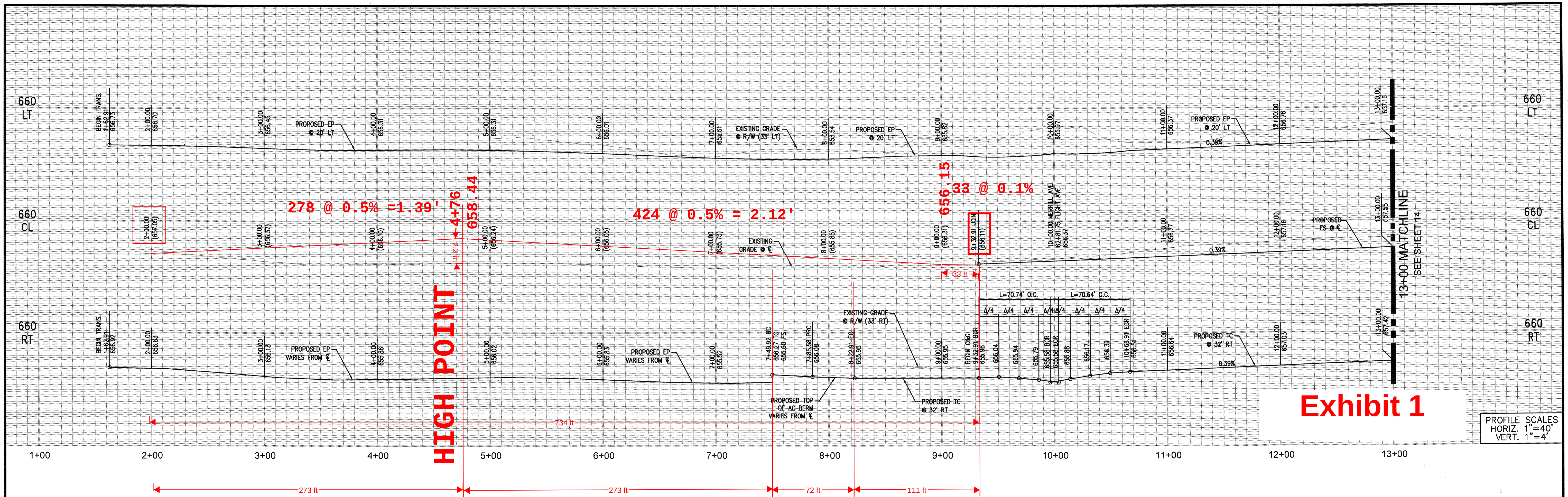
Sample Description	I-3 @ 18.5 feet
Soil Classification	Light Gray Brown Silty fine Sand, little medium Sand

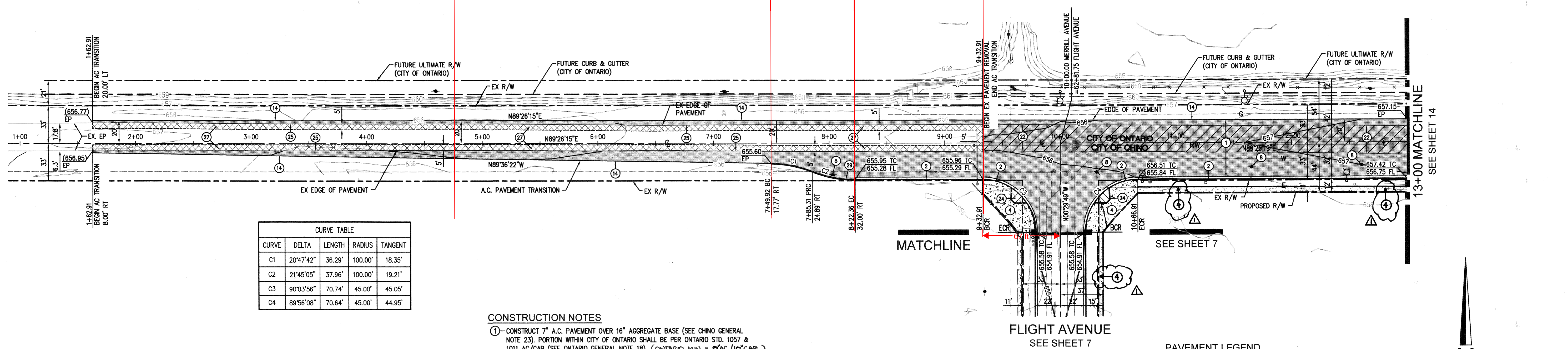
Proposed Commercial / Industrial Development
Chino, California
Project No. 16G173-2
PLATE C-3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation

Appendix E

1. Merrill Avenue Hydrologic condition and Hydraulic capacity





CURVE	DELTA	LENGTH	RADIUS	TANGENT
C1	20°47'42"	36.29'	100.00'	18.35'
C2	21°45'05"	37.96'	100.00'	19.21'
C3	90°03'56"	70.74'	45.00'	45.05'
C4	89°56'08"	70.64'	45.00'	44.95'

CONSTRUCTION NOTES

1. CONSTRUCT 7" A.C. PAVEMENT OVER 16" AGGREGATE BASE (SEE CHINO GENERAL NOTE 23). PORTION WITHIN CITY OF ONTARIO SHALL BE PER ONTARIO STD. 1057 & 1011 AC/CAB (SEE ONTARIO GENERAL NOTE 18). (ONTARIO MIN = 8"AC/10"CAB)
2. CONSTRUCT 8" CURB AND 24" GUTTER PER CITY STD DWG NO. 205 (TYPE B)
4. CONSTRUCT P.C.C. SIDEWALK PER CITY STD DWG NO. 230
8. REMOVE EXISTING POWER POLE AND INSTALL POWER LINES UNDERGROUND (BY SCE)
14. INSTALL 2"x 6" REDWOOD HEADER AT EDGE OF PAVEMENT
22. REMOVE EXISTING PAVEMENT
24. CONSTRUCT SIDEWALK RAMP PER CITY STD DWG NO. 235A-C
25. SAWCUT TO A CLEAN STRAIGHT LINE AND REMOVE 1' WIDE MINIMUM EXISTING A.C. PAVEMENT AS NECESSARY OR AS DIRECTED BY PUBLIC WORKS INSPECTOR
27. GRIND AND OVERLAY 0.15' MIN. (5' WIDE MINIMUM) AT MATCHING EDGE OF PAVEMENT
29. CONSTRUCT 8" A.C. BERM PER CITY STD DWG NO. 220

PAVEMENT LEGEND

- REMOVE EXISTING PAVEMENT
- CONSTRUCT NEW A.C. PAVEMENT
- GRIND AND OVERLAY 0.15' MINIMUM

SEAL: REGISTERED PROFESSIONAL ENGINEER GLENN MATTHEW CHUNG No. 62794 Exp. 06/30/14 CIVIL STATE OF CALIFORNIA

811 Know what's below. Call 811 before you dig.

CITY OF ONTARIO

RECOMMENDED BY: Raymond Lee 4/17/13 RAYMOND LEE, ASSISTANT CITY ENGINEER DATE

ACCEPTED BY: LOUIS ABI-YOUNES, CITY ENGINEER 4/22/13 DATE

PREPARED BY
Hall & Foreman, Inc.
Civil Engineering • Planning • Surveying • Public Works
17782 17th STREET, Ste. 200 • TUSTIN, CA 92780 • 714-665-4500
PREPARED UNDER THE SUPERVISION OF:
GLENN M. CHUNG P.E. R.C.E. 62794 1-8-13 DATE

REVISIONS: ADD SIDEWALK TO BE CONSTRUCTED — MADE BY GMC DATE 04/08/14 — APPROVED BY JP DATE 4/16/14

BENCH MARK DATA
BENCHMARK: CITY OF CHINO BENCHMARK POINT NO. 157/77, ELE. 608.216. TOP OF BRASS DISK NEAR THE INTERSECTION OF KIMBALL AVE. AND BON VIEW..

REFERENCE DRAWINGS

REVIEWED BY STAFF: WATER: SEWER: FIRE: PLANNING: TRAFFIC: SERVICES:

CITY ENGINEER'S STAFF: DRAWN: DESIGNED: CHECKED: 1/14/13 RECOMMENDED:

APPROVED BY: CITY ENGINEER DATE: 5/22/13

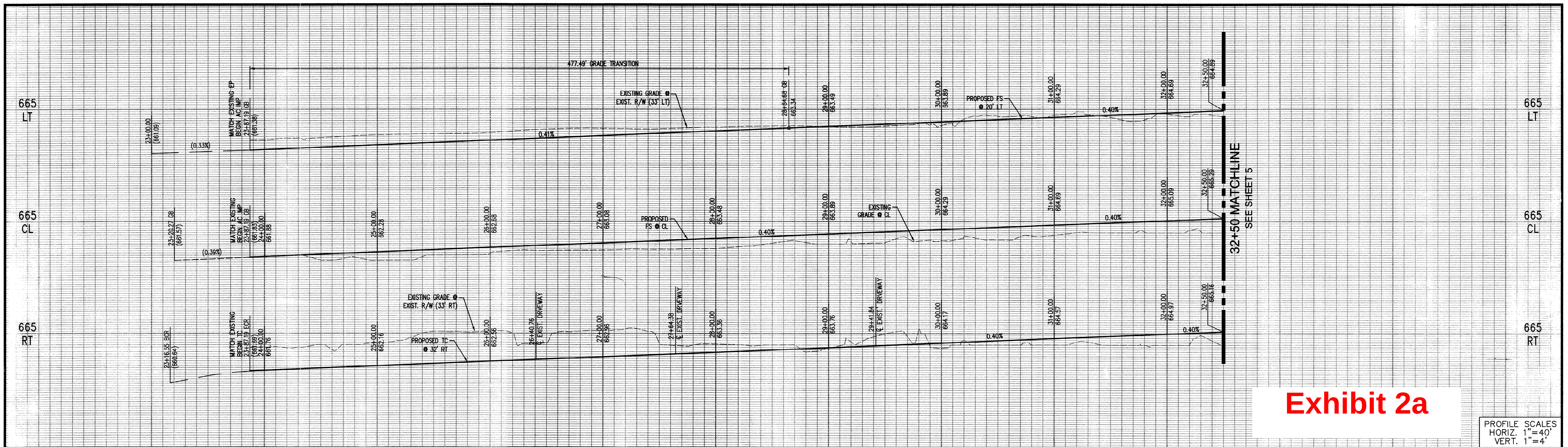
CITY OF CHINO ENGINEERING DIVISION
STREET IMPROVEMENT PLAN
MERRILL AVENUE
AT FLIGHT AVE.

City of Ontario No R 18408
PROJECT NO. PM 19368
SHEET 13 OF 18
DRAWING NO. AA4650

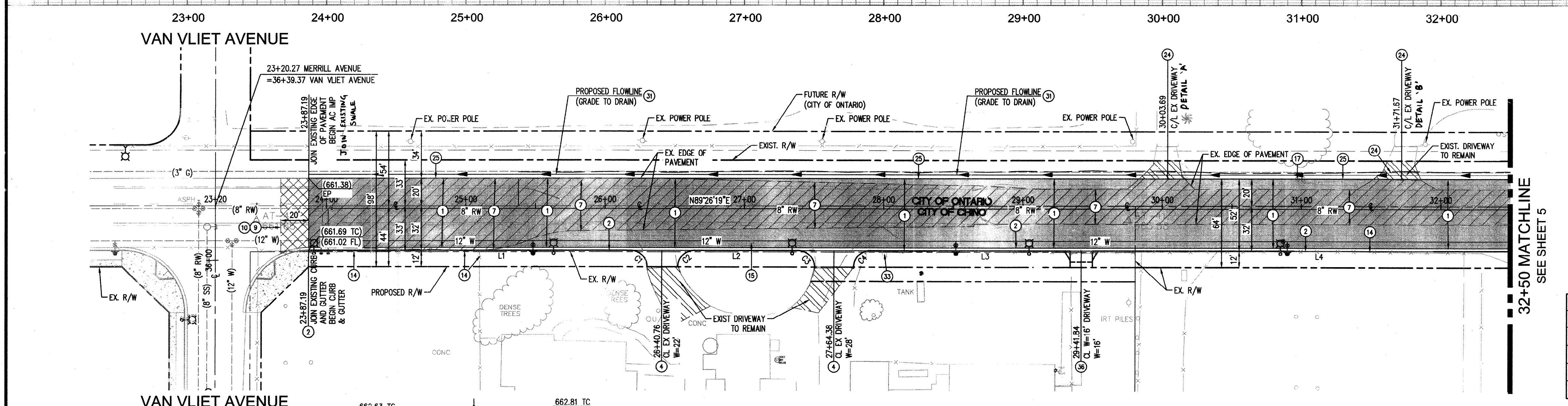
FOR CONSTRUCTION

Drawing Name: S:\080357\Eng\080357-000\Final Plots\Offsite\Street\13_0803570071.dwg Last Opened: Jan 04, 2013 - 1:04pm by: jhuber

Exhibit 2a



PROFILE SCALES
HORIZ. 1"=40'
VERT. 1"=4'



MERRILL AVENUE

CONSTRUCTION NOTES

1. CONSTRUCT 7" A.C. PAVEMENT OVER 8" AGGREGATE BASE. PORTION WITHIN CITY OF ONTARIO SHALL BE PER NOTE *1
2. CONSTRUCT 8" CURB AND 24" GUTTER PER CITY OF CHINO STD DWG NO. 205 (TYPE B)
4. CONSTRUCT 8" P.C.C. DRIVEWAY APPROACH (W=XX' CALLED OUT ON PLAN) PER CITY OF CHINO STD DWG NO. 250
7. REMOVE EXISTING PAVEMENT
9. SAWCUT TO A CLEAN STRAIGHT LINE AND REMOVE 2' WIDE MINIMUM EXISTING A.C. PAVEMENT AS NECESSARY OR AS DIRECTED BY PUBLIC WORKS INSPECTOR
10. GRIND AND OVERLAY 0.15' MIN. (20' WIDE MINIMUM) AT MATCHING EDGE OF PAVEMENT
14. REMOVE EXISTING FENCE WITHIN PUBLIC RIGHT OF WAY PER ROUGH GRADING PLANS
15. REMOVE EXISTING POWER POLE AND INSTALL POWER LINES UNDERGROUND (BY SCE)
17. REMOVE AND RELOCATE EXISTING MAILBOX IN ITS ENTIRETY
24. RECONSTRUCT EXISTING DRIVEWAY TO MATCH PROPOSED GRADES (SEE SHEET 20).
25. CONSTRUCT 2" X 6" REDWOOD HEADER
31. HYDROSEED MANUFACTURED SLOPES
33. REMOVE AND RELOCATE EXISTING POWER POLE
36. CONSTRUCT 8" P.C.C. DRIVEWAY APPROACH (W=XX' CALLED OUT ON PLAN) PER CITY OF CHINO STD DWG NO. 255

*1. CONSTRUCT 8" AC OVER 10" CAB MIN ON MERRILL AVENUE AND 6" AC OVER 8" CAB MIN ON CARPENTER AVENUE WITHIN CITY OF ONTARIO.

LINE TABLE

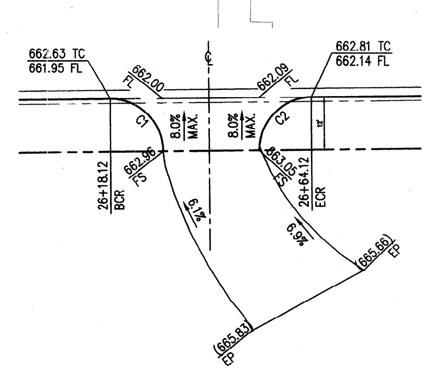
LINE	BEARING	DISTANCE
L1	N89° 26' 20"E	230.92
L2	N89° 26' 20"E	74.26
L3	N89° 26' 20"E	143.46
L4	N89° 26' 20"E	300.17

CURVE TABLE

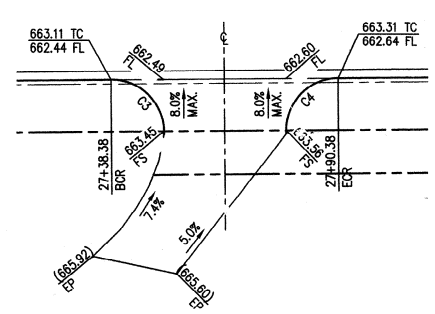
CURVE	DELTA	LENGTH	RADIUS	TANGENT
C1	90°00'00"	18.85'	12.00'	12.00'
C2	90°00'00"	18.85'	12.00'	12.00'
C3	90°00'00"	18.85'	12.00'	12.00'
C4	90°00'00"	18.85'	12.00'	12.00'

PAVEMENT LEGEND

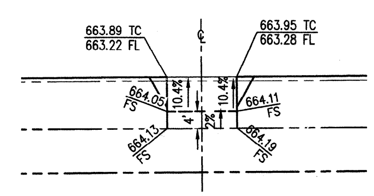
- RECONSTRUCT EXISTING DRIVEWAY
- GRIND AND OVERLAY
- REMOVE EXISTING PAVEMENT
- CONSTRUCT NEW A.C. PAVEMENT



STA 26+40.76
DRIVEWAY DETAIL
1"=20'



STA 27+64.38
DRIVEWAY DETAIL
1"=20'



STA 29+41.84
DRIVEWAY DETAIL
1"=20'

scale 1"= 40' feet

CITY OF ONTARIO

RECOMMENDED BY: KHOI DO, P.E. ASSISTANT CITY ENGINEER — DATE 11/1/16

ACCEPTED BY: LOUIS ABI-YOUNES, P.E. CITY ENGINEER — DATE 11.3.16

SEAL

REGISTERED PROFESSIONAL ENGINEER GLENN MATTHEW CHUNG No. 62794 Exp. 06/30/18 CIVIL STATE OF CALIFORNIA

811 Know what's below. Call 811 before you dig.

PREPARED BY

Hall & Foreman
A Division of David Evans and Associates, Inc.
17782 17TH STREET, SUITE 200 · TUSTIN, CA 92780 · 714-665-4500
GLENN M. CHUNG, P.E. R.C.E. 62794 — DATE 9/21/16

REVISIONS | MADE BY DATE | APPROVED BY DATE

BENCH MARK DATA

BENCHMARK:
CITY OF CHINO BENCHMARK POINT NO. 157/77, ELE. 608.216. TOP OF BRASS DISK NEAR THE INTERSECTION OF KIMBALL AVE. AND BON VIEW..

REFERENCE DRAWINGS

REVIEWED BY STAFF	BY	DATE
WATER: ENV: RV 10.12.16		
SEWER:		
FIRE:		
PLANNING:		
TRAFFIC:		
SERVICES:		

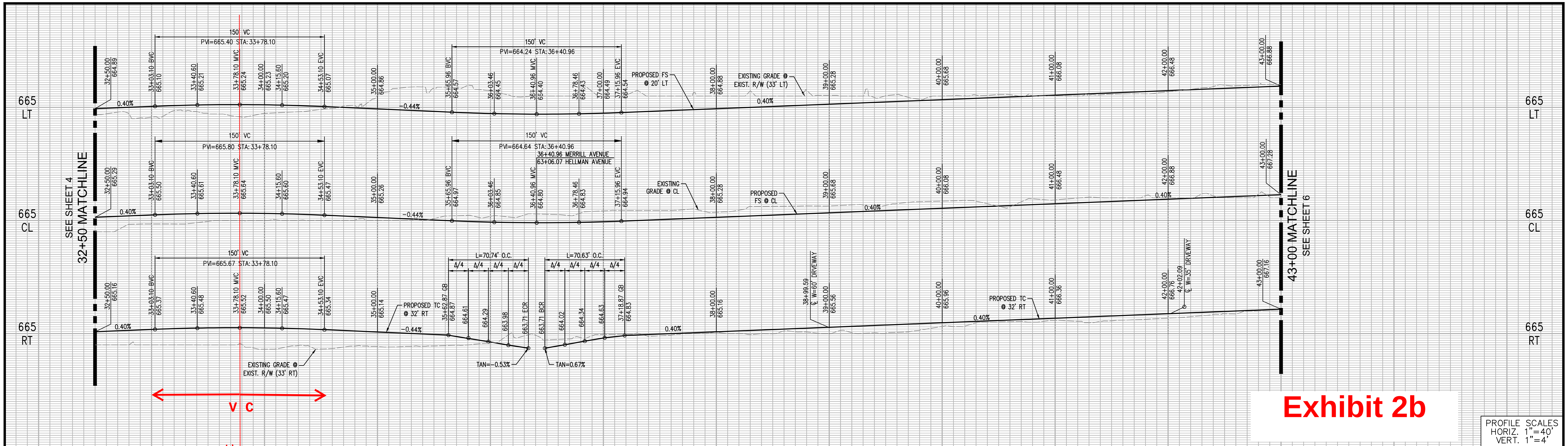
CITY ENGINEER'S STAFF	BY	DATE
DRAWN:		
DESIGNED:		
CHECKED: RKA	dg	9/28/16
RECOMMENDED:	MB	9/28/16

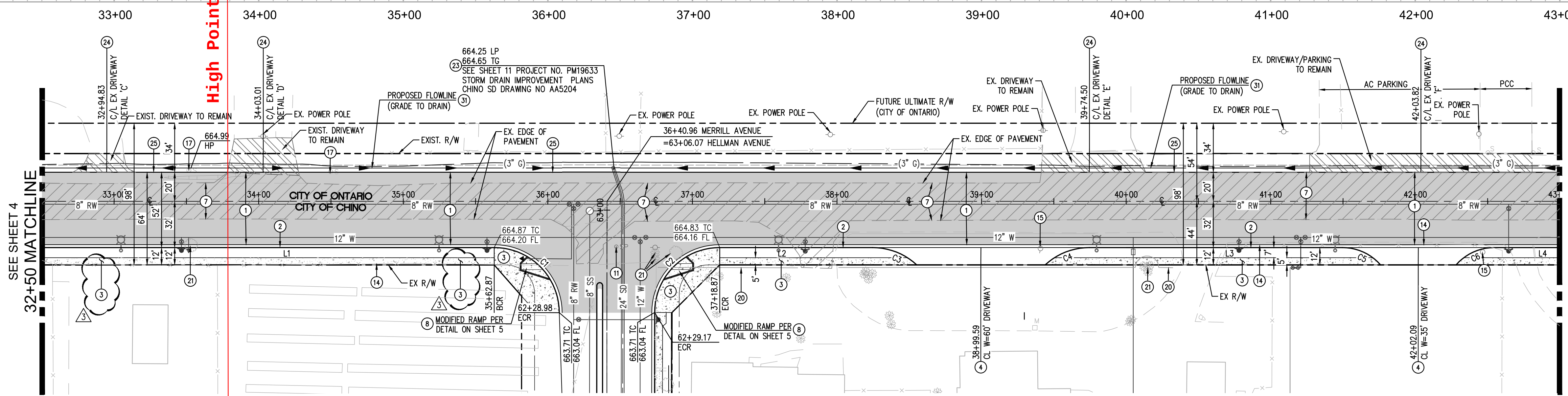
APPROVED BY:
CITY ENGINEER
DATE: 10/14/16

CITY OF CHINO ENGINEERING DIVISION
STREET IMPROVEMENT PLANS
MERILL AVENUE
FROM VAN VLIET AVE TO 950' EAST OF VAN VLIET AVE

PROJECT NO. PM 19633
SHEET 4 OF 24
DRAWING NO. AA 5225
R19261

Drawing Name: P:\W\WAL00000-0100\Eng\130180-000\Final Plots\Offsite\Street\04_130180s1.dwg
Last Opened: Sep 21, 2016 - 11:16am by: mxgo





MERRILL AVENUE

LINE	BEARING	DISTANCE
L1	N89° 26' 20"E	312.87
L2	N89° 26' 20"E	105.72
L3	N89° 26' 20"E	175.00
L4	N89° 25' 39"E	45.41

CURVE	DELTA	LENGTH	RADIUS	TANGENT
C1	90°04'07"	70.74'	45.00'	45.05'
C2	89°55'54"	70.63'	45.00'	44.95'
C3	42°50'00"	33.64'	45.00'	17.65'
C4	42°50'00"	33.64'	45.00'	17.65'
C5	48°55'04"	29.88'	35.00'	15.92'
C6	48°55'04"	29.88'	35.00'	15.92'

PAVEMENT LEGEND

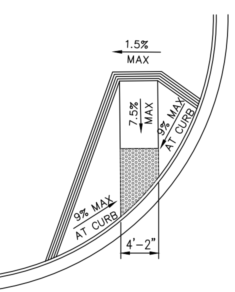
- RECONSTRUCT EXISTING DRIVEWAY
- REMOVE EXISTING PAVEMENT
- CONSTRUCT NEW A.C. PAVEMENT

*1 CONSTRUCT 8" AC OVER 10" CAB MIN ON MERRILL AVENUE AND 6" AC OVER 8" CAB MIN ON CARPENTER AVENUE WITHIN CITY OF ONTARIO

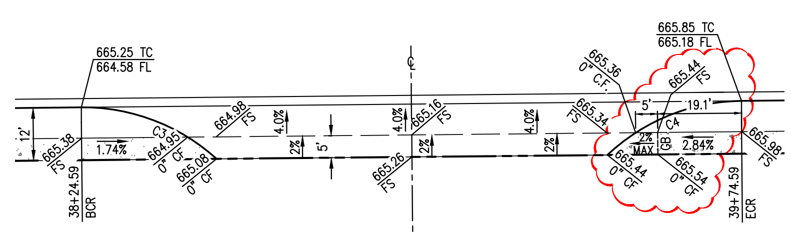
CONSTRUCTION NOTES

1. CONSTRUCT 7" A.C. PAVEMENT OVER 8" AGGREGATE BASE. PORTION WITHIN CITY OF ONTARIO SHALL BE PER NOTE *1
2. CONSTRUCT 8" CURB AND 24" GUTTER PER CITY OF CHINO STD DWG NO. 205 (TYPE B)
3. CONSTRUCT P.C.C. SIDEWALK PER CITY OF CHINO STD DWG NO. 230 (WIDTH PER PLAN)
4. CONSTRUCT 8" P.C.C. DRIVEWAY APPROACH (W=XX' CALLED OUT ON PLAN) PER CITY OF CHINO STD DWG NO. 250
7. REMOVE EXISTING PAVEMENT
8. CONSTRUCT SIDEWALK RAMP PER CALTRANS STD PLANS RSP A88A, CASE A
11. REMOVE EXISTING STANDPIPE
14. REMOVE EXISTING FENCE WITHIN PUBLIC RIGHT OF WAY PER ROUGH GRADING PLANS
15. REMOVE EXISTING POWER POLE AND INSTALL POWER LINES UNDERGROUND (BY SCE)
17. REMOVE AND RELOCATE EXISTING MAILBOX IN ITS ENTIRETY
20. REMOVE EXISTING WALL AND FOOTING
21. REMOVE EXISTING TREE PER ROUGH GRADING PLANS
23. TEMPORARY CSP INLET PER STORM DRAIN IMPROVEMENT PLANS
24. RECONSTRUCT EXISTING DRIVEWAY TO MATCH PROPOSED GRADES (SEE SHEET 20).
25. CONSTRUCT 2" X 6" REDWOOD HEADER
31. HYDROSEED MANUFACTURED SLOPES

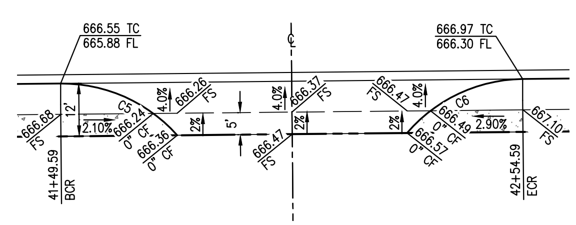
*1 CONSTRUCT 8" AC OVER 10" CAB MIN ON MERRILL AVENUE AND 6" AC OVER 8" CAB MIN ON CARPENTER AVENUE WITHIN CITY OF ONTARIO



8 CURB RAMP DETAIL
NOT TO SCALE



STA 38+99.59
DRIVEWAY DETAIL
1"=20'



STA 42+02.09
DRIVEWAY DETAIL
1"=20'

scale 1" = 40' feet

CITY OF ONTARIO

RECOMMENDED BY: KHOI DO, P.E. ASSISTANT CITY ENGINEER DATE

ACCEPTED BY: LOUIS ABI-YOUNES, P.E. CITY ENGINEER DATE

SEAL

REGISTERED PROFESSIONAL ENGINEER GLENN MATTHEW CHUNG No. 62794 Exp. 06/30/18 CIVIL STATE OF CALIFORNIA

811 Know what's below. Call 811 before you dig.

PREPARED BY

Hall & Foreman
A Division of David Evans and Associates, Inc.
17782 17TH STREET, SUITE 200 • TUSTIN, CA 92780 • 714-665-4500
GLENN M. CHUNG, P.E. R.C.E. 62794 DATE

REVISIONS	MADE BY	DATE	APPROVED BY	DATE
1 SIDEWALK ADDED	SRM	1/11/17		

BENCH MARK DATA

BENCHMARK: CITY OF CHINO BENCHMARK POINT NO. 157/77, ELE. 608.216. TOP OF BRASS DISK NEAR THE INTERSECTION OF KIMBALL AVE. AND BON VIEW..

REFERENCE DRAWINGS

REVIEWED BY STAFF	BY	DATE
WATER:		
SEWER:		
FIRE:		
PLANNING:		
TRAFFIC:		
SERVICES:		

CITY ENGINEER'S STAFF	BY	DATE
DRAWN:		
DESIGNED:		
CHECKED:		
RECOMMENDED:		

APPROVED BY:

CITY ENGINEER DATE:

CITY OF CHINO ENGINEERING DIVISION

STREET IMPROVEMENT PLANS
MERRILL AVENUE
AT HELLMAN AVENUE

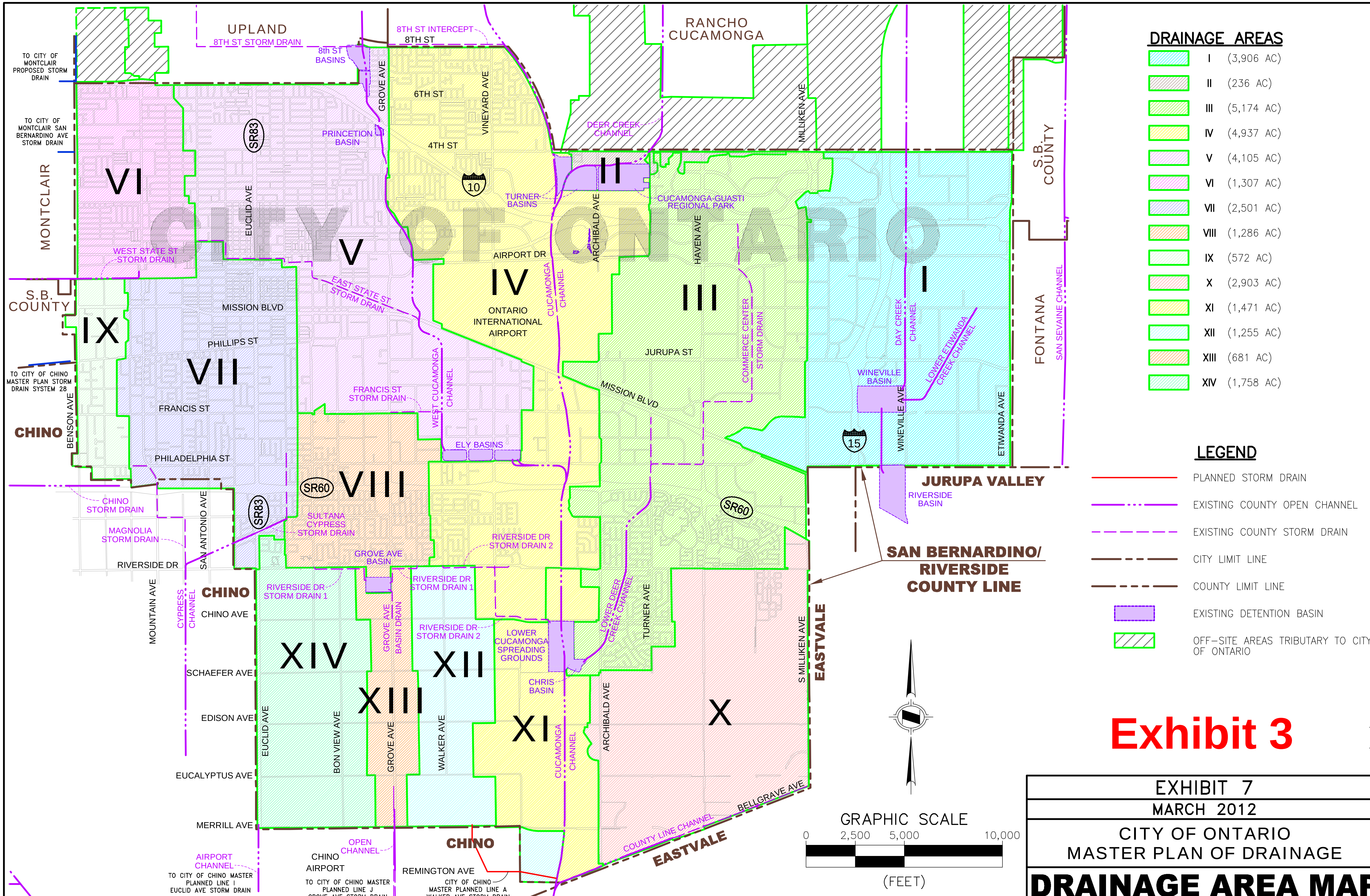
PROJECT NO. PM 19633

SHEET 5 OF 24

DRAWING NO. AA 5226

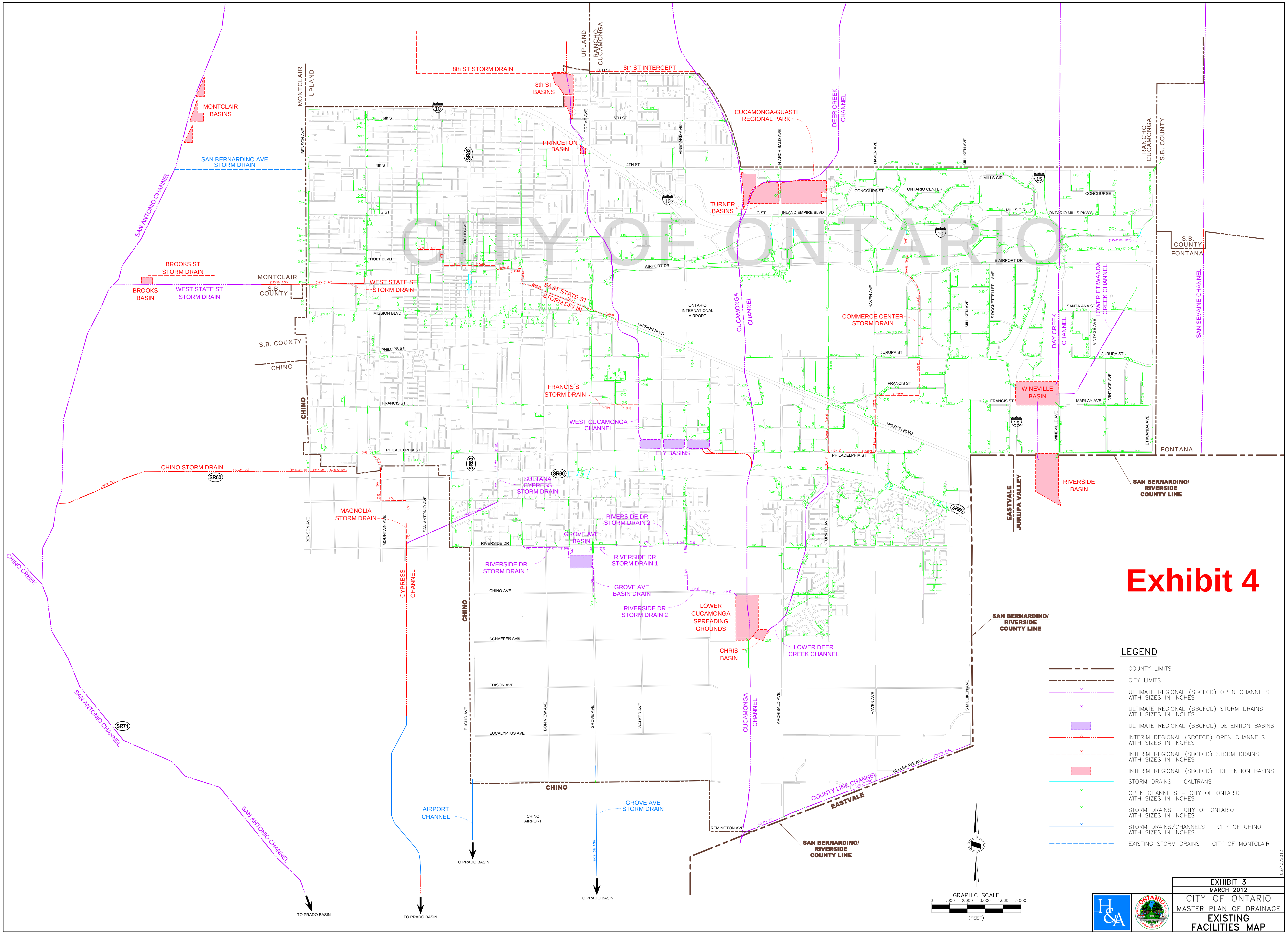
R19262

Drawing Name: P:\W\WAL00000-0100\Eng\130180-000\Final Plots\Offsite\Street\05_130180st.dwg
Last Opened: Mar 22, 2017 - 4:30pm by: mxgo



DRAINAGE AREAS
I (3,906 AC)
II (236 AC)
III (5,174 AC)
IV (4,937 AC)
V (4,105 AC)
VI (1,307 AC)
VII (2,501 AC)
VIII (1,286 AC)
IX (572 AC)
X (2,903 AC)
XI (1,471 AC)
XII (1,255 AC)
XIII (681 AC)
XIV (1,758 AC)
LEGEND
PLANNED STORM DRAIN
EXISTING COUNTY OPEN CHANNEL
EXISTING COUNTY STORM DRAIN
CITY LIMIT LINE
COUNTY LIMIT LINE
EXISTING DETENTION BASIN
OFF-SITE AREAS TRIBUTARY TO CITY OF ONTARIO
CITY OF ONTARIO
UPLAND
RANCHO CUCAMONGA
MONTCLAIR
S.B. COUNTY
FONTANA
JURUPA VALLEY
SAN BERNARDINO/ RIVERSIDE COUNTY LINE
EASTVALE
CHINO
ONTARIO INTERNATIONAL AIRPORT
CUCAMONGA-GUASTI REGIONAL PARK
WINEVILLE BASIN
RIVERSIDE BASIN
ELY BASINS
GROVE AVE BASIN
CHRIS BASIN
LOWER CUCAMONGA SPREADING GROUNDS
TURNER BASINS
PRINCETON BASIN
8th ST BASINS
8TH ST INTERCEPT
8TH ST STORM DRAIN
DEER CREEK CHANNEL
WEST STATE ST STORM DRAIN
EAST STATE ST STORM DRAIN
FRANCIS ST STORM DRAIN
SULTANA CYPRESS STORM DRAIN
RIVERSIDE DR STORM DRAIN 1
RIVERSIDE DR STORM DRAIN 2
CHINO STORM DRAIN
MAGNOLIA STORM DRAIN
CYPRESS CHANNEL
AIRPORT CHANNEL
OPEN CHANNEL
COUNTY LINE CHANNEL
DAY CREEK CHANNEL
LOWER ETIWANDA CREEK CHANNEL
SAN SEVAINE CHANNEL
COMMERCE CENTER STORM DRAIN
LOWER DEER CREEK CHANNEL
CUCAMONGA CHANNEL
WEST CUCAMONGA CHANNEL
GROVE AVE BASIN DRAIN
TO CITY OF MONTCLAIR PROPOSED STORM DRAIN
TO CITY OF MONTCLAIR SAN BERNARDINO AVE STORM DRAIN
TO CITY OF CHINO MASTER PLAN STORM DRAIN SYSTEM 28
TO CITY OF CHINO MASTER PLANNED LINE I EUCLID AVE STORM DRAIN
TO CITY OF CHINO MASTER PLANNED LINE J GROVE AVE STORM DRAIN
CITY OF CHINO MASTER PLANNED LINE A WALKER AVE STORM DRAIN
CHINO AIRPORT
GRAPHIC SCALE
0 2,500 5,000 10,000
(FEET)
Exhibit 3
EXHIBIT 7
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
DRAINAGE AREA MAP
03/10/2012

Exhibit 4



F:\0641\Engineering\SY_SD Master Plan\Rpt_SD Master Plan\Exh 3 – EXISTING FACILITIES.dwg

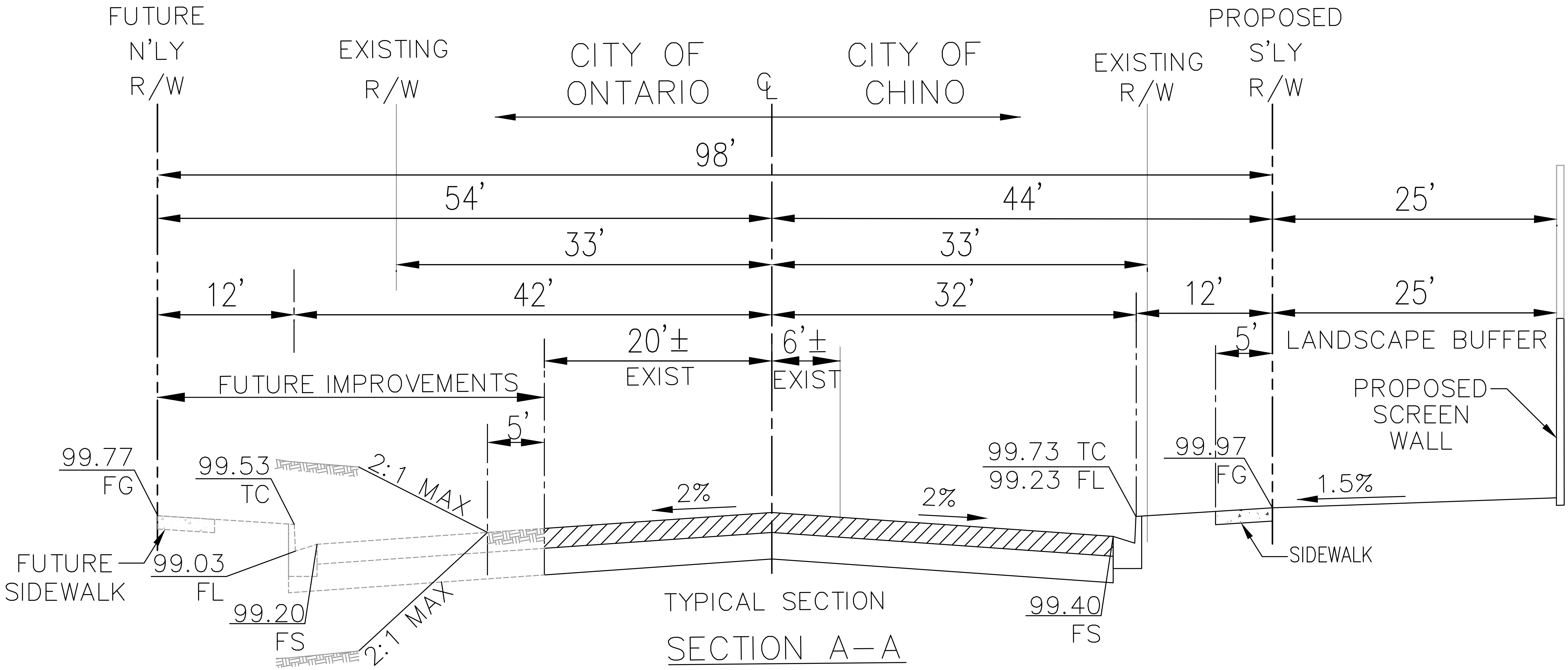
D & D ENGINEERING, INC.
8901 S. LA CIENEGA BLVD, SUITE 106
INGLEWOOD, CA 90301
Phone: 424-351-6800

CHINO PARCEL
DELIVERY FACILITY

EXHIBIT 5

SCALE:
NOT TO SCALE
DATE:
10/17/2018
SHT NO.:
01 OF 01

Drawing Name: M:\17004\Admin\Reports\Hydrology Report\Apendix E for Merrill\Highpoint.dwg
Last Opened: Oct 17, 2018 – 3:05pm by: Erika



SECTION A–A
MERRILL AVENUE
NOT TO SCALE

44' HALF STREET PER CHINO
GP TRANSPORTATION ELEMENT

D & D ENGINEERING, INC.
8901 S. LA CIENEGA BLVD, SUITE 106
INGLEWOOD, CA 90301
Phone: 424-351-6800

CHINO PARCEL DELIVERY FACILITY

EXHIBIT 6

SCALE: NOT TO SCALE
DATE: 10/17/2018
SHT NO.: 01 OF 01

Drawing Name: M:\17004\Admin\Reports\Hydrology Report\Apendix E for Merrill\Merrill Ave.dwg
Last Opened: Oct 17, 2018 – 3:04pm by: Erika

Cross Section for Irregular Section - 1

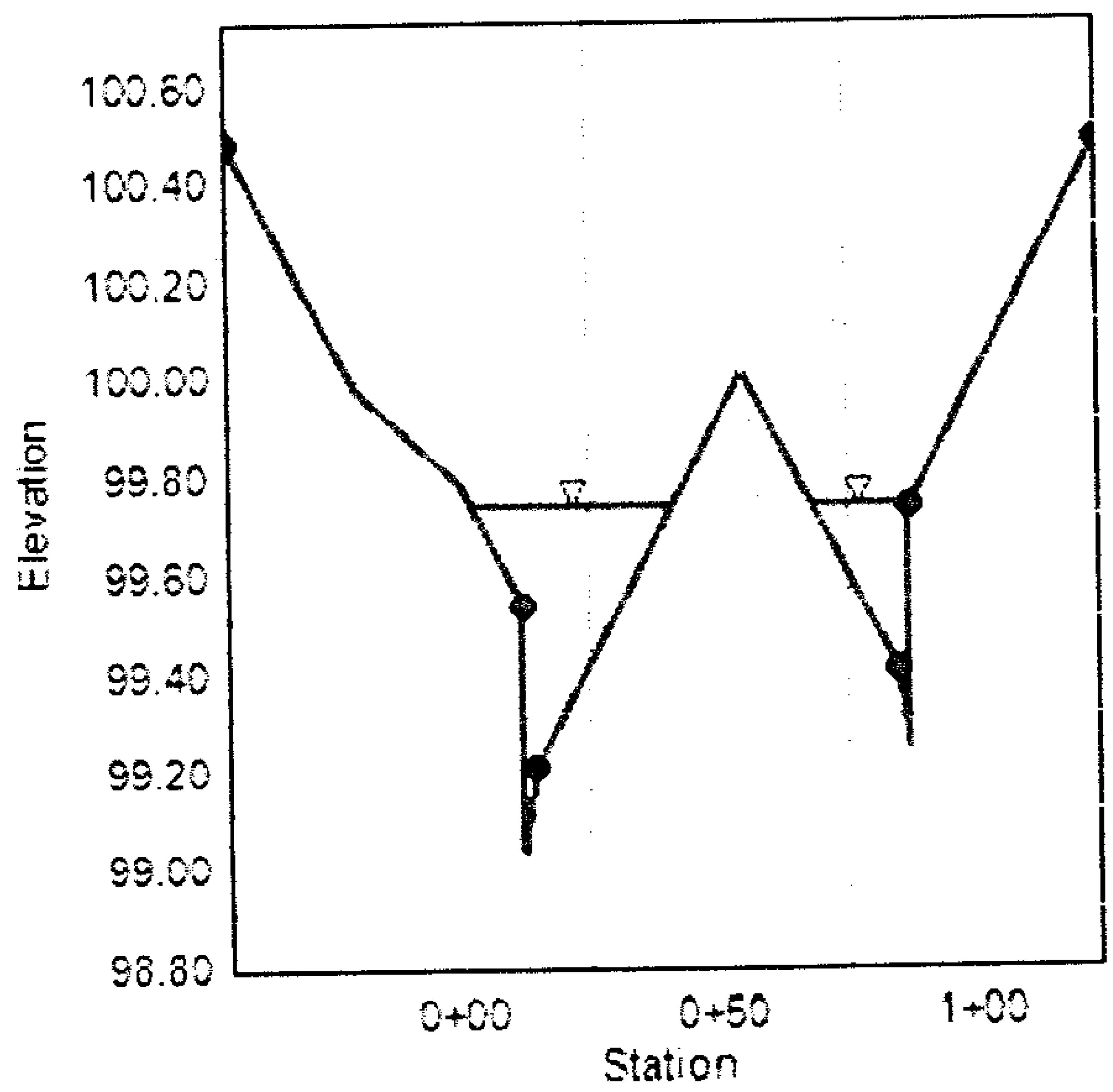
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.70	ft
Discharge	33.17	ft³/s

Cross Section Image



99.73 top f [illegible]

Worksheet for Irregular Section - 1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.70	ft
Section Definitions		

Station (ft)	Elevation (ft)
-0+45	100.47
-0+20	99.97
0+00	99.77
0+12	99.53
0+12	99.03
0+14	99.20
0+54	100.00
0+84	99.40
0+86	99.23
0+86	99.73
0+98	99.97
1+23	100.47

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+45, 100.47)	(0+12, 99.53)	0.015
(0+12, 99.53)	(0+14, 99.20)	0.011
(0+14, 99.20)	(0+84, 99.40)	0.013
(0+84, 99.40)	(0+86, 99.73)	0.012
(0+86, 99.73)	(1+23, 100.47)	0.015

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method

Worksheet for Irregular Section - 1

Options

Closed Channel Weighting Method	Pavlovskii's Method	

Results

Discharge	33.17	ft^3/s
Elevation Range	99.03 to 100.47 ft	
Flow Area	12.81	ft^2
Wetted Perimeter	58.03	ft
Hydraulic Radius	0.22	ft
Top Width	57.00	ft
Normal Depth	0.70	ft
Critical Depth	0.69	ft
Critical Slope	0.00433	ft/ft
Velocity	2.59	ft/s
Velocity Head	0.10	ft
Specific Energy	0.80	ft
Froude Number	0.96	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.70	ft
Critical Depth	0.69	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00433	ft/ft

Cross Section for Irregular Section - 1

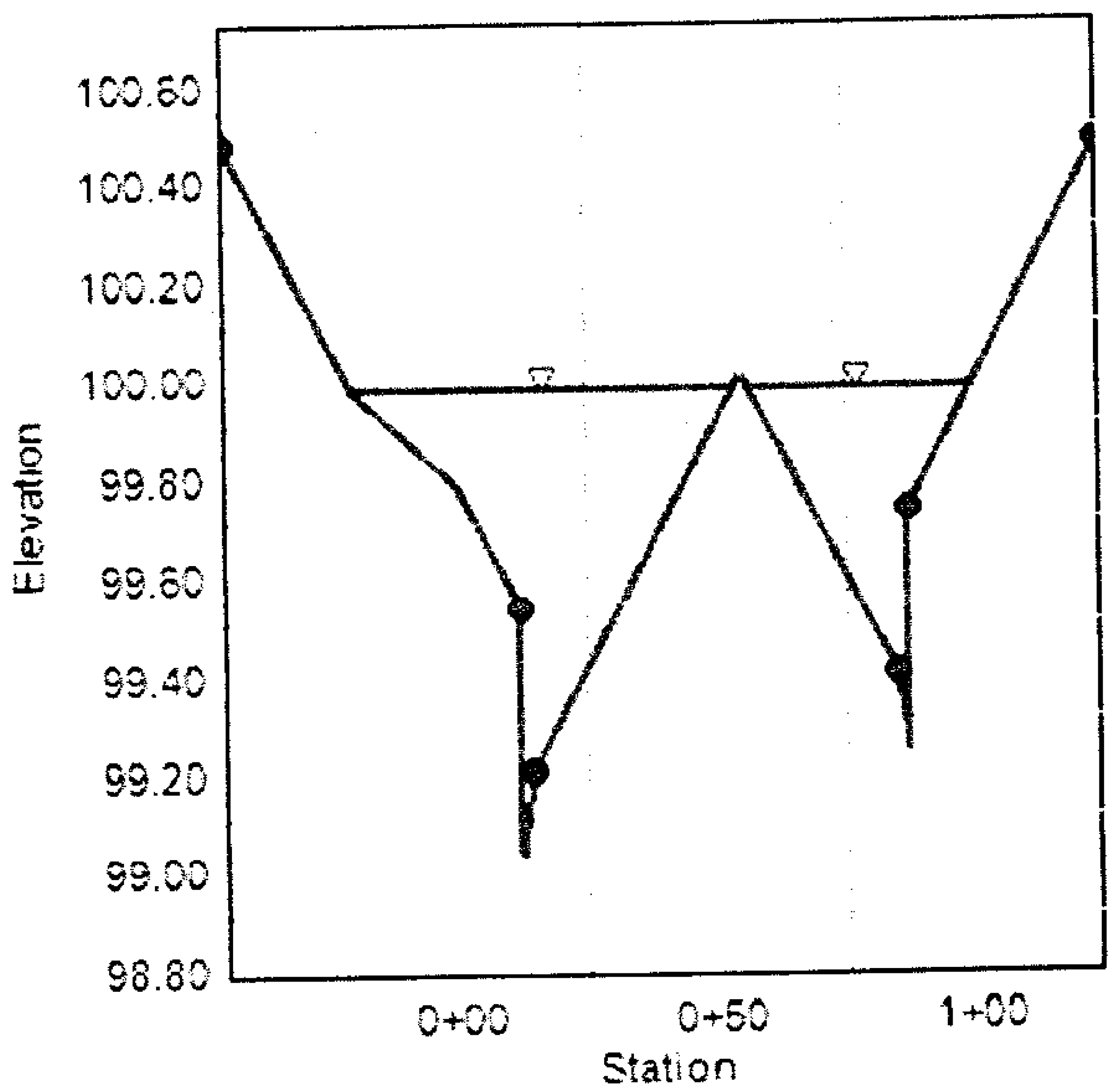
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.94	ft
Discharge	98.86	ft³/s

Cross Section Image



99.97 R/W [illegible]

Worksheet for Irregular Section - 1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.94	ft

Section Definitions

Station (ft)	Elevation (ft)
-0+45	100.47
-0+20	99.97
0+00	99.77
0+12	99.53
0+12	99.03
0+14	99.20
0+54	100.00
0+84	99.40
0+86	99.23
0+86	99.73
0+98	99.97
1+23	100.47

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+45, 100.47)	(0+12, 99.53)	0.015
(0+12, 99.53)	(0+14, 99.20)	0.011
(0+14, 99.20)	(0+84, 99.40)	0.013
(0+84, 99.40)	(0+86, 99.73)	0.012
(0+86, 99.73)	(1+23, 100.47)	0.015

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method

Worksheet for Irregular Section - 1

Options

Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		98.86	ft^3/s
Elevation Range	99.03 to 100.47 ft		
Flow Area		33.24	ft^2
Wetted Perimeter		116.03	ft
Hydraulic Radius		0.29	ft
Top Width		115.00	ft
Normal Depth		0.94	ft
Critical Depth		0.93	ft
Critical Slope		0.00422	ft/ft
Velocity		2.97	ft/s
Velocity Head		0.14	ft
Specific Energy		1.08	ft
Froude Number		0.98	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	0.93	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00422	ft/ft

D & D ENGINEERING, INC.

December 10, 2018

Michael Bhatanawin/David Hammer and Chris Magdosku
City of Chino
13220 Central Avenue
Chino, CA 91710

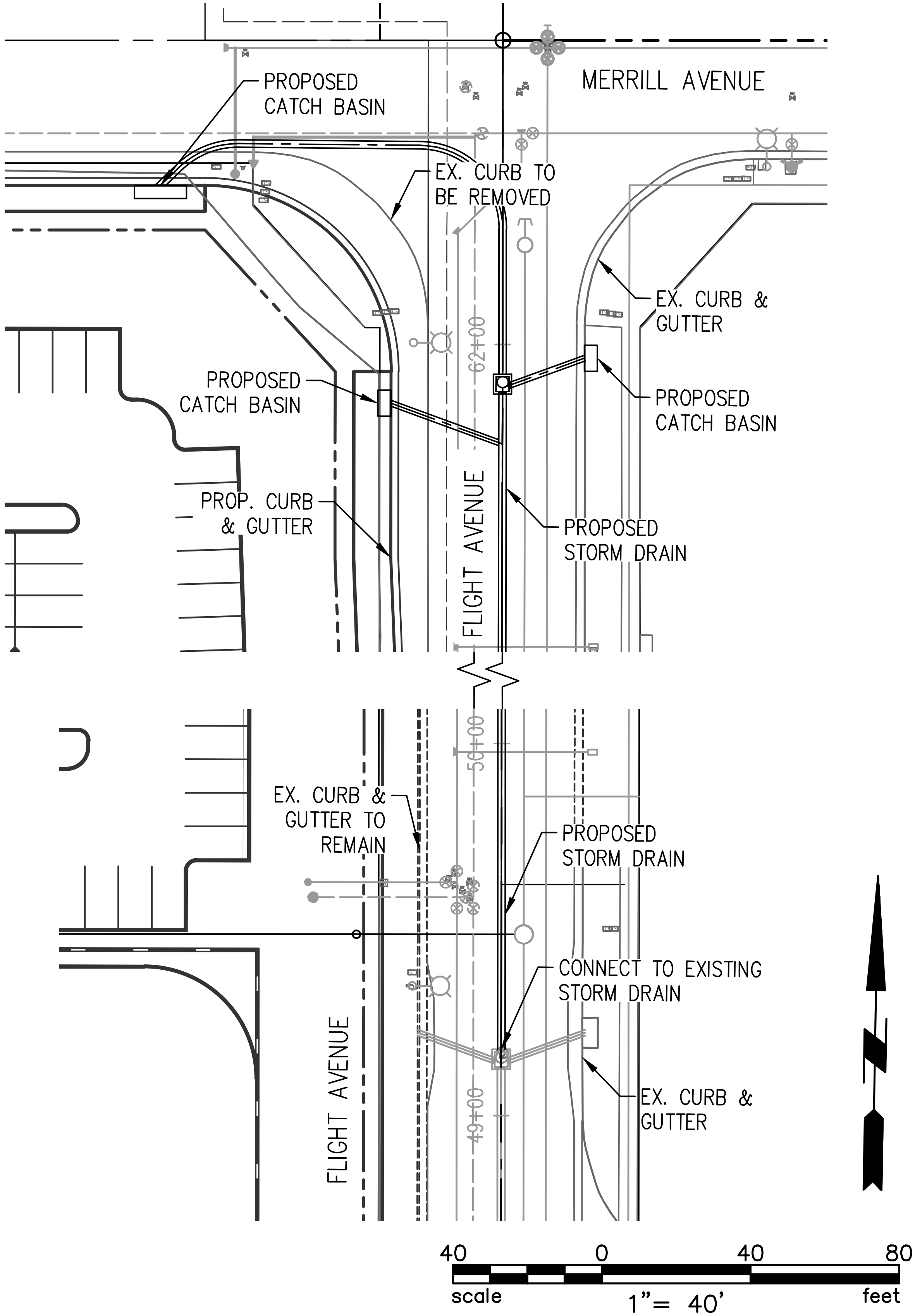
Re: Chino Parcel Delivery - Hydrology Report Amendment to Appendix E

The purpose of this letter is to amend the Appendix E of Hydrology report dated October 18, 2018, expanding the scope of discussion within the Appendix.
Per our recent site visit on November 20, 2018 with City staff Mike Bhatanawin, Dave Hammer and Chris Magdosku, and Henrik Nazarian with D&D, it was collectively agreed that storm drain flow along Merrill Avenue at intersection of Flight shall be collected with new and proposed catch basin and inlets and drained via new Storm Drain line south to connect to Flight Avenue existing storm drain line.

It was also discussed to consider this new storm drain line along Flight Avenue as part of City Master Plan of Drainage facility in lieu of the 72" lateral along Merrill connecting to future Grove Avenue line (please see Figure 4 in the Report and attached here with green flow direction arrows). This will assure the Developer for either fee credit or a reimbursement for constructing Master Plan storm drain facility.

Please also see attached proposed preliminary Catch Basin locations and the extend of the new storm drain line along Flight Avenue.

This solution and recommendation for Merrill Avenue should complete the previous study to have a comprehensive on and off-site drainage system for the project site and surrounding streets.



Drawing Name: M:\17004\Eng\17004\Exhibits\24_CB Exhibit 12-7-18\Catch Basin Exhibit.dwg
Last Opened: Dec 10, 2018 – 10:00am by: Robert Dizon

D & D ENGINEERING, INC.
8901 S. LA CIENEGA BLVD, SUITE 106
INGLEWOOD, CA 90301
Phone: 424-351-6800

CHINO PARCEL DELIVERY

CATCH BASIN EXHIBIT

SCALE: AS SHOWN

DATE: 12/10/2018

SHT NO.: 01 OF 01

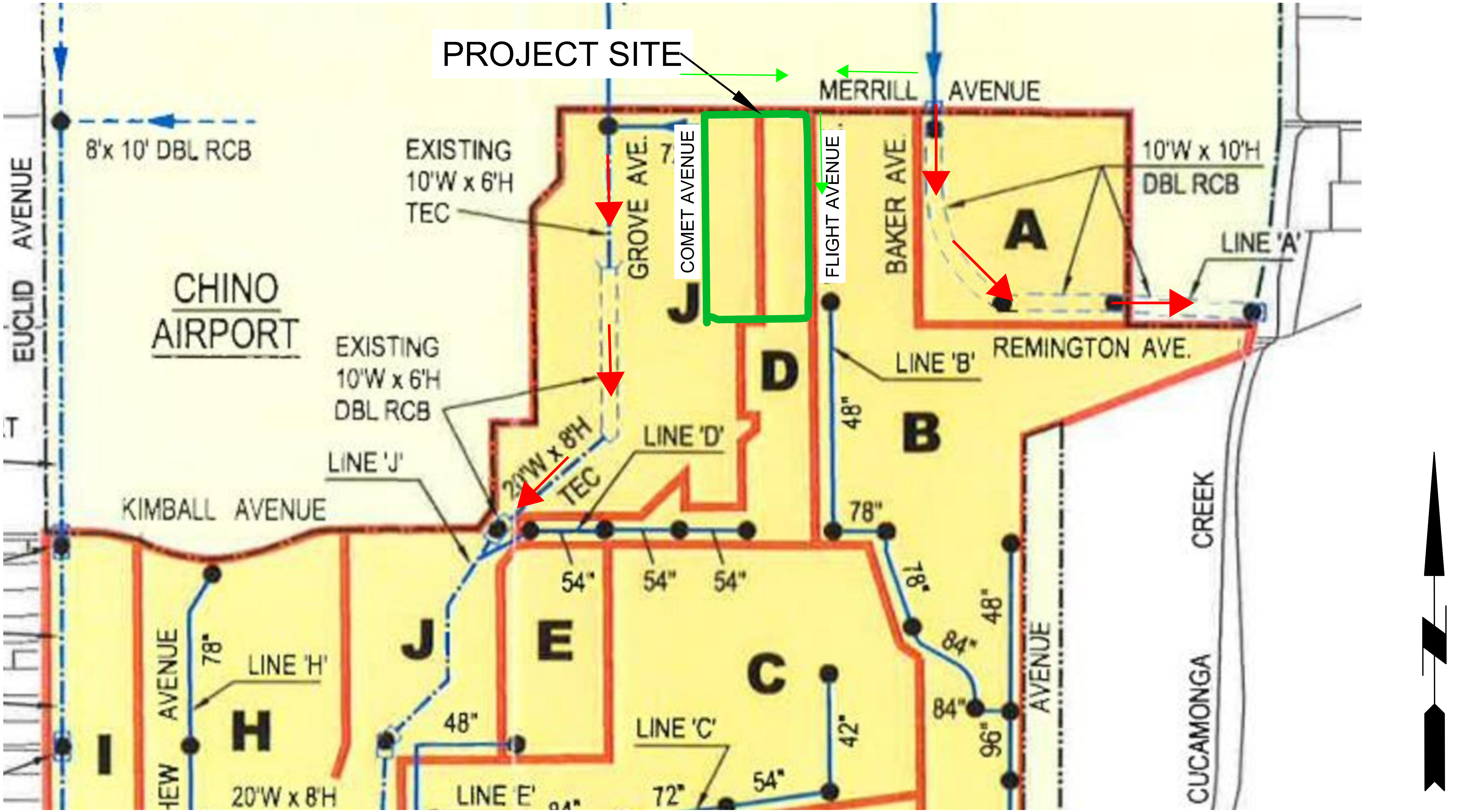


FIGURE 4

NOTE:
TEC = TRATEZODIAL EARTHEN CHANNEL

D & D ENGINEERING, INC.
8901 S. LA CIENEGA BLVD, SUITE 106
INGLEWOOD, CA 90301
Phone: 424-393-4122

CHINO PARCEL DELIVERY FACILITY

MASTER PLAN OF DRAINAGE MAP

SCALE: NOT TO SCALE
DATE: 05/02/18
SHT NO.: 01 OF 01

Drawing Name: M:\17004\Eng\17004\Hm\Hydrology\Master Drainage Plan – Figure 4.dwg
Last Opened: May 04, 2018 – 1:03pm by: Boris

Appendix E

1. Merrill Avenue Hydrologic condition and Hydraulic capacity

Introduction

Merrill Avenue is a secondary arterial east-west street between Archibald and Euclid avenues in City of Chino. The street is also a border line for City of Chino and Ontario where the street center line is northerly City boundary for City of Chino.

Chino Parcel Delivery preliminary offsite street improvement plans (exhibit 1) depict a high point for the Merrill avenue between Comet and Flight avenues. Watson project to the east is also creating a high point for Merrill avenue between Vineyard avenue and Van Vliet (exhibits 2a and 2b). These high points create an isolated sump situation for Merrill avenue where the intersection of Merrill and Flight becomes the low spot and surface flows for Merrill drains east easterly of Vineyard and to the west westerly of Comet.

In order to analyze the hydrologic condition and run on for Merrill avenue, City of Ontario Master Plan of Drainage was studied where portion of drainage subareas XII and XIII (Exhibit 3) are contributing to Merrill avenue. City of Ontario "Existing Facilities Map" (exhibit 4) depicts Grove avenue storm drain and defines that as Grove Avenue Storm Drain (City of Chino master planned storm drain – Line J), which drains south from Merrill Avenue to an existing RCB under the runway in Chino Airport; thence, through the City of Chino to Prado Flood Control Basin. This system conveys runoff generated in the cities of Ontario and Chino. Based on this exhibit run-on for Merrill Avenue would be the area between Eucalyptus avenue and Merrill Avenue from Grove Easterly.

Exhibit 5 shows the area that realistically have a potential to contribute runoff to Merrill Avenue if they manage to spill over earthen berms along the northerly right of way line and if they exceed detention / retention capacity within each of their reprehensive subareas. The total areas for above is 45 acres and the rest are well protected by dairy land basins and protections to avoid any spill from those areas to Merrill avenue.

Based on Master Plan of Drainage City of Ontario, upstream subareas to Merrill have anywhere from 0.88 to 1.28 cfs/acre based on their size and time of concentration. Our own onsite Hydrology also confirms below 1.5 cfs/acre flow for 100-year storm for 40 +_ acre subareas. Based on the information above and to be conservative, we assumed 1.5 cfs/acre flow from 45 acres contributary to Merrill Avenue which results 67.5 cfs flow for 100-year storm event.

Setting up the Merrill street section in FlowMaster as per Exhibit 6, and running the model, results in a 33.17 cfs capacity for flow up to top of the curb elevation but since we are studying the 100-year storm event, we also checked the street capacity up to 99.97 elevation which is the right of way to right of way limits, and that resulted in a 98.86 cfs capacity (larger than required 67.5 cfs) with a longitudinal channel slope of 0.4%. Please see the detailed reports at the end of this section after Exhibit 6. This concludes our study and proves that we should not have a flooding issue between the studied section as long as we can pick up and take care of 67.5 cfs at the intersection of Merrill and Flight.

In order to handle the 67.5 cfs at the Merrill and Flight Intersection, further discussion with the City staff and study would be required to determine proper routing of this flow either through Flight surface street and ultimately under sized storm drain system or perhaps new storm drain line along Merrill connecting to future Grove master drainage.

At this time, we conclude that Merrill capacity after creating two aforementioned high points are enough to handle potential run-on without flooding any property downstream of Merrill.