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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2010 Advanced Engineering Software (aes)
Ver. 17.0 Release Date: 07/01/2010 License ID 1355

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* VALIANO *
* HILL VALLEY ROAD CROSSING HYDROLOGY *
* JULY 5, 2013 *

FILE NAME: HVR.DAT
TIME/DATE OF STUDY: 11:31 07/05/2013

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.000
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (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.*

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
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RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 808.00
DOWNSTREAM ELEVATION(FEET) = 801.00
ELEVATION DIFFERENCE(FEET) = 7.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.964
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.384

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SUBAREA RUNOFF(CFS) = 0.90
 TOTAL AREA(ACRES) = 0.39 TOTAL RUNOFF(CFS) = 0.90

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 53

>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 801.00 DOWNSTREAM(FEET) = 785.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 215.00 CHANNEL SLOPE = 0.0744
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .0744 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) = 0.90
 FLOW VELOCITY(FEET/SEC) = 1.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 2.35 Tc(MIN.) = 9.31
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 315.00 FEET.

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.294
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) = 76
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3600
 SUBAREA AREA(ACRES) = 1.78 SUBAREA RUNOFF(CFS) = 3.39
 TOTAL AREA(ACRES) = 2.2 TOTAL RUNOFF(CFS) = 4.14
 TC(MIN.) = 9.31

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 53

>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 785.00 DOWNSTREAM(FEET) = 724.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 812.00 CHANNEL SLOPE = 0.0751
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .0751 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 CHANNEL FLOW THRU SUBAREA(CFS) = 4.14
 FLOW VELOCITY(FEET/SEC) = 2.46 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 5.50 Tc(MIN.) = 14.81
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1127.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.924
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) = 76
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3600
 SUBAREA AREA(ACRES) = 13.05 SUBAREA RUNOFF(CFS) = 18.44
 TOTAL AREA(ACRES) = 15.2 TOTAL RUNOFF(CFS) = 21.50
 TC(MIN.) = 14.81

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FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 724.00 DOWNSTREAM(FEET) = 702.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 812.00 CHANNEL SLOPE = 0.0271
CHANNEL FLOW THRU SUBAREA(CFS) = 21.50
FLOW VELOCITY(FEET/SEC) = 5.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.69 Tc(MIN.) = 17.50
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 1939.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.524
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3600
SUBAREA AREA(ACRES) = 32.92 SUBAREA RUNOFF(CFS) = 41.76
TOTAL AREA(ACRES) = 48.1 TOTAL RUNOFF(CFS) = 61.07
TC(MIN.) = 17.50

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 48.1 TC(MIN.) = 17.50
PEAK FLOW RATE(CFS) = 61.07

END OF RATIONAL METHOD ANALYSIS

Existing Condition

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 61 cfs

Design Flow: 61 cfs

Maximum Flow: 61 cfs

Table 1 - Summary of Culvert Flows at Crossing: Existing Conditions

Headwater Elevation (ft)	Total Discharge (cfs)	Existing 24 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
703.75	61.00	24.57	36.41	8
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.75	61.00	24.57	36.41	2
703.50	23.28	23.28	0.00	Overtopping

Rating Curve Plot for Crossing: Existing Conditions

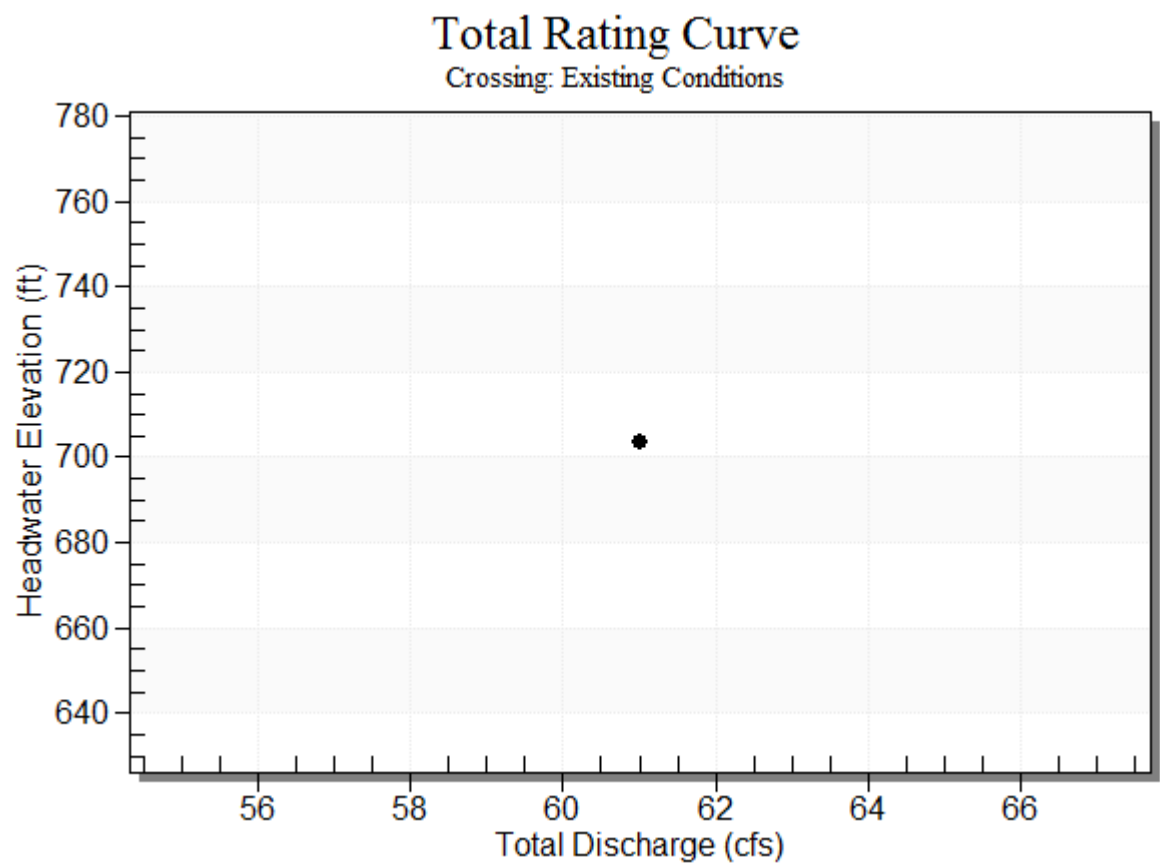


Table 2 - Culvert Summary Table: Existing 24

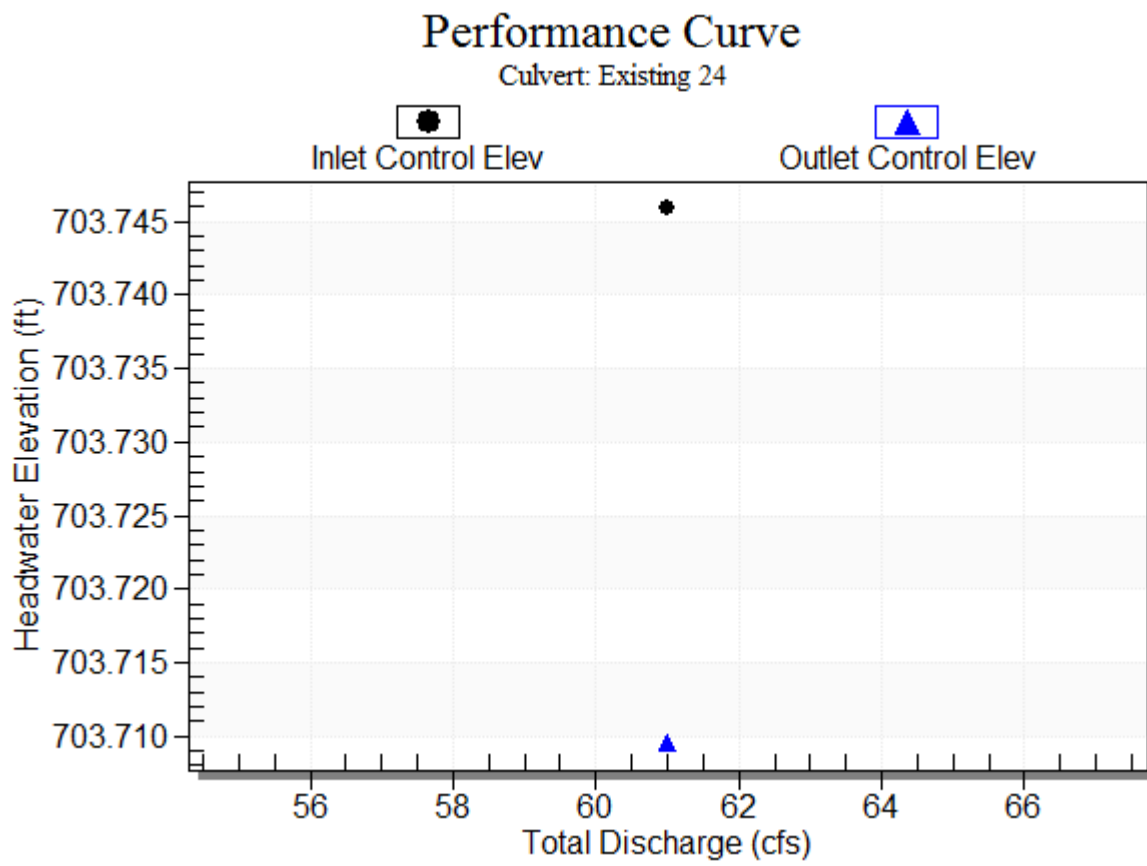
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Straight Culvert

Inlet Elevation (invert): 700.00 ft, Outlet Elevation (invert): 699.70 ft

Culvert Length: 60.00 ft, Culvert Slope: 0.0050

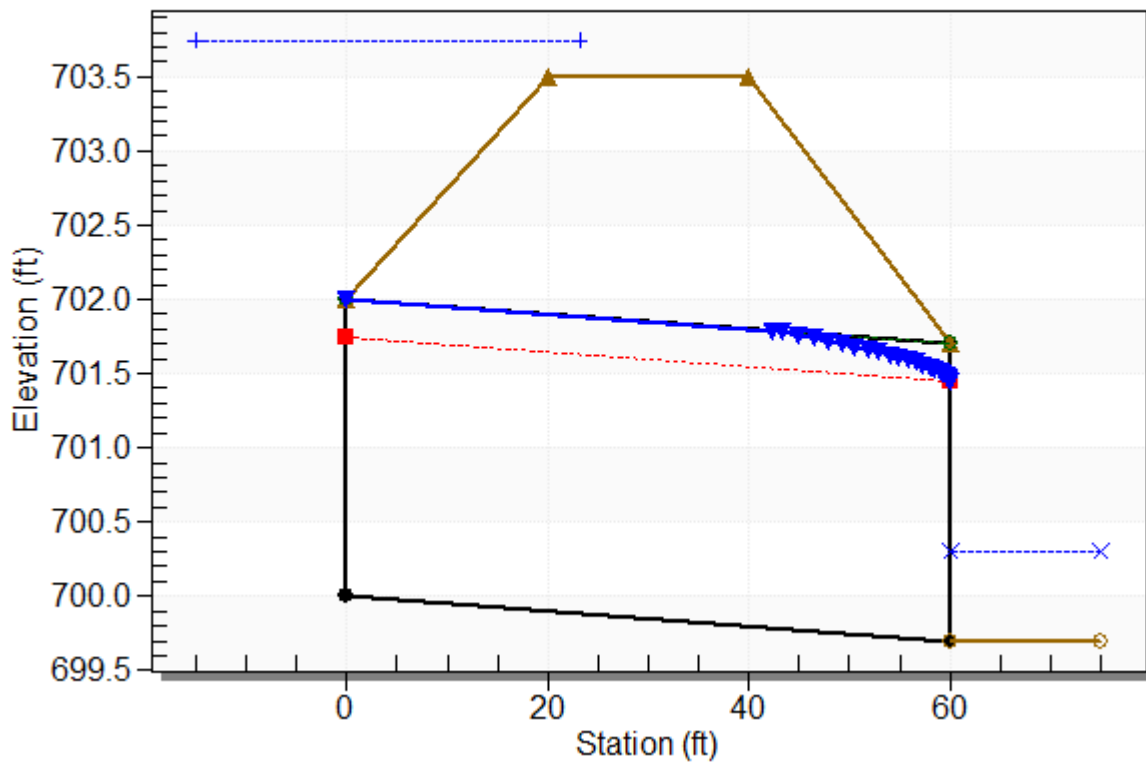
Culvert Performance Curve Plot: Existing 24



Water Surface Profile Plot for Culvert: Existing 24

Crossing - Existing Conditions, Design Discharge - 61.0 cfs

Culvert - Existing 24, Culvert Discharge - 24.6 cfs



Site Data - Existing 24

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 700.00 ft

Outlet Station: 60.00 ft

Outlet Elevation: 699.70 ft

Number of Barrels: 1

Culvert Data Summary - Existing 24

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Existing Conditions)

[illegible]

Tailwater Channel Data - Existing Conditions

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

Side Slope (H:V): 25.00 (1:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 699.70 ft

Roadway Data for Crossing: Existing Conditions

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 703.50 ft

Roadway Surface: Paved

Roadway Top Width: 20.00 ft

Proposed Condition

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 61 cfs

Design Flow: 61 cfs

Maximum Flow: 61 cfs

Table 1 - Summary of Culvert Flows at Crossing: Proposed Conditions

Headwater Elevation (ft)	Total Discharge (cfs)	Proposed Dual 30 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
703.22	61.00	61.00	0.00	1
704.00	75.46	75.46	0.00	Overtopping

Rating Curve Plot for Crossing: Proposed Conditions

Total Rating Curve

Crossing: Proposed Conditions

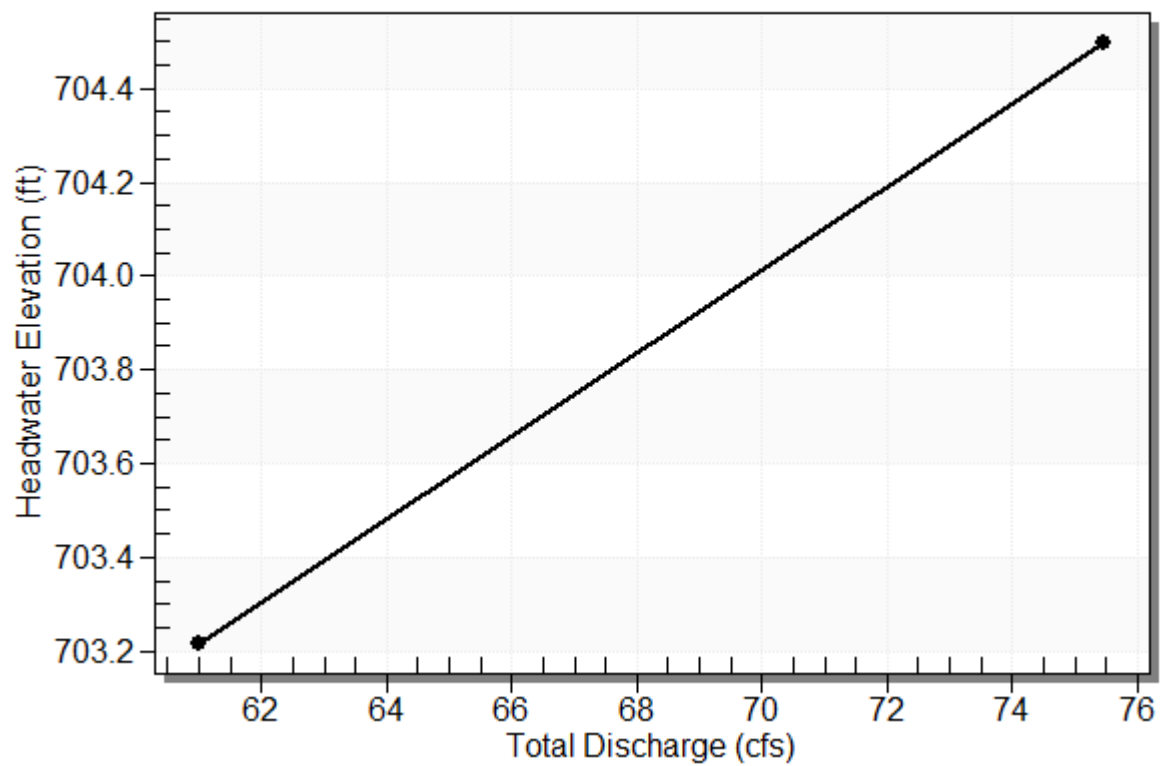
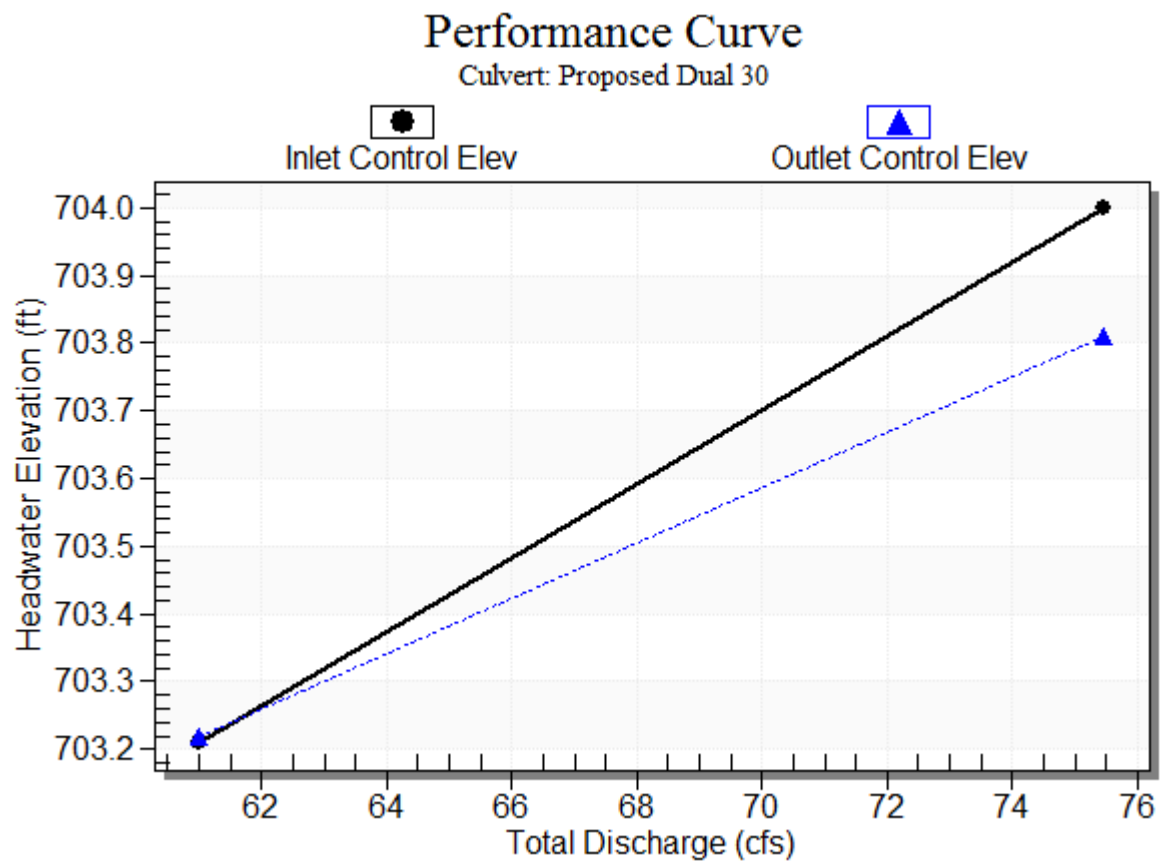


Table 2 - Culvert Summary Table: Proposed Dual 30

[illegible]

Straight Culvert
Inlet Elevation (invert): 700.00 ft, Outlet Elevation (invert): 699.80 ft
Culvert Length: 40.00 ft, Culvert Slope: 0.0050

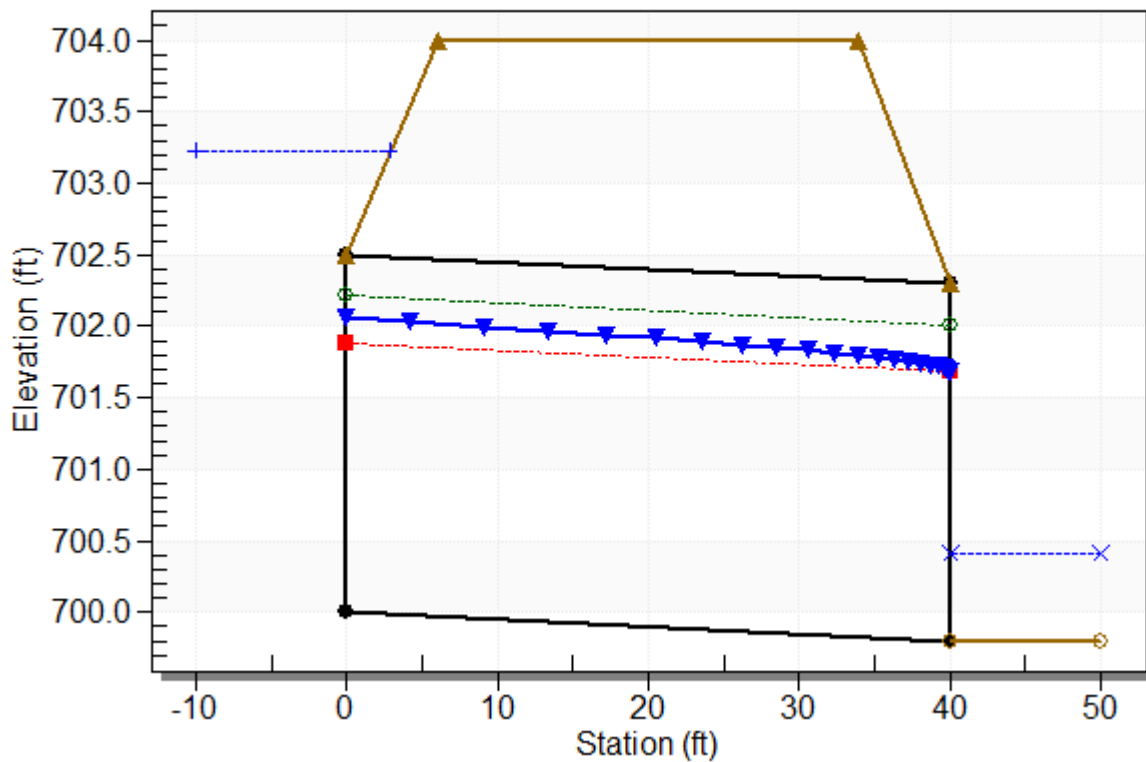
Culvert Performance Curve Plot: Proposed Dual 30



Water Surface Profile Plot for Culvert: Proposed Dual 30

Crossing - Proposed Conditions, Design Discharge - 61.0 cfs

Culvert - Proposed Dual 30, Culvert Discharge - 61.0 cfs



Site Data - Proposed Dual 30

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 700.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 699.80 ft

Number of Barrels: 2

Culvert Data Summary - Proposed Dual 30

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Proposed Conditions)

[illegible]

Tailwater Channel Data - Proposed Conditions

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

Side Slope (H:V): 25.00 (1:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 699.80 ft

Roadway Data for Crossing: Proposed Conditions

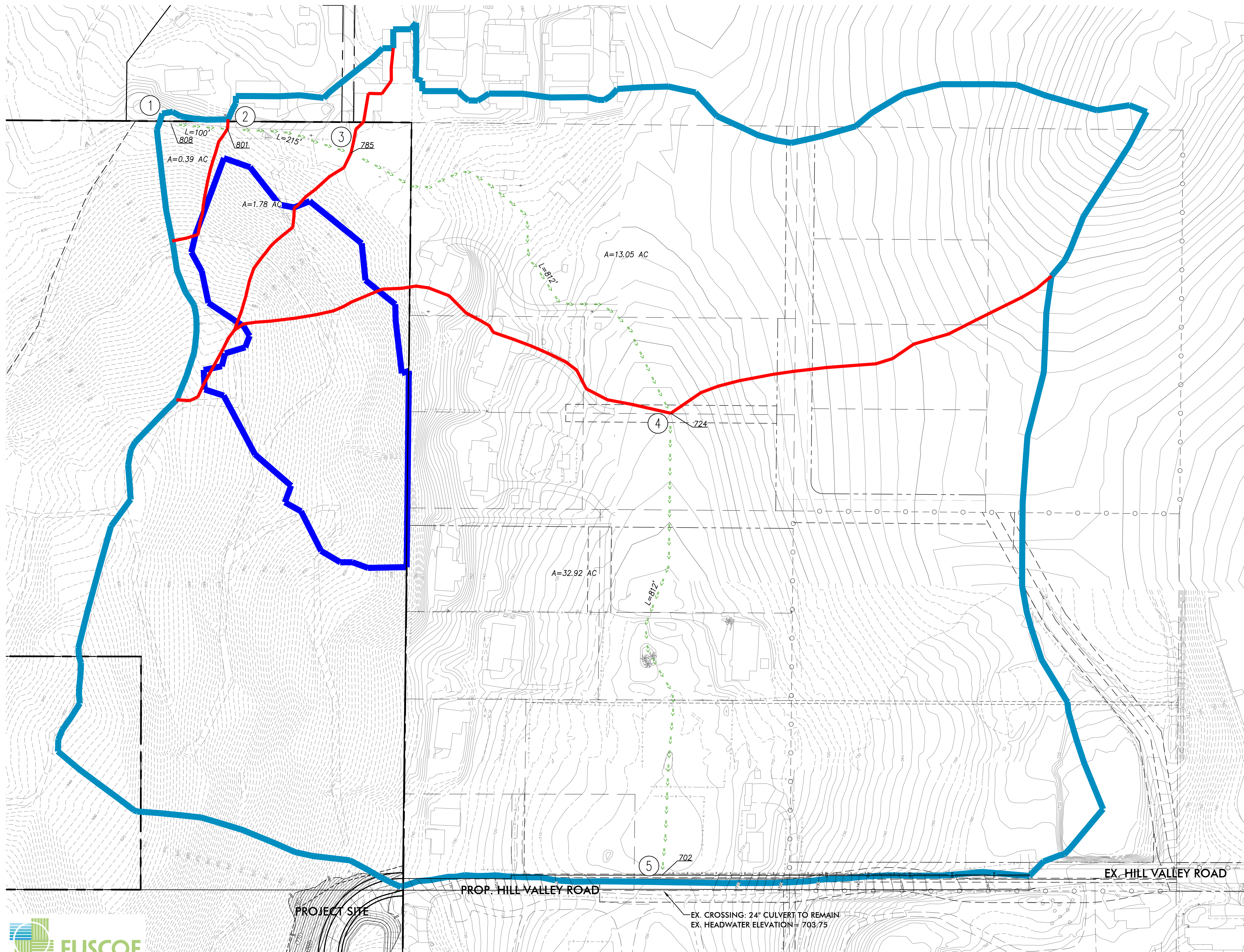
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 704.00 ft

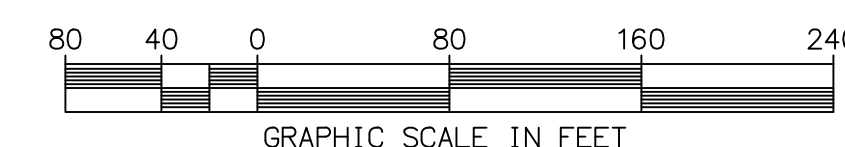
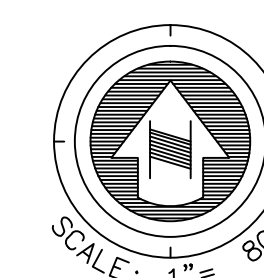
Roadway Surface: Paved

Roadway Top Width: 28.00 ft



LEGEND

PROPERTY LINE	---
PROPOSED ACCESS EASEMENT	- - -
EXISTING CONTOUR	~ ~ ~
PROPOSED CONTOUR	— — —
BASIN BOUNDARY	— — —
SUB-BASIN BOUNDARY	— — —
FLOW PATH	==> ==> ==> ==>



Appendix H

Map Pocket

Existing Conditions Hydrology Exhibit

Proposed Conditions Hydrology Exhibit

Valiano Neighborhood 5 100 Year Storm Inundation Exhibit

Valiano Neighborhood 3 100 Year Storm Inundation Exhibit