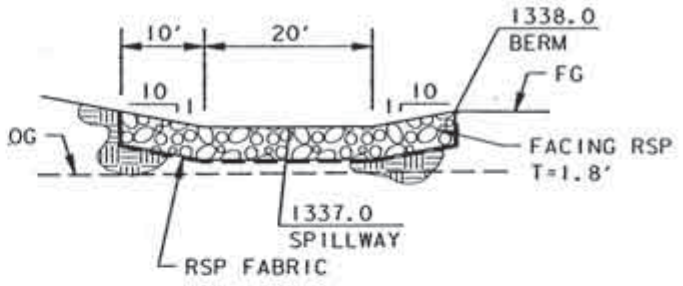
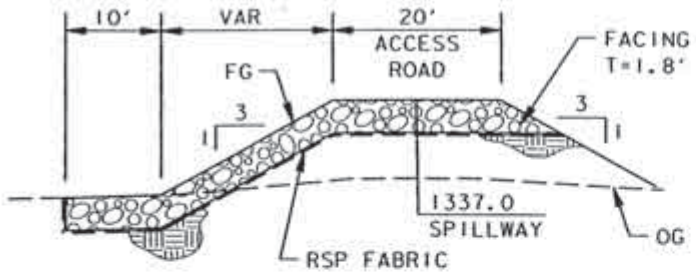
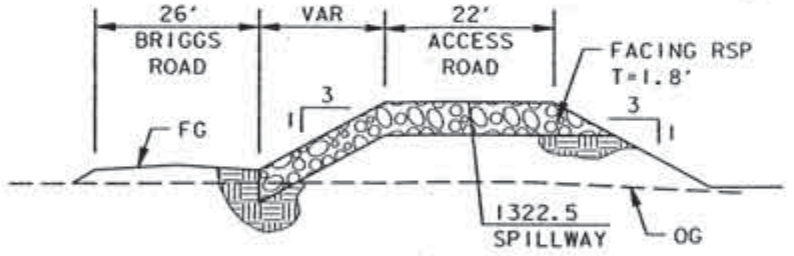


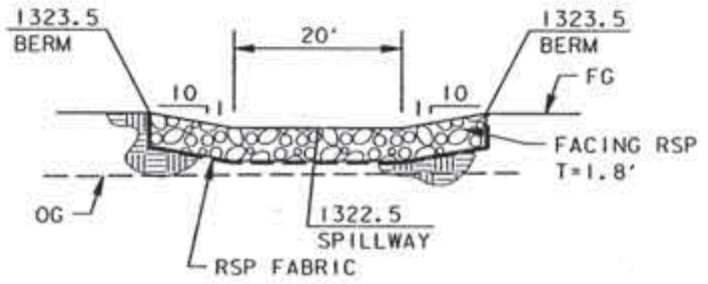

SECTION A-A



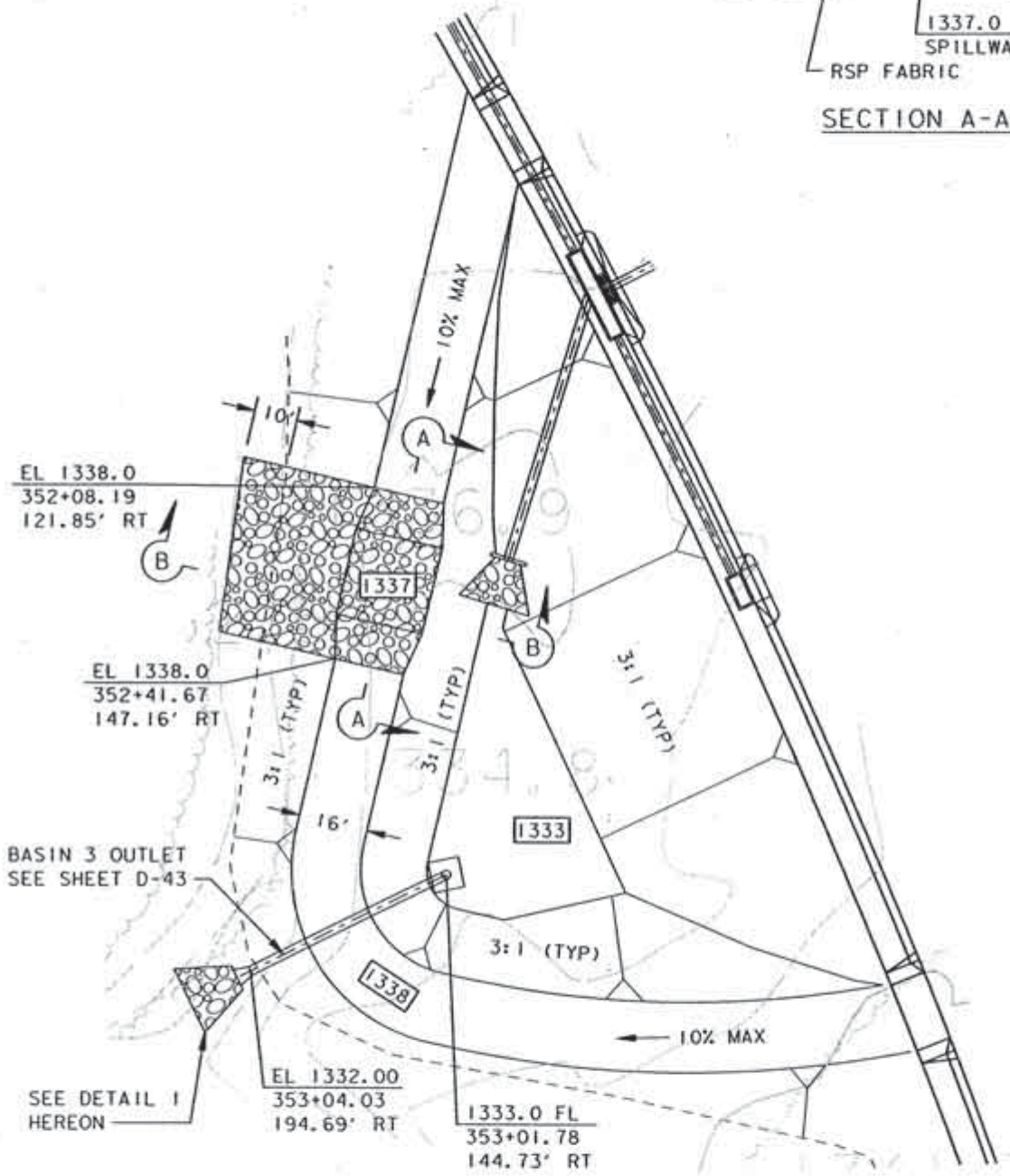

SECTION B-B



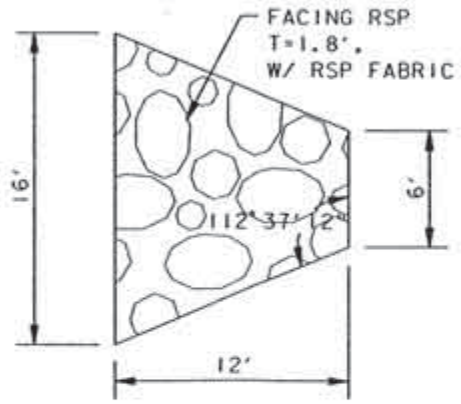

SECTION C-C




SECTION D-D




BASIN 3 PLAN
NTS




DETAIL 1




BASIN 4 PLAN
NTS

| REVISIONS | | | | | RIVERSIDE COUNTY TRANSPORTATION DEPARTMENT | CH2MHILL ENGINEERING COMPANY | PROJECT | REFERENCE |
|---|---|---|---|---|---|---|---|---|
| REV | BY | DESCRIPTION | APPROVED | DATE | CHARLES SCOTT STALEY<br>RECOMMENED BY: DATE<br>ENGINEERING DIVISION MANAGER | SHENG-CHUAN HSU C45806 12/31/06 CIVIL STATE OF CALIFORNIA<br>PREPARED BY: DATE<br>SHENG-CHUAN HSU - R.C.E. C45806<br>3550 VINE STREET, SUITE 320<br>RIVERSIDE, CA. 92507 | **CLINTON KEITH RD**<br>FROM<br>ANTELOPE ROAD TO STATE ROUTE 79<br>**DRAINAGE DETAILS** | W.O. NO. B2-0472<br>SURVEY NO. SXXXX<br>F. B. NO. XXXXXX<br>CAD FILENAME D-39.dgn<br>SHEET -- OF 174 |

**Worksheet 1**

## Design Procedure for BMP Design Volume

85th percentile runoff event

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 12-1-05
Project: CLINTON KEITH ROAD EXTENSION
Location: EDB #4 (BY FRENCH VALLEY CREEK)

| | | |
|---|---|---|
| 1. Create Unit Storage Volume Graph | | |
| a. Site location (Township, Range, and Section). | T 6S &R 3W (Section) | (1) |
| b. Slope value from the Design Volume Curve in **Appendix A**. | Slope = 1.1 | (2) |
| c. Plot this value on the Unit Storage Volume Graph shown on **Figure 2.** | | |
| d. Draw a straight line form this point to the origin, to create the graph | Is this graph attached? Yes ☒ No ☐ | |
| 2. Determine Runoff Coefficient | | |
| a. Determine total impervious area | $A_{impervious}$ = 5.6 acres | (5) |
| b. Determine total tributary area | $A_{total}$ = 5.6 acres | (6) |
| c. Determine Impervious fraction i = *(5)* / *(6)* | i = 1 | (7) |
| d. Use *(7)* in **Figure 1** to find Runoff OR $C = .858i^3 - .78i^2 + .774i + .04$ | C = 0.9 | (8) |
| 3. Determine 85% Unit Storage Volume | | |
| a. Use *(8)* in **Figure 2** Draw a Vertical line from *(8)* to the graph, then a Horizontal line to the desired $V_u$ value. | $V_u$ = 1.0 in-acre / acre | (9) |
| 4. Determine Design Storage Volume | | |
| a. $V_{BMP}$ = *(9)* x *(6)* [in- acres] | $V_{BMP}$ = 5.6 in-acre | (10) |
| b. $V_{BMP}$ = *(10)* / 12 [ft- acres] | $V_{BMP}$ = 0.47 ft-acre | (11) |
| c. $V_{BMP}$ = *(11)* x 43560 [$ft^3$] | $V_{BMP}$ = 20,300 $ft^3$ | (12) |

Notes:

Worksheet 3

## Design Procedure Form for Extended Detention Basin

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 12-1-05
Project: CLINTON KEITH ROAD EXTENSION
Location: EDB #4 (BY FRENCH VALLEY CREEK)

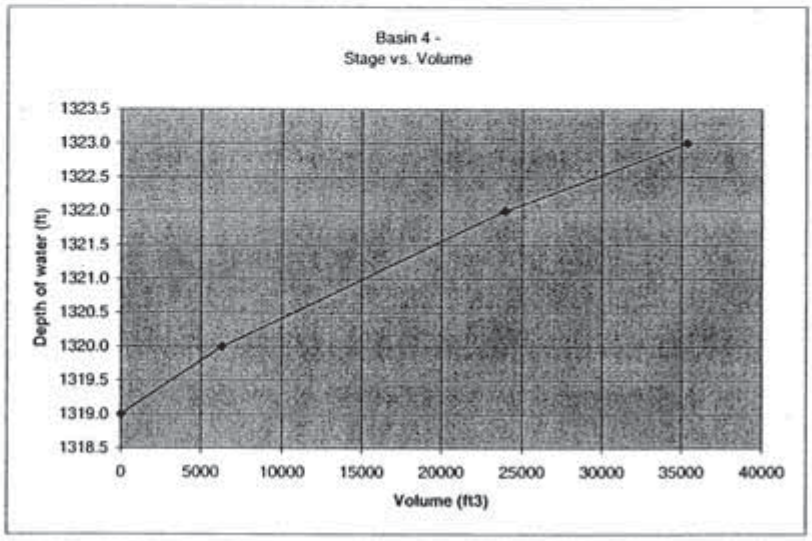
| | |
|---|---|
| 1. Determine Design Volume (Use Worksheet 1)<br>a. Total Tributary Area (minimum 5 ac.)<br>b. Design Volume, $V_{BMP}$ | $A_{total}$ = 5.6 acres<br>$V_{BMP}$ = 20,300 $ft^3$ |
| 2. Basin Length to Width Ratio (2:1 min.) | Ratio = 5:1 L:W |
| 3. Two-Stage Design<br>a. Overall Design<br>1) Depth (3.5' min.)<br>2) Width (30' min.)<br>3) Length (60' min.)<br>4) Volume (must be ? $V_{BMP}$)<br>b. Upper Stage<br>1) Depth (2' min.)<br>2) Bottom Slope (2% to low flow channel recommended)<br>c. Bottom Stage<br>1) Depth (1.5' to 3')<br>2) Length<br>3) Volume (10 to 25% of $V_{BMP}$) | Depth = 3 ft<br>Width = 40 ft<br>Length = 200 ft<br>Volume = 24,000 $ft^3$<br>Depth = N/A ft<br>Slope = N/A %<br>Depth = N/A ft<br>Length = N/A ft<br>Volume = N/A $ft^3$ |
| 4. Forebay Design<br>a. Forebay Volume (5 to 10% of $V_{BMP}$)<br>b. Outlet pipe drainage time (? 45 min) | Volume = N/A $ft^3$<br>Drain time = N/A minutes |
| 5. Low-flow Channel<br>a. Depth (9" minimum)<br>b. Flow Capacity (2 * Forebay $Q_{OUT}$) | Depth = N/A ft<br>$Q_{Low\ Flow}$ = N/A cfs |
| 6. Trash Rack or Gravel Pack (check one) | Trash Rack X Gravel Pack _____ |

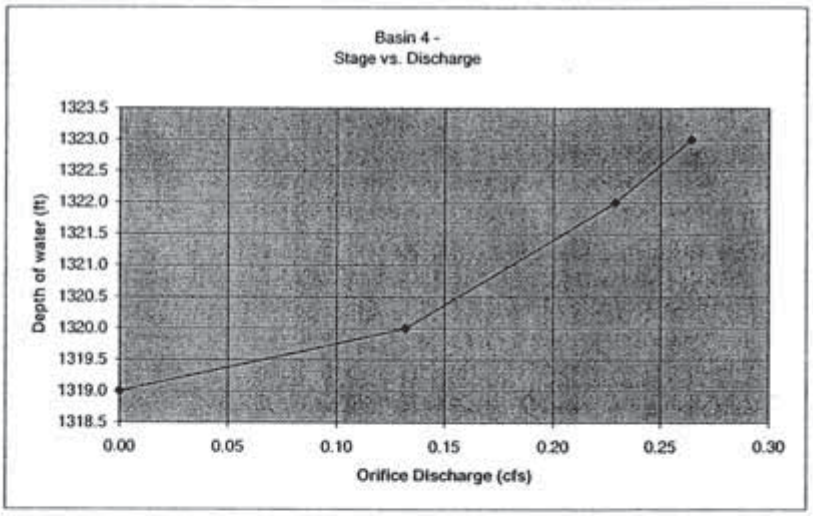
| | |
|---|---|
| 7. Basin Outlet<br>a. Outlet type (check one) | Single orifice _____<br>Multi-orifice plate _____<br>Perforated Pipe X<br>Other _____ |
| b. Orifice Area<br>c. Orifice Type<br>d. Maximum Depth of water above bottom orifice<br>e. Length of time for 50% $V_{BMP}$ drainage (24 hour minimum)<br>f. Length of time for 100% $V_{BMP}$ drainage (between 48 and 72 hours)<br>g. Attached Documents (all required)<br>1) Stage vs. Discharge<br>2) Stage vs. Volume<br>3) Inflow Hydrograph<br>4) Basin Routing | Area = 0.025 ft²<br>Type 3x 3/8" DIA HOLES<br>Depth = 3.25 ft<br>Time 50% = 29 hrs<br>Time 100% = 58 hrs<br>Attached Documents (check)<br>1) X<br>2) X<br>3) _____<br>4) _____ |
| 8. Increased Runoff (optional)<br>Is this basin also mitigating increased runoff?<br>Attached Documents (all required) for 2, 5, & 10-year storms:<br>1) Stage vs. Discharge<br>2) Stage vs. Volume<br>3) Inflow Hydrograph<br>4) Basin Routing | Yes _____ No X<br>(if No, skip to #9)<br>Attached Documents (check)<br>1) _____<br>2) _____<br>3) _____<br>4) _____ |
| 9. Vegetation (check type) | X Native Grasses<br>____ Irrigated Turf<br>____ Other<br>_____ |
| 10. Embankment<br>a. Interior slope (4:1 max.)<br>b. Exterior slope (3:1 max.) | Interior Slope = 33 %<br>Exterior Slope = 33 % |
| 11. Access<br>a. Slope (10% max.)<br>b. Width (16 feet min.) | Slope = 10 %<br>Width = 16 ft |

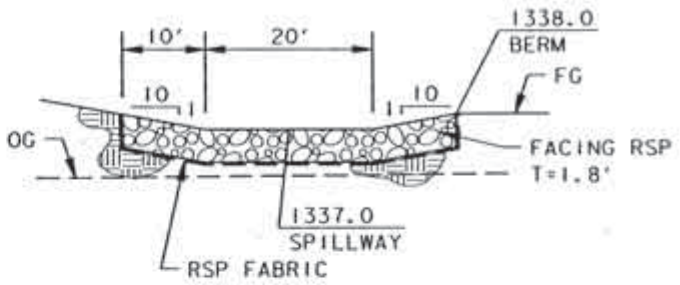
| ws elev (ft) | area ($ft^2$) | volume ($ft^3$) | discharge ($ft^3$/sec) |
|---|---|---|---|
| 1319.0 | 5515 | 0 | 0.00 |
| 1320.0 | 7115 | 6315 | 0.13 |
| 1322.0 | 10486 | 23916 | 0.23 |
| 1323.0 | 12416 | 35367 | 0.26 |

| | | |
|---|---|---|
| C= | 0.66 | for thin-walled orifice |
| g= | 32.2 | gravity in ft/sec2 |
| H= | 1322 | WQV ws elevation |
| $H_o$= | 1319 | floor/orifice elevation |
| A= | 7960 | mid-depth ws area (ft2) |
| a= | 0.0249 | orifice area (ft2) |
| T= | 58 | drawdown time (hr) |
| | 0.38 | 3 holes with this dia (in) |

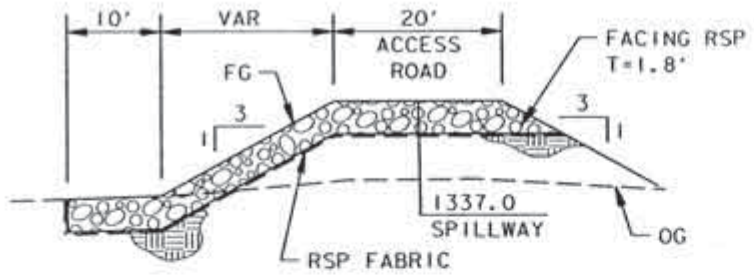
| | | |
|---|---|---|
| top of riser elev= | 1322 | |
| spillway elev= | 1322.5 | |
| Peak ws elev= | 1322.5 | |
| d= | 4 | riser diameter (ft) |
| l= | 12.6 | sharp-crested weir len |
| $C_{RISER}$= | 3.3 | |
| $Q_{RISER}$= | 14.8 | cfs |
| w= | 20 | spillway width (ft) |
| $C_{SPILL}$= | 3.0 | |
| $Q_{SPILL}$= | 0.0 | cfs |
| $Q_{TOTAL}$= | 14.8 | cfs |
| $Q_{10}$= | 11.6 | cfs |
| $Q_{25}$= | 13.5 | cfs |



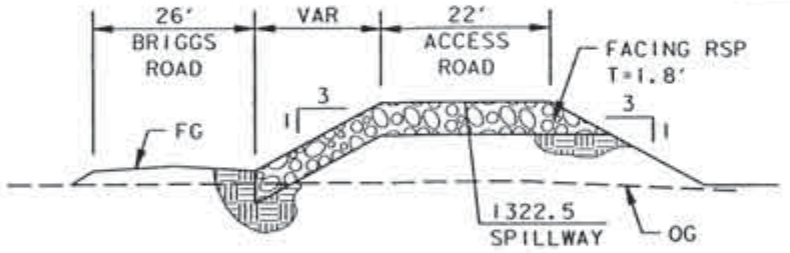





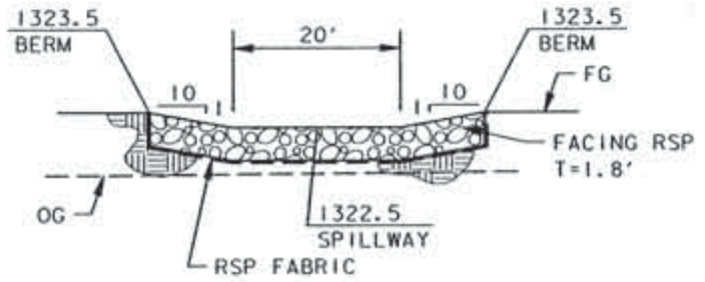

SECTION A-A



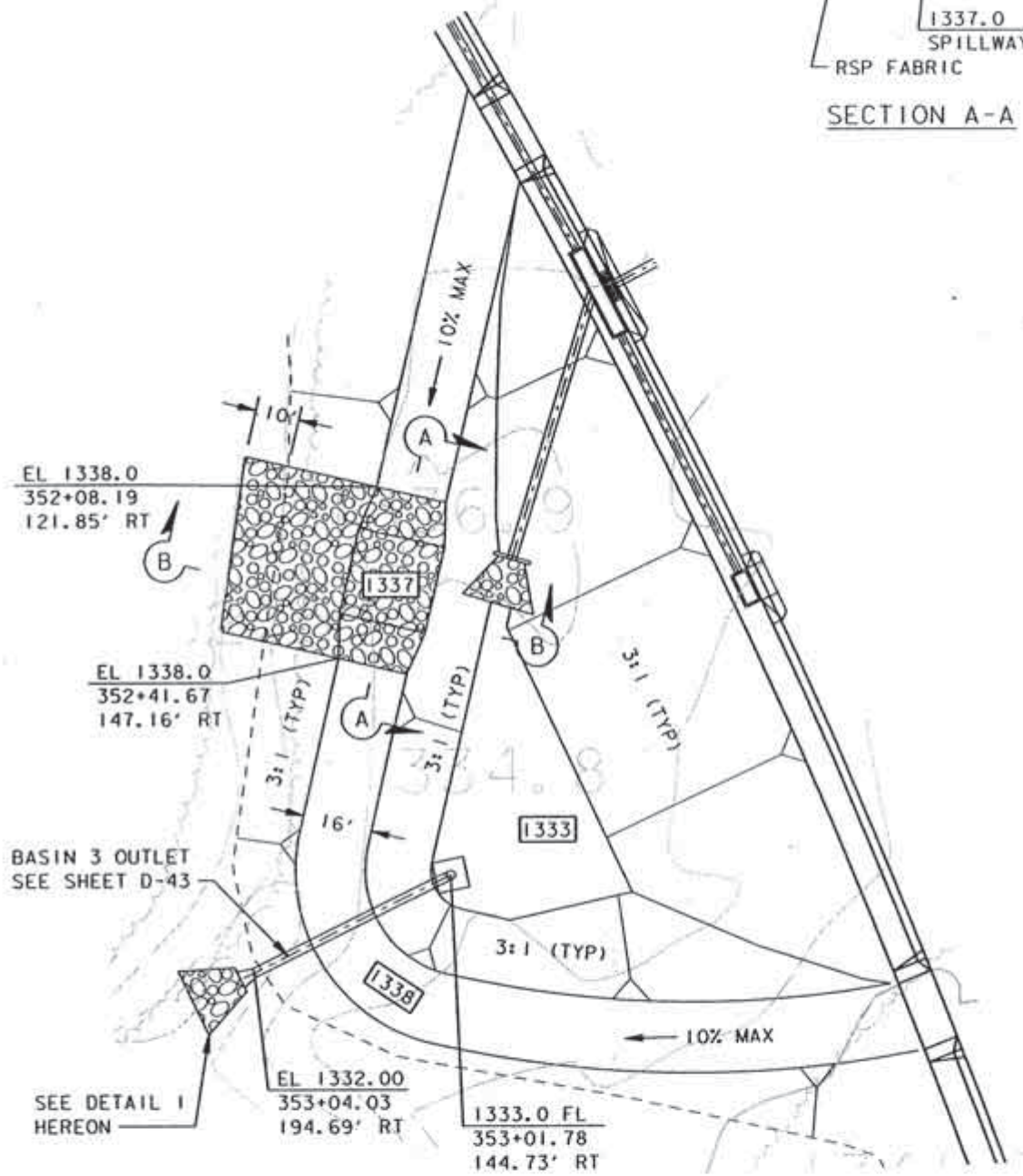

SECTION B-B




SECTION C-C




SECTION D-D




BASIN 3 PLAN
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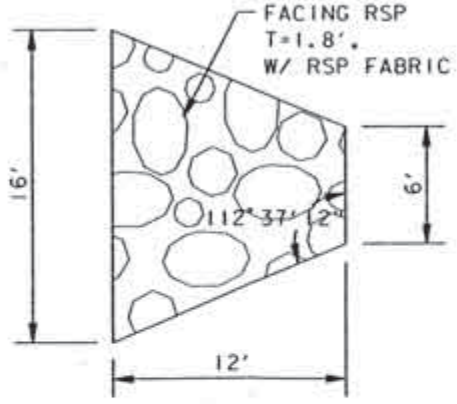



DETAIL 1




BASIN 4 PLAN
NTS

| REVISIONS | | | | | RIVERSIDE COUNTY TRANSPORTATION DEPARTMENT | CH2MHILL ENGINEERING COMPANY | PROJECT | REFERENCE |
|---|---|---|---|---|---|---|---|---|
| REV | BY | DESCRIPTION | APPROVED | DATE | CHARLES SCOTT STALEY<br>RECOMMENED BY: DATE<br>ENGINEERING DIVISION MANAGER | SHENG-CHUAN HSU C45806 exp.12/31/06 CIVIL<br>PREPARED BY: DATE<br>SHENG-CHUAN HSU - R.C.E. C45806<br>3550 VINE STREET, SUITE 320<br>RIVERSIDE, CA. 92507 | **CLINTON KEITH RD**<br>FROM<br>ANTELOPE ROAD TO STATE ROUTE 79<br>**DRAINAGE DETAILS** | W.O. NO. B2-0472<br>SURVEY NO. SXXXX<br>F. B. NO. XXXXXX<br>CAD FILENAME D-39.dgn<br>SHEET -- OF 174 |

**Worksheet 2**

## Design Procedure Form for Design Flow

Uniform Intensity Design Flow

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 5-16-05
Project: CLINTON KEITH ROAD EXTENSION
Location: CLINTON KEITH & SR-79 INTERSECTION, NW QUADRANT

| | | |
|---|---|---|
| 1. Determine Impervious Percentage | | |
| a. Determine total tributary area | $A_{total}$ = 1.0 on C-K + 0.7 on SR-79 = 1.7 acres | (1) |
| b. Determine Impervious % | i = 100 % | (2) |
| 2. Determine Runoff Coefficient Values Use **Table 4** and impervious % found in step 1 | | |
| a. A Soil Runoff Coefficient | $C_a$ = N/A | (3) |
| b. B Soil Runoff Coefficient | $C_b$ = N/A | (4) |
| c. C Soil Runoff Coefficient | $C_c$ = N/A | (5) |
| d. D Soil Runoff Coefficient | $C_d$ = N/A | (6) |
| 3. Determine the Area decimal fraction of each soil type in tributary area | | |
| a. Area of A Soil / *(1)* = | $A_a$ = N/A | (7) |
| b. Area of B Soil / *(1)* = | $A_b$ = N/A | (8) |
| c. Area of C Soil / *(1)* = | $A_c$ = N/A | (9) |
| d. Area of D Soil / *(1)* = | $A_d$ = N/A | (10) |
| 4. Determine Runoff Coefficient | | |
| a. C = *(3)*x*(7)* + *(4)*x*(8)* + *(5)*x*(9)* + *(6)*x*(10)* = | C = 0.9 | (11) |
| 5. Determine BMP Design flow | | |
| a. $Q_{BMP}$ = C x I x A = *(11)* x 0.2 x *(1)* | $Q_{BMP}$ = 0.3 $\frac{ft^3}{s}$ | (12) |

Worksheet 9

## Design Procedure Form for Grassed Swale

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 5-16-05
Project: CLINTON KEITH ROAD EXTENSION
Location: CLINTON KEITH & SR-79 INTERSECTION, NW QUADRANT

| | |
|---|---|
| 1. Determine Design Flow (Use Worksheet 2) | $Q_{BMP}$ = 0.3 cfs |
| 2. Swale Geometry<br>a. Swale bottom width (b)<br>b. Side slope (z)<br>c. Flow direction slope (s) | b = 2 ft<br>z = 4<br>s = 0.5 % |
| 3. Design flow velocity (Manning n = 0.2) | v = 0.22 ft/s |
| 4. Depth of flow (D) | D = 0.39'(4.7") ft |
| 5. Design Length (L)<br>L = (7 min) x (flow velocity, ft/sec) x 60 | L = 100 ft |
| 6. Vegetation (describe) | |
| 8. Outflow Collection (check type used or describe "other") | ___ Grated Inlet'<br>___ Infiltration Trench<br>___ Underdrain<br>X Other SHEET FLOW/NATURAL CHANNEL |

Notes:

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: temp

Comment: Line H / NW corner bioswale

Solve For Depth

Given Input Data:

| | |
|---|---|
| Bottom Width..... | 2.00 ft |
| Left Side Slope.. | 4.00:1 (H:V) |
| Right Side Slope. | 4.00:1 (H:V) |
| Manning's n..... | 0.200 |
| Channel Slope.... | 0.0050 ft/ft |
| Discharge..... | 0.30 cfs |

Computed Results:

| | |
|---|---|
| Depth..... | 0.39 ft |
| Velocity..... | 0.22 fps |
| Flow Area..... | 1.38 sf |
| Flow Top Width... | 5.11 ft |
| Wetted Perimeter. | 5.21 ft |
| Critical Depth... | 0.08 ft |
| Critical Slope... | 1.4087 ft/ft |
| Froude Number.... | 0.07 (flow is Subcritical) |

## CONSTRUCTION NOTES:

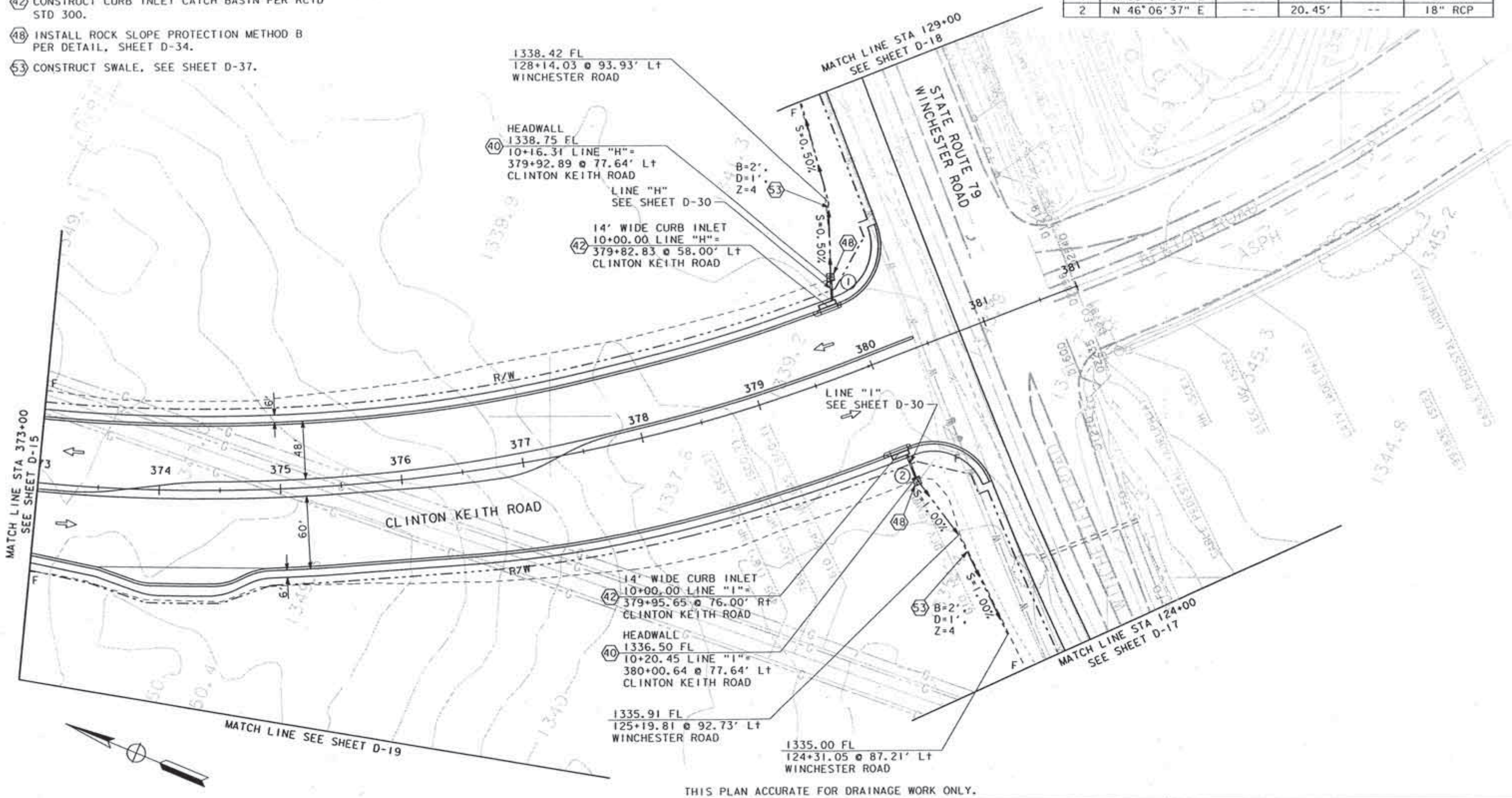
(40) CONSTRUCT HEADWALL PER CALTRANS DETAIL D89.

(42) CONSTRUCT CURB INLET CATCH BASIN PER RCTD STD 300.

(48) INSTALL ROCK SLOPE PROTECTION METHOD B PER DETAIL, SHEET D-34.

(53) CONSTRUCT SWALE, SEE SHEET D-37.

| ○ | STORM DRAIN DATA TABLE | | | | |
|---|---|---|---|---|---|
| NO. | DELTA / BEARING | RADIUS | LENGTH | TANGENT | REMARKS |
| 1 | N 63°01'20" E | -- | 16.31' | -- | 18" RCP |
| 2 | N 46°06'37" E | -- | 20.45' | -- | 18" RCP |




THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY.

40 0 40 80 120

SCALES: 1" = 40' HOR
1" = 4' VER

| REVISIONS | | | | |
|---|---|---|---|---|
| REV | BY | DESCRIPTION | APPROVED | DATE |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |

RIVERSIDE COUNTY TRANSPORTATION DEPARTMENT

CHARLES SCOTT STALEY
RECOMMENED BY: DATE
ENGINEERING DIVISION MANAGER

CH2MHILL ENGINEERING COMPANY

REGISTERED PROFESSIONAL ENGINEER SHENG-CHUAN HSU C45806 12/31/06 CIVIL STATE OF CALIFORNIA

PREPARED BY: DATE
SHENG-CHUAN HSU - R.C.E. C45806
3550 VINE STREET, SUITE 320
RIVERSIDE, CA. 92507

PROJECT

**CLINTON KEITH RD**
FROM
ANTELOPE ROAD TO STATE ROUTE 79
**DRAINAGE PLANS**

REFERENCE

W.O. NO. 82-0472
SURVEY NO. SXXXX
F. B. NO. XXXXXX
CAD FILENAME D-16.dgn

SHEET 102 OF 174

**Worksheet 2**

## Design Procedure Form for Design Flow

Uniform Intensity Design Flow

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 5-16-05
Project: CLINTON KEITH ROAD EXTENSION
Location: CLINTON KEITH & SR-79 INTERSECTION, SW QUADRANT

| | | |
|---|---|---|
| 1. Determine Impervious Percentage | 1.0 on C-K + 0.0 on SR-79 | |
| a. Determine total tributary area | $A_{total}$ = 1.0 acres | (1) |
| b. Determine Impervious % | i = 100 % | (2) |
| 2. Determine Runoff Coefficient Values Use **Table 4** and impervious % found in step 1 | | |
| a. A Soil Runoff Coefficient | $C_a$ = N/A | (3) |
| b. B Soil Runoff Coefficient | $C_b$ = N/A | (4) |
| c. C Soil Runoff Coefficient | $C_c$ = N/A | (5) |
| d. D Soil Runoff Coefficient | $C_d$ = N/A | (6) |
| 3. Determine the Area decimal fraction of each soil type in tributary area | | |
| a. Area of A Soil / *(1)* = | $A_a$ = N/A | (7) |
| b. Area of B Soil / *(1)* = | $A_b$ = N/A | (8) |
| c. Area of C Soil / *(1)* = | $A_c$ = N/A | (9) |
| d. Area of D Soil / *(1)* = | $A_d$ = N/A | (10) |
| 4. Determine Runoff Coefficient | | |
| a. C = *(3)*x*(7)* + *(4)*x*(8)* + *(5)*x*(9)* + *(6)*x*(10)* = | C = 0.9 | (11) |
| 5. Determine BMP Design flow | | |
| a. $Q_{BMP}$ = C x I x A = *(11)* x 0.2 x *(1)* | $Q_{BMP}$ = 0.2 $\frac{ft^3}{s}$ | (12) |

Worksheet 9

## Design Procedure Form for Grassed Swale

Designer: JOEL EVANS / GEORGE HSU
Company: CH2M HILL
Date: 5-16-05
Project: CLINTON KEITH ROAD EXTENSION
Location: CLINTON KEITH & SR-79 INTERSECTION, SW QUADRANT

| | |
|---|---|
| 1. Determine Design Flow (Use Worksheet 2) | $Q_{BMP}$ = 0.2 cfs |
| 2. Swale Geometry<br>a. Swale bottom width (b)<br>b. Side slope (z)<br>c. Flow direction slope (s) | b = 2 ft<br>z = 4<br>s = 1.0 % |
| 3. Design flow velocity (Manning n = 0.2) | v = 0.25 ft/s |
| 4. Depth of flow (D) | D = $0.26^{(3.1^4)}$ ft |
| 5. Design Length (L)<br>L = (7 min) x (flow velocity, ft/sec) x 60 | L = 125 ft |
| 6. Vegetation (describe) | |
| 8. Outflow Collection (check type used or describe "other") | ___ Grated Inlet'<br>___ Infiltration Trench<br>___ Underdrain<br>X Other SHEET FLOW / NATURAL CHANNEL |

Notes:

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: temp

Comment: Line I / SW corner bioswale

Solve For Depth

Given Input Data:

| | |
|---|---|
| Bottom Width..... | 2.00 ft |
| Left Side Slope.. | 4.00:1 (H:V) |
| Right Side Slope. | 4.00:1 (H:V) |
| Manning's n..... | 0.200 |
| Channel Slope.... | 0.0100 ft/ft |
| Discharge..... | 0.20 cfs |

Computed Results:

| | |
|---|---|
| Depth..... | 0.26 ft |
| Velocity..... | 0.25 fps |
| Flow Area..... | 0.81 sf |
| Flow Top Width... | 4.11 ft |
| Wetted Perimeter. | 4.18 ft |
| Critical Depth... | 0.06 ft |
| Critical Slope... | 1.5189 ft/ft |
| Froude Number.... | 0.10 (flow is Subcritical) |

## CONSTRUCTION NOTES:

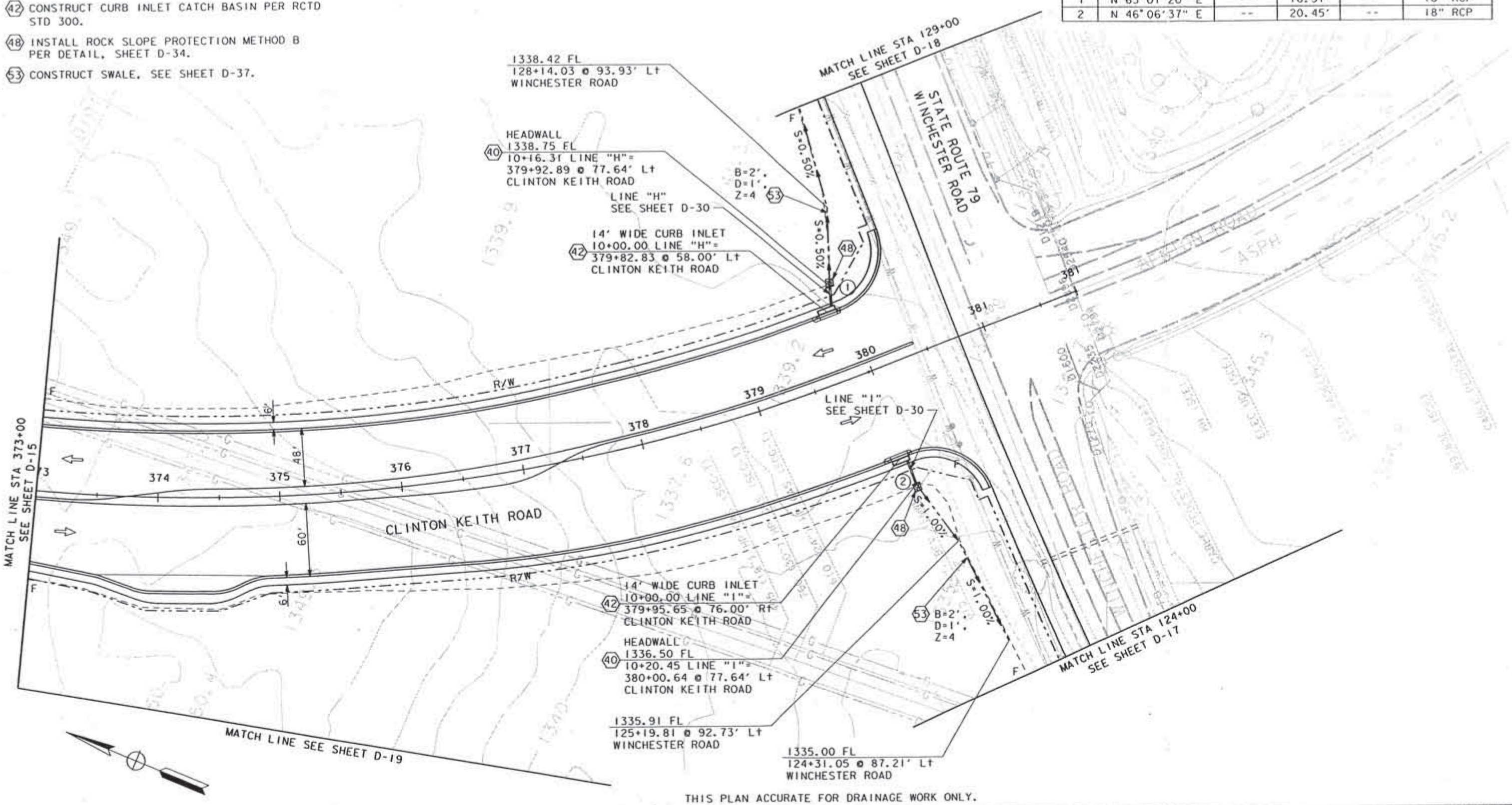
(40) CONSTRUCT HEADWALL PER CALTRANS DETAIL D89.

(42) CONSTRUCT CURB INLET CATCH BASIN PER RCTD STD 300.

(48) INSTALL ROCK SLOPE PROTECTION METHOD B PER DETAIL, SHEET D-34.

(53) CONSTRUCT SWALE. SEE SHEET D-37.

| STORM DRAIN DATA TABLE | | | | | |
|---|---|---|---|---|---|
| NO. | DELTA / BEARING | RADIUS | LENGTH | TANGENT | REMARKS |
| 1 | N 63°01'20" E | -- | 16.31' | -- | 18" RCP |
| 2 | N 46°06'37" E | -- | 20.45' | -- | 18" RCP |




THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY.

40 0 40 80 120

SCALES: 1" = 40' HOR
1" = 4' VER

| REVISIONS | | | | |
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RIVERSIDE COUNTY TRANSPORTATION DEPARTMENT

CHARLES SCOTT STALEY
RECOMMENED BY: DATE
ENGINEERING DIVISION MANAGER

CH2MHILL ENGINEERING COMPANY

SHENG-CHUAN HSU No. C45806 Exp. 12/31/06 Civil STATE OF CALIFORNIA

PREPARED BY: DATE
SHENG-CHUAN HSU - R.C.E. C45806
3550 VINE STREET, SUITE 320
RIVERSIDE, CA. 92507

PROJECT

**CLINTON KEITH RD**
FROM
ANTELOPE ROAD TO STATE ROUTE 79
**DRAINAGE PLANS**

REFERENCE

W.O. NO. 82-0472
SURVEY NO. SXXXX
F. B. NO. XXXXXX
CAD FILENAME D-16.dgn

SHEET 102 OF 174

# Appendix G

AGREEMENTS – CC&RS, COVENANT AND AGREEMENTS AND/OR OTHER MECHANISMS FOR ENSURING ONGOING OPERATION, MAINTENANCE, FUNDING AND TRANSFER OF REQUIREMENTS FOR THIS PROJECT-SPECIFIC WQMP

# Appendix H

## PHASE 1 ENVIRONMENTAL SITE ASSESSMENT – SUMMARY OF SITE REMEDIATION CONDUCTED AND USE RESTRICTIONS

# Appendix C: Drainage Report for Hydraulic and Scour Analysis for Warm Springs Creek and French Valley Creek Bridges

*Final*

# Drainage Report

*For*

# Hydraulic and Scour Analyses for Warm Springs Creek and French Valley Creek Bridges in Clinton Keith Road Extension Project

**April 2006**

*Submitted to*

## Riverside County

*Prepared by*

CH2MHILL

*3 Hutton Centre Drive, Suite 200*
*Santa Ana, CA 92707*
*Contact: George Hsu, Ph.D., P.E.*

This Drainage Report has been prepared by CH2M HILL Engineers under the direction of the following Registered Civil Engineer. The undersigned attests to the technical information contained herein and the qualifications of any technical specialist providing engineering data upon which recommendations, conclusions, and decisions are based:

_____

George Hsu, Ph.D, P.E.
Registered Civil Engineer

# CONTENTS

## SECTION



## APPENDICES

## TABLES



## FIGURES

## ACRONYMS

| | |
|---|---|
| APS | Advance Planning Study |
| County | Riverside County |
| CDFG | California Department of Fish and Game |
| cfs | cubic feet per second |
| CMP | Corrugated Metal Pipe |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| ft | foot or feet |
| RCB | Reinforced Concrete Box Culvert |
| SR | State Route |
| USACE | U.S. Army Corps of Engineers |
| WSE | Water Surface Elevation |

# SECTION 1
# INTRODUCTION

## 1.1 SCOPE

The County of Riverside Transportation Department, acting on behalf of Riverside County (County) and in cooperation with the City of Murrieta, is proposing the construction of the Clinton Keith Road Extension Project (Project) as a six-lane urban arterial in the City of Murrieta and unincorporated Riverside County. The construction of Clinton Keith Road is needed to provide an east-west urban arterial between Interstate (I)-215 to State Route (SR)-79 (Winchester Road). Figure 1-1 shows a vicinity map and the project location.

CH2M HILL is under contract to the County to prepare the construction plans for the Project. The purpose of this report is to document the hydraulic and scour analyses for the proposed two bridges. The study used available hydrologic data to perform hydraulic analysis to assess the potential impacts associated with the proposed bridges. Scour analysis is also conducted to provide design information for the bridge foundation design.

## 1.2 PROJECT DESCRIPTION

The proposed Project is located in western Riverside County along the northern jurisdiction of the City of Murrieta and unincorporated Riverside County. The Project is generally located between I-215 and SR-79. Clinton Keith Road currently is a two-lane dirt road east of Whitewood Road/Meadowlark Lane for approximately 0.8 mile to its intersection with Los Alamos Road. Clinton Keith Road does not currently exist east of Los Alamos. The current Clinton Keith Road alignment was adopted by the County in the County General Plan Amendment 409.

Clinton Keith Road, at ultimate build-out, will include a total of six travel lanes. Cut and fill slopes outside of the roadway prism will be sloped at a ratio of 1 vertical to 2 horizontal. Where topography requires slope construction outside of the basic roadway right-of-way, an additional slope easement (variable in width) will be acquired by the County. The two major water courses along the roadway alignment are Warm Springs Creek and French Valley Creek, which will be bridged with structures. These structures will be designed to pass the 100-year storm event. The locations of both bridges are shown in Figure 1-1.

## 1.3 CREEK AND SITE DESCRIPTION

Warm Springs Creek is a steep and narrow water course with steep sideslopes and heavy vegetation. Within the study reach, the creek is crossed by Los Alamos Road approximately 755 feet (ft) south of the proposed Clinton Keith Road alignment. The cross-culvert at Los Alamos Road is three 5-ft diameter corrugated metal pipes (CMPs).

In contrast to Warm Springs Creek, French Valley Creek is relatively flat and wide, with shallow side-slopes and lighter vegetation. French Valley Creek is conveyed in culverts under Thompson Road, Briggs Road, and Porth Road within the study reach. The culvert crossings at Porth and Thompson Roads consist of a 2-ft and 7-ft CMPs, respectively. The

cross-culverts at Briggs Road is currently two 5-ft CMPs, which will be improved before the construction of the Project. The crossing will be a six-barrel 14 ft by 5 ft reinforced concrete box culvert (RCB). The existing Briggs Road profile will be also raised about 9 ft at the crossing. Creek highlights, taken in the field investigation on December 9, 2004, are presented in Figures 1-2 to 1-7.

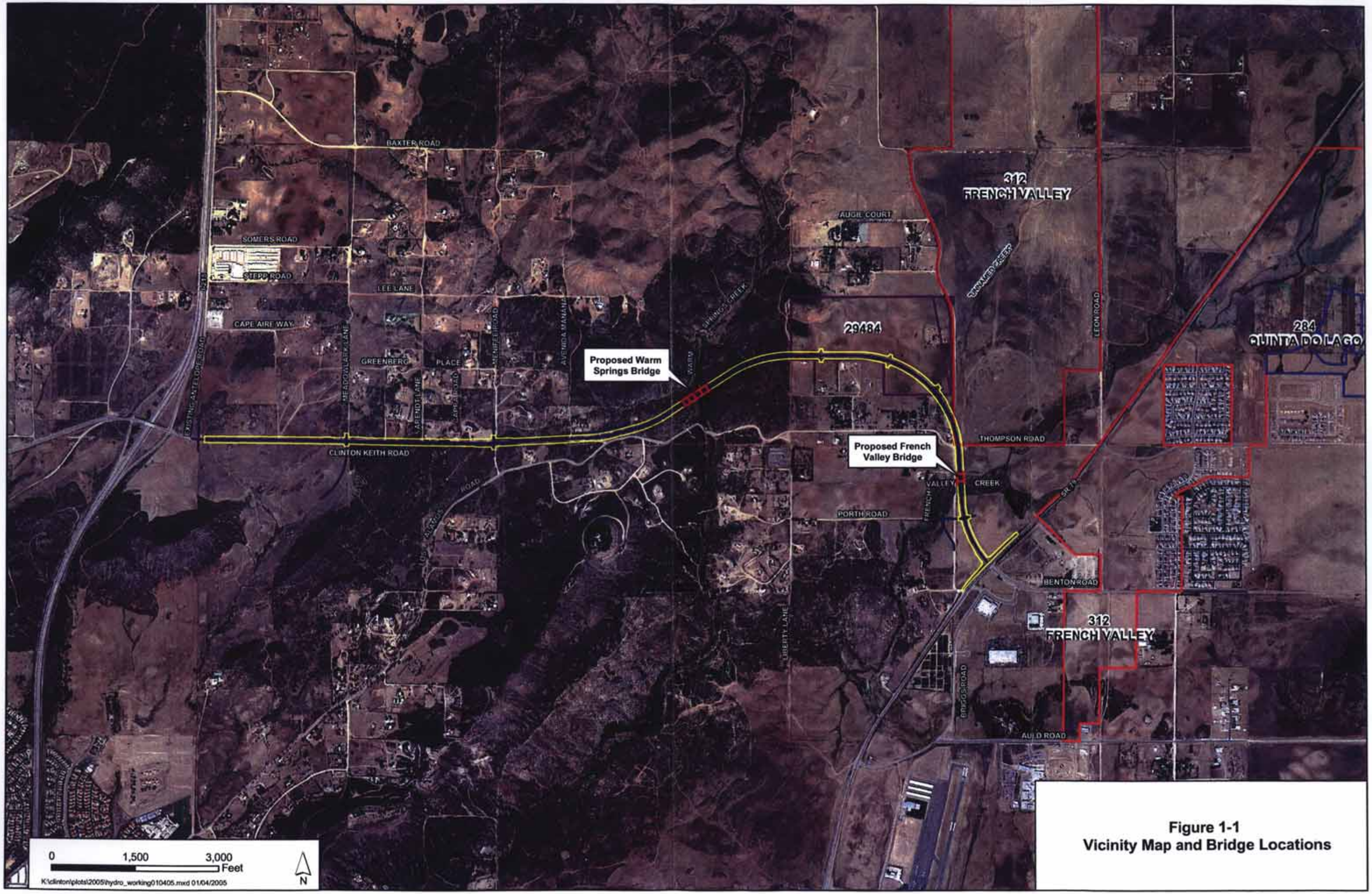


**Figure 1-1**
**Vicinity Map and Bridge Locations**

**Figure 1-2** – Warm Springs – Looking downstream at Los Alamos Road Culvert

**Figure 1-3** – Warm Springs - Looking upstream from Los Alamos Road

**Figure 1-4** – Warm Springs Creek downstream of Los Alamos Road

**Figure 1-5** – French Valley - Looking downstream from Briggs Road

**Figure 1-6** – French Valley - Looking upstream from Briggs Road

**Figure 1-7** – French Valley - Looking downstream from Porth Road

# SECTION 2

# HYDROLOGY

Warm Springs Creek is one of the major tributaries of Murrieta Creek. The drainage area of Warm Springs Creek is approximately 52.1 square miles at the confluence of French Valley Creek. The US Army Corps of Engineers (USACE) conducted a feasibility study on Murrieta Creek in 1990 (USACE, 1990). The hydrologic analysis included several concentration points along Warm Springs Creek. Immediately downstream of the confluence of French Valley Creek, USACE estimated the 100-year flows to be 12,100 cubic feet per second (cfs) and 13,200 cfs for the existing and future conditions, respectively. Based on USACE's study, the adjustment ratio for the future development within Warm Spring Creek watershed is approximately 1.09.

USACE recently conducted another study on Warm Springs Creek (USACE, 2003), where the 100-year flow was determined to be 6,020 cfs upstream of the confluence of French Valley Creek. As the proposed Clinton-Keith bridge is about 4,500 ft upstream of the confluence, it would be conservative to assume 6,020 cfs for the bridge flow. The land use in the 2003 USACE study was based on the existing condition. Considering the future development, the same adjustment ratio (1.09) discussed above could be used. The 100-year flow at the Clinton-Keith bridge would be about 6,600 cfs for the future condition.

French Valley Creek is a tributary of Warm Springs Creek. It confluences an unnamed creek about 3,800 ft downstream of the Clinton-Keith crossing, where the drainage area is about 14.4 square miles. The creek then joins Warm Springs Creek 2,200 ft further downstream of the unnamed creek. The 2003 USACE study determined the existing 100-year flow to be 4,810 cfs at the confluence of the unnamed creek. The ultimate hydrology was conducted in the French Valley Specific Plan (RC, 2001). The 100-year flows for French Valley Creek were determined to be 5,465 cfs at about 1,400 ft upstream and 6,100 cfs at about 1,500 ft downstream of the Clinton –Keith crossing, respectively. To be conservative, 6,100 cfs was used for the bridge design. Copies of referenced documents are presented in Appendix A.

# SECTION 3

# HYDRAULIC ANALYSIS

The US Army Corps of Engineers (USACE) River Analysis System HEC-RAS program (USACE, 2004) was used to compute water surface profiles of both creeks for the 100-year flood event. The results from the HEC-RAS models were used to evaluate the hydraulic impacts of the proposed bridge and to evaluate potential scour potential at the bridge piers and abutments. Water surface profiles were computed for both the existing and proposed conditions.

## 3.1 EXISTING CONDITION

The project team conducted a field reconnaissance to gain an understanding of the stream environment and to determine the location for the cross sections to be used in the hydraulic analysis. Most of the cross sections were complied from a 2-ft contour map surveyed for the current project in 2002. For cross sections outside of project survey, the county's 4-ft county-wide contour maps were used to make up the information. The study reach cover enough channel length to address the hydraulic impact.

### 3.1.1 WARM SPRINGS CREEK

The study reach of Warm Springs Creek is approximately 0.3 mile long and extends from just south of Los Alamos Road at the downstream end to about 700 ft north of the proposed crossing for Clinton Keith Road (see Figure 1-1 and Exhibit 1 in Appendix B). At Los Alamos Road, there is an existing cross-culverts, consisting of three 5-ft CMPs. The rest of the channel remains natural.

Channel roughness was determined based on field review. The channel is comprised of trees and shrubs. A Manning's "n" value of 0.050 was used for both overbank and channel areas in the model.

Table 3-1 summarizes the results of the hydraulic analysis for the 100-year flood event under the existing condition. Detailed HEC-RAS outputs of the existing conditions are presented in Appendix B.

**TABLE 3-1**
**SUMMARY OF 100-YEAR HYDRAULICS OF WARM SPRINGS CREEK**

| | Existing Condition | | Project Condition | | |
|---|---|---|---|---|---|
| Cross Section | Water Surface Elevation (ft) | Channel Velocity (ft/s) | Water Surface Elevation (ft) | Channel Velocity (ft/s) | WSE Difference (ft) |
| 10.0 | 1295.82 | 6.72 | 1295.82 | 6.72 | 0.00 |
| 9.0 | 1294.25 | 8.05 | 1294.25 | 8.06 | 0.00 |
| 8.0 | 1292.20 | 8.54 | 1292.26 | 8.41 | 0.06 |
| 7.0 | 1291.36 | 5.48 | 1291.55 | 5.22 | 0.19 |
| 6.0 | 1290.74 | 5.79 | 1291.02 | 5.53 | 0.28 |
| **Proposed Bridge** | | | | | |
| 5.0 | 1290.54 | 4.31 | 1290.52 | 4.45 | -0.02 |
| 4.0 | 1290.10 | 5.20 | 1290.10 | 5.20 | 0.00 |
| 3.0 | 1289.66 | 5.41 | 1289.66 | 5.41 | 0.00 |
| 2.0 | 1289.37 | 4.30 | 1289.37 | 4.30 | 0.00 |
| 1.0 | 1289.08 | 3.70 | 1289.08 | 3.70 | 0.00 |
| **Los Alamo Culvert** | | | | | |
| 0.0 | 1284.16 | 11.80 | 1284.16 | 11.80 | 0.00 |

Note: The soffit of the proposed bridge is about Elev. 1326 ft.

### 3.1.2 FRENCH VALLEY CREEK

The study reach of French Valley Creek is approximately 0.7 mile long and extends from just south of Porth Road at the downstream end to about 900 ft north of the existing Thompson Road (see Figure 1-1 and Exhibit 2 in Appendix C). Culvert crossings are located at Porth Road, Briggs Road, and Thompson Road. The culvert crossings at Porth and Thompson Roads consist of a 2-ft and 7-ft CMPs, respectively. The culvert crossing at Briggs Road is expected to be improved before the construction of the project. The crossing will be a six-barrel 14 ft by 5 ft reinforced concrete box culvert (RCB). A copy of detailed layout is presented in Appendix C. The rest of the channel remained natural.

Channel roughness was determined based on field review. The channel is comprised of trees and shrubs. A Manning's "n" value of 0.050 was used for both overbank and channel areas in this model.

Table 3-2 summarizes the results of the hydraulic analysis for the 100-year flood event under the existing condition. It appears that two existing culverts and the new RCB are not designed to convey the 100-year flood. Floodwater would overtop these three crossings in major events. Detailed HEC-RAS outputs of the existing conditions are presented in Appendix A.

**TABLE 3-2**
**SUMMARY OF 100-YEAR HYDRAULICS OF FRENCH VALLEY CREEK**

| | Existing Condition | | Project Condition | | |
|---|---|---|---|---|---|
| Cross Section | Water Surface Elevation (ft) | Channel Velocity (ft/s) | Water Surface Elevation (ft) | Channel Velocity (ft/s) | WSE Difference (ft) |
| 18.0 | 1338.63 | 7.07 | 1338.63 | 7.07 | 0.00 |
| 17.0 | 1335.93 | 4.78 | 1335.93 | 4.78 | 0.00 |
| 16.0 | 1335.00 | 3.98 | 1335.00 | 3.98 | 0.00 |
| 15.0 | 1334.67 | 3.09 | 1334.67 | 3.09 | 0.00 |
| **Thompson Culvert** | | | | | |
| 14.0 | 1332.19 | 8.12 | 1332.17 | 8.22 | -0.02 |
| 10.0 | 1328.44 | 4.61 | 1328.47 | 4.55 | 0.03 |
| 9.0 | 1327.42 | 4.78 | 1327.55 | 4.54 | 0.13 |
| 8.0 | 1327.24 | 2.42 | 1327.38 | 2.36 | 0.14 |
| 7.0 | 1327.13 | 2.78 | 1327.28 | 2.68 | 0.15 |
| 6.0 | 1327.00 | 2.91 | 1327.17 | 2.82 | 0.17 |
| 5.5 | 1326.58 | 5.03 | 1326.82 | 4.63 | 0.24 |
| **Proposed Bridge** | | | | | |
| 4.5 | 1326.50 | 4.19 | 1326.60 | 3.84 | 0.10 |
| 4.0 | 1325.76 | 7.48 | 1325.84 | 7.41 | 0.08 |
| **Briggs New Culvert** | | | | | |
| 3.0 | 1320.91 | 12.54 | 1320.91 | 12.54 | 0.00 |
| 2.0 | 1320.22 | 2.60 | 1320.22 | 2.60 | 0.00 |
| 1.0 | 1319.92 | 2.82 | 1319.92 | 2.82 | 0.00 |
| 0.5 | 1319.35 | 3.70 | 1319.35 | 3.70 | 0.00 |
| **Porth Culvert** | | | | | |
| 0.0 | 1318.17 | 3.77 | 1318.17 | 3.77 | 0.00 |

Note: The soffit of the proposed bridge is about Elev. 1333 ft.

## 3.2 PROPOSED CONDITION

### 3.2.1 WARM SPRINGS CREEK

The proposed condition considers the full construction of Clinton Keith Road across Warm Springs Creek. The proposed bridge design consists of a 360-ft span bridge with 2 piers associated with the bridge deck. Dimensions of the proposed bridge was developed from General Plan of Advance Planning Study (APS), which is presented in Appendix B. Circular columns of 5.5-ft diameter and 4 per bent are proposed for bridge piers. Based on the vegetation growth in the creek, an additional 1 ft debris loading was added to each pier. The goal of placing the bridge span was not to increase the water surface elevation (WSE) by more than 1.0 ft from the existing condition, based on Federal Emergency Management Agency (FEMA) criteria. Additionally, the placement of this bridge was designed to minimize encroachment on USACE and California Department of Fish and Game (CDFG) jurisdictional areas.

The hydraulic results showed that the proposed bridge structure would continue to have capacity to fully convey the 100-year floodwater. The 100-year hydraulic results for the proposed condition is presented in Table 3-1. Detailed HEC-RAS outputs of the proposed conditions are included in Appendix B.

### 3.2.2 FRENCH VALLEY CREEK

Similar to Warm Spring Creek Bridge, the proposed condition considers the full construction of Clinton Keith Road across French Valley Creek. The proposed bridge design consists of a 140-ft span bridge with no piers associated with the bridge deck. Dimensions of the proposed bridge was developed from General Plan of APS, which is presented in Appendix C. The placement of the bridge span was designed so as not to impact the water surface elevation by more than 1.0 ft and to minimize encroachment on USACE and CDFG jurisdictional areas.

The hydraulic results showed that the proposed bridge structure would continue to have capacity to fully convey the 100-year floodwater without increasing the water surface elevation more than 1.0 ft. Table 3-2 presents a summary of the hydraulic results for the proposed bridge widening under the 100-year flood event. Detailed HEC-RAS outputs of the proposed conditions are included in Appendix A

## 3.3 DISCUSSION

Tables 3-1 and 3-2 depict a comparison of the hydraulic results from the existing and proposed conditions. As shown in Table 3-1, the proposed Warm Springs Creek bridge would result in an increase of 100-year water surface of 0.28 ft. The impact of WSE would die out within 475 ft.

As shown in Table 3-2, the proposed French Valley Creek bridge would result in an increase of 100-year water surface of 0.24 ft. The WSE impact would die out before Thompson Road. These impacts are considered insignificant and within the FEMA guidelines, which limits the increase to 1.0 ft.

# SECTION 4
# SCOUR ANALYSIS

Bridge scour was computed in accordance with HEC-18 (FHWA, 2001a) procedures. Based on HEC-18, total scour at a highway crossing consists of the sum of 1) long-term degradation, 2) contraction scour, and 3) local scour. The following sections discuss the sediment size distribution, and each component of scour. Potential total scour depth is recommended for the bridge footing design.

## 4.1 SEDIMENT SIZE DISTRIBUTION

During the site visit, a qualitative assessment of particle sizes of channel bed materials in Warm Springs and French Valley Creeks were conducted. Sampling and sieve analyses were performed for Warm Springs Creek in 2004. Based on the sieve analyses, the bed material of Warm Springs Creek primarily consists of silty sand, with a $D_{50}$ and $D_{95}$ (50% and 95% finer, respectively) of approximately 0.1 mm and 2.0 mm. No bed materials were sampled for French Valley Creek. The same sediment gradation in Warm Springs Creek was assumed for French Valley Creek.

## 4.2 LONG-TERM DEGRADATION

Long-term bed elevation changes may be the natural trend of the stream or may be the result of some modification to the stream or watershed. The streambed may be aggrading, degrading, or in relative equilibrium in the vicinity of the bridge crossing.

No data were available regarding long-term degradation of the Warm Springs and French Valley Creeks at this site. However, both proposed bridges are located upstream near the existing roadways, which would behave as grade control structures. The potential for long-term channel degradation is considered to be negligible.

## 4.3 CONTRACTION SCOUR

Contraction scour, in a natural channel or at a bridge crossing, involves the removal of material from the bed and banks across all or most of the channel width. This component of scour can result from a contraction of flow area, an increase in discharge at the bridge, or both. It can also result from a change in downstream control of the water surface elevation. This scour is the result of increased velocities and shear stress on the channel bed.

The HEC-RAS functions for bridge scour analysis were used for the evaluation of the proposed abutment fills on Warm Spring Creek and French Valley Creek. The results of those analyses show that contraction scours of 0.40 ft and 2.61 ft would occur at Warm Springs Creek and French Valley Creek Bridges, respectively.

## 4.4 LOCAL SCOUR

Local scour involves removal of material from around flow obstructions such as piers and abutments. It is caused by an acceleration of flow and resulting vortices induced by the flow obstructions.

HEC-18 (FHWA, 2001a) recommends the CSU equation for pier scour. The equation predicts maximum pier scour depths. The equation is:

$$y_s/y_1 = 2.0\ K_1\ K_2\ K_3\ K_4\ (a/y_1)^{0.65}\ Fr_1^{0.43} \qquad [4\text{-}1]$$

Where: $y_s$ = scour depth (ft)

$y_1$ = flow depth directly upstream of pier (ft)

$K_1$ = correction factor for pier nose shape per HEC-18

$K_2$ = correction factor for angle of attack of flow per HEC-18

$K_3$ = correction factor for bed form per HEC-18

$K_4$ = correction factor for armoring by bed material size per HEC-18

a = pier width, including debris width (ft)

L = length of pier, adjusted for multiple columns if applies (ft)

$Fr_1$ = Froude Number directly upstream of the pier = $V_1/(gy_1)^{0.5}$

$V_1$ = mean velocity of flow directly upstream of pier (ft/s)

g = acceleration of gravity

Abutment scour typically occurs when a bridge encroaches into the floodplain and flow travels parallel to the roadway embankment and around the abutment in the downstream direction. HEC-18 (FHWA, 2001a) recommends the Froehlich's abutment scour equation for abutment scour. The HEC-RAS program provides optional local scour analysis for both pier and abutment scours of Warm Spring Creek and French Valley Creek Bridges.

The total computed scour is based on the estimated depth of local, or pier, scour that is likely to occur. Each of the piers were treated the same, with the total pier scour depth being assumed to occur equally at each of the pier bents. The 5.5 ft pier columns in Warm Springs Creek will connected to the larger shaft of 7.5 ft diameter near creek bed or within the scour depth. A conservative 7.5 ft shaft was used in the scour analysis. As in the hydraulic analysis, additional 1.0 ft debris loading was added at the piers in Warm Springs Creek. Therefore, the overall pier width used in the scour computations was 8.5 ft. Since there are no piers in the French Valley Bridge, pier scour was not calculated. Additional attack angle of 10 degrees and multiple-pier effect were considered in evaluating the pier scour for Warm Springs Creek Bridge.

Although the low flow channel or thalweg (the lowest point of the cross-section) is not currently at the proposed pier or abutment locations, it could migrate over time to anywhere within the floodplain. It is possible the thalweg could be at the piers or near the toe of abutment during a major event. Therefore, it is prudent to use the thalweg elevation as the ground elevation to apply the total scour depth for the piers and abutments.

The total scour depths and elevations are summarized in Tables 4-1 and 4-2. The design length of the piers shall take into account the total scour depth. Detailed HEC-RAS outputs of the scour calculations are included in Appendix D.

Table 4-1 BRIDGE SCOUR SUMMARY OF WARM SPRINGS CREEK

| Structure Location | Channel Invert Elev* | Long-Term Scour | Contraction Scour | Local Scour | Total Scour | Estimated Scour Elev |
|---|---|---|---|---|---|---|
| **a. Pier Scour** | | | | | | |
| All 2 bents | 1281.60 ft | 0.00 ft | 0.40 ft | 17.80 ft | 18.20 ft | 1263.4 ft |
| **b. Abutment Scour** | | | | | | |
| Left (East) | 1281.60 ft | 0.00 ft | 0.40 ft | 3.10 ft | 3.50 ft | 1278.1 ft |
| Right (West) | 1281.60 ft | 0.00 ft | 0.40 ft | 6.39 ft | 6.78 ft | 1274.8 ft |

*Note: * Channel invert is taken at the thalweg.*

Table 4-2 BRIDGE SCOUR SUMMARY OF FRENCH VALLEY CREEK

| Structure Location | Channel Invert Elev* | Long-Term Scour | Contraction Scour | Local Scour | Total Scour | Estimated Scour Elev |
|---|---|---|---|---|---|---|
| **a. Pier Scour** | | | | | | |
| N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **b. Abutment Scour** | | | | | | |
| Left (South) | 1316.90 ft | 0.00 ft | 2.31 ft | 15.50 ft | 17.81 ft | 1299.1 ft |
| Right (North) | 1316.90 ft | 0.00 ft | 2.31 ft | 11.76 ft | 14.07 ft | 1302.6 ft |

*Note: * Channel invert is taken at the thalweg.*

## 4.5 SLOPE PROTECTION

Due to environmental concerns, no counter-measure on the creek bed is proposed for the pier scour. The design length of piers shall take into account the total scour depth and estimated scour elevation.

As the toes of abutments on both bridges would be in 100-year floodplain, the abutment scour hole could be developed and cause slope failure. Riprap is proposed to place along the new fill slope in order to prevent erosion and abutment scour. The riprap could be placed between the high water surface (100-year WSE plus a freeboard of 3.0 ft) and toedown (determined by the thalweg elevation minus abutment scour) along a 1(v) to 2(h) slope. As an alternative, HEC-23 (FHWA, 2001b) recommends riprap apron, extending along the entire length of the abutment toe, around the curved portions of the abutment to the point of tangency with the plane of the embankment slopes. The width of apron should be equal to twice of flow depth in the overbank area near the embankment, but less than 25 ft.

The alternative of HEC-23 would cause less impacts to jurisdiction areas on the creek beds and is recommended for this project. It was estimated that the apron widths to be 10 ft

and 12 ft for Warm Spring Creek and French Valley Creek Bridges, respectively. Riprap sizing calculations and sketches detailing the placement as shown in Appendix D.

# SECTION 5
# SUMMARY AND RECOMMENDATIONS

The proposed construction of Clinton Keith Road over the Warm Springs Creek and French Valley Creek would provide increased access to the surrounding area. This report documents the hydraulic and scour analyses for the proposed bridge widening. This report includes hydraulic analysis for both the existing and proposed conditions and scour computations for the proposed bridges.

In summary, the results of the analyses indicate that:

- The proposed Warm Springs Bridge would cause a small increase (0.28 ft) to the existing 100-year water surface immediately upstream of the bridge. The increase is considered insignificant and within the FEMA guidelines, which limits the increase to 1.0 ft.
- The proposed French Valley Bridge would cause small impact (0.24 ft) to the existing 100-year water surface immediately upstream of the bridge. The increase is considered small and within the FEMA guidelines as well.
- For the pier scour analysis, the pier widths of Warm Springs Bridge were increased by 1.0 ft to account for the debris loading. The total scour depth is 18.20 ft. Scour elevation of 1263.4 ft shall be used in the bridge foundation design.
- Riprap is proposed to be placed along the new fill slope in order to prevent erosion and abutment scour. Riprap should be placed on the abutment slope between the high water surface (100-year WSE plus a freeboard of 3.0 ft) and creek bed. In addition, a riprap apron should be placed along the entire length of the abutment toe, around the curved portions of the abutment to the point of tangency with the plane of the embankment slopes. It is recommended that apron widths be 10 ft and 12 ft for Warm Spring Creek and French Valley Creek Bridges, respectively.

## REFERENCES

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Federal Highway Administration (FHWA). HEC-18: *Evaluating Scour at Bridges*. FHWA NHI 01-001, May 2001a.

FHWA. HEC-23: *Bridge Scour and Stream Instability Countermeasures*. FHWA NHI 01-003, March 2001b.

U.S. Army Corps of Engineers (USACE). *HEC-RAS: River Analysis System: User's Manual*. Version 3.1.2, April 2004.

USACE. September 2000. *Marrieta Creek Feasibility Study,* LA District.

USACE. February 2003. *Flood Plain Delineation Study for Warm Springs Creek,* LA District.

Riverside County. June 2001, *French Valley Specific Plan 312.*

# APPENDIX A
# Relevant Hydrologic Data

SUBJECT Clinton-Keith Extension Ck Hydrology

BY GH

SHEET NO. ____ of ____ DATE 12/21/04

PROJECT NO. 171364.T2.02.04

1. Warm Springs Ck

County's Study (1990) $Q_{100}$ = 6,700 cfs @ I-15 (70% Valley/30% Foothill)

ACOE Murrieta Ck Fea. Study (2000)

$Q_{100}$ = 12,100 cfs @ d/s FV (Existing) > ratio = 1.09

$Q_{100}$ = 13,200 cfs @ " (future)

ACOE Flood Plain Delineation Study (2003)

$Q_{100}$ = 6,020 @ u/s FV (Existing), which is about 4,500' d/s of the C-K prop bridge → conservative

To adjust for future conditi

$Q_{100}$ = 6,562 cfs, say 6,600 cfs #

2. French Valley Ck

ACOE (2003) Study (Existing)

$Q_{100}$ = 4,810 @ about 3,800' d/s of the C-K prop. bridge → conservative

County French Valley Specific Plan 312 (Ultimate)

$Q_{100}$ = 5465 cfs @ about 1,400' u/s of the C-K bridge (A1)

$Q_{100}$ = 5465 + 642 = 6,107 cfs @ about 1,500' d/s of C-K bridge (A1+A2)

→ conservative say 6,100 cfs #

# FLOOD PLAIN DELINEATION STUDY

(A SECTION 22, PLANNING ASSISTANCE TO THE STATES, STUDY
COST SHARED BETWEEN THE CORPS OF ENGINEERS
AND THE CALIFORNIA DEPARTMENT OF WATER RESOURCES)

# WARM SPRINGS CREEK

## FROM DIAMOND VALLEY RESERVOIR
## DOWNSTREAM TO NEAR CALLE DE AMOR

**RIVERSIDE COUNTY, CALIFORNIA**

*Prepared by: U.S. Army Corps of Engineers*
*Los Angeles District*



**FINAL**
February 2003

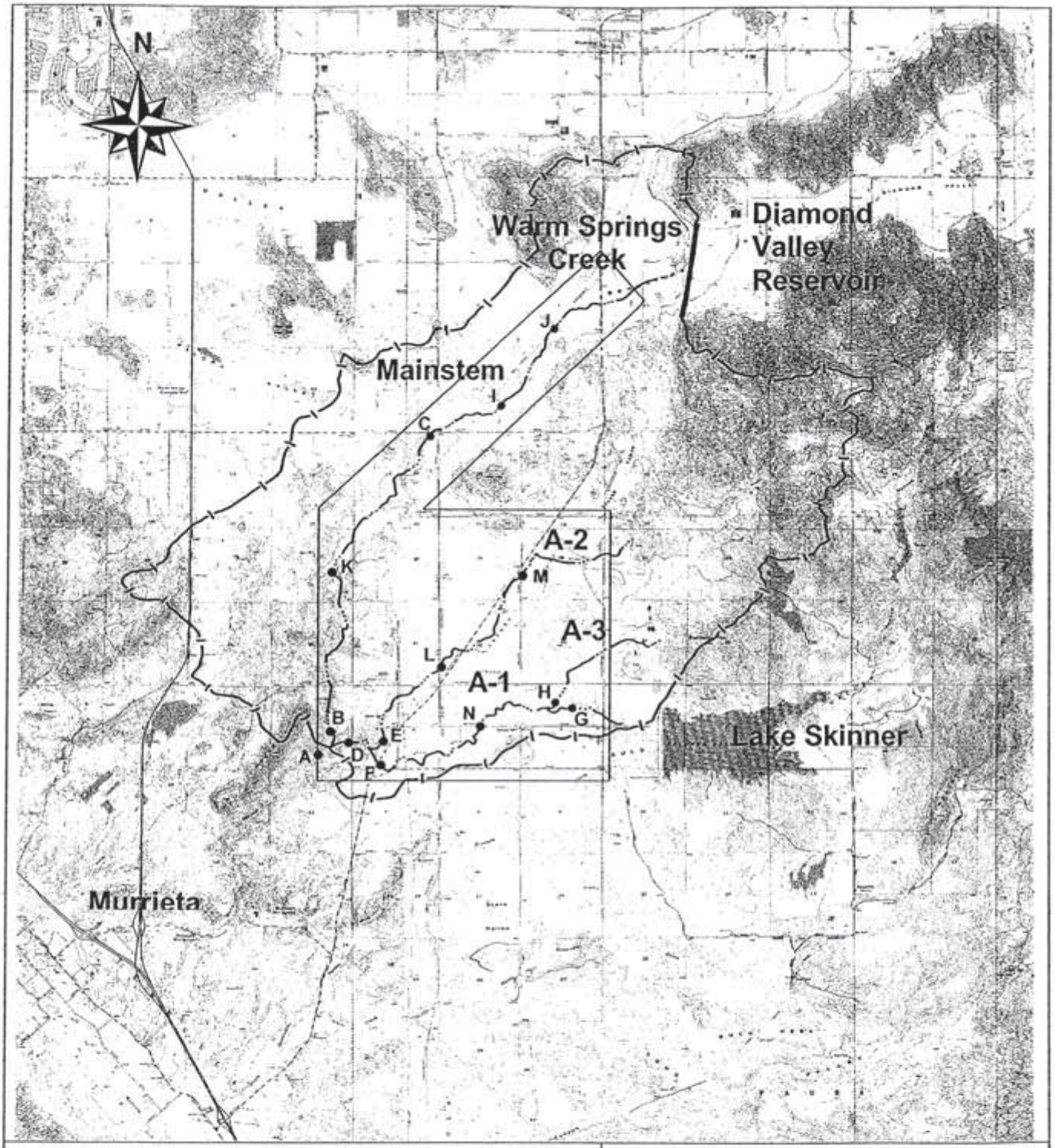
**Table 2. Peak Discharges**

| Location [Cross-section number from HEC-RAS] | Drainage Area ($mi^2$) | CP | Peak Discharge ($ft^3/s$) 10-yr | 50-yr | 100-yr | 500-yr |
|---|---|---|---|---|---|---|
| Lower Warm Springs near Calle de Amor; (downstream end of study area) [Cross-Section 0] | 36.2 | A | 5,980 | 10,200 | 12,100 | 16,500 |
| Lower Warm Springs ab Tributary A-1 [Cross-Section 2479] | 18.8 | B | 2,970 | 5,070 | 6,020 | 8,200 |
| Upper Warm Springs near Scott Road [Cross-Section 27105] | 10.1 | C | 1,670 | 2,860 | 3,390 | 4,620 |
| Tributary A-2 above Warm Springs [Cross-Section 0] | 18.2 | D | 3,010 | 5,130 | 6,080 | 8,300 |
| Tributary A-2 above Tributary A-1 [Cross-Section 3506] | 14.4 | E | 2,380 | 4,050 | 4,810 | 6,560 |
| Tributary A-1 above Tributary A-2 [Cross-Section 0] | 3.5 | F | 580 | 990 | 1,180 | 1,600 |
| Tributary A-1 above Tributary A-3 [Cross-Section 17296] | 1.0 | G | 160 | 270 | 320 | 440 |
| Tributary A-3 above Tributary A-1 [Cross-Section 0] | 1.3 | H | 220 | 370 | 440 | 600 |
| Upper Warm Springs near Pines Airpark Road [Cross-Section 33772] | 6.6 | I | 1,090 | 1,860 | 2,210 | 3,020 |
| Upper Warm Springs above Garboni Rd. [Cross-Section 40668] | 4.6 | J | 760 | 1,290 | 1,530 | 2,090 |
| Lower Warm Springs at Briggs Rd. [Cross-Section 17368] | 12.7 | K | 2,090 | 3,570 | 4,240 | 5,780 |
| Tributary A-2 at Leon Rd. [Cross-Section 11421] | 10.8 | L | 1,780 | 3,040 | 3,600 | 4,910 |
| Tributary A-2 near Pourroy Rd. [Cross-Section 20909] | 4.3 | M* | 710 | 1,210 | 1,430 | 1,960 |
| Tributary A-1 at Benton Rd. [Cross-Section 10825] | 2.8 | N | 460 | 790 | 940 | 1,280 |

Note: The terms 'Lower' and 'Upper' were included for modeling purposes only; they are not meant to reflect geographical locations.

* CP M is located near the confluence of Tributary A-2 (studied) and one of its unnamed smaller tributaries (not studied), and reflects the drainage area and discharge of Tributary A-2 only; backwater effects of Tributary A-2 along the unnamed tributary are included on the flood plain maps. The confluence of these two tributaries is about 1000 feet upstream from Pourroy Road.

See Plate 3 for CP locations.




Legend

Drainage Area Boundary
Watercourse
Study Area Boundary
Concentration Point

Not to Scale

Flood Plain Delineation Study
USACE/CDWR
Section 22 – Planning Assistance to the States Program

# Warm Springs Creek
# Riverside County, CA
# CONCENTRATION POINT LOCATIONS

Prepared by U.S. Army Corps of Engineers
February 2003 – FINAL

PLATE 3

General Investigations

US Army Corps
of Engineers

Los Angeles District

# APPENDIX II

Murrieta Creek/Temecula Creek Confluence

# A – GEOTECHNICAL ANALYSIS
# B – HYDROLOGICAL ANALYSIS
# C – HYDRAULIC ANALYSIS

SEPTEMBER 2000

Table 2. Murrieta Creek *Existing Without-Project Conditions (1998/2001)*: Peak Discharge Frequency Results[a]

| CP NO. | LOCATION | EFFECTIVE DA, mi² | 500-YR | 200-YR | 100-YR | 50-YR | 25-YR | 10-YR | 5-YR | 2-YR |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Discharges in ft³/s | | | | | | | |
| | MURRIETA CREEK | | | | | | | | | |
| 1 | Murrieta Creek at gaging station #11043000 | 222.0 | 46,000 | 37,200 | 32,600 | 27,000 | 21,500 | 14,400 | 10,000 | 4,550 |
| 2 | Murrieta Creek above Old Town Temecula | 219.4 | 46,600 | 37,800 | 33,100 | 27,400 | 21,900 | 14,800 | 10,200 | 4,600 |
| 3 | Murrieta Creek below Empire Creek (Long Canyon) above Rancho Cal. Road Bridge | 217.7 | 46,900 | 37,900 | 33,200 | 27,400 | 22,000 | 14,900 | 10,200 | 4,580 |
| 4 | Empire Creek (Long Canyon) above Murrieta Creek | 5.8 | 5,160 | 4,370 | 3,960 | 3,450 | 2,930 | 2,250 | 1,730 | 1,010 |
| 5 | Murrieta Creek above Empire Creek (Long Canyon) | 211.9 | 45,700 | 36,900 | 32,300 | 26,600 | 21,300 | 14,500 | 9,910 | 4,420 |
| 6 | Murrieta Creek below Santa Gertrudis Creek | 206.9 | 46,400 | 37,600 | 33,000 | 27,100 | 21,300 | 14,500 | 9,840 | 4,420 |
| 7 | Santa Gertrudis Creek above Murrieta Creek | 89.6 | 12,700 | 10,100 | 8,750 | 7,250 | 5,760 | 4,010 | 2,860 | 1,460 |
| 8 | Santa Gertrudis Creek below Tucalota Creek | 86.5 | 12,400 | 9,770 | 8,500 | 7,070 | 5,660 | 3,990 | 2,840 | 1,420 |
| 9 | Santa Gertrudis above Tucalota Creek | 26.0 | 9,640 | 7,960 | 7,020 | 5,890 | 4,790 | 3,460 | 2,530 | 1,320 |
| 10 | Tucalota Creek above Santa Gertrudis Creek | 60.5 | 5,040 | 3,500 | 3,020 | 2,550 | 2,070 | 1,500 | 1,100 | 570 |
| 11 | Tucalota Creek at Skinner Reservoir | 50.7 | 4,080 | 2,810 | 2,080 | 1,550 | 0 | 0 | 0 | 0 |
| 12 | Murrieta Creek above Santa Gertrudis Creek | 117.3 | 37,300 | 30,700 | 27,100 | 22,300 | 17,800 | 12,200 | 8,440 | 3,850 |
| 13 | Murrieta Creek below Warm Springs Creek | 115.6 | 38,500 | 31,600 | 28,000 | 23,400 | 18,700 | 13,100 | 9,000 | 4,190 |
| 14 | Warm Springs Creek above Murrieta Creek | 57.7[b] | 17,700 | 14,700 | 13,000 | 10,900 | 8,870 | 6,320 | 4,460 | 2,180 |
| 15 | Warm Springs Creek at Garfield Avenue | 57.7 | 17,800 | 14,900 | 13,200 | 11,100 | 9,000 | 6,370 | 4,610 | 2,190 |
| 16 | Warm Springs Creek at French Valley | 52.1 | 16,500 | 13,600 | 12,100 | 10,200 | 8,320 | 5,980 | 4,290 | 2,110 |
| 17 | Warm Springs Creek at Diamond Valley Reservoir[c] | 15.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | Murrieta Creek above Warm Springs Creek | 57.9 | 25,600 | 21,000 | 18,800 | 16,000 | 13,600 | 9,780 | 6,940 | 3,260 |
| 19 | Murrieta Creek below Guava Street | 55.3 | 25,700 | 21,000 | 18,700 | 16,000 | 13,400 | 9,820 | 7,080 | 3,310 |
| 20 | Murrieta Creek at Teneja Rd. | 32.5 | 21,000 | 17,200 | 15,200 | 12,800 | 10,400 | 7,550 | 5,630 | 2,810 |
| 21 | Murrieta Creek below Cole Canyon | 32.1 | 21,200 | 17,300 | 15,400 | 13,000 | 10,500 | 7,580 | 5,720 | 2,850 |
| 22 | Murrieta Creek below Slaughterhouse Canyon | 19.8 | 15,200 | 12,500 | 11,100 | 9,400 | 7,810 | 5,730 | 4,190 | 2,220 |
| 23 | Murrieta Creek at Clinton Keith Road | 11.5 | 10,600 | 9,000 | 8,190 | 7,030 | 5,780 | 4,160 | 3,110 | 1,660 |
| 24 | Murrieta Creek at McVicar Street | 9.5 | 9,330 | 7,860 | 7,060 | 6,110 | 5,170 | 3,920 | 2,980 | 1,620 |

[a] These are the discharge results for Preliminary Alternatives 1, 5, 6 and 7, and Final Alternatives 1 and 2.
[b] There is no additional contributing area from CP-15 to CP-14, because runoff from adjacent areas flow into Murrieta Creek, not Warm Springs Creek (Communication with RCFC&WCD).
[c] Runoff produced by 15.9 mi² subarea above Diamond Valley Reservoir was diverted out of watershed.

Table 3. Murrieta Creek *Future Without-Project Conditions* (2051): Peak Discharge Frequency Results[d]

| CP NO. | LOCATION | EFFECTIVE DA, mi² | 500-YR | 200-YR | 100-YR | 50-YR | 25-YR | 10-YR | 5-YR | 2-YR |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Discharges in ft³/s | | | | | | | |
| | MURRIETA CREEK | | | | | | | | | |
| 1 | Murrieta Creek at gaging station #11043000 | 222.0 | 50,900 | 41,900 | 37,100 | 31,500 | 25,900 | 19,000 | 14,100 | 7,600 |
| 2 | Murrieta Creek above Old Town Temecula | 219.4 | 51,400 | 42,500 | 37,600 | 32,000 | 26,300 | 19,400 | 14,300 | 7,650 |
| 3 | Murrieta Creek below Empire Creek (Long Canyon) above Rancho Cal. Road Bridge | 217.7 | 51,800 | 42,700 | 37,800 | 32,000 | 26,300 | 19,400 | 14,200 | 7,610 |
| 4 | Empire Creek (Long Canyon) above Murrieta Creek | 5.8 | 5,340 | 4,560 | 4,150 | 3,630 | 3,110 | 2,430 | 1,910 | 1,160 |
| 5 | Murrieta Creek above Empire Creek (Long Canyon) | 211.9 | 50,400 | 41,500 | 36,700 | 31,000 | 25,500 | 18,800 | 13,700 | 7,320 |
| 6 | Murrieta Creek below Santa Gertrudis Creek | 206.9 | 50,900 | 42,000 | 37,300 | 31,500 | 25,700 | 18,600 | 13,600 | 7,170 |
| 7 | Santa Gertrudis Creek above Murrieta Creek | 89.6 | 13,800 | 11,100 | 9,810 | 8,290 | 6,790 | 4,960 | 3,680 | 2,030 |
| 8 | Santa Gertrudis Creek below Tucalota Creek | 86.5 | 13,100 | 10,500 | 9,210 | 7,760 | 6,340 | 4,620 | 3,410 | 1,850 |
| 9 | Santa Gertrudis above Tucalota Creek | 26.0 | 9,730 | 8,050 | 7,110 | 5,980 | 4,880 | 3,540 | 2,600 | 1,380 |
| 10 | Tucalota Creek above Santa Gertrudis Creek | 60.5 | 5,680 | 4,140 | 3,630 | 3,150 | 2,650 | 2,050 | 1,600 | 960 |
| 11 | Tucalota Creek at Skinner Reservoir | 50.7 | 4,080 | 2,810 | 2,080 | 1,550 | 0 | 0 | 0 | 0 |
| 12 | Murrieta Creek above Santa Gertrudis Creek | 117.3 | 40,700 | 34,000 | 30,300 | 26,000 | 21,100 | 15,500 | 11,300 | 6,050 |
| 13 | Murrieta Creek below Warm Springs Creek | 115.6 | 41,700 | 34,700 | 31,000 | 26,600 | 21,800 | 16,000 | 11,800 | 6,190 |
| 14 | Warm Springs Creek above Murrieta Creek | 57.7[e] | 18,900 | 16,000 | 14,200 | 12,100 | 10,100 | 7,460 | 5,530 | 3,010 |
| 15 | Warm Springs Creek at Garfield Avenue | 57.7 | 18,900 | 16,100 | 14,500 | 12,300 | 10,200 | 7,500 | 5,600 | 3,030 |
| 16 | Warm Springs Creek at French Valley | 52.1 | 17,600 | 14,800 | 13,200 | 11,300 | 9,390 | 6,990 | 5,220 | 2,850 |
| 17 | Warm Springs Creek at Diamond Valley Reservoir[f] | 15.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | Murrieta Creek above Warm Springs Creek | 57.9 | 27,700 | 22,800 | 20,400 | 17,700 | 14,900 | 11,600 | 8,710 | 4,560 |
| 19 | Murrieta Creek below Guava Street | 55.3 | 27,400 | 22,600 | 20,200 | 17,400 | 14,700 | 11,300 | 8,500 | 4,530 |
| 20 | Murrieta Creek at Teneja Rd. | 32.5 | 21,900 | 18,100 | 16,100 | 13,600 | 11,300 | 8,330 | 6,340 | 3,440 |
| 21 | Murrieta Creek below Cole Canyon | 32.1 | 22,100 | 18,100 | 16,200 | 13,800 | 11,400 | 8,330 | 6,380 | 3,430 |
| 22 | Murrieta Creek below Slaughterhouse Canyon | 19.8 | 15,800 | 13,100 | 11,600 | 9,900 | 8,290 | 6,200 | 4,630 | 2,560 |
| 23 | Murrieta Creek at Clinton Keith Road | 11.5 | 10,800 | 9,220 | 8,420 | 7,280 | 6,050 | 4,430 | 3,320 | 1,850 |
| 24 | Murrieta Creek at McVicar Street | 9.5 | 9,520 | 8,050 | 7,260 | 6,310 | 5,360 | 4,110 | 3,160 | 1,770 |

[d] These are the discharge results for Preliminary Alternatives 1, 5, 6 and 7, and Final Alternatives 1 and 2.
[e] There is no additional contributing area from CP-15 to CP-14, because runoff from adjacent areas flow into Murrieta Creek, not Warm Springs Creek (Communication with RCFC&WCD).
[f] Runoff produced by 15.9 mi² subarea above Diamond Valley Reservoir was diverted out of watershed.

# COUNTY OF RIVERSIDE

*TRANSPORTATION AND*
*LAND MANAGEMENT AGENCY*

## Planning Department

*[illegible]ard K. Lashbrook*
*gency Director*

*Aleta J. Laurence, A.I.C.P.*
*Planning Director*

June 27, 2001

Building and Safety Department – Grading Division – Tony Harmon
Planning and Land Use (2nd Floor) – Mark Balys
Planning and Land Use (Murrieta Office) – Dave Mares (2 copies)
County Parks and Recreation Department – Kim Johnson
Department of Environmental Health – Greg Dellenbach
County Fire Department – Dan Wagner
County Flood Control and Water Quality District – Stuart McKibbin
Transportation Department – Russ Garrett.
Clerk of the Board of Supervisors – Nancy Romero
Central Files – Rose Keathley (3 copies)
City of Temecula
City of Murrieta

**RE: Specific Plan 312 (French Valley)**

Attached are the final Specific Plan/Environmental Impact Report documents as adopted by the Board of Supervisors for the above-listed project. Please discard all prior copies of the documents of this specific plan. One copy will be placed in central files, and two copies are to be placed in storage.

Should you have any questions, please give me a call at (909) 955-9076.

RIVERSIDE COUNTY PLANNING DEPARTMENT
Aleta J. Laurence, A.I.C.P., Planning Director

Keith E Gardner

Keith Gardner, Senior Planner

RECEIVED
JUL 02 2001
[illegible] AND [illegible] CONTROL
[illegible] CONSERVATION DISTRICT
[illegible] SECTION

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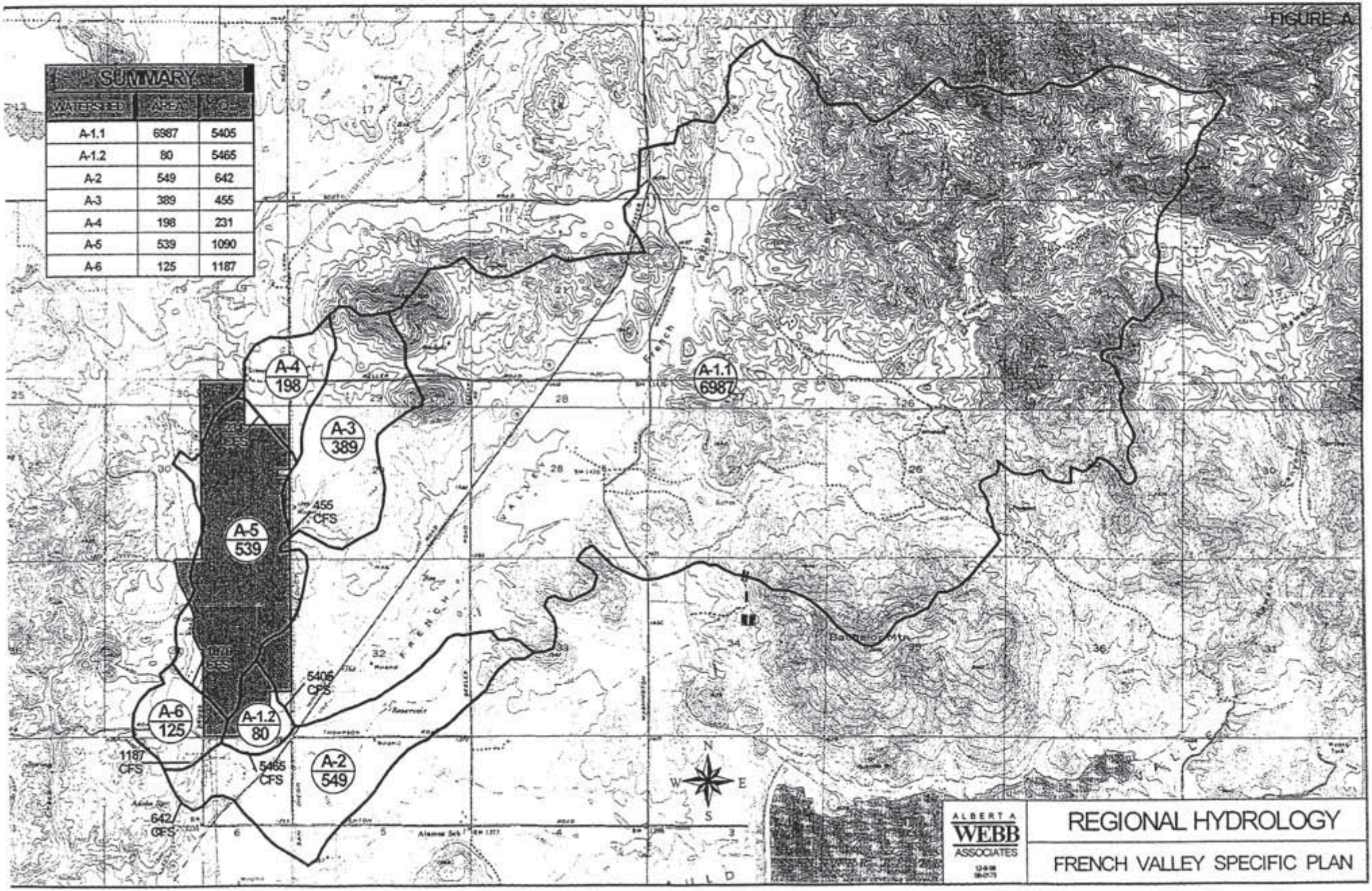
[illegible]verside Office· 4080 Lemon Street, 9th Floor
[illegible]. Box 1409· Riverside, California 92502-1409
[illegible]) 955-3200 · Fax (909) 955-3157

Indio Office· 82-675 Hwy 111, 2nd Floor
Room 209, Indio, California 92201
(760) 863-8277 · Fax (760) 863-7040

Murrieta Office· 39493 Los Alamos Rd.
Murrieta, California 92563
(909) 600-6170 · Fax (909) 600-6145

FIGURE A

| SUMMARY | | |
|---|---|---|
| WATERSHED | AREA | Q100 |
| A-1.1 | 6987 | 5405 |
| A-1.2 | 80 | 5465 |
| A-2 | 549 | 642 |
| A-3 | 389 | 455 |
| A-4 | 198 | 231 |
| A-5 | 539 | 1090 |
| A-6 | 125 | 1187 |




ALBERT A WEBB ASSOCIATES

# REGIONAL HYDROLOGY

## FRENCH VALLEY SPECIFIC PLAN

# APPENDIX B
# Hydraulic Output --
# Warm Springs Creek

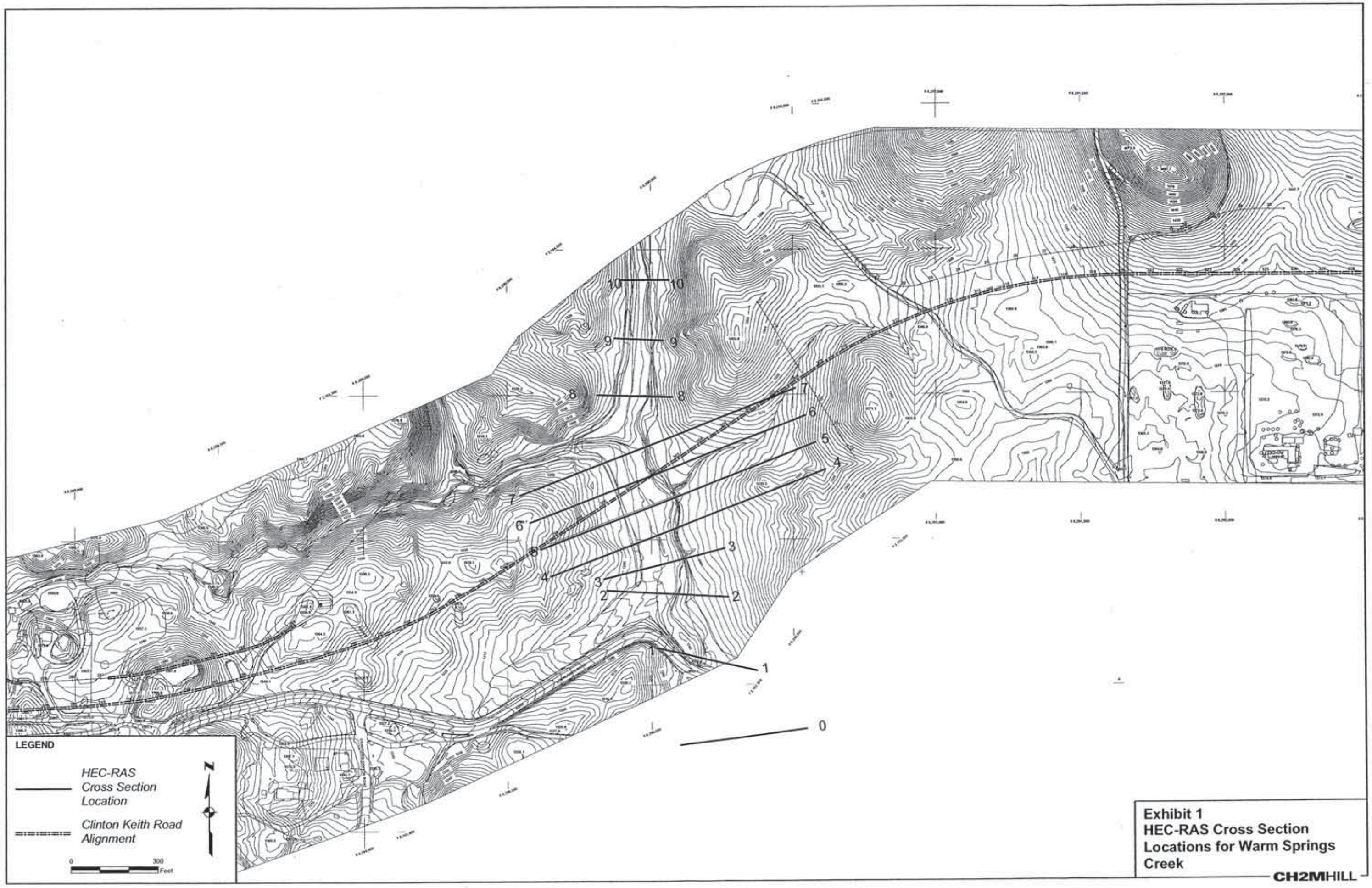
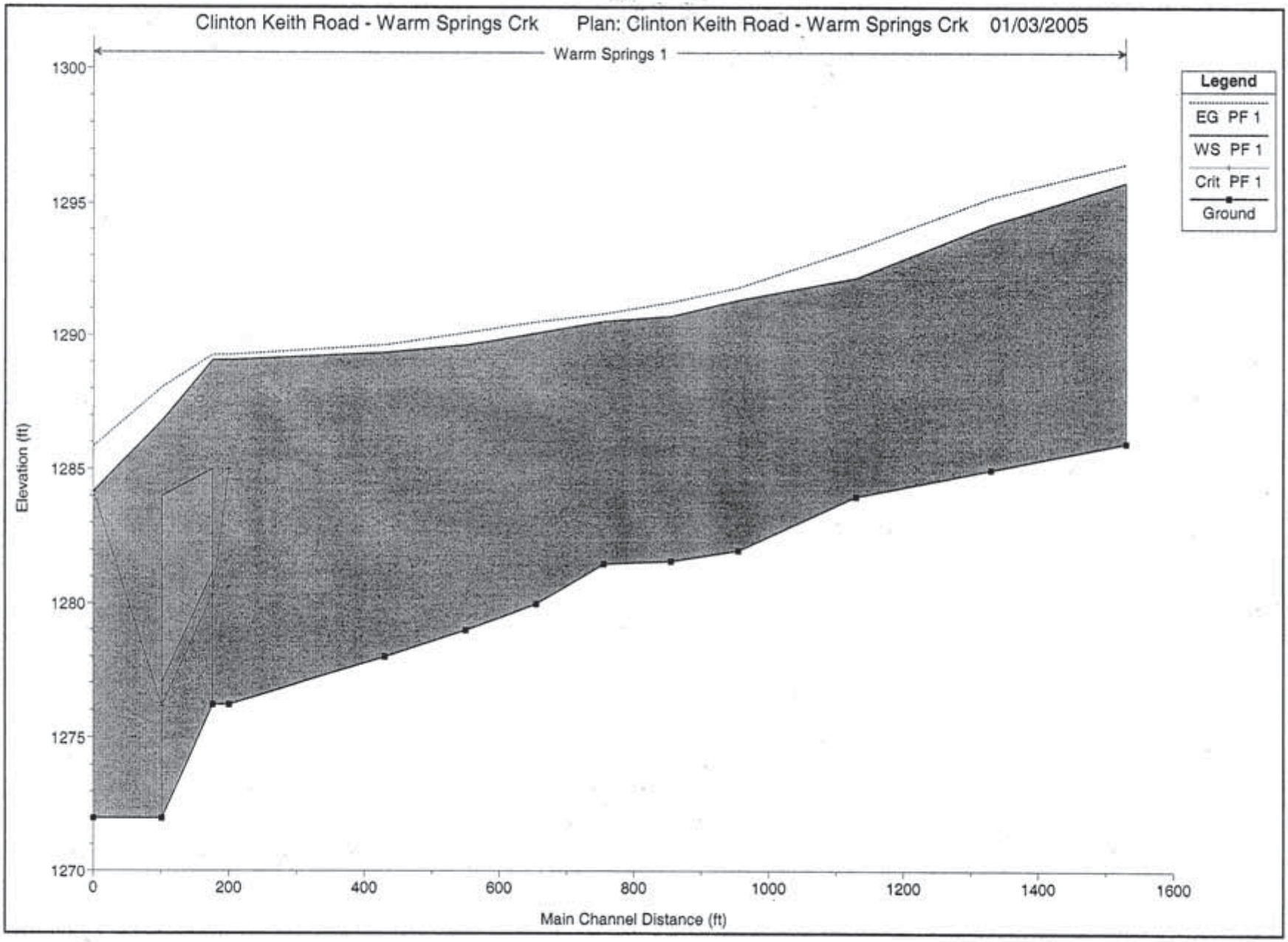


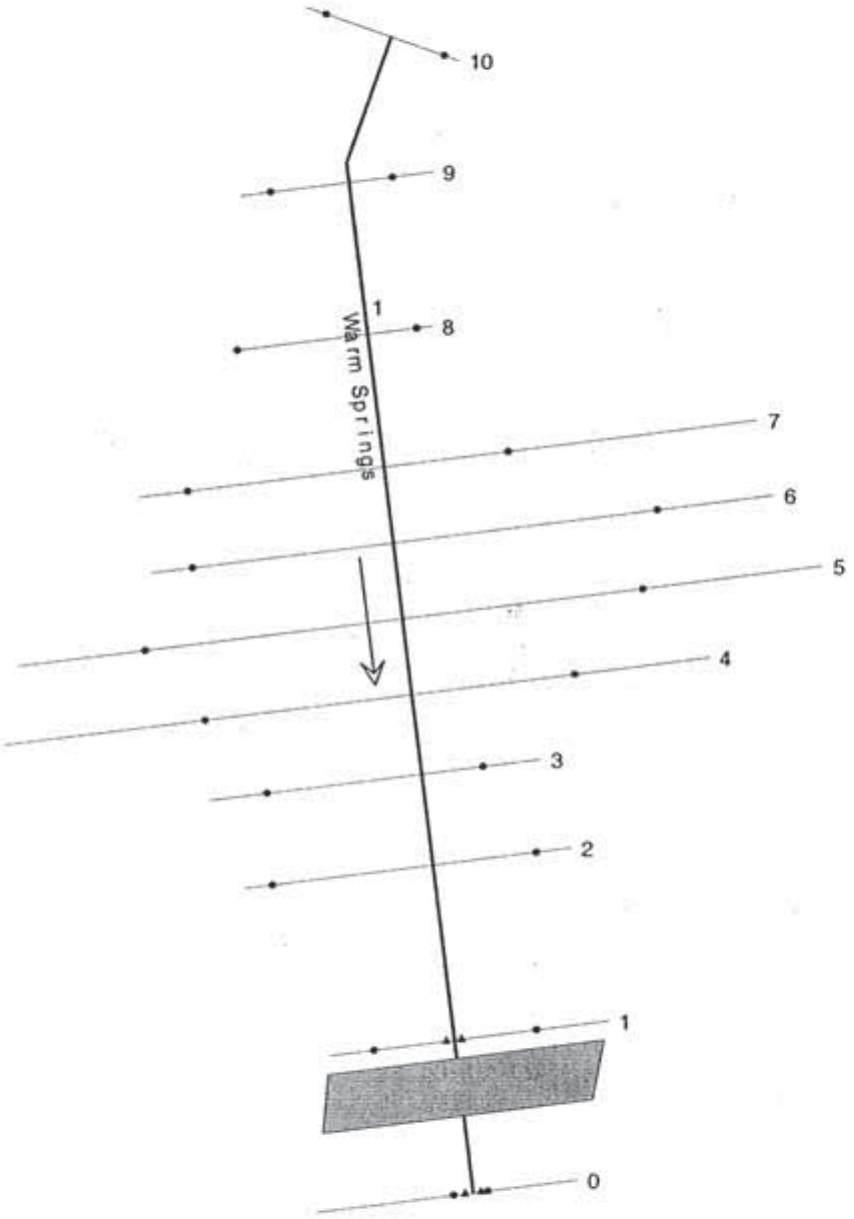

**Exhibit 1**
**HEC-RAS Cross Section Locations for Warm Springs Creek**

CH2MHILL

LAS \\Elvis\PROJ\WBG\Clinton_Keith_Road\mxd\hecras1.mxd 01/04/05




Warm Springs - Existing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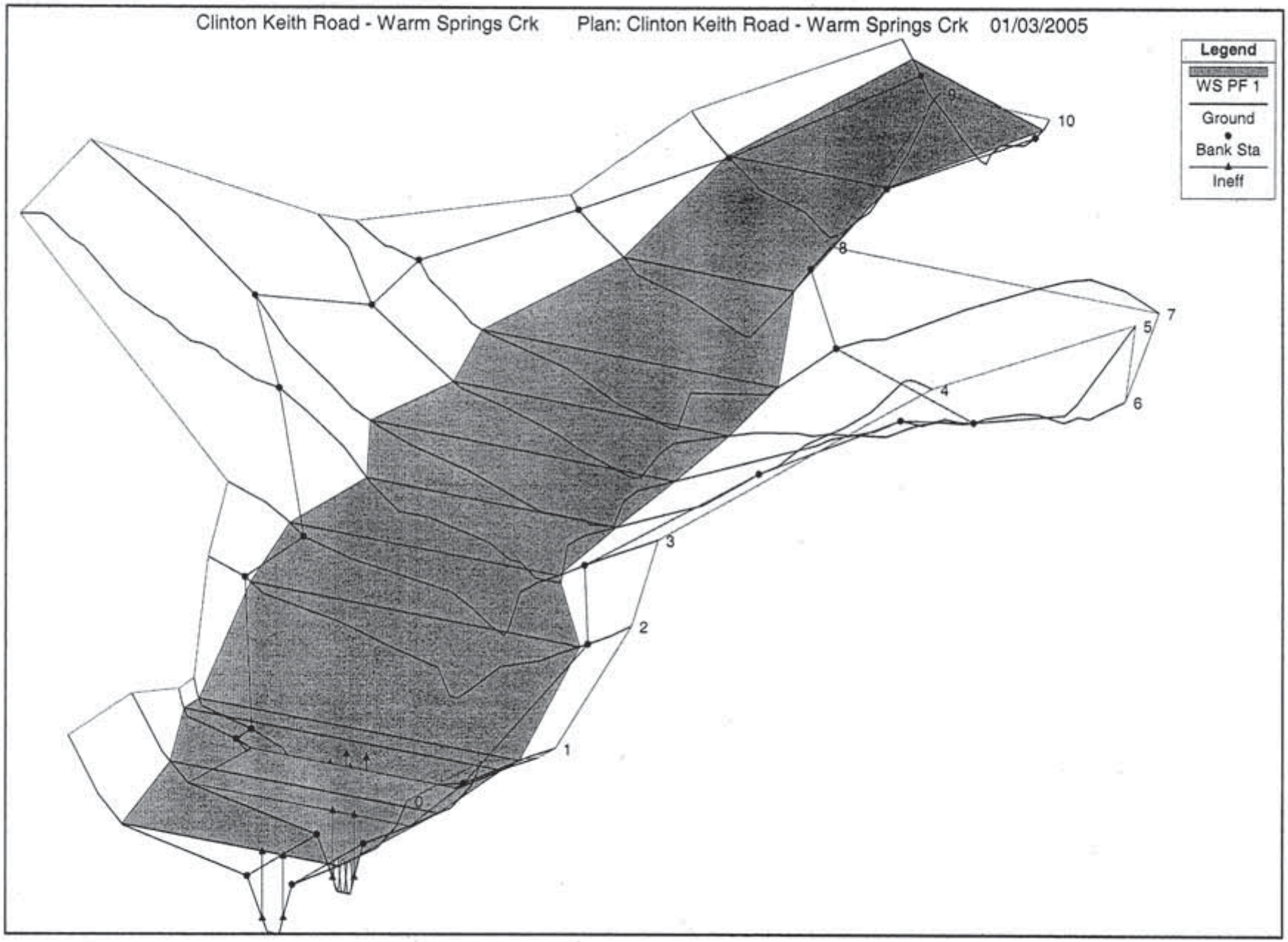
9
1
8
Warm Springs
7
6
5
4
3
2
1
0

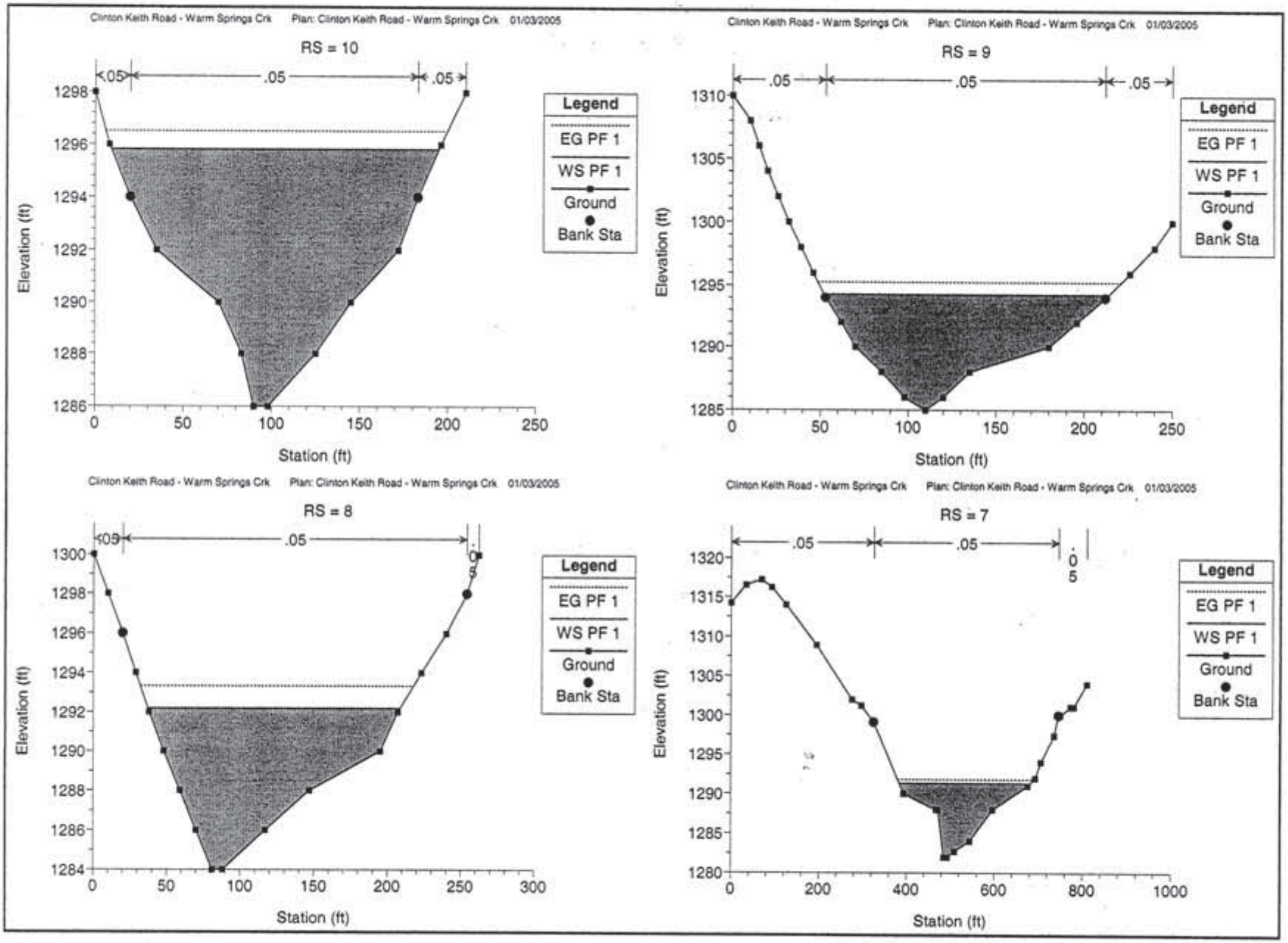

Clinton Keith Road - Warm Springs Crk
Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
Legend
WS PF 1
Ground
Bank Sta
Ineff
0
1
2
3
4
5
6
7
8
9
10

HEC-RAS Plan: Clinton3 River: Warm Springs Reach: 1 Profile: PF 1

| Reach | River Sta | Profile | Q Total | Cum Ch Len | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| 1 | 10 | PF 1 | 6600.00 | 1530.00 | 1286.00 | 1295.82 | | 1296.52 | 0.004744 | 6.72 | 996.85 | 185.78 | 0.48 |
| 1 | 9 | PF 1 | 6600.00 | 1330.00 | 1285.00 | 1294.25 | | 1295.26 | 0.008322 | 8.05 | 820.26 | 161.64 | 0.62 |
| 1 | 8 | PF 1 | 6600.00 | 1130.00 | 1284.00 | 1292.20 | | 1293.33 | 0.011166 | 8.54 | 773.25 | 171.44 | 0.71 |
| 1 | 7 | PF 1 | 6600.00 | 955.00 | 1282.00 | 1291.36 | | 1291.82 | 0.005321 | 5.48 | 1205.02 | 298.37 | 0.48 |
| 1 | 6 | PF 1 | 6600.00 | 855.00 | 1281.60 | 1290.74 | | 1291.26 | 0.005792 | 5.79 | 1140.84 | 277.98 | 0.50 |
| 1 | 5 | PF 1 | 6600.00 | 755.00 | 1281.50 | 1290.54 | | 1290.83 | 0.002481 | 4.31 | 1531.66 | 307.09 | 0.34 |
| 1 | 4 | PF 1 | 6600.00 | 655.00 | 1280.00 | 1290.10 | | 1290.52 | 0.003591 | 5.20 | 1269.72 | 251.68 | 0.41 |
| 1 | 3 | PF 1 | 6600.00 | 550.00 | 1279.00 | 1289.66 | | 1290.11 | 0.004216 | 5.41 | 1227.31 | 270.79 | 0.44 |
| 1 | 2 | PF 1 | 6600.00 | 430.00 | 1278.00 | 1289.37 | | 1289.66 | 0.002727 | 4.30 | 1534.50 | 331.17 | 0.35 |
| 1 | 1 | PF 1 | 6600.00 | 200.00 | 1276.20 | 1289.08 | 1285.01 | 1289.28 | 0.000996 | 3.70 | 1924.05 | 321.51 | 0.23 |
| 1 | .25 | | Culvert | | | | | | | | | | |
| 1 | 0 | PF 1 | 6600.00 | | 1272.00 | 1284.16 | 1284.16 | 1285.85 | 0.009148 | 11.80 | 780.11 | 217.56 | 0.69 |

Plan: Clinton3 Warm Springs 1 RS: .25 Culv Group: Culvert #1 Profile: PF 1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 635.24 | Culv Full Len (ft) | 75.00 |
| # Barrels | 3 | Culv Vel US (ft/s) | 10.78 |
| Q Barrel (cfs) | 211.75 | Culv Vel DS (ft/s) | 10.78 |
| E.G. US. (ft) | 1289.28 | Culv Inv El Up (ft) | 1276.20 |
| W.S. US. (ft) | 1289.08 | Culv Inv El Dn (ft) | 1272.00 |
| E.G. DS (ft) | 1285.85 | Culv Frctn Ls (ft) | 1.69 |
| W.S. DS (ft) | 1284.16 | Culv Exit Loss (ft) | 0.12 |
| Delta EG (ft) | 3.43 | Culv Entr Loss (ft) | 1.63 |
| Delta WS (ft) | 4.92 | Q Weir (cfs) | 5964.76 |
| E.G. IC (ft) | 1289.20 | Weir Sta Lft (ft) | 33.96 |
| E.G. OC (ft) | 1289.28 | Weir Sta Rgt (ft) | 358.19 |
| Culvert Control | Outlet | Weir Submerg | 0.00 |
| Culv WS Inlet (ft) | 1281.20 | Weir Max Depth (ft) | 4.28 |
| Culv WS Outlet (ft) | 1277.00 | Weir Avg Depth (ft) | 3.60 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 1166.51 |
| Culv Crt Depth (ft) | 4.14 | Min El Weir Flow (ft) | 1285.01 |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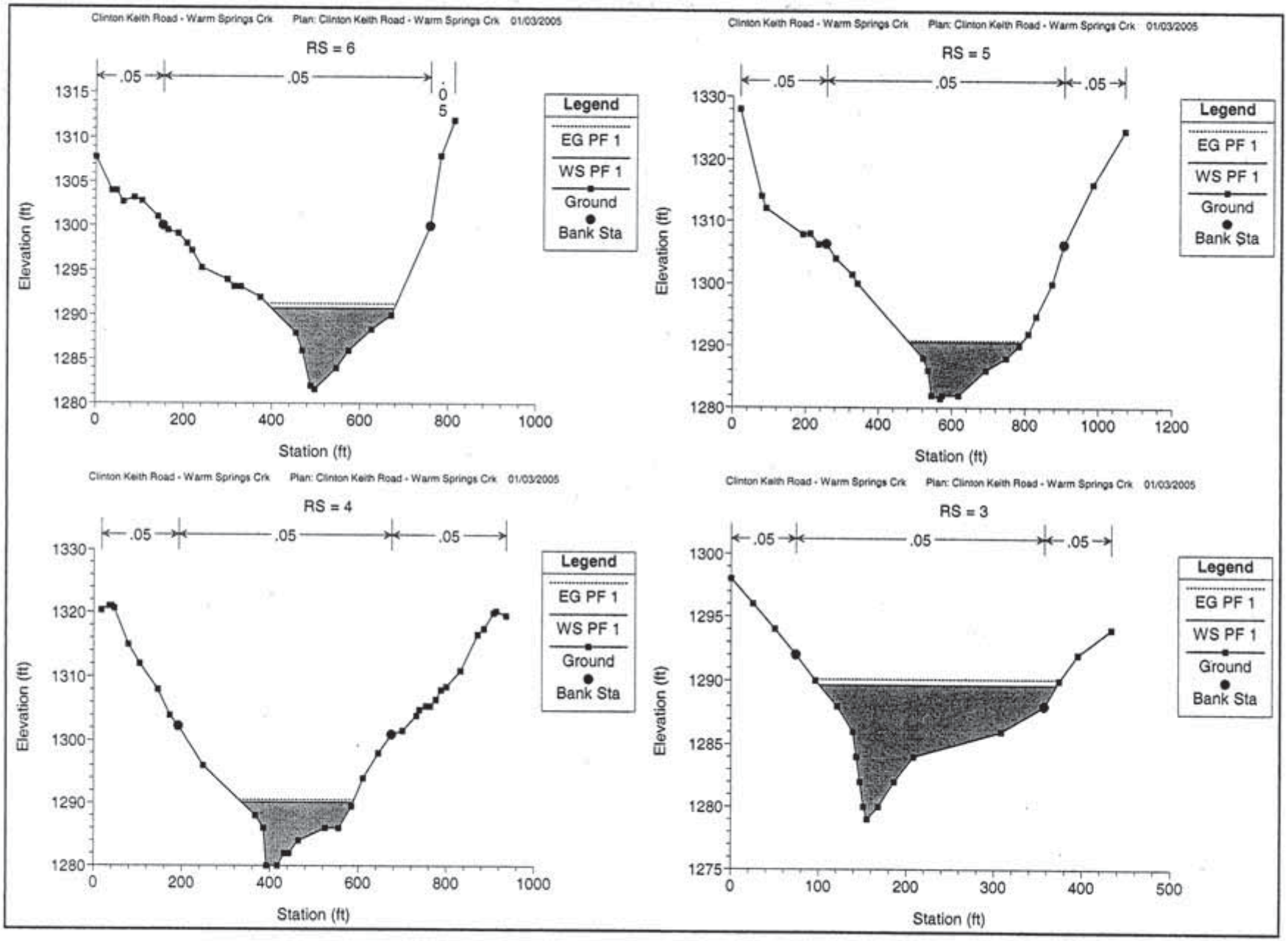
RS = 10
.05
.05
.05
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 9
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 8
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 7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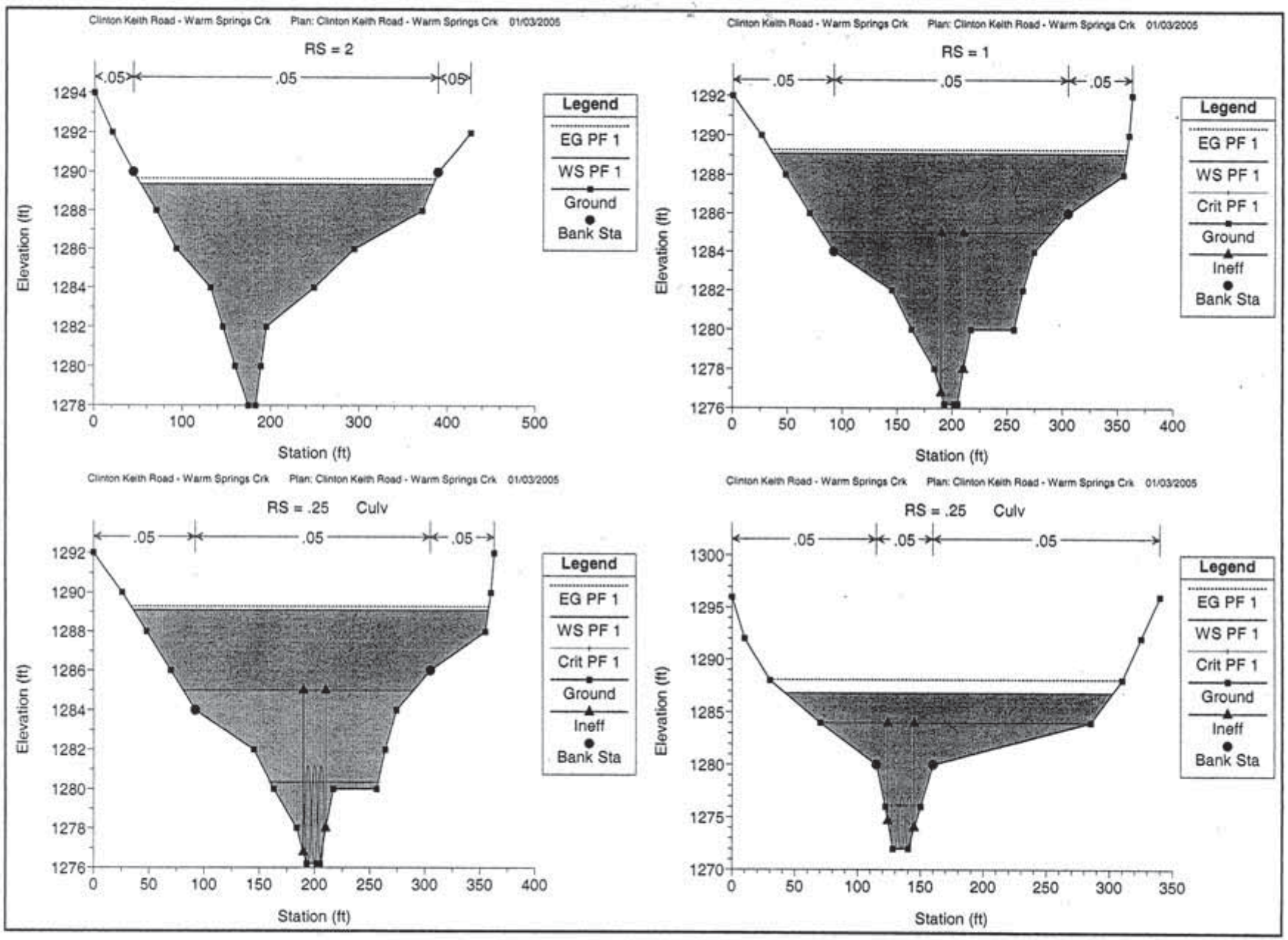
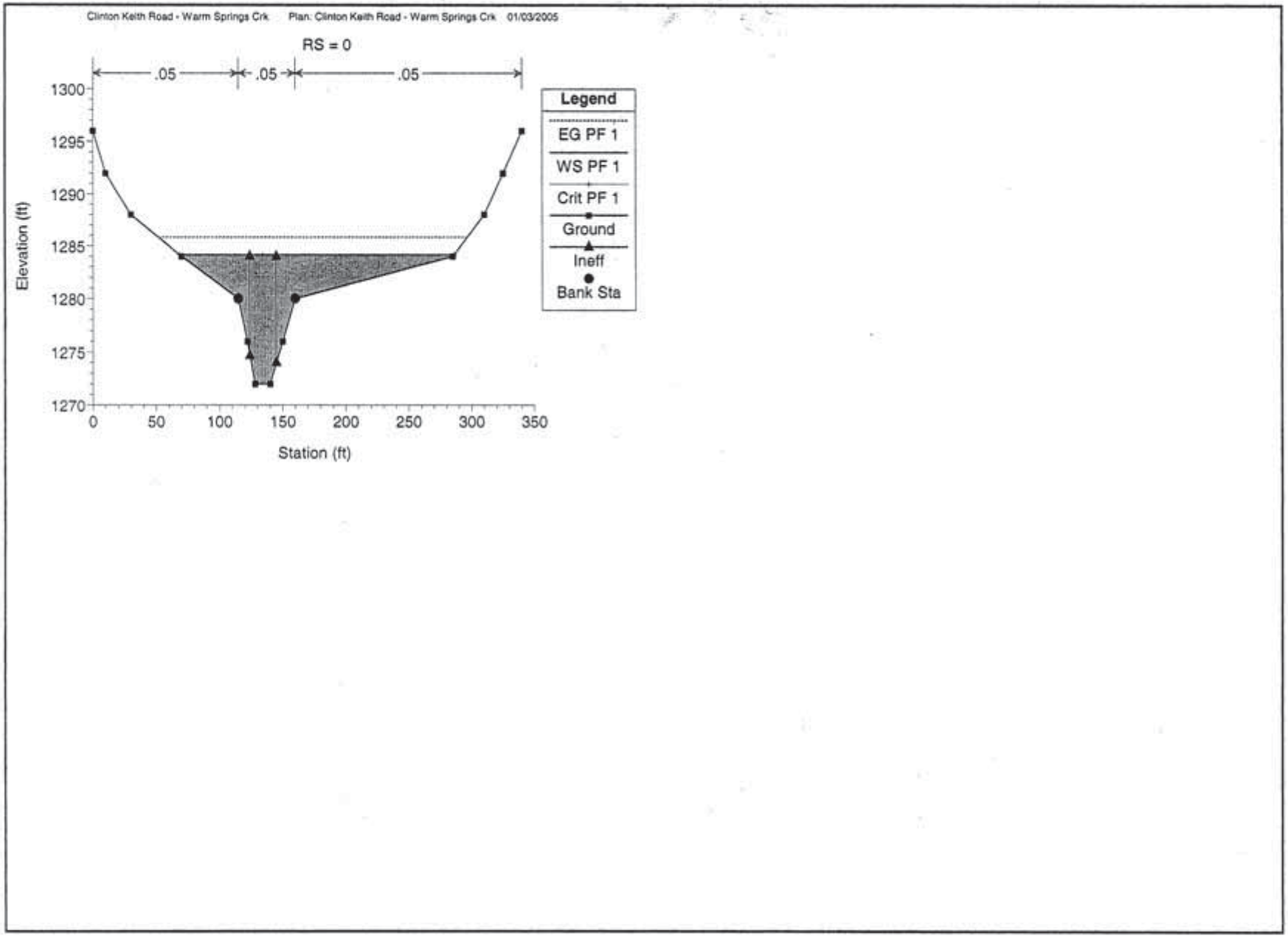
.05
.05
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 5
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 4
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 3
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 2
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = .25 Culv
Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
RS = .25 Culv


Clinton Keith Road - Warm Springs Crk Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
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.05
.05
Elevation (ft)
1300
1295
1290
1285
1280
1275
1270
0
50
100
150
200
250
300
350
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 08 | Riv | | | | |

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — CIVIL — STATE OF CALIFORNIA

*The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.*

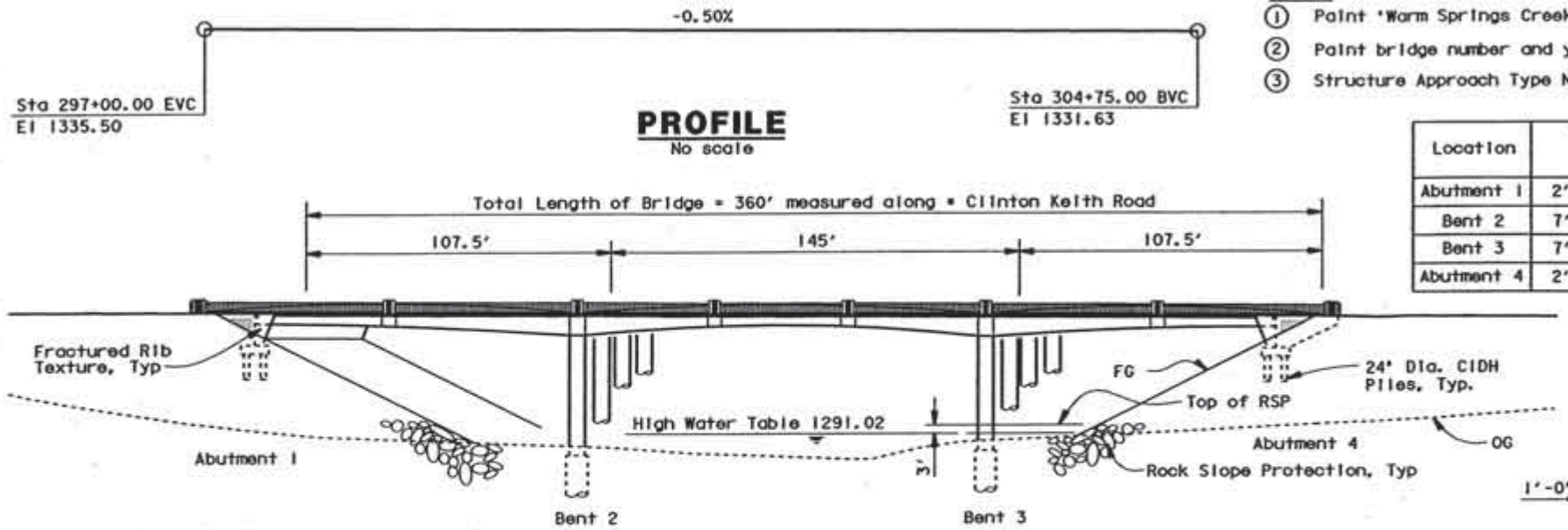

**COUNTY OF RIVERSIDE**
4080 LEMON STREET
RIVERSIDE, CA 92502

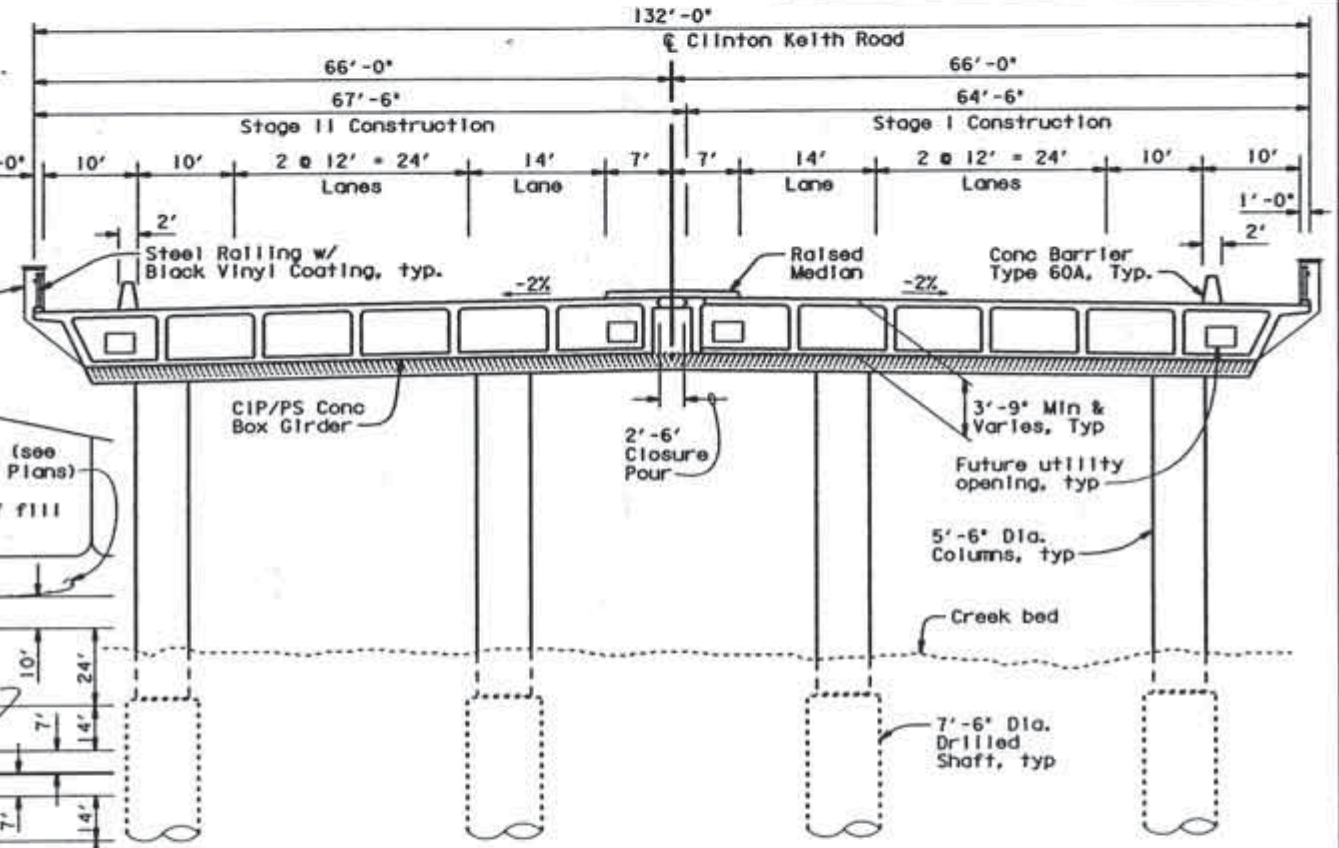
**CH2MHILL**
3 HUTTON CENTRE DRIVE, SUITE 200
SANTA ANA, CALIFORNIA 92707


LEGEND:
1. Paint "Warm Springs Creek Bridge"
2. Paint bridge number and year constructed
3. Structure Approach Type N(30S)

## PILE DATA TABLE

| Location | Pile Type | Design Loading (Service) | Nominal Resistance Compression | Nominal Resistance Tension | Design Tip Elevation | Specified Tip Elevation |
|---|---|---|---|---|---|---|
| Abutment 1 | 2'-0" CIDH | | | | | |
| Bent 2 | 7'-6" CIDH | | | | | |
| Bent 3 | 7'-6" CIDH | | | | | |
| Abutment 4 | 2'-0" CIDH | | | | | |




**TYPICAL SECTION**
1"=10'

**ELEVATION**
**STEEL RAILING WITH CONCRETE PILASTER ALTERNATIVE**
NO SCALE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DESIGN OVERSIGHT | DESIGN | BY A. SALAMA | CHECKED | LOAD FACTOR DESIGN | LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD | | |
| | DETAILS | BY E. MAECHLER | CHECKED | LAYOUT | BY | CHECKED | |
| DN OFF DATE | QUANTITIES | BY | CHECKED | SPECIFICATIONS | BY | PLANS AND SPECS COMPARED | |

IGN GENERAL PLAN SHEET (ENGLISH) (REV. 5/9/00)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS: 0 1 2 3

**PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION**

AYMAN SALAMA
PROJECT ENGINEER

CU
EA

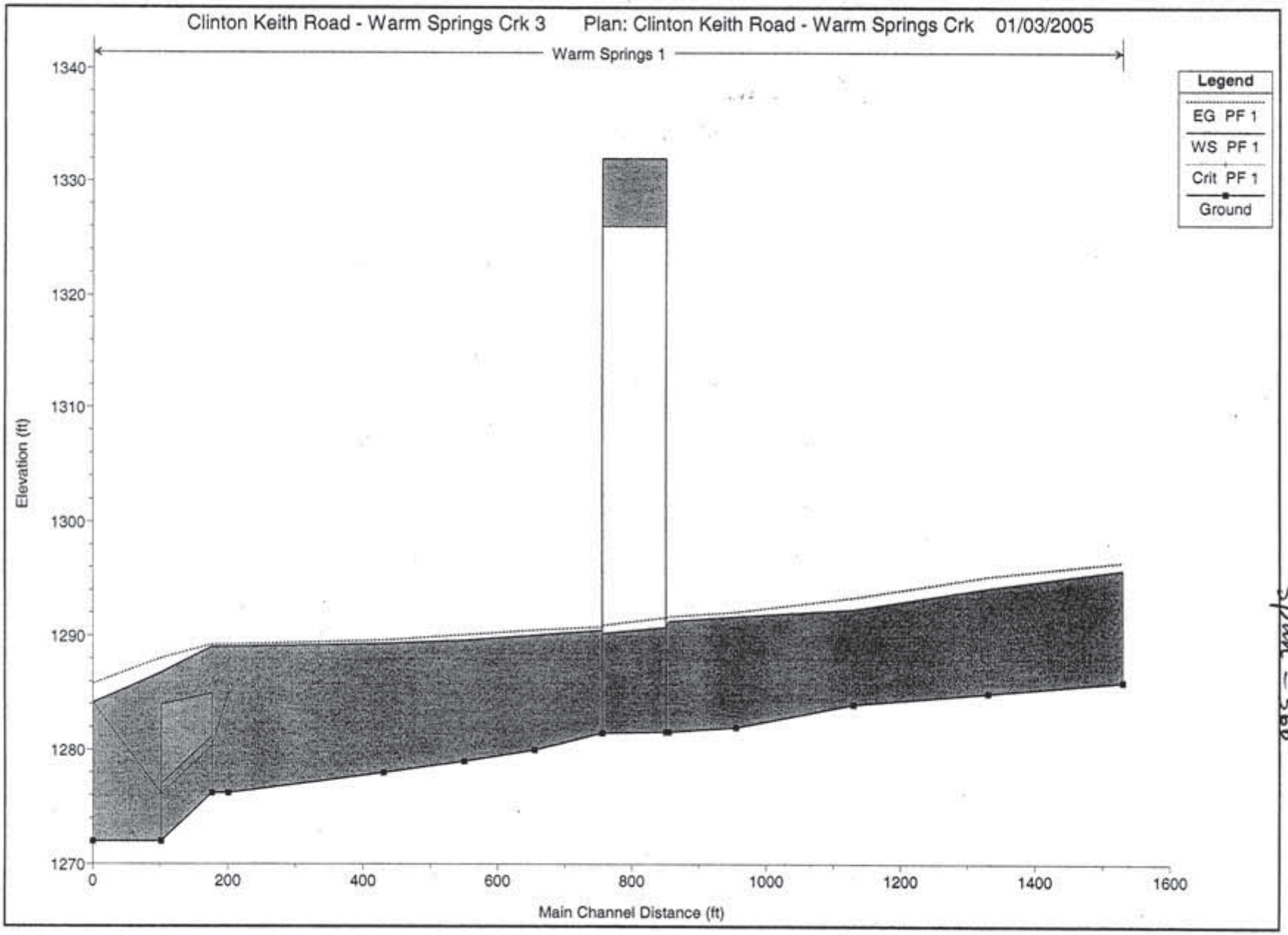
| BRIDGE NO. | WARM SPRINGS CREEK BRIDGE |
|---|---|
| M 8415 | GENERAL PLAN |
| POST MILES | |

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

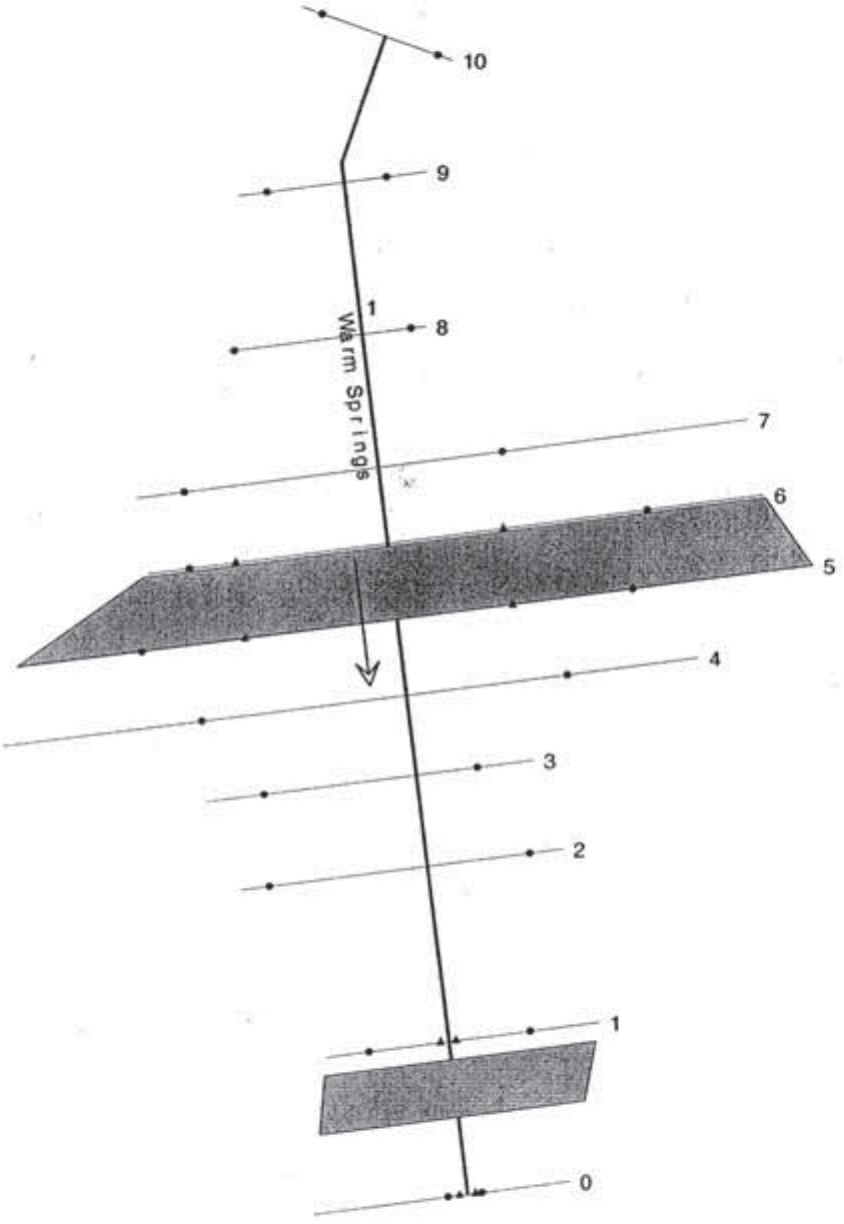
REVISION DATES (PRELIMINARY STAGE ONLY)

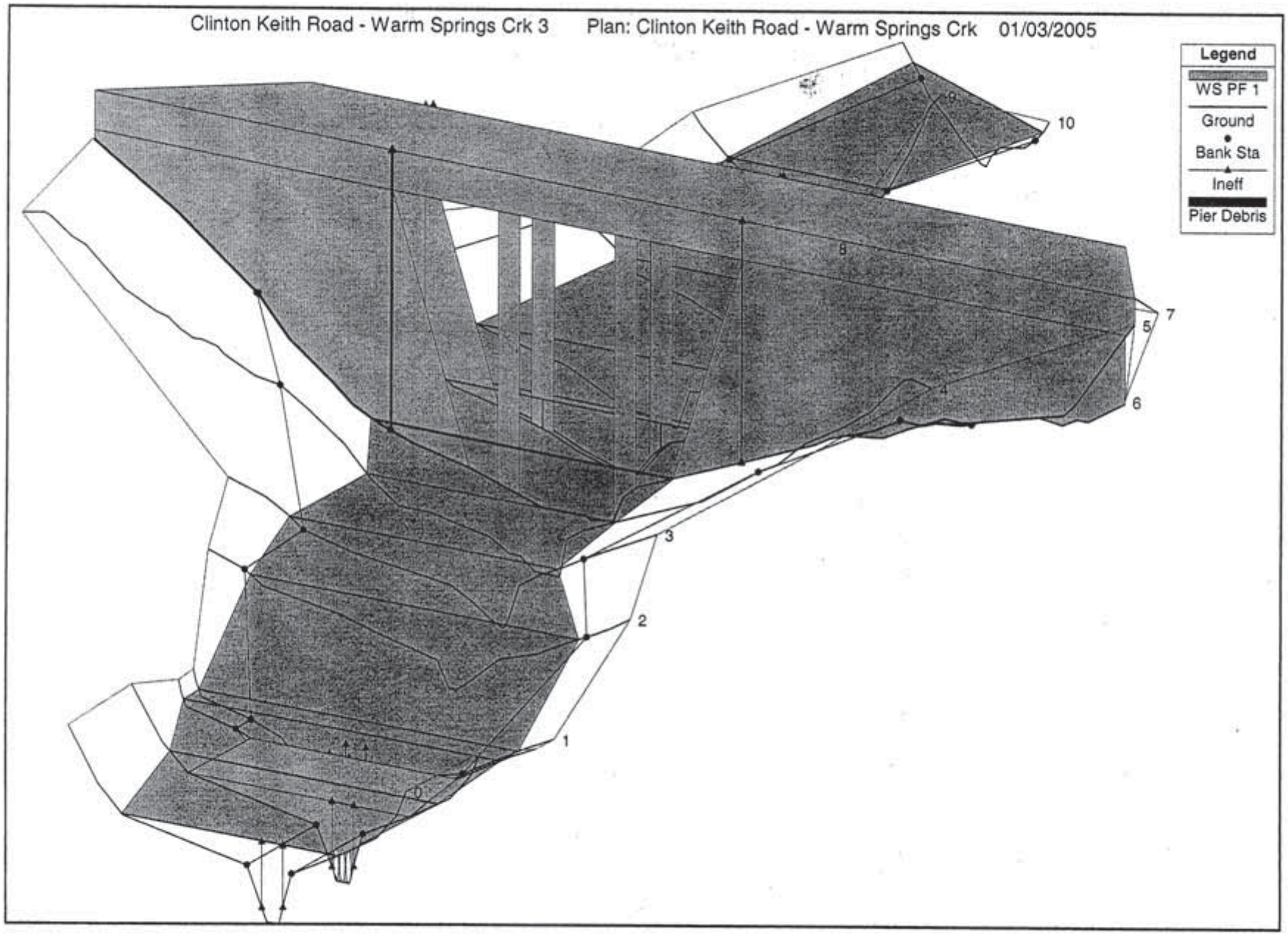
SHEET OF

USERNAME -> @USER DATE PLOTTED -> @DATE TIME PLOTTED -> @TIME




Warm Springs – Proposed
Span = 360'


10
9
1
8
Warm Springs
7
6
5
4
3
2
1
0


Clinton Keith Road - Warm Springs Crk 3
Plan: Clinton Keith Road - Warm Springs Crk 01/03/2005
Legend
WS PF 1
Ground
Bank Sta
Ineff
Pier Debris
10
9
8
7
5
6
4
3
2
1
0

HEC-RAS Plan: Clinton Keit River: Warm Springs Reach: 1 Profile: PF 1

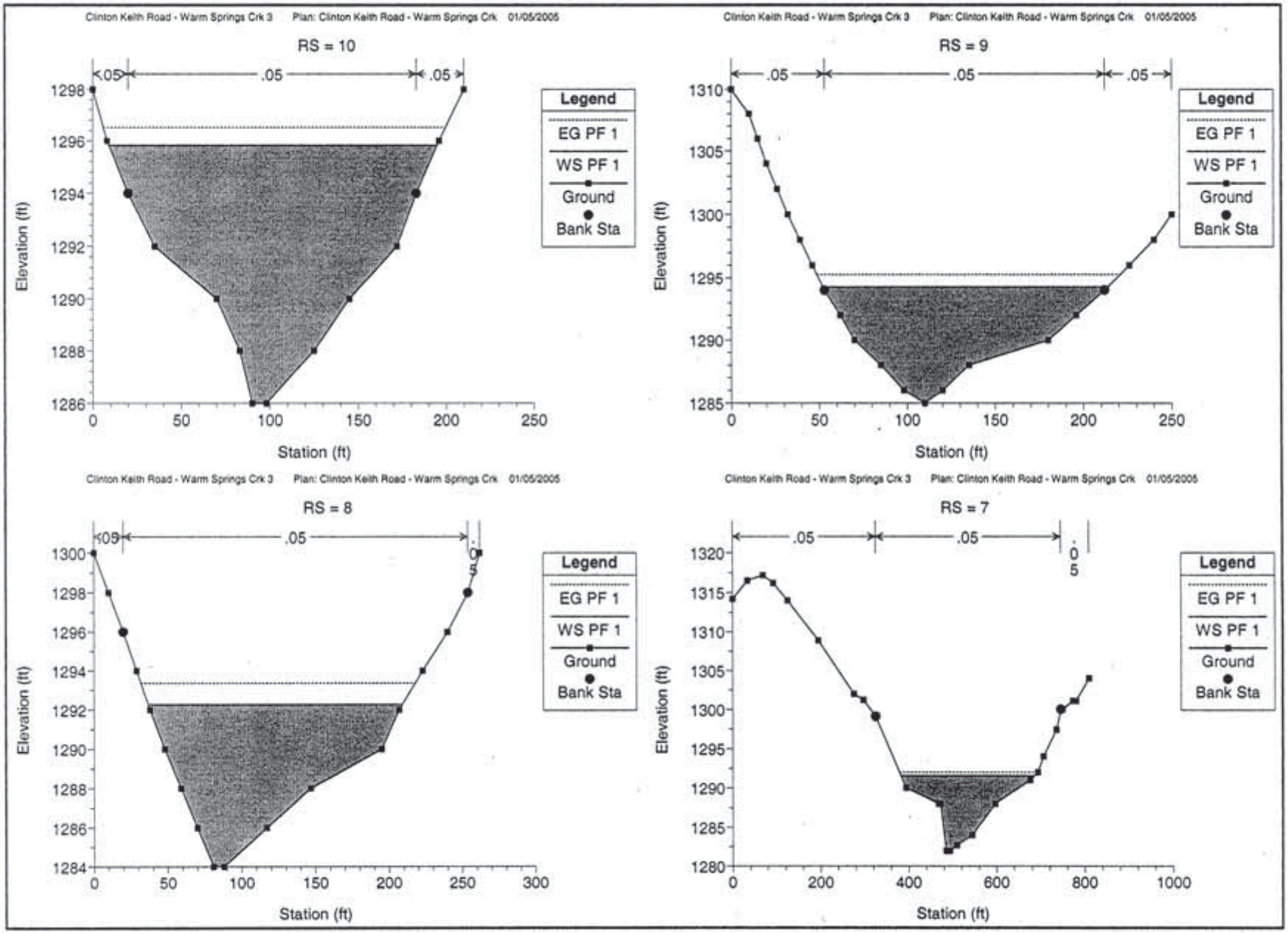
| Reach | River Sta | Profile | Q Total | Cum Ch Len | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| 1 | 10 | PF 1 | 6600.00 | 1530.00 | 1286.00 | 1295.82 | | 1296.52 | 0.004747 | 6.72 | 996.65 | 185.77 | 0.48 |
| 1 | 9 | PF 1 | 6600.00 | 1330.00 | 1285.00 | 1294.25 | | 1295.25 | 0.008351 | 8.06 | 819.39 | 161.58 | 0.63 |
| 1 | 8 | PF 1 | 6600.00 | 1130.00 | 1284.00 | 1292.26 | | 1293.36 | 0.010706 | 8.41 | 784.57 | 172.27 | 0.69 |
| 1 | 7 | PF 1 | 6600.00 | 955.00 | 1282.00 | 1291.55 | | 1291.98 | 0.004634 | 5.22 | 1264.13 | 303.20 | 0.45 |
| 1 | 6 | PF 1 | 6600.00 | 855.00 | 1281.60 | 1291.02 | 1288.68 | 1291.49 | 0.005033 | 5.53 | 1194.14 | 280.43 | 0.47 |
| 1 | 5.5 | | Bridge | | | | | | | | | | |
| 1 | 5 | PF 1 | 6600.00 | 755.00 | 1281.50 | 1290.52 | 1287.03 | 1290.83 | 0.002462 | 4.45 | 1482.77 | 300.59 | 0.34 |
| 1 | 4 | PF 1 | 6600.00 | 655.00 | 1280.00 | 1290.10 | | 1290.52 | 0.003591 | 5.20 | 1269.72 | 251.68 | 0.41 |
| 1 | 3 | PF 1 | 6600.00 | 550.00 | 1279.00 | 1289.66 | | 1290.11 | 0.004216 | 5.41 | 1227.31 | 270.79 | 0.44 |
| 1 | 2 | PF 1 | 6600.00 | 430.00 | 1278.00 | 1289.37 | | 1289.66 | 0.002727 | 4.30 | 1534.50 | 331.17 | 0.35 |
| 1 | 1 | PF 1 | 6600.00 | 200.00 | 1276.20 | 1289.08 | 1285.01 | 1289.28 | 0.000996 | 3.70 | 1924.05 | 321.51 | 0.23 |
| 1 | .25 | | Culvert | | | | | | | | | | |
| 1 | 0 | PF 1 | 6600.00 | | 1272.00 | 1284.16 | 1284.16 | 1285.85 | 0.009148 | 11.80 | 780.11 | 217.56 | 0.69 |

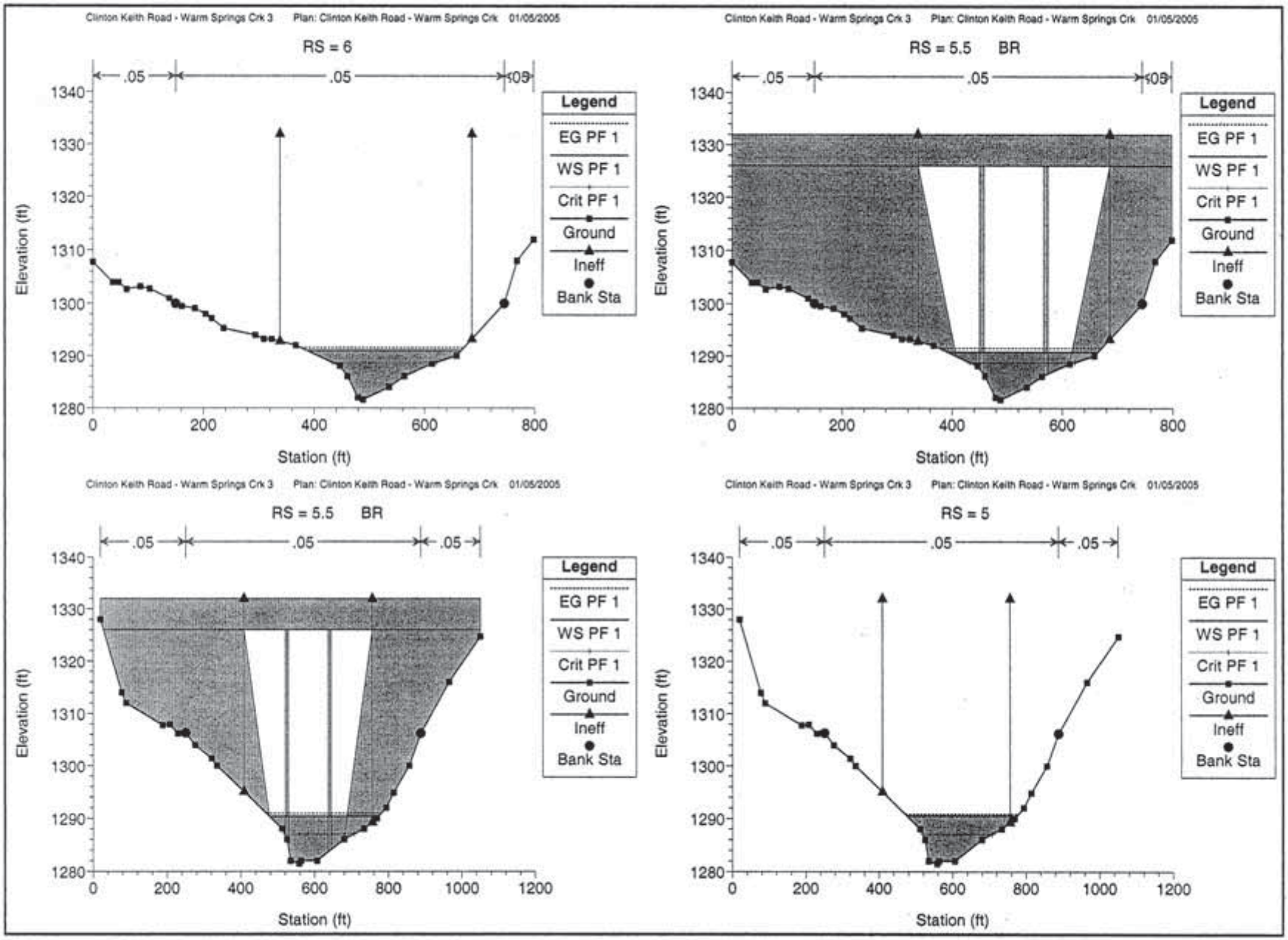
Plan: Clinton Keit  Warm Springs  1  RS: .25  Culv Group:  Culvert #1  Profile: PF 1

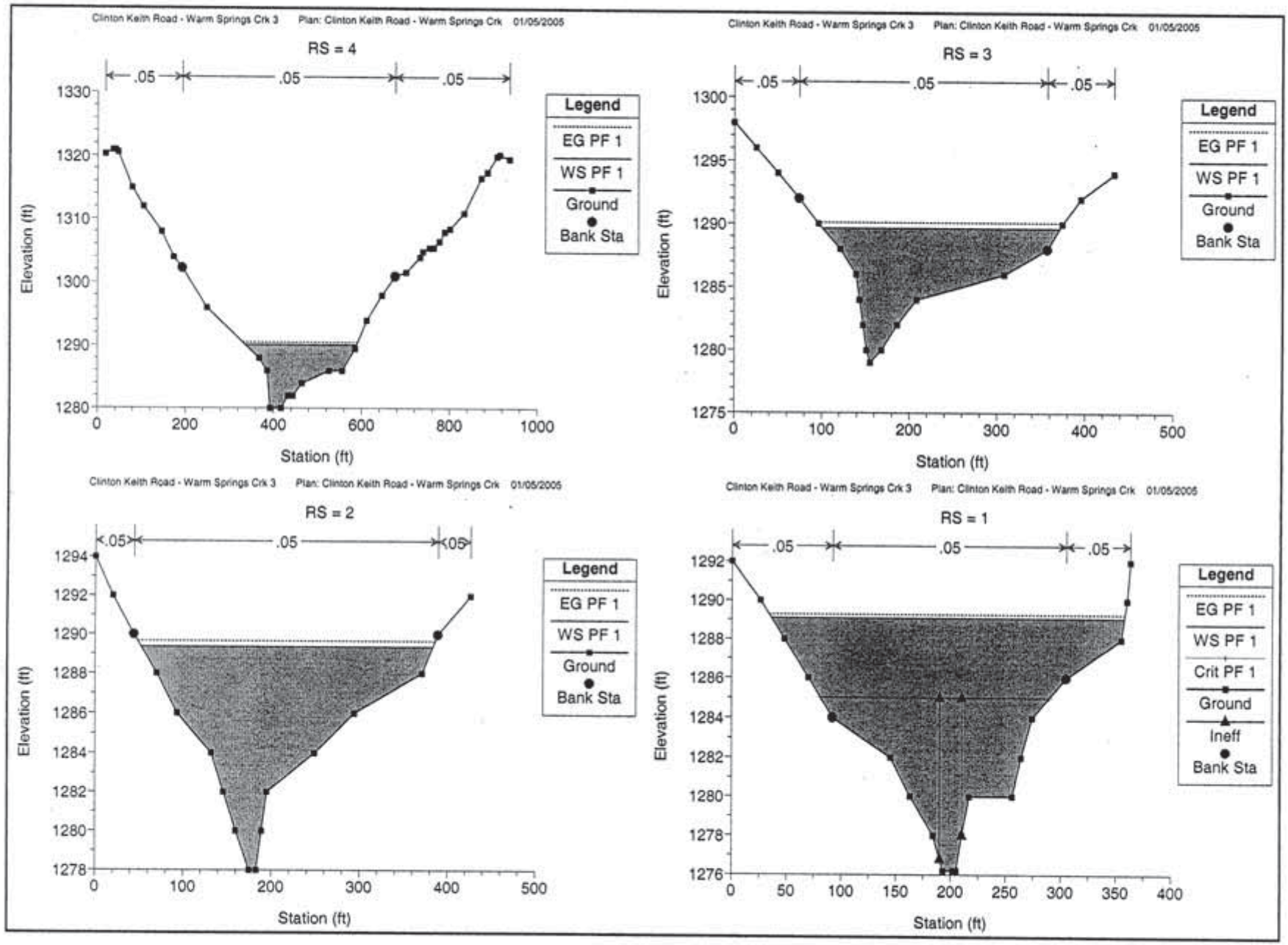
| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 635.24 | Culv Full Len (ft) | 75.00 |
| # Barrels | 3 | Culv Vel US (ft/s) | 10.78 |
| Q Barrel (cfs) | 211.75 | Culv Vel DS (ft/s) | 10.78 |
| E.G. US. (ft) | 1289.28 | Culv Inv El Up (ft) | 1276.20 |
| W.S. US. (ft) | 1289.08 | Culv Inv El Dn (ft) | 1272.00 |
| E.G. DS (ft) | 1285.85 | Culv Frctn Ls (ft) | 1.69 |
| W.S. DS (ft) | 1284.16 | Culv Exit Loss (ft) | 0.12 |
| Delta EG (ft) | 3.43 | Culv Entr Loss (ft) | 1.63 |
| Delta WS (ft) | 4.92 | Q Weir (cfs) | 5964.76 |
| E.G. IC (ft) | 1289.20 | Weir Sta Lft (ft) | 33.96 |
| E.G. OC (ft) | 1289.28 | Weir Sta Rgt (ft) | 358.19 |
| Culvert Control | Outlet | Weir Submerg | 0.00 |
| Culv WS Inlet (ft) | 1281.20 | Weir Max Depth (ft) | 4.28 |
| Culv WS Outlet (ft) | 1277.00 | Weir Avg Depth (ft) | 3.60 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 1166.51 |
| Culv Crt Depth (ft) | 4.14 | Min El Weir Flow (ft) | 1285.01 |

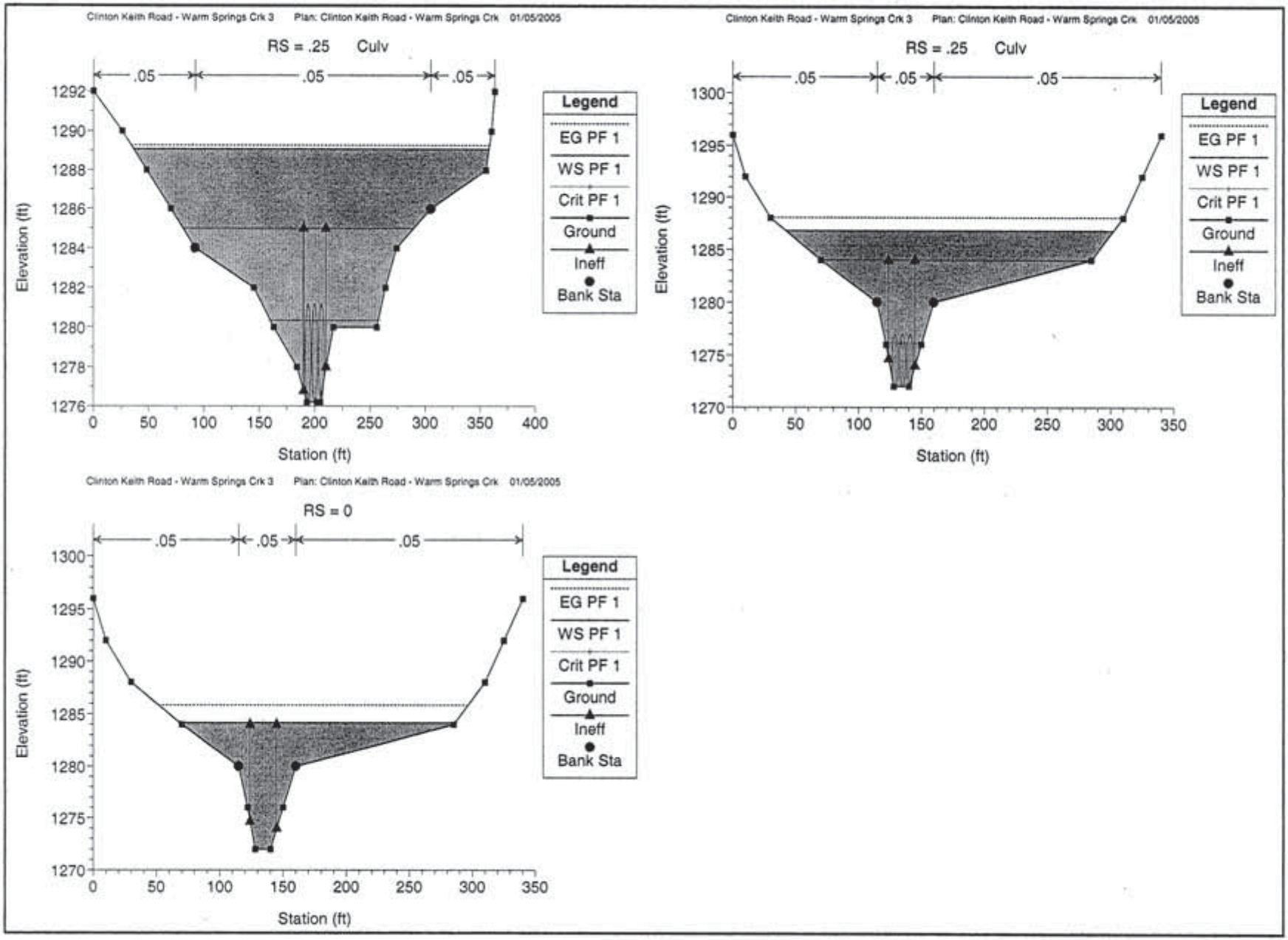
Plan: Clinton Keit  Warm Springs  1  RS: 5.5  Profile: PF 1

| E.G. US. (ft) | 1291.49 | Element | Inside BR US | Inside BR DS |
|---|---|---|---|---|
| W.S. US. (ft) | 1291.02 | E.G. Elev (ft) | 1291.44 | 1290.89 |
| Q Total (cfs) | 6600.00 | W.S. Elev (ft) | 1290.74 | 1290.38 |
| Q Bridge (cfs) | 6600.00 | Crit W.S. (ft) | 1288.73 | 1287.00 |
| Q Weir (cfs) | | Max Chl Dpth (ft) | 9.14 | 8.88 |
| Weir Sta Lft (ft) | | Vel Total (ft/s) | 6.75 | 5.74 |
| Weir Sta Rgt (ft) | | Flow Area (sq ft) | 978.09 | 1149.44 |
| Weir Submerg | | Froude # Chl | 0.53 | 0.42 |
| Weir Max Depth (ft) | | Specif Force (cu ft) | 4501.28 | 5368.89 |
| Min El Weir Flow (ft) | 1332.01 | Hydr Depth (ft) | 5.01 | 5.91 |
| Min El Prs (ft) | 1326.00 | W.P. Total (ft) | 213.12 | 218.77 |
| Delta EG (ft) | 0.66 | Conv. Total (cfs) | 80275.2 | 103238.0 |
| Delta WS (ft) | 0.49 | Top Width (ft) | 195.13 | 194.49 |
| BR Open Area (sq ft) | 10267.91 | Frctn Loss (ft) | 0.49 | 0.00 |
| BR Open Vel (ft/s) | 6.75 | C & E Loss (ft) | 0.06 | 0.06 |
| Coef of Q | | Shear Total (lb/sq ft) | 1.94 | 1.34 |
| Br Sel Method | Energy only | Power Total (lb/ft s) | 13.07 | 7.70 |


Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 10
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 9
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 8
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 7
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta


Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 6
.05
.05
.09
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 5.5 BR
.05
.05
.09
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 5.5 BR
.05
.05
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 5
.05
.05
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 4
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 3
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 2
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 1
Crit PF 1
Ineff


Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = .25 Culv
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = .25 Culv
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Clinton Keith Road - Warm Springs Crk 3 Plan: Clinton Keith Road - Warm Springs Crk 01/05/2005
RS = 0
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

# APPENDIX C

## Hydraulic Output -- French Valley Creek

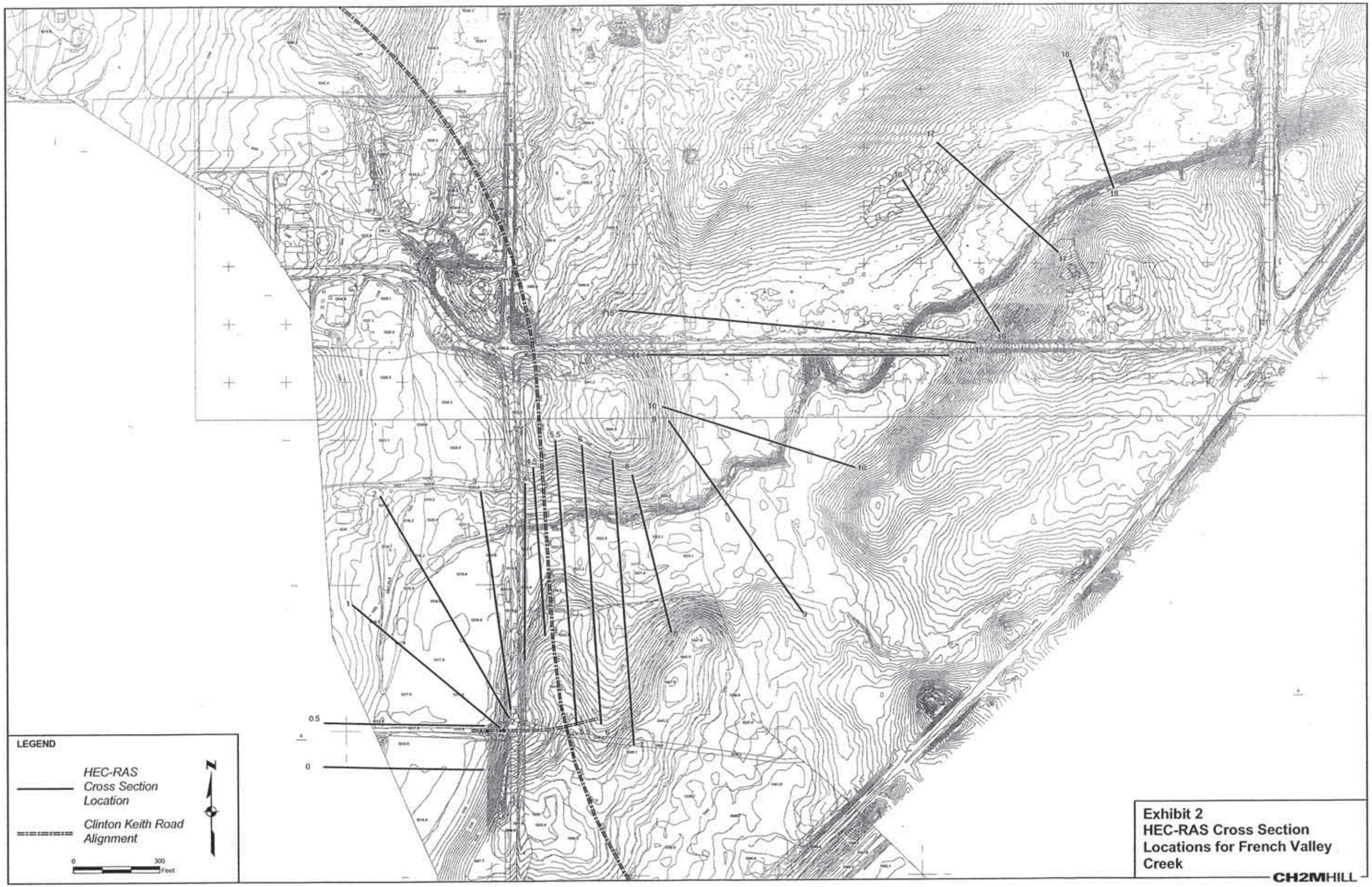
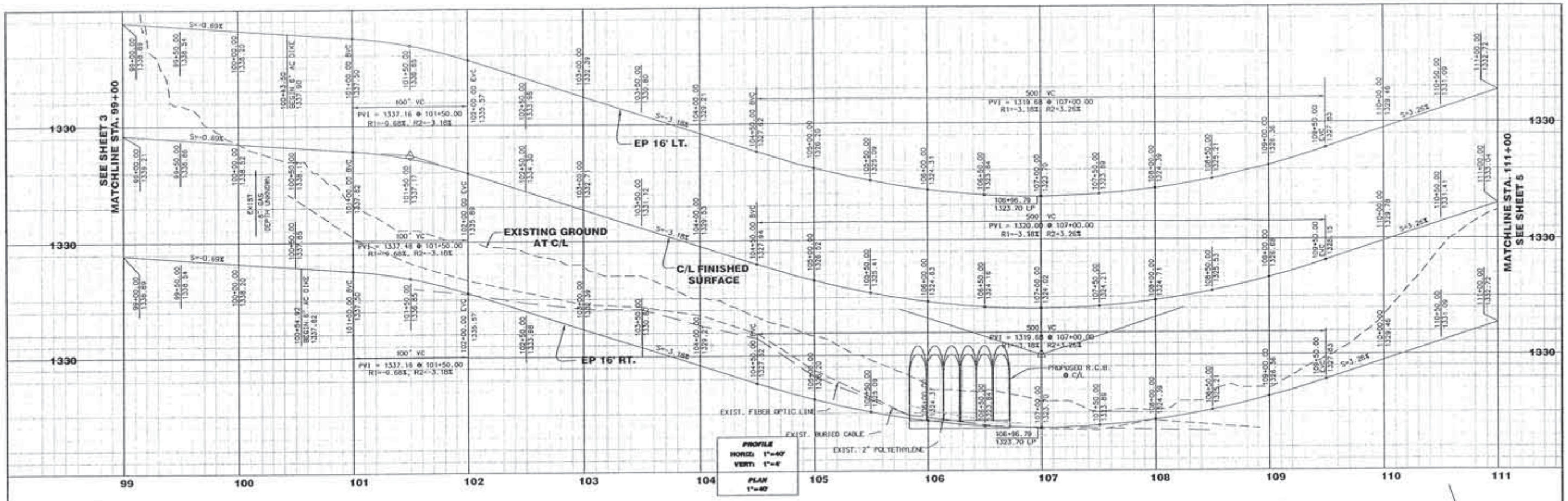
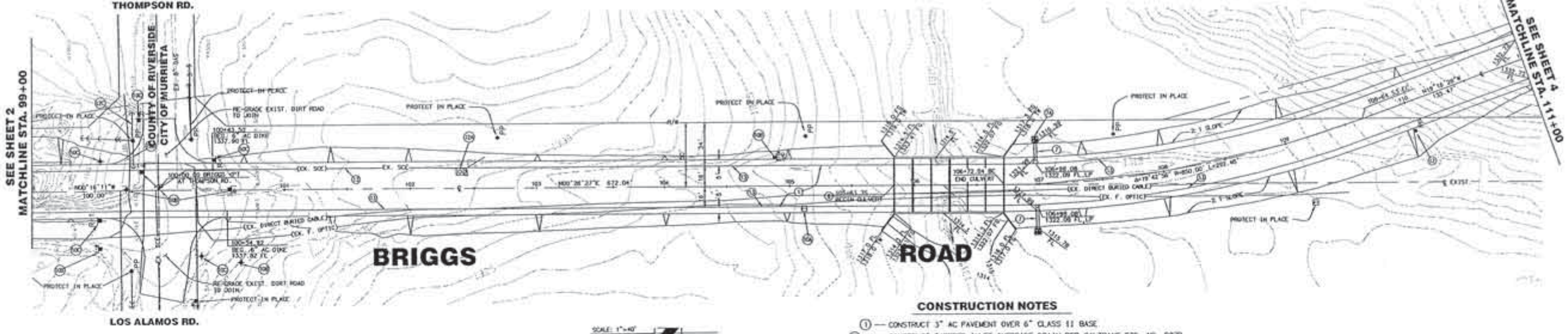



**Exhibit 2**
**HEC-RAS Cross Section Locations for French Valley Creek**

CH2MHILL

LAS \\Elvis\PROJ\WBG\Clinton_Keith_Road\mxd\hecras2.mxd 01/04/05




## CONSTRUCTION NOTES

1. CONSTRUCT 3" AC PAVEMENT OVER 6" CLASS II BASE
7. CONSTRUCT TAPERED INLET OVERSIDE DRAIN PER CALTRANS STD. NO. D87D
7A. CONSTRUCT 5'x5'x.6' THICK LIGHT RIPRAP OVER 4" FILTER FABRIC
8. CONSTRUCT 6-14'W X 5'H BOX CULVERT PER CALTRANS STD. D-81 WITH TYPE 'A' CULVERT WINGWALLS PER CALTRANS STD. D-84
09. RELOCATE EXIST. TELEPHONE RISER
10. RELOCATE EXISTING SIGN
10'. RELOCATED EXISTING SIGN
12. ADJUST EXIST. POWER POLE TO GRADE
23. ADJUST ELECTRICAL MANHOLE TO GRADE
28. RELOCATE EXISTING GUY WIRE
X. RELOCATED EXISTING GUY WIRE
13. CONSTRUCT 6" AC DIKE PER RIVERSIDE COUNTY STD. NO. A87.

SCALE: 1"=40'
40 0 40 80 120
GRAPHIC SCALE

DIG ALERT
DIAL TOLL FREE 1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

CITY OF MURRIETA
APPROVED
JAMES ELERY KINLEY, CITY ENGINEER
RCE 34908 EXP. DATE: 9-30-05
DATE

APPROVED FOR SIGNATURE
WILLIAM SIKKT, BERRYMAN/HENIGAR
RCE NO. 48819 EXP. 9-30-06
DATE

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for knowing the accuracy and acceptability of the design herein. In the event of discrepancies arising after county approval or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the county.

| MARK | BY | DATE |
|---|---|---|
| ENGINEER | | |

REVISIONS

| APPR | DATE |
|---|---|
| COUNTY | |

SEAL-COUNTY: REGISTERED PROFESSIONAL ENGINEER KHALED A. OTHMAN No. 33950 Exp. 6/30/06 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY
KHALED A. OTHMAN
R.C.E. NO. 33950
EXP. DATE: 6-30-06
DATE:
RECOMMENDED
DATE:

SEAL-ENGINEER: REGISTERED PROFESSIONAL ENGINEER JOHN D. TANNER III No. Exp. CIVIL STATE OF CALIFORNIA

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
27555 YNEZ ROAD, SUITE 400
TEMECULA, CALIFORNIA 92591-6579
909.676.8042 • FAX 909.676.7240 • www.RBF.com
PREPARED BY: JOHN D. TANNER III
EXP. DATE: 6-30-06
R.C.E. NO. 60132
DATE:

BENCHMARK: ELEV. 1339.039

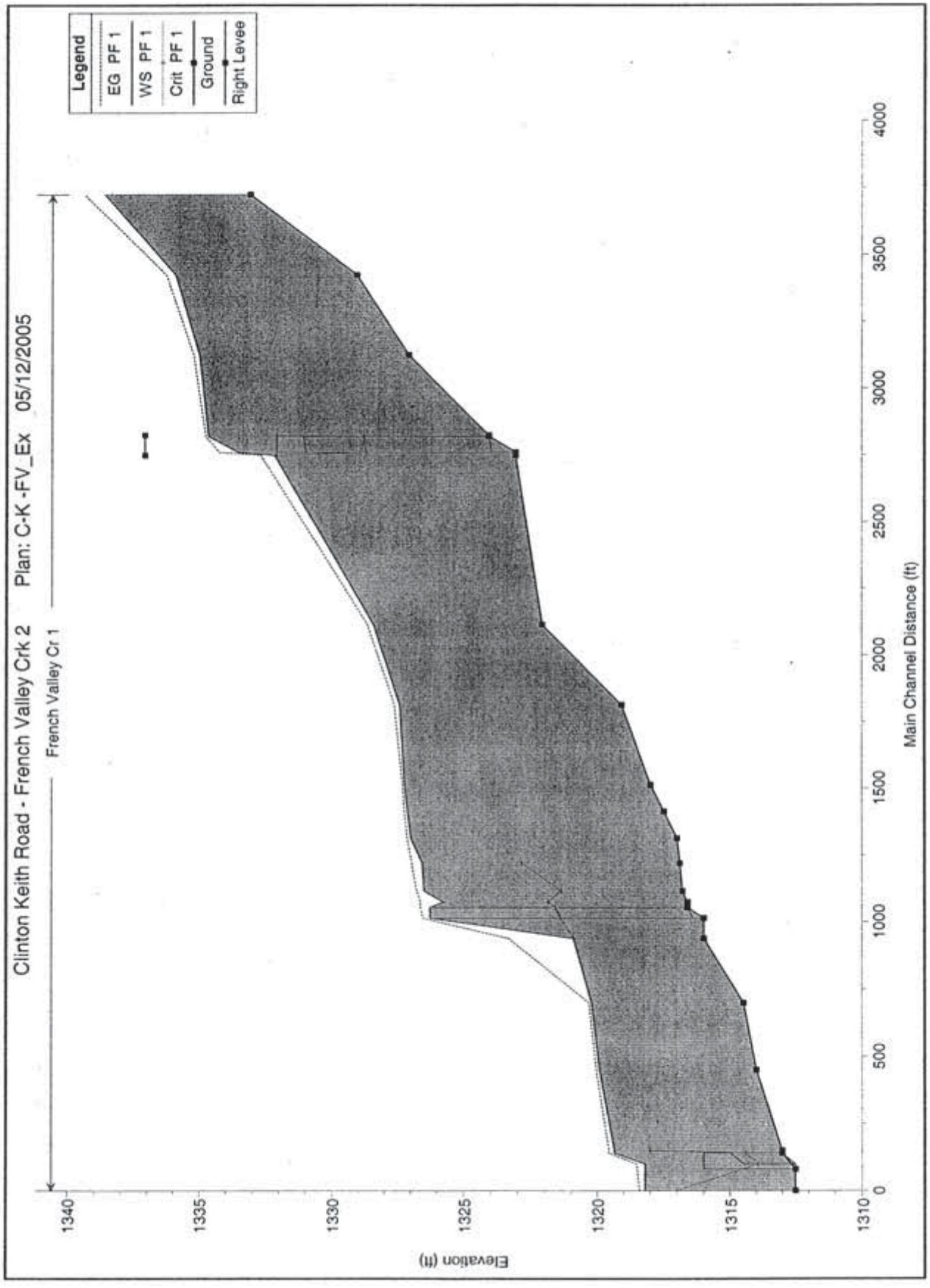
| | |
|---|---|
| DRAWN | M. DOTY |
| DESIGNED | M. DOTY |
| CHECKED | J. TANNER |
| SCALE | AS SHOWN |
| JOB NUMBER | 15-110992 |
| DATE | |

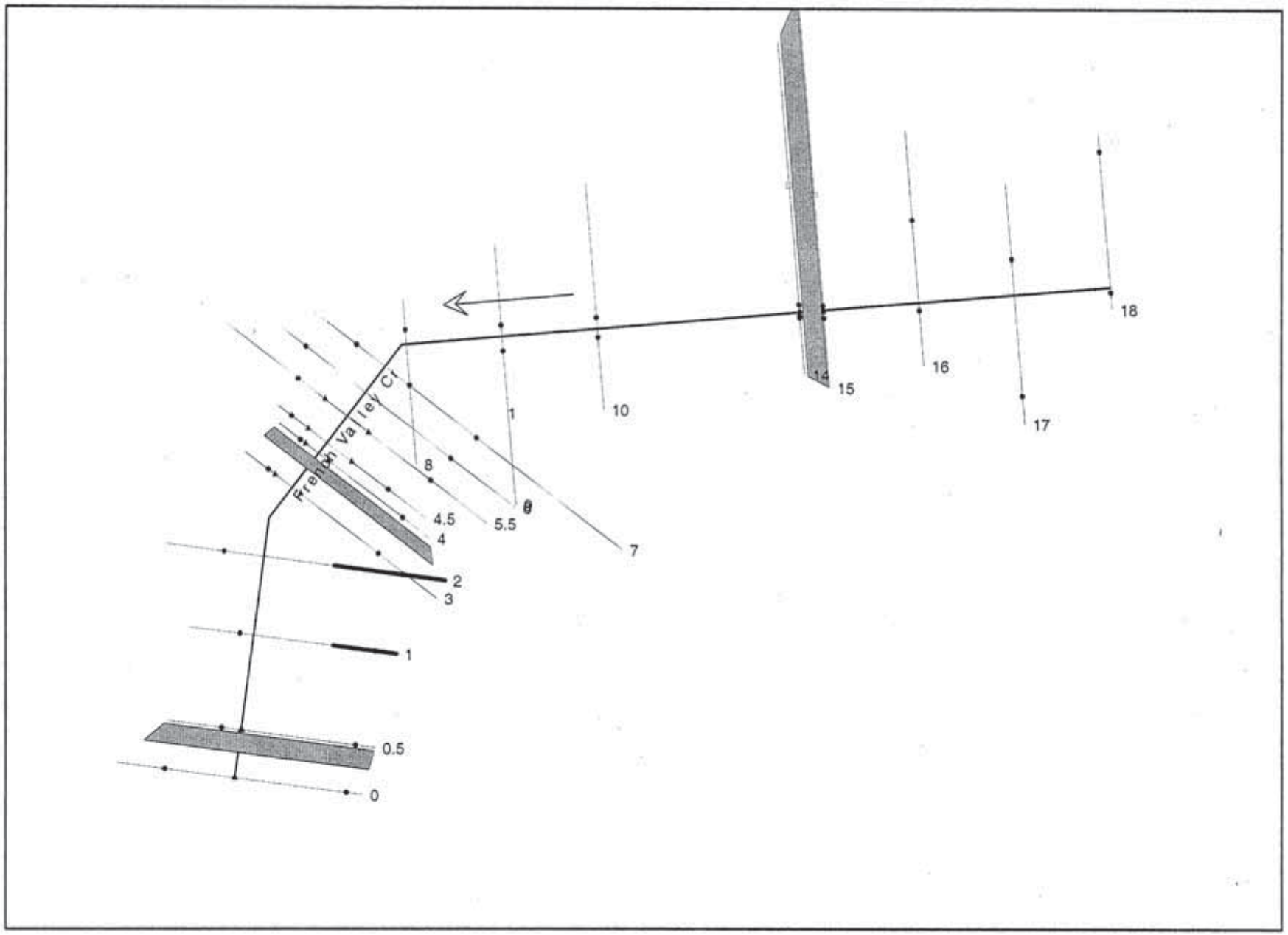
TRACT NO. 29484 IP - 040177
COUNTY OF RIVERSIDE
SCHEDULE "A"
OFF-SITE STREET IMPROVEMENT PLAN
BRIGGS ROAD INTERIM IMPROVEMENTS
FOR: D.R. HORTON W.O. COUNTY FILE NO.

SHEET NO. 25 OF 27 SHEETS

H:\PDATA\15100992\CADD\LAND\LV\IMPROVE\STREET\SR25TO525.DWG MDOTY 12/13/04 10:33 am

French Valley - Existing




French Valley Ct
18
14
15
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17
10
1
8
4.5
5.5
6
7
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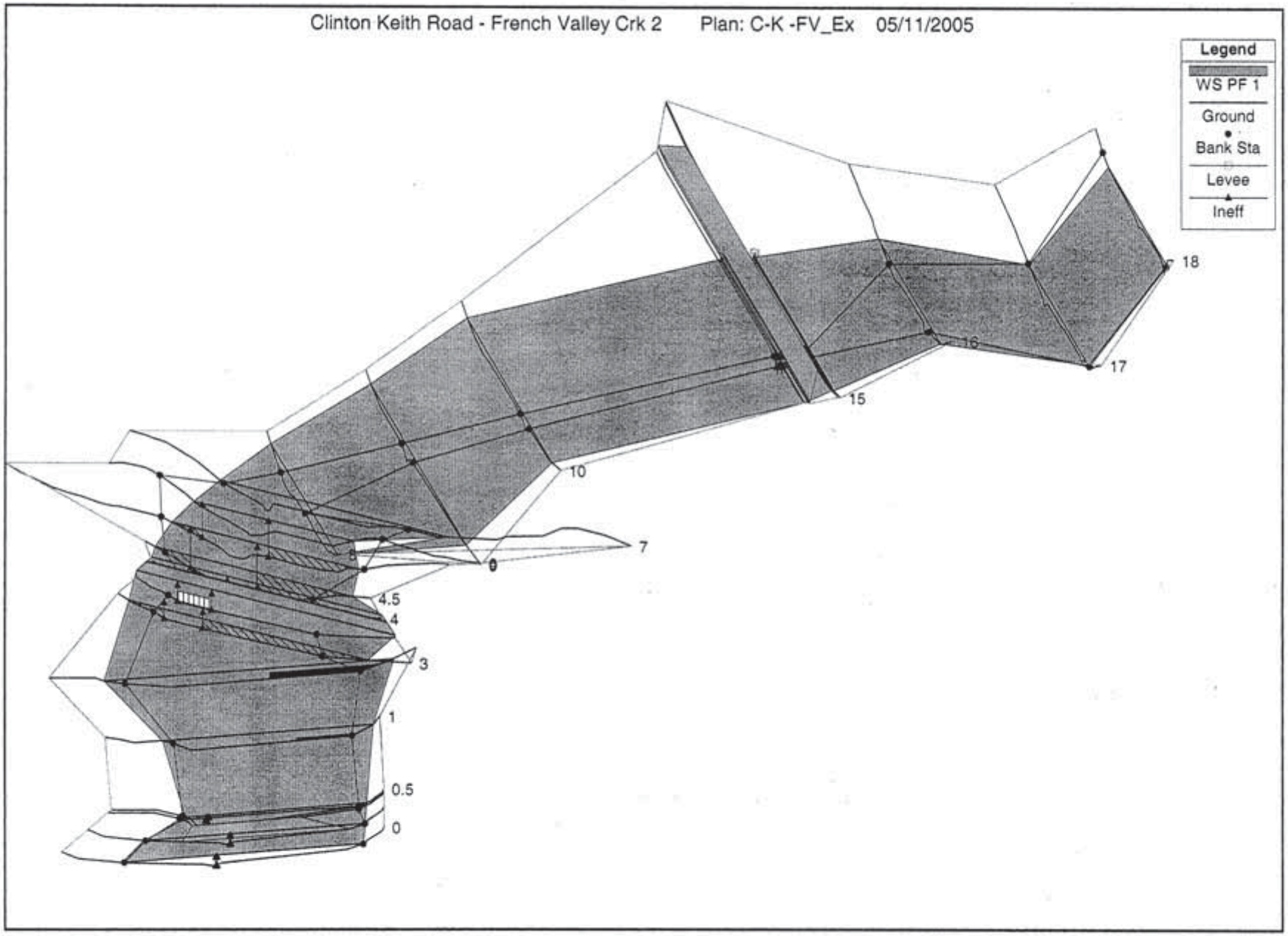
2
3
1
0.5
0


Clinton Keith Road - French Valley Crk 2 Plan: C-K -FV_Ex 05/11/2005
Legend
WS PF 1
Ground
Bank Sta
Levee
Ineff
18
17
16
15
10
7
4.5
4
3
1
0.5
0

HEC-RAS Plan: ex w 88dat River: French Valley Cr Reach: 1 Profile: PF 1

| Reach | River Sta | Profile | Q Total | Cum Ch Len | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| 1 | 18 | PF 1 | 6100.00 | 3724.42 | 1333.10 | 1338.63 | 1338.39 | 1339.41 | 0.020573 | 7.07 | 864.22 | 405.34 | 0.85 |
| 1 | 17 | PF 1 | 6100.00 | 3424.42 | 1329.10 | 1335.93 | | 1336.29 | 0.005884 | 4.78 | 1276.38 | 419.31 | 0.48 |
| 1 | 16 | PF 1 | 6100.00 | 3124.42 | 1327.10 | 1335.00 | | 1335.23 | 0.002211 | 3.98 | 1665.87 | 437.74 | 0.32 |
| 1 | 15 | PF 1 | 6100.00 | 2824.42 | 1324.10 | 1334.67 | 1332.11 | 1334.77 | 0.000908 | 3.09 | 2421.89 | 555.14 | 0.21 |
| 1 | 14.5 | | Culvert | | | | | | | | | | |
| 1 | 14 | PF 1 | 6100.00 | 2749.42 | 1323.10 | 1332.19 | 1332.11 | 1332.71 | 0.009428 | 8.12 | 1202.72 | 593.00 | 0.64 |
| 1 | 10 | PF 1 | 6100.00 | 2114.42 | 1322.10 | 1328.44 | | 1328.67 | 0.004143 | 4.61 | 1603.73 | 600.18 | 0.42 |
| 1 | 9 | PF 1 | 6100.00 | 1814.42 | 1319.10 | 1327.42 | | 1327.63 | 0.002922 | 4.78 | 1837.21 | 676.68 | 0.37 |
| 1 | 8 | PF 1 | 6100.00 | 1514.42 | 1318.00 | 1327.24 | | 1327.32 | 0.000435 | 2.42 | 2855.26 | 468.11 | 0.15 |
| 1 | 7 | PF 1 | 6100.00 | 1414.42 | 1317.50 | 1327.13 | | 1327.25 | 0.001168 | 2.78 | 2258.91 | 585.36 | 0.23 |
| 1 | 6 | PF 1 | 6100.00 | 1314.42 | 1317.00 | 1327.00 | | 1327.13 | 0.001089 | 2.91 | 2096.73 | 409.57 | 0.23 |
| 1 | 5.5 | PF 1 | 6100.00 | 1221.00 | 1316.90 | 1326.58 | 1322.86 | 1326.97 | 0.002097 | 5.03 | 1212.25 | 480.32 | 0.33 |
| 1 | 4.5 | PF 1 | 6100.00 | 1117.00 | 1316.80 | 1326.50 | 1321.37 | 1326.78 | 0.001137 | 4.19 | 1455.78 | 508.10 | 0.25 |
| 1 | 4 | PF 1 | 6100.00 | 1075.00 | 1316.60 | 1325.76 | 1321.86 | 1326.63 | 0.004236 | 7.48 | 815.50 | 89.00 | 0.44 |
| 1 | 3.5 | | Culvert | | | | | | | | | | |
| 1 | 3 | PF 1 | 6100.00 | 940.00 | 1316.00 | 1320.91 | 1320.91 | 1323.36 | 0.021334 | 12.54 | 486.32 | 611.49 | 1.00 |
| 1 | 2 | PF 1 | 6100.00 | 700.00 | 1314.50 | 1320.22 | | 1320.32 | 0.001221 | 2.60 | 2436.47 | 690.92 | 0.23 |
| 1 | 1 | PF 1 | 6100.00 | 450.00 | 1314.00 | 1319.92 | | 1320.04 | 0.001086 | 2.82 | 2227.44 | 502.04 | 0.22 |
| 1 | 0.5 | PF 1 | 6100.00 | 150.00 | 1313.00 | 1319.35 | 1318.01 | 1319.57 | 0.002460 | 3.70 | 1658.60 | 432.50 | 0.33 |
| 1 | 0.25 | | Culvert | | | | | | | | | | |
| 1 | 0 | PF 1 | 6100.00 | | 1312.50 | 1318.19 | 1317.01 | 1318.41 | 0.004003 | 3.77 | 1618.92 | 576.18 | 0.39 |

Plan: ex w 88dat  French Valley Cr  1  RS: 14.5  Culv Group:  Culvert #1  Profile: PF 1

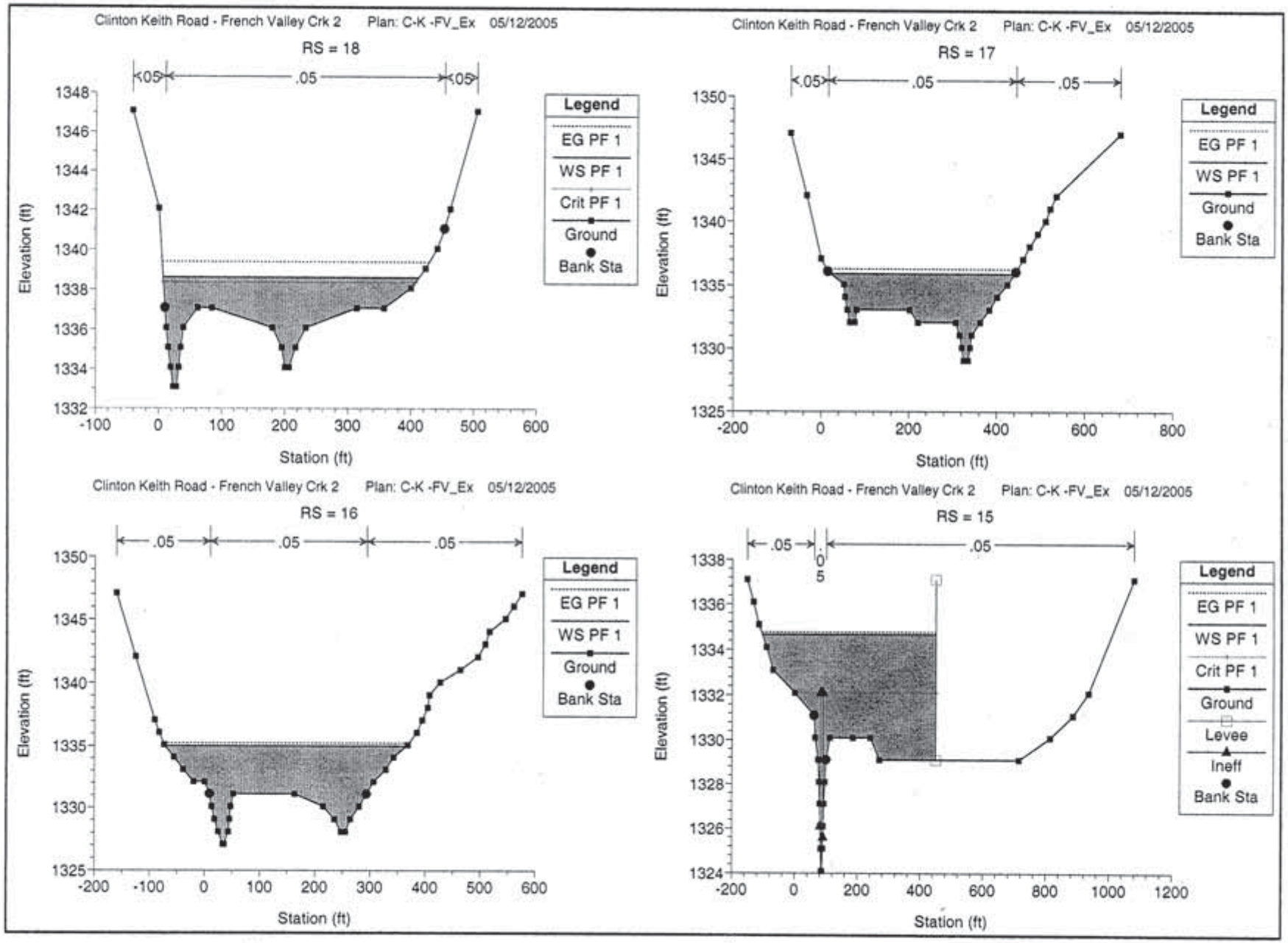
| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 321.80 | Culv Full Len (ft) | 60.00 |
| # Barrels | 1 | Culv Vel US (ft/s) | 8.36 |
| Q Barrel (cfs) | 321.80 | Culv Vel DS (ft/s) | 8.36 |
| E.G. US. (ft) | 1334.77 | Culv Inv El Up (ft) | 1324.10 |
| W.S. US. (ft) | 1334.67 | Culv Inv El Dn (ft) | 1324.00 |
| E.G. DS (ft) | 1332.71 | Culv Frctn Ls (ft) | 0.52 |
| W.S. DS (ft) | 1332.19 | Culv Exit Loss (ft) | 0.57 |
| Delta EG (ft) | 2.07 | Culv Entr Loss (ft) | 0.98 |
| Delta WS (ft) | 2.47 | Q Weir (cfs) | 5774.73 |
| E.G. IC (ft) | 1334.74 | Weir Sta Lft (ft) | -107.83 |
| E.G. OC (ft) | 1334.77 | Weir Sta Rgt (ft) | 450.00 |
| Culvert Control | Outlet | Weir Submerg | 0.03 |
| Culv WS Inlet (ft) | 1331.10 | Weir Max Depth (ft) | 2.67 |
| Culv WS Outlet (ft) | 1331.00 | Weir Avg Depth (ft) | 2.48 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 1385.38 |
| Culv Crt Depth (ft) | 4.72 | Min El Weir Flow (ft) | 1332.11 |

Plan: ex w 88dat  French Valley Cr  1  RS: 3.5  Culv Group:  Culvert #1  Profile: PF 1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 5751.07 | Culv Full Len (ft) | 40.00 |
| # Barrels | 6 | Culv Vel US (ft/s) | 13.69 |
| Q Barrel (cfs) | 958.51 | Culv Vel DS (ft/s) | 13.69 |
| E.G. US. (ft) | 1326.63 | Culv Inv El Up (ft) | 1316.60 |
| W.S. US. (ft) | 1325.76 | Culv Inv El Dn (ft) | 1316.40 |
| E.G. DS (ft) | 1323.36 | Culv Frctn Ls (ft) | 0.87 |
| W.S. DS (ft) | 1320.91 | Culv Exit Loss (ft) | 0.96 |
| Delta EG (ft) | 3.28 | Culv Entr Loss (ft) | 1.46 |
| Delta WS (ft) | 4.85 | Q Weir (cfs) | 348.93 |
| E.G. IC (ft) | 1326.80 | Weir Sta Lft (ft) | 0.00 |
| E.G. OC (ft) | 1326.63 | Weir Sta Rgt (ft) | 589.00 |
| Culvert Control | Outlet | Weir Submerg | 0.00 |
| Culv WS Inlet (ft) | 1321.60 | Weir Max Depth (ft) | 0.37 |
| Culv WS Outlet (ft) | 1321.40 | Weir Avg Depth (ft) | 0.37 |
| Culv Nml Depth (ft) | 5.00 | Weir Flow Area (sq ft) | 219.72 |
| Culv Crt Depth (ft) | 5.00 | Min El Weir Flow (ft) | 1326.27 |

Plan: ex w 88dat  French Valley Cr  1 RS: 0.25  Culv Group: Culvert #1  Profile: PF 1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 15.61 | Culv Full Len (ft) | 40.00 |
| # Barrels | 1 | Culv Vel US (ft/s) | 4.97 |
| Q Barrel (cfs) | 15.61 | Culv Vel DS (ft/s) | 4.97 |
| E.G. US. (ft) | 1319.57 | Culv Inv El Up (ft) | 1313.00 |
| W.S. US. (ft) | 1319.35 | Culv Inv El Dn (ft) | 1312.50 |
| E.G. DS (ft) | 1318.41 | Culv Frctn Ls (ft) | 0.65 |
| W.S. DS (ft) | 1318.19 | Culv Exit Loss (ft) | 0.16 |
| Delta EG (ft) | 1.16 | Culv Entr Loss (ft) | 0.35 |
| Delta WS (ft) | 1.16 | Q Weir (cfs) | 6089.09 |
| E.G. IC (ft) | 1319.56 | Weir Sta Lft (ft) | 38.05 |
| E.G. OC (ft) | 1319.57 | Weir Sta Rgt (ft) | 475.68 |
| Culvert Control | Outlet | Weir Submerg | 0.57 |
| Culv WS Inlet (ft) | 1315.00 | Weir Max Depth (ft) | 3.57 |
| Culv WS Outlet (ft) | 1314.50 | Weir Avg Depth (ft) | 3.00 |
| Culv Nml Depth (ft) | | Weir Flow Area (sq ft) | 1311.90 |
| Culv Crt Depth (ft) | 1.42 | Min El Weir Flow (ft) | 1316.01 |


Clinton Keith Road - French Valley Crk 2 Plan: C-K -FV_Ex 05/12/2005
RS = 18
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Clinton Keith Road - French Valley Crk 2 Plan: C-K -FV_Ex 05/12/2005
RS = 17
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - French Valley Crk 2 Plan: C-K -FV_Ex 05/12/2005
RS = 16
.05
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Clinton Keith Road - French Valley Crk 2 Plan: C-K -FV_Ex 05/12/2005
RS = 15
.05
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta